2022

Murray-Darling Basin Social and Economic Conditions Report

AITHER

A report prepared for the Murray-Darling Basin Authority

Acknowledgement of Country

Aither and the Murray-Darling Basin Authority acknowledge Aboriginal and Torres Strait Islander people as the First Peoples of Australia and the Traditional Custodians of its lands and waters. We pay respect to the deep connection Aboriginal and Torres Strait Islander people hold with Country, and celebrate the continuing effect of cultural knowledge and practices on Country and communities in the Murray–Darling Basin and across Australia.

We pay our respect to Elders past and present, whose knowledge and leadership has protected Country and allowed Aboriginal spirituality, culture and kinship to endure through the ages.

We recognise the injustices and hardship faced by Aboriginal communities and reflect on opportunities for all Australians to play a part in reconciliation and the development of mutual understanding and respect across cultures.

Background and context

Following a period of challenging conditions for people in the Murray-Darling Basin (MDB), an independent assessment of social and economic conditions was commissioned in 2019 by the then Minister for Agriculture and Water Resources. The assessment sought to investigate conditions affecting rural and regional communities and delivered a final report to the Australian Government in September 2020.

The independent assessment made several recommendations, one of which responded to data and information challenges limiting understanding of socio-economic conditions faced by Basin communities. Recommendation 8 suggested development of social and economic indicators and a program of continuous evaluation.

"To support adaptive management and better prepare for scheduled formal reviews, the MDBA should bring forward a program of continuous evaluation, including the development of timely and relevant social and economic indicators."

The Australian Government responded to this and other recommendations, through its Murray–Darling Community Investment Package, which includes the Murray-Darling Basin Authority's (MDBA) $7.5m Basin Condition Monitoring Program (BCMP). The BCMP aims to improve understanding of the social, economic, environmental and cultural trends and challenges in the Basin.

This report is an early activity under the BCMP and a response to Recommendation 8. As part of the BCMP, the MDBA may release future reports on social and economic conditions, supported by investment in information and data collection and further development of indicators. The BCMP may also include other projects and activities involving analysis and research on Basin conditions.

The MDBA will also be undertaking related activities on the path towards the Basin Plan Review. These include the MDB Outlook and the 2025 Basin Plan Evaluation. Information in this report may contribute to building knowledge and data to support these and other MDBA initiatives, but it is not an evaluation of water policy or of the Basin Plan, which will require a variety of analyses and other research activities.

About this report

This report presents a high-level summary of social and economic conditions across the Murray-Darling Basin based on a selection of indicators and publicly available data at the time of preparation.

The report's purpose is to provide an initial contribution towards improved understanding of social and economic conditions of the Basin. The report does not provide coverage of all social and economic conditions. It is intended, wherever possible, to focus on social and economic data or indicators which relate to water or water management. However, it is not an assessment of water policy, and cannot be relied on as such.

The report presents data across five themes:

- Economic conditions for Basin communities and businesses
- Social wellbeing of Basin communities
- Water ownership, use and trade in the Basin
- Water compliance and metering in the Basin
- Water quality in the Basin.

These themes include indicators which describe certain aspects of social and economic conditions in the Basin. In some cases indicators may be closely related to water management, in other cases they may be more contextual. This is due to limitations in publicly available data and other constraints (see Box).

The report has been prepared by Aither with input from the MDBA and other government agencies and researchers.

Disclaimers and limitations:

- Production of this report was limited in its scope, timeframes for preparation, and budget, and limited to publishing data that was publicly available at the time of preparation. Primary data collection was not within scope.
- This report does not attempt to establish causal links between water management activities or programs in the Basin and social and economic conditions. Doing so requires significantly more comprehensive and bespoke analysis and multiple lines of evidence.
- Information and data have been sourced from government agencies and researchers and are presented in good faith. Aither has not verified the accuracy of underlying data.
- Indicators included were determined through a series of workshops undertaken with the MDBA, ABARES, and researchers or experts in relevant fields. Many potential indicators and data were considered, but final indicator selection was constrained by available data. Indicators also seek to respond to community feedback and interests expressed in forums undertaken separately in 2021.
- This report is intended as a high-level summary of a subset of social and economic conditions – related to water wherever possible. It does not include analysis at very local levels, mainly due to data limitations. As such it should not be used to infer trends or understand conditions at regional or local scales.
- To support continuity across future reports, regularly updated data sources have been prioritised in this report.
- The report provides a mix of point in time, trend, and different timescale data. This is due to differences in data collection frequency and data availability. Wherever possible, similar timescales have been reported, but in some cases, data was unavailable so some indicators present different timescales. A summary of timelines for each indicator can be found in Appendix A.
- Dollar figures have been presented as they appear in original datasets, have not been inflation adjusted and may be presented in nominal or real terms.

Key messages

There are significant gaps in social and economic condition data in the Basin

This report contains data describing social and economic conditions in the Basin, with an emphasis on Basin-wide conditions and trends. This data provides some insights, but limitations including relevance of data, and frequency of updates, means it does not provide a comprehensive view of Basin scale (or regional or local) conditions and trends.

Some datasets are not updated regularly, or do not provide enough historical data to observe trends. Some datasets are incomplete or do not include data at a sufficient spatial resolution, limiting observation of trends at a regional or local scale. In some cases, no regularly updated datasets exist at an appropriate spatial scale.

At the Basin scale, recent data indicate some positive social and economic conditions

Gross regional product, local jobs and population have steadily increased over the last 10 years while community views on personal and community wellbeing in the Basin reached a 5-year high in 2020. Data suggests reported personal and community wellbeing is consistently higher in the Basin than the regional Australian average.

There are opportunities to collect more informative data

Enhanced monitoring and reporting in the Basin will require better data sharing and targeted collection of new data describing social and economic conditions related to water management in the Basin.

This would support more robust analysis to determine causal links between water policy and social and economic conditions. However effective evaluations of water policy will always require multiple lines of evidence and analysis and a degree of bespoke assessment.

There are several programs and projects currently underway which will remove some of the data gaps identified in this report, including projects planned under the MDBA's Basin Condition Monitoring Program. There are also several other opportunities for government to invest in improved data collection and sharing.

Where they can be observed, local scale social and economic conditions and trends vary

Basin scale trends hide differences in social and economic conditions at local scales. For example, despite an overall increase in the value of regional production across the Basin, about half of Basin local government areas (LGAs) experienced a decrease from 2016 to 2021. Similarly, while the Basin's overall population has grown, populations have shrunk in some regions.

Social and economic conditions for First Nations communities in the Basin are often below the Basin average

Indigenous employment rates in the Basin are much lower than non-indigenous employment rates. This reflects a broader social and economic gap between Indigenous and non-Indigenous people across Australia. Water ownership by Indigenous corporations is also low and has decreased in recent years.

The value or irrigated agricultural production experienced a drop in 2019-20, but is rebounding

The value of irrigated agricultural production dropped by 28% in 2019-20 from a peak in 2017-18. This decrease is modest compared to the reduction in water use over the same period. Higher rainfall in 2020-21 and the first half of 2021-22 should support increased agricultural production, with the gross value of Australian agriculture forecasted to reach a record $81 billion for 2021-22.

Tourism in Basin regions along the Murray River has trended upward over the long-term but has reduced in recent years

The performance of tourism in Basin regions along the Murray River decreased from 2017 to 2020. Despite this setback, tourism in these regions has still grown over the past decade and makes a significant economic contribution to the Basin.

Headline figures in the Murray-Darling Basin

Economic

Gross regional product has been growing in the Basin over the long-term. This was

$231 billion in 2021

(Up 11.5% from 2011)

There were

1.6 million local jobs

in Basin LGAs in 2021

(up 6.2% from 2011)

The gross value of irrigated agricultural production was

$6 billion in 2020

(down 22% from 2011)

Gross value added from tourism in Basin tourism regions was

$6 billion in 2019-20

(down 19% from 2018-19)

Water ownership, use and trade

The total volume of water applied to irrigated farms was

3,300 GL in 2020

Aboriginal organisations held

0.17% of the total volume of water entitlements in the Basin in 2021

The median allocation price across the Basin was

$100 per ML in 2020-21

The median entitlement price across the Basin was

$4,000 per ML in 2020-21

Social

The total regional population was

2.34 million in 2021

(up 7.8% from 2011)

Reported personal and community wellbeing

increased in 2020

following a low point in 2018

Basin communities report

higher average

personal and community wellbeing than the average across regional Australia

Note: Figures describing gross regional product, local jobs, tourism value added, regional population, and personal and community wellbeing are based on Aither analysis of local or regional scale data. These figures may be subject to significant estimation error due to differences in the spatial boundaries of the Basin and spatial structures used in the original datasets.

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How data in this report relates to the Basin Plan

This report is an initial contribution toward improving understanding of social and economic conditions in the Basin.

This report presents data and information against several themes and indicators within those themes. The report also identifies data gaps and opportunities for better monitoring of social and economic conditions in the Basin.

The next Basin Plan evaluation, which is planned for 2025, will assess whether objectives in Chapter 5 of the Basin Plan have been met. Reports such as this may help generate data or information to inform the 2025 or other evaluations.

The table below illustrates some of the conceptual relationships between Basin Plan objectives and information in this report. Some indicators are very relevant to Basin Plan objectives, while others provide more contextual information.

This report does not attempt to attribute changes in conditions to the actions of the Basin Plan, or other government policies and programs. This report does not include detailed analysis of social and economic conditions at a local scale, which will be required for effective evaluations of water policy.

		5.02 Overall Basin Plan outcomes	5.03 Environmental outcomes	5.04 Water quality and salinity outcomes	5.05 Long-term average SDL outcomes	5.06 SDL adjustment mechnism outcomes	5.07 Water market trade outcomes
1 Economic							
1.1	Gross regional product	●			●	●	●
1.2	Value added in water-sensitive industries	●●			●	●	
1.3	Farm production and profitability	●●			●	●●	●●
1.4	First Nations businesses and employment	●●					
1.5	Regional economic confidence	●●			●	●	●
2 Social							
2.1	Regional demographics	●				●	
2.2	Wellbeing in Basin communities	●●			●	●	
2.3	Nature-based recreation and tourism	●●	●		●	●	
3 Water ownership, use and trade							
3.1	Water ownership and use on irrigated farms	●●	●		●	●	●●
3.2	First Nations water ownership	●●			●	●	●
3.3	Trade volume and participation	●●					●●
3.4	Trade constraints	●●					●●
3.5	Water prices	●●				●	●
4 Water management							
4.1	Compliance and metering uptake	●●	●		●	●	●
5 Water quality							
5.1	Salinity	●●	●	●●	●	●	
5.2	Water quality	●●	●	●●	●	●	

indicators in this report section are not materially relevant to outcomes in this section of the Basin Plan

● indicators in this report section provide contextual information which is relevant to outcomes in this section of the Basin Plan

●● indicators in this report section are directly relevant to outcomes in this section of the Basin Plan

Note: If an indicator is directly relevant to Basin Plan outcomes, it does not mean that the indicator can be used to evaluate achievement of those outcomes. Evaluation of achievement of Basin Plan outcomes requires multiple lines of evidence and analysis and is outside of the scope of data presented in this report.

How indicators were selected

Aither developed a long list of indicators relating to social and economic conditions relating to water management in the Basin. The long list was informed by several resources including the independent assessment of social and economic conditions in the Basin and feedback from MDBA's regional community forums (separate from this report) undertaken in 2021.

Aither shortlisted around 30 indicators from the long list to be included in this report based on workshops with the MDBA, ABARES and other Commonwealth agencies and researchers. The shortlisting process was based on the following criteria:

Relevance:

- Is the indicator relevant to social and economic conditions relating to water management in the Basin?

