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Governing Climate-Related Systemic Risks in the Murray-Darling Basin in Australia

COLLECTION:
MANAGING RESPONSIBILITIES FOR CLIMATE CHANGE RISKS

ARTICLE

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ABSTRACT

Mass fish kills and widespread drought in Australia's Murray-Darling Basin (MDB) have demonstrated the importance of leaving enough water in rivers for river ecosystems, a challenge that is set to intensify under climate change. Water governance must grapple with these 'systemic' climate risks and prepare communities for the wide-ranging and significant changes that will occur. But addressing climate risks will require governments and water regulators to move beyond existing practices and take into account non-stationarity as well as stochastic and non-linear changes in the future climate. Governance systems will need to be structured to engage more directly and intensively with the many perspectives on how much water can be consumed now and in the future. This article evaluates the legal content of the governance regime for climate risks in the MDB, drawing conclusions on who, or what, bears the risk of climate change. It will then use theories of risk governance and deliberative democracy to demonstrate how the systematic adoption of a deliberative approach through statutory evaluation and review processes could improve the MDB regime's problem-solving capabilities, as well as its ability to reduce polarisation in a hotter, drier climate.

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1. INTRODUCTION

Climate change is transforming global approaches to water governance. Historical records no longer provide reliable predictions of future water availability, and water managers are incorporating predictive climate models into the water planning process. However, models and scenarios are only a starting point for resolving the complex and uncertain social, economic and environmental risks and challenges involved in water (re)allocation under climate change. Difficult trade-offs must be made between a variety of water uses, at different scales, and studies have focussed on the need for greater public participation, or multistakeholder approaches, to address the normative questions involved in water reallocation and social needs.[1] The article extends this body of work by arguing that climate risks to water availability should be managed as 'systemic risks', with the support of structured deliberation. It aims to identify and describe an inclusive governance model for deliberation that is effective in the context of the trade-offs involved in reallocating water. In order to achieve this, the article examines the potential role of structured deliberation in Australia›s Murray-Darling Basin (MDB), where the systemic risks posed by climate change to the MDB are unlikely to be governed effectively by the complex of legislation, policies, institutions and processes in place to manage water use. Mass fish kills in the Menindee Lakes and Lower Darling River in 2018 and 2019, as well as widespread drought, indicate the nature of these climate change risks and the severe environmental consequences of mismanagement. Water regulators are facing significant pressure to move beyond existing practices and factor in non-stationarity,[2] stochasticity[3] and non-linearity[4] under climate change.

Drawing on perspectives from risk governance and theories of deliberative democracy, this analysis focusses on the upcoming 2026 review of the Murray-Darling Basin Plan 2012 (Cth) (Basin Plan) to show how deliberative methods can be used to identify potential threats and assign trade-offs between different risks and benefits, enable early and meaningful participation of all stakeholders, and guide society towards effective and acceptable solutions.[5] Adapting to a hotter and dryer climate in the MDB, as elsewhere, has significant implications for governments, communities, Indigenous Peoples, industries and the environment. These stakeholders and communities must be positioned within the process to deliberate constructively on fundamental issues concerning the opportunities and costs of possible futures within the MDB. Structured deliberation can integrate expert, policy, and community knowledge, differing perspectives, and align water policy with 'public reason'.[6] The article will argue that transparent deliberative methods can enhance the existing regulatory tools that apply to the MDB, and enable governments, stakeholders and communities to better understand the complexities of systemic climate risk, and to make policy decisions with difficult distributional impacts or that involve unavoidable trade-offs between ecological, social and economic objectives.

Part 2 will describe existing and future climate risks in the MDB, in a governance context that relies heavily on predictive models and scenarios. While there is scientific consensus that the MDB will experience increasing average temperatures, more frequent droughts and decreasing volumes of inflow, managing these risks will take water managers into unfamiliar territory where they must govern for projected future climate risk rather than annual climate variability. Part 3 then characterises these climate risks in the MDB as 'systemic risks', which are located at the intersection of natural events, socio-economic systems and policy driven actions.[7] Using theories of risk governance and deliberative democracy, this Part will argue that deliberative

1 See, for example, Claudia Pahl-Wostl et al, 'Social Learning and Water Resources Management' (2007) 12(2) Ecology and Society 5; Paul A Sabatier et al (eds), *Swimming upstream. Collaborative approaches to watershed management* (MIT Press 2005); Dave Huitema et al, 'Adaptive water governance: assessing the institutional prescriptions of adaptive (co-)management from a governance perspective and defining a research agenda' (2009) 14(1) Ecology and Society 26.

2 Where the nature of the problem is not fixed and is constantly in motion.

3 Where there is randomness and uncertainty in relation to possible outcomes.

4 When causes do not result in a proportional change in effects.

5 Brian Head, 'Wicked Problems in Water Governance: Paradigm Changes to Promote Water Sustainability and Address Planning Uncertainty' (Urban Water Security Research Alliance Technical Report No 38, 2010); Amy L Fallon, Bruce A Lankford, and Derek Weston, 'Navigating wicked water governance in the "solutionscape" of science, policy, practice, and participation' (2021) 26(2) Ecology and Society 37.

6 See, for example, John Rawls, 'The Idea of Public Reason Revisited' (1997) 64(3) The University of Chicago Law Review 765.

7 Ortwin Renn, 'New challenges for risk analysis: systemic risks' (2021) 24(1) Journal of Risk Research 127.

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techniques can build capacity within governance regimes to address systemic climate risks to water-stressed basins in an ongoing way, enabling statutory water managers to 'confront complexity', clarify knowledge and assimilate a range of perspectives and expertise in water reallocation.[8] Part 4 will describe and evaluate the relevant policy, legal and institutional structures for governing climate risk in the MDB, focusing on the risks and responsibilities imposed on various public and private actors and the question of who, or what, currently bears the risks of climate change in the MDB. It will then apply a structured deliberation framework developed by Ortwin Renn to demonstrate how the systematic adoption of a deliberative approach can improve the ability of the Water Act 2007 (Cth) (Water Act) and the Basin Plan to respond to the challenges of systemic climate risks in the MDB. The article will argue that the upcoming review of the Basin Plan in 2026 provides a significant opportunity to build deliberation back into the management of the MDB and restore cooperative or collaborative processes that existed prior to the Basin Plan enactment at local and regional levels. With the Murray-Darling Basin Authority (MDBA) set to begin the groundwork for the Basin Plan review, now is the right time to develop and embed well-designed processes of deliberative decision-making into the governance process.

2. CLIMATE CHANGE RISKS IN THE MURRAY-DARLING BASIN

The MDB is Australia's largest river system and agricultural heartland. Throughout the 20th century, state governments developed MDB water resources for human use and allocated permits to extract water, mainly for irrigation.[9] By the 1990s, it was evident that the MDB was significantly over-allocated and the riverine environment was rapidly deteriorating.[10] Over-extraction impacts have included increased salinity, toxic blue-green algae outbreaks and mass fish kills.[11] The MDB has also endured devastating droughts, including the Millennium Drought that preceded the Basin Plan. All of these events demonstrate the importance of leaving enough water in rivers for river ecosystems, a challenge that is set to intensify significantly under climate change. Projected declines in stream flow under climate change may also trigger a dramatic change in the physical structure and function of Australia's inland rivers, with significant consequences for both ecosystems and human development.[12] Water governance must grapple with these climate risks and prepare communities for the wide-ranging and significant changes that will occur in the short and medium term.

