

Workshop “Counting our gains: Sharing experiences on identifying, assessing and communicating the benefits of transboundary water cooperation”

Case Study: Murray-Darling Basin

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1. Introduction to the transboundary river basin/lake/aquifer

The Murray-Darling Basin (MDB) is a large geographical area (1,061,469 km²) in southeastern Australia, whose name is derived from its two major rivers, the Murray River (2,530 km long) and the Darling River (1,472 km long). It drains around one-seventh of the Australian land mass, and is one of the most significant agricultural areas in Australia. The MDB covers four states and one territory in Australia. In particular, it spans most of the states of New South Wales, Victoria, and the Australian Capital Territory, and parts of Queensland (lower third) and South Australia (south-east corner). The River Murray travels through three states: New South Wales (NSW), Victoria (VIC) and South Australia (SA).

The MDB is an iconic area for agricultural production (it produces over one third of Australia’s food supply and is known as Australia’s ‘food bowl’); ecological importance (e.g. Ramsar wetlands, up to 30,000 wetlands, 2,442 key environmental assets); recreational significance and cultural values (home to 34 indigenous groups). 65% of Australia’s irrigated land is located in the MDB, and it is home to over two million people. There is a diversity of production: horticulture dominates in SA, dairy in VIC and broadacre (rice/cotton) in NSW.

Agricultural access to water in the MDB is subject to considerable variation within and between years, and across lengthy periods. Rainfall is the key climate variable that governs the spatial and temporal availability of water. Over the last 120 years, there have been a number of notable droughts in the MDB: the Federation drought (1895-1902), the World War II drought (1937-1945), and the Millennium drought (1997-2009). The recent Millennium drought caused severe reductions in water runoff and water use in the MDB, resulting in water quality issues, biodiversity conservation loss and ecosystem function disruption. Such issues led to the Commonwealth government demanding the need for a comprehensive, coordinated Basin plan across all states.

2. Description of the process of transboundary water cooperation and how Basin management evolved

Before the Federation of Australia (1901), there were six separate British self-governing colonies: Queensland, NSW, VIC, Tasmania, SA, and Western Australia. These colonies became states of the Commonwealth of Australia. Water was one of the battlegrounds for the colonies and for keeping state sovereignty in the development of the Federation. The first major transboundary water agreement occurred after the Federation drought: the *1915 River Murray Waters Agreement* was a result of many years of negotiation between the states and provided the first catchment-wide agreement in the MDB. The evidence of the first ‘benefits’ shown by the state were purely economic: SA=benefits from using the river for transport; NSW/VIC=agric. production. The next phase of water policy, up to the 1980s, is often referred to as the “expansionary or development phase” (where it was more focussed on water supply rather than water demand). However, water scarcity, environmental problems meant increasing attention was given to water demand management (e.g. water markets as a reallocation tool). By the 1990s, there was a broadening of water reform and trade, with growing calls for federal involvement, because states could not sufficiently coordinate or cooperate to achieve necessary goals.

The current stage of water market development in Australia (2000s onwards) is characterized by major transboundary reforms, and was driven by the Millennium drought. The Commonwealth assumed an increasingly active role to ensure state collaboration and coordination. It introduced the Water Act (2007); created the Murray-Darling Basin Authority (who were charged with estimating sustainable diversion limits in the MDB) implemented the *Water for the Future* policy (initially an AUD\$12.9 billion investment over 10 years to 2018-19 which was to fund the water reallocation). The MDBA released a guide to the Basin Plan in 2010, which called for environmental water holdings to be increased by 3000-4000 GL annually, which represents an average reduction in current watercourse consumption diversions of 27-37%. The enormous unrest caused by this Guide resulted in substantial reductions in the targets for environmental water holdings in the final Plan.

In November 2012, the federal Parliament passed the MDB Plan into law, confirming a target for sustainable diversion that limited recovery volumes to 2,750GL. Water is to be purchased from willing sellers and through irrigation infrastructure investment. It is also anticipated that 450GL/pa of additional water for the environment could be recovered through infrastructure investment expenditure, which would bring total water recovery up to 3,200GL/y. The Commonwealth committed AUD\$1.77 billion over ten years from 2014 for this. In February 2014, NSW and Queensland finally joined SA, ACT and Victoria and signed the Intergovernmental Agreement on Implementing Water Reform in the MDB and an amended National Partnership Agreement. In order to achieve this agreement, the Commonwealth agreed to cap water purchases at 1500GL and prioritised water infrastructure programs, and offered AUD\$80 million for NSW irrigation programs. AUD\$97.5 million was also offered to the states from the Commonwealth through the Regional Economic Diversification Program.

