

Water reform in the Murray-Darling Basin

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[1] In Australia's Murray-Darling Basin the Australian and state governments are attempting to introduce a system of water management that will halt ongoing decline in environmental conditions and resource security and provide a robust foundation for managing climate change. This parallels similar efforts being undertaken in regions such as southern Africa, the southern United States, and Spain. Central to the project is the Australian government's Water Act 2007, which requires the preparation of a comprehensive basin plan expected to be finalized in 2011. This paper places recent and expected developments occurring as part of this process in their historical context and examines factors that could affect implementation. Significant challenges to the success of the basin plan include human resource constraints, legislative tensions within the Australian federal system, difficulties in coordinating the network of water-related agencies in the six jurisdictions with responsibilities in the Murray-Darling Basin, and social, economic, and environmental limitations that restrict policy implementation.

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1. Introduction

[2] Water challenges exist in terms of overuse and misuse in many parts of the world, but especially in arid and semiarid environments where water scarcity is more pronounced. The key to successful governance and overcoming threats to water security is institutional change that brings together key stakeholders in ways that ensure long-term, sustainable futures for the environment, water users, and their communities. These are common issues in many of the world's major river basins, particularly those in the northern and southern temperate zones such as those in southern Africa, the southern United States, Spain, India, and China, where the need to manage climate variability and also climate change is a major challenge.

[3] Arguably, one of the most comprehensive water reforms ever attempted at a basin level is the process currently being implemented in Australia's Murray-Darling Basin (MDB). This reform is in response to various threats, the most important being the overuse of water from irrigation diversions, but other anthropogenic risks include salinity and nutrient pollution caused by changing land management practices in the catchments. These threats are exacerbated by the fact that the MDB is a low-energy system with little capacity to purge itself of salts and sediments. For instance, much of the salt that is mobilized 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.

[4] There are six governments with responsibilities in the MDB. They include the Australian government, the Australian Capital Territory, and the four states governments of New South Wales, Queensland, Victoria, and South Australia, which all have land within the basin. Until very recently, policy development and management was largely conducted at the state level, with a few functions coordinated centrally. The coordinated activities included agreements about the respective shares of flow between the states in the southern basin and responsibility for some of the salt impacts across borders caused by agricultural development.

[5] Concerns about the state of the environment, exacerbated by a decade-long drought in the southern part of the basin that ended in 2010, have resulted in major water reform and changes to governance structures over the past 15 years. We document the causes and consequences of these changes in governance and review governance prospects for the coming decade. While many of the insights are specific to the MDB, they are relevant for other jurisdictions struggling with implementing water reform.

2. Context

[6] River regulation to deal with extreme climate variability in the MDB dates from the late nineteenth century. The biggest change following European settlement was the transformation of riparian rights into statutory water rights by states at the end of the nineteenth century. Water also features in section 100 of the Australian Constitution which states that

The Commonwealth [Australian government] shall not, by any law or regulation of trade or commerce, abridge the right of a state or of the residents therein to the reasonable use of the waters of rivers for conservation or irrigation.

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[7] To date, there has been very little litigation referring directly to the interpretation of section 100, but that could change with the implementation of the Murray-Darling Basin Plan which is to be finalized in 2011.

[8] Substantial differences exist across states in terms of water governance. Some of the contrast arises from variations in hydrological conditions and the history of water development. Irrigation in the southern part of the basin is dominated by the Murray and Murrumbidgee rivers and developed many decades ago, but there has also been substantial growth in extractions post World War II. Irrigation districts were established as government-run operations with water managers exercising detailed supervision of settlers who could be evicted for unsatisfactory performance. Many returned service men were settled along the rivers through these schemes. The relationship between governments and these communities eventually matured, but even today, there is a greater reliance on state government assistance in irrigation districts compared with the irrigation areas that developed more recently. In contrast, irrigation in the northern part of the MDB developed in the final decades of the twentieth century. The north was less suited to the building of large dams, and most of the water storages in the northern basin are privately owned and off river, such that much of the water is captured on the floodplain before it enters designated streams where it comes within the official management framework.

[9] Incremental development through the twentieth century has put the existing governance framework under increasing pressure. Until the 1990s, a rising level of water extractions, combined with climate variability that reduced the frequency of years in which the full allocation of water could be provided to irrigators, as defined by their state water licenses, led to a gradual realization by state governments that they were unable, individually, to manage water effectively without greater coordination and investment by the Australian government. These current water reforms, however, have their parallels to reform in the early twentieth century. Both processes originated with severe droughts that compromised existing governance structures and arose from a rare willingness by states to cooperate to deal with a crisis of drought and/or overuse that could not be resolved without collective action.

