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Australian water markets: trends and drivers 2007–08 to 2011–12

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Contents

Tables

Figures

Executive summary

This report analyses trends and factors that are influencing Australian water market activity between 2007–08 and 2011–12. It draws primarily from data reported in the annual *Australian water markets report* (*AWMR*) series, which has been published by the Commission since 2007–08. Where other market information is available, analyses of longer term trends have also been included.

The report focuses on:

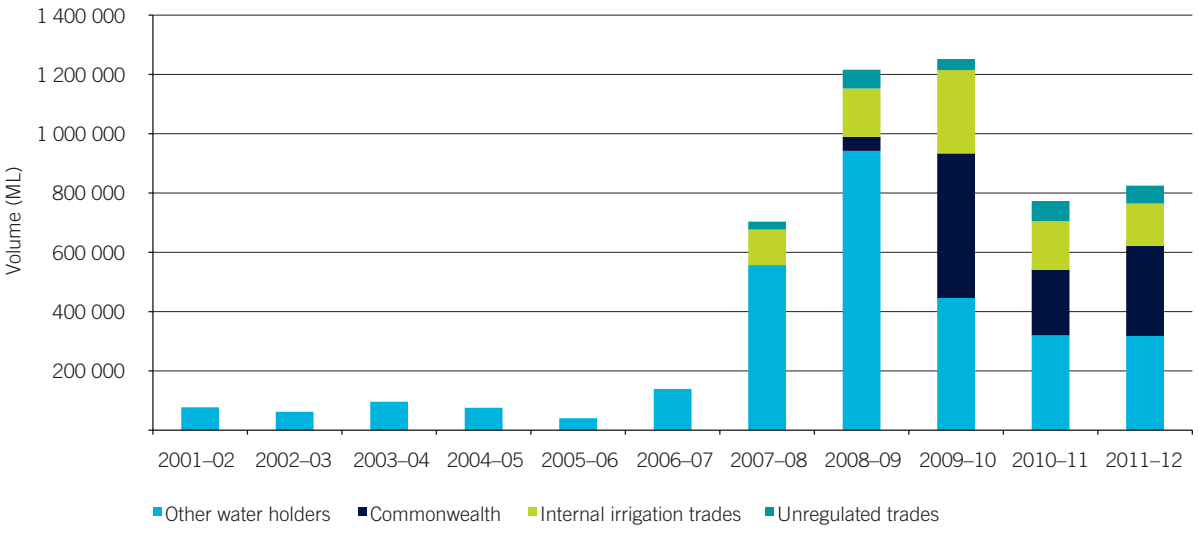
- the geographical location of markets and trading mechanisms
- trends in volumes and prices of entitlement and allocation trades, broken down into national, southern Murray–Darling Basin (MDB), northern MDB, and outside-basin analyses, but with a focus on the MDB, where most entitlement (85%) and allocation (98%) trading occurs
- the key market drivers at the national, basin and outside-basin levels, including seasonal conditions affecting water availability, regulatory and legislative conditions, environmental protection initiatives and agricultural market factors.

Trends in entitlement trading

Nationally, the volume of all entitlement trade increased by 19% between 2010–11 and 2011–12, from 1204 GL to 1437 GL. Water entitlement trading volumes have decreased since 2009–10 following above-average rainfall and floods across much of south-east Australia, including the MDB. With improved storage levels and water availability, prices for entitlements have gradually declined. There have been 4%–9% reductions for all entitlement classes since 2010–11 in the MDB, with the exception of prices for high-security entitlements in New South Wales, which fell by 18%. With more water available, it is likely that buyers are taking more time to consider the need to buy more entitlements as a risk management tool.

Entitlement trade in the southern connected MDB increased from 773 GL in 2010–11 to 825 GL in 2011–12 (Figure E1). The Australian Government continued to be a major participant in the market, accounting for 249 GL of trade purchases in the southern basin in 2011–12. Other trends and patterns include an increase in the average size of entitlement trades after four years of decline and spikes in monthly trade linked to the ballot system used in Victoria to manage entitlement sales under the 4% limit on interregional trade.

Figure E1: Entitlement trade in the southern MDB, 2001–02 to 2011–12 (ML)

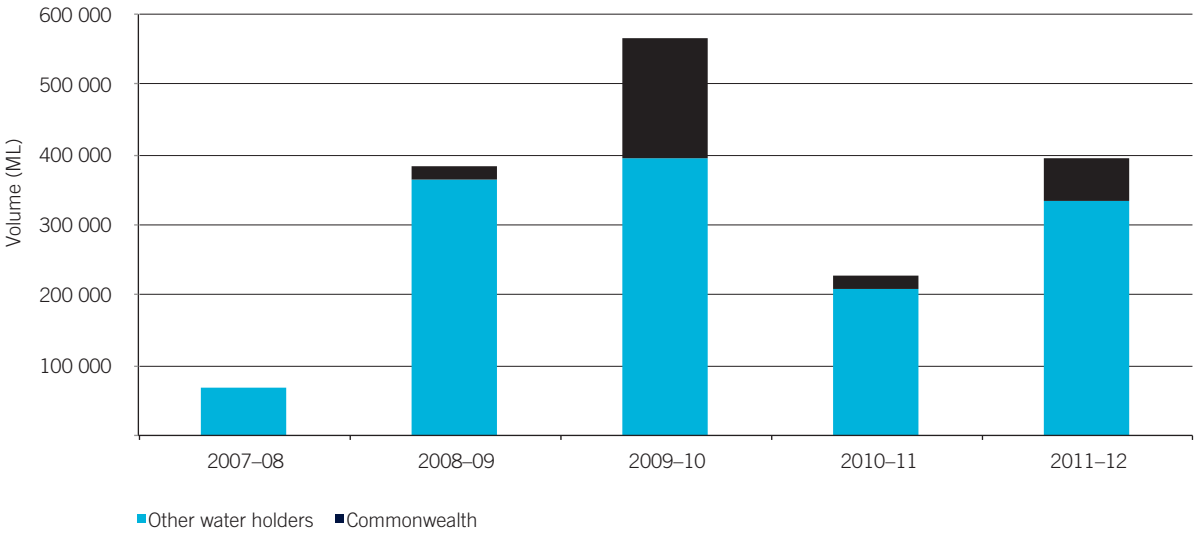


Notes: Entitlement data for years before 2007–08 does not include internal irrigation and unregulated entitlement trades. Entitlement trade in this chart is registered trade. Registered volumes for the Commonwealth include water not purchased from the market, such as gifted water and acquisitions through the Sustainable Rural Water Use and Infrastructure Program. Excludes 14.6 GL and 8.1 GL of non-tradeable *Water Act 1912* (NSW) licences that were registered by the Commonwealth in 2010–11 and 2011–12, respectively, as part of land purchases.

Sources: NWC (2010b), *AWMR* series.

Entitlement trade in the northern MDB increased by 73% from 226 GL in 2010–11 to 393 GL in 2011–12 (Figure E2). The increase was partly driven by increased Commonwealth purchases (from 19 GL to 60 GL), but most trading was by water holders other than the Commonwealth.

Figure E2: Entitlement trade in the northern MDB, 2007–08 to 2011–12 (ML)



Note: Entitlement trade in this chart is registered trade.

Source: *AWMR* series.

Outside the basin, entitlement trade increased from 205 GL in 2010–11 to 218 GL in 2011–12, mainly as a result of increased trade in Tasmania (Figure E3). Overall entitlement trade volumes have remained relatively stable outside the basin, apart from a notable decline in 2009–10.

Figure E3: Entitlement trade outside the MDB, 2007–08 to 2011–12 (ML)

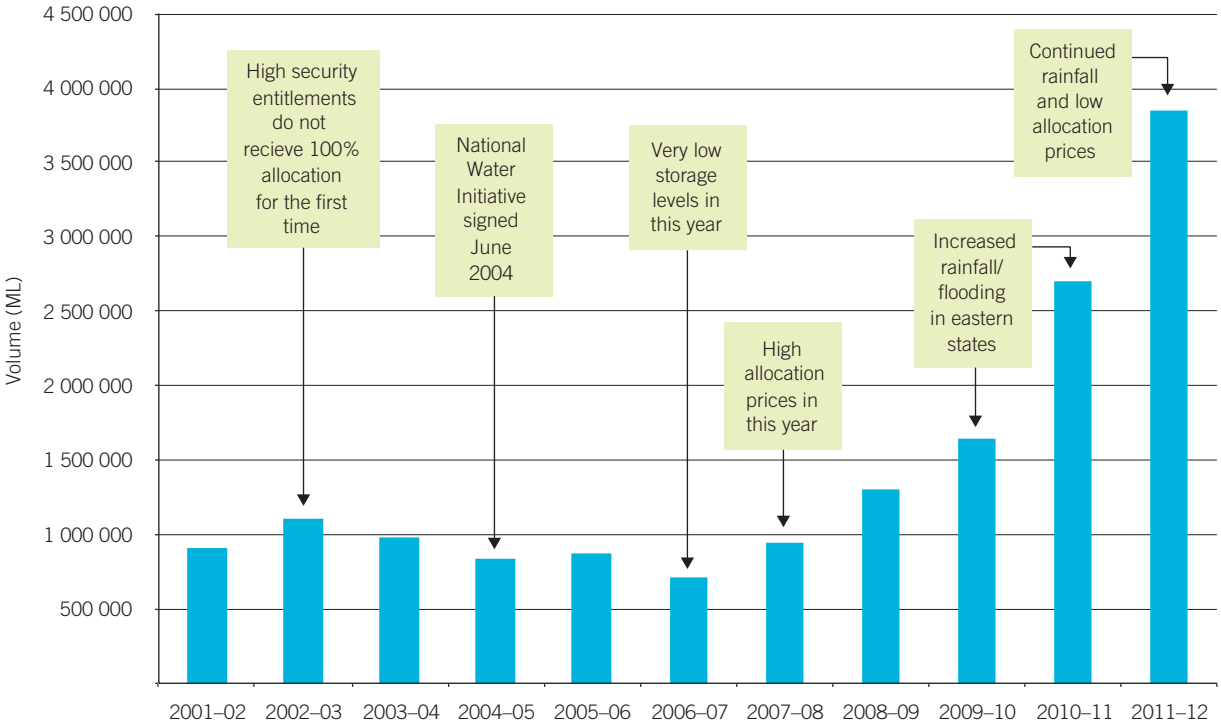
Source: *AWMR* series.

