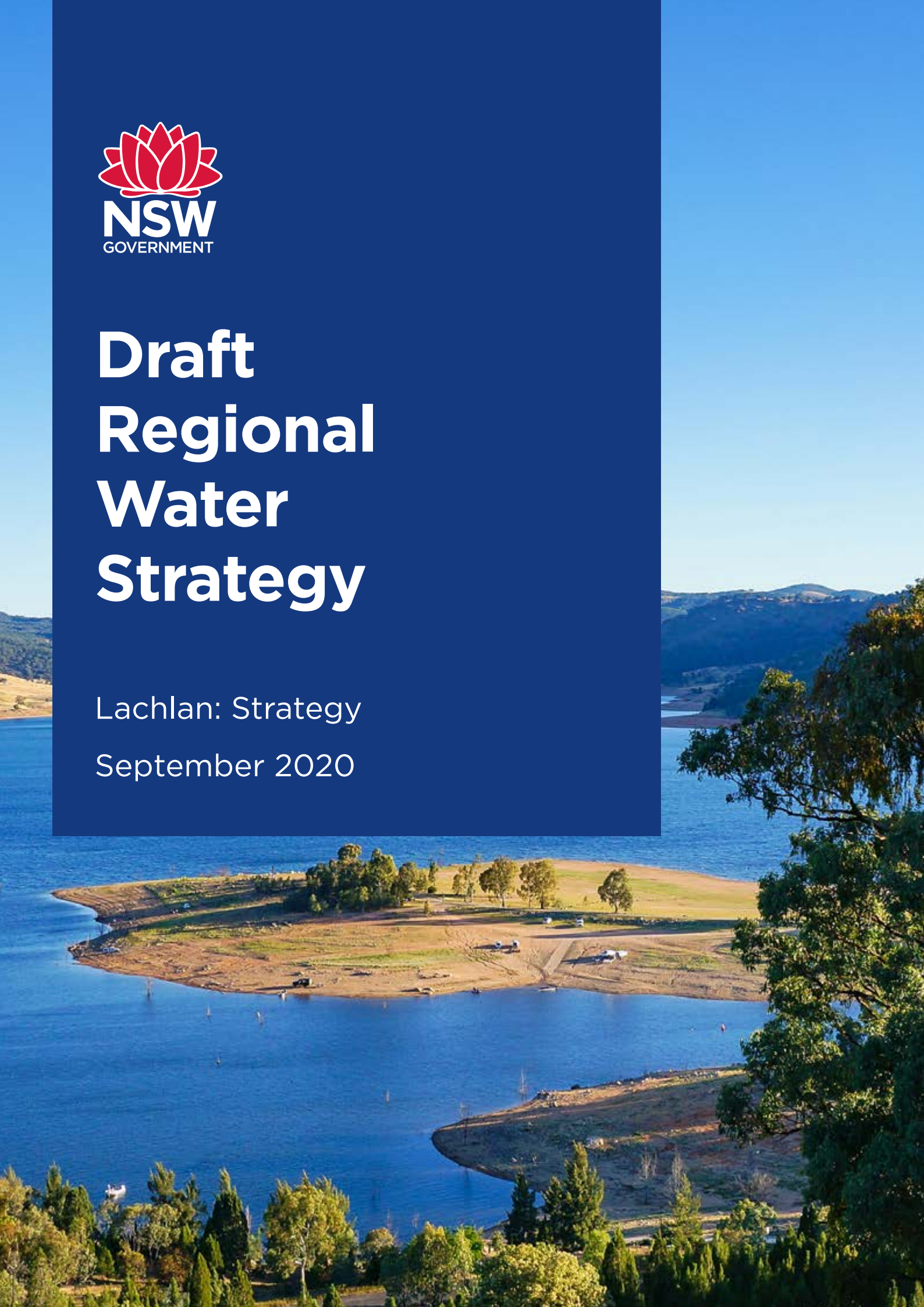
NSW GOVERNMENT

Draft Regional Water Strategy

Lachlan: Strategy

September 2020



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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 acknowledge that the people of the Nari Nari, Ngiyampaa, Wiradjuri, Barkandji and Yita Yita Nations hold a significant connection to the lands in which the Lachlan Regional Water Strategy falls upon.

The Lachlan region holds areas of great spiritual, cultural and economic importance to Aboriginal people and the NSW Government recognises the connection of the water to the people of these nations.

We recognise the intrinsic connection of Traditional Owners to Country and acknowledge their contribution to the management of the Lachlan Regional Water Strategy area landscape and natural resources.

NSW Department of Planning, Industry and Environment understands the need for consultation and inclusion of Traditional Owner knowledge, values and uses in water quality planning to ensure we are working towards equality in objectives and outcomes.

NSW Department of Planning, Industry and Environment is committed to continue future relationships and building strong partnerships with Aboriginal people. We thank the Elders, representatives of the Nari Nari, Ngiyampaa, Wiradjuri, Barkandji and Yita Yita Nations and Aboriginal community members who provided their knowledge throughout the regional water strategy development process.

Image courtesy of Destination NSW.

Minister's foreword

The NSW Government made a commitment before the last election to undertake comprehensive modelling that would enhance the management of water, to improve water security and better prepare our communities for future droughts.

Water is our most precious resource—for our towns, industries and maintaining our natural and cultural assets.

Our water management and understanding has improved considerably in recent times—if you can't measure it you can't manage it.

Communities have participated in tough decisions that have returned just over 1000 gigalitres to natural river flows in the past decade through the Murray-Darling Basin.

The knowledge we have garnered in the development of these strategies will underpin future investments through a better understanding of optimum water management.

Engaging with our Aboriginal communities is vital given water is an essential part of their connection to Country and culture, and their cultural water holdings will be vital to creating local jobs into the future.

I appreciate the engagement by local government in the development of the draft strategies. Their continued partnership is very important to ensure the strategies respond to the needs of catchments and which may include many local government boundaries.

Australia is no stranger to extremes, we have always had to manage our water resources through floods and prolonged droughts.

In preparing these strategies, we've engaged leading academics at a number of universities. The Paleoclimate informed rainfall and evaporation modelling was largely undertaken by the University of Newcastle and Adelaide University to help understand and mitigate risk in the most extreme circumstances.

The climate modelling in this draft strategy is based on a deliberately conservative scenario which is intended to pressure test the effectiveness of these strategies in a worst-case scenario. They also do not account for changes in how we operate the system moving forward, where in reality we will respond actively to ongoing drought conditions to prolong the availability of water for critical human needs.

These climate scenarios will not necessarily eventuate, but they give us an idea of the possible climate risks and allow us to begin planning to mitigate these risks if they arise.

The recent drought has taught us a great deal about managing our water resources and we need to put these lessons to good use in preparing for future extreme weather events.

In short, the better evidence and information we now have means we can better plan for the future to ensure this precious shared resource is managed to sustain secure regional lifestyles, create jobs, support industry and protect our precious natural environment.

There is no one size fits all policy to manage water in our regions, and I encourage all stakeholders to take part in giving us your views on how to improve these draft strategies to ensure our water management policies support the future of NSW.

Melinda Pavey
Minister for Water,
Property and Housing

Image courtesy of Destination NSW.

Contents

Snapshot

The Lachlan region

100,000
population

90,000 km²
area

Nari Nari, **Barkandji, Ngiyampaa**, **Wiradjuri** and **Yita Yita Nations**

Key regional centres incude:

Parkes, Cowra, Forbes, Young

Major river systems: Lachlan River and Belubula River

Plus a number of unregulated rivers and creeks

Existing commitments:

$650 million to raise Wyangala Dam wall

Parkes Special Activation Precinct

Major water storages:

Wyangala Dam on the Lachlan River, with a storage capacity of 1,217 GL

Carcoar Dam on the Belubula River, with a storage capacity of 35.8 GL

Key environmental assets:

Booligal Wetlands, Lake Cowal and the Great Cumbung Swamp

Threatened native species including 9 fish species, 5 frog species and 10 bird species

Gross Regional Product: **$5.8 billion**

Image courtesy of Stefanie Schulte.

Overview

Across NSW, our valuable and essential water resources are under pressure. Changing industry and employment patterns, and a more variable climate mean we face difficult decisions and choices about how to balance the different demands for this vital resource and manage our water efficiently and sustainably into the future.

The NSW Government is preparing comprehensive regional water strategies that will bring together the best and latest climate evidence with a wide range of tools and solutions to plan and manage each region's water needs over the next 20 to 40 years.

The strategies also aim to generate greater community benefits and create new economic opportunities across regional NSW from improving how we share, manage and use water.

The Lachlan Regional Water Strategy is one of 13 strategies (12 regional water strategies and a Greater Sydney Water Strategy) the Department of Planning, Industry and Environment is developing in partnership with water service providers and local councils. The final strategies will be informed by communities and other stakeholders across NSW.

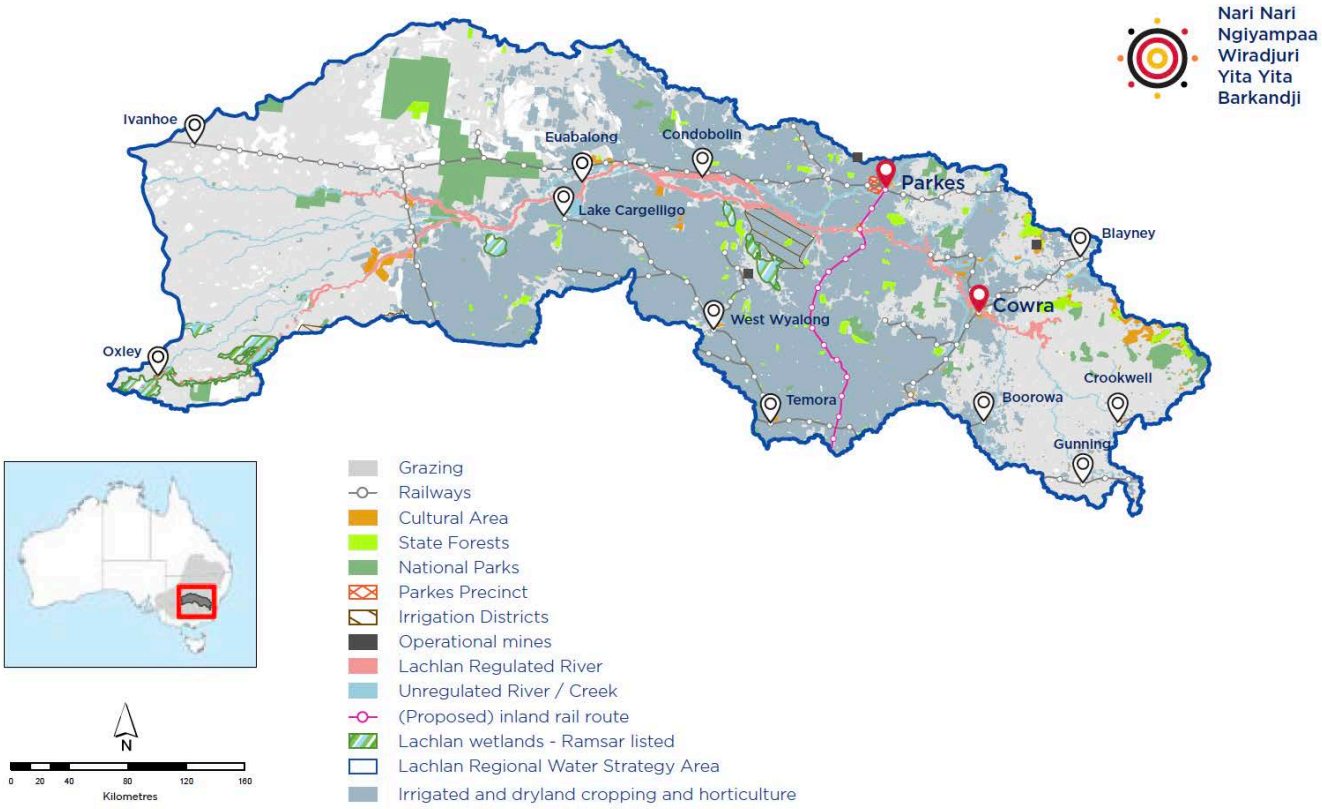
The Lachlan region

The Lachlan region (Figure 1) lies west of the Great Dividing Range in central NSW. Extending across 90,000 km^2, the region is home to 100,000 people and the centres of Parkes, Cowra, Forbes and Young. Agriculture drives the regional economy together with mining, tourism, transport and logistics.

Located predominately within the traditional lands of the Wiradjuri Nation, the Lachlan region also lies within the lands of the Ngiyampaa, Yita Yita, Barkandji and Nari Nari Nations.

The Lachlan region is changing and growing. Over the next 10 to 15 years, the region's population is expected to be steady; however, growth is expected in centres like Parkes, Cowra and Forbes. The region's industry mix is also diversifying—horticulture continues to expand, tourism is increasing, and food processing is expected to grow in coming decades. The Parkes Special Activation Precinct and the Inland Rail Project will encourage further industry development and regional growth.

Figure 1. Map of the Lachlan region



Water in the Lachlan region

The Lachlan region is the fourth largest river catchment in NSW by size, sourcing its water from the regulated Lachlan and Belubula Rivers, unregulated rivers and creeks, and groundwater. Water supports the region's towns and communities, underpins key industries and local employment and protects culturally and nationally significant environmental assets, including the Lake Cowal-Wilbertroy Wetlands, the Booligal Wetlands and the Great Cumbung Swamp.

The region has a very variable climate that can lead to extended droughts and severe floods. The Millennium Drought was the worst drought on record for the region—a period of almost 10 years without significant rainfall or inflows into the region's main storages. The drought was followed by significant floods in 2012 and 2016 which refilled storages, and rejuvenated environmental assets and habitats for native fish and bird species. However, the floods also caused damages to some industries and towns.

Over the last two years, drought conditions have returned to the Lachlan region and are placing communities, industries and the environment under stress. The current drought reinforces the importance of water for the Lachlan economy, the environment and its people and highlights the need for long-term strategic planning to deliver healthy, reliable and resilient water resources for a liveable and prosperous Lachlan region.

The region has some inherent water management challenges. The length of the river system can make it difficult to deliver water to towns, industries and environmental assets at the end of the system. The region's extreme dry and wet periods can affect water security, reliability and water quality.

Despite these challenges, towns and communities that make use of pipeline connections, treated wastewater and groundwater bores, as well as regulated river supply, have a relatively secure water supply. However, extended and severe drought periods can stress all towns and communities in the region. Securing water for smaller towns that rely mainly on unregulated rivers and creeks will also become increasingly challenging in the context of a more variable climate.

Over the years, the region's industries have adapted to the highly variable climate by adopting a conservative approach to water use and obtaining water entitlements from a range of water sources to meet their water needs and mitigate supply side risks. However, changes in industry profiles and the recent expansions of horticulture and mining developments, as well as large-scale dairying, suggests that water use and demand patterns could be changing in the region. Ongoing work is required to better understand how climate variability and climate change may impact these industries, and to identify better ways of managing water that will add value to existing and emerging industries in the region.

Improved water reliability will also be critical to attracting businesses and jobs to the region, supporting the growing tourism industry and taking up new opportunities offered by the Parkes Special Activation Precinct, Inland Rail and other investments in the region. The regional water strategy aims to provide more certainty and assists water users in business planning through a greater understanding of levels of risk.

Water flowing the length of the Lachlan River provides essential environmental benefits; however, it can sometimes be difficult to provide water for a healthy environment. High evaporation rates and seepage to groundwater mean that large volumes of water are needed to provide benefits to environmental assets that rely on surface water. In addition, the region's main storages cause cold water pollution which poses risks to native and threatened fish species. Floods and droughts can also increase the risk of blackwater events or localised algae blooms. At present, despite a number of measures, the fish community of the Lachlan valley is in poor health and some species are under serious threat.

Aboriginal people in the region rely on water for their health, wellbeing and connection to Country. Aboriginal people consider that current water access licences are unable to meet the full spectrum of their spiritual, cultural, environmental, social and economic needs, as defined by the 2007 Echuca Declaration[1]. Aboriginal people also seek more opportunities to manage water using their cultural knowledge and improved economic opportunities, either as license holders or as partners in decision making.

Definitions

We are using the following definitions in the regional water strategies:

Water security in the context of regional water strategies refers to the acceptable chance of not 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.

Water reliability refers to how often an outcome is achieved. It is often considered to be the likelihood, in percentage of years, of receiving full water allocations by the end of a water year for a licence category. For example, a 60% reliability means that in 60% of years a licence holder can expect to receive 100% of their licensed entitlement by the end of the water year. Other measures of volumetric reliability could also be used. For example, the percentage allocation a licence holder could expect to receive at a particular time of the year as a long-term average. Reliability may also refer to how often an acceptable water quality is available. A reliable water supply gives some clarity to water users and helps them plan to meet their water needs.

Resilient regional centres means water users are able to withstand extreme events, such as drought and flood, and/or adapt and respond to changes caused by extreme events.

1. Murray Lower Darling Rivers Indigenous Nations 2007, Echuca Declaration, Part 1. The full declaration is available here: www.mdba.gov.au/sites/default/files/pubs/sa-mldrin-echuca-declaration-2009_0.PDF

Future climate risks

The NSW Government has invested in new climate datasets and improved modelling that provide a more sophisticated understanding of historic climate variability in the Lachlan region, as well as potential future climate risks over the next 40+ years. This means that we can move from making decisions based on a single 'worst case' recorded drought to a much more comprehensive understanding of potential extreme events[2].

We can now better plan for plausible future climate change scenarios, better understand the climate risks faced by different water users across NSW (such as the likely frequency, duration and severity of droughts and floods) and better manage our water resources over the medium and long-term to mitigate these risks.

At the same time, this new evidence allows us to look beyond these risks to plan for a better future in which more efficient and innovative water management can support diversity, growth and opportunity in our regional towns, communities and industries.

This new information is the basis for preparing robust new water strategies for our regions and offers fresh evidence for reviewing our existing water policies, operational rules and management plans.

The new climate data and updated hydrological modelling developed for this draft regional water strategy suggest:

- the highly variable climate conditions seen historically are fairly normal when compared against long-term records
- the region will continue to be affected by prolonged dry and wet periods
- droughts similar to the Millennium Drought have occurred in the distant past and could occur in the future (but the likelihood is low)
- that if future climate change projections hold true, times between droughts could shorten which would give the system less time to recover.

This means there may be longer periods where water is in short supply. Without considering changes to how we manage the system or the rules by which we share water, water levels in the Lachlan region's main storages—Wyangala and Carcoar Dams—could be consistently lower based on future climate change projections.

Making choices for the future

Like most regions across Australia, the Lachlan region faces choices and challenges in balancing the needs of different water users as climate conditions change. However, the region's communities and industries have adapted to the variable climate, and past droughts have informed drought management plans to help address severe and prolonged dry periods. Recent government investment decisions have also sought to diversify and strengthen town water supplies.

2. For further information on the climate modelling method, see the *Regional Water Strategies Guide*.

This has put the region in a good position to tackle future climate risks.

To meet future water challenges in the Lachlan region and cater for the growth that will be stimulated by the Parkes Special Activation Precinct and Inland Rail Project, we may need to make better use of technology to reduce water demand, invest in water efficiency and conservation measures, find ways to better manage groundwater sources and make more use of recycled wastewater and stormwater.

In particular, with growth expected in the region's major centres, we need to make decisions now about how best to give these centres water security into the future and provide access to water for new commercial uses. Improved water security and reliability will also be critical to attracting people, businesses and jobs to the Lachlan region and leveraging opportunities from new investment in the area.

We also need to review the existing water allocation process, drought operating rules and the efficiency of the water trade and water pricing to make sure we enhance water resilience across the region in the future.

Any solutions we adopt will need to improve outcomes in the significant wetlands and other important environmental assets that are present along the length of the Lachlan catchment, and deliver benefits to communities that rely on these assets remaining healthy and productive.

A new, comprehensive water strategy for the Lachlan region

The Lachlan Regional Water Strategy will guide how we address future water resource challenges, make the right policy and infrastructure choices and open up new opportunities for the region.

The strategy will bring together all the tools we have—policy, planning, regulatory, educational, technology and infrastructure solutions—in an integrated package that is based on the best evidence, responds to the region's growth, balances different water needs and delivers the right amount of water for the right purpose at the right times.

The strategy will aim to provide choices to better use, share, store and deliver water in the Lachlan region.

The strategy will cover the whole Lachlan region and all water types (regulated and unregulated river flows, creeks and groundwater) and it will change how we manage water in the future.

Our vision for the strategy

Our vision for the strategy is to have healthy and resilient water resources for a liveable and prosperous Lachlan region. To achieve this, we need to position the region so there is the right amount of water of the right quality, delivered in the right way for Aboriginal people, towns and communities, industries and the environment.

In line with the objectives we have set for all regional water strategies, the Lachlan strategy has a strong focus on working closely with communities to deliver healthy, reliable and resilient water resources that:

- deliver and manage water for local communities
- enable economic prosperity
- recognise and protect Aboriginal water rights, interests and cultural values
- protect and enhance the environment
- are affordable.

The final strategy will set out clear and accountable actions for the NSW Government, local councils and industries to tackle the challenges facing the Lachlan region and maximise opportunities arising from growing regional centres and industries, major transport improvements and developments such as the Parkes Special Activation Precinct.

The strategy will build on current and planned investments and commitments to deliver further critical actions that will help secure a strong and prosperous future for the region.

To reinforce the significant water reform program undertaken by the NSW Government over the last three years, the final strategy will also help to improve the sequencing and integration of these reforms across the Lachlan region to ensure they are implemented effectively.

The department will develop an implementation plan that identifies actions and timeframes.

The options

A long list of options is presented as part of this draft strategy and includes three existing NSW Government commitments.

These commitments are to progress business cases for increasing the capacity of Wyangala Dam and the construction of a pipeline between Lake Rowlands Dam to Carcoar Dam as well as to undertake a feasibility study into the augmentation of Lake Rowlands.

Infrastructure options identified through the strategy could also benefit from the NSW Government's move to streamline the approvals process for drought-related projects. Other options, such as policy solutions, will be designed in partnership with communities.

To identify and develop options for the draft strategy, we have drawn from a range of sources including previous studies, targeted community engagement, experiences in the Millennium Drought and existing government programs. We have aligned our approach with regional development and land use strategies to ensure that all options can be integrated and sequenced with state-wide and local plans.

The options cover actions, projects, reforms and investments that focus on:

- **maintaining and diversifying water supplies**, such as new pipelines, improving storages and reuse, recycle and stormwater projects
- **protecting and enhancing natural systems**, such as fish passages, better support for water quality management and improved management of wetlands on private land
- **supporting water use efficiency and conservation**, such as water efficiency measures, pricing and trade reviews
- **strengthening community preparedness for climate extremes**, such as reviewing drought operation rules, allocation processes and improving data collection and education programs
- **improving the recognition of Aboriginal people's water rights, interests and access to water**—such as reviewing cultural water access licences, ensuring greater involvement of Aboriginal people in water management and establishing Aboriginal regional water advisory committees.

The strategy will also consider how government and local water utilities can adopt a more integrated approach to managing surface water and groundwater.

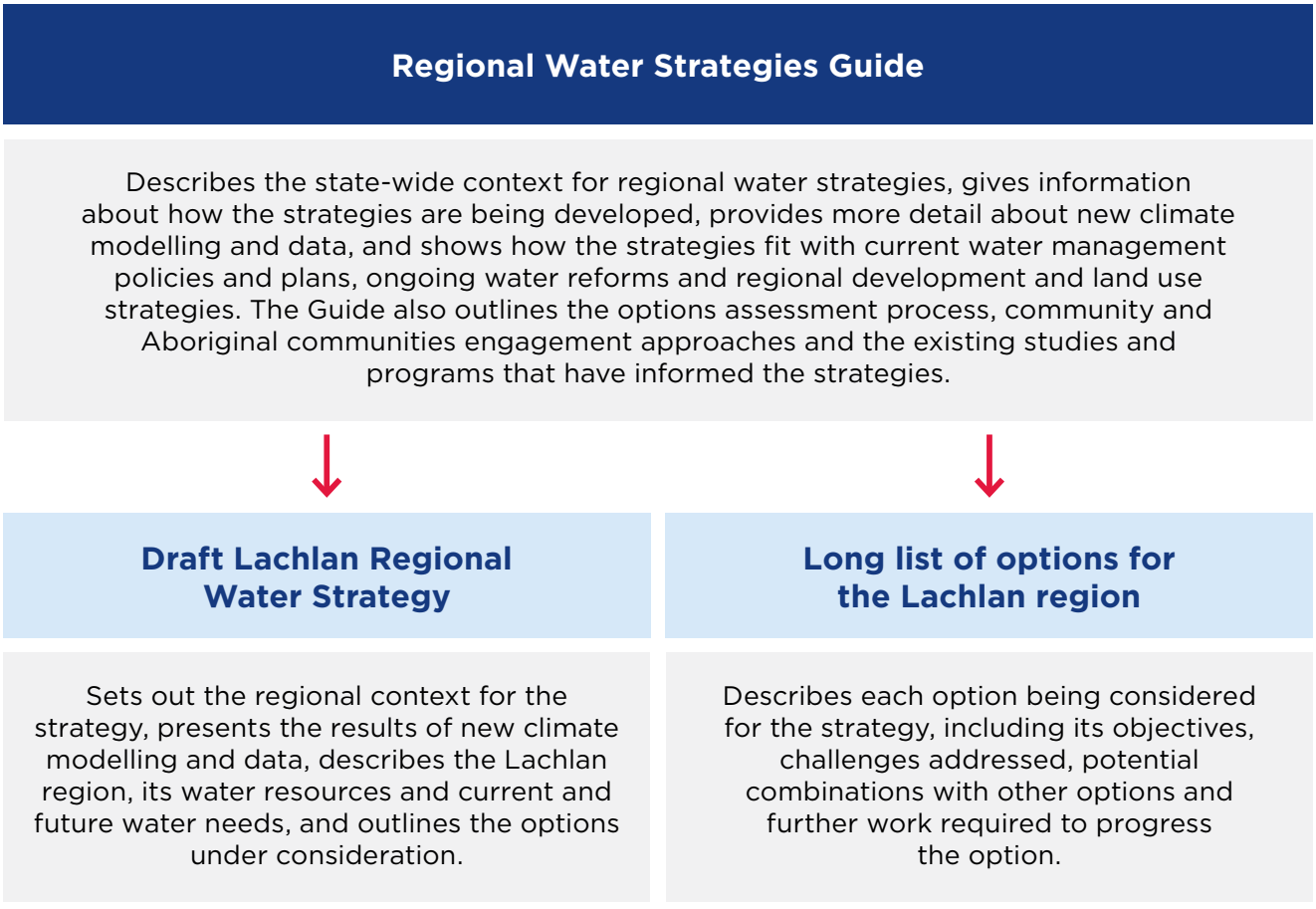
The limited hydrological connectivity between the Lachlan and downstream regions provides an opportunity to test some new and innovative ideas in the Lachlan region before considering them more broadly in other regions. However, we acknowledge that connectivity and end of system flows are important to Aboriginal people and the environment, and that options to enable flows to the end of the system to occur more frequently should be considered.

Many of the options and government commitments are interrelated. This means that to get the most benefit out of these options—and make the best use of the region's water resources—they may need to be combined into packages.

Not all options will be progressed, and many have not been costed. Following feedback on the draft strategy, we will conduct an evidence-based assessment to identify the best actions for the Lachlan region. These will form the final, comprehensive Lachlan Regional Water Strategy.

The Draft Lachlan Regional Water Strategy is accompanied by a more detailed description of the long list of options and an overarching explanatory guide that outlines the broader context for the development of regional water strategies across NSW (Figure 2).

Figure 2. Draft Lachlan Regional Water Strategy



Chapter 1

Context

Snapshot

We are preparing comprehensive regional water strategies across NSW, bringing together the best and latest climate evidence with a wide range of tools and solutions to plan and manage each region's water needs over the next 20 to 40 years.

- The regional water strategies will assess the future water needs of each region, identify the challenges and choices involved in meeting those needs and set out the actions we can take to manage risks to water security and reliability.
- Through better strategic planning the NSW Government aims to provide and manage water for towns, communities and industries, enable economic prosperity, and safeguard and enhance the environment. The strategies will also recognise and protect Aboriginal cultural values, rights and assets.
- The Lachlan Regional Water Strategy is one of 13 strategies (12 regional water strategies and a Greater Sydney Water Strategy) the Department of Planning, Industry and Environment is developing in partnership with water service providers, local councils, Aboriginal peak bodies. The final strategies will be informed by communities and other stakeholders across NSW.

New climate data and modelling, plans, studies and investments have also influenced the direction of the Lachlan Regional Water Strategy.

- A significant amount of work since the Millennium Drought including drought assessment studies and the Lachlan Incident Response Guide, has improved our understanding of the risks affecting water resource management in the Lachlan region. Community engagement has also given insights into the best way to prepare for future droughts and floods in the region.
- The NSW Government has invested in new climate datasets and improved modelling to provide a more robust and sophisticated understanding of future risks to water availability in the Lachlan region.
- The regional water strategies will build on existing NSW Government commitments to improve water security, resilience and reliability across regional NSW, including investment in water infrastructure, the repair of water and sewerage systems in Aboriginal communities, a range of state-wide water reforms and a new streamlined approval process for drought-related projects. Specifically, NSW Government Safe and Secure Water Program is a $1 billion dedicated fund to strengthening and improving town water schemes in regional NSW.
- The strategy also aligns with existing policies and plans that are improving the management of water resources across NSW, as well as being integrated with strategic and local land use planning.

1.1 Purpose of regional water strategies

Regional water strategies bring together the most up-to-date information and evidence with a wide range of tools and solutions to plan and manage each region's medium and long-term water needs.

The strategies look out over the next 20 to 40 years and look at the challenges and choices involved in meeting the region's future water needs and the actions we can take to manage risks to water availability and secure healthier, more resilient water sources.

The strategies also explore new solutions to tackling these issues with the potential to add value to the way we manage water, generate greater community-wide benefits and create new economic opportunities for each region.

With improved strategic planning around water, the NSW Government aims to achieve resilient water resources for towns and communities, industry, Aboriginal people and the environment.

The Lachlan Regional Water Strategy is one of 13 strategies (12 regional water strategies and a Greater Sydney Water Strategy) the Department of Planning, Industry and Environment is developing in partnership with water service providers, local councils, Aboriginal peak bodies, communities and other stakeholders across NSW (Figure 3).

