



UNSW
AUSTRALIA



**Submission on the review of
the Water Sharing Plan for
the Barwon-Darling
Unregulated and Alluvial
Water Sources 2012**

**to the Natural Resource
Commission**

**Centre for Ecosystem Science,
UNSW, Sydney**

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1. Executive Summary

There has been considerable public attention on the effect of the Water Sharing Plan for the Barwon-Darling and Alluvial Water Sources 2012 and in particular the changes made to the plan after public consultation which have proved to have significant effects on the river environment. Many of the rules and practices which were changed remain in the current plan under review by the Natural Resources Commission. In addition, the state of the Darling River continues to decline, most severely seen with the massive fish kill at Menindee in 2018/2019 and the river running out of water for towns and traditional owner communities and affecting a range of ecosystem services. Some of these impacts were exacerbated by the current drought but also compounded by the effects of increased diversions of water, particularly during low flows. This submission highlights six areas requiring significant changes to ensure that the plan meets the objectives of the *Water Management Act 2000* and also the policy framework of the plan (i.e. vision, objectives) and that of the Murray-Darling Basin Plan. Specifically, there are six key areas in which this plan will not currently meet the vision of the plan or the objectives of the *NSW Water Management Act 2000* or the *Water Act 2007*.

Objectives, strategies and performance indicators

The current objectives, strategies and performance indicators do not adequately specify how the vision of the plan can be met. They are insufficiently specific to be measurable and inadequately specify the environmental values and objectives already known and specified under the Murray-Darling Basin Plan. In particular, such values need to be specified and linked to flow regimes for accountability.

Water allocation accounts and management rules

Major degradation in the Barwon-Darling River has resulted directly from changes to management of water allocation accounts and management rules. In particular, the 300% carryover of water ensures that the river is not able to recover during wet periods, given that considerable amounts of water can be pumped. This rule needs to be changed to reflect the plan at the time of public consultation. In addition, access to the river during low flows and cease to flow periods should not be permitted. Changing the management of the river to an event based focus is recommended, as long as it does not increase the 'take of water' at different parts of the flow regime.

Changes to licences and removal of restrictions on pump capacities

The amalgamation of A class licences, their transfer, and increased pump sizes have damaged low flows in the river, led to the diversion of 'environmental water' and considerably impacted on the ecological resilience of the river and contributing to increased blue-green algal blooms and ultimately fish deaths in the river. Current management of the river with models does not adequately capture these changes. This issue could be addressed

by reducing pump capacities, restricting access to low flows and potentially purchasing A class licences.

Increases in off-river storages in the Barwon-Darling and tributary river catchments and the effects of increased 'take of water' with floodplain harvesting;

There has been an increase in the numbers and volume of off-river storages in the Barwon-Darling and its tributaries increasing the potential 'take of water' through floodplain harvesting. There is a need for an audit of structures and their potential take in relation to 1993/1994 levels of development, as agreed under the Murray-Darling Basin Cap. Floodplain works should not be licenced if established after this period and removed if they are diverting water from the river. There needs to be a regular program of metering and tracking flows harvested from the floodplain, reporting transparently to the public.

Modelling of river flows for managing 'take of water' under this plan and the Murray-Darling Basin Plan

Current hydrological modelling inadequately track changes in river flows, particularly low flows and floodplain flows. Further the modelling does not incorporate many of the changes to flow rules or user behaviour which have occurred in this river over time. As such, the models inadequately represent change, underestimating impacts to the river and its dependent communities. There needs to be transparency about such uncertainties and increased use of multiple lines of evidence, reporting on actual data on diversions and ecosystem condition. In particular, there needs to be a review of the Murray-Darling Basin Cap level for this river and analysis of actual data which includes all diversions (including floodplain harvesting) to determine the level to which the cap is meant. It is not good enough to simply rely on IQQM modelling.

Specification and management of environmental water

Environmental water is primarily specified by determining what is left in the river following access to river water, primarily for irrigation. In addition, this is determined primarily through the use of modelling, which has its uncertainties. There is a need for improved specification of environmental water in the river through particular measurement points. There is also a need to protect environmental water flowing from tributary river catchment, through rules on the connectivity so they are not pumped to irrigate crops as they can be at present.