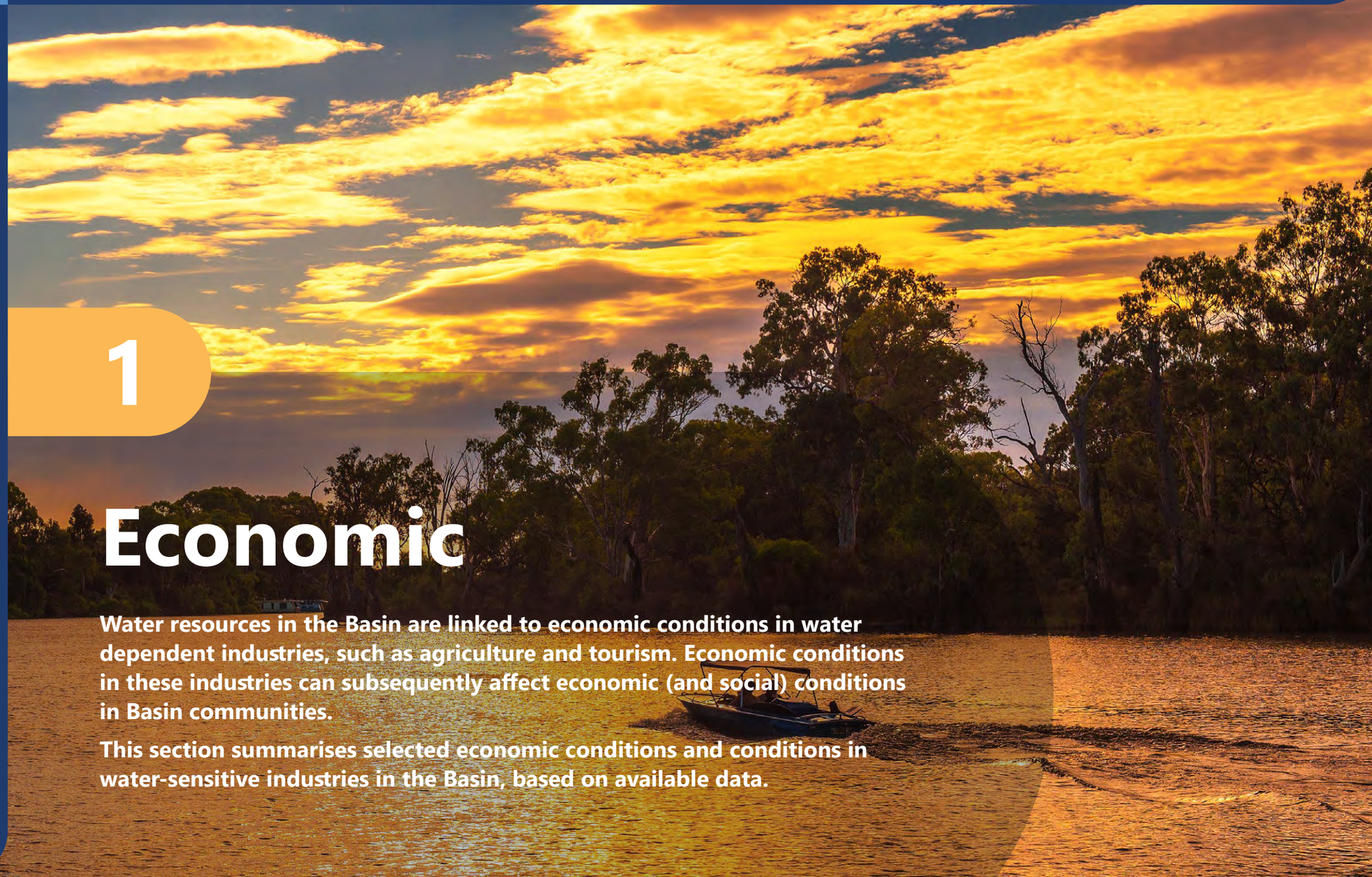
Data availability:

- Are data available to report on the indicator?
- Are data accessible and ready for use?
- Are data expected to be updated on a regular basis (e.g. annually) in the future?

Data quality:

- Are data at an appropriate spatial and temporal resolution?
- Are data spatially complete?
- Are data up to date?
- Are sufficient historical data available to observe trends?

Through the shortlisting and data collection process, Aither found that only a small portion of a longer list of potential indicators met all criteria, and most indicators only met some of these criteria. This highlights the need for further development of indicators and collection of new data relating to social and economic conditions in the Basin.



1

Economic

Water resources in the Basin are linked to economic conditions in water dependent industries, such as agriculture and tourism. Economic conditions in these industries can subsequently affect economic (and social) conditions in Basin communities.

This section summarises selected economic conditions and conditions in water-sensitive industries in the Basin, based on available data.

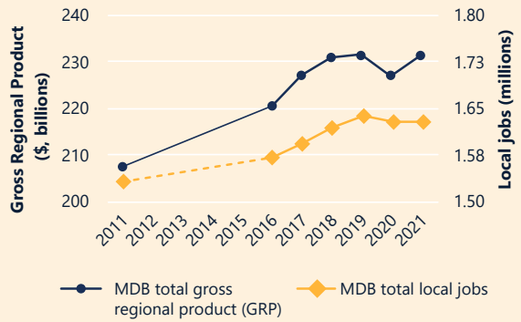
1.1 Gross regional product

Some Basin economies are getting larger, and others are getting smaller

Gross regional product (GRP) is an indicator of a region's overall economic performance.

Informed Decisions reports GRP estimates for Local Government Areas (LGAs) across Australia. Since 2011 GRP in LGAs within or partially within the Murray-Darling Basin has generally trended upwards (see below). However, since 2016, many regional LGAs have experienced year on year variation, or a decline in GRP (see right). From 2016 to 2021, about half of Basin LGAs grew their GRP and half experienced a decline.

Total GRP and local jobs in Basin LGAs, 2011 to 2021

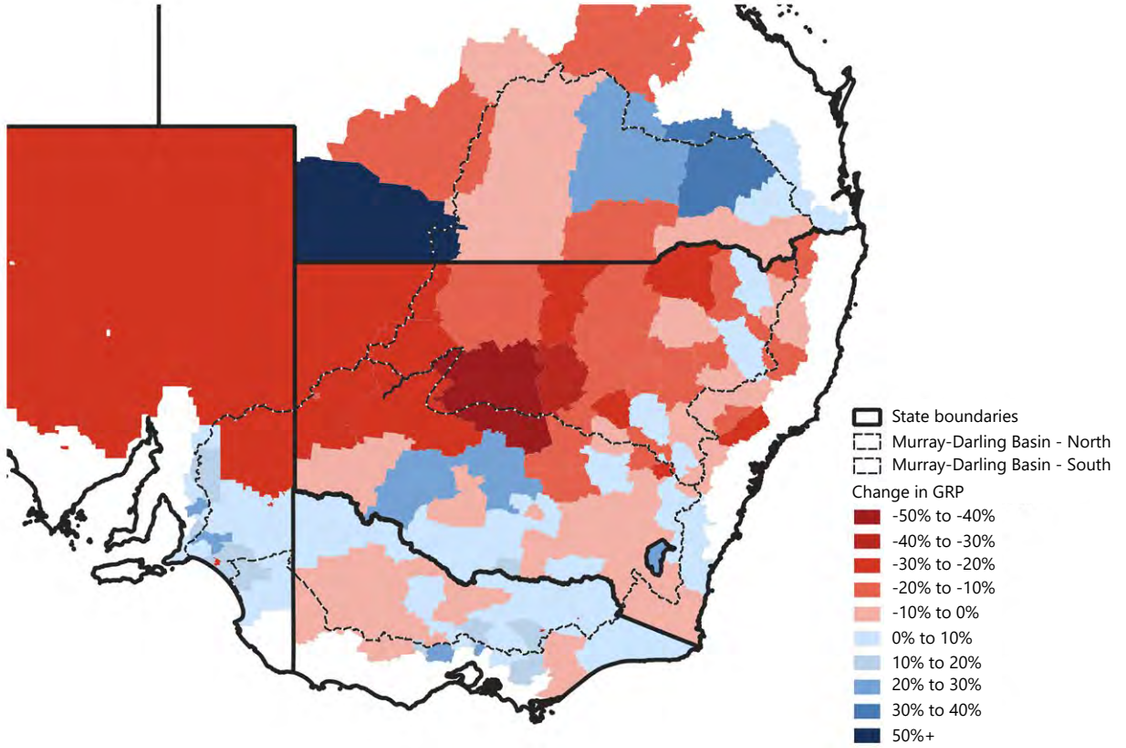


Note: Based on total GRP and local jobs in LGAs within or partially within MDB boundaries. Total figures are likely to be overestimated due to inclusion of LGAs which are partially outside the Basin. GRP figures are based on a 2018/19 price base for all years.

Source: Informed Decisions (.id), 2022

Gross regional product is the value of all goods and services produced in a region.

Change in GRP (%) from 2016 to 2021 in Basin LGAs



Source: Informed Decisions (.id), 2022

LGAs which experienced growth also tended to have larger economies. The average GRP of an LGA which experienced growth from 2016 to 2021 was more than double that of LGAs which experienced a decline ($2.2 billion per year vs $923 million). This explains how overall GRP in the Basin has increased despite a decrease in GRP in half of Basin LGAs.

Data from Informed Decisions also show that local jobs in Basin LGAs have not recovered to their 2019 peak (see left). This is despite all time high Basin GRP in 2021.

Additional information: A report prepared by SGS Economics and Planning in 2021 provides GRP figures and other economic data for LGAs across Australia from 2011 to 2021.

1.2 Value added in water-sensitive industries

Agriculture is a significant industry in many Basin regions

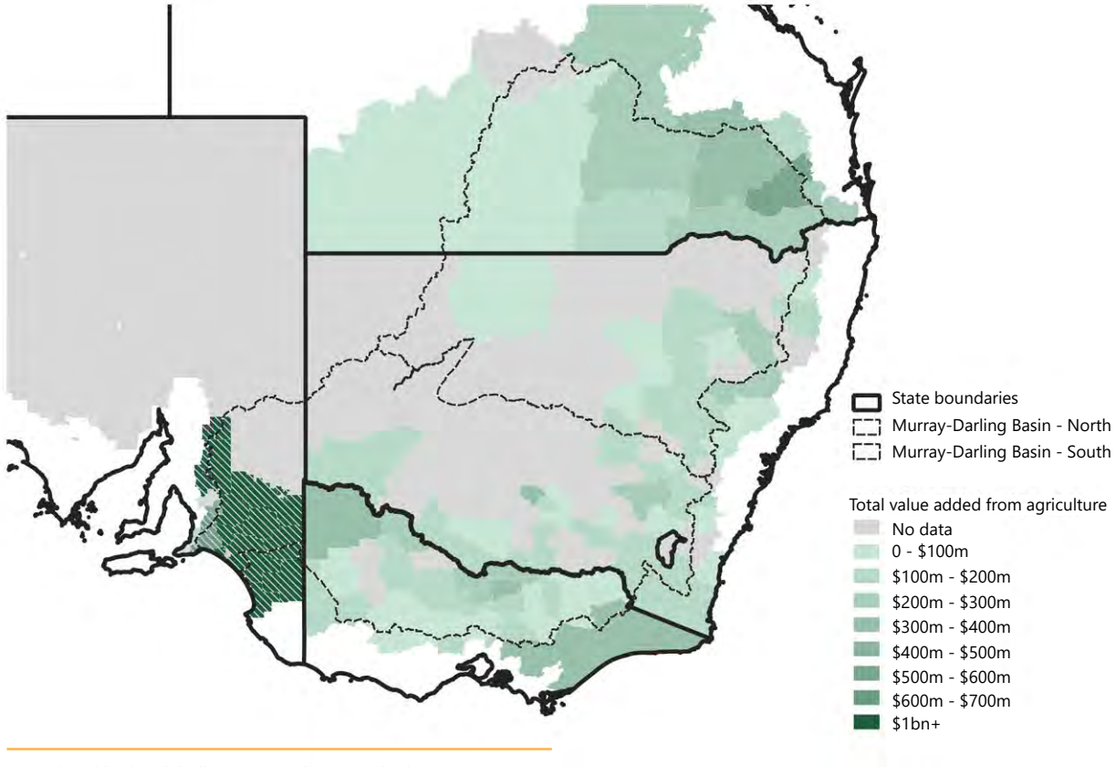
Agriculture uses most of the water available for consumptive use in the Basin. Total value added from agriculture is a useful indicator of a region's reliance on water resources for economic wellbeing. Value added from agriculture is used as there is limited data describing value added from irrigated agriculture at a regional level.

Data from Informed Decisions and REMPLAN (see right) shows that several Basin regions contribute a significant amount to the Basin's economy, including Mildura ($345m), Griffith ($339m) and Greater Shepparton ($309m).

Publicly available data does not exist for all LGAs in the Basin, and data for LGAs in central and western NSW is particularly limited. Industry-level time series data is also not publicly available.

Value added is the total value of goods and services produced in an industry or region minus the cost of their production. Value added is distinct from **gross value of production**, which only measures the total value of produced goods and services.

Total value added from agriculture in Basin LGAs, 2021



Note: LGAs with stripped shading are reported at an RDA-level as LGA-level data is not available.

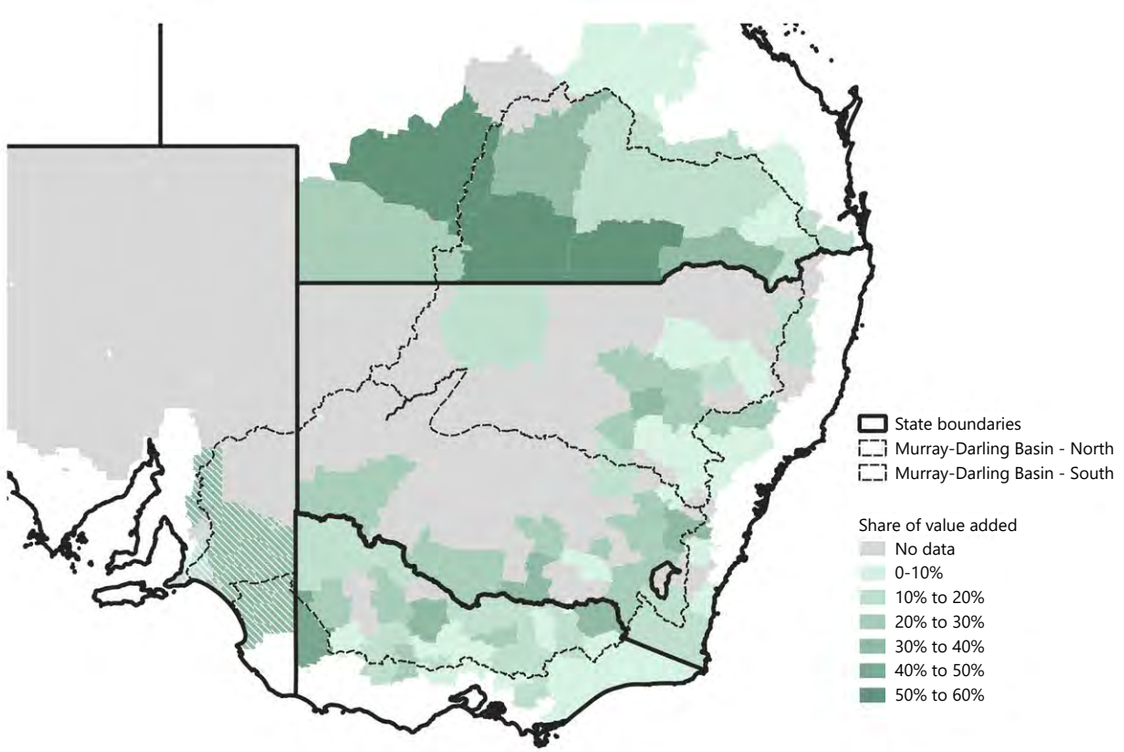
Source: Aither analysis based on Informed Decisions (.id), 2022 and REMPLAN, 2022

1.2 Value added in water-sensitive industries

Some Basin communities are dependent on agriculture

Data from Informed Decisions and REMPLAN shows that many communities in both the southern and northern Murray-Darling Basin rely on agriculture. The figure on the right shows that agriculture represented 25% or more of total value added in 35 out of 108 measured Basin LGAs in 2021. Agriculture represented 50% or more of total value added in 3 out of 108 measured Basin LGAs in 2021 – Paroo (52%), Quilpie (52%) and Balonne (50%).

