

Draft Regional Water Strategy

Murrumbidgee

Discussion Paper: Draft regional challenges

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Acknowledging First Nations people

The NSW Government acknowledges First Nations people as its first Australian People and the traditional owners and custodians of the country's lands and water. We have recognised that First Nations people have lived in NSW for over 60,000 years and have formed significant spiritual, cultural, and economic connections with its lands and waters.

Today, they practice the oldest living culture on earth.

The NSW Government acknowledges the First Nations people/Traditional Owners from the Murrumbidgee region as having an intrinsic connection with the lands and waters of the Murrumbidgee Regional Water Strategy area. The landscape and its waters provide the First Nations people with essential links to their history and help them to maintain and practice their traditional culture and lifestyle.

We recognise the Traditional Owners were the first managers of Country and by incorporating their culture and knowledge into management of water in the region is a significant step for closing the gap.

Under this regional water strategy, we seek to establish meaningful and collaborative relationships with First Nations people. We will seek to shift our focus to a Country-centred approach, respecting, recognising and empowering cultural and traditional Aboriginal knowledge in water management processes at a strategic level.

We show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places where First Nations people are included socially, culturally and economically.

As we refine and implement the regional water strategy, we commit to helping support the health and wellbeing of waterways and Country by valuing, respecting and being guided by Traditional Owners/First Nations people, who know that if we care for Country, it will care for us.

We acknowledge that further work is required under this regional water strategy to inform how we care for Country and ensure First Nations people/Traditional Owners hold a strong voice in shaping the future for Indigenous/Aboriginal and non-Aboriginal communities.

Artwork: Image courtesy of Nikita Ridgeway.

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Snapshot

The Murrumbidgee region



262,000
population



84,000
km²



Key regional centres include:
Wagga Wagga, Griffith,
Queanbeyan



First Nations:

Wiradjuri, Nari Nari, Barapa Barapa, Wemba Wemba, Yita Yita, Mutthi Mutthi, Wadi Wadi, Nyeri Nyeri, Ngunnawal/Ngunawal, Wolgalu and Ngarigu



Major river systems:

Murrumbidgee River, Tumut River, Yanco Creek System. Plus a number of unregulated rivers and creeks



Main groundwater sources:

Bungendore Alluvial, mid-Murrumbidgee Alluvial, lower Murrumbidgee Alluvial, Lachlan Fold Belt Murray–Darling Basin



Smaller regional towns include:

Cooma, Tumut, Yass, Cootamundra, Gundagai, Junee, Narrandera, Hay, Leeton, Balranald and Bungendore



Connections:

Snowy Scheme, the Australian Capital Territory, the Murray River region and broader southern connected basin



Major water storages:

Burrinjuck Dam on the Murrumbidgee River, with storage capacity of 1,026 GL
Blowering Dam on the Tumut River, with a storage capacity of 1,628 GL



Key environmental assets:

Fivebough and Tuckerbil Wetlands, mid-Murrumbidgee Wetlands, lower Murrumbidgee (Lowbidgee) Floodplain including Gayini Nimmie-Caira
Threatened and vulnerable native species including 12 fish species, 6 frog species, 44 bird species



Major investments:

Wagga Wagga Special Activation Precinct, South Jerrabomberra Regional Job Precinct, Inland Rail Project, Snowy 2.0

Gross Value Added (2020–21): **\$16.7 billion**



Key sectors and engine industries: agriculture, manufacturing, health care, public administration and tourism

Purpose of this discussion paper

Secure, reliable and resilient water sources are critical to regional communities in NSW. They contribute to the appeal and prosperity of rural areas, regional towns and cities. They create cultural connections to Country and support community well-being. Water in the right places at the right times is also vital for healthy regional landscapes and sustainable ecosystems. Changing water demand, increased climate variability and shifting community expectations mean we need to plan and invest in improved long-term regional water security.

The NSW Government is developing a suite of regional water strategies that 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 and beyond.

The first draft of the Murrumbidgee Regional Water Strategy, which identified all the challenges and opportunities in region, was released in April 2022 along with a long list of potential options to address those challenges¹.

Since public consultation on the draft strategy, we have taken on board what we heard and undertaken additional baseline hydrological modelling based on the new climate data. We have used this information to further refine the challenges for the region.

In response to stakeholders wanting to be more involved in the development of the regional water strategy, and being prevented from doing so with the current flood situation, we are releasing this discussion paper which presents the outcomes of this work.

Clearly identifying the key challenges for the region is an important first step in helping assess what tools and solutions are needed to manage the water needs of the Murrumbidgee region over the next 20 years and beyond.

¹ The draft Murrumbidgee Regional Water Strategy and long list of options is available at: www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

We are planning a second round of consultation in mid-2023 on a shortlist of actions to address the key challenges, prior to finalising the strategy.

You can find additional background information on stakeholder feedback in the Draft NSW Murray and Murrumbidgee Regional Water Strategies What We Heard report².

You can find information on the climate and hydrological modelling that underpin the draft Murrumbidgee Regional Water Strategy in the Climate and Hydrological modelling: Draft NSW Murray and Murrumbidgee Regional Water Strategies³ report.

The regional water strategies cannot provide a comprehensive response to flooding

The role of regional water strategies is to support the delivery of healthy, reliable and resilient water resources that sustain a liveable and prosperous region.

Improvements to flood risk mitigation are being considered through the 2022 NSW Flood Inquiry. The inquiry report and the NSW Government response can be found at: www.nsw.gov.au/nsw-government/projects-and-initiatives/floodinquiry

Although a comprehensive response to flooding is outside the scope of the regional water strategies, the strategies can play a supporting role for local councils in the region to make targeted flood management improvements.

References to flooding in the strategies are in the context of providing state and local decision-makers with technical advice to support holistic flood management taking place through other channels. This advice can assist councils with the best evidence base to help meet these challenges.

² The Department of Planning and Environment, Draft NSW Murray and Murrumbidgee Regional Water Strategies What We Heard report available at www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

³ The Department of Planning and Environment, Murray and Murrumbidgee Regional Water Strategies: Climate and hydrological modelling available at www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

Why we are developing regional water strategies

Across NSW, valuable and essential water resources are under pressure. A more variable climate, changes in industries, and population growth mean we face difficult decisions and choices about how to manage water efficiently and sustainably while balancing different demands for the resource. The regional water strategy process identifies these risks and seeks to understand how we can best be prepared for future uncertainties and challenges.

In addition to understanding and managing future pressures, there are opportunities to consider the role water resources will play in growing the regions, improving liveability and ensuring each region remains a great place to live, work, play and visit. The NSW Government's strategic investments in special activation precincts, regional job precincts, renewable energy zones, hydroelectricity and other actions identified through regional economic development strategies are critical to realising this vision. However, all these activities rely on access to water.

The regional water strategies program is helping to provide the evidence-base needed to support existing investments and identify new opportunities to sustain successful regional industries into the future.

The regional water strategies will include a wide range of tools and solutions to help us better use, share, store and deliver water to smooth the highs and lows of water availability and change how we manage water into the future.

Objectives of regional water strategies

Each regional water strategy will identify the key challenges that impact on our ability to achieve its key objectives. The final strategies will set out a long-term 'roadmap' that addresses the challenges and work towards meeting at least one regional water strategy objective (Figure 1).

Figure 1. Regional water strategy objectives



How regional water strategies fit with other NSW water strategies

The NSW Water Strategy, together with the regional water strategies and metropolitan water strategies that underpin it, will form the strategic planning framework for water management in NSW. The NSW Water Strategy (2021) was developed in parallel with the draft regional water strategies. The NSW Water Strategy guides the strategic, state-level actions and the regional water strategies will prioritise how those state-wide actions, as well as other region-specific, place-based solutions, should be staged and implemented in each region.

As part of delivering the NSW Water Strategy, the NSW Government will deliver other state-wide strategies including:

- the Aboriginal Water Strategy: co-designed with Aboriginal people to identify a program of measures to deliver on Aboriginal People's water rights and interests in water management
- the NSW Groundwater Strategy: to ensure sustainable groundwater management across NSW
- the Town Water Risk Reduction Program: to identify long-term solutions to challenges and risks to providing water supply and sewerage in regional towns in collaboration with local water utilities

- a new state-wide Water Efficiency Framework and Program: to reinvigorate water use efficiency programs in our cities, towns and regional centres.

The NSW Water Strategy and the draft Murrumbidgee Regional Water Strategy also complements other whole-of-government strategies, including *the 20-Year Economic Vision for Regional NSW* and accompanying *Future Ready Regions Strategy* the updated State Infrastructure Strategy 2022–2042 and the South East and Tablelands Regional Plan 2041.

The draft Murrumbidgee Regional Water Strategy also seeks to align its actions and recommendations with the goals and directions set out in relevant regional plans,⁴ and support the growth and development enabled through the Inland Rail Project, South Jerrabomberra Regional Jobs Precinct, Wagga Wagga Special Activation Precinct, South-West Renewable Energy Zone and Snowy 2.0.

The regional water strategy will be cognisant of further developments resulting from existing government commitments to develop water-related infrastructure business cases in the Murrumbidgee region and other NSW Government initiatives, programs and studies that are under development, including the review of the regional economic development strategies, the development of the Riverina Murray Regional Plan 2041, the South East and Tablelands Regional Plan 2041, the Housing 2041 – NSW Housing Strategy and the NSW Electricity Strategy.

By providing a coordinated approach to support the range of transformational NSW Government policies recently introduced, we will proactively build resilience in regional communities, adopt a place-based framework that is adaptive to changing circumstances, and enable government and regional communities to work together to ensure the Murrumbidgee region is a great place to live, work, and visit.

Regional water strategies are backed by new climate data

To improve our strategic forward planning, new ground-breaking climate datasets have been developed for the Regional Water Strategy program. These datasets provide us with a more comprehensive understanding of the climate variability in the Murrumbidgee region beyond the recorded historical data.

To support the development of the draft Murrumbidgee Regional Water Strategy, we are using the recorded dataset as well as two plausible climate scenarios to test their respective implications for regional water resources:

- Historical climate: data from rainfall and evaporation records collected from the Australian Government’s meteorological records over the past 130 years.
- Long-term historical climate: 10,000 years of stochastic-generated climate data developed using paleo climatic information from the University of Adelaide, Australia
- Dry future climate: applying the NSW and Australian Regional Climate Modelling (NARClIM) climate projections for 2060–2079 compared to the baseline period of 1990–2009 to define a dry future climate scenario.

⁴ The Murrumbidgee Regional Water Strategy area’s overlaps with the boundaries of the Far West Regional Plan, the Riverina-Murray Regional Plan and the South-East and Tablelands Regional Plan.

The dry future climate scenario⁵ is the *SRES A2* which represents a high carbon emissions scenario, and thus results in higher projected climate change impacts on the region⁶. This is not a forecast of how climate change is expected to eventuate, but it is one possible future outcome.

While these climate change scenarios may not eventuate, they help us to highlight key water challenges we may need to focus on in the future, over a range of wet and dry sequences. In addition, they will be used to test the comparative benefit/impact of options across a range of climate scenarios⁷.

While using this climate change dataset is appropriate for developing a regional water strategy with a 20-year horizon, it is not fit-for-purpose for operational and water sharing plan decisions, such as, available water determinations (allocation announcements), annual permitted take calculations and sustainable diversion limit compliance. Further work will be undertaken by the department to examine how climate information can be incorporated into shorter term decision-making.

Our climate science is continually improving. The regional water strategies are an important first step to better understand the potential vulnerability of our towns, communities, industries and the environment to a more variable and changing climate. We know that the future climate is uncertain, and work is progressing to further enhance our understanding of the region's climate and how it affects our vital water resources, including groundwater.

⁵ The scenario uses the regionally downscaled factors from the NARCLiM 1.0 Project to adjust the long-term past climate scenario rainfall and evapotranspiration data. Further information on NARCLiM 1.0 Project is available on the NSW Government, AdaptNSW website: www.climatechange.environment.nsw.gov.au/climate-projections-used-adaptnsw

⁶ The SRES A2 assumes a 2C warming over the regional water strategy planning horizon.