Trends in allocation trading

Allocation trade has continued to grow in volume every year since 2007–08. Some of the drivers of the increase have changed over that period and are discussed below. In 2011–12, national allocation trade volume increased by 23% over 2010–11 levels (from 3493 GL to 4297 GL).

In the southern MDB, the increase in allocation trade (Figure E4) was largely driven by increasing volumes of intrastate trade (81% of trade). The volume of interstate trade declined modestly, from 842 GL in 2010–11 to 804 GL in 2011–12. Victoria exported considerably larger volumes than in previous years.

Figure E4: Allocation trade in the southern MDB, 2001–02 to 2011–12 (ML)

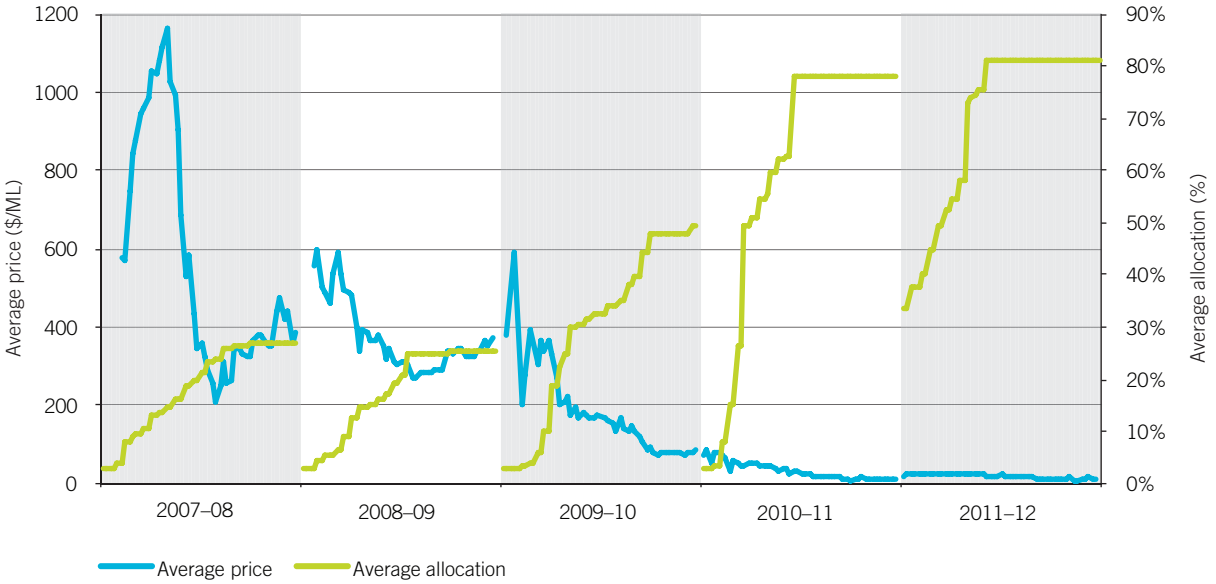


Note: Includes only trades of regulated water from the Lower Darling, NSW Murray, Murrumbidgee, SA Murray, Victorian Murray, Goulburn and Campaspe–Loddon systems. Excludes trades internal to irrigation districts.

Sources: NWC (2010b), *AWMR* series.

High allocations, combined with high levels of carryover (2522 GL in Victoria alone, more than three times the carryover in the previous year), meant that prices remained very low across the entire year. The average price of $17/ML contrasted starkly to prices of more than $1000/ML paid at the height of the drought in 2007–08 (Figure E5).

Figure E5: Average water allocations and average prices in the southern MDB, 2007–08 to 2011–12



Note: The method for calculating the allocated amounts for the 2010–11 water year in last year's report was incorrectly reported because the volume of low-security entitlements was not included in the calculation. That error has been corrected in this report.

Source: *AWMR* series.

In the northern MDB, high water availability resulted in record high allocations; most water systems received full or over 100% allocations. Average prices declined in all major water systems.

Allocation trading outside the MDB increased marginally from 77 GL in 2010–11 to 81 GL in 2011–12. Increased trading in Victoria and Queensland offset reductions in Western Australia. Trading in Queensland appears to be increasing again following a significant decline in 2010–11 linked to flooding in many regions.

Drivers of trade

Outcomes in the water market are assessed mainly with reference to prices and volumes traded, which depend on supply and demand in the market. Water markets are very complex, with many interlinking drivers.

From a demand and supply perspective, the main driver of water trading activity in the MDB in 2011–12 continued to be the positive seasonal and weather conditions. There was a return to rainfall levels closer to average after significantly above-average rainfall in the previous year, and years of drought before that. Compared to 2010–11, this appears to have led to an increased reliance on water allocations, carryover and water trading to support expanded production, with less supply being met by rainfall.

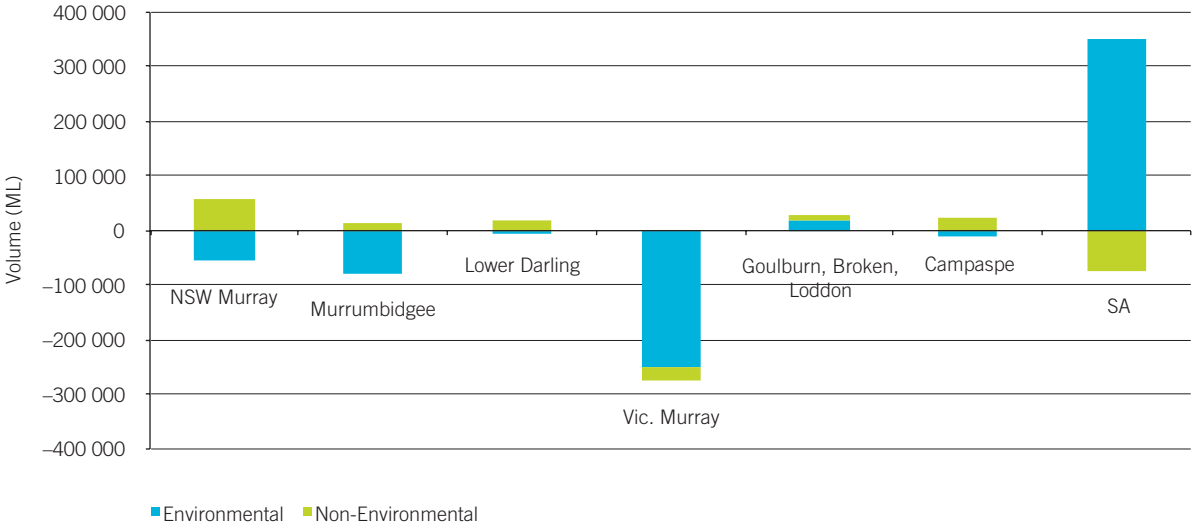
Other drivers of water trading include regulatory and legislative conditions, agricultural market factors and environmental protection initiatives:

- In the latter part of 2011–12, there were again suspensions of trading affecting New South Wales, Victoria and South Australia. Water trading continues to be constrained by the 4% limit on entitlement trades out of irrigation districts in Victoria (the limit for high-reliability water shares was reached in seven districts).
- The production of key agricultural commodities in the MDB increased, particularly production of rice and cotton. In the rice-growing regions, such as the NSW Murray and Murrumbidgee, this reversed trading trends observed during the Millennium drought. NSW Murray moved from being a net allocation exporter to being an importer.
- In 2011–12, the Australian Government purchased 274 GL for environmental purposes (22% of entitlement trade in the basin), down from 415 GL in 2009–10.

The overall reduction in entitlement trade volumes from the peak in 2009–10 can be attributed to improved water availability and reduced purchases by the Australian Government.

In 2011–12, as in 2010–11, large volumes of environmental allocation trades occurred to facilitate deliveries within the basin to achieve environmental watering objectives. This was marked by increased trade (largely made up by a small number of significant trades) from Victoria to South Australia.

Figure E6: Net change in intervalley and interstate trade in the environmental and non-environmental sectors, 2011–12 (ML)



Source: Murray–Darling Basin Authority (MDBA).

Environmental trades or transfers were the main factors influencing interstate allocation trading in 2011–12 (Figure E6). This was a change from the drought years of 2007–08 to 2009–10, when interstate allocation trading was largely driven by horticulturalists purchasing water from producers of annual crops in order to keep their long-lived plantings alive. Environmental trades do not necessarily affect other market participants, as they usually occur at different times of the year from trades for agricultural purposes. However, they are reported in volumes traded even though they generally do not involve payment. Environmental trades can mask interstate trading patterns of other users, as they often involve large volumes and (as Figure E6 shows) can occur in the opposite direction.

Section 1

Overview of water markets

1 Overview of water markets

This chapter provides a brief overview of water markets in Australia. More detail on market frameworks and market activity can be found in the *AWMR* series.

Water is managed by individual states and territories, which issue water users with entitlements to access and use the resource. The entitlements are referred to using differing (jurisdiction-specific) terminology (explained in Section 1.1).

In Australia's most important agricultural region, the Murray–Darling Basin (MDB), water allocation systems generally define pools of water that are available for consumptive use and share the available resource among entitlement holders. Each season, holders of water entitlements receive water allocations based on the amount of water in storages, expected inflows and other factors. The allocations are defined as a percentage of the nominal quantity of water entitlement available for consumptive use.

Some systems are based on allocations being used for consumptive use during the water year (which matches the Australian financial year, from 1 July to 30 June). Others (such as in the St George and Macintyre Brook irrigation schemes) are based on the continuous sharing of dam storage. In some systems, allocation volumes are forfeited if not used or traded by a water user; in others, carryover arrangements allow unused water (or a proportion of it) to be used in the next water year.

Water entitlements exist in both regulated and unregulated systems. In regulated systems, flows are controlled through the use of infrastructure that stores and releases water, while flows in unregulated systems are not controlled through the use of infrastructure.

Water entitlements in regulated sources have different levels of reliability, such that high reliability entitlements receive their allocations before low reliability entitlements. A holder of a water entitlement with an estimated reliability of 90% would expect to receive full allocations in 90 years out of 100. The levels of reliability of water entitlements vary by jurisdiction.

Water entitlements in unregulated systems have no formal reliability. The ability to take water from an unregulated water source is generally specified by a number of restrictions on extraction (minimum flow conditions, maximum daily extraction and extraction timing).

1.1 Data and terminology

This report sources data from, and builds on, the *Australian water markets report* (*AWMR*) series from 2007–08 to 2011–12 and uses reporting conventions established by those reports. It also uses data from a number of other sources, particularly for years before 2007–08. However, directly comparable data is available only from the time of production of the first *AWMR* in 2007–08. For example, data from before that year does not include trades in unregulated rivers and groundwater; nor does it include trades within New South Wales irrigation corporations or South Australian irrigation trusts.

