Community impacts of the Guide to the proposed Basin Plan

Volume 4: Informing choices

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A consortium of EBC, RMCG, MJA, EconSearch, Geoff McLeod, Tim Cummins, Guy Roth and David Cornish with special advice from Chris Miller

EBC
RMCG Consultants for Business, Communities & Environment
MARSDEN JACOB ASSOCIATES
econsearch

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Preface

This report is Volume 4 in a suite of documents that has been prepared by the EBC consortium on the potential community impacts of the proposed Murray-Darling Basin Plan.

The MDBA commissioned the consortium to assess the potential community impacts of proposals in the *Guide to the proposed Basin Plan*. The primary objective was to understand the impacts on local, small-scale, human issues and costs during the short and medium term. A key aim was to consult with communities to understand how they would be impacted by the proposals in the Guide.

A round of interviews with key informants was completed in April 2011, covering 48 social catchments, 80 local government areas and 119 towns and regional centres. The discussions involved nearly 700 people from across the full range of sectors and employment groups. Additional economic analysis was undertaken to supplement and inform the outcomes of the community interviews.

The outcome of the project is reported in nine volumes:

- Volume 1: An Executive Summary - provides an overview and condensed report on the core outcomes of the project;
- Volume 2: Methodology - sets out the framework and analytical methodology for the study;
- Volume 3: Community Impact - provides a comprehensive report on the breadth of the issues raised in the community impact assessment. This includes the identification of a number of significant issues which are material for the roll-out of the future Basin Plan;
- Volume 4: Informing Choices - takes the key issues from Volume 3 and provides further analysis and assessment of the issues to help provide information to optimise decisions on the development and implementation of the draft plan at least cost to the community;
- Volume 5: Regional analysis: Southern Connected Basin Overview;
- Volume 6: Regional analysis Queensland - provides detailed reports on the key findings from the community engagement process at a regional scale. These regional analyses focus on the short to medium term impacts of the proposals in the Guide on industries and communities at the local level;
- Volume 7: Regional analysis New South Wales;
- Volume 8: Regional analysis Victoria; and
- Volume 9: Regional analysis South Australia.

1 Introduction and summary

1.1 A pathway to the Basin Plan

The Murray-Darling Basin Authority has the responsibility for preparing a Basin Plan. The process of developing the Basin Plan involves a journey with a number of stages and players. This study and report form part of that journey.

The key stages in that journey have been:

- the *Guide to the proposed Basin Plan* was published in October 2010. This was the outcome of significant work over eighteen months. The intention was that the Guide would provide an overview to assist people to understand the basis of the proposed Basin Plan, and the rationale behind the proposals;[1]
- Members of the Authority then undertook an extensive round of public meetings to explain the contents of the Guide and the draft proposals at locations across the Basin;
- the Guide and those meetings led to concern across the community on the possible socio-economic impacts of the proposals at a local scale;
- as a result, the Authority commissioned this study to assess further the socio-economic impacts of the proposals in the Guide at a community scale. That involved an extensive program of interviews with key informants across the Basin between January and April 2011 which documented the basis for the community concerns. The outcomes are reported further below.

Since the study was commissioned, the Authority has acknowledged the complexity in respect of the decision making process and all arms of government have agreed to work together to achieve better outcomes. This commitment was confirmed in the *Communiqué from the Murray-Darling Basin Ministerial Forum* on 1 April.

> *Ministers agreed there was a need for a new broader approach that brings together all relevant programs and involves local communities.*
>
> *In particular, Ministers agreed the need to better align Commonwealth and State programs and policies aimed at improving water use efficiency and infrastructure programs, recovery of water for the environment and environmental water use and infrastructure.* [2]

The MDBA has also acknowledged community concerns about the potential impacts of the Guide and of the limited community engagement process during 2010. In a speech to the *Sustaining Rural Communities Conference* in Narrabri on 6 April, the Chair of the Authority emphasised the importance of working more closely with local communities to further develop the Plan, and to reviewing

[1] http://thebasinplan.mdba.gov.au/guide/guide.php?document=the-murray-darling-basin
[2] www.environment.gov.au/minister/burke/2011/communique-20110401.html

opportunities to better align water purchasing, infrastructure, and environmental water management programs.

The main thrust of the current planning process is to recognise that there is a suite of policy options that can be developed and implemented in a way that will help to optimise the outcomes – generating the desired environmental result, but at a lower socio-economic cost to the Basin communities.

This volume contributes to that process and pathway by providing insights and analysis on key issues from the community impact assessment to help inform future policy choices so that the outcome of the plan is optimised.

1.2 Concerns and issues from the community assessment

The interviews with key informants[3] documented concerns that:

- the proposals in the Guide would reduce irrigated production across the Basin and would have a significant impact on irrigation-focused communities at a local scale in the short and medium term;
- the reduction in irrigation production would be likely to create third party impacts for farmers who remain, businesses that service farmers, processing companies, and community level businesses and services; and
- resultant social impacts could include loss of population and change in population mix, change in community identity, increased demand for social services and psycho-social impacts.

The impacts would be likely to be more profound for vulnerable communities, identified as smaller communities and those with greater dependence on irrigated agriculture.

The process for developing the Guide and the Basin Plan was also subject to adverse comment including:

- *Nobody asked my opinion:* There was a common complaint that nobody had asked local people what they thought was reasonable when drafting the Guide. The process was seen as being driven by Canberra, which was felt to be out-of-touch with the reality of life in regional Australia. Key informants believed that the MDBA had ignored the previous hard work that communities had put into developing Water Sharing Plans and Sustainable Water Strategies.
- *It will have devastating impacts and you are not listening:* There was considerable anger and a profound sense of disbelief that the Guide had

[3] 'key informants' were selected by the Consortium as being well-placed to talk about their sector of their community. They were identified in consultation with regional stakeholders, including councils, Basin Community Committee members, and Regional Development Australia committees. They were not asked to act as representatives of their communities, but rather, to answer Lines of Enquiry as best they could given their knowledge of their communities.

been presented as having only minor, temporary impacts, when this contrasted with their own perception of the likely impacts at a local level.[4]

The over-riding response from communities was that they wanted to be given a chance to be part of the process.

The buyback program as currently operated was also believed to generate a range of negative externalities:

- the speed of the proposed buyback program (with the proposals in the Guide meaning that most purchases outside of Victoria needed to be completed by the end of 2014) was felt to be well beyond the capacity of communities to adapt;
- the money received by willing sellers was widely believed to not stay in the region and thus the local impacts on non-irrigation businesses would not be offset;
- many expect that the buyback program will result in 'Swiss cheese' effects, whereby randomly located sales throughout a region leave an inefficient distribution system designed to supply more irrigation services, which may increase the costs for the remaining irrigators. Communities suggested that a co-ordinated targeted buy-back would be preferable and weren't convinced that the current program was targeted; and
- water sales were seen to leave abandoned properties as dryland with weed, pest and disease problems.

The purpose of this volume of the report was to analyse these key issues and factors to identify how far it would be possible to ameliorate the impacts through adoption of alternative approaches and policy options.

1.3 Large and small impacts at the scale of the Basin economy

Taking decisions about water use in the Basin requires recognition of the scale of irrigated agriculture within the economy of the Murray-Darling Basin and the distributional effects of the proposed Basin Plan. In summary, changes to irrigated agriculture may have a significant impact if assessed at a local scale but appear not to be material if assessed at the scale of the regional economy.

The Murray-Darling Basin generates 39% of Australia's agricultural production by value. Of this production, approximately 40% is accounted for by irrigation, which is 15% of national irrigated agricultural output. Over the past 100 years, the Murray-Darling Basin's agricultural base has been transformed from a low intensity, volatile dryland sector to a more intensive, mixed irrigation and dryland system. Agriculture now represents 93.7% of land use across the Basin, 32% of businesses and 10.8% of jobs. This contribution of agriculture to total

[4] This dislocation is a good example of the general challenge identified by the Productivity Commission in reviewing policy implications that address structural adjustment, see Productivity Commission (2001), *Structural Adjustment – Key Policy Issues*, Commission Research Paper

employment is much higher in smaller regional communities.[5] Agriculture has also demonstrated sustained growth in productivity over the last twenty years, at a rate that is greater than the rest of the national economy.[6] These figures indicate the importance of irrigated agriculture to the socio-economic characteristics of the Basin.

However, despite this significance, irrigated agriculture by itself only accounts for 7% of the gross regional product of the wider Basin economy. This means that a large impact on irrigated production appears relatively small, when assessed at the scale of the Basin. For example, the 3,000GL scenario in the Guide involved an average 27% reduction in water diversions for NSW and Victoria. That reduction seems large at the local scale but represents a direct reduction of less than 2% in the wider Basin's productive capacity, if applied pro-rata to average irrigated production. As the Basin's economy is growing at more than 2% per year, this loss could be made up within the year at the Basin scale, even if there were no re-allocation of capital or labour from the impacted activities.

However, these figures do not include the substantial activity and employment in the processing of food and fibre, nor the major sectors that exist to service both primary production and secondary processing, such as transport, light engineering, wholesale supplies and machinery sales. Taken together these represent a far greater percentage of the total Basin economy, particularly within some regional communities.

Furthermore, any change to irrigated agriculture is not applied equally across the Basin as a whole. It is concentrated in certain towns and locations where the reduction represents a higher percentage of local economic activity and employment. There is therefore a strong distributional effect. The community impact assessment indicated that the effects may be particularly profound in smaller and more irrigation dependent communities.

Figure 1-1 plots a range of communities within the Basin against two core parameters which are accepted as indicators of vulnerability:[7]

- size: with a threshold marked at a figure of 10,000 people; and
- dependency: with a threshold marked at 15% of total employment in agricultural related sectors,

where the size of the marker in the figure shows the estimated irrigation expenditure per head of population in the town.

[5] ABS/ABARE/BRS (2009), *Socio-economic context for the Murray-Darling Basin,* report for the MDBA
[6] Australian Government, 2008, *The Future of Rural and Regional Australia - Australia 2020*. Based on ABS, 2007, *Experimental estimates of industry multifactor productivity*. ABS Catalogue no. 5260.0.55.001
[7] John W Keller, 2000, *The Importance Of Rural Development In The 21st Century - Persistence, Sustainability, And Futures*. First National Conference on the Future of Australia's Country Towns, The Regional Institute Ltd.

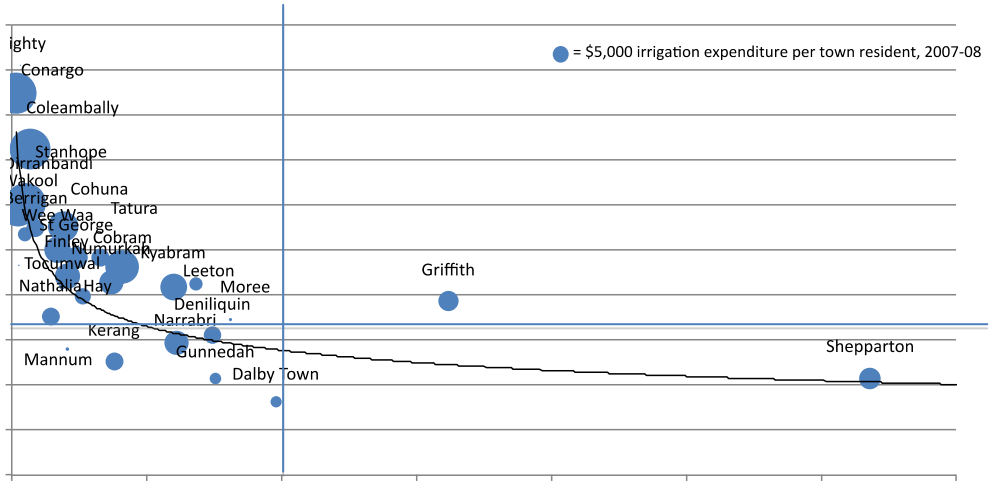


Figure 1-1. Risk factors for selected towns in the Basin.[8]

Figure 1-1 suggests that many of the communities assessed in this study are at risk from reduced water availability, as they are both small in scale and highly dependent on agriculture. In this figure, the percentage of employees strictly refers to all agriculture. However, in the relevant communities irrigated agriculture is predominant.

