The Socio-economic implications of the proposed Basin Plan

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This document fulfils the requirement under s43A(3) of the Water Act 2007 (Cth) for the Murray–Darling Basin Authority to provide advice to each member of the Murray–Darling Basin Ministerial Council on the likely socio-economic implications of any reductions in the long-term average sustainable diversion limits proposed in the proposed Basin Plan.
Executive Summary

Background

The Basin Plan will provide an integrated and strategic framework for water management in the Basin. It ensures that sufficient water is allocated to the environment through setting sustainable diversion limits on the use of Basin water resources, which are consistent with an environmentally sustainable level of take.

In developing the Plan, the Authority has assessed the potential socio-economic implications through a comprehensive range of social and economic analyses, which make use of the best available scientific and socio-economic knowledge.

While the sustainable diversion limits are only one element of the Basin Plan, they—more than any other element of the Plan—will influence the overall scale of the socio-economic benefits and costs of implementing the proposed reforms. It is for this reason, that we have developed a transitional approach rather than introducing one cut all on one day.

It is also necessary to consider the social and economic implications of the Basin in the context of—and the effects of the Basin Plan abstracted from—the long-run economic, demographic and social changes occurring across Basin communities. In particular:

- agriculture, and the communities of the Basin that rely on it, have been undergoing significant change for many decades, and this has resulted in demographic and social pressures for some Basin communities;
- agriculture in the Basin has experienced large productivity improvements in recent decades, which are expected to continue; and
- international market conditions for agriculture are likely to improve and be favourable.

The Authority’s economic modelling has been peer reviewed to ensure that the best available science has been used in the Authority’s deliberations. KPMG reports that:

“The approaches employed to model the socio-economic impacts are considered to be appropriate … Overall, the MDBA has brought together an appropriately qualified and experienced set of subject matter experts, and has produced a set of informative studies that serve to provide important insights into particular components of the problem.”
Impacts on agricultural production

While some towns in the Basin may face more significant adjustment, the Authority has found that the overall impact on the Basin economy—flowing from reduced water available for irrigated agricultural production—is likely to be modest, at less than 1 per cent per annum.

The Authority considers that, in the context of a growing Basin economy, this reduction—spread over the period to 2019—is a scale of change that Basin communities in aggregate should be able to adjust to. This scale of change is likely to be less than natural growth in total Basin production—so, while production may be lower in 2019 than it would be without the Basin Plan, continuing productivity growth would result in production in 2019 still being higher than it is today.

• The modelled reduction in irrigated agricultural output as a result of the Basin Plan is in the range of 5–10 per cent, spread over the period 2007 to 2019—a change of less than 1 per cent per annum. In comparison, agricultural productivity growth over the last 25 years has been around 3 per cent per annum.

Employment implications

The impact on employment depends on a range of factors associated with the Basin Plan, including the extent of infrastructure investments to recover water and whether the receipts to farmers from water buybacks are reinvested in irrigated production or used to retire debt.

Under modest assumptions, employment should increase in the short term, mostly because of the fiscal stimulus that the Commonwealth’s $4.8 billion in infrastructure and water management is likely to generate over the period to 2019—estimates are in the range of a net 2,000–3,000 additional jobs.

The long-run impacts are the permanent effects on employment by 2019, once the Basin Plan takes full effect and the temporary government expenditures associated with implementing the Basin Plan have ceased.

• Without the Basin Plan, employment (excluding the ACT) is expected to increase on average by about 13,000 full time jobs per annum in the period to 2019—or approximately an additional 100,000 jobs created by 2019.

• In comparison, the scenario under the Basin Plan where buyback proceeds are not reinvested, indicates that the level of employment could be a total of 1,600 fewer full time jobs in 2019—an adjustment of less than 200 jobs per annum compared with the 13,000 jobs created each year.
Potential for more agricultural production with less water

The Authority’s vision is for a healthy working Basin. All of its economic analyses indicate that the overall economic effects of its proposed reallocation of water from irrigated agriculture to the environment are modest. Importantly, the main economic effect is likely to be to reduce the rate of natural growth in agricultural production for the period to 2019, after which, growth should be expected to return to trend.

- Historically, the long-run rate of agricultural productivity growth results in around 3 per cent more output every year on average with no change in factor inputs.
- In comparison, the scale of change from the Basin Plan is a total reduction in irrigated agricultural production in the range of 5–10 per cent—this translates to a less than 1 per cent per annum reduction in output on average to 2019, after which production returns to natural growth rates.

This finding—that the effect of the Basin Plan overall is likely to be to reduce the rate of natural growth in irrigated agricultural production for the period until around 2019—supports the Authority’s vision for a productive agricultural sector in the Basin. However, it also diverges from widely held community beliefs that the Basin Plan will severely damage irrigated agriculture.

Because types of agricultural production are distributed across the Basin in broad patterns based on regional economic, landscape, climate and historical characteristics, each irrigation-dependent community tends to have one or two dominant agricultural sectors. The question that community feedback has posed for the Authority is—do any of these particular characteristics lead to different conclusions about negative local economic impacts than are indicated in the macroeconomic results (with potential consequences for the vulnerability of different communities)?

When the Authority looks at the ability of different agricultural sectors to adjust through productivity improvements—particularly through increases in water use efficiency—it sees significant potential for most agricultural sectors to continue past trends of increasing production and value with less water use, albeit this growth may not be uniform year on year.

Of particular note, recent studies by the University of Melbourne (2012) used biophysical, production and economic models to calculate productivity, profitability and water balances, to design experiments in irrigated dairy, horticulture, dryland cropping and grazing, and irrigated cropping.

- Modelling and farming system experiments at Dookie indicate that, through changing dairy farming systems away from perennial pastures to annual crops and pastures, and improving irrigation efficiency, dairy businesses could achieve competitive profits even with only 33 per cent of historical water use. This can be compared with around 81 per cent of historical water use that will be available under the Basin Plan. Field trials are underway to further test these techniques, with promising early results.
- The techniques involve the innovative optimisation of a range of technologies, many of which are already in use by leading farmers—changes in pasture and crop types, including more use of annual pastures and summer active fodder crops; use of double cropping rotations; cropping decisions based on soil moisture; opportunistic summer cropping; use of technology-assisted irrigation; and changes to the timing of calving and milk production.
- The results also indicate that, while horticulture is already relatively efficient in the use of irrigation water, there are still significant potential gains through the use of automated irrigation technology to improve product quality and value, and to decrease labour inputs.

The Authority sees these types of results replicated by other researchers and in practice by leading farmers. Nevertheless, the 2015 review provides the opportunity to check that industry and community adjustment is occurring as the Authority expects.
Implications for irrigated agricultural communities

While the overall impact of the Basin Plan is expected to be modest, the Authority acknowledges that some communities will likely be more vulnerable to impacts from moving to the proposed sustainable limits on diversions. The Authority’s analysis has indicated that the following communities could be relatively more vulnerable to the Basin Plan:

- communities in the cotton growing areas of the Lower Balonne;
- the rice growing areas of the Murrumbidgee and NSW Murray;
- smaller dairying communities in northern Victoria; and
- horticultural communities in Sunraysia and the South Australian Riverland.

Based on the findings of which communities were relatively more vulnerable to reductions in water use in irrigated agriculture, the Authority commissioned a detailed study of local economic impacts for 12 case study local government areas. The potential short-term direct impacts were estimated, together with the potential flow-on effects for employment in other sectors of the local economy. The analysis indicated that:

- in general, smaller irrigation dependent local areas are likely to be more significantly impacted as a result of the Basin Plan;
- reductions in water extractions are likely to be accompanied by a decline in irrigated agricultural production (this effect will vary according to location);
- these declines in irrigated agricultural production will be slightly offset by an increase in dryland production;
- Commonwealth infrastructure investment is expected to significantly assist in offsetting job losses in both the short term and long term;
- the proceeds from water buybacks provide a small on-going benefit to local communities; and
- water trading and changes in commodity prices could substantially alter outcomes in different locations.

There are limitations in this type of local scale analysis and significant uncertainties around how the water market is likely to redistribute any reductions in water use—so the results are only indicative of the potential range of impacts rather than being predictive of particular impacts.

The Authority recognises that the impacts of the Basin Plan will be felt as a social as well as an economic issue. The experiences of many communities during the millennium drought illustrate the social impacts of very large reductions in water availability. While the Basin Plan is not like a drought—refer to page 19—it too could have social impacts if its implementation is not managed carefully.
Financial capacity and adjustment

The severe and prolonged millennium drought has resulted in many farmers in the Basin being under significant financial stress.