[10] The first phase of transboundary water management commenced with the 1915 River Murray Waters Agreement, which provided for the sharing of water between the states in the southern section of the Murray-Darling Basin, New South Wales, Victoria, and South Australia. Like all subsequent intergovernmental agreements, including the most recent reforms in 2007, it excluded land use issues, which remain the preserve of the states. The 1915 agreement also excluded the large northern part of the catchment which drained into the Darling River and only applied to the Murray River [Connell, 2007]. The early royal commissions that led to this agreement stressed the need for a catchment-wide approach to policy and management. After years of difficult negotiations, the agreement put in place a tightly conscribed water-sharing agreement between the states. This agreement, however, broke down in the 1970s and 1980s because of growing development pressures and increasing salinity problems. It was replaced in the mid-1980s by the Murray-Darling Basin Ministerial Council,

the Community Advisory Committee, and also the Murray-Darling Basin Commission (MDBC). Described collectively as the Murray-Darling Basin Initiative, these new bodies were designed to take account of a broader range of political, community, productivity, and environmental interests [Doyle and Kellow, 1995, pp. 220–238]. In part, these reforms were the product of changing ideas about how public institutions should be organized and operated.

[11] The new institutional arrangements of the 1980s were intended to improve sustainability, as well as maintain agricultural production. This brought the environment and agriculture into the “institutional fold” along with water management, but other issues such as tourism, recreational use, indigenous affairs, and local government remained outside of the ambit of basin-wide reform. In the lead up to meetings of the Ministerial Council and Commission, each jurisdiction was expected to develop a whole-of-government position on the various issues. Changes were subsequently incorporated in new legislation and passed as identical acts in each of the parliaments of the MDB in 1992–1993 [Parliament of Australia, 1993, Act 38].

[12] Most of the activities incorporated into the 1993 act were advisory or discretionary in nature and needed the cooperation of all the governments and agencies involved before they could be implemented. This applied particularly to activities outside the Murray River corridor. In addition, the long-established unanimity principle still applied to all decision-making processes. This gave the power of veto to any state jurisdiction that wanted an item excluded from the agenda or any jurisdiction that was dissatisfied with any decision made. Despite these constraints, the initial years of the MDB Initiative witnessed substantial achievement. Unfortunately, it proved incapable of resolving many of the current challenges that threaten environmental sustainability and resource security in the basin.

2.1. Acceptance of Limits: The Cap on Further Expansion

[13] A limit on further increases in extractions in the mid-1990s called the cap indicated acceptance by the governments in the MDB that the water resources in the MDB are a finite resource. The decision to impose the cap was in response to riverine conditions and resource security in the MDB that were continuing to deteriorate despite the reforms of the 1980s. In particular, a spectacular algal bloom in the summer of 1991–1992 that extended along more than 1000 km along the Darling River gave the issue international prominence.

[14] In response, the Murray-Darling Basin Ministerial Council commissioned an audit of water use in the MDB that was delivered in June 1995 [Murray-Darling Basin Ministerial Council, 1995]. The Murray-Darling Basin Ministerial Council responded to the audit by introducing an immediate temporary cap on further expansion of surface water diversions beyond the 1993–1994 levels of development, the irrigation season upon which the water audit was based [Murray-Darling Basin Ministerial Council, 2000, p. 9]. In July 1997 the cap was made permanent. Its formula is complex, and the surface water volumes made available vary from year to year depending on seasonal conditions. An important feature of the formula is the incorporation of existing management rules. Although sensitive to drought,

these rules were countercyclical, supplying proportionally more water to irrigators in dry years than in wet periods. The struggle to maintain the traditional function of water regulation to supply irrigation (the original rationale, which is still relevant) and at the same time to find ways to manage to ensure the ecological integrity of the river system continues to be one of the most difficult conundrums for water reformers in the MDB.

[15] The cap did not limit further irrigation development, but rather, it set a total volume of water that could be extracted each year for consumptive purposes. The goal was to establish a limit to extractions so as to protect the environment. Water markets, in combination with restrictions on water use in places where it would cause significant environmental harm, were to be used to reallocate water to the locations where irrigation had a higher value in use and also did not impose substantial costs on the environment.

