www.water-alternatives.org Volume 13 | Issue 1

Grafton, R.Q.; Colloff, M.J.; Marshall, V. and Williams, J. 2020.
Confronting a 'post-truth water world' in the Murray-Darling Basin, Australia.
Water Alternatives 13(1): 1-28

Confronting a 'Post-Truth Water World' in the Murray-Darling Basin, Australia

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ABSTRACT: Several independent findings about the current state of the environment and water management in the Murray-Darling Basin were released in early 2019 by the South Australia Murray-Darling Basin Royal Commission, the Australian Productivity Commission, and the Australian Academy of Science. We review these findings in relation to: an environmentally sustainable level of water diversions, as mandated in the Australian *Water Act 2007*; Sovereign Indigenous water rights and interests; the economics of water recovery to increase stream and river flows; and water governance. After reviewing the independent findings and the responses by government agencies, we propose the following actions to respond to post-truth: (1) instituting greater transparency in measurements of water use, consumption, storage and return flows and also of water values (market and non-market); (2) using deliberative democracy, engaging in more effective and inclusive participation in decision-making in terms of water planning and allocations, especially of those who have been long excluded such as the First Peoples of Australia; and (3) giving primacy to the environmental goals of the *Water Act 2007* and supporting this through the establishment of an independent standing commission which reports to the Australian parliament and has audit and oversight powers in relation to land, water and the environment.

KEYWORDS: Scientific integrity, deliberative democracy, regulatory capture, Indigenous water rights, Murray-Darling Basin, Australia

> *…for opinion is thought to relate to all kinds of things, …; and it is distinguished by its falsity or truth, not by its badness or goodness, while choice is distinguished rather by these (Aristotle, Nicomachean Ethics, 1999: 37).*

INTRODUCTION

In 2016, in relation to its widespread use in the media, the Oxford English Dictionary designated 'post-truth' as the word of the year, defining it as "relating to or denoting circumstances in which objective facts are less influential in shaping public opinion than appeals to emotion and personal belief" (Oxford Dictionaries, 2016). While the word post-truth is a neologism, it also has a long history; it arises whenever the truth is inconvenient and when influencing people by whatever means possible – at least in the short

term – is considered to be more important than the facts. Post-truth also involves the blurring of facts and values, where values are expressed as preferences, interests and opinions, and are inextricably linked to values in public policy (Jasanoff and Simmett, 2017).

Post-truth is most closely identified with political campaigns, elections and referenda. It also has an important and deleterious effect on how society responds to sustainability challenges (Lubchenco, 2017), trust in government agencies, and scientific integrity (Baker et al., 2019).[1] If post-truth is accepted or dominates public perception, then opinions and falsehoods will have a greater influence than verifiable facts or the 'best available science'. This is of profound importance in relation to complex issues and 'wicked' problems (Grafton, 2017a), when a situation prevails – as, for example, with climate change – where feedback and delays come between actions and outcomes.

Values and interests, as well as facts and evidence, are (and should be) important in policymaking (Chindarkar and Grafton, 2019). We also recognise the shortcomings of the 'knowledge deficit model' in relation to policymaking and the mistaken belief that the role of experts is simply to compensate for the knowledge gaps of decision makers or persons of influence (Scheufele, 2014). Post-truth includes: (1) refusing to accept, or seeking to refute or undermine, verifiable facts whenever such facts contradict the interests of those in authority (Baker et al., 2019), and (2) accepting opinions as being the equivalent of replicable findings (Munafò and Smith, 2018) that are published in peer-reviewed academic journals. Both these post-truth behaviours impede the resolution of public policy problems.

We confront what we call a 'post-truth water world' by reviewing water governance outcomes in the Murray-Darling Basin (MDB), Australia. In our view, the dominant, top-down systems of water governance practised in the MDB delegitimise certain forms of knowledge and practice and involve multi-scale hierarchies of power and control (Swyngedouw and Boelens, 2018).

We selected the MDB for this study because: (1) all the co-authors have many years of first-hand research and policy experience in relation to water governance and water outcomes in the MDB; (2) the MDB has been endorsed globally by some for the past decade as an example of policy 'best practice' (Glyde, 2018) – including in Australia – thus the separation of truth from opinion or falsehood in the MDB is of global interest; and (3) independent findings with regard to water governance in the MDB that were made available in early 2019, and the policy responses to these findings, provide a timely example of the truth-versus-post-truth water world.

In the following section we provide a brief background to the MDB, with a particular focus on the past decade. We then summarise the key findings of independent reviews of water governance and reform in the MDB (all of which were published in early 2019) in relation to: (1) an environmentally sustainable level of water diversions, as mandated in the Australian *Water Act 2007*; (2) Sovereign Indigenous water rights and interests; (3) the economics of water recovery to increase stream and river flows; and (4) the water reform agenda.

We review the responses to the three independent reports by the Australian government and by the Murray-Darling Basin Authority (MDBA), its lead overall agency for water management in the MDB. We then employ a 'what, how and who' lens to help explain the wide divergence in views and the contemporaneous existence of both truth and post-truth. We conclude with three strategic actions to confront a post-truth water world.

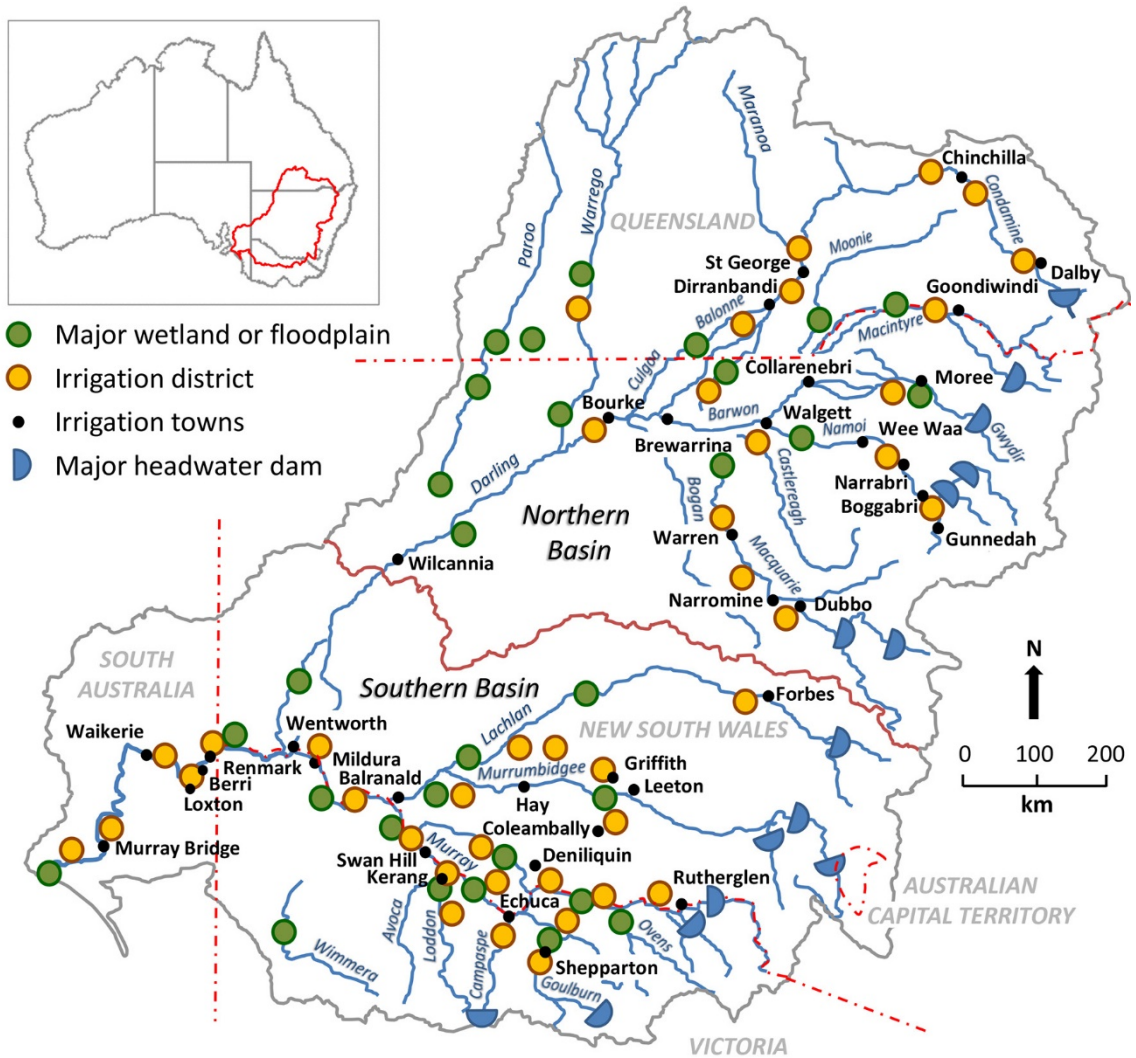
[1] The US National Oceanic and Atmospheric Administration (NOAA) defines scientific integrity as "the condition resulting from adherence to professional values and practices when conducting and applying the results of science that ensures objectivity, clarity, and reproducibility, and that provides insulation from bias, fabrication, falsification, plagiarism, interference, censorship, and inadequate procedural and information security".