- Many farmers survived the drought on a combination of exceptional circumstances payments and off-farm income, and by running down farm equity.
- Some irrigators sold permanent water entitlements to keep debt levels down, and bought annual water allocations to continue irrigated farming.
- The average gross margin return on farm assets over five years to 2010 for horticulture, broadacre, livestock, dairy, and mixed farms was in the range of 2 to 3 per cent. When debt and interest costs are included, the average annual return on assets during that period was negative for the majority of farms surveyed.
- Since 1996, levels of farm average cash income have fallen significantly, and levels of average farm debt have increased substantially in most areas of the Basin.

For farmers in many areas of the Basin, the millennium drought was broken by two years of flooding, and this has exacerbated their financial difficulties. Compounding these financial pressures have been weak farm gate commodity prices, in particular for citrus and grapes. This is relevant when considering the implications of the Basin Plan.

- Irrigators who are under severe financial stress will have limited access to resources—particularly financial capital, time and emotional capital—in order to adjust effectively to a future with less water available.
- However, the Basin Plan is accompanied by significant financial resources allocated by the Commonwealth that facilitate the adjustment process. In particular, the Water for the Future program provides:
  - joint funding for investments which promote increased on-farm water use efficiency;
  - funding for large scale irrigation infrastructure investments that will improve the efficiency of water use, particularly for those irrigators who are part of open channel irrigation networks; and
  - access to an additional source of capital through the buybacks program, whereby irrigators can sell all or part of their water entitlements in order to reinvest in their business or restructure their finances.
**Socio-economic benefits of the Basin Plan**

While the irrigated agriculture sector will need to adjust to a future with less water available, many sectors of the economy are expected to benefit from the Basin Plan. In particular, the environmental benefits which are likely to flow from the reallocation of water to the environment are expected to lead to increases in socio-economic benefits for a range of industry sectors and other stakeholders, and these will offset the socio-economic costs flowing from less irrigated agricultural production.

CSIRO (2012) calculated the value of a diverse range of socio-economic benefits across the Basin, which stem from improved environmental condition—refer to Figure 2—including estimated annual benefits from:

- fewer blackwater events in the range of $5–10 million;
- recreation benefits from fewer cyanobacterial blooms in the range of $5-11 million;
- reduced incidence of acid sulphate soils worth $9 million;
- reduced risk of bank slumping worth $24 million; and
- increased tourism worth $124 million in the Murray–Lower region (Coorong) and $38 million in the Murray–Middle region (Barmah–Millewa Forest).

Water salinity affects all urban and industrial water users throughout the Basin. For the agricultural sector, significant cost impacts begin to appear for users located downstream of Swan Hill. The reduction in salinity from increased flows under the Basin Plan is estimated to provide a benefit of approximately $10 million per year.

There are broad benefits to irrigation businesses and communities from increased certainty about the availability of water and the rules governing its availability. They will be able to make planning and investment decisions with more confidence that governments are managing and allocating water on a sustainable basis. This will reduce risk and encourage investment.

The Basin Plan will provide a framework for consistent and comprehensive water trading rules. This will ensure that all market participants have the same rights and are confident of their rights regardless of where they are trading.
The Authority has commissioned further studies of the benefits from the flow scenarios resulting from the proposed Basin Plan to:

- floodplain grazing and cropping;
- recreational and commercial fishing; and
- recreational boating.

These studies are due to report by the end of June 2012.

**Transitioning to the Basin Plan**

The Authority acknowledges community feedback on its *Guide to the proposed Basin Plan* (MDBA 2010) that Basin communities would not have been able to adjust to a large change in water availability within the short timeframes implied in that document.

The Authority considers that governments can act to minimise the socio-economic implications for vulnerable communities, through careful management of the implementation of the Basin Plan.

Underpinning this smooth adjustment process, the Authority is proposing a seven-year transition period between 2012 and 2019, with a review point in 2015. This will provide opportunities for:

- further improvements in scientific knowledge to inform possible refinements to the Basin Plan and the SDLs, as new evidence may support changes to the SDLs;
- governments to take actions and examine potential policy opportunities that could mitigate the social and economic impacts of the Plan and ease the transition to new SDLs; and
- communities to plan for their own futures, and to successfully adjust to less water available for their irrigation purposes and more water available for their environment.

Given time, communities can be highly adaptive and innovative when appropriately informed and equipped with the right tools and assistance. The Authority’s intention is to work with Basin communities to assist them in that endeavour.
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1. Introduction

1.1 The Basin Plan

The Basin Plan will provide an integrated and strategic framework for water management in the Basin that will:

- define Basin-wide environmental, water quality and salinity objectives;
- ensure that sufficient water is allocated to the environment, through setting sustainable diversion limits (SDLs) on the use of Basin water resources which are consistent with an environmentally sustainable level of take (ESLT);
- define a Basin-wide consistent framework for water trading; and
- provide for continuous improvement in the adaptive management of Basin water resources, through monitoring and evaluation, and investment in knowledge and information.

1.2 Sustainable diversion limits

The Water Act 2007 (Cth) requires that SDLs for Basin water resources reflect an environmentally sustainable level of take (ESLT). In compliance with legislative requirements, the Authority determined an ESLT for surface water and ground water in the Basin.

- The methodology used to determine the ESLT for surface water is described in detail in the documents The proposed “environmentally sustainable level of take” for surface water of the Murray-Darling Basin—method and outcomes report (MDBA 2011a) and Hydrologic modelling to inform the proposed Basin Plan: Methods and results (MDBA 2012a).
- The report Groundwater Baseline Diversion Limits and Sustainable Diversion Limits (MDBA 2012b) summarises the broad methods used to determine the groundwater SDLs. More recent work by the Authority has resulted in a more conservative application of these methods and, as a result, a lower groundwater SDL across the Basin.

At a Basin-wide scale, the Basin Plan proposes a long-term average SDL of 10,873 GL/y for surface water.

- This comprises 3,468 GL/y in the northern Basin and 7,405 GL/y in the southern Basin. Relative to a June 2009 baseline, this SDL represents a Basin wide-reduction in consumptive use, and an increase for environmental purposes, of 2,750 GL/y.
- The Authority considers that, in recovering 2,750 GL/y of water to reach the proposed SDL:
  - 2,360 GL/y should be sourced from the southern Basin, of which 1,389 GL/y is to meet the local in-catchment environmental water needs, and 971 GL/y is to meet
shared downstream environmental water needs for the Murray (and could be sourced from a number of southern catchments)

- 390 GL/y should be sourced from the northern Basin, of which 247 GL/y is to meet local in-catchment environmental water needs, and 143 GL/y is to meet shared downstream environmental water needs for the Barwon–Darling (and could be sourced from a number of northern catchments).

The Authority has determined a proposed SDL for ground water of 3,184 GL/y. The proposed SDL can be compared to a Basin-wide baseline diversion limit (BDL) which represents the Authority’s determination of the limits on groundwater use under existing water management arrangements. The baseline diversion limit is 2,373 GL/y.

1.3 Socio-economic implications of the Basin Plan

While the SDLs comprise only one element of the Basin Plan, they—more than any other element—will influence the socio-economic implications. The Authority has assessed the potential implications through a comprehensive range of social and economic analyses, which make use of the best available scientific and socio-economic knowledge.

The Authority’s assessment of the social and economic implications of the Basin Plan for the irrigated agricultural sector is described in detail in its November 2011 synthesis report Socioeconomic analysis and the draft Basin Plan—Parts A and B (MDBA 2011b; c). The Authority has also undertaken further analysis since November 2011. This has included further analysis of agricultural productivity, and new commissioned work, notably a report by the CSIRO on the benefits of the Basin Plan (CSIRO 2012) and three new projects (currently underway) to assess the benefits of the Basin Plan for specific industries.

This report focuses on the implications of the SDL option proposed in the Basin Plan for surface water. This surface water SDL represents a Basin-wide reduction in consumptive use of 2,750 GL/y, relative to a June 2009 baseline.

- Note that for the purposes of economic and hydrological modelling, water recovery of 2,800 GL/y was used. Many of the benefits and costs are not of sufficiently high precision to be able to discern a significant difference between 2,750 GL/y and 2,800 GL/y.

This report includes information about the following socio-economic implications:

- the macroeconomic implications of reducing the water use for irrigated agriculture by 19 per cent as part of recovering 2,750 GL/y for the environment;
- the local economic implications for agriculture and the flow-on effects, based on strict assumptions about how the catchment scale effects are distributed to local areas; and
- the socio-economic benefits for industries which benefit from improved environmental condition.

This purpose of this report is to report on the likely socio-economic impacts of reductions in long-term average SDLs proposed in the Basin Plan. As the proposed Basin-wide groundwater SDL represents an increase over baseline diversions, the Basin-wide
implications of the groundwater SDLs are not assessed in this report. While there are two groundwater SDL resource units in which the SDLs proposed in the Basin Plan represent a reduction from baseline diversions, these reductions will not have a material socio-economic impact and are also therefore not considered further.