The Australian states and territories use different terminology to describe statutory water rights and dealings. In some cases, different terms are used to refer to essentially the same market product or dealing (see Table 1.1, which shows National Water Initiative equivalent entitlement terminology). To avoid confusion, this report uses the generic terms 'entitlement' and 'allocation', which are equivalent to the National Water Initiative terms 'water access entitlement' and 'water allocation'.

Table 1.1: National Water Initiative equivalent entitlement terminology, 30 June 2012

Jurisdiction	Water access entitlement	Water allocation
Victoria	Water share	Water allocation
South Australia	Water licence (bundled) and water access entitlement (unbundled)	Water allocation
New South Wales	Water access licence	Water allocation
Western Australia	Water licence	Water allocation[a]
Northern Territory	Water licence	Water licence
Australian Capital Territory	Water access entitlement	Water allocation
Tasmania	Water licence	Water allocation
Queensland	Water allocation	Seasonal water assignment

a Applicable only to irrigation cooperatives.

Note: This is not a complete list of entitlements on issue in each jurisdiction.

1.1.1 Unbundling and trading

Entitlements can be either bundled or unbundled. 'Unbundling' refers to the separation of bundled entitlements into their individual elements, including their separation from land title. The unbundled entitlement system is illustrated in Figure 1.1. Historically, most entitlements were bundled with land, and bundled use and access rights. Most entitlements in significant surface water systems have now been unbundled from land.

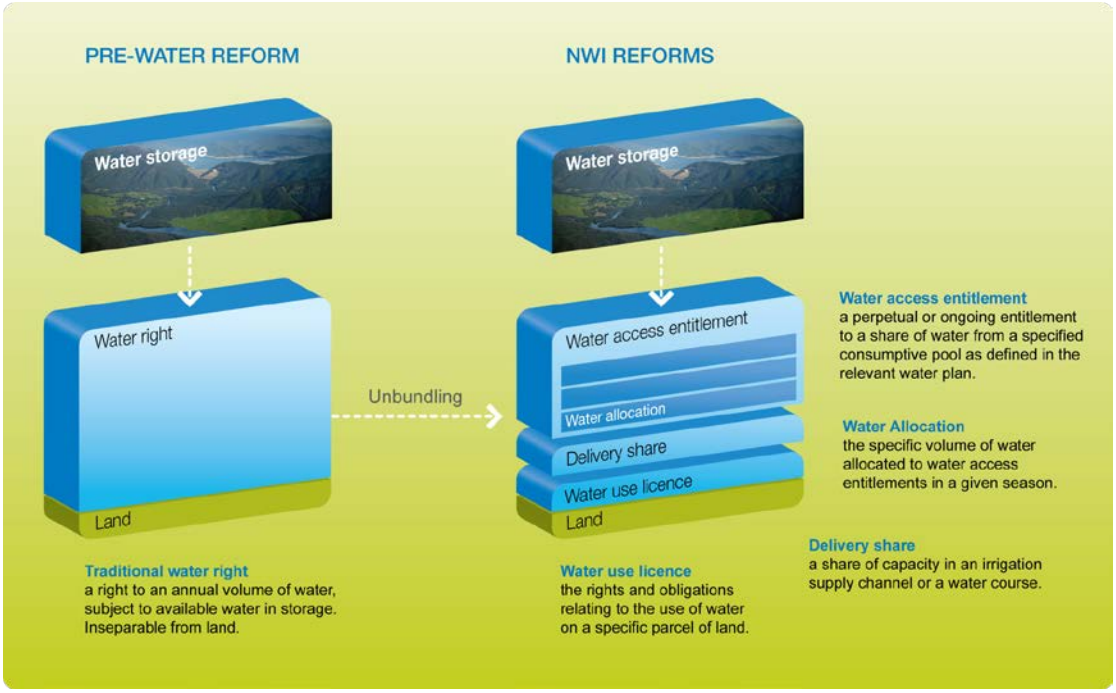
The most common model adopted in regulated surface water systems involves:

- a tradeable *water access entitlement*—a perpetual or ongoing entitlement to a share of water from a specified consumptive pool as defined in the relevant water plan
- a tradeable *water allocation*—the specific volume of water allocated to water access entitlements in a given season.

Additional degrees of unbundling are also possible—for example, to include a share of channel capacity (a delivery share).

Unbundling has given water users greater flexibility in managing the delivery of their water and has improved the efficiency and cost-effectiveness of water trading.

Figure 1.1: Simplified example of an unbundled entitlement system

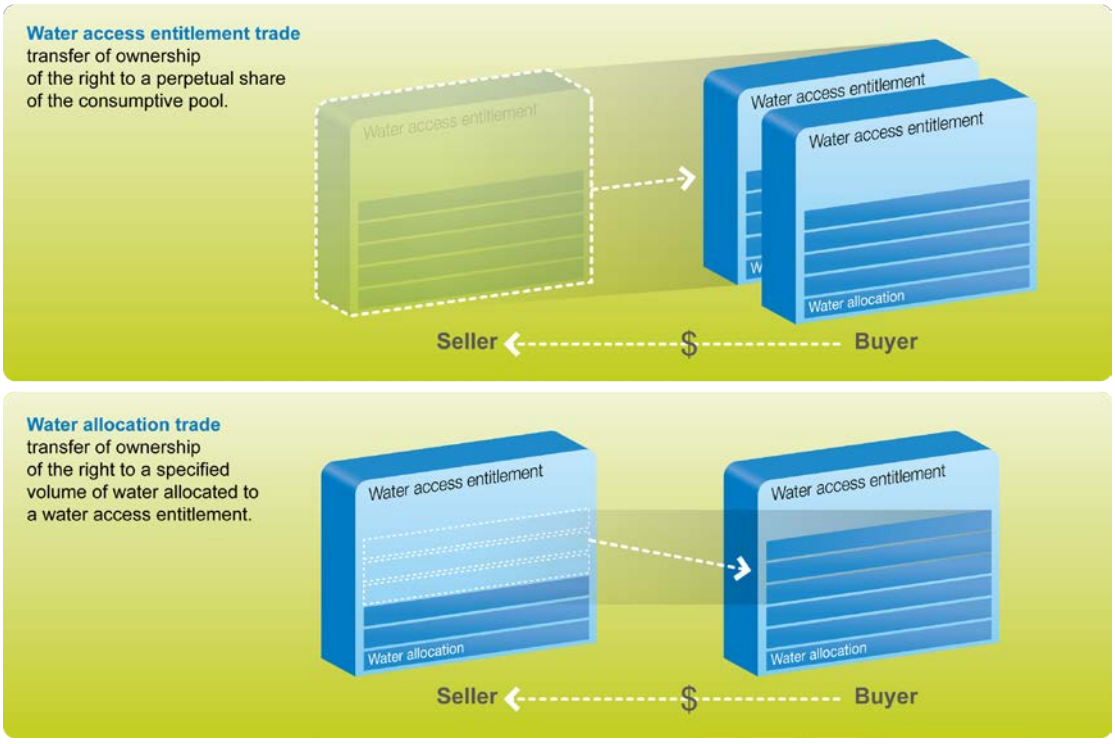


Note: NWI reforms refers to the series of reforms that started with the 1994 COAG Water Reform Agreement through to the signing of the NWI in 2004.

Generally, there are two types of water trade transactions (Figure 1.2):

- *water access entitlement trade*—transfer of the right to a perpetual share of the consumptive pool
- *water allocation trade*—transfer of the right to a specified volume of water allocated to a water access entitlement.

Figure 1.2: Simplified example of trading in an unbundled entitlement system



1.1.2 Water trade definitions

In this report, the definitions of water trades are the same as those in the *Water Act 2007* (Cwth):

- a transfer of an entitlement from one legal entity to another, with or without a change in location—includes transfers with or without land sales and transfers of ownership between related parties (often involving zero consideration)
- an assignment (or trade) of water allocation from one authorised water user to another, or between water accounts held by the same water user, with or without a change in location—includes trading or transfers of allocations within or between accounts of environmental parties.

1.1.3 Characteristics of trading

Water entitlement trading is generally driven by changes in long-term demand and in the nature and location of water-using industries. Entitlements can be purchased as an investment or risk management tool, and entitlement trading may also reflect shifts between agricultural sectors, or participants exiting from irrigated agriculture. As water users become more efficient, they may have entitlements that are surplus to their requirements and can be offered up for sale.

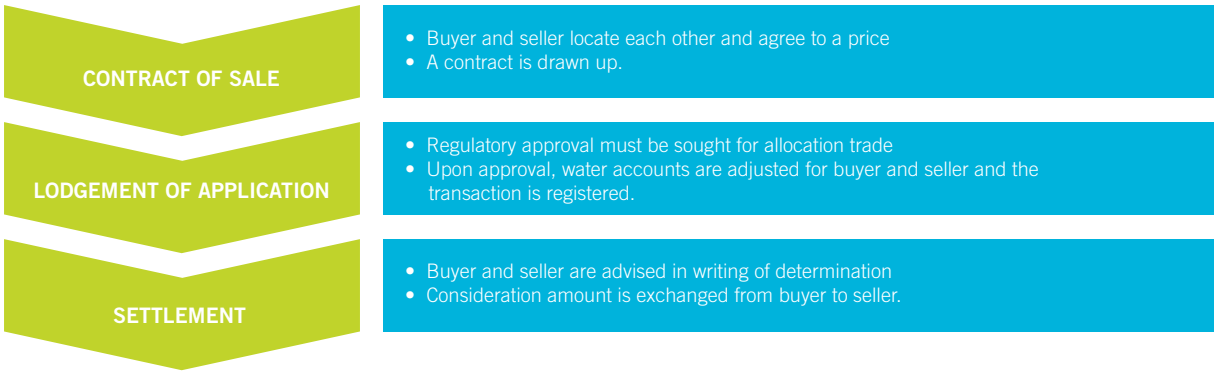
Water allocation trading generally assists water users to respond to seasonal conditions and other short-term events by reallocating water among them within a particular year.

The dominant participants in the market are irrigators. However, in recent years environmental water purchasers, such as the Australian Government's Restoring the Balance in the Murray–Darling Basin Program (which acquires entitlements that are subsequently managed by the Commonwealth Environmental Water Office on behalf of the Commonwealth Environmental Water Holder), have become significant market participants.