Share of value added from all industries derived from agriculture (%) in Basin LGAs, 2021



Note: LGAs with stripped shading use RDA-level data as LGA-level data is not available.

Source: Aither analysis based on Informed Decisions (.id), 2022 and REMPLAN, 2022

1.2 Value added in water-sensitive industries

The value of tourism has trended upward over the long-term but reduced in 2019-20

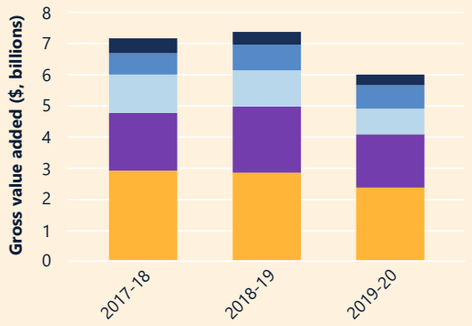
The Basin river system and ecosystems supported by them can be significant tourist attractions. Tourism is also a significant contributor to many local Basin economies.

Tourism Research Australia data (see below) shows that gross value added from tourism regions within or partially within the Murray-Darling Basin was around $6 billion in 2019-20, down 16% from $7.2 billion in 2017-18. COVID-19 is likely to have contributed to this decline.

Tourism in some Basin regions is more reliant on water systems than others. Water-related tourism is prominent in NSW, VIC and SA regions bordering the Murray River, where recreational camping, hiking, fishing and boating are common. Popular attractions in these regions also include national icon sites which receive environmental watering, such as the Barmah-Milewa Forest.

Tourism value added in regions bordering the Murray River has trended upward since 2008-09 but reduced in 2019-20. Despite the 2019-20 downturn, tourism value added in 2019-20 was equal to or greater than tourism value added in 2011-12 in all regions.

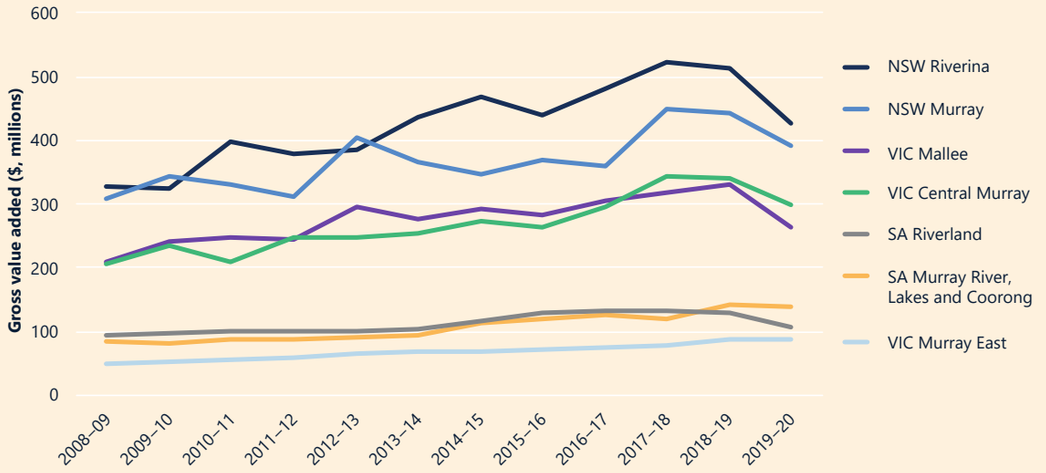
Gross value added from tourism in Basin tourism regions by jurisdiction, 2017-18 to 2019-20



Note: Based on tourism value added from tourism regions within or partially within the Murray-Darling Basin.

Source: Tourism Research Australia, 2021

Gross value added from Basin tourism regions bordering the Murray River, 2008-09 to 2019-20



Source: Tourism Research Australia, 2021

1.3 Irrigated farm production and profitability

At a Basin-wide scale, irrigated agriculture has been resilient to dry conditions

The gross value of irrigated agricultural production (GVIAP) is a useful and reliably collected statistic which can support understanding of the performance of irrigated agriculture in the Basin.

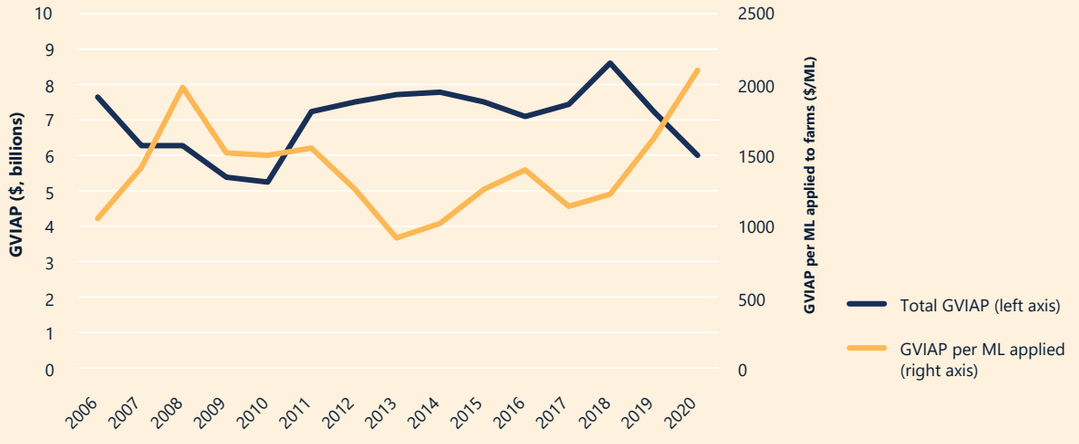
ABS data (see right) shows GVIAP in the Murray-Darling Basin has varied in recent years, from $7.4 billion in 2017 to $8.6 billion in 2018, and back down to $6.0 billion 2020. It is likely that dry conditions during this period contributed to this decline.

The total decline in GVIAP from 2018 to 2020 was around 31%. This decline is modest compared to the decline in water use over the same period. From 2018 to 2020, GVIAP per ML applied to irrigated farms in the Murray-Darling Basin increased by 71%.

Higher rainfall in 2020-21 and the first half of 2021-22 should support increased agricultural production. The gross value of Australian agriculture (including dryland and irrigated industries) is forecast to reach a record $81 billion for 2021-22 (ABARES, 2022).

The **gross value of irrigated agricultural production** is the value of all goods and services produced by irrigated agriculture industries.

GVIAP and GVIAP per ML applied in the Basin, 2011 to 2020



Source: ABARES, 2021

1.3 Irrigated farm production and profitability

Production trends differ across industries

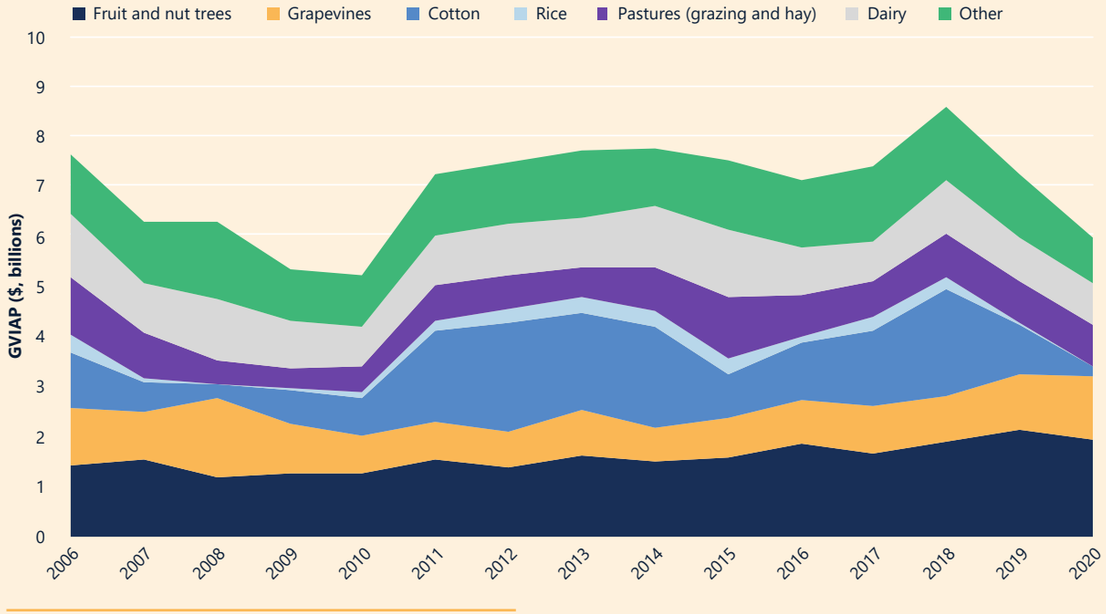
GVIAP can be observed at an industry-level to understand how production trends differ between irrigated industries.

GVIAP from horticultural industries in the Basin grew by 39% from 2011 to 2020. This growth was consistent across the 10 year period and persisted in recent years despite a downturn in overall GVIAP. Conversely, GVIAP from cotton and rice in the Basin decreased significantly from 2018 to 2020.

GVIAP from dairy and pasture remained relatively stable between 2011 and 2020.

The **gross value of irrigated agricultural production** is the value of all goods and services produced by irrigated agriculture industries.

GVIAP by irrigated industry in the Basin, 2006 to 2020



Source: ABARES, 2021

1.3 Irrigated farm production and profitability

Irrigated broadacre industries are profitable, but made less profit in 2017-18 and 2018-19

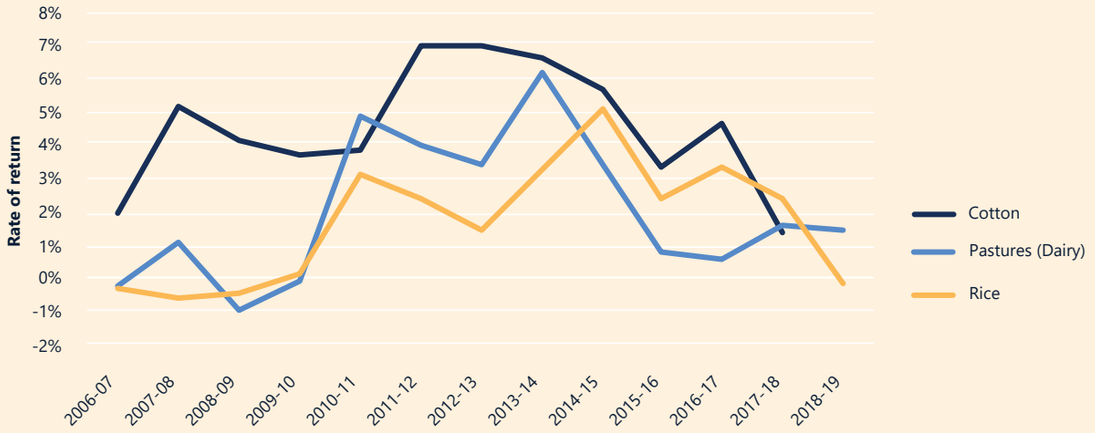
Performance in irrigated agricultural industries is an important driver of economic conditions and outcomes.

Irrigated farm performance data in the Basin is regularly collected by ABARES but is not regularly published. ABARES data published in 2020 suggests that cotton, dairy, and rice industries in the Basin are profitable on average (see right). The average rate of return from 2011-12 to 2018-19 for cotton, dairy and rice farms in the Basin were 5.1%, 2.6% and 2.5% respectively. Cotton farms tend to have the highest rate of return compared to dairy and rice farms. The rate of return in broadacre irrigated industries trended downward between 2014-15 and 2018-19 but generally stayed above 0%.

Estimates from 2016 suggest that horticulture farms are also profitable on average and have an average rate of return of 3% (see below). There is limited recent data describing the profitability of horticulture in the Basin.

Rate of return is calculated by expressing profit at full equity as a percentage of total opening capital.

Rate of return for irrigated broadacre industries in the Basin, 2011-12 to 2018-19



Source: ABARES, 2020

Additional information: An ABARES research paper released in 2020 analyses the effects of on-farm irrigation infrastructure programs on farm performance in the Murray-Darling Basin.