[16] Despite many official statements of intent, the cap was never extended to include groundwater or to encompass much of the northern section of the MDB [*Murray-Darling Basin Ministerial Council*, 2000]. The failure to follow through on full implementation of the cap in the late 1990s and early 2000s was symptomatic of the failure of the MDB Ministerial Council to capitalize on earlier achievements. As a result, it was unable to put in place a system of water management to prevent a long-term decline in environmental conditions [*Connell*, 2007]. At the implementation of the cap, the intention was to further restrict volumes of water extracted for consumptive purposes and to appropriately link surface and groundwater use and management. As part of this process the cap was to be reviewed in 2000 before the introduction of further limits on extractions.

[17] Apart from management differences across the many distinct management regimes in the basin, the availability of data at a catchment or stream level, such as measured flows and extractions, has made it difficult to adequately plan and manage change at a local and basin level. Similar sets of policy and management regimes developed in parallel for groundwater and were managed separately, even in those regions where there was high connectivity between surface and groundwater systems. The catchment and state differences in management rules have also proved to be a major challenge to successfully achieving basin-wide objectives. In response to these difficulties, the Australian government has taken the lead to propose, and also fund, initiatives that provide benefits across the basin, such as the Living Murray First Step.

2.2. An Emergency Response: The Living Murray

[18] Five years after the cap was introduced, a review was undertaken of its implementation. The review found that without the cap, degradation would have continued at an even faster rate than had been the case. The Living Murray First Step [*Council of Australian Governments (COAG)*, 2004b] initiative was introduced in response to the ongoing environmental declines, with its title indicating the need for a more systemic response in the medium term. Early in the planning phase for the Living Murray First Step, the MDB Ministerial Council established a scientific reference panel to give advice about the potential benefits

of a range of rehabilitation options. Six options were assessed by the panel against the probability that they would restore the River Murray to a condition that could be described as that of “a healthy working River Murray system.” Three of the options identified, (1) business as usual, (2) improvement in the operations but no increases in environmental flows, and (3) improved operations plus an additional 340 gegaliters (GL) for new environmental flows, were all considered to have a “low” probability of success. The option of improved operations plus 750 GL in increased environmental flows was given a “low-moderate” rating. An increase of 1630 GL in environmental flows was expected to result in a “moderate” probability of success. The option of a volume of 3350 GL in environmental flows plus improved operations was given a “high” probability of success. Given the size of the volumes recommended, there was resistance from rural interests represented by the National Party (ex-Country Party) within the conservative coalition government, which was then in power at the national level. The coalition government did not accept the recommendations, but as an initial gesture it did allocate \$500 million in June 2004 to fund infrastructure improvements to provide water for five icon sites along the Murray River as well as the Murray channel. Subsequently, in May 2006 the coalition government added another \$200 million to the project plus an additional \$300 million for other infrastructure works (all values are in nominal Australian dollars; as of November 2010, US\$1 = A\$1).

[19] The Living Murray First Step represented a much higher level of coordinated interjurisdictional activity in the MDB than had occurred previously. It encompassed a range of projects that were already underway, included additional projects, and substantially enlarged the total funding in river rehabilitation. The initiatives included fishways which the MDBC had been installing on its major structures so that fish would be able to move up and down the Murray over more than 2000 km from its mouth. In addition, the MDBC returned “snags” back in the rivers. For important wetlands, such as those in the Barmah-Millewa forests, environmental flows have been allocated so as to extend the bird breeding seasons, and engineering works and pumps have been installed so that particular locations can be selectively watered. A concerted effort has also been made to include indigenous people in the planning and management of sites of particular cultural significance.

[20] The Living Murray First Step marks a major improvement in policy in terms of the challenges facing the environment in the basin, but it was insufficient to meet the challenges of the basin’s ecosystems. At its inception, the Living Murray First Step sought to acquire 500 GL of water for the environment by 2009 by improving water use efficiency with infrastructure investments and the purchase of water entitlements [*Grafton and Hussey*, 2007]. However, to achieve even a moderate probability of success, multiples of this quantity are required [*Wentworth Group of Concerned Scientists et al.*, 2010]. Those additional volumes were meant to result from the implementation of the National Water Initiative (NWI) approved at the same meeting of COAG in June 2004 (see section 3).

