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## Murray-Darling Basin Plan mark II. What should stakeholders plan for?

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### ABSTRACT

The revised Murray-Darling Basin Plan is scheduled for 2026. Given the Plan's complexity, and issues involved in the revision it is worth asking what will be the main drivers of change? What changes can reasonably be anticipated? What preparations should stakeholders make for their engagement in the planning process? As we move towards the next Basin Plan, there are multiple wheels in motion that could shape the future. Several factors we anticipate being important are examined. Our aim is to stimulate stakeholders to think about and prepare for major contingencies that could affect their interests. We focus on those that will likely affect water availability, and changes in policy and water-governance by public agencies. We take the starting point that rivers are complex social-ecological systems, within which structural circumstances and forms of social capital will affect individuals' and communities' abilities to maximise what they achieve from their natural assets, and their resilience to unfavourable contingencies. We conclude with some observations about how stakeholders might strengthen their ability to respond to opportunities or threats. While the future is always uncertain and all planning processes are flawed, how stakeholders conceive of and respond to today's challenges will substantially affect their capacity to be resilient.

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## 1. Introduction

Stakeholders in the Murray Darling Basin (MDB) are subject to many forces and factors, including world markets, climate variability, and public policies such as the Murray Darling Basin Plan (MDBP). Developed in 2012, the MDBP provides a broad framework, substantially determining what is possible and prohibited in terms of water extraction and use. It has undergone significant reforms since then intended to improve the management of water resources in the Basin, by increasing the efficiency of water use, improving the health of the Basins riverine landscapes, and protecting the rights of local communities (Hart et al. 2020). Some of the changes include increasing the amount of water environmental flows, implementing stricter regulations on the use of water, and increasing the involvement of local communities in the management of water resources.

Water is only one of the elements within this complex socio-hydrological system (Thoms, Rose, and Dyer 2020). The MDBP is also not the only legal instrument that affects stakeholder water interests – policies of five states and territories govern communities and towns, environmental and agricultural organisations, and individuals also are involved. In common with many areas of public policy, stakeholder interests are affected by the actions of political actors, financial organisations, and of indirect stakeholders

pursuing their own strategies and interests, responding to their expectations of the anticipated context.

Plans reflect stakeholders' and decision makers' perceptions of desired outcomes, anticipated conditions, and the resources they expect to be available. A plan or strategy, like the MDBP, is a 'formula' or 'instrument' that guides the allocation of available resources to achieve its stated aims within an anticipated context, over a defined period. The context of the Basin is complex, with many factors determining whether successes (or failures) are ultimately achieved (Hart et al. 2020; McLoughlin, Thoms, and Parsons 2020). These factors include world events, climatic circumstances, contextual supports, institutional impediments, resources, competitors, opportunities, and incentives and disincentives.

Those who plan make explicit or implicit decisions about the future, and the factors they think will significantly impact their plans, and the likelihood of their success. Typically, people explicitly consider only a few major changes to the likely context, which implies a belief that other variables will not change materially or will have little impact on outcomes. People determine plans based on 'assumptions' about important variables or conditions that they think are likely. It also makes sense that people should also consider less

**Table 1.** Biophysical, political, and instrumental factors with the potential to influence water outcomes of the Murray Darling Basin Plan.

Influencing factors - assumptions	Explanation
Biophysical	Less and more volatile and variable rainfall
Environmental water allocations	Restoration of science-based environmental flows
Institutional and social	Maturation of First Nations water rights
Water law	Scheduled 2024 review of the Water Act Scheduled 2026 revision Murray-Darling Basin Plan
Legal – EPBC Act	Environmental Protection and Biodiversity Conservation Act reform
Political and institutional	National decarbonisation initiatives

certain but high-impact changes as ‘contingencies’ which might pose risks or create opportunities.

In this manuscript, six biophysical, political, and instrumental drivers of change that could have major effects on the MDBP are considered (Table 1). We do not claim these represent all possible drivers of change for MDB stakeholder interests (either as assumptions or contingencies), but we expect they will affect the interests of many stakeholders and influence the trajectory of MDB water policies. While each driver of change will have specific effects, and their interactions will create other dynamic effects, we are not aiming to predict how these factors will affect conditions in the future. Instead, our aim is to stimulate stakeholders to think about and prepare for the major contingencies that could affect their interests and to begin exploring how they intend to shape the MDBP.

We want to stimulate discussions about what kind of MDBP will generate value to stakeholders, to society, and to nature, with sufficient time to shape or respond to the significant changes. Planning at the scale of the MDB involves deep and multiple uncertainties (McLoughlin, Thoms, and Parsons 2020). Although we believe each of the assumptions to be potentially significant to many stakeholders, and highly likely, each involves ‘sub-factors’ that are less predictable. For example, it is impossible to be precise about rainfall predictions over a decade, and it is unclear how the water interests of First Nation citizens will be institutionalised and implemented or what environmental values will be prioritised for protection.

Detail presented for each driver of change, in this manuscript, is supported by relevant publications. Our examination was based on a ‘futures’ method, as outlined in Leary and Walker (2018) and Stoianoff, Martin, and Lim (2023). The manuscript reflects a qualitative meta-analysis of journal papers, books and chapters extracted from a Mendeley database of reviewed literature on natural resources law and governance assembled over 18 years. For this manuscript, 260 records were collected from the initial meta-analysis of which, 53 were identified as both likely and having significant impacts on stakeholders’ interests.

## 2. Changes to water availability

Water resources planning in the MDB has essentially assumed that climatic patterns will not vary from that

experienced in the last 130 years, creating a sense that the Basin’s future will continue to be like that experienced over the 20<sup>th</sup> century (Alexandra 2020). The instrumental record and palaeo-climate studies demonstrate that a highly variable climate – oscillating between droughts and floods – drives a wide range of flow conditions. However, the Basin’s climate is changing, and studies predict increasing variability with an overall drying trend (Chiew et al. 2022). The CSIRO (2006, 2008, 2010, 2012) has repeatedly predicted that the MDB is likely to experience hotter drier futures, with reduced inflows in all the basin’s rivers. While there are regional differences and some uncertainty about the projections, the CSIRO scenarios infer MDB stakeholders must prepare for more volatile water availability, with intense and extreme droughts and variable flooding regimes. The recent study by Chiew et al. (2022), using hydro-climatic models, suggests an increased probability of drier conditions and significantly lower stream flows. Changing circulation patterns are expected to alter rainfall patterns across the MDB, reducing the reliability of cool season rains that had historically generated most of the stream flow (CSIRO 2010; 2012). These hydroclimatic predictions highlight the need to strategize for hotter, drier futures, with greater variability and less reliable water resources. This will require greater attention on how risk assessments and risk management are undertaken (Alexandra 2021)

