Murray Darling Basin- State of the Basin Project

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Home

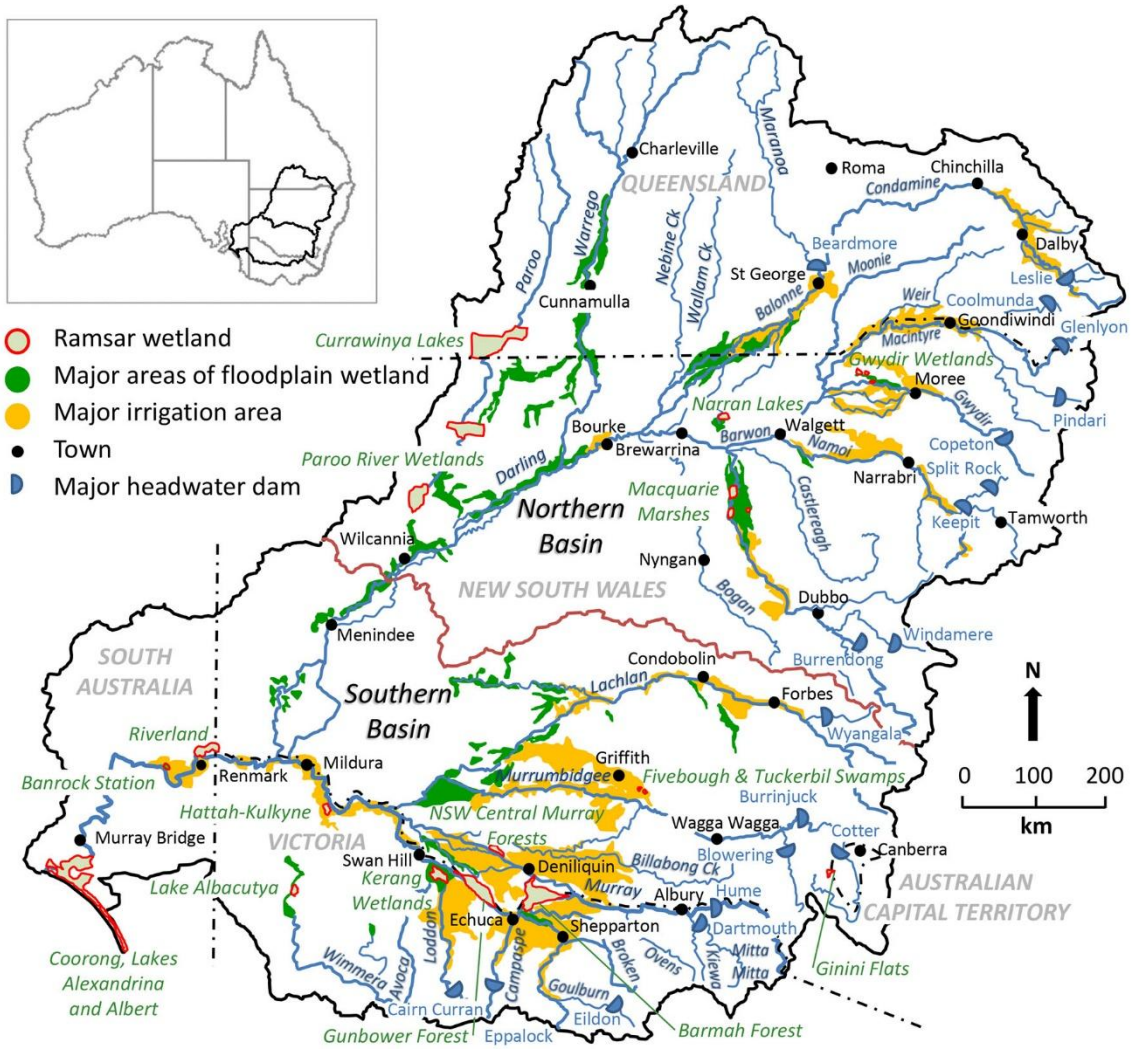

Image: Map of the Murray Darling Basin with irrigation districts and major wetlands (Source: M. Colloff)

Systematic, rigorous monitoring and reporting helps determine the effectiveness of water reform policies. This project assesses the outcomes from implementation of the Murray–Darling Basin Plan and associated water reforms. The assessment is led out of the Fenner School of Environment and Society at the Australian National University, with support from experts at institutions across Australia.

