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Australian Bureau of Agricultural and Resource Economics and Sciences

Inquiry into the management of the Murray–Darling Basin

ABARES Submission to the Senate Standing Committee on Rural Affairs and Transport

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Science and economics for decision-makers

Executive summary

The Senate Standing Committee on Rural Affairs and Transport has sought submissions on the Murray–Darling Basin Plan. This submission addresses the terms of reference relating to the social and economic effects of changes put forward in the *Guide to the Proposed Basin Plan*.

The *Guide to the Proposed Basin Plan* considers reducing consumptive diversions in the Murray–Darling Basin by between 22 and 29 per cent. ABARES estimates that these reductions could reduce the value of irrigated agricultural production in the Basin by between 13 and 17 per cent, if the mitigating effect of government investment in improved irrigation infrastructure and government water purchases are not taken into account. When taking government actions into account, ABARES estimates the reduction in the value of irrigated agricultural production would fall from 15 per cent to 10 per cent under the 3500 GL SDL scenario.

The analysis outlined in this submission assesses the effects on irrigated agriculture and the broader economy of reductions in water use implied by the sustainable diversion limits (SDLs) outlined in the guide and the mitigating effect of government investment in improved irrigation infrastructure and government water purchases. This includes the commitment to purchase any gap to the SDLs. While these programs will compensate irrigators for any loss in activity, local business, such as downstream processors and their employees, may incur significant costs.

The analysis indicates that the broader long-term economic effects of the Basin plan will be relatively small, especially at the national and Basin levels. This is to be expected given that irrigated agriculture in the Basin accounts for one-half of 1 per cent of Australia's gross domestic product (GDP), and that the economy of the Basin is relatively large and diversified. However, these modest higher level effects should not be seen as diminishing the importance of the effects on individuals and some communities in the Basin. The analysis indicates there could be significant effects at the regional and local levels.

The ABARES analysis indicates that businesses located in regions heavily dependent on irrigated annual broadacre activities (particularly rice and cotton) are likely to be worst affected. Impacts in some regions are magnified by interregional trade, with significant volumes of water currently used in annual activities such as irrigated rice and cereals likely to be traded out of the Murrumbidgee and NSW Murray irrigation systems.

The sensitivity of local communities to lower irrigation diversions and their capacity to adapt to change were also investigated. Factors affecting capacity to adapt include income, education, age structure, mobility and economic diversity. The analysis identified a region in the north-east of the Basin (covering parts of the Border Rivers, Barwon–Darling, Gwydir and Namoi regions) and another in the south above the confluence of the Murray and Darling rivers and along the Murrumbidgee River that are highly vulnerable to change. These two regions roughly correspond with the regions identified in the economic analysis; that is, regions heavily dependent on annual cropping activities such as rice and cereals and on pasture-based activities like dairy in the southern Basin and cotton in the northern Basin.

ABARES research also highlights a number of risks in trying to predict socioeconomic effects at too fine a scale. The subregions and local areas affected will be largely determined by which irrigators decide to sell their entitlements to the government. The ABARES irrigation survey clearly identifies a wide variation in farm performance across industries and regions, as well as between irrigators within a region. As a result, it is difficult to identify parts of a region as performing relatively poorly and being more likely to participate in water purchase programs. It is important that this is understood when attempting to estimate (or interpret) effects at a local level.

There are also uncertainties about the timing of effects, as the purchase of water is expected to occur over a relatively long time frame. However, the long time frame is beneficial in helping adjustment to occur gradually as water availability is reduced. In addition, it is difficult to predict when critical thresholds for some businesses are likely to be reached. Other sources of uncertainty include how much water will be saved via investments in water savings infrastructure (this will affect the change in irrigated activity and aquifer recharge) and how the states will implement the new SDLs, which could have implications for the variability of irrigation water supplies.

In developing responses to the adverse effects of changes in water availability, it will be important to recognise that uncertainty will remain about where effects will occur. The development of effective response options will be assisted through identifying the full scope of effects. These may include, for example, transitional employment effects, changes in the provision of services and the range of social effects.

It will be important to monitor effects. Identifying them as they occur will improve the delivery of any programs designed to assist adjustment. The analysis already undertaken by ABARES and others provides an indication of regions that may warrant close monitoring. It will be important not to implement policies that act to impede beneficial adjustment form occurring.

There may also be significant benefits in identifying options to help mitigate the effects on irrigated production. For example, it may be particularly useful to investigate the benefits from increasing the flexibility of water property rights (particularly dam storage rights) and the cost effectiveness of using engineering solutions to achieve environmental outcomes using less water than traditional methods. The behaviour of the Commonwealth Environmental Water Holder will also affect the level of irrigated agricultural activity. For example, if the water holder is able to hold and trade water entitlements and allocations (so as to partially mimic unregulated flows and to meet internal budgetary requirements), the opportunity cost of achieving environmental objectives may well be reduced.

Introduction

The Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) is a research organisation within the Australian Government Department of Agriculture, Fisheries and Forestry. The bureau (formerly the Australian Bureau of Agricultural and Resource Economics and the Bureau of Rural Sciences) has a strong history in contributing to private and public sector decision-making through its research, analysis and statistical collections. In addition to delivering independent economic and scientific research, ABARES engages in integrated socioeconomic and biophysical analyses of some of the more difficult policy issues facing Australia's primary industries. ABARES also collects a wide range of physical and financial data for broadacre, dairy and irrigation farms to assist in its analyses.