BACKGROUND

The MDB is in Southeast Australia (Figure 1) and covers an area of over one million square kilometres. It has a population of over two million people, 4% of which are Indigenous. As with most of Australia, the MDB has a high temporal and spatial variability in rainfall, with a mean annual runoff of some 24,000 gigalitres (Gl) (Murray-Darling Basin Commission, 2006: 2).

Historically, water diversions have exceeded 50% of annual surface water availability, and in extremely dry years this can be a much higher proportion (CSIRO, 2008: 9). As a result of the high level of both water diversions and water consumption – which account for about 70% of diversions and about 90% of water consumption in the basin (Grafton and Wheeler, 2018) – outflows to sea at the Murray Mouth, based on the climate records from 1895 to 2006, are about 40% of what they would be without irrigation extractions (CSIRO, 2008). This is the principal reason why the Murray Mouth is kept open via dredging. High levels of water diversions by irrigation are also an important contributor to 'very poor' inland water ecological processes and key species populations within the basin (Argent, 2017: 56).

Figure 1. The Murray-Darling Basin showing proximity between major wetlands or floodplains, and irrigation districts (note the major headwater dams on most rivers).



Source: M. Colloff.

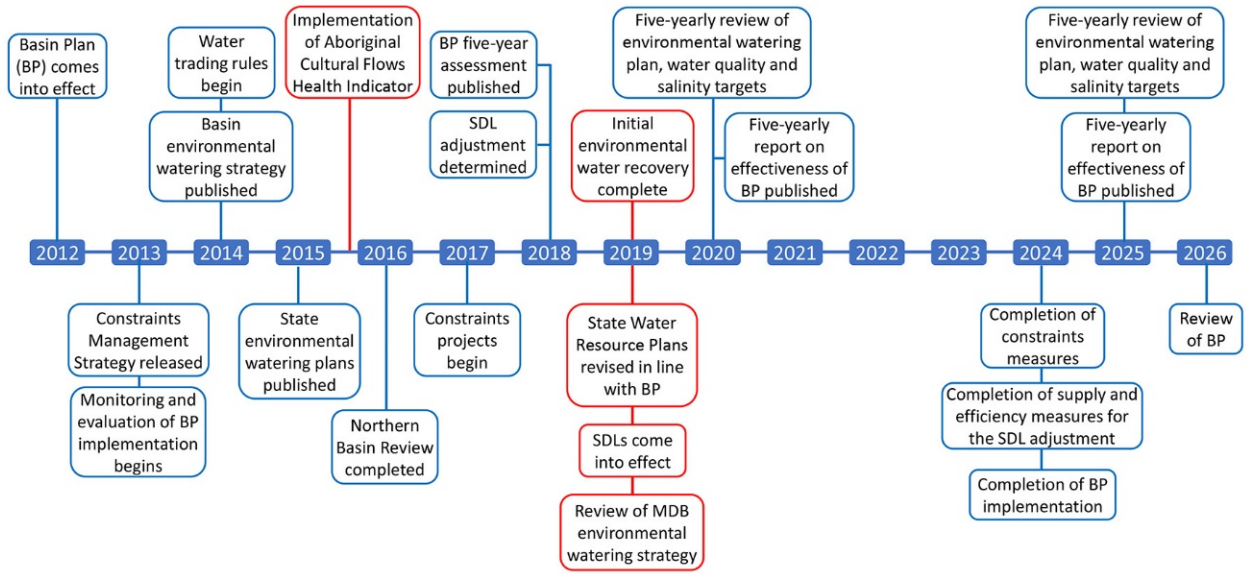
The Millennium Drought (1997-2010) resulted in very low basin inflows which, in turn, had negative impacts on basin communities, farmers and the environment. Australian governments formally recognised the environment as a legitimate user of water as early as 1994 (ARMCANZ and ANZECC, 1996). Recognition that many basin ecosystems were in poor condition (Davies et al., 2008; Davies et al., 2010: 773), exacerbated by the Millennium Drought, led to a 2004 Council of Australian Governments (COAG) agreement on water reform, called the National Water Initiative (NWI). As part of the NWI, state governments and the Australian government signed up to a water reform process that included a commitment to increasing stream flows for the environment (Grafton and Hussey, 2007). Importantly, the National Water Commission (NWC) was established by the *National Water Commission Act 2004,* as an independent statutory body to provide oversight of the water reforms. The NWI included the stated goal of implementing transparent and statutory-based water planning and liberalisation of water markets (Horne and Grafton, 2019). A further step in the development of water markets was the establishment of water entitlements which represent to their owners a permanent share of a consumer pool (Grafton and Horne, 2014) and are defined in specific volumes of water. These water entitlements are annually assigned a physical volume of water for extractive purposes called 'water allocations' that vary depending on the reliability of the underlying water entitlement, the levels of stored water, and the expected inflows to catchments (Grafton and Wheeler, 2018).

As a result of the perceived inaction by some states on what they had agreed to in the 2004 NWI, the Australian Prime Minister in 2007 announced a ten-year A$ 10 billion package for water reform called the National Plan for Water Security, an amount that was increased to A$ 13 billion in 2008 and renamed Water for the Future. To date, some A$ 8 billion[2] has been allocated for water recovery in order to acquire water entitlements from willing irrigators via direct purchases (buy-backs), and to provide subsidies and grants for water infrastructure designed to increase water-use efficiency (Department of Agriculture, 2019a). A share of the 'water savings' achieved by irrigators (typically 50%) is provided to the Australian government in the form of water entitlements. The water entitlements so acquired (from buy-backs and water-use efficiency subsidies) are intended to increase stream flows for environmental purposes, and these entitlements are managed by the Commonwealth Environmental Water Holder (CEWH) established under the *Water Act 2007*.

In 2007, the Australian parliament, with bipartisan support, legislated the *Water Act 2007*, which gave the Australian federal government the power to determine basin-wide and catchment-level diversions within the MDB; such powers had previously been held by the states. This Act created the Murray-Darling Basin Authority, which is responsible for designing and implementing the Basin Plan which was legislated in November 2012 and is operational until 1 July 2024 (Figure 2). This Basin Plan has as one of its key instruments basin- and catchment-scale sustainable diversion limits (SDLs), which represent the maximum average annual permissible volume of water diversions for both surface water and groundwater. These SDLs are to be delivered through full compensation to irrigators by the sale of water entitlements from willing sellers, and also subsidies to increase irrigation efficiency.

[2] A summary of expenditures on water recovery for the environment to 30 June 2017 is provided by the Australian government's Department of Agriculture and Water Resources (2017: 38) while Grafton and Wheeler (2018, Table 2) provide a summary of actual expenditures to the end of September 2017, calculated to be about A$ 6 billion. These expenditures do not include funding for water monitoring and water meters, A$ 1.5 billion allocated to increasing 'water efficiency' announced in 2018-2019 (Department of Agriculture, 2019b), or the multibillion dollar subsidies for dams and water infrastructure announced in 2019 (Morrison, 2019).

Figure 2. Timeline of the Murray-Darling Basin Plan; red lines indicate activities delayed or only partly implemented



Source: Modified from www.mdba.gov.au/basin-plan-roll-out/basin-plan/basin-plan-timeline.

The setting of the SDLs in the Basin Plan was and remains highly controversial (Senate Rural and Regional Affairs and Transport References Committee, 2013). In terms of surface water, the SDLs were established at, on average, 10,873 Gl/year, which amounted to a reduction of only 0.6% relative to the modelled historical average watercourse diversions of 10,942 Gl/year (MDBA, 2010a: 51); the SDLs for groundwater allowed for a 40% increase in diversions relative to 2009 (Grafton, 2019). A key issue in the public debate about the setting of SDLs is whether the MDBA, in developing the Guide to the Proposed Basin Plan (MDBA, 2010a), and the final Plan (MDBA 2011), must give environmental considerations precedence over social and economic factors. The Water Act affirms the relevance of social and economic considerations while also making clear that they are secondary to the MDBA's and minister's obligation to give effect to the relevant international agreements (Skinner and Langford, 2013).

The intent of the 2012 Basin Plan was to give effect to the *Water Act 2007* and, in particular, to increase stream flows for the environment by 2,750 Gl/year, supposedly by 1 July 2019. In fact, stream flows have not been increased by this volume because of: (1) possible reductions in return flows and increased utilisation of existing water entitlements (Wheeler et al., 2014) by irrigators that may have reduced stream flows by some 700 Gl/year (Williams and Grafton, 2019); (2) increased groundwater extractions of some 400 Gl/year between 2012-2013 and 2017-2018 (MDBA, 2019a: 7) which will continue to reduce future stream flows; (3) increase in the capture or interception of overland or flood water on the floodplains with levees or dams, water that would otherwise have become stream flows (AAS, 2019; Slattery et al., 2019); this was identified by the Murray-Darling Basin Royal Commission (MDBRC) as "one of the most significant threats to water security in the Northern Murray-Darling Basin" (MDBRC, 2019: 598); (4) inadequate water metering, monitoring and compliance, especially in the northern Murray-Darling Basin (Carmody et al., 2018; Matthews, 2017); and (5) the 2018 SDL adjustment mechanism that will be implemented by 1 July 2024, which allows basin governments to reduce the volume of water entitlements held by the environment by 605 Gl/year as a result of: (i) supply projects that supposedly allow decision makers to more efficiently deliver water for the environment; (ii) efficiency projects that are claimed to change water-use practices to 'save' water for the environment; and (iii) constraints projects intended to allow for the more effective delivery and flow of water in the

MDB. The assumption underpinning the SDL adjustment mechanism is that environmental outcomes will be equivalent or better than can be achieved by water recovery, but this is not based on any publicly available, rigorous and peer-reviewed scientific assessment (Wentworth Group of Concerned Scientists, 2018a).