Average income, profit and rate of return horticulture in the Murray-Darling Basin from 2013-14 to 2015-16

Farm cash income ($)	106,760
Farm business profit ($)	34,923
Rate of return (%)	3

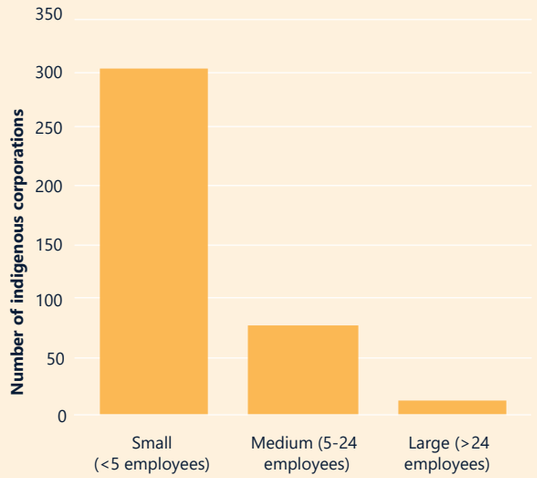
Source: ABARES, 2020

1.4 First Nations businesses and employment

There are a significant number of Indigenous corporations in the Basin, but Indigenous employment is low

Business and employment outcomes for First Nations people in the Basin are key component of social and economic conditions in the Basin.

Number of registered indigenous corporations in Basin postal areas, May 2022



Note: Based on list of indigenous corporations registered with the Office of the Registrar of Indigenous Corporations (ORIC) which are based in postal areas within or partially within the Basin.

Source: ORIC, 2022

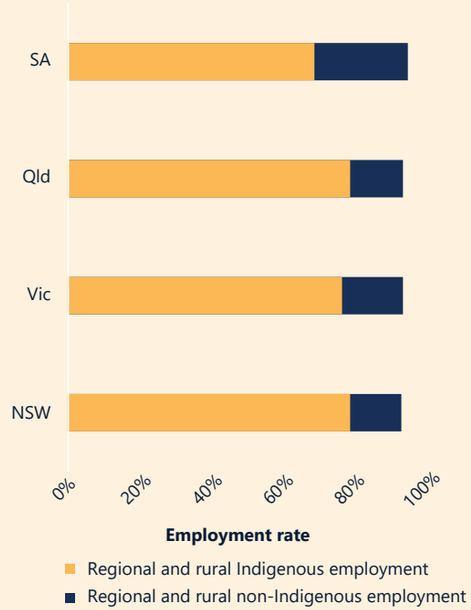
In May 2022 there were 391 Indigenous corporations registered with the Office of the Registrar of Indigenous Corporations (ORIC) in the Basin (see left). This is likely to be an underestimate of the number of Aboriginal-owned businesses in the Basin as not all Aboriginal-owned businesses are registered with the ORIC. The majority of Indigenous corporations registered with the ORIC (301) had less than 5 employees.

The ORIC's register also shows that a portion of registered Indigenous corporations in the Basin are involved in water-sensitive industries. 28 of these corporations are active in the agriculture, forestry and fishing sectors, and 78 are involved in land management.

Data from the 2018-19 Australian Aboriginal and Torres Strait Islander Health Survey suggests that there is a significant gap between Indigenous and non-Indigenous employment rates in regional and rural areas of Basin states. In 2018-19, the Indigenous employment gap in regional and rural NSW and Victoria was 14% and 17% respectively.

Additional information: Indigenous business registers such as Supply Nation may include indigenous businesses that are not listed in the ORIC's database.

Indigenous and non-Indigenous employment rates in regional and rural areas of Basin states, 2018-19



Note: Includes Indigenous and non-Indigenous people in regional and rural areas outside of the Basin. Excludes major cities.

Source: ABS, 2019

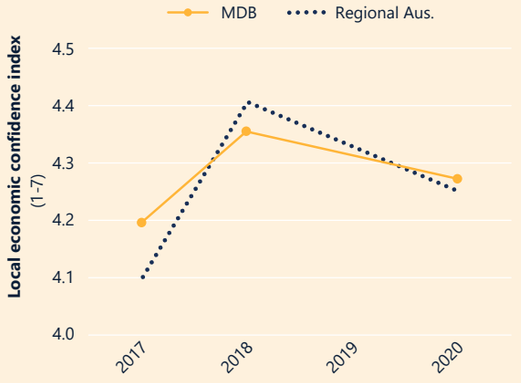
1.5 Regional economic confidence

Economic confidence across the Basin has been stable in recent years, but varies significantly across regions. Agribusiness confidence was high in 2021.

Regional economic confidence can provide useful information on Basin community and business sentiments.

Aither analysis of the University of Canberra's (UC) Regional Wellbeing Survey (RWS) data suggests economic confidence in Basin LGAs increased between 2017 and 2018 but decreased between 2018 and 2020. Trends in economic confidence in the Basin are generally similar to trends across regional Australia.

Average local economic confidence across the Basin, 2017-2020



Source: Aither analysis based on UC Regional Wellbeing Survey data

To calculate the **economic confidence index**, RWS respondents were asked to select a number from a 7-point scale. A score of 1 indicates a respondent believes the local economy is 'getting worse' and a score of 7 indicates they believe it is 'getting better'.

2020 Regional Summary

Highest confidence in local businesses (out of 7)

Griffith (NSW)	Coonamble, Gilgandra, Mid-Western, Narromine and Warrumbungle (NSW)	Toowoomba (QLD)
4.78	4.49	4.45

Lowest confidence in local businesses (out of 7)

Indigo (VIC)	Narrabri (NSW)	Alpine and Towong (VIC)
2.91	2.91	2.93

Source: UC Regional Wellbeing Survey, 2020

In 2020, community confidence in local businesses varied significantly between Basin regions. The average business confidence score reported across the Basin was 4 out of 7, compared to a regional Australian average of 3.9 out of 7.

To **calculate the local business confidence index**, RWS respondents were asked to select a number from a 7-point scale. A score of 1 indicates they 'strongly disagrees' with the statement 'local businesses in this town are doing pretty well at the moment'. A score of 7 indicates they 'strongly agree' with the statement.

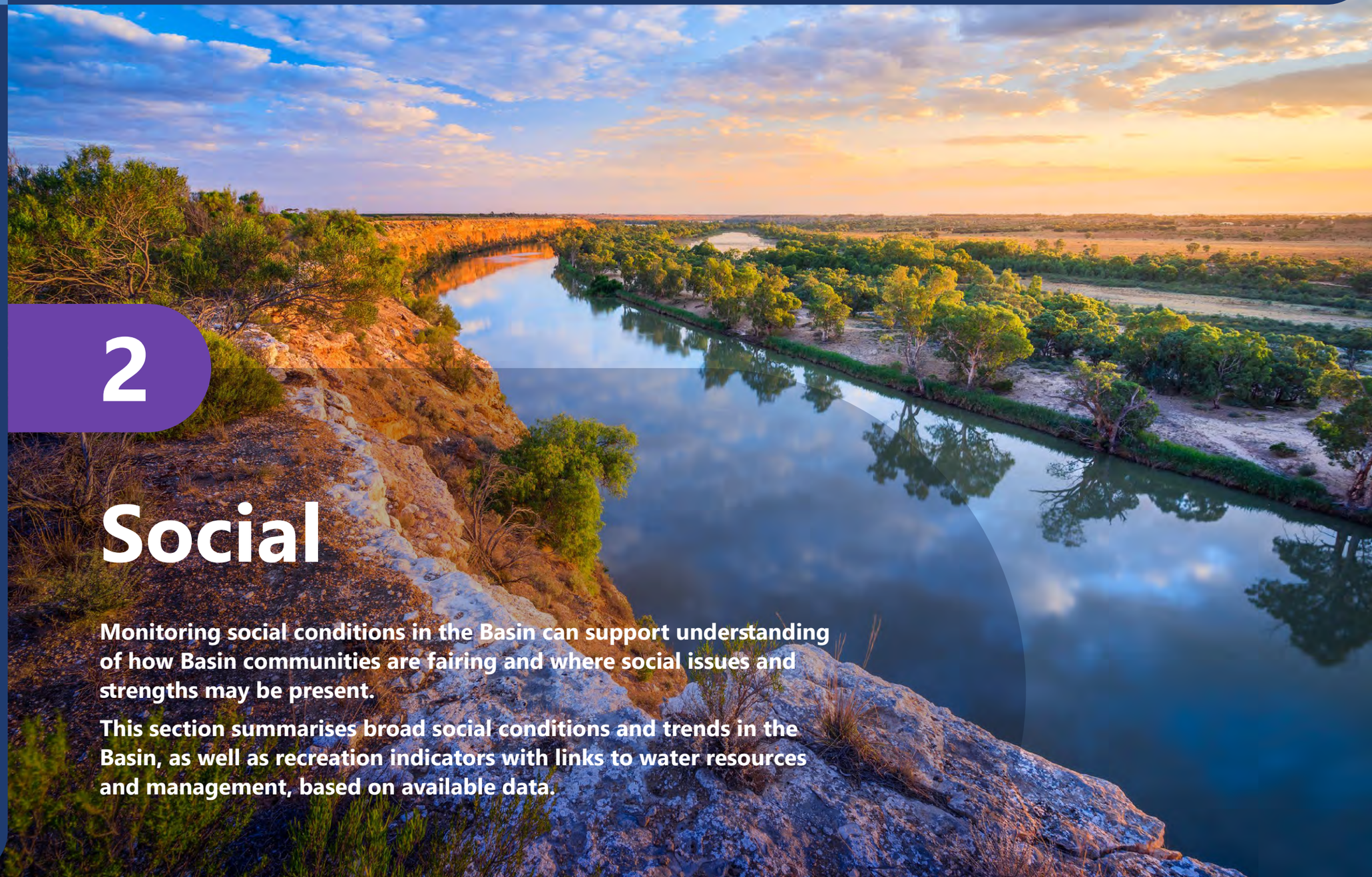
Aither analysis of Rabobank's monthly Rural Confidence Survey suggests that agribusiness confidence in 2021 was high across all the Basin states.

Proportion of farmers in Basin states expecting agribusiness conditions to improve or remain stable in the next 12 months, 2021 average

NSW	VIC
91%	88%

QLD	SA
88%	89%

Source: Aither analysis based on Rabobank Rural Confidence Survey



2

Social

Monitoring social conditions in the Basin can support understanding of how Basin communities are fairing and where social issues and strengths may be present.

This section summarises broad social conditions and trends in the Basin, as well as recreation indicators with links to water resources and management, based on available data.

2.1 Regional demographics

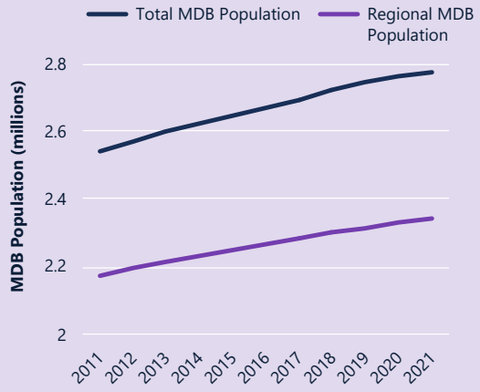
The Basin's population is growing, however regional areas are growing more slowly and have older populations

ABS population data suggests that the regional areas of the Basin have experienced modest population growth since 2011 (7.8%). This is slightly lower than population growth across the whole of regional Australia across the same period (10.0%).

The figure below demonstrates contrasting age profiles in regional and metropolitan areas of the Basin. Canberra has been used as a comparator for the regional Basin as it is located within the Basin and has a similar climate and geography.

ABS population data suggests that more than 40% of the population in the MDB is 50 years old or older. The same age group represents under 30% of the population in Greater Canberra. Ageing populations are not a Basin specific issue and can be observed in other areas of regional Australia (AIHW, 2022).

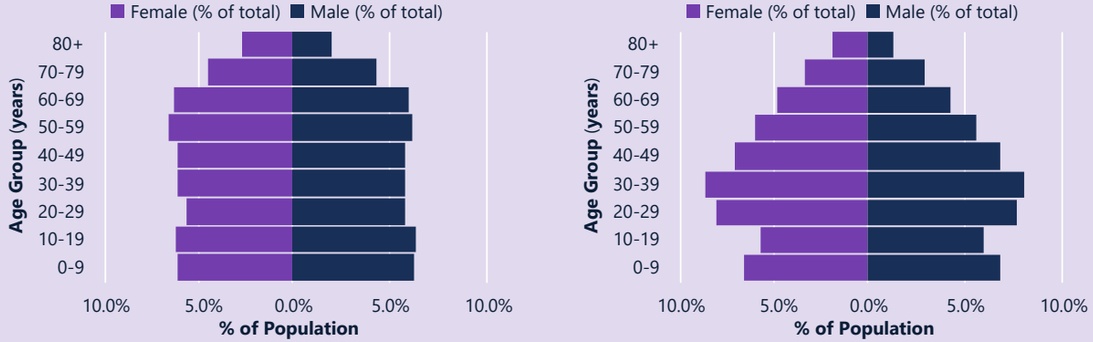
Basin population (total and regional) from 2011 to 2020



Note: The total MDB population estimates are based on the total population of all SA2s within or partially within MDB boundaries. The regional MDB population estimates exclude the Australian Capital Territory. Population figures are likely to be overestimated due to inclusion of SA2s which are partially outside the Basin.

Source: Aither analysis based on ABS, 2022

Population distribution by age and sex in the regional Basin (left) and the ACT (right), 2020



Source: Aither analysis based on ABS, 2021

2.1 Regional demographics

Populations growth is mixed across the Basin

Population increases in the Murray-Darling Basin have not been uniform across regions.

From 2017 to 2021, urban centres generally experienced growth or had a stable population size. Towns which experienced significant growth include Albury (14% growth in Albury East) and Bathurst (10% growth in Bathurst East).