⁷ For further details about the new climate data and modelling, please refer to www.dpie.nsw.gov.au/water/plans-and-programs/regional-water-strategies/climate-data-and-modelling.

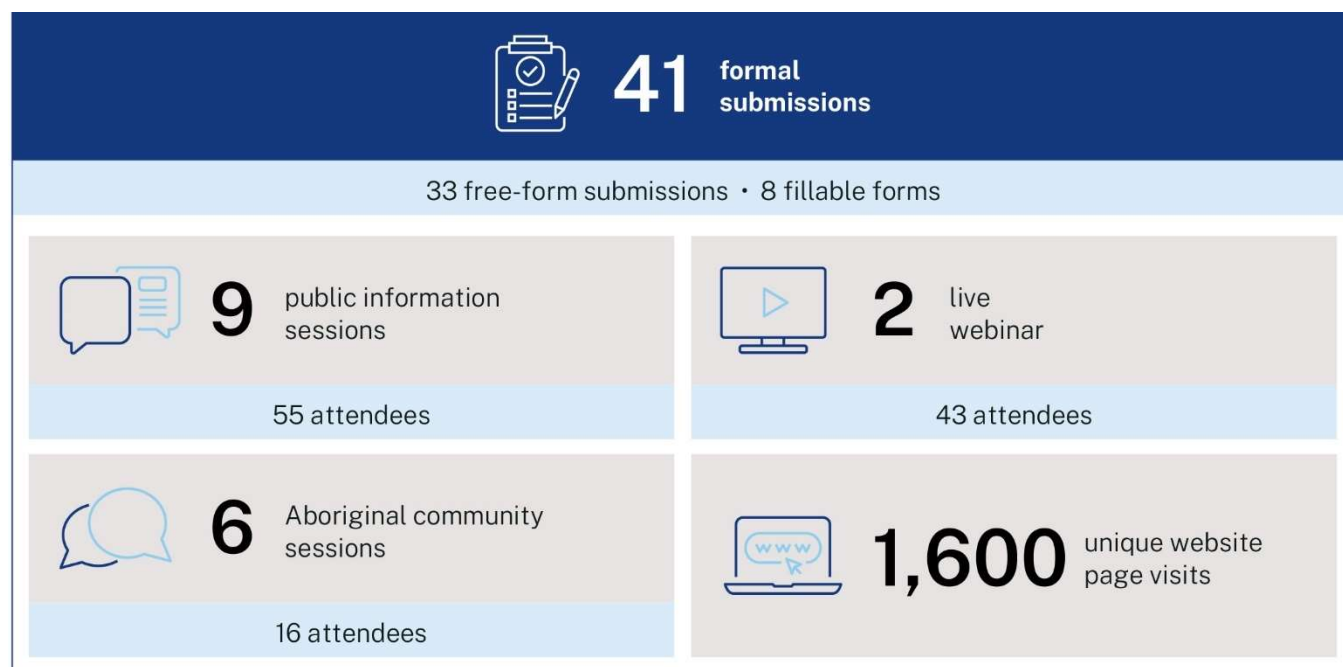
What we have heard so far

Developing an effective and lasting regional water strategy requires input from Aboriginal people, landholders, community members, local councils, and industry and environmental groups.

To guide the development of the draft Murrumbidgee Regional Water Strategy, targeted consultation was held with local councils and representatives from Aboriginal communities. Unfortunately, due to the COVID-19 pandemic, the targeted consultation with Aboriginal communities was not as extensive as intended.

Following this consultation, the draft Murrumbidgee Regional Water Strategy was placed on public exhibition from 11 April to 22 May 2022. A broad engagement program with the general public, stakeholder groups and local government supported this process and included online webinars and face-to-face public information sessions (Figure 2). This consultation was held jointly with consultation on the draft NSW Murray Regional Water Strategy.

Figure 2. Stakeholder engagement during the first public exhibition period, April-May 2022



Similar feedback was received for the Murrumbidgee and NSW Murray regions, and, given the connectivity across the two regions, a combined *What We Heard* report⁸ has been prepared.

There was general support for the development of a regional water strategy for the Murrumbidgee region, but concerns were raised about insufficient consultation with some stakeholders, and it was argued that development of the strategy should not proceed without hydrological modelling results. We also heard the next phase of the draft Murrumbidgee Regional Water Strategy development should be accompanied by an open, transparent, and broad-scale consultation process to ensure that all stakeholder voices are heard, and that a broad cross-section of the community is represented in the discussion. In response we have published this discussion paper to ensure we articulate the key challenges in the region and identify the most appropriate solutions and actions to address these challenges.

The key insights we heard during our most recent consultation with landholders, local councils, Aboriginal communities, stakeholders and the general public are provided in Figure 3 below.

Figure 3. Key insights from consultation on the draft Murrumbidgee Regional Water Strategy

Feedback theme	Feedback summary
Climate and modelling	- Concerns about the ‘worst-case scenario’ approach to modelling, which many considered unreasonable and unlikely to eventuate. The data, information and modelling used to inform the strategies should consider both wet and dry future conditions, not just dry. - Support for making data, information and modelling publicly available to aid transparency and inform people’s understanding of how it had been applied to the strategies, preferably prior to the strategies being finalised. - Concern at using projected climate change impacts with a timeframe that differs to the planning horizon/timeframe of the strategies.
Water security, availability and use	- Further investigation into the trends impacting reliability of water licences was suggested as a way of understanding the extent of the issue and identify drivers and options to address. - Support for options and actions aimed at developing a better understanding of people’s behaviours and assumptions around water availability and use. - Concerns about the impacts of a changing and variable climate on the environment, water sources, water availability, water quality, ecological degradation, water sharing and water users. - Stakeholder concerns also reflect the need to meet forecast population growth requirements in the region.

⁸ Department of Planning and Environment 2022, *Draft Murray and Murrumbidgee Regional Water Strategies What We Heard Report*, available via: www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

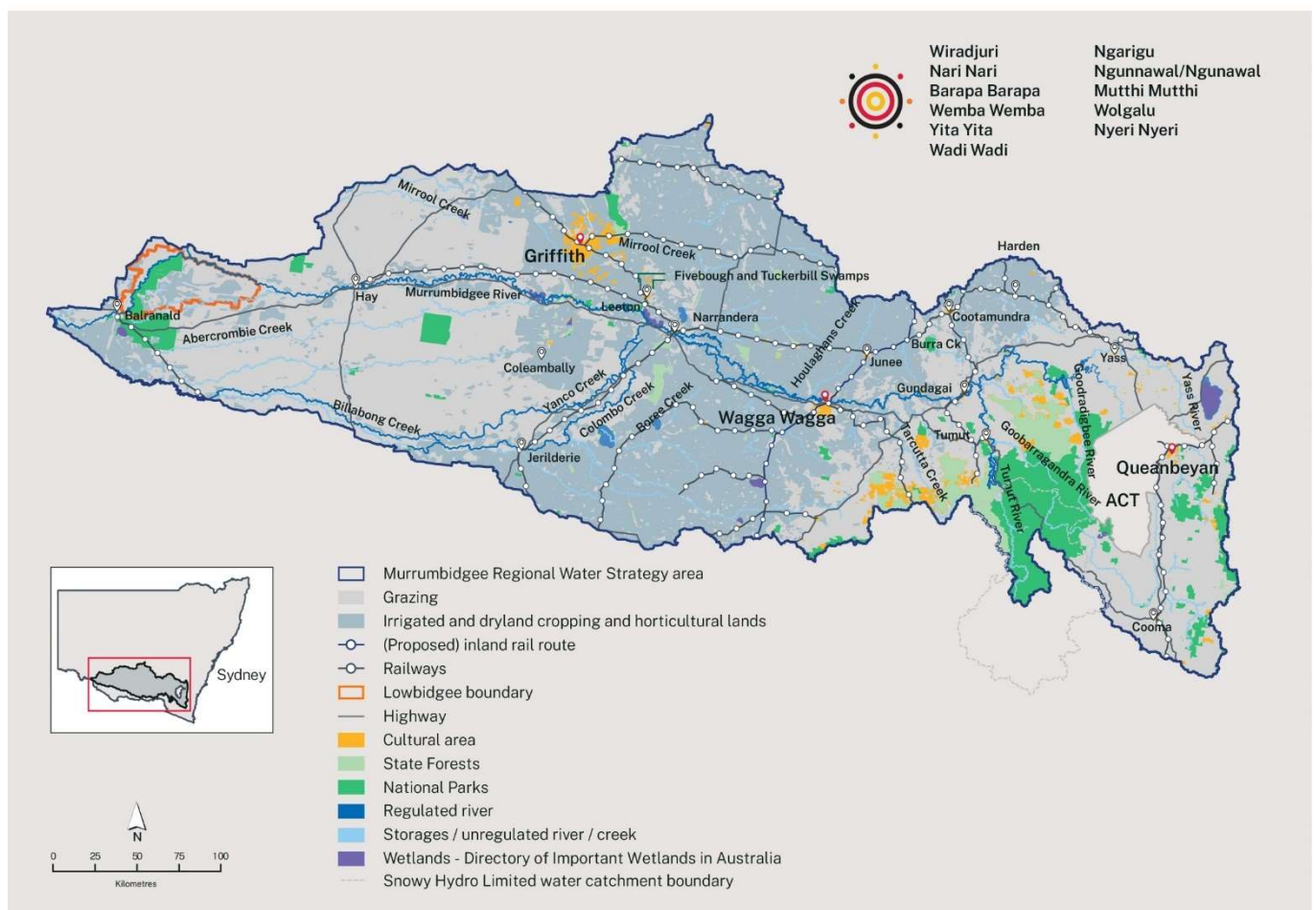
Feedback theme	Feedback summary
Environmental health, ecosystems and water quality	• Support for the commitment made by government to protect and support environmental values. Feedback highlighted the importance of undertaking stakeholder engagement and supporting stakeholder partnerships in progressing these options. • Support for initiatives aimed at addressing the impacts of a changing and variable climate on issues such as water quality and availability as well as local ecosystems. • Noted the importance of ensuring that regional water strategies clearly align with and relate to other key water plans, policies and initiatives. • Bushfire and flooding impacts were noted as contributors to poor water quality and traditional burning methods of catchments should be considered to help solve water quality issues. • Suggestion that environmental water delivery rules, practices and programs be reviewed as part of the regional water strategy, and that the ecological targets and objectives of the Murray-Lower Darling Long Term Water Plan be incorporated into the regional water strategy.
Improving water-related opportunities for Aboriginal people	• Significant support for improving opportunities for Aboriginal people to be more involved in water related matters, including regional land and water management issues, access to water entitlements, recognising and respecting Aboriginal cultural and spiritual ties and connection to Country, and acknowledging the cultural significance of water. • There needs to be more consultation with Aboriginal stakeholders and communities to capture Aboriginal cultural perspectives and incorporate local knowledge into the draft strategy and options.
Land and water management planning	• The inter-connectedness of the NSW Murray and Murrumbidgee regions is key to water management. • There were strong calls for improvements to inter-jurisdictional water sharing and management, noting the complexity of interstate agreements and rules impacting both the NSW Murray and Murrumbidgee regions, including suggestions for mechanisms such as inter-jurisdictional working groups to support better outcomes. Support for developing a better understanding of the impacts of land use change and population growth on water resource.
Strategy development and implementation	• Need to ensure that regional water strategies align with government commitments and other water management plans, policy, reform and legislation. • Further consultation with the general community and stakeholders about how the draft strategies will be developed and finalised is important, as is culturally appropriate engagement with Aboriginal stakeholders and communities.
Connectivity between regions – southern connected Basin	• It is important to consider improving connectivity between adjoining regions. • It may not be possible to improve connectivity when the Lower Darling River dries up naturally from time to time.

About the Murrumbidgee region

The Murrumbidgee region lies west of the Great Dividing Range in southern NSW and includes stunning natural landscapes that vary from mountainous terrain in the east to open plans in the west.

