

## Responses to Climate Change in the Murray-Darling Basin

*Dr Daniel Connell*  
*Australian National University*

### Abstract

Climate change is predicted to cause increasing rainfall variability in many of the world's river basins. Impacts are expected to be particularly severe in the temperate zone, in southern Australia, southern Africa, the south-west of the United States and around the Mediterranean rim. In coming decades water managers in those regions will have to juggle demands from irrigators and other water entitlement holders for continued resource security in the face of growing uncertainty about inflows into storages and streams. The recent history of water management in the Murray-Darling Basin (MDB) in south-eastern Australia gives some indication of the way in which these tensions can develop. It can be argued that many of the issues involved in adjusting the water management framework to take account of climate change have been incorporated into policy through the adoption of the National Water Initiative in 2004 by the Council of Australian Governments. Implementation of the NWI has been delayed, however, by a complex coalition of interests. Although the requirement to protect environmental sustainability is central to the NWI there has been little success in defining what that might mean in practice. Over allocation has long been officially acknowledged as a major issue but efforts to reduce it have been successfully opposed so far by agriculture based politicians despite the existence of many 'willing sellers'. Australia has now started a second attempt to implement the NWI with the passing by the Commonwealth parliament of the Water Act 2007. This paper outlines some of the issues that will need to be confronted.

### Overview

The Murray-Darling Basin (MDB) covers more than one million square kilometres and is located on the dry inland plains to the west of the mountain range that runs down the coast of eastern Australia. Home to just under two million people, the region supplies much of the water used by another million in South Australia and generates approximately 40 percent of Australia's agriculture and pastoral production. Those three million people and various industrial activities use about 4 percent of the region's water resources. The other 96 percent is used by irrigated agriculture. This constitutes about two thirds of the nation's rural and urban water consumption. The MDB is just over a million square kilometres in size and has a diverse range of landscapes, ecosystems, land uses and climates ranging from the tropical north to the temperate south. It includes over 30,000 wetlands, eleven of which are listed under the Ramsar Convention of Wetlands of International Importance.

Divided between the southern and eastern Australian states of New South Wales, Victoria, South Australia and Queensland and the Australian Capital Territory the MDB is subject to a federal overlay of six jurisdictions which provides an extra political dimension not found in any other major Australian river catchment. Despite the existence of a near century old inter-jurisdictional water sharing framework, since the mid-1990s there has been growing concern about continuing environmental

degradation and declining resource security. More recently the region has experienced the worst drought in its recorded history, widely attributed to climate change, and water management in the MDB has become a major political issue.

In the late nineteenth century, partly in reaction to developments in California, Australian governments took direct legislative control of water management in order to promote the settlement of the dry inland. English riparian law and the American doctrine of prior appropriation were both rejected. The extreme variability of Australia's rivers was well recognised from the beginning of irrigation development and resulted in the evolution of a range of highly innovative management approaches. Water entitlements that provided proportions of available flow during times of drought rather than volumetric entitlements were established between the three states that shared the southern part of the MDB and governments created water licensing systems based on public policy priorities that have proved quite robust. The flexibility and political responsiveness made possible by that institutional system, however, is now under attack from water entitlement holders wanting to protect themselves against the growing unreliability of supply resulting from over allocation at a time when climate change appears to be already reducing rainfall.

### The National Water Initiative

The National Water Initiative approved in June 2004 by the Council of Australian Governments is the water policy framework introduced to manage these tensions and introduce management systems and approaches that will be capable of managing the predicted severe impacts of climate change. The NWI combines recognition of the enormous economic benefits to be gained from water with a stress on the need to make the overall management regime sustainable, thereby protecting the interests of future users, broadly defined, and current users in the future. It also shows awareness that to protect economic benefits the water management regime must be accepted by the wider community. This means that other claims, environmental, social, cultural, aesthetic and religious, in addition to those with an economic base, must be taken into account if economic activity and water management are to be conducted in a politically stable environment.

The NWI has been designed to create rights and responsibilities within a public policy framework. This is occurring in a water management context where the relationship between governments, public water authorities and private water users, principally irrigators, is changing significantly after more than a century of relative stability. For many decades the interests of governments and water users were similar. Governments used water as a tool to promote the growth of communities and there was little concern about environmental issues. During this period even though water entitlements were vaguely defined from a legal perspective the reliability of supply was relatively high. Variations were usually the result of administrative decisions made in response to drought and concerns about future supply and the decisions were accepted as sensible and necessary in the communities affected. In more recent times this congruence of interests has broken down. The growth in diversions in the second half of the twentieth century has caused serious environmental problems and intensified competition between water users. Increasing insecurity about the reliability of supply has resulted in calls for greater legal security of entitlements. Now, however, governments have little capacity to provide reliable supply because climate

variability combined with levels of allocation that require a high proportion of average annual flow results in many years when available water is less than that which has been committed.

