Water markets in Australia

A SHORT HISTORY
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A SHORT HISTORY
Foreword

The National Water Commission is pleased to release *Water markets in Australia: a short history*. This report traces the development of water markets in Australia.

Making the best use of Australia’s limited fresh water resources has been an enduring challenge since European settlement. Our rainfall and river flows are highly variable by international standards.

In response to this challenge, governments encouraged and financed an extensive expansion in water infrastructure and use in the early and mid 20th century, with a view to promoting economic development and prosperity. Governments played an active role in determining how, where, and by whom, water should be used.

Then, as options for harvesting more water dwindled, we recognised the need to make the best use of existing resources. Water markets and trading were the primary means to achieve this.

Creating a working market in Australia required policy makers to put faith in the collective wisdom of water users, rather than governments, in deciding how to make the best use of the resource. The flexibility and autonomy offered by water trading has increased agricultural production, helped farmers and communities to survive severe drought, and provided the mechanism for recovering water for the environment.

Governments still have a vital role to play in improving the efficient functioning of the market, and managing unintended consequences of trade.

Today, our water markets are internationally recognised as Australia’s water reform success story. A market now boasting an average turnover of $2.4 billion is allowing water to be put to its most productive uses, for a price determined by water users. Trading generates economic benefits valued in hundreds of millions of dollars annually.

The fundamental reforms that enabled water markets to develop in Australia have, necessarily, taken time. When the first tentative steps toward trading were taken in the 1980s, few would have foreseen the growth in trading that followed.

In publishing this history, the Commission hopes to promote a better understanding of the benefits of water reforms, together with the sustained commitment and leadership required to achieve long-term gains. Australia’s water markets story demonstrates how perseverance, collaboration and pragmatism can lead to good policy outcomes and tangible benefits.

The great challenge still ahead is to resolve the historic overallocation of water rights and so realise the full benefits of sustainable water management. This too will require strong leadership to build and sustain the case for change.
The Commission acknowledges the assistance of Frontier Economics, which developed this report based on consideration of the available literature and consultation with individuals from government agencies, water authorities and research institutions involved in the development of water markets.

We welcome feedback and look forward to working with governments and other stakeholders to further advance water reform in Australia.

Laurie Arthur
Commissioner
8 December 2011
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Executive summary

Background

Global demand for water is increasing due to rapid increases in population and food demand. Meanwhile, supplies of surface water and groundwater are finite, variable, and increasingly at risk from climate change and environmental degradation.

The development of efficient, flexible and sustainable approaches to allocating scarce and variable water resources between competing uses is therefore vital for continued economic and social development. Yet, in most countries, flexible market-oriented mechanisms play little or no role in allocating water. Water is often allocated based on political mandate or outdated administrative arrangements.

To address these issues, a number of countries have sought to introduce water markets, and Australia is prominent among them. The development of water markets in Australia, particularly in the Murray–Darling Basin (MDB), has resulted from a concerted and ongoing effort across multiple levels of government, and from collaboration with users and water service providers. Yet it would be misleading to portray the development of water markets as the seamless rollout of a grand vision or master plan.

This report tells the story of water market evolution in Australia.

Why were water market reforms implemented?

By the 1980s, it had become clear that many of Australia’s surface water and groundwater systems, particularly in the MDB, were fully developed, if not overdeveloped. A range of forces converged to provide the impetus for the more flexible allocation of water:

- The willingness of governments to fund large-scale rural water infrastructure projects was decreasing.
- The assumption that government-driven water development was good for the community was increasingly being questioned.
- The agricultural sector was becoming more exposed to international competition in commodity markets.
- There was growing awareness of the increasing impacts of water storage and use on the environment.

Once it became clear that the water resources in particular catchments were fully allocated, the deficiencies of existing systems of water rights became increasingly exposed. After limits on total use were implemented, the only way existing or new users could gain access to more water to commence or expand their activities was by getting it from someone else who already held a licence. However, because
water licences were tied to land, there were no readily available mechanisms to transfer water or licences from one user to another. Those wishing to secure more water were often forced to purchase the land to which a water licence was attached, incurring considerable costs and delays.

To address those problems, some users and policymakers began to advocate for the ability to reallocate water between users via trading. Water trading thus largely began as a pragmatic and user-driven response to emerging circumstances, rather than as a comprehensive strategy for introducing a new market.

**What water market reforms have been implemented?**

The 1980s and 1990s saw the first tentative, but far-reaching, steps towards water trading. However, there were reservations about the treatment of water as an economic good, which led to a very closely controlled and incremental approach to introducing water trading. In many areas ‘temporary’ seasonal allocation trading was allowed before ‘permanent’ entitlements could be bought and sold. Trading was also initially confined to geographically defined areas, such as within public irrigation districts.

The adoption of nationally agreed water reform packages in 1994 and 2004 facilitated the expansion of water markets across connected valleys and eventually state borders in the MDB. Refinements have since been made to the key elements of water markets:

+ Tradeable water access entitlements now have a secure statutory basis.
+ Trading rules have been developed and refined to enable market transactions to better reflect hydrological realities.
+ Complementary tools for managing third-party impacts have been introduced.
+ More robust trading platforms and accounting systems have been put in place.

Although further reform needs have been broadly identified and some rules still reflect regional and state interests, the market system in place is functioning effectively, if not completely efficiently.

**What are the results of water market reform?**

**Economic outcomes**

Water markets have given individual irrigators an additional tool to manage water availability risk and have increased flexibility in their water and production decisions. This has helped them to respond to external factors such as drought and changes in input prices, commodity market conditions and their individual business and personal objectives.
These benefits for individuals have translated into benefits for communities and regions, particularly in the MDB. During the ‘millennium drought’, water trading was vital for the horticultural, rice and irrigated dairy industries and helped cities and towns to secure urban water supplies. Water access entitlement trading has also underpinned longer term investment and structural adjustment decisions. For example, the rapid development of the Australian almond industry would not have been possible without entitlement trading.

Overall, water trading has delivered benefits valued in the hundreds of millions of dollars a year and has been a major success story in water policy reform. It is inconceivable that centrally determined systems of water provision to competing users would have enabled the flexible movement and reallocation of water that has occurred over the past decade.

Social and environmental outcomes

Many of the feared potentially adverse social and environmental impacts of water trading have not materialised. Market rules and complementary policy tools (such as those to manage salinity) have helped to manage these impacts.

Considerable public debate has focused on the potential negative socioeconomic impacts of the movement of water out of local or regional economies. However, given the much greater impacts of drought, it is very difficult to attribute any regional economic or social change to outward water trading. Declines in water use due to trading are likely to have had some flow-on impacts on associated industries and communities at the local level, but trading was not the main driver of those changes—it merely enabled structural adjustment to occur. At the same time, water trading has helped individual farmers survive tough times or leave the industry with dignity.

Key challenges in developing water markets

The development of water markets has not been without problems. There have been a number of impediments that have prevented the full potential benefits of water trading being realised. The key challenges can be categorised as:

- **technical**: for example, the cost of acquiring the necessary information to establish workable and efficient trading rules
- **political**: for example, the parochialism of states
- **social**: for example, community concerns about loss of water from some regions and the possible emergence of ‘water barons’
- **cultural and managerial**: for example, personnel in water management agencies typically were not experienced in the use of market-based mechanisms, but instead had science or engineering skills.
What can be learned from water market reform in Australia, and how can those lessons be applied in other settings?

Australia now has around two decades of experience in the establishment and operation of water markets. It can legitimately be seen as a world leader in the market-based allocation and management of scarce water resources.

The main lessons from that experience include the following:

1. It is feasible to develop working water markets in complex hydrological systems, including across jurisdictional boundaries.

2. Well-designed water markets can deliver significant benefits in any system where water access is scarce by signalling the value of water dynamically.

3. There are universal physical and economic characteristics that suggest where water trading will be most beneficial. They include situations where:
   + resources are fully developed for consumptive use
   + there is variability in seasonal water availability and variability between connected systems within seasons
   + there are a large number of connected water users
   + users have varying demands and degrees of flexibility to respond to water shortages
   + water users are exposed to the cycles of global agricultural markets
   + demands for urban and environmental water are increasing
   + there is pressure for change in the existing structure of water-using industries.

4. Despite these universal characteristics, water market design needs to be informed by the history and specific characteristics of local water resource management.

5. Universal prerequisites for effective water markets include:
   + setting an effective cap on total sustainable extractions (preferably before scarcity becomes acute)
   + establishing entitlements that are clearly specified, monitored and enforced so that users know exactly what they can buy and sell
   + having a sound regulatory and governance framework within which water trading can take place
   + implementing fundamental elements of good water management, such as metering and water accounting.
6. An incremental approach to water market development is appropriate to manage uncertainty and stakeholder concerns, but benefits will be forgone if suboptimal arrangements are left in place too long.

7. Measures to address environmental and social outcomes that could be affected by water trading should be carefully considered and targeted to limit interference with the operation of the market. Some interventions, such as restrictions imposed on trade, are costly and have unintended negative consequences.

8. Market participants learn quickly and make decisions based on the rules that are in place. Any efforts to stifle market development or impede progress inevitably lead to creativity by market players, which may have unintended consequences for property right holders.

9. As water markets mature and develop, roles and responsibilities influencing market outcomes need to be assigned carefully to avoid conflicts of interest, which can undermine reform objectives.

Australia’s experience of introducing a market-based mechanism for allocating scarce water resources could be instructive for other nations dealing with the challenges of water scarcity, as well as in the management of other natural resources.
Section 1:
About this report
1.1 Background

Global demand for water is increasing due to rapid increases in population and food requirements. At the same time, freshwater resources are finite. While further water source development is possible in some places, including through investments in desalination in coastal locations, many countries have mature and fully developed water systems. In fact, water use in many surface water and groundwater systems already exceeds sustainable long-term limits.

Variability in the availability of fresh water is another major challenge. Often, water is plentiful in some places but in short supply when and where it is needed most.

Climate change threatens to exacerbate the twin problems of scarcity and variability. Taking a global snapshot, a consortium of water management experts recently found that by 2030 over a third of the world’s population will be living in river basins that will have to cope with significant water stress (2030 Water Resources Group 2009).

These challenges mean that developing economically efficient and sustainable approaches to allocating water between competing rural, urban and environmental uses is vital for sustainable economic and social development. However, in most countries, market mechanisms play little or no role in allocating water among competing uses. As a result, administered water prices do not reflect the underlying scarcity value of the resource and water is allocated largely via inflexible political, administrative and customary arrangements.

There is growing interest in water reform, particularly in the potential of water markets to help overcome these problems. Australia has had significant experience in the development of water markets. Indeed, the ability to trade water has emerged as a key part of water management in Australia.

However, until now, there has been no comprehensive review of the evolution of Australian water markets and their significant contribution to the efficient allocation of water resources.
1.2 Purpose and scope

This report aims to describe the evolution of water markets in Australia. While water markets continue to evolve, the story of their development to date is worth telling, both for the record and as a review which, it is hoped, those involved in water markets already operating in Australia and those contemplating similar reform will find instructive. It considers questions such as:

+ Why were water market reforms implemented?
+ What reforms have been implemented?
+ What are the results?
+ What can be learned from water market reform and how can those lessons be applied elsewhere?

The report documents important events in market development, but the factual history of what happened, and when, in each jurisdiction, is not provided in detail. Rather, examples are used to demonstrate general patterns, approaches, issues and drivers.

While the report naturally focuses on the southern MDB, it also highlights lessons from water markets outside the MDB where relevant. Similarly, the report focuses on the irrigation sector because that sector has accounted for the vast majority water trading in Australia. However, it also describes the more recent emergence of intersectoral trade, particularly by urban water authorities and environmental water agencies.

1.3 Approach

The vast majority of trading activity in water markets has occurred in the past 15 years. However, a full understanding of the evolution of water markets requires going back much further. Indeed, important features of Australian water markets can be traced back to Federation in 1901.

The story of water market development is embedded within the broader evolution of water policy in Australia. Several authors have previously described the phased chronological approach to Australian water policy development—exploration, expansion, maturity, and transition to sustainability (Connell 2007, Pigram 2006, Musgrave 2008, Watson and Cummins 2010). While there are generally no strict cut-off dates, water market development also follows a phased approach within the maturation and sustainability phases of water policy development (Figure 1.1).
Figure 1.1: The evolution of Australian water markets

The report addresses the evolution of key elements of water market design within this phased chronological approach.

Thus, the remainder of this report is structured as follows:

+ Section 2 provides a brief introduction to the concept of water markets and a snapshot of water markets in Australia today.
+ Section 3 describes early approaches to Australian water management, which involved very little water trading but established some important prerequisites.
+ Section 4 describes the emergence of water markets in Australia from the 1980s, when the first steps towards trading were taken.
+ Section 5 describes the decade from the mid-1990s, when there was a major broadening and expanding of water markets, particularly across the MDB.
+ Section 6 describes the most recent phase from the mid-2000s, as markets and institutions transition towards a more sustainable and mature state, and also considers the future of water market reforms.
+ Section 7 provides an overview of the economic, social and environmental results of water market reforms.
+ Section 8 outlines the Commission’s views on lessons learned in the market development process that could be applied in other settings.
Section 2:
An introduction to water markets
2 An introduction to water markets

2.1 The basic idea and objectives of water markets

When water is plentiful, it can simply be provided to, or taken by, everyone who needs it. However, in many cases, water is limited and its use by one person affects its availability to others. This may result in competition and conflict, and creates the need for a coordinated, equitable and efficient system of allocation.

Economists have long taken an interest in arrangements for allocating scarce natural resources, such as water. Water markets stem from the basic idea of a ‘cap and trade’ system in which:

+ the cap represents the total pool of the resource available, consistent with sustainable levels of extraction
+ individual users are provided with entitlements to a share of the total pool
+ entitlement rights and the quantity of water allocated to an entitlement each season (a water allocation) are tradeable, so that ownership, control and use can change over time
+ the price is determined in the market by the value placed on water by many buyers and sellers.

This is illustrated in Figure 2.1.

**Figure 2.1: The ‘cap and trade’ approach to establishing water markets**

1) Limit total extractions from water resource

![Diagram showing the cap and trade approach]

2) Limit/specify extractions for each user

3) Trade allows individual water use to be reallocated

The objective of the cap and trade water market approach is to facilitate the economically efficient allocation of water while ensuring environmental sustainability.
Environmental sustainability

In establishing markets for water, or other natural resources, a threshold issue is determining the total quantum of the resource that is available for consumptive use. The setting of the cap should consider the long-term environmentally sustainable levels of extraction to ensure that the long-term interests of water users and the broader environmental values of the community are considered in a balanced manner (see Box 2).

**Box 2.1: What are ‘sustainable levels of extraction’?**

Water extractions alter the timing and distribution of flows (such as through the regulation of rivers). This changes environmental outcomes in a natural water system.

For example, building storages and permitting diversions particularly alters the seasonality of flows as well as the frequency, duration and magnitude of floods. Furthermore, the management of in-stream structures (such as weirs) generally dampens the variability of in-stream flows. Therefore, ecosystems adapted to the natural flow patterns are at risk, and this causes changes to the environment, such as changes to ecological functions or the prevalence of various species.

Some negative environmental changes are considered acceptable to society as a means to reap the benefits of water use. However, significant negative environmental changes that compromise the viability of important environmental functions are generally not acceptable. ‘Sustainable levels of extraction’ mean permitting only water extractions that keep environmental change within the bounds of what is considered acceptable to society, and no others.

Importantly, the objective of ‘sustainability’ is not necessarily to preserve the pristine natural state of the river. For example, depending on legacy issues and the costs and benefits of river restoration and protection, the community may develop alternative visions of ‘a healthy working river’.

In addition to the impacts of water extraction, the way water is used on land can also have adverse environmental effects. For example, the amount of water applied and the characteristics of the land determine the degree of waterlogging and the amount of salt that moves through the soil. Consequently, ‘sustainable water diversion’ and ‘sustainable water use’ are separable concepts that relate to water management and land management, respectively, although the links between the two clearly need to be taken into account.
Because different people have different values, a key challenge lies in developing a shared vision of sustainability. Unfortunately, as shown in this report, experience in Australia suggests that defining and establishing a sustainable level of extraction as the ‘cap’ element of a water market—ideally as a precursor to allowing water trading—is easier said than done.

However, water markets can also help recover water for environmental uses where governments have identified that the historical assignment of rights to consumptive users provides insufficient water to support healthy rivers and groundwater systems. That is, acting on behalf of the environment, governments can purchase water entitlements or allocations and reduce the amount of water extracted for consumptive purposes.

**Economic objectives**

After a cap on total consumptive water use is established, water trading is a mechanism to ensure that limited water resources are put to their most productive uses.

The idea is that water markets will promote economic efficiency by enabling water resources to be reallocated to those who value them most highly in both the long and the short terms:

+ **Seasonal water trading** enables the water available in any given season to be reallocated across crops, locations, irrigators and other water users in response to seasonal conditions (the concept of *allocative efficiency*). This is particularly valuable where different users have different water demands. For example, given adequate forewarning, rice growers can simply choose to reduce the areas they sow during times of low water availability. However, other farmers, such as those growing perennial horticultural crops (such as fruit trees), need water every year. Trading provides the opportunity to move water between users with different water demands.

+ **Water trading** can facilitate investment and structural adjustment in response to changing conditions (known as *dynamic efficiency*). For example, in a capped system in which no new entitlements are available, trade enables new water users, such as a new ‘greenfield’ irrigation developments, to establish and develop. The corollary is that water markets provide a mechanism for existing users to retire or move on. As a result, markets enable dynamic changes in the size and composition of water-using industries over time. This is particularly useful in a market-oriented economy such as Australia’s, in which farmers face global market forces for the commodities they produce.

+ **Water trading** can also promote *productive efficiency*. The price signal for water in the market provides an incentive for users to make efficient use of all inputs and invest in improving the efficiency of their on-farm water use.
In short, markets allow water users, rather than governments, to make these complex long- and short-term decisions about who should use water for what. Market prices provide a signal for users to consider the opportunity costs of their water-use decisions and make decisions in their own best interests.

However, for the decisions of individuals to be consistent with the broader public interest, water markets must operate within the physical and hydrological realities of surface water and groundwater systems. Therefore, to be efficient, water trading needs to be governed by rules that reflect those realities.

By increasing flexibility, markets will inevitably affect distributional and socioeconomic outcomes as water moves between individual users, industries and regions. That process is beneficial in aggregate, but it gives rise to the possible need for other policy tools to meet any particular distributional, equity or regional development objectives that governments have—ideally, without undermining the operation of water markets.

### 2.2 Elements of water market design

In general, the economic efficiency objectives of markets are promoted when:

- property rights to access water are secure
- market participants are well informed
- market participants take account of all the costs and benefits generated by their actions (that is, any externalities are internalised)
- there are low barriers to entry and few impediments to trade
- there are low transaction costs (ACCC 2010b, NWC 2011a).

Often, market developments were prompted by the desire to improve one or more of these characteristics.

In practice, developing water markets with these characteristics requires consideration of the elements described in Table 2.1. Those elements are used to guide the discussion on the development of markets in the following chapters of this report.
Table 2.1: Elements of water market design

<table>
<thead>
<tr>
<th>Element</th>
<th>Description and rationale</th>
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<tr>
<td>The balance between consumptive and environmental water use</td>
<td>Markets should be established based on a clear definition of the total resource available for consumptive use and how it could change over time. This will influence the overall development of water-reliant industries. If such limits do not reflect the agreed sustainable level of extraction, there is likely to be unacceptable environmental degradation and pressure to move extraction to within limits that reflect the community’s desire for environmental outcomes. This creates uncertainty for water-using industries, which reduces their incentive to invest efficiently.</td>
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<td>Clearly defined and tradeable property rights</td>
<td>A prerequisite for an effective market is a clearly specified property right that people can understand and are able to trade. An efficient market requires property rights that are:</td>
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<td></td>
<td>+ <em>clearly specified:</em> so that owners and potential owners understand exactly what benefits and obligations the entitlement brings</td>
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<td></td>
<td>+ <em>secure:</em> the entitlement is not subject to modification or extinguishment at the discretion of others without due compensation</td>
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<tr>
<td></td>
<td>+ <em>exclusive:</em> the direct benefits and costs associated with exercising the entitlement accrue solely to the holder</td>
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<tr>
<td></td>
<td>+ <em>enforceable and enforced:</em> it must be possible to determine when an entitlement has been infringed and to have legally binding ways of preventing infringement or providing redress</td>
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<td>+ <em>transferable and divisible:</em> the entitlement can be traded in whole or in part to others.</td>
</tr>
<tr>
<td>Regulation of the market</td>
<td>In practice, it is rare for any market to operate without some form of government regulation. Regulation of trading is important to manage potential impacts on other water users and the environment. Similarly, regulation of the prices charged for access to and use of (publicly owned) irrigation networks helps prevent distortions in the water market (such as where pricing practices provide an effective subsidy for some users and not others, or where charges limit the ability of some users to participate in the market).</td>
</tr>
</tbody>
</table>
Table 2.1: continued

<table>
<thead>
<tr>
<th>Element</th>
<th>Description and rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trading platforms</td>
<td>Entitlement holders will trade only if the transaction costs are not prohibitively high. Trading platforms, including exchanges, and the emergence of water market intermediaries (such as brokers) help reduce the cost of bringing buyers and sellers together. Publicly available information helps ensure that buyers and sellers can make well-informed decisions.</td>
</tr>
<tr>
<td>Registers, water accounting, and compliance and enforcement arrangements</td>
<td>Robust registers of water entitlements and accounting mechanisms for water trading and use are essential in ensuring that markets operate effectively. It is also essential that water use is accurately measured and that monitoring and compliance arrangements are in place.</td>
</tr>
<tr>
<td>Institutional and governance arrangements</td>
<td>Markets sit within a broader institutional and governance framework in which decisions are made by resource managers, policymakers and regulators in relation to the rules governing trade. It is important that roles and responsibilities are clearly defined and that there are no conflicts of interest.</td>
</tr>
</tbody>
</table>

While not part of the market arrangements per se, supplementary mechanisms may also be needed to manage adjustment and distributional outcomes. For example, governments may have regional development objectives or concerns that the movement of water out of particular regions may create structural adjustment costs. However, autonomous adjustment in response to market conditions is essential for economic growth and one of the main benefits of water trading. For efficiency reasons, it is important that any such measures are well targeted and do not adversely affect water market outcomes. However, in many cases governments constrain markets to achieve particular distributional results.

2.3 A snapshot of water markets in Australia today

The nature of entitlements and trading

Australia is generally regarded as a dry continent. Although that is a reasonable observation, it is more correct to say that much of the continent’s water is in the wrong place, or arrives at the wrong time. Australia’s rainfall is highly episodic and stochastic (see Musgrave 2008).

Dams can help to manage supply variability, but because of uncertainty about rainfall it is risky to define individual tradeable rights as fixed volumes. Instead, the general approach adopted in Australia is that access rights are specified to a proportion of the total pool of water available each year. That way, the exact volume can change from year to year depending on the seasonal conditions.
There are two main types of property rights to access water, and both are traded in Australian water markets:

+ **water access entitlement**: the perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool (as discussed below, there are various types of such entitlements with different characteristics, including differing ‘reliability’)
+ **water allocation**: the specific volume of water allocated to a water access entitlement in a given season.

A water access entitlement of, say, 10 megalitres (ML) is not guaranteed to provide 10 ML each year. The 10 ML will only be available when there is a water allocation of 100%. For example, when resource availability is 80%, the entitlement would only yield 8 ML that year, and so on.

Subject to rules and regulations, water users can choose to:

+ use the water allocated to their entitlements
+ buy additional water allocations
+ sell part or all of their allocations
+ buy or sell entitlements
+ lease entitlements.

In some water systems, and under some circumstances, users can also choose to ‘carry over’ water, which means that they do not use it in the current year but instead leave it in storage for use or trade in the following year.

The mix of water property rights traded in Australian water markets is dominated by water entitlements and water allocations; there is little use of futures, options, leases or more sophisticated derivative products. This could be attributed to the majority of water traders being water users and the fact that the available water entitlement types and allocations are well suited to users’ risk management and water use needs. For example, water allocation transfers are used to supplement water availability in a given season, or to dispose of water that is surplus to crop requirements. In addition, in many jurisdictions there is more than one type of water entitlement in a given water system and water users can choose to hold the type of entitlement that best suits their requirements. High- and low-reliability entitlements provide different volumes of allocation under different seasonal conditions. Therefore, a water user with relatively fixed water demands may choose high-reliability entitlements while a water user with water demands that are more flexible may choose a greater proportion of lower reliability entitlements. Furthermore, the interregional trading of water entitlements means that users can develop a portfolio of entitlements (each with unique risk characteristics).
The extent and scope of water trading

Australia does not have a single water market (nor would that make sense, given that hydrological connectivity does not exist between water systems that are vast distances apart). For example, water systems where trade is possible include regulated surface water systems, unregulated surface water systems, groundwater systems, and various connected water systems in some regions. Water markets in different water systems have developed at varying speeds and to different degrees. In broad terms, the market can be categorised into three distinct geographical segments of varying size, activity and interconnectedness:

+ the southern connected MDB, which is operated as a connected resource comprising 13 distinct water trading zones (Figure 2.2)
+ the northern MDB, including the upper Darling, Macquarie–Bogan, Castlereagh, Namoi, Border Rivers, Moonie, Condamine–Balonne, Paroo and Warrego river catchments, which is characterised by unregulated rivers or rivers regulated by single storages
+ outside the MDB in Victoria, Queensland and New South Wales, and in Tasmania, Western Australia and the Northern Territory.

In some areas (for example, Queensland and New South Wales) water trading arrangements are well established, while water markets are in their formative stages in Tasmania, Western Australia and the Northern Territory.