Clearly, the most vulnerable communities are those that combine all three features: small population, high dependency on agriculture and high irrigation spend per capita. However, even a larger town such as Shepparton may still be at risk as it provides significant services to a wide range of irrigation dependent communities across northern Victoria and southern NSW.

However, just because a community may be vulnerable to reduction in water availability, is not predictive that it will be affected in proportion to the overall reduction. Many factors will influence the outcome, including the scale of any proposed change, the location of willing sellers, the potential for irrigation system modernisation, the age profile of farmers, farm profitability and the capacity of communities to adjust. Possible outcomes may also be mitigated and transitions smoothed.

1.4 Objective of the project and report

As noted, the last one hundred years have seen a structural shift towards more intensive irrigated agriculture across the Basin. This expansion of irrigation has come at a cost to the environment, as a greater percentage of average surface water flows and ground water have been diverted. The Basin Plan would rebalance the relative allocation of water between consumptive use and the

[8] Source: EBC consortium analysis of ABS and ABARES data

environment. This implements the objectives of the *National Water Initiative* (NWI)[9] and the *Water Act 2007*.

Following on from the community impact assessment (Volume 3), the objective of this study has been to identify ways to help minimise the economic cost and social impact of the proposed Basin Plan for a given level of environmental outcome. There was a particular focus on reducing impacts and enhancing adaptive capacity in the most vulnerable communities.

This volume focuses on how to minimise the cost impacts of the proposed Basin Plan. It does not attempt to assess the benefits but recognises that the nature of the environmental outcomes sought and the character of the entitlements needed to achieve those objectives will affect the cost impacts.

It is helpful, in this regard, to distinguish between costs to irrigators and wider third party impacts. The NWI undertook to deal with change responsively and fairly, by:

- engaging water users and other stakeholders in achieving NWI outcomes; and
- addressing adjustment issues arising as a result of the NWI and MDB plan processes.

The direct costs of change for irrigators who sell their water are being addressed through the ten-year *Water for the Future* program, under which the Government has allocated $3.1 billion to the *Restoring the Balance in the Murray-Darling Basin* program, which is being used to purchase water entitlements from irrigators willing to sell. A further $5.8 billion has been allocated to generating water savings through investment in improved water supply infrastructure.

In the absence of third party impacts, this program could be considered to have met the commitment in the NWI to address adjustment issues. However, the community impact assessment (Volume 3) identified impacts — beyond those experienced by irrigators who sell — on suppliers, small businesses and other third parties. Current adjustment programs do not directly mitigate for these impacts and costs. Equally, investment in system modernisation generates positives outcomes for productivity and the local economy beyond the value of the water savings.

This report, therefore, focuses on the wider economic effects of alternative approaches (taking account of all potential impacts and benefits) rather than just a simple financial cost to the Budget. In contrast, many commentators have focussed solely at the $/ML cost to the Commonwealth Budget of water savings.

[9] In 2004, Australian governments agreed on a *National Water Initiative* (NWI). Under the NWI, they agreed to establish clear pathways to return all water systems to environmentally sustainable levels of extraction. This will ensure long-term environmental sustainability, while also creating greater certainty for investment and industry.

1.5 Options and opportunities

The *Guide to the proposed Basin Plan* was based on the understanding and analysis available at the time of its production. A similar suite of assumptions also informed impact modelling by ABARES and wider community expectations. These earlier explicit and implicit assumptions included that:

- uniform targets for end-of valley flows would be applied to each region;
- SDLs would be considered largely as average diversions;
- a pro-rata suite of entitlements would meet the environmental needs of most valleys;
- the range of water entitlements are broadly interchangeable, with reference only to their LTCE value;
- water trade will see entitlements move between sectors based on relative gross margins without reference to the security of supply;
- there would be a broadly consistent approach across both the northern and southern systems;
- buyback would be the major source of water for the environment; and
- the Commonwealth Environmental Water Holder would not participate in the water market trade in the water that it owns.

Since the Guide was published, there has been the opportunity to explore and develop a richer analysis of a number of the key issues and variables that will influence the socio-economic cost of the plan. This helps broaden the analysis away from a focus on the aggregate reduction sought, to an understanding of the choices available to better optimise outcomes.

In particular, there are several factors that may have material effects on the cost impacts of the Basin Plan. The analysis of these options provides the Authority and community with information about opportunities to meet the environmental outcomes required at a lower overall socio-economic cost. The policy options will also be material for any further development and refinement of the buybacks program and any potential future programs that might arise.

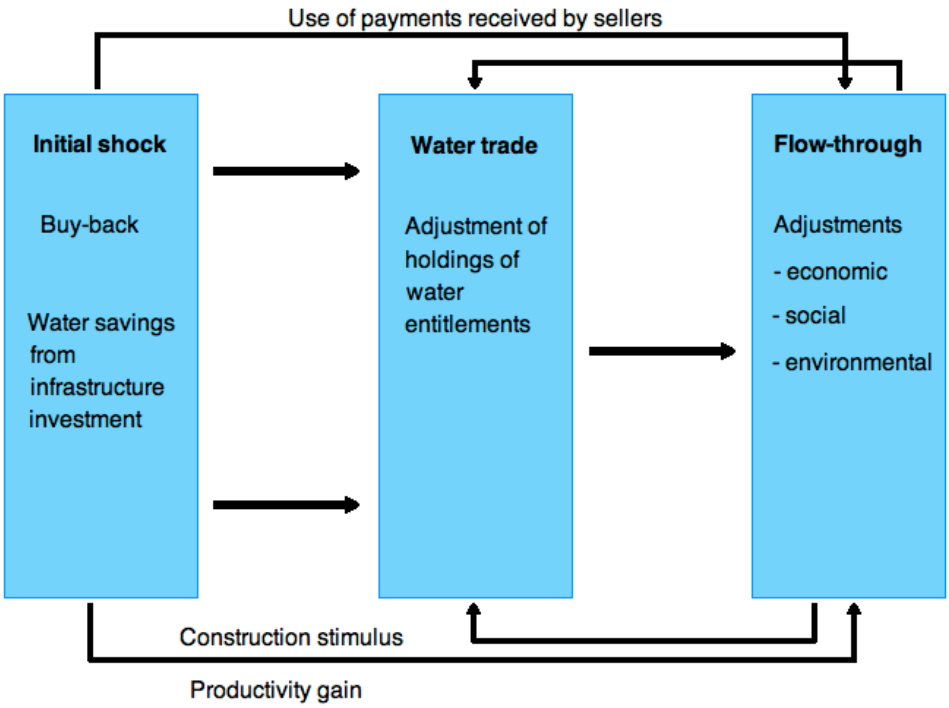
1.6 Analytical framework

The future impact of the Basin Plan on communities and economies can be separated into three stages (Figure 1-2):

- the initial impact of buyback purchases and modernisation investments by government;

- adjustment through trade as irrigators adjust their entitlement holdings to match the increased scarcity of entitlements available; and
- flow through, second and later round adjustments to the rest of the local, regional and national economy.

Figure 1-2. Conceptual stages of the impact and adjustment.[10]



This provides a useful framework to understand the significance of different factors and drivers in determining the impact of the proposed Basin Plan.

1.7 Community impact assessment

The community impact assessment (Volume 3) used several methods to inform judgments on the likely scale and distribution of the changes and impacts of the proposals in the *Guide to the proposed Basin Plan*. These methods included:

- on-ground interviews with key informants based on an assumption that there would be a pro-rata reduction in each class of entitlement equal to the overall reduction in the Guide for that valley;
- economic modelling undertaken by ABARES (Volume 2) based on a two stage process:
  - the relative change in water use for each irrigated activity in each region was simulated using the 'Water Trade Model'; and
  - the results and the capital inflows from buyback and modernisation investments were then used to populate the *AusRegion* CGE model to

[10] Source: EBC consortium analysis.

estimate the wider economic implications for the regions and the national economy; and

- developing an informed judgement based on the consortium's experience of the history of water use, farm operations and budgets, and water trade within the Basin especially during the recent drought.

The different methods generated different assessments of the possible socio-economic outcomes. The reason for this variance was that the outcomes were sensitive to the assumptions made, in particular to the assumption on the likely type of entitlement that would be sourced to meet the reductions required:

- for the 'community assessment' a pro-rata reduction was assumed across all entitlements types, regions and sectors, noting that this did not provide for adjustments through trade;
- the 'economic modelling' estimated impacts based on changes in water availability in an average year. This 'annual allocation' model makes no distinction between the type of entitlement or its security. The model results in the largest impacts being felt by annual cropping activities holding lower security entitlements such as those used for rice production in the Murrumbidgee; while
- the 'informed judgement' assumed that there would be a need for a high proportion of high security entitlement to meet environmental needs, which implied relatively greater impacts on dairy and horticultural growing areas.

The analysis identified that the socio-economic costs are likely to be greater where the method assumes that a larger proportion of the environmental portfolio would be comprised of high security entitlement (see Annex A for further details).

This recognition of the importance of assumptions in determining the extent of the cost impact of the Basin Plan triggered analysis of other wider assumptions and factors inherent in the *Guide to the proposed Basin Plan*, and that formed the major focus of this report.

1.8 North – South differences

The southern and northern parts of the Basin are markedly different across a wide range of variables:

- the valleys in the southern Basin are interconnected, with trade widely used to facilitate movement of water between irrigators in the three main sectors (dairy, rice and horticulture). It therefore needs to be considered as a single integrated system (see Volume 5). In comparison, the northern valleys are largely independent from one another;
- the southern system relies on large regulated public storages and irrigation districts – while the northern system relies more heavily on supplementary flows and on-farm storages;

- the southern Basin tends to have winter-dominated rainfall and historical reliability of rainfall from year to year – while the northern Basin tends to have more variable rainfall between seasons and a greater preponderance of summer rainfall;
- the southern system has been able to rely on large public storages and historically reliable rainfall to support the development of permanent plantings and dairy pastures;
- where, by contrast, the northern valleys have had to rely more on opportunistic annual crops that can be varied in extent from year to year. Irrigators are therefore more dependent on maximising yields and opportunities in years of high rainfall to off-set years with low revenues.

These differences influence how water is managed for irrigation and therefore how the proposed Basin Plan will impact and should be implemented.

1.9 Choices, options and opportunities

This volume examines factors that will have a material impact on the cost impacts of the future Basin Plan. The analysis of these factors provides the Authority and community with information on policy opportunities to meet the environmental outcomes required at a lower overall socio-economic cost. These opportunities may also be material for any further development and refinement of the *Water for the Future* program and any potential future programs that might arise.

The following chapters analyse the outcomes of this wider analysis:

- **Chapter 2: The impact of entitlements on costs:** this chapter reviews the characteristics and cost impacts of different entitlement types;
- **Chapter 3: Optimising acquisition:** this chapter assesses the costs and benefits of the different approaches available to acquire the environmental portfolio at least overall economic cost;
- **Chapter 4: Delivering outcomes at lower costs:** this chapter concludes that there is a suite of tools and mechanisms available that may achieve the same environmental outcome at lower socio-economic cost;
- **Chapter 5: Factors which mitigate adjustment impacts**: this chapter analyses policies that could be developed to help soften and mitigate adjustment impacts; and
- **Chapter 6: Process and governance: exploring 'localism':** this chapter reviews how to involve local communities in decision making and yet achieve the desired Basin-wide outcomes.