The Murray-Darling Basin Plan (2012) and associated programs has been supported by around AU$13 billion-worth of Commonwealth Government water reform funding and is intended to ensure water resources are used sustainably. The Murray and Darling rivers have a catchment in south-eastern Australia that covers around a seventh of the continent.

Many aspects of Basin water reform implementation are poorly monitored and reported due to fragmented and inadequate data collection across jurisdictions. To address this problem, we synthesised publicly available data for 27 indicators that provide insights into the state of the Basin before and since Plan implementation commencement in 2012. These indicators, grouped into Indigenous, economic, environmental, social and compliance themes, were chosen to assess the outcomes from water policy and management interventions relevant to the objectives of the *Water Act* 2007 (Cth) and its subsidiary Basin Plan.

Of the targets for the 27 indicators, seven were met (26%), ten were variable but showed no overall trend (37%) and ten were not met (37%). Five of seven economic targets, relating to irrigated agriculture and land as a capital asset, showed improvement, whereas of 20 Indigenous, environmental, social and compliance indicator targets, only two environmental targets were met.

The report can be found here.

Media coverage of the release of the report includes:

https://abc.net.au/news/rural/2024-12-02/murray-darling-basin-plan-failing-river-health-wentworth-group/104663684

https://theconversation.com/a-13-billion-30-year-flop-landmark-study-reveals-stark-failure-to-halt-murray-darling-river-decline-244296

https://www.abc.net.au/listen/programs/am/scientists-assess-murray-darling-/104671320

https://www.sbs.com.au/news/podcast-episode/australias-beating-heart-the-murray-darling-basin-is-declining-in-health/ytkisytx2

Background

Image: Aerial view of the Lower Murray (Tanya Doody, CSIRO Environment)

Rivers, wetlands and water resources worldwide are vulnerable to growing threats from irrigation diversions, land use change, pollution and global warming, and their management has become increasingly challenging. Mitigating these increased stressors on rivers and wetlands requires cooperation among multiple agencies and stakeholders, and the design and implementation of programs to allocate water justly, sustainably, efficiently and effectively.

The Murray-Darling Basin in south-eastern Australia contains over 30,000 wetlands, over 100 species of waterbird, and 51 species of native freshwater fishes. It produces 40% of the value of agricultural production in Australia, provides domestic water supplies for 2.2 million people, and its lands and waters cover the country of more than 40 Indigenous nations. Excessive water extractions have resulted in environmental degradation, which is being exacerbated by climate change.

The 2012 Murray Darlin Basin Plan and associated programs is one of the largest environmental restoration programs attempted globally. The main objective of the Basin Plan is to return water to the environment by reducing water extraction for agriculture to redress the balance between consumptive use and the environment. It is also intended to provide greater security of water supply for people and agriculture.

Effective implementation of the Basin water reforms requires rigorous, transparent, accountable systems for monitoring, evaluating and reporting on implementation policy instruments. However, two key Basin monitoring programs were cut at the time the Plan was adopted in 2012. Subsequent reporting on progress has often focussed on inputs, like accreditation of subsidiary plans and volumes of water reallocated, not desired outcomes such as populations of wildlife, and jobs in Basin communities. In practice the collection, curation, analysis and synthesis of monitoring data is not centralised, remains incomplete, and much of it is not available publicly.

Concerns with the existing arrangements for monitoring, evaluation and reporting inspired this independent assessment of the effectiveness of the Basin water reforms. It is intended to enhance the standard of monitoring, evaluation and reporting in the Basin. It is intended to inform

governments and other stakeholders where there is desired progress and of other areas that need more attention.

Methodology

Image: Figure showing drivers of change, policy instruments, response variables and associated indicators (Source: Colloff et al., 2024)