The recovery of water for the environment has been accomplished by the acquisition of water entitlements funded through the Water for the Future programme and implemented by the Department of Agriculture and Water Resources, with the acquired water entitlements to be managed by the CEWH. State water resource plans at a catchment level, including the associated SDLs and the rules and processes for water diversions, were intended to come into force on 1 July 2019 following their approval by the MDBA, but have been postponed until 1 July 2020 because of delays in developing the plans by states.[3]

The underlying justification for the Basin Plan is that wetlands, rivers and floodplains were deteriorating because of over-allocation of water for irrigation (Davies et al., 2008; Davies et al., 2010; MDBA, 2010b). Water would be recovered for the environment at a level determined by modelling the environmental water requirement (EWR) of key environmental assets and functions, in order to derive an environmentally sustainable level of take (ESLT) for surface water. This ESLT is the sum of the sustainable diversion limits at the regional and basin scales (Figure 3a).

In 2015, the Australian government legislated to cap the acquisition of water entitlements through direct purchases from willing sellers at 1,500 Gl at the prompting of irrigator lobbyists.[4] In 2014, the Australian government abolished the National Water Commission, which had been established under the NWI to report on progress of water reforms (Grafton and Williams, 2019. The argument put forward for the closure of the NWC by the Australian government was that it was no longer required (Baldwin, 2015). However, by 2017 there was already a scientific body of evidence to show that the Basin Plan had serious flaws in its implementation (Carmody et al., 2016) and was failing to deliver the expected improvements in stream flows and ecological benefits at a basin scale (Argent, 2017; Grafton, 2017b).[5] A parliamentary inquiry into water-use efficiency that same year highlighted further concerns about the effects of water recovery in terms of its cost effectiveness, and also the unintended consequences on stream flows of increases in irrigation efficiency (Grafton et al., 2018).

In July 2017, an Australian Broadcasting Corporation investigative television programme, *Four Corners*, identified possible water theft by some cotton growers in the northern MDB (ABC, 2017). One of the irrigators identified in the programme subsequently pleaded guilty to illegally pumping water from the Barwon River and was fined A$ 190,000 (Brown, 2019). In a court affidavit, this same irrigator also claimed that the state water minister at the time had told him that he could pump the water from the river despite the fact that stream flows at the time were below a level that would permit such water diversion (Henderson, 2019).

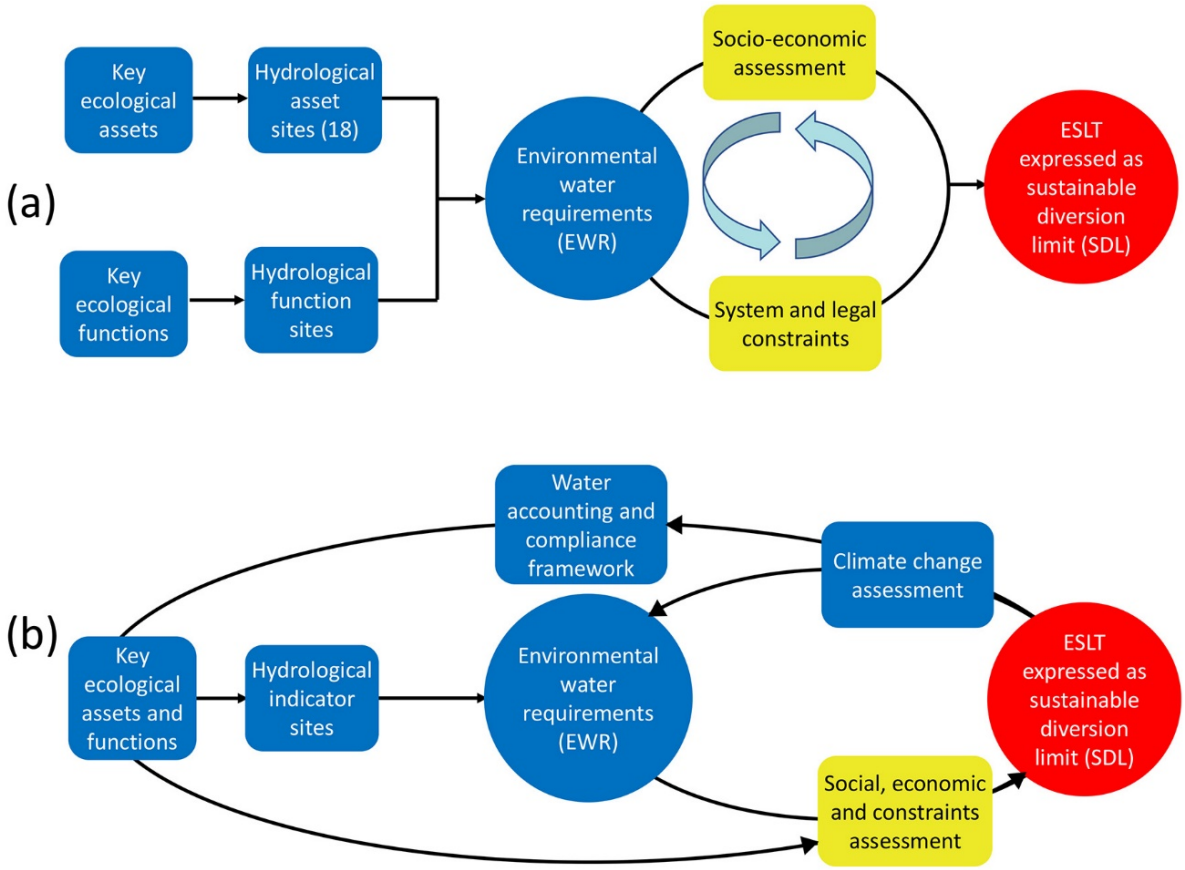
[3] The most recent reviews of the water reforms in the MDB from 2007 onwards include Colloff and Pittock (2019), Grafton (2019), and Grafton and Williams (2019). Marshall and Alexandra (2016) and Williams (2017) provide good descriptions of the historical reforms and a good explanation of the pathways followed from an institutional perspective. Connell and Grafton (2011) provide an overarching historical view.

[4] In a submission to the Senate Environment and Communications Legislation Committee (Submission 31) in early 2019, the National Irrigators Council (NIC, 2019) writes that "we have made it clear we are strongly opposed to large general buybacks".

[5] Grafton (2017b: 15) observed that, "[w]ithout proper funding and capacity to ensure sufficient monitoring and reporting of diversions and environmental audits, along with the necessary management feedbacks in response to new information coupled with effective risk management, then any basin and environmental watering plan is, simply, not worth the paper it is written on".

In a public response to Grafton's article, the MDBA CEO stated that "[c]ontrary to the claims in Professor Quentin Grafton's recently published editorial Water Reform and Planning in the Murray–Darling Basin, Australia, the Basin Plan is on track and delivering results for irrigators, communities and the river system itself" (Glyde, 2017). He further signalled that there would be no changes in the actions of the MDBA in response to Grafton's published findings.

Figure 3. (a) The process used to establish the environmentally sustainable level of take (ESLT) and sustainable diversion limits (SDLs) for surface water of the Murray-Darling Basin Plan; (b) A prospective process for the adaptive iteration between water availability under climate change, the environmental water requirement, and SDLs.



Source: (a) from Williams (2017), based on a figure supplied by Professor Barry Hart, a former board member of the MDBA.

Note: This alternative and proposed water accounting and compliance framework includes comprehensive assessment of the effects on inflows of floodplain harvesting, return flows and evaporation from off-channel storages in irrigation districts. The climate change assessment includes accounting for reductions in inflows, increases in evaporative losses, and increased soil uptake of flows after dry periods.

The 2017 ABC programme triggered national outrage and, ultimately, resulted in seven reviews of water compliance and monitoring at the state and federal levels (Productivity Commission, 2018: 301), including an independent enquiry chaired by Ken Matthews who was the founding chair and chief executive of the NWC (Matthews, 2017). The Matthews Inquiry itself led to the creation of the NSW Natural Resources Access Regulator (NRAR) in the NSW Department of Planning, Industry and Environment. The NRAR is responsible for compliance and enforcement of water management legislation in the state (NRAR, 2019).

Further controversy and media attention erupted in 2018 over the SDL adjustment mechanism which will, by 2024, increase basin-wide SDLs by 605 Gl/year, and the Northern Basin Review (NBR) which will increase SDLs in the northern basin by 70 Gl/year. Both these amendments to the Basin Plan were passed (not disallowed) in the Australian parliament on 8 May 2018 with the support of the federal opposition (Grafton, 2019).