The Australian Government has taken a basin-level approach to water allocation and management, which interlocks with existing water-allocation and planning mechanisms at the state level and seeks to enable complex trade-offs between a variety of human water uses and ecological needs.[13] Under this approach, the Government attempted to recast MDB water resources as *shared* resources and achieve a high degree of certainty in relation to the delivery of environmental water requirements through the Basin Plan.[14] That original policy intention, however, was undermined by politics during the development of the Basin Plan, which compromised the recovery targets set through Sustainable Diversion Limits (SDLs).[15] There has also been significant public disagreement regarding both the extent of and methods used to recover water for the riverine environment. According to the former interim Inspector-General of MDB Water Resources, the 'public debate around Basin management

8 Hayley Stevenson and John S. Drysek, *Democratizing Global Climate Governance* (Cambridge University Press 2014) 14.

9 See Warren Musgrave, 'Historical Development of Water Resources in Australia: Irrigation Policy in the Murray-Darling Basin', in Lin Crase (ed), *Water Policy In Australia: The Impact of Change and Uncertainty* (RFF Press 2008).

10 See Australian National Water Commission, 'Water Markets in Australia: A Short History' (Canberra, 2011) 46-48.

11 Commissioner Bret Walker SC, 'Murray-Darling Basin Royal Commission Report' (South Australia, 29 January 2019) 307.

12 ZT Larkin et al, 'Identifying threshold responses of Australian dryland rivers to future hydroclimatic change' (2020) 10: 6653 Nature Scientific Reports 1.

13 Under the Water Act 2007 (Cth) and the Murray-Darling Basin Plan 2012 (Cth).

14 Katherine Owens, *Environmental water markets and regulation: A comparative legal approach* (Routledge/ Earthscan Studies In Water Resource Management 2017) 248–249.

15 Owens (n 14) 127–130.

has become increasingly toxic' and has 'created division between the Basin States and even within communities themselves', with conflict between stakeholders in the MDB 'fuelled by uncertainty, misinformation, misperceptions or misappropriation of available information'.[16] Grafton and Williams demonstrate how rent-seeking behaviour and regulatory capture have affected public decisions regarding both targeted water entitlement purchases and irrigation infrastructure subsidies in the MDB.[17]

Managing both water scarcity and ecosystem health requires an intertemporal trade-off between the consumptive requirements that water users have historically enjoyed, and the need to conserve the riverine environment for both current and future generations under climate change.[18] The 2019 SA Royal Commission on the MDB drew renewed focus to the governance of climate risks in the MDB and the MDBA's 'maladministration' of the Basin Plan development process.[19] Commissioner Bret Walker SC criticized the MDBA's failure to consider the potentially 'catastrophic' risks of climate change in preparing the Basin Plan, observing that 'politics rather than science' had driven regulatory settings.[20] Although denying that it 'ignored' the issue of climate change, the MDBA acknowledged, for its part, that 'more work is needed to improve understanding of how climate risks will affect the Basin'.[21] Indeed, climate risk governance in the MDB is heavily reliant on predictive models and scenarios, which are used to identify possible changes in climate and their effects on water availability.[22] This modelling and projection process is complicated by the fact that climate change is intensifying the natural variability of the MDB's climate, which is highly unpredictable and driven by the El Niño and La Niña cycles and the Indian Ocean dipole.[23] While scientists agree that the MDB will experience increasing temperatures, more frequent droughts, and a decrease in inflow, both natural variability and model-to-model differences in relation to rainfall are large, especially in the Northern Basin.[24] The complexities of understanding and modelling these climatic processes, and uncertainties in relation to future greenhouse gas emissions, mean that MDB water regulators do not know the *precise* outcomes that are likely to occur.[25]

Water planning in the MDB must, therefore, accommodate non-stationarity in the future climate. The MDBA has failed to grapple with these uncertainties, and has been open about the political challenges of responding to climate modelling, remarking that '[t]aking action to address future risks can have immediate costs [for current water users], which need to be weighed up against future benefits, which are less clearly understood'.[26] An ongoing challenge for the MDBA is 'understanding how each aspect of the climate will change and then anticipating how these changes will affect the environment, industry and communities within the Basin' (for example, at a catchment level).[27] Yet, while the MDBA's public remarks underline the challenge of governing climate risks within a 'coupled socio-ecological system' like the

16 Mick Keelty, 'Impact of Lower Inflows on State Share Under the Murray–Darling Basin Agreement' (Report of the Interim Inspector-General of Murray–Darling Basin Water Resources)(Canberra 2020) 38.

17 R Quentin Grafton and John Williams, 'Rent-seeking behaviour and regulatory capture in the Murray-Darling Basin' (2020) 36 Australia Intl J Water Resources Development 484.

18 Owens (n 14) 15.

19 Walker (n 11) 54.

20 ibid 54, e.g. para 5.5.

21 ibid 54–5, paras 5.5 and 6.2.

22 See Penny Whetton and Francis Chiew, 'Climate change in the Murray-Darling Basin' in Barry T Hart et al (eds), *Murray-Darling Basin, Australia: Its Future Management* (Elsevier 2021).

23 Australian Government, Bureau of Meteorology, 'Australian Climate Influences' (Melbourne, 2022); Whetton and Chiew (n 22); Anthony Slatyer, 'Adaptation and policy responses to climate change impacts in the Murray-Darling Basin' in Barry T. Hart et al (eds), *Murray-Darling Basin, Australia: Its Future Management* (Elsevier 2021) 275.

24 Whetton and Chiew (n 22) 272.

25 Murray-Darling Basin Authority, 'Climate change and the Murray-Darling Basin Plan: MDBA Discussion Paper (Canberra, 2019) 8.

26 Murray-Darling Basin Authority (n 25) 15.

27 ibid 12.

MDB,[28] these uncertainty risks are likely to be 'overstated'.[29] The SA Royal Commission remarked that the fact that '[p]rojections exist within a range creates only a level of uncertainty as to how much the Southern Basin will warm, and how much it will dry' and '[t]hat it will be both significantly warmer and drier is unfortunately not uncertain in any realistic sense'.[30] Indeed, Whetton and Chiew warn that 'the extreme dry end of projections would threaten agriculture production, ecosystems and rural communities and would require transformative adaptation and solutions'.[31] Managing these climate risks will send MDB water managers into unfamiliar territory, in which public decisions are made based on projected climate futures rather than annual climate variability, and must assimilate the risk of stochastic and non-linear changes.[32]

3. GOVERNING SYSTEMIC RISKS: WHY DELIBERATION?

These climate risks, as described, are 'systemic risks' defined by leading risk theorist Ortwin Renn as risks that occur at the intersection of natural events, socio-economic systems and policy driven actions.[33] Interconnected, non-linear and unpredictable, these risks endanger the functionality of *critical systems* in society, and have ripple effects that extend beyond the immediate environment to our social, economic and environmental systems.[34] The 'totality' of these threats distinguishes systemic from other types of risks, but a key problem for regulators is that tipping points are difficult to predict.[35] Systemic risks also tend to be underestimated and do not attract the same degree of attention as more immediate catastrophic events, given the potential distance in time and space, the difficulty of social learning in the context of tipping points and the common-pool nature of these problems.[36] Systemic risks also go beyond existing regulatory capacities and create new, largely unresolved, challenges for governance.[37] Addressing climate change within the MDB requires regulators to engage with complex environmental functions, water engineering and infrastructure, community and agribusiness development, climate variability and climate change. It requires governments and water regulators to move beyond an approach that assesses and then manages risks sequentially to one that is better equipped to deal with various forms of uncertainty.

