



Submission on Inquiry into the integrity of the water market in the Murray-Darling Basin

**Professor Richard Kingsford,
Director of the Centre for
Ecosystem Science, UNSW, Sydney**

Table of Contents

1.	Background	3
a.	Allegations of theft and corruption in the management of water resources in the Murray-Darling Basin	3
b.	Investigation and public disclosure by authorities, including the New South Wales Government and the Murray-Darling Basin Authority, of reported breaches within the Murray-Darling Basin, including the Barwon-Darling Water Sharing Plan.....	4
c.	Actions of member states in responding to allegations of corruption and the potential undermining of the Murray-Darling Basin Plan.....	4
d.	Use of Commonwealth-owned environmental water for irrigation purposes, and the impact on Basin communities and the environment.....	4
e.	Operation, expenditure and oversight of the Water for the Environment Special Account, and	5
f.	Other related matters.....	5
i.	Legislation inadequacy	5
ii.	Overdependence on modelling for policy decision-making and auditing.....	6
iii.	Solutions	7

1. Background

I am the Director of the Centre for Ecosystem Science, UNSW Sydney, with a strong track record in the science of river and wetland management and their dependent organisms. In particular, I have:

- spent more than 30 years undertaking scientific investigations into the impacts of water resource development (dams, diversions and floodplain development) on the environment;
- advised governments of the Murray-Darling Basin on environmental flow management and river management;
- undertaken research on Ramsar-listed wetlands and waterbirds throughout the Murray-Darling Basin and;
- worked for the New South Wales Office of Environment and Heritage and other government departments. During this time, I was involved in coordinated development of policy advice for the Government of New South Wales. This often involved joint taskforces involving all of government agencies involved in water management across the State and with other jurisdictions.

This submission focuses on the key issues which relate to the integrity of the water market in the Murray-Darling Basin, with particular reference to:

a. Allegations of theft and corruption in the management of water resources in the Murray-Darling Basin

I have little more to add in relation to allegations of theft and corruption in the management of water resources in the Murray-Darling Basin beyond those raised in the recent ABC Four Corners program (Besser, 2017) and in the Guardian (Slezak, 2017) in relation to the Barwon-Darling River, and more recently in the Guardian on the Gwydir River (Davies, 2017).

The independent investigation into NSW water management identified that some of these matters required further investigation (Matthews, 2017). Many of the problems in relation to the rivers of the Murray-Darling Basin relate to long-term inadequacy in policy and legislative frameworks and corresponding poor compliance and auditing (see Solutions).

Ultimately, a Commonwealth judicial inquiry would reveal the full extent of potential theft and corruption in relation to the management of Basin water resources.

b. Investigation and public disclosure by authorities, including the New South Wales Government and the Murray-Darling Basin Authority, of reported breaches within the Murray-Darling Basin, including the Barwon-Darling Water Sharing Plan

There is an overall lack of transparency and accountability in water management. This affects the Murray-Darling Basin Plan and its implementation, which in turn reduces community confidence in the as identified by the independent report into NSW water management and compliance (Matthews, 2017).

Previously, there was reasonable reporting of water management by the National Water Commission and the Murray-Darling Basin Independent Audit Group to the public. These entities ensured transparent reporting on the state of Murray-Darling Basin rivers, water use and potential breaches of limits on diversions (previously known as the Murray-Darling Basin Cap).

In the spirit of introducing robust reporting frameworks, even this reporting was not completely effective as it failed to adequately assess and disclose information about interceptions on floodplains. It also relied too much on modelling outputs, without reporting of actual data (see solutions below). While modelling of river flows and changes are inevitably uncertain, it is clearly important to specify this uncertainty and also the many assumptions underlying hydrological models used for reporting and the quality of input data. The hydrological models primarily report on flows in the main channel of the river, not floodplain inundation. Such modelling tends to underestimate floodplain impacts (e.g. Macquarie River, Ren and Kingsford, 2011).

Just as importantly, there is a need for multiple lines of evidence in relation to water use. This can be achieved through use of satellite imagery, water meter data (with adequate compliance) and by monitoring developments on floodplains. The current modelling does not allow for transparent and rigorous reporting on water use, particularly in relation to floodplain flows.

c. Actions of member states in responding to allegations of corruption and the potential undermining of the Murray-Darling Basin Plan

The interim independent investigation into NSW water management and compliance (Matthews, 2017) was a welcome initiative by the NSW Government. It identified some clear concerns in relation to alleged corruption, as raised in the ABC Four Corners program, *Pumped* (Besser, 2017). It remains a concern that other policy processes by the NSW Government in particular, but also other governments, may also be undermining the Murray-Darling Basin Plan (including the management of environmental water) (see below).

d. Use of Commonwealth-owned environmental water for irrigation purposes, and the impact on Basin communities and the environment

The importance of protecting environmental water in the Murray-Darling Basin and the complexity associated with doing so was clearly identified in the recent

Matthews (2017) report. Specifically, he noted that “Protection of environmental flows is a major and complex issue.... [this report] observes the significant public concern about it, encourages intensified work by basin state officials on an enduring solution...”