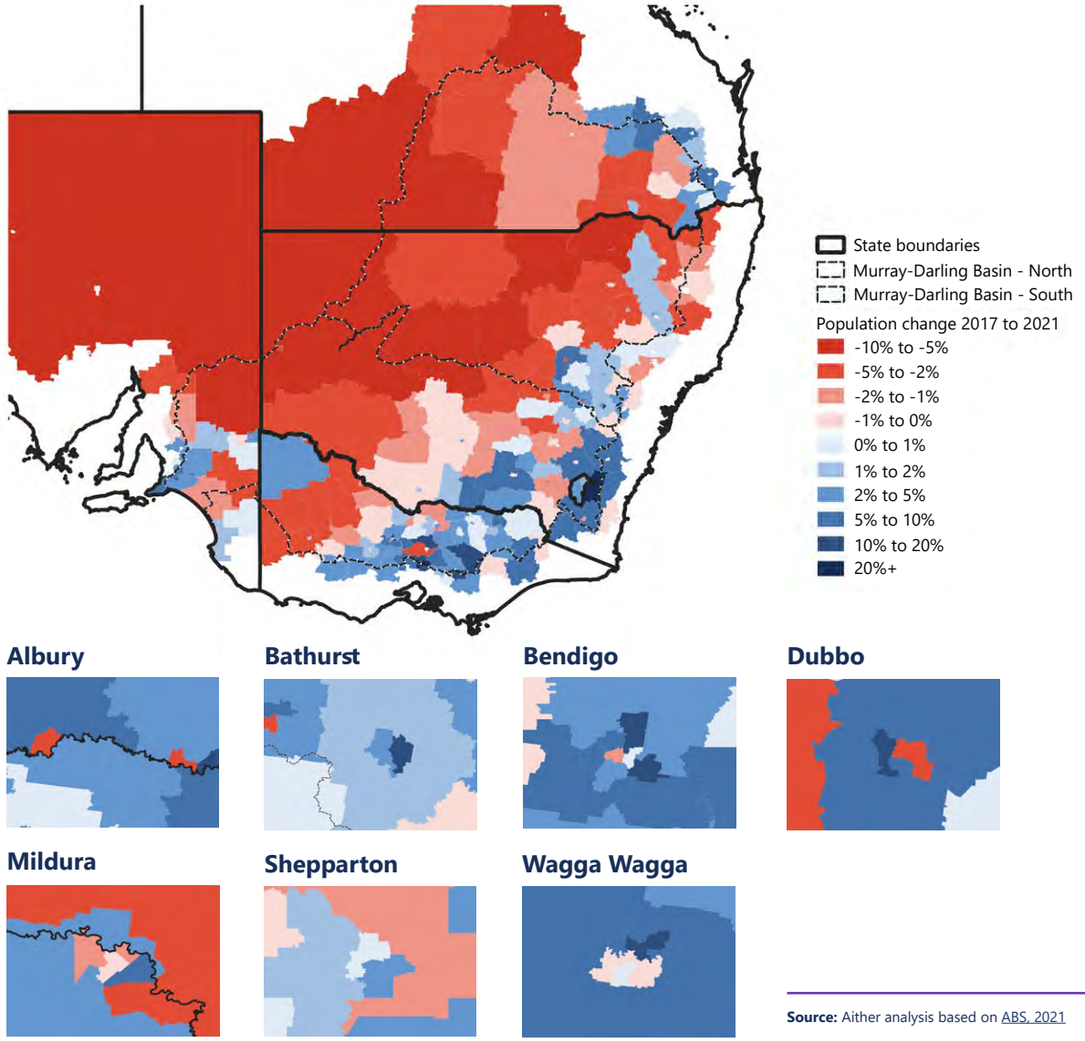
Growth in regional areas has been mixed, with some experiencing significant population growth and others experiencing a decline.

Rural areas such as western and central NSW have generally experienced population declines of between 2% and 10%. Similar trends can be observed in the long-term in other parts of rural Australia (Productivity Commission, 2017).

Population changes appear to align with trends in the gross regional product observed in Section 2.1 (that is, GRP has increased in areas where population has increased).

Additional information:
– Towns in Time provides population data at the Urban Centre and Locality (UCL) level in Victoria from 1981 to 2016.
– The Regional Movers Index provides quarterly migration data at an LGA level.

Change in population (%) from 2017 to 2021 in Basin SA2s (Statistical Area 2)



Source: Aither analysis based on ABS, 2021

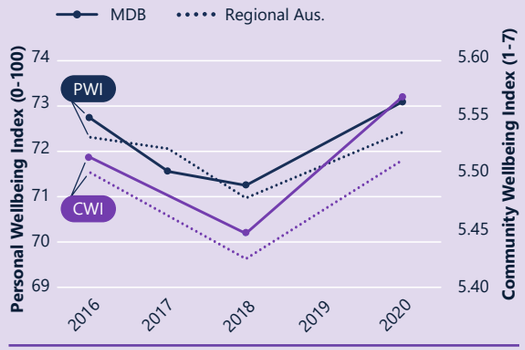
2.2 Wellbeing in Basin communities

Wellbeing in Basin communities increased in 2020

Data from the University of Canberra's Regional Wellbeing Survey suggests that personal and community wellbeing in the Basin was decreasing from 2016 to 2018. However, 2020 saw personal and community wellbeing at its highest level in 5 years, coinciding with an increase across regional Australia.

In all survey years, community wellbeing in the Basin was higher than the regional Australian average. Personal wellbeing in the Basin was higher than the regional Australian average in all surveyed years except for 2017.

Personal and community wellbeing indices in the Basin, 2016 to 2020



Source: Aither analysis based on UC Regional Wellbeing Survey data

The **personal wellbeing index** is based on RWS respondents' answers to questions about their satisfaction with their standard of living, health, personal relationships, safety, connection with community, and future security.

The **community wellbeing index** is based on RWS respondents' answers to questions regarding their views on their community's livability, resilience, prospects, and community spirit.

2020 Regional Summary

Highest personal wellbeing index scores (out of 100)

Carrathool, Hay and Murrumbidgee (NSW)	Griffith (NSW)	Eastern Riverina (NSW)
80.6	77.3	77.1

Highest community wellbeing index scores (out of 7)

Federation and Berrigan (NSW)	Indigo (VIC)	Gunnedah and Liverpool Plains (NSW)
6.0	6.0	6.0

Lowest personal wellbeing index scores (out of 100)

Northern Central NSW	Forbes, Lachlan, Parkes and Weddin (NSW)	Benalla (VIC)
68.2	68.6	69.2

Lowest community wellbeing index scores (out of 7)

Cowra, Forbes, Lachlan, Parkes and Weddin (NSW)	Greater Shepperton (VIC)	Horsham (VIC)
5.0	5.3	5.4

Additional information: Figure 3 in the independent assessment of social and economic conditions in the Murray-Darling Basin provides a regional breakdown of community wellbeing in the Basin compared to the Regional Australia average.

2.3 Nature-based recreation and tourism

Recreation and tourism supported by natural assets in the Basin has increased over time

Visits to state and national parks in the Basin

Many state and national parks in the Basin are reliant on Basin water resources to sustain environmental health and attract visitors. Visits to parks in the Basin can improve the social wellbeing of visitors and provide economic benefits to the surrounding region.

Data from state governments suggests that visits to state and national parks in the Basin have generally been increasing. However, data for individual parks within the Basin is not always available, and different parks have different levels of reliance on water resources than others.

VIC

50 million visits
were made to national and state parks across the whole of Victoria in 2018-19

Up from 27 million in 2001-02 (Parks Victoria, 2019)

In 2011, Murray Central and the Mallee made up around
10.5% of visitors
to Victorian national and state parks. (Zanon et al., 2015)

NSW

Over
6.8 million visits
were made to parks managed by the NPWS Northern Inland, West, and Southern Ranges branches in 2018.

This is a 207% increase
in visits to parks in the same regions in 2012 (Roy Morgan, 2019)

SA

Visitors to parks in the Riverland and Murray Lands contributed over
$5.7 million
to the SA economy in 2018-19, including
$151k in direct economic contributions.
(NPWS, 2022)

Recreational fishing activity

Recreational fishing provides social and economic benefits for Basin communities and is supported by water availability and management. Activities such as environmental watering can improve riverine ecology and support fish populations.

Research reports over the last 15 years have estimated the population of recreational fishers in the Basin to be between 430,000-830,000. A report published in 2019 estimated the total gross output of recreational fishing in the Basin to be $108 million in 2018.

Total economic contribution of recreational fishing in the Basin, 2014-18

Year	2014	2015	2016	2017	2018
Gross output ($, millions, 2019)	99	100	90	117	108
Gross value added ($, millions, 2019)	85	85	77	100	93

Source: MJA, 2019

3

Water ownership, use and trade

Water use and trade supports Basin industries, including irrigated agriculture, to perform more effectively in a range of water availability and market conditions.

This section summarises conditions and trends in water ownership, use and trade in the Basin, based on available data.

Disclaimer: This section includes high-level information relating to water ownership, use and trade at a Basin scale. More detailed information on water use and trade in the Basin can be found from a number of sources including the BoM's water markets dashboard and ABARES water markets research.

3.1 Water ownership and use on irrigated farms

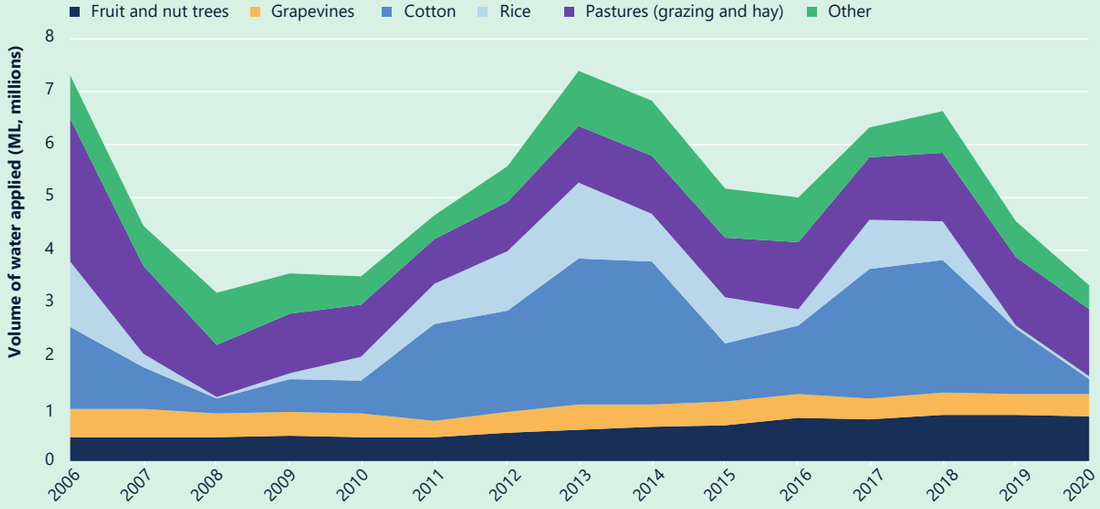
Overall water use in irrigated broadacre industries is more variable than in horticultural industries

Water use data (see right) can help to understand how different waters uses (including the relative mix) in the Basin are changing over time.

Total water use declined sharply from 2018 to 2020 coinciding with extended dry conditions. During these periods cotton and rice used less water, whereas water use for pastures reduced by a smaller amount. Conversely, water demand from permanent horticulture has steadily increased over time.

As data for 2021 and beyond becomes available, it may show that water use from cotton and rice will increase due to wetter conditions.

Water use in the Basin by crop type, 2011-12 to 2019-20



Source: ABARES, 2021

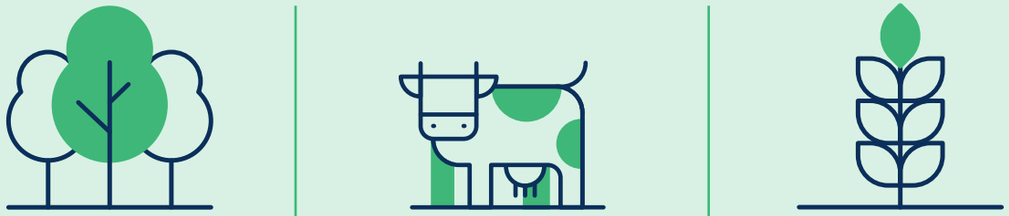
Recent trends:

Total water use decreased by 50% between 2018 and 2020, coinciding with the driest 36 months on record in the MDB.

Cotton and rice dropped from 53% to 10% of the total share of irrigated water use between 2017 and 2020.

Water use by fruits and nuts has steadily grown and made up 26% of all irrigated water use in 2020.

3.1 Water ownership and use on irrigated farms



Horticulture	Dairy	Broadacre
Volume of entitlements held (ML) per hectare of area operated		
5.1	2.1	1.2
Proportion of entitlement portfolio that is high reliability		
94%	78%	32%
ML of water used per hectare		
4.1	1.9	0.9

Water assets in different irrigation industries reflect their water use requirements

Monitoring trends in water ownership can provide insights into how different irrigation industries are investing in water and managing their water needs.

There is currently no dataset available which describes the total volume of entitlements held by different irrigation industries in the Basin. Recent ABARES research (see left) estimates water ownership in different industries per hectare operated.

The ABARES research suggests that irrigation industries with flexible demand for water own smaller volumes of water with lower reliability. Horticultural industries with fixed water needs hold greater volumes of water with higher reliability.

Note: See the ABARES website for industry definitions.