Water markets differ between jurisdictions due to the states' and territories' differing approaches to water planning and management and differing administrative and institutional arrangements. Each jurisdiction generally records and manages trade transactions on its own registry system. The broad processes for entitlement and allocation trading are outlined in figures 1.3 and 1.4, although specific arrangements may differ between jurisdictions.

Figure 1.3: Entitlement trading

Figure 1.4: Allocation trading

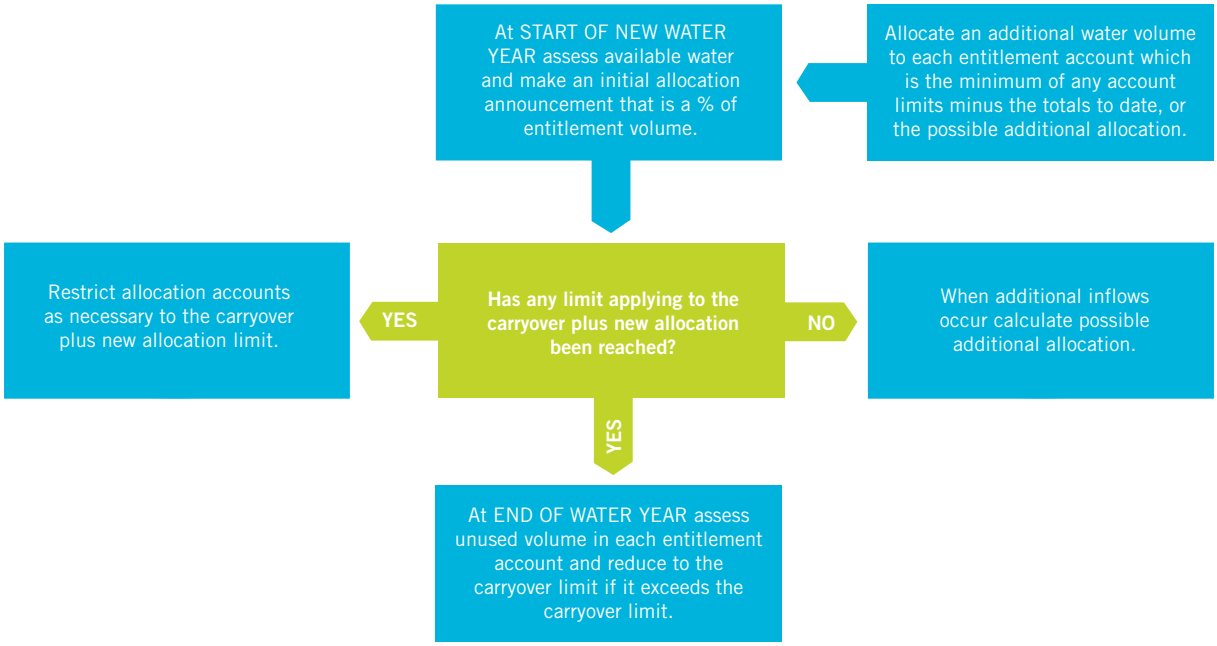


1.1.4 The allocation process

In regulated river sources, allocation systems with carryover rules involve an annual process of allocating water allocation credits. However, at the end of each water year at least some part of any water remaining in a water allocation account can be retained (carried over) for use in the next year.

There are usually limits applied to allocation accounts in annual allocation systems with carryover rules. The system may limit the volume that may be carried over, the maximum volume of carryover plus new season allocation that may be held in an allocation account, or both. Figure 1.5 shows the water credits that may remain in water accounts part way through a water year in a regulated water source operating under a typical annual allocation system with carryover rules.

Figure 1.5: Typical annual accounting system with carryover rules—allocation cycle for a regulated river

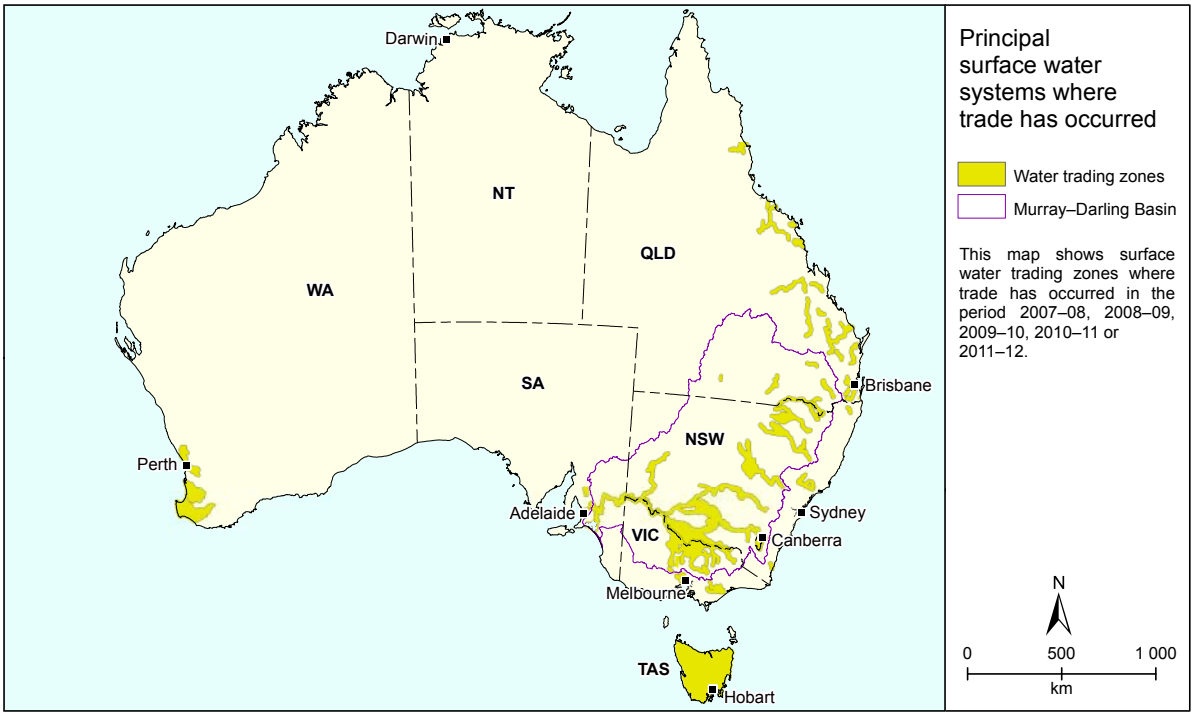


Source: Barma Water Resources Pty Ltd et al (2011).

1.2 Market segments

The Australian water market consists of a number of separate markets of varying size, activity and connectivity with each other. The separate markets are generally defined by physical water system boundaries and interact with each other where there is hydrological connectivity. Figure 1.6 shows the main Australian water systems in which trading has occurred since 2007–08. The largest geographically defined market (with the highest numbers and volumes of entitlements) is the southern connected MDB.

Figure 1.6: Principal water systems where trading has occurred



Data sources: WA Department of Water, Qld. Department of Natural Resources and Mines, NSW Office of Water, ACT Government, Vic. Department of Sustainability and Environment, SA Department of Environment, Water and Natural Resources, Tas. Department of Primary Industries, Parks, Water and Environment. Topographic data: Geoscience Australia.
Map produced by ABARES © Commonwealth of Australia.

Table 1.2 summarises the water markets in Australia. With a small number of exceptions, only intraregional trading is possible in the northern MDB and outside the MDB; however, both intraregional and interregional trading are possible in the southern MDB.

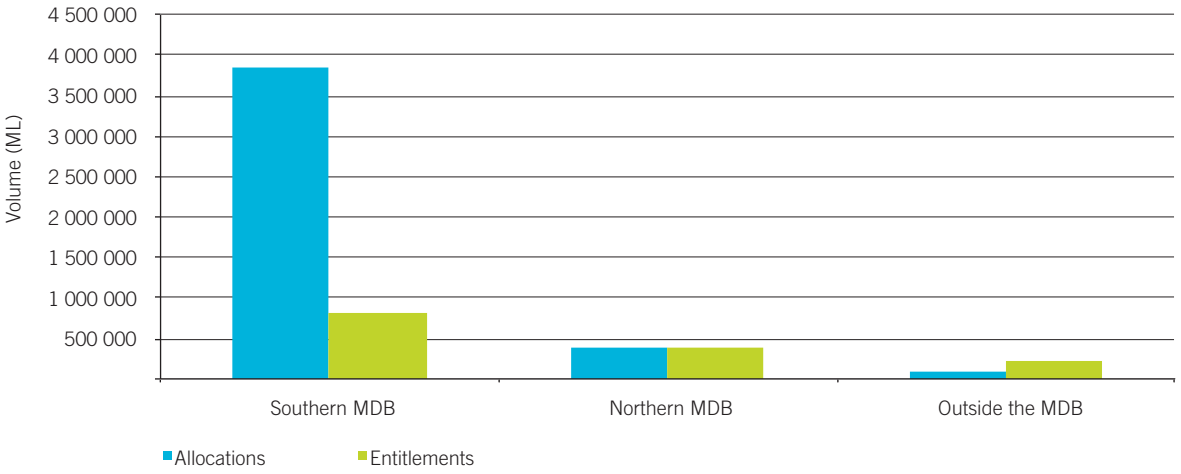
Table 1.2: Market segments

Region	Market segment
Murray–Darling Basin (MDB)	Northern MDB (parts of New South Wales and Queensland)
	Southern connected MDB (parts of South Australia, New South Wales, Victoria and all of the Australian Capital Territory)
Outside the MDB	Tasmania
	Northern Territory
	Western Australia
	South Australia outside the MDB
	Queensland outside the MDB
	New South Wales outside the MDB
	Victoria outside the MDB

Figure 1.7 shows the total volumes of water trading during 2011–12 in the southern MDB, northern MDB and outside of the MDB. The vast majority of allocation trading and a large proportion of entitlement trading occurred in the southern MDB.

Of the remaining entitlement trade, almost twice as much was in the northern MDB as in areas outside the MDB. Minor levels of allocation trading took place in those regions.

Figure 1.7: Water traded in major market segments, 2011–12 (ML)



Source: *AWMR* series.

The analysis in this report focuses on the MDB, and particularly the southern MDB, because:

- most trading has occurred in that area (as a result of its large proportion of land under irrigated agricultural production and its well-developed water infrastructure)
- as a result of the greater level of trading, there is significantly more data available on trading in the region.