[21] Officially, the Living Murray First Step project and the National Water Initiative were described as a

coordinated package. It is the lack of coordination and the unresolved contradictions between them, however, that indicate some of the conflicts behind the scenes that have shaped water policy in the MDB. Tensions are particularly obvious in paragraph 14 of the NWI, which provides the foundation for the Living Murray First Step. Its second subclause states that the separate intergovernmental agreement (establishing the Living Murray First Step) is to “address the over-allocation of water and achievement of environmental objectives in the MDB”. Using the environmental sustainability criteria contained in the NWI, the only scientific assessment of what was needed for that result was the one provided by the Scientific Reference Panel. It was this panel who advised that an increase of 3350 GL in environmental flows for the Murray River plus management changes would have a high probability of achieving a healthy working river. The tension between the two policies was made stark by the absence of any hint of when the second step might be taken or even what it might constitute when that time came. These two questions may be answered eventually, however, through implementation of the Murray-Darling Basin Plan that is due to be released in 2011.

3. Council of Australian Governments

[22] Central to the water reform process has been the intergovernmental agreements negotiated within COAG which brings together the Australian government, the six state governments, and the territory governments of the Australian Capital Territory and the Northern Territory. The principle is that once they have unanimously approved an intergovernmental agreement on a particular subject, each government will then enact the necessary legislation in their own parliament to bring it into force. COAG involves collaboration on multiple levels, from the prime minister and the state premiers to relevant ministers and their public servants.

[23] Agreements at COAG have initiated much of the basin-wide water reform. Beginning in 1994, there was a COAG agreement that there should be a range of water reforms and initiatives, including the facilitation of water trading and water pricing reform. Many of the institutional changes approved by COAG were needed to create efficient water markets, including the creation of volumetric and tradable water entitlements that were separate from land titles and the institutional separation of regulation, water service delivery, and resource management functions. These initiatives were designed to improve economic efficiency in water management that would allow for further reform to address the problems of overallocation and overuse of surface water within the basin. Increasing frustration with the slowness in implementing the 1994 reforms, however, led to the approval of a more detailed package, the National Water Initiative, in 2004 [COAG, 2004a].

[24] COAG also established a Water Reform Committee, consisting of senior federal and state water agency officials, to monitor progress and to promote a uniform approach to the implementation of the reform, particularly, by providing guidance on the most controversial questions, such as the best methods for taking account of externalities in

establishing the full cost of water consumption and the development of guidelines for pricing.

[25] In late 2007, after it was clear that progress with implementation of the NWI was stalling, the Australian government passed the Water Act 2007 to reenergize the reform effort. In contrast to previous arrangements based on parallel legislation passed in all parliaments, this was passed by the Australian Parliament only, a significant departure from the past which indicated determination by the national government to take greater responsibility for policy [Connell, 2007]. A particular problem had been created by paragraph 49 of the NWI, which recommended that the reduction in extractions to restore sustainability should be without compensation and only after 2014, when sustainability was expected to have been restored, were further reductions to be compensated. Although the principle of noncompensation was never explicitly repudiated, there had been a growing sense in government circles that it was politically too difficult to introduce.

[26] The new Water Act 2007 was based on a new approach to implementation, which was announced in January 2007 in a federal funding package that was renamed Water for the Future in 2008, following a change in government. It provides for up to \$12.9 billion in expenditures over 10 years [Wong, 2008]. Its principal parts include \$5.8 billion to subsidize water use efficiency improvements, both off farm and on farm, and \$3.1 billion for the purchase of water entitlements from willing sellers. Both programs are intended to reduce the current levels of water extractions in the basin and to increase environmental flows, with the Australian government receiving, typically, 50% of the water savings from infrastructure subsidies in the form of water entitlements. The \$5.8 billion for water infrastructure also provides the means by which state priorities for water reform are realized. Financing these state priorities of up to \$3.7 billion out of the \$5.8 billion allocated was crucial in ensuring state acceptance of the jurisdictional reforms detailed in the Water Act 2007 and its 2008 amendments.

3.1. Impact of the Federal System on Planning

[27] Central to the Water Act 2007 is the requirement to prepare a comprehensive Murray-Darling Basin Plan, which is due for finalization in 2011. The Murray-Darling Basin Plan is meant to provide a catchment-wide framework for sustainable management. In recent decades the ambit of water planning in the MDB has broadened beyond merely providing water for irrigators to also taking account of the many problems and issues that have emerged as the level of extractions has increased. As agreed in paragraphs 23 and 25 and Appendix E of the NWI, water plans are now meant to be comprehensive statutory documents. It is through their preparation that the difficult issues involved in balancing the need for sustainability and the ambitions of production interests are to be resolved.

