



Proposal for a Basin-Wide Audit of Diversions

‘We don’t know the total availability of water and we don’t know the total availability of allocation in entitlements, so it’s very difficult to reconcile how much water there is, who’s entitled to take it and what they’ve taken.’

- Interim Inspector-General Mick Keelty, 12 May 2020¹

Background

The outcomes of the Murray-Darling Basin Plan to date are uncertain and widely disputed. Observed flows are lower than expected at this point in implementation. Water accounting is fragmented and fails to provide adequate information. A comprehensive basin-wide audit of diversions would help resolve uncertainty and could be used to inform decision-making and long-term policy.

Changing Inflows: Causes & Consequences

The changing distribution of inflows to the southern Basin can be attributed to multiple causes. Each has a different impact to state shares and allocations. Each warrants a different line of further investigation.

In the northern Basin, floodplain harvesting impacts the amount of water reaching Menindee Lakes. When inflows are low, the Murray-Darling Basin Authority (MDBA) has no right to direct releases from the lake system, instead calling more water from the Murray River. With the responsibility of delivering downstream entitlements, squeezing more water through the system, there may be greater losses from overbank transfers (unseasonal flooding) through the Barmah-Millewa Forest. Considering these losses, as well as competition between deliveries, there may be considerable impacts on the availability and future reliability of shares. *How much water is diverted by floodplain harvesting?*

In the southern Basin, irrigation efficiency projects have impacted the nature of return flows, meaning that expected water savings may not be appearing in the river. When less water returns to the river systems than operators had accounted for, state water entitlements may be less reliable. These discrepancies may be significant, ranging from over 100-700 GL per year. *Are there any discrepancies in water accounts where efficiency projects have been installed?*

Unconsidered impacts of climate change may be having an impact as well. Lower flows from the Ovens and Kiewa Rivers might increase the need to call upon water from tributaries to deliver

¹ Public hearing, Senate Select Committee on the multi-jurisdictional management and execution of the Murray-Darling Basin Plan

operational requirements under the Murray-Darling Basin Agreement. In this event, the Authority would increase demand for Intervalley Trade from the Goulburn and Murrumbidgee River systems. The Goulburn River faces constraints in the system while higher demand from the Murrumbidgee may increase losses on the floodplain. Allocations in both systems would be in competition with, or compromised by Intervalley Trade, required because of unconsidered climate impacts. *To what extent do observed flows meet expectations set out in the Basin Plan?*

Addressing these scenarios requires an understanding of the volume of water diverted through floodplain capture and sitting in private storages, the downstream impacts of irrigation efficiency projects and the extent to which observed flows meet expectations.

A comprehensive and independent basin-wide audit of where the water is, how it is used, and total volumes diverted and returned would provide a solid foundation for decision-making. It would uphold the integrity of entitlements and allow policy to be properly evaluated.

Water Accounting Background

In 2004, all Australian governments agreed to implement the National Water Initiative (NWI) in order to provide fair and responsive water management. One objective of the NWI was to achieve water accounting which could meet the information needs of different water systems including planning, monitoring, trading and environmental and on-farm management.² The parties sought to provide greater certainty, underpinning the capacity of Australia's water management regimes to deal with change responsively and fairly.³

Since the National Water Commission – which had been charged with implementing the NWI – was abolished in 2014, its functions have been transferred to other agencies. Water accounting is carried out by the Bureau of Meteorology, the Murray-Darling Basin Authority and states in the development of water accounts. However, none of these accounts are situated to answer critical questions for Basin-wide system management – in particular, *How much water is used? Who is using it? Where is it used?*

Inadequacies of Existing Accounting

The integrity of entitlements and water markets depends on state water registers. At Basin scale, the Bureau of Meteorology's National Water Account reports on water stores, flows, rights and use. The MDBA has also published a regular water take report in the form of Water Audit Monitoring Reports, Cap Registers, Transitional Water Take Reports and Sustainable Diversion Limit Reporting. While the BOM and state water accounts would provide the basis of an audit, these existing accounts fall short.