These regulatory challenges align with the broader evolution of risk governance, which has become increasingly sophisticated over time through incorporating a more diverse range of disciplinary inputs and values.[38] Renn has developed an inclusive model of risk governance based on empirical research over a number of years, which seeks to encompass the social and political dimensions of systemic risk and provides a framework for deliberation under the Water Act.[39] Renn's strategies for governing *systemic* risk emphasise that risk evaluation should not

28 Lee Godden and Ray Ison, 'Community participation: exploring legitimacy in socio-ecological systems for environmental water governance' (2019) 23(1) Australasian Journal of Water Resources 45.

29 See Jason Alexandra, 'The science and politics of climate risk assessment in Australia's Murray-Darling Basin' (2020) 112 Environmental Science and Policy 17.

30 Walker (n 11) 251.

31 Whetton and Chiew (n 22); see 'Abstract' at <publications.csiro.au/publications/publication/PIcsiro:EP192925> accessed 1 March 2022.

32 Barry T Hart et al, 'The way forward: Continuing policy and management reforms in the Murray-Darling Basin' in Barry T Hart et al (eds), *Murray-Darling Basin, Australia: Its Future Management* (Elsevier 2021) 393.

33 Ortwin Renn, 'New challenges for risk analysis: systemic risks' (2021) 24(1) Journal of Risk Research 127.

34 Ortwin Renn, 'Systemic risks: the new kid on the block' (2016) 58(2) Environment: Science and Policy for Sustainable Development 26, 30; Ortwin Renn et al, 'Systemic risks from different perspectives' (2020) Risk Analysis 1,2.

35 Renn, 'Systemic risks: the new kid on the block' (n 34) 29.

36 Renn, 'Systemic risks: the new kid on the block' (n 34) 30; Renn, 'Systemic risks from different perspectives' (n 34) 4.

37 Renn 'Systemic risks from different perspectives' (n 34) 14.

38 Ortwin Renn, 'White Paper on Risk Governance: Towards an Integrative Approach' (International Risk Governance Council, 2006) 11–12; Ortwin Renn, *Risk Governance: Coping with Uncertainty in a Complex World* (Routledge 2008) 178; Ortwin Renn, 'Stakeholder and Public Involvement in Risk Governance' (2015) 6 International Journal of Disaster and Risk Science 8, 9; Elizabeth Fisher, 'Framing Risk Regulation: A Critical Reflection' (2013) 4(2) European Journal of Risk Regulation 125–132, 125

39 Andreas Klinke and Ortwin Renn, 'Adaptive and Integrative Governance on Risk and Uncertainty' (2012) 15(3) Journal of Risk Research 273, 278; Ortwin Renn et al, 'Coping with Complexity, Uncertainty and Ambiguity in Risk Governance: A Synthesis' (2011) 40 Ambio 231; Renn, *Risk Governance: Coping with Uncertainty in a Complex World* (n 38); Renn, 'Stakeholder and Public Involvement in Risk Governance' (n 38).

be designed to contain messiness but should instead encourage decision makers to confront complexity, uncertainty, ambiguity and ripple effects through deliberations.[40] Complexity arises when there are many intervening factors that may affect causal or functional relationships between variables.[41] Uncertainty, by contrast, can reduce the confidence in estimates of the causes and effects of impacts.[42] Ambiguity encompasses the multiple viewpoints that may exist in evaluating whether adverse effects are tolerable or acceptable and, when present, creates challenges in agreement on the prioritisation of risks, what values to bring to the process, and what boundaries to apply to possible outcomes.[43] Systemic risks are often also accompanied by ripple effects that emanate from the immediate location of the risk to disturb larger portions of the system.[44] Where systemic risks are regulated 'as if they were simple' the consequences can range from 'social amplification or irresponsible attenuation of the risk, sustained controversy, deadlocks, legitimacy problems, unintelligible decision-making, trade conflicts, border conflicts, expensive rebound measures and lock-ins'.[45]

While it is clear that there is 'no simple recipe'[46] for evaluating and governing systemic risk, what specific features should be included in a governance framework? Renn prescribes a tripartite structure for systematic deliberation on the relevant trade-offs.[47] The first stage requires expert deliberation, or 'epistemic discourse' to accurately describe a phenomenon, articulate dissenting views and create an accurate risk profile, for example in relation to modelling physical impacts, recognising that complex phenomena require multidisciplinary communicative exchanges and debates among experts.[48] Where there is high uncertainty, the conclusions reached through epistemic discourse need to be brought to a public deliberative arena that includes both stakeholders and public interest groups.[49] This form of 'reflective discourse' is important in implementing the precautionary principle and assessing trade-offs between risk-averse or risk-prone approaches to regulation.[50] The final stage, 'participatory discourse', focusses on 'resolving ambiguities and differences about values'.[51] The idea is to settle on solutions that are 'compatible with the interests and values of the people affected and to resolve conflicts among them'.[52] Issues of fairness and environmental justice, future visions and societal change can play a major role in this stage of the deliberation process.[53]

Renn's model of risk governance has strong parallels with theories of deliberative democracy, and particularly the work of theorists John Drysek and Hayley Stevenson in the context of global climate governance.[54] Stevenson and Drysek analyse how global governance can be 'democratised' through deliberative methods to better combat and adapt to the multiple challenges of climate change. Deliberative approaches give the public a proper opportunity to clarify knowledge and assess trade-offs between over- and under- protection. Water management institutions, for example, must bring a range of perspectives, and potentially conflicting criteria, to bear on the complex question of how much water can be consumed now and in the future. A deliberative approach, when properly implemented, enables water managers to 'confront complexity', and assimilate a range of perspectives and expertise.[55]

40 Renn (n 33) 128; Renn, 'Stakeholder and Public Involvement in Risk Governance' (n 38) 9.

41 Ibid.

42 ibid.

43 ibid.

44 ibid.

45 Renn, 'Coping with Complexity, Uncertainty and Ambiguity in Risk Governance: A Synthesis' (n 39) 236, 243–44.

46 Renn (n 33).

47 ibid 130–1.

48 ibid 130–1.

49 ibid 131.

50 ibid.

51 ibid.

52 ibid.

53 ibid.

54 Hayley Stevenson and John S Drysek, *Democratizing Global Climate Governance* (Cambridge University Press 2014) 14.

55 ibid 14.

While deliberation does not ensure a decision is 'correct', it is recognised that genuine deliberation will lead to decisions that are more responsive to reason.[56] The Organisation for Economic Co-operation and Development (OECD) has recently reviewed deliberative decision-making approaches and concluded that representative deliberative processes are effective for tackling 'values-driven dilemmas', 'complex problems that require trade-offs' and longer term problems about which there is 'political deadlock'.[57] Researchers have also demonstrated empirically that personal preferences can be constructed through processes of deliberation, and that deliberative techniques can cut through partisan and intractable policy debates.[58]

When designed and embedded effectively, it is argued that risk governance and deliberative techniques can improve the problem-solving capacities of the MDB regime, the ability of the regime to reduce polarisation and to mobilise and respond to relevant information in determining how to adapt to a changing climate.[59] Although deliberative processes do not completely remove the risk of 'power asymmetries, political deadlock, or loss of trust in governance institutions', it is argued that these processes can provide a significant safeguard, and increase the capacity of MDB governance systems to convene authentic, inclusive deliberation with real impact.[60] Through structured deliberative techniques, water management can be based on the best available scientific and stakeholder knowledge, and reflect 'values-based decisions' that have been 'collectively negotiated to ensure sufficient stakeholder "buy-in"'.[61] Communities can have access to information and deliberative forums for clarifying knowledge and assessing the trade-offs between 'the competing extremes of over- and under-protection'.[62] In these ways, risk governance is not only the process of educating the public about relevant risks, but also of promoting a dialogue regarding how these risks may be effectively managed and promoting a mutual learning process that incorporates experiential local knowledge.[63] In the context of the systemic risks posed by climate change to water allocation in the MDB, communication needs are set to become significantly more demanding and will be integral to all stages of the risk governance process.