Over 90% of Australia's water market activity is concentrated in the southern MDB, in the country's south-east, where trading is now possible over large distances and across state boundaries (NWC 2011a) (Figure 2.3). Water trading (in both water allocations and entitlements) has expanded rapidly in the southern MDB over the past decade of drought, reaching an annual turnover of $3 billion in 2009–10 (NWC 2011a). In that year, about 11% by volume of entitlements on issue in the MDB (or 7% nationally) was traded, while approximately 20%–30% of water allocated to entitlements in major systems of New South Wales was traded.
Trading activity outside the MDB occurs in smaller surface water and groundwater systems in Victoria (for example, the Macalister Irrigation District), New South Wales and Queensland. Trading also occurs in Western Australia and other jurisdictions. In Western Australia, most trading occurs in the south-western irrigation districts managed by Harvey Water (all surface water) and in horticultural areas to the north of Perth, which draw predominantly on groundwater. In places such as the Northern Territory and Tasmania, trading activity is limited by hydrological constraints and the fact that new licences are still available to enable further development (however, there has been an increase in entitlement trading in Tasmania in the past three years in those catchments that are at full allocation).
The growth of water markets in the southern MDB is at least partly a result of the unique underlying characteristics of the region’s water resources and industry mix (see Box 2.2). In particular, the area’s large interconnected water systems, extremely variable inflows and diverse mix of agricultural industries (with different water demands) make it conducive to water trading (see NWC 2010b).

Despite these natural advantages, for trading to reach the level it has today has required a concerted and ongoing effort across multiple levels of government, in collaboration with users and water service providers, over 30 years. This report tells the story of that evolution.
Box 2.2: Water resources and irrigation in the Murray–Darling Basin

The Murray–Darling Basin (MDB), which covers much of south-eastern Australia, accounts for around 14% of Australia’s landmass and 10% of its population. Agriculture dominates land use, accounting for nearly 90 million of the basin's 106 million hectares. MDB agriculture produced around 39% ($15 billion) of Australia’s gross value of agricultural production ($38.5 billion) in 2005–06 (ABS 2008).

In 2005–06, the basin accounted for 65% of Australia’s irrigated land and 66% of the nation’s agricultural water use (ABS 2008). The largest activities by irrigated land use were pasture (717 000 hectares, mainly for dairying), cereal growing (329 000 hectares, mainly rice) and cotton growing (247 000 hectares). Other major irrigated crops were grapes (106 000 hectares), other fruit (75 000 hectares) and vegetables (31 000 hectares) (ABS 2008). This pattern is also reflected in irrigation water use: most water is devoted to annual activities, including pasture and annual crops. Less than 15% of agricultural water use was allocated to perennial activities in 2005–06.

In 2005–06, the gross value of irrigated agricultural production in the basin was around $4.6 billion, or around 44% of the total value of irrigated agricultural production in Australia ($10.5 billion). The largest activities were dairying ($938 million), fruit and nuts ($898 million), cotton ($797 million) and grapes ($722 million) (ABS 2008).

The distribution of irrigated activities in the basin varies between the northern and southern regions. Some of the key differences include soil types, rainfall patterns, the reliability of irrigation water supplies, and the availability of groundwater. For example, around 80% of horticultural activities are located in the southern MDB because its climate is suited to many varieties of horticultural crops and because the regulated southern river system provides more reliable access to water, which is essential for permanent plantings.
Sources: ABS (2008), Musgrave (2008), Hone et al. (2010).
Section 3:

Early approaches to water management in Australia
3 Early approaches to water management in Australia

The early phase of water management in Australia covered the period from European settlement through to around the 1970s. While there was very little water trading during this period, an understanding of the historical approach to managing water resources and the development of irrigated agriculture in Australia is critical to understanding later developments.

This chapter:

+ describes the approaches to defining rights to water under early Australian statutes developed by colonial and, later, state governments (Section 3.1)
+ outlines the agreements that were developed for sharing water between the states in the MDB (Section 3.2)
+ describes the ‘development’ focus of this period, in which state governments invested heavily in water resource infrastructure to support irrigated agriculture and regional settlement (Section 3.3)
+ explains the systems for providing access to water that underpinned this period (Section 3.4)
+ notes the very limited role of water trading during this period (Section 3.5)

For the greatest part of the period since European settlement, the inherent variability and periodic scarcity of water in Australia meant that water managers relied on engineering, rather than market-based, solutions.

3.1 Common law riparian rights and early water statutes

In Australia, the first water laws following European settlement were based on English common law, which gave rights to use water in streams and rivers to the adjacent (riparian) landholders. However riparian rights came to be seen as inadequate for Australia because of the inherent variability of supply and the consequent need for storage and delivery infrastructure to enable water to be used when and where required. As Musgrave (2008:29) has observed:

“The British settlers brought with them at least two seriously flawed expectations as far as water is concerned. First, they expected, quite reasonably, that Australian hydrology would be similar to that of northern hemisphere countries. Second, they expected riparianism to be an adequate basis for the exploitation of water in the colony. For much of mainland Australia, these expectations were not warranted. Consequently, the assumptions the colonists made as to the appropriate institutions and works for the extraction and use of water were an inadequate and a troubled basis for the development of sound water policy over most of the nineteenth century. This was particularly true of the Murray–Darling Basin.”
Under the influence of Alfred Deakin, early Australian statutes during the late 19th and early 20th centuries (commencing with the Victorian *Irrigation Act 1886*) therefore sought to limit riparian rights by vesting the right to ‘the use and flow, and to the control of water resources’ in the Crown (that is, the states). This allowed each of the states to establish centralised systems, administered and closely controlled by public authorities, for allocating water rights.

Deakin’s vision was that, with control vested in the state, the state could then assign water to irrigators guided by its own experts or ‘water masters’, with the object being ‘to encourage the greatest possible utilisation of the water on the largest possible area’ (Deakin 1885:54–55). Supported by public investment in irrigation infrastructure, it was envisaged that this would promote economic and social development of the regions through closer settlement and increased agricultural production.

While the early water legislation established highly centralised systems for allocating water, it was nevertheless a significant precursor to the later establishment of clearly specified and tradeable water entitlements because it gave government the power to limit total extractions and to define relatively homogeneous rights to the resource. In many other countries, the existence of riparian rights is a significant barrier to the development of water markets because each right is different and location-specific. One example is the ‘first in time, first in use’ allocation policy that applies in much of the United States and allocates water to licence holders based on the ages of their licences.

### 3.2 Sharing water between the states

How to manage the shared water resource of the River Murray was another major issue at the turn of the 20th century, and was to be important in the later advent of water trading. Early negotiations were driven by the parochial economic objectives of the colonies, and later the states. Water was a battleground for state sovereignty in protracted discussions about Federation (see Connell 2007). While Victoria and New South Wales both originally sought to harvest water from the River Murray with a view to encouraging irrigation development, South Australia initially sought to use the river as a means of transport, in the hope of establishing the Murray mouth as the major port from which to transport produce from the MDB (Crase 2008:5). The debate about water was therefore linked to competition between the states in the development of road and rail transport links (Connell 2007).

Interstate tensions over water continued after Federation (Figure 3.1), and it was not until 1915 that the River Murray Waters Agreement was signed by the Commonwealth Government and the governments of South Australia, New South Wales and Victoria (MDBC 2006). The agreement provided for equal sharing of the flow of water at Albury between New South Wales and Victoria, with each state retaining control of its tributaries below that point, and guaranteed a minimum entitlement for South Australia.
The agreement focused on consumptive uses and the management of common resources, but did not limit total diversions. Each state believed that its share of the water resources of the MDB would be maximised and used as a tool for productive consumptive use for economic development within its jurisdiction. This parochialism and focus on regional economic development are key contextual factors in understanding later reluctance to trade water interstate.
The 1915 River Murray Waters Agreement also provided for the construction of storages, weirs and dams to ensure a permanent flow of water for irrigation and navigation and created the River Murray Commission to approve designs of proposed water infrastructure (MDBC 2006, Connell 2007). Costs of development and construction would be shared equally between the states and the Commonwealth, whereas operating and maintenance costs would be shared equally between the states (a system that remains largely unchanged today). Importantly, except for some specific procedural matters, unanimous decisions by the jurisdictions would be required.

The agreement marked a critical development in a more cooperative cross-jurisdictional approach (Green and Dole 2001). It is also noteworthy in that it marks the beginning of serious federal government involvement in water resource planning and in financing irrigation (Smith 1998).

3.3 Development of water resources and irrigated agriculture

The role of government

Rights to manage natural resources, including water, were clearly vested in the states (rather than the Commonwealth) in the Australian Constitution, and each state actively developed water resources as a key driver of economic and social development for much of the 20th century. As observed by Connell (2007:15):

“The irrigation-based communities that emerged first in Victoria in the 1880s were the product of innovative engineering and institutional development. Governments largely abandoned the riparian law inherited from Britain and legislated to take over direct control of water management. This allowed them to create entitlements to water that varied depending on climatic conditions, in effect providing a proportion of available flow rather than a fixed volume. This response to extreme climate variability was and still is relatively novel compared to normal practice in most parts of the world. Their aim was to use irrigation water to create communities of property-owning independent small farmers as a foundation for a democratic society. To do this the size of landholdings was restricted to prevent the creation of grand estates worked by armies of low-paid workers similar to those developing in southern California. Water rights were also tied to land titles to discourage water market speculation and the development of water monopolies and cartels. Unlike the United States where similar measures were rapidly subverted, the formula worked moderately well for much of the following century. In broad terms the other States paralleled the Victorian experience.”
The development era saw the construction and operation of substantial headworks and delivery systems, subsidised by government and designed to droughtproof the settled parts of country. As noted by Ward (2009:8):

The provision of water supply infrastructure has been considered by Australian governments of all persuasions as an unequivocal public good and intrinsically coupled to the strategic social objective of national and regional development. The primacy of economic development and regional employment resulted in the provision of water diversion and reticulation schemes regardless of cost … On the basis of these institutional and policy dictates, State governments became extensively involved in the water industry as developers of water supply infrastructure such as dams, and developers and owners of large-scale urban and rural supply schemes (including irrigation).

The deployment of this grand scheme received broad political and commensurate financial support, and was facilitated by a well-established engineering hierarchy, responsible for the conceptualization, planning and construction of dams, and reticulated supply, drainage and sewerage systems. Additionally, the statutory authorities responsible for supplying rural irrigation water progressively controlled the pattern of rural settlement, inclusive of farm size and crop types. The agency objective and tasks, whilst large in magnitude and scale, were narrow in scope and comprehensively specified … there was no legislated obligation to consider external consequences, and the subsequent metric of rural water development success was couched in engineering terms and measured accordingly. Although punctuated by the Depression and two World Wars, the pace of water development, particularly rural irrigation schemes, continued unabated over the 100-year period initiated by Deakin’s Irrigation Act of 1886.

The period from 1918 through to the 1970s marked significant expansion and government investment in irrigation activities in the MDB. After World War I, Australian governments created soldier settlement schemes to help returned servicemen gain employment in the rural sector. The schemes were often jointly funded by the relevant state government and the Australian Government (MDBC 2006; also see Box 3.1). They generally involved small property sizes and emphasised intensive horticulture and mixed cropping and grazing.

Governments established irrigation areas in the New South Wales Murray and Murrumbidgee valleys, the Victorian Goulburn–Murray and Sunraysia regions, and St George in Queensland (MDBC 2006). To support the schemes, they invested heavily in the construction of new dams, weirs and locks across the MDB. Among the dams completed in this time were Lake Victoria (completed 1926), Burринjuck (1928), Eildon/Sugarloaf (1929), Hume (1936), the dams of the Snowy Mountains Scheme (1974), and Dartmouth (the last in 1979) (MDBC 2006).

1 Soldier settlement schemes were established to assist returned servicemen from World War I, World War II and the Korean and Malayan operations.
The post-World War II period was marked by a significant increase in the scale of investment in dams and associated water infrastructure, including a number of ‘megaprojects’ such as the Snowy Mountains Scheme (south-east Australia), the Ord River Scheme (Western Australia) and the Burdekin Dam (Queensland). The Australian Government was a major source of funding. There was a tenfold increase in the capacity of major dams in Australia between 1940 and 1990 (ABS 2010).

In addition to water infrastructure construction and resource management, governments also had a much more active, paternalistic and protectionist role in agricultural policy than they do today. Public servants were initially sent overseas to bring back crops suited to Australian conditions. More significantly, various forms of protection, including tariffs on imported products, production controls and quotas, price reserve schemes and statutory marketing arrangements, were commonplace in a number of agricultural industries (and in other sectors of the economy) throughout much of the early to mid-1900s (Industry Commission 1991).

The collapse of the first soldier settlement schemes after World War I led to a realisation that technical engineering excellence alone was not a guarantee of commercial success in global commodity markets.
Patterns of development in irrigated agriculture

Consistent with Australian governments’ ‘development’ focus, their agricultural, water resources and infrastructure policies led to major growth in intensive irrigated agriculture. The initial types of irrigated farming varied, but included intensive dairying and sheep farming, pig and poultry farming, cereals, vineyards, orchards and market gardens.

While the promotion of agriculture through irrigation water resource development was common to all the states, there were significant differences in the nature of the activities promoted by each (see Box 3.1).
Box 3.1: Patterns of development of irrigated agriculture in Australia

In Victoria, the area under irrigation expanded rapidly in the first half of the 20th century and by 1977–78 had reached 575,000 hectares (McCoy 1988:54–55). The biggest and most important area was on the northern plains of the state. Initial development was focused on the Goulburn system around Shepparton, but development later moved north to the Murray River (Hallows and Thompson 1995). Centred on Mildura, the Sunraysia districts of Red Cliffs, Merbein, Robinvale and the First Mildura Irrigation Trust were established as very small block horticultural enterprises.

A similar approach to the development of irrigation took place in South Australia in the adjacent reaches of the Murray River, complemented by a region of irrigated dairy production in the lower reaches of the Murray. Irrigation in South Australia was also supported by available groundwater reserves (McCoy 1988, Hallows and Thompson 1995).

In New South Wales, settlement of the Murrumbidgee Irrigation Area began in 1912 following the construction of the Burrinjuck Reservoir, with weirs and supply channels and the acquisition of land for farms and towns. At the start of the 20th century, irrigation was slower to develop in New South Wales than in Victoria, and only really took off in the 1950s. Following successful rice cropping trials in the Murrumbidgee Irrigation Area in 1922–23, and the relaxation of controls on rice growing in the 1940s and 1950s, rice shaped the irrigation sector in the Riverina. During the period from the early 1960s to the early 1990s, the area of rice irrigated in the Murray increased nearly fourfold, from about 16,000 hectares to 57,000 hectares (Martin 2005). By 1981–82, 64% of irrigation water in southern New South Wales was used on rice (Musgrave 2008:37). Horticulture is also an important irrigated agricultural crop in the Murrumbidgee and Western Murray regions of New South Wales.

In Queensland, apart from the Dawson Valley Irrigation Scheme initiated in the 1920s, there was little interest in irrigation until after World War II. The government-sponsored St George Irrigation Area in the south-west began in the 1950s and, as more water became available, expanded to some 10,000 hectares of cotton, cereals and oilseeds. Most of the cotton-oriented irrigation development in the northern MDB (in New South Wales and Queensland) came much later and was generally driven by the private sector, not governments (Hallows and Thompson 1995).

In Western Australia, irrigation development in the south-west aimed at closer settlement and providing agricultural produce to Perth. Development of the Harvey, Waroona and Collie irrigation districts dates back to the early 1900s. Smaller irrigation schemes elsewhere in the state include the Preston Valley, Carnarvon (1000 kilometres north of Perth) and the Ord (in the Kimberly region) (Hallows and Thompson 1995).

In Tasmania, irrigation developed in the state’s east, where some private schemes date back to early developments in the 19th century. Irrigation development has included private irrigation based on stream diversions, water districts based on major storages to regulate flow, and government-sponsored irrigation schemes. The development of government schemes came about after the creation of the River and Water Supply Commission in 1958 (Hallows and Thompson 1995).
Historically divergent prospects and approaches to water policy in the MDB can still be distinguished today:

Irrigation in NSW focuses on annual allocation of all available resources, and agriculture is accordingly dominated by annual cropping. By way of contrast, the Victorian approach to water allocation has always been more conservative, budgeting for longer-term water security. Ultimately, this has resulted in a preponderance of perennial irrigation enterprises, like horticulture and dairying. In South Australia, the original interest in navigation and its geographical location at the tail of the Murray–Darling catchment resulted in an even more conservative allocation regime. This was reinforced by the need to supplement Adelaide’s water supply with extractions from the River Murray. The upshot has been the development of permanent horticultural enterprises making relatively frugal use of irrigation resources. (Crase 2008:5)

Meeting urban water needs

The ‘development’ paradigm also applied to the procurement of water supplies to support growth in urban areas.

In the major cities, large integrated public utility suppliers were established during the 19th century with strong powers to plan and augment supply sources in line with population growth, and to recover the cost of doing so through property taxation. In regional areas, water was provided by local government. As in the rural sector, engineering principles dominated policy development, and urban water supply relied predominantly on surface water captured through dams and other regulating infrastructure. Risks to supply were typically managed through the development of considerable reserve capacity.

Importantly, the supply system for each city was also run as a stand-alone system, separately from the surrounding region. In particular, the separation of urban and rural sources was taken as an article of faith. This was encapsulated in Victorian Premier Henry Bolte’s ‘Bolte’s divide’ declaration in 1964, when he stated that he would ‘not allow one drop of water to be taken from north of the divide to augment Melbourne supplies’.2

The political, cultural and possible ideological split between rural and urban water remains an important constraint on the development of fully open water markets (see Section 6.3). Even today, New South Wales rural councils can simply apply for extra water for town development (rather than having to buy it on the market), ultimately reducing the yield and security of entitlements held by irrigators.

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2 Sir Henry Bolte was Premier of Victoria between 1955 and 1972.
3.4 Licensing systems and controls on water ownership

During the ‘development’ phase up to the 1970s, licences providing access to water were available virtually on demand. Each state established statutory licensing systems whereby rights to use water were granted, in the form of statutory privileges (such as licences and permits to take water), rather than property or proprietary rights in the legal sense (Tan 2002). Potential users simply applied to state agencies for licences. This approach continued even when some sections of the irrigation community were raising their own concerns. For example, a member of the New South Wales Irrigators Council unsuccessfully opposed the issue of more licences on the Darling River at a land board hearing in the 1970s.

Licences for irrigation were generally issued based on the area of irrigable land. Government water administrators made judgements about the most suitable crops in particular irrigation districts and their water needs. Critically, these administratively determined initial endowments would form the basis of tradeable water access entitlements.

One of the big concerns throughout this period was that water (and land) should not be allowed to accumulate in the hands of large corporate entities. This fear of water barons or speculators is still sometimes raised today in public discussions about water markets.

Governments minimised the corporatisation of agricultural land and water rights by:

+ limiting farm sizes in public irrigation developments to the assumed needs of a family farm
+ limiting the area of land that could be irrigated on any single land parcel
+ tying water rights to the land on which the water was to be used.

In New South Wales, restrictions on farm size were initially entrenched in planning controls following the creation of the ‘home maintenance area’ early last century. The home maintenance area was theoretically based on the area of land which, when used for the purpose for which it is ‘reasonably fitted’, would be sufficient for the maintenance of an average family in average seasons and circumstances. The home maintenance area was then used as a planning control to restrict land transfers by expressly limiting the aggregation of land parcels into large holdings. As a result of those policies, water rights were not separately tradeable as assets in their own right.

The link between land and water was strong. For example, Powell (1989:107) cites Alfred Deakin (1885:46) proclaiming that:

\[\ldots\text{as a matter of public policy it is desirable that the land and water be joined never to be cut asunder; that the farmers would enjoy in perpetuity the use of the water necessary for the irrigation of their respective lands; that, when the land is sold, the right to water shall also be sold with it, and that neither shall be sold separately.}\]
As a result, the link between land and water remained a central feature of water policy in Australia for many years and was one of the key hurdles to be overcome in the development of water markets. Given that the ownership of land and water in tandem locked in the status quo (in terms of the location of irrigation—including soil type, cropping layout and, in some respects, crop choice), it was unlikely to lead to an efficient perpetual distribution of water.

Under this system, irrigators could generally use as much water as they liked, but only on the area defined for irrigation. Even where volumetric proxies were in place, such as rights to a certain number of acre feet of water per acre, the system provided little incentive to conserve water (let alone reallocate it to higher value uses), as there was little to stop individuals from using more water on their defined irrigable land area.

Initially, the take-up of these water rights was slow, as irrigators had to pay a fixed annual fee—regardless of whether or not water was actually used—to pay off the public infrastructure investment. For example, it was not until the drought period between 1939 and 1944 that the demand for water rights increased significantly in Victoria (Babie 1997).

A related feature of early water resource development in Australia was the widespread introduction of metering. In 1910, John Dethridge (a commissioner of the Victorian State Rivers and Water Supply Commission) invented the iconically Australian Dethridge wheel, which could measure the amount of water being supplied to a property (Stein 2008). Metering was introduced primarily to maintain some centralised control and to help irrigators manage water applications. In particular, given irrigators’ demand for high flows to quickly and evenly apply water to their properties, metering helped to regulate the share of flow in the channel between users. The existence of a comprehensive network of water meters to monitor the taking of water by irrigators later proved to be an important prerequisite for the establishment of a water market based on enforceable water access entitlements. However, a major shortcoming of the licensing system was that water accounting systems were unsophisticated and metering only partially covered extractions, so there was poor understanding of total extractions and licensed volumes on issue at any one time. That shortcoming, combined with the fact that licences were issued at a time when the MDB was in a 50-year ‘wet period’ (compared to the previous 50 years), contributed to the overallocation of licences.

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3 Typically specified in the number of turns per minute.
While licences were issued for specified periods, and were always able to be legally amended or cancelled at any time without payment of compensation, there was an expectation of automatic renewal, particularly from private diverters. As rights were renewed over time, it became more and more difficult for governments to later establish caps reflecting sustainable levels of extraction within which trading of entitlements could then take place (McKay 2008:47).
3.5 Water markets at the end of this phase

The early stages of water resource management in Australia were characterised by a command-and-control approach to the development and allocation of water resources. There was no real scope or incentive for trading when water resources were freely available.

However, a couple of notable exceptions occurred during droughts. As the Victorian Department of Natural Resources and Environment has noted:

"Already in the 1940s droughts, there were stories of short-term, unofficial trade: a farmer would pay some money to his neighbour and then simply ask the water bailiff to 'send Joe's water down to me for the next two weeks'. (DNRE 2001:7)"

Temporary transfers of water rights were permitted in New South Wales during the droughts of 1966–67 and 1972–73 (Alvarez et al. 1989). Trading was also permitted in Victoria during the drought of 1966–67, and in a restricted version over the period from 1982–83 to its more general introduction in 1986–87 (DWR 1986). These very limited examples of water trading were generally seen as one-off responses to isolated and temporary water shortages. In hindsight, however, they can be seen as forerunners of the trading that would later be required to address water scarcity.

During this development era, people continued to believe that it was possible to build infrastructure to droughtproof the country. Against that background, and in the absence of demand by irrigators for water trading, there was arguably little motivation for water managers to invest in the thinking and administrative processes required for managing trading.
Section 4:
The emergence of water markets
4 The emergence of water markets

The 1980s and 1990s saw the first tentative but far-reaching steps towards capping diversions and permitting the more flexible reallocation of water between irrigators, rather than the continual issuing of more licences. The introduction of water trading was certainly not part of a grand plan for the market that exists today in the MDB. Nevertheless, the first steps by state governments to enable water to be held separately from land can now be seen as seminal moments in the development of water markets in Australia.

Reservations about the treatment of water as an economic good led to a very gradual and closely controlled approach to introducing water trading.

This chapter:

+ describes the pressures for change away from the ‘development’ paradigm towards the more efficient and sustainable use of water resources in Australia (Section 4.1)
+ identifies the key precursors to water trading implemented in the 1970s and 1980s (Section 4.2)
+ outlines the main concerns in the initial debates about introducing water trading (Section 4.3)
+ describes the initial steps to introduce water trading in the 1980s (Section 4.4)
+ summarises the early results from water trading experiences (Section 4.5).

While trading was initially quite limited and closely controlled, its value—particularly during dry years—was becoming apparent, as was the need for a more comprehensive and coordinated approach, particularly in the MDB.

4.1 Pressures for change: the beginning of scarcity

From about the 1970s and certainly by the 1980s, a range of forces were converging that would lead to the end of the era of unfettered development of water resources and to initial steps towards the more flexible allocation of water.

One important factor was simply that the financial capacity and willingness of governments to fund large-scale infrastructure projects was declining. Viable options for increasing water supply were diminishing: as lower cost options were exhausted, the remaining options became increasingly expensive. Irrigation authorities were struggling to fund the replacement or renewal of their ageing and deteriorating reticulation systems, let alone to fund new investment (Musgrave 2008).
Moreover, the assumption that government-driven water development was good for the community was being increasingly challenged. In particular, economists were becoming more vocal in questioning the economic viability of water resource development.

Davidson (1969) published a strong critique of the development paradigm in his book, *Australia wet or dry? The physical and economic limits to the expansion of irrigation*. He criticised the level of government expenditures on irrigation schemes on the grounds that droughtproofing and irrigation schemes were fundamentally ill-founded and misconceived, and ran counter to Australia’s comparative advantages of large tracts of cheap land, the use of low inputs of labour, and the production of relatively durable export commodities.

In 2008, WF Musgrave noted:

> The 1960s saw a decline in support for closer settlement, as realisation spread that Australia’s comparative advantage lay in broad acre farming, not in the establishment of a small farm yeomanry as envisaged in the late nineteenth and early twentieth centuries … There was a growing appreciation that closer settlement was also an inefficient tool for the redistribution of wealth and the pursuit of social justice. (Musgrave 2008:38)

Access to government funding was also becoming less assured: under fiscal constraints, the Commonwealth was increasingly seeking cost–benefit studies to support requests for financial assistance. Yet, as also noted by Musgrave, it took some time before economic arguments gained traction:

> From the outset, development of irrigation in Australia had its Cassandras. But it was not until the late twentieth century that their arguments were able to blunt the enthusiasm of the wider community for the romance of making the desert bloom, and the belief that the development it represented was in the overall national interest. Prior to the 1960s, the developers reigned supreme and their high priests were the leaders of the state water agencies—engineers all. That irrigation was in the overall national interest was axiomatic; and the need for critical, including economic, analysis was not considered necessary. In the battle between the economists and the pro-irrigation forces in the 1960s, the arguments of the former were, initially, dismissed by the latter with magisterial contempt … With the passage of time, the logic of the economists’ case became accepted and the wider community came to doubt the value of further dam building and subsidisation of irrigation water supply. (Musgrave 2008:38)
Reflecting the increasing emphasis on economics, there was also a broader policy shift away from protectionism in both agricultural and trade policy around that time. The winding back of agricultural protection meant that the sector was increasingly exposed to international competition in commodity markets. This, in turn, required farmers to be more flexible in responding to variations in the prospects in agricultural markets. It also provided a driver for more flexible, market-driven patterns of water use enabled by trading.

