Structural adjustment pressures in the irrigated agriculture sector in the Murray–Darling Basin

A REPORT PREPARED FOR THE MURRAY–DARLING BASIN AUTHORITY

March 2010
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The Murray-Darling Basin Authority commissioned this report, amongst a number of consultancy reports, to examine a range of different aspects of the socio-economic implications of reducing current diversion limits. These studies were conducted at specific points in time during the development of the proposed Basin Plan and aimed to analyse the likely implications of a range of potential scenarios for reducing long-term average diversion limits in order to inform the MDBA on options for setting Sustainable Diversion Limits and other aspects of the proposed Basin Plan.
# Structural adjustment pressures in the irrigated agriculture sector in the Murray–Darling Basin

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Executive summary

Purpose and scope of this report

Frontier Economics was engaged by the MDBA to assess the relative importance of water availability, water policy and non-water related factors in influencing the process of adjustment in the Murray–Darling Basin (MDB).

- The report provides an early input to the development of the Basin Plan, before draft sustainable diversion limits (SDLs) and detailed socio-economic assessments are available.
- The paper should be seen as a ‘primer’—the objective is to build common understanding and promote informed discussion about the potential impacts of the Basin Plan in the context of ongoing change in Basin communities.
- The report does not attempt to predict the future by estimating the impact of the Basin Plan. This task was simply not possible given that the Basin Plan and SDLs are not yet available. Moreover, this report highlights that uncertainty in market, environmental and policy factors make attempts to forecast the future extremely fraught.
- Instead, the report illustrates how different factors may evolve over time, and considers how important they might be in affecting irrigation communities. It highlights that the ongoing and unpredictable forces driving change favour a secure yet flexible approach to water policy and management. Strategies that the MDBA could adopt to facilitate efficient adjustment in response to the Basin Plan are identified.

What is adjustment and structural change?

- Structural change is the ongoing process of change in the relative size of industries, in the characteristics of the workforce, and in the size and mix of activities within regions. It is the aggregate response of the numerous individual adjustment decisions influenced by market, social, environmental and technological factors, as well as government policy.
- Adjustment and structural change is a natural process of growth and decline that is essential for improving national productivity and driving innovation.
- Debate about adjustment often arises as the benefits and costs of change can be unevenly distributed. Attempts by governments to slow down or defer adjustment can distort the process of change and reduce the related benefits.

Non-water related factors

- Irrigation industries and communities in the Basin have been constantly changing over many decades in response to market, social and technological factors that are entirely unrelated to water availability and water policy.
- It is inevitable that the pattern of rural change typified by farm consolidation, ageing farmers, and population movements from small towns to regional centres, will continue regardless of changes in water availability or policy.
Irrigation industries in the MDB compete in global markets. The recent collapse in farm gate milk and wine prices highlight that market conditions will play a critical role in determining the future of irrigated agriculture.

When monitoring changes in socio-economic outcomes, it is extremely difficult to separate the impacts of water policy and other government interventions from the background of change. In most cases, attributing all observed changes in socio-economic outcomes to government policy interventions will overstate their importance.

**Water availability for irrigation**

- Against this ongoing background of change, the severe and prolonged drought has led to more rapid change and hardship. Some industries, such as the rice industry, have wound back production almost entirely in recent years. This has flow-on effects on associated industries and communities.

- Future water availability will be critical in determining the nature and extent of irrigation in the MDB, and is subject to high uncertainty due to climate change.

- Increased market access and demand from urban centres (with high capacity to pay for water) could further affect water available for irrigation.

- Irrigators have found ways of managing drought, and will continue to adjust to seasonal changes in water availability.

- The water market has been critical in helping different industries survive by enabling horticultural and viticultural producers to purchase water and keep their trees and vines alive; rice growers to sell their annual allocations and generate income; and dairy producers to substitute between using/purchasing water and buying in additional fodder.

- Irrigators have also improved water use efficiency, drawn on scientific research to improve water management, and invested in upgrading irrigation infrastructure where cost-effective and labour saving.

**Water policy**

- Despite those coping mechanisms, many irrigation businesses have accumulated high levels of debt and remain in survival mode. Many are currently weighing up their options about whether to continue to irrigate or whether to sell their water, land or both.

- The impacts of future water policy need to be considered in this context. For example, the Commonwealth has recently become a major purchaser of water entitlements from irrigators and the additional financial injection is assisting many individual irrigators as they manage these changes. However many people in the Basin are wary about the buyback program, and are concerned about the flow-on social and economic impacts on local communities of reduced water for irrigation.

- These concerns also apply to the Basin Plan. The key unknowns are the nature and additional magnitude of reductions in water availability for irrigation and whether water access entitlement holders will receive financial payments under the risk assignment provisions in the Water Act 2007.
Water policy has other impacts on adjustment decisions. Water markets have provided irrigators with flexibility to respond to market conditions and drought. Conversely water market barriers, such as the Victorian four per cent annual limit, add uncertainty and cost as irrigators make tough financial and personal decisions.

More generally, when water policy is unclear or not effectively communicated, irrigators are likely to make uninformed and inefficient adjustment decisions.

A key point of this paper is that irrigators are affected by a multitude of adjustment pressures which vary across the Basin, and that these are often unpredictable. Table 1 summarises the relative importance of adjustment pressures facing irrigation regions and industries across the Basin in the near future, including the relative importance of water availability and water policy compared with non-water related factors.

**Implications for the Basin Plan**

- Moving water extraction onto a sustainable basis should be aimed at maximising the overall value of water. Achieving this will improve security for irrigators.
- Maximising the value of water requires reallocating water to the environment only up to the point where the marginal benefits (to the environment) exceed the marginal costs (to water users). Further assessment to understand these costs and benefits is essential.
- The MDBA can minimise the cost of the Basin Plan on irrigators through the provision of information and flexible policy tools.
  - Providing clear information to Basin communities on the draft Basin Plan and the application of risk assignment provisions will help irrigators make informed decisions.
  - Improving the performance of water markets through the Basin Plan trading rules and removal of artificial volumetric restrictions will help irrigators minimise the cost of the Basin Plan by allowing efficient reallocation of remaining water.
  - Timing of SDL reductions (e.g. in wet versus dry years) will affect the costs to irrigators and needs to be considered in SDL design. Flexible carryover provisions and transparent arrangements for water allocation in dry times at the State level will help irrigators manage increased variability in water allocations.
- The MDBA can play an ongoing role in identifying where water policy adjustment pressures in the MDB are significant, but as an agency responsible for water management, the MDBA is not responsible or well-placed to make social welfare policies.
Table 1: Summary of the relative importance of adjustment pressures

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Overall</th>
<th>Dairy</th>
<th>Wine / Horticulture</th>
<th>Rice</th>
<th>Cotton</th>
<th>Management tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market factors</td>
<td>International comparative advantage and market factors are one of the most important factors influencing farm profitability and adjustment.</td>
<td>Very high – international commodity price fluctuations, exchange rates and input costs are all important.</td>
<td>Very high – slowing export demand created the current glut in wine markets which is depressing prices.</td>
<td>High – however prices have risen recently in response to global supply shortages.</td>
<td>High – the recent increase in world prices was offset by exchange rate appreciation. Chinese demand is influential in the Australian market.</td>
<td>The presence of many private agents making independent and flexible investment and production decisions in response to market conditions.</td>
</tr>
<tr>
<td>Social, technological and legacy factors</td>
<td>The relative importance of the agricultural sector in regional economies is declining and there is an overall decrease in agricultural employment. Farmers are ageing and young people are leaving rural areas, although ‘tree changers’ are moving to some rural areas with high amenity values and good transport connections. There is a general movement of people and services from small towns to regional centres. Declines in the viability of any agricultural communities will have a feedback effect on adjustment decisions made by individuals. Farms will continue to consolidate to remain competitive, although small land parcels in public irrigation districts are a constraint so land use policy and planning will influence outcomes.</td>
<td>Land use policy and planning, flexible water management.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other government policy</td>
<td>Drought assistance distorts and delays adjustment decisions. Tax effective MIS schemes have had a major impact on recent investment in the horticulture sector. Land use planning and policy will be important in managing the impacts of change, including the need for further farm consolidation and pressures from competing land uses.</td>
<td>Land use planning/policy.</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Adjustment pressures related to water availability for irrigation

| Prolonged drought | Very high - has resulted in significant adjustment. Remaining irrigators are vulnerable due to increased debt. | Very high – major reduction in production and/or increased feed costs. | High – changes in production and increased costs to purchase water. | Very high – major reduction in production. | Very high – major reduction in production. | Production responses and water markets. |
### Pressure

<table>
<thead>
<tr>
<th>Pressure</th>
<th>Overall</th>
<th>Dairy</th>
<th>Wine / Horticulture</th>
<th>Rice</th>
<th>Cotton</th>
<th>Management tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Climate change</td>
<td>Uncertain but potentially very high, due to water availability impacts, severe weather events and market impacts due to changes in global agricultural commodity markets.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Production responses and water markets.</td>
</tr>
<tr>
<td>Competing uses</td>
<td>Medium – demand from urban users depends on climate change and drought. Impacts of mining, forestry, and power generation need case-by-case assessment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Water property rights and markets.</td>
</tr>
</tbody>
</table>

### Water policy factors affecting water availability and adjustment

| Buyback                        | Medium / high - the $3.1 billion budget for buyback will have a significant impact on water availability for irrigation in the Basin. However, irrigators are given a financial injection, which may not be available under a planned reduction in water availability. |                                                                     |                     |      |        | Buyback provides financial assistance to irrigators. |
| The Basin Plan                 | Uncertain. The impact depends on additional reduction in water availability due to SDLs in addition to the buyback program, and how this is shared in wet and dry sequences. The extent of market, drought and climate change driven adjustment before the Basin Plan is adopted will also be important. Risk assignment provisions are uncertain and could influence adjustment outcomes. |                                                                     |                     |      |        | Minimise the cost of the plan through efficient SDL design, water markets, and communication. |
| Water markets and trade barriers | Water markets have been critical in reducing the impacts of drought. The overall movement of water out of irrigation districts in the southern system (i.e. from dairy and rice to horticulture) is much less than the reductions due to drought. |                                                                     |                     |      |        | Further market reform and removal of artificial trade barriers. |
| Irrigation charges and termination fees | Generally expected to be of less importance compared to other factors, but major increases in prices will increase farm costs and competitiveness. Where triggered, termination fees effectively decrease the net return from water entitlement sales or the underlying value of the land that is ceasing to be irrigated. |                                                                     |                     |      |        | Ensure that termination fees are not quasi-exit fees. |
| Public investment in irrigation renewal | Uncertain but potentially high. There are risks that these projects will: distort private investment, result in inefficient / inappropriate irrigation infrastructure that fails to recognise the impacts of reduced water availability, be inappropriately sequenced with buyback, restrict buyback in renewal areas, force adjustment, and result in poor adjustment decisions by irrigators due to information asymmetries. |                                                                     |                     |      |        | Government due diligence and Business Case assessment. |
| Metering policy                | Lack of clarity about cost-sharing and implementation creates uncertainty. |                                                                     |                     |      |        | Implementation plans.                                |
1 Introduction

1.1 Background

*The Basin Plan and Sustainable Diversion Limits*

The Murray-Darling Basin (MDB) is under enormous stress as a result of past water allocation decisions, prolonged drought, natural climate variability and emerging climate change. As part of the process for addressing these problems, the Murray-Darling Basin Authority (MDBA) has been assigned the historic task of preparing a plan for the integrated and sustainable management of water resources across the whole MDB (‘the Basin Plan’) (MDBA 2009a).

A key requirement of the Basin Plan is to shift consumptive water extraction onto a more sustainable footing through the establishment of new sustainable diversion limits (SDLs) (MDBA 2009b). Given the evidence of widespread environmental decline in the MDB (ISRAG 2008) and the risks posed by climate change under current allocation patterns (CSIRO 2008), it is envisaged that the eventual shift to these SDLs will result in an overall reduction in water availability for consumptive use for the irrigation sector (which uses the vast majority of water in the MDB). The reduction from SDLs will be in addition to natural variation and the impacts of climate change.

While the quantum of the SDL reduction is yet to be defined, it is important to understand how reductions in irrigation water availability might affect individual irrigators, industries and local and regional communities throughout the MDB. The MDBA is explicitly required under the *Commonwealth Water Act 2007* to consider the socio-economic implications of the Basin Plan.

*The impact of reduced water availability on irrigated agriculture*

By taking a static view of the irrigation sector in the MDB, it might be possible to estimate the economic cost of a reduction in irrigation water availability due to reduced production and to model the flow-on economic impacts in local and regional communities dependent on the irrigation sector.

However, the irrigation sector in the MDB is not static. A wide range of inter-related market, environmental, social and technological factors are driving change in the irrigation sector of the MDB in a complex and dynamic manner, and water markets have been established to allow the flexible reallocation of water between individual water users across connected parts of the system.

Currently, structural adjustment in the irrigation sector is occurring primarily due to the acute combination of prolonged drought (and the high levels of debt this has induced) and recent commodity price declines. However, while the current adjustment pressures are severe, individual farmers, irrigation communities and
the entire rural sector have been adjusting constantly to changing circumstances over many decades.

The dynamic nature of the irrigation sector creates a significant challenge for the MDBA in assessing the incremental socio-economic impacts of the Basin Plan, as compared with the other factors driving change. As part of their approach to address this challenge, the MDBA has engaged Frontier Economics to undertake an assessment of adjustment pressures in the MDB.

1.2 Purpose and objectives

The purpose of this report is to promote better understanding of the process of structural adjustment and in particular to:

- identify, define and assess the range of current and potential future pressures for adjustment in the irrigated agricultural sector in the MDB
- assess the relative importance of natural factors affecting water availability and government water policy compared with other non-water related factors contributing to adjustment.

To do this, we complete a qualitative assessment that draws upon quantitative data and examples where possible. The assessment also includes some advice to the MDBA on further data and information requirements that may be useful in the future.

The project assesses the adjustment implications of key current water policies and highlights implications for the MDBA in relation to the Basin Plan. We do not provide advice or recommendations on the possible policy responses to adjustment pressures and their economic and social impacts.

1.3 Report structure

The report is structured as follows:

- Section 2 provides a framework for the assessment and identifies key factors affecting adjustment in irrigated agriculture in the MDB.
- Section 3 examines adjustment pressures not related to water, focusing on market and social factors in agriculture in Australia.
- Section 4 examines the adjustment pressures related to water availability for irrigation focusing on the prolonged drought and climate change.
- Section 5 examines the adjustment implications of a range of government policy reforms related to water and irrigation.
- Section 6 provides overall conclusions on the relative importance of various factors affecting adjustment in the irrigation sector and identifies relevant implications for the MDBA in relation to the Basin Plan.
2 Framework and approach

Adjustment and structural change is a natural process essential for improving national productivity and driving innovation. The benefits and costs of adjustment can be unevenly distributed.

There is a great deal of misunderstanding and trepidation within governments and the community about the term ‘structural adjustment’. As Musgrave (1982) points out, while structural adjustment includes both growth and decline, “explicit discussion of the phenomenon is usually restricted to those occasions when the sector is declining… Because of this the term ‘adjustment’ has a pejorative ring to most people which tends to cloud objective discussion”.

To address this issue this section begins by defining and explaining adjustment and the process of structural change. A conceptual framework for understanding adjustment decisions made by irrigators is then developed and the specific adjustment pressures affecting irrigation in the MDB assessed in subsequent sections are identified. This section concludes by explaining the approach adopted for the assessment of these adjustment pressures.

2.1 Understanding adjustment and structural change

2.1.1 What is adjustment and structural change?

The process of adjustment and structural change

Structural change refers to the dynamic and ongoing process of compositional changes in the economy. It includes changes in the relative size of industries, in the characteristics of the workforce, and in the size and mix of activities within regions (Productivity Commission 2001).

Adjustment is driven by decisions made by individuals and firms

While structural change is thought of at an aggregate level, it is important to recognise that it reflects the decisions of many private agents (individuals or firms). As described by Musgrave (1982), “structural change is the aggregate response, at the regional, industry and national level to the myriad of adjustment decisions made at the firm or individual level”.

Adjustment decisions are generally related to dynamic change

Individuals and firms are continually making a variety of production and other decisions in response to supply and demand side factors. However adjustment decisions are typically distinguished by discrete and long-term decisions to invest or divest from an industry or activity or to adopt a significant innovation. For
example, adjustment decisions in the irrigation context include decisions to: exit or enter, to expand or contract in a step-wise manner (e.g. through the purchase and sale of land and water), and to invest in changes to the production system or production mix. Such decisions involve both opportunity and risk and their timing can be critical (McColl and Young 2005).

2.1.2 The causes of adjustment

The adjustment process of growth and decline occurs in response to a host of external environmental, social, technological, government policy and market factors. In its discussion on policy responses to adjustment, the Productivity Commission (2001) distinguishes between “policy-induced adjustment” and “market driven adjustment” (discussed in more detail below).