4. MANAGING AND DELIBERATING RISKS IN THE MDB SYSTEM: A REGULATORY ANALYSIS

This Part describes and evaluates the internal legal content of the climate risk governance regime in the MDB, analysing the policy, legal and institutional structures for governing climate risk in the MDB and drawing conclusions on who, or what, bears the risk of climate change in the MDB. It will then demonstrate how the systematic adoption of a deliberative approach could improve the ability of public decision-makers to account for the value-based nature of risk governance in water management, evaluating to what extent it is possible, under current structures and processes, to engage a broader cross-section of the public in deliberation on water use and allocation. The political and value-based nature of water management should be recognised and should inform the development of governance frameworks that can grapple with the complex, uncertain and contested nature of water allocation decisions.[64] Yet, public participation in the management of water resources has not historically been a central feature

56 Elizabeth Anderson, 'An Epistemic Defense of Democracy: David Estlund's Democratic Authority' (2008) 5:1 Episteme 129, 129–31; James Bohman, 'Survey Article: The Coming of Age of Deliberative Democracy' (1998) 6 Journal of Political Philosophy 400, 406.

57 Organisation for Economic Co-operation and Development, 'Innovative Citizen Participation and New Democratic Institutions: Catching the Deliberative Wave (Paris 2020); see also Hart et al (n 32) 413.

58 See Hart et al (n 32) 414–5; Organisation for Economic Co-operation and Development (n 57); Stevenson and Drysek (n 54).

59 Anderson (n 56); Bohman (n 56) 401; Hayley Stevenson, 'Deliberative Democracy', in Karin Bäckstrand and Eva Lövbrand (eds), *Research Handbook on Climate Governance* (Edward Elgar 2015) 70.

60 Hart et al (n 32) 416.

61 Katherine A Daniell, 'Enhancing collaborative management in the Basin' in Daniel Connell and R Quentin Grafton (eds), *Basin Futures: Water reform in the Murray-Darling Basin* (ANU E-Press 2011) 414.

62 Renn (n 33) 131.

63 Renn, *Risk Governance: Coping with Uncertainty in a Complex World* (n 39) 201–202, 259.

64 Daniell (n 61) 413.

of water governance in the MDB, other than participation as 'users' and through representative organisations such as irrigator bodies.[65]

4.1 CURRENT REGULATION FOR CLIMATE CHANGE RISK

Climate change risks to water resources in the MDB are governed by a constitutional federal structure that divides legislative powers between federal, and state and territory governments.[66] Water allocation takes place at the state level in the MDB and comprises legal mechanisms that cascade water allocations to individual users. Those mechanisms begin with the Murray-Darling Basin Agreement, which forms a Schedule to the Water Act and allocates shares of the regulated River Murray system to NSW, Victoria and South Australia.[67] Water sharing plans under state water legislation then allocate this water (which includes both surface water and groundwater) at a valley level through seasonal water allocation mechanisms and water entitlements, with regulatory approaches that differ between 'regulated' and 'unregulated' river systems.[68] The regime therefore responds to climate variability on a year-to-year basis via various legislative mechanisms such as transferrable water entitlements and allocations.[69] These tools and institutions can provide an important means of reducing risk and building resilience into water management frameworks, allowing individual users and communities to adjust to changing conditions each year. State water sharing plans and the seasonal allocation of water to users form the building blocks of the regime and allow for seasonal adaptation.[70] In regulated systems, water access entitlements are allocated a certain volume of water throughout the year based on water availability and the security class of a particular entitlement.[71] Water is controlled in unregulated systems by other means, such as pumping restrictions contingent on river heights.[72] Under the Water Act and state legislation, entitlements and allocations of water can both be traded through the water market, allowing agricultural producers to move water around to where it is needed or to its 'highest value' use.[73] Some of these entitlements are held for the environment and protect ecosystem values. The MDBA identifies water trading as a key tool for managing climate variability in the MDB, particularly to support water-critical enterprises and environmental watering.[74]

At the MDB level, institutions and planning tools have been superimposed on, and interlock with, these state-based water allocation systems. Responding to a rapidly deteriorating riverine environment in the MDB, the Federal Government shifted in 2007 from coordinating and funding numerous state-based water management initiatives to directly controlling water allocation at a macro level. The Water Act established the MDBA to oversee water planning at the basin scale in the national interest, and basin-scale planning was then implemented via the Basin Plan, which was enacted under the Water Act to increase water efficiency and return the

65 Godden and Ison (n 28) 48; Bruce Lindsay, 'Public participation, litigation and adjudicative procedure in water resources management' (2016) 33(4) Environmental Planning and Law Journal 325.

66 Commonwealth of Australia Constitution Act 1900.

67 Water Act , Sch 1.

68 See, for example, Water Management Act NSW, Chs 2 and 3 (particularly ss 20, 21 and 57), and the applicable Water Sharing Plans. The Australian Bureau of Meteorology defines a 'regulated river' as a:

> River on which a licensed entitlement regime exists with centralised allocation, and from which orders may be placed for upstream release of a licensed allocation. A necessary, but not sufficient condition for a river to be regulated is that it is located downstream of a surface water storage.

An 'unregulated river' has 'no entitlement system at all or where there is an entitlement system [it] does not allow orders to be placed for upstream release of a licensed allocation'. See the Australian Water Information Dictionary < www.bom.gov.au/water/awid/id-996.shtml > accessed 14 September 2022.

69 Established under state legislation, for example the Water Management Act 2000 (NSW) (Water Management Act NSW).

70 See, for example, Water Management Act NSW, Chs 2 and 3.

71 For example, in NSW, restrictions are established through the Water Management Act NSW and Water Sharing Plans; Alex Gardner, Richard Bartlett, Janice Gray and Rebecca Nelson, *Water Resources Law* (2nd edn, LexisNexis 2018) 249–50, 252; Slatyer (n 23) 277.

72 ibid.

73 Key instruments establishing the market include the Water Act (e.g. Sch 3), the Basin Plan (including the Trading and Market Rules) and state water legislation, including water sharing plans.

