

Online submission

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### **Australian Academy of Science submission on the 2026 Basin Plan Review**

The Australian Academy of Science (the Academy) welcomes the opportunity to comment on the *2026 Basin Plan Review*. This review is nationally significant. The Basin is home to 2.4 million Australians, 40% of all Australian farms, and contains a variety of unique and delicate ecosystems.

The Academy is an independent organisation of distinguished Australian scientists and plays a vital role in convening experts and providing evidence for decision-makers. The Academy has a proven ability to convene expertise on this topic through the [Investigation of the causes of mass fish kills in the Menindee Region NSW over the summer of 2018–2019](#).

As noted at the *Murray–Darling Basin Authority (MDBA) Basin Plan Review Stakeholder Roundtable: Science sectors* (held on 18 February 2026), an integrated approach is needed for the Basin Plan. In preparing this submission, the Academy has sought perspectives from experts in water quality, surface water hydrology, ecotoxicology, agriculture, geography, earth system science, and ecology, evolution and conservation science.

The Academy recommends that:

- Adjustments to the Sustainable Diversion Limits should be considered due to impacts of climate change on the environmentally sustainable level of take, and that Sustainable Diversion Limit accounting should be independently peer reviewed.
- Sustained, coordinated, national investment is needed in climate science to inform evidence-based decision-making in the Basin.
- Water quality targets are aligned with contemporary guidance, a wider range of water quality parameters are monitored, and real-time monitoring techniques are expanded.
- The high priority scientific knowledge gaps identified in the Academy's [2019 report](#) are reviewed by the MDBA as part of the 2026 Basin Plan Review.
- The revised Basin Plan should ethically include First Nations people's science and knowledge to inform Basin water management.

The Academy offers to convene scientific expertise to provide science advice to the MDBA to support the Review process.

#### [Sustainable Diversion Limits must consider climate change and be transparently reported](#)

A central purpose of the *Water Act 2007* is to reduce the amount of water being extracted from the Basin to environmentally sustainable levels. Sustainable Diversion Limits (SDLs) set the maximum volume that can be extracted from rivers and groundwater systems. By law, these limits must reflect an environmentally sustainable level of take (ESLT). Initial assessments shared in the Discussion Paper show that 8 surface water and 3 groundwater SDL units potentially do not reflect an ESLT.

There is an important need for this Review as pressures on the Basin continue or worsen. The [2025 Sustainable Rivers Audit](#) showed that the Basin has become hotter and drier, native fish populations are in poor condition, and waterbird numbers show a long-term decline. This is likely to get worse due to climate change, and the Basin Plan Review must acknowledge this.

However, the Discussion Paper states that "*Given the wide range of plausible climate futures, the Authority is not proposing changes to the Sustainable Diversion Limits in response to climate change*" (p.7) and suggests that the SDLs be assessed in future 10-yearly reviews. Climate change is already affecting the water resources in the Basin. If inflows decline but SDLs stay fixed, then the real environmental share of water shrinks over time.

The consequence of not adjusting the SDLs is the inevitable decline of the ecological condition that the plan is designed to restore. Deferring SDL adjustments to a future review cycle risks compounding ecological degradation that may be irreversible within meaningful management timeframes. **Protecting environmental water volumes from being reduced will require amendments to the Basin Plan.**

**Strong evidence-based actions will be necessary to improve the environmental sustainability of the Basin.**

The Review should assess whether environmental water is being deployed effectively to achieve ecological outcomes and consider whether improvements to targeting, timing, and coordination of environmental flows are needed alongside any adjustments to SDL levels.

The Discussion Paper sets out options to improve SDL accounting and reporting. **Independent peer review of SDL accounting is strongly advised.** There has previously been criticism about a lack of transparency in SDL compliance assessment.

[Climate projections need to consider the impact of vegetation growth and overall drying on flow](#)

The Academy welcomes the increased recognition in the Discussion Paper that the Basin must be understood as more than a hydrological system. There has previously been a basic assumption that water flows throughout the Basin are fundamentally linked with rainfall and human water use.

There is now an increased understanding that a warming climate is leading to eco-physiological responses, such as vegetation growth. Vegetation responses to a warming climate may be a larger driver of flow reduction than rainfall changes. In water-limited regions like the Basin, trees use water to increase growth, therefore decreasing runoff (Chiew et al., 2025). There is considerable complexity and uncertainty in how vegetation will respond to climate change. Understanding vegetation growth responses will need to be a larger component of the future climate science research agenda.

