18. Economic Perspectives of the Proposed Basin Plan for the Southern Connected Murray

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Introduction

The *Guide to the proposed Basin Plan* is discussed in the context of the proposed sustainable diversion limits (SDLs) for the southern connected Murray River. The emphasis is on whether the Basin Plan can deliver on the economic efficiency goals set out in the *Water Act 2007*. While the discussion is by no means exhaustive, a number of issues of concern are raised. First, the tendency for a market-price premium in the Goulburn Valley in some years means that the expected opportunity cost of water in sourcing Murray water from the Goulburn is higher than it is elsewhere. This has not been considered in determining the amount of contribution the tributaries and the main channel should make to the Murray flow requirements—contravening economic-efficiency criteria. The question of the impact of environmental water plans on irrigation reliability is also raised. An example is presented in which it is shown that the economic impact of a spring-flow regime prescribed for the Goulburn by Cottingham et al. (2003) is 75 per cent higher when the impact of reliability is accounted for, compared with an analysis conducted on the mean loss in diversions. That reliability has been deemed to be 'off the agenda' is a serious shortcoming of the Guide. There are many unanswered questions regarding how the operation of environmental watering plans will affect delivery of water for irrigation and how these might affect the water market. Thorough economic analysis of these issues should be undertaken before the Environmental Water Plan is finalised.

The *Guide to the proposed Basin Plan* (MDBA 2010) sets out the principles that will be followed in developing the Basin Plan and proposes a series of sustainable diversion limits (SDLs) associated with basin-wide environmental-flow requirements of 3000 GL to 4000 GL per year. These SDLs take account of consumption from all sources, including diversions and interception activities such as farm dams and forestry. Sustainable diversion limits represent a maximum level of consumption that is allowed on average, but will be implemented like the Cap mechanism, allowing for the effect of climatic variation on consumption. It is likely that the cuts in consumptive use of water will be borne by irrigation diverters.

The development of the Basin Plan is one of the duties of the Murray–Darling Basin Authority (MDBA) under the *Commonwealth Water Act 2007*. This Act charges the Authority with the task of considering the use and management of the Basin's water resources in a way that optimises economic, social and environmental outcomes. It is also required to ensure that water reaches its most productive use through the development of an efficient water-trading regime.

In this chapter, elements of the *Guide to the proposed Basin Plan* are discussed in the context of the proposed SDLs for the southern connected Murray. The outline of the chapter is as follows. In the next section, a brief description of the SDLs is presented. This is followed by discussion of differences in the opportunity cost of sourcing water for environmental needs in the Murray River. The question of the economic impact of reliability and the potential impact of the environmental watering plan on the seasonal market is then discussed.

The Sustainable Diversion Limits

Sustainable diversion limits for catchments in the southern Murray–Darling Basin are shown in Table 18.1, for the 3000 GL and 4000 GL flow scenarios. The proposed cuts in consumptive use are uniform across the major tributaries and the Murray River—being 26 per cent for the 3000 GL scenario and 35 per cent for the 4000 GL scenario. Cuts in consumptive use are lower for the smaller Victorian catchments—ranging from 10 per cent in the Broken River to 21 per cent in the Loddon River for the 3000 GL case. Also shown is the share of consumptive use that comes from interception activities, which is very high in some of the smaller Victorian catchments—as high as 75 per cent in the Broken River. The MDBA expects that it will be too difficult for the States to demonstrate that they can cut the consumptive use for interception activities. Rather, it is likely that consumption from interception activities will be capped but not cut in the water-resource plans. In order to achieve the required cuts in consumption, there will need to be a greater cut in irrigation diversions, with a much larger impact on diversions in those catchments where interception activities are significant. For example, in the Ovens River, to achieve the overall consumptive-use cut of 12 per cent, it will be necessary to cut irrigation diversions by 40 per cent for the 3000 GL scenario. Cuts of 40 per cent are also required in the Broken, Loddon and Kiewa rivers. The Murrumbidgee River is also affected by interception activities, with diversion cuts increasing to 32 per cent over the 26 per cent consumptive-use cut required.