Of specific interest to this inquiry is ABARES research into the effect less water will have on irrigation and regional communities in the Murray–Darling Basin (MDB). The bureau has recently undertaken research examining both the economic effects of the water scenarios contained in the *Guide to the Proposed Basin Plan* in isolation from other policies (commissioned by the MDBA, ABARE–BRS 2010a) and in the presence of mitigating policies (commissioned by DSEWPaC, ABARE–BRS 2010b). ABARES also provided advice on the relative vulnerabilities and adaptive capacities of communities within the Basin with regard to reduced access to irrigation water (ABARE–BRS 2010c).

This submission summarises the socioeconomic analysis undertaken by ABARES of the reductions in water availability in the *Guide to the Proposed Basin Plan* and the potential for other policies to mitigate the effects on irrigated agriculture and regional economies. These policies not only partially offset the reduction in irrigation water availability (and hence irrigated activity) that will occur when the new diversion limits come into effect, but also lead to more expenditure in regional economies than would have otherwise occurred.

The vulnerability of Basin communities to lower irrigation diversions is also discussed. When combined with the economic impact analysis, this provides an indication of regions most likely to be significantly affected. Finally, the difficulties in predicting effects at a local level and the implications of this for the design of programs to assist adjustment are discussed.

Economic impact analysis

In October 2010, ABARE–BRS released a report commissioned by the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) examining the economic effect of the main water policies affecting irrigation in the MDB (ABARE–BRS 2010b). The specific policies analysed included:

- the Basin plan / 3500 GL (gigalitre) sustainable diversion limit (SDL) option
- the $3.1 billion Water for the Future (WftF) entitlement purchase program
- the $4.4 billion WftF investment programs targeted at upgrading water and irrigation infrastructure in the MDB
- the government's commitment to address any remaining gap between the volumes of water secured through the WftF program and the volume required to meet the SDLs through additional entitlement purchases.

Modelling

The analysis involved using a two-stage modelling process to estimate the direct and indirect economic effects of the water policy scenarios. The first stage involved using the ABARES comparative static partial equilibrium Water Trade Model (WTM) to estimate the direct effects of the SDLs, water purchases and infrastructure investments on the gross value of irrigated agricultural production (GVIAP) by sustainable yield region. The SDLs and water purchases will reduce irrigation water availability, whereas the infrastructure investments will act to increase effective water availability. For more detail about the WTM, refer to Hafi et al. (2009).

The second stage of the modelling process involved feeding estimates of changes in agricultural production generated in the WTM into a computable general equilibrium (CGE) model of the Australian economy, along with estimates of income from water sales and expenditure on investments in infrastructure, to estimate the flow-on effects to regional, Basin and national economies. Refer to ABARE (2010) for detailed information on the AusRegion CGE model.

Scenarios

Three scenarios were considered in the analysis, including a baseline and two policy scenarios. The baseline scenario represents the 'business as usual' case, which provides an initial snapshot of the extent of irrigated agriculture by region and commodity (in the case of the WTM model), and a year-by-year picture of the regional economies of the Basin (in the case of AusRegion).

The policy scenarios included an SDLs only (Scenario 1) and an SDLs with other government actions scenario (Scenario 2). Table 1 contains a more detailed description of the various scenarios. Each scenario involves an assumption of the effect of the policy on net irrigation water use, as well as any other stimulus effects on regional economies. The results of the policy simulations are then compared with those in the baseline to identify the effects of the policies on variables of interest, including GVIAP, gross value of agricultural production (GVAP), profit, water use, and irrigation land use.

A detailed description of the scenarios and the assumptions used in constructing them is contained in ABARE–BRS (2010b).

1 Policy scenarios

scenario	description
Baseline	Business as usual: irrigation water availability based on that observed in a representative 'normal' year.
Scenario 1	SDLs only: reduction in irrigation water as a result of the SDLs as defined in ABARE–BRS (2010) (3500 GL scenario).
Scenario 2	SDLs and government actions: net reduction in water availability after accounting for SDLs, government actions; regional stimulus from WftF and additional water purchases.

Data and assumptions

ABARES used available data sources to construct a baseline to represent long-run average irrigation water use, land use, and GVIAP in the Basin (table 2). In turn, the MDBA supplied SDL scenarios, while DSEWPaC supplied assumptions on WftF, including projected total regional expenditures, volumes of water recovered and the distribution of these expenditures and water recovery over time, for both the water entitlement purchase and infrastructure investment programs.

2 Baseline scenario total water use a, land use, GVIAP and GVAP by activity

	water use GL/y	land use '000 Ha	GVIAP $m/y	GVAP $m/y
Cereals	770	261	185	3 582
Cotton	2 634	405	1 293	1 389
Dairy	1 177	213	909	1 179
Fruit and nuts	469	74	1 006	1 164
Grapes	583	106	715	781
Hay	816	209	171	776
Meat cattle	666	183	612	2 983
Other broadacre	158	42	41	1 410
Rice	2 409	177	476	476
Sheep	551	182	155	2 080
Vegetables	169	37	657	720
Total	10 403	1 890	6 220	16 539

a Total water use refers to the sum of ground and surface water.

Results

While the analysis is subject to a number of limitations, the most important being that it does not capture short-term adjustment effects, the results provide some useful insights. In particular, the results highlight the potential long-term overall effects of changes in water availability and government investment in irrigation infrastructure and water purchases, as well as identifying the types of irrigation industries and regions that are likely to be most affected.

