

Australia's Murray-Darling Basin: A Century of Polycentric Experiments in Cross-Border Integration of Water Resources Management

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We respond in this article to scholars having identified a theory-practice gap commonly afflicting applications of integrated water resources management (IWRM) internationally, and thus a need for the concept to be recast according to evidence of how integration of fragmented water management efforts actually occurs. The Murray-Darling Basin (MDB) is employed as a longitudinal case study for this purpose, focusing particularly on its cross-border integration challenges. We frame IWRM as the pursuit of coherent collective action by the multiple enterprises (public, private, civic and hybrid) typically constituting the polycentric public industry involved in managing water resources. We look beyond approaches involving overt coordination to other approaches with potential to contribute towards such coherence. We find that Australian governments are no longer able to overtly coordinate the suite of interdependent enterprises relevant to the success of water management efforts in the Basin. Their success in strengthening coherence or integration in these efforts has come to depend increasingly on their ability to devise governance arrangements capable of catalysing (e.g., by fostering conditions supportive of fruitful competitive rivalry or informal collaborations) the kinds of dynamics through which more of the required integration of management efforts emerges on a self-organised basis.

Keywords: integrated water resources management, collective action, polycentricity, jurisdictional integrity, Australia, Murray-Darling Basin.

1. Introduction

Like many other large river basins around the world, Australia's Murray-Darling Basin (MDB, see Figure 1) straddles multiple government jurisdictions, with water managers in each predisposed to 'export the costs of pollution or water shortages across

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borders wherever possible' (Connell, 2011b, p. 3999). As with many such basins, a series of integrative efforts have been made to counter the commons problems arising from this predisposition. Since the 1990s these efforts have been guided by the principles of integrated water resources management (IWRM, known in Australia as integrated catchment management).

We explore in this article the practice, logic and outcomes of these efforts over almost a century to strengthen integration of water resources management across jurisdictional boundaries and sectors (notably irrigation and environmental conservation) within the MDB. We identify and treat the various stages through which these efforts have passed as observable institutional and political 'experiments' in integrating river basin management that may, when contrasted with experiments undertaken elsewhere around the world, yield insights of value for guiding new integration efforts or revitalising existing ones.

The MDB provides a useful focus for such an analysis for three reasons. First, it is the Australian region where attempts to integrate water management have arguably received the most national attention (Cruse, 2008) and where cross border conflicts between state jurisdictions have existed since well before federation in 1901. In addition to tensions about water sharing between states, the Basin has water quality issues which are made unusually complex by the size and biophysical variety of its catchment. The MDB also contains most of Australia's irrigation activity and generates very high-profile political conflicts between the sectors (e.g., irrigators and conservationists) competing for its waters. Second, as described in detail in section 3 of the paper, the Basin has a long and well-documented history of trans-boundary water management and policy development that can serve as the empirical basis for the analysis. For many decades the Basin has been a test-bed for water policy and management approaches in Australia and a source of new paradigms and programs to be exported to other jurisdictions in Australia, often since the 1990s through programs of national water reform¹. Finally, the MDB is recognised internationally as a leading source of lessons in applying integrated approaches to water scarcities, conflicts and trade-offs in river basins managed under federal political systems (Garrick, Lane-Miller & McCoy, 2011; Schlager & Blomquist, 2008). Lessons include the need to design water sharing arrangements in conditions of high climate variability on a proportion-of-available-flow basis.

This paper takes as a point of departure that the concept of IWRM is one in need of renewal. Despite the IWRM concept becoming 'a rallying call of mainstream thinking on water management' (Molle, 2009, p. 491) critics point to its essentially normative basis and the difficulties of translating the IWRM concept into practice (Biswas, 2004; Jeffrey & Gearey, 2006; Saravanan, McDonald, & Mollinga, 2009; Petit & Baron, 2009). We do not look to replicate these critiques here. Instead we take up the critics' primary challenge: to overcome the theory-practice gap often experienced in implementing IWRM by aligning this concept more closely with evidence of how integration of water management actually

¹ In particular the COAG Water Reform Framework of 1994, later expanded under the National Water Initiative in 2003 (see also section 3.5).