Figure 3. Map of NSW regional water strategy regions

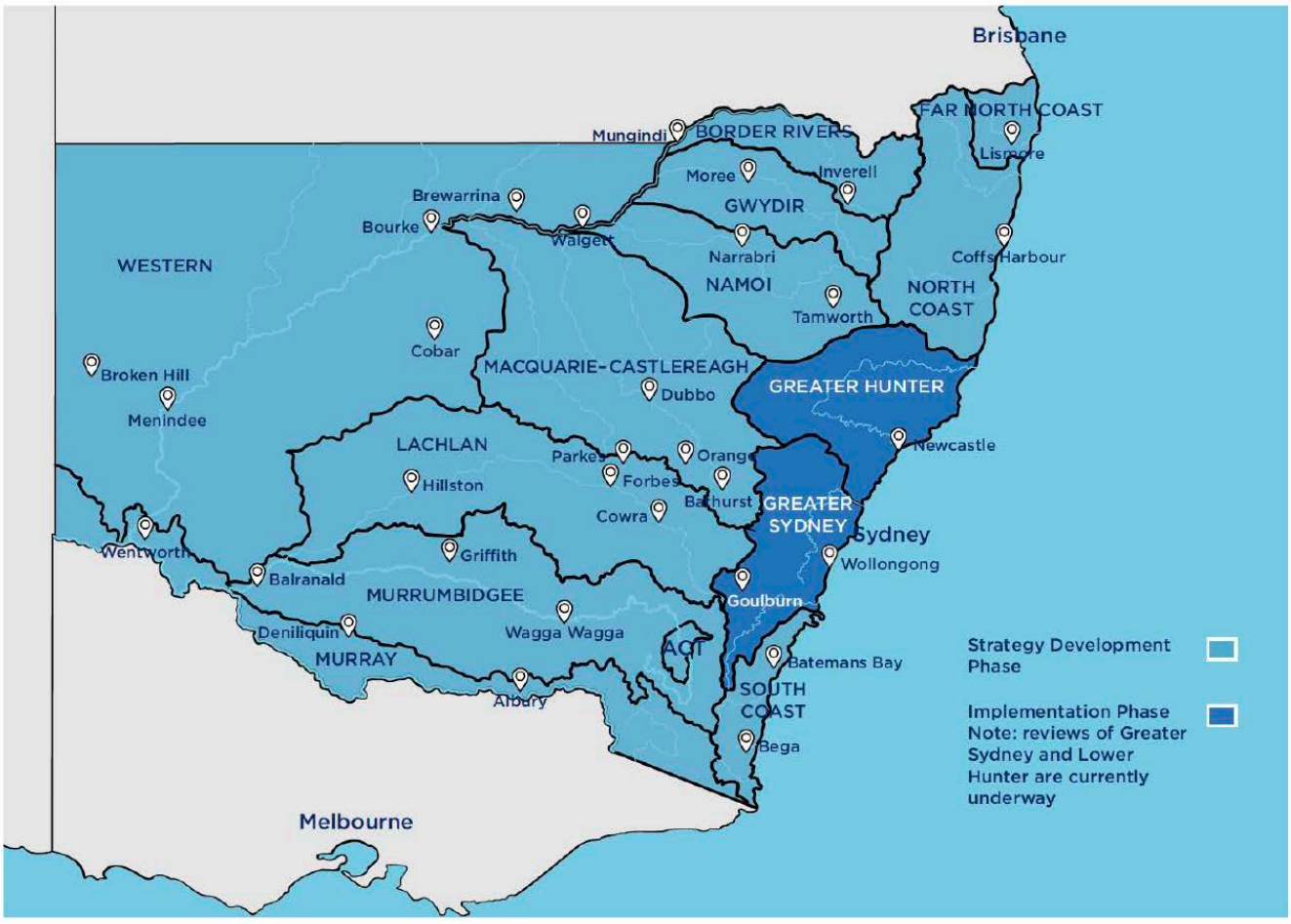


Image courtesy of Destination NSW.

1.2 Objectives of regional water strategies

Regional water strategies will set out a long-term 'roadmap' of actions to deliver five objectives. Options selected for inclusion in the final strategy for each region will need to address at least one of these objectives. Our aim is for each strategy to have a comprehensive, balanced package of options that delivers on all of these objectives (Figure 4).

Figure 4. Regional water strategies: objectives

Deliver and manage water for local communities

Improve water security, water quality and flood management for regional towns and communities.

Enable economic prosperity

Improve water access reliability for regional industries.

Recognise and protect Aboriginal water rights, interests and access to water

Including Aboriginal heritage assets.

Protect and enhance the environment

Improve the health and integrity of environmental systems and assets, including by improving water quality.

Affordability

Identify least cost policy and infrastructure options.

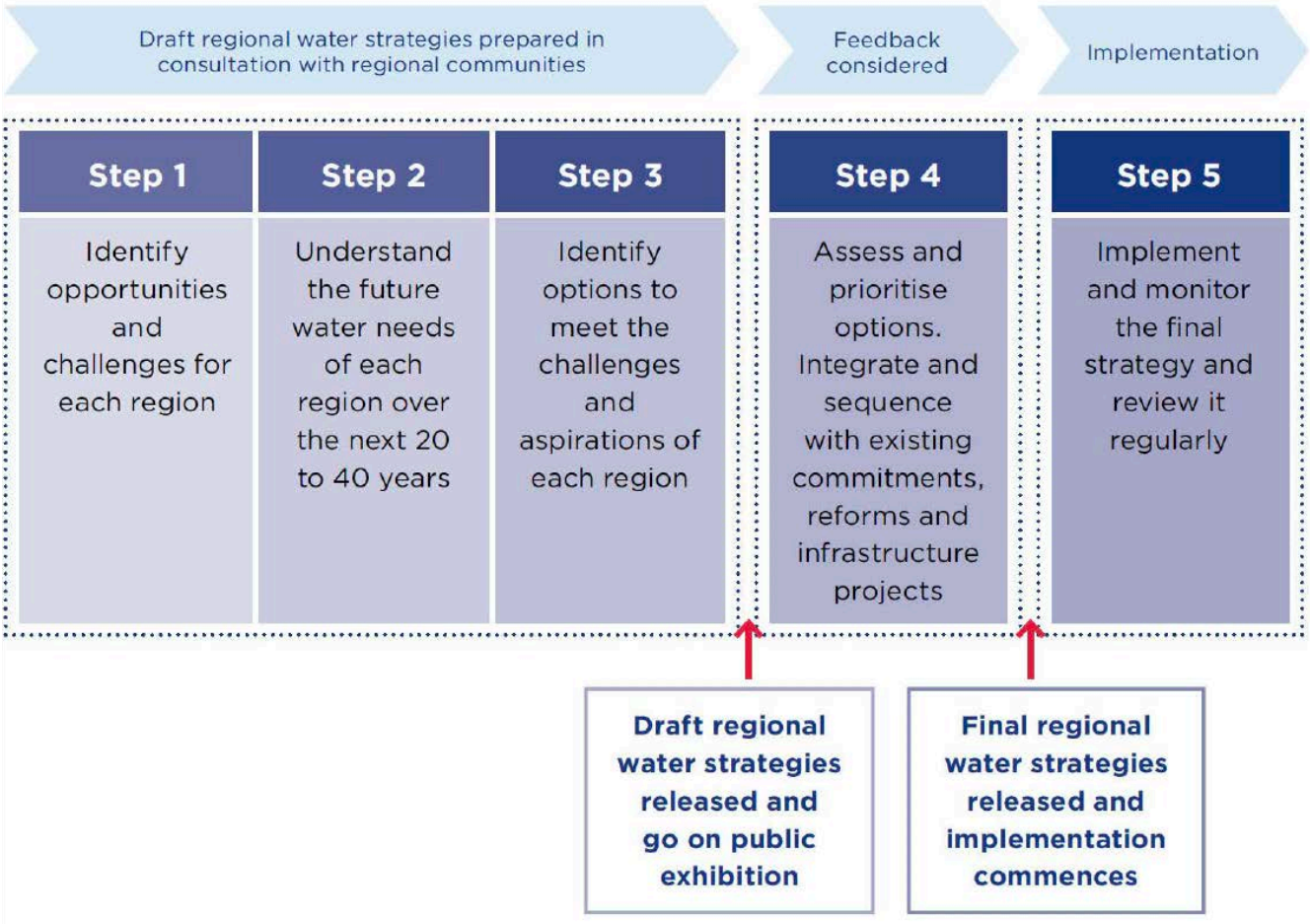
During extreme events, such as the current drought, our focus is on securing basic landholder rights and essential town water supplies. Outside of these extreme events, we have greater flexibility to deliver across all of the objectives, including providing water for the environment and industries.

It is also important to note that when formulating water sharing plans, the NSW Government must take all reasonable steps to prioritise the protection of the water sources and their dependent ecosystems.[3]

Through the regional water strategies, we aim to better manage these extreme events for all water users in the future.

The NSW Government is taking a five-step approach to preparing and implementing regional water strategies, as shown in Figure 5 below.

Figure 5. Five step approach to NSW regional water strategies



3. Subsections 9(1)(b), 5(3)(a) and 5(3)(b) of the NSW *Water Management Act 2000*

Image courtesy of Paul Packard.

1.3 What has informed the draft regional water strategies?

To ensure we are using the best evidence and most recent data, and fully consider ideas and options from each region, we have used a wide range of sources to inform each strategy.

1.3.1 Improved climate modelling and data

Until now, water management in NSW has been based on historical data and observations going back to the 1890s. This has provided a limited understanding of extreme events. The NSW Government has invested in new climate datasets and modelling to develop a more sophisticated depiction of long-term streamflow and climatic conditions. These improved datasets integrate recorded historical data with paleoclimate data (data reconstructed from before instrumental records began, using sources such as tree rings, cave deposits and coral growth) to give a modelling tool that generates 10,000 years of synthetic climate data. When combined with other sources of climate data (such as climate change projections), this has helped us to better understand natural climate variability, including the probability of wet and dry periods in each region, and estimate risks to future water availability.

This improved modelling means that we have moved from making decisions based heavily on single 'worst-case' scenarios drawn from a short climatic record to a much more accurate understanding of the length and frequency of past wet and dry periods. We can now better understand the probability of future climate characteristics—such as the frequency, length and distribution of droughts in each region—and also better understand how to mitigate these risks and assess the possible benefits of medium and long-term solutions.

This new method is an important advance on previous climate datasets and models. Through this work, we can now assess the impact of changes in flows and water security over a much wider range of climatic conditions than if we had only considered the observed historical records.

This updated climate information has been used in developing the draft regional water strategies and will help to assess and compare the effectiveness of the draft options included in each strategy. It will also support all water users in making more informed decisions and better planning and preparing for climate risks.[4]

4. More information about this improved climate information and how it is being used in our river system is provided in the *Regional Water Strategies Guide.* On the advice of the expert panel, ongoing improvement of the methodology will be undertaken. This includes an assessment of non-stationarity in the historical record to determine whether changes in climate in recent decades affect estimates of present-day climate risk compared with climate risk based on the whole observed record.

Chapter 2 sets out the results from analysis of the new climate data for the Lachlan region. We will continue to use the best and latest evidence about the future climate to develop solutions to address the challenges associated with protecting and enhancing environmental assets, regional towns and industries in a more variable climate and during extreme events.

Ongoing analysis will yield more specific and robust results, giving an updated understanding of risks to town water supply, irrigation and environmental water security in the Lachlan region. The final Lachlan Regional Water Strategy will use this new data to identify the best ways to share, manage and use water to manage these risks.

1.3.2 Existing studies

A significant amount of work has been undertaken to understand the risks affecting water resource management in regional NSW. Development of the Draft Lachlan Regional Water Strategy and the long list of options identified for the region have been informed by other water security studies, water and drought planning, and regional development, infrastructure and environmental strategies prepared by a range of NSW Government departments and agencies.[5]

This strategy has also been informed by WaterNSW's *Lachlan Valley Priority Catchment Water Security Study*, WaterNSW's *20-year Infrastructure Options Study*, local council's *Integrated Water Cycle Management Strategies*, the *Centroc 2009 Water Security Study* and the *Independent Panel Assessment of the Management of the 2020 Northern Basin First Flush Event*.

We have also taken into account the NSW Governments water resource plans and long term water plans developed to meet the obligations of the Murray-Darling Basin Plan.

The Australian Government has requested an independent expert panel undertake an assessment of social and economic conditions in communities across the Murray-Darling Basin. The expert panel's draft report was released in March 2020.[6]

In August 2019, the Australian Government also announced that it would direct the Australian Competition and Consumer Commission to conduct an inquiry into markets for tradable water rights in the Murray-Darling Basin. The Australian Competition and Consumer Commission was asked to recommend options to enhance markets for tradable water rights, including options to enhance their operations, transparency, regulation, competitiveness and efficiency. An interim report has been released in July 2020 and a final report to the Federal Treasurer is due at the end of February 2021.[7]

These investigations will be important sources of information as we assess options for the final Lachlan Regional Water Strategy.

5. More information about this work is in the *Regional Water Strategies Guide.*
6. Murray-Darling Basin Authority 2019, *Independent assessment of social and economic conditions in the Basin*, www.mdba.gov.au/publications/independent-reports/independent-assessment-social-economic-conditions-basin
7. Australian Competiton and Consumer Commission 2019, *Murray-Darling Basin water markets inquiry*, www.accc.gov.au/focus-areas/inquiries-ongoing/murray-darling-basin-water-markets-inquiry

1.3.3 Community engagement

Over the last few years, the NSW Government has been consulting on water sharing plans, water resource plans, metering reforms, environmental water management and drought. Through these processes, we have heard many ideas about how to be better prepared for future droughts and floods and a more variable climate.

We have also been talking with local councils and joint organisations, local water utilities, community groups and Aboriginal people about their thoughts on what the Lachlan Regional Water Strategy could cover. Further information about these initial meetings and discussions is in Attachment 1.

What local councils, joint organisations and local water utilities have told us so far:

- There is support for a long-term strategy for water that links with local planning activities.
- There is room for some 'blue sky thinking' and an opportunity to consider innovative solutions.
- People are seeking meaningful engagement during the development of the strategy.
- Councils are supportive of the proposed Wyangala Dam upgrade. Councils are also supportive of the Lake Rowlands augmentation investigation in as far as it improves town water security in the region. Councils see these projects as an opportunity to improve water security and as a catalyst for growth and investment in the region.
- There needs to be a 'multi-water source' approach to water security and quality for regional towns and communities.
- Regional water strategies need to acknowledge that the boundaries of local government areas and local water utilities do not always align with the regional water strategy boundaries.
- The social and amenity value of water is important to the community.
- There is concern about increased groundwater use in parts of the region and councils would like more information on groundwater management in the region, as well as a review of anticipated future demands on groundwater to protect vital supplies for regional towns.
- The regional water strategies need to be accompanied by an implementation plan that includes a short-term priority action plan. The implementation plan should include details about the future governance arrangement for the regional water strategies and enable the establishment of a multi-agency government committee where Local Governments have a seat at the table.
- Councils, local water utilities and joint organisations need to have shared access to the regional water strategy modelling and data.
- The management of state-owned dams should ensure that human water needs can be met as the highest priority in the region.

What Aboriginal people have told us so far:

- We need to better recognise and deliver on cultural water rights.
- Having the ability to access cultural sites and waterways is important for connection to Country and community wellbeing.
- More culturally appropriate information and education is needed on how governments manage water.
- Aboriginal people want more opportunities to manage land and water utilising their traditional cultural knowledge.
- We need to look at options to improve water flows to the end of the Lachlan system to water important cultural sites and provide water for nations at the end of the system.

These early insights have been considered in developing the Draft Lachlan Regional Water Strategy.

1.4 Building on existing commitments and reforms

The NSW Government has made significant commitments to improve water resilience and reliability. Much of our current work is to address the risks facing regional NSW and set our regions up for the future. This includes investigating dam upgrades and investing in water saving infrastructure in the current drought and to prepare for the next one.

In the Lachlan region we have committed to:

- **Wyangala Dam raising:** a business case to raise the wall of Wyangala Dam. This will provide an additional 650 GL of storage capacity in the dam, improving water security and reliability in the Lachlan, and may provide some flood management benefits.
- **Lake Rowlands Dam to Carcoar Dam pipeline:** a business case to construct a pipeline linking Lake Rowlands and Carcoar Dam to enable water transfers between both storages and improve water security and reliability for towns and water-dependent industries.
- **Lake Rowlands augmentation investigations:** a feasibility study to assess the benefits of augmenting Lake Rowlands dam or the construction of a new dam downstream of Lake Rowlands.
- **Parkes, Forbes, Condobolin and Cowra groundwater projects and investigations**: Funding provided for test bores, bore construction, pumping infrastructure and pipeline connections with existing bores to improve access to groundwater sources. Additional funding has also been provided to Cowra to undertake an investigation into groundwater access.
- **Town Water Security Projects:** Funding to increase water security in Parkes, Forbes, Lachlan and Upper Lachlan council areas and more broadly across the Central Tablelands Water distribution area for smaller communities like Caragabal. Funding has also been provided to support water supply security in West Wyalong.
- **Cowra to Central Tablelands Water Emergency Connection:** Funding provided to plan for and deliver critical drought initiatives and potentially enable a connection to Orange.
- **Boorowa Drought Security Project:** Funding provided for Hilltops Council to examine options to provide greater water security to Boorowa.

Funding from the Safe and Secure Program has also enabled Councils such as Parkes Shire Council and Hilltops Council to progress and develop their integrated water cycle management strategies. These strategies will enable councils to identify and progress options that integrate the management of water supply, stormwater and wastewater to provide maximum benefits to all.

With growth expected in the region's major centres and new opportunities offered by the Parkes Special Activation Precinct, Inland Rail and other developments, these investments will help to improve water security and reliability as well as attract new businesses and jobs to the region.

We are also implementing a range of state-wide water reforms, including improving water and sewage services for Aboriginal communities, improving compliance and transparency around water use and access, and introducing robust new metering laws.

Along with other states, we are implementing the Murray-Darling Basin Plan, which aims to rebalance water sharing between the environment and other water users. We continue to work with communities on changes needed to implement the Basin Plan and look for opportunities through recent funding announcements made by the Australian Government (September 2020).

We have also streamlined the approvals process for drought and major dam projects through the *Water Supply (Critical Needs) Act 2019.*

We continue to work towards a state-wide Aboriginal water policy to better represent the interests of Aboriginal cultural values and rights in water management.

More information about these reforms is in the *Regional Water Strategies Guide*.

The Lachlan Regional Water Strategy will build on these commitments and reforms, seek to enhance and leverage them where possible, and address any outstanding gaps.

Responding to drought

Up until August 2020, over **$4.5 billion has been committed to the drought response in NSW**. This commitment to drought relief and water security is providing immediate support to farmers, families, towns and businesses impacted by drought:

- More than $2 billion has been provided for a support package for primary producers, businesses and communities.
- With the Australian Government, the NSW Government will deliver over $1 billion to state significant dam projects, including the upgrade of the Wyangala Dam.
- Since 2016, over $1 billion has been committed to 189 water projects, including building and upgrading water storages, pipelines and bores across regional NSW through programs like the $1 billion Safe and Secure Water Program and the NSW drought response.

1.5 Policy and planning context

Each regional water strategy sits within a broader policy and planning context. This includes a range of policies and plans that guide the management of water resources in NSW (Figure 6).

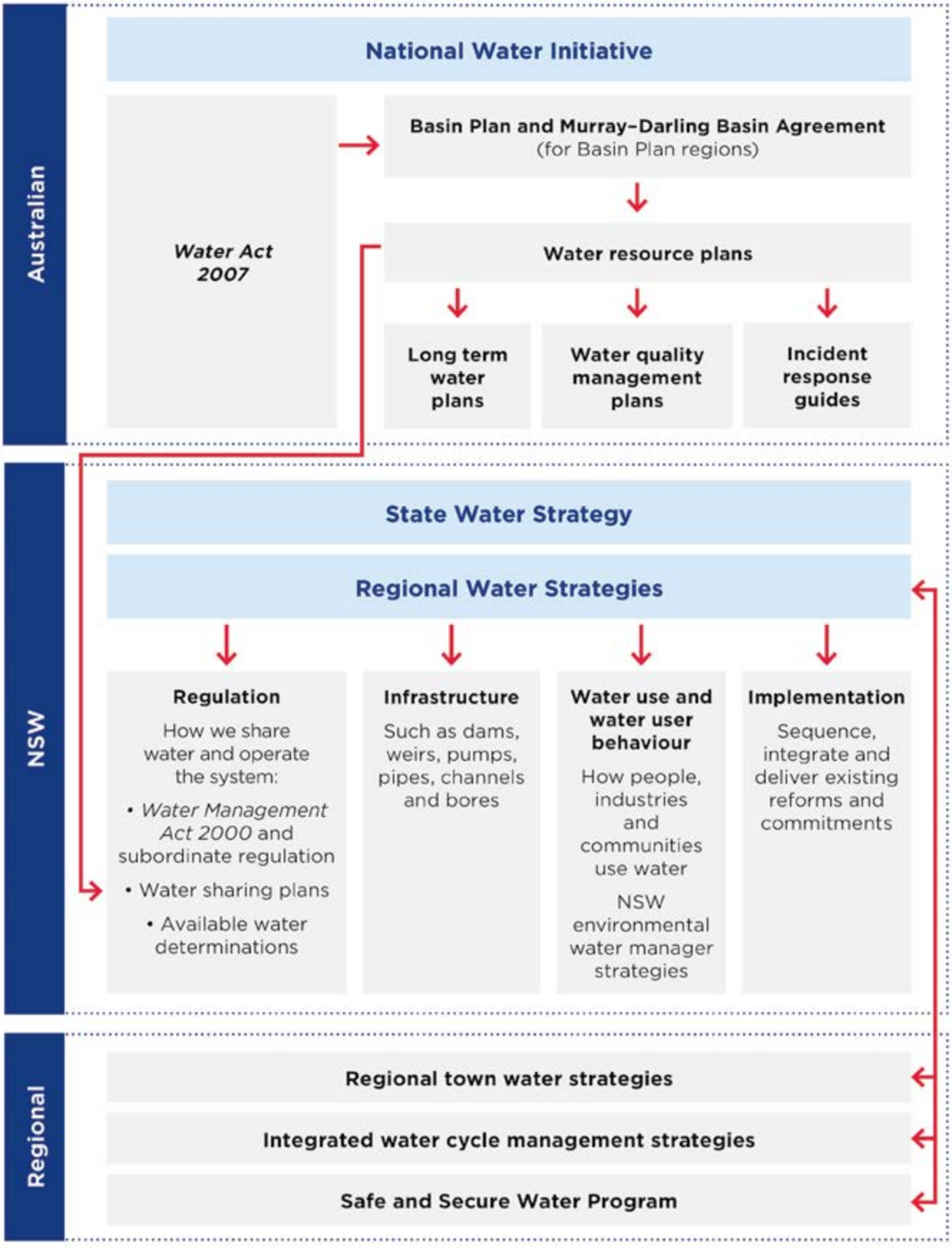
The NSW Government is also developing a 20-Year State Water Strategy. This will establish overarching directions for managing water resources and services to ensure future water security, reliability and resilience, and address long-term challenges such as greater climate variability and population changes. The strategy will set high-level outcomes and actions to achieve these across public and environmental health, service delivery, liveability, economic development and technology, and for Aboriginal people.

Regional water strategies are an opportunity to explore how we can bring together existing commitments and better integrate and shape these plans, policies and investments for improved water outcomes. In particular, the strategies will play a key role in the ordering, sequencing and integration of water reforms in each region.

The strategies also align with the NSW Government's broader strategic planning priorities and will be integrated with current land use and regional plans.[8] This includes the Regional Town Water Strategy and local councils' integrated water management cycle strategies to ensure water security for regional towns and communities is adequately addressed in the Lachlan.

8. More information about how the strategies relate to strategic, regional and water planning is in the *Regional Water Strategies Guide.*

Figure 6. NSW water policy and planning context



Chapter 2

The Lachlan region, its opportunities and challenges

Snapshot

Climate conditions combined with current operating assumptions are placing the region's water resources—and the towns, communities, industries and ecosystems that rely on them—under considerable stress.

- The Lachlan region has a naturally variable climate that includes periods dominated by either wet or dry conditions. Hydrological models updated with more sophisticated data for this strategy found that:
  - the variable climate seen over the last 122 years of historical records is fairly normal when compared to the long-term data and is an important characteristic of the Lachlan region. However, periods between droughts could shorten under climate change projections
  - Wyangala Dam is unlikely to fall below dead storage based on long-term paleoclimate records and short term climate projections
  - the towns of Cowra and Forbes, which are supplied from water stored in Wyangala Dam, are at a low risk of experiencing water supply shortfalls based on their current water access licence volumes
  - general security users in the Lachlan could experience a 1% decrease in their average water availability at the beginning of each water year based on the long-term paleoclimate records, a 4% decrease under short term climate projections and a 60% decrease under long-term climate change projections. The climate modelling results are based on a deliberate conservative scenario to stress test the results. These scenarios will not necessarily eventuate, but they provide an idea of the possible climate risks and allow us to begin planning to mitigate these risks if they do arise.
- In the 40 months to April 2020, there has only been 380 GL of inflows to Wyangala Dam. These flows are only marginally higher than the lowest historic 40-month inflow sequence (318 GL for the 40 months up to July 2005).
- Analysis of the long-term paleoclimate records indicate that droughts similar to the Millennium Drought have occurred in the past. However, the likelihood of a similar drought occurring within the next 40 years is less than 5%.
- Water security for other towns and villages in the Lachlan region that rely mainly on single supply sources, particular unregulated rivers and creeks, will be more challenging in a future of greater climate variability and climate change.
- Delivering water along the entire length of the Lachlan River will remain a challenge. In normal circumstances with average inflow conditions, water delivery to Booligal at the end of the regulated system can take over 30 days. In times of drought, timeframes can be significantly longer and require more water.

Water users in the Lachlan have adapted to the variable climate, but we need to review how we manage water, use and deliver water to meet future challenges.

- We have an important opportunity to use the new climate data and advances in climate modelling to review current water allocation and river operating rules to determine how we can enhance water resilience in the future.
- Agricultural businesses have adapted to the region's highly variable climate through a conservative approach to water use and crop choices. However, the recent expansion in horticulture and mining developments is changing the region's water use and demand patterns and may create new challenges for all water resources in the region.
- Stimulated by the Parkes Special Activation Precinct, the Inland Rail Project and other government investments, growth is expected in the region's major centres. Resilient water sources and access to water for new commercial uses will be needed to support growth.
- By exploring opportunities around water efficiency and conservation and diversifying the region's water sources through reuse, recycling and stormwater harvesting, we could enhance water resilience for towns and communities and attract businesses and jobs to the region.

Water is essential for Aboriginal people's health, wellbeing and connection to Country.

- The health of waterways impacts the wellbeing of Aboriginal people in the Lachlan region.
- While there are some provisions for accessing water for cultural purposes, these do not currently meet the needs and obligations of Aboriginal people to care for Country or achieve the cultural water flows and water management aspirations set out in the 2007 Echuca Declaration. Aboriginal people seek ownership of their water.
- Options to improve Aboriginal people's involvement in water management and recognition of their water rights can protect cultural values and deliver spiritual, cultural, environmental, social and economic benefits to Aboriginal communities in the Lachlan region.

Critical environmental assets need to be protected.

- Healthy water sources support the region's environment, which—in turn—supports liveable communities and thriving industries.
- The Lachlan catchment is the only catchment in NSW with significant wetlands and important environmental assets across its length. The region has nine nationally significant wetlands and several threatened fish species.

- Water set aside for the environment through the Murray-Darling Basin Plan and NSW water sharing plans has helped achieve some environmental outcomes in the region. However, existing infrastructure and regulation affect the ability to meet environmental targets and cause the overall health of the Lachlan River to be poor. Also, despite several measures, the fish community of the Lachlan valley is in poor health and some species are under serious threat.
- Coordinated action and planning across the region should support environmental outcomes, improve movement of native and threatened fish species, and meet ecosystem targets for important assets and areas like the Booligal Wetlands, Lake Cowal and the Great Cumbung Swamp.

Better management of groundwater.

- Groundwater sources are critical for towns, communities and industries and groundwater dependent ecosystems. However, groundwater levels in areas of concentrated use are in decline because of the large number of bores within close proximity.
- In the 2019/20 water year, groundwater extractions in the Lower Lachlan were at risk of exceeding the allowable limit for the first time since the NSW Government implemented measures to ensure sustainable groundwater use.
- If groundwater use by existing licence holders increases in a future with more extreme dry periods, we will need to reduce the amount of water these licence holders can take to ensure groundwater extractions remain within the sustainable limit.
- We need to use groundwater more efficiently, ensure sustainable access to groundwater resources by all water users and make better informed decisions about its management. This includes ensuring equitable, lawful basic landholder rights use.
- Options that increase knowledge about groundwater sources and studies of groundwater recharge rates can help to better manage groundwater resources.
- The challenge for the next 20 to 40 years is to ensure sustainable access to groundwater resources by all water users.

2.1 What we know about the Lachlan region's climate

Today's climate

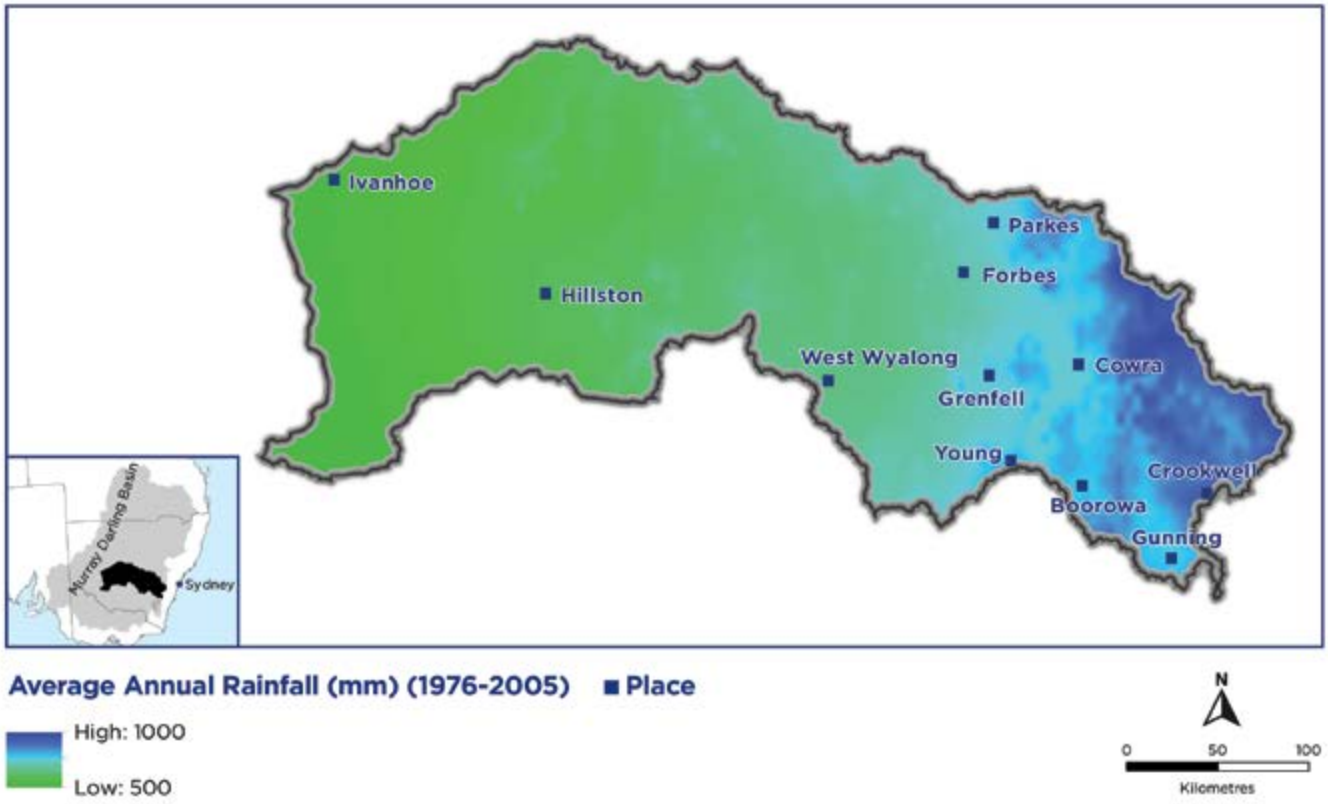
The Lachlan region has a highly variable climate, ranging from temperate conditions in the east to semi-arid conditions in the west. There is a significant elevation difference between the Upper and Lower Lachlan region which partially accounts for differences in average seasonal temperatures and rainfall.[9]

Summer temperatures range from mild to hot across the region. In the higher elevation regions of the east, average maximum temperatures are around 27°C.[10] In the mid and Lower Lachlan, maximum temperatures can range from 32 to 35°C. Winters are generally cool to mild with average temperatures of between 10 and 16°C. Frosts are common in winter. Long-term temperature records indicate that temperatures in the region have been increasing since the 1970s.[11]

Rainfall across the region is extremely variable. Average annual rainfall varies from 1,100 mm per year in the eastern part of the region to less than 300 mm in the far west (Figure 7). Rainfall is usually well distributed throughout the year, however, as we have seen in the past, it can vary significantly between months.[12] Spring and winter rainfalls are particularly important for the Lachlan region and for inflows into Wyangala Dam.