- In the Queensland Upper Condamine Alluvium groundwater SDL resource unit, an SDL of 86.5 GL/y is currently proposed, relative to a BDL of 126.9 GL/y. Consumptive use in this resource unit is already managed by the Queensland Government to the volumes specified in the Basin Plan, and there are no anticipated changes in use patterns as a result of the Basin Plan.

- In the Victorian Goulburn–Murray: Sedimentary Plain groundwater SDL resource unit, an SDL of 199.4 GL/y is currently proposed, relative to a BDL of 203.5 GL/y. The proposed reduction from 203.5 GL/y to 199.4 GL/y is not significant. Furthermore, consumptive use in this resource unit has not exceeded 60 per cent of the BDL.

1.4 Alternative modelling

The Authority notes that some organisations have commissioned their own modelling of the economic costs, which suggest there may be larger economic impacts than those estimated in reports commissioned by the Authority.

The main reasons for this relate to differing assumptions between the reports. For example, impacts will appear to be larger if it is assumed that:

- 100 per cent of water required to meet SDLs is recovered by buy-back (when in fact, a considerable portion is being recovered through infrastructure improvements);

- all water recovery is yet to occur (when in fact, the target has been half achieved already);

- water continues to be used in fixed proportions with other inputs (with no substitution between water, land, labour, capital, materials and services);

- there is no trading of water between industries or between the water resource planning regions (which might include farmers in one area selling temporary water allocations to farmers in the same area or other areas as a source of income in low allocation years);

- when farmers sell their water entitlements to the government, they sell all of their entitlements and exit the industry altogether;\(^1\) or

\(^1\) Recent studies have found that many irrigators who have sold their water entitlements to the Commonwealth sold only a portion of their entitlements, or sold entitlements but retained delivery rights. For example, the ACCC (2012) found that of the 878 GL sold to the Commonwealth in 2009–10 and 2010–11, irrigators terminated their delivery rights for only 188 GL (or 21 per cent) of their sold entitlements. The ACCC concluded that irrigators were preserving the option to irrigate and farm into the future, by meeting their water needs through the temporary water market.
• a proportional impact on irrigated agriculture flows through to an equivalent proportional effect on the size of the Basin economy and employment.

The Authority does not agree with many of the assumptions used in some independent modelling.

1.5 Environmental benefits

While the focus of this report is on the socio-economic implications of the Basin Plan, there are substantial improvements in environmental outcomes for which socio-economic benefits cannot readily be quantified, that are not covered in detail in this report.

The anticipated environmental outcomes of the Basin Plan can be evaluated by modelling the improvements in hydrologic flow regimes that can be achieved by the proposed water recovery, and then using understanding of the links between flow and ecology to estimate the likely environmental outcomes. The environmental outcomes at each site will depend on factors such as the current environmental condition of the site, future climatic conditions, priority setting through the environmental water planning process (that will include local input into the adaptive management of those sites), and other threatening processes that may exist at some sites, such as some land management practices and the impacts of invasive plants and animals.

Anticipated environmental outcomes at indicator sites associated with the Basin Plan are shown in Figure 1. These were derived by:

• proposing flow indicators (of specified magnitude, duration, timing and frequency to provide low flows, freshes, bankfull and overbank flows) to meet ecological targets for indicator sites, drawing on scientific research, observations of outcomes from past flow events, and analysing historical flow patterns (refer MDBA 2012c);

• modelling the capacity for the proposed water recovery under the Basin Plan to achieve the frequency of flows associated with those flow indicators (refer MDBA 2012a); and

• using understanding of the links between flows and ecosystem responses to estimate the magnitude of improved ecological outcomes (this process is summarised in MDBA 2011a).

As illustrated, the extent of the possible outcomes at each of the indicator sites varies across the Basin.

In the southern basin, the anticipated outcomes include:

• The ability to reinstate freshes and low flows where required to maintain water quantity and quality in drought refuge pools, and support instream process such as fish migration and spawning, inundation of instream habitats and carbon/nutrient cycling.

• The ability to reinstate more frequent and variable ‘bankfull’ flow events which will maintain healthy streamside vegetation such as river red gums and river cooba.
• The ability to reinstate more frequent and variable flow regimes to provide healthy wetland habitats and support the role that these systems play in the productivity of the river system more broadly - for example providing breeding and feeding habitats for birds and fish, and carbon/nutrient inputs to support instream productivity.

• The ability to reinstate more frequent and variable flow regimes to water low level floodplain vegetation communities such as red gum forests and woodlands, to maintain the health of these communities and the important role they play in the productivity of the Basin’s rivers.

• The ability to inundate mid and high level floodplain communities is limited by flow delivery constraints such as dam outlet capacities and the inability to flood private property. Consequently in much of the southern basin, flows for these habitats do not significantly improve and will continue to occur in response to large rainfall events in relatively wet years. In parts of the southern basin these habitats are in declining health and transitioning to more flood tolerant vegetation communities (as compared to flood dependent vegetation). There may be opportunities for works and measures to overcome some delivery constraints to improve the ability to water mid and high level floodplain communities in the future. These actions could deliver substantial benefits to these vegetation communities, but further cost-benefit analysis and consultation with stakeholders and communities is required.

There are occasional anomalies where environmental outcomes differ from the summary above. For example in locations such as the River Murray near Barmah-Millewa forest, instream outcomes will be limited by river regulation for consumptive supply affecting the pattern of flows, reducing instream flow variability and increasing flows in summer when flows were naturally low. Another example is the Lower Murrumbidgee where MDBA environmental flow indicators target the delivery of water to the operation of the existing environmental regulators. This enables efficient watering of large areas of wetland and floodplain habitat, but has some trade-offs in delivering outcomes for some parts of the environment, such as near-channel habitats along the Murrumbidgee River. Evaluating the benefits and trade-offs associated with environmental works and measures will be an important consideration in the 2015 review.

**In the northern basin** there is greater variation in outcomes, owing to differences in water management arrangements, and greater challenges in delivering targeted environmental water due to the unregulated nature of the rivers. As an example, in the Lower Balonne the ability to influence instream flows such as freshes is limited by water sharing arrangements and associated access rules to instream flows, rather than the volume of water to be recovered. In much of the northern basin high flows are less affected by consumptive use due to the unregulated nature of the rivers.

A summary of estimated changes in condition based on the proposed Basin Plan is presented in Figure 2, drawing on the assessment by CSIRO (2012), together with some additional outcomes from MDBA analysis. The CSIRO analysis supports the flow and ecosystem responses at each of the indicator sites, as illustrated in Figure 1.
Figure 1: Anticipated environmental outcomes at hydrologic indicator sites of the proposed Basin Plan
Figure 2: Estimated changes in condition based on the proposed Basin Plan

**River Murray**
- 27% increase in area of Red gum watered 1 in 2 years
- 54% increase in area of Black box watered 1 in 5 years
- 72% increase in area of Licinmara watered 1 in 5 years
- 25% reduction in blackwater risk
- 48% increase in fishery areas in lower Murray to support fish migration and recruitment
- 56-70 EC decrease in the long-term average salinity of the River Murray

**Coorong, Lower Lakes and Murray Mouth**
- 46% reduction in peak salinity in South Lagoon
- No occurrence of degraded hypersaline and reduced occurrence of unhealthy marine ecosystem states
- Large increase in mudflat habitat availability in South Lagoon for migratory waterbirds
- 56% increase in bird breeding events
- Risk of large-scale acidification minimised
- Lower average and peak lake salinity
- Ability for flows keep mouth open 9 years in 10
- Salt export increased to 2 million t/a

**Wakool River**
Ability to maintain baseflows to prevent fish kill events in drought years

**Gumbower-Keandrook-Perricona Forest**
133% increase in large bird breeding events

**Narrand Lakes**
- 114% increase in bird breeding events
- 25% increase in large bird breeding events

**Macquarie Marshes**
- 60% increase in flow events that may support small-scale bird breeding events (1000’s of birds)
- 35% increase in flow events that may support large-scale bird breeding events (10,000’s of birds)

**Lowbidgee floodplain**
- Red gum - 139% increase in habitat condition
- Blackbox - 347% increase in habitat condition
- Licinmara - 172% increase in habitat condition
- 52% increase in bird breeding events for heron
- 31% increase in bird breeding events for ibis

**Barmah-Millewa Forest**
56% increase in small-scale bird breeding events

*Figures and estimates contained within this diagram are predicted outcomes based on the proposed Basin Plan*
2. Social and economic context for the Basin Plan

The social and economic implications of the Basin Plan should be considered in the context of, and the effects of the Basin Plan abstracted from, the long-run and cyclical changes—economic, demographic and social—occurring across Basin communities.