Table 18.1 Share of interception activities in consumptive water use and its impact on the cuts to diversions required for SDLs (per cent)

Catchment	Interception share of consumption	3000 GL per year		4000 GL per year	
		Consumptive-use cut	Diversions cut	Consumptive-use cut	Diversions cut
Ovens	70	12	40	13	45
Goulburn	6	26	28	35	37
Broken	75	10	40	11	45
Loddon	49	21	40	23	45
Campaspe	26	26	35	33	45
Murrumbidgee	20	26	32	35	43
Murray (NSW)	6	26	28	35	37
Murray (Vic.)	3	26	27	35	36
Murray (SA)	0	26	26	35	35
Kiewa	56	18	40	20	45

The Guide provides details on the contribution of diversion cuts to environmental flows, according to whether the water is contributed to local or to downstream environmental needs. In the case of the Ovens and the Kiewa rivers, all of the environmental water goes to downstream uses, and irrigators incur a 40 per cent cut in diversions. This is considerably higher than the diversion cuts borne by irrigators on the Murray. The Goulburn and the Murrumbidgee rivers make a contribution to the Murray, with 93 GL, or 21 per cent, going to the Murray from the Goulburn River and 191 GL, or 29 per cent, from the Murrumbidgee River under the 3000 GL scenario.

Table 18.2 Local environmental water needs and the contribution to downstream uses

	Local	Downstream	Downstream (%)	Diversions cut (%)
	3000 GL per year			
Ovens	0	10	100	40
Broken	3	3	50	40
Goulburn	349	93	21	28
Loddon	28	10	26	40
Campaspe	28	12	30	35
Murrumbidgee	474	191	29	32
Kiewa	0	4	100	40
	4000 GL per year			
Ovens	0	11	100	45
Broken	4	2	33	45
Goulburn	504	89	15	37
Loddon	37	6	14	45
Campaspe	39	13	25	45
Murrumbidgee	675	217	24	43
Kiewa	0	5	100	45

Opportunity Cost of Sourcing Water for the Murray River

If the contribution of water to downstream uses in Table 18.2 is to be considered efficient, it is necessary for the opportunity cost of water to be the same in each of the catchments from which water for the Murray is sourced. Presumably, the MDBA has made the assumption that water trade will equalise any divergence in the opportunity cost of water—but this is incorrect.

The presence of physical trade constraints leads to a persistent price premium in the Greater Goulburn trading region, as evidenced by market data. Goulburn irrigators may sell water to other trading regions, but they may not buy water because it is impossible to deliver. The rules governing trade between the major trading regions are summarised in Table 18.3. All regions may sell to the Murray-above-Barmah trading region; the Murray below Barmah may buy from anyone except the Murray above Barmah because of the Barmah Choke. The Murrumbidgee and the Goulburn rivers may only be sellers; buying water in is prohibited. That Murrumbidgee irrigators may not buy water in has no material impact on prices, because the level of water entitlement held there is high relative to the amount of irrigation investment. Murrumbidgee irrigators tend to be net sellers. In the case of the Goulburn River, however, there are some seasonal situations when Goulburn irrigators would be willing to buy water from other trading regions, but they may not.

Table 18.3 Rules governing inter-regional trade in the southern Murray

		Buyer			
		Murrumbidgee	**Goulburn**	**Murray above Barmah**	**Murray below Barmah**
Seller	**Murrumbidgee**	Allowed	Not allowed	Allowed	Allowed
	Goulburn	Not allowed	Allowed	Allowed	Allowed
	Murray above Barmah	Not allowed	Not allowed	Allowed	Not allowed
	Murray below Barmah	Not allowed	Not allowed	Allowed	Allowed

The seasonal price observed in the Goulburn trading region since 1999 is shown in Figure 18.1, measured as the difference in the Goulburn and Murray-below-Barmah prices. In 2003 and in 2007, the price premium was more than \$100 per ML. In 1999 and 2002 it was at least \$40/ML. In those cases when the Goulburn trading region is a net seller, there is no price premium. The average premium over the period 1999–2009 was \$34/ML.