Evapotranspiration is also strongly seasonal. Monthly average evapotranspiration peaks in the summer months (around 200 mm), with minimums as low as 20 mm in the winter months.[13]

Figure 7: Observed average annual rainfall in the Lachlan region



Source: Department of Industry 2018, Lachlan Surface Water Resource Plan: Surface water resource description, November 2018

9. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface Water resource description*, p9.
10. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface Water resource description*, p9.
11. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface Water resource description*, p9.
12. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface Water resource description*, p7.
13. Verdon-Kidd, D 2020, Development of multi-site rainfall and evaporation data for the Lachlan Regional Water Strategy, Appendix G.

A better understanding of current climate variability and future climate change

As outlined in section 1.3.1, new climate datasets and improved modelling are providing a better understanding of the natural climate variability in the Lachlan region beyond the observed historical records.

This work now allows us to be able to analyse changes to flows and water availability over a much wider range of climate conditions than was possible with only the observed historical record. For example, our analysis found that the distinct wet and dry periods that were experienced in the Lachlan region over the past 122 years are not unusual when compared to long-term paleoclimate data.

Our improved modelling also incorporates recognised climate change forecasts,[14] which suggest that in the Lachlan region, there will likely be:

- **changing rainfall patterns**—annual average rainfall in the region could decline by 10-15% and heavy rainfall events are likely to be more intense over the long-term (2060–2079). Shifts in seasonal patterns are expected to cause a decrease in winter and spring rainfall and an increase in summer and autumn rainfall (Figure 8)
- **higher evapotranspiration**—potential evapotranspiration is expected to increase by around 5% by 2070 compared to levels between 1990 and 2009 (Figure 9)
- **higher minimum and maximum temperatures**—this includes a rise in average temperatures of between 0.4 and 1°C over the near future (2020 to 2039) and 1.8 to 2.7°C over the long-term (2060 to 2079)
- **more hot days (temperatures over 35°C)**—while more hot days are expected across the region, regional centres like Parkes and Forbes could see an additional 10 to 20 hot days in the near future and an additional 20 to 30 hot days by 2070.

Using climate change projections in water modelling

The NSW Government's NARCliM (climate change) data sets include a range of different future climate scenarios. We have used the most conservative result from NARCliM in our modelling—the scenario which 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 water strategies, particularly options that go towards securing water for critical human needs.

14. Office of Environment and Heritage 2014, *Central West and Orana – Climate change snapshot*, www.climatechange.environment.nsw.gov.au/Climate-projections-for-NSW/Climate-projections-for-your-region/Central-West-and-Orana-Climate-Change-Downloads

Figure 8. Average monthly changes in rainfall for the Lachlan region for the periods 2020 to 2039 and 2060 to 2079 compared to the period 1990 to 2009 from NARCliM projections

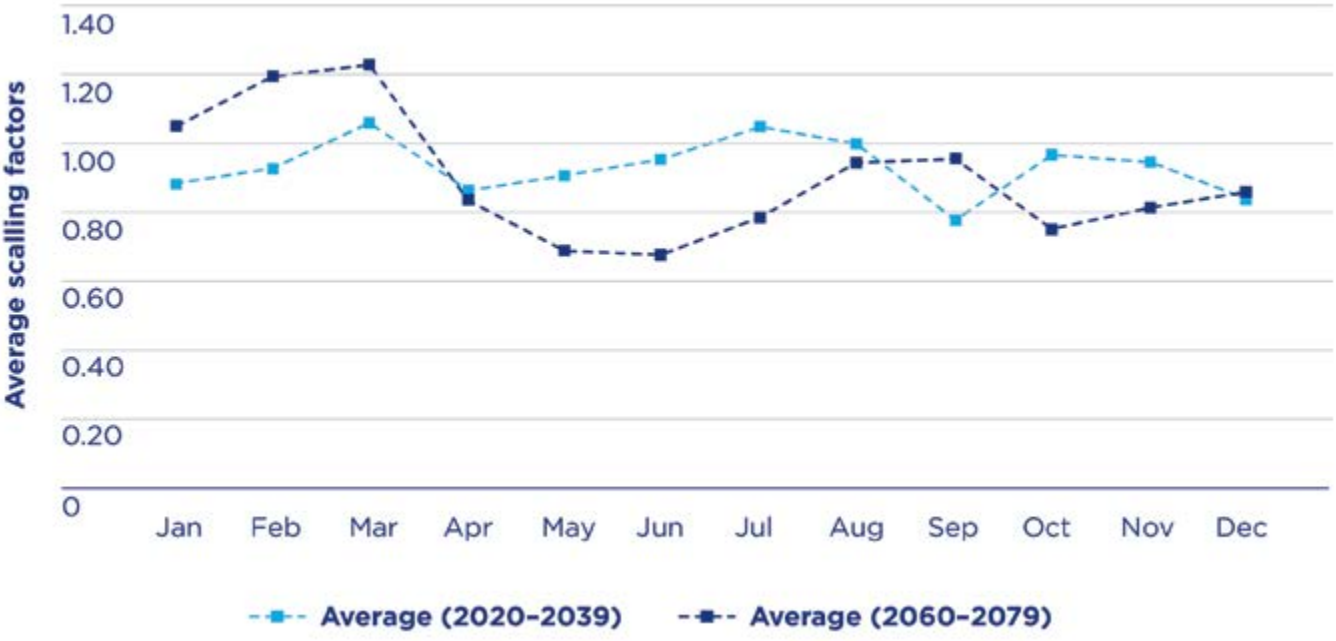
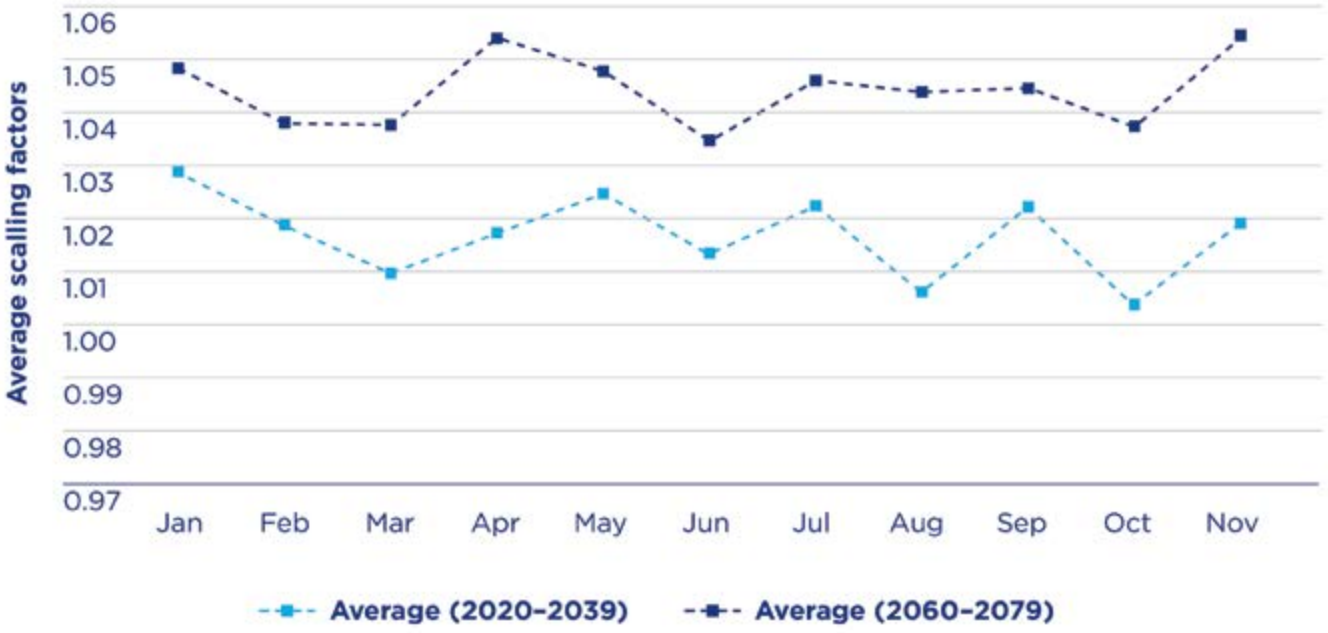


Figure 9. Average monthly changes in evapotranspiration for the Lachlan region for the periods 2020 to 2039 and 2060 to 2079 compared to the period 1990 to 2009 from NARCliM projections



The region has experienced extended drought periods which often contain very extreme low inflow periods

The Lachlan region has experienced extended drought periods over the past 122 years of observed records[15] (Figure 10). The Millennium Drought of 2001 to 2010 was the worst on record for the Lachlan—a period of almost 10 years without any significant inflows. In the 54 months to August 2010, inflows into Wyangala Dam were only 498 GL.

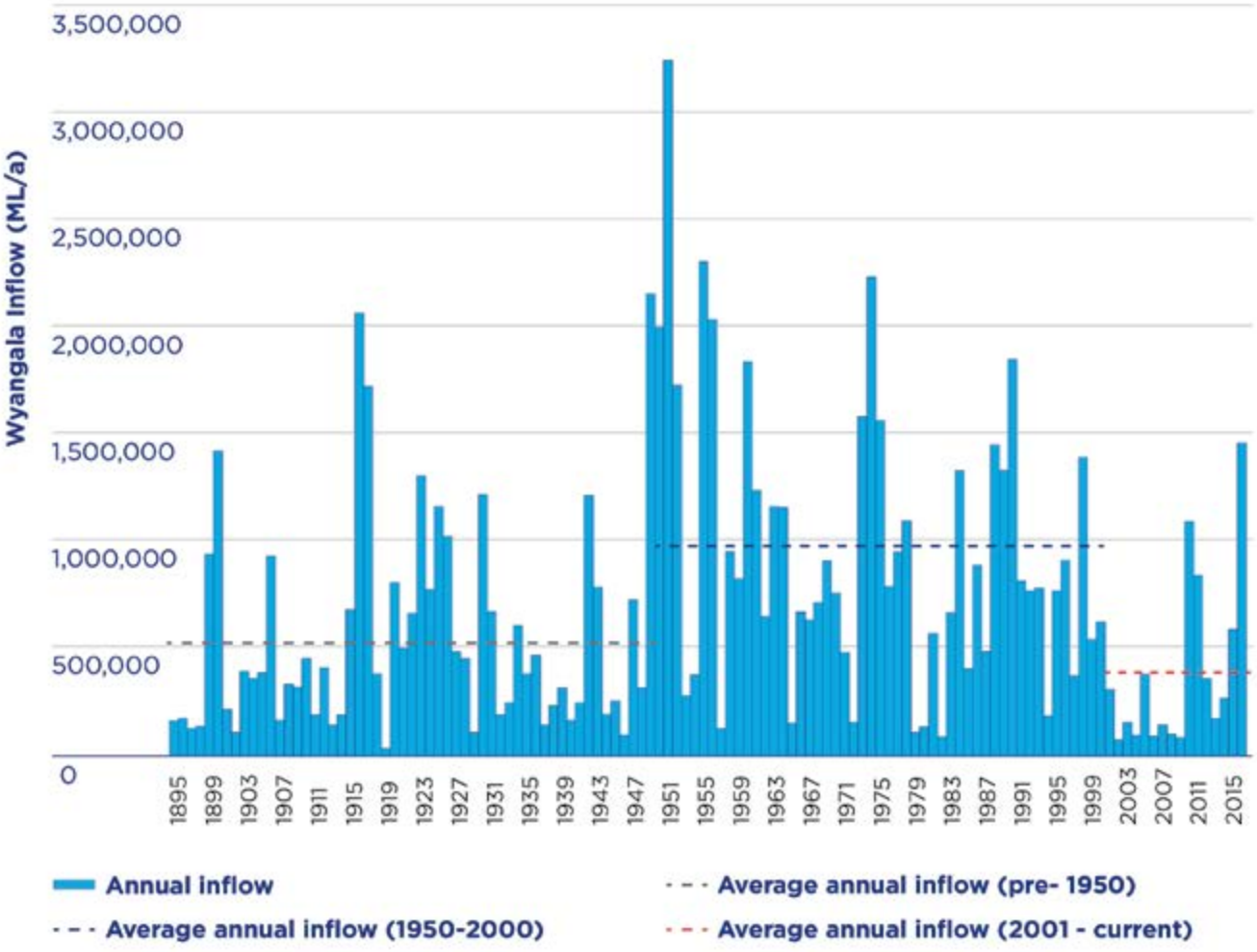
Past dry periods in the Lachlan region have extended over many years and often contained very extreme low rainfall periods. These relative short periods of extreme climate conditions (compared to the overall dry period) can critically stress water supplies. Restrictions to allocations and other drought contingency measures had to be applied to prevent a severe system failure and to ensure we were able to prioritise water delivery to towns and communities in the regulated system.

A review of the last 122 years of observed historical records indicate that persistent droughts are becoming more common. For example, the two longest back-to-back droughts over the observed historical records occurred from 2003, separated by only one year of moderate inflows.

Inflows into the region's storages can vary significantly within any given year. As highlighted in Figure 10, inflows can be as low as 14 GL in February and around 132 GL in August and there has been a strong bias towards winter and spring inflows in the past. Before the Millennium Drought, our observed historical data suggested that we could generally rely on significant winter inflows at least once in any two—or three—year period. The Millennium Drought and the current drought have shown that longer dry periods can occur, with up to three to four years without significant inflows into Wyangala Dam.[16]

15. Droughts are defined as those periods when allocations of less than 100% are made to local water utilities, domestic, stock and high security licence holders at the commencement of the water year. This generally occurs when Wyangala Dam is below 300,000 ML capacity (or 25% full).
16. WaterNSW 2019, State Overview, realtimedata.waternsw.com.au

Figure 10. Average annual inflows to Wyangala Dam over the instrumental period generated from the Department of Planning, Industry and Environment's hydrological model

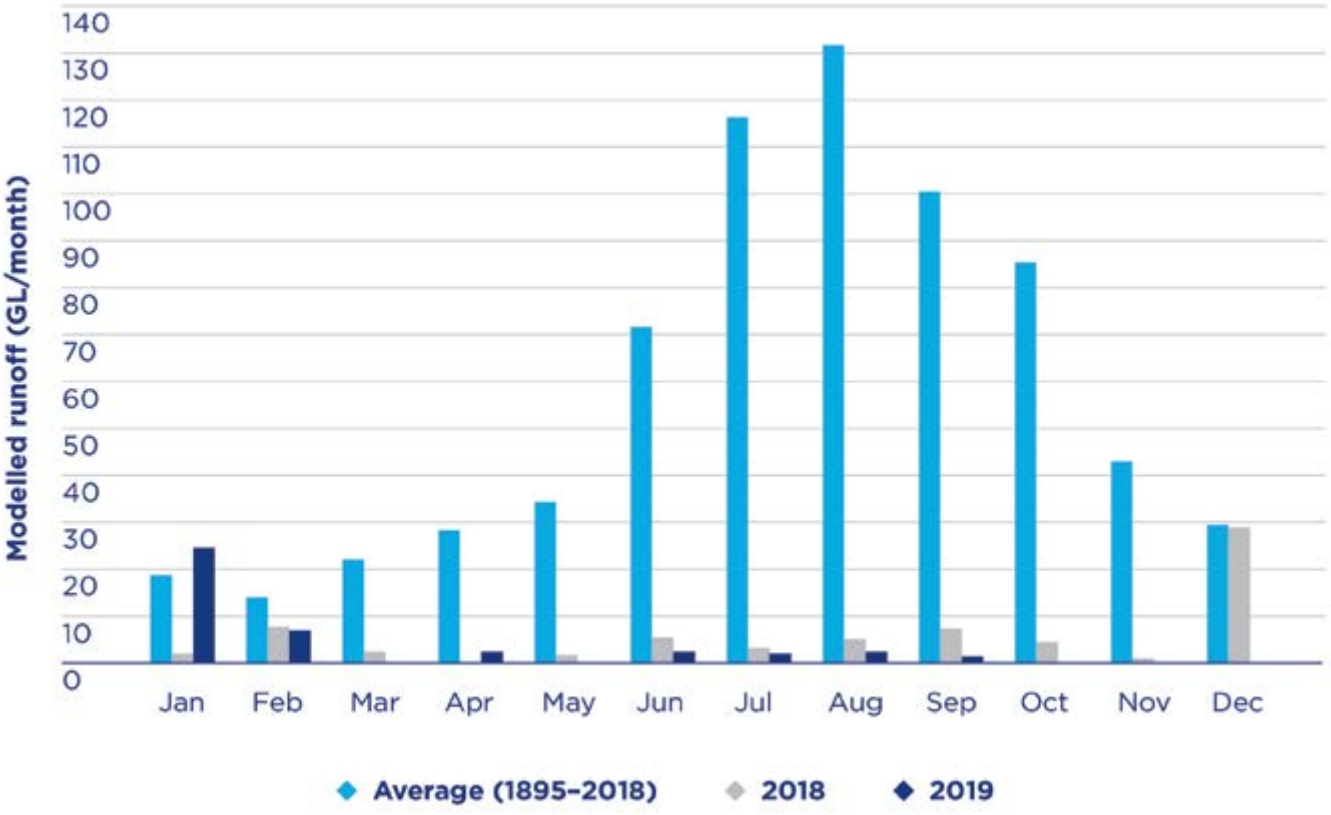


Conditions across much of NSW, including the Lachlan, have been close to the driest 36 months on record (March 2017 to February 2020).[17] Over the same period, potential evapotranspiration was above to very much above average across the region.[18]

Despite this, the most recent drought in the Lachlan is comparable to others experienced over the last 122 years.[19] Our new datasets and modelling suggest that these types of drought conditions are not unique, nor is it the worst the region is likely to have experienced in the context of the paleoclimate records. Our new extended dataset has established that similar events have occurred in the longer climate record, meaning it is plausible they could occur in the future.

The current drought conditions resulted in Wyangala Dam receiving inflows in 2018 and 2019 that are below average (Figure 11). Between July 2019 and February 2020 Wyangala Dam received only 77 GL in inflows, with around 68 GL received in February 2020 alone. In the 40 months to April 2020, there was only 380 GL of inflows to Wyangala Dam.[20] If the drought had lasted for another year, it would have been considered the worst on record. Recent winter rains improved the resource condition in the Lachlan and the region's main storages are sitting at 58% (Wyangala Dam) and 29% (Carcoar Dam) respectively (September 2020).

Figure 11. Wyangala dam catchment runoff in 2018 and 2019 compared to average



17. Bureau of Meteorology, www.bom.gov.au/climate/drought/
18. Bureau of Meteorology, www.bom.gov.au/climate/current/statements/
19. There have been three similar droughts in the Lachlan since 2004.
20. These flows are only marginally higher than the lowest historic 40-month inflow sequence (318 GL for the 40 months up to July 2005).

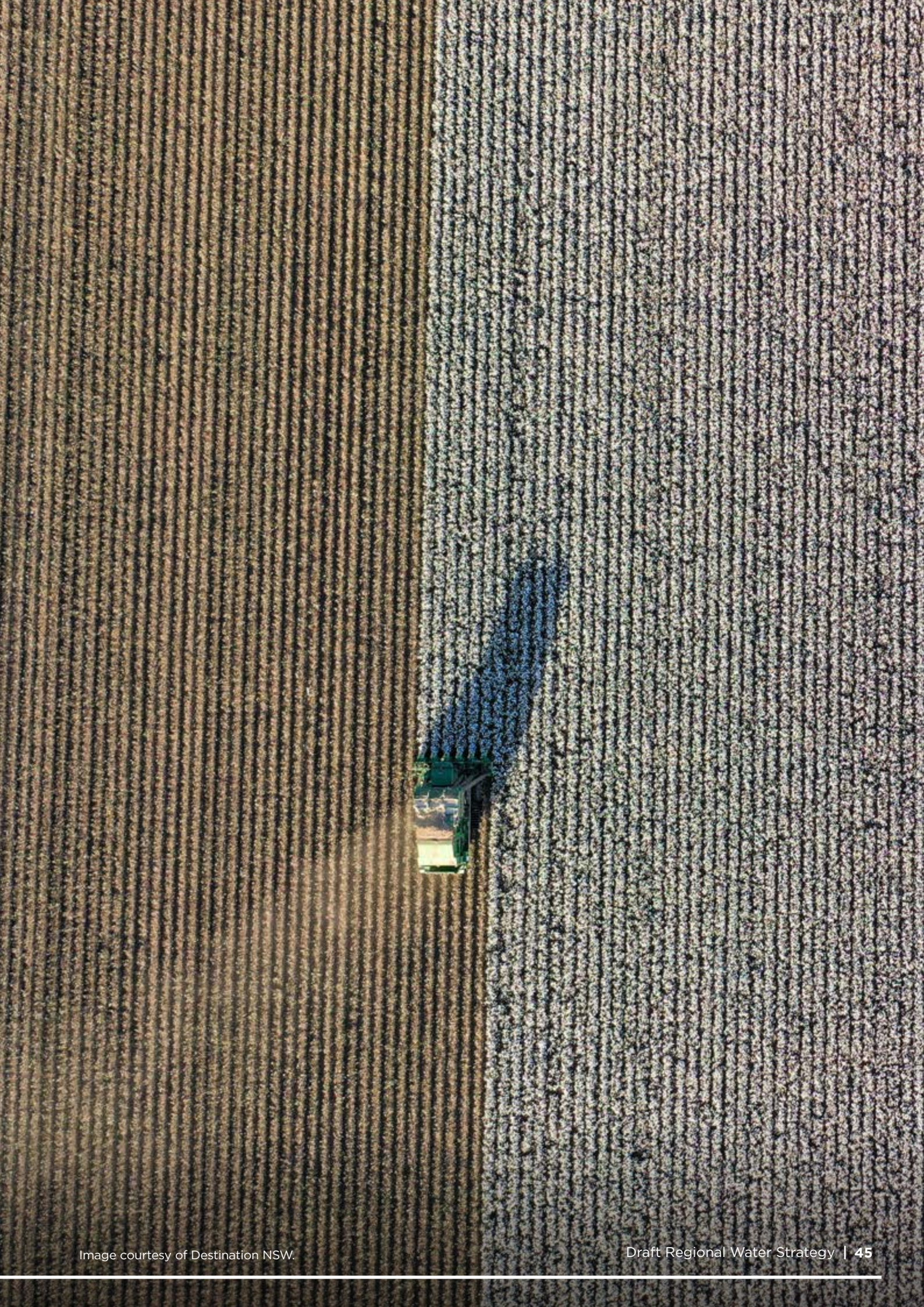
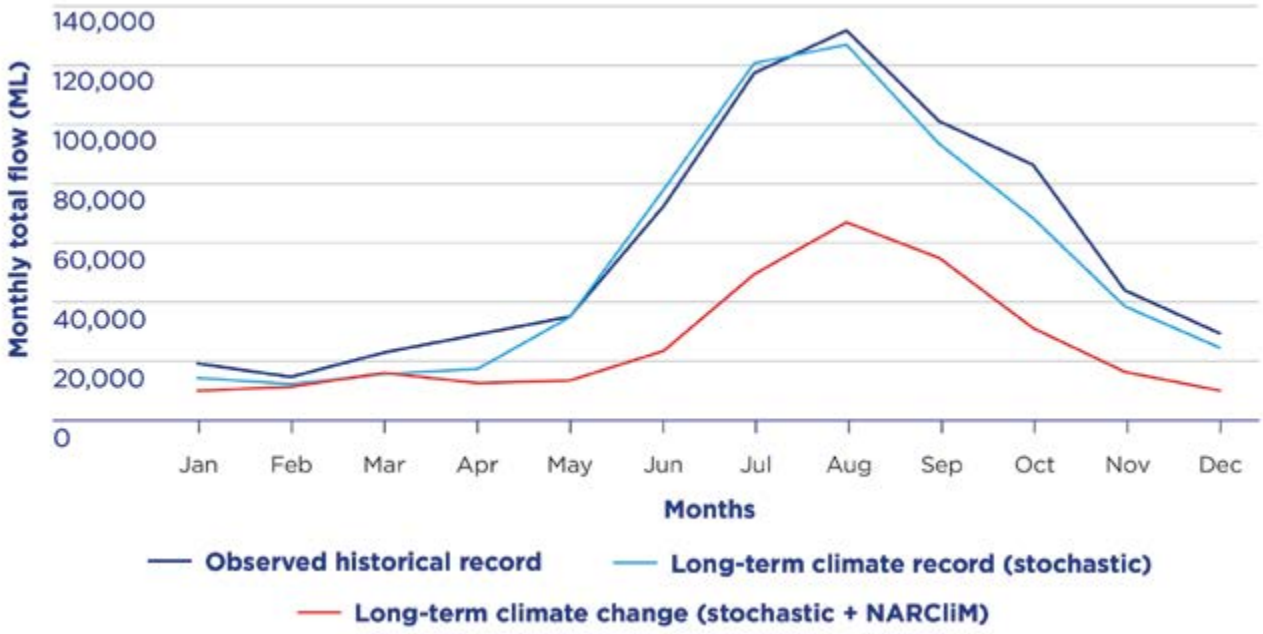


Image courtesy of Destination NSW.

Figure 12: Monthly inflows into Wyangala Dam under observed historical climate records, long-term climate and climate change scenarios



We also now understand more about the timing of inflows into Wyangala Dam and possible future storage volumes based on our new climate datasets and modelling.

Inflows into Wyangala Dam could be lower in all months under the future climate projections scenarios (Figure 12). The most obvious changes are significantly lower average inflow in winter and spring (due to lower expected rainfall under future climate projections).

Additional results and analysis from our new climate datasets and modelling indicate:

- **The high variability of climate conditions seen historically is fairly normal when viewed against the long-term records and is an important characteristic of the Lachlan catchment.**[21]
  The extended dry and wet periods observed in the last 122 years have also occurred before our historical records began and are represented in the long-term stochastic paleoclimate records.

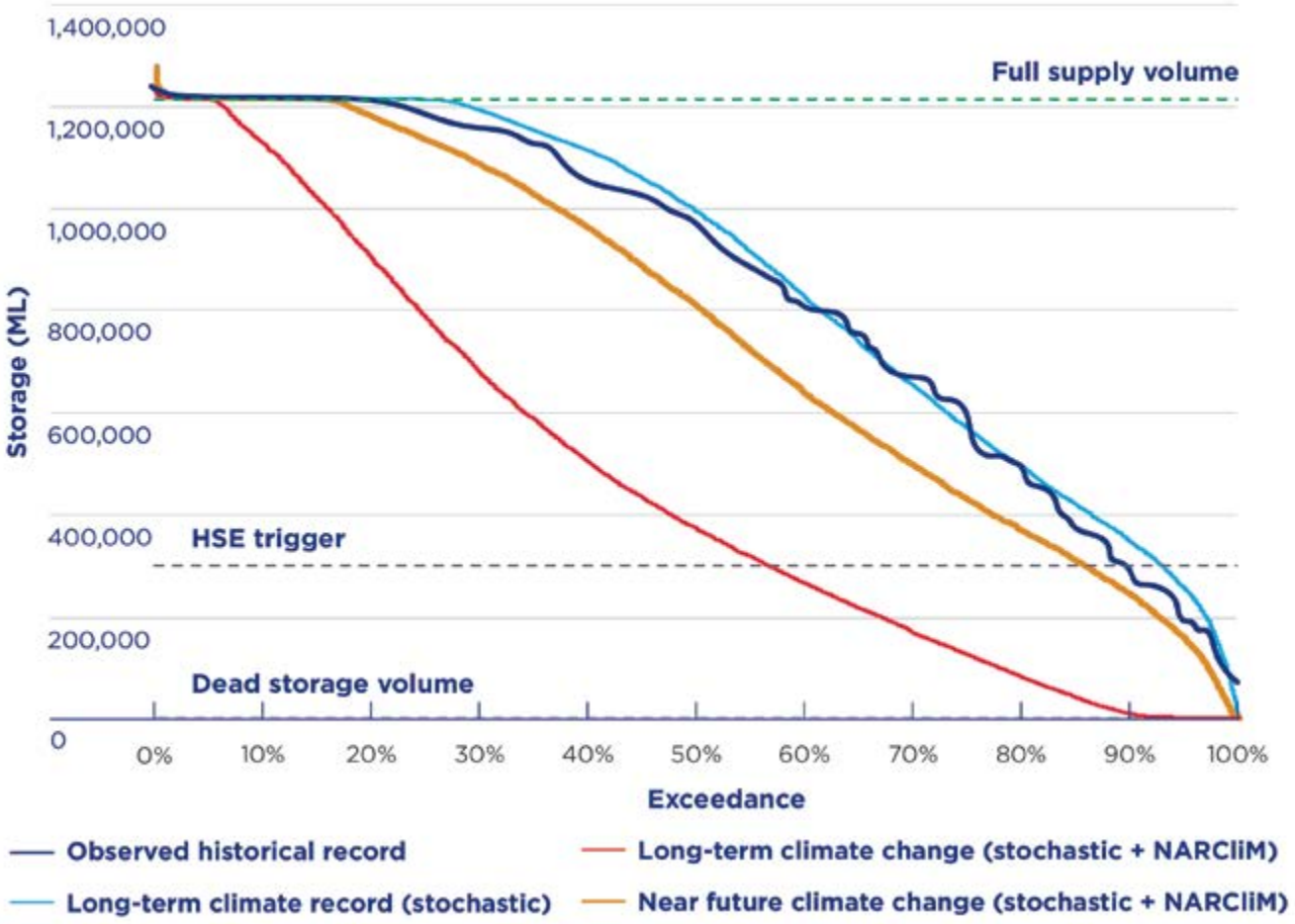
- **Droughts similar to the Millennium Drought have occurred in the more distant past.**
  A comparison of similar 10-year periods to the Millennium Drought using the long-term paleoclimate records shows that the likelihood of a similar or worse 10-year period occurring within the next 40 years is less than 5%.[22]

- **Critical winter inflows to Wyangala Dam could be significantly lower in the future.**
  Winter inflows to Wyangala Dam are critical to managing the region's water needs. New data suggests that under long-term climate change projections, these inflows could be significantly lower than what has occurred in both the observed, and long-term paleoclimate records (Figure 12).

- **Storage levels in Wyangala Dam could be consistently lower based on future climate projections.**
  The probability of levels in Wyangala Dam decreasing below the critical drought trigger[23] could increase from 7% using the long-term paleoclimate records to 14% using near future climate projections to 43% using long-term climate projections (Figure 13).

21. Refer to the Regional Water Strategies Guide for further details on the factors influencing long-term climate variability for the Lachlan region.
22. This analysis was done to understand the probability of this occurring within a 10,000-year period of replicates.
23. For the Lachlan, the critical drought trigger is notionally when the level in Wyangala Dam is below 300,000 ML. This trigger is used in the regional water strategy as an indicator to gauge when high security demands such as town water supplies may be impacted and allocations reduced.