2 The impact of entitlements on costs

The characteristics of entitlements are significant in understanding the costs of implementing a Basin Plan and in developing an approach that provides an optimal balance between costs and environmental outcomes. The key insights are:

- different types of entitlement with differing levels of security appear not to be fully interchangeable;
- the type of entitlement acquired to meet the environmental objectives will affect the economic cost;
- the environmental watering plans will determine the mix of entitlements needed to deliver the environmental outcomes; and
- different mixes of entitlements will drive different levels of costs.

2.1 Entitlement security affects cost

Water entitlements are divided into differing 'classes' of security, where 'security' refers to the frequency with which water allocated under that entitlement is able to be supplied in full. Higher security entitlements have higher average and less variable yields than lower security entitlements.

Over a period of time a large volume of low security entitlement may generate the same average LTCE[11] yield as a smaller volume of high security entitlement. However, these holdings do not have the same value either for irrigators or for the environment. Many high value irrigation activities cannot rely on low security entitlements, as the likelihood of low allocations in dry years would create an unacceptable level of risk for their capital investment (e.g. fruit trees or vines). The same logic applies to high value environmental assets if they require watering every year.

Observed prices in tenders and the water market confirm that different categories of entitlements have differing market values for the same volume of LTCE. Irrigators' behaviour in trading entitlements and seasonal allocations, and the spectrum of prices for different reliability products with the same LTCE, indicate that low security entitlements trade at a substantial discount to high security entitlements and are not simply interchangeable.

Table 2-1 shows the average prices paid for entitlements by the Commonwealth through the tenders received up until March 2011.

[11] The long-term cap equivalence (LTCE) of an entitlement equates to the long-term average volume of water that could be expected to be provided by that entitlement, drawn from the historical time series of hydrological modelling.

Table 2-1: Relationship between prices for low reliability and high reliability entitlements, and their long-term cap equivalent yield

Region	Entitlement class	Average price to March 2011	Cap factor	$/ML LTCE
NSW Murrumbidgee	High security	2,400	95	2,522
NSW Murrumbidgee	General security	978	64	1,528
NSW Murrumbidgee	Supplementary	218	14	1,557
NSW Murray	High security	2,248	95	2,364
NSW Murray	General security	1,277	81	1,577
VIC Murray	High reliability	2,121	95	2,233
VIC Murray	Low reliability	199	24	829
South Australia	High security	2,242	90	2,491

Source: EBC Consortium analysis of data from SEWPAC

If the Cap Factors that underpin the LTCE are applied to the tender prices then, if those entitlements were broadly substitutable, we would expect to see an equivalence in price. However, we observe that high security entitlements command a significant premium, of approximately $1,000/ML.

This analysis indicates that high security entitlements are recognised to provide superior performance in terms of risk management in the face of seasonal variability, when compared with lower security entitlements.

2.2 Entitlement types are not fully interchangeable

a) Averages and LTCE

In contrast with the above analysis, the proposals in the Guide have been influenced by the concept of 'long term cap equivalence' with a focus on average diversions. Equally, to date, all economic modelling of the likely impact of the Basin Plan has been based on "*an annual water allocation model*", which makes no distinction between the types of entitlement when assessing likely responses to buyback or water trade.

Consequently, the economic models assume that "water is water" and that the choice and location of buyback purchases will be driven by the value of water in alternative uses in each region. The modelled outcome has been that:

- the purchase has mainly impacted on lower value activities such as rice and annual crops; and
- the location of the impact has been heavily in southern NSW in areas such as Murrumbidgee and NSW Murray.

Equally, economic modelling based on an annual allocation model assumes that water trade will facilitate adjustment between sectors with all entitlement types considered equivalent. This minimises the costs of buyback as it provides a mechanism to shift cost impacts from higher to lower intensity sectors,

irrespective of the relative security of the underlying entitlement that each sector tends to use.

Current economic modelling estimates impacts from an 'average' year using models based on annual allocations. This approach does not take account of the changes in longer-term investment patterns that would be likely to result from an increase in water supply variability. That increase in variability would be likely to result if the environmental manager increases the proportion of high security water it holds. In these circumstances, the investment in perennial activities would be likely to fall relative to annual activities. This would increase the estimated economic costs from reducing the level of water available for consumptive use.

These assumptions, combined with a lack of information about how the Basin Plan will affect variability of irrigation water supply (i.e., information about environmental water requirements in dry and wet periods) have influenced the estimates of the potential cost impacts for the Basin Plan.[12]

b) Longer-term developments

There are continuing developments in the water market that provide opportunities for entitlement holders to influence the relative security of their holdings. This applies in particular to the expansion of private carry-over rights and more sophisticated trading options.

For example, the security of lower security entitlements could be enhanced by extending the private right to carry-over an allocation to the following season. However, existing allocation regimes already involve complex decisions on the sharing of rights to the available resource within and between seasons. Increasing private carryover may create some economic benefits but may also reduce storage capacity and increase risks of spills. Individual irrigators will tend to lose water that spills whilst the environment may benefit from both carryover and spills. In the long-run, the overall security of the supply cannot be enhanced without reducing its average annual yield.

Seasonal allocations are, of course, guaranteed quantities and the temporary allocation markets do work on the basis that "water is water" — i.e., volumes of annual allocations to high and low reliability entitlements are equivalent once they have been allocated. However, the average level of allocation does vary across types of entitlement and therefore carry-over may only make a marginal difference to the value of low security entitlements in a run of dry seasons.

[12] In ABARE-BRS (2010), *Environmentally sustainable diversion limits in the Murray-Darling Basin: Socioeconomic analysis*, report to client, Canberra, October, it is recognised that 'If SDLs were to increase water supply variability, it is possible that this would, in the long run, lower the relative profitability perennial horticulture and encourage substitution toward annual cropping' (p. 5)

c) High reliability water has a higher intensity and opportunity cost

Farm budgets for irrigation show that dairy and horticulture are associated with higher incomes and higher variable costs than other irrigated farming activities. Furthermore, irrigated enterprises consistently spend a larger sum per hectare each year in purchasing services and inputs to their production from the regional economy than do dryland sectors. In addition, 'higher value' activities such as permanent plantings and dairy spend more than lower value sectors such as annual crops and rice.

Therefore, if the reduction in water available for consumptive use results in a relatively large reduction in high-value, high-intensity sectors, this would generate higher costs for the local and regional economy.

Table 2-2. Relative intensity of irrigated and dryland variable costs.[13]

Irrigated commodity	Income ($/Ha)	Variable Costs ($/Ha)	Variable costs, multiple of dryland	Irrigation (ML/Ha)
Fresh trellis tomatoes	$50,820	$46,509	186	6
Apples – packed	$57,667	$43,687	175	6
Apricots – Packed	$32,715	$17,614	70	6
Nectarines – Packed	$38,551	$16,602	66	6
Table Grapes	$17,682	$13,748	55	8
Winegrapes	$10,678	$ 5,252	21	6
Dairy	$ 6,416	$ 4,080	16	9
Surface Irrigated Lucerne	$ 3,833	$ 2,906	12	10
Maize (Grain)	$ 3,840	$ 2,312	9	10
Medium grain rice	$ 3,000	$ 1,465	6	14
Long grain rice	$ 3,145	$ 1,390	6	13
Oats (Hay)	$ 2,400	$ 1,073	4	3
Wheat	$ 1,485	$ 805	3	4

Therefore, there is a higher opportunity cost from the purchase of high security entitlement where this is currently held by sectors with higher value irrigated production and greater intensity of expenditure in the regional economy. The significant feature is that dairy and horticulture preferentially hold higher security entitlements as a risk management tool to be able to guarantee watering between seasons with variable rainfall.

Observation of changes in water use from year to year in response to higher or lower seasonal allocation levels indicates that water is used by different sectors following a sequence of priorities. Water tends to be used first by horticulture, second by dairy and third by rice and other broadacre activities, as larger volumes become available (Table 2-3).[14]

[13] MJA (2011), consortium briefing paper sourced from ABS and NSW Department of Industry.
[14] Source: EBC consortium from MDBA data in the Guide

Table 2-3. Relationship between irrigation activities and water availability.[15]

Water availability for diversions GL/y	Stylised relative level of industry activity		
	Horticulture	**Dairy**	**Rice**
< 2,000 GL	low	nil	nil
2,000 – 4,000 GL	medium	low	nil
4,000 – 6,000 GL	high	medium	low
6,000 – 8,000 GL	high	high	medium
> 8,000 GL	high	high	high

So for example, the rice sector would not generally be expected to access water in years of low allocation because most rice is grown with General Security entitlement and what limited allocation is available is more likely to be sold to higher value users than for rice production. In contrast, horticulture and dairy may need to hold a greater proportion of higher security entitlement in order to command this priority allocation in a year of low allocations. Therefore, purchase of high security entitlements seems likely to create a greater economic impact than purchase of lower security entitlements.

d) Implications

If environmental watering requirements mean that significant volumes of high security water need to be purchased, then this would be likely to increase the variability of aggregate irrigation water supply and imply a shift in production mix away from perennial activities and toward annual activities. This would tend to increase the overall economic costs compared with current and previous modelling results.

The location of the impact of the Basin Plan will also, in part, be determined by the mix of entitlements sought. Current modelling points to relatively more impacts on southern NSW. However, a portfolio of environmental water assets that has more high security entitlements would result in greater impact on dairy in northern Victoria and on horticultural areas across the Basin. Note that the Government so far has purchased a significant mix of entitlements, both low and high security, from catchments across the Basin.

2.3 The watering requirement will determine the type of entitlement

a) Issue

Environmental watering plans will specify how the environmental manager will seek to achieve the environmental watering objectives set out in the Basin Plan. These outcomes are likely to be complex and stochastic, varying from season to season and within seasons depending on a wide range of factors.

[15] Source: EBC consortium from MDBA data in Guide

The different outcomes sought and their watering requirements will determine the portfolio of environmental entitlements needed and so the socio-economic cost of removing that water from consumptive use.

This cost may not be linear to the volume acquired as the total costs will be influenced by the relative mix of lower and higher reliability entitlements - acquired in the buyback - as well as by the total volume. Finalising the proposals for the Basin Plan provides an opportunity to optimise trade-offs between the outcomes sought, the total volume of water acquired, the mix of different types of entitlement acquired and the cost impacts for the community.

b) Implications & opportunity

- the watering plan will determine the type of entitlement required;
- the detail of the watering plans is not yet known, but it is likely that they will involve complex patterns to reflect multiple objectives;
- different types of entitlement are not perfectly interchangeable, as guaranteed annual watering can only be delivered through high security entitlement; and
- the cost impact of the Basin Plan will be determined by the mix of acquisition mechanisms, the mix of the types of entitlement sought as well as the total volume required.

3 Optimising acquisition

3.1 Assessing the costs and benefits

The Commonwealth can use a range of mechanisms to acquire water for the environment, including:

- buyback of water entitlements, which could be untargeted or targeted;
- modernisation investment, which seeks water savings in irrigation systems; and
- on-farm investment in water savings.

These mechanisms will result in different costs to the Commonwealth budget for the acquisition of environmental water, but they all also generate third party effects. Therefore the assessment of these options needs to be cast in the wider frame of a cost benefit analysis rather than simply in the narrow frame of the budgetary cost of the purchase of the water.