The Murrumbidgee Regional Water Strategy region (Figure 4.) is home to many vibrant towns and communities, productive agricultural and agribusiness industries, and culturally significant wetlands of national importance, including the Lowbidgee and mid-Murrumbidgee wetlands and the Ramsar-listed Tuckerbil and Fivebough Swamps.

Figure 4. Map of the Murrumbidgee Regional Water Strategy region



The Murrumbidgee region is located within the traditional lands of the Nari Nari, Barapa Barapa, Mutthi Mutthi, Ngarigu Ngunnawal/Ngunawal, Nyeri Nyeri, Wadi Wadi, Wemba Wemba, Wiradjuri, Wolgalu and Yita Yita nations. These nations have been caretakers of the region for more than 60,000 years.

The Murrumbidgee region is part of the broader southern connected Basin, linked hydrologically and through water management arrangements to the Murrumbidgee River and, by extension, to Victoria and South Australia. The region also receives inflows from the Snowy Scheme under the Snowy River Licence.

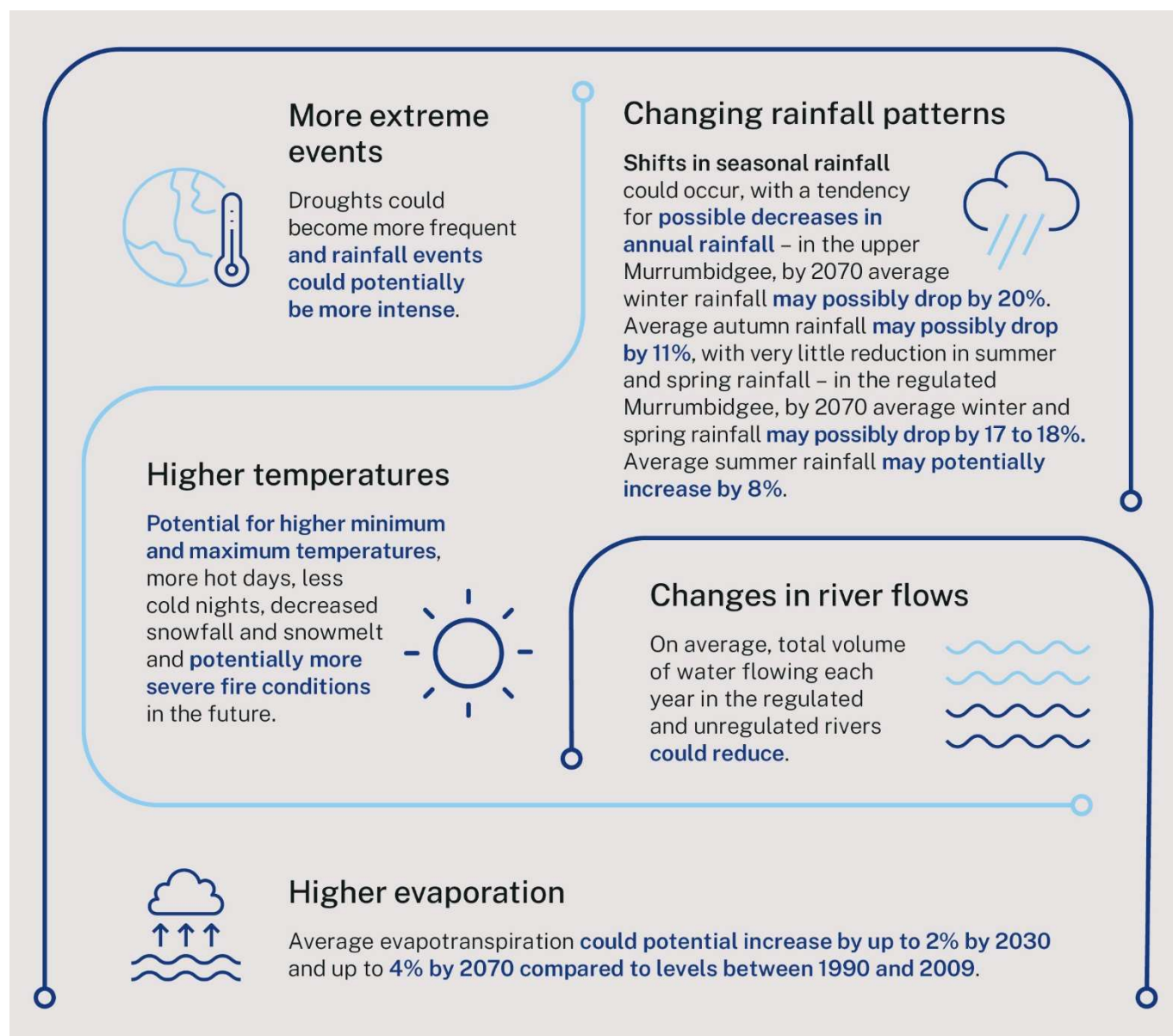
The Murrumbidgee region has access to surface water and good quality groundwater for towns, recreational use, industry, and cultural and environmental needs. The groundwater sources in the Murrumbidgee region are extensively used as an important water source for the region's towns, industries and the environment.

What the future climate could look like in the Murrumbidgee region

We do not know for certain what the future climate in the Murrumbidgee region will look like. However, our analysis of different climate scenarios shows there could be changing rainfall patterns, higher minimum and maximum temperatures, more hot days, fewer cold nights, more severe fire weather days, reduced or increased groundwater recharge depending on location, and decreased snowfall and snowmelt (Figure 5)

We need to plan for these uncertainties and continue to refine our understanding of climate-related risks in the Murrumbidgee region to ensure people, the environment and industries can thrive in the future.

Figure 5. What the future climate could look like in the Murrumbidgee region



Key challenges for the Murrumbidgee region

Our vision for the Murrumbidgee region, is to support the delivery of healthy, reliable and resilient water resources that will sustain a liveable and prosperous region.

Like other regions across Australia, the Murrumbidgee region will likely face a more variable and changing climate in the future. We need to prepare now for the transition to a scenario where we may have more variable and potentially less water available. We also need to set actions in motion to make smarter decisions about our water use and management armed with better knowledge and information to protect our the most critical water needs.

The draft Murrumbidgee Regional Water Strategy provides an opportunity to develop a long-term strategic plan so that communities, the environment, and industries can be better prepared for a future changing climate. This long-term strategy will help keep the Murrumbidgee region an attractive place to live, work and visit.

We have identified 4 key challenges that are the immediate priority for the region:

- Challenge 1: Resilient water supplies for regional centres, towns and communities in a changing climate
- Challenge 2: Improving the health and resilience of aquatic and floodplain ecosystems
- Challenge 3: Addressing barriers to Aboriginal water rights and access
- Challenge 4: Supporting agriculture and emerging industries

Addressing these challenges will help us meet the vision and objectives we have set for the regional water strategy.

Challenge 1: Ensuring resilient water supplies for regional centres, towns and communities in a changing climate

Population growth and land use are placing the region's town water resources under pressure. A drier future climate could also reduce the reliability of water resources. There is a growing awareness that regional NSW needs to not only build its capacity to respond and recover from water-related shocks and stresses but also change its relationship with water to create an environment for the region to thrive.

Climate change will put pressure on water availability for towns and communities

Many of the towns in the Murrumbidgee region rely exclusively on surface water flows for town water supply. As a result of the highly variable climate conditions, local water utilities across the region have invested in infrastructure and water entitlements to secure town water supplies. More recently, investments in secure town water supplies are informed by integrated water cycle management planning, and, from 1 July 2022, will continue to be guided by local water utility strategic planning under the Regulatory and Assurance Framework for Local Water Utilities⁹.

Our new modelling and climate data suggests that the risk of surface water supply shortfalls¹⁰ in the supply of surface water to meet current levels of town water demands in the Murrumbidgee region are generally low, but likely to increase significantly under our dry future climate change scenario and with growing populations.

For example, Jerilderie, which displayed the greatest shortfalls, only has a 0.1% annual probability of experiencing up to 12 days where at least 25% of daily unrestricted demand cannot be met under the long-term historic climate scenario. However, this increases to 243 days under the dry future climate scenario.

The models also show the probability of these shortfalls will vary across the region, with Tumut, Gundagai, Morundah and Hay modelled to have much less severe shortfalls than Jugiong, Jerilderie, Wanganella and Balranald¹¹.

The results of our modelling, coupled with the implications of projected population growth and the levels local water utility licence entitlements held by each council will have varying implications for councils and local water utilities in the region and we will be working with them to understand what the information means for their local area. Consideration of our new climate modelling data and future water availability risk will be important to understand shortfall risks and assess performance of regional water strategy options.

⁹ www.industry.nsw.gov.au/water/water-utilities/best-practice-mgmt/iwcm

¹⁰ A shortfall is the number of days where a town's surface water supply is less than an identified level of demand (e.g. 5%, 10%, 25%, 50% and 75%).

¹¹ For results, refer to Climate and hydrological modelling: Draft Murray and Murrumbidgee Regional Water Strategies report available at: www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

In addition to climate-driven challenges, the draft NSW Murrumbidgee Regional Water Strategy recognises that there are other challenges including significant population growth and catchment challenges across the region.

Growing regional centres are placing pressures on supplies

Significant population growth of regional centres and towns is expected over the next 20 years (Table 1). In particular, the Queanbeyan-Palerang and Yass Valley areas are forecasted to have high growth rates, and more moderate growth is expected for Wagga Wagga.

Table 1. Forecast population growth for local government areas within the Murrumbidgee region

Local Government Area	2021 population	2041 population	Percentage increase
Griffith	27,063	31,641	17%
Junee	6,754	7,941	18%
Queanbeyan-Palerang	62,836	83,550	33%
Snowy Monaro	21,035	23,845	13%
Wagga Wagga	65,835	73,267	11%
Yass Valley	17,442	20,684	18%

Source: NSW 2022 Common Planning Assumptions¹²

Our new climate data and surface water modelling results show that potential population increases could start to result in supply shortfalls, albeit with a very low likelihood, against town water supply demands under the dry future climate scenario:

- a marginal increase in shortfalls for Queanbeyan at a very low likelihood (0.1% annual chance of occurring) under the dry future climate scenario – a 141-day shortfall event where 25% of the required daily demands were not met
- shortfalls for Yass shortfalls did not result. However, Yass has experienced some significant supply restrictions in the past, requiring further consideration through their respective local water utility strategic planning process.

Stakeholders also reflect the need to plan for accommodating sustainable growth, particularly given the strain that forecasted population growth could put on the region's resource requirements.

Bungendore, located within the Queanbeyan-Palerang Regional Council area, is experiencing rapid population growth that is expected to continue. Existing groundwater supplies are limited and not likely to meet the requirements of the growing population. In Yass Valley and Bungendore, stakeholders have highlighted the need to integrate local supplies with ACT supply.

The ACT and NSW governments have entered a non-binding agreement (re-signed in 2020), through a Memorandum of Understanding for Regional Collaboration, to work together to implement policy

¹² Data available at: www.planningportal.nsw.gov.au/populations

and deliver targeted services and economic outcomes for cross border communities. Under the Memorandum of Understanding's Priority Focus Area Plan, a joint water working group is proposed to help facilitate a regional approach to strategic water and land use planning.

Wagga Wagga, which is reliant on groundwater for a significant portion of its supply, is experiencing steady population growth and a corresponding increase in water demand. The planned Wagga Wagga Special Activation Precinct is expected to increase population growth patterns.

Land use can cause water quality challenges for local water utilities

Unregulated water supplies to towns are affected by turbidity during floods and high river flows, resulting in a reduced ability to treat water and temporary boil-water alerts issued to residents. More intense storms due to climate change and an increased likelihood of bushfires will increase risks to town water quality. Councils are preparing for this by investing in upgrades to water treatment facilities.