Management of the river in the face of increasing climate change

Increasing temperatures in NSW and Australia are leading to more evaporation and less water in the rivers for users and the environment. The plan poorly deals with this problem. There should be explicit ways in which the problem of diminishing flows will be managed so there is equity among all users, including the environment. Currently the environment is

likely to meet much of this impact, affecting planned environmental water.

2. Centre for Ecosystem Science, UNSW Sydney

The Centre for Ecosystem Science, UNSW Sydney, supports instruments of government, including natural resource plans that improve effectiveness of water management for communities, ecosystem services and the environment, founded on a strong evidence base. Researchers in Centre for Ecosystem Science have established track records in the research and management of the rivers in New South Wales, including the Murray-Darling Basin (<https://www.ecosystem.unsw.edu.au/>). The Centre for Ecosystem Science welcomes the opportunity to provide a submission on the Barwon-Darling Unregulated and Alluvial Water Sources 2012. The Centre for Ecosystem Science have considerable expertise in policy, legislation and research on management of rivers and dependent ecosystems.

3. Vision for the Barwon-Darling Unregulated and Alluvial Water Sources 2012

Assessment

The vision for this plan is robust, relevant and applicable to the legislation frameworks for managing this river. However, there is little evidence in the detailed sharing of the waters of the Barwon-Darling that there is any prospect of achieving “...*healthy and enhanced water sources and water dependent ecosystems*”. Long-term degradation is continuing to occur in this river, as a result of increasing diversions from the catchment and its tributaries and inadequate policies to constrain growth in diversions. The supporting detail in this plan will not adequately provide the policy and management mechanisms to reach the vision articulated for the plan.

There is inadequate regulation or reporting of floodplain harvesting, river interception and insufficient transparent reporting of diversions. Current policy and management rely primarily on hydrological modelling to provide information for regulation, policy and reporting. This remains insufficient. It is critical that multiple lines of evidence and information be used and reported in relation to metered diversions, floodplain harvesting and the state of ecosystems. There is also insufficient detail on the dependent ecosystems and key performance indicators in relation to flows or environmental outcomes that would provide the public with sufficient certainty that the plan is delivering on the vision and its objectives. Specifically, there are six areas where this plan will not deliver unless significant change are made:

- objectives, strategies and performance indicators;
- water allocation and management rules; changes to licences and removal of restrictions on pump capacities;

- increases in off-river storages in the Barwon-Darling and tributary river catchments and the effects of increased ‘take of water’ with floodplain harvesting;
- modelling of river flows for managing ‘take of water’ under this plan and the Murray-Darling Basin Plan;
- specification and management of environmental water and;
- management in the face of increasing climate change.

These are presented in more detail in relevant sections below, followed by recommendations.

4. Objectives, strategies and performance indicators

Assessment

Objectives, strategies and performance indicators are currently poorly specified and not measureable. This makes it impossible to identify whether the plan meets its objectives under legislation. There is a general lack of information on the environment and cultural values, which are well known and established, in other government policy and legislative areas. In particular, the following issues are problematic.

- i. The objectives reflect the vision of the plan reasonably well but lack specificity for clear accountability and linking of performance indicators.
 - a. In particular, there is no list or even broad specification of river flow dependent or groundwater dependent ecosystems. This is despite listing of nationally important wetlands in the Directory of Important Wetlands (e.g. Tallywalka system) and dependent ecosystem identified by the Murray-Darling Basin Authority. Further the background document to the plan makes little commitment to the protection of wetlands (Section 6.2.1.3), as required by the legislation.
 - b. There is also no specification of the threatened Lower Darling Ecological Community or threatened species dependent on river flows (e.g. silver perch).
 - c. There is similarly no specificity in identification of Aboriginal, cultural and heritage values.
- ii. It is not clear how the objectives in the plan link to the environmental objectives specified by the Murray-Darling Basin Authority in terms of key sites and environmental objectives (vegetation, fish, waterbirds).
- iii. The strategies are similarly broad and do not clearly link the objectives to performance indicators.
- iv. Performance indicators are inadequately specified. There should be considerably more detail ensuring they are measureable and can adequately be used to link to flow thresholds and volumes, used in the management of the river. There is a considerable contrast in the specificity detailed in the plan for water access compared to required specificity for environmental flow management.
 - a. Simple specification of changes to low, moderate and high flow regimes are inadequate. There should be clear articulation of what these measures

actually mean and where are they measured and how they link to the objectives and vision. There should be clear flow thresholds, which ensures that the plan and its management have accountability.