The public attention to water reform and governance in the MDB was a contributing factor to the South Australian government agreeing, at the end of 2017, to the establishment of the Murray-Darling Basin Royal Commission. This South Australian royal commission had a wide remit, with a particular focus on the setting of environmentally sustainable levels of water diversions (and their determination). On 5 February 2018, a declaration by 12 scientists and economists called for a halt to further public expenditures on water-use efficiency, an audit of public expenditures to date, comprehensive water accounting, and the establishment of an independent expert scientific advisory body to monitor the basin's health (Murray-Darling Declaration, 2018).

In 2018, sworn witness testimonies to the MDBRC attracted public attention to the political interference in the 2012 Basin Plan in the setting of the SDLs. That this testimony was made by the person who had been director of environmental water planning at the MDBA from March 2009 to November 2017 (Bell, 2018) highlighted legitimate concerns about whether the SDLs had been established with the 'best available science', as required under the *Water Act 2007*.

In November 2018, the Wentworth Group of Concerned Scientists released a comprehensive evaluation of the state of the basin, and concluded that there was no evidence to support claims that there had been basin-wide improvements or that deterioration of core river conditions had halted (Wentworth Group of Concerned Scientists, 2018b). This was followed by a February 2019 report, also by the Wentworth Group, which observed stream flows to be similar to, or less than, before the Basin Plan was implemented and that there had been a decline in water flows since 2012 (Wentworth Group of Concerned Scientists, 2019).

Global media attention on the state of the basin erupted in January 2019 with the release of a YouTube video of rotting fish along the Darling River and nearby Menindee Lakes (Grafton et al., 2019). This 'fish kill' led the Australian Academy of Science (AAS), in consultation with other learned academies, to establish (on the request of the leader of the opposition) an expert panel to investigate the immediate and indirect causes of the fish kill and the steps needed to improve river health. The report of the AAS, undertaken independent of the Australian government, was released on 18 February 2019. The five-year statutory review of the Basin Plan by the Productivity Commission, an Australian government agency that reports to the Australian parliament through the federal treasurer, was made available on 25 January 2019. The MDBRC that was commissioned by the South Australian government released its report on 29 January 2019.

Media attention to water governance in the MDB has continued since the release of these three reports in early 2019, and has been directed towards the ongoing basin drought that began in 2017. Another ABC *Four Corners* programme that was broadcast in July 2019 focused on the public expenditure of billions of dollars by the Australian government on irrigation infrastructure intended to ensure environmentally sustainable levels of extractions (ABC, 2019). This July 2019 ABC programme questioned the value for money of the public expenditures and highlighted that some of the government subsidies had been used to build levees and on-farm private water storages that provided no apparent benefit in the form of water 'savings' (Slattery et al., 2019). Despite the evidence presented by the ABC and documented in the academic peer-reviewed literature (Grafton and Wheeler, 2018; Grafton, 2019; Williams and Grafton, 2019), an open letter signed by 27 scientists – some of whom have close links to the MDBA (Grafton and Williams, 2019) – argued that the Basin Plan was "being unfairly maligned" and that any substantial policy changes should wait until a scheduled review of the Basin Plan in 2026 (Vertessy et al., 2019a).

KEY FINDINGS AND RESPONSES TO THE INDEPENDENT REVIEWS

Transparent, adaptive water governance within a democratic system requires structures and processes for independent oversight. The enquiries by the MDBRC, the AAS and the Productivity Commission focus

attention on the complex interrelationships between law, science and public policy. Here, we highlight the findings of independent reviews published in 2019 in relation to four criteria.

The three reviews we examine had different terms of reference. The Productivity Commission's report included an initial submission process, a draft report for which submissions were sought, and a final report that was published in January 2019. The focus of the Productivity Commission report was on the delivery of the Basin Plan and it was far-reaching in its investigations. The MDBRC had a wide-ranging remit, but much of its attention was directed at the lawfulness of the SDLs established in 2012, the SDL adjustments in 2018, and the decision processes undertaken by the MDBA. The AAS had just a month to complete its work and concentrated its efforts on the causes of the large fish kills along the Darling River at the end of 2018 and in early 2019.

For each review, and where relevant, the findings are summarised with respect to: (1) an environmentally sustainable level of water diversions, as mandated in the *Water Act 2007*; (2) Sovereign Indigenous water rights and interests; (3) the economics of water recovery to increase stream and river flows; and (4) water governance.

Environmentally sustainable levels of water diversions

Findings

The issue of whether the *Water Act 2007* does or does not give primacy to the environment in the determination of environmentally sustainable levels of take was a controversial issue from the establishment of the MDBA; disagreement over this question may have been a contributing factor in the resignation of the MDBA's first chair (Rodgers, 2010). The MDBRC (2019: 217) found that the MDBA, by adopting a 'triple bottom line' approach, failed to give primacy to environmental priorities as required by the *Water Act 2007*, and that the simultaneous optimisation of environmental, social and economic outcomes is not possible in setting an ESLT or SDL (ibid: 52-54).

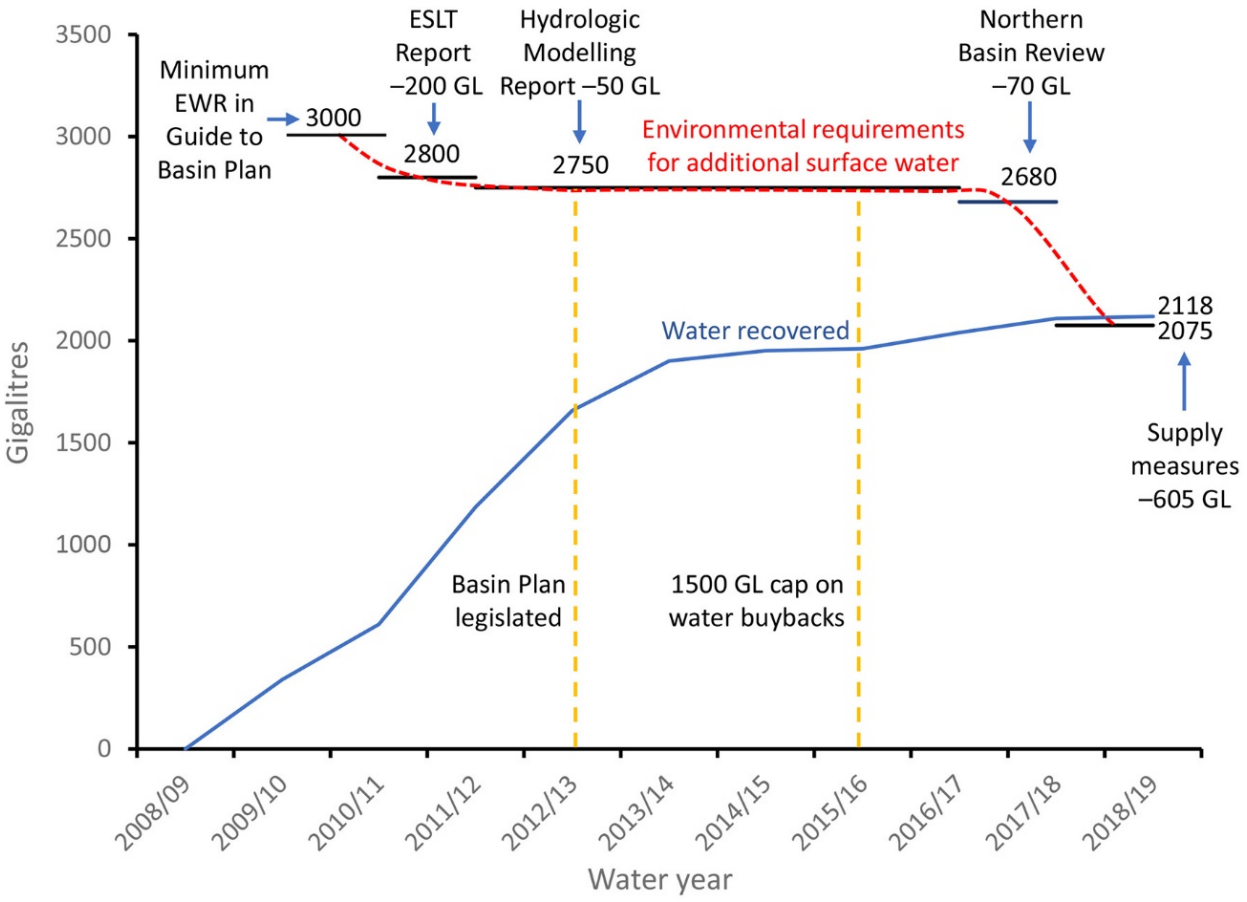
The MDBRC highlighted "the MDBA's lack of an intelligible, scientific justification for the change in the recovery amount, as between the guide [MDBA, 2010a] and the ESLT report [MDBA, 2011]". It also found that the MDBA failed to use 'best available science' in determining the basin-wide ESLT and that it did not disclose its modelling methods in a manner that allowed conclusions to be validated. The MDBRC observed that "[b]est available scientific knowledge is neither secret nor classified. It is available to the scientific community, and the broader public. It involves processes and actions that represent science – that is, that are capable of being reviewed, checked and replicated" (2019: 53). Indeed, estimates of the basin-wide environmental water requirements (and not just at the Murray Mouth) have been reduced on at least four occasions since 2010, at an amount equivalent to at least 925 Gl/year (Figure 4). As a result, the MDBRC found that

> [p]olitics rather than science ultimately drove the setting of the Basin-wide SDL and the recovery figure of 2750 Gl. The recovery amount had to start with the number '2'. This was not a scientific determination, but one made by senior management and the Board of the MDBA. It is an unlawful approach. It is maladministration.