1.3 Physical layout and trading zones

The MDB is Australia's main region for water market activity, making up more than 94% of the volume of entitlements and allocations traded across Australia in 2011–12. The basin is considered to comprise two parts: the southern MDB (81% of volume traded in Australia in 2011–12) and the northern MDB (13% of volume traded). This distinction reflects the lack of hydrological connectivity between the northern and southern systems, which means that it is not possible to trade between the two regions.

The southern MDB includes a number of connected water systems that cross state boundaries. The region accounts for most of the water used and traded and most of the irrigated agricultural activity in the basin. It is therefore the main focus of this report.

The northern MDB includes a number of distinct water systems that cross the state boundary between Queensland and New South Wales. Trading between those systems is not possible, with the exception of limited trading between parts of the NSW and Queensland Border Rivers trading zones where those zones are adjacent within the same water system (for example, the Macintyre River).

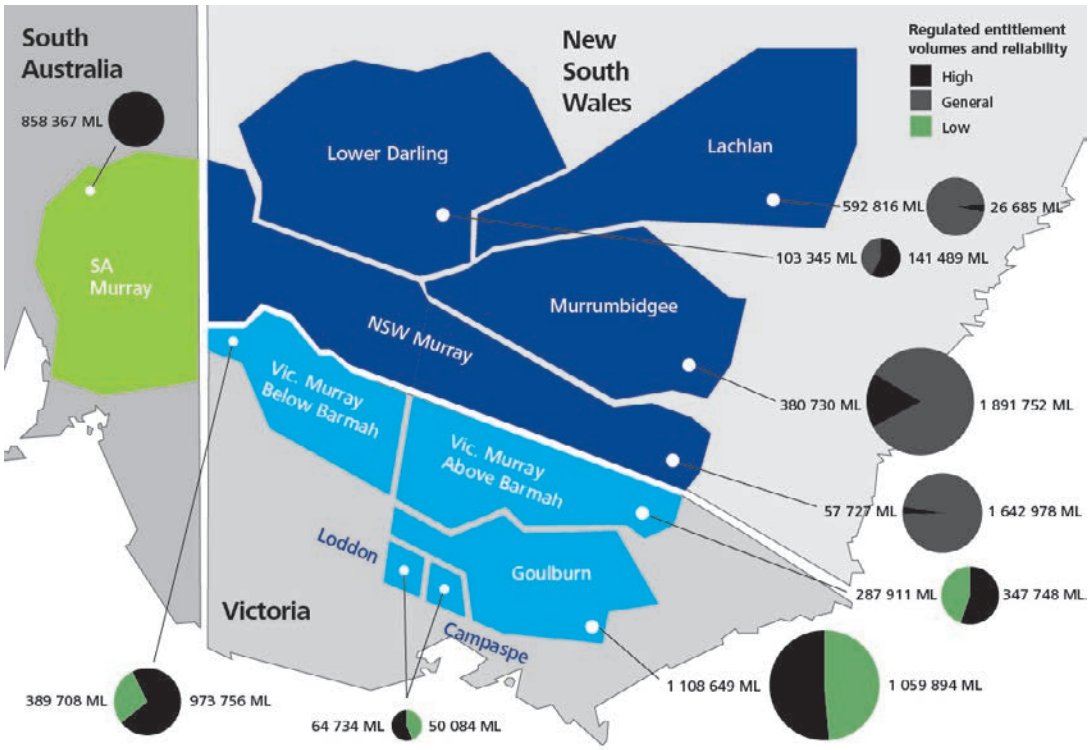
The boundary between the southern and the northern MDB is the Lower Darling Regulated River zone, which feeds directly into the Menindee Lakes in New South Wales.

This section provides information on both parts of the MDB as background to subsequent discussions.

1.3.1 Southern MDB

The southern part of the MDB is hydrologically linked, allowing for trading between catchments and resulting in a relatively large and deep market. The southern MDB is also regulated, which means that irrigation uses water released from upstream dams, making supply more reliable and flexible. Figure 1.8 gives an indication of the volumes and reliability of entitlements on issue in the trading zones of the southern MDB.

Figure 1.8: Regulated entitlements on issue in the southern MDB (ML)

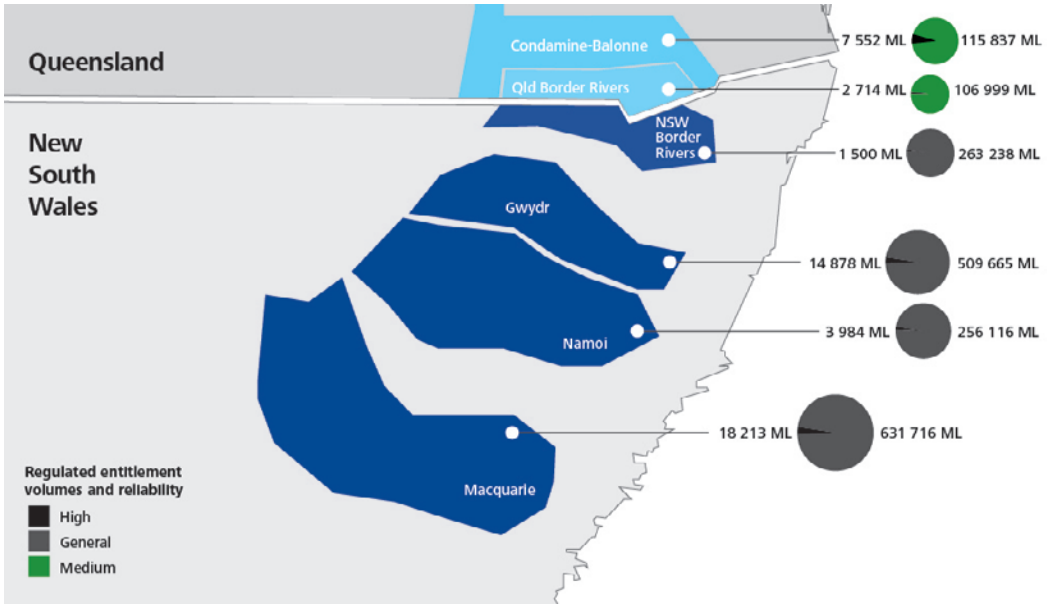


Note: NSW entitlement volumes for regulated systems exclude supplementary reliability entitlements. In this report, all South Australian entitlements are referred to as 'high reliability', consistent with the approach of the South Australian Department of Environment, Water and Natural Resources. However, as that entitlement is further classified into nine classes, the reliability of some South Australian entitlements may be lower than that of high-reliability entitlements in other jurisdictions. While considered part of the southern MDB, the Lachlan catchment is not sufficiently hydrologically connected to enable trading with other trading zones in the southern MDB.

1.3.2 Northern MDB

In the northern MDB (and in contrast to the southern MDB), about half of annual inflows occur during the summer. Consequently, although most of the northern systems are regulated (with the exception of systems in Queensland), irrigation is typically opportunistic and based on the prevailing rainfall patterns. For example, the area planted to cotton varies significantly between years, depending on rainfall and the availability of water. Irrigated crops in the northern MDB tend to be annual—for example, cotton—rather than perennial. Furthermore, valleys in the northern MDB are not sufficiently hydrologically linked to permit water trading. Figure 1.9 provides detail on the volume and reliability of entitlements in the northern MDB for all trading zones.

Figure 1.9: Regulated entitlements on issue in the northern MDB (ML)



Note: NSW entitlement volumes for regulated systems exclude supplementary reliability entitlements. For the Condamine Balonne and Qld Border Rivers, medium entitlements volumes refer to medium priority entitlements and Risk-A and Risk-B entitlements. The reliability is different (higher) than general security entitlements in NSW. They have been separately identified in this figure.

1.3.3 Outside the Murray–Darling Basin

Catchments in areas outside the MDB are typically hydrologically isolated, and water trading is limited to smaller geographical areas. For these and other reasons, markets are often thin and trading activity varies widely.

The maturity of water markets in the jurisdictions outside the MDB also varies. For example, while water trading is possible in the Northern Territory, none has occurred there, largely because water resources have not been fully allocated (that is, there is no unsatisfied demand).

There is potential for expanding water trading outside the MDB as competition for water increases and the need for a mechanism to move water to its highest value uses becomes more apparent. For example, trading in water licences in Tasmania has recently expanded due to the development of larger irrigation areas in that state.

Queensland

With the exception of the catchments that make up the northernmost reaches of the MDB, Queensland is made up of small, hydrologically isolated water trading regions. The water market within each region tends to be shallow due to the small number of market participants and the region's uniform climatic conditions and agricultural production profile. The price and volume of water traded vary significantly between trading regions.

New South Wales

The major trading zone in New South Wales outside the MDB is the Hunter Valley. Most water use in the Hunter is for pasture for beef and dairy cattle, although water for wine grape production is also important.

Tasmania

Most water trading in Tasmania, other than that related to land sales, has occurred in the major irrigation schemes and through privately arranged physical transfers between landholders. Recently, there has been significant investment in expanding and developing new irrigation schemes throughout eastern Tasmania.

Victoria

Trading in southern Victoria typically occurs in a few hydrologically isolated trading zones. A north–south pipeline linking the Goulburn River and Melbourne is in place but is not in use. The Thomson/Macalister system has the largest volume of surface water trading. Significant groundwater licence trades (most with sales of land) occur in the area serviced by Southern Rural Water around Melbourne.

Western Australia

Western Australia relies heavily on groundwater as a source of water for urban, rural and mining uses. Groundwater is the sole source of water for many towns and contributes most of Perth's water supply.