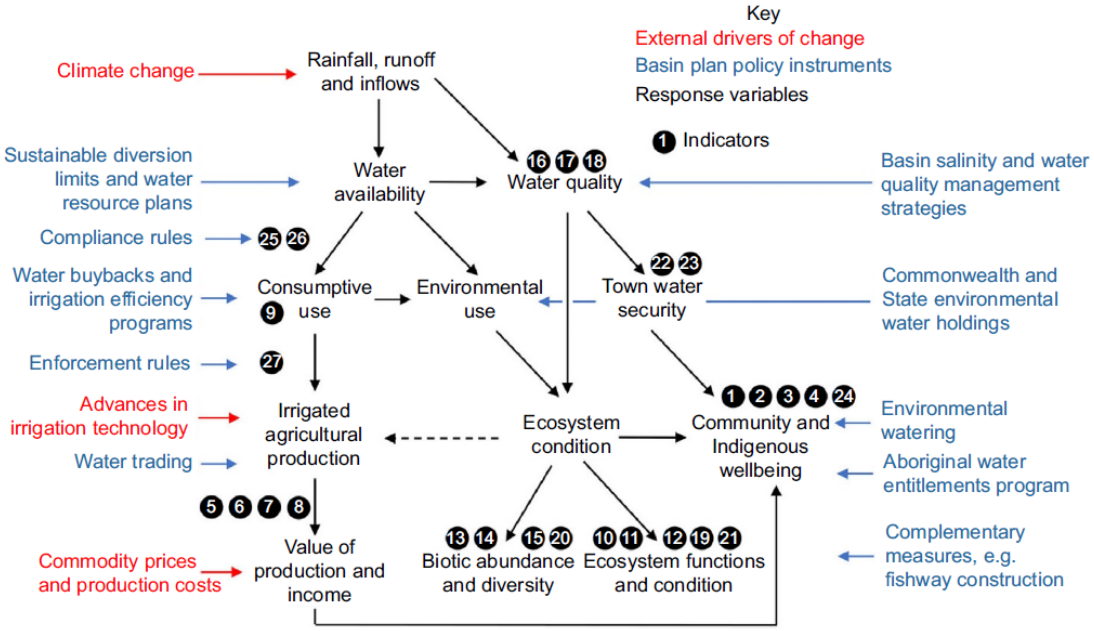

Fig. 1. Diagram showing drivers of change, policy instruments and response variables and the respective Indigenous, economic, environmental social and compliance indicators used to assess changes in the Murray–Darling Basin since the commencement of the Basin Plan. Numbers refer to indicators for each variable (see text and Table 1 for details).

The State of the Basin project team used the objectives of the *Water Act 2007* (Cth) and Basin Plan (2012) as the basis for developing indicators of progress towards desired Indigenous, economic, environmental, social and compliance benefits.

The indicators are simple surrogate measures that track status and trends of more complex social-ecological systems where not everything can be measured. The indicators can be used to assess conditions at a point in time or monitor changes over time to assess performance of policy and management interventions. Several indicators have more than one measurement for their assessment, and new indicators may be added or existing ones adapted and improved over time. The choice of indicators is a trade-off between comprehensiveness and accessible communication. Indicators met the following criteria:

1) Directly relate to objects in the *Water Act* or the Basin Plan;
2) Provide evidence of the extent of progress towards desired outcomes;
3) Link to Indigenous, economic, environmental, social, or compliance variables, policy interventions and responses;
4) Draw on objective (i.e. falsifiable) quantitative information;
5) Effectively track change over time (indicators that were capable of only showing increases were not included);
6) Draw on publicly available data;
7) Use data that are collected and updated regularly;
8) Enable a target for each indicator to be set based on legislation or national standards.

We used data that was available up to and including 31 March 2024.

Further details about methods used to derive the indicators and references to the sources of data are provided in the Supplementary Materials. The article and supplementary materials are open source and can be accessed here.

Indigenous Indicators

Number	Theme and Target	Data can be used as reported publicly?	Data completeness (spatially and temporally)	Status	Trend
1	Proportion of water held by Indigenous organisations is improving	Additional analysis required	Available for NSW Basin; only 3 annual data points	Poor	Declining
2	Volume of water released into wetlands in areas of Indigenous organisations is increasing	Additional analysis required	Complete	Intermediate	No trend, variable

Neither Indigenous target was met. Water holdings by Indigenous organisations are the most incomplete of the datasets. The small volume of Indigenous cultural water entitlements indicates continued disempowerment of Indigenous peoples for control over the management of water on Country, with knock-on effects for health and wellbeing. Water justice for Indigenous peoples is conspicuous by its absence from the *Water Act* and the Basin Plan. The Commonwealth Government recently increased funding of the Aboriginal Water Entitlements Program from A$40 million to A$100 million, as 'part of a broader effort to strengthen the Water Amendment (Restoring Our Rivers) Bill 2023' and as 'a strong commitment to addressing historical water access challenges'. But even this increased sum is unlikely to substantially increase rights to water for Indigenous nations.