74 Ian Neave et al, 'Managing water in the MDB under a variable and changing climate' (2015) 42 Water (AWA) 102.

river system to more sustainable levels of use.[75] The constitutional validity of these legislative instruments depends on the Basin Plan 'giving effect' to Australia's obligations under a variety of international environmental agreements, including the UN Framework Convention on Climate Change and the Ramsar Convention.[76] 'Giving effect' to these international environmental agreements means that the MDBA is legally required to take climate change into account when developing the Basin Plan and develop strategies to manage the risks to water resources posed by climate change.[77]

Climate risks are addressed by numerous provisions of the Water Act. As discussed, the Basin Plan must be prepared so as to provide for giving effect to relevant international agreements.[78] The MDBA must also take into account the principles of ecologically sustainable development and act on the basis of available scientific knowledge when exercising its powers and performing its functions under the Water Act, which include preparing the Basin Plan.[79] The best available scientific knowledge includes climate change modelling and projections by authoritative scientific bodies, and the Water Act defines 'ecologically sustainable development' to include the precautionary principle, which instructs the MDBA that, in circumstances where there is a threat of serious or irreversible environmental damage, a lack of scientific certainty is no reason to postpone measures to prevent that damage occurring.[80] The SA Royal Commission observed that this principle similarly compels the MDBA to act on the basis of climate modelling and projections by the Commonwealth Scientific and Industrial Research Organisation.[81]

The key measure for promoting sustainable water use under the Basin Plan and the Water Act is the establishment of a long-term average sustainable diversion limit (SDL) across the MDB.[82] The SDL specifies how much water may be taken for consumption from each catchment and, by extension, how much must be left for the environment, and must reflect an 'environmentally sustainable level of take' (ESLT).[83] Characterised by the MDBA as a government-led 'buffering' mechanism, the SDL is designed to build the resilience of water-dependent ecosystems in a variable and changing climate.[84] Currently, the SDL is set at a level that reduces average consumptive water use in the MDB by around 20% from the pre-Basin Plan average. Within these limits, states must prepare water resource plans that are consistent with the Basin Plan and, if compliant, the Commonwealth Minister must accredit the state plan.[85] In this way, state-level licensing and planning measures interlock with the Basin Plan.

The Basin Plan itself must also address climate change risks.[86] Under section 22 of the Water Act, the Basin Plan must identify risks to the condition, or continued availability, of MDB water resources and the risks dealt with must include risks to the availability of MDB water resources that arise from climate change. A specific objective of the Basin Plan is to ensure that water-dependent ecosystems are resilient to climate change and other risks and threats, and to restore and protect water-dependent ecosystems and ecosystem functions with strengthened resilience to a changing climate.[87] Each year, environmental watering priorities

75 Water Act, s 20 and Pt 9.

76 ibid ss 3, 9, 20, 21.

77 ibid ss 3, 9, 20, 21, 22.

78 ibid s 21.

79 ibid s 21(4).

80 ibid s 4(2).

81 Walker (n 11) 247.

82 Water Act, s 22.

83 Defined in s 4 of the Water Act to mean:

> 'the level at which water can be taken from that water resource which, if exceeded, would compromise:
> (a) key environmental assets of the water resource; or
> (b) key ecosystem functions of the water resource; or
> (c) the productive base of the water resource; or
> (d) key environmental outcomes for the water resource'.

84 Neave et al (n 74).

85 Water Act, s 56.

86 ibid s 22.

87 Basin Plan, cl 5.03.

under the Basin Plan are determined based upon an analysis of the amount of available water, and environmental watering is conducted in a way that incorporates strategies to take into account variations in the climate.[88] In addition, to be accredited under the Basin Plan, each state must consider the risks of climate change when developing water sharing plans and determine how to respond, including how to protect groundwater-dependent ecosystems and the productive base of groundwater, and consider how extreme dry periods can be managed.[89] States may also propose an amendment to an accredited plan to the Commonwealth Minister if updated scientific evidence on climate change indicates a change in the chances of such events happening.[90]

In these ways, the Water Act and state water laws work together to provide a number of potential mechanisms for managing water scarcity under climate change. Individual users and communities can adapt to changing conditions each year with the tools and institutions that comprise these frameworks, reducing risks and building resilience. The use of water markets to recover water for the environment can also provide an important means of protecting ecosystem values when combined with environmental caps and the ability to hold water entitlements for environmental needs. But key questions remain as to whether these regulatory mechanisms are sufficient, and who or what will bear the burden of the risks of climate change within these systems.

4.2 THE INADEQUACIES OF CURRENT REGULATION FOR CLIMATE CHANGE RISK

This section argues that the Water Act and Basin Plan are unlikely to effectively manage climate risks for six key reasons. First, the risks of climate change have not been allocated fully to entitlement holders, contrary to the intention of policy agreements pre-dating the Water Act.[91] The 2004 Intergovernmental Agreement on the National Water Initiative (NWI) established a 'risk assignment' framework to manage 'any future reduction in the supply of water for consumptive use'. Under this framework, where reductions did not arise from over-allocation or over-use, water access licence holders are asked to bear the risks of reductions due to climate change or other natural events.[92] Reductions resulting from improved knowledge of water systems were to be shared between water access entitlement holders, state/territory governments and the Commonwealth Government, and if reductions arose from changes of government policy, then the relevant government is to bear those risks.[93] The NWI provisions were enacted by the Water Act, which enables the Basin Plan to determine any reduction in entitlement reliability due to the Basin Plan SDLs and how the risks and costs associated with that reduction should be shared.[94] The current Basin Plan, however, attributes the risk and cost of reductions through SDLs to the Commonwealth, treating it as a Commonwealth-led policy change rather than a response to external factors such as climate change.[95] The effect of these provisions is that entitlement holders bear the risk of fluctuations in water reliability owing to climate change and climate variability (in the short or long term), but the Commonwealth bears the risk of changes in water reliability for entitlement holders if that reduction occurs through regulation, as would occur through setting SDLs under the Basin Plan.[96] In other words, the Basin Plan deems a reduction through this regulatory mechanism to be a reduction arising from government policy change, even though SDLs can be a response to climate change.[97]

88 ibid Ch 8, Pt 4.

89 Water Act, ss 22, 55, 63; Basin Plan, Ch 10, Pt 4.

90 Water Act, s 65.

91 Slatyer (n 23).

92 Council of Australian Governments, *An Intergovernmental Agreement for a National Water Initiative* (Meeting Communique, 25 June 2004) cl 48–50.

93 Council of Australian Governments (n 92).

94 Water Act, Pt 2, Div 4; Sch 3A.

95 Basin Plan, s 6.13; see Slatyer (n 23) 278.

96 Slatyer (n 23) 278.

97 ibid 278.

The effect of these deeming provisions in the Basin Plan is that not all water scarcity and climate risks are assigned and governed by the entitlement system.[98]

In addition, 'planned water' exists outside of the consumptive pool and is managed by water resource plans, for example water for base flows, dam spills, and environmental and public benefits.[99] Importantly, state water plans may preference entitlement holders over the environment in dry conditions, for example by not guaranteeing minimum flows to high value ecosystems in very dry conditions, and allowing consumptive uses to access very low flows to which they would not normally be entitled.[100] This was demonstrated between 2012 and 2021 by the controversial water-sharing rules in the Barwon-Darling River, which failed to protect river flows when the river was low.[101] Environmental groups have also argued that water-sharing plans do not consider the connectivity of the MDB system and the impacts of water use on downstream ecosystems.[102]

Secondly, the current SDL is a political compromise that breaches the Water Act and does not reflect best available science or modelling in relation to projected climate change impacts. When the Basin Plan was being prepared, many independent studies predicted a reduction in future water availability owing to climate change, but the MDBA did not explicitly allow for reduced inflows on account of these impacts, opting instead to set SDLs based on historical long-term (114 years) inflow records, given the uncertainties outlined in Part 3 above.[103] The SA Royal Commission held that, in choosing to rely on the historical record, the MDBA breached its obligation under the Water Act to act on the best available scientific evidence, in accordance with the principles of ecologically sustainable development which include the precautionary principle. The SA Royal Commission characterised the MDBA's strategy as a 'head in the sand approach', remarking that this attitude to the 'certainty of higher temperatures and less water in the Southern part of the Basin is, amongst other things, unfair to the residents who live and work there'.[104] This approach had reduced the agency of communities, in depriving them of the 'foresight, such as it is, that science can provide as to the likely future climate scenarios' and inhibiting 'informed, appropriate and necessary planning and adaptation'.[105] Ultimately, an SDL that does not reflect an environmentally sustainable level of water take gives rise to the risk that there will be a significant difference between the predicted long-run water availability as reflected in the SDLs and the actual conditions upon which annual permitted water takes are based,[106] and means the MDBA lacks a plan or governance strategy for responding to long-term climate signals.