- b. There needs to be actual measures and surveys of ecosystem health, once better specified, to determine if the plan is failing the vision and its objectives. It is currently not clear which ecosystems might be measured to determine the effectiveness of the plan.
- c. Extraction limit measurements should provide actual data on diversions. There need to be measures of drivers of impacts (i.e. diversions from the river, groundwater, floodplain harvesting, interceptions), not simply modelling outputs.

Recommendations

- i. Objectives need to be much better defined and clear, using the available information and commitments by the NSW Government to environmental management, including environmental requirements identified by the Murray-Darling Basin Authority.
- ii. There need to be clear strategies which can be specifically linked to clear objectives and performance indicators.
- iii. Performance indicators are currently inadequate. They need to focus on reporting on all actual diversions along the river (river, interceptions, floodplain harvesting).
- iv. Performance indicators need to specify ecosystems, as identified by the legislation and the vision. A list of key ecosystems on the river and their requirements are required, followed by measurement of their condition. Even if there are relatively few of these, it is imperative that they are specified.
- v. Transparent reporting is required for all performance indicators.

5. Water allocation accounts and management rules

Assessment

The focus on management of the Barwon-Darling River, following major ecological disasters is considerable. It is particularly important to address long-term contributory impacts to these ecological and community problems, given the effects throughout the river system experienced during the recent drought. Changes to water allocation accounts and management rules are particularly important with considerable impacts on the condition of the river. In particular, the following issues are problematic.

- i. Section 42(3) states "water taken...must not exceed a volume equal to three times the share component of the access licence plus...". This rule links 'take' related to the account balance, not the size of the licence. Other unregulated Water Plans for unregulated resources limit take to allocations. This is not only an inequity but this clause also allows for high diversions, detrimentally affecting river flows and impacting on the vision and objectives.
- ii. The current strategy for managing the Murray-Darling Basin Cap in the Barwon-Darling is to cut volumes by a third but this rule for the account balance

essentially then provides a 300% take, allowing significant volumes to be diverted. On two occasions, Barwon-Darling accounts have been credited with 200% allocation as compensation for the changes. The large carryover essentially means that management to cap is not successful.

- iii. There is currently a decision to allow water extraction in low flow and no flow conditions (clauses 47-48, similarly for B class licences in anticipation of flows, clause 49), despite the poor ecological state of the river, particularly with pumping thresholds for A class licences under the base environmental flow in 1998/1999 flow rules.
- iv. Event based management of water is supported and should be implemented, allowing protection of some flows in the river but this must be regulated to ensure that there are limitations on the amount of water that can be taken from a particular event over all parts of the flow regime.

Recommendations

- i. Carry-over for the river should not be 300% but linked to available water. This would assist managers in meeting the diversion levels of the Murray-Darling Basin Cap.
- ii. Event based management of flows is essential
 - a. It requires good monitoring systems in relation to diversions and floodplain harvesting
 - b. It provides a mechanism for protection of planned and adaptive environmental water
 - c. It should not increase the take. In particular, management should not move diversions to particularly parts of the flow regime, such as high flows, by way of substitution. High flows are also critical for connecting wetlands, providing water to floodplain communities and breeding and recruitment opportunities (e.g. native fish species).

6. Changes to licences and removal of restrictions on pump capacities

Assessment

Major changes have occurred to licences, resulting from changes in rules and user behaviour which have had a long-term detrimental impact on the state of the river and its ability to deliver ecosystem services to downstream communities. In particular, the following issues are problematic.

