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Briefing Note

Inquiry into the Water Amendment (Restoring Our Rivers) Bill 2023

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Introduction

Thank you for holding this hearing and inviting me to provide a perspective on research findings. My career has spanned 20 years and my research has predominantly focused on matters relating to fisheries and river management. Much of my work has focused on fisheries management, environmental water outcomes and the development of "complementary measures" which are management interventions implemented in addition to e-water initiatives and can be strategically deployed to maximise environmental watering outcomes. In recent times I have been called to provide expert advice to two panels which have investigated fish kills in the Darling-Baaka. The "Vertessy Panel" (2018-19) investigated three separate fish kill events which occurred during drought conditions. The "NSW Chief Scientist" panel investigated a significant event in 2023 where an estimated 30 million fish perished following a flood event. Both of these experiences have provided a detailed opportunity to explore, in detail, a range of matters related to river health and environmental outcomes in the Murray-Darling Basin. These are extremely relevant to the proposed, Restoring our Rivers, amendment. I am happy to respond to any questions which focus on the science behind environmental water delivery, fish kills, fisheries resources and/or complementary measures as means to achieve environmental outcomes.

Critical background

Despite being in a semi-arid region, the Darling River flows for over 90% of the time (gauged data, 1885-2019). Droughts and zero flows are a natural feature of the Darling River and fish, and other aquatic biota, have adapted to cope with these situations when they have historically occurred. But the nature and extent of droughts have changed in recent times. Floods were also far more frequent in the past. Points of significance include that:

1. At low flows, critical flowing river habitat now only occurs in reaches between weirpools on the Barwon-Darling (Baawan-Baaka). Low flows are only a trickle (e.g. typically <5 ML per day at Wilcannia during the Millennium Drought), compared with past droughts (e.g. 250-400 ML/d in 1895-1903) when the low flows were enough to create a flowing river.
2. A flowing river is critical for fish like Murray cod and silver perch to reproduce and survive. A flowing river requires baseflows and less weirpools.
3. The impacts of recent extended periods of low and zero flows are highly exacerbated by weirs which create deep weirpools that prone to stratification which encourages blue-green algae; compared with shallower natural pools.
4. The frequency of small natural floods is reduced. Normally, these small floods would carry leaf litter (and carbon) off the floodplain every year or two, but now – in the absence of frequent small floods - carbon accumulates on floodplains over many years. The increase in flooding intensity due to climate change now mobilises carbon from the floodplain (i.e leaf litter in floodwaters) at a much greater level; and hence, it leads to greater oxygen demand - which results in blackwater - and fish kills.
5. Floods are now bigger and shorter term in duration. They are also now associated with adverse water quality events (such as black water or extreme low oxygen).
6. There is an increase in adverse environmental impacts during some flood events; especially in the southern basin.
7. There has also been, in recent times, an increase in fish kill events where large numbers of fish are lost from rivers. It can take the river decades to recover from these events.
8. Managing flows well, and adding effective complementary measures, is the key to stabilising and improving the situation (An example is provided in Attachment 1).

Relevance to the *Water Act 2007 (Restoring our Rivers amendment)*

Additional time to deliver basin plan: This amendment is welcomed. Implementation of the Basin Plan has been significantly hampered. A range of critical projects have not commenced and, subsequently, it is impossible to assess whether these have been successful. The key activities of note include delivery of the northern basin toolkit (a suite of complementary measures across the Northern Basin) and the Sustainable Diversion Limit Adjustment Mechanism (SDLAM) projects. These projects are all designed to deliver water savings and environmental outcomes but without completion, operation and monitoring, it is impossible to assess whether benefits have acrued.

Additional water recovery: Water is life. Rivers cannot function without reliable, good quality, water. It is noted that water recovery is a critical component of the amendments. It is important that any additional water recovery proceeds based on a well-established plan. The plan needs to ensure that water is available, in the regions that need it, when it is urgently required. Any further water recovery should consider a suite of possible mechanisms including operational approaches, efficiencies and/or buybacks, but would need to occur in the regions that need it most and create the flowing water habitat which has been steadily in decline.

Environmental Water has delivered benefits: There is overwhelming evidence that water delivered for environmental outcomes has provided benefits. This is validated by the extensive, and publicly available, monitoring data. Environmental water is contributing to breeding events (fish, birds and vegetation), migration events, improving region-scale connectivity, dispersing poor water quality, generating improvements to food webs and enhancing habitat availability. These benefits would not have accrued if environmental water had not been delivered.