[28] The water resource plans are to include secure water access entitlements, statutory-based planning, statutory provision for environmental and public benefit outcomes, plans for the restoration of overallocated and stressed systems to “environmentally sustainable levels of extraction,” the removal of barriers to trade, clear assignment of risk for future changes in available water, comprehensive

and public water accounting, policies focused on achieving water efficiency and innovation, capacity to address emerging issues, and many more elements. They are to provide for “adaptive management of surface and ground-water systems,” with their connectivity recognized where it is significant. In addition, water plans must take account of indigenous issues by making arrangements for indigenous representation in water planning “wherever possible” and provision for indigenous social, spiritual, and customary objectives “wherever they can be developed.” They should also include allowance for “the possible existence of native title rights to water in the catchment or aquifer area.”

[29] The water resource planning process is to take place at various levels. Underpinning the implementation of the basin plan are governments of each state, who are to develop regional and catchment plans consistent with the overall plan. Implementation of regional water plans must, out of necessity, involve decentralized or regional institutions, stakeholder engagement, and adequate capacity because states still retain ownership of water resources and responsibility for implementation of catchment water resource plans. Water resource plans are to be developed on a catchment or subcatchment scale and allow for input from various stakeholders, including environmental non-governmental organizations, catchment residents, and water extractors. The development of these plans is a lengthy process and involves interactions between the local catchment management authority, state officials, and stakeholders. The best plans are those that are developed with the inputs of scientists and modelers using reliable data that are widely accepted by different stakeholders. These plans should also be flexible to climactic variability, such as changes in inflows, and also new information and understandings.

[30] Despite appearances, interjurisdictional water management in the MDB does not only occur when state premiers meet at COAG meetings. The political agreements are announced at COAG meetings, but the on-the-ground implementation occurs at a catchment level. Authority provided by the federal and state jurisdictions creates focal points around which contending interest groups arrange themselves, moving from one to the other as their members make strategic decisions about alliances and about how best to promote their goals or to block those of others.

[31] A key part of the planning process at a local level includes catchment management authorities (CMAs) who are subordinate to state governments from which they receive their funding but have independent corporate standing and sometimes also receive federal funding. Resources are also provided by both the Australian and state governments to a variety of stakeholders and various engagement processes. Interspersed with these formal processes are lobbying efforts designed to sway decision makers and to convince the general public of their particular view of the world and the way that water reform should occur. States have substantial direct regulatory power as they still retain ownership over their water resources. State government are responsible for implementing water resource plans, direct environmental flows that are part of their planning processes, and allocate water to holders of state water entitlements.

3.2. Centrality of the National Water Initiative

[32] Most of the core elements of the Water Act 2007 can be traced to the NWI approved by COAG in June 2004. The initiative provides a checklist of most of the major issues that have shaped the history of water management in the MDB over the past century. It has its weaknesses; for instance, there is little discussion about water quality issues or the complexities involved in managing water in combination with the many other aspects of the catchment with which it interacts, such as land use policy. However, it is also an ambitious and far-reaching document.

[33] The NWI puts forward an ambitious plan to restructure water management and promote economic growth within a strong regulatory framework designed to improve and protect the environmental condition of both surface and subsurface hydrological systems. Similar efforts are underway in a number of policy spheres ranging from fisheries to forests. Like the NWI, they too combine efforts to maximize productivity while conserving the environmental resource.

[34] To be properly understood, the NWI needs to be viewed in the wider context of the National Competition Policy, arguably COAG’s primary concern. It is part of the nation-building enterprise that began well before federation in 1901 and is not merely an attempt to solve Australia’s contentious water management problems. The aim is to meld the semiautonomous states into a more unified national economy and society [Painter, 1998]. In the sphere of water policy, the NWI is meant to promote this process by strengthening management, encouraging water trading, and reducing the significance of state borders.

[35] Tension between states has always been a potent force in the water reform debate. As a result of increasingly obvious degradation caused by overextraction and drought in the recent past, state governments have grudgingly agreed to cooperate. The result was the NWI. Although New South Wales and Victoria have accepted the need for collective action, they have imposed very long delays on the introduction of the new water-planning regime, as has been documented in detail in the second biennial report on NWI implementation released by the National Water Commission (NWC) in late 2009 [NWC, 2009].