Adjustment decisions are typically necessary when some economic structures or activities are no longer viable or sustainable (McColl and Young 2005). However, as well as occurring in response to negative pressures, adjustment occurs in response to emerging opportunities (e.g. Australia’s mining boom driven by increasing demand from China).

Some of the external adjustment pressures affecting industries are persistent (e.g. declining terms of trade), while others are more temporary and volatile (e.g. an oil price shock or natural disaster). In an open market economy such as Australia’s, adjustment and structural change is often driven by international market forces, consumer demands and the policies of governments in other countries well beyond our control (e.g. agricultural tariff barriers).

2.1.3 The individual, industry and community impacts of adjustment

At any time, any industry may contain a mix of static, growing and contracting enterprises as a result of adjustment and competitive pressures. For an expanding sector of the economy, the growth in successful firms is greater than the decline in others. For a contracting sector, the converse applies. At an aggregate level, this type of structural change drives economic growth by fostering productivity and innovation and ensuring that resources are utilised flexibly to maximise their value as society’s needs change.

However, while the autonomous process of adjustment is essential for economic success in a dynamic and ever changing world, there are often costs of adjustment incurred by some agents, at least in the short term. That is, there are distributional impacts of adjustment—winners and losers. Despite the fact that adjustment frees up capital and labour to move to more efficient and often more sustainable uses in the longer term, this transition also involves some costs and many tough personal decisions are made which affect individuals, families and communities.
In general, these impacts are more significant when:

- the local or regional economy is more highly dependent on the industry in question rather than containing a mix of diverse economic activities
- the pressures for adjustment are severe and/or unexpected
- the individuals affected by adjustment pressures have limited skills, capacities and alternative opportunities to respond to change.

Concern about adjustment is often particularly strong when community viability may be called into question (i.e. where adjustment decisions by private agents are expected to have flow-on economic and social effects in a community). For example, consolidation of the agricultural sector in a region may mean reduced patronage and therefore viability of a local football club, transport service or school.

However, there is debate about the extent to which industry adjustment is necessarily a bad thing for regional communities. For example, McColl and Young (2005) found that “one of the most important characteristics of adjustment at the regional level is that relatively inefficient businesses or practices are replaced by more efficient ones. Thus regional impacts are often much less than those that occur in an industry sector”.

### 2.1.4 Government policy and adjustment

**Policies aimed at facilitating adjustment**

Australian governments have long pursued a range of policy reforms that facilitate adjustment and promote national economic efficiency and welfare. The COAG-led microeconomic reform agenda in Australia has been targeted at enabling adjustment by removing barriers to change and encouraging competition in successive waves of effort over the last three decades (see Productivity Commission 2001). For example, the removal of agricultural protection and liberalisation of trade can be seen as an example of a set of policies aimed at facilitating and promoting adjustment. In this regard, McColl and Young (2005) conclude that:

“experience suggests that Australian farmers, as a whole, and Australian communities have demonstrated great skill in adjusting to changing circumstances. Overall, the result of exposing the farm sector to market forces has been the retention of a vibrant and internationally competitive Australian farm sector, dynamically engaged with an ever-changing global economy”.

However reforms aimed at facilitating adjustment have not been limited to the Australian agricultural sector. Structural change has been observed in a variety of industries in recent years, including in the mining, manufacturing, financial services and tourism sectors, and in reforms in other areas of the economy (e.g. labour market, deregulation and tax reform).
The national water reform agenda outlined in the 1994 COAG Strategic Framework for Water Reform and the 2004 National Water Initiative also aim to promote and facilitate adjustment with a focus on the development of water markets to enable water to move to its highest valued use, and on ensuring the sustainable allocation of water between consumptive and non-consumptive water use (Bjornland and McKay 1999).

**The impacts of policy induced adjustment**

Negativity towards adjustment is often focussed on government policies that facilitate that adjustment, rather than on the underlying factors such as changed market conditions, that drive the adjustment. This is because it is often presumed that government policy is a major cause of adjustment pressure. Furthermore, government policies are often blamed for all of the negative community impacts of market driven and policy-induced adjustment, and become the focus for political resistance to various government reforms.

However, there is significant debate about the causes of adjustment or the relative contributions of government policy and other factors. For example, Frontier Economics et al (2007) highlighted that water trading merely facilitate the movement of water in response to external adjustment pressures, rather than being the primary driver. This study demonstrated that there are significant benefits associated with water markets in managing drought and the difficulties in attributing any social and economic impacts that might be associated with water trade against the background of severe drought and low water allocations.

It is important to recognise that many government policies resisted on the basis of their adjustment impacts on regions are aimed at improving economic and welfare outcomes for the nation as a whole. Often the benefits of such reforms are incremental and dispersed, while the costs are concentrated and visible. Where the overall benefits of policy reform exceed the costs, the question for governments becomes one of what to do about such costs, if anything? This is a question about equity, not about efficiency.

**Policies aimed at restricting, deferring or slowing down the pace of adjustment**

Governments have intervened across a variety of sectors to restrict, defer or slow down the pace of adjustment in response to concerns about the costs of adjustment, particularly where the concerns are related to policy-induced adjustment. It is often argued that slowing the pace of adjustment gives communities time to adapt. However the evidence on this point is not clear and is likely to vary on a case by case basis. McColl and Young (2005) conclude that:

“the ‘appropriate’ rate of structural adjustment is not known and providing changes are occurring in a procedurally fair manner, there is no logical basis for masking, slowing or speeding up the rate determined by markets”.

Framework and approach
The problem with policy responses that impede or slow down adjustment is that the positive benefits of adjustment are often forsaken and they can produce additional costs, delay the inevitable, and result in unintended consequences, including for the environment (Productivity Commission 2001). For example, Frontier Economics (2009) demonstrated many of these impacts in relation to the four per cent annual limit on inter-district water entitlement trade. Once this limit is reached, it impacts harshly on irrigators that are under pressure to make adjustment decisions such as to exit irrigation.

A general principle of public policy is that where the government intervenes in the market to achieve more than one objective, it should use a separate policy tool to achieve each objective. This ensures transparency, increases the likelihood of the policy tool being successful, and reduces the possibility of unintended and harmful outcomes. This is particularly so when addressing the distributional consequences of adjustment, which is best achieved with well targeted and specific measures (Productivity Commission 2001).

**Adjustment assistance measures**

Australian governments have a long history of developing assistance packages aimed at helping industries and local communities deal with both market and policy induced adjustment pressures (see McColl and Young 2005; Musgrave 1982; Productivity Commission 2001). In an objective policy discussion about adjustment it is important to distinguish between natural or autonomous adjustment processes and government responses to these processes.

Government responses can include both financial and non-financial measures aimed at:

- facilitating and expediting necessary adjustment
- reducing the costs of adjustment
- addressing equity or distributional impacts
- underpinning the social welfare of those affected.

While most are well-intentioned, financial assistance measures have been criticised on a number of grounds, including that they are:

- costly
- poorly targeted
- financially beneficial to those that do not require assistance on welfare grounds
- driven by local political motives
- a disincentive for market driven adjustment
- a contributing factor to inefficient and environmentally damaging resource allocation.

As stated by the NWC (2009):
Successful adjustment is necessary for successful water reform. For that reason governments should pay attention to the pressures and processes of adjustment. However this does not mean that special adjustment programs are either necessary or desirable. On the contrary, too many supposedly pro-adjustment programs and policies have, in the past, delayed, distorted or derailed adjustment processes—to the long-run cost of the communities involved.

Perhaps the most notorious example of adjustment assistance relates to drought assistance and “exceptional circumstances” drought relief as it is currently known. In their recent report on drought assistance, the Productivity Commission found that a large swathe of southern Queensland has been receiving “exceptional circumstances” payments since the scheme was introduced (over ten years ago), despite the fact that rainfall during the period was roughly equivalent to the long-term average.

Despite the benefits of a steady and phased approach to reform, many economists argue that, while good policy design and implementation needs to consider adjustment implications, positive national reforms should not be overly inhibited or slowed down because of adjustment concerns. Instead, adjustment pressures are likely to be best dealt with by:

- clearly signalling policy reforms in advance
- allowing adjustment to proceed
- providing clear information so that private agents can make informed and timely decisions
- emphasising non-financial measures over financial measures where possible
- ensuring that any assistance is time bound
- clearly targeting and structuring any particular financial assistance to defined equity and welfare objectives
- intervening on welfare grounds only where the general welfare system is assessed to be insufficient.

### 2.1.5 Summary

Structural change is largely a natural process driven by individuals and firms. It is essential in driving national productivity and innovation. However the benefits and costs of adjustment are often unevenly distributed. The process of adjustment is particularly controversial when it is concentrated in local and regional communities.

Government policies aimed at enhancing national productivity can facilitate localised adjustment and are often resisted where the costs of adjustment are concentrated. In turn governments have a history of adopting a range of responses varying from facilitating and expediting adjustment to slowing it down and preventing it from occurring altogether. The problem with policy responses that impede or slow down adjustment is that the positive benefits of adjustment are often forsaken and the adjustment policy responses can produce additional costs, delay the inevitable adaptation, and result in unintended consequences.
2.2 Conceptual framework

This section provides a conceptual framework for understanding of adjustment processes in the irrigation sector of the MDB, and assessment of the relative importance of various adjustment pressures. Figure 1 provides a summary of this conceptual framework.

**Figure 1: Irrigators’ adjustment decisions and their economic and social impact**

<table>
<thead>
<tr>
<th>Adjustment pressures:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Market</td>
</tr>
<tr>
<td>- Social</td>
</tr>
<tr>
<td>- Technological</td>
</tr>
<tr>
<td>- Government policy</td>
</tr>
<tr>
<td>- Environmental</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual irrigators’ adjustment decisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual decisions consider:</td>
</tr>
<tr>
<td>- Expected profitability</td>
</tr>
<tr>
<td>- Outlook</td>
</tr>
<tr>
<td>- Financial position</td>
</tr>
<tr>
<td>- Business objectives</td>
</tr>
<tr>
<td>- Risk aversion</td>
</tr>
<tr>
<td>- Understanding and uncertainty</td>
</tr>
<tr>
<td>- Perceptions, attitudes and ethics</td>
</tr>
<tr>
<td>- Strategic behaviour</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Industry level structural change</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Local/regional community impacts of change</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Types of social and economic impacts at the community level:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
</tr>
<tr>
<td>- Direct economic impacts (e.g. on suppliers of inputs, processors, distributors)</td>
</tr>
<tr>
<td>- Indirect economic impacts (e.g. on local business activity)</td>
</tr>
<tr>
<td>Social</td>
</tr>
<tr>
<td>- Viability of community services (e.g. sporting clubs, schools and medical services)</td>
</tr>
<tr>
<td>- Impacts on community attitudes and human / social capital</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Importance or severity of these impacts is influenced by:</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Extent of aggregate /cumulative adjustment</td>
</tr>
<tr>
<td>- Dependence on irrigated agriculture</td>
</tr>
<tr>
<td>- Alternative economic opportunities</td>
</tr>
<tr>
<td>- Timing of adjustment decisions</td>
</tr>
<tr>
<td>- Community resilience and capacity to deal with change (e.g. education, skills, human capital)</td>
</tr>
</tbody>
</table>

**Source:** Frontier Economics

**Individual adjustment decisions**

The framework highlights that structural change is driven by the adjustment decisions of individual irrigators. Fundamentally, these decisions are driven by expectations about the future profitability of their individual enterprise based on the range of market, social, technological, government policy and environmental
factors. The specific adjustment pressures identified for assessment in this project are identified in section 2.3 below.

These individual adjustment decisions are based on all factors affecting expected profitability in combination. The impact on expected profitability is an important way of assessing the relative importance of any particular adjustment pressure. However attribution to any single pressure is often very difficult. Moreover, individual decisions often reflect a range of other factors including:

- **Outlook** – each irrigator will have a different outlook for the future in relation to a range of factors influencing expectations regarding future profitability. Future commodity prices and climatic conditions are key examples where outlook can vary significantly.

- **Financial position** – each farmer will have a different level of debt versus equity, face slightly different costs of capital, have a different level of reliance on off-farm versus on-farm income, be seeking different rates of return on their capital investments, and have a different propensity or ability to take on more debt. Relatively higher levels of debt and a poor cashflow situation may increase the likelihood of a farmer exiting the irrigation sector. However, farmers will also consider overall wealth effects, such as impacts on the capital value of their land and water.

- **Business and lifestyle objectives** – some farmers will be aiming to grow and develop their business, others might want things to remain the same, while others may be planning to exit the industry, particularly in ageing family farming businesses without a succession plan. Others may sacrifice profitability and wealth where farming provides them with lifestyle benefits. Importantly, all members of the family unit will experience these lifestyle benefits or otherwise. These factors will have a major influence on the propensity to make adjustment decisions in response to external change.

- **Capacity to change** – older irrigators, and those with less education and skills, may be relatively unwilling to change their production systems.

- **Risk aversion** – each farmer will have different attitudes towards adjustment. Some may embrace change, while others will resist it. Failing to adjust to changed circumstances is often the more risky response, particularly where it involves escalating levels of debt.

- **Perceptions and intangibles** – personal views and societal norms play a key role in determining adjustment decisions, and feed into shared perceptions about future outlook.

- **Understanding and uncertainty** – It will be critically important that any irrigator fully understands the profitability implications of adjustment decisions for their business both now and into the future. Uncertainty about the expected costs and benefits will influence outcomes and will typically slow down adjustment responses.

- **Strategic behaviour** – farmers may avoid making adjustment decisions or take a certain course of action if they believe it could lead to other, more favourable
outcomes in the future or a deferment of inevitable adverse outcomes. Strategic behaviour is particularly important for responses to government policies and actions.

Variation in these factors explains why adjustment patterns are difficult to predict.

**Industry and community impacts**

The framework recognises that the decisions made by individuals can impact on industries and local and regional communities. Economic impacts include direct impacts, such as on the activity and viability of local input suppliers and output processors, as well as indirect impacts on local economic activity and employment through flow-on effects on expenditure.

In some cases, these economic impacts might lead to capital leaving an area and depopulation which might affect the viability of community services. Such outcomes, and the fear or perceptions that they may occur, can also affect community attitudes, human capital and resilience.

Again, where it is possible to measure these outcomes, it is important to remember that they reflect the range of adjustment pressures facing the individuals in that community, and it is difficult to attribute such outcomes to one single factor.

**Severity of industry and community impacts**

It is broadly recognised that adjustment outcomes vary considerably from community to community. The severity of the economic and social impacts is strongly influenced by the:

- extent and timing of individual adjustment decisions
- reliance or dependence of the regional community on irrigated agriculture
- availability of alternative economic opportunities and social services
- resilience of the community or capacity to deal with change.

For example, a study on the economic and social impacts of water trade by Frontier Economics et al (2007) found that large regional centres such as Mildura and Shepparton are more diverse and relatively less dependent on irrigated agricultural production than a number of smaller localities affected by adjustment in the irrigation industry. This study also highlighted how rapid decreases and increases in water availability in any local community can affect economic and social outcomes. For example, community services and housing in Robinvale struggled to keep up with the influx of investment and employment associated with new horticultural developments. While it might be possible to obtain an indication of the economic reliance of particular regions on irrigation through statistics such as the percentage of the population employed in irrigated
agriculture, it is more difficult to empirically assess the resilience or adaptive capacity of a local community to change.

**Links between communities and individuals**

Finally, the framework adopted for this study recognises that social systems are complex. One simple way of characterising this complexity is to recognise that there are feedback loops between community level outcomes and individual adjustment decisions. For example, changes in the availability of community services may affect the locational investment decisions of individuals and firms. More broadly, the social and economic factors driving the movement of young people out of farming over recent decades has had a feedback effect on the succession planning and adjustment decisions of ageing farmers. The importance of such inter-relationships is likely to be highest when there are direct inter-dependencies between irrigators and downstream employment, or where the viability of transport and distribution links requires a critical mass of production in order to remain competitive.

### 2.3 Adjustment pressures to be assessed

Figure 2 identifies the specific adjustment pressures that are examined in more detail in subsequent sections of the report. It includes:

- non-water related factors
- factors related to water availability for irrigation use such as the current drought and climate change
- factors related to government water and irrigation policy.

These factors are based on a desktop review of relevant literature and our previous experience in the area. This list aims to cover the most important adjustment pressures in the irrigation sector of the MDB.

In assessing the importance of each factor it is necessary to consider the current conditions (e.g. current commodity prices), natural volatility or variability in each factor, and any longer term trends. For instance, a key question for the MDBA in relation to the Basin Plan relates to the extent of permanent structural change likely to occur in the next few years due to the prolonged drought, debt and prevailing commodity prices and the longer term future viability of irrigated agricultural industries in the MDB.
2.4 Approach to the assessment

The assessment uses the conceptual framework outlined in Figure 1 to assess the extent and importance of each of the factors outlined in Figure 2. This provides guidance on the relative importance of the Basin Plan in the adjustment process.