Thirdly, methods of water recovery adopted by the Federal Government to manage SDL reductions and limit their impact on entitlement holders are inefficient, ineffective and maladaptive. Once the Basin Plan was enacted, government policy for recovering water for the environment underwent a policy shift to favour recovery through irrigation upgrades and environmental works and measures. These infrastructure measures are considered by both scientists and economists to be maladaptive and have a higher probability of leading to 'lock-ins' that are incompatible with the increasing climate variability. The government's original strategy was to recover water for the environment through a mix of government purchases of water licences ('water buybacks') and taxpayer-funded infrastructure upgrades.[107] Conducted by the Federal Government under its Restoring the Balance programme, water buybacks were

98 ibid.

99 ibid 279.

100 ibid.

101 Water Sharing Plan for the Barwon-Darling Unregulated River Water Source 2012 (NSW).

102 See Anne Davies, 'New Plans for Barwon-Darling river system still prioritise irrigation over the environment' *The Guardian* (26 June 2020) <www.theguardian.com/australia-news/2020/jun/26/new-plans-for-barwon-darling-river-system-still-prioritise-irrigation-over-environment> accessed 1 March 2022.

103 Neave et al (n 74); see Alexandra (n 29) 20; Walker (n 11) 244.

104 Walker (n 11) 247.

105 ibid.

106 Slatyer (n 23) 280.

107 David Adamson and Adam Loch, 'Possible negative feedbacks from "gold-plating" irrigation infrastructure' (2014) 145 Agricultural Water Management 134; Jamie Pittock et al, 'Beguiling and risky: "environmental works and measures" for wetland conservation under a changing climate' (2013) 708(1) Hydrobiologia 111, 114.

transferred to the statutory Commonwealth Environmental Water Holder (CEWH), who manages the Commonwealth's environmental water holdings to satisfy the watering requirements of various environmental assets.[108] The scheme relied on voluntary irrigator participation, or willing sellers, and the government's environmental watering efforts under the programme focused on the largest, publicly-owned floodplain wetlands.[109] Irrigation communities, however, resisted the Federal Government's water buyback programme, claiming it had adopted a 'just add water' approach, taking advantage of farmers already stressed by the ongoing Millennium Drought and undermining rural communities.[110] As a result of this resistance, the Government of Prime Minister Abbott capped buybacks at 1,500 gigalitres(GL)/year in 2015, abolished the independent National Water Commission and embarked on a programme of efficiency measures that included upgrading on-farm irrigation.[111] Efficiency measures have proven to be a very expensive means of recovering water for the environment compared with the cost of purchasing water through buybacks. Moreover, there is good evidence that these infrastructure solutions do not actually 'save' water at the catchment level, but increase water use, providing private benefits to irrigators in place of the intended public benefit of increasing net stream flows.[112]

Fourthly, water managers have not implemented effective strategies for managing climate risk under the Basin Plan. As discussed above, an objective of the Basin Plan is to improve the resilience of water-dependent ecosystems against climate change.[113] But the strategy in the Basin Plan for achieving this objective is framed in minimal terms, requiring only that knowledge regarding the impacts of climate change on water required to deliver environmental, social and economic benefits in the Basin be 'improved'.[114] The SA Royal Commission remarked that:

> The word 'strategy' in the English language is usually in reference to some form of plan of action. As plans of action, the climate change strategies identified in Chapter 4 of the Basin Plan seem somewhat whimsical at best.[115]

Fifthly, facilitating adaptation relies significantly on conducting ten-year reviews of the Basin Plan and other review processes such as the five-year review process of the environmental watering plan.[116] Public attention will focus primarily on the statutory review of the Basin Plan scheduled for 2026, for which climate change is likely to be a key issue given widespread drought and the significant fish kills in the Darling River. Nevertheless, this ten-year cycle does not provide an adequate feedback loop for managing climate risks in the MDB, which are intensifying rapidly.[117] To manage these risks, a governance style that is adaptive and continuously learning is needed, as well as the capability to handle unusual developments and non-linearity.[118] In addition, it is not clear how much the MDBA will leverage the available climate science, with the SA Royal Commission observing that:

> [Climate change] appears to be regarded by the MDBA as a factor to be dealt with by the same mundane operational flexibility as the system always has displayed in order to cope with 'normal' variability. But the warming and drying of the Basin which, overall, is by far the most likely future for our children is something more than that variability.[119]

108 Water Act, Parts 2 and 6.

109 See Katherine Owens, 'Environmental Water Transactions and Innovation in Australia' in Cameron Holley and Darren Sinclair (eds), *Reforming Water Law and Governance* (Springer 2018) 84.

110 See Owens (n 109) 84.

111 Water Amendment Act 2015 (Cth); National Water Commission (Abolition) Act 2015 (Cth); see Owens (n 109) 84.

112 See Sarah A. Wheeler et al, 'The rebound effect on water extraction from subsidising irrigation infrastructure in Australia' (2020) 159 Resources Conservation and Recycling 104755.

113 Basin Plan, s 5.03.

114 Basin Plan, s 4.03.

115 Walker (n 11) 253.

116 See Water Act s 50 and Basin Plan s 8.17.

117 Owens (n 14) 129.

118 Renn (n 33) 131.

119 Walker (n 11) 34–5.

Finally, public decision-makers have failed to demonstrate transparency and accountability in discharging their duties. Generally, water planning and allocation is the responsibility of statutory water authorities, which undertake a number of 'steering' functions under the regime, notably water planning, environmental water management, and enforcement.[120] In accordance with the Water Act and Basin Plan, most of these decisions are ultimately made by the MDBA or the Commonwealth Minister. The SA Commission found that, since 2010 when the MDBA published the 'Guide' to the draft Basin Plan and made the ESLT determination in 2011, the general public and the scientific community have not been given access to modelling as related to key decisions under the regime, and that the MDBA 'has preferred to avoid making itself accountable to the public and to the wider scientific community'.[121] Key examples include determining the 2,750 per year water recovery amount, or information and material that are necessary to check, query, test and improve scientific work done pursuant to the Water Act and Basin Plan. The failure to provide clear, factual explanations of why decisions are made and who benefits have created opportunities for irrigation interests to disproportionately influence government decision making.[122]

4.3 ENHANCING THE DELIBERATIVE CAPACITIES OF THE REGIME

The effectiveness of the MDB regime has been diminished by a lack of will by Federal authorities and systematic undermining of key elements of the Basin Plan by state governments and irrigators. A key reason for these poor outcomes is the failure of public decision-makers to account for the complexities of these coupled human and ecological systems, and to develop governance processes that can grapple with systemic risks and the public values at stake. This section will describe the current allocation of risk and responsibility for climate risks in the Basin, and evaluate to what extent it is possible, under the current structures and processes, to address the challenges identified above. It will focus specifically on the regime's potential to engage a broader cross-section of the public to deliberate in a more targeted and transparent way on these future risks and how available water should be shared. While a substantial portion of climate change risk will be borne by individual water entitlement holders, through adjustments to seasonal allocations and other controls, the risks and impacts of climate change will ultimately be borne by public taxpayers, communities and the environment. The section draws on theories of deliberative democracy and Renn's models for governing systemic risk to demonstrate how to enhance the deliberative capacities of the regulatory regime and create processes that can assist public decision-makers in evaluating the systemic risks associated with an increasingly hot and dry MDB.