In particular, it is critical that arrangements in relation to ‘shepherding’ of environmental flows to protect them from consumptive use (including via floodplain works) (Brewster, 2017; Davies, 2017) must be addressed (Steinfeld and Kingsford, 2013). This has been the subject of considerable discussion by the Commonwealth Environmental Water Holder and State governments and requires urgent attention.

e. Operation, expenditure and oversight of the Water for the Environment Special Account, and

There is a need for more transparency with respect to the expenditure of public funds from the Water for the Environment Special Account. Currently there are relatively few accessible reports in the public arena, apart from high level distribution regarding the total budget of approximately \$13 billion. Furthermore, there is a need for auditing and monitoring to understand the actual environmental gains (or losses) associated with efficiency upgrades. For example, it is not clear whether building larger storages for increased efficiencies simply provides more opportunity to capture flows in the rivers, including environmental flows.

f. Other related matters

i. Legislation inadequacy

Australia is increasingly recognized as developing world’s best practice in water legislation and policy, particularly in relation to the Murray-Darling Basin water management. Despite this, there are some inadequacies relating to the management of floodplain flows which could be addressed with appropriate amendments to Federal and State legislation. This would not ameliorate many of the current problems which are the focus of this inquiry but it would avoid future problems.

Furthermore, a key problem underlining the focus of this inquiry is inadequate legislative frameworks for dealing with the full river system. In particular, until relatively recently, many legislative frameworks did not include floodplain ecosystems, which are a critical part of the ecological and cultural landscape of rivers. This has meant that developments, including access to and alteration of flows on floodplains, have remained largely unregulated and outside the law or policy framework. Many governments have tried to address this issue by designating floodplains or drawing up guidelines for development. However, these frameworks are ultimately inadequate, not least of all because guidelines are ignored (e.g. Macquarie Marshes floodplains, Steinfeld and Kingsford, 2008). Furthermore, certain regulatory frameworks actually increase extraction from

floodplains. For example, in the Lower Balonne, the Queensland Government has provided allocation of water for irrigation that used to flow across developed floodplains.

Finally, once structures on floodplains are developed, there is poor commitment to adequately dealing with unlawful structures that change flooding to downstream communities and their environments. These floodplains structures are often 'grandfathered', essentially providing a right to water which was not within the policy or legislative intention at the time.

Floodplain structures are very well developed in the Northern (Darling) Basin. Many cause considerable problems to environments, changing flow regimes, and also affecting agriculture downstream. These problems have been exacerbated in irrigation areas as a result of levee banks allegedly changing access to water resources for irrigation enterprises, as recently detailed in ABC Lateline report (Brewster, 2017). There are also other allegations that floodplain works may be diverting environmental water (e.g. Gwydir River, Davies, 2017).

Finally, best-practice legislation does not necessarily translate into best-practice outcomes. This is arguably the case in relation to the implementation of certain aspects of the Basin Plan where State or other processes are not adequately meeting the expectations of the Basin Plan. For example inadequate protection of environmental flows remains a stark reminder of some of the problems in this area.

ii. Overdependence on modelling for policy decision-making and auditing

Hydrological modelling remains the primary analytical tool used to audit and make decisions about rivers and their diversions in the Murray-Darling Basin. Two key issues are relevant to used and reporting of such hydrological models: 1) transparency and 2) poor data and analyses, including modelling of floodplain flows.

1. Transparency

There is a need for improved transparency of reporting of changes to flow in relation to implementation of the Murray-Darling Basin Plan and Sustainable Diversion Limits. This requires reporting for each of the river valleys in relation to current diversions of water as well as modelled use. The former should utilized multiple lines of evidence (see below).

2. Data analyses

Multiple lines of evidence are needed to inform hydrological models in relation to other sources of analyses. These should include levels of storage and crop water use, monitoring of floodplain flows and adequate reporting of metering in relation to annual and event monitoring, particularly for environmental flows, river channel and overbank flows.

This is required because of the considerable uncertainties of all models, including mechanistic hydrological models used for informing and auditing management of the rivers of the Murray-Darling Basin. There is currently little transparency about the assumptions underpinning hydrological models and the poor state of input data. Such complex hydrological models rely on many different variables, often with unspecified assumptions (Ren and Kingsford, 2011). These models are useful tools but analyses of actual data is also important in terms of long-term trends as well as identifying other sources of data for reporting.

Further, there is good scientific evidence that current hydrological modelling does not adequately test effects of reductions to flow on inundation patterns of wetlands. A comparative analysis of IQQM (Integrated Quantity and Quality Modelling) modelling, used in the Northern Basin analysis, and a statistical analysis using actual flow data and rainfall for the Macquarie Marshes showed that IQQM significantly underestimated impacts to wetlands (Ren and Kingsford, 2011).

Specifically, IQQM overestimated flows after development and underestimated flows before development in the Macquarie River and Macquarie Marshes. This is critical for understanding the level of ecological impact and also opportunity for restoration with environmental flows. As a result, there was an underestimation of hydrological impact of about 10% to one of the gauges (Oxley) in the Macquarie Marshes.