The assessment presented in the following sections systematically addresses each of these adjustment pressures by:

- defining the adjustment pressure and describing how it affects adjustment decisions of irrigators
- drawing on qualitative and quantitative evidence and examples to assess and demonstrate the impact and relative importance including considering:
  - the extent and severity of the pressure (both now and into the future, including in a historical context)
  - the timing and spatial distribution of the pressure
  - how the impacts might vary between different irrigators, industries, locations and production systems
  - options available to mitigate the adjustment pressure.
We also comment on the availability of data to enable further assessment. Important linkages between different types of adjustment pressures are recognised and described throughout the analysis and conclusions are provided in section 0.

The MDBA has asked Frontier to assess adjustment pressures related to water availability, water security and water policy. To do this requirement, section 4 examines natural factors that affect the availability of water for irrigators both now and in the future (e.g. drought) and the expected reliability of water entitlement products (e.g. climate change).

Section 5 examines water policy factors. This includes government policies that affect the availability and reliability of water for irrigation, such as efforts to address unsustainable levels of allocation and address environmental decline (e.g. buyback and the Basin Plan). It also includes other adjustment impacts of water policy factors such as:

- perceptions of the long-term security of water entitlements
- certainty about future water availability and the policy environment
- the flexibility of water markets and allocation regimes to manage adjustment pressures
- the costs of publicly provided irrigation services into the future.

Given the scope of the study and the complexity of the issues, it is necessary to make a large number of generalisations about the adjustment pressures to provide a high level view of the relative importance of those pressures. This can inform government policy, but it is important to recognise that every irrigator is different—there are successful and unsuccessful irrigators in all regions, across all types of production systems, and all types of business structures. As such, any policy responses to mitigate adjustment pressures need to be designed and targeted based on an understanding of the specific concerns and circumstances in the industries or locations the policy is designed to help.
3 Adjustment pressures not related to water

This section examines the adjustment pressures affecting irrigators that are not related to water availability or future policy changes (see Figure 2 above) including market factors, social, technological and legacy factors and non-water related government policy.

3.1 Market factors

*The “cost-price squeeze”—the relentless pressure to remain competitive in a changing rural setting.*

Farm profitability is a key driver of adjustment decisions. Profitability (at full equity) is the difference between revenue and costs, where revenue is the price of outputs multiplied by the quantity of outputs produced, and costs include fixed costs (such as capital and fixed annual irrigation access fees) and variable costs (such as labour and fuel).

Market prices and input costs change over time in response to a range of underlying supply and demand side conditions in relevant markets. The price mechanism provides the ultimate adjustment signal in any market by acting to balance supply and demand. For example, when global rice production falls, the price to consumers goes up and manufacturers of rice products may increase their prices paid to farmers in an attempt to attract increased supply. The corollary of this is that as supply increases above market demand, prices decrease. The wine glut in Australia is a perfect example, where major increased investment in the supply of wine grapes has failed to adequately consider the underlying market demand.

In global markets for commodities produced using irrigation in the Basin, individual irrigators are generally regarded as “price takers”—that is, they are forced to accept the price set internationally and cannot influence that price. Over several decades the real prices of agricultural products have been in decline, while the cost of inputs to the production process have either increased, or not fallen at the same rate as prices. This phenomenon is also known as the “cost-price squeeze” (see Figure 3).
Adjustment pressures not related to water

Figure 3: Australian agricultural terms of trade (1960 – 2003)

![Australian agricultural terms of trade](image)


As they have limited ability to pass on cost increases to end consumers in this environment, irrigators and other agriculturalists have been forced to increase productivity and manage input costs to remain competitive.

*Australian agriculture has undergone considerable change over the last few decades. Thanks to rapid productivity growth, agricultural output has more than doubled in this period. Nevertheless, with the even faster growth of the services sector, agriculture’s share of the economy has declined. At the same time, there have been marked changes in the make up of the sector, driven by a variety of domestic and international forces (Productivity Commission 2005).*

As discussed below, the cost-price squeeze is also associated with a range of social and demographic changes in rural communities and significant consolidation within the agricultural sector.

For export markets such as those for most major irrigated agricultural products in the Basin, the price received is affected by global supply and demand conditions. As a result, foreign exchanges rates also have a major impact on the price for Australian commodities.

Investment decisions and the ability of irrigators to manage variable returns are also driven by the cost of capital or debt (i.e. prevailing interest rates).

Furthermore, while the long-term average terms of trade for agricultural products is in decline, global markets are affected by a complex mix of factors, and global economic conditions and outlook, rather than commodity specific factors, have a significant influence on outcomes. Variability or volatility in commodity markets and the cost of inputs is a key issue for irrigated agricultural producers.

Changes in price signals result in dynamic production responses by irrigators. While each individual irrigator has a different capacity to manage the competitive pressures they face, the adjustment pressures associated with market factors are
best described at the industry level. When examining the relative performance and prospects of particular industries in the face of adjustment pressures, it is useful to consider the “comparative advantage” of various regions and production systems compared to their competitors. For example, irrigated dairy in northern Victoria competes directly with dryland dairy in Gippsland and Western Victoria. When irrigation water availability is high, the cost of dairy production in the irrigation sector is competitive with dryland producers, however when water availability declines, the irrigated dairy producers are at a significant competitive disadvantage.

To explore the basic industry economics and importance of market factors in driving adjustment, the following sections examine general trends in production, commodity prices, input costs and financial returns in key irrigated agricultural products in the Basin, namely dairy, rice, wine, and cotton.

3.1.1 Dairy

Figure 4 following shows the export oriented growth in the Australian dairy industry during the 1990s. This growth peaked in 2001-02 when the drought led to a decline in overall production. Over this period, the quantity of dairy products consumed in the Australian market has remained relatively constant.

Figure 4: Australian dairy industry production and proportion of exports

Notably, more than 60% of milk produced in Victoria and Tasmania was exported in 2007-08, with local drinking milk accounting for less than 10% of production, and manufactured products for local consumption making up the remaining 30%.

Reduced demand and lower prices

Figure 5 shows major increases in prices for export dairy products from October 2006 which were sustained until July 2008. These price rises were a response to
generally favourable economic conditions and some commentators thought that a permanent increase in prices may have emerged (which would have put the Australian industry in a more viable long term financial position). However the severe decline in market conditions brought on by the global financial crisis led to a rapid and severe decline in commodity markets, including the dairy industry in 2008-09.

Figure 5: Recent fluctuations in prices for dairy export products

These trends in export products were echoed in the farm gate prices to farmers in Victoria, South Australia and Tasmania. As indicated in Figure 6, farm gate prices increased from approximately $3.80 in 2006-07 to $5.40 in 2008-09 before declining to around $3.50 in 2009-10 (all figures in $/kg milk solids).

In the irrigation regions, the high prices in the lead-up to the global financial crisis assisted irrigators to pay for supplementary feed and encouraged them to keep producing, despite the low water availability. However this changed at the start of 2009 primarily as a result of the global economic downturn. The low prices at the start of 2009 meant that many dairy operators in northern Victoria and southern NSW could not cover the operating costs of production, let alone provide a return on capital. As a result, many operators have made significant adjustment decisions, including to reduce herd size (partially or fully), and sell water entitlements (including to the Commonwealth).
Figure 6: Estimated opening milk price to VIC, SA, TAS dairy farmers ($/kg milk solids)

Source: Dairy Australia 2009

Price volatility

Figure 7 shows that price volatility is higher in Victoria, South Australia, and Tasmania than in Queensland and WA markets, which are more focused on domestic supply. These fluctuations pose a significant cashflow management challenge for irrigators, particularly in the export oriented markets.

Figure 7: Farm gate milk prices across Australia

Source: Dairy Australia 2009
Adjustment pressures not related to water

Appreciation of the Australian dollar

The appreciation of the Australian dollar in 2009-10 has also had a direct impact on these price outcomes. Dairy Australia (2009) estimates that a 10 cent appreciation in the Australian dollar against the US dollar leads to a reduction in the farm gate price of 5 to 6 cents per litre (or roughly a 10% to 20% decrease depending on the prevailing conditions). If the current high level of the Australian dollar is sustained, this factor alone could have a major impact on the viability of the dairy industry.

Industry response and prospects

The dairy industry has demonstrated significant productivity gains over recent decades, as demonstrated in the following figure which shows that milk production has increased from 2,848 litres per cow in 1979-80 to 5,750 litres per cow in 2008-09.

Figure 8: Productivity improvements in the dairy industry – milk production per cow

<table>
<thead>
<tr>
<th>Year</th>
<th>NSW</th>
<th>VIC</th>
<th>QLD</th>
<th>SA</th>
<th>WA</th>
<th>TAS</th>
<th>AUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979/80</td>
<td>2,870</td>
<td>3,012</td>
<td>1,964</td>
<td>3,163</td>
<td>3,105</td>
<td>2,958</td>
<td>2,848</td>
</tr>
<tr>
<td>1989/90</td>
<td>3,602</td>
<td>3,920</td>
<td>3,122</td>
<td>3,934</td>
<td>4,205</td>
<td>3,791</td>
<td>3,751</td>
</tr>
<tr>
<td>1999/00</td>
<td>4,827</td>
<td>4,989</td>
<td>4,349</td>
<td>6,790</td>
<td>6,338</td>
<td>4,381</td>
<td>4,996</td>
</tr>
<tr>
<td>2000/01</td>
<td>4,687</td>
<td>4,977</td>
<td>3,943</td>
<td>6,369</td>
<td>5,903</td>
<td>4,177</td>
<td>4,859</td>
</tr>
<tr>
<td>2001/02</td>
<td>5,030</td>
<td>5,391</td>
<td>4,067</td>
<td>5,933</td>
<td>5,402</td>
<td>4,646</td>
<td>5,215</td>
</tr>
<tr>
<td>2002/03</td>
<td>4,996</td>
<td>4,885</td>
<td>4,230</td>
<td>6,556</td>
<td>5,348</td>
<td>4,304</td>
<td>4,913</td>
</tr>
<tr>
<td>2003/04</td>
<td>5,093</td>
<td>4,944</td>
<td>4,162</td>
<td>6,021</td>
<td>5,285</td>
<td>4,219</td>
<td>4,925</td>
</tr>
<tr>
<td>2004/05</td>
<td>4,925</td>
<td>5,101</td>
<td>3,735</td>
<td>5,862</td>
<td>5,418</td>
<td>4,497</td>
<td>4,983</td>
</tr>
<tr>
<td>2005/06</td>
<td>5,039</td>
<td>5,221</td>
<td>4,076</td>
<td>5,791</td>
<td>5,369</td>
<td>4,581</td>
<td>5,108</td>
</tr>
<tr>
<td>2006/07</td>
<td>5,151</td>
<td>5,261</td>
<td>4,033</td>
<td>6,417</td>
<td>5,235</td>
<td>4,696</td>
<td>5,182</td>
</tr>
<tr>
<td>2007/08 (i)</td>
<td>5,031</td>
<td>5,393</td>
<td>4,163</td>
<td>5,799</td>
<td>5,907</td>
<td>4,961</td>
<td>5,275</td>
</tr>
<tr>
<td>2008/09 (e)</td>
<td>5,332</td>
<td>5,864</td>
<td>4,995</td>
<td>6,142</td>
<td>6,326</td>
<td>5,303</td>
<td>5,750</td>
</tr>
</tbody>
</table>

Source: Dairy Australia 2009

Overall, unless conditions improve markedly, the future for irrigated dairy (with its higher cost structures compared to competing dryland producers) is under threat solely as a result of underlying market conditions.

3.1.2 Rice

Rice production in Australia is concentrated in the NSW Riverina, mainly in the Murrumbidgee and NSW Murray regions. Production varies significantly from year to year based primarily on seasonal water availability (see Figure 9).
The recent commodity price story in the rice industry is similar to that of dairy but has some important differences. As a result of increasing global demand, Sunrice, a major producer of Australian rice, increased its price paid to farmers from $328 per tonne of paddy in 2007-08 to $450 per tonne in 2008-09, and announced a new record price of $550 per tonne for 2009-10.

Sunrice (2009) has stated that these major price increases are driven by regional shortages of supply, in part due to the prolonged drought affecting the whole of the Australian rice industry. Increases in rice prices in global markets were also observed. However, the price in 2008-09 was not sufficient to encourage irrigators to produce rice, as greater returns could be had by selling limited water allocations to horticulturalists. As Sunrice (2009) confirm:

> just 200 growers on 207 farms grew rice in 2008/09, which resulted in a harvest of only 65,922 tonnes. It remains a small fraction of our normal one million tonne crop.

Sunrice (2009) has also pointed to shortages in global rice production as a driver of price increases:

> 2008 was an extraordinary year for the world in many ways – the global financial crisis has had a tremendous impact on many countries and communities. This was also a watershed year for diminishing global food and rice supply. Rice prices increased by up to 300 percent and communities that rely on rice as a key food – an estimated 50 percent of the world’s population – were heavily impacted as a result.

Declines in rice production threaten the rice mills, storage and production facilities in Coleambally, Leeton and Deniliquin. Sunrice further reduced handling and milling infrastructure in 2008-09 although the company has stated that it has
“retained core technical and processing skills so we have the flexibility to re-start operations at these sites when the Riverina returns to producing a normal rice crop”. However, it is not known how long these assets and human resources can be effectively mothballed if dry conditions continue. Further work may be required to understand the costs and responsiveness of the downstream industries, in order to understand the potential impacts of water availability on regional employment and economic activity.

In summary, if water availability returns to reasonable levels, the current level of development in the rice industry in Australia could have a viable future in the short to medium term. Water availability is likely to be a key factor. The drought has driven the rice industry to test opportunities for rice growing in other parts of Australia, including in the north, with limited success to date.

### 3.1.3 Wine grapes

The Murray-Darling Basin produces approximately three quarters of Australia’s wine grapes (ABS 2008). The main warm climate grape growing regions, which are those that rely more heavily on irrigation water, are concentrated in Riverland (South Australia), Sunraysia/Swan Hill (north west Victoria/ south west NSW), and Riverina (Jackson 2009). Wine grapes are used to produce wine that is consumed locally and internationally. As such, global demand for wine has a strong influence on the industry.

**Expanding production**

Wine production in the Basin grew significantly from 2001 to the mid-2000s but has slowed since then (Figure 10). The growth in production in the early 2000s was due to strong demand in export markets and significant investment in the industry (Jackson 2009). However, increased competition in export markets, and increased imports into the domestic market, contributed to the subsequent slow-down in grape production in the Basin (Jackson 2009; Jackson, Stokes and Dyack 2009).
Falling prices

Average Australian grape prices have generally fallen since 2001 but increased in 2007-08 (Figure 11). Prices for cool and warm climate grapes fell by up to 50 per cent from 2000-01 to 2007-08. These changes have had a major impact on farm profitability.

ABARE has attributed the increase in wine grape prices in 2007-08 to wineries offering significantly higher prices to growers due to concerns about consecutive

Adjustment pressures not related to water
below average vintages. In response, growers purchased additional water which helped increase production (Jackson 2009) (Figure 10). However, there is significant variability in wine prices and recent reports indicate that they remain at critically low levels in some areas.

**Inventory growth**

Australia’s wine stocks increased from the mid 1990s to the mid 2000s but declined in 2006-07 (Figure 12). ABARE attributes the increase in wine stocks during the late 1990s and early 2000s to positive expectations about future sales, particularly in export markets. As export growth slowed and export prices declined (in real terms) in the early to mid 2000s (Figure 13), wine stocks continued to increase as production growth exceeded sales growth (Jackson 2009). Wine stocks fell in 2006-07, as production was cut back. However, a higher than expected grape crop and falling sales meant that stocks increased again in 2007-08.

**Figure 12: Australian wines stocks, 1996-07 to 2007-08**

![Diagram showing Australian wines stocks from 1996-07 to 2007-08](source: Jackson 2009.)
The effects of the downturn in the wine industry are evident in wine growing regions. As noted by ABARE (2007):

*Early in 2006 it became apparent that the horticultural industries in the Mildura—Wentworth region of north west Victoria and south west New South Wales were being adversely affected by a coincidence of factors affecting their financial viability. Increasing import competition, diminished export prospects and, in the case of the wine industry, significant oversupply all served to reduce farmgate prices for the main horticultural crops of the region. These market pressures raised the question about the long term viability of horticultural production in the region.*

Limited water availability is contributing to these pressures in irrigated wine production across the Basin:

*...the availability and cost of water for irrigation is expected to have a major effect on production in the coming years (Jackson 2009).*

With an increasing stockpile of wine and continuing low prices, many producers have reduced their planted area. In some cases, farmers are choosing to not harvest their grapes as the returns available do not cover the variable costs associated with harvesting.
Region specific factors influence the how grape growers are affected by general industry pressures in the wine industry and changes in water availability: For example:

- Horticulturalists in the Murrumbidgee historically received higher volumetric entitlements per hectare than their counterparts in the Sunraysia. Murrumbidgee high security entitlements also often receive equal or higher allocation volumes than those in the Murray system. This has meant Murrumbidgee irrigators have been better placed to sell water or produce grapes in recent dry years.