3.2 The impact of buyback depends on the procurement schedule

a) Issue

The buyback of water entitlements is one of the major tools available to allow government to obtain additional entitlement to promote environmental watering requirements. The extent of the impact from that buyback will depend on the procurement strategy and schedule adopted.

Communities will require time to adjust and respond to any significant scale of water purchase, as this may involve businesses and individuals making major changes in their activity, employment and location. However, the current buyback procurement program is front-loaded, with most purchases scheduled for the next five years.

Other significant aspects of the buyback program are:

- buyback provides significant off-setting benefit to the individual seller;
- if buyback is relatively small in scale within a district then it can be a positive aid by helping promote restructuring and exit of smaller, less viable players;
- where buyback seeks to purchase a major percentage of the total entitlement within a district then the reduced overall production can have knock-on effects for the regional economy;
- if buyback is integrated with modernisation then it provides an additional incentive to promote change to create a lower cost, more resilient delivery system and facilitate wider water savings;
- if buyback is targeted then it may be able to generate multiple outcomes including reduction in salinity and retrenchment of irrigation from poor quality

soils. For example, a study in the Torrumbarry system, found that targeted reductions—as part of an integrated strategy that mitigates associated impacts—could lead to win-win outcomes with improved environmental and production benefits;[16]

- however, targeted buyback needs to be reinforced by permanent adjustments to delivery infrastructure otherwise water trading has the potential to unwind the locational benefits generated; and
- if watering requirements require high security entitlements then buyback will need to be targeted to obtain this portfolio.

Therefore the wider socio-economic cost impact of buyback depends on the procurement schedule adopted.

b) Implications & opportunity

- adjustment requires time. The speed and focus of the buyback procurement strategy and schedule has significant effect on its cost impact (Section 5.2);
- targeting of buyback can achieve multiple outcomes.

3.3 Investment in modernisation of delivery infrastructure

a) Issue

Investment in delivery system modernisation generates water savings from volumes previously lost through outfalls, leakage, seepage and meter under-registration. This investment may generate a high proportion of high security entitlement if the savings come from conveyance losses.[17]

Investment in modernisation generally has a higher budgetary cost than buyback in terms of the $/ML for the water savings generated. However, the investment may also generate wider economic benefits than the simple value of the water savings. Investment in system modernisation may generate the following benefits:

- maintaining or increasing existing productive capacity in the irrigation district. This avoids the third party impacts associated with buyback;
- delivery of higher levels of service which can promote greater productivity on-farm – enhancing the productive capacity of the regional economy;
- positive externalities from, for example, reduced accessions to groundwater with resulting salinity; and
- short-term construction benefits in the region from the works required.

[16] See Crossman, N., Connor, J., Bryan, B., Summers, D. & Ginnivan, J. (2009) *Reconfiguring an irrigation landscape to improve provision of ecosystem services*. CSIRO Working Paper Series 2009-07.
[17] Some smaller off-river schemes are metered at the river off-take and only hold low security entitlement.

The extent of these benefits in comparison to the modernisation costs involved will differ between locations and projects. In some cases the total economic benefits may be greater than the costs, but it is not known how many projects will demonstrate this positive outcome. The costs of recovering water this way are likely to rise quickly as the lower cost projects are completed.

b) Implications and opportunity

- investment in system modernisation may generate high security entitlements;
- the $/ML cost for water savings is generally higher than buyback;
- however, modernisation may also generate positive economic outcomes; and
- viable projects may therefore provide a cost effective means to acquire entitlements at lower economic cost.

3.4 Investment in water savings on-farm

Investment in greater water-use efficiency on-farm can also generate water savings. The security of the water saved will vary by industry sector, with savings in high value sectors expected to be predominately high security. However, it is recognised that there is not a large volume of efficiency savings to be obtained from most high value sectors.

The investment will also often promote greater productivity on-farm from enhanced water use efficiency, so once again the program needs to be assessed in terms of total economic costs and benefits.

There is a balance to strike in the sharing of any resultant water savings between the irrigator and government.

3.5 Comparing policy choices

Decisions in respect of the future Basin Plan therefore involve policy choices on the primary route used to acquire water for the environment, in particular the relative balance of investment between buyback and modernisation. The overall impact of the Basin Plan will also depend on associated policy choices for its implementation.

The preceding analysis identifies that any assessment of options should be framed in terms of a wider cost benefit analysis rather than a limited financial budget. The roll-out of the proposed Basin Plan and Water for the Future should therefore take account of the full costs and benefits when ranking alternative projects.

4 Delivering outcomes at lower costs

The third category of policy issues relates to tools and mechanisms that can be adopted to help deliver the same environmental outcomes but at a lower socio-economic cost to the community.

The following issues are explored further below:

- 'works and measures' could deliver the same environmental outcomes with lower volumes of water, and so less need to reduce water used for irrigation, and therefore with lower socio-economic costs;
- improved river operations could deliver the same environmental and consumptive outcomes with lower volumes and so lower costs; and
- improved use of carry-over and trade allows more of the portfolio of environmental water entitlements to be held as low security.

4.1 Works and measures may deliver outcomes at lower costs

a) Issue

The *Guide to the proposed Basin Plan* generally sought to generate environmental outcomes through raised overall flow rates in relevant river systems. High flow rates require acquisition of large volumes of environmental entitlements.

It may be possible to generate the desired in-stream needs of nominated icon sites through direct means rather than through raised overall flow rates. These means would rely on specific works and measures, such as the construction of levy banks, easements or pumps to provide the required flows. This may allow the same outcomes to be achieved, but with lower volumes and less secure entitlements.

It is well documented that works and measures applied to the icon sites can achieve reasonable watering at regulated flows using less water than would be required under natural flooding.[18] For example, the Mallee CMA in Victoria suggests that:

> *With the use of infrastructure the volume of water required to achieve maximum inundation of Lindsay Island is 92 GL. In the absence of infrastructure 1,000 GL is required to achieve the same inundation*.[19]

b) Implications and opportunity

- the use of works and measures may reduce the total volume required to achieve a desired environmental outcome;

[18] MDBC (2009), *Blueprints for the future of the Murray's iconic floodplains and wetlands,* Burns et al
[19] Mallee CMA (2009), *Submission to Murray-Darling Basin Authority Issues Paper.*

- the use of works and measures may also change the mix of entitlements required;
- both changes can result in a smaller economic cost impact;
- the approach may also reduce the budgetary costs, due to the saving in buyback involved;
- however, this approach fails to address wider flow requirements for the river itself, dilution flows or downstream needs such as the Murray Mouth.

4.2 Enhanced river operations can deliver outcomes at lower costs

a) Issue

Most rivers in the Basin (particularly in the southern Basin) are now highly regulated, with significant headworks, regulators, weirs and off-stream storages to deliver water for environmental and consumptive uses. Current monitoring arrangements and the levels of control are relatively simple.

Real time river operation and management tools provide river operators with greatly enhanced ability to measure and control required releases. More focussed and timely releases, controlled by better regulators down the system, can deliver the right volume of water to the right location at the right time, with potentially less overall water released from the dams.[20]

In addition, there is complexity in the types of water products held for the environment with both 'rules-based' water and environmental entitlements. Equally, multiple players across jurisdictions have roles in the use of that water. Good coordination and targeted delivery can maximise the value of the outcomes achieved for the volume held.

b) Learning & opportunity

- investment in more sophisticated river operations, flow monitoring and control systems holds potential for outcomes to be achieved with smaller volumes and lower losses;
- this would generate an efficiency dividend that is available to contribute to downstream outcomes;
- therefore smaller volumes may need to be acquired through other means and the mix could rely more on lower security and so lower cost entitlements.

[20] State Water (2011), *the Murrumbidgee Computer Aided River Management project*

4.3 Improved carry-over and trading products can reduce the cost of achieving outcomes

a) Issue

The introduction and extension of private rights to 'carry-over' allows unused allocation to be used in the following season. This policy gives allocations from low security entitlements some of the characteristics of higher security entitlements, as an allocation in a high rainfall year can then be shared over a number of the following seasons.

Existing allocation regimes already involve complex decisions on the sharing of a limited resource between different types of entitlement within and between seasons. Carry-over allows individuals to affect the availability of water across a limited number of seasons. However, the only way to enhance the long-term security of supply is to reduce the annual average yield. Enhanced carryover may also reduce the volume of storage available in season and increase the risks of spills. Spill management policies will tend to favour environmental entitlements as they will benefit from the opportunity provided by carryover and may also see increased environmental flows from spillage.

In a similar fashion, a range of water trading products are being developed that will provide a range of risk management options between seasons.

Both of these approaches may allow the same environmental outcomes to be met with a larger proportion of low security entitlement and so a lower economic impact than a reliance on high security entitlements to guarantee watering outcomes in a specific season.

b) Learning & opportunity

- Improved carry-over and trading products could allow a higher percentage of the environmental entitlement to be held as low security;
- this means that the same environmental outcomes could be met at a lower economic cost impact.

4.4 Conclusions

A suite of tools and approaches could be developed to allow the overall environmental outcomes to be achieved with lower overall volumes and/or use of lower security entitlements. These approaches could reduce the wider economic cost to communities.

5 Factors that affect the adjustment impacts

Once the overall design of the Basin Plan is finalised, there are a range of factors that may affect the flow-through adjustment impacts. These factors include:

- CEWH trading behaviour;
- the timing and pace of environmental water acquisition;
- the flexibility of labour and capital markets;
- use of buyback proceeds; and
- the potential for targeting of water purchases.

5.1 CEWH trading behaviour

The community consultations revealed concern that growers with permanent plantings would not be able to source the additional water they needed in dry years through the temporary water market if the CEWH were absent from the water market.

a) Background

The water market in the Murray-Darling Basin has grown significantly in recent years.[21] Water trading helps irrigators manage climate variability and storage limitations. In dry seasons, irrigators with lower-value crops may typically sell allocations, and in doing so gain cash injections which they can use to manage debt. Irrigators with higher-value crops may typically purchase allocations to maintain production and ensure that expensive assets are not lost.

In the southern interconnected Basin, all agricultural sectors rely on the ability to acquire water from other sectors in different seasons. For example, during drought:

- rice growers may cease production and sell their water allocations;
- dairy irrigators may sell entitlements to generate revenue to purchase fodder or additional water allocations to maintain production; and
- horticultural irrigators may purchase additional water allocations to maintain their long-lived assets (e.g. vines or fruit trees).

This trade has depended on the availability of a 'pool' of surplus allocation that can be drawn on by higher value users. One outcome of buyback could be to reduce the size of that pool as the volume is transferred into the Commonwealth's environmental water holding.

If, in dry years, the CEWH holds entitlements but does not participate in allocation markets, there would be a reduction in allocations available for trade.

[21] National Water Commission (2010). *Australian Water Markets Report 2009-10*, page ii.

This would increase the price of allocations. There is a risk that some irrigators may no longer be able to trade at these higher prices, thereby affecting their viability and management of the risks of seasonal and climate variability.

If, in wet years, the CEWH does not sell its allocations, and instead carries them over this may crowd-out the headspace in dams, increase the likelihood of spills and reduce the ability of irrigators to carry over water from year to year.

b) Issues Analysis

The Commonwealth has advised that the CEWH will engage in water trade. What is not so clear is how the CEWH will trade, and what its strategic objectives will be when trading water.

Two characteristics of the CEWH's portfolio are important: the size of the total holdings and the proportion of those holdings which are high or low security water.

The CEWH could seek to hold sufficient total volume of water that it could water under most circumstances, no matter how dry, or alternatively hold a smaller volume of entitlements with a greater proportion of high reliability entitlements. However, both of these options are expensive. By trading allocations, there is potential for the CEWH to acquire enough water to meet its environmental targets, but in a more cost-effective way.