2.1 Communities in the Murray-Darling Basin

The Murray–Darling Basin is home to over 2 million people (ABS 2006; ABS, ABARE et al. 2009) who rely directly or indirectly on its water resources. The majority of the Basin population (over 70 per cent) live in either Canberra or the inner regional areas in the south-east and east of the Basin. The population becomes increasingly remote towards the north and west of the Basin. Approximately 70,000 of the Basin’s population identify as Indigenous, constituting 15 per cent of the national Indigenous population.

In 2006, there were 922,000 people employed in the Basin, with over 21 per cent of this employment located in Canberra. The distribution of employed persons across the industries of the Basin is not too dissimilar to the national distribution. The significant exception is agriculture, forestry and fishing which is a dominant industry in the Basin.

- Excluding Canberra, 47 per cent of the Basin's income earners earned less than $400 per week as gross income in 2006, approximately equivalent to the national proportion of 45 per cent.

- For higher incomes, 17 per cent of working Basin residents earned more than $1,000 of gross income per week which was also approximately equivalent to the national proportion of almost 20 per cent.

- A similar pattern, of lower income earners and fewer higher income earners, emerges when the gross weekly incomes are combined for families.

Agriculture is a defining feature for many of the Basin’s communities. Production from the Basin accounts for 40 per cent of Australia's agricultural production and is estimated to be worth $15 billion annually, while around $5 billion of this production is produced with the assistance of irrigation. Of the 60,000 agricultural businesses operating in the Basin in 2005–06, almost one third (18,600) applied water in some form as part of their production processes (ABS 2006). Key agricultural products in the Basin include fruit and nuts, vegetables, table and wine grapes, dairy, rice, cotton, grain, sheep and beef cattle.

Agriculture and the communities of the Basin that rely on it have been undergoing significant change for many decades. Particularly since the 1980s, economic reforms and market changes have exerted pressure on agricultural producers. In response, agricultural producers have increased their productivity, farms have grown larger and labour intensity has declined. This has led to significant demographic and social change for Basin communities. More recently the millennium drought had significant impacts on many communities in the Basin.
2.2 Irrigated agriculture in the Basin

Irrigated agriculture is the largest user of consumptive water in the Basin. It is likely to be the sector most affected by reallocating water from consumptive purposes to the environment.

The development of irrigated agriculture has occurred differently in the northern and southern regions of the Basin.

- In the north, cotton is the dominant crop and is planted as a highly adaptable annual crop in areas of high climatic variability.
- In the south, rice is grown as an adaptable annual crop in the central Murray and Murrumbidgee. The dairy industry is centred in the Goulburn–Murray. Cotton production has recently been introduced in the Murrumbidgee.
- Horticulture occurs throughout the Basin, but particularly in southern regions.

Many factors—other than changes in water availability alone— influence the volumes and value of irrigated agricultural output. Irrigated agricultural output has a history of adjusting significantly between seasons, reflecting changes in climatic conditions and water availability, commodity prices, exchange rates, water use efficiency and broad productivity growth. Increasingly efficient water markets play a significant role in facilitating these seasonal adjustments.

The characteristics of the Basin’s irrigated agricultural industries have been described in detail in reports undertaken for the Authority by EBC, RMCG et al. (2011a) and MJA, RMCG et al. (2010). Detailed data on regional variations in irrigated agricultural production are also collected by ABS and ABARES.

2.3 Changing context for agriculture

Irrigators and other agriculturalists have had to increase productivity and manage input costs to remain competitive (Frontier Economics 2010). Australian agricultural producers have been very successful at increasing their productivity—thanks largely to rapid productivity growth, agricultural output more than doubled over the four decades to 2003–04 (Productivity Commission 2005).

Long-term changes in the economic prospects for agriculture have resulted in changes to the Basin’s social and economic makeup and outlook.

Over the longer-term, the proportion of those employed in agriculture has declined. For example, recent Census figures show that between 1996 and 2006, the number of people identifying themselves as ‘farmer’ or ‘farm manager’ in the Murray–Darling Basin declined by 10 per cent—from 74,000 to 67,000 (ABS Various years).

Many larger communities in the Basin have grown significantly. Analysis by the ABS has shown that 10 major urban centres in the Basin grew by more than 30 per cent over the period
1976–2001\(^2\). However, some smaller rural communities have grown relatively slowly, or may even have experienced population decline. This is symptomatic of a long term trend, since the beginning of the twentieth century, for the proportion of the population living in rural areas of the Basin to decline (ABS, ABARE et al. 2009).

Labour intensity in the agriculture sector has declined significantly over time—from around 9,000 people per unit of output in 1966–67 to around 3,000 people per unit of output in 2006–07. This increase in labour intensity has been a significant influence on demographic trends over the last century.

The declining use of labour per volume of agricultural output has been offset by the increase in overall agricultural production. The consequence is that the overall size of the agricultural labour force has been relatively flat for much of the last century.

In conjunction with these trends in agricultural labour, the average age of labour in the industry—reflected in the age profiles of many Basin communities—has been steadily increasing. The agriculture industry has the highest proportion of workers aged over 45 years (56.8 per cent) and over 65 years (15.2 per cent) compared with any other industries. Across the Basin as a whole, the proportion of persons aged over 65 has increased from 10.8 per cent in 1991 to 14.5 per cent in 2006. This ageing trend has been particularly pronounced in some Basin Plan regions—especially smaller rural communities.

On the other hand, it should not be assumed that most rural households earn most of their income from farming. Over the last decade or so, an important farm adjustment strategy has been the increasing linkage between farm households and rural towns through involvement in ‘off-farm’ work (Gow and Stayner 1995; McColl and Young 2005; Peterson and Moon 1994). This trend predates the onset of the millennium drought.

2.4 Productivity growth in the agricultural sector

Productivity growth measures increases in output relative to use of additional inputs. Historically, productivity growth has been a major driver of growth in Australia’s agricultural sector, and has typically exceeded productivity growth in the rest of the economy—refer to Figure 3. Productivity growth has helped maintain competitiveness in export markets and is the main driver of increases in the total value of global agricultural production over time—refer to Figure 4.

- Between 1985–86 and 2010–11, total factor productivity in Australia’s agriculture, forestry and fisheries sector increased at an average annual rate of around 3 per cent (ABS 2011). Productivity growth in the agriculture, forestry and fisheries sector has been substantially higher than in the manufacturing sector, the retail trade sector and the mining sector (Productivity Commission 2011).

\(^2\) See ABS, ABARE et al. (2009:13). The ten urban centres cited in this report were Mount Barker, Mildura, Canberra–Queanbeyan, Dubbo, Murray Bridge, Bathurst, Albury-Wodonga, Toowoomba, Echuca–Moama (Echuca part) and Shepparton-Mooroopna.
Recent work by ABARES suggests that farms with greater capacity to innovate—based on factors such as higher education, greater labour availability, larger farm sizes and more intensive land use—have greater potential to deliver productivity gains. ABARES also suggests that well-formed business and investment plans will help facilitate the best profitability and productivity outcomes by ensuring appropriate management and technology options (Liao and Martin 2009; Nossal and Lim 2011).

2.5 Financial capacity and adjustment

The severe and prolonged millennium drought has resulted in many farmers in the Basin being under significant financial stress. Many farms survived the drought on a combination of exceptional circumstances payments and off-farm income, and by running down farm equity (MJA, RMCG et al. 2010).

In the dairy sector, the drought led to changes in the feeding systems used. Previously, farmers irrigated perennial pastures. During the drought, there was a move away from irrigated pastures to more flexible feeding systems, with increased production of annual crops, lucerne and annual pastures. Many farmers purchased more feed, and increased their debt levels in doing so.

- Dairy Australia analysis of ABARES farm survey data for the period from 1999–00 to 2007–08 shows that the average total debt of farms in the Goulburn–Murray Irrigation District grew by 41 per cent, from $367,000 to $518,000 (analysis based on ABARES various years). The biggest driver was the increased requirement for working capital, which grew by 200 per cent from $84,000 to $255,000. Interest
payments became the second largest farm expense item for dairy farmers (EBC, RMCG et al. 2011b:73).

Rice production was severely affected by the drought, and many rice growers experienced a dramatic reduction in their on-farm revenue. Horticultural producers faced a critical need to ensure they had water for permanent plantings, and purchased large quantities of temporary allocations to obtain water—much of this came from upstream broadacre growers, such as rice and dairy producers. Some irrigators sold permanent water entitlements to keep debt levels down at the same time as they bought allocations (Dairy Australia 2011; MJA, RMCG et al. 2010).