The Water Act requires water resources within the MDB to be governed as a common resource within socio-ecological settings, but the range of tools for facilitating these public outcomes remains underdeveloped or maladapted for water management under climate change. A more deliberative approach to regulation under the Act could generate and coordinate information flows and harness governance capacities across the range of necessary scales in the Basin, from the national to the individual. More intensive forms of public deliberation could also help public decision-makers to determine appropriate distributional trade-offs and find a balance between environmental, social, and economic objectives and too little and too much precaution. When done well, deliberative approaches can produce more transformative outcomes that are driven primarily by local communities, collectively negotiated and are more likely to be implemented successfully, as they reflect community challenges, needs, capacities and priorities.

At present, public consultation is largely limited to statutory notice and comment processes under the Water Act, and public decision-makers enjoy wide discretion in implementing these provisions.[123] Under these processes, public access and engagement has often been curtailed by a lack of transparency on the part of decision-makers regarding the basis for key decisions,

120 Owens (n 14).

121 ibid 710. The Guide to the proposed Basin Plan was released by the MDBA in 2011 to 'assist people to understand the basis of the proposed Basin Plan, including the rationale behind the proposals presented for discussion': see https://www.mdba.gov.au/publications/archived-information/basin-plan-archives/guide-proposed-basin-plan accessed 15 September 2022.

122 Grafton and Williams (n 17).

123 Godden and Ison (n 28) 49.

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particularly in relation to water planning. Direct community participants in the regime are mainly water users holding access rights to water, who contribute on the basis of their '"economic" relationship with water resources'.[124] The SA Royal Commission observed that the statutory processes and institutional structures for developing and implementing the Basin Plan are 'flawed' in that they 'permitted what is, in effect, a small group of MDBA Board members, staff and others, to engage in a secretive exercise in respect of scientifically-based decisions'.[125] Low transparency and low public engagement have been most pronounced with respect to climate models and anticipated and preferred climate futures. An independent assessment of social and economic conditions in the MDB, commissioned by the Minister for Agriculture and Resources in 2019, recommended that MDB governments and communities 'find better ways to engage about Basin and broader reforms'.[126]

Prior to the enactment of the Basin Plan, cooperative or collaborative processes existed at the local and regional levels that assisted stakeholders in developing knowledge and supporting MDB programmes, for example through integrated catchment management groups and regional Natural Resource Management bodies.[127] During the Basin Plan development process, these existing local, regional and state networks with substantial knowledge and experience were sidelined and they criticised the lack of transparency and engagement associated with the creation and implementation of the Basin Plan.[128] Creating new structures that facilitate deliberations between all levels of government could go some distance in resolving these tensions and creating the local knowledge that is required for MDB water planning, risk management, and confidence building in the operating environment.[129]

In this regard, the Water Act and Basin Plan provide numerous opportunities for implementing deliberative approaches, techniques, and processes via periodic and discretionary evaluation and review processes. The MDBA is required, for example, to provide an annual analysis of the Basin Plan's effectiveness,[130] review its Basin-wide environmental watering strategy every five years,[131] and review the Basin Plan every ten years.[132] Likewise, the MDBA has the discretion to conduct certain reviews in relation to aspects of the Basin Plan, including the SDLs, and aspects of the MDB's condition.[133] Much of the current public focus, and the most significant of these opportunities, is the upcoming review of the Basin Plan in 2026 and, with the MDBA set to begin the groundwork for the Basin Plan review, now is the right time to develop well-designed processes of deliberative decision-making. The review will be conducted by the MDBA in consultation with the Basin States, Basin Officials Committee and Basin Community Committee, as well as the public, and any submissions will be taken into account when compiling its report.[134] The MDBA must then provide the report to the Commonwealth Minister and the relevant minister in each Basin state, and make it publicly available.[135] The MDBA may also propose to the Commonwealth Minister that the Basin Plan be amended in accordance with the Water Act's amendment process.[136]

This review process, although mandatory, leaves a considerable margin of discretion to the MDBA, which can devise its own approach to the review and the extent of stakeholder and

124 ibid 48; Lindsay (n 65) 325.

125 Walker (n 11) 692.

126 Independent Panel for the Assessment of Social and Economic Conditions in the Basin, 'Final Report: Independent assessment of social and economic conditions in the Murray-Darling Basin' (Canberra, April 2020) 12.

127 Daniell (n 61) 416–7.

128 ibid 417.

129 ibid.

130 Water Act, s 52A.

131 Basin Plan, s 8.17.

132 Water Act, s 50.

133 Basin Plan, s 6.06.

134 Water Act, s 51.

135 ibid s50(5).

136 Water Act, s 45.

community engagement. A key part of the review will be new knowledge pertaining to climate risks, and the MDBA will need to ensure that its assessment and evaluation is readily understood by the community. Renn's evaluative model recognises as a first step that deliberation by experts (not necessarily scientists) is required to resolve complexity related to systemic risk and produce a profile of the risk that is broadly accepted.[137] This 'epistemic discourse' should provide a comprehensive description or explanation of risks, as well as explanations of dissenting views and why certain models are best suited to estimating future conditions in the MDB.[138] This step assumes, however, that while a systemic risk calls for sophisticated modelling, the experts are confident the model can account for most of the uncertainty.[139] Where the systemic risks involve high uncertainty, then this scientific input becomes the basis of a more complex evaluation procedure, or 'reflective discourse', in the second step, in which information about the various uncertainties is compiled and brought into a 'deliberative arena' comprised of stakeholders and public interest groups.[140] The idea is to clarify knowledge and strike a balance between 'risk-averse' and 'risk-prone' approaches.[141] According to Renn there is 'no scientific answer' to this problem, and even 'economic balancing procedures are of limited value, since the stakes are uncertain'.[142] In this process, participants must evaluate how much uncertainty they are willing to accept for the potential benefits of, in this case, certain levels of water use.

A further third step of deliberation, or 'participatory discourse', may then be required to resolve ambiguities and conflicts over values in the evaluation process.[143] In this step, participants develop solutions that reflect the interests and values of those affected, and they resolve conflicts among themselves regarding issues such as fairness, environmental justice and social change.[144] Techniques that can be employed to this end include conferences, roundtables or citizen juries, which all function as non-binding informative or advisory forums.[145] These intensive techniques can be used to deliberate on the implications of public knowledge gaps, public funding constraints and political uncertainties that prevail in the MDB, based on 'modelling, metrics, quantification and expert scientific opinion'.[146] The combined effect of these deliberative approaches would be to allow the MDBA to both 'open up' consideration of multiple perspectives and diverse interests and work through the solutions that will be needed to reach final decisions.[147]

The upcoming review of the Basin Plan will require all three forms of deliberation. Epistemic and reflective discourses will be required to establish both the models to be used and the scenarios on which to base a new reference condition for the MDB (i.e. ahead of the changing climate), and the MDBA will need to draw on this process to select both a model(s) and a scenario(s) to use.[148] Scientific experts should determine which of the available models has the most 'skill' in predicting future climate change in the MDB,[149] but reflective discourses will be required to deliberate on which scenario should be used as a basis for calculating the reference conditions, which fall on a spectrum between the worst-case or 'driest' scenario and the most optimistic or 'wettest' scenario.[150] Such a process in conjunction with rigorous and complete disclosure would reflect the systemic complexity of decisions to be made, and the fact that water

137 Renn (n 33) 130.

138 Ibid. See also Slatyer (n 23).

139 Renn (n 33) 131.

140 ibid.