The NWI requires that comprehensive water plans be developed for all major hydrological systems to provide clearly defined water rights and at the same time protect environmental sustainability and resource security against threats such as climate change. These plans are to resolve all tensions between competing interest groups, restore over-allocated systems to 'environmental sustainability', protect those not yet in that condition and develop a comprehensive approach to managing emerging issues such as climate change. It is through the preparation of water plans that the difficult issues involved in balancing the need for sustainability and the ambitions of production interests are to be resolved. In each case they are to recognize the particular and sometimes unique characteristics of the water system for which they are designed.

The water plans are to include secure water access entitlements, statutory based planning, statutory provision for environmental and public benefit outcomes, plans for the restoration of over-allocated 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 (COAG, NWI, 23, 25, Sched E). They are to provide for 'adaptive management of surface and groundwater systems (COAG, NWI, 25)' with their connectivity recognized where it is significant. In addition, water plans must make 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' (COAG, NWI, 52-54).

Tension between promoting economic activity by giving greater certainty, and the need to retain or improve management flexibility to protect the environment, can be resolved if the rights created apply to a sufficiently modest proportion of the resource that enough is left unclaimed to allow public policy goals to be achieved. In principle the NWI attempts to resolve this conflict by requiring that all systems be, or be restored to, environmental sustainability before perpetual rights are allocated. The risk is that the process of establishing an environmentally sustainable regime will not be sufficiently rigorous to regain the volumes of water and flexibility needed to achieve that condition. Given the political strength of demands for greater legal recognition of a wide range of different types of water entitlements, and the unanswered questions that persist about who can represent and protect the environment, there is a real danger that water property rights will be locked in at too high a proportion of total flow. If that happens riverine environments will continue to decline, resource security will be further eroded and litigation about water 'rights' will increase.

#### Balancing environmental, social and economic objectives

The NWI states explicitly and repeatedly that the volume of flow needed to maintain environmental sustainability, at what ever level of modification has been defined as

reasonable in the negotiations involved in the development of the relevant water plan, must be met first before allocations for extraction are determined (COAG, NWI, 23, 25, 41-49). It should be noted that this does not privilege environmental sustainability as a higher value than the economic and social in that the level of modification is to be set first before the requirements to achieve environmental sustainability – in effect environmental stability – are calculated. Much of the NWI focuses on the promotion of economic activity but there are many sections that state the principle that all water bodies, no matter what level of modification is accepted as appropriate, must be maintained in or restored to an environmentally sustainable condition as the first priority. This is not a drafting error in that it is a logical result of the definition of the task. It is hard to see how a long term national policy could require anything less than the protection of the basic resource upon which all else depends. (Otherwise it would become a policy relevant only to the short term during which some of the resource would still be available.) This is a radical proposition, however, in the context of Australian water management which has been focussed on encouraging expansion ever since its beginnings in the late nineteenth century.

One of the strange features of the on-going debate about the future of Australian water management is that almost no one puts forward an explicit in-principle defence of unsustainable management but so many take that approach in practice. The most notable example is the National Party a partner in the Coalition government which has been in power nationally since 1996. Although this may change under the new Water Act 2007 the National Party has successfully blocked any attempt to reduce entitlements in catchments officially designed as over-allocated even when this would involve purchases at commercial prices from 'willing sellers'. When it is presented, the case for unsustainable practices is usually a defence of social and economic benefits threatened by efforts to achieve reform. Rarely confronted is the likelihood that the capacity to maintain them will be eroded by continued business-as-usual. It seems that many people involved in water management do not accept in practice the proposition that environmental sustainability is a necessary long-term foundation for economic activities. The release of the NWI highlights this disjunction and sets the scene for a widespread struggle about the fundamental assumptions underpinning water management in Australia.

### Defining 'sustainability'

Central to the NWI is the development of institutional processes to define the requirements for environmental sustainability in the context of climate change. This gives the ongoing debate about the concept 'environmental sustainability' a new urgency. Extrapolating from the Brundtland definition of sustainability and the relevant sections of the NWI there would seem to be two minimal conditions that need to be met for a modified environmental system to be defined as environmentally sustainable: its environmental condition needs to be stable from a system-wide perspective and politically acceptable to society in general.

First is the requirement that the level of environmental sustainability should be stable, durable and maintainable over a reasonable period of time and not in a state of continuing decline. This has many implications. The NWI appears to make no provision for a situation where a specific site is defined as sustainable (perhaps as a result of a locally focussed management regime) while the wider system of which it is

a part is in a state of continuing decline. This is made clear in many sections of the NWI. It requires 'the return of all currently over allocated or overused systems to environmentally sustainable levels of extraction' and 'recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource' (COAG, NWI, 23 iv & x). Similarly, the planning framework is to 'implement firm pathways and open processes for returning previously over allocated and/or overdrawn surface and groundwater systems to environmentally sustainable levels of extraction' (COAG, NWI, 25 v).