Specifically, the ability of the CEWH to forego using water allocated in particular sequences of dry years could have a significant effect in minimising the socio-economic costs.

c) Opportunities

There is a need for the CEWH to make clearer to the public that it can and will trade. The CEWH also needs to articulate more clearly how it will trade. While the CEWH will hold 'normal' irrigation entitlements, it does not necessarily follow that the CEWH will trade those entitlements in a similar manner to irrigators. The irrigation community would benefit from a clearer understanding of the CEWH's objectives and intentions.

5.2 Timing and pace of environmental water acquisition

The community consultations revealed concern about the extent and speed of the proposed buyback program.

a) Background

The question of *when* water is acquired affects both the extent to which that water can be used to achieve environmental objectives, and the socio-economic impacts of using that water for the environment.

From an environmental perspective, water management needs to be adaptive: that is, trade-offs need to be made either in space (for different environmental assets) or time.[22] To facilitate this adaptive management, ecological outcomes need to be translated into environmental watering outcomes that may have different indicators across different timeframes.[23] These environmental watering outcomes will be set out in the *Murray-Darling Basin Environmental Watering Plan* and associated documents.

b) Issues

From a socio-economic perspective, the timeframe over which acquisition takes place is significant. A slower paced acquisition process may allow smoother, less costly adjustment, while speeding up infrastructure investment may boost regional communities, through injection of further capital. Generally speaking:

- the pace of infrastructure investment is already slower than buyback, due to the timescales involved in designing, approving and commencing major capital investments. Furthermore, communities stand to benefit from the stimulus effect of infrastructure investment;
- the pace of water acquisition through buyback, on the other hand, could be slowed down if an aim is to mitigate socio-economic impacts;
- a longer timeframe for water purchases may be preferable, as it helps farmers and communities with forward planning and allows technological change to play its part in minimising disruption[24];
- alternatively, water purchases might be preferable when the economy is growing strongly, particularly:
    - if that growth is concentrated in the value of agricultural production, so the income effects on irrigation communities of reductions in water availability would not be so noticeable; or

[22] Kingsford, Richard, 2010, *Environmental flows – how much and how do we manage them?* (In) Making decisions about environmental water allocations. Australian Farm Institute, June 2010.
[23] Norris, Richard, 2010, *How should Australia decide how much water in Australian rivers should be allocated to the environment, and how can the community be sure environmental water is being used efficiently?* (In) Making decisions about environmental water allocations. Australian Farm Institute, June 2010.
[24] Wittwer, G., 2011, *Water buybacks and drought in the Murray-Darling Basin of Australia: confusing policy and catastrophe*. Paper presented to the 14th Annual Conference on Global Economic Analysis, Venice, Italy, June 16-18. Centre of Policy Studies, Monash University.

- during periods of relatively high levels of allocation when water is not so scarce and therefore the opportunity cost of removing those entitlements and allocations is lower.

c) Opportunities

- the Environmental Watering Plan will determine when water is required, and with what degree of security. There is need for greater clarity in this respect;
- there may be scope to amend the requirements of the Watering Plan to minimise socio-economic impacts by amending the time frame for environmental outcomes; and
- the balance between infrastructure investment and buyback will be relevant in terms of timing and effects.

5.3 Flexibility of labour and capital

The community consultations revealed concern about the speed at which irrigation-dependent communities could be expected to adjust to a future with less water.

a) Background

Structural adjustment represents a continuing process of compositional shifts in the economy — that is, changes in the relative size of industries, in the characteristics of the workforce and in the size and mix of activities within regions. These changes are driven by the need to respond to external events, such as changing consumer preferences, technology, prices, policy, or the environment. The Basin Plan constitutes one such external event, as it will result in reduced water availability for irrigation consumption purposes in the Basin.

Structural adjustment is an autonomous process – that is, a process of individual firms and households seeking to maximise their operating objectives through the reallocation of scarce labour and capital in response to one or more external events.

Flexibility of labour, and capital mobility, are important factors in the adjustment process. Freer movement of labour and capital will allow the Basin economy to adjust more smoothly to a new equilibrium under which resources are used most efficiently. This will minimise longer-term Basin-wide economic effects, and longer-term social impacts.

'Stickiness' of labour and capital, on the other hand, will inhibit the efficiency of structural adjustment. This could result in greater adverse Basin-wide longer-term economic impacts, and social impacts.

b) Issues

Economic modelling has typically assumed that labour and capital can be reallocated quickly between uses and regions with limited loss of capital.

These assumptions may be realistic over the longer run and in economies with non-specialised labour. However, in the shorter run (over, say 3- 5 years) the ability of labour and capital to reallocate without friction may be constrained. For example, families may be reluctant to move between geographic regions immediately after moving out of agricultural employment, or it may take time for an agricultural worker to re-skill before gaining new employment. It may also take time to sell a house before moving regions to find alternative employment.

The ABARES modelling undertaken for the EBC consortium in February 2011 examined the effect of assuming little or no adjustment in capital or labour beyond the boundaries of the seven regions in the Basin. This somewhat extreme assumption could be indicative of the short run economic adjustments that could occur. The modelling (Annex A, Volume 4) indicated that, under such a scenario, there would likely be increased adverse impacts on employment and GRP in total and especially in regions where there is substantial buyback.

c) Opportunities

To maximise longer-term Basin economic and social outcomes, there is a need to develop a better understanding of the extent of capital and labour market 'stickiness', and incorporate stickiness into modelling and policy analysis.

There is a need to consider more specific adjustment programs, tailored to regional needs that take account of local characteristics regarding the flexibility of capital and labour. The adjustment process also needs to be managed so that it occurs at a pace and scale that communities can deal with.

5.4 Quantum of buyback proceeds and where they are spent

The community consultations revealed concern that capital proceeds from the buyback program may not be spent in the local area.

a) Background

Buyback is transferring considerable funds to willing sellers of water entitlements. The effect of the capital injection on local economies will depend on decisions taken by the seller on how and where to use that capital.

Much of the economic modelling has assumed benefits from the capital injections from buyback to off-set the negative impacts from reduced irrigated production.

b) Issues

The likelihood that not all sales proceeds from buyback will be spent locally is well understood, and that there is the potential for buyback proceeds to provide only limited benefit to local communities.

A range of assumptions have been adopted in the economic modelling to-date. Most commonly, the modelling assumes that the payment to the irrigator is used to pay off debt. This then frees up income equal to the previous debt servicing fees. This is often modelled as the equivalent of a 5% annuity of the capital sum. There is also an off-setting reduction in farm revenue associated with the reduced level of water available for irrigation.

To test the importance of this assumption, further modelling was undertaken for the consortium by ABARES (Annex A), which assumed that none of the buyback proceeds were spent in the local economy and compared the outcome with the assumption of the 5% annuity model.

The change was not material in the economic modelling, indicating that the additional stimulus from the buyback is small when compared with the impact on regional production and the role of the infrastructure modernisation program.

5.5 The Swiss-cheese effect

The community consultations revealed concern about the third party impacts from untargeted buybacks in irrigation districts.

a) Background

The 'Swiss-cheese effect' is a term used to describe the 'holes' in irrigation districts caused when some irrigators decide to terminate their irrigation delivery rights. Irrigation infrastructure operators may have to increase water delivery charges to remaining irrigators if the costs of maintaining the irrigation infrastructure operator's network are not reduced as demand for irrigation water delivery in the area falls.

Communities are concerned that untargeted buybacks will reduce the average level of water use efficiency, increase the operating costs for remaining farms, and reduce the ease with which system rationalisation can be implemented. There may also be additional third party effects (weeds, amenity etc) if the old farms are abandoned.

Perceptions about the extent and cost of the Swiss-cheese issue increases opposition to the development and implementation of the Basin Plan.

b) Issues

The Australian Government questions the extent of the Swiss-cheese effect arguing that:

- termination fees provide a medium-term measure to compensate system operators for loss of revenue;
- substantial investment in system modernisation helps system operators plan for and implement rationalisation programs to optimise future delivery efficiencies;
- the Government is encouraging irrigators to come forward with proposals for the coordinated purchase of water entitlements in a particular irrigation subsystem, combined with the shutdown of the subsystem; and
- while some irrigators may be selling up and moving away, the market should enable other irrigators to purchase their land and buy water on the market leading to 'hole filling'. However, the community interviews identified that much of the land taken out of irrigation remains abandoned and has limited value for dryland cropping.

Even if the Swiss-cheese effect is accepted, then the Productivity Commission argues against targeting of the buyback. They have concerns around attempts to pick winners and also the use of one funding stream to achieve multiple public

policy outcomes. They also recognise that targeting may be unwound if the water market is able to rebalance water within the region.[25]

However, a CSIRO team led by Crossman *et al.* (2009) has suggested that a more planned purchasing approach could return water to the environment, while at the same time not compromising the economic value of irrigated agricultural production.[26] In addition to the Torrumbarry investigation, the CSIRO-led team has undertaken at least five other investigations of rationalisation opportunities and benefits in the southern interconnected Basin. At least three off-river irrigation systems are currently investigating or progressing rationalisation opportunities.

Key informants identified a range of issues that may merit further exploration to improve uptake or inform program design:

- the extent to which a structured approach to infrastructure retirement can be implemented may be influenced by the irrigation water provider institutional arrangements. While private operators (corporations, trusts, etc) must operate on a consensus basis, State owned enterprises are able to identify where irrigation is a priority;
- irrigators and irrigation water providers may not have sufficient scientific information, particularly on surface and groundwater connectivity, to spatially identify where retirement would maximise the environmental and production benefits — however, note that Commonwealth funding to address this is available through the Irrigation Modernisation Planning Assistance program;
- state government legislative obligations to deliver water across a specific geographic area (i.e., mandated service areas) may impede rationalisation opportunities;
- system retirement projects seem unlikely to attract participants at market prices. Retirement transactions need to (at least) reflect the combined market value of entitlements, change in land value, stock and domestic water supply costs, and property reconfiguration costs;
- small schemes are better positioned to coordinate group retirement activities. It is challenging for schemes with large geographic footprints to fund and coordinate group retirement activities to mitigate the effect of a large reduction in diversion limits;
- will termination fees be adequate in response to a 50% or larger reduction in local diversions? As an example, would the termination fees set for, say, Coleambally irrigation be sufficient to cover the costs of system closure and (where relevant) remediation?[27] and

[25] Productivity Commission (2010). *Market mechanisms for recovering water in the Murray-Darling Basin,* pages 193-196.
[26] Crossman, N, Connor, J, Bryan, B, Summers, D and J. Ginnivan (2009) *Reconfiguring an irrigation landscape to improve provision of ecosystem services*, Socio-Economics and the Environment in Discussion, CSIRO Working Paper Series 2009.07, CSIRO Available at http://www.csiro.au/files/files/pqha.pdf
[27] Biggar (2010) has argued that allowing water delivery rights to be cancelled: "without fees or charges leads to inefficient trade in water markets, hinders efficiency on-farm investment in sunk complementary assets and leads to

- coordination of buyback and modernisation provides an opportunity to minimise costs by facilitating the closure of uneconomic spur channels with high water losses. This provides an opportunity to pay extra to those who are exiting where this results in reduced construction and/or whole of system costs.

c) Opportunities

There is a need for further analysis to:

- assess the extent to which environmental and production benefits identified by Crossman et al (2009) might apply across the Basin;
- understand and prioritise the multiple impediments to efficient early adoption of the Group Purchase scheme(s) and other approaches to targeted buyback and rationalisation;
- include specific funding for buyback as part of the infrastructure modernisation project and integrate programs to save costs;
- coordinate program delivery at the property scale so that individual irrigators can make robust business decisions taking account of buyback as well as off-farm and on-farm modernisation initiatives; and
- examine some issues of Swiss-cheese by estimating the increased unit costs of delivery systems and examining the reduction in production due to the increase in input costs, and the impact of termination fees and government spending programs on the extent of this issue. It would also be useful to examine the extent to which any Swiss Cheese effect is caused by other factors, including water trade and commodity price changes.

inefficient network rationalisation decisions. Instead, the revenue stream of irrigation operators should be insulated from water trade decisions, through high termination fees, tying irrigation charges to the land, or tagging the obligation to pay delivery charges to the new owner of the traded water". See Biggar D (2010) *Exit Fees and Termination Fees Revisited: Funding Irrigation Infrastructure in a Manner Compatible with Water Trade*, Australian Journal of Agricultural and Resource Economics, Vol. 54, No. 4, pp. 421-435, October 2010.