The MDBRC (2019: 383) stated that:

> [t]he Murray-Darling Basin Authority (MDBA) has asserted, since November 2011, that a Basin-wide long-term average sustainable diversion limit (SDL) of 10,873 Gl – representing a water recovery for the environment [water recovered for the environment] of 2,750 Gl a year on average compared to a 2009 baseline – reflects an 'environmentally sustainable level of take' (ESLT). Based on the best available scientific knowledge, it almost certainly does not.

Figure 4. Recovery of water for the environment and adjustments to environmental water requirements in terms of long-term average annual yield of water.



Source: Based on a figure published by the Wentworth Group of Concerned Scientists (2017, Figure 8 therein).

Note: The figure shows how additional surface water requirements have been adjusted downwards after the ESLT and hydrologic modelling reports (MDBA, 2011, 2012), the Northern Basin Review (MDBA, 2016), and the SDL adjustment using supply measures (MDBA, 2017).

The MDBRC further highlighted that the MDBA failed to account for climate change in the setting of SDLs, despite being advised by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in 2009 that it should consider recent climate (1997-2006, which coincides with the Millennium Drought), in the setting of the ESLT. However, the MDBA used historical climate (1895-2009) and inflow data, rather than giving greater weight to more recent years including the Millennium Drought or using projections in relation to possible changes in inflows in the MDB as a result of climate change. Consequently, the MDBRC concluded that "in the ESLT Report, climate change was not considered or factored into the modelling at all. This decision was unlawful, as it meant the Basin Plan was not based on the best available scientific knowledge" (ibid: 55).

On the 70 Gl reduction in water recovery from the NBR, the MDBRC found that the decision was influenced by the same misconstruction of the *Water Act 2007* as in the setting of the ESLT and SDL, and that the MDBA had not disclosed its modelling: "There is no scientific, intelligible or rational justification put forward for the reduction of 70 Gl. The obvious inference to be drawn is that political considerations largely drove the NBR, not science. This is not only unlawful but is deplorable" (ibid: 63).

On supply projects that included environmental works (such as building or improving river or water management structures and changes to river operating rules intended to achieve environmental outcomes with less water) and the SDL adjustment mechanism, the MDBRC (ibid: 57) found that the rationale lacked substantive assessment; the modelling is highly uncertain and is not based on best available science, and there is the possibility of serious adverse ecological impacts. Further, business cases for many projects have been kept secret and are in breach of MDBA guidelines; analyses by the MDBA also indicate major concerns about ecological risks, particularly for the Menindee Lakes and the Lower Darling. The Productivity Commission report (2018) did not cover the setting of ESLTs, but observed that a reduction of the water recovery target for the northern MDB from 390 Gl to 320 Gl was dependent on basin governments implementing 'Toolkit measures', and that "[u]nlike supply measures, Governments are not subject to the same checks and balances to incentivise them to implement the Toolkit" (ibid: 7).

The Productivity Commission concluded, in relation to supply projects, that "[t]he package of supply measures to achieve equivalent environmental outcomes using 605 Gl less water recovery is highly ambitious. Failure of key projects would delay environmental benefits and could cost taxpayers about half a billion dollars for further water recovery" (ibid: 2). It also noted a "degree of dissatisfaction and mistrust in parts of the community, including traditional owners, arising from a lack of transparency and consultation in relation to supply measures." (ibid: 717).

Based on its own findings and on the concerns raised by the MDBRC and the Productivity Commission, the AAS Panel (2019: 55) recommended major reforms to the Basin Plan. These reforms included scientifically informed planning to restore the health of the Darling River and Menindee Lakes; repeal of the 70 Gl/year Northern Basin Amendment decision; repeal of the 1500 Gl cap on water buy-backs; adjustment of northern basin SDLs to take account of climate change; new determinations of ESLTs and SDLs; and independent oversight and auditing of implementation of the Basin Plan. Some of these recommendations were supported by a separate review commissioned by the Australian government in relation to the fish kills, namely, that governments should commit to protecting low stream flows in the Barwon-Darling especially during droughts, and also protecting 'first flow' after significant rainfall (Vertessy et al., 2019b).[6] The recent findings on the Barwon-Darling water sharing plan by the NSW Natural Resources Commission, an independent statutory agency, provided evidence and analysis to support a similar recommendation to protect low stream flows from extraction by irrigators (New South Wales Natural Resources Commission, 2019: 1).

Responses

The MDBA claimed that it acted lawfully in determining the SDLs and ESLT by balancing environmental, social and economic outcomes, based on advice from the Commonwealth Government Solicitor General. The Federal Minister of Agriculture and Water, however, has refused to release this legal advice for public scrutiny despite being requested to do so by the Commissioner of the MDBRC. The MDBA also rejected the findings of the MDBRC on the setting of the ESLT: "This was a task the Authority undertook consistent with the requirements of the Act and having regard to the purposes of the Basin Plan, which included the optimisation of economic, social and environmental outcomes" (MDBA, 2019b: 8).

The MDBA justified the water recovery of 2,800 Gl/year in the ESLT report – compared with the higher figures in its own 2010 *Guide to the Basin Plan* based on 106 hydrological indicator sites of between 3,000

[6] The "Independent assessment of the 2018-19 fish deaths in the lower Darling" (Vertessy et al., 2019b), unlike the AAS report, was commissioned and paid for by the Australian government. In our view, independence can be represented on a scale. At one end is research that is not paid for by any funding agency and that is published in academic and peer-reviewed journals where the reviewers are not paid, are at 'arm's length', and where the authors and reviewers do not have any real or perceived conflicts of interest. At the other end are consultant reports where the findings and results are subject to alteration or negotiation by the funder, and where peer review (if it occurs) is managed and paid for by the research funder.

and 7,000 Gl/year (MDBA, 2010a: 110) – by claiming that the hydrological modelling of indicator sites was 'more robust' than end-of-system modelling (MDBA, 2011: v, 56). The further 50 Gl reduction in the hydrologic modelling report was, they asserted, because modelling in the Condamine-Balonne "exploring alternative water recovery volumes and strategies (…) led to a further increase of 50 Gl in SDL (…) and a total proposed reduction of 2750 Gl across the Basin" (MDBA, 2012: v).

The MDBA responded to the MDBRC findings mostly in general terms and by assertion rather than with evidence. For example, in response to the finding that best available science was not used in the Basin Plan: "The Authority has performed its functions and exercised its powers consistent with its legislative obligations and with the utmost integrity. The Authority's work is science based and is focused on gathering the best available knowledge and information and does so in a transparent way" (MDBA, 2019b: 9). The MDBA was given every opportunity to give evidence under oath at the royal commission, but no one was willing, or permitted to do so by the minister (MDBRC, 2019: 437).

The MDBA has asserted that the Basin Plan responded to climate change (Neave et al., 2015), a claim debunked by Pittock et al. (2015). The claim was repeated in the MDBA response to the MDBRC (MDBA, 2019b: 2), despite the statement by Young et al. (2011: 22) that climate change was not considered in the Basin Plan. On 20 February 2019, the same day it released its response to the MDBRC, the MDBA announced the launch of work on the impact of climate change on the basin, as "a platform to advance the Basin Plan's accommodation of a changing climate in the lead-up to the major 2026 Basin Plan review" (MDBA, 2019c).

The MDBA has not responded to the recommendations of the AAS review other than to state that "[t]he key AAS finding, that flows in the northern rivers need to be improved, is exactly what the Basin Plan sets out to achieve" (MDBA, 2019d). The Joint Basin governments' response to the Productivity Commission's five-year review of the Basin Plan was to agree to 23 of its 38 recommendations and to implement these recommendations as soon as was practical. Key basin government responses to the Productivity Commission report include: (1) the establishment of a basin-wide science platform that would include annual MDB climate statements; (2) the appointment of an Aboriginal member to the MDBA Board and the disbursement of the Australian government's A$ 40 million fund to support the cultural and economic values of Aboriginal communities in the MDB, and to develop a First Nations Engagement Strategy to improve Aboriginal participation in water planning, delivery and monitoring for the environment; (3) the establishment of an independent panel to assess MDB community socio-economic health, and the allocation of A$ 25 million to strengthen the social and economic resilience of 15 basin communities; (4) the implementation of projects to achieve the environmental outcomes of the Basin Plan with less water; and (5) the implementation of a 'compliance compact' to ensure better monitoring and compliance, remote sensing and also the establishment of the statutory position of Inspector-General of Murray-Darling Basin Water Resources (Department of Agriculture, 2019b).

Sovereign Indigenous water rights and interests

Understanding the well-being and health of the MDB through an Indigenous lens and ontological purview requires an understanding of Australia's First Peoples' inherent relationships with the land and water and the way in which these are regulated by Indigenous laws, customs and practices (Marshall, 2017a: 4). The establishment of irrigation in the MDB and its subsequent expansion by surface and groundwater irrigation systems rendered Aboriginal communities politically invisible; they became disenfranchised from economic water entitlements and framed by western cultural constructs (Marshall, 2017b: 156-164).