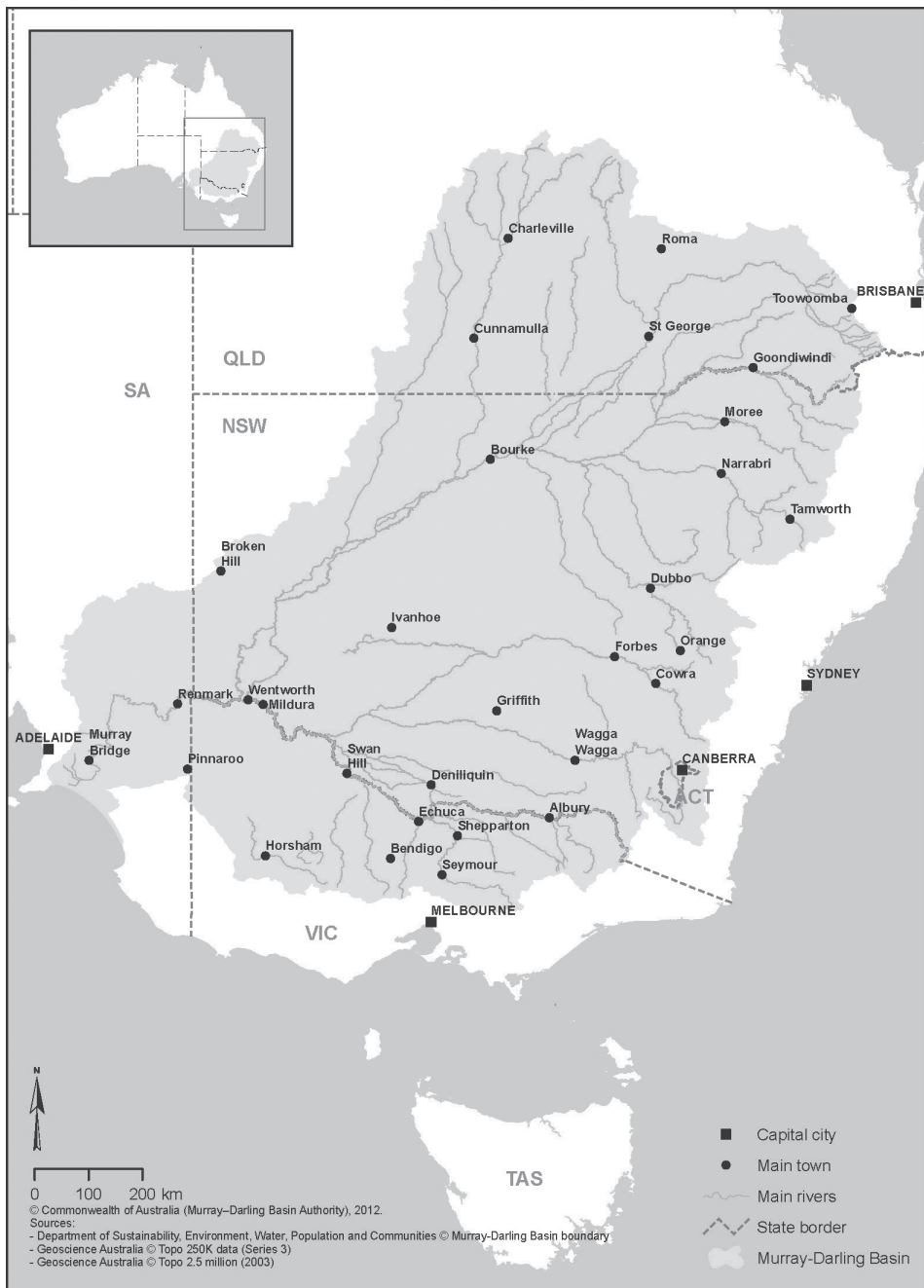


Figure 1. The Murray-Darling Basin

occurs in practice. This means accounting more directly for the dynamics of power involved in integrating water management (Vogel, 2012; Saravannan et al., 2009). It also relies on thinking about how integration in water resources management might be brought about on a more case-specific basis (e.g., Biswas, 2004; Mollinga, 2006; Vogel, 2012), and less on pursuing some uniform logic or principles for achieving integration through overt coordination.

We apply in this paper a theoretical perspective of collective action to problems of IWRM in the Murray Darling Basin. This perspective, we argue, helps to address the criticisms of IWRM and progress scholarship on this problem in line with the proposed directions above. It also provides a suitable and effective means of structuring our analysis of institutional and political changes in the Basin over time.

2. Reframing the integration problem: IWRM as collective action

Water management provides collective goods when, as is often the case, the benefits cannot be appropriated exclusively by individual parties investing resources in that management (Olson, 1965). Traditional principles of public administration imply that the collective action required to provide such goods should be organised moncentrically by government, with its decisions implemented by elaborate hierarchies of officials (Ostrom & Ostrom, 1999; Marshall, 2009). As is typical with water management, however, responsibilities for providing many kinds of collective goods have become widely fragmented, across multiple units and levels of government and the private and voluntary (civic) sectors (Ostrom, 2010).

Contemporary organisation of collective action can be understood as a 'public economy' comprising various 'public industries' (e.g., water and health services industries) (Ostrom & Ostrom, 1999). Each such industry may comprise a variety of public, private, civic and hybrid (e.g., public-private) 'enterprises' at different (e.g., spatial) levels. Collective action within many public industries, including the water industry, often occurs on a polycentric basis – where the constituent enterprises are sufficiently autonomous that they cannot be directed by any single centre. Polycentric public industries of this kind thus encounter a further, higher-level, problem of collective action in ensuring that the constituent enterprises serve the public interest rather than succumb to temptations to pursue only their sectional interests (e.g., via 'turf protection' or transferring costs onto others).

Ostrom, Tiebout, and Warren (1999) cautioned against the conventional presumption that higher-level collective action problems of this kind are normally intractable, and that polycentric public industries will therefore normally be less efficient than monocentric ones. They argued that the question of whether enterprises comprising a polycentric public industry behave pathologically as a 'mess', or coherently as a 'system', can only be answered case-by-case. They concluded from case-study evidence that such coherence or 'jurisdictional integrity' (Skelcher, 2005) within what Lubell, Henry, and McCoy (2010) called an 'ecology of games' can emerge 'to the extent that [the enterprises] take each other into account in competitive arrangements, enter into various contractual and cooperative

undertakings, or have recourse to central mechanisms to resolve conflicts' (Ostrom et al., 1999, p. 32). Integrating the behaviour of enterprises constituting a polycentric public industry therefore 'requires a delicate balancing act between strategic entrepreneurship and emergent dynamics' and the 'weav[ing of] an ever-changing web of cooperation and competition' among these enterprises (McGinnis & Ostrom, 2012, pp. 15–16).