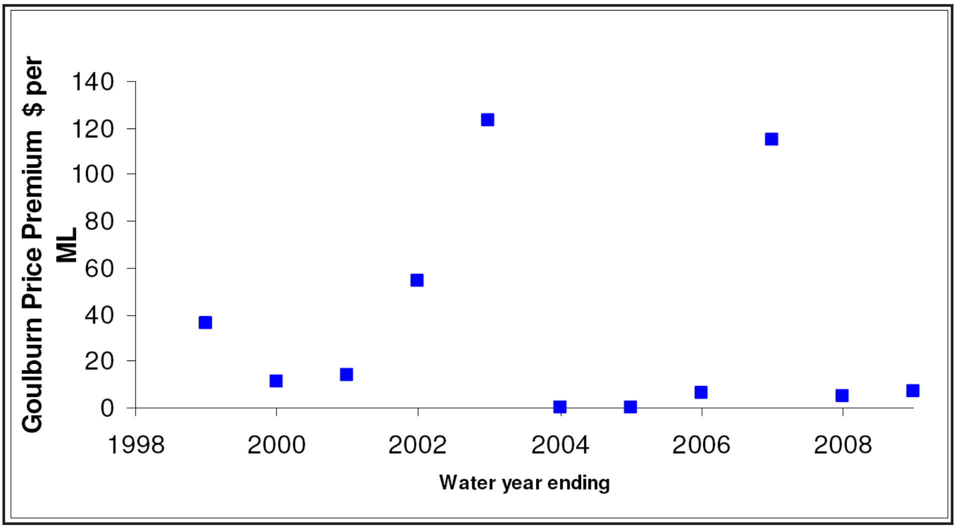

Figure 18.1 Seasonal price premiums in the Goulburn trading region, 1999–2009

Using a market-simulation model developed by the author, Brennan (2010b) demonstrated that this price premium is not simply a phenomenon of the past decade, but would be expected to persist over a 100-year simulation using water-allocation data derived from the CSIRO sustainable yields project (CSIRO 2008). The simulation model determines trade volumes and prices in each trading region for each year of the simulation, maximising the gains from trade given water allocations, using econometrically estimated water-demand curves, and subject to the trading rules of the market. Prices predicted by the model over the period 1999–2009 are compared with actual market data in Table 18.4. The model predicts very well for the Goulburn and the Murray below Barmah. The divergence in predicted prices is greatest for the Murrumbidgee (modelled prices 8 per cent higher), but this could be due to the presence of ad-hoc changes to trading rules over the period, such as the prohibition of trading out of the Murrumbidgee in 2007, which would have depressed actual market prices.

Table 18.4 Modelled and actual market prices over the period 1999–2009

	Actual mean price $/ML	Modelled mean price $/ML	Difference %
Murray above Barmah	146	156	6
Murray below Barmah	162	157	–3
Murrumbidgee	144	157	8
Greater Goulburn	195	200	2

Expected market prices were calculated using allocations from the CSIRO's future climate scenario, using entitlements held in 2008, and entitlement reductions required to meet the sustainable yield cuts. Results are shown in Table 18.5. The model predicts that the price premium—measured using 2008 entitlements—would be $15/ML. The effect of reducing entitlements by the diversion cut for 3000 GL/yr is to raise prices by $58 in the Goulburn and $44 elsewhere, increasing the Goulburn premium to $27.90/ML. The 4000 GL scenario raises prices by about 150 per cent over the baseline (2008 entitlements), and increases the Goulburn premium to $31/ML.

Table 18.5 Expected market prices for water allocations, 2008 baseline, 3000 GL and 4000 GL SDL scenarios

Entitlements:	2008	3000 GL SDL	4000 GL SDL
Goulburn	61.2	118.9	154.2
Murray above Barmah	44.8	88.8	117.3
Murray below Barmah	46.5	91.0	122.9
Murrumbidgee	46.5	91.0	122.9
Goulburn premium	14.8 (32%)	27.9 (31%)	31.3 (25%)

These results, along with the evidence from the actual market over the past decade, suggest that there is a price premium for water in the Goulburn and this is likely to be exacerbated by the proposed SDLs. This higher opportunity cost should be considered when sourcing water for the Murray. Failure to do so contravenes the economic-efficiency criteria set out under the *Water Act*.

Economic–Environment Trade-Offs Regarding Reliability

At the time of writing, the technical documentation supporting the Guide had not been released, and the main criterion provided regarding environmental flows is the end-of-systems flows that would be achieved for each catchment. The economic analysis has been limited to an assessment of the economic cost of an average reduction in water allocated in an average year.

There are a number of operational conflicts between managing water for environmental flows and managing water for irrigation that have implications for the economic returns from water use. If the MDBA is to meet the requirement of trading off economic and environmental objectives, it should provide an assessment of the economic impact of different watering regimes and their environmental outcomes.

Consider spring flows, for example. An increase in the amount of water used to meet medium-scale floods will improve outcomes for bird breeding and other ecosystem functions, but will have implications for irrigation reliability. The extent to which irrigators can mitigate these reliability impacts depends on the rules governing storage and how capacity is divided between the irrigation industry and the environmental water-holder. Different rules of storage management might result in different outcomes for the environment as well as for irrigation reliability. The effect of these rules, and the effect of different overall levels of spring flooding on the achievement of environmental outcomes and the net economic returns to irrigation, should be assessed as part of the decision-making process. It could be that marginal gains in environmental outcomes have a very high economic cost. Or they might not. It is difficult to know when nobody has asked the question, or provided the necessary information to conduct economic analysis of the trade-offs.

If the MDBA followed a rigorous process of quantifying the economic trade-offs of environmental watering it could then make an informed judgment as to what is acceptable. If it chooses to impose higher costs on the irrigation community in order to provide greater security of outcomes for the environment then at least the issue of compensation for the irrigation industry will be clearly articulated.