The recognition of the importance of Indigenous rule of law in Australian water law and policies would enshrine the status of Australia's First Peoples as central, not as a special interest group or minor stakeholder (Marshall, 2017b: 227). The first page of the MDBRC report acknowledges the basin's Traditional Owners and States, and asserts the imperative of listening to and respecting the cultural

authority of Traditional Owners and Aboriginal Nations to speak and care for their country (MDBRC, 2019: 1).

Frontier wars and the establishment of colonial settlements across Australia were defined by the exercise of control over access to water and property interests. The MDBRC found that both the *Water Act 2007* and the Murray-Darling Basin Plan are unclear on water resource policies for Aboriginal communities despite clarity on the obligations for native title in the NWI, and among international agreements as they are reflected in the *Water Act 2007* (MDBRC, 2019: 63).

In Mabo v Queensland (No 1) [1988] and Mabo v Queensland (No 2) [1992], High Court decisions elevated the rights and interests of Aboriginal citizens outside of the restrictive international law definition of 'special measures' (McHugh, 2011: 43); such measures were used by the Australian government to suspend and breach human rights in order to implement Commonwealth laws (Australian Law Reform Commission (ALRC), 2012). The Meriam people successfully argued that the *Queensland Coast Islands Declaratory Act 1985* was a breach of the *Racial Discrimination Act 1975 (Cth)* and Article 5 of the International Convention on the Elimination of All Forms of Racial Discrimination (CERD) – a deprivation of equality before the law and of the enjoyment of property rights.

Introduction of an interstate market-based water system to Australia since the 1990s and the further freeing up of land from water have deprived Indigenous peoples of the exercising of their water rights and interests beyond stock and domestic rights to water. The NWI included three discretionary clauses (52, 53 and 54) to respond to the whole of Indigenous Australia's water requirements (Marshall, 2016: 9), ignoring the entirety of thousands of years of Indigenous sovereign rule; this further entrenched the post-contact inequalities experienced by Indigenous Australians in the appropriation of water resources. In relation to property rights, the MDBRC noted that a non-exclusive interest determined under native title legislation provides a usufructuary right only, one that is restricted by other rights holders, licences, permits and the MDBA (MDBRC, 2019: 475).

The MDBRC identified that Aboriginal peoples of the MDB have suffered damage and loss to their culture and way of life due to the over-exploitation of water resources in the MDB by governments and other sectors of Australian society (MDBRC, 2019: 473-474). The MDBRC also noted that the publication *Overturning Aqua Nullius: Securing Aboriginal Water Rights* (Marshall, 2017a) helps "build the understanding needed to bridge the gap between non-Aboriginal and Aboriginal participation in the legal and administrative scheme for water use and management in the Basin (and more broadly)" (MDBRC, 2019: 470).

The MDBRC highlighted the importance of Aboriginal knowledge values in water as they relate to the Convention on Biological Diversity (CBD). The CBD was explicitly mentioned by the minister who introduced the Commonwealth water legislation; it was cited as a relevant international agreement in Section 4 of the Water Act (MDBRC, 2019: 107). The MDBRC noted that Article 8(j) of the CBD is referred to in the objects of the *Water Act 2007,* which promotes the involvement of Indigenous peoples in the conservation and sustainable use of the environment (MDBRC, 2019: 480, 481). Despite this finding, the Australian government is yet to ratify the Nagoya Protocols to the CBD, which ensure increased legal certainty and transparency for all parties (Marshall, 2013: 15).

A key conclusion of the MDBRC was that, "the current governance framework under the Water Act is defective as it fails to provide Aboriginal people with a central decision-making role on all matters concerning the Basin" (MDBRC, 2019: 68). The MDBRC further stated that, "it is essential, in the interests of the Basin as a whole, that this situation be urgently rectified" (MDBRC, 2019: 68). The MDBRC, however, was not specific as to what volumes of water entitlements should be provided to Aboriginal communities.

In sum, there has been a failure by governments to review or fully consider the impacts of water reform on Indigenous communities, to identify the cultural water and economic water requirements of Indigenous Australians, and to value the ontological relationships of Indigenous water requirements

under Aboriginal law, customs, practices and creation stories. As a way forward, Recommendation 4 (of nine recommendations) in Marshall (2014) calls for Aboriginal water rights to be enshrined in law, and that the Australian national, state and territorial governments, with leadership from Aboriginal communities and Aboriginal organisations, provide for: 1) the recognition of Aboriginal peoples' special association to water as a First Right before other water rights, 2) the increase of Aboriginal participation in the water market, 3) an increase in the ownership of water property assets by Aboriginal communities, and 4) self-determination (Marshall, 2017b: 219).

Responses

To date, the Australian government, the basin state governments and the MDBA have failed to adequately respond to the urgency of the issues raised by the MDBRC or more broadly. Present commitments, announced before the release of the MDBRC or Productivity Commission Reports, include: funding to Indigenous basin communities for cultural and economic activities; funds to support two full-time positions for three years with the Murray Lower Darling Rivers Indigenous Nations (MLDRIN) and the Northern Basin Aboriginal Nations (NBAN), in order to translate the findings of the National Cultural Flows Research Project into practical activities; and a commitment to work with the New South Wales and Queensland state governments to identify water entitlements in the northern basin for possible allocation to Indigenous communities (Department of Agriculture and Water Resources, 2019).

The MDBA does not accept the MDBRC finding that the MDBA's consultation with First Peoples has been superficial; it notes that it supports the appointment of one Indigenous member to the MDBA Board (a commitment to appoint an Indigenous member of the Board was publicly announced in September 2019) and also that it has encouraged state governments to engage with Indigenous representative groups in water planning and management (MDBA, 2019b: 4). While there are numerous statements about the need to consult and consider Indigenous values and uses (Productivity Commission, 2018: 201-216), to date these have had little practical effect in meeting Indigenous water priorities. Moreover, as far as we are aware, the A$ 40 million committed by the Australian government for Aboriginal water rights has not, as of December 2019, delivered any water entitlements to First Peoples in the MDB.

Economics of water recovery to increase stream and river flows

Findings

Only the Productivity Commission and the MDBRC reviewed the economics of water recovery, the acquisition of water entitlements intended to increase stream flows for environmental purposes. The funding for such acquisitions was provided by the Australian government "with the objective of putting the MDB back on a sustainable track, significantly improving the health of the rivers and wetlands of the Basin, and bringing substantial benefits to irrigators and the community alike" (Howard, 2019: 3).

The Productivity Commission confirmed the findings of Grafton and Wheeler (2018) and others that the acquisition of water entitlements through water infrastructure intended to increase water-use efficiency is more than twice as expensive per litre as the direct purchase of water entitlements from willing sellers; however, this cost may be many times greater if the reduction in return flows to streams, rivers and aquifers from water-use infrastructure upgrades are considered. Indeed, the issue of return flows and the need for robust water accounting in the MDB is well established by Young and McColl (2003: 4); they observe that:

> [t]he accounting systems used are not robust. They do not guarantee that when one person or one process uses more water, another uses less. Significant omissions include the influence of land-use changes that reduce recharge and run-off to the river, as well as the impact of increases in water-use efficiency on river flow.

This issue of return flows is material because Williams and Grafton (2019) find that, using their midpoint reduction in return flows associated with water-use efficiency infrastructure, the cost per litre of increasing stream flows from irrigation infrastructure upgrades could be 25 times more expensive than from direct purchases from willing sellers.

The Productivity Commission (2018 114) noted that the "choice to invest in infrastructure modernisation to recover water has substantially increased the cost of meeting water recovery targets", and that such infrastructure provides "a number of private benefits for irrigators, but [it] does not substantiate that infrastructure projects have delivered public benefits that have helped sustain regional communities"; it observes that "the public benefits of the investment must exceed the costs to taxpayers". Indeed, 'value for money', one of the key criteria of the Australian government when recovering water for the environment, has not been satisfied.

The MDBRC compared buy-backs to water-use efficiency infrastructure, as methods to recover water for the environment. It highlighted a 2010 report by the Productivity Commission called 'Market Mechanism for Recovering Water in the Murray-Darling Basin', which identified that direct purchase was a more effective and efficient method for recovering water for the environment (Productivity Commission, 2010). In relation to this report, the MDBRC observed that "[i]t is always somewhat of a curiosity when government requires an expert body to inquire into a matter, make findings and recommendations, only for it to ignore those matters if they are not, for example, deemed politically expedient" (MDBRC, 2019: 391).

The MDBRC also found that, on the evidence presented, the claimed negative impacts of direct purchases of water entitlements to recover water for the environment are either not true or are less than claimed. Further, it was unable to find any relevantly qualified person who favoured water-use efficiency as a means of water recovery over direct acquisition from willing sellers. Importantly, the MDBRC (2019: 393) observed that reports commissioned by the MDBA in relation to the socio-economic impacts associated with the direct buy-back of water entitlements were "fundamentally misconceived at a basic level".