While some critiques have characterised IWRM as a monocentric exercise involving consolidation of water management into a single enterprise established per watershed (e.g., Biswas, 2004), this is not how the concept is now understood by most commentators in this field. The diseconomies and infeasibilities of a monocentric course given the multiplicity of complex shifting interdependencies – between different water management functions and between these and management functions in other public industries (e.g., energy and agriculture) – is increasingly recognised (e.g., Vogel, 2012; Bellamy, Ross, Ewing, & Meppem, 2002). With increasing recognition that 'polycentricity is a fact of life' in managing water resources (Huitema et al., 2009), most recent commentators seem to accept at least implicitly that there is no alternative to pursuing water management as an exercise in polycentric governance, and that the focus of IWRM should therefore be on finding means to get the diverse enterprises in each setting working coherently as a system. Governance involves 'formation and stewardship of the formal and informal rules that regulate the public realm, the arena in which the state as well as economic and societal actors interact to make decisions' (Hyden, Court, & Mease, 2004, p. 16).

A variety of such means have been proposed and applied in the name of IWRM, and these conventionally presume that the task of achieving coherence or integration across management efforts (both horizontally across enterprises at the same level, and vertically across enterprises at different levels) primarily involves overt coordination. The means for this overt coordination are typically understood as involving mixtures of: (i) developing watershed management plans; (ii) formal programs of deliberation and collaboration; and (iii) purchaser-provider 'partnerships'. Meanwhile, the contributions of the IWRM literature towards reframing IWRM as a polycentric endeavour have tended to underplay how 'covert' institutional dynamics contribute less obviously but sometimes more significantly towards these enterprises functioning collectively as a dynamically efficient system. Covert dynamics of this kind include competitive rivalry and informal collaborations among enterprises within a polycentric public industry, as well as self-organised efforts by enterprises to resolve their conflicts using available political or legal instruments (Ostrom & Ostrom, 1999).

Where this literature has focused on how competitive rivalry between public enterprises affects their performance as a system, its attention has been predominantly on negative consequences of this rivalry including 'turf protection' and 'empire building'. The potential for such negative effects is real; the challenge is to craft institutional arrangements that tip the scales towards competitive rivalry enhancing rather than sabotaging integrated performance. Where there are multiple possible providers of management services for a given beneficiary group (e.g., irrigators, fishers or conservationists), competitive rivalry between them has potential to enhance integrated performance by offering

the group opportunities to bargain with those providers to procure the services they seek at least cost. Such bargaining creates incentives for these groups to increase levels of information and evaluate performance. Rivalry also strengthens responsiveness of management providers to beneficiary demands, and creates incentives to innovate. It can thus help erode barriers to efficiency in the public industry for water management that arise from the ability of existing providers to protect their sectional interests.

Our framing of the integration problem in water resources management as one of collective action among the diverse enterprises comprising this polycentric public industry echoes the recognition by Huitema et al. (2009) of the unavoidably polycentric nature of water resources governance. Rather than proposing polycentricity as a normative principle for the design of IWRM arrangements, we accept that the transaction costs of solving the coordination problems faced under polycentric arrangements are typically formidable. It follows that attention to governance is essential if such costs are to be reduced to levels where polycentric arrangements for water resources management can function in a sufficiently integrated manner. Consistent with our arguments above, this paper was motivated by an interest in looking beyond overt coordination measures, including programs formally designed to promote collaboration, when seeking to understand how the transaction costs of cross-border integration of polycentric arrangements for water resources management are sometimes made affordable in practice. We pursue this interest in the next section through a longitudinal case study of efforts over almost a hundred years to achieve cross-border integration of water resources management within the Murray-Darling Basin. These efforts fall into discernible phases which are treated as experiments in governance from which lessons may be drawn for guiding efforts in this Basin and elsewhere to achieve cross-border integration of water resources management.

Broadly, in our ensuing analysis we construct a historical narrative that identifies the more significant changes in the policy contexts, practices and instruments that have shaped the development of IWRM thinking in Australia. That is, we look to interpret meaning from both the products (e.g., agreements, incentives, legislation, commissions and councils) resulting from interaction, and the behaviours employed (e.g., consensus, regulation and conflict) by policy actors over time to shape or contest integration. The narrative is based on a meta-analysis of the authors' previous work involving: critical review of policy and planning documents; in-depth interviews with actors engaged in these policy processes; and participant observation of decentralised water planning processes in the MDB and other Australian river basins over the last three decades (e.g., Connell, 2007, 2011b; Marshall, Wall, & Jones, 1996; Marshall, 2005; Marshall & Stafford Smith, 2010; Taylor, 2010; Taylor & Lawrence, 2012).

3. Cross-border integration of water management in the Murray-Darling Basin

3.1. Biophysical and social setting of the case study

Just over a million square kilometres in size, the MDB has a diverse range of landscapes, ecosystems, land uses, and climates ranging from the sub-tropical north to the

temperate south with its long dry summers, wet winters and snowfields (although most of the Basin is naturally semi-arid). It contains the watersheds of two major rivers – the Darling and the Murray – along with their many tributaries. The Basin includes over 30,000 wetlands, of which 11 are listed under the Ramsar Convention of Wetlands of International Importance.

The MDB is divided between the jurisdictions of the five 'Basin states': New South Wales (NSW), Victoria, South Australia (SA), Queensland and the Australian Capital Territory (ACT). (See below for discussion of the impact of strong state governments on efforts to integrate horizontally across state borders within the Basin.) Perhaps the defining feature of water management in the Basin states of SA, NSW and Victoria is that river systems in these areas are recognised as fully developed or over-allocated. The rivers of the MDB are now essentially in a state of maintenance, repair or re-allocation. Compared with river basins elsewhere in Australia, the MDB is more densely settled and intensively developed for agriculture, and its formal water management arrangements have the longest standing in the country.