3.3. Australian Government’s Response to Slow Progress

[36] The Australian government initially expected rapid reform as a result of the NWI approved by all governments in 2004. When that did not happen, it introduced the Water Act 2007 [Australian Government Attorney-General’s Department, 2007]. Although the new act increased national government power, it did not give it total control over the basin’s water resources [Fisher, 2009, pp. 157–159]. A key aspect of the act was the creation of the Murray-Darling Basin Authority (MDBA), which is charged with developing and implementing a basin plan. This plan will define, for the first time, an integrated approach to manage the MDB’s water resources. It is a legally enforceable document due for implementation in 2011. Key elements of the basin plan will include (1) sustainable limits for surface and groundwater, (2) basin-wide environmental objectives, including water quality and salinity targets, (3) rules for a basin-wide water trading regime, (4) requirements for each

of the four state subplans that will implement the basin plan objectives, and (5) measures that will improve security for water entitlement holders.

[37] Central to the basin plan will be a “sustainable diversion limit” set for the basin as a whole, with diversion limits also developed for subbasins. At the basin-wide level, there will be plans for the environment, water quality, and salinity. The basin plan will also identify key environmental assets (such as Ramsar wetlands) and core ecological functions that must be maintained. It is supposed to be designed for a wide range of circumstances, as is appropriate for a highly variable climate, and will identify potential future risks such as climate change, bush fires, and new agricultural activities that could change runoff patterns.

[38] Scientific data and models will be used to determine the overall extraction limits, combined with socioeconomic and political considerations. All of the various plans will be subjected to periodic review, as required by the Water Act 2007. Central to the basin plan will be catchment and basin-level sustainable diversion limits (SDLs) that are to represent an environmentally sustainable level of take which, if exceeded, would compromise [MDBA, 2009]: (1) key environmental assets of the water resource or (2) key ecosystem functions of the water resources or (3) the productive base of the water resource or (4) key environmental outcomes of the water resource. The “take” or water extractions will be allowed to vary from year to year depending on factors such as storage levels, expected inflows, groundwater levels and rates of recharge, and interception activities such as new forest plantations. To ease the transition from historical levels of allocation where current extractions are judged to be more than is sustainable to the new regime, a temporary diversion provision will be provided for the first 5 years of implementation. This transition is already being prepared for by the Australian government through its program of purchasing water for the environment and providing compensation to willing sellers of water entitlements at market prices [Grafton, 2010a].

[39] A crucial body created by the Water Act 2007 is the Commonwealth Environmental Water Holder (CEWH). The CEWH is responsible for using the water gained through purchases and some of the water gained through the federal-funded infrastructure improvements to achieve environmental objectives through a program of active targeted watering [Department of Environment, Water, Heritage and the Arts, 2009]. The water will be held as water entitlements with the same legal characteristics and levels of security as those owned by irrigators. The level of security and assignment of risk is a very significant issue given the predictions for a drier future in the southern basin as a result of climate change. The MDBA has concluded that it is reasonable to attribute 100% of the entire reduction in current diversion limits to a change in Australian government policy [MDBA, 2010, p. 155].

[40] Working within the parameters established by the basin plan, the four basin states will be required to develop their own plans that will be subject to accreditation for consistency with the basin plan by the relevant federal minister. This recognizes the significant differences that exist between the various states and also the reality that water management expertise in terms of implementation resides within state agencies.

[41] States retain control over their water resources but will need to ensure that their water resource plans are consistent with the overall basin plan. The states and their subsidiary regional organizations will ultimately implement the water resource plans. Thus, the success of the Water Act 2007 to achieve its goals of ensuring ecological sustainable development depends on the effective interaction and consistent application of the basin plan and its interaction with state and regional water plans.

[42] The process of preparing the plan has involved considerable, albeit highly controlled, consultation. The MDBA’s Basin Community Committee has had continuous detailed involvement in the preparation of the basin plan since it first began to be developed in early 2009. As required by the Water Act 2007, professional researchers have been commissioned to prepare social and economic impact studies to accompany the final basin plan when it is submitted to the Australian government for final approval. Stakeholders will also be actively involved in the development of regional water plans that will need to be consistent with the basin plan.

4. Difficult Future

4.1. Tensions Between Legislatures

[43] The new arrangements involve a substantial shift in power toward the national government and away from the states and the relatively weak provisions for compliance in the Water Act 2007. Efforts to create a robust institutional framework across the national and four state jurisdictions in the MDB have to take account of long-standing tensions between the two layers of government that go much wider than water policy and management.