There is a growing awareness that the next Basin Plan must adjust to the changing climatic conditions and integrate the latest climate science (Pittock, Grafton, and Williams 2015; Alexandra 2020, 2021). Despite consistent science-based warnings about hotter and drier futures (CSIRO 2006; 2008, 2010, 2012; Whetton, Grose, and Hennessy 2016), for the first MDBP the MDBA relied on numeric targets based only on the instrumental record (Pittock, Grafton, and Williams 2015; Alexandra 2020). Assessment of the MDB’s water resources assumed continuation of the average conditions experienced between 1896 and 2010. To be robust under uncertain future conditions, the next MDBP will need to use a wide range of inputs, including long-term observations and climate models that can help to calculate a wide range of credible, future scenarios (Prosser, Chiew, and Stafford Smith 2021). How to deal with uncertainty in water planning

is a pressing concern, involving questions about what conditions might be experienced, and how far the world is changing from the historical observations that have been the basis of past approaches to planning.

The concept of hydro-climatic ‘non-stationarity’ is influencing water resources planning, given a regime of climate change (Milly et al. 2008). Rivers and riverine ecosystems are changing beyond the reference points established by historical observations (Thoms and Delong 2018). This has implications for how we think about managing or restoring ecosystems (Ross et al. 2015), like the wetlands of the MDB. The Millennium Drought and the 2017–2020 drought demonstrated what extremes in dryness mean to industries and communities, and the need to adjust to severe water shortages. In the latest drought, towns had to adopt emergency strategies to ensure water supplies, rivers ceased to flow, major fish kills demanded national attention and demonstrated unprecedented social and environmental impacts of intense drought (Jackson and Head 2020). A lesson from this drought is the need to plan for complex risks and cascading impacts, resulting from climatic conditions beyond the historical experience. This highlights that social, political and environmental dimensions of risk management and public policy development are intimately interlinked with the changing climate (Alexandra 2021).

Stakeholders thus should not assume that the future conditions will be a linear continuation of the past. While most planning models assume moderate changes to climatic conditions, there are good reasons to plan for lower probability and more extreme scenarios. The risks of extreme futures could be catastrophic, and stakeholders should hold government agencies to account for their risk management in Basin planning, and ensure the methods are rigorous, transparent, and contestable. Care is needed to ensure that formal plans and the planning process used are robust given the conditions that may occur, even if these conditions seem to have a low probability at present. Projecting past averages into the future – as occurred with the 2012 Basin Plan – or adopting conservative positions on the probable rates of change, will not equip communities for uncertain but possible futures. It is advisable that communities undertake localised risk assessments and become familiar with climate projections that could be significant determinants of their future. Centralised planning models, like those used by the Murray Darling Basin Authority (MDBA) for the 2012 Basin Plan may not cope with the variables that will determine regional conditions. Scenario planning and contingent planning promote questions about the futures that might unfold, encouraging stakeholders to consider low probability but high impact factors. The adoption of scenario

planning methods at the regional scale could help communities express their preferred futures and possible pathways towards these preferable futures.

### 3. Changed environmental water allocation

Environmental water allocations are important in water policy in many countries, including Australia (Dyson, Bergkamp, and Scanlon 2003). The Brisbane Declaration (Arthington et al. 2018) outlines the importance of environmental flows defining them as ‘*the quantity, timing, and quality of freshwater flows and levels necessary to sustain aquatic ecosystems which, in turn, support human cultures, economies, sustainable livelihoods, and well-being*’.

Formalising environmental flows became a central feature of government policy following the Council of Australian Governments (COAG) Water Reforms of 1994 (COAG 1994). These reforms attempted to rebalance extractive water uses with environmental flows, whilst liberalising water markets and providing greater legal security to entitlement holders (Alexandra and Rickards 2021). The implementation of environmental flow policies in the MDB requires that the policy framework provided by the National Water Initiative (Council of Australian Governments 2004) and the Water Act will remain and that governments will remain committed to the trajectories of these reforms. This means that water markets will have a major role in how water entitlements are re-allocated, and governments (state and national) will remain committed to environmental flows through both planned and held environmental water (‘PEW’ and ‘HEW’).

Continuation of these policy settings depends on all MDB governments remaining committed to the framework provided by the Water Act and the MDB agreements. This willingness may be challenged by extreme drought and/or abrupt climate change, which will increase water insecurity in some regions, increasing pressure on States to look after their stakeholders’ interests. The rise in populism and post-truth politics could alter the political fundamentals underpinning the MDB (Grafton et al. 2020). A political or financial crisis in one jurisdiction could undermine the historic agreements that established cooperative federalism in the MDB. While this seems unlikely and is a low probability, history is littered with examples of high impact political events, and their impacts continue (Klassen 2022). Continuation of the cooperative federalism model relies on relatively stable politics in all the MDB jurisdictions, and on their continued will to work together. Another scenario that could dramatically alter MDB planning would be if First Nations legal claims to water rights are upheld in a form that creates an aquatic version of the *Mabo v Queensland* (1992)

and *Wik Peoples v State of Queensland* (1996) decisions. We will discuss this later.

Stakeholders need to be aware that water policy frameworks are socially constructed and depend on a political settlement. This settlement may be fragile at times, and the politics of water in the MDB can become intense particularly during extended droughts, which are predicted to be increasingly severe and frequent (Chiew et al. 2022). Droughts are likely to occur because of a longer-term drying trend, and they will intensify competition for water. The history of policy and institutional reform in the MDB is one of mostly gradual evolution, where emerging issues are accommodated within the framework of cooperative federalism. However, there have been disruptive events in water policy, including Federation and the gazetting of the Water Act (Alexandra 2018). Deliberate design, major ruptures, and climatic events (especially droughts) and wider geo-political circumstances can alter the trajectory and processes of institutional evolution. It is sensible that stakeholders are aware that major disruptive changes are a possibility.

Whilst many factors could destabilise policy settings in the MDB, our expectation is that the established policy and institutional settings will gradually evolve to address new challenges. However, more disruptive scenarios, particularly those triggered by political positions on implementation of environmental flows, are possible contingencies that should be considered by stakeholders.

#### 4. First Nations water rights

There is growing recognition that the ‘unfinished business’ of Australia’s water laws and policies is water rights for First Nations peoples (Hartwig, Jackson, and Osborne 2020). Interconnected water and land systems have religious and cultural significance, having been relied upon by First Nations peoples for tens of thousands of years (Hartwig, Jackson, and Osborne 2020; Moggridge and Thompson 2020). Over 40 First Nations customary territories are part of the MDB (Hartwig, Jackson, and Osborne 2020).