- In the South Australia Riverland, growers are well placed for blending opportunities with the Barossa and other SA winegrowing areas and therefore achieve higher returns. Further, Riverland growers have generally been growing wine for longer than irrigators in some other regions and have therefore enjoyed the high returns from the wine boom. Consequently, their financial reserves were possibly superior when the slump hit in the mid 2000s (pers. comm. Tim Cummins).

3.1.4 Cotton

The Murray-Darling Basin accounts for nearly all cotton production in Australia (approximately 92 per cent of production in 2005-06) (ABS 2008). The main cotton growing regions are in the northern part of the Basin and include the Border Rivers, Condamine-Balonne, Gwydir, and Namoi. The vast majority of cotton production is irrigated. Cotton production in the Basin decreased substantially from 2000-01 to 2007-08, with large variations between years (Figure 14). These changes in production were reflected in the area of land used for cotton production, with the area of land used for cotton production in 2007-08 less than half that in 2000-01 (Figure 15).
Adjustment pressures not related to water

Cotton production is opportunistic and changes dramatically each year depending on water availability. Figure 16 illustrates the effects of drought on annual water allocated in selected cotton-growing regions of the northern MDB. This reduction in water availability is linked to the overall reduction in cotton production from 2000-01 to 2007-08. Seasonal weather and pest conditions also contribute to cotton yields in a given year.
Figure 16: Announced water allocations in selected cotton growing regions 1998/99 – 2007/08

![Announced water allocations graph]

*Source: MDBA Water Audit Monitoring Report (various years)*

Although world prices for cotton increased from 2001-02 to 2007-08, this was offset by the appreciation of the Australian dollar (Figure 17).

Figure 17: World Cotton price and AUS/US exchange rate, 1998-99 to 2007-08

![Cotton prices vs Australian dollar value graph]

*Source: USDA (2009)*

Despite this, exports of cotton to China increased substantially from 2004-05 and 2005-06.

Adjustment pressures not related to water
The cotton industry has experienced significant improvements in yields in recent decades due to use of transgenic crop varieties and other developments in technology (MDC 2008) (Figure 19). It is also notable that Australian average yields are approximately three times the world average.

Despite the pressures in the cotton industry including reduced water availability and the short-term effects of the global financial crisis on demand for cotton, ABARE (2009) recently reported a positive outlook for the industry:
Cotton is expected to remain the most profitable irrigated crop in its traditional growing areas in Australia over the medium term. As a result, average cotton production is projected to increase to around 719,000 tonnes by 2013-14.

3.1.5 Other products

There are a number of other irrigated agricultural commodities produced in the Basin, including stone and pome fruits, almonds, olives, vegetables and citrus. Cotton growers can also irrigate other broadacre crops such as wheat. Each commodity has its own unique market conditions. Further detailed assessment of these industries may be important as part of developing the Basin Plan.

3.1.6 Overall assessment

Market factors play a critical role in determining overall adjustment outcomes and industry structures in the Basin. Key factors include commodity prices, productivity and input costs. While prices and costs are influenced by supply and demand conditions in the relevant markets, factors such as foreign exchange rates also contribute significantly to these prices and costs.

Recent price trends in dairy and horticulture have been important in driving recent adjustment. In an overall sense, the financial sustainability of these industries is questionable, at least. ABARE surveys of irrigators in the Basin in 2006-07 and 2007-08 were used to estimate the overall farm business performance of irrigated dairy, broadacre and horticultural farms in the Basin. The results of this survey show that average farm business profit in dairy and broadacre farms was negative in both years and the overall rate of return was between 0.3% and 1.5%. This is extremely concerning given the fact that dairy prices have declined significantly since the survey was completed. Despite making a small operating profit, the rate of return in horticulture was not much better at 1.5% to 2.0%. If these extremely low rates of return continue, there are significant doubts about the longer term prospects of these key irrigation industries in the Basin. However, Musgrave (1982) and others highlight the fact that farmers are often slow to adjust, with long lags despite poor ongoing financial performance.

More generally, the unpredictability of market outcomes should be a central concern to those developing the Basin Plan. This section highlights that picking winners in particular industries is a very risky strategy. Instead, policy settings should continue to provide flexibility to private agents in meeting the goal of the NWI to allow water to move to its highest value use.

3.2 Social, technological and legacy factors

The market factors discussed above are linked to broader social change in rural areas and in the structure of farming businesses. Legacy issues such as the
configuration of small farming units, particularly in public irrigation districts in the southern Basin, have been a critical constraint as the irrigation industry attempts to address the cost-price squeeze.

3.2.1 Rural demographic change and the ageing farming population

Description

The demographic and social structures of rural communities in the Basin are changing over time. While the factors affecting social systems are complex and every town and region is different, there are a number of clear trends in rural communities and the farming population that are expected to continue over time. These include a decrease in the proportion of people employed in agriculture and an increase in the average age of farmers.

Scope and extent of impact

Declining employment in agriculture

The agricultural sector as a whole is a large employer in the Basin, employing around 97,000 people. However this is only approximately 10.8% of the total employment in the Basin. The proportion of people employed in irrigated agriculture in the future is expected to be much lower.

There was a notable decline in agricultural employment in the Basin between 2001 and 2006 of approximately 12%, despite an overall increase in employment in the Basin of 8.3%. Farm employment is also in decline within the Basin and across Australia. From 2001 to 2006 there was a 7.4% decline in the number of farmers in the Basin from 73,140 in 2001, and a 9% decline across all of Australia (ABS et al 2009). Further data shows that over the last 10 years farm employment has fallen by 1.6% per annum and the agricultural industry experienced the largest decline in employment of all industries.

However, there is significant variation across the Basin. In the Sustainable Yields regions with the most farmers (i.e. Murray and Murrumbidgee), farmers represent about 10% of the total people employed. In the Moonie and Paroo regions, there are only small numbers of farmers, but they form 50% and 40% of the total of people employed, respectively. By region, the population of farmers declined most between 2001 and 2006 in the Eastern Mt Lofty Ranges (-16.2%), the Murray region (-12.1%), and the Wimmera (-11.4%) (ABS et al 2009).

Ageing farmers

The agricultural industry is ageing. In 2006, 67.6% of farmers were aged over 45 years and 18.6% were over 65 years. The number and proportion of farmers over 55 has increased from 2001 to 2006 despite an overall decrease in farmer
numbers. Similarly, over time there has been a decline in farmers in the younger age brackets indicating that new farmers are not replacing the older ones.

More generally, the ABS et al (2009) highlight the ageing workforce across the Basin in general, particularly in outer regional, remote and very remote areas. For example, in very remote areas approximately 24% of persons employed are over the age of 55 whereas the Australia wide average for very remote regions, and for major cities, is approximately 14%.

**Movement from local to regional centres**

Among other factors, declining transport costs, decreasing labour requirements and improved communications over recent decades have pushed the processing and distribution of agricultural commodities and sourcing of inputs away from small local communities to larger regional centres (see ABS et al 2009 for further evidence). Better community services such as health, education and aged care have also attracted people to the regional towns and cities at the expense of small localities. This trend is expected to continue over time.

**Changing land use patterns and lifestyle farmers**

While the agricultural sector is consolidating in response to the cost-price squeeze, there is also a trend towards people moving to rural areas in pursuit of lifestyle objectives. The so called sea change / tree change movement has been linked to retiring baby-boomers and other urban residents moving to the country on a permanent and part-time basis. Lifestyle farmers are more prevalent in areas close to natural amenities and with good transport links to major cities.

The trend toward lifestyle farming and other land use changes (such as new forestry plantations on private land) has created a number of tensions between competing landholders and has further increased the value of agricultural land to prices well above its value in agricultural production. On one hand, this has helped retiring farmers receive a high price for their land. However, it is also a constraint to further necessary consolidation of land in the agricultural sector and a cause of significant tension and ongoing debate about rural land use planning and planning decisions.

Competition for land is also occurring as a result of localised population growth, urban and peri-urban development and economic growth driven by mining developments which support increases in land values in other zones.

**Summary**

Basin communities and social structures have been changing for decades, particularly as a response to the cost-price squeeze and lower relative labour inputs. Farmers across the Basin are also old and getting old. With younger generations preferring to live in the cities, many current farmers have no viable
succession plans. As a result, further farm consolidation, decreases in the number of people employed in agriculture, and decreased importance of agriculture to the rural economy are likely to continue in the future, even in the absence of any further declines in water availability or changes in water policy.

The declining importance of agriculture in the Basin economy might mean that communities are more resilient to changes in irrigation water availability (e.g. with alternative employment opportunities). However there is significant variation across the Basin and detailed assessment is required to identify communities that are most reliant on irrigation. For example, further data and analysis of the age and future plans of irrigators across the MDB, as well as pressures for land use change will be useful in understanding potential adjustment patterns over time.

3.2.2 Farm size and characteristics

Description

The number, size and production characteristics of irrigation farms across the Basin are expected to affect adjustment outcomes.

Scope and extent of impact

Overall, the size of irrigation farms is increasing and the number of farms is decreasing over time in response to the cost-price squeeze. However there are still a very large number of very small and non-viable irrigation farm enterprises that are heavily reliant on off-farm income.

As an example, Figure 20 shows that the number of dairy farms in Australia has more than halved since 1979-80, despite the fact that production has increased dramatically (see Figure 4). Part of this decline in farm numbers has been driven by deregulation of the dairy industry which has exposed the industry to competitive pressures. Consolidation of agricultural enterprises is a response to the cost-price squeeze enabled by improved technology and increasing capital intensity. For example, anecdotally the number of milking cows to maintain a viable farm family business has increased from approximately 100 a generation ago to approximately 300 today. Despite productivity improvements and intensification this generally requires more land per viable enterprise.

While the drought is also expected to be a contributing factor to declining farm numbers in many regions, declines such as those in the dairy industry were clearly present before the drought, and could be expected to continue in the future across most irrigation industries.
The public irrigation districts in the Sunraysia region of Victoria provide another important example of the legacy of small irrigation allotments in public irrigation districts. For example, in 2003, approximately 74% of horticultural businesses were classified as small, operating on less than 14 hectares and heavily reliant on off-farm income. Only 6% were classified as large with over 50 hectares under production (RMCG 2006). In assessing the impacts of commodity price declines in the Mildura region, RMCG (2006) found that the medium sized enterprises (20% or around 600 businesses) “are at high risk, because these growers are less likely to have access to the buffer of off-farm income. These growers are expected to be the most exposed group, as they do not have the advantage of economies of scale or the buffer of off-farm income”.

In other industries, such as the rice and cotton industry, consolidation is also likely to continue. For many of these farmers and managers of mixed farming enterprises, irrigation is only a proportion of total agricultural land and there is some capacity for substitution between irrigation and broadacre dryland production on an annual basis (see later discussion on responses to variability in water availability).

**Summary**

Small farms will continue to struggle to compete in international markets and are only likely to be viable at the moment as a result of increased reliance on off-farm income. Further consolidation of irrigation properties is expected to continue in the future, even in the absence of changes in water availability and water policy. In some cases such as in the small blocks in the public irrigation...
districts in and around Mildura, these properties may not remain under irrigation, and dryland agriculture is not viable. Irrigators in many areas are competing with lifestyle farmers and land use change is emerging as a key issue in many rural and regional areas. Any new irrigation developments are more likely to emerge on greenfield sites with direct access to major supply channels and rivers. Small and fragmented land parcels in existing public irrigation districts are likely to form a barrier to new investment, consolidation and conversion to viable dryland agriculture in these areas.

3.2.3 Community dependence on irrigation

**Description**

Any declines in irrigation industries due to autonomous adjustment pressures, water availability and water policy may have impacts on social and economic outcomes at the community level (see Figure 1). For example, there may be fewer shops, schools may close or combine classes, and health services might be reduced. This will then impact on the decisions made by remaining irrigators depending on the importance they place on these community outcomes.

Key issues to consider are:

- the economic dependence of a community on irrigation
- the availability of alternative economic opportunities
- the adaptive capacity and resilience of a community.

**Scope and extent of impact**

**Economic dependence on irrigation**

There are a number of potential indicators of economic dependence on irrigation. These include measures of the proportion of employment, regional production, investment and value added in irrigated agriculture (and related industries). Much of this data is not directly available to Frontier at this stage, although we understand that some assessment methods, data and combined metrics have been developed.

However, some general patterns are evident. For example, in terms of gross value of production, irrigated agriculture grew from $5.1 billion to $5.5 billion from 2001 to 2006. This accounts for approximately 37% of the total value of agricultural production in the Basin (ABS et al 2009). Despite its higher intensity, irrigated agriculture accounts for only 2.3% of land use in the Basin, whereas all agriculture accounts for 83.7%.

Across the Basin, irrigated agriculture accounts for a much smaller percentage of the overall gross product in the Basin. This indicates that other sectors are likely to make a much larger contribution to economic activity and employment, and play a greater role in determining community level outcomes, as compared with
irrigation. This trend is not unique to the Basin, but occurs throughout Australia and other developed countries. Australian Bureau of Statistics National Accounts data indicate that agriculture accounts for around 3 per cent of Australia’s GDP at present, compared to 5 per cent in the early 1980s, 13 per cent in the early 1960s and closer to 20 per cent after World War II (ABS 5220.0; Maddock and McLean 1987).

Dixon, Rimmer and Wittwer (2009) concluded that:

*rural regions have followed a global trend that agriculture’s share of an economy decreases with economic growth. To put this shrinkage into context, Australia at a national level was more agriculture intensive 60 years ago than the Central Murray NSW statistical sub-division is now. The vitality of regional economies in the future will depend much less on preserving existing water rights assigned to irrigation and more on regional provision of services, particularly in education, health and aged care, which already account for substantial shares of economic activity at a regional level.*

While the total value of irrigated agriculture at the Basin level has remained steady, this masks significant fluctuations at the regional level and across major crop types. For example, the ABS et al (2009) highlights that a large majority of the irrigation farms, total irrigated area, volume of water applied and gross value of irrigated agricultural production is concentrated in the Murray, Murrumbidgee and Goulburn-Broken regions. Similarly, the dependence on irrigated agriculture varies dramatically across the Basin, including from town to town in regional areas.

Importantly, some analysis may neglect the direct dependence of some manufacturing and processing businesses on irrigated agricultural industries. Key examples of significant downstream employment include the dairy and fruit processing industries in northern Victoria and the rice industry in the NSW Riverina. ABS et al (2009) provides some data on employment in food manufacturing industries by region, which shows significant employment in the Condamine-Balonne, Namoi, Macquarie-Castlereagh, Lachlan, Murrumbidgee, Murray, Goulburn-Broken, Loddon-Avoca and Eastern Mt Lofty Ranges regions (over 1,000 people). However, many of these industries are dependent on dryland agriculture rather than irrigation. The main irrigation areas of Murrumbidgee, Murray, and Goulburn-Broken are likely to have more employees involved in downstream industries reliant on irrigation.

A key adjustment issue for these downstream industries is the presence of economies of scale and scope. For example, at what point does declining irrigated agricultural production make it unviable to operate a rice mill, fruit cannery or a dairy manufacturing centre? And if this downstream productive capacity is lost, can it return if conditions improve, will it return in that region, or will downstream activity move elsewhere?
The economic dependence on irrigated agriculture varies dramatically across the Basin, including from town to town in regional areas, and requires further investigation.

**Alternative economic opportunities**

The presence of alternative economic opportunities and employment will be a key factor determining whether regional communities can adapt to adjustment pressures. All other things held constant, a more diverse regional economy may also assist communities to overcome downturns in any particular industry. A number of indicators may inform a more detailed assessment of such alternative economic opportunities.

Importantly, where unemployment is already high, this is expected to indicate where alternative economic opportunities are limited. In this regard, the Basin has lower overall unemployment figures than Australia as a whole and the rate of unemployment has decreased from 2001 to 2006 in all Sustainable Yields regions with the exception of Wimmera, which was essentially constant. However the rate of unemployment varies across the Basin with the highest rates present in the Barwon-Darling, Namoi, Loddon-Avoca and Border Rivers regions (ABS et al 2009).

**Resilience and adaptive capacity**

The potential for alternative economic opportunities may not be realised if the individuals involved in declining industries do not have the skills or capacity to adapt to new employment opportunities. As such the adaptive capacity of individuals is important in determining how resilient they will be to change. Adaptive capacity and resilience may also be assessed at the community level, where formal and informal institutions play an important role. Adaptive capacity varies significantly from town to town and is best assessed by social scientists through fieldwork and community engagement. However we understand that coarse measures based on ABS data are being developed and applied in the Basin. For example, educational levels, age and other demographic factors all play a role.

**Summary**

Communities change and evolve due to a range of adjustment pressures. In turn, these changes are likely to influence the decisions made by remaining irrigators, particularly where community infrastructure, services and lifestyle factors are a motivating factor.
3.3 Other government policy measures

**Description**

Government policy affects the costs and returns associated with irrigation, even where it is not related to water management. Government policy can affect the viability of irrigators and distort adjustment outcomes by affecting incentives. Policy uncertainty may also affect adjustment decisions.