A per- and polyfluoroalkyl substances (PFAS) plume from the RAAF base at Forest Hill is migrating towards the East Wagga Wagga bore field (and potentially west) posing a risk to the future long-term safety of the large regional town water supplies in the area. Several NSW Government agencies¹³, the Australian Department of Defence, Riverina Water and Goldenfields Water are working closely together to address and mitigate this risk to town water supplies. In response, the Australian Department of Defence has installed monitoring bores, continue to monitor the migration of the PFAS plume and, in consultation with NSW government agencies and local water utilities, is in the process of updating its PFAS Management Area Plan.

Local water utilities have highlighted concerns that wastewater discharges, from intensive agricultural production and poor catchment health, reduce the quality of raw water supplies and create significant challenges in the supply of clean water to towns. The NSW Government will continue to support Riverina Water and Goldenfields Water County Council to ensure a safe water supply for their customers. Stakeholder feedback has also highlighted a need to improve coordination of legislation and regulations of inter-related issues such as land management and water quality.

¹³ NSW Government agencies including Department of Planning and Environment, the Environment Protection Authority, Department of Health and Department of Regional NSW

Challenge 2: Improving the health and resilience of aquatic and floodplain ecosystems

Development has affected ecosystem health in the Murrumbidgee region and connected valleys contributing to changes in flow variability, water quantity and water quality. The challenge is to protect and enhance the region's water-dependent ecosystems by using water effectively during wet and dry periods.

The Murrumbidgee region contains natural riverine features and assets including a range of upland and lowland rivers, nationally and internationally recognised wetlands, lakes, extensive river red gum forests, and a diverse range of native and threatened plants and animals. These riverine features exist across the entire length of the region and are critical to sustain the health of the river system to ensure continued cultural values of these assets are maintained now and into the future.

The river system, floodplains, aquifers and wetlands of the Murrumbidgee region provide habitat for many water-dependent species including waterbirds, frogs and native fish, and including endangered and vulnerable native species such as the Southern Bell Frog and the Murray Cod. There are also important areas of river red gum, blackbox, lignum and spike rush.

Altered flow regimes are affecting ecosystem health

Water infrastructure, river regulation and water extraction have influenced flow variability, water quality and the distribution of water throughout the catchment. Despite extensive water reform initiatives to address flows and improve water for the environment, the challenges of an altered flow regime continue to affect ecosystems in the Murrumbidgee region. For example, headwater and re-regulating storages (Blowering and Burrinjuck dams and others) have disrupted the natural flow regimes and caused declines in the condition of the catchment's environmental assets and species.¹⁴ The effects of existing infrastructure and river operations include:

- reductions in the frequency and duration of connection between the river, floodplains and nationally significant wetlands
- changes in the natural flow regime (low summer and autumn flows and high winter and spring flows) to meet irrigation and other demands. This has altered the seasonal pattern, volume, magnitude and frequency of flow events (including floods) that are required to support a healthy and ecologically resilient river system¹⁵
- increases in annual flow and peak velocities in the upstream part of the regulated river are causing bank erosion in some areas of the Tumut River
- large extractions between Berembed and Gogeldrie weirs, which have reduced downstream flows

¹⁴ NSW Office of Environment and Heritage. 2019. Murrumbidgee Long Term Water Plan, Part A: Murrumbidgee catchment

¹⁵ Flows are now more frequent in the middle flow range, at the expense of smaller low flows, baseflows and higher flows, limiting natural wetland and floodplain connectivity to the river.

- low flows continue to affect the ecosystem of the upper Murrumbidgee River despite environmental flow rules as a result of the Snowy Water Inquiry in 1998.

River flows could be much less with a dry future climate

Modelling the effects of our chosen climate scenarios along the regulated Murrumbidgee River indicates the potential for a dry future climate to result in significant changes to river flows by 2060-2079, that will affect riverine, wetland and floodplain ecosystems. Our modelling estimated that under a dry climate future there could be significant decreases in median annual flows compared to those seen under the historical climate¹⁶ (Figure 6).

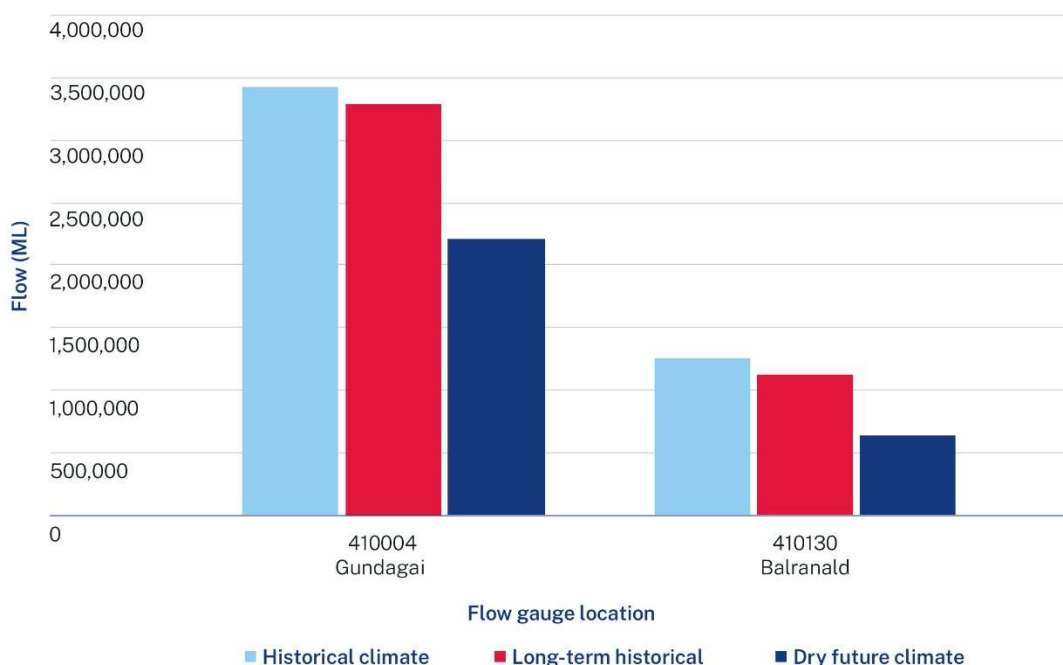
The modelling estimated:

- a 35% decrease in median annual flows at Gundagai, and
- a 49% decrease in median annual flows at Balranald.

Reduced flows could constrain attempts to restore the health of key environmental assets along the Murrumbidgee River including the Lowbidgee Floodplain and fish populations within the main channel.

Modelling for the upper Murrumbidgee River indicates that median flows are to be lower, and cease-to-flow events more prevalent under the dry future climate scenario compared to the historical climate scenario.¹⁷

Figure 6. Effects of long-term climate risks on median annual flows in the Murrumbidgee River



¹⁶ The Department of Planning and Environment Murray and Murrumbidgee Regional Water Strategies: Climate and hydrological modelling available at www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

¹⁷ Refer to the Climate and hydrological modelling: Draft Murray and Murrumbidgee Regional Water Strategies report for further information available at www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy.

Restoring healthy flow regimes in the Murrumbidgee region

Since 2004, through water sharing plans, the Murray-Darling Basin Plan (Basin Plan) and other initiatives, the NSW Government and other Basin governments have introduced an environmental flow regime which is managed through a combination of planned and held environmental water sources, and environmental-watering works to enhance floodplain inundation at key environmental sites informed by a long-term watering plan¹⁸.

Initiatives such as the Reconnecting River Country Program aim to improve wetland and floodplain connectivity through relaxing system constraints to enable flexible and efficient use of existing water for the environment. This program has recently prepared Strategic Business Cases for the Australian Government and has commenced the detailed flow option investigation stage to understand through working with stakeholders, the benefits, impacts and proposed mitigation measures associated with the options under consideration.

Initiatives to address flows and improve water for the environment

Reconnecting River Country Program

The Reconnecting River Country Program¹⁹ aims to improve wetland and floodplain connectivity by striking a balance between economic, social, cultural and environmental outcomes across southern NSW.

The program focuses on relaxing or removing some of the constraints or physical barriers impacting the delivery of water for the environment in the:

- Murray River from Hume to Yarrawonga and Yarrawonga to Wakool
- Murrumbidgee River.

The program is part of the Sustainable Diversion Limit Adjustment Mechanism (SDLAM) which aims to achieve improved environmental outcomes using existing water for the environment.

Snowy Water Licence Review

The construction of the Snowy Scheme caused a significant decline in the health of the Snowy River. In response the Snowy Water Inquiry was held in 1998 and resulted in environmental flow rules that would see more water and higher flows delivered to the Snowy River from a new outlet at Jindabyne Dam. These environmental flows have resulted in improved health and condition of the Snowy River.

Every ten years, the Snowy Water Licence is subject to reviews under the Snowy Hydro Corporatisation Act 1997, with the first review being completed in 2018 and the next scheduled to commence in 2027. These reviews focus on a range of administrative and technical issues including exploring better ways to deliver environmental flows. Actions from the review are being investigated and are due for completion in December 2023. The timeframe has been extended to enable the use of integrated modelling to provide rigorous analysis to inform any potential changes to the licence.

¹⁸ The Murrumbidgee Long Term Water Plan is available at: www.environment.nsw.gov.au/topics/water/water-for-the-environment/planning-and-reporting/long-term-water-plans/murrumbidgee

¹⁹ More information on the Reconnecting River Country Program is available at: www.dpie.nsw.gov.au/water/water-infrastructure-nsw/sdlam/reconnecting-river-country-program

It could become more difficult to meet environmental water needs

The NSW and Commonwealth environmental water holders own and manage a total of 1,153 GL of water entitlement in the Murrumbidgee catchment which is 32% of total regulated Murrumbidgee River entitlement. This environmental water is held in the following categories:

- 583 GL as supplementary water with the majority (555 GL) being for the Lowbidgee
- 478 GL as general security
- 75 GL as conveyance, and
- 16 GL as high security²⁰.

Just like any other licence holder, the amount of water licensed for the environment and the environmental water allowance that is available for use varies year by year depending on water allocations and how much water has been carried over. This variability is considered part of the annual planning process by environmental water managers. However, it can mean that during dry periods, less water may be available to release for the environment and, in some instances, limited opportunities to maintain critical environmental needs such as refuge river pools, core wetland areas and seed banks in the soil. Ongoing dry conditions would also reduce the reliability of these licences.

We heard concerns from stakeholders about the effects of a changing and variable climate on the environment, water sources, water availability, water quality, ecological degradation, water sharing and water users. There is considerable support for initiatives that address the effects of a changing and variable climate, particularly in relation to water quality, water availability and protection of local ecosystems.

Ecological communities are at risk

Threatened and high value ecological communities

The Murrumbidgee region is home to a variety of key species and ecological communities, some of which are threatened or endangered. The lowland Murrumbidgee and the Montane peatland wetlands of the upper Tumut and upper Murrumbidgee Rivers and tributaries are listed as threatened ecological communities in NSW. Threatened and iconic species inhabit the area:

- several species of native fish including the Murray Cod, Trout Cod and Macquarie Perch, Murray Crayfish
- vegetation communities of black box, river red gum, lignum and spike rush
- waterbirds such as the Australasian bittern and Australian painted snipe
- six threatened and vulnerable species of frogs, including the endangered Southern Bell Frog.

The region contains 2 of only 4 remaining natural populations of Macquarie Perch and Tantangara Creek contains the only known population of Stocky Galaxias.

²⁰ Figures are for 2020 and 2021. See NSW Department of Planning and Environment, 2022. General Purpose Water Accounting Report 2020–21: Murrumbidgee Catchment. www.industry.nsw.gov.au/water/allocations-availability/water-accounting/gpwar

Groundwater-dependent ecosystems (GDEs) are ecosystems that have their species composition and natural ecological processes determined to some extent by the availability of groundwater. GDEs are at risk where they are highly connected, if groundwater becomes increasingly extracted due to a drying climate or other reasons, and if there is reduced recharge. GDEs are mapped as part of the water sharing plan process and those ecosystems of high conservation value (high priority GDEs) are protected by rules in the relevant plans. For the Murrumbidgee this is the Water Sharing Plan for the Murrumbidgee Alluvial Groundwater Sources 2020. As shown in the GDE map in this plan, high priority GDEs are located from the east of Wagga Wagga to the west at lower reaches of the catchment near Balranald. Mapping of GDEs is regularly reviewed and included in new or revised water sharing plans leading to greater protection of GDEs.