Basin-level effects on irrigated agriculture

Table 3 contains basin-wide WTM results for scenarios 1 and 2 in 2018–19 (the year the final set of SDLs are implemented). The estimates indicate that GVIAP and GVAP in the Basin may decline by around 15 per cent and 5 per cent, respectively, if the SDLs are implemented in the absence of mitigating policies (Scenario 1), and by around 10 per cent and 4 per cent, respectively, in the presence of mitigating policies (Scenario 2).

3 WTM estimates of the effect of the 3500 GL Basin plan, WftF and additional water purchases on Basin water use, GVIAP and profit, 2018–19

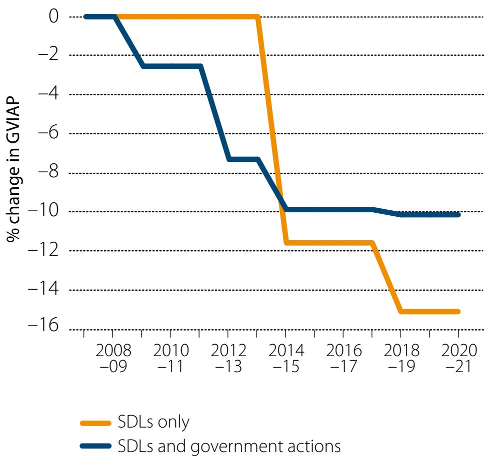
	unit	baseline	scenario	% change	value change
Scenario 1 a – SDLs only					
Water use	GL/y	10 403	7 316	–29.7	–3 087
GVAP	$m/y	16 539	15 668	–5.3	–871
GVIAP	$m/y	6 220	5 281	–15.1	–938
Profit	$m/y	1 956	1 804	–7.8	–152
Scenario 2 – SDLs and government actions					
Water use	GL/y	10 403	8 273	–20.47	–2 129
GVAP	$m/y	16 539	15 945	–3.6	–594
GVIAP	$m/y	6 220	5 589	–10.1	–630
Profit	$m/y	1 956	1 866	–4.6	–90

a There is a small difference between the WTM estimates for the Basin plan scenario in this report and those in the ABARE–BRS report to the MDBA (ABARE–BRS 2010a), due to slightly different assumptions for the Goulburn–Broken, Loddon and Campaspe regions.

Figure a depicts the Basin-wide effects of the two scenarios on GVIAP over the time frame of the WftF program, factoring in the different timings of SDL adoption for MDB states. Under Scenario 2, government water purchases bring forward reductions in irrigated agricultural production that would have otherwise occurred at the time the SDLs are implemented. Hence, the reduction in GVIAP prior to 2014–15 is shown to be larger for the scenario that includes government actions than for the SDL only scenario.

Scenario 2 assumes that water 'saved' from infrastructure investments becomes available when the SDLs are implemented. It is estimated that these water savings reduce the overall effect of the Basin plan on GVIAP by one-third, to around 10 per cent.

a Basin-wide effects of the Basin plan, WftF and additional water purchases on GVIAP



The WTM estimates indicate that reductions in GVIAP (both in percentage change and absolute terms) will be greater for irrigated broadacre activities than for horticulture (both annual and perennial), and that these reductions are greater under Scenario 1 (the SDLs only scenario) than under Scenario 2 (table 4).

Under Scenario 1, the largest absolute reductions in GVIAP are expected to occur in irrigated cotton (–$297 million), rice (–$176 million), dairy (–$93 million), hay (–$84 million) and cereals (–$83 million). When the mitigating policies considered in this study are incorporated, the effect on GVIAP is reduced to –$216 million for cotton, –$119 million for rice, –$53 million for dairy, $54 million for hay and –$58 million for cereals.

The reductions in GVIAP for irrigated cotton and rice account for over half of the total reduction in GVIAP under both scenarios. The relatively small effects on horticulture are consistent with water being traded away from lower value activities to higher value activities, or horticulture irrigators not selling water under the buyback program.

4 Effect of SDLs and government actions on GVIAP relative to baseline, by agricultural activity, 2018–19

	baseline $m/y	scenario 1 level change ($m/y)	scenario 1 % change	scenario 2 level change ($m/y)	scenario 2 % change
Irrigated cereals	185	–83	–45.1	–58	–31.4
Cotton	1 293	–297	–22.9	–216	–16.7
Irrigated dairy	909	–93	–10.2	–53	–5.8
Fruit and nuts	1 006	–31	–3.1	–20	–2
Grapes	715	–36	–5.1	–24	–3.4
Irrigated hay	171	–84	–49.1	–54	–31.4
Irrigated meat cattle	612	–59	–9.7	–35	–5.8
Other irrigated broadacre	41	–18	–44	–13	–30.9
Rice	476	–176	–36.9	–119	–25.1
Irrigated sheep	155	–48	–31.3	–29	–19
Vegetables	657	–14	–2.1	–9	–1.3
Total	6 220	–939	–15.1	–630	–10.1

Regional-level effects on irrigated agriculture

The regions most adversely affected by reduced access to irrigation water are spread across the northern and southern Basin (table 5). These regions also tend to be those that are most heavily involved in producing cotton and rice, as well as pasture-dependent commodities such as dairy products.

The Murrumbidgee and Murray regions in southern NSW almost exclusively account for rice production in the MDB. Under the SDLs only scenario (Scenario 1), these regions account for nearly one-third of the $939 million reduction in GVIAP estimated for the Basin. The major cotton growing regions in the northern Basin (Gwydir, Condamine and Namoi) in turn account for more than 20 per cent of the total reduction in GVIAP under Scenario 1, as do the northern Victorian regions specialising in dairy and hay production (Goulburn–Broken, Murray (Vic) and Loddon).