**Scope and extent of impact**

There are a number of national, state and local government policies that affect the adjustment decisions made by different irrigation businesses, despite being unrelated to water. The following provides a brief overview of some of the main policies expected to influence outcomes.

**Drought assistance**

Agricultural producers in Australia are currently provided with financial support in the event of severe drought or some other climatic events through Exceptional Circumstances (EC) payments. ABS *et al* (2009) show that since the onset of the drought, the proportion of agricultural land subject to EC payments in the Basin has increased to approximately 80%. However it is not known how many irrigators within the Basin have been receiving EC payments as this also includes dryland agriculture.

While these payments may have been important income support for some agriculturalists and their families, the Productivity Commission (2008) provides the most recent in a long list of critical assessments of drought assistance policies. Chief amongst these criticisms are that drought assistance payments are a disincentive to efficient risk management by individual farmers and that they distort the pattern of adjustment, including in areas where the sustainability of agriculture is financially and environmentally questionable.

**Taxation policy and MIS developments**

New irrigated horticultural developments (wine, almonds, and olives) predominantly along the Murray River have emerged over the last decade. Favourable taxation policies contributed to the emergence of these Managed Investment Schemes (MIS). Several major MIS companies failed as a result of the global economic downturn and some of their assets have since been resold by administrators.

**Regulation**

Quality standards, environmental and other regulation impose costs on irrigation businesses. To the extent that such regulatory requirements form an additional cost that is not incurred by competitors in other states or countries, regulation could have an impact on the viability of irrigation industries in Australia.
However, some regulation can provide benefits in assisting producers differentiate their products based on quality and environmental grounds. For example, Australia has long marketed its agricultural products based on the ‘clean and green’ image.

The regulatory decisions of other governments to provide or restrict market access for Australian commodities, and to subsidise their industries, can also have a major influence on commodity prices for our goods.

**Land use planning and policy**

Competing land uses, such as urban and peri-urban development are an important factor in irrigation areas within close proximity to cities and major regional centres. By providing a process for land use to change, land use planning and policy can have a significant impact on the adjustment options available to irrigators and the incentive to adjust away from existing land use.

**Summary**

Other government policy can have an impact on the relative economic performance and viability of industries, particularly when they are competing internationally. Clear and flexible land use planning and policy is likely to be important in facilitating efficient adjustment in the future.
4 Adjustment pressures related to water availability for irrigation

Drought and climatic uncertainty has had a significant impact on irrigation in the MDB.

This section examines the impact of drought and climate change on the cost, availability, and variability of irrigation water supply. These are factors affecting water availability that are beyond the control of government water managers and irrigators. However, this section shows that flexible water management policies, including water markets and carryover have been extremely effective in enabling irrigators to manage the impacts of reduced water availability. This has important implications for the Basin Plan.

4.1 Annual variability and the prolonged drought

Description

Variability in rainfall is a feature of the Australian environment. In the iconic poem ‘My Country’, Dorothea Mackellar wrote in 1908 ‘I love a sunburnt country, a land of sweeping plains, of ragged mountain ranges, of drought and flooding rains’.

The ability to manage natural rainfall variability through accessing supplementary irrigation water is a major benefit for agriculture in the Basin. However, a prolonged sequence of drought years has challenged the ability of water storages to smooth water availability between wet and dry years. This is sometimes termed an ‘irrigation drought’, when the dry sequence is of such severity and duration that water storage reserves are run down and irrigation water available is significantly reduced.

Scope and extent of impact

The impact of rainfall variability affects crop water demands. During hot and dry weather, crop water demands are generally higher. In addition, reduced rainfall during extended hot and dry periods means that more of these water demands need to be met from supplementary water sources like irrigation water.

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In general, irrigation drought leads to significant reductions in the volume of water available (in total) for use in irrigation activities. The availability of water for irrigation affects the ability to supplement rainfall to meet crop water demands, and can reduce production.

In considering the impacts of drought it is important to take into account the characteristics of the water resource from which irrigation is occurring:

- **In regulated systems**: Irrigated agriculture is often dependent on access to a highly reliable water supply, particularly for non-interruptible industries such as horticulture or semi-interruptible industries with high capital components such as dairy. Annual crop industries, such as rice and cotton, can also use irrigation water when it is relatively abundant.

- **In unregulated systems**: Irrigated agriculture may be more focussed around opportunistic irrigation activities such as annual crops that are better suited to the characteristics of the available water resource.

- **In farm dam or overland interception circumstances**: Irrigated agriculture may be more focussed around opportunistic irrigation activities such as annual crops that are better suited to the characteristics of the available water resource.

Although irrigation is used to help smooth seasonal variability, the degree to which this smoothing can occur depends on opportunities for storage. In this way irrigated agricultural activities in regulated systems are structured to function with more certainty of water availability, and hence may incur more costs when there is a severe and prolonged drought sequence. This has been observed in the southern Murray-Darling Basin where the recent irrigation drought has led to decisions where perennial trees and vines were dried off due to the record low water availability.

**The drought over the last decade**

The decade-long drought in the Basin has had a major impact on individual irrigators and irrigation dependent communities. Due to low rainfall and runoff, water allocations have decreased markedly across the Basin, to the point where many low reliability entitlements have not had any allocations for many years.

Because storages in the southern Murray-Darling Basin (such as in those in the Murray and Murrumbidgee) are significantly larger and yields are more reliable than those in the northern Basin (such as those that supply the Lachlan, Gwydir and Namoi), annual determinations in the southern system are much less likely to fall to zero. Larger storages allow water users in the southern Basin to smooth water consumption across years by holding some water in reserve as a buffer against annual variation in inflows. Figure 21 and Figure 22 show that final determinations (i.e. allocations) for NSW general security entitlements have been zero twice in the Murray since 1991-92 (i.e. 2006-07 and 2007-08) and have never
been zero in the Murrumbidgee. In contrast, determinations in the Lachlan, Gwydir, and Namoi have been zero in several years since 2002-03.

Despite the existence of large storages in the southern Basin, prolonged dry conditions over the past decade have prevented these storages from recovering and there has been a decline in general security water determinations in Murray and Murrumbidgee. Even allocations to high reliability entitlement products in Victoria have fallen well below 100 per cent, to as low as 20-30% in the worst seasons. There has been some improvement in inflows in 2009-10, in some systems.

Figure 21: General security water determinations in NSW Murray and Murrumbidgee

Final determinations also vary across valleys within the northern and southern parts of Basin. In the northern Basin, for example, determinations in both Gwydir and Namoi reached 20 per cent between 2007-08 and 2008-09 while the Lachlan Valley had zero allocations.
Adjustment pressures related to water availability for irrigation

The drought has had a significant economic impact on irrigators across the Basin and flow-on effects on employment and regional economic activity. However, there is limited recent data that we are aware of to demonstrate the overall economic impacts. Importantly, the impacts of the drought on the Basin economy and particular communities are a combination of the dryland and irrigation drought.

ABARE (2009) reported on the impact of the current prolonged drought conditions in the Murray-Darling Basin and found that that “the financial performance of Australian farms (including both dryland and irrigated farms) fell sharply in 2006-07 as severe drought across most of southern Australia led to a significant reduction in farm production and incomes”. Although the performance of both dropped markedly, irrigated farms still generally outperformed dryland enterprises (Figure 23).
Adjustment pressures related to water availability for irrigation

The purpose of the ABARE study was ‘to identify the regions and industries within the Basin facing the greatest pressure for structural adjustment, based on irrigators’ financial situations’. Its survey of irrigation farms across 10 regions of the Murray-Darling Basin found that the effect on the financial performance of irrigators associated with the large reductions in water allocations to irrigations farms varied across the Basin by region and industry. Also, the survey results showed there was diversity in the financial returns of irrigators across the Murray-Darling Basin such that there were no industries or regions with substantially better or worse financial results than the others in 2006-07.

More generally, ABARE surveys of all farm financial performance (both irrigated and dryland) found that there have been improvements in 2007-08 and 2008-09 for northern NSW and Queensland agriculture. However, southern MDB farms are not experiencing similar improvements due to continued low water availability as well as poor prices for some irrigated outputs.

Source: ABARE (2009) from ABARE survey of irrigation farms in the Murray-Darling Basin
**Tools available to irrigators to manage adjustment pressure**

There are a number of tools available to irrigators to manage the impacts of low irrigation water availability:

- **Production decisions** – to change production levels or cease production altogether depending on whether the activity is interruptible (e.g. annual cropping), semi-interruptible (e.g. dairy) or non-interruptible (e.g. trees and vine crops).

- **Water trading** – has arisen as a valuable tool for water to be reallocated between irrigators and irrigation activities to the highest value uses in the prevailing circumstances. Extremely high spot prices for water observed in early parts of dry irrigation seasons makes it expensive to purchase the additional water required to keep trees and vines alive or maintain production. High prices also make it attractive for rice growers to sell limited early season allocations and not produce a crop, given uncertainty about end of season allocations.

- **On-farm storage** – provides some additional opportunities for smoothing water resource availability between seasons. However on-farm dams are often not as effective as large river storages at this function.

- **Individual access to headworks storages** – the ability for individual irrigators to hold water over in the large communal storages of the southern connected system occurs through carryover ‘opportunities’. Northern MDB systems have continuous accounting or capacity sharing which also enables individuals to manage water held in storage.

- **Groundwater substitution** – provides an alternative to surface water resources. This may also have been an attractive alternative given that groundwater resources have not traditionally been managed under the MDB Cap and therefore have been a more accessible resource in times of water scarcity.

- **Drought contingency planning and drought assistance** – reflecting either irrigator or government actions.

- **Other income and farm equity** assist in management - other farm income allows financial shortfalls to be managed without degrading asset position. High equity gives a position where more debt can be sought. Appreciation of farm land values over time adds to farm equity.

Many of these tools for managing variability in water availability will also aid in managing longer-term reductions in water availability as opposed to seasonal variability. A key difference between these factors reducing water availability is the expectations that surround them. Some are uncertain and unknown, such as the anticipated impact of climate change (as discussed in the following subsection), while others are planned, such as SDLs under a Basin Plan. The way that SDLs are specified may either increase or decrease the seasonal variability of water available to the irrigation sector (even though SDLs are expected to reduce...
the average water availability) depending on the relative shares of water available for extraction and the environment in wet or dry years.

Summary

Seasonal variability in the availability of irrigation water and periods of prolonged drought are critical factors affecting adjustment in irrigation industries and consequently on regions and communities that are dependent on these irrigation industries. The prolonged drought over the last decade has reduced farm financial performance, increased debt levels, and has brought forward many farmers’ decisions to exit the industry.

4.2 Climate change

Description

Human induced climate change as a result of greenhouse gas emissions is likely to result in changes in weather patterns that affect rainfall and runoff in the MDB. More broadly, climate change is expected to result in fundamental changes in global weather patterns and could have a major impact on global supply of agricultural commodities.

Scope and extent of impact

In the MDB, the CSIRO (2008) Sustainable Yields Study found that:

*The impacts of climate change by 2030 are uncertain; however, surface water availability across the entire MDB is more likely to decline than to increase. A decline in the south of the MDB is more likely than in the north. In the south of the MDB, a very substantial decline is possible.*

*In the north of the MDB, significant increases are possible. The median decline for the entire MDB is 11 per cent—9 per cent in the north of the MDB and 13 percent in the south of the MDB …*

*The median water availability decline would reduce total surface water use by 4 per cent under current water sharing arrangements but would further reduce flow at the Murray mouth by 24 per cent to be 30 per cent of the total without-development outflow. In volumetric terms, the majority of the impact of climate change would be borne by the environment rather than by consumptive water users.*

As well as an average reduction in water availability, climate change is expected to increase the variability of water availability in the Basin, with droughts potentially becoming longer and more severe. CSIRO (2008) found that:

*The relative impact of climate change on surface water use would be much greater in dry years. Under the median 2030 climate, diversions in driest years would fall by more than 10 per cent in most New South Wales regions, around 20 per cent in the*
Murrumbidgee and Murray regions and from around 35 to over 50 per cent in the Victorian regions …

Climate change is also expected to increase the frequency and severity of major weather events such as frosts, storms, heatwaves, bushfires and dust storms. It could have impacts on the prevalence of pest plants and animals. The importance of these impacts is more difficult to predict, but should not be underestimated. Horticultural and viticultural crops are particularly at risk from adverse weather events.

These factors create additional costs and threaten production, increasing adjustment pressure. Such pressures could also affect the relative merits of alternative production systems. For example, increased variability in water availability might favour more interruptible production systems such as rice or annual pastures over perennial production systems, such as horticulture.

While these impacts could completely change irrigation in the Basin, the direct impacts on irrigated agricultural industries might be outweighed by the overall market effects of climate change on global agricultural markets. Any major changes in the supply and demand for agricultural commodities as a result of climate change could have substantial impacts on the price of irrigated agricultural commodities in Australia. Such changes are extremely difficult to predict, but in the long term, they too could fundamentally alter the production mix in the irrigation sector in the MDB.

Government policies that seek to mitigate climate change, such as payments for carbon sequestration, will also alter land use decisions such as incentives for plantation forestry.

**Tools available to irrigators to manage adjustment pressure**

As noted in section 4.1 above, irrigators have a range of tools to help them manage changes in water availability. Various farm management practices may need to be enhanced and modified to address the impacts of severe weather events, and increases in pest plants and animals.

**Data and information availability**

CSIRO studies on water availability and climate change scenarios are being considered by the MDBA in the development of the Basin Plan. Further thought might be given to the exposure and vulnerability of irrigation industries and regions to severe weather events. The impacts of climate change on global agricultural supply and resultant market impacts for Australian commodities may also be an area of further research.
Summary

Climatic uncertainty is a major factor affecting the outlook of many irrigators. The prolonged drought over the last ten years has compounded this uncertainty, with fears that there may have been a step change reduction in inflows in the Basin. While reduced water availability and increased variability could have a major impact on irrigation in the Basin. In the long term, the global price effects of climate change on agricultural commodity markets could be an equally important driver of adjustment in the irrigation sector of the MDB.

4.3 Demand from competing users

Description

While irrigated agriculture remains the largest water user in the Basin, other uses are increasing, and could have a significant impact on the amount of water available for irrigation over time. These competing users include the mining industry and other major industrial users (e.g. power generators), and urban water users both within the Basin, and outside the Basin (e.g. Adelaide and Melbourne).

Scope and extent of impact

Frontier Economics (forthcoming) has recently undertaken a review of rural-urban water trade across Australia. The review found that a large portion of rural-urban water trades have occurred in the southern Murray-Darling Basin, due to the proximity of urban centres to Australia’s largest rural water markets. Most rural-urban trade involves urban water authorities purchasing water (entitlement or allocations) from rural water users, but there are several examples of allocation trade in the opposite direction (e.g. in Victoria, New South Wales, and Queensland).

Some urban water authorities are also using water entitlement trading to shore up long-term supply in response to the expected reduction in water security due to climate change and population growth. In several cases, rural-urban trades have been vital in maintaining supply to metropolitan and regional urban centres. The most prominent purchases were by northern Victorian water authorities (for Bendigo and Ballarat) and SA Water (for Adelaide). These purchases were made to secure urban water supplies and reduce the severity of urban water restrictions in response to drought.

In the future, it would be expected that urban water authorities continue to purchase water in water markets to secure urban water supplies. This means that irrigation water users are compensated financially if water available for irrigation is reduced through such water purchases. Importantly, this better supports the accompanying structural change (especially compared to an uncompensated change involving reallocation of water to urban areas by Ministerial decree.)
Mining and power sector development in the MDB is likely to be most significant in Queensland, and in northern New South Wales. The adjustment impacts of such developments need to be considered on a case-by-case basis. It is worth noting that some developments, such as the Coal Seam Methane projects being investigated in Queensland could actually extract water from groundwater aquifers as a by-product of the production process. This water might be treated and become available for irrigation water use, or replace irrigation demands from current surface and groundwater resources.

An important unknown is the possible growth of forestry enterprises that may change land use and water use within the MDB. A contributing factor to this uncertainty is the additional incentive for forestry that may be provided under climate change mitigation policies. The NSW Irrigators Council submission to Senate Inquiry into Food Production in Australia noted that there are potentially significant impacts on agriculture—and irrigated agriculture in particular—due to increased levels of forestry to obtain carbon credits. However, the NSW Irrigators Council submission cites that DAFF does not believe that there will be a significant increase in plantation forestry due to the implementation of the ETS.

**Tools available to irrigators to manage adjustment pressure**

Under a situation of capped water use across the Basin, new entrants or growth in water demand from existing urban or industrial water users would require purchases of entitlements or allocations in the water market.

Although challenging, interception activities such as forestry need to be integrated into the water planning and entitlements framework in order for adjustment pressures not to be unduly exacerbated by third-party impacts.