Australia’s legal system of water management was founded on legitimised colonial actions, to the exclusion of Indigenous peoples (Taylor 2021). Marshall (2017) describes this state of affairs as ‘Aqua Nullius’. The exclusion of First Nations peoples has continued with the governance of the Basin, including limiting riparian rights and access to statutory water entitlements (Hartwig, Jackson, and Osborne 2020), marginalising Aboriginal participation (Lindsay, Jaireth, and Rivers 2017) and entrenching distributional challenges in the operation of water markets (Hartwig, Jackson, and Osborne 2020).

First Nations water rights are now receiving substantial policy and research attention (Hartwig,

Jackson, and Osborne 2020). Australia has endorsed the United Nations Declaration on the Rights of Indigenous People (UNDRIP) that states that Indigenous people have the right to own, use and develop waters that they traditionally owned (Productivity Commission 2018). Efforts have been made to better engage Indigenous people in water governance and planning (Jackson 2018), but few of their cultural values and community objectives have as yet been reflected in water plans (Productivity Commission 2018). Declarations (cf. the Echuca Declaration, Jackson 2018), and projects on Cultural Flows (see also Brisbane Declaration and Global Action Agenda on Environmental Flows Arthington et al. 2018) aim to develop new models of water rights and influence (Godden, Jackson, and O’bryan 2020; Anderson and Leal 2019).

Recognition of First Nations’ interests has been introduced in New South Wales and Queensland water statutes (Jackson 2018). Queensland has established water economic reserves ‘for the purpose of helping Aboriginal persons or Torres Strait Islanders to achieve their economic aspirations’ (Godden, Jackson, and O’bryan 2020). In New South Wales, statutory measures (e.g. cultural access licences, community development licences, Aboriginal environment licences and commercial access licences) grant-specific Indigenous entitlements (Jackson 2018). There have been allocations of water to Indigenous people in statutory water plans in northern Australia and ‘Strategic Indigenous Reserves’ (Jackson 2018). Despite this progress, statutory definitions of Indigenous water rights have narrowed, and have been applied in areas generally characterised by low water usage. This limits the benefits from their use, limits group or communal customary legal rights, or precludes commercial gain from the exercise of water rights, under Australia’s native title regime (Godden, Jackson, and O’bryan 2020; Jackson 2018).

There is general agreement that Australian water laws and policies have not adequately addressed Indigenous water rights and claims (Hartwig, Jackson, and Osborne 2020; Productivity Commission, 2018). Major issues remain, not least redistribution of rights to use water for commercial purpose (Hartwig, Jackson, and Osborne 2020). Investment in water distribution has increased under various programmes (e.g. Victorian, Commonwealth) aimed at the purchase of Indigenous water entitlements (Godden, Jackson, and O’bryan 2020). However, First Nations groups in the Basin share only 0.12 per cent of the market (Foley 2021). In NSW, almost one-fifth of Aboriginal water holdings by volume were reportedly lost over 2009–2018, and no Aboriginal organisations had secured new water entitlements over the same decade, holding just 0.2% of available surface water (Godden, Jackson, and

O'bryan 2020; Hartwig, Jackson, and Osborne 2020; Jackson 2018).

Along with 'A Voice to Parliament', attention to addressing the water challenges of First Nations peoples are likely to be a reform priority. The current Federal government's election policy on Water Resources noted a desire to increase First Nations ownership and involvement in decision-making in the Basin (Australian Labor Party 2022). There are various options on First Nations water ownership (cf. O'donnell, Godden, and O'bryan 2020) but significant legal issues and funding options remain. Distinctions between environmental flows and cultural flows (Jackson 2021), the integration of cultural and economic development opportunities (Productivity Commission, 2018) and potential redesign of water market policy to address distributional issues (Wheeler 2022) are possible but uncertain areas for reform (Manero et al. 2022). Minimally the MDBA has noted a 'need to provide First Nations with a clearer pathway to achieve enhanced cultural outcomes in the Basin, as well as to clarify their involvement in water resource management' (MDBA 2020; Productivity Commission, 2018). Although the Australian public reportedly supports increased water rights for First Nations (Jackson 2018; Wheeler 2022), there is a need to resolve the question of whether Indigenous people are to be treated as 'new' or 'community' water users, or peoples and nations with rights, laws and institutions that pre-exist colonial institutions (Taylor 2021). Longer-term claims for economic damages may also arise in the future (Manero et al. 2022). These matters are unlikely to disappear until there is a pathway forward to resolve such issues.

## 5. Political assumption: review of the water act

The national 2007 Water Act is central to the governance of the MDB socio-hydrological system. The Water Act is scheduled for a full review before 2025 (Water Act 2007, S.253) and the Murray Darling Basin Plan is scheduled for a full review in 2026.

The Water Act is subject to the water and environmental rules and administration of the five basin states. It is affected by the contracts and administration of irrigation organisations, state and local government rules governing the development and operation of water infrastructure, competition and investment laws, corporation and finance rules, consumer and industry water arrangements and a myriad of public policies. All are shaped by political forces, and the dynamics of interest bargaining.

Though changing situations and interest bargaining mean that changes to water rules are inevitable, it is difficult to predict (and to plan for) precisely what

rule changes will happen. Rules change not only reflects logical policy, but it also reflects bargaining, competing ideas, political processes, chance, and subjective perceptions. A political party can take a water policy to an election, but the rules that ultimately emerge can be different from that policy, and implementation may be different again. Similarly, institutional complexities and dynamics exist for national, state, and local rules affect infrastructure development, water quality, decarbonisation, and biodiversity protection (as the specific rules, agencies and stakeholders vary).

With its policies for the national election, the Labour party signalled its intention to make major changes to Australian water, climate, and environmental policies. Relevant State and local government electoral policies (not the focus of this paper) are also subject to change, and to policy implementation agreements with the Commonwealth. Stakeholders in the Murray Darling should plan with an expectation of substantial change.

To assume that MDB water rules will remain unchanged is therefore unrealistic! It is more sensible to treat the rules that stakeholders expect will emerge as plan assumptions; and to treat lower impact, but more uncertain, changes as 'contingencies'. To prepare this paper, we extrapolated a list of 73 possible changes to legal rules governing Murray-Darling Basin water from a review of over 200 policy statements, government reviews, reports, journal, and news articles, coupled with our experience and judgement. The possible changes include potential changes to the underlying 'architecture' of rules, and operational rules and administration, including changes that are likely and that have been advocated but seem less likely. We distilled a shortlist of key changes relevant to most stakeholders' interests, which we summarise below. For brevity and clarity, we focus only on the Water Act, and we cite only some key sources.