The largest percentage reductions in GVIAP under Scenario 1 occur in the Moonie, Gwydir, Murrumbidgee and Barwon–Darling regions.

5 Effect of SDLs and government actions on GVIAP relative to baseline, by region, 2018–19

region	baseline $m/y	scenario 1 a level change ($m/y)	scenario 1 a % change	scenario 2 level change ($m/y)	scenario 2 % change
Condamine	457	–70	–15.3	–64	–13.9
Border Rivers (Qld)	245	–21	–8.6	–17	–7
Border Rivers (NSW)	185	–24	–13.1	–17	–9
Warrego	7	–1	–11.8	–1	–10.5
Paroo	6	0	0	0	0
Namoi	332	–59	–17.7	–49	–14.7
Macquarie	275	–49	–17.8	–23	–8.4
Moonie	40	–15	–37.1	–13	–32.7
Gwydir	321	–84	–26.1	–44	–13.9
Barwon–Darling	172	–38	–22.1	–38	–22
Lachlan	165	–16	–10	–8	–5
Murrumbidgee	890	–225	–25.3	–157	–17.6
Ovens	56	–2	–3.5	–1	–2.4
Goulburn–Broken	704	–85	–12.1	–41	–5.8
Campaspe	134	–14	–10.6	–8	–6.2
Wimmera	13	0	0	0	0
Loddon	284	–56	–19.5	–27	–9.5
Murray (NSW)	409	–79	–19.3	–53	–12.9
Murray (Vic)	779	–66	–8.5	–45	–5.8
Lower Murray–Darling	71	–5	–6.6	–3	–4.5
Murray (SA)	514	–30	–5.8	–21	–4
Eastern Mt Lofty Ranges	163	–1	–0.5	–1	–0.5
Total	6 220	–939	–15.1	–630	–10.1

a There is a small difference between the WTM estimates for the Basin plan scenario in this report and those in the ABARE–BRS report to the MDBA (ABARE–BRS 2010), due to some slightly different assumptions for the Goulburn–Broken, Loddon and Campaspe regions.

6 Change in GVIAP ($m) – Scenario 2, by region and activity

	industry											
region	cereals	cotton	dairy	fruit and nuts	grapes	hay	meat cattle	other broadacre	rice	sheep	vegetables	total
Condamine	–9.0	–42.1	–1.1	–1.0	–0.1	–5.6	–2.2	–1.6	0.0	–0.2	–0.8	–63.6
Border Rivers (Qld)	0.0	–14.8	0.0	–0.2	–0.1	–1.3	–0.3	–0.2	0.0	–0.1	–0.4	–17.2
Border Rivers (NSW)	–1.5	–13.4	0.0	–0.1	0.0	–1.1	–0.2	–0.2	0.0	–0.1	0.0	–16.6
Warrego	0.0	0.0	0.0	0.0	0.0	–0.3	–0.4	0.0	0.0	0.0	0.0	–0.7
Paroo	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Namoi	–4.8	–36.9	–0.7	0.0	0.0	–3.7	–1.1	–1.1	0.0	–0.3	0.0	–48.7
Macquarie	–1.6	–15.5	–0.5	–0.2	–0.3	–2.8	–0.5	–0.7	0.0	–0.7	–0.2	–23.0
Moonie	–0.1	–12.3	0.0	0.0	0.0	–0.3	–0.3	0.0	0.0	–0.1	0.0	–13.0
Gwydir	–1.5	–40.9	0.0	–0.5	–0.1	–0.4	–0.1	–0.8	0.0	–0.2	–0.1	–44.5
Barwon–Darling	–1.3	–35.3	0.0	–0.1	–0.1	–0.3	–0.1	–0.2	0.0	–0.4	–0.1	–37.8
Lachlan	–1.6	–2.0	–0.1	–0.4	–0.3	–1.6	–0.4	–0.2	–0.7	–0.5	–0.5	–8.2
Murrumbidgee	–27.2	–2.9	–0.7	–2.2	–3.5	–12.3	–4.0	–6.1	–87.5	–8.7	–1.4	–156.5
Ovens	0.0	0.0	–0.3	0.0	–0.2	–0.2	–0.4	0.0	0.0	–0.1	0.0	–1.4
Goulburn–Broken	–0.7	0.0	–18.2	–1.8	–0.2	–6.1	–9.1	–0.1	–1.4	–2.7	–0.6	–40.9
Campaspe	–0.5	0.0	–3.4	0.0	0.0	–1.3	–1.8	–0.1	0.0	–0.6	–0.4	–8.3
Wimmera	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Loddon	–3.0	0.0	–6.1	–1.4	–0.5	–5.6	–3.9	–0.7	0.0	–5.3	–0.6	–27.1
Murray (NSW)	–4.6	0.0	–3.9	–0.2	–0.4	–3.9	–3.9	–0.3	–28.9	–6.4	–0.3	–52.8
Murray (Vic)	–0.4	0.0	–15.8	–5.3	–7.8	–6.6	–6.2	–0.3	–0.7	–1.3	–0.9	–45.3
Lower Murray Darling	–0.1	0.0	0.0	–0.7	–1.9	0.0	0.0	0.0	0.0	–0.4	0.0	–3.2
Murray (SA)	0.0	0.0	–1.7	–5.8	–8.8	–0.5	–0.4	0.0	0.0	–1.1	–2.4	–20.7
Eastern Mt Lofty Ranges	–0.1	0.0	–0.2	0.0	–0.1	–0.1	–0.1	0.0	0.0	–0.1	–0.1	–0.8
Total	–58.0	–216.0	–52.7	–20.0	–24.5	–53.9	–35.3	–12.7	–119.3	–29.3	–8.7	–630.4

When government actions are taken into account under Scenario 2, the effects on GVIAP are reduced by around one-third (from –$939 million to –$630 million), with regional effects following a similar general pattern to that displayed under the SDLs only scenario (see table 6 for changes in GVIAP by region and activity). The largest percentage reductions in GVIAP under Scenario 2 occur in the Moonie, Barwon–Darling and Murrumbidgee regions.