A drier and more variable climate will increase the stress on ecological communities. Events such as intense bushfires can have serious effects. For example, populations of the endangered Macquarie Perch were severely affected by the 2019-20 black summer bushfires when a loss of streamside vegetation caused increased sediment loads and ash to wash into streams, rapidly resulting in loss of habitat and poor water quality including low dissolved oxygen.

Native fish remain under stress from physical and operational barriers

The ability to sustain the native fish of the Murrumbidgee region is impaired by physical structures such as dams, weirs and floodplain infrastructure that do not have fishways and restrict the ability of native fish to move to breed and find ideal habitat.

Water releases Blowering Dam and Burrinjuck Dam have high potential for causing severe cold-water pollution because they draw water from relatively deep levels in the storages and release large volumes of water during summer. The combined cold water pollution effects of both dams persist for up to 200 to 300 km downstream of the Tumut–Murrumbidgee River confluence. Cold water pollution has significant damaging impacts on riverine ecological function, particularly in summer when biological cues for fish spawning are disrupted.

Every year, large numbers of native fish are extracted from rivers by unscreened pumps in the Murrumbidgee region. Adult fish as well as juveniles, larvae and eggs are extracted by pumps and diverted into irrigation channels, along with debris such as sticks and leave. This impacts the sustainability of native fish populations and can also cause damage to irrigation infrastructure.

Installation of screens at pump sites and diversion regulators can reduce fish losses by over 90%, helping more fish survive to maturity and boosting fish numbers. The protection extends to other aquatic species such as crayfish and turtles. Screening infrastructure also improves pump operation, water delivery and extraction efficiency for asset owners through fewer blockages caused by debris.

Addressing physical and operational barriers in the regulated Murrumbidgee River

The NSW Government is investigating a range of initiatives for the Murrumbidgee River system as part of rescoping the Yanco Offtake SDLAM Project. These measures are part of a new Better Bidgee Program²¹ which has a key focus on improving conditions for native fish. Infrastructure improvements and operating rules are being considered to make the management of the Murrumbidgee River system more flexible. This is to ensure that the ecological function of the regions rivers and floodplains can be maintained and improved, and sustainable local communities, agriculture and industries are supported.

Aquatic species remain under stress from water quality risks such as hypoxic blackwater

Hypoxic blackwater events impede the efforts of programs²² working to improve conditions for native fish throughout the Murrumbidgee region. These events occur when accumulated dead leaves and other plant matter decompose in waterways, drawing oxygen from the water which causes the death of fish and other aquatic animals. These events are more pronounced after long droughts followed by flooding which washes the build-up of organic matter into the rivers.

We heard from stakeholders concerned about water quality issues including salinity, elevated nutrient levels, blue-green algae, hypoxic blackwater and cold-water pollution. We are mindful of the considerable amount of information contained in the Murrumbidgee Long Term Water Plan and how this information can be used in the regional water strategy.

²¹ More information is available at: www.dpie.nsw.gov.au/water/water-infrastructure-nsw/better-bidgee-program

²² Information on restoration and recovery programs for native fish within NSW DPI is available at: www.dpi.nsw.gov.au/fishing/fisheries-research/freshwater-ecosystems

Challenge 3: Addressing barriers to Aboriginal people's water rights and access

Water is an essential part of Aboriginal people's culture and heritage, but the current water management framework is not meeting the needs and aspirations of Aboriginal people.

Limited understanding of the cultural significance of water to Aboriginal people

There is a limited understanding and acknowledgement of the spiritual connection of Aboriginal people have to healthy waterways and important cultural sites. The current water management framework inhibits access to culturally-significant areas and waterways and there is limited acknowledgement of the impact of current river operations on the environmental and cultural value of these sites.

As the first managers and carers of this natural resource, Aboriginal people have rights and a moral obligation to care for water under their law and customs. These obligations connect across communities and connected surface water and groundwater systems.

There is a lack of understanding of the key cultural sites in the region

There is concern from Aboriginal people that our understanding of the extent of culturally-significant sites within the region is limited and needs to be better considered in water management decisions.

The Murrumbidgee Long-Term Water Plan recognises 7 cultural sites including: Coolamatong (Lambie Gorge); the Wiradjuri Reserve to Gobba Beach; Koondan; Nap Nap Burial Ground; Dippo Ceremonial Ground; Toogimbie Indigenous Protected Area; and Gayini Nimmie-Caira²³. However, to nourish these important sites, it is acknowledged that genuine and ongoing consultation with Aboriginal people is vital.

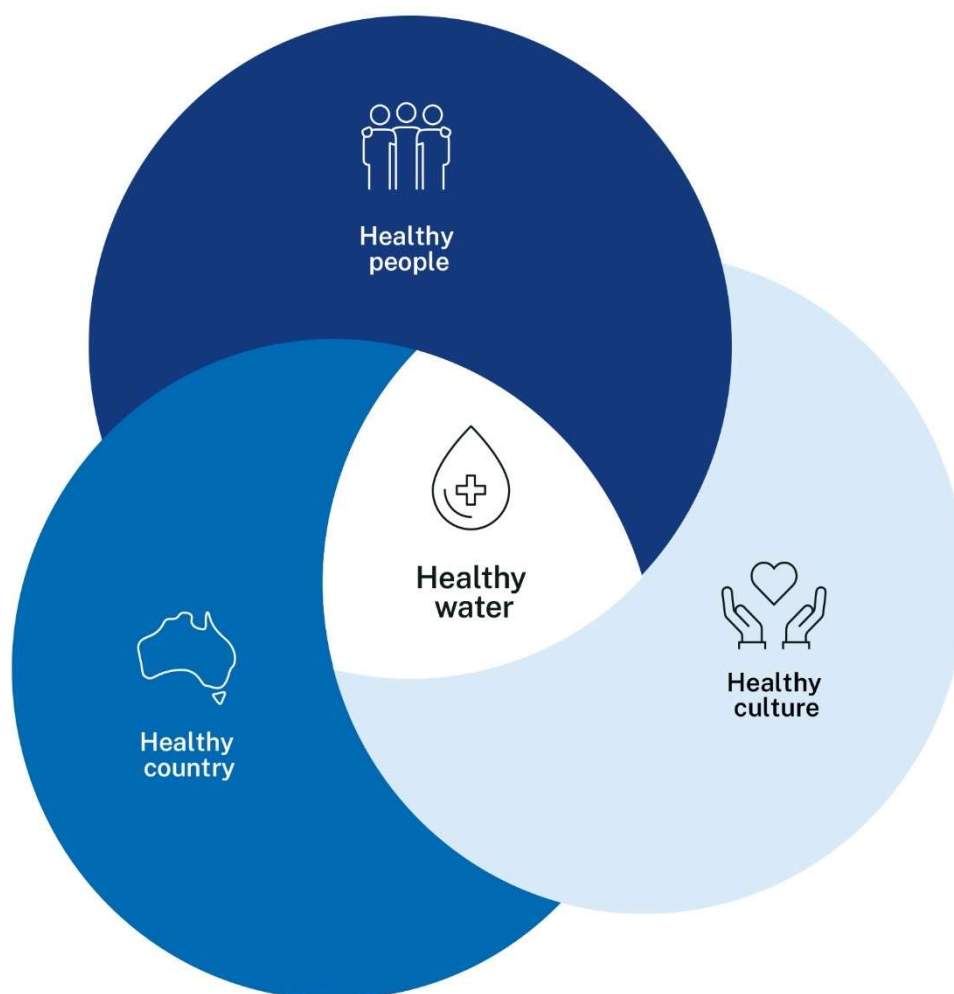
In feedback, stakeholders said there is a desire to better understand the needs of the upper Murrumbidgee River region as they relate to improving the health of the waterways.

Healthy waterways and environmental assets are critical for connection to Country

Aboriginal people rely on the health of water and their waterways for their wellbeing and continued practice of cultural traditions. If a site dries up or has consistently poor water quality, the traditional story or meaning of a site can be lost. When the cultural and spiritual values of water are sustained by providing water that is sufficient in both quantity and quality, many other components of Aboriginal people's lives will be healthy (Figure 7).

²³ Department of Planning, Industry and Environment 2020, Murrumbidgee Long-Term Water Plan, Part A: Murrumbidgee catchment

Figure 7. Australian Aboriginal people's view of the relationship between water, environment, culture and people



Source: Adapted from Moggridge, B. 2010. Aboriginal Water Knowledge & Connections, in: Water and its Interdependencies in the Australian Economy, 22 to 23 June 2010, Australian Academy of Technological Sciences and Engineering, Sydney

A significant number of cultural sites in the Murrumbidgee region are on floodplains and many cultural activities focus on floodplain areas. Development on floodplains, such as levees, have altered flow patterns and resulted in stranded cultural assets that are disconnected from main waterways.

Current water management framework may limit the ability of Aboriginal people to access water for economic, cultural and basic human needs

While Aboriginal people can currently access rights to water through water use entitlements, the framework is complex, confusing and can be difficult to navigate. In addition, current water access rights may limit Aboriginal people's access to water for economic purposes and there are some remote Aboriginal communities that have limited access to clean drinking water²⁴.

The costs associated with accessing water are also prohibitive. Whilst there are some fees waived on purchasing licences and annual fees²⁵, there are costs associated with purchasing and maintaining related water infrastructure such as pumps and pipes. Although governments have at times set aside funding to help Aboriginal people invest in water entitlements, these commitments have often been 'in principle' and are yet to be implemented.

There are restrictions with Aboriginal cultural water access licences

The Murrumbidgee is the only region in NSW that has a dedicated Aboriginal cultural water access licence codified in its water sharing plan.²⁶ The licence is administered by the Riverina Local Land Service, which calls for 'expressions of interest' for its use each water year. The combined annual volume used on this licence cannot exceed 2,150ML²⁷, and we have heard that there are few locations it can be accessed in the Murrumbidgee region²⁸. Further work is needed to review the relevant clause in the water sharing plan, consider opportunities to simplify the application process and investigate ways to improve access locations.

In NSW, Aboriginal people can also apply for an individual Aboriginal cultural water access licence.²⁹ If granted, this licence can provide up to 10 ML/year for cultural purposes³⁰ but cannot be associated with commercial activities or provide direct or indirect economic benefit. Granting of this type of licence is further constrained in the Murrumbidgee region because the total volume of water cannot exceed the volume of the Aboriginal cultural water access licence (above).

To help remove institutional constraints to better access to water for Aboriginal people, some stakeholders have indicated support for the use of Aboriginal cultural water access licences for economic activity. Feedback from other stakeholders expressed concern that these licences should not be allowed for an economic gain if water availability for third parties was impacted.

²⁴ Improved access to clean drinking water for remote Aboriginal communities currently being addressed through the department's Aboriginal Communities Water and Sewerage Program. The Aboriginal communities in the region that are part of the Aboriginal Communities Water and Sewerage Program include: Brungle, Three ways and , Balranald Endeavour Drive

²⁵ For example, the Aboriginal Cultural Licence is a non-billable licence with no entitlement or usage fees

²⁶ NSW water sharing plans set out a number of aboriginal cultural objectives and outcomes. In groundwater water sharing plans, groundwater-dependent culturally significant areas are identified, and rules applied to ensure they are protected from any impacts associated with the construction or use of water supply works.

²⁷ Water Sharing Plan for the Murrumbidgee Regulated River Water Source 2016, section 67

²⁸ The Aboriginal Cultural Licence for the regulated Murrumbidgee River has three associated nominated works approvals related

²⁹ In NSW, the *Water Management (General) Regulation 2018* allows for applications to be made for any category of specific purpose access licence, subcategory Aboriginal Cultural, for Aboriginal cultural purposes. This ensures that applications can be made for an Aboriginal Cultural licence throughout NSW, in both surface water and groundwater. These licences allow the take of water independent of Native Title rights.