Figure 13. Wyangala Dam storage behaviour as of July 1 based on the long-term climate record (stochastic), and future (near future and long-term) climate projections



- **Times between droughts could shorten and periods between when dams are full could lengthen.**
  The long-term paleoclimate records suggest that the average time between critical drought conditions could be around 10 years. Under climate change projections, the conditions could continue to worsen. Fill events may also become less frequent. While the frequency of droughts may increase, it is unlikely that the main dams in the region will reach dead storage (the probability in any one year of reaching dead storage is 0.1% under paleoclimate records, 0.5% under short term climate projections and 5% under long-term climate projections). This suggests that there is a reasonable level of resilience in maintaining town water security in the regulated river systems. However, securing water for towns and communities, as well as other users in unregulated rivers and creeks, could become increasingly difficult in a future with greater climate variability and climate change.

A note of caution: the scenarios in these models will not necessarily eventuate. They are potential scenarios and there is always a level of uncertainty with this type of modelling, which needs to be taken into account as part of any water decision-making and planning.

In some instances, this may mean managing risks to our water security by being prepared and resilient, rather than relying on firm predictions and hard numbers.

As the science develops further, we will be able to reduce or quantify some of these uncertainties.

Floods are a feature of the past, and the future

The Lachlan region has experienced significant flood events over the past 122 years of observed records, notably in 1952, 1990 and 2012. The most recent significant flood occurred in September 2016 when flood levels peaked at 10.67 m at the Forbes Iron Bridge.[24]

Daily stream flows provide an indication of the variability of flow patterns and the peak height of flood events. In June 1952 flows of more than 366,000 ML/d were recorded at Cowra. In 2012 and 2016 flows peaked at only 74,000 ML/d at Cowra during both flood events. In the unregulated rivers, high flows are strongly seasonal. In the Upper and Mid-Lachlan, they have frequently occurred from July through to September and in the Lower Lachlan from September to December.[25]

The management of floods is an ongoing challenge for the region. The *NSW State Infrastructure Strategy 2018* identified flood management risks for the Lachlan region.[26]

Floods can have significant detrimental impacts on people and businesses in the Lachlan region—damaging infrastructure, creating safety risks and causing financial and economic loss. In addition, floods can impact water quality and heighten the risk of blackwater events, which pose a risk for the environment and threatened species.

But floods are also a vital, natural process that supports the region's ecological productivity. The floods of 2016 assisted in improving the conditions of the Lower and Mid-Lachlan floodplains and wetlands, which suffered significantly during the Millennium Drought.[27] It also triggered the largest waterbird breeding event in 20 years. During large floods, flows can also connect to the Murrumbidgee region.

Another example that highlights the benefits of floods is illustrated by Lake Cowal. When Lake Cowal is fully flooded, it can retain water for up to three years. After it dries out, the lakebed is used for lakebed cropping and grazing.[28] This highlights that the prosperity of some industries in the Lachlan region is closely linked to flood events.

Research indicates that the intensity of heavy, flood producing rainfall events is expected to increase with climate change. However, this may not translate into increased runoff and larger floods due to the likelihood of drier soils and catchment conditions. Drier catchments might mean that when we get high intensity rainfall events there may still be a lower likelihood of flood events.

The Lachlan Regional Water Strategy is an opportunity to identify how we can improve the benefits of floods while minimising their damage to private and public assets in the region. It also provides the opportunity to assess whether there are any gaps in the current rural flood management framework and whether there is any ability to improve dam management and flood control works in rural areas.

24. Bureau of Meteorology 2017, Special Climate Statement 58, www.bom.gov.au/climate/current/statements/
25. Department of Industry 2018, Lachlan Surface Water Resource Plan: Appendix A—Surface Water resource description, p17
26. Infrastructure NSW 2014, State Infrastructure Strategy Update 2014, www.infrastructure.nsw.gov.au/expert-advice/state-infrastructure-strategy/state-infrastructure-strategy-update-2014/
27. Department of the Environment and Energy 2019, Lachlan Catchment, www.environment.gov.au/water/cewo/catchment/lachlan
28. Department of Industry 2018, Lachlan Surface Water Resource Plan: Appendix A—Surface Water resource description, p20.

2.2 The landscape and its water

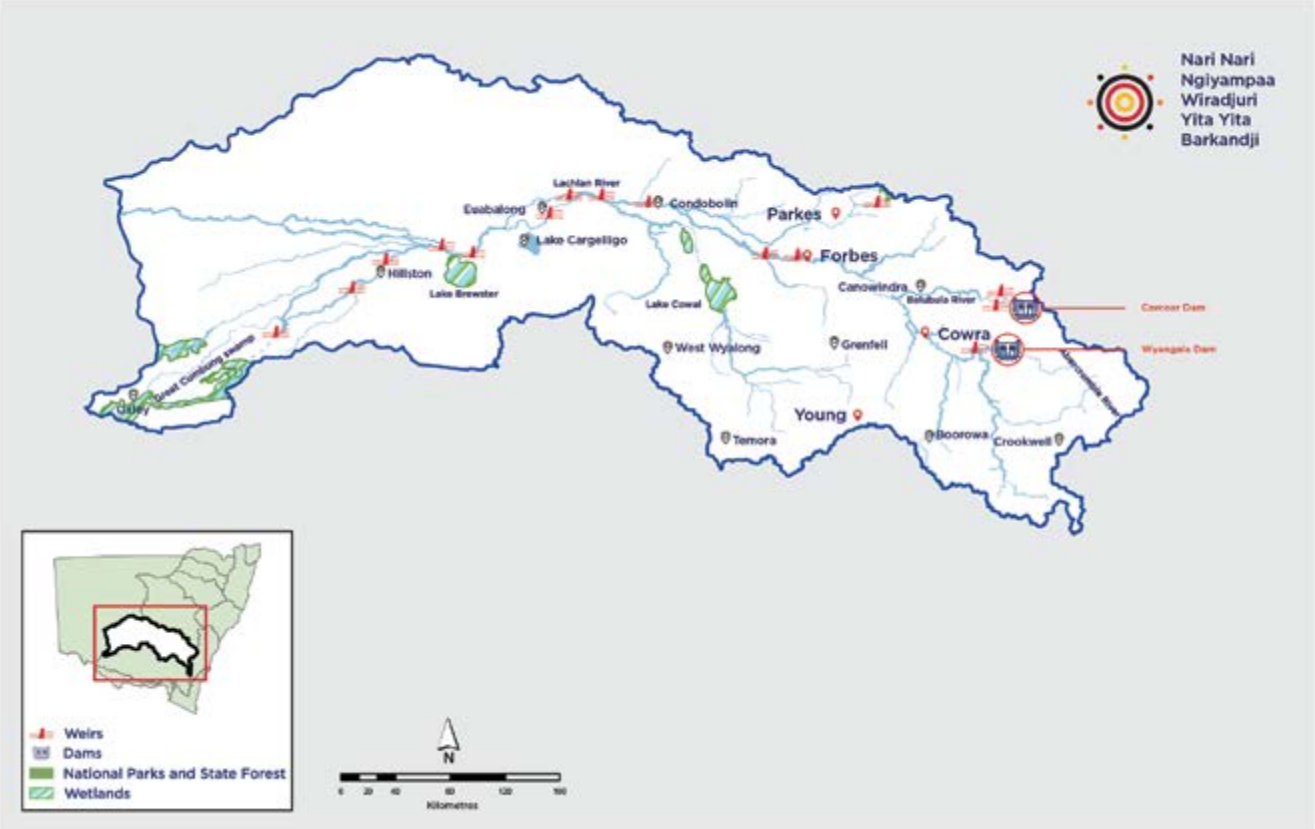
The Lachlan region is located in central NSW, west of the Great Dividing Range. It covers an area of around 90,000 km2.[29] The Great Dividing Range borders the region in the east, with the landscape becoming flat and encompassing wetlands, floodplains, agricultural land and major bird breeding areas in the west.

2.2.1 Water resources in the region

The region is supported by multiple sources of water (Figures 14, 15 and 16), including:

- two regulated rivers: the Lachlan River, supplied from Wyangala Dam; and Belubula River, supplied from Carcoar Dam[30]
- a system of creeks and unregulated rivers[31]
- groundwater sources including the Lower Lachlan, Upper Lachlan, and Belubula alluviums as well as the Lachlan Fold Belt and Young Granite
- reuse of existing water sources, including recycled wastewater.

Figure 14. Map of the Lachlan region: key water resources and infrastructure



29. Murray-Darling Basin Authority 2020, Lachlan—Water resource plan www.mdba.gov.au/publications/mdba-reports/lachlan-water-resource-plan
30. A regulated river or stream is one where the flow has been modified from its natural state through structures such as dams, weirs or off-takes. Major dams usually control the flow of water down regulated rivers.
31. An unregulated river or stream is not controlled by releases from a dam or through the use of weirs or gated structures. Water users are reliant on climatic conditions and rainfall.

Major rivers and dams

The Lachlan River flows from the Great Dividing Range near Gunning to its junction with the Murrumbidgee River near Oxley (Figure 15). At around 1,400 km length, it is the fourth longest river in Australia.[32] The Belubula River meets the Lachlan River approximately 50 km downstream of Wyangala Dam.

Large water users and environmental assets are spread along the river. As shown in Figure 15, Wyangala Dam is located around 200 km downstream of Gunning; the town of Forbes is located a further 200 km downstream from Wyangala Dam; Lake Cowal is located about 275 km downstream of Wyangala Dam and other nationally important wetlands are 700 km from the dam. These distances challenge water delivery along the Lachlan River.

Lower Lachlan re-regulating storages such as Lake Brewster wetland and weir pool and Lake Cargelligo capture tributary inflows below Wyangala Dam, providing greater flexibility in managing flows. However, despite the Lake Brewster Water Efficiency Project, higher evaporation losses from Lake Brewster and Lake Cargelligo compared to Wyangala Dam mean that these re-regulating storages are emptied first and only filled from unregulated tributary flows.

The length of the river and high evaporation rates can make it difficult to deliver water to towns, stock and domestic users, industries and environmental assets during dry periods once the Lower Lachlan re-regulating storages are empty or are below effective capacity.

Major water infrastructure on the Lachlan regulated catchment includes:

- **Wyangala Dam**: is the main storage in the region and is situated at the junction of the Lachlan and Abercrombie rivers. It can hold up to 1,217 GL of water[33]
- **major off-stream storages**: Lake Brewster (154 GL) and Lake Cargelligo (36 GL) are off-stream storages along the Lachlan River.[34] Lake Cargelligo is a major recreational asset and also supports water sports and fishing.

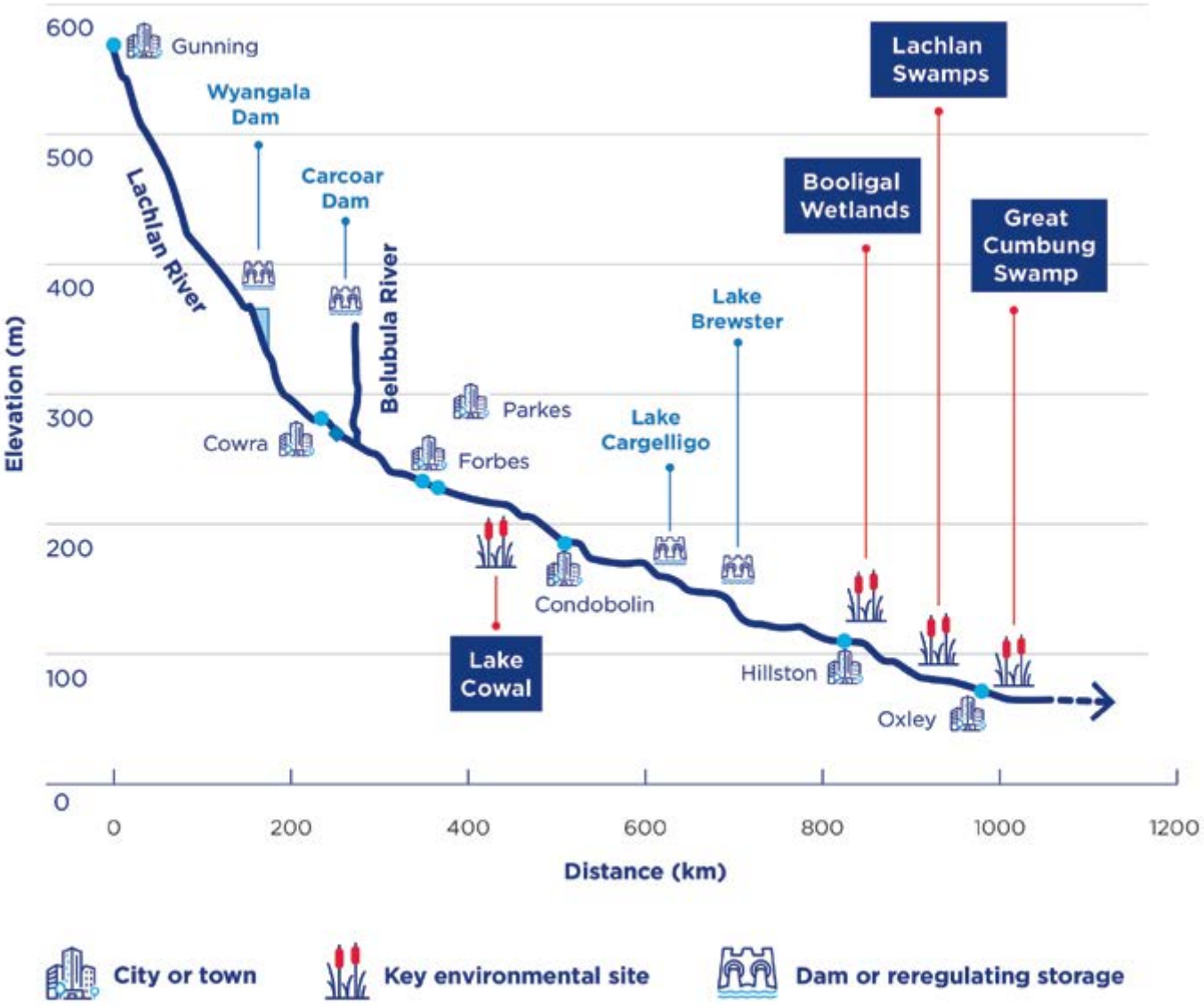
The Belubula River is approximately 60 km long, rising midway between Bathurst and Orange and flowing through Canowindra before meeting the Lachlan River near the town of Gooloogong.[35]

The main water infrastructure in the Belubula regulated catchment consists of:

- **Carcoar Dam**: is situated in the headwaters of the Belubula River and holds 35.8 GL. It provides water for irrigation, stock, households, Cadia Mine and environmental needs.

The floodplains of the region are also significant: during high flows, the floodplains connect the region's river systems and support industries such as floodplain grazing and lake bed cropping.

Figure 15. Lachlan River: longitudinal profile



Source: Murray-Darling Basin Authority, Lachlan River longitudinal profile, www.mdba.gov.au/sites/default/files/pubs/Lachlan_LP.pdf

32. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface water resource description*, p1-2
33. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface water resource description*, p1
34. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface water resource description*, p31
35. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Appendix A—Surface water resource description*, p5

Unregulated rivers and creeks

A series of creeks and unregulated rivers run through the Lachlan region.

Many smaller towns in the region rely heavily on unregulated rivers for their water supply. In the Upper Lachlan and Belubula areas, the towns of Boorowa, Crookwell, Gunning and Canowindra (with a combined population of approximately 5,400)[36] rely predominantly on unregulated surface water supply.

An extensive town water supply system exists across the region, capturing water from unregulated systems in smaller capacity dams and weirs, and moving this water around the region via a pipeline system that connects many towns. The largest of these town water storages is Lake Rowlands, which captures water from an unregulated tributary of the Belubula system near Blayney.

The region's creeks are not regulated and do not always flow. Despite their intermittent flow, the creeks are an important water source to meet environmental, industrial, stock and domestic needs.

In the Lower Lachlan area, creeks are provided with replenishment flows from the regulated river when there is enough water.

During droughts, one of the first water management measures is to limit the delivery of stock and domestic water to some of these creeks. This is because the transmission losses associated with delivering this water during drought conditions are very high.

Securing water for users of unregulated rivers and creeks will become increasingly difficult in a future with even greater climate variability.

Groundwater

The region's three main groundwater sources are the Upper Lachlan, Lower Lachlan and Belubula groundwater sources.

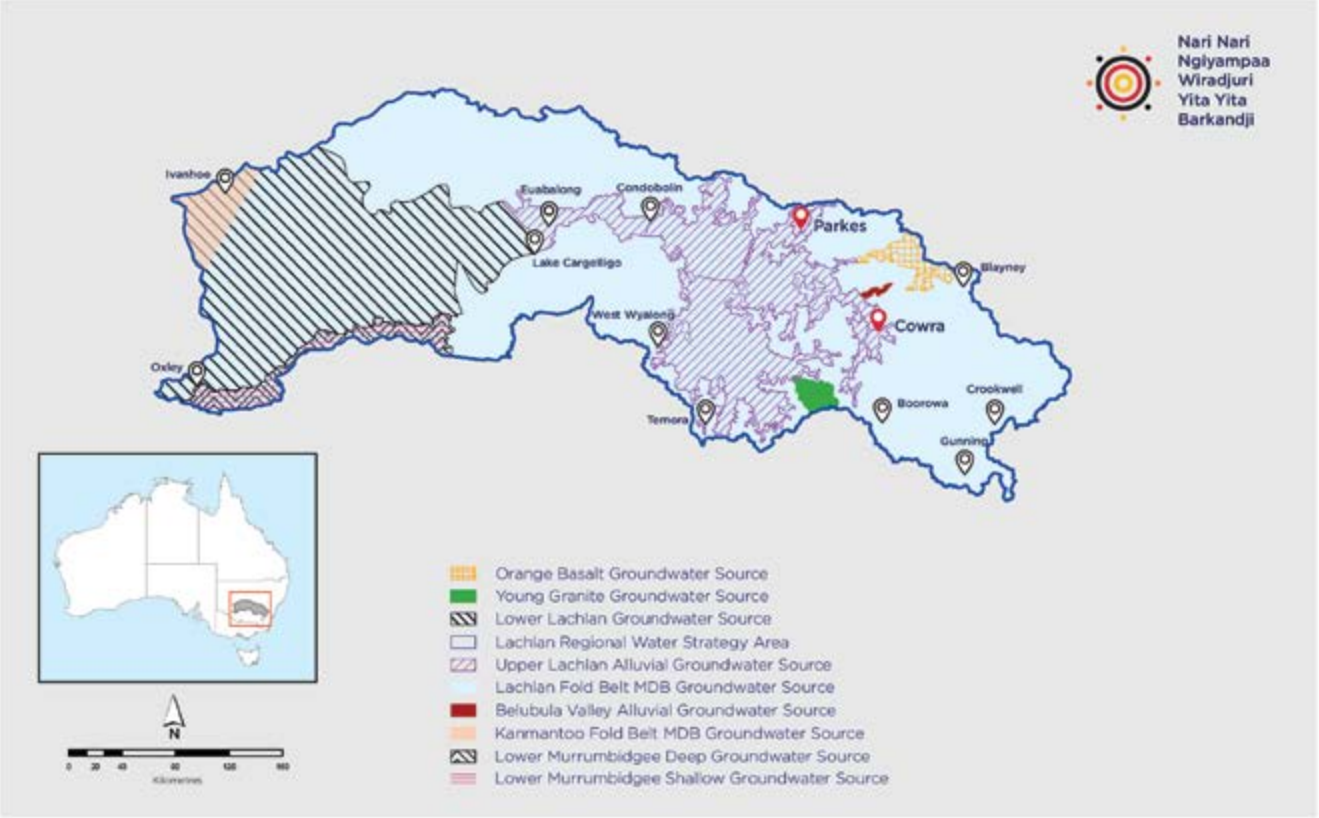
The Lower Lachlan groundwater source is the most productive and contains areas of high quality water, although in its western extent the water quality is generally poor. Groundwater is also available from fractured rock water sources such as the Lachlan Fold Belt and Young Granite. The Lachlan Fold Belt is mainly used for stock watering due to the low yield rates and lesser quality. The fractured rock groundwater sources extend beyond the boundaries of the Lachlan Regional Water Strategy. When we refine the regional water strategies further, we will consider the challenges and opportunities for these groundwater sources as they apply across multiple regional water strategy areas.

Groundwater is an important town water source for the Lachlan region—as a primary source (for towns such as Parkes and Hillston) or as an alternative supply (for towns such as Forbes). Groundwater also plays an important ecological role in supporting ecosystems, particularly during extended dry periods in the Lower Lachlan region. During these times, groundwater can maintain biota and fish refuges.

For some agricultural industries, groundwater is their only source of water; for others, it can be an important water resource when surface flows are unavailable. During the Millennium Drought, the NSW Government stopped the Lachlan River flowing at Condobolin to preserve water for critical human needs. This meant that those producers without groundwater licences either did not produce a crop or had to trade in temporary water allocations to bring water to their properties.[37]

36. Australian Bureau of Statistics 2016, Australian Census of Population and Housing, via TableBuilder Pro.
37. For a description of how water trading operates in the Murray-Darling Basin, see www.mdba.gov.au/managing-water/water-markets-and-trade

Figure 16. Map of groundwater sources in the Lachlan region



Groundwater is likely to become an increasingly important water source for the Lachlan region in the future. During periods of drought with limited surface water availability, people with groundwater licences rely more on groundwater. This puts more pressure on groundwater sources that are already under stress. Less rainfall also affects how groundwater resources replenish and places further pressure on these resources.

As groundwater is recharged from surface water and also provides base flow to the Lachlan River during periods of low flow, options that change the way surface water systems are operated will affect the security and reliability of groundwater supply.

Governments and communities will need to continue to manage localised groundwater drawdown, particularly downstream of Hillston and in two areas above Lake Cargelligo where levels are declining.[38]

An extensive groundwater monitoring network exists across regional NSW, with data going back to the 1970s. Continuing to improve our collective understanding of groundwater will enable better informed decisions about its management and use. In particular, providing more information to local councils can help them make well-informed decisions about which water sources they draw from at different times.

38. Department of Industry 2018, *Lachlan Alluvium Water Resource Plan: Schedule D—risk assessment*, www.industry.nsw.gov.au/water/plans-programs/water-resource-plans/drafts/lachlan-alluvium/components-for-consultation

NSW has a strong groundwater management framework that has undergone significant reform, including actions to protect the sustainability of groundwater sources. In 2005, licences to access groundwater in the Lower Lachlan were reduced by approximately 100 GL as part of NSW's Achieving Sustainable Groundwater Entitlement program. The program was implemented because there was an over-allocation of licences in NSW's six major inland groundwater systems, including the Lower Lachlan.[39]

However, opportunities still exist to continue to improve how we manage the Lachlan region's groundwater resources. In particular, the Draft Lachlan Regional Water Strategy will consider options to improve the understanding of groundwater processes, provide reliable and sustainable access to groundwater and give greater clarity in managing groundwater extraction (see Options 10, 21, 22 and 23 in Table 3). These and other options aim to use groundwater more efficiently, sustainably and innovatively to make sure groundwater of suitable quality is available for critical needs and to manage risks to the resource.

Recycled wastewater

In the Lachlan region, five out of 12 local water utilities with sewerage systems produce recycled water for reuse. This water is primarily used for agricultural, industrial and environmental purposes. In 2017/18, 2217 ML of recycled water was supplied in the Lachlan region—almost half (47%) of the total wastewater collected by the region.[40] The regional water strategies are an opportunity to explore whether recycled water should be used as a drinking water supply, along with other initiatives (such as stormwater harvesting) that could increase town water security (see Option 9 in Table 3).

While councils like Parkes Shire Council are leading the way in using recycled water, there are opportunities for other councils to manage wastewater as a resource during normal and drought periods, including for maintaining green open spaces.

A 'new' water source for Parkes

The social impacts of extended dry periods and severe droughts can be significant for regional communities. Many regional towns are unable to fill public pools, irrigate playing fields or keep public space 'green'. This often has a detrimental effect on the social wellbeing of these communities.

Councils like Parkes Shire Council are using recycled water to maintain green spaces, relieving pressure on existing water supplies and creating room for growth in demand. Parkes is implementing a new scheme to use recycled water for open space irrigation sites around the region. It will produce up to two megalitres of water per day, equal to two Olympic size swimming pools of water.

Schemes like these can help to improve water security by providing additional sources of water for a town's green spaces without the need to rely on potable (drinking) water supply from rivers and groundwater sources.

39. Department of Primary Industries 2016, *Achieving Sustainable Groundwater Entitlements Program—Final Report to the Commonwealth Government of Australia.*
40. Department of Planning, Industry and Environment—Water, Local Water Utilities Performance Monitoring Database 2019. This data is progressively being published online at www.industry.nsw.gov.au/water/water-utilities/lwu-performance-monitoring-data

2.2.2 Water and the regional environment

The Lachlan region is home to the historically and culturally significant Cliefden Caves. These heritage-listed caves are one of the most cavernous limestone areas in NSW. The caves are spiritually significant to the Wiradjuri Traditional Owners who continue to visit the site for ritual purposes and cultural obligations to the land.[41]

The region also has several important water dependent environmental assets:

- **native flora and fauna species**, including diverse native fish populations and endangered river snails. Some of these are listed as threatened or endangered. Many are essential for river health, water quality and recreation
- **nationally important wetlands and swamps**, including Lake Cowal near Forbes, Lake Brewster, the Booligal wetlands and the Great Cumbung Swamp in the Lower Lachlan. These wetlands provide important feeding habitat for migratory waterbirds and contain one of the largest reed swamps in the Murray-Darling Basin
- **Endangered Ecological Communities**, which are naturally occurring groups of native plants, animals and other organisms living in a unique habitat. In particular, the natural drainage system of the lowland catchment of the Lachlan River is listed as an Endangered Ecological Community under the *NSW Fisheries Management Act 1994*
- **floodplains**, which provide important environmental functions and—in times of flood—enable a connection between the Lachlan River to the Murrumbidgee through the Great Cumbung swamp. These areas are also highly important for Aboriginal people.

Healthy water sources support these environmental assets and species. A healthy environment also improves the liveability of the region, contributes to the health and wellbeing of communities and sustains the tourism and other industries. For example, healthy fish species support Aboriginal cultural and recreational fishing in the region and provides stimulus to the local economy.

However, the regulation of the Lachlan region's regulated rivers—through dams, storages, weirs and regulators—has reduced the frequency, depth and duration of connection between the river and its highly productive floodplain and nationally significant wetlands.[42] These extensive ephemeral floodplain wetlands sustain waterbird, frog and native fish populations by providing the habitat they require to breed and recruit to sustain long-term populations. The existing infrastructure and their associated operation has also contributed to deteriorating conditions of the catchment's ecosystems and resulted in:

- reduced moderate to high flows in the Lower Lachlan region, which has prolonged the period between large flows reaching these areas
- barriers to fish passage, which reduce the ability for fish to migrate leading to habitat fragmentation and drying
- cold water pollution, which can reduce the growth of fish, impact their lifecycle and reduce their chance of survival
- fish being extracted by pumps and diverted into channels.[43]

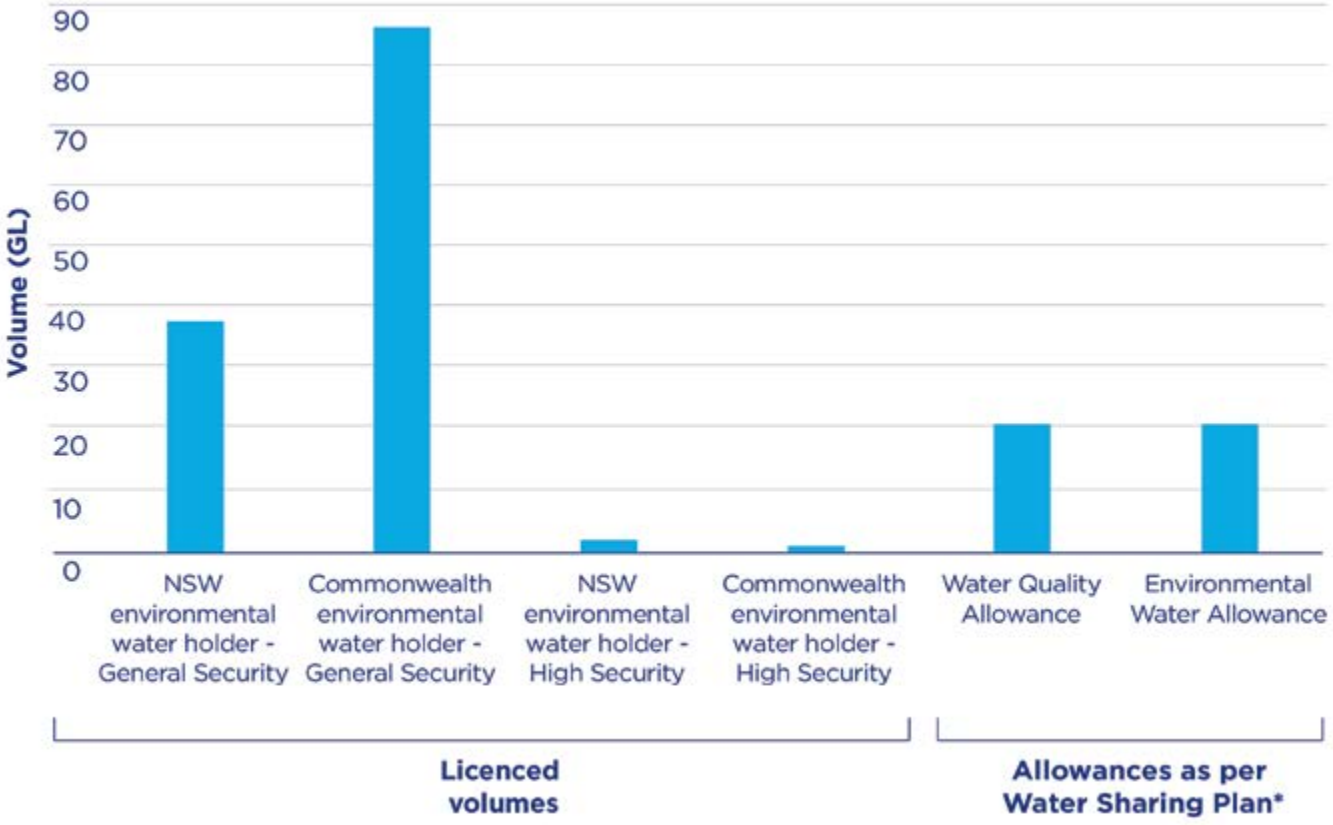
41. Office of Environment and Heritage 2019, Cliefden Caves Area—Natural and Cultural Landscape, www.environment.nsw.gov.au/heritageapp/ViewHeritageItemDetails.aspx?ID=5051851
42. Office of Environment and Heritage 2018, *Lachlan Long Term Water Plan Part A: Lachlan catchment*, www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/long-term-water-plans/lachlan
43. Department of Primary Industries 2007, *The effects of selected irrigation practices on fish of the Murray-Darling Basin Fisheries*, www.dpi.nsw.gov.au/content/research/areas/aquatic-ecosystems/outputs/2007/901

The existing infrastructure and regulation affect the ability to meet environmental outcomes and cause the overall ecological health of the Lachlan River to be poor. Also, the region's fish community remains in poor health and some species are under serious threat.[44]

The water sharing plans for the region and the Basin Plan protect water to deliver environmental outcomes.