- i. A class licences have been amalgamated for large parts of the river and concentrated to a few users; this has occurred with the removal of restrictions linking water use to land use.
- ii. This has increased the 'take' at low flows, affecting ecosystems and the resilience of the river, with more activation of A class licences.
- iii. Increased planned and adaptive environmental flows are reaching the Barwon-Darling from tributary rivers (e.g. flows from the Macquarie River) but these are not protected from diversions with A class licences.

- iv. The removal of restrictions on pump capacities for A class licences has allowed for more diversions from the river at low flow levels compared to before the Murray-Darling Basin Cap. This has also contributed to the increased 'take of water' from the river.
- v. Modelling of these changes and effects on policy, actual water and the ecological state of the river remain unknown, largely because these changes were not incorporated in the modelling. This is particularly problematic if the models are used to manage diversions (see general point below).
- vi. Similarly, changes to pump capacities for B class licences remain largely unknown, given that these changes are not incorporated in the modelling.

Recommendations

- i. Low flows should be protected by restricting access to the low flows to levels of 1993/ 1994 development as stipulated under the Murray-Darling Basin Cap.
- ii. The Government could consider buy back of low flow licences to reduce the pressure on the river.
- iii. Modelling should incorporate data on changes in all licences and the effects on diversions.
- iv. Actual data should also be regularly reported on diversions for different licence categories.
- v. Original pump size specifications for A class licences need to be reinstated (i.e. 150 mm diameter).

7. Increases in off-river storages in the Barwon-Darling and tributary river catchments and the effects of increased 'take of water' with floodplain harvesting

Assessment

There is evidence that diversions are increasing from the river, through the increased floodplain harvesting in the Barwon-Darling River and its tributary river catchments. This is contributing to the long-term ecological decline of the river and its services to communities. These issues are not adequately captured in current process of modelling and regulation. In particular, the following issues are problematic.

- i. The numbers of off-river storages and potential interception structures (channels and levees) has continued to increase in the Barwon-Darling and its tributary catchments since 1993/1994 levels of development (Australian Academy of Sciences 2019), making it difficult to track the extent of diversions after the Murray-Darling Basin Cap and the Murray-Darling Basin Plan.
- ii. There is little evidence that these changes were adequately incorporated into the hydrological modelling for managing the Barwon-Darling or other recent analyses (e.g. Northern Basin Review).
- iii. There is no public audit of the distribution of structures on floodplains, developed to divert and store floodplain waters.

Recommendations

- i. There is a need for an audit of the number, location of all structures on floodplains capable of diverting and storing floodwaters of the Barwon-Darling River.
- ii. Floodplain works should only be licenced if they were in place in 1993/1994, as agreed under the Murray-Darling Basin Cap.
- iii. There needs to be an analysis of the trajectory of change in the building of these structures since 1993/1994 (Murray-Darling Basin Cap) to determine how much water they divert from the river and the effects on river flows and downstream communities.
- iv. To bring the river back to Cap, there should be a program of assessment and structural adjustment for removal of these structures if they are legal and removal if they are illegal.
- v. Models need to be updated for the new data provided by such an audit.
- vi. Floodplain harvesting and interceptions need to be regularly and transparently reported to provide relevant and necessary data for river management and delivering on the vision of the plan for this river.

8. Modelling of river flows for managing ‘take of water’ under this plan and the Murray-Darling Basin Plan

Assessment

Management of the rivers of the Murray-Darling Basin, including the Barwon-Darling, are highly dependent on up to date and robust hydrological modelling, notably the Integrated Quality and Quantity Model (IQQM), used by the NSW Government. There is increasing evidence that this modelling is insufficiently tracking changes over time and inadequately tracking low flow and high flow changes in the river. This has serious implications for regulation and policy decisions on the river. In particular, the following issues are problematic.

- i. Current modelling primarily uses conditions of the previous 2012 Barwon-Darling Water Sharing Plan, which has not been updated for the major changes to licences, pump capacities or increased off-river storages (see above).
- ii. Updating of the model would allow assessment in relation to the river and its level of diversions, relevant for Clause 10.28 of the Murray-Darling Basin Plan.
- iii. It is not clear how cap credits are managed or the carryover of 300% take, including the crediting of 200% twice in the rivers management.
- iv. There is little transparency in the modelling of changes to river flows under different policy scenarios, particularly in relation to key drivers such as floodplain harvesting. There is no inclusion of real data on the extent of floodplain harvesting or interception of flood flows in the modelling. As this has increased, it effects the delivery of the vision and the objectives for downstream communities and ecosystems.