3. Benefits of transboundary water cooperation

Current Benefits: There have been many benefits from past transboundary water reform in the MDB. Most of the estimation of this past benefits focussed only on economic benefits (namely transport and agricultural production). The main benefit from the 1980s onwards was the establishment of water markets (officially from the 1980s onwards). Although it is difficult to directly compare the dollar values given differing methodologies, time-periods and scenarios modelled, it is clear that economic studies show that there are millions of dollars in economic and financial benefits that have been derived from having water markets in place in Australia. Water markets have allowed farmers to: optimize the management of their businesses; reduce farm debt; facilitate retirement; to restructure their farm. It's allowed greater flexibility, during the course of a season, to adjust their mix of inputs, or to hedge against the risk of water uncertainty and losing long-lived assets (e.g. herd size in the dairy sector and perennial crops in horticulture). In particular, the ability to trade water in the MDB has played a critical role in maintaining irrigation sector income during drought. However, it is essential to note that the adaptive capacity of the irrigation industry was significantly enhanced because of the diversity of different types of agricultural production in the MDB, and, in particular, by the presence of opportunistic annual crops (e.g. cotton and rice). Although it is often argued that Australia should not be growing cotton or rice due to their high water use, this ignores the adaptability of such crops in dry and wet conditions, and the role those farmers play in providing water to more permanent crop irrigators in times of drought.

Predicted benefits of the 2012 Basin Plan: The environmental, social, economic and geopolitical benefits include: **Improved flow regimes:** Enhanced capacity to mitigate periods of potential extreme environmental stress during extended dry periods. If key constraints in the system are relaxed, there is an improvement in peak and frequency of high flow events; **Anticipated environmental benefits at hydrologic indicator sites:** Some benefits. If system constraints are relaxed, there is an overall improvement in peak and frequency of high flow events, but not enough to reach any more indicator targets; **Estimated changes in ecological condition:** Some positive outcomes, but only partial indicators of overall ecological benefits across the Basin was assessed; **Reduced risk of blackwater events and cyanobacterial blooms:** increased recreational benefits; **Tourism benefits:** Increase in total expenditure in region; **Recreational and commercial fishing:** increase in consumer and producer surplus in region; **Recreational boating:** increase in total surplus; **Floodplain agriculture:** incremental economic value; **Avoided costs—salinity:** avoided costs for water supply, agriculture loss; **Reduced risk of acid sulphate soils:** avoided costs; **Reduced risk of river bank collapse:** avoided costs of repair; **Adaptation:** reform of water policy/water trade allows for greater farm adaptation to climate change; **Non-use values:** Cultural, spiritual and environmental benefits associated with a healthier Basin; and **Coordination benefits:** Clear and coordinated Basin-wide objectives and outcomes will help ensure that Basin water resources are used in a way that optimises economic/social/environmental outcomes.

4. Have the parties needed/requested an assessment of the (actual or potential) benefits of transboundary water cooperation?

Before the Guide to the Basin Plan was released in 2010, there were substantial consultancies undertaken on the benefits and costs of various water reallocation scenarios. Part of this process involved funding millions of dollars towards ecological and hydrological analyses to estimate “environmentally sustainable level of takes” for surface water regions and sub-regions in the Basin, as well as setting proposed groundwater baselines and sustainable diversion limits and assessing the impacts of removing system constraints. In addition, the MDBA funded socio-economic research work into: a) baseline socio-economic circumstances (profiling using population and census data); b) economic modelling and analysis (e.g. ABARES AusRegion CGE model, University of Queensland’s state contingent model, Monash COPs model); c) local profiles and assessments; d) farm surveys of farmers to suggest exit probabilities; d) social analysis to identify indicators of community vulnerability and adaptive capacity; e) impact of the change in water availability on indigenous populations; f) an assessment of the ecological and economic benefits of environmental water, and g) benefit assessment for boating, fishing and floodplain agriculture.