Today in the Lachlan, 127 GL of water entitlements are managed by state and federal environmental water holders (Figure 17). Of these entitlements, just over 49.6 GL has been recovered for the environment under the Murray-Darling Basin Plan.[45]

Figure 17. Environmental water volumes in the Lachlan region*



*Note: The allowance as per the water sharing plan for the Lachlan Regulated River Water Source 2016 does not include translucent flows. Under the state rules that govern management in the regulated Lachlan River, if a certain amount of water (250,000 ML since 1 January of each year) flows into the Wyangala Dam over the period 15 May to 15 November, water from tributaries or a volume released down the river from storage is allowed to flow the length of the river. This is called a translucent flow and is a type of planned environmental water event that is intended to restore some medium to high flows, seasonality and flow variability. Translucent flows can be an important contributor to the health of the Lachlan catchment because water from tributary inflows is generally richer in nutrient than water released from the dams

Source: NSW Government 2020, Current water holding, www.environment.nsw.gov.au/topics/water/water-for-the-environment/about-water-for-the-environment/current-water-holdings
Commonwealth environmental Water Holder 2020, Environmental water holdings, www.environment.gov.au/water/cewo/about/water-holdings

The majority of licensed water entitlements managed by state and federal environmental water holders are general security entitlements. The water entitlements held by governments for environmental assets and ecosystem functions are subject to the same pressures and obligations as that of other general security entitlement holders, including agriculture.

The water sharing plan for the Lachlan regulated river also include rules that address essential and sometimes different but complimentary ecological functions to meet the region's environmental needs.[46] These include:

- an environmental water allowance[47]
- a water quality allowance
- daily environmental releases (also referred to as translucent flows).

These daily releases occur for short and infrequent periods as they are linked to seasonal cues. They are only available between May and November and are tied to wet climate conditions or natural inflows into Wyangala Dam.[48]

Despite these rules, providing water for a healthy environment can be difficult during extreme events due to several factors.

Options being considered through the Draft Lachlan Regional Water Strategy have a strong focus on improving the health of natural systems and protecting water-dependent species, such as native fish.[49] These include measures to reduce the impacts of cold water pollution (see Option 11 in Table 3), works to restore environmental flows (Option 12), better management of wetlands on private land (Option 13) and actions to improve the health of native fish species (Options 14 and 18).

Further work is underway to better reflect the demand and use of held environmental water in the Lachlan region's hydrological models. Initial consultation with environmental managers to understand the intention and rules for using held environmental water has begun. Our models will be updated as our management of environmental water evolves.

44. Department of Planning, Industry and Environment—Environment, Energy and Science, *Lachlan Long Term Water Plan*, www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/long-term-water-plans/lachlan
45 Department of Agriculture, *Surface water recovery under the Basin Plan as at 31 March 2019*, www.agriculture.gov.au/water/mdb/progress-recovery/progress-of-water-recovery
46. There are also existing rules in water sharing plan for the Belubula regulated river to meet the environmental needs in the Belubula catchment. These rules are being reviewed as part of the development of the water resource plans.
47. The water sharing plan for the Lachlan regulated river includes conditions for making releases under the environmental water allowance. The environmental water allowance is 'pegged' to general security allocations being a certain percentage of general security share component.
48. The water sharing plan for the Lachlan regulated river includes conditions for these releases. Daily environmental releases are dependent on inflows into Wyangala Dam. These releases are only available once Wyangala Dam inflows exceed 250,000 ML.
49. The regional water strategies will also seek opportunities to improve environmental outcomes for other aquatic species, including water rats, turtles, shrimp and yabbies and macro and micro invertebrates as well as frogs and waterbirds with life cycle dependencies on access to permanent waterbodies to survive dry periods and inundation of floodplain habitats for greater opportunities for feeding and breeding.

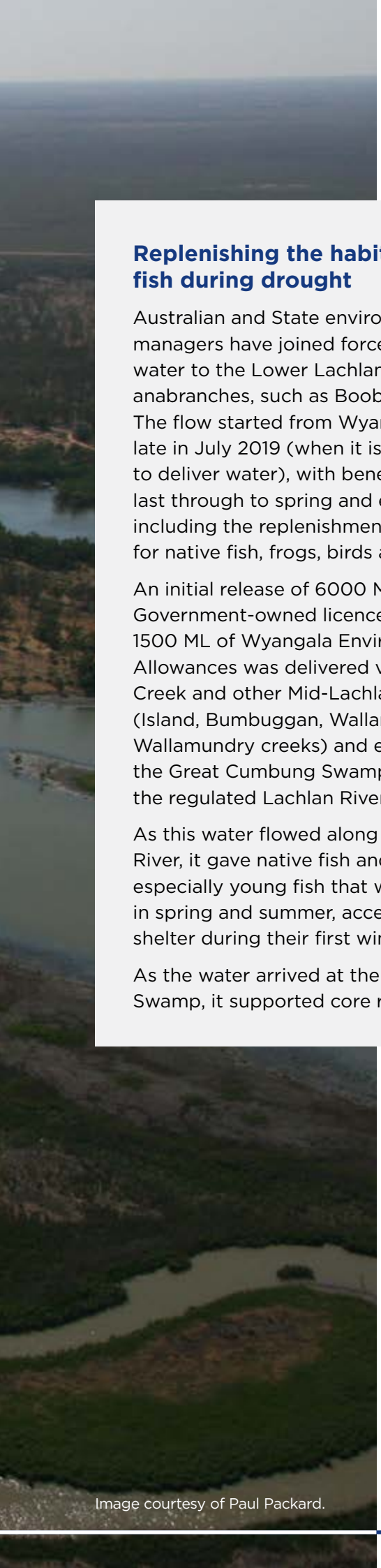


Image courtesy of Paul Packard.

Replenishing the habitat of native fish during drought

Australian and State environmental water managers have joined forces to deliver water to the Lower Lachlan River and key anabranches, such as Booberoi Creek. The flow started from Wyangala Dam late in July 2019 (when it is more efficient to deliver water), with benefits that will last through to spring and early summer including the replenishment of vital habitat for native fish, frogs, birds and plants.

An initial release of 6000 ML of Australian Government-owned licenced water and 1500 ML of Wyangala Environmental Water Allowances was delivered via Booberoi Creek and other Mid-Lachlan anabranches (Island, Bumbuggan, Wallaroi and Wallamundry creeks) and eventually into the Great Cumbung Swamp at the end of the regulated Lachlan River.

As this water flowed along the Lachlan River, it gave native fish and waterbirds, especially young fish that were spawned in spring and summer, access to food and shelter during their first winter.

As the water arrived at the Great Cumbung Swamp, it supported core reed beds and aquatic plants that provide habitat for native animals. The flow improved connectivity along the Lachlan River and facilitated the exchange of food resources. The strategic and efficient use of water for the environment supports key refuge sites such as Booberoi Creek for freshwater catfish and the Great Cumbung Swamp for waterfowl and migratory waders. This ensures that the river system and its wetlands can recover when higher river flows return.

In the Lower Lachlan region, the 50,000 ha swamp supports a diverse range of water dependent ecosystems that host threatened and iconic native fish like Freshwater Catfish and Murray Cod, and rare and threatened waterbird species such as Blue-billed Duck, Freckled Duck and Australasian Bittern, and migratory Sharp-tailed Sandpipers.

This coordinated watering event was informed by consultation with the Ngiyampaa Nation, the Booberoi Water Users Group, local landholders and the Lachlan Environmental Water Advisory Group to obtain advice on the best timing for the water release.

2.2.3 Managing water in the Lachlan region

Water in NSW is managed and shared under the *Water Management Act 2000*, with specific water sharing rules set out in the water sharing plans.

Dealing with extraction limits

The Murray-Darling Basin Plan sets the limit on the amount of water that can be extracted from sources in the Lachlan region, based on long-term models of the river system. The current estimated sustainable diversion limits for the Lachlan are 577.7 GL per year for surface water and 214 GL per year for groundwater.[50]

These limits are implemented through water sharing plans for the *Belubula Regulated River Water Source 2012*, the *Lachlan Regulated River Water Source 2016*, the *Lachlan Unregulated Water Source 2012*, the *Lachlan Alluvium Groundwater Sources 2020* and the *NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020.*[51] Extractions in the Lachlan valley are managed so that they remain within these limits, irrespective of the licenced entitlement volume.

The current rules for allocating surface water and determining extraction limits in NSW are based on historic rainfall records prior to the development of the first water sharing plans. Reserves are set aside to operate the river system—both during normal and dry periods.[52] The rules are not set up to account for more extreme climate conditions, including those that may arise due to climate change.

The Lachlan Regional Water Strategy is an opportunity to consider whether the water allocation and accounting framework in the Lachlan region is appropriate, particularly in relation to the new climate data, water use trends and other regional developments (for example, see Options 33 and 34 in Table 3). In doing so, we need to examine the trade-offs of amending the current framework and understand how water users have already adapted to the existing risks. In the Lachlan in particular, many general security entitlement holders manage their risks of low future allocations through a conservative approach to water use. This has meant that surface water use in the Lachlan has generally trended below the allowable extraction limit in the water sharing plans.

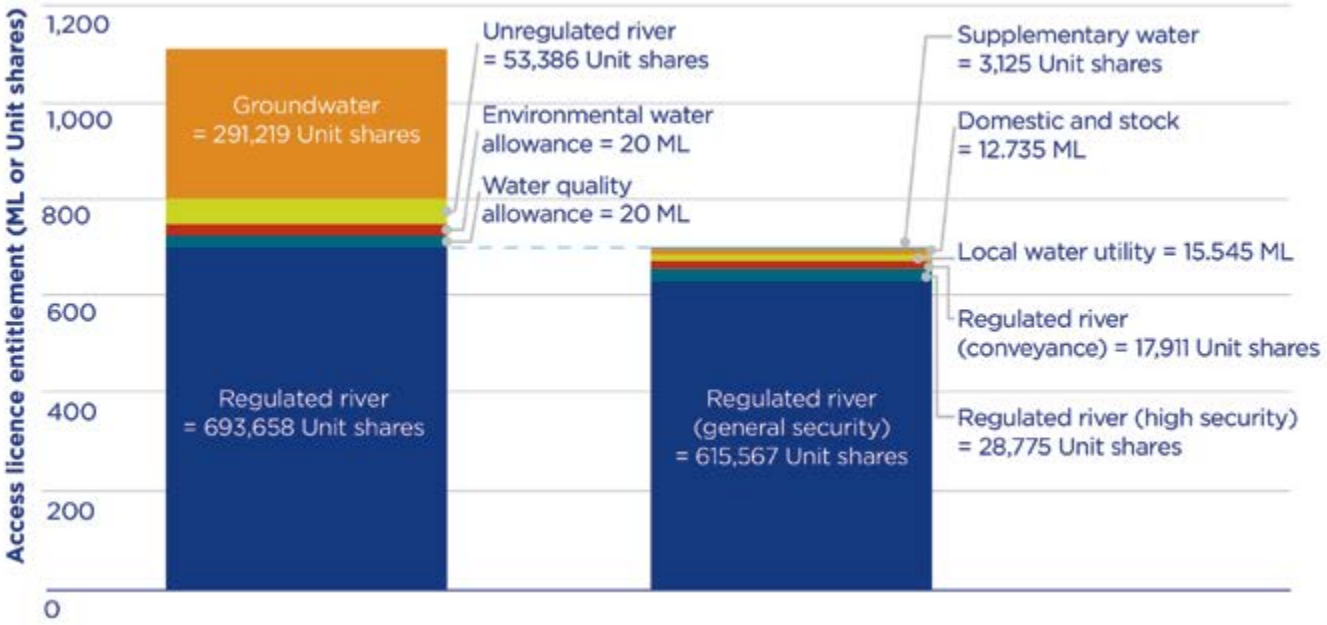
Image courtesy of Stefanie Schulte.

Entitlements to water in the region

The majority of the water entitlements in the Lachlan region are for regulated river and groundwater sources.

In the regulated river, only a small portion of water licences is for stock and domestic use and town water supplies (Figure 18). The vast majority of water entitlements (89%) are general security entitlements which are mainly used for commercial and environmental purposes. General security entitlements are less reliable, but the water sharing plan allows the unused general security allocations to be carried over from one year to the next.

Figure 18. Graph of water entitlements in the Lachlan region*



*Note:

- The water sharing plan for the Lachlan Regulated River Water Source 2016 provides for an Environmental Water Allowance and translucent flows that are subject to inflow conditions. These are managed by the NSW Government in collaboration with the Australian Government.
- Entitlement is based on licensed share components only and does not include Basic Landholder Rights.
- Groundwater entitlement only includes the share component for the Belubula Valley Alluvial Groundwater Source, the Upper Lachlan Alluvial Groundwater Source and the Lower Lachlan Groundwater Source.

Source: Department of Planning, Industry and Environment 2018, *Lachlan Water Resource Plan: Surface water resource description*, Lachlan Water Resource Plan and NSW Department of Planning, Industry and Environment water licence database

50. Department of Industry 2018, *Lachlan Surface Water Resource Plan: Sustainable diversion limit scenario model Appendix C to Schedule F* and *Department of Industry 2018, Lachlan Alluvium Water Resource Plan: Groundwater Resource Description.* The Sustainable Diversion Limit figures are draft figures until the Lachlan Surface Water and Groundwater Water Resource Plans have been finalised and accredited
51. Department of Planning, Industry and Environment, Lachlan Region, www.industry.nsw.gov.au/water/plans-programs/water-sharing-plans/status/lachlan-region
52. In the Lachlan, the worst inflow sequence prior to the commencement of the water sharing plan was used to determine the volume of reserves that needed to be set aside.

Setting priorities for water sharing

The *Water Management Act 2000* sets out how we prioritise water sharing during normal operations, with the highest priority being for the environment, followed by basic landholder rights (Table 1).

During extreme events, such as prolonged droughts, the priority changes. Basic landholder rights and essential town water services (authorised by an access licence) become the highest priority, followed by the environment.

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 as they provide certainty for all users of these water sources. The Lachlan Regional Water Strategy is an opportunity to consider whether the trigger should be reviewed (see Options 33 in Table 3).

Managing water quality

Water quality is managed through several legislative and regulatory instruments and agencies. For all inland NSW regions, water quality management plans have been developed to support the development of the water resource plans and meet the relevant requirements of the Murray-Darling Basin Plan.

The water quality management plans provide a framework to protect, enhance and restore water quality to:

- provide essential and recreational amenities for rural communities
- protect and improve ecological processes and healthy aquatic ecosystems
- fulfil Aboriginal peoples' spiritual, cultural customary and economic values
- assist industry to be productive and profitable.

Table 1. Priorities for water sharing

Priority	Extreme events	Normal circumstances
Highest	• Critical human water needs	• Needs of the environment
High	• Needs of the environment	• Basic landholder rights
	• 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 any priority 3 take	• Local water utility access licences • Major utility access licences • Stock and domestic access licences
	• General security licences	• Regulated river (high security) access licences
Low	• Supplementary licences	• All other forms of access licences • Supplementary access licences

Source: Based on priorities table in *Lachlan Surface Water Resource Plan: Schedule G—Incident Response Guide for the Lachlan Surface Water Resource Plan*

Water sharing plans are a key mechanism to manage water quality in the Lachlan region. The plans provide a number of mechanisms and tools (including extraction limits, protection of tributary flows and cease to pump rules) to help ensure sufficient flow is available to meet water quality objectives and targets.

The water sharing plan for the Lachlan Regulated River Water Source is one of the few legislative instruments that specifically sets aside water to manage water quality through a Water Quality Allowance.

The Lachlan Water Quality Allowance has been used twice in the last two years: during the 2018/19 summer and more recently in January 2020. Releases were used to increase the river flow rate to reduce the risk of poor water quality in the river. In January 2020, the Water Quality Allowance was triggered by low dissolved oxygen levels, which posed a significant risk to the region's aquatic ecosystems.

The regional water strategy offers the opportunity to consider whether any additional actions are needed to help manage water quality in Lachlan region. This potentially includes water quality treatment works (see Option 7 in Table 3) and environmental and water quality restoration works (Options 12 and 16).

Gathering more and better information

Improving the information we have about water use and water needs will help us to manage the Lachlan region's water sources more effectively and ensure we can plan to have enough water available at the right time. Improving the collection of data will give us a better understanding of the water risks in the region for the environment and all water users. More data and knowledge will also support future decisions about water sharing.

Improved information can help water users, future investors and regions make more informed decisions about the industries that are most suited to each region.

Better data and information on floods in the Lachlan region is also critical to understand how floodplains are connected, how groundwater sources are replenished and the flood risks of towns and villages. Flood studies that analyse the characteristics and movements of floods will provide valuable information to assist in the decision-making process around how to protect rural properties and vital infrastructure, while ensuring that environmental and cultural assets are not negatively affected.

Given the continuing demand on groundwater, enhancing our understanding of the interaction between surface water and groundwater resources in the Lachlan will help us improve the resilience of our water sources. We need to understand where a change in groundwater use can influence flows to rivers and vice versa. We also need to understand how a changing climate is impacting the replenishment of groundwater sources. More broadly, we need to ensure ongoing investment in the groundwater monitoring network so we have the water quantity and quality information we need to manage the resource into the future (see Options 21 and 36 in Table 3).

In addition, the Department of Primary Industries is undertaking a three-year program to identify and map important agricultural lands.[53] Knowing where this land is situated and understanding its location, value and contribution will assist businesses in making decisions about current and future agricultural land uses. A comprehensive and consistent approach to collecting water statistics information will greatly help this process.

Technology can help

The NSW Government and WaterNSW are developing a new data platform to increase the availability and accessibility of critical non-urban water information, including:

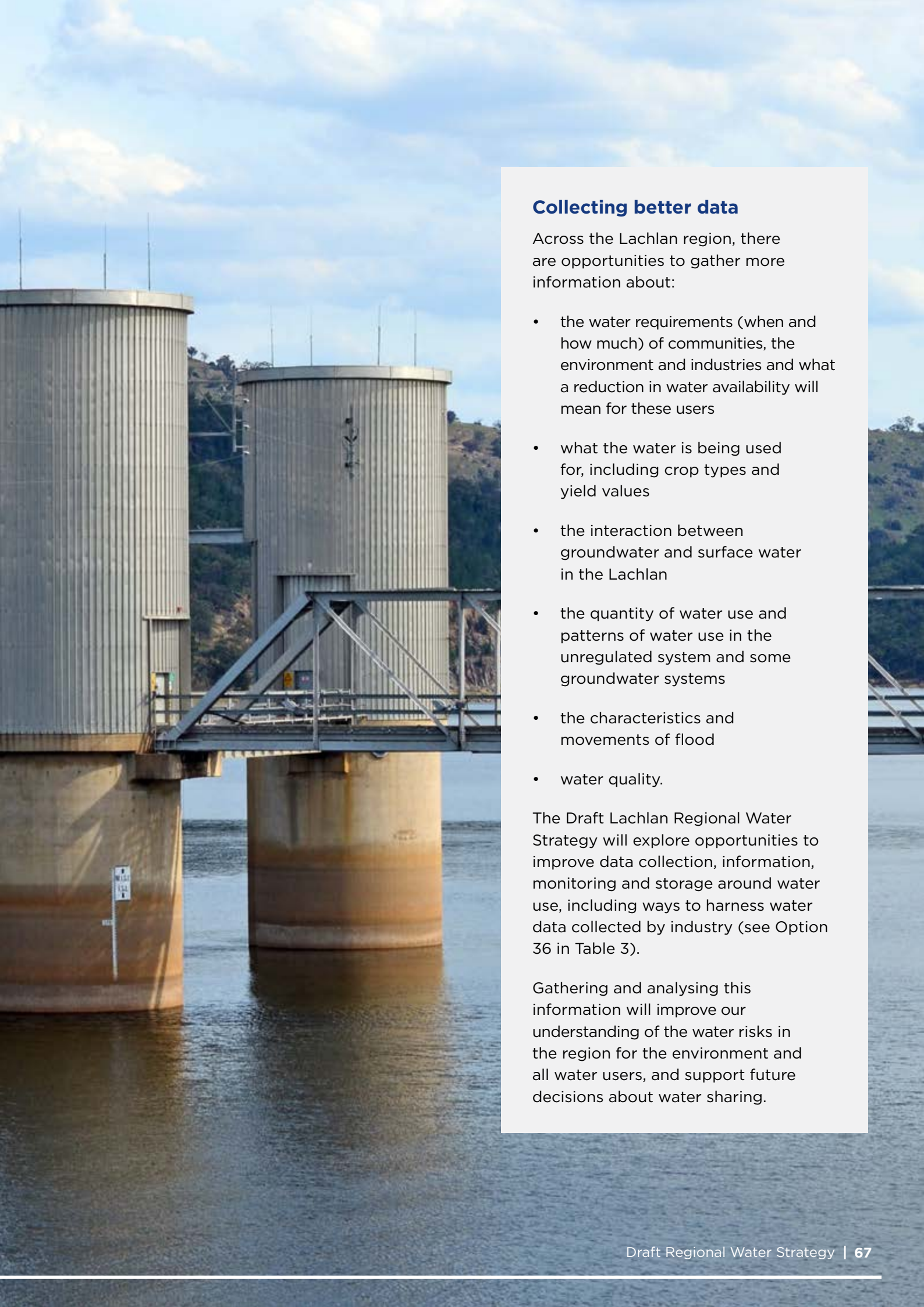
- water sharing plan rules
- entitlements and works approvals
- transactions
- water take
- water flows.

The initiative will be developed progressively and be fully operational by 2025.

In addition, under the new metering laws, large surface water users will need to install telemetry and remotely transmit water information to government. This will give the Natural Resources Access Regulator a reliable source of data about water take to inform its compliance and enforcement functions, as well as supporting WaterNSW and Department of Planning, Industry and Environment in their billing and other water management activities.

Water users will also be able to access their information via a private online dashboard.

53. Department of Primary Industries 2019, *Important Agricultural Land Mapping in NSW*, www.dpi.nsw.gov.au/agriculture/lup/agriculture-industry-mapping/important



Collecting better data

Across the Lachlan region, there are opportunities to gather more information about:

- the water requirements (when and how much) of communities, the environment and industries and what a reduction in water availability will mean for these users
- what the water is being used for, including crop types and yield values
- the interaction between groundwater and surface water in the Lachlan
- the quantity of water use and patterns of water use in the unregulated system and some groundwater systems
- the characteristics and movements of flood
- water quality.

The Draft Lachlan Regional Water Strategy will explore opportunities to improve data collection, information, monitoring and storage around water use, including ways to harness water data collected by industry (see Option 36 in Table 3).

Gathering and analysing this information will improve our understanding of the water risks in the region for the environment and all water users, and support future decisions about water sharing.

2.3 People, industries and water use

2.3.1 Aboriginal people

Most of the Lachlan region is the traditional land of the Wiradjuri people, the largest Aboriginal Nation in NSW. They are the people of three rivers: the Kalari/Galari (Lachlan River), the Wambool (Macquarie River) and the Murrumbidjeri (Murrumbidgee River). Their traditional land extends from the Murray River to beyond Dubbo and west to near the township of Hay.

Water is the lifeblood of Aboriginal people. It allows kinship, recreation, connection, stories, songlines and healing through medicine and food. Healthy waterways and groundwater systems are critical to Aboriginal communities for culture, health and wellbeing.

Aboriginal people have been caretakers of the land and water of the Lachlan region for over 60,000 years. Irrespective of European colonisation, which interfered with Aboriginal peoples' traditional land and water management, Aboriginal people have an ongoing cultural obligation to care for Country.

Today, Aboriginal people make up around 9% of the total population in the region.

Some significant water-dependent sites are recognised throughout the Lachlan region including ceremony and dreaming sites near and on Booberoi Creek, fish traps and grinding grooves near Willandra Creek Weir, scar trees, ring trees and evidence of occupation (earth ovens, axe heads) around waterholes and ephemeral floodplain wetlands. Waterways and wetlands such as Pimpara Creek, Goobang Creek, Lake Waljeers, Ita Lake, Lake Cowal, Willandra Lakes, The Murie Lake, Euabalong Lagoons, the Great Cumbung Swamp, Lachlan Swamps, Bundaburrah Cowal and Booligal Wetlands are also culturally significant. Protecting these places is important to Aboriginal people.

The landscapes around these areas are old, with occupation extending back 40,000 years. Getting water to these sites will help to improve the landscape and cultural values, as well as deliver environmental, social and economic benefits to Aboriginal communities.

Water for Aboriginal people

Aboriginal people's legal rights as they apply to water management have been recognised in international human rights treaties and conventions, in Australian and NSW Native Title and land rights laws, and in national and state-based water plans. These instruments recognise the right of self-determination, strengthening relationships to traditionally owned lands and water, maintaining the environmental knowledge and practices of Aboriginal people, promoting their full participation in decisions about water resources and acknowledging Aboriginal cultural values and uses in water planning.

In addition, 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'.[54]

While there are some ways of accessing water for cultural purposes, we heard from Aboriginal people in the Lachlan that the current provisions in the *Water Management Act 2000* are not meeting their spiritual, cultural, social and economic needs.

Image courtesy of Destination NSW.

Australia's Native Title laws recognise the traditional rights and interests to land and water of Aboriginal people. Anyone who holds Native Title with respect to water can take and use water for personal, domestic and non-commercial communal purposes. Native Title holders often have water related aspirations from the protection of water, to advice on water management practices in a determinations area, to water allocations.

The Barkandji nation have a Native Title determination (NCD 2015/001) in the Ivanhoe area. The Ngemba, Ngiyampaa, Wangaaypuwan and Wayilwan nations have registered a Native Title claim (NC 2012/001) in central NSW, which includes part of the Lachlan region. Over the coming years, there could be more Native Title determinations in the Lachlan region.

Culturally, Aboriginal people can apply for an Aboriginal cultural water access licences. If granted, this licence can provide up to 10 ML/year for drinking, food preparation, washing and watering domestic gardens, as well as for Aboriginal cultural uses.[55]

Despite this, during our consultation we heard that current cultural water access licences are inadequate to meet the social, spiritual, cultural and economic needs of Aboriginal people.

54. Murray Lower Darling Rivers Indigenous Nations, 2007, Echuca Declaration, Part 1. The full declaration is available here: www.mdba.gov.au/sites/default/files/pubs/sa-mldrin-echuca-declaration-2009_0.PDF
55. For example Water Sharing Plan for the Lachlan Regulated River Water Source 2020, Part 7, section 39(2)

We also heard that water for Aboriginal people should be licences or water entitlements owned by Aboriginal people and allow for economic benefit. While some Aboriginal businesses, groups and Aboriginal Land Councils own water access licences, which are available on the market for trading, often the cost involved prohibits Aboriginal people from buying these entitlements and allocations.

Within the Lachlan, access to sacred and cultural landscapes is a significant issue with fencing on Traveling Stock Reserves preventing gathering and cultural practices. Collectively, these constraints prevent adequate access to water and Country to fulfil Aboriginal cultural rites, or to protect Aboriginal sites.

Aboriginal people also want to be more involved in water management decision making. Increasingly, Aboriginal knowledge is recognised as an essential element of how we manage natural resources in Australia. However, the complexities of water management, legislation and licensing—along with a lack of opportunities to participate in decision making—are significant barriers to making better use of Aboriginal people's knowledge and skills. Aboriginal people would also like to see more economic opportunities around the management of water.

For Aboriginal people, uncertainties around the future climate in the Lachlan region add urgency to developing policy settings and programs that fully recognise Aboriginal water rights and provide dedicated water allocations for Aboriginal people. This includes prioritising water for Aboriginal people in water sharing arrangements.

Partnering with Aboriginal people when undertaking research and monitoring programs provides an opportunity to better use their traditional knowledge and understanding of the region's waterways and wetlands.[56]

Partnerships between the Ngiyampaa Nation and NSW environmental water managers to achieve cultural outcomes in Booberoi Creek and land management partnership programs, such as Nature Conservancy Australia's Saving the Great Cumbung Swamp Project, are examples of these alliances at work in the Lachlan region.

Ensuring water reaches the end of the Lachlan system is important for the Nari Nari people. We heard that we need to look at ways to allow flows to reach the end of the system more easily, including looking at structures in the river that impede water flows. We also heard that the NSW Government's commitment to increasing the wall of Wyangala Dam could have negative impacts on Aboriginal cultural values and the ability of water to flow downstream.

The Lachlan Regional Water Strategy will reflect the results of our consultation with Aboriginal people in the region and consider options on how to recognise and deliver water rights for these communities.[57]

This includes a culturally appropriate water knowledge program (see Option 41 in Table 3), a project to identify and map water-dependent cultural sites (Option 42), a review of cultural water access licences (Option 43) and support for Aboriginal people to purchase water entitlements (Option 44). The draft strategy also includes options for an Aboriginal River Ranger Program (Option 19), co-management of Travelling Stock Reserves (Option 46) and a Regional Water Advisory Committee (Option 47). These and other options could potentially be incorporated in a state-wide Aboriginal water policy.

We will also assess all draft options to determine whether the options would have a positive or negative impact on outcomes for Aboriginal people.

56. Murray-Darling Basin Authority 2020, Basin-wide environmental watering strategy, www.mdba.gov.au/publications/mdba-reports/basin-wide-environmental-watering-strategy
57. More information about our Aboriginal engagement approach is in the *Regional Water Strategies Guide*.

2.3.2 People and towns

The Lachlan region is home to over 100,000 people and includes the regional centres of Parkes (population of 10,200), Cowra (8,400), Forbes (7,200) and Young (7,300).[58]

The rest of the population lives in small towns or rural areas. Smaller towns are located close to productive agricultural lands and mining developments, and are important to a thriving regional economy.

The regional centres are cultural hubs for their surrounding areas and the broader Lachlan region, hosting several festivals and events throughout the year—such as the National Cherry Festival in Young, the biennial River Arts Festival, the annual 'foodie adventure' Grazing down the Lachlan in Forbes and the annual Elvis Festival in Parkes which attracts over 26,000 visitors to the region.[59]

The region's economy and population are expected to grow over the next 15 years. Most of this growth is likely to be concentrated in Parkes, Cowra and Forbes, which will continue to provide jobs and services for surrounding towns.[60]

Economic growth in the region will be stimulated by the Inland Rail Project and the Parkes Special Activation Precinct.[61] Special Activation Precincts are a new way of planning and delivering infrastructure projects in specific regional locations in NSW to attract businesses, stimulate the local economy and provide more local employment opportunities.

Parkes has been chosen as the first such precinct in NSW because of its potential for business and employment growth associated with the east–west rail line and the north-south Inland Rail Project.

The NSW Government is also focused on improving employment opportunities for Aboriginal people in the Lachlan region. The Aboriginal Participation in Construction Policy supports a minimum of 1.5% Aboriginal participation in construction projects undertaken by NSW Government agencies.[62]

As the region grows, so will the need for town-based services such as healthcare, construction and retail. The NSW Government is investing heavily in transport, logistics, community and digital connectivity infrastructure to cater for the future population, including:

- over $49 million in community infrastructure such as recreation facilities, town halls, playgrounds and local libraries[63]
- almost $7 million for the Parkes National Logistics Hub, which will be located in the Parkes Special Activation Precinct
- $500 million in upgrades to the Newell Highway
- a $400 million package to improve digital connectivity across regional NSW.

58. Australian Bureau of Statistics 2016, *Australian Census of Population and Housing, via TableBuilder Pro* (note: Town population figures are based on urban centre and localities measures from the Australian Bureau of Statistics and are not based on total local government area population).
59. Parkes Elvis Festival 2019, *Festival History*, www.parkeselvisfestival.com.au/about/festival-history/
60. Department of Planning, Industry and Environment 2019, *NSW population projections*
61. Department of Planning, Industry and Environment 2019, *Parkes Special Activation Precinct*, www.nsw.gov.au/improving-nsw/regional-nsw/snowy-hydro-legacy-fund/activation-precincts/parkes-special-activation-precinct/
62. buy.nsw.gov.au/policy-library/policies/aboriginal-participation-construction
63. This figure does not include other grant programs, such as Growing Local; Economies or the Drought Stimulus Package. Total investment through the Regional Growth Fund in the Lachlan region is over $76 million as of April 2020.