### 5.1. Rules and processes to ensure governance integrity

Given past management failings, stronger mechanisms are likely to be implemented, to ensure water management integrity (Productivity Commission 2018; *undefined*). Four possible developments are particularly relevant.

- (1) Regulatory restructure, including tighter oversight of the MDBA by the 'Inspector General – Water Compliance' instituted in 2020 (in addition to other regulatory oversight by the proposed national environmental law regulator and the existing the Australian Competition and Consumer Commission (ACCC)).

- (2) Clarification of (and accountability for) state/federal responsibilities, including stronger federal and state reporting and evaluation requirements (particularly for water productivity and environmental investment).
- (3) Greater specificity and precision of water efficiency measures/efficiency accountability – including greater attention to the validity of investment, efficiency evaluations, transparent funds allocation, and clearer accountability.
- (4) An increase in public information, aiming to improve transparency and accountability (e.g. for water trading and environmental outcomes data).

### **5.2. Environmental watering rules and processes**

Based on government policy commitments, stakeholders should anticipate changes to environmental watering rules and process, and increased allocations of water to the environment. An analysis of issues concerned with environmental watering rules and process has been undertaken by the Wentworth Group of Concerned Scientists (2017, 2019). Based on this review, we believe that stakeholders should expect the following:

- (1) Reversal of prior government restrictions on water recovery mechanisms, to increase environmental flows by 450 GL, including through direct purchase of water for the environment.
- (2) Clarification and tighter specification of the scientific analysis that underpins water allocation, to increase the emphasis on improved biodiversity outcomes.
- (3) Refinement of the Commonwealth Environmental Water Holder environmental investment and accountability rules. Closer integration of water management with broader rural natural resource management decision-making is also possible.
- (4) More stringent control against water theft or fraud, including the potential for increased penalties. Civil compensation (based on class actions) is a related private law contingency
- (5) Given the history of ‘North/South’ tensions, it is likely that tighter controls will be implemented over Northern basin extraction (including of overland flows), to maintain flows to the lower Basin.

### **5.3. Risk-management reforms**

The Water Act offers some risk protection for water licence holders, and embeds a role of science, but does not guard against risks to other stakeholder interests

(despite the problems and costs that have crystallised). The MDB Plan (Chapter 6) deals only with risks arising from reduction in diversion limits, and risks arising from other changes to the Basin Plan. The approach does not deal (for example) with risks to communities from interventions under the MDB Plan, nor with risks of policy failure. An argument can be made for more comprehensive risks-management requirements in the Water Act or MDBP (possibly including explicit risk sharing with states). The following risk-management developments are possible.

- (1) An explicit obligation on the MDBA to conduct social impact and risk assessments, and social risk management, before significant initiatives and investments.
- (2) Risk management arrangements for climate variables, including drought and flood risks to natural and social assets.
- (3) The analysis of risk to communities being required when determining sustainable levels of water extraction.
- (4) A legislated requirement for an explicit MDBA risk-management strategy, alongside the MDBP.

### **5.4. Process and operations reform**

Many problems that have arisen with management and operations indicate the need for changes to process and operational rules, such as:

- (1) Stronger water investment standards and accountabilities, to address the economic and functional underperformance of public water investments (Wentworth Group of Concerned Scientists 2019).
- (2) More precise specification of technical planning and assessment standards, possibly with standardisation across jurisdictions and between agencies.
- (3) Improved data and accountability systems and technologies (potentially leading to a blockchain approach to water entitlement and use records).
- (4) Increased specification of water trading competition rules and arrangements, including more stringent rules governing the business operations of intermediaries (water agents and brokers).

Significant reforms and changes should be anticipated with Murray-Darling governance, based upon the implementation problems that have emerged so far in implementation of the National Water Initiative within the MDB. For example, contingencies include that the scope of the MDBP will expand (e.g. to specifically address reuse or desalinated water, or return

flows); that flood management will become part of the role of the MDBA; that an independent Water Markets Regulator will be established (alongside the MDBA, a Basin Plan Regulator, a national Environmental Law agency, and the Australian Competition and Consumer Commission); radical adjustments to the science-based markets paradigm; possibly legal ‘personality’ for the river; a co-regulation model with industry or local government; or de-emphasising water marketisation by increasing administrative controls.

Given the history of the MDB, and the changes to the context we discuss in this paper, it is easy to imagine a substantially changed legal framework for water use and management. The Water Act does not override other national and state laws, so changes to other environmental and climate laws and policies, which are also likely, will also impact on the MDBP.

## 6. Reforms to national environmental law

Australia’s environment is experiencing significant decline (Cresswell, Janke, and Johnston 2021) notwithstanding the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBCA), the key part of Australia’s national environmental law regime. The EPBCA identifies issues for national protection. Many of these involve environmental sensitivities that are significantly affected by the management of the MDB – these include threatened species, and ecological communities, world and national heritage sites, migratory species, listed wetlands, marine environments, nuclear actions and water resources impacted by coal seam and large coal extraction (Burnett 2021). The EPBCA governs plans for conservation and seeks to efficiently assess and approve ecologically sustainable use of resources (Burnett 2021). It is unavoidable that the management of major surface, groundwater, wetland, and freshwater ecosystems in a semi-arid, flat landscape will have environmental effects, so it should be anticipated that national environmental legislation will play an important part in how that system is governed.

This two-decade old legislation has been subject to two major reviews (the Hawke review in 2009 and the Samuel review in Samuel 2020). Both reviews and three reports by the Australian National Audit Office (2014, 2017, 2020) recommended major reforms. With some exceptions, the Act’s suboptimal performance has largely been due to underfunding (Burnett 2021) and substantial political discretion in decision-making. These issues have opened the Act to criticism that it favours development over environmental considerations (Dickson and Woolaston 2021; Ng 2021). At the same time, industry perceives the EPBCA as being cumbersome and imposing unnecessary delays and costs on development (Ng 2021).

The most recent review found that the EPBCA does not enable the Commonwealth to effectively fulfil its environmental responsibilities. The Act, and how it is implemented, results in piecemeal decisions, which rarely work in concert with the environmental management responsibilities of the States and Territories. The Act thus impedes holistic environmental management which, in the context of Australia’s federation, is essential for success (Samuel 2020). Despite the EPBCA’s specific objectives to recognise Indigenous people, the involvement of Indigenous people in implementation of the Act has been limited (Goolmeer, Skroblin, and Wintle 2022).