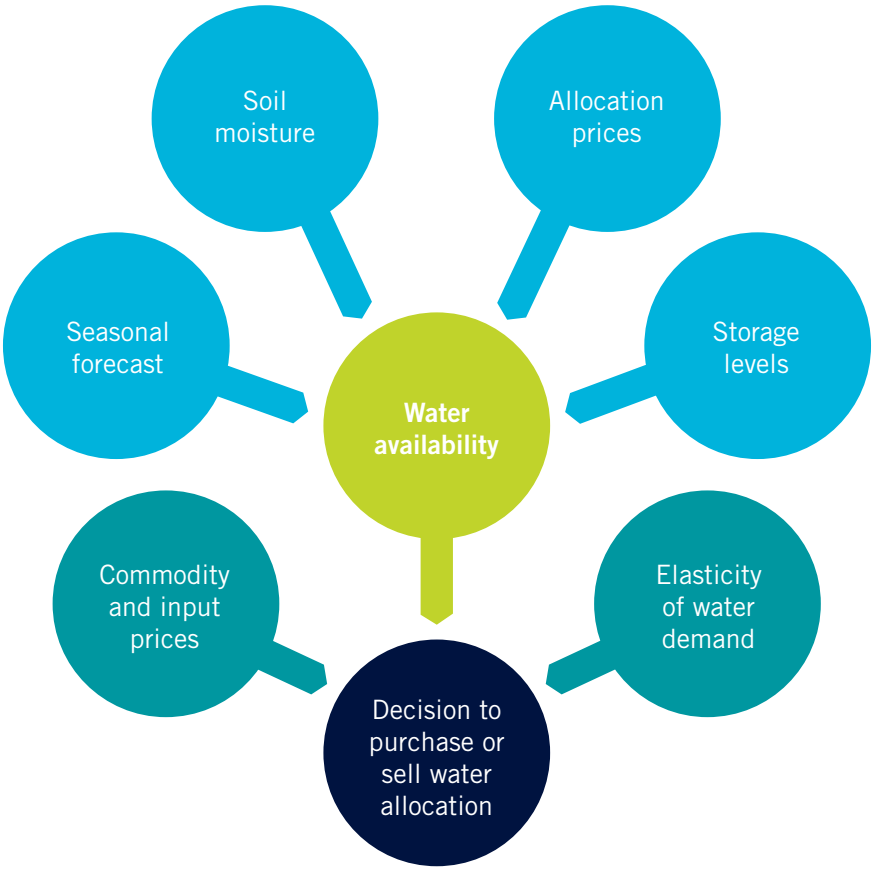
1.4 Overview of drivers

Outcomes in any market, which are mainly assessed by reference to prices and quantities traded, depend on both supply and demand in the market. The factors influencing supply and demand in the water market are more numerous and complex than in many other markets. They include the following:

- *Seasonal weather patterns and longer term climatic trends*. Both affect the supply of water through availability in water storages and the soil moisture available for crops. Seasonal conditions also influence the demand for irrigation water as a supplement to rainfall, as well as temperature and evaporation rates that affect crop water requirements.
- *Physical and hydrological constraints*. The presence or absence of connections (pipelines, watercourses) determines the ability to move water within and between regions. The homogeneity of production and water-use characteristics tends to increase with increased regional connectivity, which can influence patterns of demand for water.
- *Conditions in commodity markets*. Such factors as the prices of commodities and exchange rates influence production and irrigation water demand decisions. Irrigators can be characterised as 'price takers' in terms of buying and selling behaviour.
- *Jurisdictional agricultural and water policies and governance and administration of the market*. These factors can influence the supply of water that is available for consumptive use, the demand for water trading and the ease of trading. They include restrictions on water use and the ability to carry over water between years, differences between jurisdictions' arrangements and changes to those arrangements.
- *Efforts to address the historical overallocation of water resources*. For example, the Australian Government has been a significant purchaser of water entitlements in recent years through its Restoring the Balance in the Murray–Darling Basin Program (a 'buyback' program).
- *The absence of a single or dominant trading platform*. Unlike trading in some other markets (such as the Australian Stock Exchange), most buying and selling of water is facilitated through various market intermediaries, such as brokers.

Figure 1.10 illustrates the array of factors that influence decisions to purchase or sell water allocations within a season. Motivations for buying or selling entitlements are also influenced by changes in many of these factors, but typically over a longer period. Entitlements are usually seen as longer term assets, and changes in the entitlement market are driven more by structural changes in the water-using industries.

Figure 1.10: Factors influencing decisions to buy or sell water allocations



Section 2

Trends

2 Trends

This chapter provides figures and charts that detail changes in water entitlement and allocation markets from 2007–08 to 2011–12. It describes and discusses key trends at the national level, in the southern and northern MDB, and outside the basin. It also briefly describes the drivers behind those trends. Chapter 3 includes a more detailed discussion of key drivers.

2.1 Trends in water entitlement markets

2.1.1 National and basin-level water entitlement markets

Nationally, the total volume of entitlement trades increased by 19% between 2010–11 and 2011–12, from 1204 GL to 1437 GL (Table 2.1). About 4% of the total entitlements on issue in 2011–12 was traded. There has been a significant decline in entitlement trading since 2009–10 because of generally improved water availability and a reduction in entitlement purchases by the Australian Government for environmental purposes in the MDB (discussed further below).

Table 2.1: Water entitlement trading volumes in Australia, 2007–08 to 2011–12

	2007–08 (GL)	2008–09 (GL)	2009–10 (GL)	2010–11 (GL)	2011–12 (GL)	% change since 2010–11
MDB						
Regulated	723	1490	1744	894	1065	19
Unregulated and groundwater	47	108	74	105	153	46
MDB total	770	1598	1818	999	1219	22
Other water systems						
Other water systems	150	202	131	196	218	6
Total Australia	**920**	**1800**	**1949**	**1204**	**1437**	**19**

Source: *AWMR* series.

2.1.2 Water entitlement markets in the southern MDB

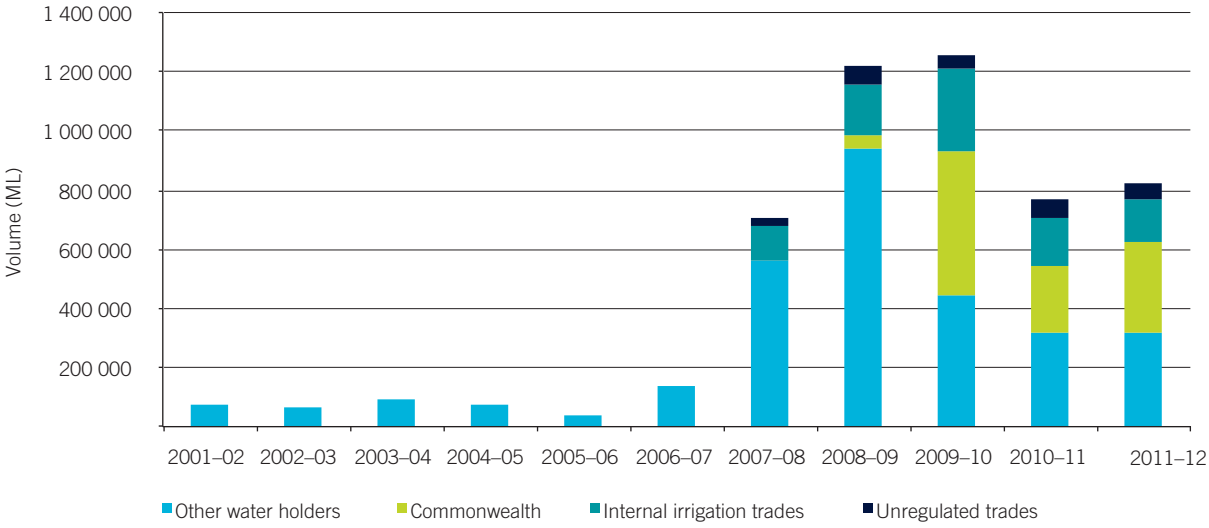
Entitlement trading volumes in the southern connected MDB increased from 773 GL in 2010–11 to 825 GL in 2011–12 (Figure 2.1). The Australian Government continued to be a major participant in the market, accounting for 29% (249 GL) of entitlement purchases, although this was down from 376 GL in 2009–10.

The following observations can be made about entitlement trading in the southern connected MDB in 2011–12:

- The average size of entitlement trades increased after four years of decline (Figure 2.3)
- Prices declined by between 4% and 9% across all security classes (Figure 2.6), with the exception of high-security entitlements in New South Wales, which decreased in price by 18%.
- The volume of Australian Government entitlement purchases, particularly purchases of high-reliability entitlements, increased compared to 2010–11 (Section 3.4.1, Figure 3.12).
- Spikes in the number of trades in September 2011 and March 2012 (Figure 2.4) are likely to have been caused by the ballot used in Victoria to manage entitlement sales under the 4% limit.
- An increase in the volume of New South Wales general-security entitlements traded in September 2011 to 153 GL was caused by three 34 GL trades that month in the Macquarie trading zone. Some of this trade is likely to be linked to the large volume of entitlement purchases by the Australian Government in that zone during 2011–12.

The volume of entitlements traded in the southern MDB was very modest until 2007–08, when it increased significantly (Figure 2.1). Further significant increases followed in 2008–09 and 2009–10, before the volume fell in 2010–11 and increased only slightly in 2011–12. Trading of entitlements following the collapse of some managed investment schemes may have contributed to the high volume of entitlement sales in 2008–09 and 2009–10. As discussed in Section 3.4, the fall in 2010–11 can be attributed to a number of causes, including a reduction in Australian Government purchases. The above-average rainfall and subsequent water resource improvement during 2010–11 may also have been responsible for the smaller number and volume of entitlement trades in that year. With allocations at their highest levels in many years and storages close to full, irrigators had less need to purchase entitlements to meet their water needs. Similar seasonal conditions in 2011–12 can explain why volume of trade in that year remained low with a marginal increase compared to 2010–11 linked to increased entitlement trades by the Australian Government.

Figure 2.1: Entitlement trade in the southern MDB, 2001–02 to 2011–12 (ML)

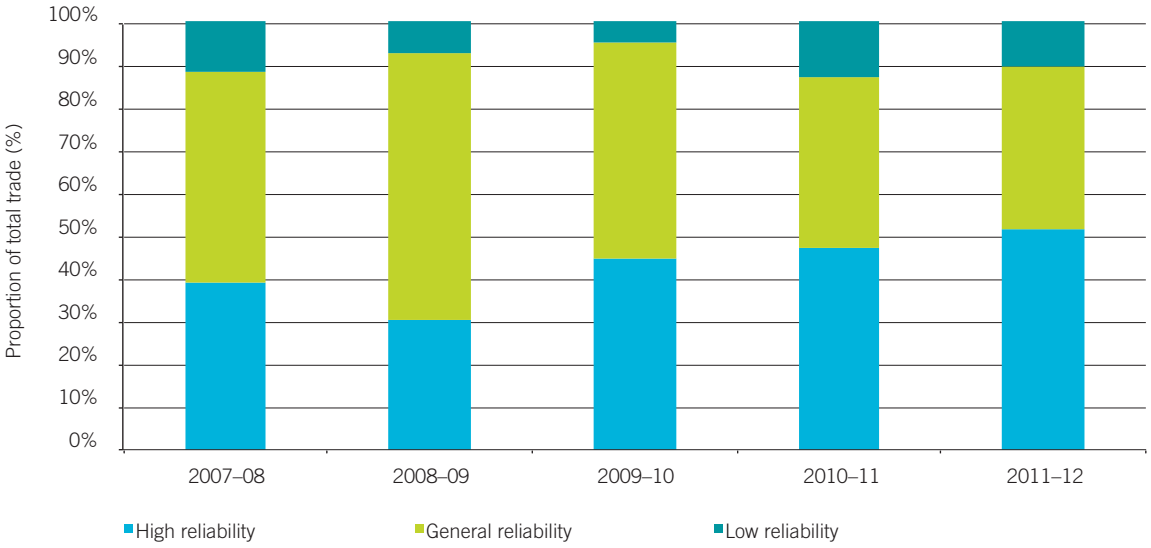


Notes: Entitlement data for years before 2007–08 does not include internal irrigation and unregulated entitlement trades. Entitlement trade in this chart is registered trade. Registered volumes for the Commonwealth include water not purchased from the market, such as gifted water and acquisitions through the Sustainable Rural Water Use and Infrastructure Program. Excludes 14.6 GL and 8.1 GL of non-tradeable *Water Act 1912* (NSW) licences that were registered by the Commonwealth in 2010–11 and 2011–12, respectively, as part of land purchases.