The Basin is home to just under two million people, supplies much of the water used by another million in SA, and generates approximately 40 percent of the gross value of Australia's agriculture and pastoral production (Bohensky, Connell, & Taylor, 2009). Those three million people and various industrial activities use about four percent of the water diverted from the region's rivers. The other 96 percent is used by irrigated agriculture and constitutes about two-thirds of national rural and urban usage (Connell, 2011b). The ecological health of 20 of the 23 major river valleys in the Basin has been classified as either poor or very poor (Williams, 2011). Fundamental to the Basin's biophysical setting is that it sits on an almost closed groundwater basin with only one outlet at the Murray Mouth in SA.

The Basin's rainfall is low, and is one of the most variable of the world's major river systems (CSIRO, 2010). Compared with other major river systems in the world, the Murray-Darling is a low energy system with little capacity to purge itself of salts and sediments. Much of the salt mobilised into streams is not flushed out of the Murray Mouth but is redistributed elsewhere in the Basin to what were previously fertile low lying areas or onto floodplains of high environmental value, often over state borders (Connell, 2007).

3.2. *Institutional and political setting*

For over a century, irrigation development in the MDB has been primarily the responsibility of Basin state governments, each operating with a high degree of autonomy within its jurisdiction. This has resulted in state-focused systems with different management arrangements, types of water entitlements and contrasting conceptions of the appropriate relationship between irrigation communities and governments. These contrasts have begun to generate political conflicts as governments have attempted to distance themselves – to varying degrees – from their previous role of promoting the expansion of irrigated agriculture and, instead, focus more on arbitrating between competing interests and the need to improve riverine environmental conditions. Partly as a result of the institutional

and policy complexity that has resulted from over a century of parallel but largely uncoordinated development in relation to many issues, and despite the existence of a near century old inter-jurisdictional water management framework, environmental degradation of the region's rivers and catchments is intensifying and resource security is declining. Australia's national government is thus being forced to play an increasingly central role by intervening vertically in the horizontal relationships between the governments of the Basin states.

The questions remain, what powers does the national government have in these poly-centric arrangements for cross-border water resources management, and how should it use them? There is general agreement that primary responsibility for water management resides with the states. This reflects the historical record and the consensus of constitutional lawyers (Fisher, 2011). However the national government does have some leverage through its capacity to enforce international treaties, which apply in the case of water resources primarily to environmental issues, and its financial strength compared to the states (because during the past century its tax base has expanded much faster than that of the states). Although the financial need of the states potentially offers the national government leverage, the capacity of the national government in practice to 'punish' states that do not comply with its policies is limited. Any perception that a state is being discriminated against is likely to result in a voter backlash in that state against national government parliamentarians. This is a significant restraint in a federation with only six states (compared with fifty in the United States). In practice, the central factor in defining the extent or limits of government capacity to implement reforms that promote IWRM is not the nature of the legal powers available (which in principle are strong) but rather the state of public opinion.

Three main phases can be identified in the history of attempts at cross-border integration in the MDB. Table 1 summarises the key features of each. To a significant degree all three have been driven by the concerns of SA, the state at the end of the Basin where the River Murray flows to the sea. Far more than any other state, this one depends on the River Murray.

The upriver Basin states slowly made concessions to these SA concerns because they wished to avoid the uncertainties of litigation and they needed the funds that only the Commonwealth could provide. By the end of 1915 the River Murray Waters Agreement had been incorporated into identical legislation and passed by each of the then-existing parliaments with water management responsibilities in the southern MDB: the Commonwealth, NSW, Victoria and SA. Although the concept of IWRM only came to be articulated much later, these developments anticipated it in key ways.

3.3. Phase 1: River Murray Waters Agreement (1914–15 to 1992)

This first attempt to integrate cross-border water management in the Basin contained three main elements (Clark, 1971). Although each of these elements entailed overt coordination measures, agreement to these measures was driven in large part by the existence of the newly created federal system under which upriver states perceived net benefits from

Table 1
Pursuing cross-border integration of water management in the MDB: a summary of the three phases

Emerging tensions in MDB	Integration instruments	Logic for instrument choice	Limits encountered
<i>Phase 1 — 1914–15 to 1992: River Murray Waters Agreement (RMWA)</i>			
Political pressure from downstream state to maintain cross-border inflows with continued irrigation development proposed upstream	Cross-border legislative coordination	Reduces litigation (constitutional) uncertainties; necessary to establish RWMA and RMC	Integration focus of RMWA limited to managing River Murray water resources for navigation and irrigation purposes only
	Cost-sharing agreement for implementation of integrated cross-border engineering works program	Conflicts over implementation responsibilities are amenable to cost-sharing agreements; agreements can be enforced	
	Cross-border water-sharing agreement	Agreement can be enforced (e.g., during droughts)	
<i>Phase 2 — 1992 – 2007: Murray-Darling Basin Initiative</i>			
Downstream state concerns over declining water quality for domestic and irrigation uses.	Cross-border legislative coordination	Reduces litigation (constitutional) uncertainties; necessary to establish MDBMC and MDBC	
	Inter-governmental consensus via Ministerial Council to develop cross-border strategies/policies/programs	States would only accept consensus decision making; consensus approach (complemented by cost sharing) assumed capable of resolving conflicts	
	Cost-sharing and (CoAG) progress-payment agreements for program/policy implementation	Multilateral negotiation between governments strengthens scrutiny of their proposals & actions	Degree of conflicts exceeds what can be resolved by a consensus approach given the limited funding available for cost-sharing and progress payments
Growing public demands for sustainable water resources management in the Basin	Facilitation of participation by, and partnerships with, non-government stakeholders	Conflicts over implementation responsibilities are amenable to cost-sharing and progress-payment solutions; such measures can be enforced	
		Participation / partnerships facilitate implementation by strengthening ownership by stakeholders	

Table 1
(Continued.)