4.2. Ambitious Targets

[44] The reforms will create ambitious targets for what is a very loosely connected network of agencies in six jurisdictions. At the core of the debate is water planning where all the tensions involved in water management come together. The task for those involved in preparing them is to resolve, or at least contain, the tensions between the major stakeholders. The task is daunting. They are to define the pathway to environmental sustainability. Among many other considerations, the water plans must take into account the time lags that often exist between management actions and their effects, some of which may not be evident for years. Previously, water plans did not have to show the same level of accountability for the long-term outcomes of their implementation but were simply required to focus on a relatively small part of the bihydrological system that was directly relevant to water delivery and drainage.

[45] To ensure effective implementation of the basin plan, its designers will have to work with four very different state water management systems. Over the past century, each water management system has developed in response to different climatic conditions and the demands of a wide variety of crops, largely in isolation from each other. Until now, there was no requirement for a single policy framework based on shared core principles. The challenge involved in developing principles and approaches that can be applied to all systems but are not so vague that they are

incapable of having a real and positive impact on water management is formidable.

4.3. Negotiating Change

[46] The Water Act 2007 assigns important monitoring and auditing roles to national agencies such as the Bureau of Meteorology, the Australian Competition and Consumer Commission, the National Water Commission, and the Murray-Darling Basin Authority. This monitoring is to include environmental conditions, climate, water trading, and water planning and should improve the information and database needed to make more effective decisions in terms of water planning but will also require cooperation from state governments.

[47] A variety of complex challenges have been created by the processes in the Water Act 2007 for the development and coordination of the 10 year subplans, through which the four states and the Australian Capital Territory will implement the basin plan. In order to get agreement from the states to refer some of their constitutional powers over water to the federal government so that the new act could expand its ambit, the Australian government agreed to include elaborate consultation processes to deal with potential points of disagreement. In light of the history of similar arrangements regarding forests, biodiversity, and salinity in Australia [*Dovers and Wild River*, 2003], the process of negotiating the state subplans is likely to be protracted and their subsequent supervision difficult.

[48] One of the requirements of the basin plan is that it should promote water trading. Water trade has long been seen as the potential driver of change, a primary source of energy that was to be harnessed to promote the reform of water management in the MDB. To date, this vision has not been fully realized because of interstate restrictions on trade of water entitlements. Nevertheless, there is substantial trade of water entitlements within states and of seasonal allocations both within and across states that increased the gross domestic product of Australia by about \$220 million in 2008–2009 [*NWC*, 2010].

4.4. Ecological Thresholds

[49] Over the past decade, water managers have faced unprecedented environmental challenges. These challenges have been particularly obvious in the basin's lower lakes at the Murray River's mouth, with exposure to acid sulfate soils, very high levels of salinity, and low to zero inflows from 2002 until October 2010. Despite these evident problems, tensions remain between different interests about how water reform should proceed. Irrigator organizations have voiced their concerns about the impact of reduced diversions on those that choose to remain farming and their communities, while nongovernmental organizations are worried that the final basin plan may provide insufficient water for key environmental assets and ecosystem functions. Setting an acceptable level of extractions and adequate environmental flows remains a key goal of the political actors and those involved with water reform.

[50] The environmental challenges of the past decade place a "spotlight" on what is possibly a serious weakness in the water reforms and the Water Act 2007. While flooding over most parts of the basin in 2010 provides a valuable respite for environmental assets that have not received

water in many years, the fact remains that the basin plan will come into force in New South Wales in 2014 and in Victoria 5 years later, with an allowance for a further 5 year transition period after existing water-sharing plans expire. This schedule is based on the premise that ecological conditions are sufficiently stable and that little will be lost during the years that will elapse before full implementation.

4.5. Public Engagement

[51] A serious constraint on water reform in the MDB is a lack of understanding on the part of the public of the underlying principles and the approaches to implementation being taken by the various governments involved. There is strong support in principle for substantial action to reverse obvious degradation. However, it can be argued that the approach taken in the NWI is not widely understood or supported, particularly in the communities most directly affected. In late 2009, the National Water Commission, charged with monitoring and facilitating progress of the NWI, published its second biennial assessment on implementation of the NWI. The report was critical in its assessment of progress by some states in terms of their implementation of the NWI [*NWC*, 2009].

[52] Delays in implementation of agreed-to reform derive from the radical nature of the changes being implemented. The NWI and the Water Act 2007 require that the ongoing decline in environmental conditions and water security that has characterized the MDB over past decades be halted by increasing environmental flows and changing water management and planning rules. The proportion of river flow remaining, once this is achieved, is to be available for production. However, even in a relatively wet period, such as the 1990s, it would be difficult to make reductions in extractions to significantly improve the state of riverine environments. In a time of drought, the economic and social pain in many communities from reduced diversions will be compounded.