Sources: NWC (2010b), *AWMR* series.

The proportion of entitlement types traded in the southern MDB have changed over the past five years (Figure 2.2). In 2007–08, more than 10% of total entitlement purchases were of low reliability entitlements. By 2009–10, the proportion of low reliability entitlement trades had more than halved to less than 5%. In 2010–11, the proportion of such trades increased to 13% before declining again in 2011–12 to around 10%. This change in the mix may reflect changing market expectations about the reliability of low reliability entitlements, particularly in the short term. During the drought, low reliability entitlements often received no allocations; however, in 2010–11 and 2011–12, most low reliability entitlements (with the exception of Victorian low-reliability entitlements) received relatively high allocations. With storages close to full, there may be some expectation that this will continue for a few years at least.

Figure 2.2: Entitlement trade in the southern MDB, by reliability class, 2007–08 to 2011–12 (%)



Note: High reliability entitlements include Victorian high-reliability water shares, New South Wales high-security water access licences (WALs) and South Australian water entitlements. Low reliability entitlements include Victorian low-reliability water shares and NSW supplementary WALs. General reliability entitlements are NSW general-security WALs. Only trades in regulated systems are shown.

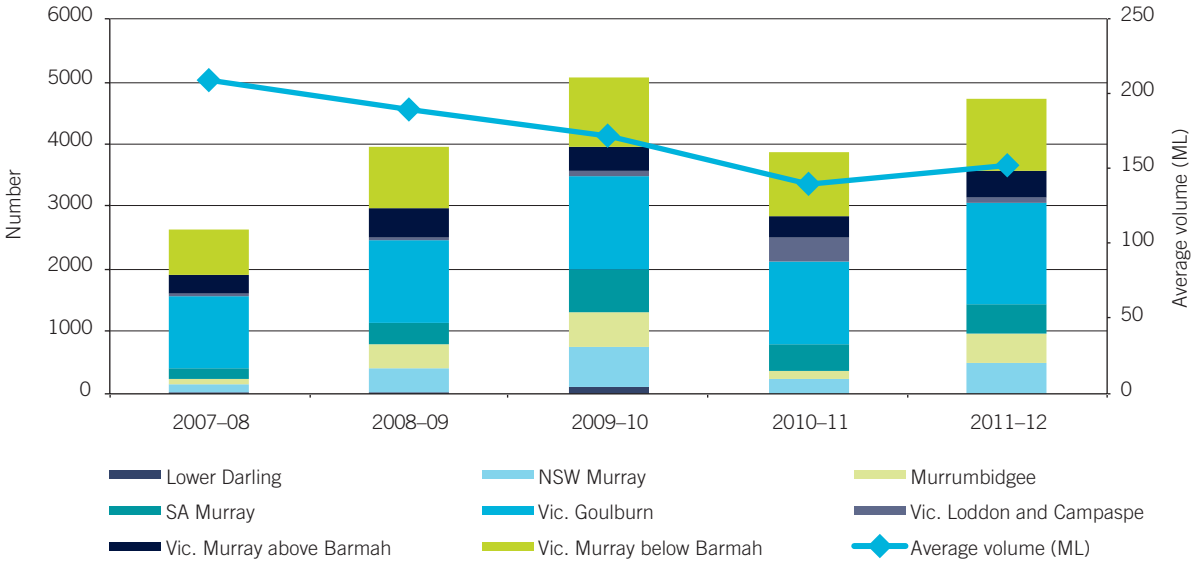
Source: *AWMR* series.

The number of entitlement trades increased steadily from 2007–08 to 2009–10 and then declined by 20% in 2010–11 (Figure 2.3). The fall was mainly due to considerable reductions in the number of trades in the SA Murray, Murrumbidgee and NSW Murray zones in that year.

In 2011–12, total and average size of entitlement trading increased compared to 2010–11 due to higher entitlement trade volumes in the NSW Murray, Murrumbidgee, Vic Goulburn, Vic. Murray above Barmah and Vic. Murray below Barmah. Only trade volume in the Vic. Loddon and Campaspe decreased.

The average volume of allocation trades (Figure 2.19) moves in the opposite direction to the average volume of entitlement trades (Figure 2.3). The average volume of allocation trades decreased steadily over the years from 2007–08 but increased for the first time in 2011–12. In contrast, the average volume of individual entitlement trades continued to decrease steadily in recent years, but increased in 2011–12.

Figure 2.3: Entitlement trades in the southern MDB, numbers and average volumes, 2007–08 to 2011–12

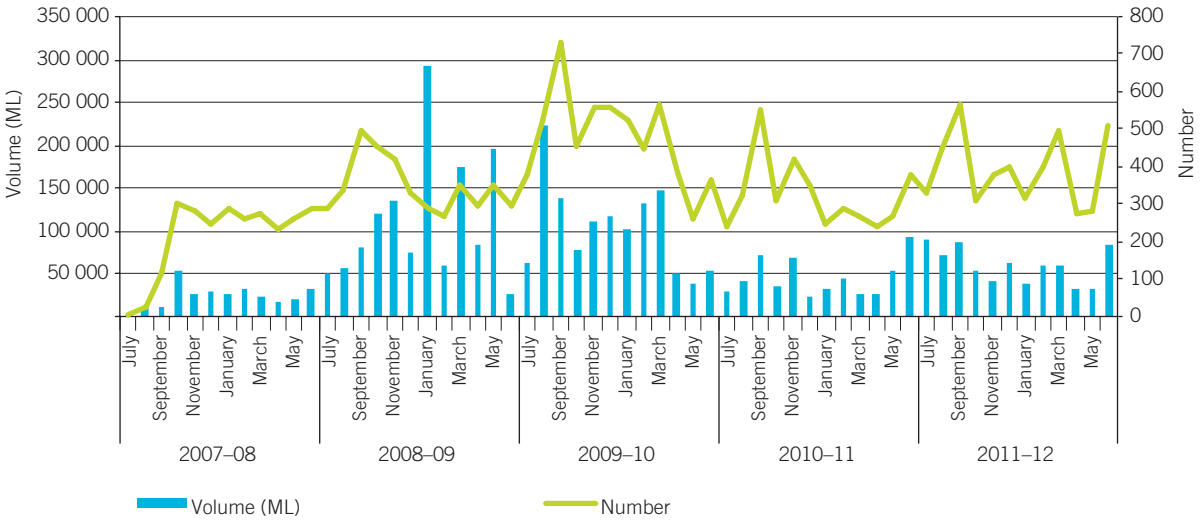


Note: Only trades of regulated water products are shown.

Source: *AWMR* series.

Figure 2.4 shows the numbers and volumes of entitlements traded in the southern MDB between 2007–08 and 2011–12, by month. The number of trades typically peaks around September and October. Entitlement trading is less volatile within the year, in numbers and volumes of trade, than allocation trading. This is to be expected, given the long-term nature of the investment made in an entitlement purchase. Unlike in allocation trading, there is no clear entitlement trading cycle during a water year, although the time series suggests a comparative peak in August and September. This is likely to reflect the registration of entitlement trades out of various Victorian zones that are balloted at the start of each water year, pursuant to the 4% limit in Victoria. This pattern may also reflect water users purchasing entitlements early in the season in order to receive both the full allocation and any available carryover for that year.

Figure 2.4: Entitlements traded in the southern MDB, numbers and volumes, by month, 2007–08 to 2011–12



Note: Only trades in regulated water products are shown.

Source: *AWMR* series.

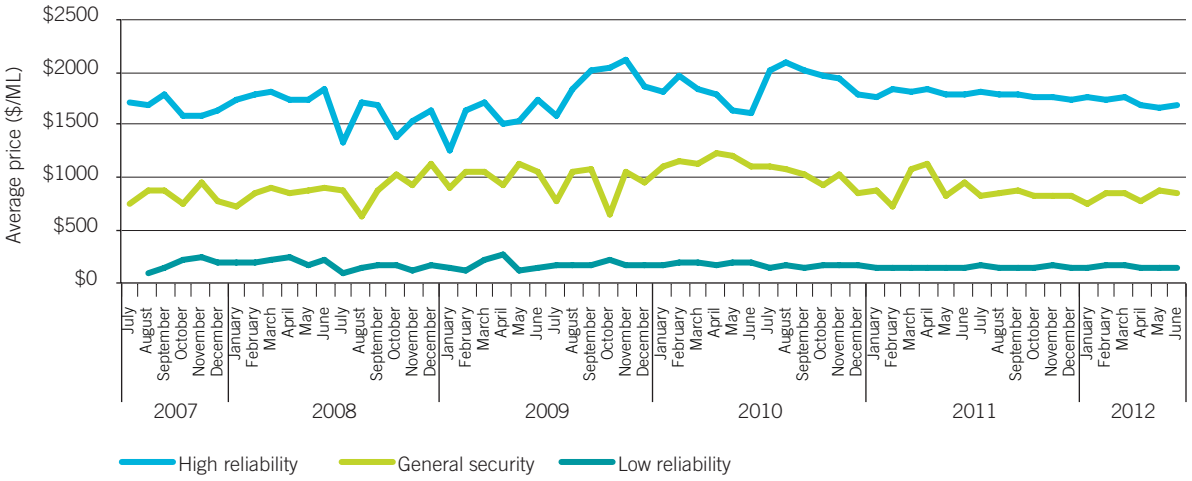
Prices

Prices for entitlements in the southern MDB have fluctuated much less than prices for allocations in the past five years (Figure 2.5). This is to be expected: entitlements are long-term products, and decisions to purchase them are based on the expected value of the stream of water access they provide for use or sale, which in turn is determined by long-term factors such as projected commodity prices and growth in agricultural industries, as well as structural changes to individual farms. By contrast, allocation trades are short-term responses to seasonal water excesses and shortages, resulting in prices that reflect seasonal conditions (Wijedasa et al. 2002).