An Example of the Possible Cost of the Reliability Impact of Spring Flows

A simple example is provided in the potential impacts of spring flows on irrigation reliability and the cost to irrigators. Spring-flow requirements for the Goulburn River were quantified using formulae provided in Cottingham et al. (2003), which express the quantity of environmental water required for spring flows as a function of September and October inflows. These spring-flow requirements were then deducted from inflows available for irrigators, and, using the historical storage rules, the amount of water that would be allocated to irrigators in each season was calculated. This is referred to as the allocation sequence that accounts for spring flows. The mean reduction in diversions was 15 per cent. The mean annual loss in economic value associated with these spring-flow allocations was calculated using irrigation-consumption demand curves reported in Brennan (2008, 2010a). As shown in Table 18.6, the expected annual loss in value in the Goulburn Valley is $20 million per year. Also provided in the table is an estimate of the value of a 15 per cent cut in consumption measured at the mean level of diversions. (This latter approach is the basis on which all the calculations have been done for the Basin Plan to date, as reported in ABARE–

BRS 2010). The estimated cost of a reduction in consumption of 15 per cent valued at the mean level of diversions is only $11.4 million. Properly accounting for reliability increases the impact of spring flows by 75 per cent.

It is possible that irrigators might be able to reduce the impacts of the loss in reliability by using carry-over. The effectiveness of carry-over in improving reliability will depend on rules governing storage-capacity ownership and spill-accounting procedures. Because of non-negativity of storage, however, it is never possible to smooth consumption perfectly and therefore there will be a reliability impact even if storage arrangements are favourable to irrigators. This reliability impact will be a cost imposed on those remaining in the industry, not those selling water under the buyback scheme. The question of reliability (and rules governing how irrigators might manage reliability better through carry-over) should be addressed before the Basin Plan is finalised.

Table 18.6 An example analysis of the economic impact of spring flows if reliability is accounted for

Scenario	Expected annual cost $ m
Average year approach, with allocations cut by 15 per cent	11.4
Properly accounting for spring-flow impact on reliability (old storage regime)	20.0
Difference	75%

Potential Jeopardy in the Water Market

There are a number of other operational conflicts that will have implications not only for the economic cost of environmental flows but also for the functioning of the seasonal water market. This is because of the strategy of adaptive management, which could result in rules changing during the irrigation season, which will cause windfall commercial gains and losses to irrigators who have taken an early position on the water market.

For example, the requirement for low summer flows could conflict with demands for channel capacity for delivery of irrigation water at the peak of the irrigation season. SKM (2006) suggests that this potential conflict will be binding for the Goulburn River, and that investment in alternative delivery infrastructure such as pipelines might be a way of overcoming the delivery constraint. The economic cost of such investment should be assessed and compared with the economic and environmental impacts of alternative summer flow/delivery constraint regimes. But even if the optimal flow/investment regime is determined, there remains the question of how the summer flow/delivery constraint will be implemented. Will it be seasonally dependent? Will adaptive management require that the decision about the summer flow required for that season be adjusted during the season? If adaptation is desirable, this will have the effect of increasing uncertainty in the water market. The economic impact of this should be quantified before the environmental watering plan is finalised.

The *Water Act* permits the environmental water-holder to trade on the seasonal market, if it is beneficial for achieving environmental outcomes. An example would be the selling of water in dry years when prices are high to create revenue for buying substantially more water in wet years when prices are low. But the presence of a large player in the market might have a significant impact on prices. Rules governing the participation of the environmental water-holder in the seasonal market require serious consideration. It might be necessary, for example, to require that the environmental water-holder declare what quantity it intends to buy or sell in the market prior to the commencement of trading. This would avoid the problem of windfall gains and losses to irrigators using the water market.

Conclusion

This chapter has raised questions regarding the adequacy of the Basin planning process with respect to the requirement that water planning be economically efficient. The list of issues raised might have barely scratched the surface of potential conflicts between environmental-flow requirements and irrigation demands, but demonstrates the need for more in-depth economic analysis using output from hydrological models.

From the information reported on market-price premiums, it is reasonable to conclude that the SDLs presented in the Guide do not meet economic-efficiency criteria. The example presented on spring flows demonstrates the folly of using an average approach to estimating economic impact, and the potential for high costs associated with the reliability impact of environmental-flow regimes. That reliability has been deemed to be 'off the agenda' is a serious shortcoming of the Guide. There is a whole range of unanswered questions regarding how the operation of environmental watering plans will affect delivery of water for irrigation and how these might affect the water market. Thorough economic analysis of these issues should be undertaken before the Environmental Water Plan is finalised.

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