Another key driver of the shift away from the development paradigm was concern about the environmental impacts of water-related developments (Musgrave 2008). From the early 1970s there was a growing awareness of the impacts of water extraction and use on the environment. In particular, toxic blue-green algal blooms and irrigation-induced land salinisation were seen as a major concern for all water users in the MDB. The impacts on the health of aquatic ecosystems associated with existing water extraction and usage patterns also began to emerge as a concern for the broader community. It became evident in several states that water was overallocated:

> Water resources in NSW were overcommitted at an early stage as a result of the government’s drive to settle the State and promote economic activity. The problem was aggravated by area-based allocations with no control on actual water use. (Bjornlund and O’Callaghan 2003:8).

At around this time, concerns about the environment were emerging. Somewhat later, in 1987, the United Nations published the influential Brundtland Report, which articulated the concept of sustainable development as ‘development that can meet the needs of the present without compromising the ability of future generations to meet their own needs’ (WCED 1987).

Growing environmental concerns led to a shift in thinking about how the Murray River should be managed—that environmental factors, in addition to engineering and economic factors, should be incorporated into decisions on the management of the MDB. In response to the increasing awareness of environmental impacts, the River Murray Waters Agreement was amended in the 1980s, and the responsibilities of the River Murray Commission were extended to include limited environmental issues, particularly the management of salinity (MDBC 2006).
The focus of water resource management in Australia began to shift from the continuous development of new water resources and investment in infrastructure to managing limited water resources more efficiently and sustainably. At the same time that options for supply were decreasing, demand for water was increasing: aggregate water use in Australia increased by 65% between 1983–84 and 1996–97. This provided the preconditions for greater use of economic instruments in managing and allocating water.

4.2 Precursors to water trading

As an initial move to address such concerns, governments took two main types of action between the late 1960s and early 1980s:

+ the introduction of volume-based licences to replace area-based water rights
+ embargoes on new water diversions to prevent further deterioration in the environment.

Conversion to volumetric entitlements

Increasing water scarcity, land-use changes (particularly subdivisions) and increasing awareness of the environmental impacts of new dams led to pressure for entitlement reform from the late 1960s to the 1980s. As observed by Sturgess and Wright (1993), escalating demand in the 1950s and 1960s meant that the resource could no longer be put to additional uses without compromising the security of existing licence holders.
Area-based licences that had traditionally been issued in parts of the MDB did not limit the actual volume of water that could be used. For example, in New South Wales irrigation was limited to a specific area per property. However, irrigators were simply able to subdivide their land into multiple properties and expand irrigation to that area on each property. As a result, area-based licensing was eventually abolished and limits were placed on the volume of water that could be extracted under a licence in non-drought periods.

In New South Wales, the introduction of volumetric entitlements occurred progressively from the mid to late 1960s, using the area-based approach as the prime criterion in determining the conversion (Martin 2005). After that time, any land subdivision meant the subdivision of the assigned volume, not an increase in total rights:

> With the introduction of the [volumetric allocations], the irrigated area limits were lifted and the holders of volumetric water rights were permitted to irrigate any area of land they chose with water made available to them through allocation announcements and within the land management conditions applying. They set their own security levels. (Martin 2005:87)

However, in New South Wales, private diverters on regulated streams were not brought under a volumetric entitlements system until 1975, which produced some tension in the interim (Martin 2005). In South Australia, entitlements to the SA River Murray were converted to volumetric terms with the Water Resources Act 1976, based on their current, and in some cases potential, level of development. Entitlements in unregulated river systems and groundwater systems remained as area-based licences.

### Limits on further water diversions

In response to the pressures for change, further diversions were also limited by placing bans on the issuing of more licences in some valleys and water sources that were clearly overallocated:

+ South Australia placed a moratorium on new licences in 1969.
+ New South Wales imposed an embargo on the issue of licences in a number of valleys in 1977, although a full embargo was not adopted until 1981.
+ In Victoria, licences to pump from unregulated streams during summer ceased to be generally available after the 1967–68 drought (DNRE 2001).

There were even some initial attempts to claw back existing entitlements. For example, when entitlements were converted to volumetric terms in South Australia in 1976:

> It was soon evident that some entitlements were excessive. It was therefore decided in 1979 to revise all licences based on their actual use during the 1976 to 1979 period, which resulted in a reduction of total volume of entitlements by nearly 10%. (Bjornlund and O’Callaghan 2003:6)
However, while the embargoes halted further diversions, they essentially capped water use at the existing levels of development rather than a level that had been assessed to be sustainable. Moreover, the limits did not apply to all systems (for example, groundwater licences continued to be issued in Victoria), and a number of water-using activities were allowed to continue with minimal or no controls on extraction (such as farm dams, overland flow interceptions, harvesting, forestry and other interception activities).

The embargoes therefore did not prevent ongoing environmental degradation, which was evident in increasing algal blooms, salinity and loss of aquatic native plant and animal species (DLWC 1999). Bjornlund and O’Callaghan (2003:7) found that:

“The environmental impact of irrigation in northern Victoria was increasingly being acknowledged and the State Government therefore initiated two major investigations in 1975, which resulted in three major reports in 1982, 1984, and 1986. These reports came to the conclusion that the water made available by the Dartmouth Dam had already largely been committed, and therefore only a small volume (approximately 4%) should go to increasing supply and that generally no new entitlements should be given to irrigation. The reports also recommended that auctions should be used to allocate the limited volume of new water, and that water markets should be used to facilitate future reallocations of water between irrigators.”

Implementing embargoes on new water licences was not always straightforward. For example, when word spread that an embargo was to be placed on issuing new licences in the Gwydir system, a flurry of applications were submitted (and approved) before the process to implement the embargo was completed.

While there were forces opposing reform throughout this period, the need to manage scarce resources for the benefit of the community as a whole prevailed. For example, in Victoria:

“farmers campaigned to have their water rights augmented, but by the 1970s the era of large-scale construction was coming to an end. The economic and environmental limits to exploitation were being reached, and the emphasis was shifting to making best use of what water was already available. (DNRE 2001:7)”

Many irrigators also foresaw that it was in their best interests for water management to recognise natural limits.
4.3 Proposals and debates about water trading

The imposition of embargoes on issuing new licences meant that the only way existing or new users could gain access to more water was by getting it from someone else who already held a licence. However, because water licences were tied to land, there were no readily available mechanisms to transfer water or licences from one user to another. Instead, those wishing to secure more water were often forced to buy the land to which a water licence was attached. This entailed considerable costs and delays to transactions that had the primary purpose of reallocating water. A good example of the cumbersome processes in South Australia is provided by Bjornlund and O’Callaghan (2003:6):

“... the demand for water from the expanding horticultural industry in the Riverland was strong, thus putting pressure on the government to provide mechanisms to facilitate the movement of water from existing users to new users. Prior to 1979, transfers were only possible if a parcel of land was rendered unsuitable for irrigation. The owner of such land could transfer the entitlement to another parcel of land under his or her ownership. Then, in 1979 this right was expanded to allow amalgamation of all entitlements between all land in common ownership, which allowed expanding farmers to increase their entitlement by buying up land with existing entitlements, amalgamate the entitlements, and sell the land again, sometimes to the original owner.

As a result of these problems, some users and policymakers increasingly began to advocate for the ability to reallocate water between users via trading. Economists from academia and government agencies pointed out that water markets could help address the problems, and developed many of the intellectual and practical underpinnings of water market reform. For example, in 1984 the Australian Water Resources Council and the Australian Agricultural Economics Society held a joint seminar on water rights in Melbourne. The proceedings noted:

“It is now regarded as axiomatic that Australia’s continued economic growth and development depends on optimising the allocation of resources. The primary mechanism for achieving this allocation is to expose production processes to market forces, with inputs and outputs valued, as far as practicable, at their economic cost. The opening of a market in water rights/entitlements is seen by many as an important initiative in addressing water allocation problems and wider issues of structure adjustment in rural industry. (AWRC 1986:v)
While some irrigators called for more flexible allocation of water, many others remained unconvinced. Given that the link between land and water had been a fundamental element of the development paradigm and water licensing arrangements since the founding legislation in the late 19th and early 20th centuries, it is perhaps not surprising that considerable inertia fostered opposition to loosening that link. There were concerns that breaking the nexus between water and land would privatise a community resource, and that rapid trading of water out of irrigation areas would lead to stranded assets and adverse regional economic impacts. The development of markets was the clearest sign of the change in policy objectives away from regional development and towards overall economic efficiency.

There was also a fear, which persisted for some time, that ‘water barons’ would monopolise the market and drive up the price of water. In July 2003, the investigative television program *Four Corners* presented the issue as follows:

> Picture an entrepreneur plying his business from a mid-city café. He rattles off a series of numbers into his mobile phone, but they have nothing to do with house prices or stocks or gold futures. He talks in ‘megs’ and ‘gigs’; he’s a creature of the city yet he’s transfixed by what the weather’s doing in the bush.

> What this silvertail buys and sells is a low maintenance but now hot commodity: the right to use megalitres and gigalitres of water from a meandering brown river thousands of kilometres away. Drought boosts his price: rain depresses it. Not so long ago, the water was free for all to use. Welcome to the world of the water baron.

> —‘Sold down the river’, *Four Corners*, ABC TV, 14 July 2003

Another concern was that the movement of water enabled by trading would exacerbate salinity problems in the southern MDB (Bjornlund 1999).

Despite those concerns, events such as the widespread drought in 1982–83 helped increase acceptance of the need to begin severing this link, but securing the necessary legislative changes and implementing administrative processes to allow it to happen all took time. There was typically a gap of some years between imposing embargoes on new licences and enabling transfers of water rights between users. Many of the mechanics of trading were developed during these long lead times in the 1980s, and many battles over real and perceived impacts were fought. For example, while the 1982–83 drought drove recognition of the need for water trading in Victoria, it was not until 1989 that a new Victorian Water Act enabling trade came into force, after a lengthy public review process and several major reports (Babie 1997). In New South Wales, Martin (2005:94) noted:
The embargo on the issue of licences in a number of valleys meant that the only way in which existing users or new users could gain access to new water was through a transfer mechanism. Unfortunately, it took five years for the transfer policy to be introduced by the Government. This delay was not all the fault of the bureaucracy, as the concept of transfer was a new process and irrigators, at that time, were not totally supportive, fearing large corporate farmers would dominate the market. Discussions were protracted by these concerns.

### 4.4 Initial steps in water trading

The introduction of trading was a gradual process. Initially, it was limited to defined locations, types of users (for example, private diverters as opposed to those within public irrigation districts) and types of trades (especially trades of annual allocations). Thus, some market segments developed before others. In particular, there was greater willingness to allow trading within irrigation districts than between districts (intradistrict trading involved a reallocation of water within a district rather than a loss of water from the district). There was also a greater acceptance of temporary allocation trading rather than permanent trading of entitlements, which was associated with exits from irrigated agriculture with longer term regional implications.

In short, the initial steps towards water trading in the southern MDB states were as follows:

- **South Australia**: The embargo on new licences in 1969 was followed by the commencement of entitlement and allocation trading between private diverters in 1983. Trading within irrigation districts began in 1989, but it was not until 1995 that trading between private diverters and those in irrigation districts was allowed.

- **New South Wales**: The embargo on new licences from 1977 was followed by trading in water allocations in 1983 and entitlement trading among private diverters in 1989. Intervalley allocation trading was enabled in 1991.


States adopted different legislative approaches to enable trading. In Victoria, the introduction of trading required legislative reform, whereas in South Australia trading was initially enabled by the responsible minister using discretionary powers under existing legislation, and it was not until 1994 that tradeable water entitlements were given clear legislative backing. In New South Wales, existing legislation was initially amended and then revised further as part of later reforms (see Pigram et al. 1992). Previously, the temporary trading of water allocation volumes was possible only via a seven-step bureaucratic process.
The initial concerns about water trading underpinned the gradual and incremental approach to trading. They also led to various restrictions or constraints on trading, particularly entitlement trades out of irrigation districts. In some cases, policy decisions about outward entitlement trading were left to the irrigation district boards. For example, the board of the Central Irrigation Trust in South Australia adopted rules that meant that only 2% of the total entitlement of each area was permitted to be exported out of the area each year. Some of the New South Wales irrigation districts prohibited outward entitlement trading altogether. In 1994, when interdistrict trading was made possible, the Victorian Government imposed a 2% limit on entitlement that could be traded out of an irrigation district in any one season. The motivation and justification for the state’s trading limit was set out by the Victorian Department of Natural Resources and Environment:

> the rule allows a ceiling to be put on the rate of structural change in an area, and any associated erosion of the community as a whole. For most areas this ceiling is high, its effect nominal. Yet the rule provides real comfort that areas won’t be allowed to collapse overnight, and has been important in achieving local concurrence for trade out of areas. (DNRE 2001:44)

### 4.5 The status of water markets at the end of this phase

The introduction of trading addressed many of the cumbersome administrative processes associated with the bundling of land and water. However, the take-up of the newly available opportunities to transfer water allocations and entitlements was initially quite modest. To some extent, this reflected the restrictions placed on the type and geographic scope of trading permitted, but it also probably reflected a lack of understanding and experience in water trading and the relatively high availability of water in the late 1980s and early 1990s. For example, for the first seven years of allocation trading, less than 1% of total water use was facilitated through trade (DNRE 2001). In South Australia, Pigram et al. (1992) found that allocation transfers accounted for approximately 4.4% of all water used for irrigation in 1989, or 3.1% of the 537 GL allocated for irrigation. Allocation trading was given its first real test in 1994–95, when water availability was much lower than in previous years. Trading activity increased dramatically, and irrigators got their first real taste of the benefits of such trade in dealing with climatic variability (see Section 5).
While these first steps to water trading were significant milestones, trading was still very restricted and localised (for example, there was no formal mechanism for interstate trading), was subject to a number of anomalies, and involved fairly cumbersome administrative and approvals processes. At the end of the period, entitlement trading out of public irrigation districts was still extremely difficult, if not impossible. In essence, there were separate local markets and ineffective caps in cross-border systems (that is, the MDB).

There was also growing recognition through the 1980s and early 1990s that the ‘cap’ part of the ‘cap and trade’ model had not been adequately addressed. This led to concerns that entitlements would be cut at some point in the future, which reduced the security of the underlying asset. In turn, this was a likely limiter of entitlement trading.

One perverse effect of the initial opening up of water trading was the activation of so-called ‘sleeper’ and ‘dozer’ licences—licences that conferred rights to take water, but which were not being used, or being used only intermittently. Once trading was permitted, holders of such licences realised that they had an asset that was of value to those who needed additional water. Initially, therefore, water for new developments was largely sourced from unused (sleeper) or underused (dozer) licences, rather than from existing uses, leading to an increase in aggregate water use.

These factors all suggested the need for a more comprehensive and coordinated approach, particularly in the MDB, for water trading to be able to fulfil its potential role in allocating what was becoming an increasingly scarce resource to its highest valued uses.
Section 5:
Broadening and expanding water markets
5 Broadening and expanding water markets

The period from the early to mid-1990s through to the mid-2000s was one of broadening and expanding water markets. It was characterised by a much more integrated approach to reform across the states. Water markets in the southern MDB expanded considerably in scale and scope, and market activity grew rapidly.

This section:
+ identifies the economic and environmental drivers and objectives behind the push to broaden the scope of water trading (Section 5.1)
+ describes the national policy framework agreed by COAG for implementing water market reforms in the mid-1990s (Section 5.2)
+ describes what the states did to facilitate water trading over the subsequent decade in each of the key elements of water market reform (Section 5.3)
+ summarises the status of water markets at the end of this phase (Section 5.4).

5.1 Drivers and objectives

By the early 1990s, the focus of water management had shifted even further away from regional development objectives and engineering solutions towards ensuring that resources were used more efficiently and sustainably.

The twin objectives of economic efficiency and environmental sustainability were integral to the greater involvement of the Commonwealth in water management, particularly in relation to the interjurisdictional management of the MDB. Put another way:

"The motivations for reform represent a two-dimensional movement; one indicated by the transition from developmentalism to sustainability and the other from state control of resources to individualism. (Crase 2008:250)"

Reforms in the later part of the period were driven by the millennium drought, which was arguably the worst drought since Federation and which affected rural and urban areas across much of Australia for the best part of a decade."
The emergence of sustainable development

There was a marked increase in awareness of environmental sustainability issues in the late 1980s and early 1990s.

On the ground, environmental concerns were triggered by a number of high-profile events and investigations into the condition of Australia’s water resources and the environment. For example, from 1981 to 1983, the River Murray mouth closed for the first time since regulation of the river system began, leading to an increased awareness of environmental water requirements (MDBA 2010:53). In 1991, there was a major blue-green algal bloom along the length of the Darling River with major economic, social and environmental impacts. A 1995 Murray–Darling Basin Ministerial Council audit of water use outlined the decline in basin river health and pointed to significant problems if the issues were not addressed effectively (MDBA 2010:53).

At a strategic policy level, Australia was a contributor to the global push for ecologically sustainable development. The 1992 National Strategy for Ecologically Sustainable Development (NSESD) agreed that the future development of all relevant policies and programs should take place within the framework of the strategy, which had its origins in the Brundtland Report, Agenda 21 and the Rio Earth Summit Declaration.

The Australian NSESD required consideration of the increased use of economic measures to deal with environmental problems, including externality pricing and tradeable entitlements. Governments committed to continue to:

+ develop practical experience in the use of pricing and economic instruments, such as tradeable rights, in the management of resources
+ monitor and assess the economic and environmental benefits of those economic instruments already in place
+ establish pilot programs within a number of specific natural resource sectors as a means of testing the practicability and effectiveness of different mixes of market and regulatory mechanisms (COAG 1992).

National microeconomic reform

Increased awareness of environmental issues coincided with the advent of a broader microeconomic reform agenda for the Australian economy. The aim was to improve economic efficiency, particularly in publicly owned industries.

Developed in the early 1990s, the National Competition Policy reforms aimed to promote and maintain competitive forces to increase efficiency and community welfare while recognising other social goals. The microeconomic reform agenda was developed in response to concerns about Australia’s overall economic performance and productivity in comparison with other countries in the Organisation for Economic Co-operation and Development.
In the water sector, the drive for economic reform played out through policies aimed at:

+ cost-reflective pricing of water storage and delivery services to enhance efficiency
+ institutional reform of government-owned water utilities
+ the further development of water markets to facilitate the movement of water to its highest valued uses.

In 1991, Australian Treasurer John Kerin instructed the Industry Commission to carry out a broad inquiry into Australia’s water resources and wastewater disposal. The Industry Commission strongly recommended the introduction of water allocation and entitlement transfers within all irrigation systems for surface water and groundwater, and both within and between irrigation schemes (Bjornlund 1999).

The subsequent report for COAG by Sir Eric Neal picked up on those ideas, thereby leading to the 1994 COAG Water Reform Framework:

“The concept of tradeable water rights or entitlements, given that it would operate within a market framework, is generally considered to be the best way to secure the maximum benefit from the use of the resource. (Neal 1994:18)”

More broadly, these changes were driven by a reimagining of the role of government and the public sector in resource management. Smaller government, empowering individuals to make decisions in their best interests, and regulating only where necessary to avoid market failure were in vogue. As stated by Pigram (1999:497):

“A common element is willingness by public agencies to endorse alternative institutional arrangements to the previous regulatory (command-and-control) approach to water allocation and management. The end-result is a lessening in the degree of discretion left to water authorities and an increasing requirement to accommodate economic instruments and market-based approaches in water allocation and use.”

5.2 The nationally coordinated approach to water reform

Reflecting the national economic imperatives as well as heightened recognition of the need to manage water in the MDB in an integrated manner, this period was marked by a shift from predominantly state-based approaches to water trading and water resource management more generally to collaborative interjurisdictional reforms.

Major intergovernmental initiatives during this period included:

+ the Murray–Darling Basin Agreement in 1992
+ the COAG Water Reform Framework in 1994
+ the National Water Initiative in 2004.

These reforms led to the development of an MDB-wide cap on water extractions (first developed in 1995 and formally agreed in 1997), further entitlement reform, the commencement of interstate entitlement trading, and the beginning of efforts to address overallocation in the MDB.

The 1992 Murray–Darling Basin Agreement

The growing awareness of the extent of the environmental problems in the MDB and the need for an integrated approach to tackling them led to moves to revamp the interjurisdictional arrangements for water management.

In 1992, a new Murray–Darling Basin Agreement was signed by the Australian, New South Wales, Victorian and South Australian governments (Queensland and the Australian Capital Territory later formalised their participation). The new agreement replaced the earlier River Murray Waters Agreement, which had been in place since 1915 (see Section 3.2). The stated purpose of the agreement was to ‘promote and co-ordinate effective planning and management for the equitable, efficient and sustainable use of the water, land and other environmental resources of the MDB’. This represented a significant extension in roles beyond simply sharing water resources for consumptive purposes to encompass water resource management and environmental issues, such as land degradation and salinity.

The Murray–Darling Basin Agreement established several new institutions, including the Murray–Darling Basin Ministerial Council, and the Murray–Darling Basin Community Advisory Committee. Notably, the MDBC was tasked with advising on all aspects of water, land and other environmental issues throughout the basin, as well as carrying the traditional responsibility for managing the allocation and delivery of water to the three River Murray states.

Arrangements for promoting interstate water trading were incorporated into a schedule to the Murray–Darling Basin Agreement. As discussed below, the MDBC, in conjunction with the states, played a significant role in facilitating interstate water trading.

1994 COAG Water Reform Framework

A major impetus for the development of cohesive water markets in Australia, particularly in the MDB, was the 1994 national reform agenda agreed by COAG as part of the broader National Competition Policy.
The COAG Water Reform Framework was a major turning point in the evolution of water allocation arrangements in Australia, away from administrative allocations by government and towards a market-oriented approach based on clearly defined and tradeable property rights. It was seen as signalling a new urgency on the part of governments, both state and federal, to promote the efficient, sustainable use of water in Australia.

Water market reforms were a key component of the national reform agenda through efforts to ensure that the ‘cap’ was set sustainably and that irrigators were able to trade effectively and efficiently. As Pigram (2006:65) observes:

"From this point, Australia was firmly engaged in a wide-ranging process of water reform directed towards promoting economic efficiency in water use in a competitive environment, within the context of ecologically sustainable development."

In relation to water allocations and entitlements, the COAG water reform framework included agreement that:

+ water be used to maximise its contribution to national income and welfare, within the social, physical and ecological constraints of catchments
+ comprehensive systems of water allocations or entitlements be established, backed by the separation of water property rights from land title and clear specification of ownership, volume, reliability, transferability and, if appropriate, quality
+ cross-border trading be facilitated and arrangements be consistent, where that is socially, physically and ecologically sustainable
+ allocations for the environment be created, and the environment be established as a legitimate user of water
+ environmental allocations be determined on the best scientific information available.

The states were still very much driving the implementation of the water reform agenda. The Commonwealth’s role was that of facilitator of reform and assessor of progress. Initially, this was achieved through the provision of National Competition Policy payments tied to reform achievements implemented at the state level, which undoubtedly drove major reforms at the state and interjurisdictional levels.

Nevertheless, progress was patchy. In 1998, a high-level steering group comprising chief executives from water resource management agencies and other representatives found that rapid progress had been made in some jurisdictions. Trading was taking place on the internet, across state borders, in groundwater allocations, and between valleys and sectors (HLSG 1999). However, the steering group concluded that water markets were not as active as they should be and, in some areas, faced significant
impediments and community opposition because of social, environmental and economic concerns. It identified the impediments as poorly defined and measured water property rights, inadequate definition of water trading zones, restrictive water trading rules, uneven market information, and uncertainty about the nature of risks, particularly policy and industry uncertainties. A review of progress in water reform by the National Competition Council in 2004 found that trading of allocations was widespread in the MDB, but that trading of water entitlements was only just beginning (NCC 2004).

The National Water Initiative

The major drought of 2002–03 led to a renewed focus on and commitment to the objectives of economic efficiency and environmental sustainability. In July 2003, the Wentworth Group of Concerned Scientists produced the *Blueprint for national water reform*, which highlighted the need for major changes to address the ongoing failure to provide for the environmental needs of river systems (WCGS 2003). Notably, a key part of the blueprint was the establishment of a new, nationally consistent water entitlement and trading system to provide security both to water users and to the environment.

In 2003, COAG agreed to develop the National Water Initiative (NWI) to review and refresh its 1994 water reform agenda. In addition to the drought, the NWI reflected concerns that variation in progress between regions and jurisdictions, and in developing an expanded knowledge base, meant that COAG’s objectives had not been fully achieved.

A key driver for the NWI was the desire to balance the need for secure property rights (which give water users confidence to invest) with the need for adaptive management of the environment as scientific knowledge improves over time. While they are ‘property rights’ in the economic sense, the legal status of water entitlements was an ongoing point of debate in the development of water markets (Harris 2005, Connell 2007, McKay 2008). The key issue here, as discussed further below, is the assignment of risk between water entitlement holders and governments in circumstances where it becomes necessary to reduce the consumptive pool or in other ways restrict the volumes of water that can be taken under an entitlement. Increasing calls on governments to ‘claw back’ water for the environment engendered a major debate about property rights. At the heart of the debate were the question of whether compensation should be paid when pre-existing entitlements to water are reduced, and the level of such compensation.

Against this background, the overarching objective of the NWI is to develop a compatible market, regulatory and planning-based system for managing surface water and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes. Further nationally consistent water market development was a core element of the NWI (see Box 5.1).
Box 5.1: Water market reforms under the National Water Initiative

The NWI provides a consistent framework and set of definitions for the implementation of best practice cap-and-trade systems of water management across Australia. Specifically, the states agreed that their water market and trading arrangements would:

+ define water access entitlements as ‘a perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in a relevant water plan’
+ facilitate the operation of efficient water markets and opportunities for trading, within and between states and territories, where water systems are physically shared or hydrologic connections and water supply considerations permit water trading
+ minimise transaction costs of water trades, including through good information flows in the market and compatible entitlement, registry, regulatory and other arrangements across jurisdictions
+ enable the appropriate mix of water products to develop, based on access entitlements that can be traded either in whole or in part, and either temporarily or permanently, or through lease arrangements or other trading options that may evolve over time
+ recognise and protect the needs of the environment
+ provide appropriate protection of third-party interests.