Under Scenario 2, entitlement holders will be compensated for reductions in water use. However, employees and providers of upstream and downstream services will be affected.

Broader effects on regional economies

The Basin plan and WftF program will affect irrigated activity, which will have flow-on effects for regional economies dependent on irrigation. The economy-wide impact estimates presented below were derived using AusRegion. Three changes were introduced into AusRegion: (i) changes due to the reduction in water use by irrigators from the net effect of the SDLs, WftF and additional water purchases; (ii) changes in households' consumption due to government water purchases; and (iii) changes in investments in the construction and services industries as a result of the infrastructure investment program.

Effect on gross regional product

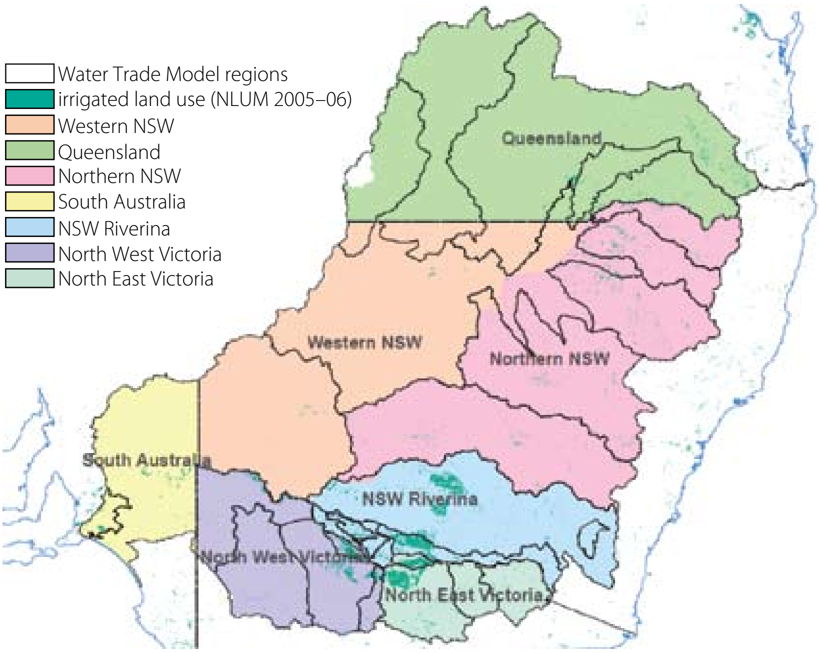
In the absence of other policies, it is estimated that the Basin plan will reduce gross regional product (GRP) in the MDB by around 1.3 per cent, with the Riverina and North East Victoria regions being most affected and Northern NSW being least affected (map 1) (note, regions used in AusRegion are aggregations of sustainable yield regions used in the WTM—see discussion below on problems analysing flow-on effects at finer geographical scales).

The WftF program and additional water purchases aimed at 'bridging the gap' will help mitigate the flow-on effects of reduced irrigated agriculture, with expenditures from increases in income from water sales and investments in irrigation infrastructure partially offsetting these effects. Even if irrigators use payments for water entitlements to reduce debt, disposable income should rise as interest payments are reduced.

Expenditure from investments in infrastructure provides a significant and immediate—but relatively short-lived—stimulus to regional economies. In contrast, additional income from water sales is expected to have a relatively modest effect on regional economies, but to be maintained over time. The latter assumes that irrigators selling water remain in the region. Clearly this will not always be the case. However, previous research by ABARE suggests that changing the assumption about whether irrigators remain in or leave the region makes little difference to the GRP estimates (see Hone et al. 2010).

Table 7 contains estimates of the effect of the Basin plan and government actions on real GRP and GDP in 2018–19. It is estimated that the WftF program and additional water purchases will reduce the effect of the Basin plan on GRP in 2018–19 by nearly half, from –1.3 per cent to –0.7 per cent. These effects range from –0.4 per cent in Northern NSW to –1.2 per cent in the Western NSW and Qld MDB regions.

map **1** AusRegion regions (compared with WTM regions[a])



a AusRegion regions are coloured; WTM regional demarcations are shown in black.

7 Estimated change in real GRP and GDP, 2018–19

	baseline	scenario 1		scenario 2	
	$b/y	% change	level change ($b/y)	% change	level change ($b/y)
Northern NSW	19.5	–0.9	–0.18	–0.4	–0.08
Riverina NSW	14.87	–1.9	–0.29	–0.8	–0.13
Western NSW	2.26	–1.6	–0.04	–1.2	–0.03
North East Vic	12.38	–1.7	–0.22	–1	–0.12
North West Vic	14.43	–1	–0.15	–0.5	–0.08
Queensland MDB	11.23	–1.4	–0.15	–1.2	–0.14
South Australia MDB	4.63	–1.1	–0.05	–0.5	–0.02
MDB **a**	79.31	–1.3	–1.01	–0.7	–0.57
Australia	1 102.48	–0.1	–1.28	–0.1	–1.27

a Excluding the Australian Capital Territory.