Efforts to achieve stability system-wide in the many hydrological systems of concern will require a strong capacity for scientific research and monitoring (much more than currently available). Implementation will require detailed knowledge of the ecosystems in question so that the prerequisites for stability can be included in the relevant management programs. The historical record has shown that Australian ecosystems are highly variable, poorly understood and subject to unpredictable threshold changes so increased investment in science to gain a better understanding of ecosystem dynamics is essential. Crucially, when management plans are being negotiated, substantial scientific input will be needed to make sure that economic and social considerations do not result in compromises that will undermine environmental stability in the longer term. Given the considerable time lags that often exist between actions and their environmental consequences, it is easy for the rhetoric of the moment to disguise such a risk.

The second minimal condition is that the level of modification agreed on through the water planning process needs to be politically acceptable to the wider community. Water plans should not be based on fragile ad hoc deals opportunistically made between key interests. Horse trading as it has often been conducted in the past is not likely to provide the security desired by production-based groups because political conflicts will continue to grow if the causes are not neutralized.

What will happen in the MDB if the necessary steps are not taken to introduce management practices that can adjust for climate change and protect resource security? Some of the possible risks were outlined in 2000 by a five-year official review of the Cap on further surface water extractions in the MDB for irrigation

introduced in the mid-1990s (Marsden 2000, 14). Discussing the risks should governments fail to implement effective management regimes, the review predicted that future irrigation development would undermine the security of established producers and provide a disincentive to new entrants. Degradation of the riverine environment and water quality would accelerate and fuel tensions between irrigation groups and surrounding regions as water supply security declined. Water trading would become more aggressive and the incomes and viability of irrigated enterprises and communities would become more sensitive to seasonal and climatic variation. Ultimately, as end-of-valley flows continued to fall and the damage to riverine environments became stark, irrigation communities would become alienated from the wider society, a bleak prospect for all concerned.

Living Murray project

The unresolved tensions between the desire to retain as much water as possible for irrigation and the pressure to manage the potential impacts of climate change are very clear in the case of the Living Murray project the most significant rehabilitation project introduced so far in the MDB. (Implementation has been underway since mid 2004 but there has been very little progress, in large part because of the ongoing severe drought.) Early in the planning phase for the Living Murray project the Ministerial Council established an expert reference panel of prominent scientists to advise about the potential benefits of a range of rehabilitation options. Six 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'. The first three, do-nothing, improved operations only, and improved operations plus 340 gegalitres (GL) for new environmental flows, were all considered to have a 'low' probability of success. Improved operations plus 750 GL, was given a 'low-moderate' rating. For improved operations and 1630 GL, the probability was 'moderate'. Only 3350 GL plus improved operations was rated 'high'. Eventually in June 2004, \$500 million was approved for use on six sites along the River Murray. At the very low price of \$1000 per megalitre this would have resulted in 500 GL being returned to the river. In practice prices have been up to 30 to 40% higher. Subsequently, in May 2006 the Commonwealth added another \$200 million.

Although the Living Murray project is ambitious it aims for much less than what is needed. For a start it focuses on the River Murray only. Even though the Murray is by far the biggest it is still only one stream among many in the MDB. Compared with what preceded it, however, the Living Murray project will require a much higher level of coordinated inter-jurisdictional activity. It brings together a number of projects that have been underway for some time, adds new ones and substantially increases the total effort invested in river rehabilitation.

For some years the MDBC has been installing fishways on its major structures so that fish will be able to move up and down the Murray over more than two thousand kilometres from the Murray Mouth to the foot of Hume Dam. After more than a century of de-snagging to improve navigation thousands of old tree trunks are being placed back in the river to improve fish habitat. Efforts are also being made to involve Indigenous people in the planning and management of sites of particular cultural significance to them. On important wetlands such as those in the Barmah Millewa forests environmental flows are being released to extend bird breeding seasons and engineering works and pumps are being installed so that important sites can be selectively watered. These projects are important in themselves and because of the opportunity they provide for water managers and policy makers to work out in practice what can be done to achieve environmental objectives on a river system subject to intense development pressure. The Living Murray project is a major addition to this list but together they still fall far short of what is required to deal with climate change.