5.3 The elements of water market reform—what was done?

While the national and interjurisdictional agreements outlined above provided high-level frameworks and defined actions to promote better water resource management, including the development of water markets, what really mattered were the on-the-ground actions to give effect to those commitments.

The following discussion outlines in broad terms what was done by the states after the national reform agreements of the mid-1990s to facilitate water trading. It is organised around the key elements of water markets outlined in Table 2.1 in Section 2:

+ determining the balance between consumptive and environmental water use
+ creating clearly defined and tradeable property rights
+ regulation of the market
+ trading platforms
+ registers, water accounting, and compliance and enforcement arrangements
+ institutional and governance arrangements.
Determining the balance between consumptive and environmental water uses

This period marked a significant change in approach to the provision of water for the environment. The development era was definitely over, and a combination of factors meant that Australia was facing up to the need to manage water wisely. Environmental pressures meant that significant emphasis was placed on the ‘cap’ component of the cap-and-trade model during this period.

As noted in Section 2.1, establishing the cap based on the sustainable balance between consumptive and environmental water uses is a key prerequisite for effective water markets, as it establishes the total quantum of the resource that is available for use or trading and increases the security of the underlying entitlements.

The cap on extractions in the MDB

An audit of water use in the MDB released in 1995 found that water diversions in the basin had increased by nearly 8% from 1984 to 1994, despite the moratoriums on new licences (MDBMC 1995). Key factors driving the increase were the activation of previously unused ‘sleeper’ or partially used ‘dozer’ entitlements, irrigators’ ability to access supplementary water, and the incomplete coverage of the moratoriums on new licences.
Tightening the previous moratoriums on new licences provided further impetus for water trading as a means of reallocating water. Most notably, a cap on water diversions in the MDB was established for each jurisdiction. In 1997, the MDB states and the Commonwealth capped the level of extraction from the basin at 1993–94 levels of development. Importantly, existing entitlements were accepted whether or not they had been utilised. It was left to the individual states to decide how they were going to stay within the cap.

The cap was a major driver of moves to facilitate the reallocation of available water via trading. It was also a major step in preventing further decline in flow-dependent environmental values in the MDB, and a significant achievement in the context of competing state-based interests. However, the cap was not based on a scientific assessment of the environmental water needs of the basin system (MDBC 2008), so it did not stop calls by environmentalists for cuts to existing irrigation entitlements. This in turn created uncertainty and adversely affected the confidence of some irrigators to invest.

State-based water planning

At the state level, where many of these tensions played out, water planning emerged as the main tool by which governments influenced the balance between consumptive water use and the needs of the environment. As stated in the National Water Commission’s position statement on water planning:

> Effective water planning is fundamental to the National Water Initiative … because it provides certainty about the terms of access for consumptive and environmental water users within an evidence-based, participatory and transparent process. Water planning is central to dealing with the challenges of stressed water systems and to determining how we share valuable water resources between competing uses. (NWC 2008:1)

Each of the states undertook significant legislative and water planning exercises (see Box 5.2).
Box 5.2: Water resource planning during the 1990s and 2000s

A prime example of water reforms was the New South Wales Water Management Act 2000, which introduced water sharing plans in the 1990s and 2000s that established the rules for ‘sharing water between the environmental needs of the river or aquifer and water users, and also between different types of water use such as town supply, rural domestic supply, stock watering, industry and irrigation’ (NOW 2011).

During the 1990s, Victoria began converting bulk entitlements established under its 1958 Water Act to entitlements under the 1989 Water Act and established streamflow and groundwater management plans. The objectives of the bulk conversion included providing a basis for sharing limited water resources while protecting the entitlements of other users and protecting in-stream values (PC 2003).

In Queensland, the Water Act 2000 authorised the government (through the Department of Natural Resources and Mines) to plan allocations of water to environmental and other uses. This was to be achieved through the preparation of a variety of planning instruments (water resource plans and resource operations plans) and licensing arrangements.

In South Australia, the Water Resources Act 1997 set out the procedures that must be followed in developing a water allocation plan. Among other matters, water allocation plans must provide for the allocation (including the quantity of water that is to be available for allocation) and use of water so that an equitable balance is achieved between social, economic and environmental needs for the water, and the rate of use of the water is sustainable.


Unfortunately, water allocation plans were largely unsuccessful in addressing the central task (and NWI commitment) of ensuring that extractions were within sustainable limits in fully allocated or overallocated systems. There were debates about terminology and delays in the development of plans due to resourcing and technical challenges (NWC 2007). In his covering letter to the Prime Minister for the 2007 biennial assessment of progress in implementing the NWI, the Chair and CEO of the National Water Commission, Ken Matthews, wrote:

> Overallocation of water resources continues to be a central national challenge. It is still not being managed as envisaged under the NWI. A number of states have not delivered on their commitment to move to sustainable levels of water extraction. (NWC 2007:3).
Despite some localised and hard-fought successes (see Hamstead et al. 2008), the biggest issues that slowed down water planning in fully or overallocated systems (particularly in New South Wales) were those of clawbacks of entitlements, adjustment assistance and compensation associated with moving to sustainable levels of extraction.

The de jure position of government was simple: … licences entailed no permanent property right, so there was no legal requirement to compensate irrigators for water clawed back to provide sustainable environmental flows or for other purposes. However the de facto position facing regional water planners was that it was considered economically, socially and politically unacceptable to clawback more than a marginal amount of water without some form of adjustment assistance. (Gentle and Olszak 2007)

Similarly, some states were reluctant to prevent the activation of unused licences. For example, the New South Wales Government made it clear at the time that it was concerned about litigation by such ‘sleeper’ licence holders if their licences were cancelled. The refusal to recognise irrigators’ history of use in southern New South Wales left many with bitter memories.

As noted by Hamstead et al. (2008), ‘lack of certainty about ecosystem water requirements and risks, as compared to the more pressing and obvious effects of reduced water for irrigation or towns, resulted in greater ecological risks being taken’. Moreover, fiscally constrained state governments were unwilling to embark on major compensation programs.

Limiting the lifespan of water plans (such as to 10 years in New South Wales and 15 years in Victoria4) provided an opportunity, which states were unable to resist, to defer action to deal with overallocation. However, this meant that uncertainty for irrigators was not resolved.

The Living Murray Initiative First Step Agreement

Concerns about the declining health of water systems were reflected in a seminal study by the Expert Reference Panel for the Living Murray, which indicated that:

+ the overall health of the river was in decline
+ it could no longer be considered healthy
+ it could only be restored to health with major improvements to river management (Jones et al. 2002).

4 The Victorian Government committed to ‘amending legislation to require that an expert assessment of the state’s water resources be made at 15 year intervals to determine: whether the resource base has suffered a decline, and if it has fallen disproportionately on the environment or water users; and river health is deteriorating for flow-related reasons … If either is the case, the Minister will establish an open consultative review of the balance between the water available for consumption and the Environmental Water Reserve, and of necessary corrective action. If a review is necessary, it would begin shortly after the assessment, with its recommendations being implemented at the end of the 15 year period (Victorian Government 2004).’
This led to the Living Murray Initiative First Step Agreement, which aimed at providing additional water for the environment. In 2003, despite considerable disquiet in irrigation communities about socioeconomic impacts, it was decided to recover 500 GL of water over the following five years as a first step towards restoring the River Murray as a healthy working river. The ‘first step’ term was important, as environmental studies indicated that 1500 GL would need to be recovered:

“The important conclusion from the report is that more environmental water is needed for the River Murray—at least 750 GL and probably 1500 GL. State and federal governments (under COAG) have now agreed to provide up to $500 million. While this might not be enough to secure the long-term health of the Murray, it will be a useful beginning.

—Gary Jones, Chief Executive of the CRC for Freshwater Ecology and Chairman of the Expert Reference Panel, cited in a media release by the CRC for Freshwater Ecology, 29 September 2003

Importantly, the Living Murray program and other state-based water recovery efforts were focused on engineering works to recover water (PC 2006). While purchasing entitlements from irrigators was not yet politically palatable, these early recovery efforts generally maintained the reliability of existing water entitlements and, to some extent, reduced the likelihood of uncompensated reductions in the quantity or reliability of entitlements in the future. However, it transpired that few cost-effective options to secure water savings were available and progress was very slow. As the drought worsened, the pressure to make serious progress in addressing overallocation intensified.

Creating tradeable property rights

The 1994 COAG agreement and the NWI placed strong emphasis on converting previously ill-defined entitlements into tradeable and bankable assets. Key reforms included:

- clear and secure specification of entitlements
- some further enabling of entitlement trading
- interstate entitlement and allocation trading
- specification of risk assignment provisions
- specification of entitlements for the environment.
Clear and secure specification of entitlements

The NWI included a commitment to implement a robust framework for water access entitlements to encourage investment and maximise the economic value created from water use, while ensuring that there is sufficient water available to support environmental values. It proposed a nationally compatible system of water access entitlements to improve the security of entitlements through:

+ defining them as perpetual or open-ended shares of the consumptive pool of a specified water resource (as determined by the relevant water plan)
+ the clear assignment of risks of reductions in future water availability
+ returning overallocated systems to sustainable allocation levels.

Throughout this period, the states took steps to define their water access entitlements as clear, secure rights supported by legislation, with clear rules that determine the reliability of the entitlement. In 2007, the National Water Commission found that:

almost all states and territories (states) have made good progress in implementing NWI-consistent water access entitlement and planning frameworks. Good progress has also been made in specifying NWI-compliant water access entitlements in high priority water systems.

Victoria

In Victoria, the entitlement to a secure share of water from a defined system is now referred to as a ‘water share’. The water access right under a water share is expressed as the maximum volume of seasonal allocation that may be made against that water share. Depending on the frequency with which full seasonal allocations are expected to be made available, water shares are classified as either high or low reliability.

Two new water access entitlements were created as part of Victoria’s 2004 *Our water, our future* White Paper reform process: high-reliability water shares were conversions of existing licences, and previously available ‘sales water’ was converted into legally recognised low-reliability water shares (Victorian Government 2004). Importantly, low-reliability shares were tradeable, whereas sales water was not. However, low-reliability shares had a lower reliability than the previous sales water, which meant that Victoria could make a large contribution to meeting its commitment to recover water under the Living Murray Initiative. As noted by the Victorian Government at the time:

The water previously available as ‘sales’ water will now be converted into an independent, legally recognised entitlement. It will have ongoing tenure, be a share of the consumptive water pool and be tradeable. It will retain the lower reliability of the original ‘sales’ water, and will be a share of the available resource leading to its volume fluctuating in line with seasonal conditions.
The introduction of this new entitlement will provide irrigators in northern Victoria with a more secure title to this water compared with the past, as well as the flexibility provided from a new separately tradeable water product. It will provide a firmer basis for farm planning, financing and future investment. (Victorian Government 2004: 21)

New South Wales

In New South Wales, the entitlement to a secure share of water from a defined water source is referred to as a ‘water access licence’. The NSW Water Management Act 2000 provides for high-security, general security and supplementary6 entitlements in regulated systems (that is, those controlled by storage infrastructure such as dams), as well as entitlements for unregulated rivers and groundwater aquifers. High-security licences have the highest reliability, followed by general security and supplementary licences. Under the Water Management Act, the licences created under the Water Act 1912 were redefined and separated into separate licensing arrangements.7 New water access licences specify the share of the available resource that the holder can take, and the rate of extraction. The Water Management Act abolishes common law riparian rights (PC 2003).

South Australia

In South Australia, an entitlement to a secure share of water from the River Murray Prescribed Water Course is referred to as a ‘water access entitlement’. All water access entitlements issued in the water course have been classified as high reliability. Seasonal allocations in South Australia are made each water year by the responsible minister. The state’s Water Resources Act 1997 included several significant changes to water rights, including the formal allocation of rights to take and use water and the establishment of a system for trading rights to water (PC 2003).

Differences between jurisdictions

Despite these reforms, the state-based approach meant that there remained significant differences in water access entitlements between jurisdictions. In particular, there were differences in the underlying reliability of entitlements (that is, the expected allocation based on historical inflow patterns), and the underlying statutory conditions remained different from state to state. The specification of entitlements varied between individual catchments. Some types of rights to water were not converted at all (such as riparian rights to water for stock and domestic use). In 2005, Shi undertook a stocktake of entitlements in the southern connected River Murray system (encompassing parts of New South Wales, Victoria and South Australia) and found that:

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5 Supplementary water refers to natural flows that result in dams overflowing or above average flows in regulated rivers. When these uncontrolled flows exceed any immediate water needs and any specific environmental requirement, they may be made available to licence holders on regulated rivers (PC 2003).
7 There are now access licences, use approvals, works approvals, controlled activity approvals and aquifer interference approvals.
From an irrigation perspective, when consideration is given to supply reliability, entitlement tradability, allocation tradability, tenure, access priority and use restrictions associated with issues such as salinity, 183 types of irrigation entitlements can be identified. (Shi 2005:iii)

However, having a large number of different types of entitlements is not necessarily a problem for trading, provided that the nature of the entitlements is clearly defined. In fact, a mix entitlement types allows users to assemble a portfolio that is matched to their risk preference.

**Specification of risk assignment provisions**

Since the cap on extractions in the MDB had been introduced, concerns about potential policy changes to address overallocation had dogged efforts to provide irrigators with certainty and confidence to invest (Bjornlund and Rossini 2009). One of the main fears was that there could be uncompensated reductions in the consumptive pool or compulsory acquisitions of entitlements. Some irrigation groups argued strongly against the compulsory acquisition or uncompensated attenuation of their entitlements.

The NWI sought to provide clarity about the assignment of the risks arising from future changes in the availability of water for consumptive use. The NWI risk assignment framework defined how the risks of reduced or less reliable water allocations were to be shared between water access entitlement holders and governments, including when compensation would be payable to entitlement holders. Specifically, it proposed the following:

- Water access entitlement holders are to bear the risks of any reduction (or less reliable water allocation) from seasonal or long-term changes in climate and periodic natural events such as bushfires and drought.
- The risks of any reduction as a result of improvements in knowledge of sustainable extraction levels are to be borne by users up to 2014. Changes after 2014 are to be shared between water access entitlement holders (bearing the first 3% reduction), state and territory governments and the Australian Government (sharing, respectively, one-third and two-thirds of reductions in water allocations under water access entitlements of between 3% and 6%, and sharing equally reductions greater than 6%).
- Governments are to bear the risks of any reduction or less reliable water allocation that is not previously provided for, arising from changes in government policy (for example, new environmental objectives).

While New South Wales adopted this framework in full, other states had different views and risk assignment remained an issue that affected the security of entitlements throughout the period. For example, compared to the NWI risk assignment framework, the Victorian Government preferred an approach that allocated more risk to the government, whereas South Australia assigned more risk to irrigators. Clarity about risk assignment in the connected southern MDB therefore remained an important issue for irrigators.
Specification of entitlements for the environment

While clarifying the security of tenure of entitlements for consumptive use, the COAG 1994 and NWI agreements required jurisdictions to make similar improvements to the security of water provided for the environment. For example, the 2004 Victorian White Paper committed to setting aside water in an environmental water reserve that would have legal status, maintain the environmental values of the water system, and sustain biodiversity. However, the government explicitly committed to not reducing the security of existing entitlements (and thus not addressing overallocation in relevant systems). In systems that were not fully developed, the environmental water reserve was to be established based on a precautionary approach (Victorian Government 2004).

Interstate entitlement and allocation trading

To help achieve the goal of moving water to its highest valued use, the 1994 COAG agreement specified that ‘where cross-border trading is possible, that the trading arrangements be consistent and facilitate cross-border sales where this is socially, physically and ecologically sustainable.’

The states and the MDBC began a process to incrementally enable interstate allocation and entitlement trading. In general, there were fewer concerns about interstate allocation trading, as it was seen to be temporary and reversible, but interstate entitlement trading required the development of a range of complementary regulatory and administrative tools (for example, to address salinity issues) to enable it to progress. Commencing in 1998, the Interstate Entitlement Trading Pilot Project started in a geographically confined area (in the Sunraysia and Riverland areas close to the intersection of the South Australian, Victorian and New South Wales borders) and involved only private diverters. The project enabled both entitlement and allocation trading.

The pilot was gradually expanded over time. The first extension, in May 1999, included high-security water entitlements within the pumped irrigation districts below Nyah (in northern Victoria). By 2003, the Murray–Darling Basin Ministerial Council agreed to expand the scope of the project to the entire southern connected MDB. Following the NWI’s endorsement of interstate entitlement trading, agreements were finally put into place in May 2006 when a revised Schedule E of the Murray–Darling Basin Agreement was adopted (Cummins and Watson 2007). These reforms significantly enhanced the tradeability of water entitlements and allocations in the MDB.

The role of the MDBC in facilitating the interstate trading pilot was an important factor in establishing interstate trading in Australia. The MDBC convened an interstate trade working group, whose members were from the state departments and had technical skills in water management, hydrology and water policy. The resulting ideas were ‘road tested’ on water system operators, who would be responsible for implementing the arrangements. The MDBC had the modelling tools and expertise to audit and oversee trading arrangements, and also undertook annual reporting and review of the pilot. The resulting agreed interstate trading rules were established as schedules to the Murray–Darling Basin Agreement, meaning that they could be adapted and refined much more flexibly. If the rules had been directly included as part of the agreement, changes would have had to be passed by all MDB state parliaments.
Regulation of water markets

As noted in Section 2.1, the regulation of trading is important to manage potential impacts on other water users and the environment. Similarly, regulation of the prices charged for access to and use of (publicly owned) irrigation networks helps to prevent distortions in the water market.

From their inception in the 1980s, water markets in Australia have been highly regulated and controlled (see Bjornlund 1999). Many of the rules are required to ensure that market transactions can match the physical realities of surface water or groundwater systems.

Throughout this period (from the 1990s to early 2000s), state governments introduced approvals processes that must be followed to finalise water trades. Recognising the long-term nature of entitlement trades, the approvals processes for trades in entitlements were more stringent than those for allocations. They were seen as necessary to ensure that:

+ an individual trade did not have adverse environmental impacts (particularly on salinity and drainage)
+ the trade did not diminish the entitlements of others
+ the trade was hydrologically possible
+ there was sufficient delivery capacity to deliver the water to the new entitlement holder
+ there was a mechanism to determine whether any exchange rate should be applied to take account of losses as a result of the trade (Allen Consulting 2006).

However, more contentious regulations were developed in response to concerns about the socioeconomic impacts of large and/or rapid exports of water out of irrigation districts, and about whether markets might excessively concentrate the ownership of water entitlements.

Governments introduced a range of trading rules and approval processes targeted at avoiding or managing such impacts. As water trading was expanded, the rules needed to be adapted.

Regulatory and approvals processes to address hydrological realities and environmental concerns

A primary concern of water resource managers was about whether the underlying physical movement of water in one-way gravity-based systems of open channels and waterways could accommodate potential trades. Water systems often have physical constraints that limit where, when and how much water can be transported around different parts of the system. For example, the southern MDB system connects several regions in south-east Australia (such as the New South Wales valleys of the Murrumbidgee and Murray, northern Victoria and the South Australian Riverland), but there are location-specific constraints to transporting water. One such constraint is the Barmah Choke, which limits water transfers downstream from the upper reaches of the River Murray in northern Victoria.
Governments adopted several tools for ensuring that water trades reflected hydrological realities, including water trading zones and rules that set out whether trades within or between trading zones would be approved. The progressive expansion of the Interstate Water Entitlement Trading Pilot Project in the southern MDB included rules disallowing trade when there is no or insufficient hydrological connectivity between trading zones.

Another issue related to how to account for transmission losses between the source of the water and the downstream destination to which it is traded. To date, governments have generally not sought to account for transmission losses through water trading rules (for example, by applying a conversion rate to account for them). Currently, water trading throughout the southern MDB occurs on a 1:1 basis, reflecting the fact that the transmission losses attributable to a water trade are generally considered small. Recently, however, there have been concerns that large volumes of trade (especially if moving water downstream during a period of low flows) may significantly increase transmission losses (NWC 2010b).

A cautious approach to approving trades of groundwater entitlements has generally been adopted, reflecting the relatively poor state of scientific knowledge about groundwater systems and the extent to which they are interconnected.

While approval processes gradually improved over time, the Productivity Commission (PC 2006) and others identified concerns about the time and cost associated with approvals. In 2006, for example, the typical time for regulatory approval for entitlement trades in the NSW Murrumbidgee was up to six months (PC 2006:109). Approval processes, particularly for entitlement trades, varied considerably depending on the source and destination of the trade, and in some cases trades required ministerial consent. Even short delays were a significant problem for allocation trades, which were often needed to meet immediate watering requirements.

Mechanisms to manage trade-related salinity impacts have been a feature of Australian water markets since the 1980s and early 1990s. State governments in the MDB introduced the Basin Salinity Management Strategy, whereby each state was required to account for any trade-related impacts of water trading. In April 2002, the Victorian Government introduced a salinity zoning policy that defined zones based on the degree of salinity impact from irrigation and imposed water-use and trade rules to limit future salinity impacts. Under the zoning policy, buyers pay a levy when they buy water from lower impact zones, thus creating a disincentive for water trades that increase salinity concentrations. Trading rules prevent water being traded into the high-impact zones. South Australia approved its salinity zoning policy in 2005 (building on an interim policy approved in 2003); among other things, the policy affects water transfers and variations of licences to change the land on which water can be used.

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8 The zones were associated with a new system of salt impact levies to manage salt concentrations from water trades in the lower Murray (comprising four low-impact zones and a high-impact zone). In 1993, only two salinity impact zones (high and low) were identified. They were later revised to reflect the rapid rise of irrigation development undertaken at the time and the further predicted development in the region (Fyfe n.d.).

9 Before unbundling, irrigators in the ‘high impact’ zone could buy water only from sellers also located in that zone. Irrigators in the ‘low impact’ zones (zones 1 to 4) could purchase water from sellers in any impact zone but had to pay a salt levy per unit of water traded if they bought water from a lower impact zone. These charges are now independent of water trading decisions.

10 State salinity zoning policies underpin broader state commitments under the Basin Salinity Management Strategy signed in 2001 by the Murray–Darling Basin Ministerial Council. Each of the states that are party to the Murray–Darling Basin Agreement is accountable for anything it does to increase (or decrease) river salinity (measured in EC units at Morgan, South Australia) (Fyfe n.d.). New South Wales, Victoria and South Australia maintain a salinity register, which records all actions that reduce or increase salt loads in the river. Actions that increase salt loads, such as new irrigation developments and trade, result in a debit; actions that decrease salt loads, such as new salt interception schemes, result in a credit.
Restrictions on trade to address stranded assets and socioeconomic concerns

A number of other rules were imposed because of concerns about the flow-on effects of water trading on other irrigators in irrigation supply systems, on the broader regional economy and community, or both.

As noted in Section 4.4, governments and irrigation infrastructure operators initially addressed concerns about stranded assets and the social impacts of water trading by restricting the volume of water entitlement trades out of irrigation districts. In 1994, the Victorian Government restricted the volume of water access entitlements that could be traded out of each irrigation district in Northern Victoria to no more than 2% of the volume of entitlement held in the district at the start of the irrigation season. This was increased to 4% on 1 July 2006.

In New South Wales and South Australia, many private irrigation corporations and trusts had put in place limits on trade out of irrigation districts by the early 2000s (Bell and Blias 2002). For example, in New South Wales, while previous reforms had enabled entitlement trading within irrigation areas, it was not until the privatisation of the state’s irrigation districts (such as the privatisation of Murray Irrigation and Murrumbidgee Irrigation in the mid-1990s) that trading between irrigation areas and private diverters was possible (Bjornlund and O’Callaghan 2003). Following privatisation, it was up to the respective boards of directors to decide whether or not to allow trades (including trades with private diverters). Due to concerns about the potential of water movements out of the districts to affect the districts’ financial viability and the broader community, most boards decided not to allow trades in entitlements out of areas, or to limit such trade significantly (Bjornlund and O’Callaghan 2003).

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Bell and Blias (2002) note that the Central Irrigation Trust limited permanent trade out to a maximum of 2% of the original allocation for each district. Renmark Irrigation Trust prohibited permanent transfers.
In 2004, George Warne of Murray Irrigation told the House Standing Committee on Agriculture, Fisheries and Forestry that his shareholder irrigators had decided early on to prohibit the sale of water out of the district:

“So communities and farmers alike have realised that bringing water into your farm business or into your community increases the potential wealth of the community and there is enormous enthusiasm for trading water in, but there are barriers in almost every irrigation community, district and river system to trading water out. A lot of those barriers are not physical; they are simply the community recognising that they want the water retained in that community for its future prosperity.”

There was growing concern that these policies were anticompetitive and a significant barrier to trade. In early 2002, the Australian Competition and Consumer Commission (ACCC) received complaints about water trading restrictions in a number of private irrigation districts in New South Wales. The complaints alleged potential breaches of section 47(2) of the *Trade Practices Act 1975* arising from restrictions in the irrigation districts’ temporary and permanent water trading rules limiting water trades out of the districts. The ACCC did not take action against the New South Wales irrigation corporations, on the understanding that governments would incorporate reforms to remove such barriers in the NWI (ACCC 2006).

In 2004, reflecting concerns about the socioeconomic and community impacts of rapid movements of water out of irrigation-dependent regions, the NWI provided for an interim threshold limit of 4% per annum on the volume of permanent trades out of water irrigation areas. The NWI parties agreed that a review of the effect of the 4% interim threshold limit should be undertaken in 2009 and that, if considered appropriate, the threshold should be raised.

Around the time that governments agreed to the 4% interim threshold, most major irrigation companies, corporations and trusts introduced exit fees on entitlement transfers out of their irrigation districts (PWC 2006). The purpose of exit fees was to help manage the financial impacts of stranded assets on remaining irrigators when other irrigators sold water out of the district.
Restrictions have also been imposed on ownership by non-water users (that is, those not owning land in the region). In particular, in 2004 the Victorian Government announced that it would introduce a 10% limit on entitlement ownership by non-water users in each system (DSE 2004). The government noted that the measure was a response to community concerns about the emergence of ‘water barons’ following the introduction of unbundling, but stated that it believed the risk was more imagined than real:

There is concern in the irrigation community that non-irrigators could buy up much of the water and drive up its price. The Government believes this risk is more imagined than real. No water will be available to buy unless irrigators choose to sell. In the long-term, the price of water will be based on the value people generate from actually using it.