141 ibid.

142 ibid.

143 ibid.

144 ibid.

145 ibid; Renn, 'Stakeholder and Public Involvement in Risk Governance' (n 38).

146 Godden and Ison (n 28) 51.

147 Hart et al (n 32) 415-6, citing R Gregory, *Structured Decision-Making* (Blackwell Publishing 2012).

148 Slatyer (n 23) 281.

149 ibid.

150 ibid 281–2.

allocation under the Basin Plan occurs within wider socio-political systems that are 'coupled' with a biophysical system.[151] In addition, it would create an opportunity for the MDBA to repair the damage created by the Basin Plan development process to public trust.

At all stages of the process, governments, stakeholders and communities will need rigorous information that enables a better understanding of the relevant climate risks and likely impacts. Slatyer remarks that:

> Basin governments, agricultural industries, rural communities, and environmental groups will need the best possible information about the costs and benefits (social, cultural, economic, and environmental) of taking a more or less adaptive approach to future climate change. In the lead up to the 2026 review of the Basin Plan, it will be an important responsibility of the MDBA to ensure this information is available and in a form that non experts can understand.[152]

Transparent data-sharing, assessment and dissemination of information regarding climate models, scenarios and risks will all be needed to inform future discussions between government, stakeholders, and the public on whether governance takes a risk-averse or risk-prone approach and how these factors apply to macro settings under the Basin Plan, such as the SDLs. Deliberations will also need to focus, given the legal requirements of the Water Act, on environmental objectives under the Basin Plan and what is achievable through environmental water management, including targets, timescales, overcoming constraints to delivering environmental water and how landscape-scale approaches can be adopted to support overall ecological processes.

Existing forums and networks can be engaged in these processes of deliberation. Under NSW's state-based water resource plans, for example, stakeholder advisory groups advise on water 'sharing', which include local industry groups, environmental NGOs, tourism operators and recreational users like fishers.[153] Recently, there has been a more concerted effort to include Indigenous Peoples.[154] The Commonwealth Environmental Water Holder has built a network of partnerships including those with other water holders, managers of planned environmental water, river managers, regional Natural Resource Management bodies, landowners and community groups.[155] Deliberative processes relating to the ecological health of the MDB can be anchored by this network, from the landscape to the Basin-wide scale. To address future climate change risks, governments will also need to consider the combined effect of Federal and state laws across the MDB. Ultimately, new or enhanced deliberative forums may be needed to facilitate the flow of information between the national, regional, state, valley and property levels, so that the Basin Plan can interlock with and complement state and local activities. Creating new structures that facilitate deliberations between all levels of government are likely to be effective in both resolving tensions and creating the local knowledge that is required for Basin water planning, risk management and confidence building in the operating environment.[156]

Ultimately, employing a structured deliberation model for the Basin Plan Review will serve to address five of the six fundamental challenges identified in section 4.2. Through deliberative processes, the Basin Plan Review can revisit fundamental questions regarding who, or what, is to bear the risks and costs of reductions through SDLs, and whether these risks are to be assigned and governed within the entitlement system. It provides important opportunities to ensure that the best available science and up-to-date climate models are reflected in SDLs, and that the Basin Plan includes a comprehensive strategy for improving the resilience of water-dependent ecosystems to climate change. Transparent, fact-based, deliberation will also

151 Godden and Ison (n 28).

152 Slatyer (n 23) 285.

153 See NSW Department of Planning and Environment, 'Stakeholder Advisory Panels' under 'Water Resource Plans', at <http://industry.nsw.gov.au/water/plans-programs/water-resource-plans/stakeholder> accessed 15 September 2022.

154 Godden and Ison (n 28) 49.

155 Neil Byron, Natural Capital Economics, 'Review of the Commonwealth Environmental Water Holder's operations and business processes' (Canberra 2017) i.

156 See Daniell (n 61).

provide a better forum for debating how to recover environmental water effectively and fairly. 'Saving' water through infrastructure upgrades has significant distributional consequences, with trade-offs between agricultural production, irrigation, cultural and environmental needs,[157] and these third party impacts need to be identified and debated. Clear, fact-based explanations that are then deliberated also reduce opportunities for irrigation interests to disproportionately influence the government decision-making process.[158] The only outstanding issue is the ten-year review cycle itself, which will not keep pace with the rapid and intensifying impacts of climate change in the MDB.

5. CONCLUSION

Having previously shied away from confronting the challenges of future climate projections, statutory water managers in the MDB must now focus on ways to address systemic climate risk in the MDB through governance strategies. Climate change is intensifying the MDB's highly unpredictable climate, and climate risk governance in the MDB relies heavily on predictive models and scenarios. While water regulators do not know the *precise* outcomes that will occur, it is very clear that water planning and allocation must move beyond annual climate variability and accommodate non-stationarity. Australian Federal and state governments will need to address a variety of weaknesses in their current approaches under the Water Act, Basin Plan and state legislation. Climate change risks have not been allocated fully to entitlement holders. The current SDL is a political compromise that breaches the Water Act and does not reflect best available science or modelling in relation to projected climate change impacts. Methods of water recovery used to manage SDL reductions are inefficient, ineffective and maladaptive. Facilitating adaptation relies significantly on statutory 10-year reviews of the Basin Plan and other review processes such as the five-year review process of the environmental watering plan, and these review cycles are not likely to keep pace with the rapid and accelerating impacts of climate change. Opaque decision-making processes have meant that it is unclear why particular decisions are made and who stands to benefit or lose.

While these challenges are significant, they have also revealed the interventions needed to develop more effective and inclusive governance models that can respond to systemic risk. The 2026 Basin Plan Review provides opportunities to build deliberation and transparency back into the management of climate risk in the MDB, and restore cooperative or collaborative processes that existed prior to Basin Plan enactment at the local and regional levels. When designed and embedded effectively, deliberative techniques can improve the problem-solving capacities of the MDB regime, transparency and accountability, and the ability of the regime to reduce polarisation and mobilise and respond to relevant information in determining how to adapt to a changing climate. Risk governance both educates the public about relevant risks, and also promotes a dialogue on how these risks may be effectively managed that incorporates experiential local knowledge. Full disclosure and well-structured and sequenced deliberation processes, inclusive of both upstream and downstream perspectives, will ensure that public decision-makers are able to better understand the complexities of systemic climate risk, and make policy decisions with difficult distributional impacts, or which involve difficult trade-offs between ecological, social and economic objectives. Importantly, more deliberative approaches to governance will enable transparent and direct discussions about possible futures that MDB stakeholders and communities are prepared to face, and the costs they are prepared to incur to get there. That engagement needs to extend to fundamental questions as to whether water managers should base water planning and diversion limits on wet or dry scenarios in 10, 20, 30 years and beyond.

COMPETING INTERESTS

The author has no competing interests to declare.

157 Katherine Owens et al, 'Delivering global water security: Embedding water justice as a response to increased irrigation efficiency' (2022) WIREs Water, e1608 <https://doi.org/10.1002/wat2.1608> accessed 1 October 2022.

158 Grafton and Williams (n 17).

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