Current projections do not adequately reflect the likelihood that the Basin will be a lower-flow regime in a warmer climate unless rainfall increases substantially. These projections do not compensate for overall drying at the scales required. The Academy can convene scientific experts to provide a more detailed independent review of the climate modelling if it is of interest.

[Sustained, coordinated, national investment in climate science is needed to inform Basin management](#)

The Discussion Paper identifies an ongoing need to update climate science for Basin water management. Although the need for better climate intelligence is routinely called for, Australia's national capability in areas such as climate science and hydrological modelling is in long-term structural decline.

Major shifts at the CSIRO and Australian Climate Service away from fundamental research weakens the modelling capability required to support the Basin in the future. As noted at the inquiry into [Funding and Resourcing for the CSIRO](#), climate modelling was reduced in recent CSIRO cuts. As there is no other organisation with the capability to do this, this raises concerns that *"Australia may lose the capability to predict the future climate at the time when we need it most."*<sup>1</sup> Prof Hogg emphasised the importance of locally developed expertise for understanding future precipitation patterns in the Basin.<sup>2</sup>

**Sustained, coordinated, national investment in climate science is needed to inform Basin management and answer nationally significant climate questions.** Climate science research programs are currently distributed across several institutions, and none are tasked with coordinating the answers to critical questions about Australia's unique climate. The Academy has previously proposed the establishment of an Australian Institute for Earth System Science, a dedicated agency tasked with developing, coordinating and implementing national strategies to deliver answers to nationally significant climate questions.<sup>3</sup> Whatever institutional form it takes,

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<sup>1</sup> Direct quote from Prof Andy Hogg, Director of ACCESS-NRI, at the [Funding and Resourcing for the CSIRO public hearing](#) on 13 March 2026 in Canberra.

<sup>2</sup> See page 63 of the [Funding and Resourcing for the CSIRO report](#).

<sup>3</sup> Australian Academy of Science (2024). [A decadal plan for Australian Earth system science 2024–2033](#).

the core requirement is long-term national commitment to climate modelling capability that underpins evidence based Basin Management. The Academy recommends that the MDBA advocate to the Australian Government for this investment as part of the Review's findings.

### *Strengthening water quality management, targets and monitoring in the Basin*

The Academy welcomes the emphasis on water quality and collaboration in the Discussion Paper. However, Chapter 8 does not articulate how key objectives, such as strengthening water quality targets, will be achieved. Substantial effort will be required to translate these objectives into impact, and the MDBA will need to prioritise the following actions.

The revised Basin Plan will need to better integrate water quantity and water quality measures that together ensure water security. The Plan must also establish a framework for modelling water quality across the Basin for non-monitored locations and for future projections.

#### *Water quality targets should be aligned with contemporary science and guidelines*

**Water quality targets should be aligned with the latest guidance.** The *Basin Plan 2012* refers to the superseded [ANZECC & ARMCANZ<sup>4</sup> \(2000\) guidelines](#), which have since been replaced by the [Australian and New Zealand Guidelines for Fresh and Marine Water Quality](#) (ANZG, 2018). The revised Basin Plan should give greater prominence to the ANZG water quality objectives, particularly its [multiple lines of evidence](#) approach. ANZG documents regarding guideline values for toxicants (e.g., Warne et al., 2025) should be cross referenced in the updated Basin Plan.

#### *Identifying water quality hotspots requires fundamental science and expanded water quality monitoring*

The Discussion Paper notes that a shared and coordinated program is needed to identify water quality hotspots, including areas likely to be affected as climate risks intensify. As discussed in the National Climate Risk Assessment [Water Security Technical Report](#), more understanding of fundamental hydrological and biogeochemical processes is required to effectively identify these water quality hotspots under a changing climate. **This must be supported by existing monitoring networks and expanding water quality monitoring across the Basin.**

#### *Identifying diffuse pollution sources requires monitoring a wider range of contaminants*

The objective to identify diffuse pollution sources for known hotspots is commendable. **This will require modelling of contaminant loads and monitoring a wider range of parameters beyond salinity.** Monitoring data should be made more readily publicly available. This could be clearly communicated through regional report cards similar to the established [Reef Report Cards](#) model.