Compounding this problem of underestimation, hydrological models used for modelling rivers, particularly in the Darling River Basin, only have data for the main channels of rivers. There are no data to test the flooding access and environmental use on the floodplain. This is because large flows on the floodplain - which are critical for ecosystems - are not adequately captured by the gauges in the main stem of the rivers. Consequently, the impacts of water resource development are underestimated as is the ecological importance of increased flows for recovery.

iii. Solutions

There is insufficient information on current diversions of water from the rivers of the Murray-Darling Basin, including their floodplains. Adequate measurement and reporting with transparency is essential. Such information can adequately allow for certainty for current water holders, including the irrigation industry, floodplain grazing, environments, urban supplies and maintenance of cultural resources.

1. Auditing of all structures in the Murray-Darling Basin and assessment of their influence on flow access and alteration. Auditing of locations of structures can be done manually with rigorous methods (Steinfeld and Kingsford, 2013). Automatic techniques have been developed using Lidar (Light Detection and Ranging), a remote sensing tool which allows identification of structures (Steinfeld *et al.*, 2013).

2. Implementing mandatory 'second-lift' meters on pumps that measure water captured on the floodplain and unregulated flows before it is stored in off-river storages. These data would also be reported as part of the licencing regime.
3. Use of satellite monitoring to determine use of water within licence conditions by analysing filling patterns of off-river storages in relation to event based flow management.
4. Improve legislative frameworks so that that they adequately incorporate floodplain regulation and management, including the Water Act 2007. Ensure that floodplain licences cannot be traded, given that they are highly dependent on local location variables. Ensure that illegal structures are not 'grandfathered' under legislation or policy.
5. Removal of all structures which significantly impact on environmental flows downstream to rivers and floodplains and which are not licenced. Those that still impede flows and are licenced may need to involve negotiations for easements or buyouts that allow for the delivering of environmental flows.
6. Ensure that all flow diversions are adequately metered and there is transparent reporting. This was a key finding of the Matthews (2017) report: "...enabling the public to readily access from a single source all details of individuals' water entitlements, licence conditions, meter readings, water account balances, and trading activities. Similarly it is recommended that arrangements be put in place for the public to readily identify any specific pump, off-take or works. Corresponding improvements to the transparency of environmental water flows are proposed. Such full transparency would, of itself, add considerably to a more compliant culture among water users."
7. Ensure that there is sufficient auditing and transparency of delivery or non-delivery of environmental water by the Commonwealth Environmental Water Holder.
8. Impose obligations on State Governments in relation to the protection of environmental water and in particular using mechanism such as 'shepherding' of environmental flows, 'piggy backing' of environmental flows on delivery flows to increase environmental outcomes, embargos on extraction on water events during environmental flows and protection of low flows.
9. There is currently no clear mitigation measure for dealing with ongoing climate change impacts in relation to reduced water availability for current users including the environment. In particular, there is evidence that planned environmental water will disproportionately reduced compared to current licenced or adaptive environmental water (Young *et al.*, 2011).
10. There is also a need for basin-wide river health monitoring. Many key sites are not adequately measured to provide basic information about dependent organisms and flooding.

References

- Besser L (2017) Pumped: who's benefitting from the billions spent on the Murray-Darling? Available: <http://www.abc.net.au/4corners/pumped/8727826>.
- Brewster K (2017) Murray-Darling Basin plan a 'failure', farmers claim water backed up in Queensland. Available: <http://www.abc.net.au/news/2017-08-31/murray-darling-basin-plan-failure-farmers-claim-water-backed-up/8859412>.
- Davies A (2017) Water usage complaint left in limbo despite allegation to NSW government. Available: <https://www.theguardian.com/australia-news/2017/sep/21/water-usage>.
- Matthews K (2017) Independent investigation into NSW water management and compliance, Government N, Sydney.
- Ren S, Kingsford R (2011) Statistically Integrated Flow and Flood Modelling Compared to Hydrologically Integrated Quantity and Quality Model for Annual Flows in the Regulated Macquarie River in Arid Australia. *Environmental Management* **48**, 177-188.
- Slezak M (2017) Murray-Darling Basin Authority knew of allegations of water theft a year before ABC report. Available: <https://www.theguardian.com/australia-news/2017/sep/27/murray-darling-basin-authority-knew-of-allegations-of-water-theft-a-year-before-abc-report?>
- Steinfeld C, Kingsford RT (2008) Floodplain development and vegetation health on the Macquarie River floodplain of the Murray-Darling Basin. University of New South Wales.
- Steinfeld C, Kingsford RT (2013) Disconnecting the floodplain: earthworks and their ecological effect on a dryland floodplain in the Murray–Darling Basin, Australia. *River Research and Applications* **29**, 206-218.
- Steinfeld CMM, Kingsford RT, Laffan SW (2013) Semi-automated GIS techniques for detecting floodplain earthworks. *Hydrological Processes* **27**, 579-591.
- Young WJ, Bond N, Brookes J, Gawne B, Jones GI (2011) Science review of the estimation of an environmentally sustainable level of take for the Murray-Darling Basin. Final report to the Murray-Darling Basin Authority, CSIRO, Canberra.