SUBMISSION

Submission to the Productivity Commission

Submission to the Murray-Darling Basin Plan: Implementation Review 2023

31 July 2023

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

The Murray-Darling Basin (MDB or Basin) is enormously important to Australia. Its water covers about 14% of Australia's total land area (ABS, 2010), and about 8.7% of all Australians, including 40 distinct Aboriginal groups, live in the Basin. The populations of Adelaide and Canberra are directly dependent on the Basin's water supply. The Basin produces more than 40% of Australia's agricultural commodities, and attracts tourism earnings of about $11 billion annually (MDBA, 2023). Australia is the world's driest inhabited continent: efficient water quality management and distribution is critical for current and future generations. ATSE advocates an evidence-informed, long-term approach to Basin planning. The following recommendations are proposed with the goal of improving water governance, sustainability, recovery, quality management, and distribution activities:

Recommendation 1: Develop strong and effective guidelines for collaboration among the state bodies and the Murray–Darling Basin Authority (MDBA) using a science-informed and technology-based approach.
Recommendation 2: Amend the *Water Act 2007* to state the order of importance of its objectives.
Recommendation 3: Use water management technologies to standardise monitoring data across Basin states and institutions.
Recommendation 4: Prioritise the integrated development plan for Digital Twin systems for long-term sustainable water management.
Recommendation 5: Modernise the Integrated River System Modelling Framework (IRSMF) facilities to enable cloud computing access for external experts.
Recommendation 6: Assess the water recovery activities and adopt highly effective and proven pathways for buyback to implement the Sustainable Diversion Limits.

Creating trusted governance structures for the Basin

The environmental health of the Basin is of growing concern, with climate change expected to continue to present further risks to the Basin. ATSE advises that the Plan's design and implementation must be grounded in the best available evidence, with the goal of improving the health of the Basin and its natural habitats, and preserving it for future generations that will rely upon it for drinking water, agriculture, sustainable communities and industries. ATSE is currently preparing a collection of peer-reviewed articles taking a long-term view on the challenges and adaptations needed for the Basin. This draws together expert views and will be made available to the Review and other relevant parties, to provide an evidence base for Basin policymaking in the context of increased impacts of climate change.

There are complex sets of regulations throughout all Basin states that are applied to manage distribution of water between and within themselves. The Australian Competition & Consumer Commission has addressed the lack of accountability in water market activities due to the numerous state and federal authorities with unclear role delineations(ACCC, 2021). Though the Murray-Darling Basin Authority (MDBA) administered all regulatory activities until 2019-2020, the office of the Inspector-General of Water Compliance (IGWC) has been working since 2020-2021 to ensure Basin states are in compliance (i.e., with the sustainable diversion limits (SDL)). This complements the MDBA's annual reporting and monitoring. Differing short-term, state-based interests have resulted in accusations of water theft and breaches of the *Water Act 2007* (Australian Government, 2007). It is critical to establish and enforce a fair distribution of water for Basin states and stakeholders, while ensuring that sufficient water remains in the Basin to support its environmental, cultural and ecological river health across various time-scales and a changing climate.

There is a need to ensure collaboration and trust between Basin states, authorities and stakeholders by establishing a strong scientific basis for data-informed decision-making and ensuring Basin communities are involved. Long-term whole-of-Basin health must be the primary consideration, over and above short-term state-based interests. The Plan must be reviewed to account for climate change. A range of factors including current governance and institutional arrangements, inadequately defined project objectives, and poor implementation have resulted in a lack of delivery of existing commitments under the Plan. It is imperative to develop trusted and independent governance structures and decision-making processes that are respected by all Basin stakeholders, to utilise scientific evidence and expertise, and to be inclusive of

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Basin communities including Traditional Owners (Austin, 2022). This would also enable more constructive responses to failures such as the Menindee fish kill events.

Noting that the original Basin Plan was passed in the Federal Parliament with bipartisan support, the fundamental requirement for delivery of the Plan is also non-partisan collaboration and agreement between all Basin governments, in the national interest. The *Water Act 2007* sets out its first objective of enabling the Commonwealth to work with Basin states to manage water in the national interest, and also includes an objective of managing water in a way that optimises economic, social and environmental outcomes (Australian Government, 2007). However, the ability to meet these objectives is constrained by the compromises made in Basin management. To enable a return to these objectives, it is recommended that the Australian Government, in collaboration with Basin states, enacts legislative reform to provide clarity on how these objectives are to be reached, and to give primacy to the national interest objective.