Water for people and towns

Providing secure and resilient water supplies to regional towns and communities is vital to ensure the long sustainability and prosperity of the Lachlan region, particularly in the context of future population growth and a changing, more variable climate.

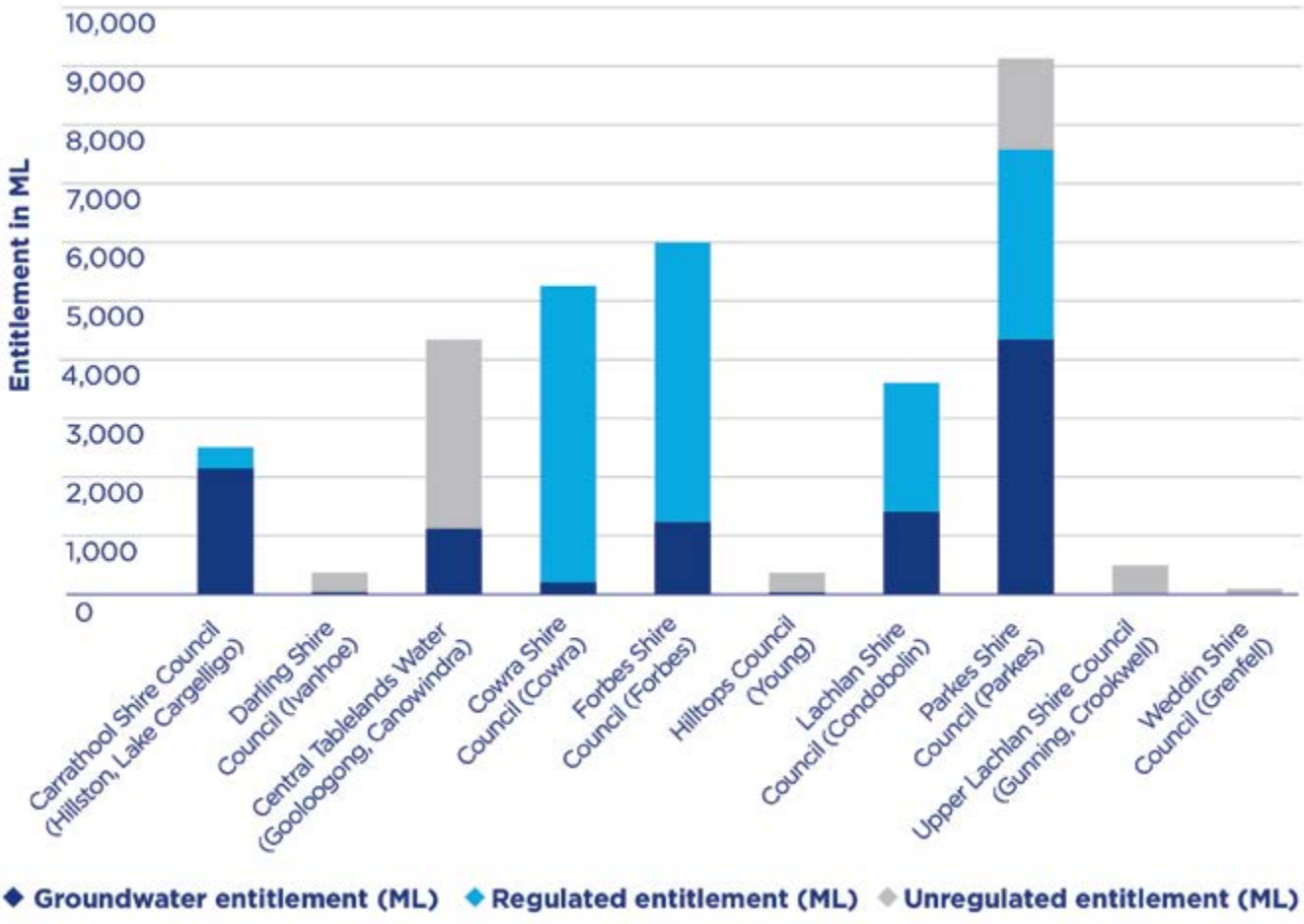
Secure and resilient water supplies support a growing population and contribute to the liveability, amenity and wellbeing of residents and visitors. Rivers, creeks and town water lakes offer social and recreational opportunities. Open spaces and parks connected to water are also important community assets and contribute to the broader social benefit of regional communities. In our conversations with local councils, we have heard that town lakes and other water bodies can also provide an escape from hardships associated with the drought. We need to find new and better ways to keep regional towns 'green' during dry periods, including through alternative water sources (see Option 38 in Table 3).

The responsibility of planning and delivering potable water and wastewater services to towns in the Lachlan region is shared between two water supply authorities (Central Tablelands Water and Goldenfields Water) and local councils. Over half of the population in the Lachlan region rely on water provided by a local government water utility.

Many towns within the region can access water from multiple sources (Figure 19) and are connected through an extensive water supply system that in some cases extends beyond the Lachlan region. Some towns, such as Young, source the majority of their water from a neighbouring catchment. In the development of the Lachlan Regional Water Strategy, we need to consider these inter-regional connections and how they can potentially mitigate critical town water security risks in the Lachlan region and beyond (see Option 6 in Table 3).

Image courtesy of Destination NSW.

Figure 19. Lachlan water entitlements by town water supplier*



*Note: This data does not include access entitlements for Goldenfields Water, which sources water from the Murrumbidgee River. Goldenfields Water is the primary water supplier for towns in Hilltop Council local government area, including Young

Source: Department of Planning, Industry and Environment water licence database

A large number of towns in the Lachlan region also rely on groundwater as either a primary or alternate source. During the last drought, a number of water utilities in the region invested in accessing groundwater to supplement water supplies during periods of limited surface water. Funding from the Restart NSW Water Security for Regions Program has supported water utilities in Cowra, Forbes and Lachlan Shires to drill bores to secure additional water supplies for their communities. In this drought, the NSW Government has provided funding to Parkes, Forbes, Condobolin and Cowra to improve their access to groundwater. However, it is important to understand that during dry periods when surface water supplies are less reliable, any increased groundwater use in the region can mean that the groundwater sources' extraction limits are exceeded; as a consequence, reduced allocations are introduced to manage the growth in use.

The regional water strategy process provide an opportunity to improve reliable access to groundwater by towns, including the removal of regulatory barriers, better policies and processes, and new infrastructure investment (see Option 10 in Table 3).

All town water supply systems are developed to balance costs with the community's expected service level targets. As such, all town water supplies have an inherent water security risk and are designed to accommodate moderate levels of restrictions. In regional NSW, these supply systems are planned and sized considering the historical and future consumptive needs and climate projections in consultation with communities. It is the responsibility of local water utilities to plan and provide water and sewerage services to each of their respective communities in a way that balances costs and community expectations. This responsibility extends to planning and delivering secure water supplies.

For towns and communities, the potential for more frequent and longer dry periods could mean less secure water supplies unless we act

Table 2. Water security risk for centres and towns in the Lachlan region*

Water utility	Drinking water supply system	Population served in 2014 (approx)	Water security risk**
Carrathool Shire Council	Hillston	1,000	High
Central Tablelands Water Council	Central Tablelands Supply System	9,700[64]	Very High
Cowra Shire Council	Cowra	8,700	Very High
Forbes Shire Council	Forbes	6,800	Very High
Hilltops Council	Boorowa	1,200	Very High
Lachlan Shire Council	Condobolin	2,800	Very High
Lachlan Shire Council	Lake Cargelligo	1,300	Very Low
Parkes Shire Council	Parkes and Peak Hill	10,900	Very High
Parkes Shire Council	Trundle, Tullamore and Bogan Gate	900	High
Upper Lachlan Shire Council	Crookwell	2,000	Very High

Note: *Compared to the risk to local water utilities surface water entitlement reliability modelled by regional water strategies, the water security access risk analysis undertaken by local water utilities (secure yield analysis as part of integrated water cycle management strategy) takes into account a local water utility's headworks arrangement and capacities, the physical water delivery environment and operational rules under water sharing plans as well as local water utilities operating protocol and past experiences in delivering water in drought conditions. This results in a water security access risk specific to each local water utility's town water supply system that is different to the modelled surface water entitlement reliability risk

**The risks identified in Table 2 represent the (preliminary) water security risks as assessed by the Safe and Secure Water Program as of April 2020 and are subject to change over time based on further investigation, new information from councils and/or delivery of projects/solutions addressing these risks

Source: NSW Government's Safe and Secure Water Program

64. In 2020, Central Tablelands Water services a population of approximately 15,000.

now to invest in diversified water sources—including climate-independent sources—and consider changes in water management arrangements. Overall, risks will be greatest for towns that rely on water from unregulated rivers and creeks. Groundwater, which is a key source of water for some towns in the region, may also become less secure as narrow and shallow groundwater sources could receive less recharge during dry periods.

Despite these risks, our new climate data and modelling indicate that the current water sharing arrangements in the regulated systems adequately scale back other water users access to protect town water supplies during dry times. This means that even if we consider the natural climate variability in the Lachlan region over the long-term, we appear to have adequate triggers in place in the current water sharing plan[65] to ensure storage levels in Wyangala Dam don't fall below a point where towns cannot access their regulated surface water entitlements. However, we know that some townships in the Lower Lachlan and those reliant on unregulated supplies were at risk of running out of water during the Millennium Drought and had to consider alternative water supply arrangements. This highlights that conditions worse than those seen in our initial modelling results are possible, even if they are unlikely to occur.

In addition, our new datasets and modelling allow us to better understand the potential implications of future climate change. As highlighted in section 2.1, the frequency and duration of drought could increase under climate change projections. This suggests that pressures on town water supplies in the Lachlan could increase in the future. However, our modelling indicates that it is unlikely that Wyangala Dam would fall below dead storage levels (the probability of reaching dead storage in any one year is 0.1% under stochastic paleoclimate data and up to 5% under long-term climate projections). This means that towns like Cowra and Forbes, which are supplied from water stored in Wyangala Dam, are at a very low risk of experiencing future supply shortfalls (in the next 20 years) based on their current water access licence volumes.

In addition to these modelled risks for surface water entitlement reliability, we also have access to the water security access risk analysis undertaken by local water utilities (secure yield analysis as part of integrated water cycle management strategies).

This additional analysis takes into account a local water utility's:

- headworks arrangement and capacities
- physical water delivery system and operational rules under water sharing plans
- operating protocol and past experiences in delivering water in drought conditions.

This results in a water security access risk specific to each local water utility's town water supply system that is different to the modelled surface water entitlement reliability risk. The water security access risk for each water utility is in Table 2.

The occurrence of extreme events always carry inherent risk to town water supplies. To ensure that towns in the Lachlan region have adequate water security into the future, we need make decisions now about how and where to direct additional investment to diversify town water supplies and protect water quality for regional communities.

This is reflected in a number of options being considered in the Draft Lachlan Regional Water Strategy, including an expansion of the piped town water supply system (Option 4 in Table 3), the replacement and upgrade of existing pipelines (Option 5), an investigation of potential sites for managed aquifer recharge (Option 8) and a range of water efficiency and conservation projects (Options 24 and 31).

65. Specific to the water sharing plan for the Lachlan Regulated River Water Source 2020

2.3.3 Jobs and industries

The Lachlan region is an important economic region to NSW. It contributed about $5.8 billion to the state's Gross Regional Product in 2018 and almost 38,000 people work in the region (Figure 20).[66] Jobs in the region are expected to grow on the back of the NSW Government investments and new and expanding industries.

While the COVID-19 pandemic will have an impact on regional communities and economies in the short term, the Lachlan region will continue to be an important economic contributor to NSW in the longer term.

The region's water resources are a critical input for many businesses and support the main industries in the region: agriculture, mining and tourism.

66. REMPLAN 2019, REMPLAN Economy: Custom data, www.remplan.com.au/economy

Figure 20. Employment and economic outputs of key industries in the Lachlan region

Notes: *'Tourism' is not a defined industry category, and indirect employment and contribution to Gross Value Added cannot be calculated. Listed value is total spend on Tourism services as defined by REMPLAN

** Mining in the Lachlan region also contributes around $95 million in royalties annually

Source: REMPLAN Economy: custom data 2019

The industry profile in the Lachlan region is changing. Recent years have seen the expansion of mining developments and large scale dairying in the Upper Lachlan region, and the growth of permanent plantings in the Lower Lachlan.

Over the next 20 years, we can expect to see more food processing and agriculture, further mining of nearby resources and increased renewable energy production. With better connectivity improving transport and trade to the rest of NSW, tourism is also expected to become a larger source of employment.[67]

Attracting new high value industries and supporting economic diversification is a strong focus for the region. Access to reliable water is important to realising this vision. The Inland Rail Project, upgrades to the Newell Highway and the Parkes National Logistic Hub will enable the region to leverage its position along nationally significant rail and road corridors, encouraging further industry development and job growth. The Parkes Special Activation Precinct will help stimulate economic growth and investments made by the NSW Government.

67. Department of Premier and Cabinet 2018, Regional Economic Development Strategies for South West Slopes, Orange, Blayney and Cabonne, Western Riverina, Cowra, and Mid-Lachlan, State of NSW.

Agriculture

Agriculture is important to the economy of the Lachlan region, contributing the most output and employing the largest number of people. The landscape allows farming versatility: from floodplain grazing and lakebed cropping to dryland cropping and grazing, and irrigated agriculture.

The main irrigated products are:

- cotton ($146 million), the dominant crop grown in the area since 2005
- vegetables ($98 million)
- hay and cereals ($76 million and $780 million respectively)
- nuts ($21 million, of which $10 million is almonds).[68]

Other agricultural industries are sheep for lamb and wool, grains, beef and cattle, dairy and viticulture.

The industry profile for the Lachlan region is changing. We have heard from councils that the horticulture industry is growing in the mid and Lower Lachlan regions, and that existing dairies in the Upper Lachlan regions are expected to expand. Councils also see opportunities for further expansion of high value agriculture in the region on the back of the Wyangala Dam raising project.

In addition, agricultural businesses are exploring new innovative farming techniques, land management practices and technologies, which all have the potential to contribute to greater productivity. Research and development, as well as, new technologies, are driving on-farm water use efficiency, drought adaptation and resilience. Wider adoption of AgTech will support precision monitoring of water use and soil moisture to give farmers the data they need to make informed decisions, driving further efficiency and productivity gains.

Moxey Farm: using AgTech to improve productivity and water efficiency

Innovative agricultural businesses in the Lachlan region are already using AgTech to improve on-farm productivity and water efficiency.

Moxey Farm is the largest single-site dairy in the Southern Hemisphere. The farm operates on 4,750 ha with 11,000 head of cattle, including 5,500 milking cows. It produces approximately 40 litres of milk per cow per day and has an annual production figure of 80 million litres.

Moxey Farm is one of the biggest employers in the area with over 200 full time staff working in trucking, construction, field operations, youngstock care, parlor crews, herd team, management and in the office.

Moxey Farm is using AgTech to improve its business and water efficiency. Initiatives include water recycling and investment in 18 new centre pivot irrigators and a new bio-digester.

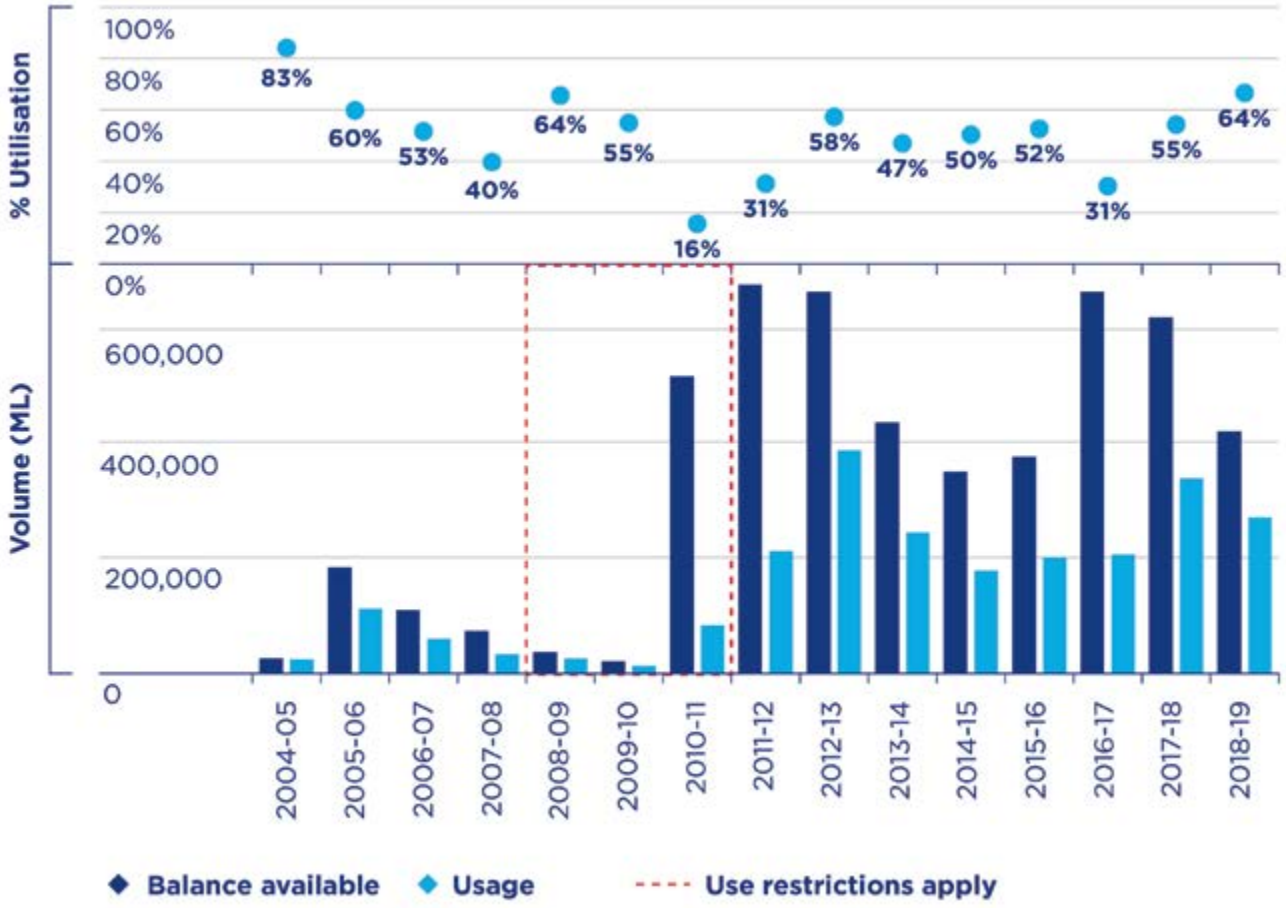
68. Australian Bureau of Statistics 2017, 7503.0—*Value of Agricultural Commodities Produced*, Australia, 2015/16, www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/7503.0Main+Features12015-16?OpenDocument

Agricultural water use

Agricultural producers need to hold a water access entitlement in order to take water for any commercial food or fibre production. Many agricultural producers hold a portfolio of water entitlements in both surface (high security or general security) and groundwater or trade water on the temporary or permanent market to meet their water needs.

The majority of agricultural producers in the Lachlan hold general security entitlements. Due to the Lachlan region's highly variable climate, the amount of water allocated each year to general security entitlements has varied widely. There have been consecutive years of zero allocations and water use restrictions have applied in several years. This is why many agricultural producers apply a conservative water use approach to mitigate their water supply risks (Figure 21).

Figure 21. Graph of conservative water use in the Lachlan*



*Note: 'Use restrictions apply' refers to temporary restrictions on allocations applied during drought, where the full amount of allocated water in accounts is not able to be supplied with the available water resources

Source: Department of Planning, Industry and Environment general purpose water accounting

Our new climate data and modelling have been used to better understand the likelihood of water being available for general security licence holders at the start of the water year (1 July) (Figure 22).

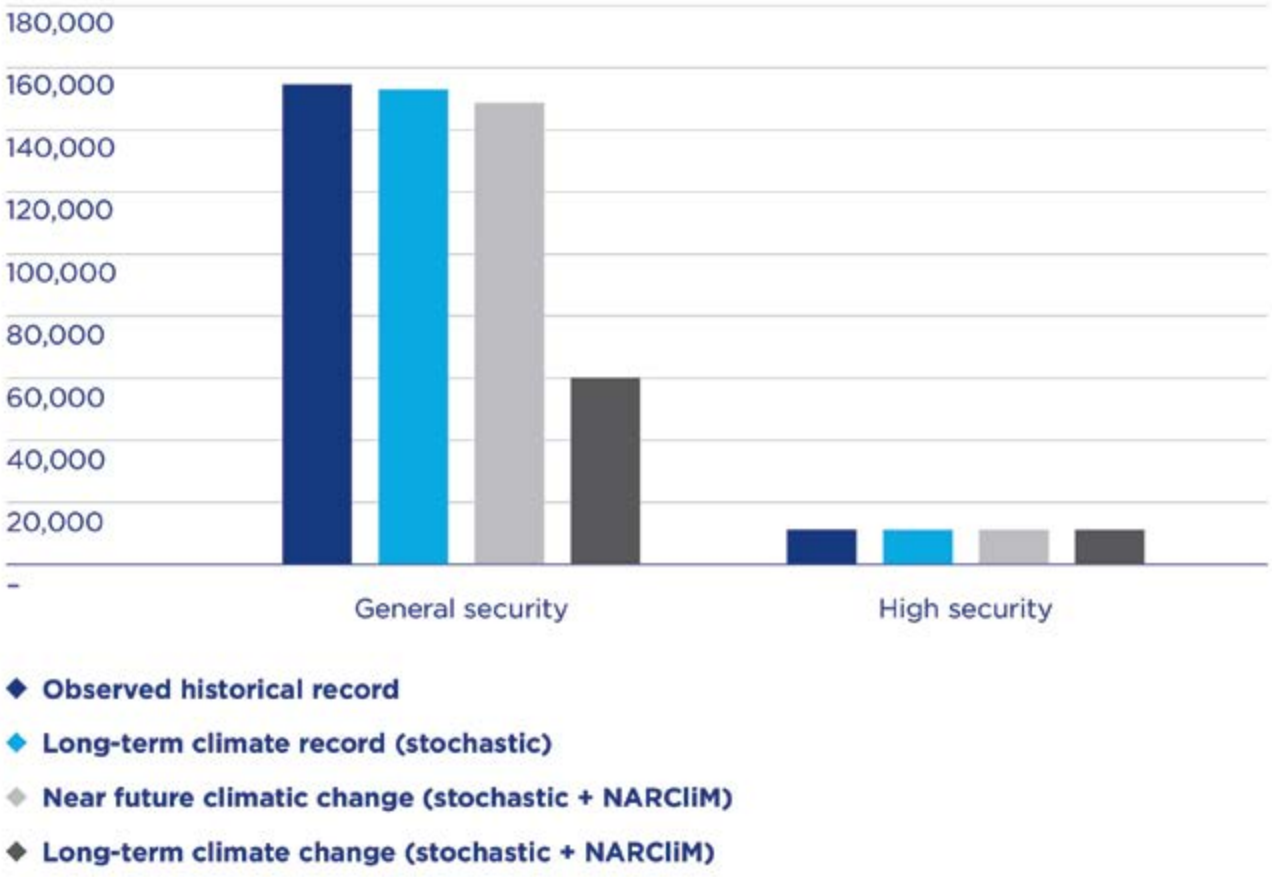
Given the variability in the climate, general security users in the Lachlan could experience a 1% decrease in their average water availability based on the long-term paleoclimate records, a 4% decrease under short-term climate projections and a 60% decrease under long-term climate change projections.

Winter and spring inflows into the region's main storages are important determinants for future water availability to high security and general security licence holders. Our new datasets and climate modelling suggest that these inflows could be significant lower in the far future which would have a significant implications for general security licence holders in particular.

These climate change projections are potential future scenarios and there is always a level of uncertainty with this type of modelling which needs to be taken into account. The long-term climate change projections used for the regional water strategies are conservative in their predictions and are used to highlight possible future risks to water availability and stress test our results.

However, work continues around better understanding the drivers of the water availability impacts for general security licence holders under long-term climate change projections.

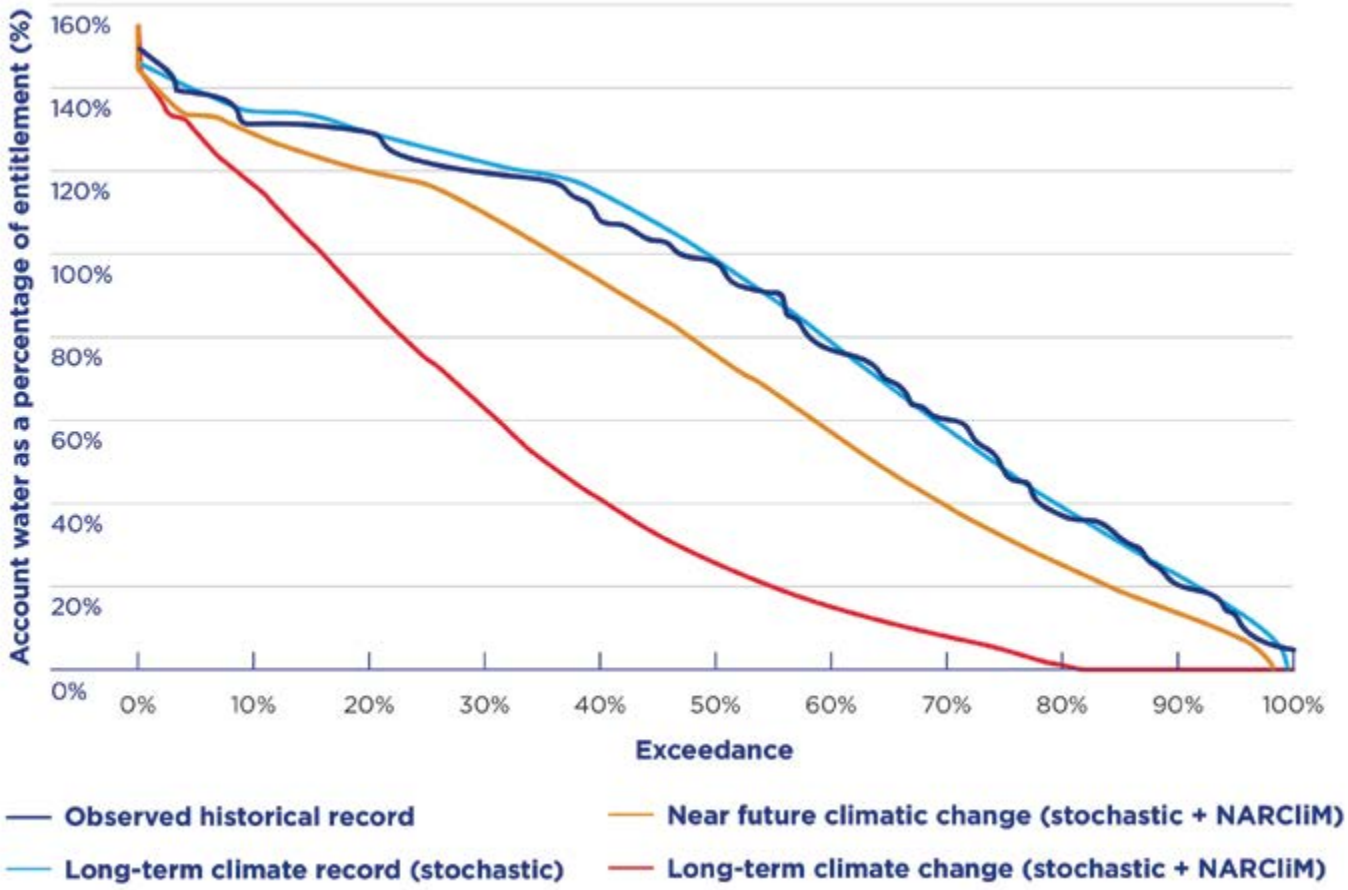
Figure 22. Impacts on Lachlan general security and high security regulated river water access licences under an 'average' 122-year period from the future climate change projection period (near future and long-term) compared with the observed and long-term record



The historic and paleoclimate informed data suggest that the likelihood of the average general security user having an account balance equivalent to 100% of their entitlement at July 1st is about 50% in any one year (Figure 23). Initial results for the near future (2020-2039) suggest water availability for general security users may continue to decline, with data indicating the likelihood of an average user holding 100% in their account falling to around 35%. Conversely, the modelling indicates that there is a very low likelihood of an average general security user having zero account water in either future climate scenario.[69]

However, it should be noted that this is based on an average of water user accounts. Water use behaviour varies widely, and there may be a significant proportion of water users with zero water in their account during these dry periods. Understanding water user behaviour will be important to develop and refine the draft options included in the strategy.

Figure 23. General security account water, Available Water Determination + carryover, as a percentage of entitlement as at the 1st July each year



In contrast, access to water for high security users is less likely to be impacted due to the rules in the Water Sharing Plan for the Lachlan Regulated River. The results from the historic and paleoclimate informed data suggest that restrictions to supply are possible but highly unlikely.

The Lachlan Regional Water Strategy is an opportunity to identify options and actions to deal with the implications of these findings and help businesses in the Lachlan to meet their water needs in the context of future climate variability and climate change (for example, see Option 35 in Table 3).

Mining and resources

Mining is an important water-dependent industry in the Lachlan region. Employment in this sector grew between 2011 and 2016[70] and is expected to continue to grow in the future.

In 2018/19, the three major metallic mines (Cadia Valley Operations, Cowal Gold Mine and Northparkes) mined and processed about 44 million tonnes of ore to produce about 127 thousand tonnes of copper, 1.2 million ounces of gold and 1.1 million ounces of silver.

The total value to the NSW economy of the metals produced was more than $2.3 billion and the sector paid royalties of almost $95 million.[71]

Mining will remain an important industry for the region.[72] There have been recent discoveries of cobalt, nickel and scandium (for example, through the Clean TeQ Sunrise project), which are important for renewable energy technologies, such as batteries, solar panels and wind turbines. These new projects, as well as existing operations, will continue to provide local and regional employment opportunities and contribute to the regional and state economy.

Mining water use

Water is a critical input to mining operations in the Lachlan and has to be managed at all stages of a mine's life cycle (e.g. exploration, planning, construction, production, and closure/reclamation).

Some operations located in the Lachlan region access water from neighbouring regional water sources. Conversely, some operations located in neighbouring regions access water from the Lachlan region's water resources. For example, Cadia Valley Operations in the Belubula system use treated effluent from the Orange sewage treatment plant.

Given the importance of water for mining operations, companies often hold a diversified portfolio. This includes regulated and unregulated surface water sources, groundwater, harvested rainfall, and treated water from municipal sewerage plants. Many companies also rely on the water market to supplement their water needs.

Compared to agriculture, mines in the region hold a small proportion of the total available surface water entitlement—approximately 5,000 ML/unit shares of general security entitlement from both regulated and unregulated surface water sources. This equates to 1% and 11% of the total pool, respectively.

Mining companies have made significant efforts to treat and recycle water as part of their business operation. In 2017/18, 30 GL of their water demand was met through water that had been treated and/or recycled within the mine site whilst 20 GL of their demand was met through allocations made against their licenced entitlement holdings, rainfall harvesting, and treated wastewater. There is an opportunity for the regional water strategy to support mines to continue such efforts to recycle water and access alternative water sources.