The 38 recommendations from the Samuel review focus on developing national environmental standards, improving efficiency and trust in the Act, the collection and sharing of data, improved compliance and enforcement and an emphasis on First Nations involvement in decision-making, with stronger protection for cultural heritage (Samuel 2020; Pacey et al. 2022).

National environmental standards are central to the proposed reforms. The standards aim to define environmental outcomes in legally binding regulations, aiming to incorporate principles to achieve improved environmental outcomes across all government levels (Ng 2021). Bates (2022) argues that an outcomes-based approach by government could be ‘far more effective in encouraging landowners and lessees to carry out land rehydration and other environmentally beneficial projects’.

Underpinning these standards are proposed new bodies, including an Office of Compliance and Enforcement, an independent statutory Environment Assurance Commissioner to conduct audits and report on decisions under the EPBCA (Ng 2021; Samuel 2020), and an Indigenous Engagement and Participation Committee to provide policy advice on Indigenous engagement and participation in decision-making (Ng 2021)

While previously similar reform proposals have been ignored or watered down (Goolmeer et al. 2022; Burnett 2021), Australia’s current Environment Minister, Tanya Plibersek has promised to introduce new environment laws in 2023 as new legislation or amendments to the EPBCA (Morton 2022). Signalling that the government will implement the Samuel Review’s recommendations, Minister Plibersek’s plans include a new national environment protection agency (Greber 2022), clear environmental standards with explicit mandatory targets, better data on key environmental indicators, and a greater emphasis on using Indigenous knowledge (Morton 2022).

The role of the EPBCA in regulating water use and agriculture has historically been limited (Hamman et al. 2021; Craik 2018) because state governments are largely responsible for property rights, and for



water and land-use decisions (e.g. mining and gas tenures and major public infrastructure). Even so, with agricultural development and related water use intensifying, and the demand for land increasing, interactions between the agriculture sector and environment and biodiversity conservation legislation are likely to increase (Hamman et al. 2021)

Stakeholders should consider whether the EPBCA coverage will be extended, as has been argued, to land clearing, ecosystems, water resources, air pollution and protected areas (Samuel 2020). How environmental laws will deal with the climate crisis is also relevant (Morton 2022). *Sharma v Minister for the Environment* failed to establish a duty of care under the EPBCA to consider potential harm to future generations, so meaningful action on climate change may have to be addressed through wider environmental reform (Melrose 2022).

The extent of federal responsibility for environmental protection looms as a significant issue. Plibersek has signalled that landowners and resources companies will be targeted by the Government's environmental watchdog over broken promises to protect landscapes and biodiversity (Greber 2022). A new national Environmental Protection Agency may have investigative powers that reach into what have traditionally been state responsibilities. Federal intervention may involve processes to rapidly assess and designate critical habitat, and to deal with contingencies such as bushfires (Fitzsimmons 2021). Regional planning and assessment may also be addressed, including potential 'no go' development zones, offset and conservation areas and more strategic evaluation of where development can be located (Pacey et al. 2022).

## 7. The effects of national decarbonisation policy

Broader systemic changes arising from decarbonisation of the economy will affect stakeholders in the Murray Darling system. After a long period of political wrangling, the national government committed to a 43 per cent emissions reduction by 2030 and net-zero by 2050. These initiatives will be led by a climate change Minister and a Climate Change Authority. Decarbonisation strategies include tighter development control over new fossil fuels projects, promotion of electric vehicles, more regulation of industrial emissions, and public energy investments and electricity network infrastructure changes.

Rural decarbonisation initiatives have not yet been disclosed. Agriculture represents around 15% of Australia's greenhouse gas emissions and produces ~2–3% of national GDP. Agriculture has a significant role in capturing and storing emissions in plants and

soil. National decarbonisation policies are likely to have many impacts on water operations and infrastructures. For example, carbon sequestration impacts are likely to become relevant to the prioritisation of environmental flows and increases in pumped hydro schemes will affect water use choices. There will also be indirect impacts from the decarbonisation initiatives of water users, particularly urban water utilities and major water using companies.

Changes in energy generation and use will have some direct impacts. Decarbonisation will create incentives for hydroelectricity and pumped hydro storage, and water will be required for hydrogen fuel generation. The timing of such water uses may be less than optimal for primary production or flood management purposes. Perhaps, a more immediate concern for stakeholders will be the greater incentives to reduce the energy costs of operating water pumps.

Decarbonisation policies will also impact environmental watering. The carbon emission or sequestration impacts of environmental water allocations will become increasingly relevant to operating decisions, and market instruments and other incentives may change the economics of water allocation to the environment. Initiatives like carbon-sequestration in forests or wetlands, or on-farm rehydration, are likely to require water allocations that will compete with other traditional water use choices, and thus influence water allocation and use decisions (and government policies on water for the environment and for agriculture).

Decarbonisation activities of agricultural water users will also have indirect impacts. Landscape management decarbonisation is likely to focus on retaining trees and vegetation, pasture or soils protection or restoration, and natural habitat protection or restoration. Decarbonising of production is likely to involve reducing fertiliser use or land disturbance, minimising animal emissions, reducing energy-related (including transport fuel) emissions. Other aspects include fire management, invasive species control, and managing landscape hydrology to increase plant biomass production (and carbon sequestration). The potential of altering landscape hydrology is of particular significance to the MDB and may result in changes to timing and volume of flows in rivers.

Voluntary or industry decarbonisation programmes including incentive schemes, credentials or labels, or farm management programmes may also have effects on industries in the MDB. It is likely that market incentives including payments for avoided emissions and carbon sequestration, and carbon market instruments, will shape landholder behaviour. Market incentives and decarbonisation supports are likely to be economically relevant to environmental watering initiatives.

The cornerstone of Australia's current government rural decarbonisation approach is the Emissions Reduction Fund (the ERF), which incorporates the

Carbon Farming Initiative (which itself incorporates the Indigenous Carbon Farming Fund and the Aboriginal Carbon Fund). The ERF issues tradeable credits within a voluntary decarbonisation investment scheme. Approved credits must use methods authorised by the Australian Government Clean Energy Regulator. There is a very long list of approved methods, but serious doubts have been raised about the integrity and cost-effectiveness of this carbon market scheme, which is subject to an independent review (Mackenzie 2018). Thus, substantial reforms to ERF and rural decarbonisation generally are very likely.