Effective management of hotspots should include an assessment of the risks, followed by implementation of solutions such as on-ground erosion work with land holders. Efforts to improve water quality for the [Great Barrier Reef](#), through improved land management practices, and reductions in fertiliser and pesticide use, offer a model for the kind of sustained, integrated approach needed in the Basin.

#### *Real-time monitoring of water quality is lacking in the Basin*

As noted in Chapter 11, real-time monitoring of water quality in the Basin is lacking and requires urgent attention. Key gaps include continuous sensor networks for nutrients, dissolved oxygen, and algal indicators at high-risk locations. **The Academy supports more extensive use of real-time monitoring techniques** (such as satellite and drone monitoring technologies). This should supplement existing grab sampling and high frequency monitoring approaches in the Basin. There may be opportunities to leverage remotely sensed water quality information data from the [AquaWatch](#) mission. However, further work is still required to understand uncertainties and errors in remotely sensed water quality data.

A funding mechanism should also be established such that state-based budget constraints do not adversely impact spatial and temporal coverage of water quality monitoring within the Basin.

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<sup>4</sup> Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

### *Groundwater monitoring should be expanded to include other parameters and eDNA sampling*

As noted in the Discussion Paper, groundwater knowledge in the Basin is insufficient, and there is a need to build a stronger groundwater evidence base. There should be more evidence on groundwater quality beyond drawdown and salinity. **This could include setting groundwater quality objectives for other parameters including nutrients, pH and toxicants.**

The use of innovative tools such as environmental DNA (eDNA) can improve understanding of biodiversity and ecosystem health. The MDBA has previously conducted [eDNA testing](#) on surface water samples. **It would be particularly valuable to extend eDNA monitoring to include groundwater** to provide evidence on the diversity and distribution of stygofauna and microbes, which play important roles in ecosystem function.

### *Priority knowledge gaps identified in the Academy's 2019 report should be re-examined*

In its [2019 report](#) (p. 57), the Academy recommended investment in high priority knowledge gaps. **This Review provides an opportunity to reassess the knowledge gaps in the 2019 report and identify which remain unaddressed.** As reflected by the knowledge gaps identified in Chapter 11 of the Discussion Paper, many of these priorities are still relevant seven years later. Knowledge gaps that remain unaddressed include the interaction and responses of vegetation to changing CO<sub>2</sub> concentrations and increasing temperature, early warning of prolonged cease-to-flow conditions and ecological stress (including water quality and algal status), and Indigenous access to water. An overall decline in funding for water research was noted in the 2019 report, with the loss of key agencies such as Land and Water Australia and the National Water Commission. This decline in funding has not been reversed, and there is a clear need for this research to meet water governance and management challenges.

### *First Nations peoples' science and knowledge should be ethically included in the Basin Plan*

The Academy welcomes the proposed options to strengthen opportunities for First Nations peoples in developing priorities and strategies. This is important for making better decisions about how water is used for the environment, and to care for rivers and Country in a meaningful way. The Academy's [2019 report](#) recommended improving meaningful engagement with Indigenous peoples and inclusion of Indigenous values in water resource planning.

**The revised Basin Plan should ethically include First Nations people's science and knowledge to inform Basin water management.** Researchers have called for more Indigenous-led water research to be integrated into science and policy (Maclean et al., 2012; Jackson et al., 2015; Moggridge and Thompson, 2021), and for analysis of current water allocation mechanisms and the ongoing effects of policy Aboriginal people's ability to access, manage, care for and benefit from water (Hartwig et al., 2020; Jackson, 2022).

Research conducted in partnership with First Nations leaders and community members from the Murray Darling Basin region has provided insights into the effects of changes in water availability on Indigenous peoples of the Basin (Jackson et al., 2010), and governance challenges faced by First Nations peoples (Maclean et al., 2012; McLean et al., 2018; Moggridge et al., 2019; Davies et al., 2021).

Tools and methods to support First Nation Peoples' involvement in water governance discussions and decision-making include principles for culturally appropriate methods to engage Aboriginal people (Moggridge et al, 2019), a framework to identify and quantify specific Indigenous requirements and a methodology to integrate Indigenous objectives into environmental flow assessments (Jackson et al, 2015), and operationalising the ecosystem services approach in water planning with a focus on First Nation cultural values for specific places in the Basin (Bark et al, 2015). **These tools should be considered when engaging with Indigenous people to ensure methods are culturally appropriate, and that water planning includes Indigenous values.**

The Murray–Darling Basin is one of Australia's most significant and complex natural systems, and its long-term health depends on water management that is grounded in current science, adequately resourced, and genuinely inclusive. This submission has identified several areas where the revised Basin Plan can be strengthened: aligning Sustainable Diversion Limits with climate realities, modernising water quality targets and monitoring, addressing unresolved knowledge gaps from the Academy's 2019 report, and ethically integrating First Nations science and knowledge. Sustained national investment in the underlying research and climate modelling capability is essential if these improvements are to be durable.