Emerging tensions in MDB	Integration instruments	Logic for instrument choice	Limits encountered
Non-government interest group pressure (especially into the new millennium) to prevent the stalling of Basin-wide water reforms	<p>Cultural-change projects (e.g., environmental education, collaboration with Indigenous interests)</p> <p>Commonwealth cost-sharing payments for 'water-saving' irrigation infrastructure</p> <p>Commonwealth funding for water buy-backs for environmental conservation</p>	<p>Cultural change enhances political feasibility of the future reforms needed for Basin sustainability</p> <p>Cost-sharing payments are sufficient to motivate required infrastructure investment; some of the water saved will be allocated for environmental conservation</p> <p>Existing knowledge enables effective allocation of this funding between alternative buy-back options</p>	<p>Limited environmental benefits from any water savings achieved</p> <p>Knowledge gaps limit environmental benefits from water buybacks</p>
<i>Phase 3 — 2007 to date: (Commonwealth) Water Act 2007</i>			
Recognition of the inter-governmental consensus approach failing to progress water reforms	<p>Unilateral legislation by Commonwealth to create a Commonwealth agency (MDBA) responsible for developing/implementing an integrated water resources management plan (the Basin Plan)</p> <p>Progress payments to Basin states for developing/implementing state water management plans consistently with the Basin Plan</p> <p>Facilitation of participation in planning process by non-government stakeholders</p>	<p>Integration focus limited to water resources.</p> <p>Constitutional uncertainties arise from lack of cross-border legislative coordination</p> <p>Gaps in the knowledge/experience needed by Commonwealth for developing Basin Plan</p> <p>Lack of support for Basin Plan from key stakeholders</p> <p>Magnitudes of payments are sufficient to outweigh political obstacles to an integrated Basin-wide approach</p> <p>Participation facilitates implementation by strengthening ownership by stakeholders</p>	<p>Commonwealth access to information and experience is sufficient to develop & implement a quality plan in the absence of multilateral negotiations with states</p> <p>Integrated Basin-wide plans developed centrally will attract sufficient support from state governments and other key stakeholders to enable successful implementation</p> <p>Commonwealth payments likely to be insufficient to outweigh political obstacles</p> <p>Participation initiatives are yet to engender significant stakeholder ownership</p>

avoiding the risks of litigation that the SA Government was threatening to launch if a political solution to the water-sharing conflict acceptable to it were not negotiated.

The first of the three elements involved a coordinating body known as the River Murray Commission (RMC), with four members chaired by the Commonwealth representative and support from a small full time secretariat. This was established to oversee implementation of the other two elements discussed below: the works program and the inter-state water sharing arrangements. Second, working through the RMC, a program of engineering works was planned as an integrated whole, with construction and operations to be the responsibility of the state within which they occurred. Finally, there were the water sharing rules for surface water. (Groundwater remained the responsibility of each state.) After providing a defined monthly flow to SA which would vary from month to month depending on the time of year, NSW and Victoria were to share equally the flow downstream of the main storage on the upper Murray, Hume Dam, and have exclusive rights to the water in the Murray's tributaries. As recommended by the 1902 Interstate Royal Commission, a proportional share arrangement between the three states was agreed for times of drought. (This reflected the great variability of the Basin's climate and is regarded as a good foundation for managing the even greater variability predicted to result from climate change.) With incremental changes over time, an intergovernmental arrangement based on these three elements has been in place ever since (Connell, 2007).

3.4. Phase 2: Murray-Darling Basin Initiative (1992–2007)

The second phase was driven initially by increasing concern about the salinity impacts of irrigation development along the Murray and its tributaries. By the 1970s irrigation development in Victoria and NSW was having significant salinity impacts on SA, threatening both downstream irrigation and water supplies for urban centres. The negotiations about salinity in the 1970s and 1980s eventually resulted in a much wider and very ambitious new arrangement, known as the MDB Initiative, which for the first time explicitly acknowledged the need for a whole of Basin approach (if only in principle).

The RMC was replaced by the MDB Ministerial Council (MDBMC) which brought together relevant ministers from the governments of the Commonwealth and the Basin states. A Community Advisory Committee, with non-government regional representatives, was established to advise the Ministerial Council. The MDB Commission, led by the heads of the government agencies working to the ministers in the Council and run by a significant staff complement, was also established to support the work of the Council. In addition, for the first time the ACT and Queensland were also represented as observers, making coverage of the entire Basin complete (Connell, 2007). As with earlier iterations, these changes were incorporated in new legislation and passed as identical acts in the parliaments of each MDB jurisdiction during 1992–93 (Kellow, 1995). In principle the new arrangements allowed for integrated policy development and management in respect of any issue upon which all jurisdictions agreed to cooperate. The limits were those imposed by what was possible in terms of politics, economics and implementation capacity rather than any restriction resulting from lack of constitutional power.

Most of the activities incorporated into the new arrangements were advisory or discretionary in nature and needed the enthusiastic collaboration and cooperation of all the governments and agencies involved before they could be implemented in any significant way. This applied particularly to activities outside the River Murray corridor. In addition, the long-established unanimity principle for major cross-jurisdictional decisions still applied. This gave the power of veto to any jurisdiction that wanted to exclude an item from the agenda or which was dissatisfied with any decision made. Despite these limitations, the early years of the MDB Initiative were marked by widespread enthusiasm and considerable achievements such as the Salinity and Drainage Strategy implemented in 1989 which significantly improved water quality in the lower reaches of the Murray, and the 'Cap' on further increases in extractions in 1995 which reflected agreement by all governments that the Basin's water resources were over-committed (Murray-Darling Basin Ministerial Council, 1995).