In a survey undertaken for the Authority, MJA, RMCG et al. (2010) found that the average gross margin return on farm assets over five years to 2010 for horticulture, broadacre, livestock, dairy, and mixed farms was in the range of 2 to 3 per cent. When debt and interest costs are included, the average annual return on assets during that period was negative for the majority of farms surveyed.

As shown in Figure 5 and Figure 6, since 1996 levels of farm average cash income have fallen, and levels of average farm debt have increased significantly, in the Riverina, Central North Victoria, Darling Downs and Riverland areas.

![Figure 5: Average farm income, selected regions, 1996–2010](source: ABARES (2011a))

![Figure 6: Average farm debt, selected regions, 1996–2010](source: ABARES (2011a))

### 2.6 Economic outlook

In the longer-term, the greatest influence on social and economic outcomes in the Basin will be conditions in the wider economy. The main drivers will include long-term changes in commodity prices, driven largely by growth in emerging Asian economies, exchange rates and anticipated continuing growth in Australia’s GDP and productivity. In particular, productivity growth in irrigated agriculture is likely to more than offset any impact of the Basin Plan on agricultural production. The implications of the Basin Plan need to be considered in the context of these likely trends.
The prospects for the Australian economy remain positive, with an underlying profile over the next year of solid growth, low unemployment, moderate inflation easing even further and a surge in business investment (Australian Government 2012b).

- The Australian economy is forecast to grow at an above-trend rate over the next two years, with real GDP growth forecast to be 3.25 per cent in 2012–13 and 3 per cent in 2013–14 (Australian Government 2012a). Overall, the non resources sectors of the economy are forecast to grow at a below trend average annual rate of 2 per cent over the next two years.

- Australia’s economic growth will be supported by robust growth in China, India, and other emerging economies of Asia. This growth has pushed Australia’s terms of trade towards historical highs, although these have fallen back recently. The terms of trade are projected to decline gradually over the medium term. Notwithstanding this, high prices for resources and strong economic activity in the resources sector should continue to support incomes and activity in the broader economy.

Strong population growth and wealth creation in the emerging economies will put upward pressure on the volumes and prices of many basic commodities traded in international markets, including food and fibre.

- Rising incomes in emerging economies are likely to stimulate demand for food products, especially those foods with relatively high value added, and this will likely continue to be combined with growing demand for agricultural products in energy production. The emergence of carbon farming in response to the adoption of carbon pricing is also likely to influence agricultural production. In contrast, global supply of agricultural products has been expanding only modestly, partly due to low levels of research into improving yields and little growth in the land area devoted to agricultural production (Lowe 2011).

In recent times there has been significant volatility in the value of the Australian dollar, especially against the US dollar. To a large extent, the recent volatility reflects financial market concerns over high levels of public debt in the United States and Europe, and the possible implications for global economic activity. While the Australian dollar is expected to retreat from recent highs in the long-term, the currency changes likely indicate a long-run reduction in comparative advantage of the Australian agriculture sector in global markets. To continue to compete on world markets, it will be important that Australian exporters continue to adapt and adjust to changes in demand, use scarce resources more efficiently, adopt new technologies, and seek opportunities to value-add, innovate and produce niche products.

In the March 2012 Agricultural Commodities Report, ABARES forecast that the total volume of farm production would increase by around 1 per cent for 2012–13, following a forecast increase of 4.2 per cent in 2011–12 (ABARES 2012). Following the wettest two-year period on record during 2010 and 2011 and generally wet conditions in early 2012, the climate is expected to move to neutral or drier conditions in the next few years. Over the medium-term, farm production is projected to rise gradually. By 2016–17, the volume index of farm production is projected to be 5.4 per cent higher than the level forecast for 2011–12.
On balance, despite some international uncertainties, these conditions are likely to offer Australian agricultural producers a range of new opportunities and markets, including for those producers in the Murray–Darling Basin.
3. Socio-economic implications of the Basin Plan

While the Basin Plan sets the overall level of water recovery required to rebalance the environment’s share of water resources, governments are responsible for determining how this water recovery occurs and choices about the management of that water. The social and economic impacts of achieving the SDLs will be significantly influenced by governments’ water recovery and management decisions, and in particular by:

- the structure of the Commonwealth’s Water for the Future program—specifically the balance between purchases of water entitlements (which reduce the amount of water available for economic purposes), offset by the impact of infrastructure investments (which generate water savings from more efficient water use, which are shared between irrigators and the Commonwealth);

- the implementation by the States of their environmental watering plans; and

- how the Commonwealth manages its environmental water entitlements in respect of those State watering plans and over variable climatic conditions.

The Authority has assessed the social and economic impacts of the Basin Plan by taking into account information from multiple sources including:

- **Findings from consultations with communities.** The Authority conducted extensive consultations before and after the release of the proposed Basin Plan in November 2011. The consultations included over 500 meetings with stakeholders in the year to April 2012; regular meetings with Basin State governments to discuss details of the Basin Plan, and a formal submissions process through which close to 12,000 submissions were received. The Authority has published the outcomes of the consultation process in a document in accordance with s.43(11) of the Water Act.

- **Economic modelling and analyses of impacts on irrigated agricultural production and regional economies.** The Authority commissioned a series of economic modelling studies to assess the impacts of the draft Basin Plan on agricultural production and other economic indicators, at a Basin and regional scale. These studies included work by ABARES, Monash University, the University of Queensland, and Arche Consulting.

- **Analyses of community vulnerability and adaptive capacity.** To assess community vulnerability and adaptive capacity, the Authority commissioned analyses by MJA, RMCG et al. (2010), EBC, RMCG et al. (2011a), ABARE-BRS (2010) and ABARES (unpublished) which developed quantitative indicators of community sensitivity, adaptive capacity and vulnerability, drawing on data from the population census, and agricultural censuses and surveys.

The Authority also commissioned KPMG (2011) to undertake an independent review of the economic modelling. The review confirmed that the modelling represents the best available analysis, and suggested areas for future development.
3.1 Economic implications of water recovery

The Basin Plan will affect irrigated agricultural production, with flow-on impacts for total agricultural production, gross regional product and employment. These impacts were assessed in the context of the scale of change in water use.

Water recovery of 2,800 GL/y equates to a reduction of −25 per cent, relative to baseline levels of water use. Water recovery through infrastructure expenditure (past and proposed) reduces the effective change to −19 per cent. After existing water purchases are taken into account, the effective change is reduced further, to −11 per cent as at the time of the Authority’s economic modelling, and to less than −10 per cent as of May 2012. Relative to the 2,800 GL/y scenario, the Authority also commissioned sensitivity analysis of ±400 GL/y—refer to Table 1.

Table 1: Economic implications of water recovery

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<tr>
<th></th>
<th>2,400 GL/y</th>
<th>2,800 GL/y</th>
<th>3,200 GL/y</th>
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<tr>
<td><strong>Irrigated agricultural production ($m/year)</strong></td>
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<tr>
<td>Net of infrastructure savings (19% scale of change, with water recovery of 2,800 GL/y)</td>
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<tr>
<td>Northern Basin</td>
<td>-118</td>
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<td>-507</td>
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<tr>
<td>Southern Basin</td>
<td>-347</td>
<td>-307</td>
<td>-366</td>
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<tr>
<td>Buybacks remaining (11% scale of change, with water recovery of 2,800 GL/y)</td>
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<tr>
<td>Northern Basin</td>
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<td>-452</td>
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<tr>
<td>Southern Basin</td>
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<td><strong>Agricultural production ($m/year)</strong></td>
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<td>Net of infrastructure savings (19% scale of change, with water recovery of 2,800 GL/y)</td>
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<td>Northern Basin</td>
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<tr>
<td>Southern Basin</td>
<td>-331</td>
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<tr>
<td>Buybacks remaining (11% scale of change, with water recovery of 2,800 GL/y)</td>
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<tr>
<td>Northern Basin</td>
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<tr>
<td>Southern Basin</td>
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<tr>
<td><strong>Gross regional product ($m/year)</strong></td>
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<tr>
<td>Net of infrastructure savings (19% scale of change, with water recovery of 2,800 GL/y)</td>
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<td>Buybacks remaining (11% scale of change, with water recovery of 2,800 GL/y)</td>
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<tr>
<td>Southern Basin</td>
<td>-263</td>
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</tr>
</tbody>
</table>

*(a) Figures are derived from ABARES (2011c)*
3.1.1  Impacts on Basin economy

The Authority’s analyses (ABARES 2011c; Wittwer 2011) found that the overall economic impacts of the Basin Plan would be modest. The Basin economy is still expected to grow under the Basin Plan, but at a slower rate than would be the case without the Basin Plan.