In summary, what decarbonisation impacts should the stakeholders in the Murray-Darling Basin consider in their planning? The following five possibilities are worth considering:

- (1) Increased energy costs for pumping, and potentially pump infrastructure replacement
- (2) Some new water demands for water/energy initiatives.
- (3) Far more attention to the carbon aspects of water for the environment, including both sequestration and de-sequestration (viz. due to environmental drying).
- (4) The impacts of incentives for decarbonisation, particularly on environmental watering
- (5) More attention to landscape carbon sequestration, including altering landscape hydrology and upstream landscape hydration.

## 8. Plan for what you expect, and be prepared for the unexpected

Strategic thinkers plan how to thrive under expected future conditions and build their capacity to manage the risk of changes they could not predict. The capacity of people and organisations to resist unexpected shocks or recover from them is often termed ‘resilience’, and the capacity to identify and take advantage of opportunities is the essence of ‘entrepreneurship’. Resilience and entrepreneurship can be strengthened by considering what strategies will work under the expected conditions, and what resources and capabilities will allow effective adaptation when the unexpected arises. Entrepreneurship and resilience mechanisms are strengthened by foresight, planning, and by building the ‘platform’ of resources, relationships and capabilities that will be needed to thrive and cope in the future.

The purpose of this manuscript is to stimulate MDB stakeholders to think about how they can prepare for socio-ecological system change in the MDB. While we focused largely on questions of water availability and changes driven by government policies, we do not rule out other major contingencies (e.g. global

economic or public health shocks). The many variables that we have not analysed include markets and industries, technologies, trade, weather events, economics and community attitudes and behaviours. Grundy et al. (2016) also provide a discussion of some scenarios for rural and regional Australia.

Although stakeholders may not be able to prevent many changes that will affect them, they can decide how they will prepare and respond. If they wait till the change is upon them before they begin to adapt, this will rule out some strategies that require time for planning, relationship, and social capital development, and building capacity. Concerning political changes (such as new rules and policies) stakeholders can choose either oppositional or collaborative approaches, noting that the collaborative strategies generally require sound relationships and more time for dialogue and negotiation. Waiting until it is clear what changes are becoming crystallised limits what is possible in terms of building coalitions and collaborative alliances.

Collaboration and innovation can create opportunities to reconcile otherwise competing interests, or to find innovations, value or mutually supporting solutions that was not previously obvious. Working collaboratively, with sufficient time to explore possibilities and develop solutions, can allow the parties to explore possible synergies, and ideas that have not been previously tried before to create value that can be shared (which would otherwise not be ‘on the table’).

Finding added value opportunities and principled sharing is more likely when communities have learned how to work together and have built the necessary social capital through past experiences. It requires places, patterns, and forums for constructive collaboration. A pivotal resilience issue is thus how communities choose to deal with difficult issues that involve potentially competing interests – do they focus on maximising the available value and working out how to share it, or do individuals focus on securing the maximum of what is ‘on the table’ to meet their own interest?

Deciding how to tackle the issues that will emerge in the MDB is about more than meeting the immediate water challenges. It is also about deciding what mechanisms the stakeholder community will have to deal with many challenges where collaboration could produce value and reduce risk, or where a ‘zero-sum’ approach will be a value-reducing strategy. How MDB challenges are handled can enhance or erode the social capital and community confidence needed to respond to future challenges.

Social capital is created by demonstrating respect and a concern for fairness, through a shared history of constructive interactions and through respect for diversity. Social capital has a demonstrated value when communities and individuals are faced with significant challenges. It takes time and practice in working together to create the relationships that are the essence of social

capital. Planning for the MDB's future offers an opportunity to build stronger ties and strengthen the relationships that build this capital.

Knowledge, skills, and competence developed through experience are required to prepare individuals and organisations to navigate the complex and difficult issues involved in revising the MDBP. Time and good processes are needed to access competent support, build trust and gain knowledge. Communities will almost certainly create better outcomes from working through the issues we have discussed, developing their own initiatives rather than waiting to respond to a draft MDBP via government run consultation. While transaction costs may be initially high, working to develop local and regional positions is an act of empowerment that could strengthen communities in the longer term.

Stakeholders in the MDB have a choice as to whether they approach the challenges we have outlined with an expectation that resolution will be primarily through competitive or collaborative processes. Communities have a choice about whether they accept the *status quo* of how MDB planning has been undertaken and how water resource competition has been managed. It is possible to create a new *status quo* of greater 'bottom-up' planning, in which they inform governments of the kinds of futures they want and are working towards. For a more effective value creation – value-sharing model to emerge community leaders need to develop the relationships, the knowledge, and the resources to run more affective planning processes. This will take time and patience.

How might a community start to develop a more resilient, value-creating model? The following six steps are our preliminary ideas, intended only as a stimulus. Ultimately the stakeholders will decide their own path towards a more resilient and fruitful future.

- (1) Identify what variables (either continuing or changing) will have the greatest influence on the interests of the community, and on sections of the community; and decide which ones they want to plan for as either assumptions (likely, important) or contingencies (less likely but high impact).
- (2) Develop future scenarios on the basis of things proceed 'naturally', or on the basis of pursuing the preferred future. For the preferred future to be feasible, consider what actions are needed to direct things towards maximising the community's long-term interests.
- (3) Decide what resources, relationships, knowledge, data, and actions are needed to take effective action to achieve the preferred future.
- (4) Commit to actions, individually and collectively, to shape the preferred future, and to adjust plans as things proceed.

- (5) Develop and implement a strategy to create the platform that stakeholders need, including expertise, data, and knowledge resources, and begin to build this collaboratively.
- (6) Continue investing in identifying and understanding the shared interests. This will require that the members of the community invest in dialogue and capacity building.

The stakeholders in the MDB are already involved in a process of negotiating and shaping their future, even if they are not conscious of this. Taking no action to consciously shape the future they want is in fact doing something significant for their future. By using up the available time, they are limiting the options that they have to build the strategic platform and social capital required for many of the possible strategies. It is in effect transferring power to those who are better prepared. Whether to wait or to act proactively is a choice that all MDB stakeholders are making. The premise of this paper is that it is better to plan for ourselves, than to let others plan for you.