Examination of just some of the actions of this period indicates the scope of what was attempted. With regard to salinity, in 1989 the four governments with irrigation sectors in the southern part of the Basin (the Commonwealth, Victoria, NSW and SA) approved a Salinity and Drainage Strategy (Murray-Darling Basin Ministerial Council, 1988) under which NSW and Victoria along with the Commonwealth helped fund interception works downstream to divert saline groundwater flowing into the Murray in SA in return for that state's acceptance of further irrigation development in their sections of the Basin. This resulted in substantially reduced salinity impacts in the lower reaches of the river (Murray-Darling Basin Ministerial Council, 1999).

The most important of the new policies approved during this period was the Cap on further increases in extractions. A number of notable initiatives focused on cultural change and community engagement were also undertaken over this time under the broad umbrella of a Natural Resources Management Strategy approved by the Ministerial Council in 1989. One of these concerned Lake Victoria, a major storage on the River Murray in south-west NSW. The lowering of the Lake in 1994 to allow structural repairs was the first such lowering since it had been enlarged in the 1920s, and revealed a large number of ancient Aboriginal grave sites reflecting over 20,000 years of occupation before European settlement. The resulting dispute with an Aboriginal community in the region about the future treatment of the graves took the storage off line for eight years. Development of the new Lake Victoria strategy to resolve the dispute explicitly recognised the importance of social and cultural issues for water resource management. After protracted negotiations a new operational plan for the Lake, which effectively took account of Aboriginal concerns and also incorporated much improved environmental management, was agreed in 2002 (Connell, 2002).

By the mid-2000s, however, with the passing of the generation of policy makers who had introduced the reforms from the late 1980s, and continuing environmental problems exacerbated by one of the most severe droughts in Australia's recorded history, the water reform process stalled. Although water sharing between the states was based on proportions of available flow, the drought required unprecedented reductions in irrigators' water allocations and created pressures for new levels of integration.

An example of the developing stresses was provided by a CSIRO study that predicted major reductions in inflows in the Murray system, and in volumes of water available for irrigation and towns, in future years because of the increasing impact of factors including climate change, farm dams, forest plantations, and reduced leakages due to delivery systems upgrades (van Dijk et al., 2006). Significantly, all these threats were outside of the previously agreed list of responsibilities of the MDBMC (which required unanimous agreement for any additions). As a result of such studies, it was widely thought that the confederate model for cross-border water management in the MDB, then in place for nearly 90 years, was not an adequate institutional framework within which to expand the agenda to take account of issues where it was difficult to get unanimous agreement.

3.5. Phase 3: Water Act 2007 to present

In response to the apparent inability of the MDBMC to manage these and other issues, the Commonwealth began to assume a more central role. An important stage in this process was agreement by the Council of Australian Governments (CoAG, including the federal and state/territory governments of the federation) to the National Water Initiative (NWI) in 2004. The NWI was ostensibly national in scope but was strongly shaped by the need to manage political conflicts in the MDB. (This was reflected in the NWI's minimal coverage of water quality, groundwater and urban issues.) Central to the NWI was the requirement for integrated water resource management plans able to address all issues of concern. It was supported by \$A10 billion in funds (later increased to more than \$A12 billion), which were provided by the Commonwealth through the *Water for the Future* program to fund new infrastructure projects by the states to help deal with climate change and to buy back water entitlements in order to conserve the environment. Payments to the states to fund particular activities such as infrastructure projects in return for compliance with Commonwealth Government policies has long been one of the main methods used in Australia to achieve state government cooperation with national initiatives, albeit with a record of very mixed success.

Initially the Commonwealth expected rapid reform as a result of all states and territories agreeing to a detailed implementation program when they approved the NWI. That did not happen for a variety of reasons which included both the complexity of what was being proposed and the opposition of irrigation-dependent communities concerned about proposed reductions in water allocations to irrigators. When the expected reform did not eventuate, the Commonwealth introduced the *Water Act 2007* (Australian Government, 2007). A key aspect of the Act involved creating the MDB Authority (MDBA) and charging it with responsibility for developing and implementing a Basin Plan. In contrast to the MDB Ministerial Council and Commission which it replaced, and which had answered to all governments in the MDB and not just the Commonwealth, the Act established the MDBA as a Commonwealth Government agency. The Commonwealth intends that the Basin Plan will lead for the first time to an integrated and comprehensive approach being taken to managing the MDB's water resources.

It is quite likely, however, that the Basin Plan will not be implemented as envisaged in the *Water Act*. Implementation will depend on a very high degree of support from the Basin states (that have most of the detailed knowledge and on-ground administrative capacity) which the Commonwealth could have difficulty attracting given the political strength of irrigation communities at the level of state governments. The Basin Plan is to be implemented through sub-plans developed by each of these states. There has been a long history of reluctant cooperation by the Australian states with such national water reform programs (Connell, 2007) and it is hard to see why that pattern will change.

Given these potential problems with implementation, the Basin Plan is unlikely to end up as the centrepiece of the MDB's high-level policy and management system in the medium term. However, the *Water Act* contains within it the potential for an alternative set of arrangements that would focus on the Commonwealth Environmental Water Holder (CEWH). The CEWH is established by this Act to manage the water entitlements that the Commonwealth is purchasing to use for environmental conservation. Lodged with the CEWH, the Commonwealth is likely to acquire sufficient water entitlements under its direct control (purchased under *Water for the Future*) to be able to achieve most of the environmental targets of the Basin Plan even if the states withhold their support. The CEWH has a \$A3 billion budget, sufficient to acquire up to a quarter of all entitlements and is now more than half way to that target (Commonwealth Environmental Water Holder, 2011). The end result could be that the Commonwealth will be responsible for achieving environmental goals while the states will take prime responsibility for irrigation-related goals, as they have in the past.