Water Quality is Important. The recent events in the Darling-Baaka, combined with the many “blackwater” events of recent times, serve as a reminder that water delivery is meaningless if the water is not of sufficient quality to sustain life. Changes to the act, in particular projects considered for funding from the WESA account, need to ensure that operationalisation does not compromise water quality. Estimating the risk of stratification, or black water, should be key decision-making determinants.

Complementary measures can assist. There is now a significant knowledge base, bound by rigorous science, that suggests that habitat rehabilitation, re-snagging, revegetating riverbank and fencing to prevent stock in the river not only enhance environmental outcomes but offer a major opportunity for positive community engagement. Investing in green Infrastructure: screens on pumps; fishways; gates on weirs (to allow low flows to pass), floating solar have all been shown to provide direct environmental benefits. These are examples of what should be able to be considered as WESA projects to enhance outcomes.

Climate change has occurred. The overwhelming findings of previous panel investigations is that the basin experiences significantly more extreme weather events that it did 50 years ago. These are creating more intense drought and flood events. We are also now seeing the transition from drought to flood, and back, at a more rapid rate than has ever been observed. For instance, there was a transition from a fish-kill inducing drought, in 2018/19, to a fish-kill inducing flood in 2023. The climatic cycle is clearly different than when many operational rules were drafted. They are also different than when much of the basin’s water infrastructure was constructed. The resultant situation is more stress on the environment and people who depend on water. Solutions need to be integrated, they need to be co-designed and they need to be demonstrated to work.

Monitoring and Research is important: Recovering the Murray-Darling Basin will require trial and error. We are embarking upon something at a significant scale crossing multiple disciplines and stakeholders. Some interventions are already being demonstrated to succeed. But some may also ultimately fail. Failing is a cornerstone of adaptive management. But it is important that we fail fast and that we fail forward. Learnings from successes and failures can only occur if there is a strong underpinning monitoring program which is feeding back into decision making processes. But it is also important that these learnings are made publicly available and disseminated in the appropriate way. A strong and robust monitoring plan should be a key part of any amendments.

How much is enough? We will know when the combined effects of water recovery and complementary measures is “enough” once we have seen the collective benefits accrue. For instance, we should not be seeing millions of fish dying repeatedly in mass events. We should not be seeing ongoing decline of species at a basin scale. We should not be seeing thousands of kilometres of river experiencing water temperatures much lower than should be experienced. We should not be seeing extensive and prolonged blue-green algal events. We should see fewer of these when the combined benefits of operational changes, water recovery and complementary measures are having a positive impact.

Attachment 1: Example of an integrated suite of solutions to solve an environmental issue. Example sourced from the NSW chief scientist investigation into the 2023 Darling Fish Kills.

Recommendation 4: Interventions to mitigate against future mass fish deaths

An integrated suite of strategies should be designed and implemented to reduce the risk of further mass fish deaths and restore the health of the broader river ecosystem. These strategies should include improved monitoring, data collection and sharing, and be integrated with other recommendations in this report. The strategies should ensure risks are identified and managed, impacts quantified and adaptive learning implemented.

These interventions should at least include:

Immediate term measures (0-12 months) to manage water quality should focus on maintaining dissolved oxygen in the Menindee weir pool. Potential interventions include:

a. modifying the nature of environmental and other water releases (such as pulsing releases) to maximise desired benefits.
b. pumping/recirculation infrastructure to enable water release from Pamamaroo outlet without exhausting environmental water holdings.
c. investigating the feasibility of oxygenation infrastructure to maintain refugia in designated areas.
d. reducing oxygen demand in the Menindee weir pool by reducing biomass - including fish removal (especially carp) and suppression of algal growth
e. applying short-term technical fish passage solutions to create temporary opportunities for fish to progress upstream.

Mid-term strategies (1-5 years) include:

a. construction of fishways identified in the NSW Fish Passage Strategy. Priority and resourcing should be given to the construction of effective fishways to maximise fish mobility above the Menindee weir pool.
b. an integrated national invasive fish species management strategy be finalised and resourced. Implementation of the strategy should be accompanied by an information, communication, and education plan, informed by local and Aboriginal knowledge, and subject to monitoring and annual reporting of actions, impacts and adaptive management responses.

Long-term strategies (ongoing) include:

a. restoration of flow regimes and connectivity across the catchment
b. water quality – accounting and management of nutrient inflows across the catchment
c. coordinated and systemic ecosystem regeneration strategies, inclusion of Aboriginal people's knowledge, including R&D and scale up of refugia for fish, invertebrate and other species.
d. in addition to other performance and impact metrics, the strategy should include monitoring of iconic long-lived animal, plant and invertebrate species recognised for their contribution to river health, including species identified as culturally significant to Indigenous communities.