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## References

- Alexandra, J. 2018. "Evolving Governance and Contested Water Reforms in Australia's Murray Darling Basin." *Water* 10 (2): 113. doi:10.3390/w10020113.
- Alexandra, J. 2020. "The Science and Politics of Climate Risk Assessment in Australia's Murray Darling Basin." *Environmental science & policy* 112: 17–27. doi:10.1016/j.envsci.2020.05.022.
- Alexandra, J. 2021. "Navigating the Anthropocene's Rivers of Risk—climatic Change and Science-Policy Dilemmas in Australia's Murray-Darling Basin." *Climatic Change* 165 (1–2): 1. doi:10.1007/s10584-021-03036-w.
- Alexandra, J., and L. Rickards. 2021. "The Contested Politics of Drought, Water Security and Climate Adaptation in Australia's Murray Darling Basin." *Water Alternatives* 14: 394–773.
- Anderson, T.L., and D.R. Leal. 2019. *Going with the Flow: Expanding Water Markets*. London: Taylor and Francis.
- Arthington, A.H., A. Bhaduri, S.E. Bunn, S.E. Jackson, R. E. Tharme, D. Tickner, W. Young, et al. 2018. "The Brisbane Declaration and Global Action Agenda on Environmental Flows." *Frontiers in Environmental Science* 6: 45. doi:10.3389/fenvs.2018.00045.
- Australian Labor Party. 2022. Labor's Plan to Future-Proof Australia's Water Resources. Press release Friday, 8th April 2022.

- Bates, G. 2022. "Re-Thinking Environmental Regulation." *Environmental and Planning Law Journal* 38: 8–12.
- Burnett, P. 2021. "Switched off Client: The Samuel Review of National Environmental Law." *AQ: Australian Quarterly* 92: 3–12.
- Chiew, F.H.S., H. Zheng, N.J. Potter, S.P. Charles, M. Thatcher, J. Robertson, D.E. Syktus, D.A. Post, and D. A. Post. 2022. "Different Hydroclimate Modelling Approaches Can Lead to a Large Range of Streamflow Projections Under Climate Change: Implications for Water Resources Management." *Water* 14 (17): 2730. doi:10.3390/w14172730.
- Council of Australian Governments. 2004. Intergovernmental Agreement on a National Water Initiative. Council of Australian Governments.
- Council of Australian Governments (COAG). 1994. *Third Meeting Communique (Attachment A: Water Resource Policy)*. Hobart: Council of Australian Governments.
- Craik, W. 2018. Review of Interactions Between the EPBC Act and the Agriculture Sector - Final Report. Aither Pty Ltd.
- Cresswell, I. D., T. Janke, and E. L. Johnston. 2021. *Australia State of the Environment 2021*, 274. Canberra: Australian Commonwealth of Australia.
- CSIRO. 2006. *Risks to the Shared Water Resources of the Murray-Darling Basin: Part II in a Two Part Series on the Shared Water Resources of the Murray-Darling Basin Prepared for the Murray-Darling Basin Commission*. Canberra: CSIRO and Murray Darling Basin Commission.
- CSIRO. 2008. *Water Availability in the Murray-Darling Basin - CSIRO Murray-Darling Basin Sustainable Yields Project* CSIRO: CSIRO and Murray Darling Basin Commission. Canberra.
- CSIRO. 2010. Climate change and variability in SE Australia – A synthesis of Phase 1 of SEACI, CSIRO Canberra.
- CSIRO. 2012. SEACI Phase 2 Synthesis Report, Climate and Water Availability in South-Eastern Australia. (9 November 2021). [www.seaci.org/publications/documents/SEACI-2Reports/SEACIPhase2SynthesisReport.pdf](http://www.seaci.org/publications/documents/SEACI-2Reports/SEACIPhase2SynthesisReport.pdf)
- Dickson, T., and K. Woolaston. 2021. "The Balance of Environmental Protection and Economic Development in Federal Decision-Making: An Investigation into Section 74A of the Environment Protection and Biodiversity Conservation Act 1999." *Environmental and Planning Law Journal* 38: 22–39.
- Dyson, M., G. Bergkamp, and J. Scanlon. 2003. *Flow: The Essentials of Environmental Flows*. Gland, Switzerland and Cambridge, UK: IUCN. 20–87.
- Fitzsimmons, S. 2021. "Resilience: Preparing for and Recovering from Crisis and Disaster." *United Service* 72: 14–18.
- Foley, M. 2021. "It Was Our Economy, Now We are Dirt poor: First Nations People Dispossessed of Water." *The Sydney Morning Herald*, February 22.
- Godden, L., S. Jackson, and K. O'bryan. 2020. "Indigenous Water Rights and Water Law Reforms in Australia." *Environmental and Planning Law Journal* 37: 655–678.
- Goolmeer, T., A. Skroblin, and B. A. Wintle. 2022. "Getting Our Act Together to Improve Indigenous Leadership and Recognition in Biodiversity Management." *Ecological Management & Restoration* 23 (S1): 33–42. doi:10.1111/emr.12523.
- Grafton, Q., M. J. Colloff, V. Marshall, and J. Williams. 2020. "Confronting a 'Post-Truth Water World' in the Murray-Darling Basin, Australia." *Water Alternatives* 13: 1–28.
- Greber, J. 2022. "Plibersek to Take Politics Out of Environmental Policing." *The Australian Financial Review*.
- Grundy, M.J., B.A. Bryan, M. Nolan, M. Battaglia, S. Hatfield-Dodds, J.D. Connor, and B.A. Keating. 2016. "Scenarios for Australian Agricultural Production and Land Use to 2050." *Agricultural systems* 142: 70–83. doi:10.1016/j.agry.2015.11.008.
- Hamman, E., F. Deane, A. Kennedy, A. Huggins, and Z. Nay. 2021. "Environmental Regulation of Agriculture in Federal Systems of Government: The Case of Australia." *Agronomy* 11 (8): 1478. doi:10.3390/agronomy11081478.
- Hart, B.T., N.R. Bond, N. Byron, C.A. Pollino, and M. J. Stewardson. 2020. *Murray Darling basin. Its Future Management*. Australia: Elsevier.
- Hartwig, L., S. Jackson, and N. Osborne. 2020. "Trends in Aboriginal Water Ownership in New South Wales, Australia: The Continuities Between Colonial and Neoliberal Forms of Dispossession." *Land Use Policy* 99: 104869. doi:10.1016/j.landusepol.2020.104869.
- Jackson, S. 2018. "Water and Indigenous Rights: Mechanisms and Pathways of Recognition, Representation, and Redistribution." *WIREs Water* 5 (6): e1314. doi:10.1002/wat2.1314.
- Jackson, S. 2021. "Enacting Multiple River Realities in the Performance of an Environmental Flow in Australia's Murray-Darling Basin." *Geographical Research* 60 (3): 1–17.
- Jackson, S., and L. Head. 2020. "Australia's Mass Fish Kills as a Crisis of Modern Water: Understanding Hydrosocial Change in the Murray-Darling Basin." *Geoforum* 109: 44–56. doi:10.1016/j.geoforum.2019.12.020.
- Klassen, T. 2022. Here are Some of the Political Events That Will Dominate Headlines in 2022. *The Conversation* 173580.
- Leary, H., and A. Walker. 2018. "Meta-Analysis and Meta-Synthesis Methodologies: Rigorously Piecing Together Research." *Tech Trends* 62 (5): 525–534. doi:10.1007/s11528-018-0312-7.
- Lindsay, B., H. Jaireth, and N. Rivers 2017. The Australian Panel of Experts on Environmental Law, Democracy and the Environment, Technical Paper 8. *Mabo v Queensland* (1992) No 2, HCA 23, 175 CLR 1.
- Mabo v Queensland*. 1992. No 2, HCA 23, 175 CLR 1.
- Mackenzie, I. A. 2018. "Australia's Emissions Reduction Fund is Almost Empty. It Shouldn't Be Refilled." *The Conversation* 26 (Feb): 2–5.
- Manero, A., K. Taylor, W. Nikolakis, W. Adamowicz, V. Marshall, A. Spencer-Cotton, M. Nguyen, and R. Q. Fraughton. 2022. "A Systematic Literature Review of Non-Market Valuation of Indigenous peoples' Values: Current Knowledge, Best-Practice and Framing Questions for Future Research." *Ecosystem Services* 54: 101417. doi:10.1016/j.ecoser.2022.101417.
- Marshall, V. 2017. *Overturning Aqua Nullius: Securing Aboriginal Water Rights*. Canberra, Australia: Aboriginal Studies Press.
- McLoughlin, C., M.C. Thoms, and M. Parsons. 2020. "Reflexive Learning in Adaptive Management: A Case Study of Environmental Water Management in the Murray Darling, Australia." *River Research and Applications* 36 (4): 681–694. doi:10.1002/rra.3607.