These relatively small percentage change estimates are to be expected given the size of the MDB economy (GRP of $59 billion in 2000–01) relative to the estimated reduction in agricultural activity (around $600 million). It should be noted that scale is an important factor when analysing regional effects. The Basin as a whole has a broad economic base, while some towns are highly dependent on irrigated agriculture. The effects on these towns could be significant.

Effect on employment

It is estimated that employment in the Basin will decline slightly (–0.1 per cent) under Scenario 1 and remain virtually unchanged under Scenario 2. In the long run, investments in water infrastructure are expected to partially offset the reduction in irrigation water that would occur under the SDLs, while payments for water entitlements should lead to a small increase in household expenditure. This should, in turn, reduce the effect on regional economic activity and employment.

The changes in employment are much smaller than changes in GRP. The employment estimates generated by AusRegion are long-term estimates, and assume that labour is relatively free to move between industries and regions. While this is likely to be a fair assumption in the long run, especially when the economy is performing strongly as it is now, changes in access to irrigation water are likely to lead to more immediate and significant effects on employment, especially in towns and communities highly dependent on irrigation. Government actions under the WftF would be expected to partially offset these effects in the short term by providing employment opportunities in the construction and installation of water infrastructure. The extent to which employees made redundant in irrigated agriculture and related industries can transfer the construction and installation of irrigation infrastructure will depend on their skill sets. The time frame over which the policies are being introduced should also help ease the transition to less irrigated agriculture, with the gradual release of labour from this sector likely to be more easily absorbed into other sectors than if there was a sudden reduction in irrigated activity. However, the location where labour is released and where it is absorbed will often differ.

When the mitigating effects of the WftF and additional water purchases are considered, changes in employment tend to follow the expenditure profile for infrastructure investments and water purchases. It is estimated that after 2018–19, when the SDLs are fully adopted and the funding under WftF and additional water purchases are phased out, employment at the regional and Basin levels will be little different than under the baseline scenario.

Local effects

Scale is an important factor when analysing regional effects. Unfortunately, CGE analyses become less reliable when undertaken at too fine a geographical scale. The data needed to undertake CGE analyses for small regions are usually not available or, where some data are available, are less reliable. Moreover, models have limited capacity to analyse a large number of small regions at one time. This is why GVIAP estimates generated for sustainable yield regions were aggregated into larger regions for the CGE analysis.

Many of these larger regions contain a mix of small and medium sized towns, as well as larger regional centres. The larger regional centres tend to have a broad economic base, which will act to cushion the impact of a decline in irrigated activity. However, some of the smaller towns may be less resilient to a decline in irrigation activity, with some communities concerned that such a decline could lead not only to reduced economic activity but also to a loss in local services, including access to health and educational services. Hence, the effects of the SDLs are likely to be more substantial in smaller regional towns heavily dependent on irrigation than in larger regional centres.

Table 8 identifies seven sustainable yield regions where Scenario 2 is estimated to lead to a reduction in the value of irrigated activity of more than $40 million a year. The Murrumbidgee, Condamine, Barwon–Darling, Murray (NSW), Namoi, Murray (Vic), Gwydir and Goulburn–Broken regions are expected to experience the greatest falls in GVIAP.

A reduction in irrigated activity is likely to be reflected in a shift away from irrigated agriculture to dryland agriculture. Since irrigated agriculture is more input-intensive than dryland agriculture, a shift toward dryland agriculture is likely to be reflected in lower farm input expenditure within a region.

8 Estimated changes in GVIAP from the long-term historical average for the most affected regions in the Basin

region	change in GVIAP ($m/y)
Murrumbidgee	–157
Condamine	–64
Murray (NSW)	–53
Namoi	–49
Murray (Vic)	–45
Gwydir	–44
Goulburn–Broken	–41

WTM estimates suggest that irrigated annual cropping and activities involving irrigated pastures are likely to decline more significantly than horticulture production, as a result of reduced diversions. Some towns that are highly reliant on irrigated agriculture could be quite susceptible to changes in water availability, especially if the main irrigated activities in the local area are rice, cotton or dairy. A more detailed discussion and analysis is contained in ABARE–BRS (2010a).

While the type of analysis outlined above provides an indication of the towns in the MDB that may be affected by changes in water availability for irrigation, in practice the future of individual Basin communities will depend on a range of variables, many of them external to the Basin plan and WtfF, such as changes in commodity prices, the effects of other government policies, demographic changes and prevailing local climate conditions.

Qualifications

Any model is a simplification of the real world, so the final outcomes may differ from those projected by the models used in this analysis. For example, one simplification is that the WTM does not take into account the full range of adaptation options available to irrigators, which could be expected to reduce the overall effect on irrigation outcomes. Similarly, the model outcomes depend on a number of assumptions that are subject to differing levels of uncertainty. For instance, it is uncertain how much water will actually be saved by investments in more efficient infrastructure. There is also uncertainty about future commodity prices, future climate, the effect of government policies other than those considered in this study and the way in which states implement the Basin plan.

The model results are also based on changes in long-run average diversions, and do not take into account the potential for a change in the variability of diversions to affect the pattern of irrigated activities. Changes in variability can have implications for short and long-run farming decisions, including crop planting decisions, capital investment decisions and decisions about different farming activities, particularly between perennial and annual crops.