The Living Murray project is being implemented in the wider context of a continuing decline in environmental sustainability and resource security. With climate change looming the MDB Ministerial Council has commissioned a number of studies to provide more information about that and other such threats. The error margins applying to predictions of this sort are necessarily very large but it is already obvious that changes are ahead that will require a major reassessment of the assumptions

underpinning water management in the MDB. Studies to assess future risks to inflows, commissioned by the MDB Ministerial Council, have focused on climate change and the reductions that will be caused by the growth in farm dams, new plantation forestry projects, increased groundwater pumping and improved channel and irrigation management. A major study undertaken by CSIRO, Australia's premier scientific research organization predicted that these threats would cause a decrease in stream flow of between 2,500 and 5000 GL over the coming twenty years. The situation is not expected to stabilize and predictions for the mid twenty first century are for a reduction in inflows of the order of 4,500 to 9000 GL (van Dijk 2006). (For purposes of comparison it should be noted that the volume of water extracted for irrigation in the MDB averages about 12,000GL.) One implication is that water managers will not be able to negotiate the sharing of water between the environment and production as a one-off process. The system will have to be capable of continual adjustment. Significantly, most of the management options needed to respond to these threats are outside the ambit of the current MDB institutional framework.

#### Persistence of state focused water management in the MDB

An indication of the inadequacy of the existing institutional arrangements in the MDB to prevent planning that conflicts with a basin-wide systemic approach is the effort under way by the governments of Victoria and New South Wales to improve their riverine environments at the expense of that of South Australia downstream. Until recent legislation passed in late 2007 which may change the situation there was no requirement to take a basin-wide approach to assessing costs and benefits of these state focused plans. The difference between South Australia's regular entitlement of 1850 GL, as specified in the MDB Agreement, and the average flow over the border of just under 5000 GL is very substantial. (Although there has been almost no flow apart from tidal action in recent years.) While the Cap process limits the volume of water that can be used for human consumption, industry and agriculture, there is nothing in the MDB Agreement that requires the two upper states to deliver more than the minimum at the border. This means that the very large difference of approximately 3000 GLs between the two flow figures could be used for environmental purposes in New South Wales and Victoria. For the two up-river states this would produce major environmental improvements and ease the political pressure to reduce allocations to their irrigators to achieve that result.

If implemented this policy innovation by the two up river states would cause serious additional degradation in South Australia the state at the end of the system. The salinity levels predicted by the 1999 MDB Salinity Audit assumed that all water not used within the Cap in the upper states would flow across the South Australian border. Smaller flow volumes would reduce the dilution of the saline groundwater seeping in from the Victorian and South Australian mallee and result in significantly higher salinity figures in the lower reaches than predicted by the Salinity Audit. It would also drastically reduce the frequency of low and medium level floods, thereby devastating the Murray's flood plain in South Australia. According to the five-year review of the Cap on extractions, the current long term average flow over the border of just under 5000 GLs results in about a 28% flow at the Murray Mouth compared with pre-development conditions. This reduction has increased the frequency of drought years in the Coorong and around the lower lakes from about 5% to over 60%. To reduce flows over the border to 1850 GL would make that situation much worse

given that over 2000 GLs at the border is needed before there is flow out of the Murray Mouth. Taking a Basin-wide perspective it is not clear whether the potential benefits in the upper parts of the catchment out-weigh the costs to the lower reaches but under the institutional arrangements in place until late 2007 there was no requirement for the two upriver states to consider that question.

### Conclusion

It is now three years since the NWI was approved in June 2004. The initial attempt at implementation relied largely on the various governments involved accepting its logic and implementing it voluntarily despite any short term political pain that would be caused by the reform process. In retrospect this was unduly optimistic although it must be admitted that the severity of the drought has made it more difficult to make changes.

No Australian government, state or national, appears to have accepted the full implications of the NWI despite their formal approval of the policy. Paragraphs 48 and 49 for example required that the total volume of allocations be reduced to a sustainable level without compensation. Not only did the National Party, a partner in the ruling national coalition, successfully oppose reduction without compensation something which was probably not politically feasible in any case, it went further and insisted that only water made available through technological improvements (sealing irrigation channels etc) could be put on the market by 'willing sellers'. This was then hedged about with so many conditions that in the end almost no water entitlements were bought back and the MDB's rivers continue to be as over-allocated as they were in the past.

Early in 2007 the Prime Minister John Howard attempted to restart the stalled reform process by making available \$10 billion to buy back over allocations and improve management. Most of the states in the MDB then agreed to transfer the relevant powers to the national government and allow it to take over water management in the region but Victoria refused. The next step was the passing of the 2007 Water Act in August by the national government. This bill is not comprehensive partly as a result of the opposition of Victoria but it does outline a new basin-wide management regime that will allow substantial adjustments in response to climate change and which accepts the likelihood of conflict and the need for at least some coercive measures to achieve compliance. The bill is weakened, however, by its lack of coverage of a range of issues in the wider catchment which will impact on water quality and water quantity and by an agreement to accept existing water sharing plans previously approved by the state governments which in some cases have more than 10 years to run. All in all, developing water management systems able to manage climate change is now part of the mainstream political agenda in Australia. There is still, however, a long way to go before any system with the necessary characteristics will be in place.

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