**Summary**

Irrigators are likely to face increasing competition for water from urban areas, the mining industry, the power generation industry, and other major industrial water users. Such competition could increase organically as these users grow and develop, and become better integrated into the water markets in the Basin. However, this competition could intensify further under a low inflow climate change scenario, so mechanisms that support water trade and efficient adjustment become more important.

Projections for future water demand from competing users may be a useful input into the development of the new Basin Plan.
5 Adjustment pressures related to water policy

The future challenges in moving to sustainable levels of extraction.

This section examines the contribution of water policy factors to the adjustment pressures faced by irrigators and associated communities. It highlights how reforms to move irrigation onto a more sustainable footing, such as buyback and the Basin Plan, are already being perceived as adding to the adjustment pressures facing irrigation communities (as described in the preceding sections).

This section highlights the need for water policy to be implemented in a clear, coordinated and transparent manner so that individuals can make informed decisions. Increasing community understanding of the objectives of these programs is also important in building confidence and support, which is also likely to smooth the adjustment process.

This section also highlights that there are a number of other water and irrigation policies that affect the autonomous adjustment processes in the irrigation sector. These include water market and trade policy, public investments in irrigation system renewal and prices for irrigation services.

5.1 The Commonwealth buyback program

Description

The Australian Government’s Restoring the Balance in the Murray-Darling Basin Program is a component of Water for the Future, the Australian Government’s national plan on water. Under the program, the Australian Government has committed $3.1 billion over 10 years to purchase water from willing sellers in the Murray-Darling Basin. The buyback program is aimed directly at addressing overuse in the MDB and protecting and maintaining important water-dependent environmental assets.

Scope and extent of impact

The buyback program is explicitly targeted as a tool to facilitate adjustment in the transition to a future where less water will be available for consumption due to climate change and the implementation of new and lower sustainable diversion limits under the Basin Plan.

By purchasing entitlements from willing sellers at market prices, the water buyback program provides water entitlement holders with additional financial resources, which helps facilitate adjustment. That is, water purchases provide a
financial incentive to change and also provide additional resources to either pay down debt or to invest in alternative farming (e.g. dryland where possible or opportunistic irrigation) and other business opportunities or lifestyle changes (e.g. retirement or moving into town).

However, as noted by the NWC (2009):

… the buyback program does not provide direct financial assistance to non-entitlement holders in irrigation-dependent communities (for example, suppliers of inputs to irrigated agriculture, or others dependent on local and regional economic activity). Non-irrigators and communities may benefit indirectly from the proceeds of entitlement sales, but the distribution of those benefits throughout the local business community will shift (for example, from irrigation equipment suppliers to other local businesses).

There is evidence of concern in the attitudes of many individuals and communities towards buyback (NWC 2009) because of these potential changes in the overall level and distribution of economic activity in irrigation communities. As stated in section 2, it is difficult to attribute broader community outcomes to any one factor, and policy induced changes are often blamed for all of the problems in rural communities. However it is possible to obtain an indication of the relative importance of the buyback program. The following table provides a summary of more recent data from DEWHA on the extent of water purchases across the MDB, particularly in 2008-09.

Table 2: Commonwealth water purchases by state and major catchment / entitlement type

<table>
<thead>
<tr>
<th>Catchment / State</th>
<th>2007-08 Purchases (ML)</th>
<th>2008-09 Purchases (ML)</th>
<th>Expected average annual volume of water available for the environment (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Queensland (total)</td>
<td>5,325</td>
<td>1,757</td>
<td></td>
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<tr>
<td>Border Rivers</td>
<td>5,325</td>
<td>1,757</td>
<td></td>
</tr>
<tr>
<td><strong>New South Wales (total)</strong></td>
<td><strong>16,264</strong></td>
<td><strong>449,001</strong></td>
<td><strong>262,080</strong></td>
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<tr>
<td>Murray above choke</td>
<td>1,780</td>
<td>102,602</td>
<td>84,550</td>
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<tr>
<td>(General security)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Murray below choke</td>
<td>3,170</td>
<td>22,057</td>
<td>20,434</td>
</tr>
<tr>
<td>(General security)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lachlan</td>
<td>7,214</td>
<td>72,391</td>
<td>33,434</td>
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</tbody>
</table>
### Table: Water Purchases and Entitlements

<table>
<thead>
<tr>
<th>Catchment / State</th>
<th>2007-08 Purchases (ML)</th>
<th>2008-09 Purchases (ML)</th>
<th>Expected average annual volume of water available for the environment (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Murrumbidgee (General security)</td>
<td>47,606</td>
<td>30,468</td>
<td></td>
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<tr>
<td>Macquarie (General security)</td>
<td>884</td>
<td>56,365</td>
<td>24,045</td>
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<tr>
<td>Gwydir (General security)</td>
<td>2,916</td>
<td>71,510</td>
<td>26,793</td>
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<tr>
<td>Barwon-Darling (Unregulated)</td>
<td>22,275</td>
<td>22,275</td>
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<tr>
<td>Victoria (total)</td>
<td>7,662</td>
<td>151,034</td>
<td>140,924</td>
</tr>
<tr>
<td>Murray above Choke (High reliability)</td>
<td>5,104</td>
<td>25,600</td>
<td>29,169</td>
</tr>
<tr>
<td>Murray below Choke (High reliability)</td>
<td>500</td>
<td>45,233</td>
<td>43,446</td>
</tr>
<tr>
<td>Goulburn Broken (High reliability)</td>
<td>650</td>
<td>62,214</td>
<td>59,721</td>
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<tr>
<td>Campaspe (High reliability)</td>
<td>635</td>
<td>3,685</td>
<td>4,104</td>
</tr>
<tr>
<td>South Australia (Murray high security only)</td>
<td>427</td>
<td>21,335</td>
<td>19,586</td>
</tr>
<tr>
<td>Total</td>
<td>24,353</td>
<td>626,695</td>
<td>424,347</td>
</tr>
</tbody>
</table>

*Source: DEWHA website, accessed December 2009*

Most recently, the Australian Government has stated that it has reached the $1 billion mark on its water buyback scheme and has purchased the equivalent of 651 GL of water (ABC 2009). Assuming that the product mix and cost of future water purchases is similar, the $3.1 billion budget might eventually equate to somewhere in the order of 2,000 GL of water entitlements.

To provide an indication of the order of magnitude of the entire buyback program ($3.1 billion) if it were concentrated in any one irrigation district, this is roughly equivalent to approximately 1,300 GL of high security entitlements in the Goulburn-Broken system, or over 80 per cent of the current high security...
Adjustment pressures related to water policy

entitlements in that system. Similarly, this figure converts to approximately all of the 2,000 GL of general security entitlements in the Murrumbidgee system.

To provide an alternative perspective on the importance of the buyback program that recognises that the buyback will not be concentrated in one irrigation district, it is worth considering the example of northern Victoria where the Victorian Government has announced an agreement with the Commonwealth under which the Commonwealth would acquire 460 GL of entitlements from the Victorian MDB over the next five years. This includes up to 300 GL that will be exempt from Victoria’s 4% annual limit on inter-district trade if purchased from irrigators in designated areas, plus at least 160 GL available through standard market purchases (Premier of Victoria 2009). To put this in context, the long-term (1891–92 through 2006–07) average of water diversions for consumptive use is approximately 1,700 GL in the River Murray and 1,640 GL in the Goulburn River system, giving a total of 3,340 GL. Therefore, based on these estimates, the buyback program is expected to reduce water availability in northern Victoria by approximately 14 per cent (NWC 2009).

The severity of the adjustment effects on local communities depends on the actual distribution of these purchases, and how water use changes across the Basin as a result. Concerns about the localised impacts of the buyback program have been linked to major purchases from large water holders, particularly the purchase of 240 GL of water entitlements (general security and supplementary licensed amounts) from the Twynam Agricultural Group in June 2009. In fact, this prompted the New South Wales Government to place a moratorium on the sale of water entitlements to the environment, which was relaxed some months later.

Concerns about the local social and economic impacts of the buyback program have led some commentators to call for it to be stopped altogether. Other concerns have also been raised, such as:

- questions about whether the buyback is well targeted at addressing defined environmental problems in a cost-effective way
- concerns about the lack of clarity over the total volume of water that the Commonwealth is seeking to purchase in particular catchments
- general concerns and lack of clear information about how the program addresses overallocation and overuse in the Basin and contributes to the transition to lower levels of water available for irrigation
- concerns about the impacts of the buyback program on the water market.

Note: there appears to be some uncertainty about whether the 460 GL is a maximum amount, or a minimum amount. The full agreement between Victoria and the Commonwealth was never published.
In summing up these concerns, the NWC (2009) stated that “the relationship between buybacks, providing for environmental assets, and the transition to new sustainable diversion limits in the MDB is not well understood”.

As indicated below, the provision of clear information and two-way communication processes can help address these concerns. Putting these concerns aside and considering only the extent of the adjustment impacts of reduced water availability as a result the buyback program it is necessary to consider what might have happened in the absence of the buyback program. For example, without the buyback program:

- the movement of water entitlements away from irrigation is likely to have been much less over the last 1-2 years—conversely this means that more water would need to be recovered later through the buyback program or Basin Plan, which may or may not be accompanied by financial payments (depending on the application of the risk assignment framework)
- the underlying pressures associated with prolonged low water allocations, increasing debt, and declining commodity prices associated with the global financial crisis would have likely driven many irrigators to sell water entitlements, allocations, or indeed their combined land and water assets in 2009
- less money may have been injected back into the economy. For example, as noted by Watson (2009), “recent sharp falls in the prices of irrigated products like wine grapes and dairy products highlight the positive effect buyback has on the incomes of irrigators and regional income in areas now affected by the slump of the wine and dairy industries”
- the number of willing buyers of water entitlements may have reduced, which could have had an impact on the market price for water entitlements (i.e. reduced the price of water) and thus reduced the financial resources available to those irrigators that needed to sell water entitlements—conversely however, those irrigation businesses with the resources to grow and expand may have been inhibited by the buyback program if it did indeed prop up prices in the water market.

On this last point, we note that we do not have the empirical evidence to assess whether the buyback program has had any impact on the market price for water and such further assessment is beyond the scope of this project. The Productivity Commission conducted an inquiry on Market Mechanisms for Recovering Water in the Murray-Darling Basin. A number of submissions raised concerns about the price impacts of the buyback program, although the DEWHA (2009) submission outlines the process for establishing benchmark prices to guide purchase decisions. The Productivity Commission’s (2010) final report found that if there were any effects of increasing prices in water entitlement markets from buyback, these effects were quite small, localised and temporary. Further discussion of the
adjustment impacts of buyback and irrigation renewal are discussed in section 5.5.

**Tools available to irrigators to manage adjustment pressure**

Given the need to address unsustainable levels of water extraction in the Basin, the buyback program can be viewed as a tool to facilitate adjustment. The market mechanism and voluntary nature of the buyback program means that water is likely to be procured from those that value it least. However cashflow considerations and debt are driving a lot of decisions by irrigators so it may be more appropriate to say that the voluntary market mechanism means that water is being procured from those that prefer the cash injection the most.

**Data and information availability**

The Commonwealth provides an up-to-date account of water purchases and outlines how this water is being used (i.e. for environmental watering). Average price information is also available but full details of individual transactions are often not available for commercial in confidence reasons. Even with such information it would be difficult to assess the empirical impacts of the buyback program on water market prices.

**Summary**

Current environmental purchases, and the cumulative impacts of the $3.1 billion buyback program, are expected to have a significant impact on water available for irrigation. However the adjustment impacts on particular communities are less clear due to uncertainty about where the water will be sourced from.

If the buyback program is viewed as a tool to manage the transition to SDLs under the Basin Plan, then its adjustment impacts are isolated to bringing forward of adjustment decisions. Importantly however, the buyback program also provides willing sellers with additional financial resources which may or may not be available under a planned reduction in water available for consumptive use.

### 5.2 The Basin Plan

**Description**

The MDBA has been given the historic task of preparing a Basin Plan for the integrated and sustainable management of water resources across the whole MDB. This is to be achieved through the establishment of new sustainable diversion limits (SDLs). Given the evidence of widespread environmental decline in the MDB (ISRAG 2008) and the risks posed by climate change under current allocation patterns (CSIRO 2008), it is envisaged that the eventual transition to
these SDLs will result in an overall reduction in water availability for consumptive use for the irrigation sector (which uses the vast majority of water in the MDB).

**Scope and extent of impact**

The scope and extent of the impact of reduced water availability is not known as the SDLs are yet to be determined. The buyback program and other water savings programs including *The Living Murray Initiative* will reduce the additional impact of the Basin Plan.

Apart from the reduction in water availability, other adjustment impacts of the Basin Plan include:

- **Information and uncertainty about the Basin Plan:** Uncertainty surrounding the timing, transition arrangements and overall magnitude of reductions in water availability as a result of the introduction of the Basin Plan could affect the long-term decisions made by irrigators. For example, some water users may decide to purchase annual allocations, even though they would otherwise prefer to buy entitlements, as a result of uncertainty about the security of entitlements following the introduction of the Basin Plan.

- **Uncertainty about risk assignment provisions:** Similarly, uncertainty about the application of the NWI risk assignment provisions in relation to the introduction of new SDLs could be affecting current decisions. For example, irrigators may choose to participate in the buyback program now rather than taking the risk of waiting for the Basin Plan which could conceivably result in an uncompensated reduction in the value of their entitlements.

- **Long-term certainty over water entitlements:** In the long term, if the Basin Plan is broadly accepted as effectively addressing unsustainable levels of water use in the Basin, then it is likely to provide benefits to remaining irrigators through improved confidence and security in their entitlement products. Lack of such security has been cited as a cause of under-investment and limited activity in entitlement markets (at least until recently) (see Bjornlund 1995).

- **Removal of barriers to trade:** Efforts to reduce or remove existing barriers to water trade, or improve the transparency and robustness of water markets and allocation mechanisms could be important in minimising the impact of reductions in water availability, and beneficial in their own right in facilitating adjustment at least cost.

- **Water quality:** Efforts to improve water quality outcomes under the Basin Plan could lead to quantifiable economic benefits for irrigators through improved productivity and reduced costs.
Tools available to irrigators to manage adjustment pressure

The tools available to irrigators to manage adjustment impacts depend on the way that any reduction in water availability for water access entitlement holders is implemented. Assuming that SDLs are implemented in the form of a uniform reduction in the water allocated to all entitlements, it is likely that a number of irrigators will rely on their ability to purchase water entitlements or allocations to return their supply security to its previous level. For others, the reduction in reliability of entitlements will be a trigger for them to sell entitlements.

While increasing scarcity would be expected to increase the market price for water, the expected allocations to any entitlement product over time fall as a result of the SDLs (i.e. reduced reliability), so the actual price outcome is uncertain. Depending on the resultant market value of water, some irrigators may invest in water use efficiency technologies that are not financially viable at current water market prices.

As a result of this expected churn in entitlements, unrestricted access to water markets will be critical in minimising the costs of the inevitable reallocation of water following a plan induced reduction in water allocations to water access entitlements.

If financial payments are made to entitlement holders through the triggering of risk assignment provisions, then such payments may help some irrigators fund the purchase of additional entitlements. For those choosing to sell entitlements, the additional financial resources may help smooth the adjustment process.

Any attempts by the MDBA to manage the adjustment impacts of reduced water availability in any area (by limiting the reductions brought about through the introduction of SDLs) will only be effective in water systems that are not connected through water markets. Where water markets exist and are not overly restricted, the decisions of individual irrigators will determine where irrigation water use actually declines, and which industries and communities are affected.

Summary

Efforts to reduce the legacy of unsustainable levels of allocation in the Basin, primarily through the combination of buyback and the Basin Plan, are critical in providing a sustainable platform for irrigation activities in the future. If successfully implemented, these policies will ultimately improve the level of confidence and security of water access entitlements.

However, while the overall reduction in water availability for irrigation and its distribution across the MDB is not known and will be heavily influenced by reallocation through the water market, it is likely that these policies (SDLs and buyback) will have economic and social impacts on individual irrigators, irrigation industries, and irrigation dependent communities.
5.3 Water markets and trade barriers

Description

Water markets have been a major reform initiative in the Basin over the last two decades. Water markets allow water entitlements and allocations to be traded between willing buyers and sellers at a market determined price. The aim of water markets and trading is to allocate scarce water resources to their most valuable uses in a flexible manner.

Water markets have been evolving and maturing over time and further reform is aimed at ensuring that water is tradeable with no impediments, except where water trade rules represent a least cost way to manage hydrological and ecological constraints (NWC 2009). Figure 24 illustrates the growth in total allocation and entitlement trade from 1998-99 to 2007-08. During this time water availability declined throughout the Basin.

Figure 24: Total allocation and entitlement trade in the Basin, 1998-99 to 2007-08

Source: MDBA Water Audit Monitoring reports (various years).