Responses

Guided by its minister, the Australian Department of Agriculture and Water Resources (DAWR) continues to support the use of irrigation infrastructure upgrades to promote water-use efficiency over the direct purchase (via reverse tender) of water entitlements from willing sellers. In its submission to the Productivity Commission (2018: 7), the DAWR stated that it "is prioritising investment in water saving infrastructure over water purchase". Indeed, this remains Australian government policy and is supported by federal legislation that caps the volume of water than can be acquired for the environment via direct purchases at 1500 Gl/year.

The MDBA in its response to the Productivity Commission does not include any discussion on the methods for water recovery (MDBA 2018); however, in a submission to the Senate Environment and Communications Legislation Committee on 27 February 2019, the CEO of the MDBA cited reports (commissioned by the MDBA) that were subject to criticisms by the MDBRC. In this submission, the MDBA CEO made the contested claim that "the buyback of water entitlements and the consequent reduction in irrigated activity would have flow on social and economic impacts for irrigation dependent businesses and communities. Murray-Darling Basin communities have expressed great concern over these flow on impacts(…)" (Glyde, 2019: 1).

In sum, the MDBA response to the findings by the MDBRC (MDBA, 2019b: 30) was to claim that it stands by its own commissioned reports, which find there to be negative socio-economic impacts of buy-backs. This is despite commissioning a review by Blackwell et al. (2018: 4-5, 7), which confirmed that the

criticisms of these reports by Wheeler et al. (2018) in a submission to the Murray-Darling Basin Royal Commission were valid.[7]

Governance

Findings

The MDBRC found that there is an inconsistency in Sections 23A and 23B of the Water Act where the minister is permitted *not* to adopt an amendment proposed by the MDBA. This power, in respect of matters that are firmly the subject of science, such as the adjustment of the SDLs, "reflects an inconsistency within the provisions of the Water Act, insofar as it has the exact opposite effect to para 48(3)(b)". The MDBRC was of the view that without "an amendment to rectify that inconsistency, the provision is open to abuse" (MDBRC, 2019: 68).

The MDBRC recognised that "[t]he National Water Commission (NWC) formed an important part of the governance structure in the Basin's legislative scheme, and since its abolition in 2014, there has been an erosion of the national oversight of water reform in the Basin" (ibid). The MDBRC further observed that:

> [s]eparating an audit function from the MDBA should ensure the new independent auditors have properly resourced powers to examine all MDBA workings, without exception and including political and legal advice. There should be no diminution in the current requirements for the MDBA to report on its work, but rather a reinforcement of their temporal and substantive aspects, towards full disclosure. (ibid)

The MDBRC findings are consistent with those of the Productivity Commission (2018: 2), which also had the view that "the significant risks to implementation cannot be managed effectively under current institutional and governance arrangements. Reform is required". Specifically, the Productivity Commission (ibid) found that:

> [t]he MDBA has conflicting roles. It supports Basin Governments (as their agent) to implement the Plan and is also required to ensure compliance with the Plan. These conflicts will intensify in the next five years. The MDBA should be split into two separate institutions – the Murray-Darling Basin Agency and the Basin Plan Regulator.

The Productivity Commission (ibid) states that:

> [t]he complex challenges ahead have been made more difficult because of the way Basin Governments have approached the implementation of the Plan. The process has lacked transparency and candour with stakeholders. It has been unclear who is responsible and accountable for leading implementation.(…) With negotiations largely settled, Basin Governments must make important changes now to ensure effective implementation. Failing to act will be costly for the environment and taxpayers, and undermine confidence that the Basin Plan has been worthwhile.

In more detail, the Productivity Commission (ibid: 57) found that "[t]here are major shortcomings in the current institutional and governance arrangements. Responsibility for leading the implementation of the Basin Plan is not clear and there has been a lack of strategic leadership".

The Productivity Commission report (see Section 14.2) provides principles to guide governance in the basin that include: promoting clear roles and responsibilities, ensuring that conflicting objectives and functions are effectively managed, instituting effective mechanisms for accountability, putting effective

[7] We also observe that the Productivity Commission (2018) ignored the evidence of a submission (#40) provided to it by Wheeler et al. (2018) in relation to the economic impacts for communities of the buy-back of water entitlements. While the Productivity Commission acknowledges that "[g]overnment water purchases have generally had positive outcomes for participating irrigators" (Productivity Commission, 2018: 78) it also observes that "[i]n the northern Basin, the MDBA has identified towns that were adversely affected by early, relatively large water purchases" (Productivity Commission, 2018: 108).

processes in place for collaboration, improving capability, and effectively engaging stakeholders. These are consistent with the OECD Water Governance Principles (OECD, 2015) and also with the NWC's recommendations to the Australian government that "rigorous, regular and independent audits should be undertaken to build trust in its ability to secure enduring outcomes for the Basin and its communities" (NWC, 2014: 6).

The AAS (2019: 58), in its report on fish kills in the Lower Darling, gave strong support to the Productivity Commission's recommendation (14.2) to strengthen the regulatory powers of the MDBA and to separate service delivery and regulatory functions into two institutions in order to respond to the governance failures outlined in their report. The AAS also endorsed the establishment of an independent, scientifically astute and experienced body, akin to the previous NWC, that would be responsible for auditing the effectiveness of the implementation of the Basin Plan.

Responses

The MDBA response to the findings and recommendations (MDBA, 2019b) of the MDBRC was to acknowledge that the perceived lack of enforcement action had produced considerable mistrust in the law and its administration, as well as within communities and among basin states. The community concern about compliance and enforcement has largely focused on the operational capacity of states to take appropriate enforcement action, and on the role of the MDBA. The MDBA (2019b) observed that it is committed to a suite of actions under the Murray-Darling Basin Compliance Compact which includes increasing transparency and accountability, reviewing legislative and compliance frameworks and capability, addressing issues with metering and measurement arrangements, and protecting and managing environmental water. This is also acknowledged by the Joint Basin government response to the Productivity Commission report (Department of Agriculture, 2019b).

When it comes to matters of institutional and governance arrangements, the Australian government claims that the MDBA does not have policy responsibility for the Water Act. Further, the MDBA disagrees with the statement that it is 'marking its own homework', or is conflicted in monitoring the progress in the implementation of the Basin Plan. The MDBA has further stated that implementation of the Basin Plan is primarily achieved through state instruments and actions of environmental water holders, and as the "MDBA is the maker of the Basin Plan, the MDBA is best placed to ensure it is complied with, and to understand where there may be opportunities to improve implementation" (MDBA, 2019b: 51).

TRUTH VERSUS POST-TRUTH

In this section we respond to three key questions that are pertinent to post-truth in the MDB.[8]

What is the water access (distribution)?

In December 2018 the Murray-Darling Basin Baseline Diversion Limits (BDL), which supposedly represent historical development levels of extractions, were estimated to be some 13,600 Gl, consisting of 10,900 Gl of watercourse diversion and 2,700 Gl of surface water interceptions (MDBA, 2019e). By comparison, the total actual mean surface water diversion from the basin for 18 years (from 1999 to 2017) was some 9,300 Gl, with a maximum in 2000-2001 of 12,023 Gl (MDBC, 2002: 7) and a minimum of 4,119 Gl in 2008-2009, the worst year of the Millennium Drought (MDBA, 2010b: 7). For 2017-2018, the Australian Bureau of Statistics (ABS, 2019) estimates that total water diversions from 9,500 irrigators in the MDB were some 6,800 Gl, an 8% increase from 2016-2017 and a 36% increase over diversions in 2015-2016.

Most of the water entitlements in the MDB are held by enterprises registered in Australia, with around 10% held by overseas interests, primarily in USA and China (Australian Taxation Office, 2019). Indigenous

[8] Our approach is similar to examining "why, where and how does nature matter politically?" (Swyngedouw, 2015: 226).

Australians own less than 0.01% of all water entitlements in Australia (Jackson and Langton, 2012) and less than 1% in volume terms of the water entitlements in the MDB (Altman and Arthur, 2009).

Who makes the decisions (authority)?

Marshall and Alexandra (2016) provide an historical overview of who acquired the water (irrigators) and why (political influence and regulatory capture by irrigators) in the MDB. They show that irrigator influence has been a long-standing feature of water decision-making in the basin, going back at least a century. Initially, it took the form of the provision of subsidised or free water infrastructure and the allocation of free water licences to irrigators; eventually, this led to the transformation of these water licences, at minimal cost to irrigators, into water entitlements that in the southern MDB are, collectively, worth some $A 16 billion (Aither, 2018). Grafton and Williams (2019) also document both rent-seeking behaviour and regulatory capture with respect to one-on-one purchases of water entitlements and the subsidies to increase irrigation efficiency in the MDB.

Given this history of an 'irrigation-first' approach to water policy in the MDB, it was inevitable that the provision of infrastructure subsidies for water-use efficiency would be delivered in ways that would prioritise the benefits to irrigators rather than the general public interest. Thus, the failure by the DAWR to undertake any cost – benefit analysis despite the public expenditure of some A$ 4 billion on irrigation infrastructure, or to even measure the individual hydrological outcomes of the subsidised projects, could be construed as a deliberate strategy which provided opportunities for public funds to be expended without necessarily generating any public benefits, and without proper due diligence.[9]

How is water conceptualised? (conceptualisation)?