3.6. Reviewing MDB cross-border integration efforts from the late 1980s

Examining the policy and institutional reforms in the MDB from the late 1980s onwards, it is possible to detect two approaches to cross-border integration of water resources management with rather different assumptions, styles and outcomes. Dominant in the late 1980s and 1990s was what could be described as the confederate approach centred on the MDBMC. The membership of each government in these arrangements was based on legislation passed in its own parliament which could be repealed at any time. This confederate arrangement emphasised the importance of intergovernmental collaboration (both horizontally between the Basin states and vertically between them and the Commonwealth) and depended on unanimous agreement between governments for major new initiatives. After initial successes, however, progress slowed. The second stage of the salinity management program focussed on salinisation processes caused by vegetation clearing in the non-irrigated sections of the MDB (98 per cent of the catchment) and required cooperation which proved very difficult to obtain from sections of the community that had not previously been involved in river management. Similarly, further reductions in extractions proposed under the Cap encountered increasing opposition from the irrigation communities that would be most affected. This opposition was backed up by their state governments. By the early 2000s the reform effort in the MDB had stalled.

The breakdown in the culture of collaboration and cooperation between governments that had animated the MDB in its early years was described in a National Library of Australia interview recorded with Peter Cullen, a commissioner on the National Water Commission and an exceptionally influential figure in Australia's public policy debate over water issues (Connell, 2007, p. 147). He argued on the basis of his experiences that the Commonwealth had undermined the multilateral process at the heart of the MDB Ministerial Council by arranging a series of bilateral funding arrangements with each of the states. This appeared to enhance the role of the Commonwealth, but in practice strengthened the position of the states. They could now operate free of the competitive scrutiny of their neighbouring states in their dealings with the well-funded but poorly-informed Commonwealth. According to Cullen, the previous approach was based on an effort to achieve cross-border cooperation through shared understanding and cultivation of a sense of comity, a concept from the field of international diplomacy where all parties undertake to work for solutions to problems that are mutually beneficial rather than antagonistic. A key to that approach was its harnessing of competitive rivalry between the Basin states as a means to 'keep each other honest' in a situation where the Commonwealth lacked the requisite knowledge and experience of management in the many different regions – each with its own complex and often idiosyncratic history of institutional development – to provide effective scrutiny by itself. The replacement bilateral approach based on the *Water Act 2007* was closer to a purchaser-provider model where integration was sought as the product of financial 'contracts' between governments. Such contracts had frequently been used before, but in situations where there was much more shared agreement about objectives. Implicitly the new approach reflected a sense that offering more funds reduced the need to develop shared understandings.

Of the six governments with responsibilities in the MDB, the five Basin states and the Commonwealth, only the latter had the Basin-wide ambit and funds to re-energise the reform program. It could have used its power to revitalise the confederate approach by, for example, channelling all Basin-relevant funding through the MDB Ministerial Council and pressuring the states to accept majority decisions if they wanted to obtain a share. Instead, it chose to work through CoAG, an organisation within which it appeared to have more power than in the MDB Ministerial Council. Working through CoAG has allowed the Commonwealth to push for reform more assertively by offering take-it-or-leave-it funding deals to the states (which are chronically in need because the Australian tax system strongly favours the Commonwealth which has more of the growth taxes such as those drawing on income and business activity).

The MDB's policy environment is volatile. At any given time, a large number of enterprises (individuals, businesses, associations, industry groups, governments, etc.) are interacting and influencing its policy process in many different ways. In practice, decisions are not made from the top down but emerge from cycles of interaction in which the participants have varying degrees of influence but no single voice is dominant. The federal political system means that cross-border integration of water management involves two levels of government, each with considerable autonomy from the other. Much of the

discussion about inter-jurisdictional water management in the MDB gives the misleading impression that interaction between the Commonwealth and states is highly structured, but the reality is far more elusive. The independent centres of power provided by the Commonwealth and state jurisdictions create focal points in a polycentric governance arrangement around which contending interest groups arrange themselves, moving from one to the other as their members make strategic decisions about alliances and how best to promote their goals or block those of others.

With the Water Act's top-down planning process and rigid requirements for state coordination, it was always going to be difficult to implement the Basin Plan in the turbulent pluralist political environment of the MDB. However, the likelihood of the Commonwealth acquiring sufficient water entitlements to achieve by itself most of the environmental targets of the Basin Plan renders the timetable for developing the state sub-plans to implement the Basin Plan almost irrelevant. When the CEWH's purchasing program is complete and it holds more than a quarter of all water entitlements in the MDB, it will be largely unfettered by legal constraints beyond the requirements of the Environmental Watering Plan to be developed by the MDBA (another Commonwealth agency) in consultation with the states. It is likely therefore that in coming years the CEWH will emerge as the most important water management institution in the MDB (Connell, 2011a).

If implementation of the Basin Plan process is blocked indefinitely by political and legal disputes and the CEWH becomes as significant as predicted in this paper, what sort of water governance system is likely to evolve in the MDB? One possibility is that the Commonwealth will end up focussing mainly on environmental outcomes, leaving the states to look after managing water for consumptive uses. Efforts to integrate cross-border, cross-sectoral (particularly between the irrigation and environmental conservation sectors) management of water resources through overt attempts at coordination (e.g., via Basin-wide strategies, plans and/or programs) could end up largely abandoned despite over two decades of effort in this direction.