- v. Current hydrological modelling does not adequately test effects of reductions to flow on inundation patterns of wetlands or low flows (Australian Academy of Science 2019).
- vi. Compounding this problem of underestimation, hydrological models used for management of the Barwon-Darling River only have data for the main channels of rivers, where the river gauges are located. There are no data to test the effects of outcomes on the floodplain, where many of the dependent ecosystems are located.

Recommendations

- i. Models should be updated with critical changes that have occurred in the diversion environment for the river, including changes to pump sizes, amalgamation of licences, transfers of licences, increased floodplain harvesting (from the Barwon-Darling and its tributary rivers).
- ii. Where such data is not obtained, there needs to be transparent reporting of the uncertainties.
- iii. This includes a clear public acknowledgement that the current modelling is inadequately models low flows and high flows (Australian Academy of Science 2019).
- iv. There needs to be a commitment and resourcing to collecting data on multiple lines of evidence in relation to diversions and health of ecosystems. In particular, there should be more measurement of flows that are overbank, linked to key performance indicators of the ecosystem.
- v. There needs to be actual data in relation to the long-term cap of 189GL from within channel extractions and 214GL per year for all extractions (including floodplain extractions).

9. Specification and management of environmental water

Assessment

The specification and management of environmental water is critical within rivers but it is currently primarily dependent on identifying what remains once the water access rules have had their effect. This is not sufficiently serving the river and its dependent communities, including ecosystems downstream. In particular, the following issues are problematic.

- i. There needs to be clearer specification of planned environmental water. Under the plan, it remains what is left in the river (i.e. based on extraction profile) and specification of flow rates and flow levels within which water take is not permitted. This remains problematic because of the evidence for increasing diversions in this system beyond 1993/1994 levels of development, as specified under the Murray-Darling Basin Cap.
- ii. There needs to be protection of adaptive environmental water reaching the Barwon-Darling from tributary river catchments of the Darling River (e.g. Macquarie River and Gwydir River).
- iii. The long-term average annual commitment, even though measured by an IQQM model, needs to be better specified in terms predicted flows at different points

on the river, under different climatic conditions. There is concern about the challenges of using a model to regulate or report on flows, without other multiple lines of evidence.

Recommendations

- i. There needs to be improved specification of requirements of an environmental flow, not just what remains in the river. This should specify requirements for meeting environmental objectives for ecosystems and organisms (e.g. native fish) and processes (e.g. blue-green algal management).
- ii. It should be clearly linked to the objectives and performance indicators.
- iii. Environmental water from tributary catchments needs to be protected using event management.
- iv. There needs to be clear assessment of actual diversions in relation to 93/94 levels of development and reductions in diversions back to the Murray-Darling Basin Cap levels. This must include river interception and floodplain harvesting assessment as well as changes in policy and user behaviour.

10. Management of the river in the face of increasing climate change

Assessment

Temperatures are increasing leading to more evaporation and less water in the rivers, including the Barwon-Darling. There is currently little effective policy or management approach to dealing with this problem explicitly within the plan. This is essential to meet the vision of the plan and objectives of the legislation. In particular, the following issues are problematic.

- i. There is limited focus on the effects of climate change on the river and its water availability, despite widespread evidence of increasing temperatures and evaporation.
- ii. Current management is likely to lead to higher impacts on planned environmental water, with insufficient protections, than all users.

Recommendation

- i. There need to be clear mechanisms implemented to determine how changes to water management rules can be adjusted, with increased drying resulting from climate change. These impacts need to be shared across users, including the environment.
- ii. These rules need to be explicit within the plans.

Reference

Australian Academy of Sciences (2019). Investigation of the causes of mass fish kills in the Menindee region NSW over the summer of 2018-2019. Report of an expert panel. Australian Academy of Sciences, Canberra.