- None are independently audited
- None include data collection that would provide for estimation of monthly water consumption

² Intergovernmental Agreement on a National Water Initiative, 25 June 2004, cl 23(vii)

³ Ibid cl 5

The contents of a comprehensive audit has been most-thoroughly delineated by Professors R Quentin Grafton and John Williams. It ‘would be a hydrological audit, using the best available science, of water storages (including privately-owned storages), end-of-system flows, diversions, and return flows by catchment for all categories of water diversions within the MDB. In addition to quantity or volume data, a water audit should also provide basic water quality measures (Salinity, Biochemical Oxygen Demand, acidity, etc.) at key locations to allow water users and water planners to make judgements about how the water they access can be used. While an audit would be done on an annual basis, it would also be important to have an historical series of water data and measures so as to allow, where at all possible, analyses, comparisons and evaluation by water users, water agencies and researchers’.⁴

Addressing Uncertainties

In order to conduct a comprehensive and independent audit of diversions, the following gaps in existing data collection and analysis may also need to be addressed.

Return Flows

After investing in irrigation infrastructure and water efficiency measures, governments have transferred water savings from these investments to environmental water holders. Nevertheless, it is unclear how these savings impact return flows to surface and groundwater systems – and by extension, flows to other entitlement holders. Water that has not been consumed, transpired or evaporated, may not have returned to streams or groundwater as they normally would have. The discrepancies may be significant, ranging from over 100-700GL per year.⁵ Governments have not accounted for return flows when assessing the benefits of water savings projects.⁶

Floodplain Harvesting

In the MDBA’s 2017 Report on Cap Compliance, floodplain harvesting in the northern Basin was estimated – with high uncertainty – at 210 GL annual take.⁷ Elsewhere, however, the MDBA has estimated that up to 1582 GL may be held in private storages in the Condamine-Ballone and 600 GL in the Gwydir.^{8 9}

There have been attempts to bring floodplain harvesting under the cap system since 1995.¹⁰ Addressing the gap in measurement and accounting has been labelled as a high priority since the

⁴ Grafton, R.Q. and Williams, J. Thirst for certainty: the urgent need for a water audit of the Murray-Darling Basin. *Farm Policy Journal* (Winter 2019), 16

⁵ Ibid 17

⁶ Productivity Commission, *National Water Reform*, Report no. 87, Canberra, 296

⁷ Murray-Darling Basin Authority and Independent Review Panel, ‘The Murray-Darling Basin Water Compliance Review’ (MDBA 44/17, November 2017), 19, 40, 42

⁸ Murray-Darling Basin Authority, ‘Hydrologic Modelling for the Northern Basin Review’ (MDBA Publication No 36/16, January 2016) (RCE 268) 25.

⁹ Richard Kingsford, Submission to Murray-Darling Basin Royal Commission (RCE 39)

¹⁰ Murray Darling Basin Authority, *Floodplain harvesting and overland flows*: <https://www.mdba.gov.au/basin-plan-roll-out/sustainable-diversion-limits/floodplain-harvesting-overland-flows>

Guide to the Proposed Basin Plan in 2010.¹¹ States agreed to implement measures to address interceptions by 2011 – including recording, licensing and monitoring systems.¹²

Still, these uncertainties continue to undermine the Water Act, taxpayer spending on water recovery and State planning with regard to water shares and allocations. In some situations, water that has been purchased for the environment remains locked away in on-farm infrastructure that has not been decommissioned.¹³

The MDBA has the power to measure, monitor and record these diversions.¹⁴ Measurement could include analysis of historic aerial photography and satellite imagery of structures as well as an estimation by remote sensing. An audit could identify the timing, location and size of these structures. On-farm storages could be metered – as they should have been by 2011.