Although the long-run effect of the Basin plan on employment is expected to be small relative to total MDB employment, the estimated employment changes remain subject to some uncertainty given their relatively small size and the simplifying assumptions of the model. The broader regional effects estimated by the AusRegion model depend on a range of assumptions, including about the extent to which displaced agricultural labour in a given region will find employment in other industries within the region or will migrate to other regions inside or outside the MDB.

The AusRegion employment estimates represent long-run predictions, in which displaced individuals and firms have time to adjust to the changes to agricultural activities. In the short run, employment effects may be more pronounced.

Vulnerability analysis

In October 2010, a report prepared by ABARE–BRS for the MDBA was released looking at the vulnerability of Basin communities to reduced access to irrigation water more generally (ABARE–BRS 2010c). This research was undertaken in collaboration with the University of New England's Institute for Rural Futures.

The aim of this study was to increase understanding of the socioeconomic circumstances of communities located in the MDB, and to provide a readily accessible measure with which to compare the relative vulnerability of communities to a reduction in access to irrigation water. It should be noted that the analysis did not attempt to differentiate between regions based on specific SDL scenarios or the nature of the response of irrigators to reduced water availability (for example, through the purchase of additional water from other irrigators).

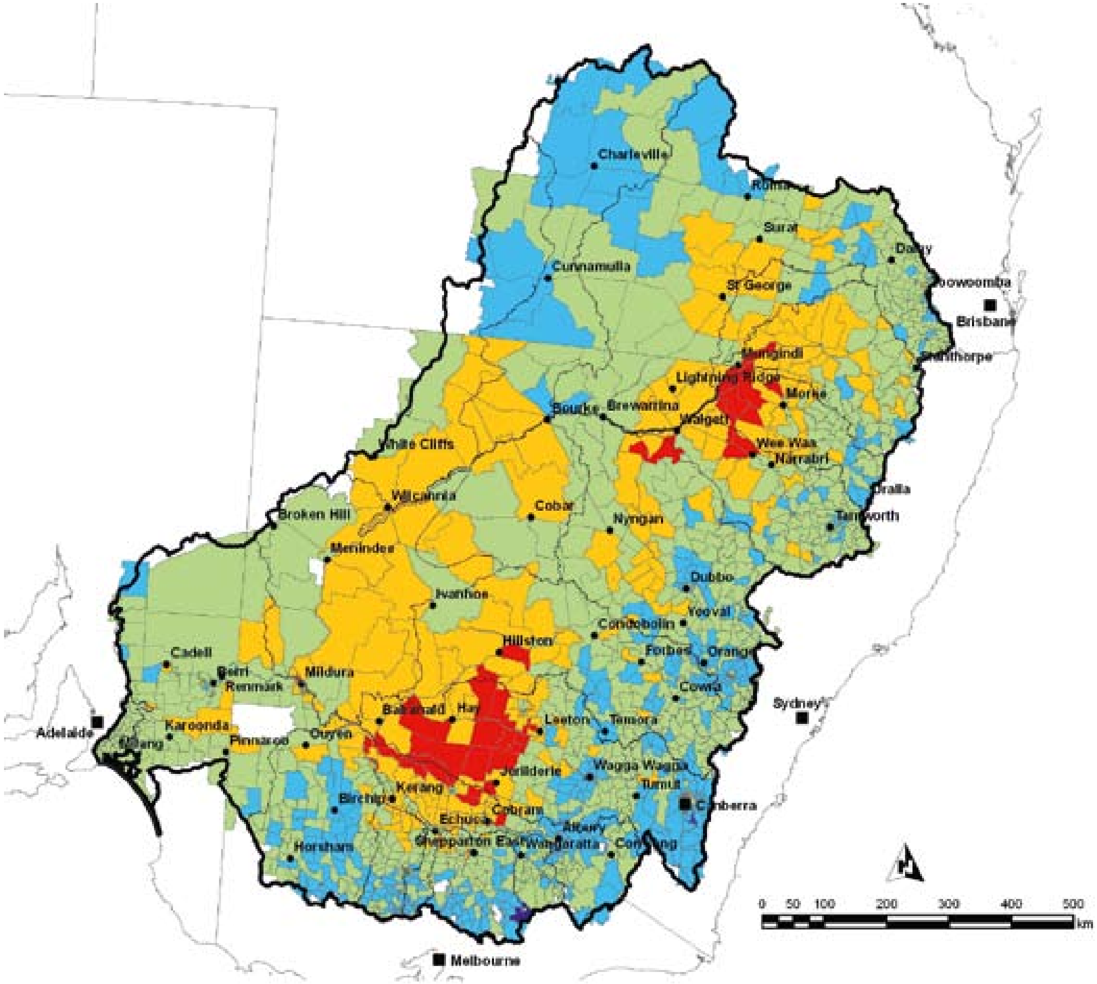
The study involved mapping the vulnerability of communities in the Basin using social indicators populated with ABS census data (ABS 2007) and water use data (ABS 2008). This is a well-known method for tracking changes in socioeconomic circumstances of resource-dependent communities.

The research defined community vulnerability as the degree to which a community is susceptible to pressures and disturbances (for example, climate change), with vulnerability being a function of sensitivity and adaptive capacity. Sensitivity is defined as a measure of a community's reliance on irrigation water and dependence on associated agricultural and processing employment. Adaptive capacity is defined as the inherent capacity of a community to manage or cope with change, taking into account measures such as income, education levels, age structure, mobility, housing and economic diversity.