The MDBRC noted that more should be done to ensure that the depth of insight, knowledge, experience and interests of Aboriginal people were advanced in the MDB (MDBRC, 2019: 692). The Productivity Commission doubted that it was possible for the state water resource plans to ensure that requirements for Indigenous values and uses are met (Productivity Commission, 2018: 57). The AAS Report (2019: 44) also noted that the Australian government had entered into and ratified, for example, the CBD, and was bound by such international obligations within the objectives of the *Water Act 2007* and in the MDB Plan.

A key finding of the MDBRC on Aboriginal engagement is that Aboriginal peoples in the MDB feel marginalised in the absence of clear policy objectives for the achievement of legal recognition of Aboriginal cultural needs and interests (MDBRC, 2019: 63-64). The MDBRC goes further in observing that considerable research has already been undertaken by Aboriginal people (in Australia), both academically and in the field, to identify the multiple benefits for Traditional Owner groups in water management.

What is required in terms of conceptualisation of Aboriginal water rights is a paradigm shift in Australian water policy and management. Importantly, an absolute imperative is to incorporate Aboriginal cultural and economic rights and interests into all aspects of water governance; accommodation is merely an act of tolerance (Marshall, 2017b: 214). This must translate into water entitlements for First Peoples; however, how much, by when, and what form these entitlements will take requires an engagement process by all basin governments which is conspicuously lacking. The state of Aboriginal health, which is deeply connected to water access and water quality, is another national priority. The MDBRC (2018: 683) highlighted findings, that:

[9] Hamilton-Smith (2019), reporting for the ABC, states that "[p]olice are alleging the rural fraud operation involved the director of the company submitting fraudulent claims, including falsified invoices related to six water-efficiency projects on the southern border property near Goondiwindi, known as Healthy Headwater projects". The ABC report quotes the police officer in charge of the investigation, Detective Inspector Mick Dowie, as stating that "[we'll allege] those invoices were modified to show it was actually for earthworks related to the improvement of water efficiency, modified to suit the needs of the claim, and, we will allege, purely fabricated claims for use of machinery to fulfil the needs of the claims" (ibid).

the manner in which Aboriginal people are engaged in all aspects of the MDB is wanting. Reform in this area must be driven by legislative amendment, in order to mandate the role of Aboriginal people in the governance of all aspects of the Water Act and Basin Plan.

POSSIBLE PATHWAYS

The current post-truth world in the MDB has not arisen simply from ignorance or insufficient evidence, as is clearly demonstrated by the peer-reviewed academic literature and the findings of independent reviews published in early 2019. In our view, the principal explanation for inaction and the failure to adapt, despite overwhelming evidence that business as usual is not working, is the concentrated influence of irrigators' peak-body groups and the politicians to which they have access (Grafton and Williams, 2019).

To respond to post-truth, it is imperative that truth be recognised and validated. The three independent reviews extensively document the implementation failures of water reform in the MDB and state clearly that alternative actions are required. We contend that these alternative pathways must ensure achievement of the water laws of Australia and the recognition and full inclusion of Australia's First Peoples in water planning and water access, including the provision of water rights.

We propose possible pathways that are consistent with the OECD Water Governance Principles. These OECD principles are underpinned by three mutually reinforcing dimensions of water governance: (1) effectiveness (a requirement for sustainable, and also implemented, water policy goals and targets); (2) efficiency (maximisation of the societal benefits of sustainable water management); and (3) trust and engagement (a requirement to earn public confidence and ensure the inclusiveness of stakeholders) (OECD, 2015: 3). We contend that these key dimensions of water governance have not been effectively achieved or implemented in the MDB, the reasons being that (1) while the goals of water governance are well defined in the *Water Act 2007*, they have not been achieved and, in our view, will not be achieved without changes to how water is governed; (2) the use of multibillion dollar subsidies for water infrastructure to recover water for the environment has been neither environmentally effective at a basin scale nor cost effective, yet it continues; and (3) as identified by the MBDRC, the Productivity Commission, and Wheeler et al. (2017), among others, there is an acute lack of trust in lead water agencies by many stakeholders.

Beyond implementation of the OECD principles, we contend that three strategic actions are required to respond to post-truth in the MDB: (1) transparent measurements of water use, consumption, storage and return flows in the MDB (Williams and Grafton, 2019); (2) full and effective participation by all, especially those who have long been excluded such as the First Peoples of Australia, in some form of a recognition – empowerment – devolution process (Nikolakis et al., 2016); and (3) accountability to the Australian parliament and people for the delivery of the key objects of the *Water Act 2007*, and especially in relation to the goal 3d(ii), "to protect, restore and provide for the ecological values and ecosystem services of the Murray-Darling Basin". Multiple responses are required to deliver on the three strategic actions; it is beyond the scope here to detail all the possible responses, but we do highlight some options. We also stress that such responses should be developed in a genuinely participatory process that includes the multiple voices of the MDB.

Strategic Action 1: We would prioritise measuring the 'what, how, when and who' of water in terms of the MDB so that there is transparency about inflows, extractions, consumption (evapotranspiration), storage (including privately owned) and return flows of water within the MDB (Williams and Grafton, 2019). This hydrological data should also be accompanied by non-market values (Garrick et al., 2017), especially First Peoples' values (MacKenzie et al., 2017), and consideration of basin-scale landscape effects of different stream flows and flooding regimes (Williams, 2017).

Strategic Action 2: Recognition of ignored and neglected voices must include restitution and a 'fair share' of the water resources being directed to the First Peoples of the basin. Such restitution should

complement First Peoples' inclusion – in a genuine rather than tokenistic way – on decision-making boards such as the MDBA and state water agencies. Empirical evidence of deliberative democracy, which includes citizens' assemblies, shows that if such processes are properly structured they promote recognition, understanding and learning (Dryzek et al., 2019). Deliberative democratic processes in the MDB could therefore allow for ignored voices to be heard and could allow for 'bottom up' understanding of the challenges and solutions to the trade-offs occurring across competing water uses in the basin.

Strategic Action 3: We contend that substantial governance reform is required based on the OECD (2015) principles, noting that such principles need to be modified to include the rights of Indigenous peoples (Taylor et al., 2019). The OECD principles highlight the importance of the separation between the formulation of policies and strategies, and their implementation, monitoring and evaluation. Further, these functions must be further separated from audit and review functions, which must be carried out by an independent body which has long-term strategic and knowledge-based leadership and capacity, which can then feed-back to policy reform and the legal framework (OECD, 2015).

For Strategic Action 3, as cogently argued by the MDBRC from a legal perspective, we would give primacy to environmental flow conditions and outcomes.[10] This approach is compatible with approaches calibrated to the MDB (Grafton et al., 2011) and, more generally, to 'designer flows', by which water is released from public water storages through estimating how much stream conditions deviate from natural flows and then adjusting flow so as to promote "key ecosystem processes or biological outcomes of interest while navigating the increasingly competing, societal demands for water and flow" (Chen and Olden, 2017: 2). A designer approach to stream flows in the MDB would require a radical change to water resource planning and allocation, one which prioritises stream flows and associated environmental outcomes over diversions. In our view, such an approach should be complemented by: (1) helping communities to adjust to the required ESLT through public investments in economic and social programmes which facilitate water reform for the public good (Wentworth Group of Concerned Scientists, 2010); (2) greater delegation of responsibilities and authority for water allocation, planning and oversight of environmental and extractive water delivery (Alexandra, 2019; Williams, 2012; Curtis et al., 2014) to local and regional agencies, coupled with deliberative decision-making and listening which includes the missing voices of Australia's First Peoples, and (3) resilient decision-making (Grafton et al., 2019) which includes planning, adaptation and transformational actions within the MDB (Abel et al., 2016).

To help operationalise Strategic Action 3, we concur with Grafton and Williams (2019) that a priority should be the establishment of a statutory independent standing commission that is answerable to the Australian parliament and is charged with audit and oversight powers in relation to land, water and the environment; this would mitigate the lack of trust in relation to national water planning (Wheeler et al., 2017). Crucially, such a standing commission – which is different from a proposed Commonwealth integrity commission (Australian Attorney General, 2019) – must have coercive powers, and the willingness to use these powers to acquire evidence and to summon witnesses to give testimony under oath where false testimony would be a criminal offence. Only with such powers will senior public servants and political advisors be fully accountable for their decisions and actions in relation to water governance.

We contend there is a critical need for fundamental reform of knowledge governance (Colloff and Pittock, 2019) in the MDB to counter the claims of a post-truth water world. Such reform includes an understanding that knowledge incorporates values; it requires a rethinking of what knowledge is credible and must include Indigenous science as both legitimate and important.

In general, when confronting post-truth there must be a proper recognition of how the perception and communication of knowledge is affected by changes in science and society (Munafò and Smith, 2018). There must also be an acceptance of multiple forms of knowledge, but this should be anchored in

[10] This is consistent with the findings of the MDBRC (2019: 21) which stated that "the true, single, bottom line is that no more water may be taken than at the level beyond which the key environmental values would be compromised".

fundamental principles of truth and scientific integrity and the importance of distinguishing facts from falsehoods. In our view, the goal of confronting post-truth should be to 'open up' policy options rather than shut them down, and to provide space to deliberate on genuine – not make-believe – solutions to the world's complex water problems.

ACKNOWLEDGEMENTS

We thank Jessica Weir (Institute for Culture and Society, Western Sydney University) for discussions on the post-truth concept.

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