The significance of this reversal would be reduced somewhat if the CEWH were, as suggested by Roberts, Seymour, & Pannell (2011) and Cummins & Watson (2012), to use regional bodies (like the 18 regional natural resource management bodies already operating within the Basin) to deliver much of the environmental water. At the regional level, in contrast with the state and federal government levels, there is potential for significant collaboration (both formal and informal) and fruitful competitive rivalry between the various local water management bodies in place (albeit with many variations between the different jurisdictions) (Marshall & Stafford Smith, 2010). Decision makers operating at the regional level are well placed to translate and adjust policies for each specific setting. Decisions at other levels of the polycentric governance system have to apply to a wide variety of settings and are therefore less likely to suit any particular one. It can thus be argued that the activities of the different levels of government may come to be integrated less by overt top-down coordination (including formalised collaboration) initiatives and more on the basis of self-organised initiatives, like informal and perhaps transient collaborations,

that emerge upwards somewhat spontaneously from lower levels of governance arrangements (guided indirectly by institutions emerging at higher levels).

4. Discussion

The foregoing case study of efforts over almost a century to integrate cross-border management of the water resources of the MDB highlights the value of the concept of polycentricity for illuminating analysis of such efforts. As observed above, the decisions ultimately affecting success in integrating cross-border management of the Basin's water resources have emerged from cycles of polycentric interaction among the numerous enterprises (from federal, state and regional levels of governance as well as the irrigation, environmental conservation and other non-government sectors) with interests in these decisions. Such cycles and their significance are difficult to recognise when an analyst starts from the presumption, based on the 'classical modernist' understanding of governance (Hajer, 2003), that the significant decisions are those that are made monocentrically from the top down. This perspective leads readily to misjudging the behaviours arising from polycentric interaction as symptomatic of 'chaos' when, as demonstrated by Blomquist (1992) in the context of Californian groundwater management, such behaviours can lead to outcomes that most stakeholders actually prefer. The tendency for agri-political, government and regional body actors to employ parallel strategies of competitive and cooperative behaviours in policy implementation have also been described previously in water quality governance settings in Australia (Taylor, 2010; Taylor & Lawrence, 2012).

Acknowledging the significance of polycentrically-made decisions for the pursuit of integrated management highlights also the importance of looking beyond overt integration measures, driven typically from the top down, when analysing success or failure in this pursuit. The overt measures introduced in each of our three historical phases of attempts to integrate cross-border management of MDB water resources (e.g., the River Murray Waters Agreement in the first phase, the MDB Initiative in the second, and the National Water Initiative in the third) were indeed important. However, the progress achieved in any phase towards integration cannot be adequately understood without deeper exploration of the political conditions, institutional design features and other less obvious (including self-organised) measures that made it possible to introduce the overt measures, and which affected how successfully they could be operated.

For instance, credible threats of litigation by SA created the political pressure on upstream states and the Commonwealth that was needed in each of these phases for inter-governmental agreement to be reached on the overt cross-border integration measures to be introduced. As another example, the institutional design features of the MDB Initiative served to effectively harness competitive rivalry among the Basin states as a way of countering their informational advantages over the Commonwealth in respect of funding negotiations. While the investments in cultural change under the MDB Initiative were not intended to contribute immediately to cross-border integration efforts, moreover, they

reflected an appreciation that indirect measures of this kind were needed to make more affordable the transaction costs of solving longer-term integration challenges of escalating complexity. As a final illustration, the slow progress achieved in implementing the National Water Initiative, including through negotiating a Basin Plan, has demonstrated not only the autonomy with which the Basin states can resist overt integration measures driven primarily top-down by the Commonwealth but also the consequences of such autonomy for how the NWI may come to be actually implemented in the Basin (i.e., less through the Basin Plan and more via the CEWH).

5. Conclusions

Our longitudinal case study of attempts to achieve integrated cross-border management of water resources within the Murray-Darling Basin has demonstrated the value of understanding the integration problem as one of collective action and of applying the concept of polycentricity to illuminate analysis of this problem. Our examination of these attempts over almost a century revealed continual polycentric re-negotiation of the rules of the game as prior attempts became unseated by changing policy parameters, the mix of public, private and other enterprises involved, and their relative powers over policy design and implementation.

In particular, our analysis of the Basin's institutional reforms since the 1980s identified recurring evidence that centralised government interventions are no longer able to overtly coordinate the suite of interdependent enterprises relevant to the success of water management efforts in this region. Such evidence highlights the value of governance arrangements capable of fostering the kinds of inter-enterprise relational dynamics through which more of the required integration of management emerges on a self-organised basis – thus enabling the role of centralised intervention to retreat to the more manageable one of 'nudging hand' (Arthur, 1999). At least for the Murray-Darling Basin, therefore, our case study highlights the importance of governments augmenting their limited capacities to control the direction of cross-border integration efforts by setting in place governance arrangements capable of catalysing (e.g., by fostering conditions favourable for fruitful competitive rivalry or informal collaborations) the kinds of self-organising dynamics through which they and other enterprises may come to manage water resources with greater regard for the interdependence of their efforts.

The research task in assessing the transferability of these case study lessons to cross-border integration challenges in water resources management outside the MDB fits neatly within the kind of research program concerning polycentric water governance that Huitema et al. (2009) identified as crucial in the search for more adaptive modes of water governance. For instance, a key question they posed for such a program was 'how . . . in polycentric settings . . . [to] resolve or prevent coordination problems, foster trust, and keep transaction costs manageable, while ensuring democratic legitimacy?'. While the lessons we have drawn from our case study are fairly general, it is important to recognise that

policy-applicable answers to this question will need to vary considerably, given heterogeneous biophysical and social conditions, if they are to stand a reasonable chance of solving coordination problems and enhancing integration in the management of transboundary water resources

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