6 Process and governance: exploring 'localism'

6.1 A commitment to engagement

One of the key messages from the community engagement program for this study was that:

> *"Nobody asked my opinion."*

There was a common complaint that nobody had asked local people what they thought was reasonable when drafting *the Guide to the proposed Basin Plan*. The process was seen as being driven by Canberra, which was felt to be out-of-touch with life in regional Australia. The over-riding response from communities was that they wanted to be given a chance to be part of the process.

The Authority has given a commitment to engage local communities far more fully in the exercise in the future, particularly in developing implementation programs that draw on local knowledge and understanding. In a speech to the *Sustaining Rural Communities Conference* in Narrabri on 6 April, the Chair of the Authority emphasised the importance of working more closely with local communities to further develop the Basin Plan, and to reviewing opportunities to better align water purchasing, infrastructure, and environmental water management programs.

This section explores some of the issues surrounding this aspect of the proposed Basin Planning process.

6.2 Localism in the Context of the Basin Plan

There is a continuing tension between the desire to coordinate and control decisions at a central level and the recognition that local people need to be involved in those decisions, and have the capacity to be involved.

Localism describes the process by which central governments devolve responsibility and resources for policy making or implementation (previously undertaken centrally) to a local level, thereby providing the 'local' community with greater autonomy.

This is not an "either/or" decision but a judgment as to the extent of the relative roles of different players. Creating such relationships requires considerable investment and long-term commitment by both politicians and public servants at all levels, but especially at the highest levels. There is also a potentially large investment, particularly of time and energy, required from locals.

6.3 Authority and delegation

The Murray Darling Basin Commission (the predecessor to the Authority) and Ministerial Council confirmed the importance of community engagement for

program development and delivery. For example, the *Corowa Communiqué* in 2002 stated that:

> *The Community Engagement Strategy is designed to facilitate the incorporation of community values, knowledge and aspirations for scientific and technical knowledge in developing, determining and negotiating options for the recovery of water for the environment. It will adopt both a river reach by river reach and a Basin-wide approach, and provide for input from local stakeholders, the general community in affected regions and the public interest nationally.*[28]

This compares with the rather more narrowly drawn current objectives of the MDBA with regard to the Basin Plan:

> *The MDBA is engaging with people to help them understand the Basin Plan development process and to improve the plan itself. We have put this strategy in place to guide our engagement with a broad range of stakeholders during the development of the Basin Plan.*
>
> *Engagement will also be essential to implementing and reviewing the Basin Plan and MDBA will refine and extend the strategy to include more activities in the future.*[29]

This difference in emphasis reflects an inherent tension in agreeing an appropriate balance between localism and centralised decision making. The MDBA was provided with greater statutory authority than its predecessor in order to progress long standing challenges. That additional responsibility may have influenced its position in respect of delegating functions to a wider group of stakeholders. The MDBA's more recent acknowledgement of the importance of localism is indicative of the fine balance between the two end-points.

6.4 Benefits of Localism

The adoption of a localist approach to the development and implementation of the Basin Plan has the potential to address a number of concerns.

- Localism could engender a more productive dialogue between local knowledge and more formal knowledge and thereby generate a 'third' more integrative understanding and best practice.
- Localism gives formal acknowledgement that there are significant differences for water management between locations, especially between the northern basin with its separate terminal systems and the more inter-connected southern basin. Through a localist approach better solutions can be generated that take account of such specific differences.

[28] www2.mdbc.gov.au/nrm/water_issues/environmental_flows/corowa_communique__april_2002/
[29] MDBA (2009), *Stakeholder Engagement Strategy: Involving Australia in development of the Murray–Darling Basin Plan,* MDBA publication no. 46/09

- On-going dialogue at a local level can secure greater local ownership of the Basin Plan. This offers potential for an active role for local communities in identifying how these objectives can best be met within the specified timeframes and the social and economic impacts within those communities most affected by water reform.
- Localism gives Basin communities an opportunity to take greater control of the process and determine the use of funding available to deliver the reductions in extractions required in their catchment.
- Successful engagement will mean that community members are more likely to feel a sense of obligation to work within local decisions once made. Such commitments also offer more effective monitoring of community behaviour and greater effectiveness in the imposition of community-endorsed sanctions on those who violate community rules.
- Finally, the experience of working together productively can provide the basis for building trust between citizens and government at all levels.

6.5 Limits to Localism

While localism has the potential to maximize local involvement, ownership and expertise at a regional scale, it is not a panacea. Local solutions may not take sufficient account or be aware of Basin-wide imperatives or the requirements of neighbouring catchments. There can be tendencies within localism for place-based competition with little regard for the consequences of their actions on neighbours, a failure to appreciate the 'big picture', and the introduction of regional inefficiencies through the pursuit of localised interests.

Since Federation, inter-state conflicts over water sharing and extraction have proved intractable. These continue to be reflected in the responses to the *Guide to the proposed Basin Plan*, especially in relation to the Basin-scale decisions regarding flows for the Lower Lakes and the Murray Mouth. Localism may simply exacerbate such conflicts. Steps need to be taken to build a greater appreciation of the inter-connected nature of the Basin and to promote the ecological, economic, social and cultural value of a 'whole-of-Basin' approach.

There is no guarantee that local solutions will prioritise good environmental management or choose to invest in long-term economic development over other competing priorities or in the face of well-organised and powerful sectional interest groups. There is always a risk that unrepresentative minorities can capture local structures whilst other minority viewpoints are excluded. Local knowledge and 'know-how' whilst valuable should not be privileged any more than other forms of knowledge. Not all solutions generated at a local level are likely to be feasible or made taking sufficient account of the best available social and physical sciences.

6.6 An established approach

There have been numerous examples of state governments of different persuasions adopting localist strategies in water resource management. For example:

- *Commonwealth environmental water is delivered with strong cooperation between government and other organizations, CMAs and local community groups. This approach takes advantage of local knowledge and on-ground capacity to manage water. It ensures the Commonwealth delivers targeted local benefits, while maintaining a Basin-wide perspective.*[30]
- Water Sharing Plans in New South Wales are prepared under the NSW *Water Management Act 2000.* Fifty-three such WSPs are now in place, with a further 20 close to completion. The development of these plans involves significant community input and ownership into firm decisions on the future sharing of water resources within a catchment between users including the environment;
- Water Allocation Plans (WAPs) in South Australia are prepared under the *Natural Resources Management Act 2004.* WAPs provide certainty regarding rights to water both for environmental water requirements and economic development. They are developed through an exhaustive process of stakeholder engagement;
- in Victoria, the *Northern Region Sustainable Water Strategy* was based on deliberative engagement principles. This involved an 18 month collaborative process including Government, independent experts, key water industry stakeholders, urban, rural and environmental water users and the broader regional community. A Consultative Committee of regional stakeholders provided strategic guidance and oversight of the Strategy's development. The Committee hosted more than 75 briefings and meetings with local communities. Two public comment periods drew 135 and 177 submissions respectively. The final Strategy has been widely accepted by different interest groups across northern Victoria;
- Water Resource Plans in Queensland under the *Water Act 2000* detail the plan area, water to which the plan applies and what the plan aims to achieve, including outcomes for consumptive water use, as well as for the environment. Once again local communities and interested parties are intimately involved in the process, and their capacity to be involved was developed so as to enable local, knowledgeable decisions.

6.7 Steps in the Implementation of Localism

The Basin planning process has two broad objectives:

[30] SEWPAC, 2010, *Commonwealth Environmental Water: 2009-10 outcomes report,* p2.

- to ensure long-term sustainable diversion limits in order to implement the requirements of the *Water Act 2007* (Cth); and
- to address any social and economic impacts of reduced water for affected communities.

Implementing these objectives involves a complex set of interlocking stages and activities. Different agencies and groups could play different roles in each of these stages and functions:

- There are a suite of issues that may need to be retained at a higher-level. These include defining the strategic objectives of the Basin Plan, the overall water diversions for each catchment, and the level of resources available for buybacks, water efficiency improvements and socio-economic development;
- Setting the specific sustainable diversion limits for individual catchments would benefit from informed input from state, regional and local advisers, but also needs to be coordinated at a central level to ensure consistency and to generate Basin-wide objectives;
- There is advantage in CMAs and related state and local groups being involved in developing local environmental watering plans that will feed into the overall EWP for the Basin;
- Existing water sharing negotiating bodies, including the state agencies, could help craft entitlement portfolios that will keep socio-economic costs low and environmental returns high, identifying environmental works and measures that will reduce the total demand for water, and the scope for reducing other interceptions;
- Each catchment could be given the opportunity to develop a Catchment Plan to achieve the objectives within the catchment, as set out in the Basin Plan. These Catchment Plans would need to closely align to the State Water Resource Plans but may provide opportunities for more finely tuned and detailed catchment initiatives, such as proposals for works and measures to improve local environmental outcomes;
- Developing and implementing those plans at a local and regional scale could be delegated to local groups. They may be best placed to understand the opportunities available to achieve local outcomes at least cost through works and measures and improved river operations; while
- The most intensive work to be done at a local level will be in the small number of locations facing the highest socio-economic impacts and community transformation. Such activity may best be undertaken at a community level.

The critical issue, consistent with the principle of subsidiarity, is to devolve decision making arrangements in the Basin to the lowest level at which it can be supported, subject to the need for Basin-wide coordination. Devolution also depends on the scale at which there is the capacity to engage and contribute to decision making.

6.8 Establishing appropriate local governance arrangements

Governance arrangements would need to be agreed to enable local involvement in appropriate decisions. In some cases this may be based on existing agencies and structures and in others it may justify setting up new time-limited arrangements. In all cases the first principle ought to be that decisions be delegated to the lowest practical level, subject to the need for coordination.

a) Use existing organisations

There are advantages from building on existing organisations that are familiar at different levels of government, have an established track record, good lines of communication with government and have secured local community legitimacy, as well as proven protocols and procedures for conducting business. This means that they would have the capacity to engage and deliver with a degree of confidence.

Three existing bodies may be suitable vehicles for a localism approach:

- CMAs,
- Regional Development Australia committees; and
- local government.

CMAs have the advantage that they are an existing forum for the engagement of local stakeholders in regional NRM planning. The CMAs across the Basin have varying roles, experience and capacity regarding water resource management. Some, like the *South Australia, Murray-Darling Basin Natural Resources Management Board*, have direct involvement in developing Water Allocation Plans. By contrast, CMAs in some other jurisdictions have little direct involvement in such water planning and do not have the capacity to take on this role, as the central agencies have traditionally played the leading role.

RDAs have expertise in advising on impact and mitigation issues regarding the regional economy. In their current configuration, some RDAs may not have the full range of skills to help steer local engagement in the development of the detail of the Basin Plan at a local level.