- MDBA. 2020. *The Basin Plan 2020 Evaluation*. Canberra: Murray Darling Basin Authority, Commonwealth of Australia.
- Melrose, L. 2022. "Emerging Trends in Australian Climate Change Litigation: Bringing the Heat." *Alternative Law Journal* 47 (3): 23–30. doi:10.1177/1037969X221112515.
- Milly, P.C.D., J. Betancourt, M. Falkenmark, R.M. Hirsch, Z. W. Kundzewicz, D.P. Lettenmaier, and R.J. Stouffer. 2008. "Climate Change: Stationarity is Dead: Whither Water Management?" *Science* 319 (5863): 573–574. doi:10.1126/science.1151915.
- Moggridge, B.J., and R.M. Thompson. 2020. "Cultural Value of Water and Western Water Management: An Australian Indigenous Perspective." *Australasian Journal of Water Resources* 25 (1): 4–14. doi:10.1080/13241583.2021.1897926.
- Morton, A. 2022. The Dire State of the Environment Report is a Major Challenge for Labor – and an Opportunity. *The Guardian*, Jul 19, 2022.
- Ng, K. 2021. "Towards an Outcomes-Driven Approach to Environmental Law: The Environment Protection and Biodiversity Conservation Act 1999." *Environmental and Planning Law Journal* 38: 223–236.
- O'donnell, E., L. Godden, and K. O'bryan 2020. Final Report of the Accessing Water to Meet Aboriginal Economic Development Needs Project. University of Melbourne. Pacey
- Pacey, K., P. Briggs, H. Asten, and M. Debenham. 2022. "New Government, New Minister, New Federal Environmental Laws?" *HSE*, June 8.
- Pittock, J., R.Q. Grafton, and J. Williams. 2015. "The Murray-Darling Basin Plan Fails to Deal Adequately with Climate Change." *Water* 42: 28–34.
- Productivity Commission. 2018. *Murray-Darling Basin Plan: Five-Year Assessment Final Report* (Issue 90). Australian Government. (2021) National Water Reform 2020, Inquiry Report no. 96, Canberra. [www.pc.gov.au.ProductivityCommission](http://www.pc.gov.au/ProductivityCommission)
- Prosser, I.P., F.H.S. Chiew, and M. Stafford Smith. 2021. "Adapting Water Management to Climate Change in the Murray–Darling Basin, Australia." *Water* 13 (18): 2504. doi:10.3390/w13182504.
- Ross, M., E.S. Bernhardt, M. Doyle, and J. Heffernan. 2015. "Designer Ecosystems: Incorporating Design Approaches into Applied Ecology." *Annual Review of Environment and Resources* 40 (1): 419–443. doi:10.1146/annurev-environ-121012-100957.
- Rural and Regional Affairs and Transport References Committee – RRATRC -. 2018. *Integrity of the water market in the Murray-Darling Basin* (Issue November). ISBN 9781 (Issue November). ISBN 978176010841. 76010841.
- Samuel, G. 2020. *Independent Review of the EPBC Act – Final Report*. Department of Agriculture, Water and the Environment, Canberra, October. CC BY 4.0.
- Stoianoff, N., P. Martin, and M. Lim. 2023. *Non-Doctrinal Methods for Environmental Law Research*. London: Routledge.
- Taylor, K. 2021. "Australian Water Security Framings Across Administrative Levels." *Water Security* 12: 100083. doi:10.1016/j.wasec.2020.100083.
- Thoms, M.C., and M.D. Delong. 2018. "Ecosystem Responses to Water Resource Developments in a Large Dryland River." *Water Resources Research* 54 (9): 6643–6655. doi:10.1029/2018WR022956.
- Thoms, M.C., T. Rose, and F.D. Dyer. 2020. "Riverine Landscapes, Water Development and Management: A View from Down-Under." *River Research and Applications* 36 (4): 5050–5511. doi:10.1002/rra.3622.
- Water Act. 2007. *Commonwealth of Australia, Water Act 2007*. Canberra: Commonwealth of Australia.
- Wentworth Group of Concerned Scientists. 2017. *Review of Water Reform in the Murray-Darling Basin*. Sydney: Wentworth Group. 13: 978-0-9944577-4-5.
- Wentworth Group of Concerned Scientists. 2019 *Water Flows in the Murray-Darling Basin: Observed versus Expected*. Summary Report. Sydney: Wentworth Group.
- Wheeler, S. 2022. "Debunking Murray-Darling Basin Water Trade Myths." *The Australian Journal of Agricultural and Resource Economics* 22: 1–25.
- Whetton, P.H., M.R. Grose, and K.J. Hennessy. 2016. "A Short History of the Future: Australian Climate Projections 1987–2015." *Climates Services* 2: 1–14. doi:10.1016/j.cliser.2016.06.001.
- Wik Peoples v State of Queensland. 1996. *HCA* 40. 187. CLR 1