The results of the analysis show that community vulnerability to changes in water availability varies widely across the Basin (map 2). In particular, there are two large areas where community vulnerability is identified as being high to very high. One is located in the north-east of the Basin (covering parts of the Border Rivers, Barwon–Darling, Gwydir and Namoi regions), while the other is concentrated along the Murray River above the confluence of the Murray and Darling rivers and along the Murrumbidgee River. The vulnerability study identifies communities located in these areas as having a combination of higher sensitivity to changes in water availability (that is, very high dependence on water for agriculture and high agri-industry employment) and limited capacity to adapt (that is, lower levels of human capital, social capital and economic diversity) compared with other areas in the Basin. These areas roughly coincide with those identified in the ABARE–BRS economic analysis as regions where there may be significant reductions in irrigated activity due to planned interventions.

The method used in the analysis has several limitations. The first limitation is that community vulnerability is complex, and it is unlikely that a single measure will capture the full experience of communities undergoing rapid change. Second, the use of ABS census data reveals only part of the story. Further validation and scrutiny of the indicators is recommended to establish whether they represent people's experiences at a community level, and to increase understanding of the community vulnerability index. As a result, map 2 should be viewed with care; it is intended to assist with understanding patterns of vulnerability in the Basin and is thus illustrative rather than definitive.

map 2 Community vulnerability



Vulnerabilty

- very low (0.0 – 0.2)
- low (0.2 – 0.4)
- moderate (0.4 – 0.6)
- high (0.6 – 0.8)
- very high (0.8 – 1.0)
- data not available

Data not available because:

– the census district or SLA lies largely outside the Basin boundary
– the census district is sparsely populated and ABS did not make the data available

Data sources:

Australian Bureau of Statistics
– Analysis of 2005–06 community profile data
– Census districts 2006
– Urban centre localities 2006
Murray–Darling Basin and Basin plan regions

Effects on food prices

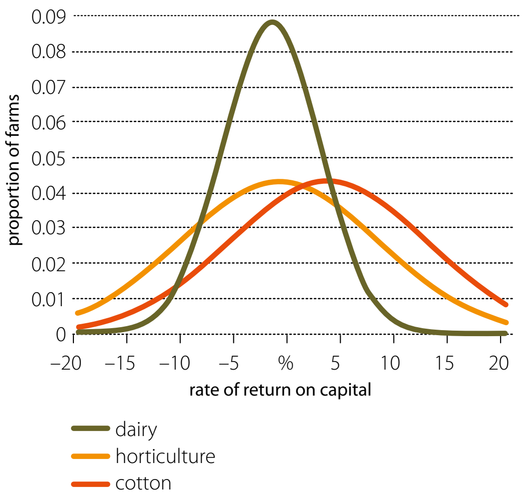
There is some concern that the reduction in irrigated production in the Basin because of changes in water availability will translate into higher food prices. However, there are a number of reasons why this is unlikely to be the case. Those food products most affected by the change—rice and dairy—are internationally traded products and their price is mainly determined in world markets.

For less trade-exposed products, such as fruit and vegetables, production is estimated to be least affected by the reductions in water availability (these irrigators are less likely to participate in any buyback). While price effects will differ for specific products, the analysis suggests that Australia's overall production of fruit and vegetables will fall by less than 3 per cent. This would be expected to translate into relatively small price increases for consumers.

Next steps

ABARES research highlights a number of risks in trying to predict socioeconomic effects at too fine a scale. While the desire to identify socioeconomic effects at a finer scale than has been undertaken to date is understandable, where these effects will occur will be largely determined by which irrigators decide to sell their entitlements to the government. ABARES irrigation survey data clearly identifies a wide variation in farm performance across industries and regions, as well as between irrigators within a region (figure b). As a result, it is difficult to identify parts of a region as performing relatively poorly and being more likely to participate in water purchase programs. It is important that this is understood when attempting to estimate (or interpret) effects at a local level.

b Distribution of returns, by industry, 2006–07



Source: ABARE irrigation survey data.

There are also uncertainties about the timing of effects, as the purchase of water is expected to occur over a relatively long time frame. In addition it is difficult to predict when critical thresholds for some businesses are likely to be reached. Other sources of uncertainty include how much water will be saved via investments in water savings infrastructure (this will affect the change in irrigated activity) and how the states will implement the new SDLs, which could have implications for the variability of irrigation water supplies.

In developing responses to the adverse effects of changes in water availability, it will be important to recognise that uncertainty will remain over where effects will occur. The development of effective response options will be assisted through identifying the full scope of effects (for example, transitional employment effects, changes in the pattern of irrigated activities because of changes in supply variability, implications for the provision of services and the range of social effects).

It will be important to monitor effects. Identifying them as they occur will improve the delivery of any programs designed to assist adjustment. The analysis already undertaken by ABARES and others provides an indication of regions that may warrant close monitoring. It will also be important not to implement policies that act to impede beneficial adjustment from occurring.

There may also be significant benefits in identifying options to help mitigate the effects on irrigated production. For example, it may be particularly useful to investigate the benefits from increasing the flexibility of water property rights (particularly dam storage rights) and the cost effectiveness of using engineering solutions to achieve environmental outcomes using less water than traditional methods. The behaviour of the Commonwealth Environmental Water Holder will also affect the level of irrigated agricultural activity. For example, if the water holder is able to hold and trade water entitlements and allocations, this would be expected to reduce the opportunity cost of achieving environmental objectives. Research by Scoccimarro and Collins (2006) concluded that to reduce the cost of meeting environmental water demands, an entitlement holding would need to be combined with significant subsequent trade in seasonal allocations.

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