Economic Indicators

Number	Theme and Target	Data can be used as reported publicly?	Data completeness (spatially and temporally)	Status	Trend
3	Personal income of Basin LGAs is steady or improving	Additional analysis required	Complete	Good	Improving
4	Disparity between LGAs with lowest and highest median income is steady or improving	Additional analysis required	Complete	Good	Steady overall for irrigation LGAs
5	Gross Value of Irrigated Agricultural Production (GVIAP) is steady or improving and the trend is equal to or greater than the national average	Yes	Most recent data 2018-19	Good	Stable
6	Value of production per unit of irrigation water used is steady or improving	Yes	Most recent data 2018-19	Good	Improving
7	Cash income and rate of return of irrigation farms is increasing	Yes	Most recent data 2015-16	Good	Declines during drought, then recovery
8	Farmland price is improving.	Yes	Complete	Good	Improving
9	Surface water diversions are declining.	Yes	Complete	Intermediate	No trend, variable

Five of the seven economic targets were met. These findings suggest, at the Basin scale, irrigation communities are not experiencing severe economic hardship as a result of the implementation of the Basin Plan, as claimed by some.

Surface-water take, primarily for economic purposes, has declined since 2012–13 by nearly 2,500 GL, which appears to indicate that the Basin Plan is reducing take. Yet, the Gross Value of Irrigated Agricultural Production has remained steady, and the production value of irrigation water has increased markedly, again indicating a lack of evidence for a significant economic downturn for the irrigated-agriculture sector. Farmland price increased by a mean value of 26% per year between 2006–07 and 2022–23. Cash income and rate of return of irrigation farms, which represent direct indicators of the economic impact of the implementation of the Basin Plan, increased substantially when most environmental water was recovered (although rate of return subsequently declined during the drought of 2017–20).

Environmental Indicators

Number	Theme and Target	Data can be used as reported publicly?	Data completeness (spatially and temporally)	Status	Trend
10	Ramsar wetlands are flooded at an appropriate extent to meet their water requirements	Yes	Complete based on remote sensing data	Poor, target not met	No trend, variable
11	Condition of vegetation in Ramsar wetlands is maintained or improving	Yes	Complete based on remote sensing data	Poor, target not met	No trend, variable
12	River flows at Hydrological Indicator Sites match projections and predictions by MDBA	Additional analysis required	Complete	Poor, observed is below expected	Declining
13	Waterbird abundance of key species is steady or improving	Additional analysis required	Complete	Poor	Declining
14	Frequency of occurrence of selected threatened species is steady or improving	Additional analysis required	Data based on field surveys at only 9 sites Basin-wide	Intermediate	One species declining, two no change, two improving
15	Number of fish kills is falling	Additional analysis required	Only available for NSW Basin	Poor	Number of severe fish kills rising
16	EC in Murray River below target levels >95% of the time	Yes	Complete	Intermediate	Improving but EC not met at Burtundy
17	Discharge 2 × 106 Mg salt year−1 from Murray Mouth	Yes	Complete	Poor	Discharge target not met
18	Reduce nitrogen and phosphorus concentrations towards water quality standards	Additional analysis required	Only available for Murray River	Fair	Some improvement
19	Cold water pollution is declining (installation of TPCDs)	Additional analysis required	Complete	Intermediate	No trend; TPCD installation sporadic
20	Populations of large-bodied fishes are maintained or increasing	Yes	Only available for NSW and Victoria	Fair	Improving
21	Murray Mouth open >95% of time without dredging	Additional analysis required	Time Murray Mouth is open not reported regularly	Poor	Target unlikely ever to be met

Of the 12 environmental indicators, only two were met, namely, nutrient pollution and improvements in populations of large-bodied fishes (coinciding with the cessation of commercial fishing) in New South Wales and Victoria. Five targets showed no trend, and five were not met.

For the indicators with no clear trend, several showed responses in relation to periods of drought and flood, particularly the 2001–10 Millennium Drought and the 2017–20 drought. Regarding Basin Plan policy measures, these responses are problematic when comparing periods pre-and post-Basin Plan commencement given the disproportionate distribution of wet and dry years. This makes it difficult to draw inferences on the contribution managed environmental watering may have made to flow-dependent ecosystems compared with high unregulated river flows.

The gap between expected and observed flows and the low frequency and extent of flooding of wetlands with environmental water are causes for concern. These indicators point to shortfalls in the prediction of water availability and increasing water scarcity. Policy options to address these issues, such as improved water modelling and accounting, regulating interception activities, more effective use of environmental water and environmental triage and adaptation have not been implemented. Irrigation communities adjusting to the effects of water reform and taxpayers need confidence that substantial public investment in water recovery has resulted in increased river flows. There are a range of possible explanations for this shortfall in water availability.