4.6. Skills Shortage

[53] A skills shortage may turn out to be one of the biggest threats of all to water reform in the MDB. In addition to long-standing issues related to the levels of extractions and salinization, the list of water management issues extends to acid soils, nutrient pollution, carbon depletion, changing patterns of rainfall, runoff and recharge, loss of native vegetation, threatened biodiversity, declining connectivity between floodplains and streams channels, changes to the seasonal pattern of flows, thermal pollution downstream from dams, indigenous issues, degraded amenity, the social impacts of economic and environmental change, climate change, and more. Management is made more difficult by the fact that many of these problems involve different levels of government or occur mainly on private land or are influenced by the activities of commercial companies. Complicating these issues are differences in capacity across states and regions within the basin.

[54] Existing shortages will be likely to get worse in coming years by the retirement of water specialists who were recruited in 1970s. This problem is recognized by the National Water Commission and other agencies. As a result, the Australian and state governments are investing in training and education in the water sector, but even with these

investments, there will still be competition from other sectors of the Australian economy that face similar recruitment and retention challenges.

4.7. Debates About Water Reform

[55] The reform strategy contained in the Water Act 2007 and the basin plan have been critiqued from a number of perspectives. For example, a report prepared by the Australian Productivity Commission released in March 2010 was critical of the Australian government for purchasing water in advance of the establishment of SDLs and before the liability for the policy induced changes had been resolved [*Productivity Commission*, 2010]. Given that the MDBA's guide document to the proposed basin plan recommends a minimum increase in additional water for the environment of 3000 GL/yr on average [*MDBA*, 2010], the SDLs will likely be substantially lower than the current rate of extractions. As a result, past purchases of water entitlements for the environment may be viewed as a "no regrets" approach to increasing environmental flows. Another question of liability for policy-induced changes has been resolved by the pledge by the Labor government in August 2010, during the federal election, to fund any acquisitions required through the purchase from voluntary sellers, thereby removing the prospect of compulsory reductions with or without compensation.

[56] It has also been argued that the level of SDLs should be set by comparing the marginal net benefits of extractive and environmental uses [*Bennett*, 2010]. In practice, this is difficult to do under existing conditions because of the limited data, although some broad indicators of costs and benefits are available [*Grafton*, 2010b]. The discussion does highlight, however, some of the issues being debated since the release of the guide document by *MDBA* [2010] in October 2010. For many critics, the guide document gives undue weight to scientific and environmental priorities as opposed to social and economic criteria in determining the recommended SDL. There is now an energetic public controversy, as yet unresolved, about these issues. Similarly, there are many criticisms of the heavy dependence of the water reform program on regaining water through infrastructure improvements. It is argued that much better value would be achieved by acquiring the water through purchases in the water market [*Cruse and O'Keefe*, 2009; *Grafton*, 2010a].

5. Conclusions

[57] Effective water reform balances the trade-offs of competing water uses and environmental flows to promote water security. Achieving this balance is a major challenge in many parts of the world, especially in arid and semiarid environments. To provide insights into this reform process, we review the recent institutional changes in Australia's Murray-Darling Basin. The current phase of reform is the third in nearly a century. The relative infrequency of such periods shows that they are difficult to undertake and consolidate. Central are the 2004 National Water Initiative and the Water Act 2007 that became operational in 2008. The National Water Initiative approved by the Council of Australian Governments in 2004 provided the framework, but an apparent reluctance to implement it caused the national government to introduce the Water Act 2007,

which imposes a top-down planning process that will be operationalized in the Murray-Darling Basin Plan to be implemented in 2011.

[58] This basin plan will, for the first time, define sustainable diversion limits at a basin and catchment level which, if exceeded, would compromise (1) key environmental assets of the water resource or (2) key ecosystem functions of the water resources or (3) the productive base of the water resource or (4) key environmental outcomes of the water resource. The biggest challenges facing effective water governance are (1) the contested nature of what constitutes sustainable diversion limits, (2) vertical integration or implementation of the basin plan at a state level through water resource plans, and (3) the slow speed of implementation of the basin plan where its provisions will not come into force in most states until 2014 and not until 2019 in the state of Victoria, and (4) the apparent lack of public understanding of what is proposed and the way it is being introduced. This planning process suggests that successful water reforms in other countries will require much greater horizontal and vertical integration and coordination across institutions and stakeholders than has occurred in the past.

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