ABARES modelling estimates that, with water recovery of 2,800 GL/y, gross regional product (GRP) for the Basin will be $513 million per annum (0.81 per cent) lower in 2019 than might otherwise be the case. Most of the impacts are expected to arise in the southern Basin. Alternative water recovery scenarios of 2,400 GL/y and 3,200 GL/y were estimated to result in impacts of $443 million and $585 million per annum, respectively.

If buybacks to date are taken into account, the remaining reduction in GRP (for water recovery of 2,800 GL/y) is $288 million per annum (0.5 per cent).

In the context of a growing Basin economy, the Authority considers this reduction in the value of total Basin production—a less than 1 per cent reduction per annum spread over the period to 2019—is a scale of change that Basin communities in aggregate should be able to adjust to.

The reductions in GRP are small when compared with the scale of change required to implement the sustainable diversion limits, because of the existence of sectors other than agriculture that make up the Basin economy, and the models’ assumptions about the ability of farmers and other sectors to adjust and redeploy resources in response to reductions in water availability for consumptive purposes.

The small macroeconomic impact estimated by the modelling can seem counter-intuitive to the expectations of communities, but is more obvious when broken down into its parts:

- The Basin produces a huge and varied range of goods and services. Agriculture makes up 15 per cent of total Basin economic output.

- Irrigated agriculture makes up around 40 per cent of total agriculture, or approximately 6 per cent of total Basin economic output.

- If the Basin Plan is estimated to lead to a reduction in the value of irrigated agricultural production by less than 10 per cent—as indicated by ABARES’ modelling, assuming a 19 per cent reduction in water availability—this translates to a reduction in total Basin production (GRP) of less than 1 per cent.

3.1.2  Impacts on employment

Long-run modelling results indicate that there will be minor employment impacts due to the Basin Plan—consistent with the modest impacts for GRP.

- The small magnitude of the employment impacts reflects modelling assumptions that labour markets will adjust and displaced labour is able to gain employment in other industries and/or regions.

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3 Gross regional product (GRP) is the value of goods and services produced for a particular region of Australia. In 2010–11, GRP for the Murray–Darling Basin was $63.8 billion.
• For modelling purposes, employment is measured in net terms—a job loss is not counted if the model assumes it will result in a job gain elsewhere.

At the same time that the Basin Plan is being implemented, the Commonwealth’s irrigation infrastructure investment program will provide local economic stimulus which offsets short-term job losses in the Basin by providing new job opportunities for communities. Both ABARES (2011c) and Monash University (Wittwer 2011) estimate that in the short term these stimulatory effects from infrastructure investment will more than offset any job losses resulting from the Basin Plan.

This underscores the very significant level of expenditure committed to these programs and the larger flow-on economic effects that construction activity has relative to farm production. While the construction stimulus is short-term—the program is expected to be finished by 2019—the programs will assist significantly in smoothing the transition to the Basin Plan.

In the short run, the offsetting construction stimulus effect from infrastructure investment and buyback proceeds will create jobs:

• Monash University modelling estimates that net employment could be approximately 0.22 per cent higher (around +2,000 jobs) when compared with baseline employment.

• ABARES modelling estimates that the short-run net effect could increase employment by 0.33 per cent (approximately +3,000 jobs).

• In a worst-case scenario, ABARES (2011b) estimated short-run job losses of approximately –5,000 across the Basin, assuming that 3,500 GL/y of water for the environment were recovered by purchasing the total volume of water entitlements at one point in time, and that the movement of capital and labour between the sectors of the Basin economy was restricted.

In the long run, assuming that the stimulus effect associated with infrastructure investment has dissipated after 2019:

• Monash University estimates that employment will be 0.17 per cent lower (around -1,600 jobs) if the buybacks proceeds are not reinvested in the economy, and 0.08 per cent higher (around +700 jobs) if the buyback proceeds are reinvested.

• ABARES estimates that employment will be 0.03 per cent lower (around –300 jobs) after infrastructure expenditure, with a potentially smaller impact depending on how buyback proceeds are reinvested.

These employment impacts need to be considered in the context of what would be occurring to Basin employment in the absence of a Basin Plan and the associated Commonwealth programs. Excluding the ACT, employment is expected to increase on average by about 13,000 full time jobs per annum in the period to 2019—based on Commonwealth Budget forecasts for employment growth—or approximately an additional 100,000 jobs created by 2019.
The Basin Plan is not like the millennium drought

There is a common misconception that the Basin Plan is just like the millennium drought. There are three principal reasons why that is not the case.

First, the scale of change in water availability for irrigators is very different.

- From 2000–01 to 2008–09 the volume of irrigation water use declined by 70 per cent. In comparison, the Basin Plan involves a reduction in water available for irrigation in the order of 19 per cent.

- The Basin Plan does not reduce water availability from the depths of the drought—the reduction is relative to a baseline of long-run average water use.

- The precise amount of water to be recovered from irrigated agricultural production depends on how governments decide to recover the water. Based on current expectations for water recovery through the Water for the Future program, irrigated agricultural use will be reduced by only 19 per cent—rather than the 26 per cent indicated by the headline figure of 2,750 GL/y—as water savings through infrastructure investments are expected to contribute around 7 per cent to the effort.

Second, the move to sustainable water use under the Basin Plan only affects irrigators—not dryland farming. The Basin Plan provides that interceptions by dryland farmers and other water users are effectively capped, but otherwise their activities are largely unaffected.

- Dryland farmers rely on rainfall for their water supply, and rainfall is unaffected under the Basin Plan. Ninety-four per cent of rainfall never enters rivers (4 per cent) or aquifers (2 per cent). Instead, rainfall typically evaporates or transpires close to where it falls.

- For most crops, irrigation is used to top–up rainfall if it is economic to do so—based on soil moisture content, the opportunity cost of applying water, the expected additional yield from applying water, and prevailing farm gate commodity prices.

Thirdly, compared to drought, the Basin Plan will have a vastly different effect on irrigators’ decision making.

- In the context of water recovery programs associated with the Basin Plan, irrigators make active decisions about whether to participate. Each irrigator decides whether to participate in these programs based on investment opportunities specific to their farm, their financial circumstances, and their short and long-term business goals.

- In comparison, adjusting to drought largely involves tentative decision making (coping) in the face of uncertainty about a return to average water availability and normal business conditions.
3.2 Agricultural and flow-on implications at a regional and local scale

3.2.1 Economic impacts

While the level of total production in the Basin is estimated to be reduced by less than 1 per cent and more than offset by broader economic growth over the transition period to 2019–20, some communities may face more significant adjustment.

Communities are likely to experience greater potential impacts as a result of the Basin Plan if they are more reliant on irrigated agriculture, or if they have greater exposure to changes in water availability, because there are larger proposed reductions in diversions, and/or because water trade is likely to result in large amounts of water leaving the community.

These impacts will be manifested through impacts on local economies, associated with reduced production and possible flow-on effects to local business. Impacts will be felt as a social as well as an economic issue.

ABARES (2011c) estimated that the regions that are likely to experience the largest reductions in value of production are the Murrumbidgee, New South Wales Murray and Goulburn–Broken regions. While this regional pattern is influenced by trade and commodity price assumptions, these are also the catchments where the greatest volumes of water are available—any method of estimating volumetrically where water will be recovered from will find that these catchments are significant contributors.

More specifically, ABARES (2011c) found that potential economic impacts could include, assuming a reduction in water availability of 19 per cent after taking into account water recovery through infrastructure expenditure:

- In the Condamine–Balonne: reduction in gross value of irrigated agricultural production (GVIAP) in the long term of around 6.6 per cent or $30 million per year.

- In the New South Wales Murray: reduction in GVIAP in the long term of 20.8 per cent or $92.4 million per year; and in the Murrumbidgee: reduction in GVIAP in the long term of around 18.7 per cent or $145.5 million per year.

- In the Goulburn-Broken region of northern Victoria: reduction in GVIAP in the long term of 12.9 per cent or $88.2 million per year.

- In the Victorian Murray, reduction in GVIAP in the long term of 5.2 per cent or $41.1 million per year.

- In the South Australian Murray, reduction in GVIAP in the long term of 2.6 per cent or $14.6 million per year.

Arche Consulting (2011) estimated the potential short-term direct impacts for 12 case study local government areas, and also considered the potential flow-on effects for employment in other sectors of the local economy. The study used regional input-output analysis, drawing on regional outputs from the ABARES (2011c) modelling.
Arche reported that:

- in general, smaller irrigation dependent local areas are likely to be more significantly impacted as a result of the Basin Plan;
- reductions in water extractions are likely to be accompanied by a decline in irrigated agricultural production (this effect will vary according to location);
- these declines in irrigated agricultural production are likely to be slightly offset by an increase in dryland production;
- infrastructure investment under Water for the Future is expected to significantly assist in offsetting job losses in both the short term and long term;
- the proceeds from water buybacks provide a small on-going benefit to local communities; and
- water trading and changes in commodity prices could substantially alter outcomes in different locations.