The new climate datasets and modelling developed for the regional water strategies will provide valuable information to mining companies to assess the potential risks to accessing their water entitlements in the future.

We also heard that there may be scope to review existing regulations to enable farmers to access water from bores constructed by mining companies during exploration. Stakeholders also told us that there is a need for better information regarding licencing and how water markets operate, as well as improved communication channels between industry and the Department of Planning, Industry and Environment. The Lachlan Regional Water Strategy provides an opportunity to review these issues to assess whether improvements could be made to support regional businesses.

69. This low likelihood of 1% is from the paleoclimatic-informed data
70. REMPLAN 2019, REMPLAN Economy: Custom data, www.remplan.com.au/economy/
71. Department of Planning, Industry and Environment 2019, Extract from Resources and Geosciences corporate database, accessed October 2019.
72. Department of Planning, Industry and Environment 2019, Planning Portal: Major Projects—McPhillamys Gold Mine www.planningportal.nsw.gov.au/major-projects/project/11686

Tourism

The Central NSW region, which includes key centres in the Lachlan region, has experienced a steady increase in tourism. In 2018, the region was host to 5.7 million visitors (including nine million overnight stays) and a total expenditure of $1.5 billion.[73] Nearly $400 million of that expenditure was spent in the Lachlan region.[74] Nearly 2000 people were employed in tourism-related industries across the Lachlan region in 2016.[75]

Tourist attractions and events in the Lachlan region that rely on a healthy environment and water availability include:

- nationally significant wetlands and freshwater lakes
- Grazing Down the Lachlan, an annual event highlighting local food and wine production
- sculptures along the Lachlan River
- water sports and recreational fishing, such as near Condobolin
- urban amenities such as sporting fields and 'green' spaces.

Tourism in the region has been impacted by the COVID-19 pandemic, as is the case for all other parts of Australia. However, over the long-term tourism is expected to continue to be an important part of the Lachlan region's economy.

73. Destination NSW 2019, *Travel to Central NSW Tourism Region—June 2019*, www.destinationnsw.com.au/tourism/facts-and-figures/regional-tourism-statistics/central-nsw
74. REMPLAN 2019, REMPLAN Economy: Custom data, www.remplan.com.au/economy/
75. REMPLAN 2019, REMPLAN Economy: Custom data, www.remplan.com.au/economy/

Image courtesy of Destination NSW.

Transport and logistics

The transport and logistics industry connects agriculture, mining and tourism in the Lachlan region to domestic and international export markets. Government investments that are stimulating jobs and economic growth in the region include:

- Inland Rail Project, which will provide fast, efficient and reliable freight connectivity to meet market demands
- Parkes National Logistics Hub, which is set to be Australia's largest multi-modal transport facility, operating 24 hours a day, 7 days a week
- upgrades to the Newell Highway, which performs an important role in road freight and maintaining regional NSW's competitiveness in agriculture and mining
- Parkes Special Activation Precinct planning and investigations, with the precinct expected to support the growth of existing industries and attract new industries to the region.

Councils in the Lachlan region (Parkes, Condobolin and Forbes) have told us they expect the Parkes Special Activation Precinct to be a significant economic driver for the local economy and jobs, including in the intensive agriculture sector. For example, Forbes Shire Council believes that its proximity to the precinct will make Forbes ideally placed to become the central distribution hub for cattle fodder across the State. This could be used to support other regions during times of drought.

Supporting growth and new development in regional industries

While industries in the Lachlan are generally well-adapted to the variable climate, new approaches will be needed to keep pace with changing industry profiles and water needs, and to make sure that industries across the region have access to reliable water supplies. Options being considered in the Draft Lachlan Regional Water Strategy to maintain and diversify water supplies (for example, see Options 4 and 10 in Table 3) or improve water efficiency (such as Options 25, 26, 27) would benefit and potentially add value to existing regional industries, as well as opening up opportunities for emerging industries.

Reuse/recycle and stormwater projects (Option 9) and water efficiency projects (Option 24) may offer innovative solutions that expand the scope, scale and diversify of existing industries such as agriculture, food processing and tourism, while also attracting new businesses and supporting new industry development.

76. Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 2019, CSIRO Supply Chain Mapping–Pilot study, www.inlandrail.gov.au/regional-development/CSIRO-supply-chain-mapping/CSIRO-supply-chain-mapping-pilot-study

Inland Rail: creating new regional opportunities

Inland Rail will become integral to freight and supply chain networks connecting regional NSW with Victoria and Queensland. Opportunities for regional NSW include:

- more jobs, with the project expected to create 16,000 new jobs during construction and an additional 700 ongoing jobs across the network
- better connections within the national freight network
- better access to and from NSW regional markets, with farms and mines moving goods via rail to domestic and international markets
- better transit time, reliability and cost savings—less than 24-hour transit time will mean that perishable goods can access markets faster
- transport cost savings, with horticulture and post processed food supply chains estimated to save on average $76 per tonne when travelling via the inland rail (compared to road trips).[76]

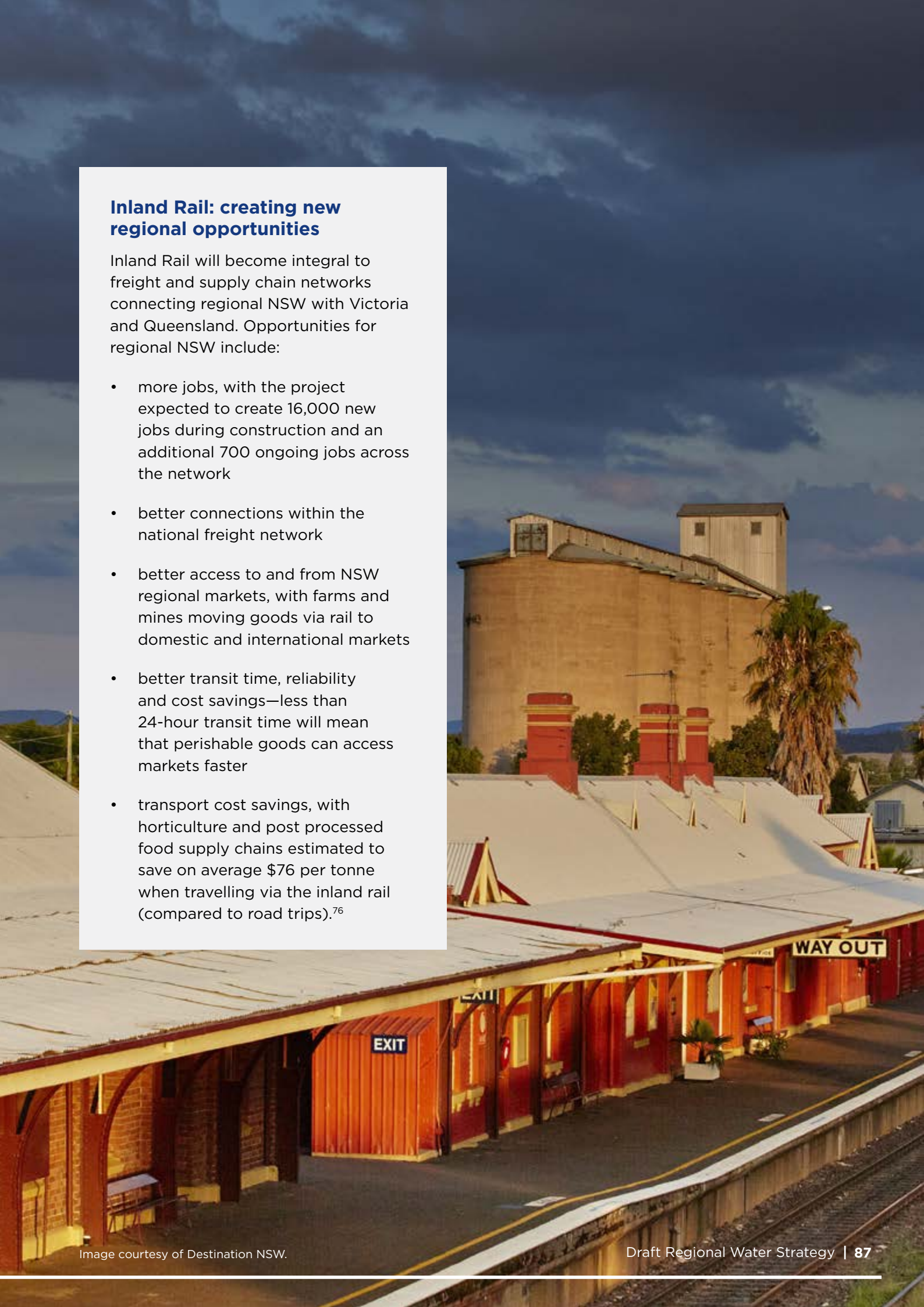


Image courtesy of Destination NSW.

Chapter 3

Options for the Lachlan Regional Water Strategy

Snapshot

We have developed a long list of options that could be included in the final Lachlan Regional Water Strategy.

- To identify options, we have drawn ideas from previous studies, experience with the Millennium Drought, targeted community consultation and government reforms and programs.
- Each option is expected to address at least one of the objectives of the regional water strategies.
- The options aim to contribute to achieving our vision of having healthy and resilient water resources for a liveable and prosperous Lachlan region.
- The options have not been prioritised and not all options have been costed.

The options we are considering aim to tackle the challenges facing the Lachlan region and maximise opportunities arising from the region's growth and change.

Options in the long list focus on:

- **maintaining and diversifying water supplies**, such as new pipelines, augmenting storages and reuse, recycle and stormwater projects
- **protecting and enhancing natural systems**, such as fish passages, better support for water quality management and improved management of wetlands on private land
- **supporting water use efficiency and conservation**, such as water efficiency measures, pricing and trade reviews **strengthening community**
- **preparedness for climate extremes**, such as reviewing drought operation rules, allocation processes and improving data collection and education programs
- **improving the recognition of Aboriginal people's water rights, interests and access to water**, such as improving cultural water access licences, investigating options for cultural flows, ensuring greater involvement of Aboriginal people in water management and establishing Aboriginal regional water advisory water advisory committees
- In each of these areas, we are open to exploring fresh ideas and innovative solutions that will add value to regional industries, leverage new investments and support new economic, employment and environmental opportunities.

Not all options will be progressed.

- Inevitably, these options will involve trade-offs and choices. To fully understand these impacts and trade-offs, we will first seek feedback on these options before undertaking a formal assessment process.
- The assessment process will look at the positive and negative effects of the option, its cost efficiency and its feasibility. Not all the regional water strategies objectives can be quantified. When the outcome is difficult to assess in a financial context, options will be assessed on how effective they are in terms of achieving objectives, rather than on a cost basis.
- Preferred options, and packages of options delivered together, will be informed by a range of evidence including modelling, expert judgement and Aboriginal community input. These will form the final, comprehensive Lachlan Regional Water Strategy.

3.1 Our vision for the Lachlan Regional Water Strategy

The challenges in the Lachlan region stem from the highly variable climate, the length of the rivers and changing water demand. We cannot change today's climate or the basic hydrology of our river and groundwater systems. However, we can deliver better outcomes for the region by changing:

- infrastructure in the region, such as dams, weirs, pumps, pipes and channels
- how we operate the water system, such as water sharing arrangements, allocations, environmental flow requirements and flood mitigation from dams
- how water is used and water user behaviour, including demand management measures
- any combination of the above three options.

We have identified policy, planning, regulatory, educational, technology and infrastructure options that address the challenges the region may face and maximise opportunities arising from growing regional centres, emerging and expanding industries, new transport investments and developments such as the Parkes Special Activation Precinct.

Our vision for Lachlan region

Our vision for the strategy is to have healthy and resilient water resources for a liveable and prosperous Lachlan region. To achieve this, we need to position the region so there is the right amount of water of the right quality, delivered in the right way for Aboriginal people, towns and communities, industries and the environment.

3.2 Identifying and developing the options

We have developed a long list of options that could be included in the final Lachlan Regional Water Strategy. In preparing this list, we recognise that a great deal of work has been done over the last few years to identify initiatives that could improve water management, water security and water reliability in the Lachlan region. We have collated these initiatives and supplemented them with further actions based on feedback from local councils, joint organisations, Aboriginal communities and government agencies. The public consultation process will provide another opportunity to identify options and seek feedback on the long list of options. Bringing all of these options together will help us to align and better sequence the various water reform processes as we develop the strategy.

In developing the long list of options for the Lachlan region, we have specifically considered the following.

- Each option that has been identified is expected to address at least one of the regional water strategy objectives (see Figure 4 in Chapter 1). Some options will support multiple objectives. Other options may have positive benefits for one objective while having negative impacts for another objective. We do not have all of the information at the moment to understand these impacts. We will do further work to understand these impacts and seek your views on how each option may impact you and your values.
- While considering a range of options to maintain and improve the resilience of the region's water resources in the face of a variable and changing climate, we have also included options that take the next step in identifying innovative water solutions that will add value to existing industries, create opportunities for new industries and generate greater benefits that extend across the community.

- As discussed in section 1.3.1, the NSW Government has invested in new climate datasets and improved modelling to gain a more accurate understanding of future climatic conditions in the Lachlan region. Several options in the long list propose reviews of existing policy settings, operational rules and management plans considering this new data.
- As discussed in section 1.3, we have drawn on a range of sources to develop the options, including existing studies, past experience (such as river operations during the Millennium Drought), community engagement and current NSW Government initiatives and programs. This process acknowledges the significant amount of thought and work already directed towards addressing the region's water-related challenges. More information about these sources is in the *Regional Water Strategies Guide.*
- We have had conversations with local councils, local water utilities and Aboriginal people to understand their views on what options the Lachlan Regional Water Strategy could consider to improve water security and quality for towns and communities (see section 1.3.3). This initial feedback is reflected in several options.
- We have included options following discussions with Aboriginal communities. These options and feedback are reflected in the long list of options.
- We have sought expert advice from government agencies.

We have not ordered or prioritised the options identified for the *Lachlan long list of options* and many options on the list have not been costed.

Several preliminary options did not make it onto the long list. We carefully considered these options before determining they should not proceed further. These options and the reasons they are not included in the draft strategy are set out in the *Lachlan long list of options* for the Lachlan region.

Image courtesy of Destination NSW.

3.3 Which options will be progressed?

Not all options in the long list will be progressed. Only feasible options will be progressed following an assessment process.

Inevitably, these options—and their priority in the Lachlan Regional Water Strategy—will involve trade-offs and choices. To understand the impacts and trade-offs we will first seek your feedback on these options and then use a formal options assessment process which will look at:

- **Effect**
  To what extent are the options expected to contribute to or otherwise impact on the objectives over the planning horizon and/or during extreme events?

- **Impacts and magnitudes of impacts**
  A risk assessment of the positive or negative impact of the option on the objectives, and the magnitude and frequency of these impacts.

- **Cost effectiveness**
  To what extent are the options likely to deliver cost effective outcomes?

- **Distribution of benefit**
  Is there likely to be a broader public or regional benefit from the option, or is the benefit concentrated to a small number of users?

- **Feasibility**
  To what extent is the option likely to be feasible, including regulatory/policy change, stakeholder acceptance, time to implement, cost, alignment with government policy, both national and international, as well as technical feasibility.

Further information on this process is in the *Regional Water Strategies Guide.*

It is unlikely that a single option will be capable of addressing all of the identified risks across the objectives we have set for the strategy. The greatest benefits are likely to be realised by combining options (or packaging them together) so that they complement each other to improve the efficiency of the system, offset impacts or unlock greater benefits by using the different levers that are available—such as policy and infrastructure levers.

For example, infrastructure options may improve water reliability for industries and water security for towns but could have negative environmental impacts. To mitigate these impacts, and increase the benefit of the projects, infrastructure projects could be combined with:

- environmental options that could mitigate the impacts of the infrastructure on native fish species and environmental assets

- demand management measures to make sure industries are operating as efficiently as possible

- policy and regulatory options that review whether the water sharing arrangements under altered conditions are appropriate.

Combining some of the options might mean that other options cannot be pursued. At present, we do not have enough information to understand the trade-offs between options or combinations of options that are described in Table 3.

Combining options for better results: Improving town water security in the Lachlan region

The NSW Government is progressing a detailed business case for constructing a pipeline linking Lake Rowlands and Carcoar Dam (Government commitment 1 in the long list of options for the Lachlan region). Lake Rowlands is located on the Coombing Creek, a tributary of the Belubula River, and is owned and operated by Central Tablelands Water. Carcoar Dam is located on the Belubula River and is operated by WaterNSW.

Preliminary consultation identified that the new pipeline could be combined with other options to further improve town water security in the region and support economic prosperity.

We heard suggestions to combine the pipeline with the augmentation of Lake Rowlands (Government commitment 3 in Table 3), the expansion to the piped town water supply system (Option 4) and upgrade of existing pipelines (Option 5). Bringing these options together could improve reliability for industries and enhance town water security in the region and enable towns to be connected to the broader town water supply system.

The combined options could also address local council concerns that towns in the region should have access to more than one water supply.

At the same time, combining these infrastructure options and government commitments will likely require a review of the water sharing plan rules in the Belubula system and other planning instruments (for example, to give Central Tablelands Water access to water stored in Carcoar Dam). In addition, impacts on the environment and cultural values will need to be considered more thoroughly.

The optimal combination of options to improve town water security in the Lachlan could also be supported by water efficiency, reuse or recycling options. These more innovative measures, which will form an essential part of local integrated water cycle management strategies, will be critical in securing town water supplies and may require refinement or reassessment of some of the infrastructure options.

As the strategy is developed, preferred options and combinations of options—and their trade-offs—will be informed by a range of evidence including modelling, expert judgement and community input. Improved data about potential future climatic conditions in the Lachlan region (see sections 1.3.1 and 2.4), along with economic analysis, will be used to understand the pros and cons of each option and the impact of various combinations of options in addressing the challenges facing the region.

It is important to remember that the way we progress options will need to take account of the *Water Management Act 2000* and NSW commitments under the Murray-Darling Basin Plan (for example, the Sustainable Diversion Limits set in the Basin Plan for each valley and Long Term Water Plan objectives and targets[77]).

Other important considerations when we arrive at shortlisted options will be who owns and maintains infrastructure options, who benefits from the option, what the impacts are and how to pay for the option: for example, should the cost be recovered from water users and what will the Australian Government pay for and what will the NSW Government pay for?

77. Murray-Darling Basin Authority 2019, *Sustainable diversion limits*, www.mdba.gov.au/basin-plan-roll-out/sustainable-diversion-limits

Image courtesy of Stefanie Schulte.

3.4 Lachlan: Long list of options and government commitments

Table 3 summarises the long list of options and existing government commitments we have identified for the Draft Lachlan Regional Water Strategy. Detailed information about each option, the challenges it will address, its potential combination with other options or government commitments and further work required to progress the option is set out in the long list of options for the Lachlan.

The draft long list options focus on:

1. **maintaining and diversifying water supplies**
2. **protecting and enhancing natural systems**
3. **supporting water use efficiency and conservation**
4. **strengthening community preparedness for climate extremes**
5. **recognising Aboriginal people's water rights, interests and access to water.**

Concentrating on these five actions enables us to address the challenges facing the Lachlan region, while maximising opportunities for regional communities and industries, and supporting their aspirations. It will also ensure we preserve our important natural systems and include the extensive knowledge of our Traditional Owners in water management decisions.

We have heard from communities that the regional water strategies should not just focus on the risks and challenges of today. This is why our draft long list of options not only focuses on the issues identified in Chapter 2, but also includes options that may become important in a few decades. These options need to be supported by comprehensive and robust data and information and the right tools and infrastructure to implement change in the future.

However, this means that some of our draft long list of options are still in a conceptual state. We need to work with communities, local councils, environmental managers, Aboriginal peak bodies, Aboriginal people and industries to develop and refine these ideas further.

As noted previously, the options included in Table 3 are not ordered or prioritised and many have not been costed.

Regional water strategy objectives:

Deliver and manage water for local communities
Improve water security, water quality and flood management for regional towns and communities.

Enable economic prosperity
Improve water access reliability for regional industries.

Recognise and protect Aboriginal water rights, interests and access to water
Including Aboriginal heritage assets.

Protect and enhance the environment
Improve the health and integrity of environmental systems and assets, including by improving water quality.

Affordability
Identify least cost policy and infrastructure options.

Table 3. Long list of options and government commitments

Government Commitments	Description	Objective
Maintaining and diversifying water supplies—*Opportunities to improve town water security, maintain suitable water quality and support growth and jobs in the region.*		
1. Water transfer pipeline between Lake Rowlands and Carcoar Dam	Detailed business case to construct a pipeline linking Central Tablelands Water's storage (Lake Rowlands with a capacity of 4.5 GL) and WaterNSW's Carcoar Dam (capacity of 35.8 GL). This project intends to enable water transfer between Lake Rowlands and Carcoar Dam, improving water security and reliability for towns and water-dependent industries in the Belubula catchment.	
2. Wyangala Dam raising project	Detailed business case development of raising Wyangala Dam wall by approximately 10 m and increasing the storage capacity of the dam by 650 GL. This project intends to improve water security and reliability during drought, and provide better flood management/protection for towns in the region.	
3. Lake Rowlands augmentation	Feasibility study to assess the benefits of augmenting Lake Rowlands (for example, by increasing storage capacity) or constructing a new dam downstream of Lake Rowlands (with varying capacity). This project aims to improve water security and reliability for towns, stock and domestic users and possibly industry users.	
Option	**Description**	**Objective**
4. Expansion to the piped town water supply system	Three pipeline connections: a) Bogan Gate to Condobolin b) Gooloogong-Forbes-Parkes c) Young to Cowra. These projects would expand the connections between town water supplies and give towns access to more than one water source.	
5. Replacement and upgrade of existing pipelines	Two pipeline projects: Parkes Shire boundary to Tottenham, Bogan Gate and Tullamore, and Cowra to Central Tablelands (bi-directional). These projects would improve the connections between town water supplies and give towns access to more than one water source.	
6. Inter-regional connections project investigation	Investigation of additional inter-regional pipeline connections between the Lachlan region and neighbouring regions, giving regional towns access to more than one water source (for example, during drought conditions). Conditions under which these inter-regional connections could operate would need to be assessed on a case-by-case basis.	
7. Water quality treatment works	Investigation of necessary upgrades of existing infrastructure or construction of new infrastructure to meet urban potable water requirements, with a focus on increasing individual town water security and quality.	

Option	Description	Objective
8. Managed aquifer recharge investigation and policy	Investigation of possible sites for temporary storage of stormwater and river flows in aquifers to improve storage efficiencies (normally referred to as managed aquifer recharge). This option would develop a supporting policy to regulate the storage and recovery of this water.	
9. Reuse, recycle and stormwater projects	Investigation of opportunities to maximise the use of surface water and groundwater for potable and non-potable uses through reuse/recycle initiatives or stormwater harvesting. These options could increase urban water security through a multi-source approach and provide options to maintain 'green' spaces during extended drought periods.	
10. Reliable access to groundwater by towns	Strategic review and planning across the state to identify towns where future water demands will exceed the capacity of surface water resources, groundwater resources that could be used as complementary supplies, regulatory issues and required infrastructure investments. This option would improve processes and policies to address challenges faced by towns accessing groundwater in the current drought.	
Protecting and enhancing natural systems—*Opportunities to protect and enhance environmental outcomes and realise broader community benefits through a healthy environment.*		
11. Cold water pollution mitigation measures	Augmentation of existing water supply infrastructure (mainly dams) to avoid cold water pollution in the Lachlan regulated system. This option aims to restore near natural river water temperature to provide native and threatened fish species with the necessary environmental cues and conditions to spawn, recruit, move and grow. It also aims to improve social amenity through access to recreational opportunities, with flow-on economic benefits.	
12. Environmental restoration works	A range of projects, including reconfiguration of regulating structures and weirs, removal of flow constraints, rehabilitation of wetlands and clearing of creeks. These works would seek to optimise the benefits that can be achieved through environmental watering.	
13. Improved management of wetlands on private land	Investigation of opportunities to improve the management of wetlands located on private land. This would protect native vegetation, including in-stream habitat, and improve water quality. This could potentially lead to incentive mechanisms for landholders to protect wetlands on private land.	
14. NSW Fish Passage Strategy	Remediation of fish passages at 33 priority weirs within the Lachlan valley. This option aims to restore native fish access throughout mainstream waterways and to key off-channel habitat.	
15. Active management of flows	Investigation to increase operational management in unregulated rivers (determining the rules for what volumes of flows can be accessed at which times) to protect environmental water in unregulated systems from extraction by other users.	

Option	Description	Objective
16. Water quality restoration works	Investigation of possible complementary actions to the water quality management plans that have been prepared for the Lachlan surface water and groundwater water resource plans. The main aims of this option are to reduce the risks of blue-green algae outbreaks, reduce upstream pollution impacts on waterways and reduce pest species (such as carp).	
17. Floodplain management works	Review of current floodplain works in the Lachlan region to assess if they pose a risk to achieving environmental, cultural and other water security outcomes.	
18. Diversion screens to prevent fish extraction at pump offtakes	Installation of screens at pump sites and diversion regulators. This option aims to retain native fish in waterways by preventing entrainment of adults, larvae and eggs. It will also improve water delivery and extraction efficiency through reduced debris blockages.	
19. River Ranger Program	Options to establish an Aboriginal River Ranger Program to assist in maintaining the health and management of rivers and wetlands throughout the Lachlan region. The aim is to improve the involvement of local Aboriginal people in the management and protection of waterways and water-dependent cultural sites.	
20. Secure flows for water-dependent cultural sites	Options to provide regular flows to culturally important sites in the Lachlan region, such as: • Murie Lake, located at the Murie Reserve, a former settlement near Condobolin • Euabalong Lagoons • Goobang Creek • Lake Waljeers • Ita Lake • Pimpara Creek • Willandra Lakes.	
21. Improved understanding of groundwater processes	This option would progress the scientific understanding of five key groundwater processes: • recharge rates, including the impacts of climate variation/change • dynamics of groundwater levels under evolving development conditions • connectivity between groundwater and surface water systems • changing patterns in groundwater quality over time • water needs of ecosystems that are partly or wholly dependent on groundwater. Outcomes would provide the scientific evidence base for future groundwater management decisions.	

Option	Description	Objective
22. Sustainable access to groundwater	This option would establish a systematic state-wide process to ensure ongoing access to groundwater resources by the environment, landholders, towns, agriculture, mining and other industries. It would review existing groundwater resource extraction limits to incorporate up-to-date information (such as scientific studies that incorporate new climate variation/change datasets, insights into ways to improve the integration of surface water and groundwater management, and knowledge of social and economic impacts).	
23. Improved clarity in managing groundwater resources sustainably	This option would review, revise and develop the necessary policies and procedures to give greater clarity in managing: • extraction within Sustainable Diversion Limits • groundwater systems where the entitlements (plus basic rights) exceed the extraction limit • areas of concentrated use.	
Supporting water use efficiency and conservation—*opportunities to improve the efficiency of existing water delivery systems, increase productivity and address water security challenges through demand management options.*		
24. Water efficiency projects (towns and industries)	Investigation of water efficiency opportunities in regional communities and businesses. This option may also require further research and development to identify suitable case studies (including in the food processing sector). As well as improving water security, this option would help industries to maintain and drive regional economic growth and productivity.	
25. Lower Lachlan efficiency measures	Construction of a piped scheme to more efficiently deliver water to landholders along the Muggabah, Merrimajeel, Merrowie, Booberoi and Willandra creeks. The scheme would provide an alternative water supply to stock and domestic users in the Lower Lachlan region and reduce transmission losses. This option will also need to consider downstream impacts, including on the Murrumbidgee system.	
26. Mid-Lachlan efficiency measures	Construction of a piped scheme to more efficiently deliver water to landholders along the Wallamundry, Nerrathong and Wallaroi creeks. The scheme would provide an alternative water supply to stock and domestic users in the Mid-Lachlan region and reduce transmission losses.	
27. Improvements to the storage effectiveness of Lake Cargelligo	Separation of the main lake at Cargelligo into three lakes to reduce evaporation losses and improve the operational effectiveness of Lake Cargelligo. This option would improve river operations and water security for towns, communities and industries.	
28. Review of water trade in the Lachlan region	Review the efficiency and effectiveness of the surface water and groundwater markets in the Lachlan region. The review would aim to address stakeholders' concerns about the operation of the water market in the region and provide transparency and confidence to water users.	

Option	Description	Objective
29. Water pricing pilot study	The option consists of a pilot study that assesses: • how the evidence gathered through the Lachlan Regional Water Strategy could assist in future rural water charge determinations in the region, including how it could assist in Lachlan-specific customer shares • implications of the new climate data and modelling on future water charges in the Lachlan region, including the merits in moving to a different fixed to variable tariff ratio (for regulated, unregulated and groundwater charges) and impacts on the determination of future high security premiums • whether there are any gaps or discrepancies in water charges for groundwater and surface water when there is a high level of connectivity between water sources.	
30. Urban water restriction policy	Development of a comprehensive policy on water use standards and appropriate water restriction levels for regional towns. The investigation would complement the Incident Response Guide and assist councils and local water utilities to revise drought management plans.	
31. The 'Sheet of Water' storage	Decommission the 'Sheet of Water' storage (a natural lake upstream of Lake Cargelligo) and construct a bypass channel. This would improve the reliability of water supply by reducing evaporation losses associated with Lake Cargelligo and improve delivery efficiency throughout the Lower Lachlan region.	
Strengthening community preparedness for climate extremes—*Opportunities to develop fit-for-purpose policies and regulation to protect town water security, strengthen community health and wellbeing and better manage risks.*		
32. Efficiency for drought security program	Investigation of opportunities to implement industry water efficiency projects in the Lachlan region where the water savings could be shared between industry and regional communities. This could increase town water security and the productivity and resilience of water-dependent industries in the region.	
33. Drought operation rules	Review the effectiveness of the *Lachlan Incident Response Guide*, including an assessment of the merit of changing the current system operational rules. This option would aim to minimise delivery losses during extreme events, improve water delivery and maintain effective reserves for high priority needs during extreme events.	
34. Review of water accounting and allocation process	Review several settings of the current surface water accounting and water allocation process in the Lachlan regulated system, including a review of the 'worst inflow sequence' assumptions in the existing water sharing plan and whether changes need to be made to keep more water in storage for high priority needs. The review would explore more effective approaches to ensure high priority water needs can be met in extended drought periods.	

Option	Description	Objective
35. Investigation of licence conversions	Consideration of the potential benefits from voluntary conversion of general security licences to high security licences. The investigation would help determine the level of water security achievable in the Lachlan region.	
36. Improved data collection and storage	Opportunities to improve data collection around water use by industry, the environment and towns in the Lachlan region. This would generate better information to inform future water management decisions in the region. This option would investigate opportunities to refurbish existing infrastructure (such as groundwater monitoring bores) and install new infrastructure and technology to enable better collection of necessary water flow, level and quality data. This option would also consider how best to share data and how to create information products suitable for different types of water users.	
37. Training and information sharing programs: **- new climate data/ modelling** **- managing groundwater resources sustainably**	Provide training and information sessions on the new regional water strategy climate data and modelling to build confidence in the new approach and identify opportunities for wider use of the new datasets. Provide training and information about groundwater resources and how they are managed. This will assist councils and other water users to make more informed decisions about their water supply security. This option would also consider how best to publicly share data, and what data analytics and information products are needed for different types of water users.	
38. Investigation to maintain amenity for regional towns during drought	Investigate opportunities to maintain town water features, local parks and recreational areas during extended drought and make them less 'climate dependent' so they can be permanent features of regional towns.	
39. In-stream storage for the Lower Lachlan	Upgrades to two existing weirs and installation of a new weir between Hillston and Booligal to allow for the re-regulation of water released from Wyangala Dam. This would provide greater operational flexibility for the river operator and provide a tool to capture/manage surplus flows in the Lower Lachlan River.	
40. Land use change impact on water resources	Investigation of the potential impacts on water resource due to land use changes and growth in the Lachlan region. This option would also examine the feasibility of land use planning controls.	