It may also be unrealistic for some local governments to take on this task. Many would see this as too daunting a task, do not have the resourcing or technical skills, or may be simply disinterested in this particular issue.

b) Set up new bodies

An alternative approach could be to create new time-limited structures to assist in implementing the Basin Plan.

The advantage of this approach is that it may be possible to design the entity to match the task that is required, and align better the process and outcome with the outputs sought. This is the approach that was adopted in Victoria with the

development of the regional-scale Sustainable Water Strategies as it allowed a scale of coverage that was greater than that of any existing bodies.

However, this approach would also have risks because it would involve setting up new entities that would have little initial capacity and so would take time to establish. They would also overlap and potentially compete with existing entities such as CMAs and RDAs.

Annex A: Approaches to assessing economic impacts

A1. A Mixed Methods Approach

The consortium's approach to evaluating impacts of these elements was based on a mixed method approach. Mixed methods research is a class of research where the researcher combines a range of approaches in a single study. Mixed method approaches are favoured in many policy evaluations, and this approach is particularly common in evaluations that are conducted for governments.

This study used several methods to inform judgments on the likely scale and distribution of the changes and impacts of the SDLs in the *Guide to the proposed Basin Plan*. These methods included:

- on-ground interviews with key informants based on an assumption that there would be a pro-rata reduction in each class of entitlement in that region equal to the overall reduction in the Guide for that valley;
- examining the modelling assumptions and results for prior and new analyses undertaken by ABARES based on a two stage process:
    - the relative change in water use from buyback and trade for each irrigation activity in each region was simulated using the 'Water Trade Model'; and
    - the GVIAP results and the capital inflows from buyback and modernisation investments were then used to populate a CGE model to estimate the wider economic implications for the regions and the national economy;
- developing an informed judgement based on experience of the history of water use and trade within the region especially during the recent drought.

The three approaches generated different socio-economic outcomes. Analysis of the reasons for this variance confirmed that the outcomes were sensitive to the assumptions made, in particular to the assumptions on the likely type of entitlement that would be sourced to meet the reductions required. The cost impact was higher where the approached assumed a higher proportion of the environmental portfolio would be comprised of high security entitlement.

The three broad approaches are reviewed further below.

A2. Interviews based on SDLs in the Guide

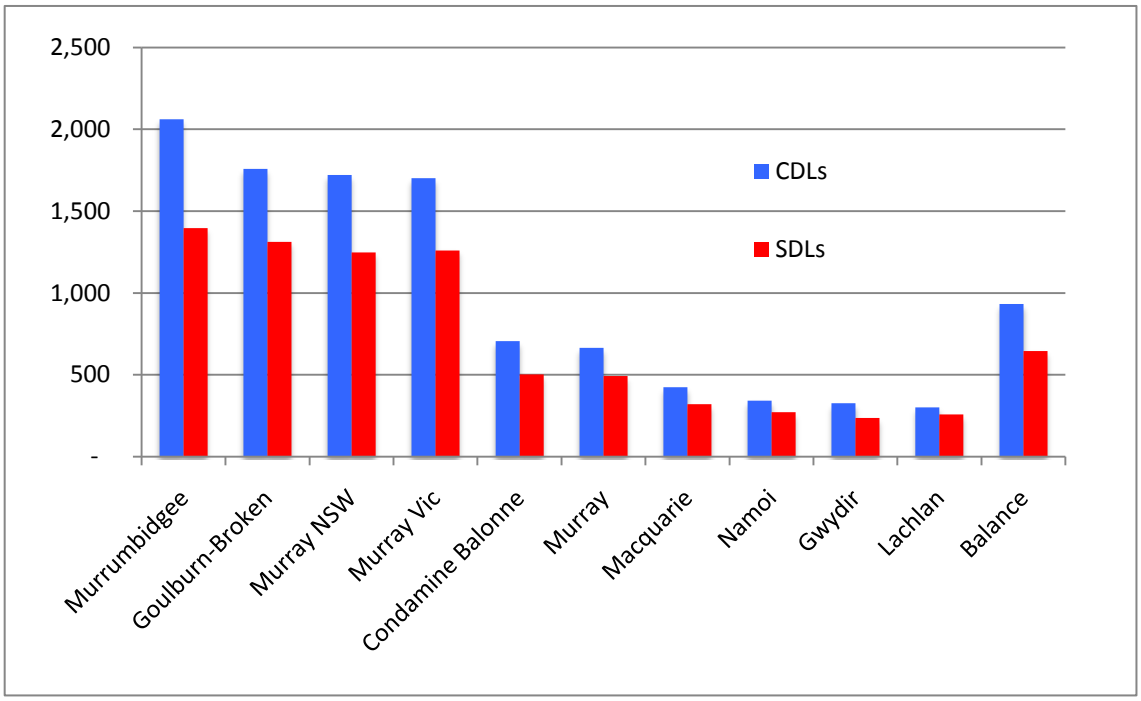
The first approach involved interviews at a community level with key informants. One of the key assumptions behind those interviews was that there would be an equivalent, pro-rata reduction in each of the entitlement types in the region based on the percentage reduction from the CDL to the SDL for the valley in question.

Under the Guide the large majority of the reductions needed to meet the SDLs were assumed to be in the four large irrigation districts in the southern systems:

- the Murrumbidgee;
- the NSW Murray;
- the Goulburn; and
- the Victorian Murray.

For these four regions the reductions required to meet the SDLs represent two thirds of the total reductions required across the whole basin at the 3,000GL scenario (Figure A-1). This reflects that 64% of the total current diversion limits are also diverted in these four catchments.

Figure A-1. SDL reductions by Region for 3,000 GL Guide scenario.[31]



Key informants considered that the scenario of a pro-rata reduction across all entitlement types within each region would generate a higher impact outcome with significant effects across regions and sectors, with the overall reduction in irrigated production resulting in a flow-on impact for the regional economy and social viability.

A3. ABARES modelling of water reductions and impacts

Economic modelling of the projected impacts was also commissioned from ABARES.[32]

[31] MDBA (2010), *Guide to the proposed Basin Plan,* Table 8.3.
[32] ABARES (2011) *Analysis of the impacts of the Basin Plan on irrigated agriculture in the Murray-Darling Basin*, ABARES report to client February. This is provided in the Annex to Volume 2 of this study.

a) Modelling approach and assumptions

The ABARES modelling is a two stage process:

- first, the relative change in water use from buyback and trade was simulated for each irrigated activity in each region using the 'Water Trade Model' to show, at a regional and sectoral scale, the changes in the volumes of water used that would then be used in each region and the consequential implications for the gross value of irrigated agricultural production (GVIAP) in that region; and
- second, the GVIAP results and the capital inflows from buyback and modernisation investments were then used in the CGE[33] model, *AusRegion*, to estimate the wider economic implications for the regions and the national economy.

The modelling commissioned for this study differed from previous ABARES modelling assumptions and treatments in two important respects:

- new assumptions on the implementation of the SDLs were considered. Specifically, the reduction in the diversions to meet the SDLs in the Guide were assumed to be met only from irrigation diversions (i.e., no contribution from urban and other sectors), which means that the percentage reduction in irrigation diversions was greater than the overall percentage reduction of total diversions for a region. This implies a larger shock for GVIAP and a different distribution across locations compared with the percentage changes shown in the Guide; and
- modelling assumptions were adjusted in the second stage to reflect possible short-term inflexibilities in labour and capital markets. Specifically, more restrictive assumptions were incorporated regarding capital and labour mobility. These assumptions were rather extreme to demonstrate the maximum possible impact from market inflexibilities and involved effectively quarantining movement out of any of the seven regions involved in the model.

Other assumptions remained unchanged:

- the model is based on annual water availability and use. There is no characterisation of entitlement types, and therefore "water is water" and there is full equivalence and substitution between entitlement types, i.e., there is no difference between high security and low security entitlements;
- there is no targeting of water purchases for either system rationalisation or for environmental benefits;
- water is assumed to be traded to higher value uses as indicated in gross margin returns on water input;

[33] 'CGE' stands for Computable General Equilibrium. A CGE model is a dynamic representation of the interaction between all sectors of society so that it is possible to estimate how changes in policy, technology or other external factors in one sector or location might impact on the economy across a wider region.

- water allocation decisions are first made at the regional level using the construct of a single representative farm;
- receipts from buyback are assumed to increase the net income of sellers of entitlement by a conservative 5% per annum of the capital receipts;
- the only adaptation options available are those represented in the baseline (there in no opportunity to introduce new technologies, crops or management practices);
- the prices of commodities reflect those of 2005/06 and these do not change in response to changes in the level of production;[34] and
- there is no productivity boost from the modernisation of irrigation systems as a result of the Commonwealth's expenditure of $5.8 billion.

In summary, compared with previous modelling the newly commissioned modelling from ABARES reflects larger reductions in water entitlements for irrigation. It is still based on a model of annual water availability and use and as such does not capture changes in long term investment decisions. It maintains the implied assumption of full equivalence between different types of entitlement and therefore of highly flexible trade, but assumes a much less flexible regional economy to adjust to these reductions.

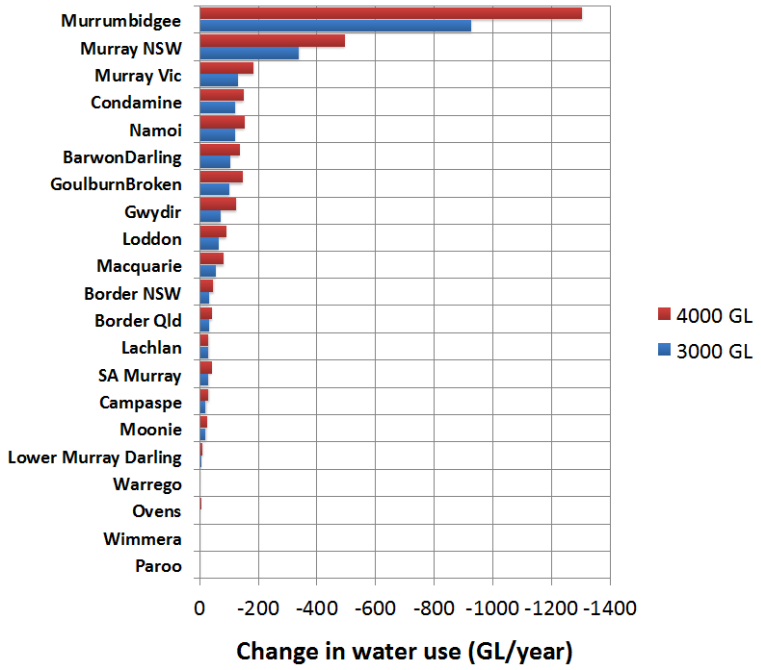
Compared with the results shown in previous ABARES modelling, the expectation therefore is that the results from the new modelling would reflect increased adverse impacts in total and greater adverse impacts on employment and regional product for those regions where there is substantial outward trade.[35]

b) Outcomes of ABARES water trade modelling

The outcomes of the first stage of the modelling are shown in Figure A-2. This indicates the forecast change in water use by region for both the 3,000GL and 4,000GL scenarios out to 2014-15.