The Arche Consulting results offer an additional interpretation of the economic impacts of the Basin Plan on communities, by focusing at the local level. The Authority acknowledges that that this type of analysis is subject to numerous limitations such that the results have the potential to be overstated:

- while this type of analysis benefits from a greater level of detail and specification than macroeconomic modelling, it is static (fixed) and is representative of the local economy at a single point in time, with no capacity to incorporate dynamic adjustments and changes between sectors within the local economy;
- it implies that the full impact of the Basin Plan will occur in a single year, rather than through a gradual transition through to 2019;
- it does not take into account the probability that economic and productivity growth will continue over time;
- it does not contemplate the potential for alternative job opportunities to arise from outside of the immediate local area; and
- it does not encompass the potential influence of broader economic and demographic trends.

The Authority acknowledges that local councils and other groups in the Basin have undertaken a number of other studies of the local impacts of the Plan.

- Many of these were reviewed in the synthesis report *Socioeconomic analysis and the draft Basin Plan* (MDBA 2011b; c).
• The findings from these different studies are highly sensitive to the assumptions employed with respect to water trading, water use efficiency and landholder decisions in terms of whether landholders stay where they are, continue farming, or move out of the Basin.

3.2.2 Social impacts

The potential social impacts of the Basin Plan on irrigated agricultural communities are discussed in substantial detail in the report *Community impacts of the Guide to the proposed Murray-Darling Basin Plan* (EBC, RMCG et al. 2011a) and the Authority’s synthesis report *Socioeconomic analysis and the proposed Basin Plan* (MDBA 2011b; c).

The report by EBC, RMCG et al. (2011a) for the Authority found that towns which are more irrigation dependent would be more vulnerable to these social impacts. The report proposed that communities would be more at risk from reductions in water available for consumptive use if they are more dependent on agricultural employment, and/or have smaller populations. Communities were categorised based on their population size and dependence on agriculture.

• **Category 1**: small towns highly dependent on irrigated agriculture and often geographically isolated.

• **Category 2**: small diverse towns that combine high-value irrigation with tourism and other sectors. These are likely generally protected from changes in water use.

• **Category 3**: larger towns highly dependent on irrigated agriculture. They are robust at current diversion levels, but would be highly exposed to any changes in irrigated agriculture in the region.

• **Category 4**: large, diverse and growing regional centres that have a breadth of activity and employment. These are generally relatively insulated from changes in irrigated agriculture in the region.

Figure 7 shows towns in Category 1 (small towns highly dependent on irrigated agriculture and often geographically isolated) marked purple and Category 3 (larger towns highly dependent on irrigated agriculture), marked orange (EBC, RMCG et al. 2011a).
Figure 7: Specific towns identified as more sensitive to changes in water availability by the EBC Consortium

Source: EBC, RMCG et al. (2011a).
3.2.3 Community vulnerability

The Authority commissioned work by ABARES to gain a better understanding of the social and economic characteristics of Basin communities and to assess some of the factors that may contribute to them being able to adjust more effectively to changes in water use (ABARES-BRS 2010; ABARES unpublished).

To do this, ABARES developed a range of indices to measure the sensitivity of communities to change and the resources within a community that may allow it to cope with change.

- sensitivity, which is a measure of how dependent a community is on the factor that is changing—in the case of the Basin Plan, to changes in water availability and any consequent changes in agricultural sector employment

- exposure, being the degree to which communities are affected by an external stress—in the case of the Basin Plan, to reductions in water availability brought about by the Basin Plan

- potential impact, or the consequences of a change, made up of a combination of exposure and sensitivity

- adaptive capacity, this being the inherent capacity of a community to manage or cope with change, and which may mitigate the potential impact on a community. Some communities have relatively low capacity to adapt, due to high debt levels, limited access to capital, and limited opportunities for diversification within agriculture.

The relationship between these measures is expressed as follows:

\[
\text{Potential Impact} = \text{Exposure} \times \text{Sensitivity}
\]

\[
\text{Vulnerability} = \text{Potential Impact} – \text{Adaptive Capacity}
\]

This work is viewed by the Authority as a starting point for understanding the characteristics of Basin communities, some of which may help a community adapt, and some of which may hinder it in doing so. In that sense, the analyses were not predictors of final outcomes because they draw only on data from a single point in time that can be readily quantified, and that do not take into account other community characteristics which may be important. For instance, a community may have particularly capable leaders. These factors are not reflected in the index. This is particularly relevant in the context of the proposed transition period to full implementation of SDLs in 2019 (EBC, RMCG et al. 2011a).

Through this analysis, the Authority identified specific communities that would be more vulnerable to the Basin Plan:

- communities in the cotton growing areas of the Lower Balonne
- the rice growing areas of the Murrumbidgee and NSW Murray
- smaller dairying communities in northern Victoria
- horticultural communities in Sunraysia and the South Australian Riverland.
These communities could experience flow-on economic impacts, on industries which service the agricultural sector such as transport, light engineering, wholesale supplies and machinery sales. Shops and clubs in many irrigation dependent towns may also be affected by declines in agricultural profits. However, while some estimates can be made of aspects of these flow-on impacts (such as the employment impacts described in the previous section), many of these impacts cannot be definitively estimated.

The three maps in Figure 8 show the spatial distribution of potential impacts under each of three water recovery scenarios—i.e. 2,800 GL/y ±400 GL/y.

- Potential impact measures the degree to which areas are sensitive to change (because of their dependence on irrigation water and agricultural employment) combined with the magnitude of exposure to change.

- In this case, exposure is the remaining change required in the volume of water available for consumptive use, after accounting for savings from infrastructure and entitlements already purchased.

- Therefore the maps illustrate the potential impact of the ‘further effort required’ to meet the SDLs.
The dark shading indicates areas that may have relatively higher potential impact scores under the particular scenario. The lighter areas are likely to be those areas that have already substantially adapted—they have little sensitivity to the changes in water availability or their exposure has already been largely met. The maps show that fewer regions are relatively highly impacted under the 2,400 GL/y and 2,800 GL/y scenarios, compared with the 3,200 GL/y water recovery scenario. More areas in the southern Basin move into the top 20 per cent ranked area as the volume of water recovery increases. This change is especially apparent for communities in the Murrumbidgee, Murray, Loddon, Wimmera–Avoca and Lower Darling Basin plan regions. The northern basin reduction remained constant across all three scenarios therefore there was no change to potential impacts in the north. Ovens and Eastern Mt Lofty Basin Plan regions will experience negligible reductions due to SDLs as reflected in their lower potential impact rankings.

Note: there is an imperfect mapping between the Australian Bureau of Statistics’ statistical local areas (SLAs) and the Basin’s catchments, as many large SLAs lie substantially across two or more catchments. Also, relative potential impact is smoothed across regions. For example, the Lower Darling region is very large and has areas ranked with highest relative potential impact; however, irrigation only occurs in a very small area of the region along the southern border. As such, the map indicates there will be a large area of potential impact when much of the effect will be confined to these southern areas.

**Figure 8: Sensitivity analysis for relative potential impact after accounting for water savings from infrastructure investment and buybacks to date**

Source: ABARES analysis
3.3 Socio-economic benefits of the Basin Plan

Chapter 1 included a summary of the environmental benefits which are likely to flow from the reallocation of water to the environment under the proposed Basin Plan. Those improvements in environmental outcomes are likely to lead to increases in socio-economic benefits for a range of industry sectors, which will offset the socio-economic costs flowing from less irrigated agricultural production.

• This report focuses on ‘use values’ associated with changes in environmental outcomes under the Basin Plan—benefits that can be valued directly through their contribution to the Basin and national economy.

• The Authority recognises that there are also a range of ‘non-use values’ that humans might ascribe to the cultural, spiritual and environmental benefits they derive from a healthier Basin. Estimates for some of these benefits are large, but measurement techniques are problematic and the reliability of the estimates is low.

  o For example, CSIRO (2012) reports that “the additional Basin-wide value of enhanced habitat ecosystem services—arising from floodplain vegetation, waterbird breeding, native fish and the Coorong, Lower Lakes, and Murray Mouth—is worth between $3 billion and $8 billion under the 2,800 GL/y scenario relative to the baseline scenario”.

3.3.1 Floodplain agriculture

A case study by Arche Consulting (2010) of three farms in the Basin (White Cliffs, Cuttaburra and Wilcannia) found that:

• flooding has a significant effect on gross profit, with a typical flood regime adding an additional 59 per cent of gross profit to standard enterprises—or $11.8 million in gross income and $6.8 million in gross profit over 15 years; and

• the additional annual gross income on floodplain area is approximately $12.50 per hectare of floodplain country, which lifts the value of this country significantly.