It is unlikely that this limit will be reached in the near future. All the permanent trade that has ever taken place in the 12 years since it began has not yet amounted to 10% of entitlement. Moreover, much of the permanent trade will continue to be from one irrigation business to another. (Victorian Government 2004)

Registers, water accounting and administrative arrangements

As noted in Section 2.1, entitlement holders will trade only if the transaction costs are not prohibitively high. Trading platforms, including exchanges, and the emergence of water market intermediaries (such as brokers) help reduce the cost of bringing buyers and sellers together. Publicly available information helps ensure that buyers and sellers can make well-informed decisions.

Robust registers of water entitlements and accounting mechanisms for water trading and use are essential in ensuring that markets operate effectively. It is also essential that water use is accurately measured and that monitoring and compliance arrangements are in place.

Arrangements for trading entitlements between regions

Where trading of entitlements was across catchments and involved the transfer of a water entitlement with different underlying characteristics (such as reliability), and where there may have been physical losses in transporting water from one location to another, there was a need to ‘convert’ the entitlement in the source region into an entitlement in the destination region.

Initially, this was accomplished by means of an ‘exchange rate’ system. Moving a water access entitlement by using exchange rate trading results in the full legal and administrative conversion of the entitlement from one jurisdiction to another. The exchange rate is the rate of conversion calculated and agreed for application to water to be traded from one jurisdiction to another (NWC 2007).
However, this exchange rate system was seen as very complicated, and there were also concerns that it led to adverse impacts on other entitlement holders by reducing the reliability of their entitlements (ACCC 2010b). Negative impacts occur if the allocations to the original entitlement and the converted water access entitlement to the new region are anything less than perfectly correlated.

Recognition of the problems with the exchange rate system led to a shift to a ‘tagging’ approach. Tagged trading of water access entitlements allows a traded entitlement to retain its original characteristics when traded to a new jurisdiction, rather than being converted into a form that is issued in the new jurisdiction. The entitlement remains subject to the relevant legislative and administrative arrangements of the state of origin. The recipient state is responsible for the site-use approval that allows the entitlement to be used.

Given that the water access entitlement is the responsibility of the donor state and that the approval for use and delivery are the responsibility of the recipient state, water tagging requires the legislative and administrative separation of water access entitlements from water use and delivery/supply licences (NWC 2007). This ‘tagged’ approach to transfers of water entitlements between regions protects against the negative third-party effects of the exchange rate approach because the characteristics of the water access entitlement are maintained and the entitlement remains on the original register.

However, establishing tagging registers was seen as complex. It was not until May 2006 that South Australia, Victoria and New South Wales agreed in principle to facilitate expanded interstate trade in water entitlements using tagging (MDBMC 2006).

There has been very little market interest in interstate tagged trades. Instead of using administratively complex tags, purchasers of entitlements have chosen to keep the entitlement in its source zone and transfer the allocations out of the zone each year. This has resulted in an inability to monitor the extent of interregional entitlement trading in the MDB.

There have also been instances in which water movement has been permitted through tagging when it would have been prevented (due to rules to manage prevailing hydrological circumstances) under an equivalent transfer of water allocations (Frontier Economics 2009).

Water registration and titling systems

In the past, water licence registers maintained by responsible authorities simply recorded the existence of statutorily based privileges. Therefore, licences were not tradeable, there was little need to provide for changes associated with transactions and the registers were little more than lists.

Once water entitlements were separated from land title, however, they became valuable assets tradeable in their own right, and registration systems needed to fulfil other functions—such as providing certainty of title and facilitating trading.

As water trading developed, it became increasingly apparent that the existing licence registration systems were inadequate for those new roles. This was highlighted by a case involving the fraudulent sale of a non-existent water entitlement in Victoria in the 1990s (Woolston 2005).
It also became apparent that the unbundling of water from land titles, while a critical step to allow water trading, gave rise to a number of financial, legal and related issues that had not been fully anticipated under the COAG reforms. In particular, while the combined value of land and water should in principle increase when the water is able to be traded separately, much of the value may rest with the water rather than the land. In fact, the value of the land, without the water, may fall significantly. This had significant implications for loans secured through mortgages on land, the transfer of land and water entitlements via wills, and the rates base for local governments (Woolston 2005).

During the 2000s, several states introduced new water register systems to record the details of water access entitlements and water allocations, including ownership, location, interests, encumbrances and trading activity. The register systems were intended to improve the transparency and accountability of water entitlements. In New South Wales, for example, a register of water access licences began on 1 July 2004 under the Water Management Act 2000.

In South Australia, the government has developed the Water Information and Licensing Management Application (WILMA) (NWMS 2011).

In Victoria, the government implemented the Victorian Water Register in northern Victorian regulated systems on 1 July 2007, and in declared water systems in southern Victoria on 1 July 2008. The Victorian Water Register is the public register of all water-related entitlements in the state. It records:

- who has been issued with water shares, and the reliability, tenure, location and holding in megalitres for each water share
- how much water has been allocated against water shares, how much has been used, and where it was used
- registered interests in water shares, such as mortgages and leases.

Significant resources were dedicated to improved registers for water trading. For example, the Victorian Government committed $7 million over four years to ‘establish a single web-based public register of all water related entitlements’, to accompany the unbundling reforms (Victorian Government 2004:70). At the same time, the NSW Office of Water developed web-based water management registers and statistics, including information on each trade or transfer in each water source. Shortly afterwards, South Australia enabled web-based reporting of every approved water trade in each of the prescribed areas in South Australia. Queensland has made monthly summary statistics available, but data on individual trades has not been freely available.
**Water accounting systems**

To track the accumulation of allocations, trades and use of water volumes accrued under water entitlements, a separate water accounting system (distinct from but possibly linked to the water entitlement register) was needed. There was also a need for the water accounting systems to enable monitoring and compliance with the MDB cap.

Governments have kept accounts of the shares of the Murray resource available to each of the states for many years. However, the progressive freeing up of water trading over the past two decades, the expansion of permanent interstate water trading, and the introduction of rules to ensure that the water can be physically delivered without undue third-party effects have increased the complexity of water accounting (SKM 2006). Another challenge has been in separately identifying and managing the various classes of environmental water in the MDB as the portfolio of entitlements grows due to buybacks (SKM 2006).

**Development of trading platforms**

The earliest water trades often involved informal bilateral arrangements organised ‘over the back fence’. This provided limited scope for sellers or buyers to identify the best deal possible, such as opportunities to trade water outside of the local area, or to undertake trades at low cost. Although water brokers emerged to help irrigators through the trading process, many brokers had started life as local real estate agents, and expertise in water markets was still developing and variable. One broker noted that temporary brokering was akin to a ‘summer job’ in the early days of markets (Wilks Water 2011).

The introduction of electronic trading platforms by governments, water businesses and private brokers in the MDB in the late 1990s and early 2000s was a significant step in reducing the cost of water trading. One of the first centralised exchanges, known as Watermove, was operated by Goulburn–Murray Water in northern Victoria. The Victorian Department of Sustainability and Environment established Watermove in 2002 to support the development of water trading across the state. Watermove now offers a number of water trading options, including a weekly pooled exchange and an online trade room environment. In New South Wales, the Southern Riverina Irrigation Districts Council (later known as the Murray Irrigation Limited) Water Exchange was started around 1999. Private exchanges (such as WaterFind, based in South Australia) also emerged. The new trading platforms and agents reduced transactions costs, encouraged a deeper market, and provided price and other market information.
Institutional capacity and governance arrangements

Throughout the 1990s and early 2000s, institutional and governance arrangements evolved incrementally. As new requirements for markets were identified, new roles were assigned. Knowledge of water markets and the capacity to implement changes were limited to a few key individuals in each state. The states often made water allocation and resource management decisions or assigned them to bulk supply authorities, such as Victoria’s Goulburn–Murray Water. The states were central to the water trading systems, as they made key policy and regulatory decisions on whether and what type of trading was allowed.

The MDBC had an important facilitative role in bringing the states together to enable trading systems to be integrated across state borders. It set up an independent audit group to ensure compliance with the MDB cap; however, there was no overarching regulatory framework for the connected market in the MDB, leading to concerns about resulting inconsistencies hampering market development.

As trading developed, it became clear that many of the governance systems were underdeveloped, including those for allocation announcements. The potential for conflicts emerged, principles of good governance were not fully embedded and there were concerns that some agencies were wearing multiple policy, regulatory and service delivery hats. For example, many of the irrigation authorities also had policy and regulatory responsibilities relating to water trading. In the New South Wales private irrigation districts, there were limited mechanisms available to encourage irrigation corporations to progressively remove artificial barriers to trade and replace them with less distorting instruments. These factors provided a basis for initiating subsequent institutional reforms in the mid to late 2000s, including moves to establish consistent trading and market rules across the MDB, overseen by the ACCC as an independent regulator.

5.4 The status of water markets at the end of this phase

In the decade from the mid-1990s, water markets expanded considerably in scale and scope and market activity across the MDB grew rapidly (see Section 7.1). This was the period in which water trading became entrenched as a key instrument in managing water scarcity, particularly in dealing with the severe water shortage associated with the millennium drought. However, active water markets were still mainly limited to the MDB.

Despite the growth in water trading and use of the market in this period, the water markets could not be said to be in a fully mature state or operating freely and efficiently. They remained subject to extensive and sometimes ad hoc government intervention and regulation that restricted and distorted trade, and were not accessible to all those who could conceivably benefit from engaging in water trading. Water markets were also being increasingly undermined by broader debates about the need to reduce levels of extraction to more sustainable levels. The need to address the overallocation problem was, properly, the dominant factor affecting the next stage of water market development.
Section 6: The transition to sustainable water markets
6 The transition to sustainable water markets

By 2007, the prolonged drought in south-eastern Australia prompted a series of major changes in water management in the MDB to move water use onto a more sustainable footing and address the legacy of the overallocation of irrigation licences in the development era.

The Commonwealth played a central role in driving reforms in the MDB, which involved historic changes to the arrangements for interjurisdictional water management in the basin. The Australian Government embarked on an unprecedented program of environmental water recovery in the basin, using market-based approaches to achieve environmental objectives and smooth the transition to sustainable diversion limits.

This period is also characterised by efforts to manage water resources using a more integrated whole-of-basin approach, including through more consistent regulatory and administrative arrangements for water markets. However, implementation of those changes has been challenging.

This section:
+ identifies the key drivers and objectives behind further reforms to water trading (Section 6.1)
+ provides an overview of the key measures adopted (Section 6.2)
+ summarises the current status of water markets (Section 6.3)
+ identifies future water market reform needs (Section 6.4).

Sustainable water markets require a robust design and architecture capable of accommodating a wide range of circumstances. They are difficult to weaken through ad hoc political interference, and market participants are confident in the underlying security of the entitlements being traded. The discussion in this section notes that there is still some way to go before water markets in Australia can be said to be sustainable.

Ongoing uncertainty surrounding the transition to more sustainable levels of extraction has obvious implications for the objective of providing entitlement holders with the confidence and security to make investment and adjustment decisions.
6.1 Drivers and objectives

Drought and escalating environmental concerns

Water was a major issue in the community as a result of the drought for most of the 2000s. The drought magnified underlying problems in water management and brought the competing interests of environmental, urban and agricultural uses into sharper focus.

By the end of the 2006–07 summer, the River Murray had experienced its 10th consecutive month of record low inflow. In the 10-month period from June 2006 to March 2007 inclusive, inflow was 770 GL, which was less than 60% of the previous minimum of 1350 GL in 1982–83 (MDBC 2007).

Concerns about the environmental sustainability of the MDB were driven by visible signs of environmental stress and potentially irreversible damage. Negligible flows to the Murray mouth and Coorong wetlands over several years increased the risks associated with acid sulphate soils (DSEWPaC 2011a). The declining health of floodplains and wetlands (such as river red gum forests) in the Murray system was also a major source of concern (MDBC 2005, CSIRO 2008, Davies et al. 2008).

Individual farmers and entire communities were also heavily affected by the drought. As stated by the then Prime Minister, John Howard:

"The drought which now grips large parts of Australia is the most severe since records began. It has taken a drastic toll on the lives and livelihoods of many Australians. Whether in the city or in the bush, communities are understandably anxious about water, concerned about getting through our present difficulties, and worried about what the future might hold. (Howard 2007:1)"

The drought provided significant political impetus to move to sustainable levels of extraction. The legacy of overallocation of irrigation licences was clearly contributing to flow-related environmental problems (CSIRO 2008). Importantly, reductions in water for the environment during the drought were proportionally greater than reductions in consumptive use (DSE 2009a).

The politics and science of climate change and water became interconnected. Modelling of climate change impacts drove concerns about the need for water allocation reforms to consider the potential for increased variability, decreasing inflows in the southern MDB over time, and potential step-change reductions in inflows. The CSIRO raised concerns about other risks to shared water resources, including unregulated growth in farm dams and plantation forestry, and the potential for existing water plans to underestimate the extent of connectivity between surface water and groundwater systems (Van Dijk et al. 2006).
While there was broad support for the allocation of more water to the environment, concerns about the economic and social adjustment costs remained. For example, the then chair of the Murray–Darling Basin Ministerial Council and Minister for Agriculture, Peter McGauran, is said to have initially rejected a proposal made by the Productivity Commission in 2005 to make greater use of markets to source water for the environment on the basis that it would hurt farmers (Scanlon 2006).

Given the actual or perceived tardiness of previous state-based efforts to address overallocation, the Australian Government entered the picture with plans to increase its role in the management of the MDB and provide funding to improve water management and address adjustment issues.

Whereas the Australian Government had previously played a coordinating and facilitating role in water reform, there was now a marked shift towards more direct Commonwealth intervention and management.

Increasing demands on the use of water markets

This period was also marked by fundamental user-driven changes in the way that water markets were being used. The changes related to:

+ the nature of the demands for water (such as volume, location and timing of use and return flows)
+ the characteristics of market participants (such as urban water authorities and environmental water managers)
+ the trading strategies that market participants adopted, which became more sophisticated (see NWC 2011a).
Again, many of these changes can be linked to the impacts of extreme scarcity during the drought (see Box 6.1)

**Box 6.1: Drivers of recent changes in the use of water markets**

- **Greater integration of urban water into the market**: There was a large increase in the participation of urban water authorities in the water market during the drought. For example, SA Water was a significant purchaser of water allocations to boost supply security in Adelaide. In Victoria, Coliban Water and Central Highlands Water bought a mix of entitlements and allocations to address critical supply shortfalls in Bendigo and Ballarat. There has also been an increase in connectivity between urban centres and rural water markets, including major investments to link Melbourne and Canberra to the water market in the southern MDB.

- **Change in the irrigation sector**: Industry change can have major and rapid impacts on water demand and both entitlement and allocation markets in the MDB. The drought drove investment in on-farm water-use efficiency, and the downstream movement of water created concerns about the extent of trade-related transmission losses. In addition, there is evidence that many perennial pasture growers in the dairy industry moved to annual pastures, which have less risk but also very different intraseasonal water requirements.

- **Increasing sophistication in water market decision-making**: Water users are becoming more familiar with trading and more sophisticated in their mix of production, water use and water trading decisions. For example, there has been a trend towards irrigators selling all or most of their entitlements and purchasing all of their seasonal water requirements in the water allocation market. In addition, the development and refinement of carryover policies, which allow entitlement holders to hold water in storage from one season to the next, have changed market dynamics and focused attention on storage access rights. There has also been greater entry by corporate agribusiness and other Australian and international investors into the water market.

- **Ownership, management and use of entitlements held on behalf of the environment**: The development of environmental watering strategies and the potential for environmental water holders to become permanent participants in the market create a number of challenges for water markets. Appropriate institutional arrangements must be in place, and environmental entitlement holders are likely to place pressure on storage and delivery rights and the operation of river systems. For example, the delivery of additional environmental water might create additional third-party impacts on adjacent landholders and entitlement holders (such as flooding).
These changes created the need for further water market reform. Increased water trading activity created pressure to reduce the transaction costs of trading. More fundamentally, the changes challenged the assumption that trading results in only marginal changes in the underlying timing and location of water use, return flows and transmission losses. This created pressure for reform of the broader water market framework, including storage and delivery arrangements, to ensure that third-party impacts are managed effectively.

6.2 Overview of key measures

The measures adopted in this phase had far-reaching implications for the operation of water markets in the MDB. On the one hand, they embedded and sought to enhance the role of water trading as an integral component of the overall regime for managing increasingly scarce water resources. For example, like the NWI, the Murray–Darling Basin Plan is required to provide for ‘water to reach its most productive use through the development of an efficient water trading regime across the Murray–Darling Basin’ (Section 20e). On the other hand, some of the initiatives entailed extensive government interventions, which themselves presented challenges to the efficient operation of the water markets.

In January 2007, the Australian Government released the National Plan for Water Security. While building on the directions in the NWI, the plan earmarked over $10 billion of new Commonwealth funding to address overallocation in rural Australia through investing in irrigation infrastructure and buying back permanent entitlements for the environment (Howard 2007).

Following the change of government later in 2007, the plan evolved into the current government’s Water for the Future program. While the program also provided some funding for urban water security, it has a particular focus on the MDB and aims to give farmers and communities more confidence to plan for a future with less water, to put water use on a sustainable footing, to enhance irrigation productivity, and to improve river and wetland health.

*Water for the Future* has three main elements:

+ the Basin Plan, to be implemented by the revamped Murray–Darling Basin Authority (MDBA) to provide for the integrated management of MDB water resources and to set scientifically based sustainable diversion limits (related measures included the introduction of a common regulatory framework for the water industry in the MDB, investments in improved metering, knowledge and information, and other functional water market refinements)

+ buybacks of water entitlements for the environment from irrigators via the Commonwealth Environmental Water Holder (known as the Restoring the Balance program)

+ extensive investment in more efficient irrigation systems.

These major changes to water management in the MDB were given effect in interstate agreements and the Commonwealth *Water Act 2007*. The Act built on the earlier reforms and incorporated the overarching objectives of the NWI.
Table 6.2 summarises the key policy and legislative initiatives affecting water markets since 2006.

### Table 6.2: Key water market policy changes since 2006

<table>
<thead>
<tr>
<th>Year</th>
<th>Initiative</th>
<th>Key changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>National Plan for Water Security / Water for the Future Plan</td>
<td>Identified a range of reforms to improve governance arrangements in the MDB. Also included financial commitments by the Australian Government to invest in irrigation infrastructure and to buy back permanent entitlements for the environment.</td>
</tr>
<tr>
<td>2007</td>
<td>Water Act 2007 (Cwth)</td>
<td>The Water Act included:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ the establishment of the Murray–Darling Basin Authority (MDBA), which is responsible for developing the Basin Plan for the integrated management of water resources in the MDB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ the assignment of a number of responsibilities to the Australian Competition and Consumer Commission (ACCC), which included the requirement that the ACCC provide advice on water sharing and water market and water trading rules.</td>
</tr>
<tr>
<td>July 2008</td>
<td>Intergovernmental Agreement on Murray–Darling Basin Reform</td>
<td>Member governments affirmed governance arrangements set out in the Water Act 2007 and provided for a range of jurisdictionally based reforms to strengthen the roles of the MDBA, the ACCC and the Australian Government in the MDB.</td>
</tr>
<tr>
<td>2008</td>
<td>Referral of state powers</td>
<td>State governments referred state powers to the Commonwealth to enable it to assume the primary responsibility for the management of the MDB under the Water Act.</td>
</tr>
<tr>
<td>November 2008</td>
<td>COAG agreement on times to process trades</td>
<td>Further reforms were designed to reduce the time taken to process trades, to better inform market participants and to improve contracting.</td>
</tr>
<tr>
<td>November 2009</td>
<td>National Water Market System</td>
<td>When complete, the system should lead to more efficient water transactions and management of state and territory water registers, and greater availability of water market information.</td>
</tr>
</tbody>
</table>
Table 6.2: continued

<table>
<thead>
<tr>
<th>Year</th>
<th>Initiative</th>
<th>Key changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009–11</td>
<td>ACCC rules</td>
<td>Water market rules prohibiting irrigation infrastructure operators from unreasonably delaying or preventing the transformation of irrigation rights came into effect in 2009.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Water Charge (Termination Fee) Rules, which protect against the stranding of assets without restricting outward trade, came into full effect on 1 September 2009.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The Water Charge (Infrastructure) Rules, which provide for regulatory oversight of charges for infrastructure services provided by irrigation infrastructure operators, came into full effect on 12 April 2011.</td>
</tr>
</tbody>
</table>

The following discussion examines the rationale for these measures, their important details and their effects on water markets in Australia, based on the key elements of water markets as identified in Section 3:

+ determining the balance between consumptive and environmental water use
+ creating clearly defined and tradeable property rights
+ regulation of the market
+ trading platforms
+ registers, water accounting, and compliance and enforcement arrangements
+ institutional and governance arrangements.

**Determining the balance between consumptive and environmental water uses**

Managing the adjustment implications of water reform had been a key part of governments’ responses over the previous decade. However, until this point, compensated purchases and reductions in entitlements had yet to be contemplated at the basin scale.14

While the development of the Basin Plan was to establish sustainable diversion limits (SDLs) for the water resources of the MDB, the impacts on irrigators were to be managed via buybacks of entitlements and investments in water-use efficiency projects. Rather than waiting until the finalisation of the SDLs before taking action, however, the Australian Government proceeded with buybacks of entitlements and infrastructure investments. This reflected both the expectation that the SDLs would be significantly lower than current levels of extraction and evidence of major environmental problems as the drought continued (such as the closing of the Murray mouth due to low flows in the system).

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14 There were some market-based water recovery programs, including under the Living Murray First Step program, but none with the magnitude and scope of the Restoring the Balance program. The earlier programs had a heavy bias towards infrastructure works, meaning that the role of market mechanisms was marginal (see PC 2006).
Buybacks of water for the environment

The Australian Government’s buyback program marked a critical turning point for water markets, which were given a major role in managing the adjustment impacts of moving to sustainable levels of extraction. The buyback program is a $3.1 billion commitment over 10 years to buy water entitlements in the MDB for environmental purposes. This was a quantum shift, in which government purchases went from a small part of the relatively small Living Murray First Step program to a large part of a large program.

All entitlements purchased by the Australian Government are managed by the Commonwealth Environmental Water Holder (CEWH). With continued drought and visible environmental problems in the early stages of the program, the government agreed to accelerate its purchases. By 30 June 2011, 992 GL (a mix of high- and low-reliability entitlements) had been purchased, including a number of very large individual purchases (DSEWPaC 2011f).

A number of challenges emerged during the accelerated buyback process. Some doubted the effectiveness of the program, while others were concerned about significant purchases proceeding before the government’s environmental water plan formally determined environmental requirements (see, for example, BDA Group 2006, NWC 2009, PC 2010, HRSCRA 2011). For example, it has been suggested that the purchase of existing entitlements may not be well suited to meeting the needs of many sites that require additional flooding (PC 2010). There are also concerns that the government has not been taking a strategic approach and is buying water entitlements in some irrigation areas where it is also investing in infrastructure upgrades, which may give rise to stranded assets (HRSCRA 2011).

Overall, however, flexible approaches to acquiring water for the environment that include direct buyback are widely regarded as much more cost-effective than approaches that prescribe that water must come from investments in irrigation modernisation or ‘water-saving’ projects (Grafton and Hussey 2007, Crase and O’Keefe 2009, Lee and Ancev 2009, PC 2010). For example, the Productivity Commission found that infrastructure projects under the Living Murray program recovered water at an average cost of around $2200/ML, compared to $1700/ML for market purchases (PC 2010:128). Most infrastructure projects recovered water at a cost that was nearly 50% higher than the average cost of recovery through market purchases.

Other concerns related to the impact of the buyback on the market, particularly the potential for the buyback program to inflate market prices and limit the ability of other purchasers to enter the market. ABARES modelling by Hone et al. (2010) suggested that entitlement prices were around 13% higher in the northern MDB and 18% higher in the southern basin than would be the case in the absence of the buybacks. However, ABARES noted that its results may overestimate the impacts, as its approach assumed a relatively high estimate of price elasticity of irrigation demand compared to other studies.
noted that higher prices can have both positive and negative impacts on irrigators (PC 2010:182). As discussed below, concerns about the impact of buybacks on the water markets also reflected misgivings about the governance arrangements of various Australian Government agencies with responsibility for water policy and management.

Parts of the irrigation sector have disputed the ‘willing sellers’ label, given the adjustment pressure felt by many irrigators after many years of drought and the downturn in commodity prices (particularly for dairy products) following the global financial crisis. For example, the Murrumbidgee Valley Food and Fibre Association’s submission on the proposed Basin Plan noted that ‘after 10 years of crippling drought, the majority of water sellers would be desperate sellers, not willing sellers’ (MVFFA 2010:2).

Despite the compensatory nature of buyback, many stakeholders remained concerned about the impacts of taking water out of regional communities, mirroring long-held concerns about the impact of water trading generally.

Several studies suggest that the impacts on regional economies have been overstated. For example, Dixon et al. (2011) and ABARES (Hone et al. 2010) found that the flow-on impacts of buybacks are minimal or even positive, given that other opportunistic irrigation and some dryland agricultural opportunities remain open to those who sell their water entitlements. Certainly, buybacks are significantly better for communities in the MDB than uncompensated reductions in water availability, but debate continues about the extent to which the proceeds of entitlement sales contribute to maintaining local expenditure (including the extent to which sellers remain in the community) and about the local economic implications of retiring debt (Environment Victoria 2011).

Those concerns engendered political responses. Further public investments in so-called ‘water-saving’ irrigation infrastructure were promised, and the battle over restrictions on interregional entitlement trading intensified. Victoria’s decision to retain its 4% annual limit on trading of entitlements out of irrigation districts (despite recommendations from the National Water Commission, the ACCC and the Productivity Commission for the limit to be removed), and the embargo imposed in response by New South Wales, threatened to impede the buybacks. While market forces were being put to work on the one hand, they were being restrained on the other.