A report on the economic and social impacts of water trading in the Victorian Murray Valley found that water trading provided important benefits to irrigators during the drought. For example:

- without water trading the dairy industry would have fared much worse than it did in the past 10 years
- without temporary trading many existing horticultural enterprises in the Goulburn system would not have survived the extraordinarily low seasonal allocations
many mixed farms survived the low seasonal allocations by selling water on the temporary market, thus making more money than they would have done growing crops (Frontier Economics et al 2007)

Despite some progress in removal of artificial barriers to trade, some barriers remain. Governments and water authorities in several Basin states have imposed trading rules that restrict the sale of water entitlements to water users outside the region or for environmental purposes. These barriers aim to slow down or mitigate the perceived negative flow-on effects on communities from removing water from irrigated production. Examples of trading rules include the following:

- In Victoria, the State Government imposes a 4% limit on annual entitlement trade from irrigation districts and, until recently, imposed a 10% limit on the volume of water entitlement that may be held by Non-Water Users (i.e. water utilities or environmental water holder) in a given water system.
- In New South Wales, there is a 4% annual limit on the volume of water entitlement that may be traded out of an irrigation area. In May 2009, the NSW Government imposed an embargo on water entitlement sales for environmental watering purposes.
- In South Australia, Central Irrigation Trust established a 12% limit on the volume of water entitlement that may be traded out of some irrigation districts over two consecutive years. The Central Irrigation Trust lifted this restriction in 2009.

**Scope and extent of impact**

At a Basin wide level, the economic benefits of trading are considerable. Economic modelling found that the opportunities presented by water trading enable reduced water availability to be better managed across the southern MDB as a whole. For example, the estimated reduction in gross regional product associated with a reduction in water availability in the southern MDB was halved when water could be traded between industries and regions (Peterson et al 2004).

The impacts of some trade rules are likely to have been relatively small or non-existent because the rules have not been binding or have only applied for a relatively short time. For example:

- Although the NSW embargo on water entitlement trades to the environment was binding, the NSW Government relaxed the embargo a few months later.
- The 12% limit on entitlement trade out of some SA irrigation districts was never binding.
- Although the 10 per cent limit of ownership by Non Water Users was binding in several years, the Victorian Government removed this limit in October 2009.
However, binding limits on entitlement trade out of irrigation districts in Victorian remain an issue of ongoing debate. The NWC (2009) has identified a number undesirable consequences associated with the 4% limit, including that it:

- impedes the use of buyback programs to assist in returning overallocated water systems to sustainable levels of extraction
- unfairly and arbitrarily penalises willing sellers of irrigation entitlements
- distorts patterns of trade out of irrigation areas (including interstate trade)
- inhibits desirable and necessary structural change
- complicates interstate collaboration in other areas of water reform.

The annual limit on entitlement trade has been reached in Victorian regions since the early 2000s and was reached in the NSW Murrumbidgee in 2008-09. In Victoria, the number of districts that have reached the 4% limit has increased substantially since 2007-08. Moreover, many districts have begun to reach the 4% limit earlier in the season (Figure 25). In Victorian, the regions where the limit has been binding typically have a high concentration of dairy farmers, while the regions where the limit has not been reached generally have a high concentration of horticulturalists.

Figure 25: Four per cent rule in Victoria

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<tr>
<td>Central Goulburn</td>
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<td>Nyah, Tresco and Woorinen</td>
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</tbody>
</table>

Dark red indicates the limit was reached early in the season (before mid-November), red indicates the limit was reached later in the water year, and white indicates the limit was not reached.

Notes: The annual limit was 4% in 2008-09, 2007-08 and 2006-07, and 2% in previous years. Information for 2008-09 is informed by a snapshot of the Victorian Water Register on 21 November 2008. (*) annotates regions where the 4% limit was not met during the initial processing of the trade ballot, however the 4% limit was close to being met and a number of trades for these regions had been set aside pending the repeal of the 10% Non Water Users limit.

Source: Goulburn-Murray Water media releases from website, Victorian Water Register data 2009.
**Tools available to manage adjustment pressure**

External pressures such as climate change, drought, policies to address over-allocation and overuse, and slumps in commodity price would affect irrigators even without trade. Without the benefits of trade, however, many irrigators would be likely to be far worse off financially. Unrestricted trade allows irrigators to attract the best price for their entitlements which can help retire debts and improve cash flows to support their business during hard times. Consequently, water trading is an increasingly utilised tool for managing adjustment.

There are concerns that water trade out of regions results in adverse economic impacts on rural communities by reducing regional economic activity. For example, reduced water use may reduce agricultural production which may in turn reduce demand for inputs from local industries and employment opportunities. The National Water Commission is currently investigating these issues as part of its obligations under the National Water Initiative.

External pressures such as drought and climate change will affect economic and social outcomes in regional communities regardless of water trade. For example, the Murrumbidgee has been one of the largest sellers of water in recent years and has often experienced a net reduction in annual water use due to water trade (i.e. the difference in the blue and red columns for each year in Figure 26).\(^3\) However the effects of water trading on regional water use are relatively minor compared to changes in water availability that would have occurred anyway due to drought (i.e. the difference in the red columns from year to year in Figure 26).

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\(^3\) The change in regional water use due to trade at a given point in time is based on the total volume of water reallocated through allocation and entitlement trade. The volume of water reallocated through allocation trade is simply net allocation trade for a region in that year (i.e. net inward trade of 1GL increases regional water use by 1GL compared to what it would have been without trade). The volume of water reallocated through entitlement trade in a given year depends on the cumulative volume of entitlement trade in previous years. For example, irrigators may have sold entitlements from the region over several years such that the current entitlement stock is well below what it would have been had trade not occurred. The volume of water reallocated through interregional entitlement trade at a point in time is therefore equal to the cumulative volume of interregional entitlement trade for the region multiplied by announced allocations in the year.
Adjustment pressures related to water policy

Figure 26: Changes in water use due to trade, Murrumbidgee

Notes: Water use with trade is equal to the volume of base entitlement in a region (which incorporates past entitlement trades) multiplied by announced allocation for the year plus annual carryover and net allocation trade for that year. Water use without trade is estimated by subtracting an estimate of 'total water reallocated through trade' from water use with trade. Total water use reallocated through trade is the cumulative volume of entitlement trades from previous years multiplied by announced allocations (i.e. 10GL x 80% announced allocation equals 8GL) plus net allocation trade for the year. Footnote 2 provides further details.

Source: Based on data from MDBA Water Audit Monitoring reports (various years)

Data and information availability

The National Water Commission reports on Australian Water Markets and the pending Impacts of Water Trading report provide further information on the extent of trade and its potential impacts.

Summary

Water markets and trade are a critical mechanism for irrigators to manage variations in water availability and drought. While water trade enables water to move from one location to another, the impacts of trade on regional water use have been far outweighed by the impacts of drought on total water availability. Artificial barriers to trade slow down the adjustment process, add cost and increase uncertainty.
5.4 Irrigation charges and termination fees

Description

Irrigators across the Basin are required to pay a range of fees and charges to irrigation infrastructure operators so that these entities can recover the cost of storage, transmission, distribution and drainage services they provide. Most irrigators pay a fixed access charge and a variable charge based on the volume of water delivered.

Termination fees relate to charges payable by irrigators to irrigation infrastructure operators upon cessation of the rights to have water delivered to a particular point in an irrigation system and the associated obligation to contribute to the cost of relevant delivery infrastructure.

Scope and extent of impact

In most areas, a large proportion of irrigation charges are fixed, meaning that they need to be paid regardless of water allocations being made. However, in overall terms, and in seasons with reasonable allocations, irrigation access fees are a small proportion of farm costs. For example, in the dairy industry in the Goulburn-Murray Water system, irrigation charges equate to approximately $10,000 per year for an average dairy farmer with 200 ML of entitlement. This is generally less than 5-10% of production costs.

As such, while irrigators will never like paying more in irrigation charges, in comparison with other factors, such as commodity prices, marginal changes in such charges are less important in driving adjustment decisions. Where any increases are large, they may affect the comparative advantage of one irrigation area over another. As indicated in the recent study by the Productivity Commission (2009), irrigation authorities should carefully consider the service needs of their customers in order to provide fit-for-purpose irrigation services.

Termination fees are different from exit fees, as it is not necessary for an irrigator to terminate access when they sell water entitlements, due to the unbundling of water entitlements from delivery entitlements in most major surface water systems in the Basin. Exit fees were a constraint to adjustment in the Basin, as they required irrigators to pay a fee to irrigation infrastructure operators whenever they sold entitlements. Exit fees are no longer allowed in the Basin, however the NWC (2009) has raised concerns about the termination fees of some irrigation operators effectively operating as exit fees. The Minister for Climate Change, Energy Efficiency and Water has announced water charge rules that cap termination fees at 10 times the fixed access fee. This limits the impact that they can have on individual irrigators and may or may not be sufficient to ensure that remaining irrigators do not have to pay more for water delivery.
Tools available to irrigators to manage adjustment pressure

Standard regulatory pricing often includes provision for price increases to be phased in over time.

In some cases, fixed infrastructure access fees have been discounted by governments to help irrigators cope with drought. However this has been criticised by the NWC (2009) and others as it distorts signals for efficient investment and production and creates a long term expectation.

In some cases, where ceasing access means that an irrigation authority can avoid costly channel or meter upgrades, termination fees have been waived.

Summary

Irrigation service fees and charges are generally a small percentage of total farm costs. However many irrigators give disproportionate attention to these costs, particularly where the services are provided by publicly-owned water authorities.

Termination fees are only incurred if the decision to sell entitlements is linked to a decision to cease access to an irrigation system. In such cases, termination fees effectively reduce the net financial return from selling water entitlements. The presence of termination fees may encourage some farmers to maintain irrigation access and to use water opportunistically.

5.5 Public investment in irrigation renewal

Description

The Commonwealth’s Sustainable Rural Water Use and Infrastructure Program has committed to expenditure of $5.8 billion on investments aimed at upgrading irrigation systems. The states are also investing in similar projects, such as the Northern Victoria Irrigation Renewal Project, for which the Victorian Government has announced Stage 1 funding of $1 billion.

Scope and extent of impact

There has been some public debate about the merits of these investments, including in relation to the rationale for government investment, the recovery of ongoing costs associated with gifted assets, and the basis for the calculations of water savings and performance under low-inflow scenarios (see NWC 2009 and PC 2009 for more detail). Many of these issues, while worthy of thorough investigation, are beyond the scope of this project.

However there are also a number of adjustment implications of irrigation renewal programs, and the way that some of these programs are being designed and implemented. These include:

- Disproportionate benefits of renewal projects: Where renewal projects improve service levels and productivity, there is a risk that investments in
particular regions are viewed by those in other regions (where renewal is not publicly funded) as putting them at a competitive disadvantage. In effect, funding based on regional development grounds results in governments distorting the pattern of private investment, and the pattern of autonomous adjustment. Subsidising investments that produce private benefits may also act to deflate the market price of water (see Cox and Warner 2009).

- **Risk of over-investment**: There is a risk that particular projects might inadequately consider the likely extent of adjustment required as a result of reduced water availability and market and social factors. While government funding would largely be sunk (and taxpayers will bear the cost), remaining irrigators may be left paying for the ongoing costs of running a new and more technologically complex system, which places them under additional financial pressure (see metering discussion below). Cox and Warner (2009) argue that irrigators are best placed to make renewal investment decisions, not governments.

- **Risk of inappropriate design given future changes in water availability**: Irrigation water demands are changing as a result of increasing variability in water availability. For example, there has been a shift from perennial to annual pastures in the dairy industry in northern Victoria to provide more flexibility in irrigation practices. However this also changes the demand for water, which in turn could threaten the attainment of design service standards (e.g. water on demand), and may mean that new technologies introduced in association with renewal are less valuable to the irrigation sector in the future. Market trends may also change the demand patterns for irrigation water and the service standards valued by customers (e.g. if climate change results in more opportunistic cropping).

- **Inappropriate sequencing with the Commonwealth buyback program**: To avoid over-investing in irrigation renewal projects it would be most efficient to only implement upgrades once the buyback program (and efforts to address overallocation and overuse) has been complete. Where buyback and renewal must be undertaken concurrently, a phased approach that concentrates on upgrading the most important long-term sections of the irrigation area might be adopted.

- **Restrictions on the buyback program**: Another approach to address the potential for over-investment is to only allow the Commonwealth buyback program to purchase entitlements in particular areas that are not targeted for investment, and thus disallow purchases in areas earmarked for upgrade (see NVIRP 2009). A variant on this approach is for the buyback program to pay more for entitlements in particular locations. There are a number of problems with this approach: it distorts the cost-effectiveness and flexibility of the buyback program; irrigators may find workaround solutions by trading amongst themselves and thus render the policy ineffective; it would be difficult to design as there are viable and unviable irrigators across all irrigation districts; it would add another layer of administrative cost in
implementation; implementation may effectively rebundle land and water and thus be counter to the National Water Initiative; and it adds uncertainty to irrigators as they make adjustment decisions (also see NWC 2009 and PC 2009). There would seem to be better ways to encourage efficient system asset rationalisation and adjustment decisions through separate purpose built mechanisms that work in conjunction with buyback, but do not distort it.

- **Forced adjustment and asset rationalisation:** In some cases there are concerns that efforts to rationalise parts of the delivery system to produce water savings may be implemented compulsorily (i.e. where irrigators are not given the choice to stay in their current farming location). In many cases such irrigators may be financially compensated or provided with an alternative location in an upgraded irrigation area, but this type of forced adjustment can create tensions in the community.

- **Upfront cash incentives and asymmetric information:** Some renewal programs may include optional connection to the upgraded infrastructure. In these cases, upfront financial incentives might be provided to irrigators, subject to the irrigator being responsible for investment in on-farm reconfiguration and reconnection to the upgraded network. Upfront financial payments may be attractive to some irrigators if faced with mounting debt. However, there could be information asymmetries (i.e. irrigators may not be informed of the full costs of reconfiguration works), and the long-run financial viability of these businesses may be questionable. Again, there is potential for distortions to efficient and informed adjustment decisions.

**Tools available to irrigators to manage adjustment pressure**

While the financial impact of increases in the cost of irrigation services (if they eventuate) is likely to affect adjustment decisions at the margin, the key adjustment issue in the short term is that irrigators require greater certainty about the costs and benefits of options available to them, and flexibility to buy or sell water as part of the adjustment process.

**Data and information availability**

Limited public information is available on the projects being considered for funding under the Sustainable Rural Water Use and Infrastructure Program, and other state based investments.

The Commonwealth is required to undertake due diligence assessments prior to funding of any infrastructure project under the Sustainable Rural Water Use and Infrastructure Program, and the National Water Commission (2009) has recommended that the Commonwealth develop and implement a robust assessment methodology and that the results are published. The Productivity Commission (2009) has released a report that is critical of these non-market measures to obtain water for the environment.
Summary

There is a risk that, unless carefully designed and implemented, publicly-funded irrigation renewal projects may distort the pattern of autonomous adjustment in the MDB and reduce rather than increase flexibility for irrigators.

5.6 Metering policy

Description

The national Water Metering Expert Group is in the process of developing a national framework for non-urban water metering (Water Metering Expert Group 2008). The current policy position would require the replacement of thousands of non-compliant rural water meters, particularly Dethridge meters in Victoria and New South Wales, which are known to systematically under-record water use by approximately 10 per cent.

Scope and extent of impact

There are number of potential adjustment impacts are associated with implementation of the new metering policy:

- decreases in the volume of water available for individual irrigators due to improved meter accuracy
- additional capital and ongoing costs associated with the new meters
- improved water management, flexibility and information
- uncertainty about the cost-sharing arrangements and implementation requirements.

These costs, benefits and risks may have an influence on the adjustment decisions that individual irrigators make, particularly in combination with opportunities available for on-farm and system level modernisation.

In relation to the first point (above), from an irrigator’s perspective, any ‘loss’ in water available due to more accurate metering will result in less water available and the need to source more water (or fodder in the case of dairy) thus increasing costs, or to sacrifice production.

Previous analysis by Frontier Economics and Farmanco highlighted the importance of recognising that systematic meter error is combined with high variation around the mean error. It appears that many farmers believe that metering errors may entail a variation of perhaps plus or minus 10 per cent. The perceived average error of +10 per cent to farmers could therefore be 0 to +20 per cent, or at least +5 to +15 percent. The impact of new meters, in terms of operating with less water, may therefore vary considerably from one irrigator to the next. At the high end, where there is currently a 20 per cent error in favour of irrigators, our previous unpublished analysis indicated that, by removing this
error, the impact on a medium sized dairy farm in northern Victoria is approximately equal to a six per cent increase in production costs, or roughly equivalent to current irrigation service charges.

Many irrigators are likely to pay for new meters through increased irrigation charges. In some cases governments are funding the capital costs of new meters. Even so, the ongoing costs of new meters are much higher due to their increased technological complexity. For example, Goulburn-Murray Water (2009) estimated the average ongoing cost of new smart meters at “around $800-$900 per meter per annum” compared to the average cost of a Dethridge meter which is thought to be approximately $50-$100 per annum.

