

Submitted by Professor R. Quentin Grafton and Professor John Williams, The Australian National University

**The Urgent Need for a Comprehensive and Independent Water Audit of the Murray-Darling Basin**

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This Senate Inquiry responds to the urgent need for much greater transparency, improved and more accessible data, and much better analysis, in relation to Basin water reforms. We support these worthy goals. Further, we recognise that, despite the detailed and valuable findings delivered by the South Australia [Murray-Darling Basin Royal Commission](#), missing evidence from federal public servants (who were not permitted to appear as witnesses before the South Australia Royal Commission) remains a substantial obstacle to improving water policy and governance in the Murray-Darling Basin (MDB)

In our submission, we wish to highlight the urgent need for a detailed water audit of the MDB that would be in addition to any information that may be obtained through the auspices of a Royal Commission. We consider such an audit to be the critical missing information to effectively and sustainably manage water in the Basin. In our view, an independent Basin-wide audit needs to include, over and above any existing water accounts of the MDB, two key parts:

- (1) Data collection and estimation of monthly water consumption (evapotranspiration or ET) at a spatial level across the MDB using 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.
- (2) Independent verification, checking, evaluation and interpretation of these water consumption accounts, and any other water accounts. Our call for a water audit of the MDB would be based on standard auditing principles. A water audit would provide many benefits to individuals and governments. For instance, it 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).

A comprehensive and independent water audit is urgently needed to respond to the following key questions: Where is the water? How is it being used? And, what volumes of water are being diverted from and returned to the system? A comprehensive water audit across all catchments, and integration between catchments, would provide a sound basis for decision-making. The water audit we propose would help ensure that all owners of water entitlements (including the Commonwealth Environmental Water Holder) obtain their 'fair share' of the available water, now and into the future.

A comprehensive and independent water audit would allow for the scientific evaluation of risks and the effects of policies in the Basin. Just three of the possible evaluations include: (1) assessment of the magnitude and nature of return flows and the impact on these caused by changes in irrigation efficiency; (2) impacts on current and future water entitlements in the transition to SDLs, especially with proposed changes to provide tradable water entitlements for floodplain water harvesting; and (3) the consequences of climate change for the reliability of existing water entitlements. The recent NSW Natural Resources Commission (NRC) Review for the Barwon-Darling catchment provides comprehensive evidence that these three issues are critical to a water audit and whether the Basin Plan and also state water resource plans are delivering on their stated objectives.

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In calling for a water audit, we recognise that there are an existing (but insufficient for what is required) set of water accounts at the Basin scale. For instance, the Bureau of Meteorology (BOM) publishes a National Water Account based on modelling and water balance methods that currently exist for 10 regions of Australia, [including the MDB](#). These water accounts are principally generated from State agency sources and include a range of information such as changes in inflows, outflows and storages. BOM partners with State and Territory water agencies—as well as with other Australian Government agencies, water utilities and various water agencies — to collect the data used to construct the National Water Account. At a state level, for example, New South Wales (NSW) is implementing [General Purpose Water Accounting Reports](#) (GPWAR) that seek to provide consistent and transparent information to water stakeholders, internal staff, external government agencies, universities, water brokers and the general public. Further, the Murray-Darling Basin Authority (MDBA) is, in 2019, conducting a [compliance test for surface water and groundwater Sustainable Diversion Limits](#) (SDLs) in the Basin to help determine whether water diversions (not consumption) is increasing (and thus are compliant) with the Basin Plan's SDL.

While the existing water accounts are a useful beginning, none of these accounts are independently audited. The closest we have to an independent audit is a recent statutory review of the Barwon-Darling Water Sharing Plan by the NSW Natural Resources Commission (NRC). It draws attention to “the (NSW) *Water Management Act 2000* (the Act) which clearly prioritises protection of the water source and dependent ecosystems, followed by basic landholder rights including native title, and then other extractive uses. The current Plan has not effectively achieved this prioritisation.” (NRC 2019, p. 1). Indeed, this statutory review by the NRC finds “...changes to the water sharing rules in the Plan area have resulted in an increased allowance for extractive use at lower flow classes that are critical to the environment. These provisions benefit the economic interests of a few upstream users over the ecological and social needs of the many.” (NRC, p. 1).