Observed vs. Expected Flows

In a 2019 assessment by the Wentworth Group of Concerned Scientists, two river gauge sites were chosen as broadly representing flows in the northern and southern Basins – Chowilla on the Murray River (as an indicator of flows to South Australia and the health of the Murray's wetlands and floodplains) and Wilcannia on the Darling River (as an indicator of the health of the Barwon-Darling system upstream of the Menindee Lakes).

The assessment found that despite recovering 63 percent of the Basin Plan's recovery target, environmental flow targets had failed to be achieved. Moreover, average flows were up to 40 to 60 percent smaller than expected under the plan. Observed flows were similar to or less than the pre-Basin Plan model results.¹⁵

With no improvement and even decline in water flows since the implementation of the Basin Plan, there is a clear need for an approach to the evaluation of river flows against expected flows, taking into consideration climate variability and illegal extraction.

If the assumptions underpinning the Basin Plan are unreliable, it will be very difficult to know if we are seeing additional flows. This speaks to this inquiry's focus on changing inflows as well as its impact on the reliability of state allocations.

An audit of diversions might be best supported by an analysis, similar to that conducted by the Wentworth Group, evaluating observed versus expected flows at key locations across the Basin.

Data Collection & Monthly Estimates

Professors R. Quentin Grafton and John Williams have highlighted a number of factors to be included in an audit, beyond those in existing water accounts. This includes 'Data collection and estimation of monthly water consumption (evapotranspiration or ET) at a spatial level across the MDB using

¹¹ Murray-Darling Basin Authority, 'Guide to the Proposed Basin Plan: Volume 2 – Technical Background' (MDBA Publication No 61/10, 2010), 158

¹² *Intergovernmental Agreement on a National Water Initiative*, 25 June 2004, cl 57

¹³ South Australia, Murray-Darling Basin Royal Commission, Report (2019) 602

¹⁴ *Water Act 2007* (Cth) para 172(1)(b)

¹⁵ Wentworth Group of Concerned Scientists, 'Water Flows in the Murray-Darling Basin: Observed versus expected' (February 2019) 8

remote sensing data from satellite along with independent expert calibration and validation. Such estimation should include all months (aggregated annually) from 2007 onwards when the Federal Water Act was legislated'.¹⁶

Independent and Transparent Accounting

In order to conduct a comprehensive and independent audit of diversions, the following procedural gaps in existing data collection and analysis may also need to be addressed.

Independent Verification

Grafton and Williams also identify the need for an audit based on standard accounting principles including independent 'verification, checking, evaluation and interpretation of these water consumption accounts, and any other water accounts. ... [I]t would allow for due diligence of Basin water governance and the tracking at a catchment and Basin-scale of progress against the key objectives of the Water Act (2007)'.¹⁷

Accounting Protocols

There has been some theoretical consideration of the standards, protocols and conventions which water accounts might be expected to include.¹⁸ For example, double-entry accounting requires that for every credit there is a debit. In water management, this would mean that when someone takes more water, someone else must consume less. This would allow targeted assessments of river health and management decisions. Additionally, an audit might allow future water accounts to ensure that end-of-system objectives and obligations are met while allowing independent auditors to verify that a river is being managed sustainably.

Transparent Accounting Factors

Schedule E of the Murray-Darling Basin Agreement outlines the purpose of the Cap to establish a limit on the volume of surface water used for consumptive purposes. When the Sustainable Diversion Limit (SDL) came into effect in July 2019, it marked the end of the transition from the Cap system which had been in place since 1995. The SDL framework 'expands on the Cap framework to include explicit reports on all forms of water take (watercourses, regulated rivers, groundwater, run-off dams, floodplain harvesting, etc.)'.¹⁹

These reports rely on 'Cap factors,' used to translate the volume and reliability of entitlements between jurisdictions. However it is unclear what these factors are or how they are applied. The result is an overall lack of faith in their application. This is to say that existing obscurity has fuelled broad speculation that numbers may be, at best, misleading and, at worst, made up.