Recent rains reduced the imperative for rapid buybacks. There is now pressure to rethink the strategic approach and pace of the buyback program (HRSCRA 2011). Watson and Cummins (2010) concluded that water buybacks should proceed more slowly while tangible environmental projects are sorted out and the modus operandi of the CEWH is established. Such an approach would also provide the opportunity to ensure that purchases are guided by a clear environmental watering strategy and that other appropriate policy tools and sequencing arrangements are put in place to exploit system rationalisation opportunities and moderate the ‘Swiss cheese’ effect in irrigation districts where infrastructure investment is occurring (see below and NWC 2009).

16 The embargo was subsequently lifted and replaced with a memorandum of understanding between the NSW and Australian governments limiting entitlement transfers to the Commonwealth to 60–80 GL per year over a number of years.
**Infrastructure investments in water-use efficiency**

A major component of *Water for the Future* is the $5.8 billion Sustainable Rural Water Use and Infrastructure Program. The stated aim of the program is to improve the efficiency and productivity of rural water use and management, to deliver substantial and lasting water returns to the environment and to help secure a long-term sustainable future for irrigated agriculture through value-for-money projects (DSEWPaC 2011e).

The program provided funding for on-farm and off-farm irrigation infrastructure and assistance for local authorities to plan strategically for adaptation to climate change. One major project is the Northern Victorian Irrigation Renewal Project Stage 2 (earmarked for around $1 billion in Australian Government funding), which augments $1 billion in state and irrigator funding for Stage 1 (see NVIRP 2011).

Some agencies, such as the Productivity Commission (PC 2009), have concluded that such infrastructure investments are not likely to be effective in obtaining water for the environment, or in sustaining irrigation communities. The Northern Victorian Irrigation Renewal Project has been the subject of a series of government inquiries, including by the Victorian Ombudsman (see Victorian Auditor-General 2008, 2010; Walsh 2011a).

Whether or not such infrastructure investments are economically viable, they have impacts on water markets. Cox and Warner (2009) demonstrated that public funding for infrastructure projects in some regions but not others creates equity impacts and distortions across connected water markets. Specifically, in cases where infrastructure is gifted and the cost is not recovered through user charges, recipient regions will be able to outbid other regions for water, thus introducing distortions into the market.

Concerns have also been raised about the ‘Swiss cheese’ effect, in which sales to the Commonwealth are distributed across an irrigation district, increasing the average cost to service and upgrade remaining infrastructure. Others have noted that using buybacks to achieve distributional goals, system rationalisation or other objectives is likely to compromise efficiency and effectiveness, and suggested that other instruments be used to address those issues directly (NWC 2009, PC 2010).
Setting sustainable diversion limits under the Basin Plan

Under the Water Act, the MDBA is responsible for developing the Basin Plan for the integrated management of the MDB’s water resources, including the introduction of SDLs.\(^{17}\) In particular, the MDBA has the task of setting SDLs that optimise environmental and socioeconomic outcomes from the allocation and use of water in the MDB.

The legislative requirement for the MDBA to develop a Basin Plan containing SDLs provided a historic opportunity to move the cap from one based on past use to one reflecting the long-term environmental sustainability of the system. However, given past difficulties in addressing the legacy of poor water-use practices, concerns were raised about the extremely high expectations placed on the MDBA and the Basin Plan process (see NWC 2009).

Following the 2010 federal election, a non-binding *Guide to the proposed Basin Plan* was released by the MDBA, proposing basin-wide reductions in average annual water use of between 3000 and 4000 GL (MDBA 2010). However, the guide was met with intense hostility from the irrigation sector, which focused on the plan’s impacts on irrigators and irrigation-dependent communities.\(^ {18}\) *The Age* noted:

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\(^{17}\) The Water Act requires that the Basin Plan prescribe ‘the maximum long-term annual average quantities of water that can be taken, on a sustainable basis, from: (a) Basin water resources as a whole; and (b) the water resources, or particular parts of the water resources, of each water resource plan area’ (s. 22(1), item 6).

The strongest criticisms were reserved for the plan’s central aspect: the development of ‘sustainable diversion limits’, which are controversial because they reveal the new limits on water extraction from rivers in the Murray–Darling Basin, and thereby the reduction in water available to farmers.

The authority’s method for calculating the new limits was described by Victoria as ‘highly inadequate’ and ‘simplistic’ science that produced limits that were unrelated to specific environmental goals.

Victoria believes the new limits should be calculated by determining the amount of water needed for specific environmental goals, such as habitat protection, species health and water quality.


In addition, the consultation process for the development of the Basin Plan was heavily criticised in a recent parliamentary inquiry led by Tony Windsor MP (HRSCRA 2011).

The chief executive officer and the chair of the MDBA have both since resigned, and the draft plan has been redeveloped after further consultations with affected communities and localised socioeconomic investigations across the MDB. The inquiry concluded that, to date, rather than improving certainty for water market participants, the Basin Plan process appears to have damaged the confidence of irrigators in water management in the basin, with flow-on impacts on markets and on investment and water-use decisions (HRSCRA 2011).

More recently, the MDBA has flagged changes in its approach to seek a better balance between economic, social and environmental outcomes and to focus more on environmental outcomes rather than volumes of water, per se. While debate about the optimal balance between consumptive and environmental use continues, the Commonwealth buyback program means that the transition to SDLs is already underway.

Clearly defined, secure and tradeable entitlements

Although considerable progress had been made in the initial reform period to convert licences into more clearly specified and tradeable entitlements, there have been a number of additional reforms in the specification of entitlements. Further issues have also emerged as trading has developed.
Further unbundling of entitlements

The first steps in establishing tradeable entitlements involved the separation of rights to access water from ownership of land, and the specification of entitlements in the form of a right to a share of the pool available for consumption. The next logical step was to further unbundle various elements of entitlements to make them potentially separately tradeable.

Water rights can be conceived of as comprising several key components:

- **water access entitlement**: a long-term interest in (a share of) a consumptive pool as defined in a water plan
- **allocation**: a unit of opportunity (usually a volume of water) distributed periodically
- **delivery**: the right to have an allocation of water delivered to a certain off-take location or to obtain water from a particular location
- **use**: permission to use an allocation, with prespecified use conditions and obligations to third parties.

In the past, many of the components tended to be bundled together within the one licence. In particular, delivery and use conditions were attached to the water access entitlement. This created a number of problems in water access entitlement trading and slowed down approvals of trades.

The push to facilitate water trading focused attention on the scope for and desirability of unbundling the components into separate instruments and allowing some to be traded separately. Figure 6.1 demonstrates the difference between a traditional water access entitlement and a fully unbundled entitlement.

**Figure 6.1: Unbundling of water rights**
On 1 July 2007, Victoria unbundled its water entitlements in northern Victoria into the following separate rights:

+ **water share**: a water access entitlement; a legally recognised entitlement to a secure share of the water available for use in a defined water system in Victoria; may be held by any legal person

+ **delivery share**: the right to have water delivered by a water authority, and a share of the available flow in a delivery system. Unlike water shares, delivery shares are linked to the land. Irrigators who do not need part, or all, of their delivery share must either continue to pay the relevant charges to the infrastructure operator or pay a termination fee and surrender all, or part, of the delivery share.

+ **water-use licence**: a licence that allows the holder to use a specified quantity of water on a specific piece of land. Unlike water shares and delivery shares, water-use licences cannot be traded separately because they remain attached to land and must be held by the owner/occupier of the land. They set out the conditions that farmers must follow in irrigating their properties, for example to minimise offsite impacts on water quality and biodiversity (Victorian Government 2004).

In a similar manner to Victoria, the South Australian\(^{19}\) and New South Wales\(^{20}\) governments have enacted legislation to separate the right to take water in a declared system from land holdings and to separate traditional bundled water licences into a number of instruments. The South Australian reforms came into effect in the River Murray Prescribed Water Course on 1 July 2009, while in New South Wales the unbundling process commenced on 1 July 2004 and is still underway (NWC 2010a).

Critically, selling a water access entitlement no longer required the termination of delivery rights and obligations, including the obligation to pay for system maintenance and operation. As stated by the Victorian Government (2004:69):

> The ‘unbundling’ of entitlements into their components will create benefits for irrigators. It will:
> + make trade easier, by separating tradeable elements from other elements
> + reduce borrowing costs, by providing for mortgages directly over water
> + assist leasing, by recording the shares of delivery capacity of both people leasing out and people leasing in
> + enable a brokering body to offer products tailored to irrigation demand
> + make it easier for irrigators to adjust either the reliability of their water supplies, or the timeliness of having water delivered, to suit their individual enterprises.

Unbundling of water access and water use also facilitated interstate trades of water entitlement under tagging arrangements, because the management of water access could continue to be overseen by the relevant authority in the state of origin, while water-use management could be separately addressed in the destination state of the tagged water transfer.

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19. These reforms were incorporated into the Natural Resources Management (Water Resources and Other Matters) Amendment Act 2007 (SA).
20. These reforms were incorporated into the Water Management Act 2000 (NSW).
Using buybacks, not uncompensated reductions, to move to sustainability

As discussed in Section 5.3.2, long-held fears of irrigators about uncompensated reductions in the consumptive pool or compulsory acquisitions of entitlements to address overallocation had not been adequately allayed by the NWI risk assignment provisions.

However, to a large extent, those concerns were ameliorated before the Guide to the proposed Basin Plan was released, when the Prime Minister and Minister for Water announced that any gap between the existing buyback program and the final SDLs for surface water would be met through further entitlement purchases from willing sellers (Gillard and Wong 2010).

There was bipartisan support for this approach, which, in effect, overrode the risk assignment provisions in the Water Act based on those in the NWI. This means that the security and reliability of existing entitlements are maintained, and the role of water markets in reallocating water to the environment is likely to continue in the future.

While this is clearly a good outcome for the security of entitlements and for existing irrigators (compared with uncompensated reductions), it is unclear how long the buyback will last. Some irrigators are concerned that any remaining gap between water acquired through buybacks and SDLs following the move to state-accredited water resource plans in 2019 might be filled without compensation.

Irrigators now argue that buyback is a de facto risk assignment because governments have been unable to agree on a workable uniform risk assignment policy. This has led to a much broader acceptance of buybacks in the irrigation sector.

Addressing remaining inadequacies in some aspects of entitlements

The increase in the scale and nature of water trading and the emergence of some extreme climatic conditions has exposed inadequacies in some aspects of entitlements where rights have not been fully specified.

For example, highly variable water availability since 2002–03 has highlighted a number of weaknesses in the underlying specification of entitlements during extreme wet and dry sequences.

Efforts are underway to address those issues, including through the carryover and system reserve policies in Victoria, which aim to improve and clarify the specification of rights to enable risks to be better managed by those best placed to do so (DSE 2009a). However, water managers have struggled to ensure that the market can function effectively without undermining storage and delivery rights and constraints.

In some cases, underlying problems with the specification of entitlements have led to restrictions on trading. For example, from 1 July 2009 to 21 January 2010 the New South Wales Government announced a temporary embargo on allocation trades from the Murrumbidgee Valley into the Murray Valley due to concerns about transmission losses (NWC 2010a). In April 2011, Victoria made the decision to suspend
all intervalley water allocation trading for the remainder of the water year to protect the next season’s allocations to owners of high-reliability water shares in the Victorian Murray system. Most recently, New South Wales irrigators have become bewildered and confused about the New South Wales Government’s announcements associated with opening allocations in the Murray system, and that has had flow-on implications for market confidence.

A key lesson—and one that is even more important given the expected impacts of climate change—is about the need to ensure that operational rules, responsibilities for managing risk and limitations on the rights of all parties are clearly specified under all inflow conditions (NWC 2009).

**New transaction types**

While water allocation and water entitlement trading are still the dominant forms of transaction in the market, as the market matures and deepens there are signs that new types of transactions are emerging to meet the needs of market participants. Water entitlement forward contracts have been offered on WaterExchange, and water access option contracts have been investigated by ABARE (Hafi et al. 2005) and the MDBC, but neither has become widespread. It is not yet clear whether brokers or users fully understand the risks and benefits. Lease-type contracts (such as those being offered by Kilter and Blue Sky Water) have been observed, but the numbers and volumes of leases are dwarfed by entitlement and allocation trading. Notably, the Commonwealth Water Act makes provision for the CEWH to acquire environmental water through options contracts.

**Emerging markets**

In recent years, the ability to trade water has emerged outside the MDB, including in Western Australia. The Western Australian Government, recognising many weaknesses in the existing legislation, has commenced a reform program to improve water management in the state. The reforms include steps to facilitate water trading by establishing perpetual water access entitlements as shares of a consumptive pool in water planning areas where the demand for water is high and the resource is nearing or at full allocation. The government also proposes to improve the statutory register of water licences, water access entitlements and dealings and interests in those instruments. However, implementation of the reform agenda is yet to make substantial progress (NWC 2011a).

**Regulation of the market**

Water markets in Australia have always been heavily regulated because of concerns about various adverse impacts that might arise from unfettered trading. Major developments in recent years include:

+ a sharp focus on a more consistent regulatory environment across the MDB
+ intensification of the debate about the 4% limit on outward entitlement trades from irrigation districts
+ a renewed debate about ownership of water entitlements by ‘water barons’ and/or foreign investors.
A more consistent regulatory environment across the MDB

Under the Water Act 2007, the Australian Government and its agencies now have a role in establishing, monitoring and enforcing compliance with water trading, water market and water charge rules (including for termination fees) (see Box 6.2 and DSEWPAC 2011c). The rules aim to provide for the introduction of a common regulatory framework for the water industry in the MDB, and aim to allow the water market to operate more effectively (DSEWPAC 2011d). The ACCC provided advice to the Water Minister and the MDBA on the development of the rules and is responsible for monitoring and compliance (ACCC 2011a).

Box 6.2: Water trading, water market and water charge rules

The water trading rules deal with various aspects of the trading of water rights in the MDB, including:

- the removal of barriers to trading water rights
- the terms and processes for trading
- the manner in which trades of water are conducted
- the provision of information to enable trading to take place.

In addition to the water trading rules, the Water Act provides for two other complementary sets of rules: water market rules and water charge rules. The water market rules and water charge rules are made by the Water Minister, while the ACCC is responsible for advice and enforcement.

Water market rules are narrower in scope than trading rules, and relate to the transformation of irrigation rights (which were previously specified as a share of a bulk water entitlement held by the irrigation authority) into statutory water access entitlements separately held by individual irrigators, which are more easily tradeable.

Water charge rules relate specifically to any costs or charges associated with the supply of water. This includes the levying of termination fees by irrigation infrastructure operators when irrigators permanently relinquish their rights to deliveries of water through the network.

One of the key issues that the new rules sought to address was that of restrictions historically imposed by irrigation infrastructure operators (IIOs) on trading by member irrigators. Members had been unable to hold separately tradeable entitlements and were charged high exit fees or high termination fees if they sold their entitlements. IIOs imposed such restrictions out of a concern that reductions in their member base would leave them unable to cover their ongoing costs from those who remained.
From the outset, governments recognised that mechanisms to manage stranded assets, such as exit fees, had the potential to be institutional barriers to trading and were therefore contrary to the principles of the NWI. In June 2006, the Australian Government asked the ACCC to develop a consistent interjurisdictional framework for the use of exit and access fees to help the New South Wales, Victorian and South Australian governments meet their obligations under the NWI (ACCC 2006).

The ACCC recommended that exit fees be replaced by termination fees based on delivery entitlements. The Water Charge (Termination Fees) Rules regulate the maximum termination fees that IIOs can impose on irrigators seeking to terminate some or all of their rights of access. The ACCC has capped such fees at 10 times the annual fixed access fee payable, reflecting a balance between ensuring that IIOs can recover their operating costs and minimising barriers to trading.

The move from exit fees to termination fees was implemented in a number of systems and was a significant achievement. As summarised by Murray Irrigation Ltd (2007:37):

"Changes to Murray Irrigation’s Constitution on January 2006 allowed our entitlements to be owned independently of land. At the same time we introduced an exit fee of $447.43 net on water entitlements transferred from the company’s licence to recover the long term capital, operation and maintenance costs which would have been charged against the entitlements. The exit fee itself may have contributed to the loss of entitlement value, particularly compared to river entitlements. This issue was resolved with the introduction of delivery entitlements, a new pricing structure and the removal of all company fees and charges from water entitlements from 1 July 2007. This is expected to enhance the tradeability and value of water entitlements going forward."

In addition, the water market rules make it easier for irrigators to transform their irrigation rights into separately held water access entitlements by ensuring that IIOs cannot prevent, or unreasonably delay, that transformation.

The rules facilitate trading by separating entitlement trading decisions from decisions to cease connection to irrigation systems, and limiting the cost of such termination payments in a consistent manner across the MDB. In March 2011, the ACCC’s Water monitoring report 2009–10 found that there was considerable transformation and termination during 2009–10 in New South Wales, South Australia and Victoria, including for particular IIOs such as Central Irrigation Trust, Murray Irrigation Limited, Murrumbidgee Irrigation and Renmark Irrigation Trust (ACCC 2011b:xiii). The ACCC concluded that the Water Charge (Termination Fees) Rules have reduced barriers to trade and increased trading activity (ACCC 2011b).

The ACCC also observed that, while irrigators were transforming and terminating, many did not transform all of their irrigation rights or terminate all of their water delivery rights, but were maintaining their involvement with their IIO and not exiting irrigated agricultural production. This suggests that irrigators are making increasingly sophisticated choices about transformation and termination in order to tailor their water holdings and use to their individual needs and circumstances.
However, the ACCC also found that barriers remain, particularly in some systems not covered by the new water market rules, such as New South Wales joint water supply schemes that collectively hold around 20% of water in that state (ACCC 2011b). In addition, while finding that compliance with the new rules has generally been good, the ACCC has conducted investigations and taken enforcement action, including against Murray Irrigation Limited and Murrumbidgee Irrigation for overcharging termination fees during the 2009–10 water year (ACCC 2011b).

Irrigators and IIOs have expressed concerns about the costs of addressing the new regulatory requirements and ongoing compliance with the new rules (for example, see ACCC 2009).

In general, however, the ability of an independent regulator to assess compliance with consistent MDB-wide rules is a major step forward for the market.

*Restrictions on trading*

One feature of water trading regulation that came under increasing pressure and debate was the interim 4% threshold limit on permanent trades out of irrigation areas established under the NWI, which was scheduled for review in 2009.

The Victorian Government staunchly defended the limit in the face of criticism from the Productivity Commission, the ACCC, the National Water Commission, irrigators, irrigator groups (such as the Sunraysia Branch of the Victorian Farmers Federation), and other state governments. The Victorian Government’s enforcement of the limit in recent years reflected a view that Victoria was bearing more than its fair share of the burden of Commonwealth buybacks, which was exacerbated by lack of clarity about the buyback strategy (NWC 2009). Understandably, Victoria was also concerned about less transparent barriers to trade, such as the impediments to the transformation and separation of irrigation rights in New South Wales.

Victoria was not the only state to restrict trading because of concerns about the buyback program. On 29 May 2009, the New South Wales Government embargoed the sale of entitlements to the Australian Government’s buyback program. The ban was driven by concerns that water trading policies in Victoria and South Australia meant that a disproportionate share of environmental buybacks was coming from New South Wales. The New South Wales Government subsequently lifted the embargo after reaching an agreement on the maximum volume of environmental purchases with the Australian Government.

As part of a bilateral agreement with the Australian Government in 2009, the Victorian Government also agreed to a package of exemptions to the 4% limit (Rudd and Brumby 2009). The aim of the agreement was to enable the accelerated buyback program to proceed, but to target additional purchases to areas not likely to be upgraded as part of the Victorian Government’s irrigation modernisation program.

However, the 4% limit was still binding and imposing costs on Victorian irrigators who could not sell their entitlements to the highest bidders and on those buyers who had to resort to less preferred alternatives. Artificial limits on interregional entitlement trading in Victoria and New South Wales increasingly constrained
both buyers and sellers, particularly from 2007–08. The restrictions created uncertainty, were costly to buyers and sellers, and reduced the ability of sellers to alleviate financial pressures. As Danny O’Brien, the chief executive officer of the National Irrigators’ Council, wrote in an opinion piece in *The Weekly Times*:

> There are now two reasons why the cap has become a hindrance to Victorian irrigators, not a help. The first is the ability of irrigators to manage their own businesses … Given current commodity prices, it’s no surprise many irrigators are trying to sell water. Not only is it unfair to stop them doing so with the 4% cap, it’s counterproductive if they go broke in the meantime. (O’Brien 2010)

The segregation of water entitlement markets inside and outside irrigation districts constrains the efficient reallocation of water access entitlements to the detriment of sellers in districts subject to the 4% threshold and potential purchasers outside those districts (ACCC 2010c). This issue became the subject of a 2009 High Court case between South Australia and Victoria on the basis that the limit creates a barrier to free trade and commerce between the states. As part of an agreement to settle the case in 2011, Victoria recommitted to completely removing the 4% limit by 2014.

As mentioned in Section 5.3.4, the Victorian Government had also imposed a 10% limit on the proportion of water entitlements that could be held by non-landholders within a district to address concerns about water barons. This ‘non-water user’ limit came into effect on 1 July 2007, when unbundling occurred and water shares came into existence. A review in 2009 found that water barons were not buying up significant quantities of water (Holding 2009), and the Victorian Government announced that it would legislate to remove the limit in May 2009. However, the 10% limit was reached in the Campaspe, Goulburn and Victorian Murray systems in August and September and therefore delayed trades before its removal was legislated on 16 September 2009 (NWC 2010a).

Despite the removal of the 10% limit, the debate about ownership of water entitlements continues to fester. For example, there are signs of increasing interest in investments in water and agribusiness interests (Snow and Jopson 2010). This potential for new or non-traditional Australian and international investment in water products may reignite concerns and create pressure for government to (re)introduce ownership controls, despite the fact that the new water trading rules aim to prevent discrimination based on the identity of the owner and despite existing arrangements for the oversight of foreign investment by the Foreign Investment Review Board. The Select Committee on Agricultural and Related Industries recently recommended that an audit be undertaken to establish the extent of foreign ownership of commercial agricultural and pastoral land, and ownership of water, in Australia (SCARI 2010). Many fears about foreign ownership are likely to be overstated, as foreign buyers still have to get a return on entitlements and ultimately that means using or trading the allocations to those entitlements.

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21 Full details of the impacts of the limit on buyers and sellers are in PC (2010), ACCC (2010), NWC (2009) and Frontier Economics (2009).
Registers, water accounting and administrative arrangements to support trading

The reforms under the Water Act included a suite of measures designed to further streamline legal and administrative processes for water trading to address longstanding concerns that the procedures were too cumbersome, costly and time-consuming.

Delays in the processing of water trades have been identified as an area for further reform since at least 2006 (PC 2006). Concerns about delays and over-bureaucratic processes particularly relate to entitlement trading and interregional trading of allocations and entitlements (NWC 2011a). Delays and red tape have been seen as undermining the efficiency and effectiveness of water markets.

Similarly, the development of market frameworks that provide the option of trading water are generally not sufficient to stimulate trading. There is also a need for potential traders to have enough confidence and willingness to participate in the market.

Recent developments include new investments in registers, accounts and market information, and in more accurate metering.

New investments in data, accounts and market information

*Water for the Future* includes a number of national initiatives that aim to improve the quality and accessibility of water management and market data.

The Bureau of Meteorology and the MDBA both have new roles in water data collection and information management. In 2008, COAG’s agreed actions on water information and capacity building included the development of annual national water accounts, including a pilot account to be published by the Bureau of Meteorology (COAG 2008). Under the *Water Act 2007*, the bureau has statutory responsibility for compiling and delivering comprehensive water information across Australia. It also has an obligation to collect water information, including ‘information about rights, allocations and trades in relation to water’, and various parties are obligated to provide that information to the bureau. The Water Act also permits the MDBA to provide a basin-wide water rights information service to provide information on, for example, water access, water delivery and irrigation rights in the MDB. However, many of those initiatives are yet to come to fruition; progress is proving to be difficult because of the underlying complexities in measuring and monitoring water movement and use.

Despite improvements that had been made in the previous phase of reform, there was still substantial variation in the information that jurisdictions recorded, their registers’ compatibility with other registers, and public access to the information. In late 2009, the Australian Government announced the development of the National Water Market System (NWMS). The system aims to strengthen Australia’s water markets through the efficient management of improved state and territory water registers and water transactions and the availability of market information. The NWMS includes a web-based national portal to provide access to new summary market information and to existing state information (NWMS 2011).
Governments also agreed to report compliance against defined service standards and reporting frameworks for processing times for water trades (NWMS 2011). The provision of water availability information (the announcement of allocation determinations) also progressed from ad hoc information provision to a system of announcements on the 1st and the 15th day of each month in all states. Private trading platforms that provide information on spot prices for all water allocation trades have also emerged.

Efforts have been made to improve the reporting of water market prices, including through the National Water Commission’s Australian water markets reports and the NWMS, both of which rely on water trade data collected by the Bureau of Meteorology. However, a recent report by the Commission has documented problems in the availability and quality of price information (NWC 2011a). For example, the price information collected and disclosed under current arrangements may contain inaccuracies because existing mechanisms do not require accurate price disclosure, and because the data is not verified. For example, a large proportion of trades recorded on public registers show unfeasibly low, or zero, prices (NWC 2011a).

The poor quality of price data is due to a combination of misreporting by traders, a lack of mandatory disclosure requirements, and instances where no consideration is involved in the transaction (often due to transfers between related parties or business holdings, or transfers of water allocation between accounts held by the same owner). Trade processes and water registers are currently not able to differentiate between such transactions.

The Commission recommended that price disclosure and data collection be made mandatory, and that the data be monitored and verified:

\[\text{Improving the quality and availability of price information will increase traders’ ability to appraise the value of water under a range of market conditions, increase participation in the market and promote better detection of market aberrations. (NWC 2011a:xiii)}\]

Together, these reforms should improve the integrity, accountability and availability of information in water markets. Improved market information has the potential to:

+ improve allocative efficiency in market transactions
+ reduce transaction costs and uncertainty
+ limit the potential for water trading to result in unintended third-party impacts (such as those caused by metering inaccuracies)
+ help identify compliance issues and opportunities for more efficient water management.
Regulation and investment in more accurate metering and measurement

COAG committed to the National Framework for Non-urban Water Metering to improve the accuracy of water metering. The framework, which came into effect on 1 July 2010, sets out the foundations for nationally consistent water metering. It aims to provide an acceptable level of confidence that measurement performance in the field is within maximum permissible limits of error of ±5%.