After the Guide was released, the level of community discontent meant there was more huge expenditure undertaken on economic and social consultancies, trying to establish the benefits and costs. In parallel, various interested parties commissioned their own studies into the social impacts of the plan, (e.g. studies were commissioned by: RDA Riverina; Griffith City Council; Coleambally Irrigation, Murrumbidgee Irrigation; the Wine Grapes Marketing Board; the Central Murray group of councils, and Narromine and Warren councils). All of this work meant that the MDBA collected (and had provided to it) a wide range of information on benefits and costs of various transboundary water agreements in the MDB.

5. How were the benefits estimates derived?

The table below summarises the benefits and costs of the MDB Plan and the methodology used. This is reported in the Regulatory Impact Statement that the MDBA provided to the Office of Best Practice Regulation. Numerous consultants worked on the various estimates below, hence it is sourced from many different reports (all grey literature). All these values were dependent upon the scientific analysis that had to estimate exactly what would happen with an increase in a variety of different flow scenarios in the River. Non-use values were significantly

higher than the use values (up to 1.7 times higher). Ignoring non-use values and only including use values and costs (namely two different estimates of the loss of agricultural profit and administration costs), this provides a ratio of benefits to costs from 0.9 to 1.1. Including all non-use value estimates, the ratio ranges from 2.4 to 3.0. Given the huge uncertainty around the non-use values, it is highly likely that they are large enough to indicate net social benefits from the Basin Plan. Ecosystem service assessment was used in some of the estimates above. Other issues with valuation include: dollar values are not all directly comparable. Some benefits are expressed in terms of increase in expenditure; others in terms of increase in incremental net economic value; and others in terms of consumer and producer surplus (making these figures more relevant for any economic marginal analysis). For costs, lost producer surplus or agricultural profit is the more relevant figure than lost agricultural production value.

Category of benefit from Basin Plan	Unit(s)	Expected benefit, by water recovery scenario		
		2,400 GL/y	2,800 GL/y	3,200 GL/y
Strategic coordination benefits				
Improved management of Basin water resources	qualitative	Will ensure that the full benefits of moving to SDLs are maximised. Benefits include those to water resource planning, environmental watering, water quality and salin management and water trading. In addition, increased certainty will benefit business and communities.		
Environmental indicators				
Improved flow regimes	frequency of meeting defined flow indicators	Would generally not achieve specified environmental objective	Enhanced capacity to mitigate periods of potential external environmental stress during extended dry periods. If key constraints in the system are relaxed, there is an improvement in peak and frequency of high flow events.	
Anticipated environmental benefits at hydrologic indicator sites	qualitative	Reduced benefits relative to 2,800 GL/y scenario.	Some benefits. If system constraints are relaxed, there is an overall improvement in peak and frequency of high flow events.	With existing system constraint limited benefits. If system constraints are relaxed, improved outcomes could be achieved.
Estimated changes in ecological condition	% change in condition	-	Some positive outcomes - but only partial indicators assessed.	
Use values (Estimated annual benefit AUD\$m/per annum)				
Tourism benefits	Increase in tourism expenditure, \$m/y	-	162	-
Floodplain agriculture	Incremental economic value, \$m/y	-	65 (Present value total)	-
Recreational and commercial fishing	Increase in consumer and producer surplus, \$m/y	-	9.3	-
Recreational boating	Increase in total surplus, \$m/y	-	42 (Present value total)	-
Avoided costs—salinity	Avoided cost, \$m/y	-	10	-
Reduced risk of blackwater events	Recreational benefits, \$m/y	-	5 -10	-
Reduced risk of cyanobacterial blooms	Recreational benefit, \$m/y	-	5-11	-
Reduced risk of acid sulphate soils	Avoided cost (\$m/y)	-	9	-
Reduced risk of river bank collapse	Avoided cost, \$m/y	-	24	-
Non-use values				
Cultural, spiritual and environmental benefits associated with healthier Basin	Indicative estimates, used benefit transfer method \$m	3,000 to 8,000 (PV total)		
ECONOMIC COSTS				
Category of cost	Unit(s)	Water recovery scenario		
		2,400 GL/y	2,800 GL/y	3,200 GL/y
Forgone gross regional production in Basin	\$m/y	-\$443m/pa (-1.3%)	-\$513m/pa (-1.5%)	-\$585m/pa (-1.7%)
Foregone agricultural profit	\$m/y		-\$109 to -160m/pa (-5.6 to -8.2%)	
Commonwealth administrative costs	Qualitative assessment and indicative estimate, \$m/y	The Authority has estimated the net additional administrative costs for the Commonwealth, Basin States, and irrigation infrastructure operators to be in the order of \$100 million per year.		
States admin costs				
Irrigation infrastructure operators admin costs				

Tourism benefits are associated with the increase in expenditure in various regions from visitors to that region. This is in contrast to recreational boating, which also includes the value of local residents in participating in recreational opportunities.