[34] Tim Goesch, Ahmed Hafi, Sally Thorpe, Peter Gooday and Orion Sanders, 2009, *Climate change, irrigation and risk management.* http://www.abare.gov.au/interactive/09_ins/a3/ accessed 4 March 2011
[35] ABARE-BRS 2010 Assessing the regional impact of the Murray-Darling Basin Plan and the Australian Government's Water for the Future Program in the Murray-Darling Basin

Figure A-2. ABARES modelled change in water use by region, 2014-15.[36]

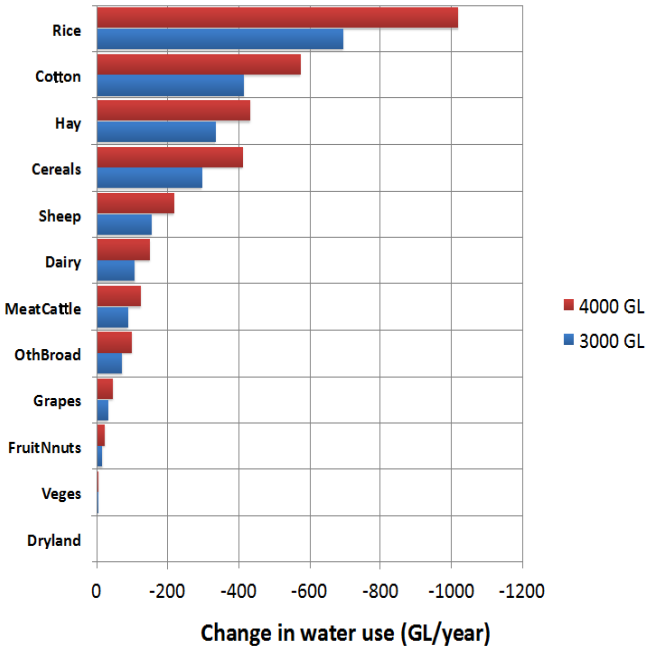


The figure suggests that the large majority of the reduction across the Basin would be realised from the Murrumbidgee region, as rice growers with relatively low gross margins sell water both to the buyback scheme and to enterprises across the Southern Basin which have higher gross margins.

Figure A-3 then shows the consequence of this change for water use by sector, with the large majority of the reduction occurring in broad acre annual crops such as rice and cotton.

[36] source: ABARES modelling for EBC consortium. Refer Volume 2 (Appendix).

Figure A-3. ABARES modelled change in water use by sector, 2014-15. [37]



Under this modelling approach, five regional commodities accounted for half of the buyback in both scenarios (Table A-0-1).

Table A-0-1. Regional commodities comprising half of environmental water recovery - GL, 3,000 and 4,000 scenarios, 2014-15

Regional commodity	3,000 GL scenario	4,000 GL scenario
Recovered (GL)	-2,220	-3,109
Murrumbidgee Rice	23%	24%
Murray NSW Rice	8%	8%
Murrumbidgee Cereals	7%	7%
Murrumbidgee Hay	6%	5%
Barwon Darling Cotton	4%	4%
Total	48%	48%

Source: ABARES modelling for consortium.

At the same time, seven regional commodities accounted for half the value of foregone irrigated agricultural production (Table A-0-2).

[37] source: ABARES modelling for EBC consortium. Refer Volume 2 (Appendix).

Table A-0-2. Regional commodities comprising half of foregone GVIAP,

Regional commodity	3,000 GL scenario	4,000 GL scenario
Total ($m)	-643.22	-915.4
Murrumbidgee-Rice	15%	16%
Namoi-Cotton	7%	6%
Gwydir-Cotton	5%	6%
Murray NSW-Rice	5%	5%
Condamine-Cotton	6%	5%
Murrumbidgee-Cereals	5%	5%
Barwon Darling-Cotton	5%	4%
Total	47%	48%

Under this modelling approach, the majority of the reduction in agricultural production would be felt in the Murrumbidgee region. Under this model the cotton sector is also affected in many of the northern rivers.

What is notable from the modelling results is the relatively limited impact anticipated for northern Victoria and dairy in comparison with the projections for the southern NSW regions and broadacre crops, and the very small impact on perennial horticulture.

This outcome reflects the simplifying assumptions built into annual allocation models which implies that all entitlements are equivalent. This has the implication that buyback in the model preferentially chooses low security entitlement as being the cheapest $/ML, which in practice means General Security entitlement used to grow rice in southern NSW. This effect is reinforced through the approach to water trade which assumes that any impact on other sectors is likely to trigger an adjustment with purchase of low security out of the Murrumbidgee and Murray to meet the needs of higher value sectors elsewhere.

Impacts estimated from an ‘average’ year using models based on annual allocations also do not incorporate changes in longer term investment patterns that would result from an increase in water supply variability. This variability is likely to increase as the proportion of high security water held by the environmental manager increases. In these circumstances, it would be expected that investment in perennial activities would fall relative to annual activities. This would increase the estimated costs.

At this stage it is not possible to determine the divergence between the scenarios modelled by ABARES and the ‘pro-rata’ or ‘informed’ scenarios, however some increase in costs could be expected. However, if the environmental watering plan requires a raised proportion of high security entitlement and so increases irrigation water supply variability significantly (as under the ‘informed’ scenario) then we could expect that the results of the current economic modelling would:

- over-estimate the impact on rice and other broad-acre crops and under-estimate the likely impact on dairy and horticulture, which will be impacted

when regions require higher security entitlement to generate environmental flow requirements;

- over-estimate the impact on the Murrumbidgee and under-estimate the likely impacts in northern Victoria and South Australia; and
- underestimate the total cost impact.

c) Modelled impacts on employment and regional product

ABARES' AusRegion model was then used to model two significant and simultaneous economic 'shocks': [38]

- one shock is the change in annual agricultural production as estimated from the results of the Water Trade Model;
- the second shock is the positive economic stimulus that is created by the inflow of funds from buyback and modernisation. Data on funding levels and timing was provided by SEWPAC and was consistent with that used in the previous ABARES report on this subject.[39]

AusRegion assesses impacts across seven regions in the Basin which means that small-scale impacts at the local community level will not always show, i.e., they might expect to be swamped by larger factors. This swamping is even more important when Basin level results are examined: irrigated agriculture accounts for less than 10% of the Basin's Gross Regional Product (GRP) and less than 5% of total employment.[40] As a consequence, changes in irrigated agricultural production have only a small impact on measures of economic performance when averaged across the regions or the Basin as a whole.

Under the 3,000GL scenario, by 2018-19, the combination of reduced agricultural output and increased capital investment in the regions results in:

- total Basin GRP falling by approximately $750 million per annum – this is less than 1% of total Basin GRP. As expected, the most significant reductions in GRP are observed in the Riverina where annual GRP falls by $230 million (i.e., one third of the total decline);
- total employment in the Basin falling by 0.5% (after increasing by around 0.5% for most of the decade during the construction phase for investments in irrigation modernisation); and
- household consumption in the Basin falling by approximately 0.4% (again, after increasing during the construction phase of modernisation).

[38] AusRegion treats the Basin as seven regions (Queensland MDB, Northern NSW, Riverina, Western NSW, North East Victoria, North West Victoria and South Australian MDB). These regions are significantly larger than the social catchment scale of the assessment and in the Riverina include major urban centres as well as adding together NSW Murray and Murrumbidgee.
[39] ABARE-BRS, 2010, *Environmentally sustainable diversion limits in the Murray-Darling Basin: Socioeconomic analysis*. Report to the MDBA. Canberra, October.
[40] *Op cit.*

In terms of the flow through impact on to the regional, Basin and national economies, the impacts on employment and national and regional domestic product are larger than for previous ABARES modelling, but still relatively small. This is hardly surprising since it is a direct result of the changed assumptions, i.e., the larger percentage reductions in water availability and the assumption of less flexibility in labour and capital markets.

These results from the CGE modelling of regional economic impacts would have been different if the inputs from the first stage Water Trade Model had made different assumptions about the likely impacts of the proposed SDLs.

A.4 Expert Judgment

The third approach to assessing impacts was based on the professional judgment and expert opinion from across the EBC consortium. This took account of the behaviour of sectors over the drought. It emphasises the lack of equivalence between low and high security entitlements and assumes variable purchases across types of entitlements.

This approach results in the following outcomes for types of entitlement and the extent and location of impact.

a) Low reliability

Experience of water trading and production decision-making would suggest the following likely responses for lower security entitlements:

- low reliability entitlements will be traded out of rice in Murrumbidgee and Murray, and out of dairy in the GMID;
- if the buyback program is designed to avoid arbitrage, then the market will see limited second-round adjustment moving water back into dairy from rice. The low reliability buyback will rationalise all those sectors that rely on General Security with no substantive market readjustment after buyback;
- entitlements will come out of irrigation distribution systems with no discernable pattern, from whichever sector is doing less well at the time. This assumes the buyback is not targeted and is not combined with a modernisation strategy that rationalises the irrigation systems;
- land impacted by buyback will be used for dryland farming or left unused. However, in general, it is marginal for dryland farming because of the low rainfall, the unsuitability of soils, and the cost of transforming an irrigation farm to dryland. This implies that much of the de-watered land may no longer have a productive use;
- in the longer term, low reliability water will move to whatever sectors face greater demand and higher commodity prices at the time. It is possible that some horticulture will buy low reliability entitlement as part of a water portfolio to manage climatic risk - owning more entitlements than required, together with a core of high reliability entitlements, in order to manage risk in respect

of dry years. This portfolio of entitlements would then be used in conjunction with mechanisms such as carryover, which may be effective in the first year or two of a dry sequence. This practice is already evident as an emergent trend in some areas.

b) High reliability

All the horticulture regions claim they will not sell entitlement, and that in net terms their region will buy entitlements. All believe their region has a unique strategic advantage over the others. However, this study suggests that significant high reliability entitlement is likely to come out of horticulture in the Riverland, Sunraysia and Murrumbidgee if the Commonwealth stands in the market to buy high reliability entitlement, and if it offers a fair market price.

Under this approach:

- 1,200 GL of high reliability entitlement seems likely to come out under the 4,000 GL scenario from horticultural and dairy enterprises, representing a third of all high reliability entitlement in the southern Murray Darling Basin;
- high reliability entitlements from the horticultural sector seems likely to come mainly from the older irrigation districts, the small blocks of the Riverland, Mildura irrigation districts, and the gazetted areas around Griffith and Leeton. It would likely be sold largely by people who exit the industry. Many will retire and move into town, or leave the district entirely. Most will sell their entire entitlement. Some may treat their entitlements as financial assets and trade their allocations;
- dairy will also be likely to sell some high reliability entitlement in the GMID, particularly in the west of the system where irrigated agriculture is more marginal; and
- entitlements are likely to come out of irrigation distribution systems with no discernable pattern, from whichever sector is doing less well at the time. This assumes the buyback is not targeted and is not combined with a modernisation strategy that rationalises the irrigation systems.

This outcome will create significant management challenges for the irrigation corporations that manage local systems, because:

- it is likely that it will not be economic to absorb horticultural land into neighbouring farms. Farmers wishing to expand are more likely to do so outside the small block irrigation areas where economies of scale are easier and cheaper to achieve;
- the retired horticultural land will raise challenges in terms of pest plants and animals and urban encroachment. This will also be an issue for some dairy farms;
- there will be flow on effects for higher water delivery and operational costs for horticultural and dairy users who remain; and

- there is a risk that some irrigation farm businesses may find themselves stranded, including some outside the small block irrigation areas who use water delivered through those systems.

A.5 Conclusion

The three different approaches generated different outcomes regarding the likely impact of the Guide.

These differences reflected the varying assumptions made about key aspects of the wider planning framework, in particular the character of the portfolio required to service the watering requirements of the different valleys.

The economic modelling, which was based on annual water availability and use and no explicit characterisation of entitlement types, estimates significant impacts in areas producing annual crops (such as rice in the Murrumbidgee) and much smaller impacts in regions predominately focussed on perennial activities.

An assumption of a pro-rata equivalent reduction across all entitlements types triggered reductions across all regions and sectors. However, this approach was effectively static and did not provide for adjustments through trade. While an assumption of a higher proportion of high security would trigger high value impacts in the dairy sector in northern Victoria and in horticultural growing areas across the Basin.