¹⁶ R. Quentin Grafton and John Williams, Submission to Murray-Darling Basin Commission of Inquiry Bill 2019 (16), 2

¹⁷ Ibid

¹⁸ Young, Mike and Jim McColl, "Thinking like an Accountant about Rivers and Aquifers" [2006] Water Droplets

¹⁹ Submission to the Senate Select Committee, Murray-Darling Basin Authority Canberra, 2019. CC BY 4.0

An audit of diversions capable of quantifying how much water is returned to streams would need to provide a common understanding and transparent methodology for cap factors, comprehensible to all parties affected.

The following questions demonstrate the complexity involved and could be used to guide the audit toward identifying comprehensible cap factors.

- Are there differences between Long-Term Diversion Limit Equivalence (LTDLE) and Long-Term Average Available Yield (LTAAY) factors? What are they?
- Is there a difference between Baseline Average Availability factors and LTAAY?
- How are Upper Bound LTDLE factors different to ordinary LTDLE factors?
- How were the LTDLE factors developed?
- Are the LTDLE factors used to calculate water recovery the same in SDL calculations?
- In what ways are the 2011 LTDLE factors out of date? How have these shortcomings been addressed in the 2018 factors? What is the new information used for the 2018 factors?
- What are the new assumptions about contemporary water use in the 2018 factors? How do they compare to the 2011 factors?
- Are the factors the same in BDL models and pre-development models?
- What are the allocation reliabilities for each valley and entitlement type indicated by the proposed BDL model? How is reliability defined?
- How are the different factors used? What is the purpose of each type of factor?
- How long are these factors expected to be fit for purpose? Why?

These questions illustrate how the information available about factors is impenetrable. It prevents the fairness that can be achieved through public scrutiny. We would like to see action by Commonwealth and State water agencies to develop transparent, comprehensible factors.

Since the Cap was established in 1995, most valleys have been cap compliant and some valleys have accumulated large volumes of cap credits over the past 25 years. These credits have been seen by some as wasted water and it has been argued that they are the result of underuse by irrigators.²⁰ The MDBA has been requested to examine this issue as part of the transition from cap accounting to SDL accounting and is due to report soon. In fact the reliability of entitlements, particularly general security in NSW and low reliability in Victoria, has been affected by a variety of factors including reduced water availability, changes in reserve and allocation policy and carryover.²¹ These complex issues are poorly understood and a full audit is required to resolve them.

Conclusion

Decision-making in response to changing inflows and entitlement reliability requires transparency and a stronger understanding of 'Who gets the water? How much water is stored and consumed? And where and how much water is returned to streams and groundwater after it is used for irrigation or for other purposes'.²²

²⁰ RMCG report for SunRice, Recognising under use in the Southern Basin and taking action. Methodology and analysis, November 2019

²¹ Interim Inspector-General of Murray-Darling Basin Water Resources, Impact of lower inflows on state water shares under the Murray-Darling Agreement, March 2020

²² R. Quentin Grafton and John Williams, Submission to Murray-Darling Basin Commission of Inquiry Bill 2019 (16), 4

A comprehensive and independent water audit may be the best resource to identify and inform policy solutions.

A broad audit of diversions would allow the Inspector-General to ensure that Sustainable Diversion Limits have been respected, confirming that jurisdictions are complying with their responsibilities under the Water Act. It would help decision-makers identify potential problems with vulnerable streams before catastrophes like fish kills occur. It would ensure that all entitlement holders, including the Commonwealth Environmental Water Holder, see fair and reliable allocations and avoid third party impacts.

Grafton and William's estimate of the water audit's total cost – including the establishment of comprehensive water consumption accounts – totals less than one million dollars per year. In total, a 'comprehensive and audited set of annual water consumption accounts for the MDB could be obtained from 2007 to 2019' for less than \$20 million, representing 'less than 1% of the total expenditures incurred to date by the federal government to increase water-use efficiency'.²³

An independent Basin-wide audit with valley by valley accounting would provide a valuable report on water reform progress, increase community trust in the Basin Plan process and inform future planning assumptions.

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²³ Ibid