In effect, this commitment means that all irrigation upgrade projects also require the replacement of noncompliant meters. This regulation particularly affects Dethridge meters, the most common form of metering in the MDB. As existing Dethridge meters have been demonstrated to systematically underestimate water inflows, their replacement provides an opportunity for governments to claim resulting reductions in water use as water savings, although this means less water available for agricultural production. Meter replacement is costly, and a significant proportion of public funding available for irrigation infrastructure modernisation projects is being used to pay for the upgrades.

Development of trading platforms

As water markets have grown and become more complex, there has been growth in the number of water brokers and other market intermediaries who bring together buyers and sellers and address administrative arrangements associated with trading. When allocation prices rose dramatically at the height of the drought, new intermediaries, many of them real estate agents, entered the complex field of deal broking and execution. Some irrigators have had bad experiences with some water market intermediaries and have called for governments to strengthen the regulatory oversight of intermediaries (including through licensing).

However, successive investigations have found that such problems are not widespread, and that many can be addressed through existing trade practices legislation and do not warrant heavy-handed regulation (Allen Consulting 2007, ACCC 2010a, NWC 2011a). Instead, a ‘watching brief’ and several light-handed approaches have been adopted or recommended. For example, COAG agreed in 2008 to disseminate information for water market participants to protect the interests of buyers and sellers and to improve contracting practices, including through the development of model contracts where appropriate (COAG 2008). The ACCC has also published guidance on dealings with water market intermediaries (ACCC 2011c). However, debate about the appropriate course of action continues.

Institutional and governance arrangements

A major focus of the 2007 reforms was on improving and clarifying institutional and governance arrangements in the MDB.
The establishment of the MDBA as an independent statutory authority means that, for the first time, a single agency is responsible for planning the integrated management of water resources across the MDB. The previous arrangements were widely perceived as dysfunctional and too driven by parochial state interests, to the detriment of water management. However, having a single responsible entity is not necessarily a guarantee of a good outcome. Arguably, the greater power bestowed on the MDBA contributed to its apparent failure to fully explore and assess the economic, social and environmental issues and trade-offs of concern to jurisdictions and other stakeholders in the initial development of the Basin Plan.

On a more positive note for water markets, the Basin Plan is to include water trading rules. Once they take effect (when new water resource plans are implemented by the states), a single set of rules will apply consistently across the MDB.

There has also been a renewed focus on the separation of regulatory, policy, service delivery and market participation roles, as envisaged in the NWI. As recently noted by the Commission:

> Through historical precedent more than by design, some organisations are performing a mixture of commercial, regulatory and operational functions in the water market. Their multiple roles may give rise to potential conflicts of interest.

> Such conflicts must be addressed to maintain participants’ confidence in institutional and governance arrangements. Damage to markets can be substantial if trust in institutions breaks down. This may occur if perceptions exist that organisations regulating the market are exploiting their position to benefit their own interest at the cost of other parties. (NWC 2011a:vii)

Some significant steps have been taken to address such conflicts. In particular, the ACCC has been established as an independent regulator of the water markets in the MDB, with responsibility for the regulatory oversight of the pricing and trading arrangements adopted by irrigation infrastructure operators.

However, some market participants are still concerned about actual or perceived conflicts of interest in water markets. For example, some are concerned that the Australian Government faces conflicts of interest because of its multiple roles in making and administering water policy, owning water entitlements, actively participating in the market as a buyer (and potentially as a seller), setting trading rules in the MDB and funding infrastructure renewals (NWC 2011a). In particular, given that the CEWH holds and can trade water, there is a real or perceived risk that the CEWH will be able to access market-sensitive information that would give it a competitive advantage over other market participants.
6.3 The current status of water markets

While Commonwealth-driven reform is still in its early stages, the water market is continuing to deepen and broaden, and its functioning is generally improving. Water trading is also playing a broader role in allocating water within and between the rural, urban and environmental sectors.

Although the system is functioning quite effectively, some rules still reflect local and state interests and the market is not functioning in a fully efficient manner.

Given the changes expected in irrigation, urban and environmental demands, stronger institutional and market governance arrangements may be required to continue to manage the inherent tensions in the allocation of scarce water resources. In its 2009 biennial assessment of progress under the NWI, the Commission found the following:

+ The annual 4% limit on trades of water out of irrigation areas was being reached in several basin states, with a wide range of undesirable consequences.
+ While significant progress had been made in unbundling water from land, additional reform was required in most states.
+ In some states, there had been delays in completing water planning, which had precluded water trading in most of those systems.
+ While there had been some improvements, delays in processing transactions, especially trades of water access entitlements, continued to undermine the efficiency and effectiveness of water markets.
+ Water allocations and water access entitlements remained the most widely traded water products, while other instruments had been slow to develop. The development of a wide range of different products would enable better risk management and better matching to the particular needs of different water users (including irrigators, environmental water managers and urban water corporations).
+ There were a number of other potential constraints on the development of fully transparent, competitively neutral and efficient water markets, which should be examined (NWC 2009).

6.4 Where to next?

Despite their successes, water markets in Australia are still at a relatively formative stage compared to markets for other goods and services. The points outlined in this chapter indicate that the legal, administrative and regulatory arrangements underpinning the market need to evolve further to deal with growing demand.

The National Water Commission has identified a number of priority areas for further reform in existing and formative water markets (NWC 2011a), including the following:

+ State and territory water management agencies should identify groundwater areas that would benefit from groundwater trading and prioritise reforms to support trade in those areas.
+ The quality, extent and transparency of information on trade processing need to be improved, and information on trade processing performance standards expanded.
Formal public disclosures of conflicts of interest should be made by all organisations with combined water market and water management roles. Arrangements for managing such conflicts should also be disclosed, and structural separation should be considered where compliance is not adequate. In particular, the Australian Government should require greater disclosure and transparency in the operations of the CEWH.

Price disclosure and data collection need to be mandatory, and the data should be monitored and verified.

The public disclosure and transparency of allocation determinations should be improved, and information supporting determinations should be provided to the market.

The water market intermediary industry should improve its business practices, and further efforts should be made to improve traders’ and intermediaries’ knowledge of their rights and obligations under existing law. Monitoring should continue, and the costs and benefits of a registration scheme should be considered.

Jurisdictions should carry out the necessary water planning and resource assessments to enable trading in formative markets outside the MDB. They should proactively establish effective trading systems and institutional and administrative arrangements to support emerging markets in order to avoid ‘legacy’ problems.

More generally, the trend towards increasing sophistication and complexity in the demands placed on water markets is likely to place pressure on policymakers to ensure that the market design evolves accordingly. The confidence of market participants can be damaged by ad hoc policy and regulatory decisions. Therefore, there is a need to ‘stay ahead of the game’ and address problems before the system is pushed to the brink by the next round of extreme weather. For example, there have been calls for improved unbundling of access, storage and delivery rights (Campbell 2005, PC 2006, PWC 2006, Brennan 2010).

In tackling these challenges, a key question is whether further incremental adaptation of existing rights is sufficient, or whether more fundamental redesign is required. Given the changes in market participants and the nature of their demands, it may no longer be safe to make incremental management decisions based on the assumption that markets will produce only marginal changes in water-use patterns.

Addressing overallocation and overuse in the MDB is a more immediate priority. Australia has not yet reached the point where water markets are operating within a cap that reflects a sustainable level of extractions, and ongoing uncertainty has obvious implications for the objective of providing entitlement holders with confidence and security to make investment and adjustment decisions. The government’s decision to purchase entitlements in the market rather than contemplate uncompensated reductions does limit the direct threat to the security of entitlements. In fact, Commonwealth buybacks are a notable international example of the use of market-based mechanisms to address the legacy issue of overallocation. However, uncertainty will remain, and water markets cannot be considered sustainable, until there are both a broader consensus on the nature and extent of flow-related environmental problems and a clear strategy in place to deal with them.
Section 7:
The results of water market reforms
7 The results of water market reforms

Economic theory suggests that well-designed markets will work to maximise the value of water resources to society. It was expected that water markets would result in:

+ short-term reallocations of water in response to variability in seasonal water availability and commodity market conditions (*allocative efficiency*)
+ long-term reallocations of water in response to market opportunities and adjustment pressures, including those related to the legacy of centrally determined patterns of irrigation development (*dynamic efficiency*)
+ investments in on-farm water-use efficiency and off-farm infrastructure (*productive or technical efficiency*).

Because transactions are voluntary, it can be assumed that they occur only when both buyers and sellers expect to be better off as a result. However, there are risks that poor market design may lead to a market failure in which trading creates spillover impacts on other users and the environment. There have also been concerns that the rapid movement of water out of some regions may result in social dislocation and community adjustment costs.

This chapter provides evidence of the results of water trading, focusing on the period since the mid-1990s when trading expanded rapidly. The chapter:

+ provides an overview of water trading activity (Section 7.1)
+ examines the economic impacts of water trading (Section 7.2)
+ examines the impacts of water trading on regional economies and communities (Section 7.3)
+ examines the impacts of water trading on the environment (Section 7.4).

The theoretical benefits of water trading were put to the test during the 2000s, when there were a severe and prolonged drought and rapid changes in the market conditions for key agricultural commodities. This chapter provides strong evidence that the market passed that test with flying colours.

7.1 An overview of water trading activity

As noted in Section 2, over 90% of water trading activity occurs in the southern MDB. The volume of water allocation and entitlement trading has grown significantly since the introduction of trading (Figure 7.1). The first significant increase was in 1994–95, when there was a large drop in seasonal water availability for the first time since the introduction of water trading.
Figure 7.1: Volumes of allocation and entitlement trades in the southern MDB, 1983–84 to 2009–10


The second boost to water trading occurred in 2002–03. The severe drought in that year prompted a step-change increase in the proportion of water allocations that were traded, from around 7% to almost 15% (Figure 7.2).

Figure 7.2: Water allocation sales as a percentage of water allocated in the southern MDB, 1998–99 to 2009–10

Source: NWC (2011b).
The third increase in water trading activity occurred in 2007–08, when the proportion of southern MDB water allocations traded more than doubled again to 41%. Interestingly, the higher levels of allocation trading were maintained in 2009–10 despite improved water availability in that year.

Allocation trading has traditionally accounted for most water trading in the southern MDB by volume. However, total entitlement trade volumes increased substantially from 2007–08. Entitlement trades included government purchases of entitlements for the environment, particularly in 2008–09 and even more so in 2009–10. However, much of the observed increase is attributable to entitlement trading between irrigators (Figure 7.1).

There is evidence supporting the proposition that water market price signals adjust to seasonal conditions. Figure 7.3 demonstrates the strong inverse relationship between the availability of water and prices for allocation trades. Allocation prices peaked in early 2007–08 on the back of concerns that the extremely low allocations in 2006–07 might be repeated. In contrast, 2009–10 was characterised by substantially lower prices because water availability had improved, and prices decreased steadily over that season as water availability increased further.

**Figure 7.3: Average water allocations and average allocation prices in the southern MDB, 2007–08 and 2009–10**

While seasonal variations in water availability and short- and long-term changes in the fortunes of different agricultural activities were major drivers of water trading, the willingness of irrigators to participate in the market increased significantly over this period (see NWC 2011b).
The changed attitudes of irrigators reflected their growing acceptance of water allocation and entitlement trading and greater understanding of how the market operates (NWC 2010b). Simply learning the administrative processes involved in water trading can take time and effort. As the market became established, more and more irrigators developed farm management strategies that involved water trading. Market participants are continuing to adapt over time (Wheeler et al. 2011), becoming more sophisticated in their use of the market and trading when it is in their best interests to do so (Bjornlund 2005, Frontier Economics et al. 2007, NWC 2010b). The growing adoption of water trading can also be attributed to improvements in the functioning of the water market, which reduce transaction costs to buyers and sellers.

Preliminary data from the Commission’s water trading supplement to ABARES’ irrigation survey22 shows that 43% of surveyed irrigation farms in the southern MDB traded water allocations in the three years to 2010–11. An estimated 47% of horticulture farms, 32% of broadacre (rice and cotton) farms and 40% of dairy farms traded water allocations over that period. Most irrigators indicated that they found the process of trading temporary water allocations to be easy (89%), reliable (84%) and affordable (72%).

Fifteen per cent of surveyed irrigators traded water access entitlements in the three years to 2010–11, including 11% of horticulture farms, 11% of broadacre farms and 17% of dairy farms. Around two-thirds of the irrigators who had traded entitlements had sold their entitlements; most (69%) indicated that the main reason for selling was to generate cash. The most common use of the proceeds from selling entitlements was to pay off debt (59%). Of those farmers who traded entitlements, 44% stated that they sold to the Australian Government, while 20% stated that they sold to another environmental purchase program. Around one-quarter of irrigators who sold entitlements were planning to cease irrigation, while a further 38% had bought temporary water allocations since selling their permanent water access entitlements. Most irrigators felt that the ability to trade water entitlements had helped their farm business (91%).

7.2 Economic impacts

Aggregate economic impacts

Economic modelling undertaken for the Commission estimated that water trading between irrigators in the southern MDB increased Australia’s gross domestic product by $220 million and gross regional product in the southern MDB by over $370 million in 2008–09. The difference between the two estimates demonstrates that trading maintained productive capacity and economic activity in the southern MDB that would otherwise have moved to other parts of Australia during the drought. The modelling found that all states benefited from trading—New South Wales by an estimated $79 million, South Australia by $16 million and Victoria by $271 million in 2008–09 (NWC 2010b).
Within the irrigated agricultural sector as a whole, according to the Australian Bureau of Statistics, water available for use dropped by 53% between 2005–06 and 2008–09. Meanwhile, the bureau’s experimental estimates of the gross value of irrigated agricultural production (GVIAP) indicate a drop of only 29% over the same period (from $5.5 billion to $4.3 billion). The fact that GVIAP fell by less than the drop in water availability is broadly indicative of the allocative efficiency benefits brought about through the movement of water, particularly to high-value horticultural enterprises. However, there are a number of acknowledged problems with GVIAP as a measure of the productivity of water. In particular, GVIAP does not consider price movements over the period; nor does it recognise the fact that many dairy farmers substituted water for other inputs (see below). Therefore, it is important to demonstrate the results of water markets at the individual and industry levels.

**Industry and individual irrigator impacts**

At the individual producer and industry levels, water trading was vital for the rice, dairying and horticulture industries in the southern MDB during the drought. These key industries are geographically concentrated: rice growing is mainly located in the NSW Murray and Murrumbidgee regions, dairying in the Victorian Goulburn–Murray Irrigation District and horticulture in South Australia and the Victorian Sunraysia region.

In drought years, a clear pattern of water movement associated with interregional allocation trading has emerged. As shown in Figure 7.4, in 2008–09 water generally moved downstream from rice growers in New South Wales to horticulturalists in Sunraysia and South Australia.

That pattern of trade is indicative of significant allocative efficiency gains, as limited water moved from producers with flexible irrigation demands to those with inflexible demands, including those who own long-lived perennial horticultural assets. The movement of water was complemented by a compensating flow of payments in the other direction, which helped maintain the viability of individual farm businesses.
Figure 7.4: Interregional water allocation trading in the southern MDB, 2008–09

Note: The movement of water to South Australia includes significant purchases for urban water users in Adelaide.
Source: NWC (2011b).

Rice

Rice production in Australia is concentrated in the Riverina area of the MDB, along the Murray and Murrumbidgee rivers in New South Wales. The rice industry is highly vertically integrated: about 1500 farms supply the grower-owned company, Sunrice, which does the vast majority of the storage, milling, processing and marketing of Australian rice.

Rice is an annual crop, so rice growers only need water in a given year if they plant a crop. They can produce when water is relatively abundant and sell water in the market to provide them with additional income when water is scarce. The flexibility of rice production is well suited to the annual variability in water availability in the MDB and the flexibility of water markets.
Most rice growers hold New South Wales general security entitlements in the Murray or Murrumbidgee systems. As shown in figures 7.5 and 7.6, rice production and water trading are extremely dependent on the size and price of allocations to those entitlements. Rice growers make decisions early in the irrigation season about how much rice to grow, based on initial water allocation announcements, the expected price of water, and the price on offer for rice. In some years, they sell their water rather than using it to grow rice, but rice production expands when water is plentiful.

**Figure 7.5: Riverina rice production and end-of-season allocations to general security water entitlements, NSW Murray and Murrumbidgee, 1998–99 to 2010–11**

Rice production peaked in 2000–01, when 2499 farmers in the NSW Riverina grew a record 1.74 million tonnes (Figure 7.5). However, the prolonged drought had a massive impact on production from 2002–03 onwards. Figure 7.5 shows that production fell even more significantly in the four years from 2006–07 to 2009–10. In 2007–08, a mere 38 farmers produced just 19 000 tonnes of rice in the Riverina. Despite the fact that rice prices increased, encouraging production, drought-induced low water availability and high water prices made it unviable to grow a crop.

Water trading has been vital in helping rice growers respond to seasonal conditions and has provided them with much-needed income. Trading in seasonal water allocations, in particular, has proved essential for growers. As the price for water allocations rose above the threshold determined by individual rice growers as viable for rice production, they tended to sell allocations. During the drought years, they could make more money, with less risk, by selling their water. For example, in the NSW Murrumbidgee:

+ in 2007–08, when a net volume of 139 096 ML was traded out, the mean water price was $495/ML and the expected gross margin for rice was $150/ML
+ in 2008–09, when 390 000 ML was traded out, the mean water price was $375/ML and the expected gross margin for rice was $260/ML (MDBA Water audit monitoring reports, National Water Commission Australian water markets reports, NSW Department of Primary Industries farm budgets.

Despite the limited allocations available to sell, rice growers particularly benefited from the high water allocation prices on offer in 2007–08 and 2008–09. Figure 7.6 shows the strong correlation between the price of water allocations and the volume of allocations traded out of rice-growing regions (especially the Murrumbidgee). Even though prices for rice were up at that time, it still made financial sense for rice growers to sell their limited water allocations and cease rice production.
For many, water sales were their only source of income for four dry years from 2006–07. Trading helped them survive and they are now able to respond to improved conditions. Improved water availability in the Murray and Murrumbidgee systems, combined with low water prices, mean that rice growers are once again using the water allocated to their entitlements and buying allocations to expand production. Rice production is back on line in the Riverina, rebounding to approximately 800 000 tonnes in 2010–11 and once again making a significant contribution to Australian agricultural exports and rural economies.

**Dairying**

Australia’s major export-oriented irrigated dairy industry is located in northern Victoria and southern New South Wales. According to Dairy Australia, the estimated farm-gate value of production in the region in 2009–10 was $610 million. There are 14 dairy factories in the region, including milk processing, milk collection and dairy product manufacturing plants (Dairy Australia 2011).

Water is a key input in irrigated dairy production, and the drought had a big impact. However, irrigated dairying can be thought of as a semi-interruptible production process. There are opportunities for dairy irrigators to avoid using water to grow fodder. Instead, they can buy fodder, move cattle elsewhere and vary their herd size. Dairy farmers can also switch between annual and perennial pastures based on their exposure to water availability risk. Therefore, water-use and trading decisions are more complex for dairy farmers than for irrigators in other industries.
Given the substitutability of irrigated pasture and purchased fodder as feed sources, the water trading behaviour of dairy producers depends on water allocation prices and prevailing fodder prices (as well as milk prices). Most dairy farmers now understand the water allocation price at which they should move from buying more water to selling water. Their break-even point depends on the prevailing price of alternative feed and the milk price. In 2007–08, when allocations in the Murray system dropped dramatically and horticulturalists purchased large volumes of water, the decision to sell allocations was straightforward. The high prices for water provided much-needed income, which could be used to buy feed and maintain production.

Figure 7.7 shows that the proportional reduction in milk production in northern Victoria was much less than the reduction in water availability (in the Goulburn system). This was primarily due to the potential to sell remaining water allocations at a high price and instead purchase fodder.
Water allocation trading has proved to be central to the decision making of dairy farmers, helping them increase or maintain production, maintain their herd size, and generate additional income. The ability to trade water provides flexibility to determine the best mix of inputs at any point in time.

Water entitlement trading has also enabled the dairy industry to respond to the prolonged drought, long-term adjustment pressures and fluctuating market fortunes. ABARES irrigator survey results from 2006–07 to 2008–09 indicate that, on average, dairy farmers in the MDB had negative farm business profit and very low or negative rates of return on their assets during the drought. The ability to trade entitlements separately from land means that irrigators in financial trouble did not necessarily have to sell their farms and water assets; many chose to sell their water, lease out their land and remain on the property. Furthermore, the opportunity to sell water entitlements to the Australian Government’s buyback program has had a significant impact on the dairy industry. Many have seen the program as an opportunity to reduce debt and change their farming strategies. The remaining irrigators have generally become more dependent on annual purchases of water allocations and carryover. Most have converted to annual pastures, which are more flexible. In this way, allocation and entitlement trading are used as part of a combined strategy.
Horticulture

There has been a significant expansion of horticulture in the southern MDB over the past decade, particularly in wine grapes, almonds and olives in the Victorian Sunraysia, NSW Riverina and SA Riverland. For example, Australia’s almond industry is one of the nation’s fastest growing horticultural sectors. As new plantings mature, the current farm-gate value of almond production of $250 million per year is expected to increase to $600 million by 2016. Wine grape production also developed rapidly in the early to mid-2000s, but a glut in the wine market has led to a significant restructuring of the industry.

Water trading has played a key role in the horticultural industry, particularly in the Victorian Sunraysia and SA Riverland regions. Access to irrigation water is essential, and with a cap on total water use in place in the MDB the ability to purchase water has underpinned new developments on greenfield sites. The horticultural industry could not have developed in the MDB over the past decade without water markets.

During the investment phase, horticulturalists preferred to purchase high-reliability entitlements. Unlike annual crops such as rice, almond trees and grapevines have relatively fixed water requirements. Unlike dairy farmers, who can buy in fodder to substitute for irrigated pasture, horticulturalists have no alternatives to irrigation. Buying high-reliability entitlements gives them a way to manage the risk of having to purchase allocations at high prices in dry years.

Buyers of entitlements were typically large private greenfield developments pumping directly from the river. Their investment decisions were driven by high prevailing wine grape prices and strong demand growth forecasts, as well as tax-effective managed investment schemes. Cummins and Watson (2007) found that interstate entitlement trading led to rapid expansions in the total area irrigated, first in the wine industry and then in the almond industry in the Victorian Sunraysia and SA Riverland regions. The area of land devoted to the almond industry (over 90% of which is in the MDB) expanded rapidly from 4595 hectares in 2000 to over 29 200 hectares in 2010 (Almond Board of Australia 2010).

Farm managers have purchased entitlements progressively in accordance with development plans and increasing water requirements as trees and vines mature. Without an active water market, including for water access entitlements, the development of the almond and wine grape industries could not have occurred in the same manner.
Most of the entitlements acquired during the horticultural development phase were purchased from dairy farmers in the Victorian Goulburn–Murray Irrigation District. However, there were also significant entitlement sales out of the old public irrigation districts in the Sunraysia region from 2002–03. Small block sizes meant that farmers were at a significant disadvantage compared to larger private developments, and required supplementary off-farm income (NWC 2010b). Importantly, entitlement purchases by horticulturalists provided sellers with a return on their water assets as they made adjustment decisions.

Despite the investments in entitlements, water allocation trading played a critical role in ensuring that horticulturalists could survive the severe drought, particularly in 2007–08 and 2008–09 when seasonal allocations dropped below 100%. To make up for the shortfall, horticulturalists had to enter the market and buy allocations (Figure 7.8).
Figure 7.8: Allocations available to high-reliability water entitlements and net allocation purchases in the Victorian Murray system, 1998–99 to 2010–11

Note: South Australian figures exclude water purchases for urban water use.

Sources: South Australian, Victorian and New South Wales governments; MDBA Water audit monitoring reports.
In the recent survey by ABARES, 63% of horticulture farms in the Murray region traded water allocations in the three years to 2010–11. Purchases of additional water allocations kept almond trees and vines alive and helped to maintain production. Without the water market, it is likely that many trees and vines would have died.

In the rush to secure their water supplies in the dry early months of 2007–08, many horticulturalists entered the market, contributing to very high prices (Figure 7.9). Although water scarcity was just as acute in 2008–09, the extremely high prices were not repeated, partly because horticulturalists had learned from the previous season and spread water purchases more widely across the season.

**Figure 7.9: Water allocation prices in Murray Zone 7, 2007–08 and 2008–09**

![Graph showing water allocation prices](image)

Source: NWC (2011b).

Two of the objectives of the development of water markets in the MDB were to enable new development within a system with overall caps on water use, and to allow water to move to where it is most needed in response to seasonal water availability. The horticulture example illustrates that these goals are being met.

Wine grape growers are now subject to low commodity prices and a wine glut, but the sale of water entitlements, particularly to the Australian Government’s buyback program, is helping adjustment in the sector.
Summary of benefits to individual irrigators

The ability to trade water has provided flexibility in water use, production and farm management that was not previously available (NWC 2010b). This helped water users manage risk and debt in response to the drought and other external factors (such as commodity prices and exchange rates) and their own business objectives. As the Commission has previously stated:

“Irrigators react to prevailing and expected conditions—farm managers continually modify their production and input decisions to maximise their financial position. Water is just one input to the production process that must be optimised, along with labour, pesticides, fertilisers and machinery. The benefits of water trading revolve around the increased flexibility that trading gives individual water users. Water trading enhances irrigators’ ability to optimise water use. (NWC 2010b:21)”

Water access entitlements provide ongoing access to annual water allocations, so entitlement trading decisions tend to underpin longer term investment and structural adjustment decisions, including decisions on changes in production (for example, a switch to dryland farming) or even decisions to exit from the industry. As noted by the Victorian Department of Sustainability and Environment:

“The sale and purchase of entitlements are driven by irrigation trends—that is, adjustment towards more economically-efficient irrigated production. For irrigators wishing to expand their business, the water market makes it possible to source additional entitlements. Conversely, for struggling irrigators the market makes it possible to exit the industry or to restructure in favour of different crop mixes. The data demonstrates that value is being created for both buyers and sellers as some irrigators permanently reduce their irrigation, while others purchase additional water for ongoing use. The market facilitates adjustment in the irrigated agriculture sector. (DSE 2008:50)”

Urban water users

Rural–urban water trading remains subject to a number of policy and institutional barriers. However, where purchases of entitlements and allocations were possible, they had significant economic and social benefits in alleviating urban water security challenges and water restrictions during the drought. For example, urban water authorities in Adelaide, Bendigo and Ballarat all made use of the water market in the southern MDB to handle urban water shortages (see NWC 2010b).
7.3 Impacts on regional economies and communities

Considerable public debate has focused on the potential negative economic and social impacts of movements of water out of local or regional economies (for example, see Fenton 2006 and Edwards et al. 2008). The logic driving this argument is that:

+ aggregate changes in water use due to trading can have direct impacts on local/regional irrigated agricultural production and other water-using activity
+ the regional economy may be indirectly affected by changes in purchases of inputs or sales of outputs to associated industries, and by local expenditure by irrigators on other goods and services
+ those changes flow into broader economic activities (for example, non-agricultural services and industries) and affect the viability of community services.