To discuss or clarify any aspect of this submission, please contact Lauren Sullivan, Science Policy and Advice Manager at [science.policy@science.org.au](mailto:science.policy@science.org.au).

## References

- Bark, R. H., Barber, M., Jackson, S., Maclean, K., Pollino, C., Moggridge, B. (2015.) Operationalising the ecosystem services approach in water planning: a case study of indigenous cultural values from the Murray–Darling Basin, Australia. *International Journal of Biodiversity Science, Ecosystem Services & Management*, 11(3), 239–249 <https://doi.org/10.1080/21513732.2014.983549>
- Chiew, F.H.S., Devanand, A., Khan, Z., Zheng, H., Potter, N.J., Robertson, D.E., Grose, M.R., Post, D.A., Fu, G. (2025.) Hydroclimate Projections for the Murray-Darling Basin. CSIRO report from Module 1 of the MDB Sustainable Yields Project, 131 pp.
- Davies, S., Wilson, J., & Ridges, M. (2021). Redefining ‘cultural values’ – the economics of cultural flows. *Australasian Journal of Water Resources*, 25(1), 15–26. <https://doi.org/10.1080/13241583.2020.1795339>
- Hartwig, L.D., Jackson, S., Osborne, N. (2020.) Trends in Aboriginal water ownership in New South Wales, Australia: The continuities between colonial and neoliberal forms of dispossession, *Land Use Policy*, Volume 99,104869 <https://doi.org/10.1016/j.landusepol.2020.104869>.
- Jackson, S., Moggridge, B., Robinson, C. (2010.) Effects of changes in water availability on Indigenous people of the Murray Darling Basin: a scoping study. *Report to the Murray Darling Basin Authority*. <https://doi.org/10.4225/08/5850382fb0b86>
- Jackson, S., Pollino, C., Maclean, K., Bark, R., Moggridge, B. (2015.) Meeting Indigenous peoples' objectives in environmental flow assessments: Case studies from an Australian multi-jurisdictional water sharing initiative, *Journal of Hydrology*, 522:141-151, <https://doi.org/10.1016/j.jhydrol.2014.12.047>
- Jackson, S. (2022). Enacting multiple river realities in the performance of an environmental flow in Australia’s Murray-Darling Basin. *Geographical Research*, 60(3), 463–479. <https://doi.org/10.1111/1745-5871.12513>
- Maclean, K., Bark R.H., Moggridge, B., Jackson, S., Pollino, C. (2012.) Ngemba Water Values and Interests, Ngemba Old Mission Billabong and Brewarrina Aboriginal Fish Traps (Baiaime’s Nguunhu). CSIRO, Australia. <https://doi.org/10.4225/08/584d948534b2d>
- McLean, J., Lonsdale, A., Hammersley, L., O’Gorman, E., Miller, F. (2018.) Shadow waters: Making Australian water cultures visible. *Transactions of the Institute of British Geographers*, 43:615–629. <https://doi.org/10.1111/tran.12248>
- Moggridge, B. J., Betterridge, L., Thompson, R. M. (2019.) Integrating Aboriginal cultural values into water planning: a case study from New South Wales, Australia. *Australasian Journal of Environmental Management*, 26(3), 273–286. <https://doi.org/10.1080/14486563.2019.1650837>
- Moggridge, B. J., Thompson, R. M. (2021.) Cultural value of water and western water management: an Australian Indigenous perspective. *Australasian Journal of Water Resources*, 25(1), 4–14. <https://doi.org/10.1080/13241583.2021.1897926>
- Warne, M.St.J., Batley, G.E., van Dam, R.A., Chapman, J.C., Fox, D.R., Hickey, C.W., Stauber, J.L., Fisher, R. (2025.). [Method for deriving Australian and New Zealand water quality guideline values for protecting aquatic ecosystems from toxicants – update of 2018 version](#). Prepared for the Australian and New Zealand Guidelines for Fresh and Marine Water Quality.