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Modernising infrastructure for MDB measurement, modelling and analysis

The current water resource models[1] for the MDB typically use historical data from 1895 to 2009 including the federation and millennium droughts data (MDBA, 2020). Throughout the Basin, there are numerous region-specific computer models, which are now connected by the Integrated River System Modelling Framework (IRSMF) developed by CSIRO during 2007-2008 (Ward, 2011). The in-progress Integrated River Modelling Uplift is planned to integrate all models by 2024. Increased challenges to protect the ecology, water, communities, and the economic activities in MDB regions require a more advanced and efficient computational framework with real-time, standardised data availability for sustainable decision making. ATSE recommends extending Uplift improvements by standardising water management technologies and terminology, implementing digital twinning, and allowing researchers external to the MDBA to access models.

The results of computational river management modelling largely depend on the data inputs that are collected through use of advanced technologies for data collection, data management and transfer systems. ATSE has highlighted the necessity of prioritising water monitoring and management systems by implementation of emerging technologies for accurate data collection, management, transfer, and utilisation that will inform relevant decision making (ATSE, 2022; ATSE, 2023). The MDBA and IGWC can support whole-of-Basin governance by standardising technology and terminology used in different states and by increasing transparency. Standardised and adequate measurement (e.g., of flood plain harvesting, dam levels, direct water withdrawals, flow rates, and water quality measures) across the Basin is the first step towards strengthening compliance.

The transformation to digital twin technologies (virtual representations of physical objects, often with real-time data feeding in from sensors on the physical object) would be a further improvement for Basin modelling, maintenance and planning (Harris, 2021, Queensland Government, 2023). If water management technologies are upgraded to collect standardised data throughout the Basin, this data can be fed in to MDBA-managed digital twins to create simulations using the most up-to-date and comprehensive information. This can enable stakeholders and decision-makers to interface with the digital twin to the assess cause and effect for a multitude of water quantity and quality scenarios, socio-economic measures, engineered infrastructure and climate change.

Facilitating research access to Basin models and data would provide an opportunity to expand the evidence base. Currently, there is a limited functionality software “eWater source” from the MDBA for external experts

[1] These models are hydrological (which simulates flow and behaviour of water) and hydrodynamic (which models how water moves in a system) (MDBA, 2020).

to conduct computational analysis (McKerrow and Robers, 2023). Independent reviews have identified limitations in current computational facilities and recommended model improvement for the future uses (Bewsher Consulting Pty Ltd., 2019, Jakeman et al., 2019). Expanding access to advanced computational facilities to experts outside the MDBA via cloud computing, with suitable security in place, would enable improved evaluation of the impacts of Basin activities. Through resource sharing, external experts could contribute model evaluation activities (i.e., documentation, data utilisation, model development and improvement, integration, calibration, verification, validation, sensitivity and uncertainty analysis, quality assurance, and forecasting accuracy) that can assist in Basin Plan implementation (Jakeman et al., 2019) .

Recommendation 3: Use water management technologies to standardise monitoring data across Basin states and institutions.
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Safeguarding the Basin's future with water recovery

The Australian Government may purchase water entitlements or temporary water allocations through the Commonwealth Environmental Water Holder as a form of water recovery for river systems and surrounds. Water availability throughout the Basin regions is variable due to diversity in landscapes and climate across the states through which the MDB catchment areas have developed. For a sustainable future for the MDB, there is a need for water to be shared more effectively, including in low flow years. It is important to understand where water resources are overallocated, and determine the most effective way of returning water to environmental, cultural and community use.

Sustainable Diversion Limits restrict the amount of water that can be taken from the system overall and from different areas. Progress to these limits is supported by the Sustainable Rural Water Use and Infrastructure Program (SRWUIP), which is designed to use infrastructure development funds to recover water from both off-farm and on-farm activities of water right owners. The recovered water (known as 'bridge the gap') is then shared for environmental and agricultural purposes where required. Some flexibility is introduced by the Sustainable Diversion Limit Adjustment Mechanism (SDLAM), which includes water recovery projects in Basin states. However, existing projects are not sufficient to keep within Sustainable Diversion Limits. Historically, the Australian Government purchases water through open, competitive tenders and strategic purchasing plans. Grafton and Wheeler (2018) have reviewed different approaches of water recovery for the MDB regions and determined that buyback (i.e., direct purchase of entitlements from willing sellers through voluntary and strategic entitlements) is one of the best options. The challenges around buybacks must be resolved to deliver existing commitments under the Plan.
ATSE advises developing high-level, transparent strategic action plans to assess all water purchase activities.. Both the water buyback (Wheeler, 2023) and the efficiency improvement programs should be assessed to identify their potential contributions to short-term recovery plans as well as to long-term Basin outcomes (ATSE, 2023).

Recommendation 6: Assess water recovery activities and adopt highly effective and proven pathways for buyback to implement the Sustainable Diversion Limits.

ATSE thanks the Productivity Commission for the opportunity to respond to the consultation on the Murray-Darling Basin Plan: Implementation Review 2023. For further information, please contact academypolicyteam@atse.org.au.

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