Source: ABARES experimental estimates, 2021

3.2 First Nations water ownership

First Nations water rights are low and have been decreasing

First Nations' ownership, management and use of water is a important for social, cultural and economic outcomes for Aboriginal people in the Basin. First Nations have managed the lands and waters of the Murray-Darling Basin for thousands of years and hold a strong cultural connection to Country.

Monitoring First Nations water ownership helps to provide understanding of First Nations' access to water. Research from the Australian Rivers Institute finds that only a small proportion of water entitlements were held by Aboriginal organisations in 2021. A separate study from the same research team found that the volume of entitlement owned has decreased since 2009.

0.17%

Of the total volume of water entitlements in the Murray-Darling Basin were held by Aboriginal organisations in 2020.

Note: 12.78 GL/y refers to the total LTDLE volume of indigenous water holdings in the Basin identified by Hartwig et al.

The volume of water entitlements owned by Aboriginal organisations in the Basin in 2021 was

12.78 GL/y.

Source: Hartwig et al., 2021

Between 2009 and 2018 First Nations' water rights decreased by

17%.

3.3 Trade volume and participation

Transfers have increased substantially over the past decade, and a large proportion of irrigators across industries trade water

Trade volumes and market participation rates can provide insight into how Basin water markets are being used.

Regularly updated government datasets such as the BoM's water markets dashboard do not distinguish between commercial trades (such as water traded between irrigators) and non-commercial trades. This means that trends in commercial trade cannot be separately observed from these datasets.

The total volume of commercial and non-commercial trades of temporary surface water in the MDB have increased over the last decade. According to the BoM's water markets dashboard, the average annual volume traded from 2018-19 to 2020-21 was 6,196 GL. This was 21% higher than the average annual volume traded from 2011-12 to 2013-14 (5,135 GL).

Irrigation industries tend to have high participation rates in temporary water markets. Water market participation by industry ranges from 46% to 74% of farms per year (ABARES, 2021). Almond growers are the most active (74% of those surveyed) followed by rice and other horticulture.

Total annual allocation trade volumes in the Murray-Darling Basin, 2008-09 to 2020-21

Note: includes commercial and non-commercial trades.

Source: BoM, 2022

Water market participation rates in the southern Basin (2007-08 to 2018-19)

74%
Almonds

49%
Dairy

46%
Other broadacre

57%
Rice

54%
Other horticulture

Source: ABARES, 2021

3.3 Trade volume and participation

Some Basin trading zones are net importers, others are exporters

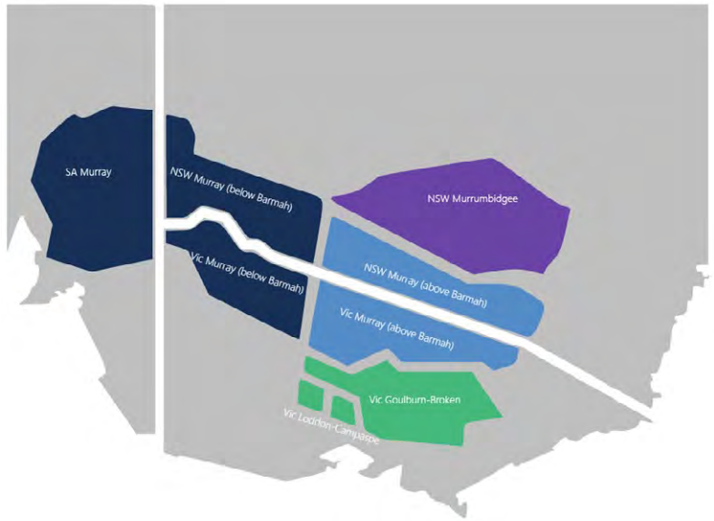
The movement of allocation water between trading zones via water markets highlights zones that are net importers or exporters of water.

There are 7 major trading zones in the southern Basin, across NSW, Victoria and South Australia as summarised in the figure below.

Movement of water through allocation trade between these zones is influenced by a variety of factors including demand, rainfall, changes in land use, other weather patterns, and hydrology and trade rules.

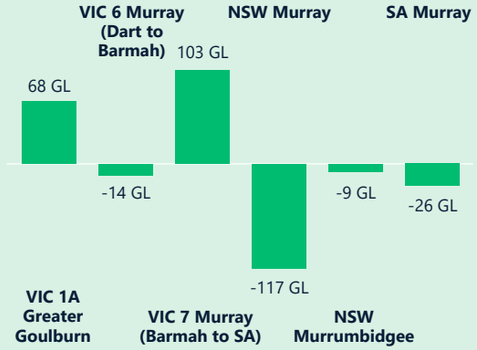
Aither estimated commercial allocation trade in its 2020-21 Water Markets Report. The report found that the Victorian lower Murray (Vic 7 Murray (Barmah to SA)) was the largest importer of water (103 GL), followed by the Goulburn (Vic 1A Greater Goulburn) at 68 GL. The NSW Murray (including upper and lower) was the largest overall exporter of water in 2020-21 (117 GL).

Major water trading zones in the southern Murray-Darling Basin



Source: Aither, 2021

Net importers (positive) and exporters (negative) of allocation water among major southern Murray-Darling Basin trading zones (2020-21)



Note: based on Aither estimates of commercial allocation trade in the southern Basin.

Source: Aither, 2021 Excludes $0 transfers.

3.4 Trade constraints

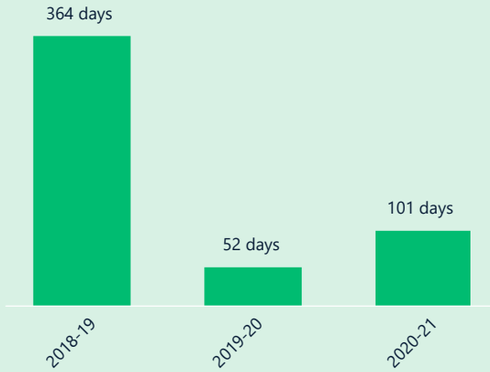
The number of days upstream to downstream trade has been available across major water trade constraints has been decreasing

Water markets allow flexible transfer or water between different areas, to support or enhance economic and other outcomes. However, certain constraints on trade are required to manage hydrological or environmental issues. For example, the Barmah Choke and Goulburn Inter-Valley Trade Constraint (Goulburn IVT) limit trading of water allocations between major southern Basin markets. Recent trends in trade availability across these two major constraints are discussed below.

Barmah Choke

The Barmah Choke is a narrow section of the Murray River that begins in Cobram, Victoria and ends in Echuca. Downstream trade through the choke is restricted to help manage operational and environmental constraints. In recent years, the number of days where it was possible to trade 10ML or more downstream has decreased.

Number of days upstream to downstream trade was available across the Barmah Choke for individual trades greater than or equal to 10ML, 2018-19 to 2020-21



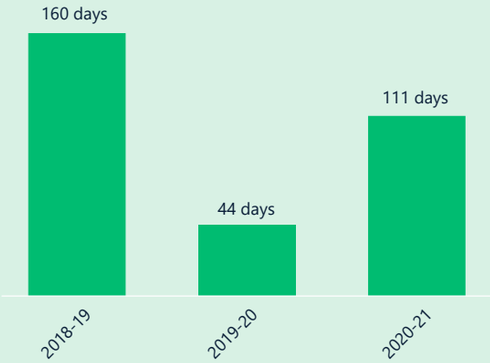
Source: Murray-Darling Basin Authority, 2022

Goulburn IVT

Similar to the Barmah Choke, the Goulburn IVT limits trade from the Goulburn and surrounding systems into the downstream Murray system. In recent years, the window of opportunity to trade out of the Goulburn has also decreased.

At the time of writing, the rules surrounding the Goulburn IVT were under review.

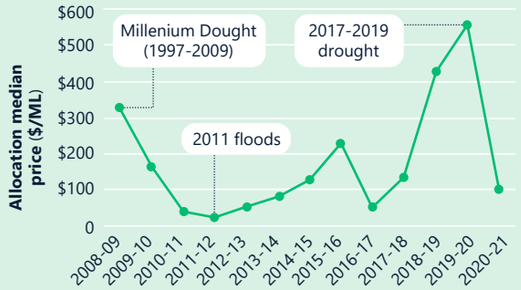
Number of days trade was available into the Murray via the Goulburn IVT for individual trades greater than or equal to 10ML, 2018-19 to 2020-21



Source: Victorian Water Register, 2022

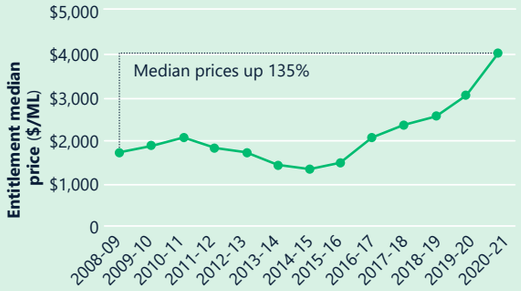
3.5 Water prices

Annual median allocation prices (surface and groundwater) in the Murray-Darling Basin



Source: BoM, 2022

Annual median entitlement prices (surface and groundwater) in the Murray-Darling Basin



Source: BoM, 2022

Allocation prices dropped significantly in 2020-21, and entitlement prices have steadily grown over time

Water allocations and entitlements provide inputs for irrigated agricultural production in the Basin. Water prices affect the cost of these inputs for agricultural businesses, which can subsequently affect production decisions and farm performance.

BoM data (see left) suggests prices peaked at $322 ML and $550 / ML during the Millennium Drought and the recent 2017-2019 drought respectively. During wet periods prices have dropped to below $100 / ML.

BoM data also suggests that median entitlement prices increased by 135% between 2007-08 and 2019-20 (see left). In 2019-20, median entitlement prices reached an all time high of $4,000 / ML.

Since 2008-09, the annual median price of water allocation has varied from

$20 to $550 per ML.

Since 2007-08, median combined entitlement prices have risen

135%.

4

Water management

Social and economic outcomes can be influenced by water related plans, processes, and rules. Compliance with those arrangements can provide confidence that they are working effectively. In turn, increased confidence in these areas can positively influence economic activity, and mental wellbeing.

This section provides an overview of recent developments in compliance and metering in the Basin, based on available data.

4.1 Compliance and metering uptake

Trends in compliance inputs, activities and outputs vary between Basin states and territories

The Inspector General of Water Compliance (IGWC) is currently establishing regular and comprehensive Basin-wide reporting arrangements for individual water user compliance with water take and metering rules in the Basin. In lieu of comprehensive compliance reporting in the Basin, key findings from reviews and reports delivered by the Basin's Compliance Compact and state regulatory bodies are presented below.

1: Definitions for terms such as 'inspections', 'investigations', and 'enforcement actions' may differ across VIC, NSW and SA compliance reporting.

2: All compliance actions in VIC, NSW and SA are reported at the state level and may include compliance actions taken outside of the Murray-Darling Basin.

Source: DELWP, 2021, NRAR, 2021, and DEW, 2021

Findings from Basin-wide reviews

MDBA Water Compliance Review (2017)

- Compliance effort varied significantly across basin states in 2017. NSW had one compliance officer per 355 GL of diversions, Qld had one compliance officer per 235 GL of diversions, and SA had one compliance officer per 56 GL of diversions.
- Metering uptake also varied significantly in 2017. 96% of surface water extraction sites in SA were metered, but between 25% and 51% of surface water extraction sites in the Northern Basin were metered.

MDBA Compliance Compact Review (2021)

- All Basin governments undertook more enforcement and detected more instances of non-compliance in 2019-20.
- NSW has revised its metering policy and will require full compliance with the new policy in the near term. Queensland is progressing its review of current state metering policies.
- The number of prosecutions commenced increased significantly from 2016-17 to 2019-20 in NSW and Vic. One prosecution was commenced in SA in 2019-20 and none were made in Qld or the ACT.