If there had been a proper set of water accounts, independently audited, the multiple problems in the Barwon-Darling (as described in the NRC statutory review) could have been identified years ago. Indeed, it is the critical contemporaneous analysis of monthly water consumption that provides the foundation for good water governance and the ability to identify problems, and to correct them, before there is a crisis.

We propose that a full set of Basin water accounts would quantify surface and groundwater flows, be spatially based, and provide contemporaneous measures of water consumption (ET). These measures of water consumption would be obtained from remotely sensed satellite images and data, coupled with available in situ data (for future water consumption accounts) of: surface water measurements, including diversions from streams, seepage losses from canals, deliveries to farms, spills from canals, and surface returns from farms along with environmental flows and accurate precipitation and ET estimates. Such remote-sensing methods have already been applied successfully in the United States with [spatial ET processing systems, such as METRIC](#), to produce ET estimates for large areas at the 30-Metre (M) Landsat scale, where consumption within individual fields can be documented.

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An overview document of these methods is attached along with a separate preliminary or 'proof of concept' report that shows how satellite monitoring of water consumption can be used for a particular catchment (Border Rivers of the Northern MDB).

The two attached remote-sensing reports show that methods already exist and could readily be applied in the MDB to obtain spatial measures of water consumption. Such properly funded, remote-sensing, coupled with other methods and also an independent water audit, would deliver a full set of audited water consumption accounts for the entire MDB. Such audited accounts would be invaluable for water decision makers, irrigators and anyone concerned with how water is being applied, consumed and returned to streams and groundwater in the Basin.

We estimate the likely cost of establishing a comprehensive set of water consumption, plus independent auditing of these accounts, would be no more than one million dollars per year for each annual account including monthly estimates of water consumption. In total, and for less than \$20 million, we believe that a complete, comprehensive and audited set of annual water consumption accounts for the MDB could be obtained from 2007 to 2019. To put this cost into perspective, this represents less than 1% of the total expenditures incurred to date (some \$4 billion) by the federal government to increase water-use efficiency since 2007 – expenditures that have occurred without the measurement and quantification of the estimated water savings.

An independent Basin-wide (including individual catchments) water audit appears to be supported by communities and also irrigators. For instance, Steve Whan of the National Irrigators Council is reported to have stated [“We do need more work and we do need more water accounting”](#) (reported 13 July 2019 in *The Saturday Paper*). On 26 July 2019, it was reported that at the NSW Farmers 2019 Conference on 25 July a motion (passed 59 to 47) was passed in favour of a Federal Royal Commission into the Murray Darling Basin Plan. Speaking in favour of this motion at this conference, [Balooga farmer observed, “If there’s no problem with it, what have they got to hide?”](#). In our view, this NSW Farmers 2019 Conference motion shows that many farmers support much greater transparency and understanding about: Who gets the water? How is water 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?

Attached is a paper by Grafton and Williams, recently published in the *Farm Policy Journal*, that provides greater detail about why a comprehensive and independent water audit of the MDB is an urgent priority for Australia. We also provide a copy of a NSW Natural Resources Commission statutory review of the Barwon-Darling Water Sharing Plan as an example of the benefits of having statutory audits on each catchment component of the MDB Plan. Two reports on how to use remote-sensing data to obtain measures of water consumption are also attached.

We are willing and able to provide in person testimony, and additional details, should the committee request further information.

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**Attachments:**

1. Allen, R.G., Kramber, W.J. and Morse, A. 2012. Mapping Evaporation in Idaho with Landsat. University of Idaho.
2. Grafton, R.Q. and Williams, J. 2019. Thirst for certainty: the urgent need for a water audit of the Murray-Darling Basin. *Farm Policy Journal* 16(2), pp. 14-22.
3. Natural Resources Commission (NSW). 2019. Draft Water Sharing Plan Review Barwon-Darling Unregulated & Alluvial Water Sources 2012.
4. Simons, G. and Kruisheer, M. 2018. Agricultural Water Consumption in the Australian Border Rivers Catchment: a Preliminary assessment.