The Commission’s previous investigations of these issues found that the drought, not water trading, was the biggest driver of changes in water use at the regional level. While trading drove some changes in regional water use, those changes were typically less than 10% compared to estimates of water use without trading. In comparison, drought led to a reduction in water availability of up to 80% in some cases, such as in the NSW Murray system. From 2007–08, trading led to larger movements of water from the Victorian Goulburn and NSW Murrumbidgee regions to South Australia and the Victorian Murray, although drought remained the biggest factor affecting overall water use (NWC 2010b).

Given water trading’s relatively small impacts on regional water use, it is very difficult to attribute any regional economic or social change to the impacts of trading. Based on Australian Bureau of Statistics Census data from 1996 to 2006, there was no discernible link between outward trades of water and regional socioeconomic measures, such as population and employment in agriculture. Observed changes in broader economic and social indicators were similar across the regions assessed, regardless of their water trading history. This indicates that other factors (such as drought and social trends in rural communities) were more important drivers of those changes.

Declines in water use due to trading are likely to have had some flow-on impacts on associated industries and communities at the local level, such as in rice-growing areas in southern New South Wales and the Pyramid–Boort region in northern Victoria, but trading was not the main driver of those changes—it merely enabled structural adjustment to occur. Reallocation of water from one area had benefits in another. However, rapid increases in water use due to trading in Robinvale (in the Victorian Sunraysia region) increased economic activity but placed pressure on housing, community services and other infrastructure, such as electricity distribution systems (Frontier Economics et al. 2007).

The debate about the impacts of water trading out of a region often distinguishes between different types of water trades. In particular, there has been greater community acceptance of seasonal allocation trading than there has been of entitlement trading. Similarly, trading of water between irrigators within a region (intraregional trade) has generally been viewed as beneficial (Frontier Economics et al. 2007). In combination, communities’ concerns have been used to justify annual limits on interregional entitlement trading activity.
However, in assessing the regional impacts of water trading it is important to examine the net impact of all types of water trading (Frontier Economics et al. 2007). Allocation and entitlement trading are often interrelated parts of an overall trading strategy. In this regard, it is not clear that restrictions on the outward trading of entitlements have assisted regional communities. The economic impact of trading on the regional economy is determined not only by the movement of water, but also by what the seller does with the proceeds. Therefore, restrictions reduce the income that might otherwise have flowed into a community from sales of entitlements. Moreover, restrictions may preserve water-use practices that might no longer be economically viable, environmentally sustainable or suited to prevailing conditions, and are unlikely to prevent reductions in local water use because of allocation trading. Also, if the market is working without restriction, water will move back to regions when and if industry prospects improve.

7.4 Impacts on the environment

One of the early concerns raised about water trading was the potential for it to exacerbate environmental problems.

In principle, water trading can cause adverse environmental impacts if it leads to more water being used in absolute terms (particularly where water is overallocated), more water being used in inappropriate areas, or reduced river flows (for example, where trade increases the amount of water extracted for irrigation upstream in a river catchment and reduces the amount that would otherwise flow down the river to be used by irrigators further downstream).

Stringent approvals processes were put in place to vet potential trades and prevent those that could be environmentally damaging (such as trades that move water into high-salinity zones). In addition, systems of site use licences generally require water users to adopt appropriate land management plans as a condition for being able to use water at a specific location.

Evidence suggests that the impacts of trading on river flows over the past decade have been very small compared with the impacts of water resource development and drought (NWC 2010b).

Until 2007–08, trade impacts on water flows were most noticeable at the ends of the Murrumbidgee, Loddon, Campaspe and Goulburn systems. Some impacts were also identified in the Broken River and South Australian Murray River. Furthermore, hydrological assessments indicate no detectable impact from changes in the timing and location of flows caused by trading on key ecological assets in the southern MDB (including the Living Murray Icon sites, Ramsar-listed wetlands and nationally important wetlands). In fact, during the severe drought conditions, the increases in flows due to trading were beneficial to the health of stressed river systems (NWC 2010b).

Trading can also affect in-stream salinity. However, such effects are managed and offset at the state level through the interjurisdictional Basin Salinity Management Strategy.
Analysis of patterns of water trading also suggests that trading has tended to move water away from degraded areas of low productivity (often caused by problems such as rising watertables in sandy soils) towards areas where more sustainable land-use practices can be used. However, differences in the water-use characteristics of buyers and sellers can result in a range of positive and negative environmental impacts. The overall effect is difficult to determine and is likely to vary between regions. In most cases, water use licences are appropriate instruments for managing negative impacts (NWC 2010b).

In summary, water trading in itself is not a cause of the severe environmental problems that have arisen in the MDB. While the initial move to enable trading did activate ‘sleeper’ and ‘dozer’ licences that may have contributed to the excessive use of water, the underlying problem is that of overallocation of the resource.

Most recently, water markets have been used as a tool to transition water extraction in the MDB onto a more sustainable footing through a number of government buyback programs. As discussed in Section 6.2.1, by 30 June 2011, 992 GL of entitlements (a mix of high and low security) had been purchased under the Australian Government’s buyback program (DSEWPaC 2011f). The Commonwealth Environmental Water Holder will be able to use water allocated to those entitlements to meet the flow-related environmental objectives being developed as part of the Basin Plan.
Section 8:
Key lessons
8 Key lessons

Australia now has around two decades of experience in the establishment and implementation of water markets and can legitimately be seen as being among world leaders in the market-based allocation and management of scarce water resources.

Lessons from the successes and shortcomings of that experience could guide reform in other settings and could help others to establish workable markets in less time. In summary, the lessons are as follows:

1. It is feasible to develop working water markets in complex hydrological systems, including across jurisdictional boundaries.

2. Well-designed water markets can deliver significant benefits in any system where water is scarce by signalling the value of water dynamically.

3. There are universal physical and economic characteristics that suggest where water trading will be most beneficial, such as where:
   + resources are fully developed for consumptive use
   + there is variability in seasonal water availability and variability between connected systems within seasons
   + there are a large number of connected water users
   + water users have varying demands and degrees of flexibility to respond to water shortages
   + water users are exposed to the cycles of global agricultural markets
   + demands for urban and environmental water are increasing
   + there is pressure for change in the existing structure of water-using industries.

4. Despite those universal characteristics, water market design needs to be informed by the history and specific characteristics of local water resource management.

5. Universal prerequisites for effective water markets include:
   + setting an effective cap on total sustainable extractions (preferably before scarcity becomes acute)
   + establishing entitlements that are clearly specified, monitored and enforced so that users know exactly what they can buy and sell
   + establishing a sound regulatory and governance framework within which water trading can take place
   + implementing fundamental elements of good water management, such as metering and water accounting.
6. An incremental approach to water market development is appropriate to manage uncertainty and stakeholder concerns, but benefits will be forgone if suboptimal arrangements are left in place too long.

7. Measures to address environmental and social outcomes that could be affected by water trading should be carefully considered and targeted to limit interference with the operation of the market. Some interventions, such as restrictions on trade, are costly and have unintended negative consequences.

8. Market participants learn quickly and make decisions based on the rules that are in place. Any efforts to stifle market development or impede progress inevitably lead to creativity by market players, which may have unintended consequences for property right holders.

9. As water markets mature and develop, roles and responsibilities influencing market outcomes need to be assigned carefully to avoid conflicts of interest, which can undermine reform objectives.

The remainder of this chapter examines each of these nine lessons in more detail.

### 8.1 Working water markets in complex hydrological systems are feasible

Perhaps the most important lesson is that effective and robust water markets can be developed despite the real challenges in matching an abstract economic tool to a complex hydrological system. Carefully framed trading rules and complementary mechanisms can ensure that water that is bought and sold in a financial transaction can be physically delivered without adversely affecting other users or the environment. While Australia’s market measures are incomplete (for example, they do not fully capture interception activities), they have survived a number of major tests, including drought and a considerable geographical expansion of trading.

Importantly for international settings, the Australian experience shows that it is also possible to develop water markets that can operate across jurisdictional boundaries. Despite historically state-based water market development, recent efforts have enabled cross-jurisdictional markets in the southern MDB to be integrated in a workable, albeit suboptimal, manner.

In progressing with water market reform, it is critical to continually make the case for change and to build acceptance and the capacity of water users to engage in trade where it is beneficial. In Australia, political decisions to enable water trading were often made in response to pressure from potential buyers and sellers during periodic droughts. There will always be opponents to change. Therefore, it is important that such opportunities are used effectively to drive change. However, the Australian experience shows that this will only be possible and effective once bureaucrats and their advisers work out how economic concepts can be implemented to address problems. Having the water market tools ‘on the shelf’ and ready to roll out was vital to the initial establishment of markets in the southern MDB.
8.2 Markets can deliver benefits in any system where water is scarce

Water markets in Australia have generally achieved their intended objective of efficiently allocating scarce water between competing uses in response to seasonal variability and longer term adjustment pressures and investment opportunities.

Over the past decade, in particular, water trading has become an essential business tool for irrigators in responding to severe drought and market fluctuations, with flow-on benefits to key irrigated agricultural industries, the states and the MDB economy. Water users have been able to exercise increased flexibility in how they operate, manage their risks and utilise their capital. Markets can also be a cost-effective tool for dealing with overallocation and addressing flow-related water requirements.

Overall, markets have enabled water use to evolve in ways bureaucrats would never have envisaged. It is inconceivable that administrative allocation systems could have responded to the dynamic changes and challenges in the supply and demand for water in the MDB over the past decade.

8.3 Universal physical and economic characteristics suggest where trading will be most beneficial

The supply and demand characteristics of water systems vary considerably across Australia and internationally. However, water trading is likely to be useful in any system in which water access is limited through caps on extraction or periodic shortages. In such capped systems, the alternative is for governments to make water allocation decisions, which may leave water users unable to respond to dynamically changing events.

Water markets are likely to be beneficial where:

+ resources are fully developed for consumptive use (that is, where scarcity exists)
+ there is variability in seasonal water availability
+ there is variability in water availability between connected systems within seasons
+ there are a large number of connected water users
+ users have varying demands and degrees of flexibility in responding to water shortages
+ water users are exposed to the cycles of global agricultural markets
+ demands for urban and environmental water are increasing
+ there is pressure for change in the existing structure of water-using industries, for example because of the historical irrigation development of small land parcels that are no longer viable for family farm enterprises, or worsening environmental problems such as salinity.
8.4 Market design should be informed by the history and characteristics of local water resource management

A key lesson is that water markets need to be designed to reflect their physical and institutional settings. Rather than attempting to apply any particular model, it is essential to understand the system that is in place and the local problems that trading might address.

In particular, it is important to recognise:

+ different user types: such as the characteristics of irrigating industries and different potential mixes of agricultural, hydroelectric, urban and industrial water users.

+ different water system characteristics: for example, many international systems have water available during peak demand periods due to summer rains or snow melts, which is the reverse of water availability in the southern MDB, where storages generally fill in winter and water demands are greatest in summer. This may affect the design of markets and the trading patterns that might be expected.

+ different water resource variability: Australian river flows are highly variable compared to flows in many large water systems in other countries.

+ density of users within a region: this is important for establishing sufficient market depth.

+ access to technology and managerial expertise: there may be limitations in establishing markets in developing countries where technology and expertise are in short supply.

In some regards, the pre-existing features of water systems in Australia were fortuitous for the development of markets. The early move to state control over water resources, rather than riparian water rights, is the key example.

Some of the missteps in the Australian water market reform story can arguably be traced to instances where the water managers and political masters of the day forgot the national history of water politics and management. While it is important to consider existing institutions, that should not prevent governments from making bold reforms where required. There is a need to look past historical precedents and fixed cultural norms.

Accordingly, the Commission would not advocate blindly transposing the water market arrangements in Australia to other countries. However, the Australian challenges are not unique. Water scarcity is an increasingly important global problem, and benefits can be obtained through the development of effective water markets.
8.5 There are universal prerequisites for effective water markets

The history of water market development in Australia suggests a number of prerequisites for establishing an effective water market:

+ setting an effective cap on total sustainable extractions as a critical first step before scarcity becomes acute (that is, cap first, then trade).
+ accurate entitlement specification (users need to know exactly what they can buy and sell).
+ a sound regulatory and governance framework within which water trading can take place
+ fundamental elements of good water management, such as metering and accounting, to enable trade in volumetric water rights.

Setting an effective cap

An important lesson from the experience in Australia is the need to get high-level allocations between consumptive and non-consumptive uses right. Setting a cap based on historical levels of development, rather than on environmental requirements and consumptive demand, creates problems.

Deferring such decisions only makes them harder. Uncertainty about the timing, nature and extent of government intervention to address the legacy of overallocation remains a key factor influencing irrigators’ investment and water trading decisions. As a result, it is sometimes argued that Australia should not have moved to a market-oriented system until overallocation had been addressed. However, once a cap on use was put in place, the ability to trade water became critical. Without water trading, the economic and social costs of the drought in the MDB would have been much worse than they were.

Specifying entitlements

One of the most important preconditions for trading is that water extractions can be measured and water rights can be clearly specified, monitored and enforced. The Australian experience highlights the benefits of:

+ limiting entitlements for connected surface water and groundwater resources at the same time to manage the potential for caps on one type of resource to be obviated by uncontrolled use of the other
+ establishing clearly specified, tradeable property rights before scarcity becomes acute
+ taking into account permitted water use that is not currently being fully utilised (in Australia, ‘sleeper’ and ‘dozer’ licences)
+ defining access rights as a share of available resources rather than as a fixed periodic volume
+ having robust allocation methodologies that work under highly variable seasonal conditions
+ defining delivery rights and arrangements for transmission losses associated with trade
+ considering return flows and market incentives to promote investment in on-farm water use-efficiency, which reduces (sometimes beneficial) flows back to the river system
+ making available entitlements with different reliabilities to allow users to choose their own appropriate mix or portfolio of water property rights
+ controlling interception activities.

**Establishing a sound regulatory and governance framework**

Water markets need to operate within a set of rules that ensure that market transactions can be translated into the movement of water between different users, without resulting in adverse impacts on third-party water users or the environment. An important lesson from the Australian experience is the need to ensure that excessive or cumbersome regulation of water markets does not undermine their development. This can be achieved by:

+ addressing third-party impacts with targeted instruments, rather than imposing excessively cumbersome regulation or blanket restrictions on water trading
+ ensuring that rules governing trading are not controlled by parties with a vested interest in trading (such as irrigation cooperatives)
+ establishing robust registration and titling systems that reflect the underlying value of the assets being traded
+ ensuring that are no artificial constraints on the financial ‘products’ that can emerge.

**Establishing the elements of good water management, such as metering and accounting**

Water markets are reliant on information about individuals' water extraction and use. It is therefore essential that extractions are measured and that effective monitoring and compliance systems are in place. Where such systems break down, there are likely to be strong incentives for individuals to simply take what water they can get when they need it.

Fortuitously, many Australian systems already had individual water metering systems in place before the advent of trading. In some cases, individual metering may be technically difficult, and more recent Australian experience shows that it can be expensive. Similarly, as water markets evolve there is a need for investments in accounting and administrative approvals systems.
8.6 An incremental approach is appropriate, but benefits will be forgone if suboptimal arrangements are left in place too long

Despite Australia’s natural advantages, the expansion of water markets took time and effort. There were political battles and extremely challenging technical questions to be addressed at every stage.

One overarching lesson may be that refinements to water markets are likely to be an ongoing task and that the establishment of water trading should not wait for the development of theoretically perfect arrangements.

Given the hydrological and demand-side uncertainties, it is very difficult to design ideal arrangements in advance. Bravery and a large dose of pragmatism are required, particularly as even limited water trading can provide significant benefits compared to the alternatives.

In Australia, refinements were made as new issues were identified and the market was allowed to expand as lessons were learned and in response to demands from users who foresaw the opportunities available. The incremental process was also vital in gaining the support of those who were initially sceptical.

Given political sensitivities about water allocation globally, an incremental introduction of water markets is likely to be the only plausible approach. Consequently, success in water market reform needs to be measured over long periods.

The Australian model—first implementing the elements that provide the biggest benefits with the least risk and complexity, followed by a monitoring and familiarisation period, before embarking on the next stage of reform—may be a useful one. If water users are engaged in the process, they will be more accepting and the benefits will increase. However, there are arguably a number of areas where Australian water managers have foreseen potential risks but have not been able to implement improved practices in time. Such incidents undermine confidence in the market. There are big benefits for governments and market participants in water managers thinking ahead and implementing measures to manage risks before they eventuate.

Moreover, reflecting its incremental development, the system now in place is still imperfect. In particular, variations in rules, definitions and approaches create unnecessary complexity for market participants. Therefore, the trade-off with incrementalism is that relatively more ongoing refinements are likely to be required, and such change may be more costly than if it were considered from the beginning. Benefits will be forgone if suboptimal arrangements are left in place too long.

In Australia, one strategy to allow smooth, cost-effective incremental change has been to define legislation at a high level and to use more flexible subordinate instruments (such as regulations and trading rules) to address elements of market design that are more likely to evolve over time.
8.7 Measures to address environmental and social objectives should not interfere with the market

Often, decisions about the operation of water markets sought to balance competing interests and contested ideas about the best pathway for the development of irrigated agriculture.

That resulted in a number of artificial barriers to trade. For example, limits on entitlement trading out of some regions have been implemented to manage the perceived community impacts of the movement of water from those areas. Similarly, blanket bans on trade have been put in place for environmental reasons.

Once they became binding constraints, those compromises have been costly, particularly for those in financial difficulty who have to sell entitlements at reduced prices, and have arguably failed to achieve their objectives. In addition, Australian experience shows that market participants will play by the rules that are put in place. If the rules are distortionary, they may be exploited by savvy irrigators seeking to maximise their positions.

Therefore, an important lesson from the Australian experience is the need to ensure that excessive or cumbersome regulation of water markets does not undermine their development. This can be achieved by addressing third-party impacts with instruments that are closely targeted to clearly defined problems, rather than by imposing blanket restrictions on trade.

Another lesson that may be drawn from the Australian experience is the need to consider the broader context within which water markets operate and to develop complementary policies to address issues such as structural adjustment. The challenge is to develop mechanisms to assist regions to adjust to changed patterns of water usage without preventing trade that benefits the individuals engaging in those transactions and the broader community.

8.8 Market participants learn quickly and make decisions based on the rules

During the recent drought, water trading became a vital tool for many irrigators. While many were tentative at first, water trading has been embraced and many irrigators now employ highly sophisticated water trading strategies.

Individuals will use the market to make the most of opportunities available to them within the market rules that are in place. Any efforts to stifle market development or impede progress inevitably lead to creativity by market players, which may have unintended consequences for other property right holders.
8.9 Roles and responsibilities should be assigned carefully to avoid conflicts of interest

It is important to develop a sound regulatory and governance framework within which water trading can take place, particularly as the market matures and develops. Unfortunately, the incremental approach to water market design in Australia has meant that organisations have sometimes been given more and more roles and responsibilities. Sometimes, this had led to potential or perceived conflicts of interest and a lack of transparency. Key examples include:

+ rules governing trade being controlled by parties with a vested interest in trading outcomes (such as irrigation cooperatives)
+ lack of transparency in allocation announcements
+ multiple and potentially conflicting policy, regulatory, service delivery and trading roles within one organisation.

Such governance arrangements can be difficult to change, so it is important to consider these issues up front. However, effective institutional arrangements also require entities that are accountable and have appropriate capacity and resourcing to undertake their designated functions. There can be significant challenges in transforming water agencies from centralised planning to decentralised allocations based on voluntary trading. Rather than seeking to micro-manage how water is allocated to different uses, agencies need to develop new skills in establishing and implementing regulatory frameworks that protect broader community values while enabling the flexible, voluntary transfer of water to alternative uses and users.
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### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Basin Plan</td>
<td>A plan for the integrated management of the water resources of the Murray–Darling Basin, to be adopted by the Water Minister under s. 44 of the Water Act 2007 (Cwth).</td>
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<tr>
<td>Cap</td>
<td>An upper limit on the volume of water available for consumptive use from a waterway, catchment, basin or aquifer.</td>
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<td>Carryover</td>
<td>The option to hold in storage a portion of unused seasonal allocations for use in a subsequent year.</td>
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<tr>
<td>Consumptive use</td>
<td>The use of water for private benefit, including irrigation, industry, urban, and stock and domestic uses.</td>
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<tr>
<td>Consumptive pool</td>
<td>The amount of water that can be made available for consumptive use under the rules of the water resource plan for a given area.</td>
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<tr>
<td>Delivery right/entitlement</td>
<td>The right of an irrigator to have water delivered by an irrigation infrastructure operator through the operator’s water infrastructure network.</td>
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<td>Exchange rate</td>
<td>The rate of conversion applied to water traded from one trading zone and/or jurisdiction to another. Entitlements in the originating system are converted into new entitlements in the destination system using an exchange rate that reflects, among other things, the difference in the reliability of the entitlements across the systems involved in the trade.</td>
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<tr>
<td>Exit fee</td>
<td>A charge (often per megalitre) imposed on the trade of a water entitlement out of an irrigation district or area.</td>
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<tr>
<td>Hydrologic connectivity</td>
<td>The physical ability of water at one location to be made available at another, taking into account the losses and constraints on flow along the way.</td>
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<tr>
<td>Irrigation infrastructure operator</td>
<td>An entity that operates water service infrastructure to deliver water for the primary purpose of irrigation.</td>
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<td>Overallation</td>
<td>In a given water system, a situation in which the total volume of water able to be extracted by the holders of water access entitlements at a given time exceeds the environmentally sustainable level of take for the system.</td>
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<tr>
<td>Reliability</td>
<td>The frequency with which water allocated under a water access entitlement is able to be supplied in full.</td>
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<td>Term</td>
<td>Definition</td>
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<tr>
<td>Stranded asset</td>
<td>An asset that is worth less on the market than it is on the balance sheet because it has become obsolete before being fully depreciated. In irrigation areas, when there is a permanent decrease in demand for water delivery services, the assets of irrigation infrastructure operators can become unused or underused and are then said to be stranded.</td>
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<tr>
<td>Sustainable diversion limits</td>
<td>Limits on the quantities of water that can be taken from the Murray–Darling Basin, to be specified in the Murray–Darling Basin Plan. The limits must reflect an environmentally sustainable level of take, which means that extractions must not compromise the basin’s key environmental assets, ecosystem functions or productive base.</td>
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<tr>
<td>Tagging</td>
<td>An accounting approach that allows a traded water access entitlement to retain its original characteristics when traded to a new jurisdiction and/or trading zone, rather than being converted into a form issued in the new jurisdiction or zone. Under this approach, water is supplied to the buyer’s location but the water entitlement is ‘tagged’ to the originating source and retains all characteristics of the original entitlement.</td>
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<tr>
<td>Termination fee</td>
<td>A fee levied by an irrigation infrastructure operator when a delivery entitlement or delivery right is surrendered to the operator to terminate any rights or obligations associated with that delivery entitlement or delivery right.</td>
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<tr>
<td>Trading zone</td>
<td>A zone in which a common set of water trading rules applies.</td>
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<tr>
<td>Unbundling</td>
<td>The legal separation of rights to land and rights to access water, have water delivered, use water on land or operate water infrastructure, all of which can be traded separately.</td>
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<td>Water access entitlement</td>
<td>A perpetual or ongoing entitlement to exclusive access to a share of water from a specified consumptive pool as defined in the relevant water plan. The volume of water available to a water access entitlement may change if the amount of water available in the water management area changes. This ensures that overallocation does not occur.</td>
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<tr>
<td>Water allocation</td>
<td>The volume of water allocated to a water access entitlement in a given season, defined according to rules established in the relevant water plan. The size of the allocation depends on how much water is available in the water resource in that season.</td>
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<tr>
<td>Water lease</td>
<td>A transaction to transfer a water right from one legal entity to another, in whole or in part, for a specified period.</td>
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<td>Water plan</td>
<td>A statutory plan for a surface water or groundwater system that is consistent with the regional natural resource management plan and is developed in consultation with all relevant stakeholders on the basis of the best scientific and socioeconomic assessment to provide secure ecological outcomes and resource security for users.</td>
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# Acronyms and abbreviations

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ABARE</td>
<td>Australian Bureau of Agricultural and Resource Economics</td>
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<tr>
<td>ABARES</td>
<td>Australian Bureau of Agricultural and Resource Economics and Sciences</td>
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<tr>
<td>ACCC</td>
<td>Australian Competition and Consumer Commission</td>
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<tr>
<td>CEWH</td>
<td>Commonwealth Environmental Water Holder</td>
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<tr>
<td>COAG</td>
<td>Council of Australian Governments</td>
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<tr>
<td>DSE</td>
<td>Department of Sustainability and Environment (Victoria)</td>
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<tr>
<td>DSEWPaC</td>
<td>Department of Sustainability, Environment, Water, Population and Communities (Commonwealth)</td>
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<tr>
<td>GL</td>
<td>gigalitre</td>
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<tr>
<td>GVIAP</td>
<td>gross value of irrigated agricultural production</td>
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<tr>
<td>IIO</td>
<td>irrigation infrastructure operator</td>
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<td>MDB</td>
<td>Murray–Darling Basin</td>
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<td>MDBA</td>
<td>Murray–Darling Basin Authority</td>
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<td>MDBC</td>
<td>Murray–Darling Basin Commission</td>
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<td>ML</td>
<td>megalitre</td>
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<td>NSESAD</td>
<td>National Strategy for Ecologically Sustainable Development</td>
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<td>NSW</td>
<td>New South Wales</td>
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<td>NWI</td>
<td>National Water Initiative</td>
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<td>NWMS</td>
<td>National Water Market System</td>
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<tr>
<td>SDLs</td>
<td>sustainable diversion limits</td>
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