State compliance reporting[1,2]

In 2020-21, Victorian water corporations:

Detected

1,193 potential breaches — Down 51% from 2019-20

Took

1,376 enforcement actions — Down 48% from 2019-20

Finalised

728 investigations — Down 66% from 2019-20

In 2021, NSW NRAR:

Inspected

3,968 properties — Up 44% from 2020

Recorded

1,696 suspicious activities — Up 31% from 2020

Took

458 enforcement actions — Down 19% from 2020

Finalised

1,673 investigations — Up 5% from 2020

In 2020-21, SA DEW:

Made

2,964 site visits — Up 19% from 2019-20

Identified

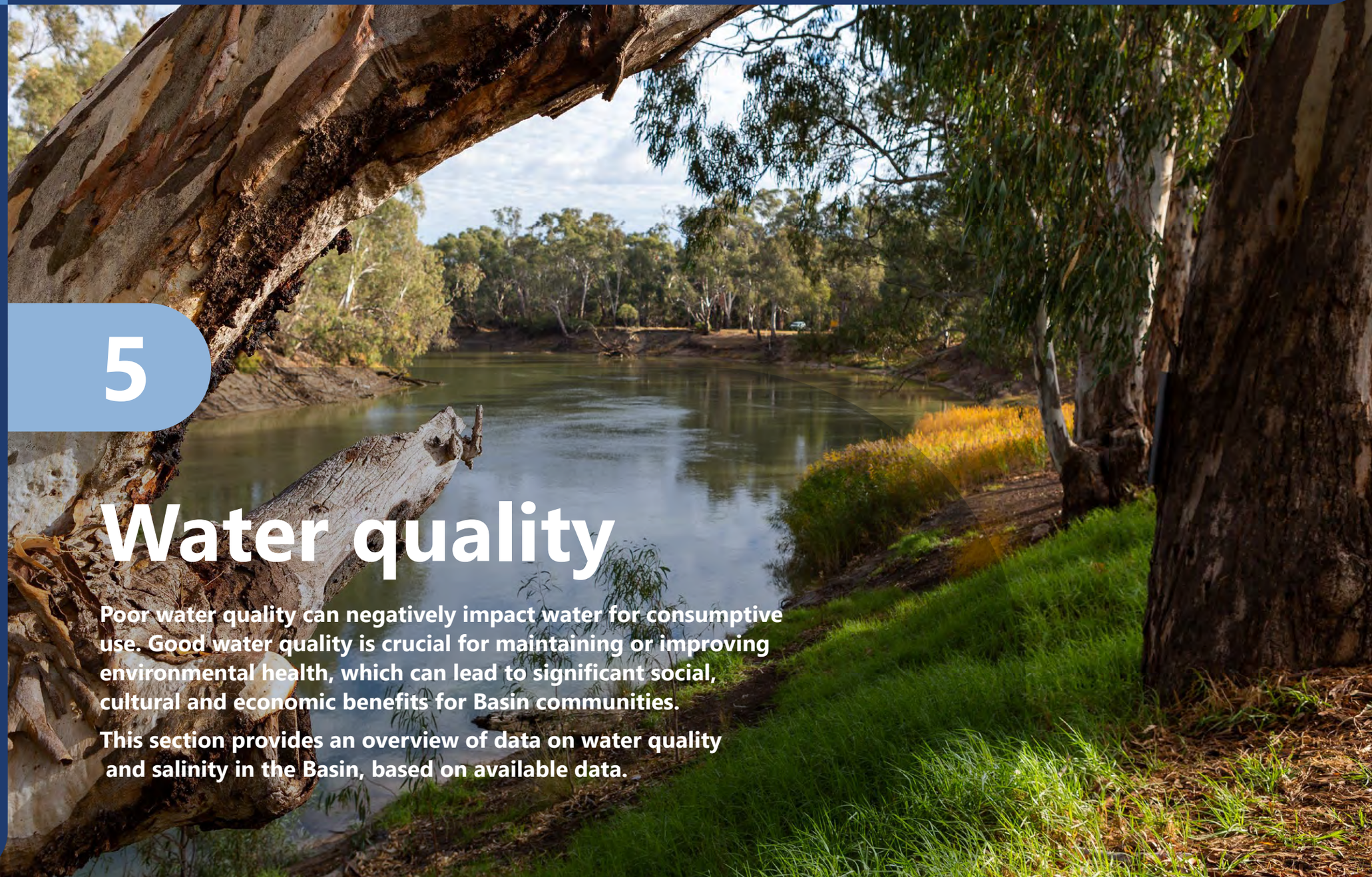
202 sites requiring compliance action — Up 184% from 2019-20

Issued

247 letters and notices — Down 65% from 2019-20

Imposed

207 sanctions and expiations — Down 29% from 2019-20



5

Water quality

Poor water quality can negatively impact water for consumptive use. Good water quality is crucial for maintaining or improving environmental health, which can lead to significant social, cultural and economic benefits for Basin communities.

This section provides an overview of data on water quality and salinity in the Basin, based on available data.

5.1 Salinity

Salinity and salt exports have improved since 2018

In 2021,

99.92%

Of daily measurements at salinity measurement sites reported salinity levels within the generally accepted threshold.

High salinity in freshwater systems and soil can be harmful to the environment as well as crops and livestock. It is important that low salinity is maintained to ensure the prosperity of water dependent industries and communities in the Basin.

Salinity in the Basin is measured in microSiemens per centimeter (µS/cm). A salinity level below 800 µS/cm is generally considered low salinity. In 2021, 16,213 daily measurements out of 16,226 (99.2%) were within this threshold. This is an improvement compared to previous years - the percentage of daily measurements below 800 µS/cm was 99.75% in 2020, 96.36% in 2019, and 98.61% in 2018.

Note: individual water salinity measurement sites in the Basin may have specific salinity targets which are above or below the generally accepted threshold.

Source: Aither analysis based on MDBA, 2022

In 2020-21,

0.62 MT

Of salt was exported from the Murray-Darling Basin into the Southern Ocean.

This is higher than salt export in the previous three years, but less than the Basin Plan's salt export objective of 2 million tonnes per year.

Additional information:

Detailed data and reporting against salinity and salt export targets can be found on the MDBA website:

– River Murray data

– Annual assessments of the salt export objective and salinity targets

5.2 Water quality

Water quality alerts decreased over 2021

Unfortunately there is no regularly updated dataset which records water quality issues in the Basin over time. The MDBA publishes monthly water quality alerts which identify the risk of water quality issues (such as algal blooms, blackwater, and low dissolved oxygen) arising across the Basin. These water quality alerts can provide an indication of water quality conditions in the Basin over time.

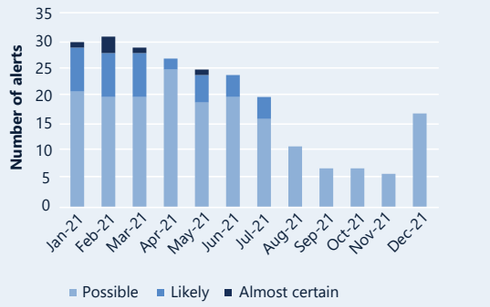
Additional information: More information on water quality in the Basin and current alerts can be found here.

Note: the number and severity of water quality alerts may not perfectly correlate with the number and severity of actual water quality issues that have arisen.

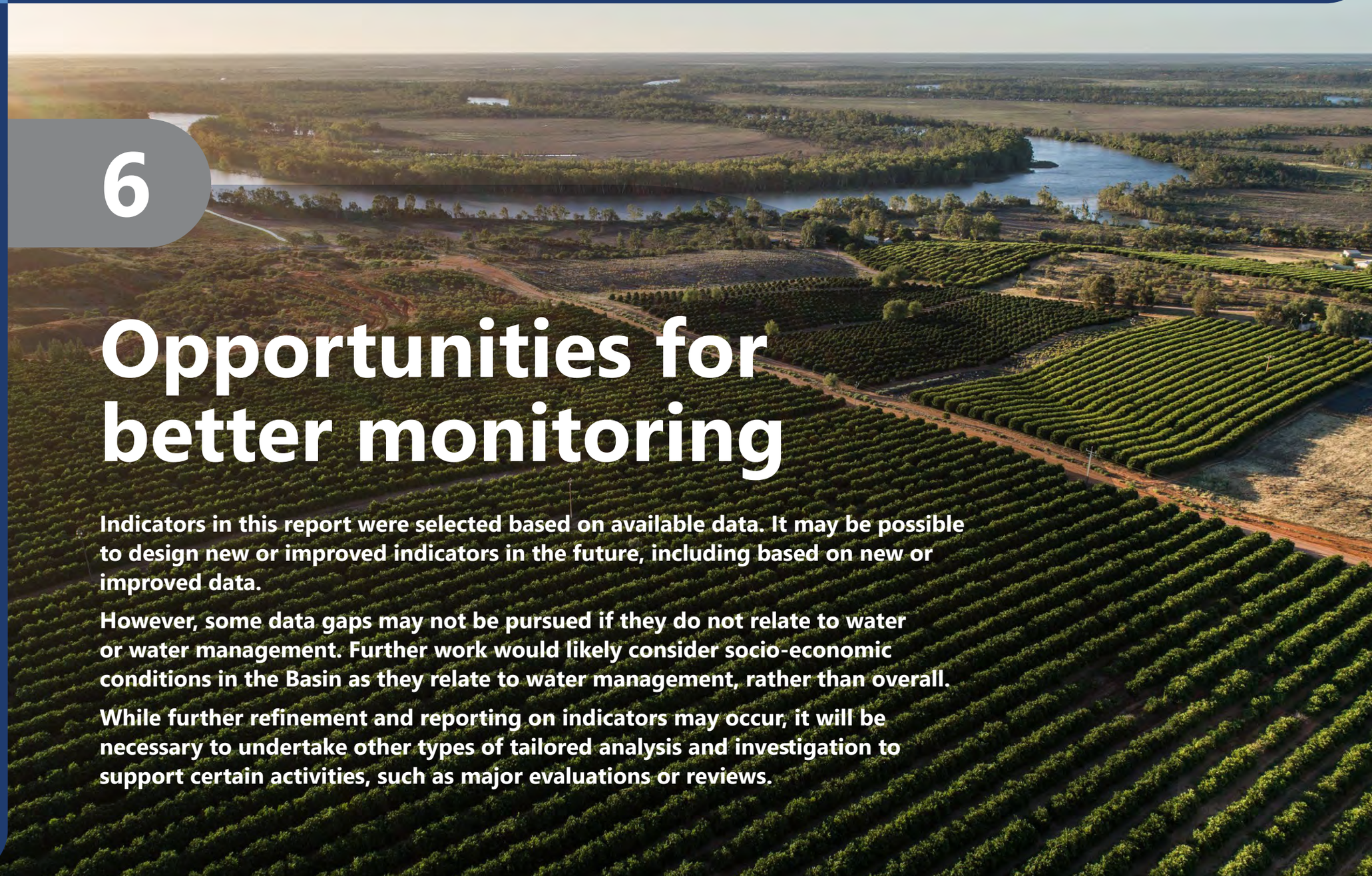
Monthly alerts in 2021 suggest that the risk of many water quality issues decreased over the year. Between August 2021 and December 2021, the MDBA detected no likely or almost certain water quality issues.

Water quality risks were highest in February 2021, when the likelihood of algal blooms in the mid-Murrumbidgee, the Lower Darling and downstream sections of the Murray was almost certain.

Number of water quality alerts in the Murray-Darling Basin, January 2021 to December 2021



Source: MDBA, 2022



6

Opportunities for better monitoring

Indicators in this report were selected based on available data. It may be possible to design new or improved indicators in the future, including based on new or improved data.

However, some data gaps may not be pursued if they do not relate to water or water management. Further work would likely consider socio-economic conditions in the Basin as they relate to water management, rather than overall.

While further refinement and reporting on indicators may occur, it will be necessary to undertake other types of tailored analysis and investigation to support certain activities, such as major evaluations or reviews.

6.1 Data gaps and opportunities for better monitoring

Summary of data gaps and opportunities

Several data collection opportunities have been identified through this project. These were identified based on understanding of current information and data gaps, relevance of each area to social-economic conditions and water management, and any work which is already being undertaken to address them.

The following table highlights gaps related to themes and indicators in this report. It is not an assessment of all gaps or opportunities related to socio-economic conditions in the Basin.

Major gaps identified through this report	Being resolved through current work	Opportunity to improve ongoing data collection?
Irrigated agriculture	Partially	Yes
Local social conditions relating to water management	No	Yes
Local economic conditions relating to water management	Some data available but not accessible without further investment	Yes
Socio-economic conditions relating to water management for First Nations people	Partially	Yes
Compliance and metering uptake	Yes	Should be addressed through current work
Water-dependent tourism and recreation	Partially	Yes
Socio-economic value of ecosystem services affected by water management	Unclear	More appropriate to address through bespoke analysis

6.1 Data gaps and opportunities for better monitoring

Data gaps, current work to resolve gaps, and opportunities for data collection

Irrigated agriculture

Data relating to irrigated agriculture in the Basin is published on an ad-hoc basis and varies across industries. This can make it challenging to understand overall trends in irrigated agriculture in the Basin, as well as how specific industries and regions are performing.

ABARES regularly collects information on irrigated farm performance, water market participation, water ownership and water use through the Murray-Darling Basin Irrigation Survey. ABARES is also currently working on a report focused on irrigated agriculture in the Basin, which will include data from the Murray-Darling Basin Irrigation Survey. The report is expected to be released later in 2022.

Despite current work, there is no ongoing government commitment to regularly publish data collected from the irrigation survey. Increased transparency and better data sharing in this area would be valuable for ongoing monitoring of social and economic conditions relating to water management in the Basin. Useful indicators relating to irrigated agriculture in the Basin could relate to:

- irrigated farm profits, receipts and costs by industry and region
- water market participation by industry and region
- water ownership and use by industry and region.

Local social conditions relating to water management

There is no ongoing collection of data describing Basin community views on water management, water related issues and social conditions relating to water management.

Local scale data on broader social indicators such as population and overall wellbeing are not available for all regions and years. For example, it is possible to determine population changes in urban and rural areas of an LGA in Victoria using Towns in Time data, however this is not possible for other Basin states/territories. Similarly, the University of Canberra's Regional Wellbeing Survey is not completed every year and relies on relatively small sample sizes within each LGA. These issues can make it challenging to draw out demographic and wellbeing trends at a local scale across the Basin.

There is an opportunity to undertake regular consultation with Basin communities to understand their views on water management, water related issues and social conditions relating to water, and how these views are changing over time.

Local economic conditions relating to water management

Local scale data on economic conditions in water-sensitive industries in the Basin is not available for all Basin LGAs. There is also a lack of time series data available for important indicators. These issues make it challenging to discern both local and Basin-wide economic conditions and trends.

There is an opportunity to invest in access to local-scale economic data sources developed by organisations such as REMPLAN or Informed Decisions. These resources would provide a more comprehensive understanding of local social and economic conditions in the Basin by:

- removing gaps where regional data is not currently publicly available
- allowing regional trends in industry value added to be observed using time series data
- allowing access to time series data for a range of other regional economic indicators relating to employment, tourism, and imports and exports.