Option	Description	Objective
Improving recognition of Aboriginal people's water rights, interest and access to water—*Opportunities to protect and strengthen cultural landscape, practices, knowledge and traditions. Supporting empowerment, self-determination and economic advancement of Aboriginal people, as well as strengthening community wellbeing.*		
41. Culturally appropriate water knowledge program	Options to develop a culturally appropriate water knowledge program that would aim to increase the capacity of Aboriginal people across the Lachlan so they can participate in negotiations on water management and policy-related matters that affect them.	
42. Water-dependent cultural practice and site identification project	Options for Aboriginal people to classify and map water-dependent cultural sites throughout the Lachlan region. This would include identification and mapping of cultural sites, places of spiritual significance and places used by Aboriginal people for traditional and contemporary uses, such as hunting, recreation and economic uses.	
43. Shared benefit project (environment and cultural outcomes)	Investigation of opportunities for shared benefits from using water for the environment to also achieve cultural outcomes. The aim of this option is to support and incorporate traditional Aboriginal ecological knowledge into water management action plans for the environment and support the cultural connection of Aboriginal people to water-sustained environments.	
44. Aboriginal cultural water access licence review	Review of the Aboriginal cultural access licence provisions for Aboriginal cultural uses to determine their effectiveness and identify opportunities for improvement. This option aims to optimise water sharing mechanisms that support cultural values.	
45. Water portfolio project for Aboriginal communities	Funding to support Aboriginal people to purchase water entitlements and build infrastructure to secure access to water for spiritual, cultural, social, environmental and economic purposes, and open up opportunities for investment in water-dependent initiatives and cultural projects.	
46. Co-management investigation of Travelling Stock Reserves	Investigation of opportunities to improve the involvement of Aboriginal people in the co-management of Travelling Stock Reserves that connect Aboriginal people to waterways and water-dependent sites of cultural importance. The option aims to improve access to waterways and other water-dependent sites of cultural importance and to support the involvement of Aboriginal people in decisions that affect them.	
47. Regional Aboriginal Water Advisory Committee	Establish an Aboriginal Water Advisory Committee to improve the ability of Aboriginal groups across the region to have a unified voice on water matters that affect Aboriginal people. This option aims to improve the representation of Aboriginal people in decision-making around water management in the Lachlan.	
48. Regional Cultural Water Officer employment program	Investigate models for establishing Cultural Water Officer roles that assist with engaging Aboriginal people regarding water management in the Lachlan region. The aim of the option is to improve the awareness and involvement of local Aboriginal people in the management of water resources across the Lachlan.	

Chapter 4

Where to from here?

We have developed this draft strategy based on our new evidence, the latest policies and programs for the region, and feedback from government agencies, local councils and Aboriginal groups.

The outcomes, challenges, opportunities and options we have identified in this draft strategy will be tested, evaluated and refined based on your input.

Image courtesy of Destination NSW.

4.1 Finalising the strategy

Our next steps are to use the feedback you provide to analyse, screen and assess the long list of options, put together a portfolio of options to be progressed and develop a final strategy for release in 2021.

We recognise that in getting to the final strategy there may be hard trade-offs, but the only way we can make the best decisions possible is to deal with issues proactively and realistically. This will give us the most likely chance of long-term success.

The final Lachlan Regional Water Strategy will have the flexibility to adapt over time and to new situations and circumstances. It will incorporate regular review processes to ensure the region has an effective strategy in place that remains relevant for future water management.

Following completion, each regional water strategy will be reviewed when the equivalent water sharing plans are reviewed.

4.2 Implementing the strategy

Community engagement does not end with consultation; it is a vital part of implementing the regional water strategies. The final strategy for each region will include:

- a final package of actions approved by the NSW Government
- a plan for implementing the strategy within clear timeframes which includes existing commitments
- clearly defined roles, responsibilities and governance arrangements for delivering each action or combination of actions
- well-defined opportunities for local and regional partnerships to deliver actions
- a schedule and plan for monitoring and reviewing each strategy.

Critically, the ongoing monitoring, evaluation and review of the strategies will identify if any key underlying assumptions are no longer valid, and when a revision is required. This process will require regular re-evaluation of the strategy outcomes against any updates in the available climate data.

We want to be clear about how we work with communities and regions to ensure:

- we are accountable for what we promise our regions
- we have the right partnerships in place to drive forward action
- we are transparent in how we go about those actions
- we can check with those with on the ground and lived experience that the directions and actions we pursue continue to be the right ones for each region.

Image courtesy of Destination NSW.

Your voice is important

We have prepared this draft strategy to continue our discussions with you about the future management of water in your community. It has been prepared in consultation with local councils and Aboriginal communities.

We would like to hear your views on the draft strategy and whether you have any further information that could help us to assess the benefits or disadvantages of any of the options. This may include:

- how your household, business, industry or community currently manages the impacts of a highly variable climate
- the current and future challenges you see in the Lachlan region and how you think these should be addressed
- the options presented in this draft strategy
- how the management of water resources can be improved or leveraged to create and take up new opportunities in the region
- how we can achieve our aims for accountability and transparency
- the best ways of partnering with communities and regions to implement the strategy.

Your views on the strategy's vision and objectives are also important.

This Draft Lachlan Regional Water Strategy is on public exhibition from 25 September to 13 November 2020. A range of supporting information is available at www.dpie.nsw.gov.au/lachlan-regional-water-strategy

We will be meeting with people from the Lachlan region over the coming months to help shape the final strategy.

You can have your say on the draft strategy by providing written feedback to the Department of Planning, Industry and Environment by midnight 13 November 2020 via:

Web: www.dpie.nsw.gov.au/lachlan-regional-water-strategy

Email: regionalwater.strategies@dpie.nsw.gov.au

Please note that all submissions will be published on the department's website unless you let us know in your submission that you do not wish for the content to be released.

We will be holding online sessions on the draft strategy during the public exhibition period to help shape the final strategy. These sessions will give participants an understanding of the context for the strategy, what the latest modelling is telling us and what the options for better managing water in the Lachlan region could mean. Times and locations for these sessions can be found at www.dpie.nsw.gov.au/lachlan-regional-water-strategy

We will also continue to meet with local councils, local water utilities, Aboriginal communities and other stakeholders. Talking with these groups is critical for designing a strategy that builds on their knowledge and capacity, is feasible in terms of implementation and links to their relevant initiatives, plans and strategies.

Attachments

Attachment 1

Targeted stakeholder engagement

Overview

A thorough engagement program supports the development of the regional water strategy. The purpose of engagement is to inform, gain information and feedback, collaborate with key stakeholders on strategy development and build support for the regional water strategy.

Development of the Lachlan Regional Water Strategy is supported by four engagement phases:

1. Targeted engagement with councils, local water utilities, joint organisations, Aboriginal people and peak bodies.
2. Public exhibition of the draft regional water strategy and targeted engagement with State and regional peak bodies.
3. Further targeted engagement with councils, local water utilities and joint organisations in each region, as well as Aboriginal people and peak bodies.
4. Public release of final regional water strategy.

An interagency panel was formed to assist in the development of the Draft Lachlan Regional Water Strategy. This panel, chaired by Department of Planning, Industry and Environment—Water, included representatives from across the Department of Planning, Industry and Environment cluster including:

- Environment, Energy and Science
- Strategy and Reform
- Regional NSW.

Members of the panel also included representatives from WaterNSW as well as and Agriculture sections of the Department of Primary Industries—Fisheries and Department of Primary Industries—Agriculture.

This report documents targeted stakeholder feedback during Phase 1 of the development of the Lachlan Regional Water Strategy.

Engagement

Discussions were held with councils, local water utilities and Aboriginal communities between September 2019 and March 2020. The following organisations or communities participated in discussions.

Local council/local water utilities/ other organisation	Aboriginal community
Central Tablelands Water	Cowra Local Aboriginal Land Council
Carrathool Shire Council	West Wyalong Aboriginal Land Council
Jemalong Irrigation	Hay Local Aboriginal Land Council
Lachlan Valley Water	Wiradjuri Traditional Custodians
Central NSW Joint Organisation	Ngiyampaa Murrin Bridge
Cowra Shire Council	Lake Cowal Foundation
Forbes Shire Council	Forbes Aboriginal and Community Working Group
Goldenfields Water	Dreaming Centre Forbes
Hilltops Council	Community representatives from Euabalong, Lake Cargelligo, Condobolin, Cowra and Forbes
Lachlan Shire Council	Murrin Bridge Local Aboriginal Land Council
Upper Lachlan Shire Council	Nari Nari Tribal Council
Parkes Shire Council	Gayini Nimmie-Caira

The purpose of discussions was to establish a collaborative relationship with local councils, local water utilities and Aboriginal communities as well as to gain an understanding of key water challenges and risks in the Lachlan region.

Discussions also focused on gaining feedback on draft long list of options for the Lachlan Regional Water Strategy. Discussions with Aboriginal communities focused on cultural challenges and the development of cultural options.

Summary

Quick stats and hot topics

A total of 29 meetings were held, with over 86 people attending and participating in discussions during the targeted engagement phase. Information about participants and a summary of recurring themes and hot topics are outlined below.

Targeted council/local water utilities/ other organisation engagement	Targeted Aboriginal engagement
Quick stats	**Quick stats**
20 targeted meetings including four round tables	Nine targeted meetings
Over 42 people participated in discussions	44 people participated in discussions
Meetings held regionally face-to-face and by video conference and in Sydney	Four Local Aboriginal Land Councils and eight other Aboriginal groups represented
Over 130 ideas, opportunities and challenges and suggestions identified	Over 150 ideas, opportunities and challenges and suggestions identified

Recurring themes	Recurring themes
Collaboration and an ongoing partnership approach is highly valued	Cultural heritage, including access to and protection of cultural and sacred sites, is essential
Water security is important for regional growth and community wellbeing	Connectivity to land and water is essential to wellbeing and healthy communities
Evidence based planning and good governance are highly valued and should be the foundation for the development of the regional water strategies	Culturally appropriate engagement and partnerships are essential and there is a strong desire for Aboriginal people to be represented in development and decision-making processes
A consistent and whole of government approach to water policy, planning and regulation is needed	Accessible information on water management is needed as there is a lack of knowledge about water policies, especially amongst younger people
All water sources are important and more information on groundwater sources is needed to support future planning	A strong desire for more business opportunities so that Aboriginal communities can use traditional water knowledge in the management and improvement of waterways
The Wyangala Dam raising project and the investigation of Lake Rowlands augmentation	More work is needed to manage environmental concerns

Targeted council/local water utilities/ joint organisation/ other organisation engagement	Targeted Aboriginal engagement
Hot topics	**Hot topics**
Regional water strategies implementation plan and governance framework	Importance of accessing water for economic outcomes
Groundwater knowledge and information gaps	Need for cultural water entitlements
Links between the Lachlan Regional Water Strategy, the Regional Town Water Strategy and other local planning processes	Need to access and protect culturally significant sites, including on Travelling Stock Reserves
Environmental water releases and groundwater use during drought	Lack of awareness of Cultural Water Access Licences
Media portrayal of 'day zero' scenarios for regional towns and its impact on investor confidence	Governance arrangements for establishing an Aboriginal Regional Water Advisory Committee
Water quality if drought persists	Groundwater drawdown impacts and water quality issues
High energy costs of pumping and pressurising water through water supply network	Environmental water releases and possible impacts on cultural sites/erosion

Detailed feedback

The following two tables summarise the feedback from round one and round two of the targeted engagement phase.

Council engagement

Topic	Comment
Collaboration and engagement	Attendees value ongoing consultation and expressed a strong desire to work collaboratively: • interested to work with other agencies in the region, and stressed the importance of a continued partnership approach even if the drought breaks • expressed concern regarding the compressed consultation timeframes and stressed the importance of ongoing communication through development and implementation of the regional water strategy including the modelling of options • suggested that regional water strategy information needs to be more readily available to assist in planning and the wider dissemination of information to communities • suggested that the regional water strategy could link with other local planning activities such as the integrated water cycle management strategies and Regional Town Water Strategies • indicated the desire to be 'proactive' and 'solution-oriented' to ensure water security and the management of water resources for the long-term • requested the regional water strategy team 'closes the loop' at the completion of the strategy's development and present main findings and future actions.

Topic	Comment
Regional growth and water security	Attendees stressed the importance of water for regional communities and planning to meet long-term needs: • stressed the importance of modelling and evidence based research, and stated that further information on future water availability (surface and groundwater) is needed to support population and industry growth in the region • requested access to, or to be provided with, reports from the regional water strategy modelling and data when it is available • expressed concern about current drought conditions and the security of various water sources • expressed concerns about water quality in the context of stricter standards and persistent drought conditions • stressed the importance of a 'multi-source' approach to water security • suggested that infrastructure and non-infrastructure options should be considered to address water security challenges including innovative solutions and the upgrade of existing (aging) infrastructure • suggested that the connectivity of water supply networks between regions would significantly improve water reliability and security (such as expanding the existing pipe network and linking directly to headwater storages) • expressed the view that while further growth opportunities in and around Canberra could be beneficial for the region, this may create additional demand on water resources in the Upper Lachlan • expressed concern that population and industry growth will impact on existing water users in the region and growth pressures • stated there had been an increase in permanent plantings in the region and also noted the potential for new mining development • expressed confusion about the application of water restrictions in different council areas in the Lachlan region • raised the need to consider land use planning in the development of the Lachlan Regional Water Strategy • raised the social/amenity value of water to regional communities (such as concerns about the lack of opportunity to fill local town lakes).

Topic	Comment
Regional water strategy development	Attendees expressed support for the regional water strategy program. They want to get it right and stressed the importance of transparency and good governance: • expressed the view that Lachlan is a 'closed system', which provides opportunities to test new approaches and trial new ideas ('blue sky thinking') • noted that information was critical to allow for better planning and quicker response times to extreme events • expressed the view that aspirational thinking was needed and to focus on all climate conditions. The regional water strategy should be a balance between development, growth, sustainability and the environment • supported the integration of climate change considerations and stressed the need to integrate groundwater and surface water models • sought more clarity about inter-regional linkages to better understand how water could be transferred and wanted certainty that water security will not be compromised • suggested there needs to be alignment in water management policy including drought emergency measures, Safe and Secure Water Program and ongoing water sharing arrangements • mentioned that the regional water strategy needs to be flexible to manage changes and emergency project announcements • emphasised that the regional water strategy needs to be a catalyst to grow the region and outline options demonstrating how each region could achieve best value of its water use • stated the need for the development of an implementation plan that has a strong governance framework to track progress • expressed concern that the regional water strategy would result in more 'red tape' with respect to planning and development application processes • expressed a range of views regarding sample options from the draft long list and provided the following comments: - rationale and logic for each option is needed - clarity is required on the use of modelling results in the assessment of options - future economic opportunities (such as high value agriculture) should be included to assist in option selection - inclusion of options (developed in consultation with industry stakeholders) to upgrade on-farm and off-farm irrigation infrastructure. Potential governance arrangements should also be considered. • stressed that the council boundaries do not match the Lachlan Regional Water Strategy boundaries. Some council areas span two or more regional water strategy areas.

Aboriginal engagement

Topic	Comment
Cultural heritage	Attendees expressed the need to be able to access and protect cultural and sacred sites, and to improve cross cultural understanding: • stressed that there are significant cultural sites all along the river and access is often difficult • stated that the river and Country are used to pass down knowledge through generations and having access to the river and waterways is needed for training and holding cultural events • stated that spiritually Aboriginal people are connected to Country—river comes first, everything else second • stated that water is about kinship, connection, medicine and songlines (above and underground). Culture is not stagnant; it is always moving and adapting, and there is a cultural obligation to protect important sites and to pass this knowledge on to children • expressed the need to have a better understanding of cultural values and uses and protection of cultural sites near waterways. Stressed that improved understanding of cultural heritage was needed and stated that clear information explaining the rights of Aboriginal people to water should be developed and made available through government websites • there was concern that cultural surveys are not taking place before the release of environmental water.
Connectivity to land and water and community wellbeing	Attendees expressed the importance of connection to water and its link with wellbeing and healthy communities: • stated that land, Travelling Stock Reserves and water cannot be accessed because of fences • expressed the importance of water for wellbeing through the ability to use bush foods, to grow food along the river and to fish—attendees were very concerned that they could not do this and that young people could not do this. Attendees stated strongly that this is about healthy communities • stated that Aboriginal people use the land and the water as their classroom, providing benefits to communities • expressed the importance of using Aboriginal language as a way to recognise cultural connection: - stated that the Lachlan River is known as the Galari or Kalari (spelling is dependent on regional dialect) - attendees supported referencing Traditional Custodians, Caretakers or Custodians of the Land in the strategy.
Engagement and partnership with communities to develop the regional water strategy	Attendees expressed the importance of local Aboriginal knowledge as well as the need for culturally appropriate engagement: • some attendees expressed concern about representation by peak Aboriginal organisations, stating that they do not feel that the Local Aboriginal Land Council and Murray Lower Darling Rivers Indigenous Nations represent them • a reference group called Lachlan River Traditional Owners group is being established to work with different groups carrying out water management in their area and to work on the development of the Lachlan Regional Water Strategy. It was requested that information about available funding be provided to support this group • stressed the value of the significant water knowledge that Aboriginal people have, stating they have over 60,000 years of water management experience. Attendees commented that people are taking water and not giving it back. There is a strong view that Aboriginal knowledge is needed and that: - knowledge can be shared but it must be protected - legally binding data use agreements are needed, co-signed by the department.

Topic	Comment
Engagement and partnership with communities to develop the regional water strategy (continued)	• suggested that Aboriginal people need to be engaged early on the regional water strategy and that meetings should be held on Country with the same staff. It was stressed that Aboriginal people need to be at the forefront of every plan and document that impacts on them • suggested establishing engagement protocols to manage representation and processes • expressed a desire to work with a range of stakeholders: - Local Aboriginal Land Councils - Council - Inland Rail - Registered Aboriginal Parties. • stated there are challenges to achieving this • suggested that regional Cultural Liaison Officers be employed to maintain ongoing engagement • stressed the importance of the Lachlan and Murrumbidgee strategies 'talking' to one another.
Water policy education	Attendees expressed the view there is a lack of knowledge about water policies, especially amongst younger people: • suggested that more information is provided on rights to water, the 10 ML cultural licences, cultural flows and other relevant water access and water use policies. Attendees also wanted clarity on the cultural water allowance under the draft water sharing plans • expressed a desire for more education in the community about water savings initiatives such as water tank use and water recycling • sought clarity on the relationship and difference between cultural water and environmental water • expressed concern about current water policy information—stating there is 'a lot of technical jargon' • suggested that more information is provided to explain the relationship and role of various water management plans including the regional water strategies, water resource plans and water sharing plans • suggested that an overarching Aboriginal water policy needs to be developed.
Water management	Attendees expressed concern across the region about how water is being managed and 'owned': • stated that water management arrangements are viewed as complex and that understanding the water management framework can be a challenge • stated that water is a birthright and suggested that New Zealand have good policies around cultural water • expressed a desire to be involved in the allocation of water and expressed concern that Aboriginal people are not involved in allocation decisions • expressed concern about increased ground water extraction and its impacts on rivers and creeks due to strong connection between surface water and groundwater • stressed the importance of caring for the river and that they are taught to look after the river for everyone—with upstream users keeping the river healthy for downstream users • suggested that cultural water allocations could be managed by local communities with support from the government • expressed concern that ageing infrastructure is impeding water flow. There is too much water loss. If infrastructure is upgraded, they would like to see it modelled

Topic	Comment
Water management (continued)	• expressed concern that the raising of the wall at Wyangala Dam will be detrimental to the lower end of the Lachlan system • several attendees raised the need to review the current framework for applications for Aboriginal Cultural Water Access Licences.
Employment and business opportunities	Attendees expressed a desire for more business opportunities so that Aboriginal communities could use traditional water knowledge in the management and improvement of waterways: • attendees outlined some opportunities for further consideration: - exploring leasing opportunities of Indigenous Protected Areas to provide cultural tourism, with government assistance provided through wages and set up costs. It was stated that this would give the community pride and ownership - provision of funding through water trusts - rights to sell water or to temporarily trade. • attendees outlined challenges for further consideration: - water theft - cleanliness of the river—economic benefits cannot be realised without clean water - increased availability of water entitlements (communities stated they would like 20–30% of the water and the fish) - employment of river rangers to protect and clean the river - employment of Aboriginal Cultural Liaison Officers.
Environmental concerns	Attendees expressed concern about the state of the rivers, flora and fauna: • expressed concern about the proposed method of using a virus to control carp in the rivers. Suggested a bounty would be better than a virus as the carp deaths caused by the virus would impact on water quality • stressed the importance of riparian zone restoration for river health and also for traditional plants such as reeds • stressed the importance of good management on the timing of environmental flows. Attendees stated that releases should be coordinated to provide benefits to the community and noted that single large releases can be problematic due to erosion and impacts on cultural heritage • expressed concern about water use by mines drawing from the Belubula River and groundwater sources • expressed concern about the drying of the Lachlan River and the impact this has on the health and wellbeing of the community. Attendees stated that the ability for cultural activities has been limited due to the drying of the river.

All feedback has been considered in developing the Draft Lachlan Regional Water Strategy and stakeholders will continue to be engaged throughout the public exhibition process and the finalisation and implementation of the regional water strategies.

Next steps

The Draft Lachlan Regional Water Strategy will go on public exhibition from 25 September 2020 for a six-week period. During this period, additional targeted and general public engagement will take place and written submissions will be accepted regarding the strategy.

Following the review of the public exhibition period, further targeted engagement will be undertaken before the final regional water strategy documents are published.

Image courtesy of Destination NSW.

Attachment 2

Glossary

Term	Definition
Access licence	An access licence entitles its holder to take water from a water source in accordance with the licence conditions. Key elements of an access licence are defined in section 56(1) of the NSW *Water Management Act 2000* as: *(a) specified shares in the available water within a specified water management area or from a specified water source (the share component), and* *(b) authorisation to take water:* *(i) at specified times, at specified rates or in specified circumstances, or in any combination of these, and* *(ii) in specified areas or from specified locations (the extraction component).* An access licence may also be referred to as a water access licence or a WAL.
Allocation	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, size of their individual entitlement, dam storage levels, river flows and catchment conditions.
Anabranch	A section of a river or stream that diverts from the main channel of the watercourse and rejoins it downstream.
Aquifer	Geological structure or formation, or landfill, that can hold water.
Basic landholder rights	Where landholders can take water without a water licence or approval under section 52, 53 and 55 of the NSW *Water Management Act 2000*. There are three types of basic landholder rights under the NSW *Water Management Act 2000:* • 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's Native Title Act 1993*.
Biota	The plant and animal life of a particular region or habitat.
Blackwater event	An event that occurs when flooding washes organic material into waterways where it is decomposed by bacteria, releasing carbon, depleting oxygen levels and giving water a black or tea-coloured appearance. The sudden decrease in oxygen can result in the death of fish and other organisms.
Catchment	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.
Cease to pump rule	A requirement in water sharing plans that licence holders stop pumping when the river flow falls below a certain level.

Term	Definition
Climate-independent water source	A source of water that does not depend on rainfall or streamflows for replenishment. Includes seawater desalination and recycled water.
Climate variability	Describes the way key climatic elements, such as temperature, rainfall, evaporation and humidity, depart from the average over time. Variability can be caused by natural or man-made processes.
Cold water pollution	An artificial decrease in the temperature of water in a river. It is usually caused by cold water being released into rivers from large dams during warmer months.
Cultural flows	While the NSW *Water Management Act 2000* does not define cultural flows, the Murray Lower Darling Rivers Indigenous Nations Echuca Declaration, 2007, 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.'
Dead storage volume	Volume of water below the level of the lowest outlet (the minimum supply level). This water cannot be accessed under normal operating conditions.
Direct employment	Refers to employment directly arising from the demand for a specific product or service.
Effective capacity	Effective capacity of a dam or reservoir is equal to the total volume less any 'dead' or inactive storage (water that cannot be used because it is below the dam's spillway or other outlet).
Effluent	Flow leaving a place or process. Sewage effluent refers to the flow leaving a sewage treatment plant. An effluent stream is one that leaves the main river and does not return.
End of system	The last defined point in a catchment where water information can be measured and/or reported.
Endangered ecological community	Ecological communities as listed in 'Schedule I' of the *Threatened Species Conservation Act 1995* or Schedule 4 of the *Fisheries Management Act 1994.*
Entitlement	The exclusive share of the available water that a licence holder can take, subject to allocations.
Environmental asset	Natural features that contribute to the ecosystem of a region. The Murray-Darling Basin Plan defines water-dependent ecosystems with particular characteristics as 'priority environmental assets' for the purposes of environmental watering.
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.
Extraction limit	A limit on the long-term average volume of water that can be extracted from a source.
Fish passage	The free movement of fish up and down rivers and streams.
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.

Term	Definition
Full supply volume	Normal maximum operating water level of a water storage when not affected by floods. This water level corresponds to 100% capacity.
General security licence	A category of water access licence under the NSW *Water Management Act 2000*. This category of licence forms the bulk of the water access licence entitlement volume in NSW regulated rivers and is a low priority entitlement (i.e. receives water once essential and high security entitlements are met).
Gross regional product	A measure of the market value of all goods and services produced in a region within a period of time. Gross Regional Product is a similar measure to Gross State Product and Gross Domestic Product.
Gross value added	A measure of the value of goods and services produced in an area, industry or sector of an economy. Gross value added is a similar measure to Gross Regional Product.
Groundwater	Water located beneath the ground in the spaces between sediments and in the fractures of rock formations.
Groundwater-dependent ecosystem	Ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain their communities of plants and animals, ecological processes and ecosystem services.
High flows	Also called bankfull events, these reshape the channel, creating habitats such as pools, bars and benches.
High security entitlement trigger	An approximate volume in Wyangala Dam under which drought measures are likely to be adopted. It is not a formal planning trigger; rather it has been used in the development of this strategy for the purposes of understanding the risks to the region's water resource management.
High security licence	A category of water access licenses in regulated rivers implemented under the NSW *Water Management Act 2000*. Receives a higher priority than general security licences but less priority than essential requirements in the available water determination process. Many high security licences are held by water users that have inflexible water demands, such as those growing permanent plantings and mining companies.
Indirect employment	Jobs that are created by other businesses to support the primary employment sector.
Inflows	The amount of water coming into a surface water source or groundwater source.
Joint organisation	An entity formed under the NSW *Local Government Act 1993* to perform three principal functions in a region: strategic planning and priority setting, intergovernmental collaboration and shared leadership and advocacy. Each joint organisation comprises at least three member councils and aligns with one of the state's strategic growth planning regions.
Local water utilities	Generally these are council owned and operated utilities that provide water supply and sewerage services to local communities.
Localised drawdown	Lowering of groundwater levels around a bore, or multiple bores, due to pumping of groundwater.
Managed aquifer recharge	Intentional recharge of water to aquifers for subsequent use or environmental benefit.

Term	Definition
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 of thousands of years in time. These indicators include marine and terrestrial deposits, tree rings and ice cores.
Permanent plantings	Crops that are not replanted after a growing season. These crops generally require more than one growing season to be productive. Examples include grapes, citrus fruits and almond trees. These are different from annual (or broadacre) crops, which are harvested within 12 months of planting and require replanting to produce a new crop.
Recharge	Groundwater recharge is a hydrologic process where water drains downward from surface water to groundwater. Groundwater is recharged naturally by rain, floods and snow melt and to a smaller extent by drainage directly from surface water (such as rivers and lakes).
Recycled water	Water that has been treated to a 'fit for purpose' standard for a specific application as per the Australian Guidelines for Water Recycling.
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 *Water Management Act 2000*, 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.
Replenishment flows	Flows provided from a regulated river along effluent systems to supply water for households, town use and stock.
Resilience	Resilient water resources as those that are able to withstand extreme events, such as drought and flood, and/or adapt and respond to changes caused by extreme events.
Salinity	The concentration of sodium chloride or other dissolved minerals in water.
Special activation precinct	A dedicated area in a regional location identified by the NSW Government to become a thriving business hub.
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 regulated 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.
Stormwater harvesting	The collection, treatment, storing and use of stormwater runoff from urban areas.

Term	Definition
Supplementary licence	Where a surplus flow from rain events cannot be captured in storages or weirs, and this water is not needed to meet current demands or commitments, then it is considered surplus to requirements and a period of Supplementary Access is announced. Supplementary Water Access Licence holders can only pump water against these licences during these announced periods. Other categories of licence holders may also pump water during these periods.
Surface water	All water that occurs naturally above ground including rivers, lakes, reservoirs, creeks, wetlands and estuaries.
Sustainable diversion limit	Sustainable diversion limits define how much water, on average, can be used in the Murray-Darling Basin by towns, communities, industries and farmers in a particular surface water or groundwater source. The limit is written into law in NSW through water sharing plans.
Transmission losses	Water, from an accounting perspective, that is considered lost. This water has been lost through surface water seeping into the ground or evaporation.
Tributary	A smaller river or stream that flows into a larger river or stream. Usually a number of smaller tributaries merge to form a river.
Unregulated river	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. Water users on unregulated rivers are reliant on climatic conditions and rainfall. For the purpose of the NSW *Water Management Act 2000*, an unregulated river is one that has not been declared by the Minister to be a regulated river.
Wastewater	Water that is an output or discharge from a particular activity, for example, from domestic, commercial, industrial or agricultural activities. The chemical composition of the wastewater (compared to the source) will be contaminated.
Water accounting	The systematic process of identifying, recognising, quantifying, reporting, assuring and publishing information about water, the rights or other claims to that water, and the obligations against that water.
Water reliability	Refers to how often an outcome is achieved. It is often considered to be the likelihood, in percentage of years, of receiving full water allocations by the end of a water year for a licence category. For example, a 60% reliability means that in 60% of years a licence holder can expect to receive 100% of their licensed entitlement by the end of the water year. Other measures of volumetric reliability could also be used; for example, the percentage allocation a licence holder could expect to receive at a particular time of the year as a long-term average. Reliability may also refer to how often an acceptable water quality is available. A reliable water supply gives some clarity to water users and helps them plan to meet their water needs.
Water resource plan	A plan made under the Commonwealth *Water Act 2007* 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.

Term	Definition
Water security	Water security in the context of regional water strategies refers to the acceptable chance of not 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.
Water sharing plan	A plan made under the NSW *Water Management Act 2000,* 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	Defined under the NSW *Water Management Act 2000* 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'. Individual water sources are more specifically defined in water sharing plans.
Water trade	The process of buying and selling water entitlements and water allocations.
Water year	The annual cycle associated with the natural progression of hydrological seasons: starting with soil moisture recharge and ending with maximum evaporation/ transpiration. In NSW (as for all of the southern hemisphere), the water year runs from 1 July to 30 June.
Wetland	Wetlands are areas of land where water covers the soil—all year or just at certain times of the year. They include swamps, marshes, billabongs, lakes, and lagoons. Wetlands may be natural or artificial and the water within a wetland may be static or flowing, fresh, brackish or saline.

Image courtesy of Destination NSW.

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