³⁰ Cultural purposes include drinking, food preparation, washing and watering domestic gardens, as well as for Aboriginal cultural uses such as manufacturing traditional artefacts, hunting, fishing, gathering, recreation, and ceremonial purposes

Cultural flows are not explicitly provided for

The development of a policy framework for cultural flows is in its infancy in Australia and they are not explicitly provided for in the *Water Management Act 2000* (NSW) or relevant water sharing plans. The Murray and Lower Darling 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.’ These cultural flows, as defined in the Echuca Declaration, do not currently exist in the Murrumbidgee region.

In recent years, environmental water managers have made efforts to achieve cultural and ecological co-benefits. For example, water for the environment has been delivered to the Fivebough and Tuckerbil Swamps and the Lowbidgee floodplain through the Nimmie-Caira Infrastructure Modification and Yanga National Park Project. However, these actions are distinct from how Aboriginal communities envision cultural flows where water is owned and managed by Aboriginal People and used as per the Echuca Declaration.³¹

Limited opportunities for Aboriginal people to participate in water management

Aboriginal people have raised concerns that water management in the region and across NSW is largely seen as an allocation problem between agriculture, towns and environment and overlook the interest, values, knowledge and rights of Aboriginal people and their cultural obligation to Country,³² including the understanding that waterways are living ecosystems that need to be cared for and protected.

A historic lack of water entitlements held by Aboriginal people is a significant obstacle for representation in decisions concerning water management that advance the economic and social needs of Aboriginal people.

Aboriginal people in the region have always been deeply connected to water and this relationship is essential to culture, community, connection to Country, and health and well-being. Cultural obligations to care for land and water connect across communities and language groups and extend to downstream communities, throughout catchments and over connected surface water and groundwater systems.

³¹ The national cultural flows research project is working to secure a future where First Nations' water allocations are embedded within Australia's water planning and management regimes, to deliver cultural, spiritual and social benefits as well as environmental and economic benefits, to Aboriginal communities in the Murrumbidgee-Darling Basin and beyond. Further information is available at: www.culturalflows.com.au

³² Jackson, S., Woods, R. and Hooper, F., 2021. Empowering First Nations in the governance and management of the Murrumbidgee–Darling Basin. In *Murrumbidgee-Darling Basin, Australia* (pp. 313-338). Elsevier.

Increasingly, it has been acknowledged that Aboriginal people's knowledge and experience needs to be recognised as an essential element to managing natural resources in Australia. However, significant gaps remain, and opportunities are still limited for Aboriginal people to co-manage activities or participate in water related decision making processes because:

- consultation timeframes and processes did not allow the time needed to adequately meet Aboriginal cultural governance processes which eroded trust and prevented important relationships between Aboriginal people and water managers to be established
- the complex set of state and federal laws and systems around water management that is often not explained in a culturally appropriate manner
- there are a lack of resources and support for Aboriginal people and Aboriginal community groups to enable their engagement in water management processes
- monitoring, evaluation and reporting do not include Aboriginal people's input in design, implementation and assessment.

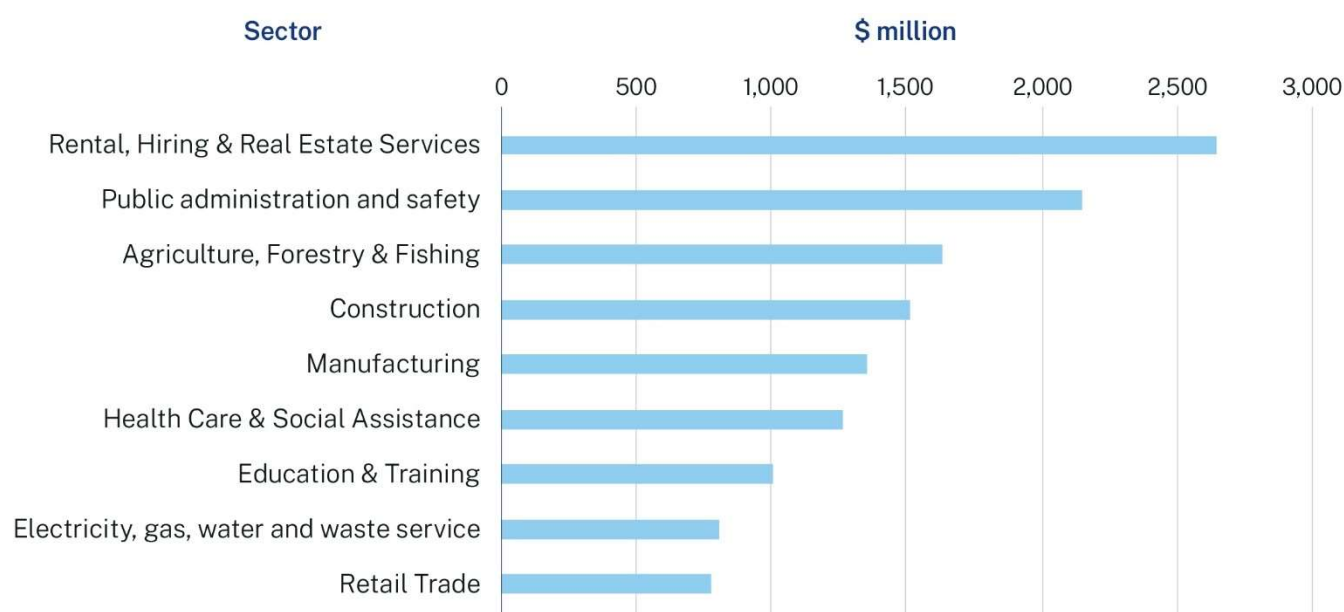
While governments are committed to improving engagement with Aboriginal people and communities, significant progress is still needed before it can be considered a mature, knowledge-sharing partnership.

Challenge 4: Supporting agriculture and emerging industries

Over the next 20 years, agriculture and agribusiness will continue to be key economic drivers for the region and other industries, such as tourism and renewable energy are growing. A dry future climate could reduce water availability for new and existing industries and lead to adverse economic and social impacts. Our challenge is to support sustainable industries to flourish within a capped system and in the context of a variable and changing climate.

The Murrumbidgee region has a diverse regional economy that contributed over \$16.7 billion in 2020/2021 in terms of gross value added to the state's economy (Figure 8). The region's water resources and waterways, directly and indirectly, underpin key economic drivers of the region including agriculture, particularly irrigated agriculture, and downstream agribusinesses and tourism. The sustainable management of water resources will be critical for the economic prosperity in the Murrumbidgee region.

Figure 8. Gross value added for key sectors of LGAs spanning the Murrumbidgee region³³



The mix of industry and crops in the region is changing. Horticulture is expanding, tourism is increasing and value-added agricultural industries are expected to grow over the next 20 years. Changes in water use and water demand locations are occurring as a result. Improving our understanding of these trends and underlying drivers will improve water management planning for the region and support economic prosperity.

³³ REMPLAN 2022, REMPLAN Economy: Custom data. See www.rempln.com.au/economy. Note: Due to the regional boundaries under which industry information is collected and reported, information that covers different local government areas located or partially located within the boundaries defined by the Murrumbidgee Regional Water Strategy is presented. Given some of these local government areas cross over into other regional water strategy regions, there will be overlapping figures presented in the Murrumbidgee Regional Water Strategy and in other strategies such as the Murray, Lachlan and Western regional water strategies.

The importance of agriculture for the Murrumbidgee region

The Murrumbidgee region forms part of a region known as Australia's 'food bowl' with a reputation as one of Australia's premium agricultural areas due to its large contribution to the country's agricultural production. In 2020/21, the agricultural sector including downstream value-added manufacturing and services³⁴ contributed over \$2.2 to regional output in terms of gross value added. In 2016, the agriculture sector including downstream value-added manufacturing and services directly employed over 16,400 people, approximately 16% of total employment in the Murrumbidgee region.³⁵ It also contributes around 25% of NSW's fruit and vegetable production, 42% of grape production, and 50% of Australia's rice production.³⁶

Given this significance, the NSW Government is committed to supporting agriculture in the region in the long-term.

The varied landscape, climate and transport links in the region support a diverse mix of agricultural industries that rely on the region's water sources. The eastern, upper Murrumbidgee region is mainly used for grazing beef cattle, forestry, dryland cropping and fruit production, including apples, pears and cherries. The mid-Murrumbidgee hosts broad-acre cropping (cereal, oilseed and pulses), beef and sheep grazing, intensive poultry and pigs, and irrigated crops (cotton, rice and maize). In the mid to lower Murrumbidgee produces irrigated crops like cotton, rice, sorghum and maize, most of the state's citrus — oranges and lemons, stone fruit, nuts — almonds, hazelnuts and walnuts and vegetables. The irrigation areas around Griffith produce around 95% of NSW's gross value of production of grapes for wine production.

Improve our understanding of climate variability to support agriculture and other water dependent industries

Climate change may result in reduced water availability and increased uncertainty for the region's industries (particularly agriculture) that are highly dependent on water. More extreme weather events, such as droughts and floods, can cause large scale economic and social losses for the agricultural sector and rural communities. Changes in temperature and seasonality may also force changes to the type of crops that are suitable for the region. These impacts have the potential to constrain industry and economic growth across the region. However, it should be noted that the Murrumbidgee River is one of the most reliable river systems in inland NSW.

Historically, water management decisions were made based on the last 130 years of climate records. The last drought and recent flood events, coupled with our new climate modelling, demonstrate that the past is not necessarily a good indicator of the future, and that the last 130 years of data could be inadequate for projections of future water availability.

A limited understanding of future water availability and publicly available climate information can lead to poor investments, business decisions and drought and flood security planning. An overly

³⁴ Total of 'Livestock, grains & other agriculture', 'Agriculture, forestry & fishing support services', 'Beverage product manufacturing' & 'Food product manufacturing'.

³⁵ REMPLAN 2022, REMPLAN Economy: Custom data. See www.remplan.com.au/economy.

³⁶ Murray-Darling Basin Authority 2019, www.mdba.gov.au/discover-basin/catchments/murrumbidgee.

optimistic outlook can also prevent us from pursuing opportunities to invest in alternative water supplies. During public consultation we heard that people are interested in the new climate datasets and modelling. However, they were also concerned the modelling was overly conservative about the climate in the future, and there was a need to consider opportunities and challenges under all climate scenarios rather than just modelling dry scenarios.

Improve the delivery of water resources in the Murrumbidgee region

The Murrumbidgee Regulated River and Murrumbidgee Unregulated River form part of the southern connected Basin. During earlier consultations with stakeholders, we heard that optimising water availability to meet the current and future needs of irrigated agriculture, is a challenge. Stakeholders stated a need to better use existing infrastructure and explore new infrastructure options to improve water security and delivery.

In the Murrumbidgee River system, delivery constraints in the Tumut and mid-Murrumbidgee Rivers are a significant part of the challenge to meet the current and future needs of irrigated agriculture. An expansion of permanent plantings and environmental water use downstream makes it difficult getting water to where it is needed and increases the chance of potential supply shortfalls.

The Murrumbidgee Regulated River's physical and operational constraints that limit the volumes of water that can be delivered include the Mundarlo Bridge between Gundagai and Wagga Wagga, the channel capacity of the Tumut River near Tumut township, the Yanco weir, and channel capacity of the Murrumbidgee River near Balranald. In particular, the channel capacity in the Tumut River limits the maximum release from Blowering Dam, placing greater reliance on Burrinjuck Dam to meet peak demands downstream during summer. This can result in rapid emptying of Burrinjuck Dam, an imbalance between the storages and the risk of supply shortfalls during extended droughts. When Burrinjuck and/or Blowering dams are near full, these constraints can also limit the ability to make releases necessary to provide the required airspace and attenuate floods.