6.1 Data gaps and opportunities for better monitoring

Data gaps, current work to resolve gaps, and opportunities for data collection

Nature-based tourism and recreation

Statistics for water-related recreational activities in the Basin are irregularly published and are incomplete. Visitation data for water dependent parks and icon sites in the Basin are collected in different ways across Basin states, and data is often too coarse to isolate visitor numbers or economic benefits relating to specific sites of interest (such as sites which receive environmental watering). Recreational fishing and boating statistics for the Basin are not measured or published regularly by any party.

The National Social and Economic Survey of Recreational Fishers may resolve some data gaps relating to recreational fishing in the Basin. The study is being undertaken by ABARES and the University of Canberra and seeks to assess social and economic benefits from recreational fishers across Australia. The project also aims to develop a repeatable methodology for collecting survey data in future years. The final report is expected to be released in 2022.

There is an opportunity to collect more specific data on water dependent parks and icon sites at more regular intervals. This data could include:

- the number of annual visits to parks and icon sites in the Basin affected by water management
- direct and indirect economic contribution of water dependent parks and icon sites in the Basin.

Socio-economic value of ecosystem services affected by water management

The rivers, wetlands and floodplains of the Basin provide a diverse range of services which can generate significant social and economic benefits. These services include recreation and tourism, as well as a range of other services including habitat provision for iconic species, water flow regulation, amenity and aesthetics.

The socio-economic value of ecosystem services can be challenging to measure and requires detailed and bespoke analysis to accurately estimate. For these reasons, it is likely to be impractical to include in ongoing condition monitoring. Despite this, there is opportunity to undertake targeted data collection and analysis in this area to inform the next Basin Plan evaluation.

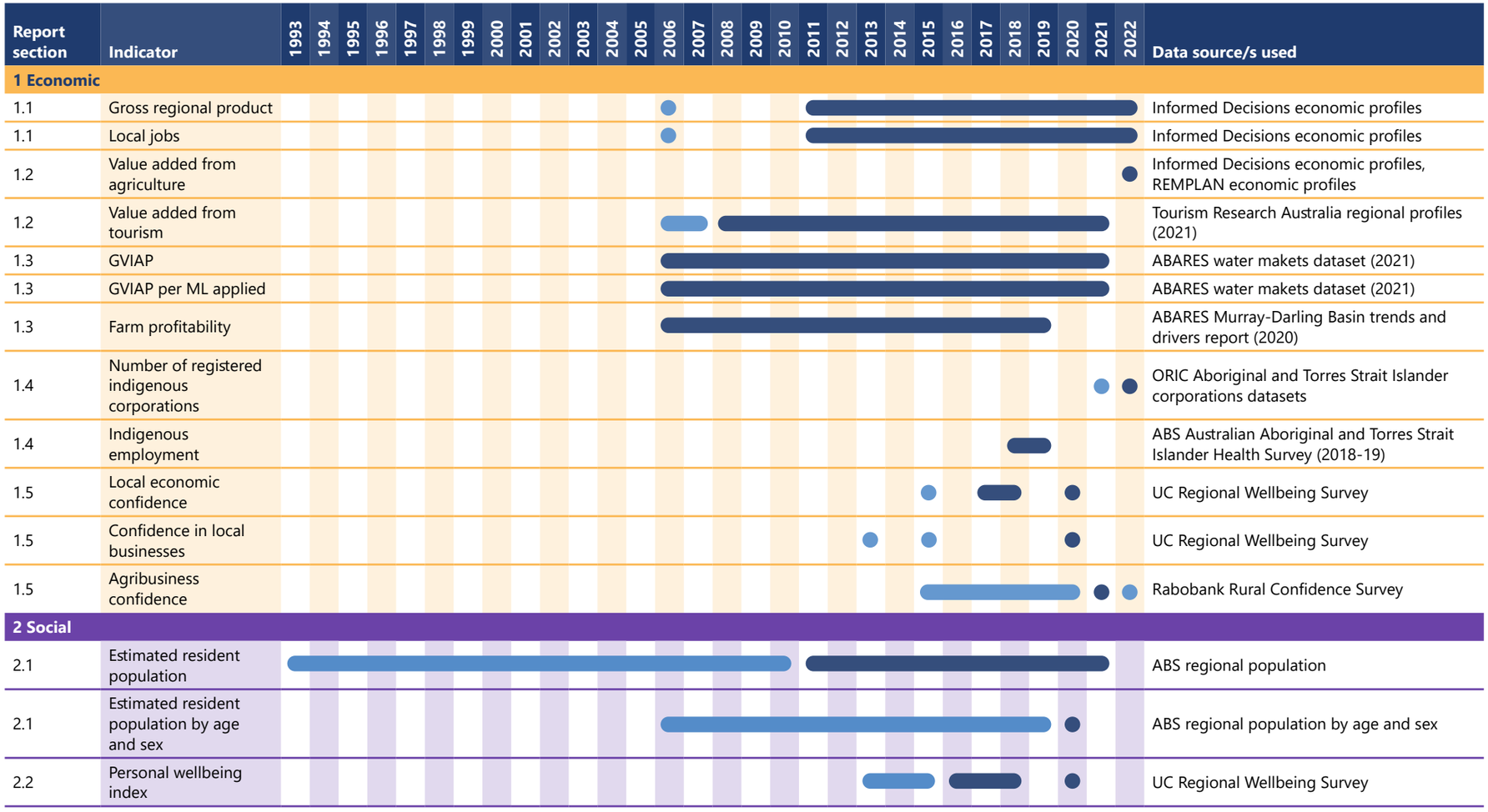
Compliance and metering uptake

There is a lack of comprehensive and consolidated compliance reporting across the Basin. The Inspector General of Water Compliance is expected to begin publishing water compliance metrics for the Basin by the end of 2022. Reporting will include a consistent set of compliance and metering metrics across Basin states at regular reporting periods. Metrics will relate to:

- regulatory inputs such as the number of compliance complaints and allegations
- regulatory activities such as the number of investigations and inspections undertaken
- regulatory outputs such as the number of warnings, civil actions, notices, and prosecutions undertaken
- metering statistics such as the proportion of meterable water take which is metered
- contextual statistics such as the number of licenses and volume of water take (permitted and actual).

Appendix A Indicator summary

Summary of indicators, timelines, and data sources used



Report section	Indicator	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	Data source/s used
1 Economic																																
1.1	Gross regional product														●					■	■	■	■	■	■	■	■	■	■	■	■	Informed Decisions economic profiles
1.1	Local jobs														●					■	■	■	■	■	■	■	■	■	■	■	■	Informed Decisions economic profiles
1.2	Value added from agriculture																														●	Informed Decisions economic profiles, REMPLAN economic profiles
1.2	Value added from tourism														●		■	■	■	■	■	■	■	■	■	■	■	■	■			Tourism Research Australia regional profiles (2021)
1.3	GVIAP														■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			ABARES water makets dataset (2021)
1.3	GVIAP per ML applied														■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			ABARES water makets dataset (2021)
1.3	Farm profitability														■	■	■	■	■	■	■	■	■	■	■	■	■	■				ABARES Murray-Darling Basin trends and drivers report (2020)
1.4	Number of registered indigenous corporations																												●	●	●	ORIC Aboriginal and Torres Strait Islander corporations datasets
1.4	Indigenous employment																										■	■				ABS Australian Aboriginal and Torres Strait Islander Health Survey (2018-19)
1.5	Local economic confidence																							●		■	■		●			UC Regional Wellbeing Survey
1.5	Confidence in local businesses																					●		●					●			UC Regional Wellbeing Survey
1.5	Agribusiness confidence																							■	■	■	■	■	■	●	●	Rabobank Rural Confidence Survey
2 Social																																
2.1	Estimated resident population														■	■	■	■	■	■	■	■	■	■	■	■	■	■	■			ABS regional population
2.1	Estimated resident population by age and sex														■	■	■	■	■	■	■	■	■	■	■	■	■	■	●			ABS regional population by age and sex
2.2	Personal wellbeing index																					■	■	■	■	■	■	■	●			UC Regional Wellbeing Survey

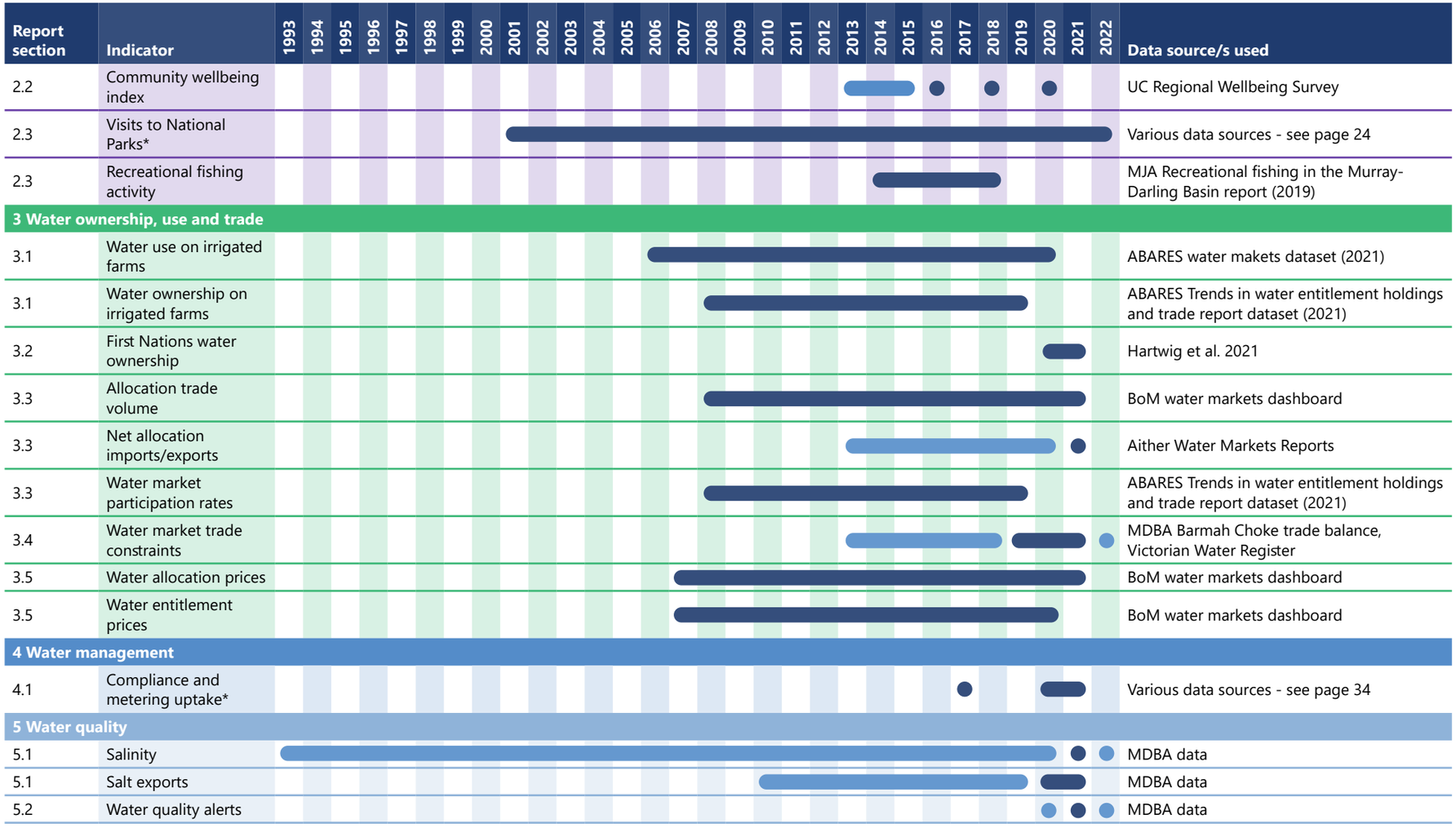
● included in report

● available from data source/s but not included in report

Note: Timelines relate to the data source/s used and do not consider availability of alternative data sources.

Note: Visits to National Parks and compliance and metering uptake rely on multiple sources from state governments. Data availability for these indicators differs across Basin jurisdictions.

Summary of indicators, timelines, and data sources used continued...



Report section	Indicator	Data source/s used
2.2	Community wellbeing index	UC Regional Wellbeing Survey
2.3	Visits to National Parks*	Various data sources - see page 24
2.3	Recreational fishing activity	MJA Recreational fishing in the Murray-Darling Basin report (2019)
3 Water ownership, use and trade		
3.1	Water use on irrigated farms	ABARES water makets dataset (2021)
3.1	Water ownership on irrigated farms	ABARES Trends in water entitlement holdings and trade report dataset (2021)
3.2	First Nations water ownership	Hartwig et al. 2021
3.3	Allocation trade volume	BoM water markets dashboard
3.3	Net allocation imports/exports	Aither Water Markets Reports
3.3	Water market participation rates	ABARES Trends in water entitlement holdings and trade report dataset (2021)
3.4	Water market trade constraints	MDBA Barmah Choke trade balance, Victorian Water Register
3.5	Water allocation prices	BoM water markets dashboard
3.5	Water entitlement prices	BoM water markets dashboard
4 Water management		
4.1	Compliance and metering uptake*	Various data sources - see page 34
5 Water quality		
5.1	Salinity	MDBA data
5.1	Salt exports	MDBA data
5.2	Water quality alerts	MDBA data

included in report

available from data source/s but not included in report

Note: Timelines relate to the data source/s used and do not consider availability of alternative data sources.

Note: Visits to National Parks and compliance and metering uptake rely on multiple sources from state governments. Data availability for these indicators differs across Basin jurisdictions.