6. How were the benefits assessment's findings communicated?

One of the goals of the new independent MDBA (established 2007) was to establish an independent, Basin-wide plan for water sustainability. In the run-up to the release of the Guide in November 2010, there was great speculation over what the Guide was going to suggest, how water was to be reallocated and the amount of water to be reallocated to the environment. Numerous rumours/fear mongering was being touted, coupled with extreme secrecy and no communication or consultation at all from the MDBA with any other water management authority (state or federal). The MDBA wanted their release of the Guide to be the first time sustainable diversion limits were proposed. The guide was released via media releases, with one large overall report; a 'clear English summary'; and all other supporting material/studies used released on their website. The impact of the Guide was immediate: it dominated national news for months (and correspondingly years); and also had the unfortunate coincidence of being released at a time many irrigation regions in the MDB were experiencing flooding- allowing critics a field day to criticise the 'need' for water reallocation. The secrecy/lack of consultation by the MDBA was correspondingly coupled with inaccurate media coverage of the Guide (for example, many stories ignored the fact that the reallocation of water from irrigation to the environment was only to come from willing sellers), this served to inflame rural uncertainty and general discontent. Part of the problem with this is the complexity of the Australian water market, and the lack of knowledge about water products by journalists. Much of the MDBA information release was confusing for many journalists, and they correspondingly did not report the Guide correctly. The Guide created enormous upheaval in the rural communities along MDB, with many arguing that the MDBA had not considered the social cost of such a policy.

The MDBA planned a period of communication after releasing the Guide, and started touring regional towns in the MDB, meeting irrigators; answering questions; handing out printed copies of the Guide and its assorted material. These meetings were loud and angry, and perhaps unfortunately; the MDBA started in the town of Griffith, NSW, which is one of the areas that stood to suffer the most from water reallocation. A few angry irrigators started a fire and burned copies of the Guide (with more and more irrigators adding their copies until it was a large bonfire) – and this became the media/public image of the Guide and came to represent how irrigators felt about the water policy. It hence became an even more 'media savvy' story, with the misrepresentations continually reported. Following this: tractors stormed the streets; copies of the Guide to the MDB Plan walked the plank to be drowned, ripped apart etc and consultation meetings were disrupted as much as possible. In general, community consultation was loud and angry, and was dominated by anti-Plan sentiments. The growing level of discontent and negative reaction led to a Commonwealth inquiry; the resignation of the head of the MDBA; increased rural community structural adjustment policies; increased expenditure on irrigation infrastructure to recover water, and, finally, to substantial reductions in the targets for environmental water holdings in the final Basin Plan. There was also huge expenditure on economic and social consultancies, trying to establish the benefits and costs, as well as significant 20-week community consultation period. These created large transaction costs.

7. How were the benefit findings used by the target audiences?

Current organisations in the MDB who a part of the target audience for benefit findings include political (Commonwealth, state governments); agricultural (farmer lobbies); environmental (Australian Conservation Foundation); NGOs; scientific (Wentworth Group); and managers (Murray-Darling Basin Authority).

As discussed above, the benefits of the Guide were hotly contested by some state governments, agricultural organisations, irrigators and rural communities. In particular the Federal department of the Environment, and the ruling Labour party, came under particular fire. Both the MDBA and the federal environment minister found it very hard to explain the benefits estimates to irrigators, and all coped with strong backlash as there was considerable debate over the validity of the methods used (for example: the amount of job losses predicted; impact on agricultural production; impact on community agricultural values). As mentioned above, there was significant collateral damage and much expenditure by the Commonwealth to get to a point where the federal Parliament passed the MDB Plan into law in November 2012. Community anger at the Plan has correspondingly died down. One reason for this is that many irrigators want the opportunity to sell their water entitlements to government, because they often have surplus water and the sale proceeds allows them to reduce debt and provide an income in lean farming times.