Inundation of low-lying agricultural lands

In recent years, increased flows from river operations, dam releases to manage large volumes of inflows, environmental releases, river operations and flooding events, have inundated low lying areas including private lands. Landholders have indicated that at times, more than 30% of their productive land can become unusable or inaccessible due to inundation and many people have expressed concern at the impact on productivity and livelihoods.

Stakeholders have expressed concern that sometimes they find themselves managing their farming operations on a day-to-day basis depending on the flows of the adjoining river. As a result, stakeholders are calling for more opportunities to have a say in water management practices that impact their ability to manage and maintain the productivity and sustainability of their land and, if impacted, are seeking some form of compensation.

Balancing the needs of landholders to use and access their land with fluctuating flow regimes and inundation will require ongoing consultation and collaboration.

The challenges associated with managing the Murrumbidgee River system are likely to be exacerbated by the effects of climate change including, changing rainfall and snowfall patterns, increased evapotranspiration, longer dry periods and more intense floods.

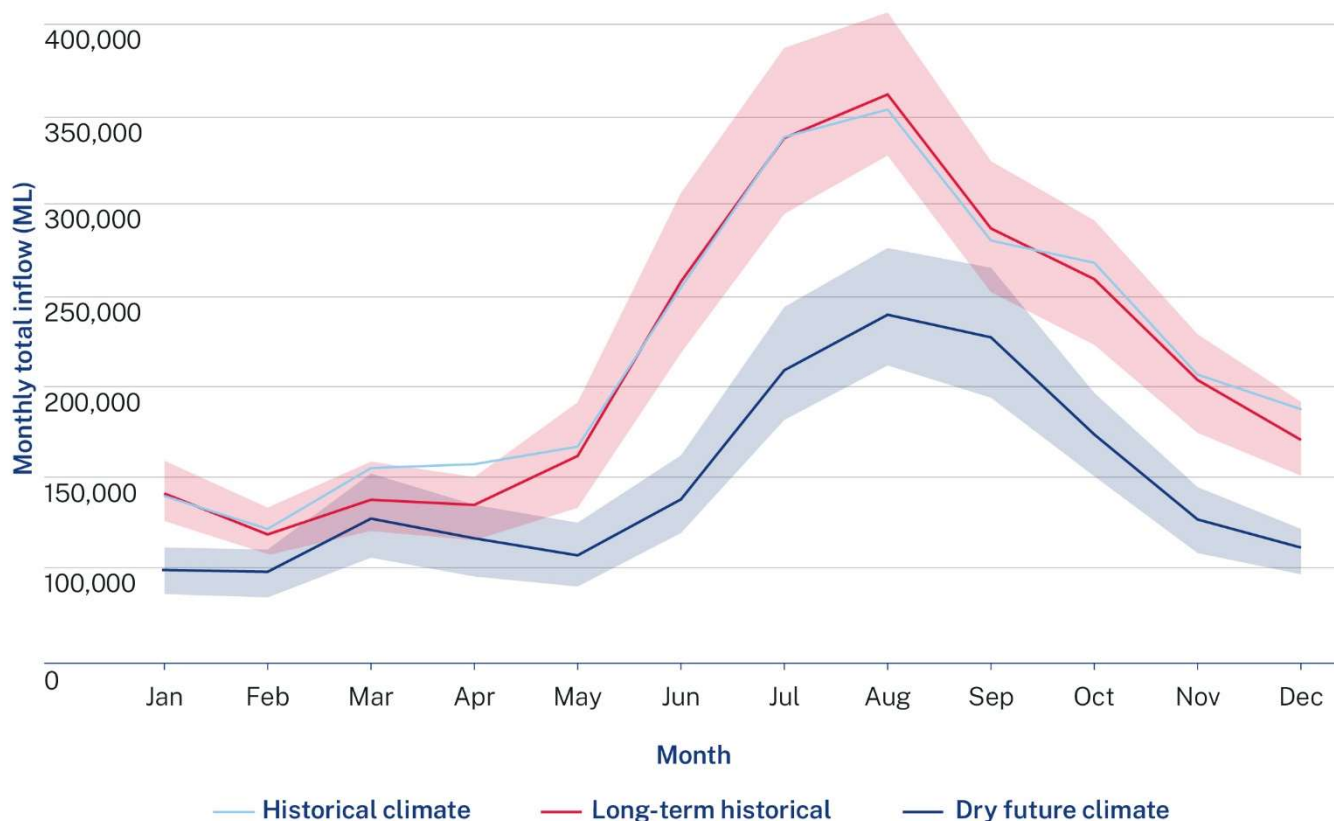
Stakeholders also communicated the significant social and economic impacts experienced by the regional communities resulting from buybacks of water for the environment, under the Basin Plan, and requested an investigation into the impacts of buybacks on NSW communities and industries.

Water availability could be significantly reduced under a dry climate future

As discussed in the draft Murrumbidgee Regional Water Strategy³⁷, it is evident that there has been a reduction in average general security water allocations since about the year 2000. This period includes two significant drought periods, the millennium drought from 1997-2009 and the drought from 2017-2020.

The new climate data and modelling, which is based on a range of plausible future climate scenarios, highlights that under the dry future climate scenario (Figure 9) there is a significant decrease in the volume of inflow into shared storages of the Murrumbidgee River system.

Figure 9. Impact of climate scenarios on seasonal inflows into the shared Murrumbidgee system storages (combined)

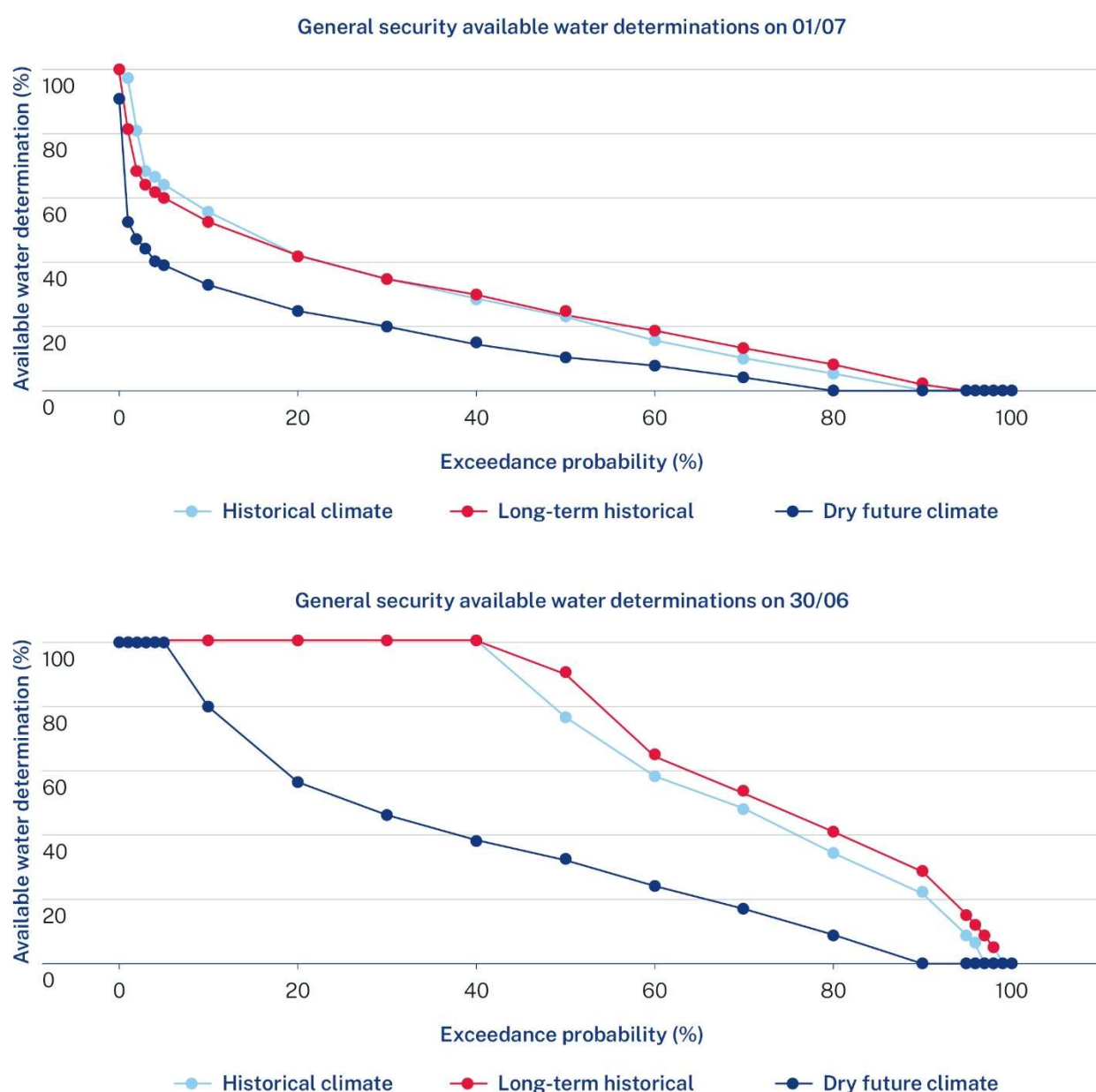


³⁷ NSW Department of Planning and Environment, Draft Murrumbidgee Regional Water Strategy, www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

The new climate data and modelling (Figure 10) also highlights several significant trends for general security water entitlements, including:

- under the long-term historical climate scenario, opening yearly allocations may be higher than experienced under the historical climate scenario. However, under the dry future climate scenario, opening allocations would be significantly reduced compared to the other two scenarios.
- end-of-year allocations are shown to be similar across both the historical climate and long-term historical climate scenarios, but significantly reduced under the dry future climate scenario.

Figure 10. Impact of dry future climate scenario on Murrumbidgee general security available water determinations for 1 July (left) and 30 June (right)³⁸



³⁸ Note that these results do not include carryover

For high security entitlements, opening allocations perform similarly across both the long-term historical climate and historical climate scenarios, but are significantly reduced under dry future climate. End of year allocations are similar for all three scenarios, albeit slightly reduced under dry future climate.

A description of the climate scenarios and these and other results are presented in the Climate and hydrological modelling: Draft NSW Murray and Murrumbidgee Regional Water Strategies report.³⁹

These results highlight that we need to explore a range of ways to improve water availability for water entitlement holders, consider opportunities and challenges afforded under both wet and dry years, and maintain water use levels within sustainable diversion limits.

Changes in land use impact the use of water resources

The draft Riverina Murray Regional Plan 2041⁴⁰ highlighted that access to water is critical for some land uses, but it is not always considered upfront in the planning process. This can lead to population and industry growth in areas without enough water available, which creates greater pressure on stressed water resources. Misalignment between regional planning, economic development and catchment boundaries may create challenges to integrating regional planning priorities with supporting water resource management. The lack of integration makes consultation and collaboration across governments crucial.

The Murrumbidgee region has a diverse economy that reflects its varied landscape, climate, transport links and strong network of interconnected centres. Its strategic location and infrastructure make it a significant contributor to the NSW economy. Government investments including the Inland Rail Project, South Jerrabomberra Regional Jobs Precinct and Wagga Wagga Special Activation Precinct will leverage the region's competitive advantages to support further industry development and job growth. This development may influence water-use patterns and intensify competition for available water resources.

Regional areas are becoming increasingly attractive places to work and live, with the ability to work remotely and access more affordable housing. For example, the 2022 NSW population projections estimate a nearly 33% population increase is expected in the Queanbeyan-Palerang local government area over the next 20 years.⁴¹ Regional housing will be a key focus to support the influx of people and there needs to be consideration of the implications on future water demand.

In the Murrumbidgee region, surface water resources and alluvial groundwater sources are fully allocated, and extraction limits guide how much water is extracted. This will result in challenges for new and existing industries should they require additional water to meet their needs.

- For existing industries, a change in water needs must be met through either a more efficient or innovative use of water or through the acquisition of licences via the water market.
- For new industries, acquisition of water access licences or an alternative water supply contract is necessary.