The Authority has commissioned a broader study of the benefits to floodplain grazing and cropping from the flow scenarios resulting from the proposed Basin Plan. The predicted increase in small and medium flooding events expected under the Plan is likely to result in significant benefits, particularly for three areas which will be a focus of the study:

• Barwon-Darling River upstream of Menindee Lakes;

• Lower Balonne River Floodplain; and

• Lower Murrumbidgee River Floodplain and its intersection with the Lachlan River.

The study is due to complete its report by the end of June 2012.
3.3.2 Recreational and commercial fishing

In 2010–11, recreational fishing in the Basin as a whole had a likely direct expenditure estimate of $1,352 million, and a number of flow-on impacts, including $375 million in direct value added, a contribution to GDP of $403 million and 10,950 jobs (Ernst & Young 2011).

- There were 429,857 recreational fishermen residing in the Basin, who undertook a total of 5.16 million fishing trips per annum (12 per fisherman) and spent an average of $262 per trip.

- Based on the National Visitor Survey, 6.3 per cent of all overnight trips to the Basin involved some fishing. In 2011, domestic visitors undertook 642,000 overnight trips to the Basin involving fishing. During those trips, people stayed 4.1 nights on average, which is above the average for all visitors to the Basin (3.1 nights).

- According to the International Visitor Survey, 9.5 per cent of visitors to the Basin undertook some fishing. Overall, 21,531 international visitors went fishing on trips to the Basin in 2011 and spent an average of 40.6 nights in the Basin during their trip to Australia.

The commercial fishing industry is significantly smaller than the recreational fishing industry and limited to specific regions in the Basin. The commercial fishing industry in the Coorong and Lower Lakes was estimated to be $8.4 million in 2008–09. There are a total of 36 fishing families, employing 100 employees and creating $40 million in value added.

In 2003, native fish populations in the Basin were estimated to be around 10 per cent of their pre-European settlement levels. The reduction of water quality is one of the contributing factors to the decline in fish populations. By the end of 2010, six Murray-Darling fish species were listed under national threatened species legislation.

The Authority has commissioned a broader study of the benefits to recreational and commercial fishing from the flow scenarios resulting from the proposed Basin Plan. The predicted increase in small and medium flooding events expected under the Plan is expected to result in significant benefits for floodplain spawning species, and is also expected to support in-stream processes such as fish migration and spawning, inundation of in-stream habitats and carbon/nutrient cycling. The improved condition of the Coorong and Lower Lakes under the Basin Plan is expected to provide significant benefits to estuarine fish species, which are of particular benefit to the commercial fishing industry.

The study is due to complete its report by the end of June 2012.

3.3.3 Recreational boating

Boating is a significant activity in the Basin. Types of boating activities include sailing, fishing, houseboating, water skiing and jet skiing, sightseeing and paddling.

The boating industry in the Coorong and Lower Lakes was particularly affected during the millennium drought. Low levels of flow, the closing of the Murray Mouth, high levels of
salinity and soil acidification, and bank slumping all had significant effects on the industry. The Basin Plan is expected to provide significant benefits to the boating industry.

The Authority has commissioned a study of the benefits to recreational and commercial fishing from the flow scenarios resulting from the proposed Basin Plan. A key challenge for this study will be to distinguish the benefits from the breaking of the millennium drought from the benefits of the Basin Plan. The study is due to complete its report by the end of June 2012.

3.3.4 Salt interception cost avoidance

Changes in river salinity (measured in EC units) have a cost (if salinity increases) or a benefit (if salinity decreases) to agricultural, urban and industrial water users. While water salinity affects all urban and industrial water users throughout the Basin, for the agricultural sector, significant cost impacts begin to appear for users located downstream of Swan Hill. Average salinity levels upstream of Swan Hill are low and do not create any yield reductions of crops or costs to agricultural users.

Well established salinity cost functions translate the changes in river salinity into salinity cost impacts. Preliminary modelling indicates that, for 2,800 GL/y of water recovery for environmental purposes, the average reduction in river salinity at Morgan, South Australia, would be 50 to 70 units. This reduction in river salinity translates to a benefit of approximately $10 million per year.

In comparison, the former Salinity and Drainage Strategy and the Current Basin Salinity Management Strategy invested more than $160 million since 1986 in Salt Interception Schemes, engineering capital works and measures. These capital works have resulted in a reduction of average river salinity at Morgan of about 140 EC units.

3.3.5 Certainty for irrigation businesses and communities

Existing water management regimes are not able to cope with extreme conditions—for example, during the recent drought many water sharing plans were suspended, leading to uncertainty over security and reliability of water rights. By ensuring that water resource plans meet specified requirements, and are made in the context of sustainable diversion limits on water that can be taken for consumptive use, the Basin Plan will ensure security and reliability of water rights.

Irrigation businesses and communities will benefit from increased certainty about the availability of water, and the rules governing its availability. They will be able to make planning and investment decisions with more confidence that governments are managing and allocating water on a sustainable basis. This will reduce risk and encourage investment.

3.3.6 Certainty for water market participants

While a range of trading rules already exist at the state and local level governing water trade within the Basin, these rules are not consistent or comprehensive. The Basin Plan will provide a framework for consistent and comprehensive water trading rules. This will ensure that all market participants have the same rights and are confident of their rights regardless of where they are trading. The trading rules will complement the water charge and water market
rules, and the role of the Australian Competition and Consumer Commission (ACCC), under the Water Act.

### 3.3.7 Water quality

The Basin Plan will include a Water Quality and Salinity Management Plan. This plan will provide a Basin-wide framework for protecting and enhancing water quality in the Basin, by setting science-based water quality objectives and targets that will need to be reflected in water resource plans. The plan will build on previous work to address water quality through the National Water Quality Management Strategy and Basin Salinity Management Strategy.

A study by CSIRO (2012) estimated a range of benefits flowing from improved water quality.

- **The likelihood of potentially hypoxic blackwater events (potential dissolved oxygen drawdown greater than 6 mg/L) was estimated to decline by around 25 per cent under a 2,800 GL/y water recovery scenario.** As a result of this improvement in river condition, CSIRO estimated the total annual recreation benefits to be in the range of $5–10 million per annum.

- **Cyanobacterial blooms render a body of water unswimmable and unfishable (as cooking fish and yabbies does not kill toxins).** In addition, odour or health risks may also mean many recreationalists avoid boating. By estimating the beneficial impact on potential visitor nights of a 2,800 GL/y water recovery scenario, CSIRO estimated the annual value of this recreation benefit to be around $5–11 million. This estimate does not include the benefit to local residents who visit the river and other day trippers.

- **Acid sulphate soils are extensive throughout parts of the southern Basin.** In addition to negative impacts on key ecological sites, including Ramsar wetlands, acid sulphate soils are also a hazard to: water quality; biodiversity, human health; commercial and recreational fisheries; engineered structures; community infrastructure; agricultural productivity; real estate values; and scenic amenity and tourism. CSIRO estimated a risk-weighted avoided cost, for 2,800 GL/y water recovery, of $9 million per annum.

### 3.3.8 Erosion prevention

During the millennium drought, highly localised costs of bank collapse were borne by landowners (i.e. landings and marina losses) and the South Australian Government (i.e. road collapse). The exact cause of bank instability and slumping is unknown but is likely a result of low river height which desiccates the banks leaving them unstable. It is likely that changes in how the river is managed under the Basin Plan might prevent many of these adverse outcomes from reoccurring. Under a 2,800 GL/y water recovery scenario, more water over the barrages is likely to reduce the risk of bank collapse. CSIRO estimated the risk-weighted avoided cost to be $24 million per annum.

### 3.3.9 Tourism

Healthy riverine, estuarine and lake ecosystems and in-channel flow and lake levels are key drivers for many water-based recreational activities. Nature-based tourism activities include camping, bird watching, fishing, yabbying, boating, kayaking and canoeing, hunting,
bushwalking, photography and ecotourism. Adequate water levels are necessary for accessibility, that is, to access boat ramps and to manoeuvre boats in the water body. Exposure of shorelines, jetty infrastructure and stranded boats at Lakes Albert and Alexandrina during the millennium drought negatively affected recreation as did low flows.

CSIRO estimated the annual incremental recreation benefits under a 2,800 GL/y water recovery scenario to be $124 million in the Murray–Lower region (Coorong) and $38 million in the Murray–Middle region (Barmah–Millewa Forest).
References


EBC, RMCG, MJA, EconSearch, Geoff McLeod, Tim Cummins, Guy Roth and David Cornish, 2011b. *Community impacts of the Guide to the proposed Murray-Darling...