Before the Plan could be passed into law, the MDBA prepared a regulatory impact statement which summarised all the work which had been done and drew out some of the key results and impacts. Although a cost-benefit analysis (CBA) of any policy or program proposal is preferable, such an analysis was not done. The Office of Best Practice Regulation, who received the regulatory impact statement, recommended that a CBA was not practicable for the Plan, but accepted that the benefits outweighed the costs.

8. Have the findings of the benefit assessment been useful in strengthening the transboundary water cooperation process?

As discussed, the benefits (and costs) of the Basin Plan came under great scrutiny. As discussed, irrigators simply did not accept economic modelling studies (usually based on computable general equilibrium models) that modelled impacts on future jobs and agricultural production. These methods are often seen as a ‘black box’ given the amount of assumptions and the inability for many non-economists to understand them. Irrigators are much more likely to be acceptable of survey-based methods, based on real information from farms. In addition, there was not that much argument over the ‘use benefits’ highlighted in Table 5, but much argument over the ‘non use values’. These values came under considerable scrutiny, and partly due to this the MDBA did not focus on them in their regulatory impact statement.

To some extent the benefit assessment in the Basin Plan both strengthened and tore apart the transboundary water cooperation process. To try and get the Basin Plan agreed to by all states in the MDB, the Commonwealth originally put AUD\$1.7 billion on the table to encourage states to sign up to the Plan, but only Victoria, ACT and SA officially signed in the months following the adoption of the Plan in November 2012. In particular, the state that complained the most about the Basin Plan (namely NSW), argued that there is not enough money available, but by missing the June 30 2013 deadline to sign the plan, NSW (and Queensland) missed out on 2012-13 round of federal funding offered to implement the plan. On February 27 2014, NSW and Queensland signed the *Intergovernmental Agreement on Implementing Water Reform in the MDB* and an amended National Partnership Agreement. In order to achieve this agreement, the Commonwealth agreed to cap water purchases at 1500 GL and prioritised water infrastructure programs, and offered AUD\$80 million for NSW irrigation programs. AUD\$97.5 million was also offered to the states from the Commonwealth through the Regional Economic Diversification Program. The consequences of this reorientation of priorities will be less water reallocated for the environment – and that many of the benefit assessments were ignored in reorientating a focus towards irrigation infrastructure rather than water entitlements. Irrigation infrastructure water recovery suffers due to issues such as reflows and increasing water use efficiency, hence many suggest that the actual recovery benefits from infrastructure upgrades will be minimal.

9. Key messages and lessons learned for others

The compensation put on the table by the Commonwealth to encourage the development of a transboundary agreement might only be an option available to wealthier countries. However, it does signal the need for countries that will be made worse-off from sharing their water resources, to develop a plan/make a case for compensation. But, it should also be recognised that these countries may often over-state their case for compensation. The MDB example has highlighted the difficulty of estimating benefits and costs from water reallocation, as well as highlighting that a considerable amount of money was spent inefficiently on consultation and consultancies, many of which were of dubious quality. In order to estimate benefits and costs of water reallocation, it is perhaps better to focus on a smaller number of high quality studies, and to give those studies enough time to analyse the impacts of water reallocation. It is also important to note that high-quality socio-economic research can take as long as scientific research. The other main lessons from the MDB example is that before having transboundary water agreements in place, there needs to be a very good understanding of hydrological considerations; the link between surface water use and groundwater use; sustainable use and environmental needs, and institutions must be in place to enforce monitoring and compliance.

Key lessons that can be drawn from the MDB experience include:

1. Droughts or crises are critical to encourage cooperation and coordination of water reform, and to drive through institutional change in the form of transboundary agreements.
2. Water reforms are driven by a complex interaction of multi-layer, path-dependent influences, with reforms building upon many previous waves of institutional reform.
3. Adaptation of farmers is most enhanced in situations where there is diversity of production, property rights in water, ability to trade water, and an ability to choose different forms of production or crop choice
4. Involve and consult all stakeholders in the process as early as possible, and keep communication lines open.
5. It is possible that no water management plan will ever reach a ‘sustainable extraction point’ at any one point in time; hence this reinforces the need for flexible and adaptive institutions and policies to allow incorporation of future changes as necessary.
6. An overall authority is needed to coordinate reform and encourage cooperation for water reform that crosses boundaries.
7. An agitator country/state plays an important role in demanding reform.
8. Effective water policy needs high quality environmental, hydrological and socio-economic information, and preference should be given to long-term research rather than short-term consultancy.