Implementation of the new standards is therefore likely to place further pressure on the profitability of the majority of irrigators and irrigation systems where new meters are required.

**Tools available to irrigators to manage adjustment pressure**

There is little that irrigators can do to manage the financial impacts of the new metering regulations other than ensure that they obtain maximum value out of the benefits provided by the new technology and attempt to defer the implementation schedule.

While the financial impact of the new metering arrangements is likely to affect adjustment decisions at the margin, the key adjustment issue in the short term is that irrigators require greater certainty about the cost sharing and implementation arrangements associated with the new metering requirements.

**Data and information availability**

DEWHA (2009) released a regulatory impact statement on the proposed new metering framework, SKM (2007) was commissioned to undertake a stocktake of non-urban meters in Australia, and Goulburn-Murray Water (2009) has examined the potential future costs of metering upgrades as part of modernisation works. A range of other reports commissioned by state and national government agencies is likely to be available.

**Summary**

Uncertainty surrounding the water losses to irrigators, cost-sharing and timing of implementation of the new national standards is likely to affect adjustment decisions in the MDB, particularly in gravity fed irrigation districts with a large proportion of non-compliant Dethridge meters. The importance of meter upgrades to any irrigator depends on the number of non-compliant meters on each property and is closely linked to irrigation modernisation, on-farm reconfiguration, and asset rationalisation programs.
6 Conclusions

This section synthesises the findings of the study and assesses the relative importance of various adjustment pressures across key irrigation industries. It concludes by discussing the implications and potential policy responses to adjustment pressures that might be considered by the MDBA in the development and implementation of the Basin Plan.

6.1 Adjustment pressures not related to water – the background of change

Irrigation industries and communities in the Basin have been constantly changing over many decades in response to a number of factors that are entirely unrelated to water availability and water policy.

Market pressures to remain competitive internationally in the face of declining agricultural terms of trade (also known as the “cost-price squeeze”) have led to private investments in new technologies and farming practices that have boosted productivity, but also reduced labour inputs and resulted in farm consolidation.

At an aggregate level, these pressures, combined with improved transport networks and access to services, have led to consolidation of economic activity in regional centres at the expense of small local towns over many decades.

Farm sizes have increased to help family farming enterprises remain viable and are also a result of increased corporatisation. Many family irrigation businesses have also supplemented their incomes through off-farm employment. With more limited lifestyle and professional opportunities in rural areas, young people are moving to the cities and the average age of irrigators is increasing. Many of the current generation of irrigators do not have viable succession plans that allow for continuation of family irrigation businesses.

At the same time, urban dwellers are moving to the country for lifestyle reasons, increasing the price of land in areas with good transport links and amenity values, creating tensions between competing land uses and affecting demand for community services.

In the southern MDB, the legacy of small unviable irrigation blocks in public irrigation districts has constrained opportunities for necessary consolidation. Instead, new corporate developments have emerged on greenfields sites with direct river access unencumbered by the uncertainty associated with system deliverability conditions and the administrative and governance burdens of public distribution systems. These greenfield developments have also been fostered by advantageous (and contentious) taxation policies (i.e. Managed Investment Schemes).
It is inevitable that this pattern of rural change will continue in the future, even in the absence of changes in water availability or policy. The importance and unpredictability of global market factors in driving adjustment patterns favours a flexible approach to water management and policy as envisaged under the NWI.

### 6.2 Recent adjustment pressures

On top of the ongoing market and social pressures for change, a number of additional pressures have forced change, and resulted in hardship and uncertainty over the last decade.

The prolonged drought in the MDB has decreased water allocations for irrigators, decreased production, and increased the cost of production for many irrigation industries. It has led to some industries such as the rice industry winding back production, almost entirely in some years.

Individual irrigators have found ways of managing drought. The water market has been critical in helping different industries survive by enabling:

- horticultural and viticultural producers in the Sunraysia and South Australian Riverland to purchase water and keep their trees and vines alive
- rice growers to sell their annual allocations and generate income
- dairy producers to substitute between using/purchasing water and buying in additional fodder.

Irrigators have also improved water use efficiency, drawn on scientific research to ensure they only apply water when it is needed, and invested in upgrading their on-farm irrigation infrastructure where cost-effective and labour saving.

Despite those coping mechanisms, many irrigation businesses have accumulated significant debt over the last decade and remain in survival mode. Furthermore, the global financial downturn at the end of that year added further severe pressure, particularly in the export-oriented dairy and wine industries, although the glut in wine markets was apparent much earlier. These forces have led many irrigators, across all key irrigated agricultural sectors, to make tough adjustment decisions affecting their personal and business future.

At the same time, the Commonwealth has been a major buyer of water entitlements from irrigators and the additional financial injection is assisting many individual irrigators as they manage these changes. However many people in the Basin are wary about the buyback program, and concerned about the social and economic impacts on local communities, despite the fact that it provides an important adjustment option for individual water access entitlement holders.

During this period of change driven by market conditions and drought, water market barriers, particularly the Victorian four per cent annual limit on inter-district trade in entitlements, have distorted the water market, constrained the buyback program, and added additional uncertainty for irrigators as they make
these tough financial and personal decisions. More generally, water policy, in particular the inter-relationships between the buyback program, irrigation infrastructure upgrades, the Basin Plan and the risk assignment framework are adding further uncertainty to the point where it is difficult for irrigators to make well-informed decisions about their future. New metering policies and irrigation renewal projects are also emerging as an important factor influencing the pattern of adjustment.

6.3 Summary assessment of relative importance of adjustment pressures by industry

A key point of this paper is that irrigators are affected by a multitude of adjustment pressures which vary across the Basin, and that these are often unpredictable. While there is no crystal ball, the following discussion examines the relative importance of adjustment pressures facing irrigation regions and industries across the Basin in the near future, including the relative importance of water availability and water policy compared with non-water related factors:

The export-oriented dairy industry in northern Victoria and in the New South Wales Murray region

The dairy industry in the Basin has been severely affected by the global economic downturn with a major step change reduction in commodity prices occurring after a decade of drought. Without a sustained increase in market prices, combined with improved irrigation water availability and/or a sustained reduction in feed prices, there is a risk of further major industry decline over the next few years.

Water availability is important to the irrigated dairy industry as it is the source of its comparative advantage over dryland dairy producers. Conversely in the absence of sufficient water supplies, irrigated dairy is at a competitive disadvantage. If the current rate of adjustment continues or increases, the 4% limit on entitlement trade out of irrigation districts will distort the pattern of adjustment in northern Victoria.

Given the historical pattern of water trade to date, it could be expected that reductions in water availability due to the Basin Plan may result in decreased water use in the dairy industry following reallocation through the water market. While much could change in the lead-up to the implementation of the Basin Plan (which is not until 2019 in Victoria), reductions in water availability might be expected to affect localised areas where growing conditions are less favourable first, such as Pyramid-Boort. However, a continuation of low water availability due to drought and climate change could have a major impact on these areas before the Basin Plan comes into effect.
Small block horticulture in Victorian Sunraysia and the South Australian Riverland

The large numbers of very small and unviable horticultural blocks in, or in close vicinity to, Mildura are likely to continue to undergo major land use changes including shifts away from irrigation to urban and peri-urban land uses. Land use planning and policy will have a major influence on this process. Some small block wine growers may stay in production due to the current reliance on off-farm income.

The future outlook is also poor for small-medium sized horticultural enterprises without off-farm income. Further downsizing of total production within the Basin may be required to address the current conditions of over-supply and very low prices. Change could be expected to occur over the next 5 years regardless of changes in water availability. As water is a relatively low proportion of overall farm costs, it is likely that viable horticulturalists will be able to purchase water entitlements or allocations to secure their supply in response to any reductions attributed to the Basin Plan.

Greenfields horticulture and MIS projects on the Murray

The major greenfields horticultural and MIS schemes (wine, almonds, olives) along the Murray river have been adversely affected by the global economic downturn and associated credit market pressures, leading to the recent collapse of major MIS companies. The future of these developments is more closely tied to market conditions (e.g. the wine glut). In response to the Basin Plan, viable horticulturalists are likely to use water markets to secure their supply. Carryover arrangements and deliverability of irrigation water throughout the irrigation season will be important.

The rice industry in the New South Wales Murrumbidgee

The rice industry has reduced production in a flexible manner in response to drought as high water prices on the allocation market have encouraged rice growers to sell water to horticulturalists, particularly when early season allocations have been low, and the outlook for water availability is poor.

Many rice growers have flexible, mixed farming systems and can increase opportunistic dryland cropping, depending on the prevailing conditions. However the drought has had a major impact on the financial position of many irrigators.

Rice prices have increased dramatically in recent years so commodity price concerns are not as evident in the rice industry in comparison with dairy and wine. Instead, the future of the rice industry in the Riverina is very much linked to water availability. The Basin Plan and the Commonwealth buyback are key issues for the industry and associated communities. Drought and climate change
are potentially more important, but uncertain and uncontrollable. If they are able to survive the drought, rice growers can respond to a return to more substantial water allocations. The loss of downstream productive capacity in the region may be an important factor, despite major producers emphasising that they have retained capacity to respond to improved production conditions for now.

**Cotton in the north of the Basin**

The cotton industry in the north of the Basin is generally considered to be profitable and flexible with production reduced in response to the drought. Localised reductions in water availability due to drought, climate change, the Basin Plan and buyback could be expected to have an impact on the cotton industry. The communities in the north are generally smaller, more varied and more isolated than those in the south.

**Other industries**

There are a number of other smaller irrigation industries which contribute to the economic production in the Basin, each with their unique adjustment challenges.

### 6.4 Overall importance of water policy in influencing adjustment

Water policy can certainly have an important influence on the process of adjustment in the Basin. Efforts to address environmental degradation by reducing the amount of water available for irrigation use through the buyback program and Basin Plan could have an impact on irrigated agricultural production in the Basin. However the relative importance of these factors can only be determined once SDLs are available.

In addition, water policy can have other impacts on the adjustment process. When water policy is unclear or not effectively communicated, irrigators are likely to make uninformed and inefficient adjustment decisions. Meanwhile water markets have been very important in facilitating adjustment during the prolonged drought.

While potentially important, the impacts of the Basin Plan and buyback program, and even of water trading, need to be considered in the context of ongoing changes in social and economic outcomes linked to water. For example, this paper has demonstrated that the prolonged drought has had a far greater impact on water use across the Basin than trade out of any particular irrigation district. Similarly, if a severe climate change scenario emerges in the future, then this may have a much greater impact on water availability than the Basin Plan.

More generally, irrigation industries and communities across the Basin are likely to continue to change as a result of a number of market and social factors. The
dairy and wine industries in the Basin are particularly at risk as a result of prevailing market conditions combined with drought induced debt. While some communities are likely to be highly dependent on irrigated agriculture, most are also reliant on dryland agriculture and even more reliant on non-agricultural industries. The contribution of agriculture to the Basin economy is small and declining over time.

6.5 Implications for the Basin Plan

Pursuing necessary reform in the national interest

National water policy is aimed at providing water users with flexibility to manage water resources efficiently and to adapt to changing circumstances. In particular, water markets enable this flexible movement of water, within a planning and regulatory framework aimed at ensuring environmental sustainability and minimising the potential for negative third party impacts. However, failure to allocate sufficient water to meet environmental sustainability objectives, particularly in prolonged dry periods, is critically undermining the achievement of the overall objectives of the national reform agenda. The setting of SDLs under the Basin Plan is designed to address this by ensuring that sufficient water is available to meet the needs of the environment.

The Basin Plan also represents a major opportunity to provide the irrigation sector with the long-term certainty and confidence it needs to make investment and adjustment decisions in the future. Until there is broad acceptance and clear scientific evidence that the balance is sustainable, water access entitlements across the Basin will continue to be viewed as insecure. This will continue to hamper efficient investment and adjustment decisions.

However, acting in the national interest can create distributional effects (winners and losers) and can thus result in additional, policy-induced adjustment. The key questions for the government in relation to these more immediate distributional effects of the Basin Plan are:

- to what extent does the Basin Plan contribute to adjustment compared with other factors?
- how can the Basin Plan be designed and implemented to minimise these costs?
- are further measures required to address any negative social and economic impacts of the Basin Plan?
- if so, what measures are likely to be most effective?


**Understanding and reporting on the adjustment impacts of the Basin Plan**

The impact of the Basin Plan clearly depends on a number of unknowns, including the magnitude of the reduction in water availability as a result of SDLs, future inflows across the Basin, market conditions and other government policies. Reallocation of remaining water through trade will further complicate the task of predicting where flow-on social and economic impacts are most likely to occur, particularly in the southern connected system.

This paper highlights that some of the current adjustment pressures are temporary and volatile, while others are more permanent trends. So, on one hand, the MDBA and governments should not be overly focused on the daily fluctuations of commodity markets in their efforts to understand where adjustment is most likely. However, on the other hand, it is important to recognise that major structural changes may occur in the next few years, particularly if current commodity prices and water availability conditions prevail.

Some of the current uncertainty will be resolved and the likely pattern of adjustment may emerge. As such, further fieldwork, analysis and consultation as planned as part of the development of the Basin Plan should focus on understanding potential adjustment pathways by identifying industries most likely to undergo further change, understanding the vulnerability of particular industries to planned reductions in water available for irrigation, and the resilience of the local communities to such changes.

Importantly, the social and economic assessment and associated reports by the MDBA should compare outcomes with the Basin Plan to a counterfactual case where the types of changes outlined in this report are considered. Failing to do so is likely to overstate the impacts of the Basin Plan.

**Minimising the cost of the Basin Plan**

Information is critical in minimising the costs of the Basin Plan. The water resource impacts of the Basin Plan should be clearly communicated and signalled to water access entitlement holders and the broader community in advance.

Other measures to mitigate the adjustment impacts of the Basin Plan include:

- All elements of the forward water reform agenda should be coordinated, clearly communicated and signalled in advance so that irrigators and those reliant on irrigation can make informed decisions about their future. Given the centrality of the Basin Plan to the range of key reforms, there is an opportunity for the MDBA to ensure that there is a clear and coordinated approach across government agencies, including across different levels and agencies.
- Careful design of SDLs, including through consideration of how they operate under various inflow conditions and sequences, could help minimise the
Conclusions

adjustment costs of the Basin Plan. However, we recommend against ad hoc changes to environmental water requirements made on the basis of perceived adjustment pressures—all rules, under all inflow conditions should be made transparent, within an adaptive management framework.

- Where the reductions in water availability due to the introduction of SDLs are large, adjustment pressures may be relieved through the use of transition arrangements possible under the Water Act 2007, although these are likely to entail some trade-off with environmental outcomes.
- Reforms to remove restrictions on trade in water entitlements and improve the transparency of market operations and Basin wide allocation processes, particularly in conditions of low water availability, will help irrigators adjust.
- Enhanced carryover arrangements will help irrigators manage water scarcity and improved water quality management may provide further tangible benefits to irrigators.

**Clarifying responsibility and risk assignment**

It is important that clear signals are provided about who bears the risk of reductions in water availability so that irrigators can make informed adjustment decisions. The potential for the Basin Plan to trigger the NWI risk assignment framework therefore needs to be clarified and clearly communicated.

If the Basin Plan did trigger financial payments to irrigators (under the NWI risk assignment framework as defined in the Commonwealth Water Act 2007 and relevant state Acts) then such payments would have an impact on adjustment.

**The question of additional assistance and the role of the MDBA**

Despite efforts to minimise localised costs, the Basin Plan may still be linked with declining water use and economic activity in some irrigation dependent communities. This could contribute to financial losses, unemployment and other social and economic impacts. Such residual impacts are likely to affect irrigators as well as suppliers of inputs and downstream industries directly dependent on irrigation activities (e.g. dairy manufacturers, rice mills).

Governments may decide that additional assistance is warranted, beyond measures generally available under the welfare system. This could involve a mix of financial and non-financial measures. Non-financial measures include: the provision of financial advisory and other counselling services, training and capacity building, better and more flexible land use planning and regulatory tools, and the development of policy tools and incentives to encourage sustainable land use outcomes, for example. Such measures may be implemented in response to particular outcomes, or as a pre-emptive strategy to minimise the transition costs.

It is unlikely that the MDBA is best placed to design and implement these measures. However, there is an opportunity for the MDBA to identify where adjustment pressures associated with the Basin Plan might be most prevalent and
to provide advice to other government agencies on the types of measures that might be relevant and beneficial in any particular community.

**Summary**

It is recommended that the MDBA pursue further work in relation to:

- **Assessment**: understanding adjustment processes and the impacts of the Basin Plan, in contrast to change that would have occurred anyway.
- **Best practice policy design and implementation**: minimising the cost of the Basin Plan on irrigators through information and flexible policy tools.
- **Communication**: providing clear information to Basin communities on the Basin Plan and its relationship with other relevant government policies.
- **Coordinated response**: developing links across different agencies and levels of government to coordinate action by governments to build capacity for change in vulnerable areas and to facilitate adjustment at least social and economic cost.
7 References


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