Social Indicators

Number	Theme and Target	Data can be used as reported publicly?	Data completeness (spatially and temporally)	Status	Trend
22	Town water security: days per year of water restrictions is declining	No, full dataset no longer publicly available	Complete for NSW Basin LGAs only	Poor	Number of days per year of water restrictions is increasing
23	Number of drinking water quality incidents is declining	No, full dataset no longer publicly available	Complete for NSW Basin only	Poor	Number of boil water notices is increasing
24	Water quality threat events to domestic, cultural and recreational water uses are declining in number	Data not publicly archived	Some reports missing	Intermediate	No trend, variable

No indicators for the social theme were met. The number of days of water restrictions and number of drinking-water quality incidents both increased. The third, numbers of water-quality threat events affecting domestic, cultural and recreational water use showed no clear trend, but the time series for this indicator was of relatively short duration.

Water quality and water security are major concerns for regional riverine communities in the Basin. For those that rely on river water for domestic supply, the prospect of poor water quality is heightened during periods of flood and drought, particularly in more remote areas. Basin States have been slow to upgrade domestic water infrastructure, and many water treatment plants are aging and in need of replacement. Lower Darling communities have been particularly impacted by poor water quality, requiring them to truck in of bottled drinking water. Yet, access to adequate, safe drinking water is a basic human right. Water for human consumption needs to meet highest standards for palatability, aesthetic qualities and safety from contaminants. The Basin contains multiple sources of contaminants from agricultural land and urban areas. Better monitoring, managing and public reporting of water quality are vital to protect water sources, human health and wellbeing.

Compliance Indicators

Number	Theme and Target	Data can be used as reported publicly?	Data completeness (spatially and temporally)	Status	Trend
25	SDL for each SWRU is met	Yes	Complete	SDL not met for 2 SWRUs	Trend toward increased exceedance of SDL compliance threshold
26	Adjusted cumulative SDL balance for each SWRU is stable or increasing	Yes	Complete	Target not met	Balance has declined in 8/29 SWRUs
27	Breaches or water laws: prosecutions and enforcement notices are declining in number	Additional analysis required	Data incomplete in NSW prior to establishment of Natural Resources Access Regulator	Intermediate	No trend, variable

No compliance indicators were met. Sustainable Diversion Limits (SDLs) for surface-water resource units (SWRUs) and adjusted cumulative balance for surface-water resources fell short of targets. The indicator for breaches of water laws is a relatively short time-series and showed no apparent trend, but there is no indication that prosecutions for breaches of water laws are in decline.

Compliance relates to the responsibilities of government agencies, but also for individual water users, to adhere to the relevant water-management rules and laws of the Basin States and Territory. The Inspector-General of Water Compliance is responsible for enforcing compliance and for reviewing SDL accounting and registers of take. The Inspector-General has expressed concern about shortcomings in SDL compliance in New South Wales and made strong recommendations to governments to act to address the issues raised.

Recommendations

This assessment is not comprehensive or complete, but it indicates poor Indigenous, environmental and social outcomes despite implementation of the Basin Plan and associated programs commenced. Despite A$13 billion committed to water reforms, trends of most indicators (74%) show no improvement or are worsening. Of those indicator targets that were met, five of seven were from the economic theme. Our results support the finding of other researchers that irrigators have fared better from the water reform process than the environment.

The Basin Plan is not due to be delivered in full until December 2027. However, after more than three decades of water reform, the objectives of the underpinning policy and legislative frameworks are still not being translated into effective actions and benefits in key sectors. The Basin Plan is due for review in 2026, and major changes will be required to governance and policy implementation if the status and trends of indicators and their associated targets are to improve.

Under pressures from unregulated water diversions, land-use change and global warming, Basin water reforms must be underpinned by rigorous monitoring and reporting if they are to deliver on intended outcomes. An important step towards improved monitoring and reporting would be to establish an independent assessment process to determine whether the objectives of the *Water Act* and Basin Plan are being achieved. Clear criteria of the effectiveness, efficiency and equity of policies, will need to be adopted and applied.

Improvements in data collection and analysis could be achieved at relatively little cost (compared with the price of already implemented water reforms) by improved co-ordination between Commonwealth and Basin State and Territory agencies and the mutual recognition and agency to co-ordinate monitoring and reporting activities more effectively and transparently.