³⁹ The Department of Planning and Environment, Climate and hydrological modelling: Murray and Murrumbidgee Regional Water Strategies available at www.dpie.nsw.gov.au/murrumbidgee-regional-water-strategy

⁴⁰ NSW Department of Planning and Environment, Draft Riverina Murray Regional Plan 2041, www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans/Riverina-Murray

⁴¹ www.planningportal.nsw.gov.au/populations

There are opportunities to reform the trade system to be more efficient, based on the recommendations of the Water market reform roadmap⁴² that was developed in response to the Australian Competition and Consumer Commission's Murray–Darling Basin water markets inquiry.

Stakeholders raised and supported the need to develop a better understanding of people's behaviours and assumptions around water availability and use, including investigating existing water management rules and behaviours that may potentially underpin underuse against sustainable diversion limits. A working group consisting of industry stakeholders and NSW and Australian government agencies has been established to explore water-related issues, including the issue of potential underuse.

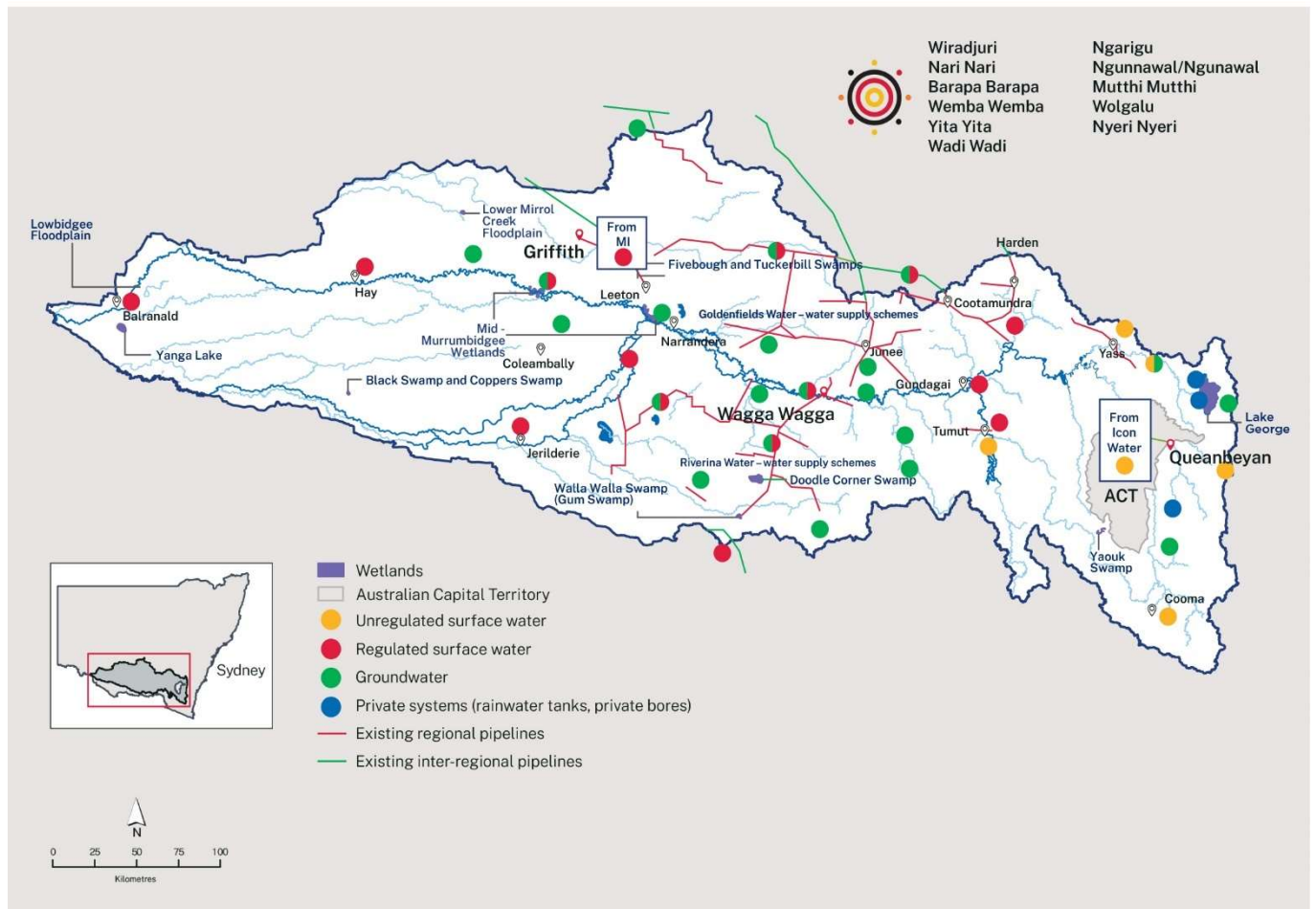
There are gaps in our understanding of groundwater resources, an important water source for the agricultural sector during dry times

Groundwater is an important water source for some towns (Figure 11), industries and the environment across the region. During droughts, reliance on groundwater can increase significantly to support the region's industries, particularly agriculture, and some town water needs. Some parts of the region have been affected by declining groundwater levels and increasing salinity caused by concentrated groundwater extraction. This poses a risk to future groundwater access and may be intensified in a future with more extreme dry periods driven by increasing climate variability and climate change.

Sustainable use of the region's groundwater sources is critical to support existing towns, industries and the environment, and will be crucial for supporting economic prosperity in the future. Robust data and information, new groundwater infrastructure and technologies and, active and efficient groundwater markets could help sustain vital groundwater sources in more variable and changing climate.

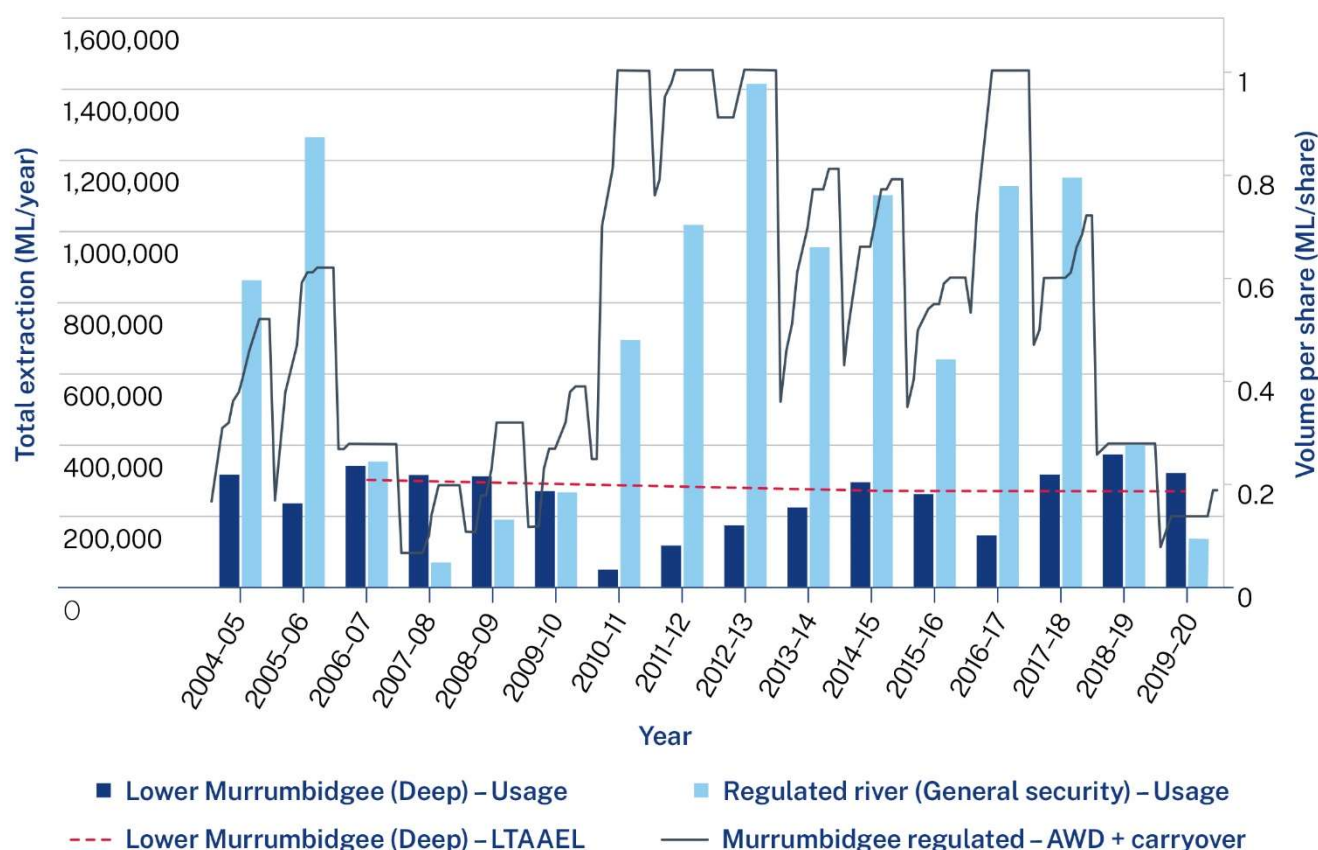
⁴² Quinlivan, D 2022, Water market reform: final roadmap report, available at: www.dcceew.gov.au/water/policy/markets/reform

Figure 11. Murrumbidgee town water supply sources and town water supply linkages



Enhancing our understanding of the interaction between surface water and groundwater across the regions will improve the management of these resources. The annual usage and surface water allocation for the Murrumbidgee Regulated River general security and Lower Murrumbidgee Deep Groundwater Source highlights how groundwater use can fluctuate from year to year and is often linked to climate conditions and the availability of surface water (Figure 12). Under the dry future climate scenario, lower surface water availability could increase reliance on groundwater sources. Increased reliance on groundwater, particularly in areas of concentrated extraction could reduce groundwater access and constrain economic growth.

Figure 12. Comparison of surface water and groundwater usage in the Murrumbidgee region⁴³



Groundwater quality impacts the availability of supplies and its potential productive uses. Declining groundwater quality can affect all water users of the affected groundwater source. In the Lower Murrumbidgee alluvial groundwater sources, several risks to groundwater quality are present, most notably high salinity.

⁴³ LTAAEL refers to the long-term average annual extraction limit defined by the NSW water sharing plans.

What we are already doing to support regional economic growth

The NSW Government's \$48 million expanded Farms of the Future program, which will support on-farm connectivity and encourage farmers to adopt agtech⁴⁴ to boost productivity, including water efficiency and drought preparedness. In early 2023, a grants program will be delivered to help farmers purchase agtech devices and applications.

The Future Ready Regions Strategy includes a commitment to upgrade the Enhanced Drought Information System to provide farmers with world-leading weather and climate data so they can make better business decisions.

The 20-Year Economic Vision for Regional NSW is the NSW Government's plan to drive sustainable, long-term economic growth in regional NSW. It is the roadmap to unlock significant economic potential in regional NSW.

The NSW Government has assisted local councils to develop regional economic development strategies (REDS) based on the concept of a Functional Economic Region. The REDS provide a clear economic development strategy for the region and are currently under review.

The Department of Planning and Environment is undertaking a feasibility assessment for a policy framework for the potential for water users to enter commercial arrangements with Snowy Hydro Limited.

⁴⁴ Agtech is the collective term for the tools and technologies – sensors, farm management software, imagery and smart farm equipment – that enables best practice agriculture.

What happens next

This discussion paper outlines the key regional challenges to ensure we are focusing on the most important issues. We will then identify which options should progress to more detailed hydrological modelling and economic and environmental analysis. This will help us identify a suite of actions to address the key challenges.

We will present this analysis and proposed shortlisted actions in a second public consultation paper and to engage with the public to ensure we have the optimal mix of actions.

After the second round of public engagement we will work to finalise the Murrumbidgee Regional Water Strategy and develop an implementation plan.

Figure 13. Process to develop the Murrumbidgee Regional Water Strategy