Prices for high-reliability and general-reliability entitlements fell by 10%–25% from July 2010 to July 2011. 2011–12 only saw a small decrease in prices. The sustained reduction is likely to reflect a number of factors, including:

- a lower level of Australian Government purchases in the market compared to 2009–10 and a different approach used by the government to make acquisitions
- lower prices for allocation water (the value of an entitlement reflects future income from selling allocations to the entitlement, so lower allocation prices are reflected in lower entitlement prices)
- greater water availability, which reduces the perceived need to purchase entitlements as a short- to medium-term risk management or insurance strategy
- restrictions on the sale of New South Wales entitlements to the Australian Government, resulting in lower demand for those entitlements (see Section 3.3.5).

Figure 2.5: Entitlement trades in the southern MDB, average prices, 2007–08 to 2011–12 ($/ML)



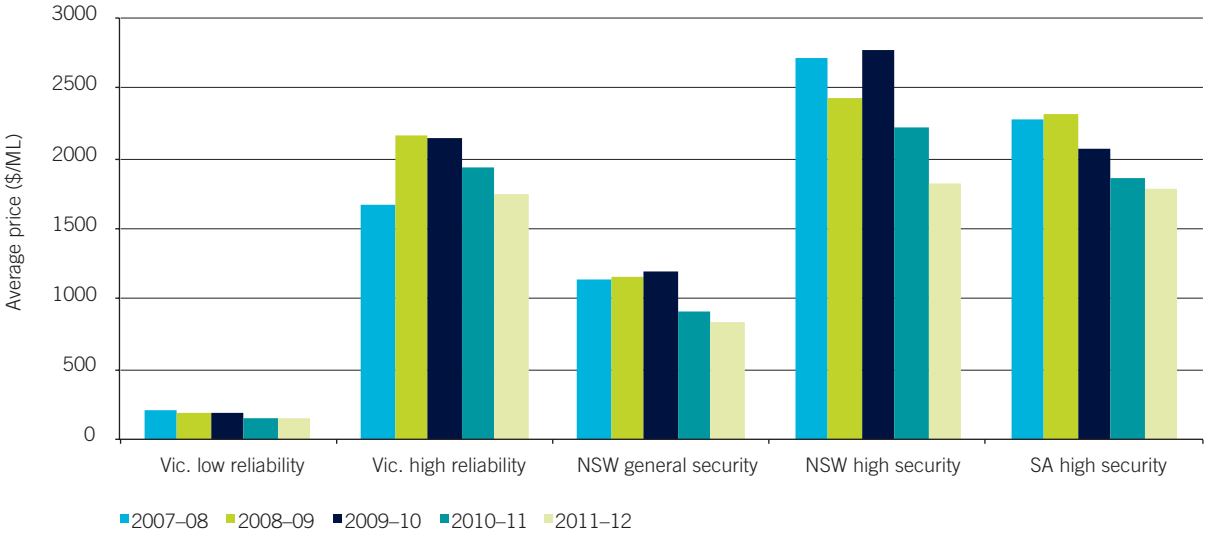
Notes: Only regulated trades are presented. Average prices for high reliability entitlement trades include prices for Victorian high-reliability water entitlements, NSW high-security water access licences and South Australian high-security water entitlements.

Source: *AWMR* series.

From 2007–08 to 2009–10, there was no clear trend in average prices for entitlements within reliability groups; some reliability classes in some jurisdictions increased in price, while others decreased (Figure 2.6). In 2010–11, however, prices for general and high-reliability classes across the southern MDB decreased by at least 10% compared to the previous year, while prices for low-reliability entitlements stayed relatively stable. In 2011–12, prices in all jurisdictions and reliability groups fell.

Figure 2.6 also provides evidence of a maturing and deepening market in the southern MDB, without significant volatility as prices normalise over time.

Figure 2.6: Entitlement trades in the southern MDB, average prices, by state and reliability class, 2007–08 to 2011–12 ($/ML)



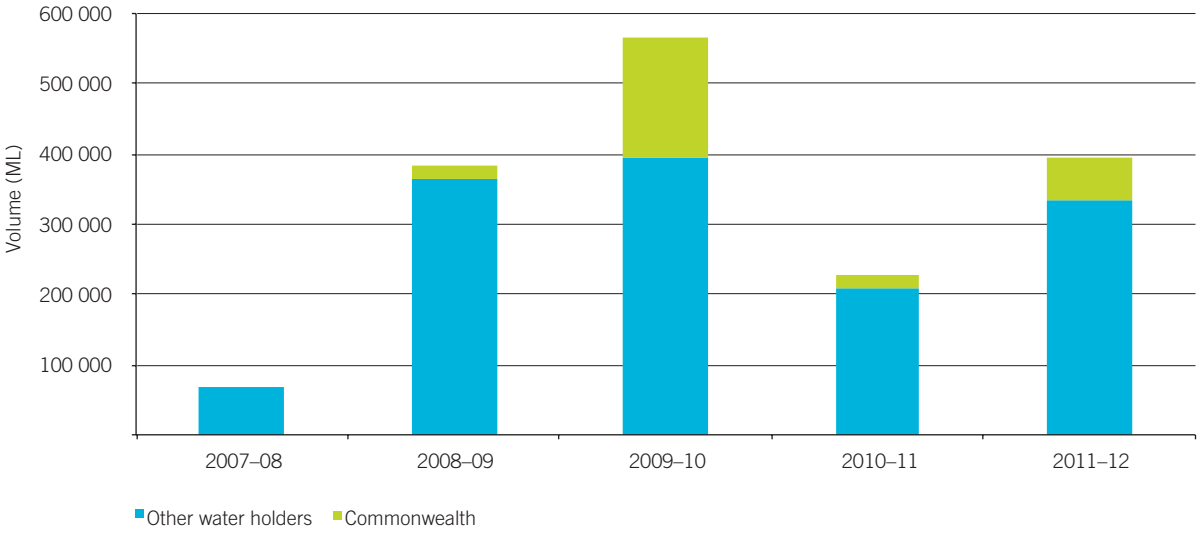
Note: Only regulated trades are shown.

Source: *AWMR* series.

2.1.3 Water entitlement markets in the northern MDB

The volumes of entitlements traded in the northern MDB increased significantly from 2007–08 to 2009–10 before falling by 53% in 2010–11 (Figure 2.7). In part, the fall was attributable to a reduction in Commonwealth environmental water purchases, which decreased from 186 GL in 2009–10 to 19 GL in 2010–11. In 2011–12, the total volume of trade increased by 74% (226 GL to 393 GL). Most of the increase was in entitlement trades by other water holders (such as cotton growers as they expanded production), which increased from 207 GL to 334 GL. Australian Government purchases also increased from 19 GL to 60 GL.

Figure 2.7: Entitlement trades in the northern MDB, 2007–08 to 2011–12 (ML)



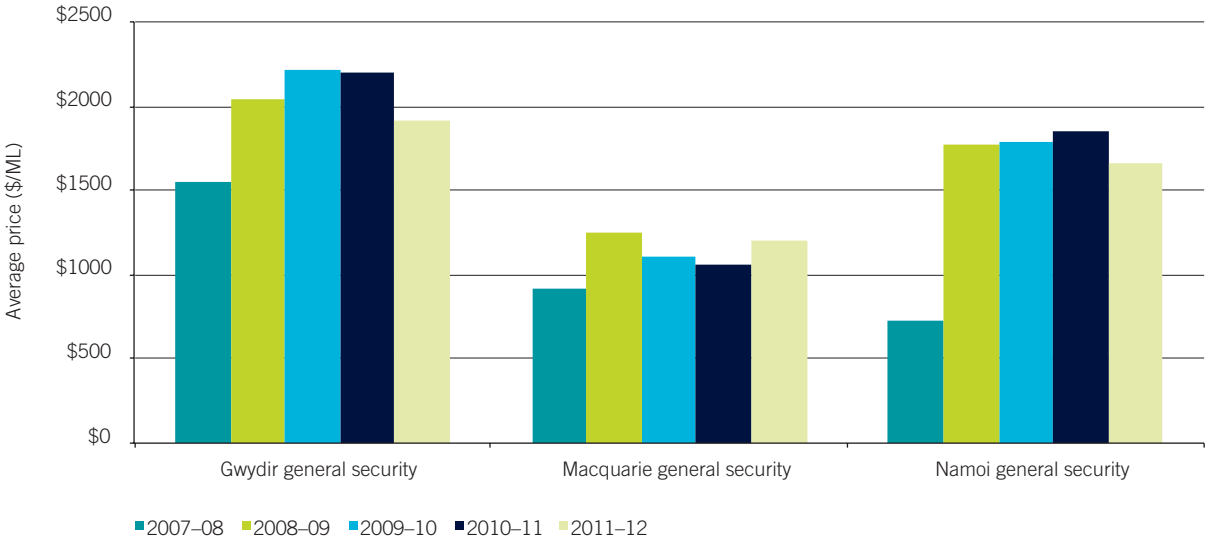
Note: Only regulated trades are shown. Includes 14.6 GL of non-tradeable *Water Act 1912* (NSW) licences that were registered by the Commonwealth in 2010–11 as part of land purchases.

Source: NWC (2010b), *AWMR* series.

Prices for entitlement trades generally fell across the northern MDB in 2011–12, although prices for Macquarie zone general-security entitlements rose slightly (Figure 2.8).

There were substantial differences in the average prices of general-security entitlement trades in the Gwydir, Macquarie and Namoi zones (due to a lack of data, other northern MDB trading zones are not included in this analysis). The variation in prices for entitlements of the same reliability class in these zones contrasts with the relative uniformity of prices in the southern MDB. Hydrological connectivity between zones in the southern MDB has allowed a more uniform price to be established, although trading rules and different reliability characteristics result in some price differences. This contrasts with the lack of connectivity between the zones in the northern MDB, which means that they operate as more separate markets.

Figure 2.8: Entitlement trades in selected northern MDB trading zones, average prices, 2007–08 to 2011–12 ($/ML)



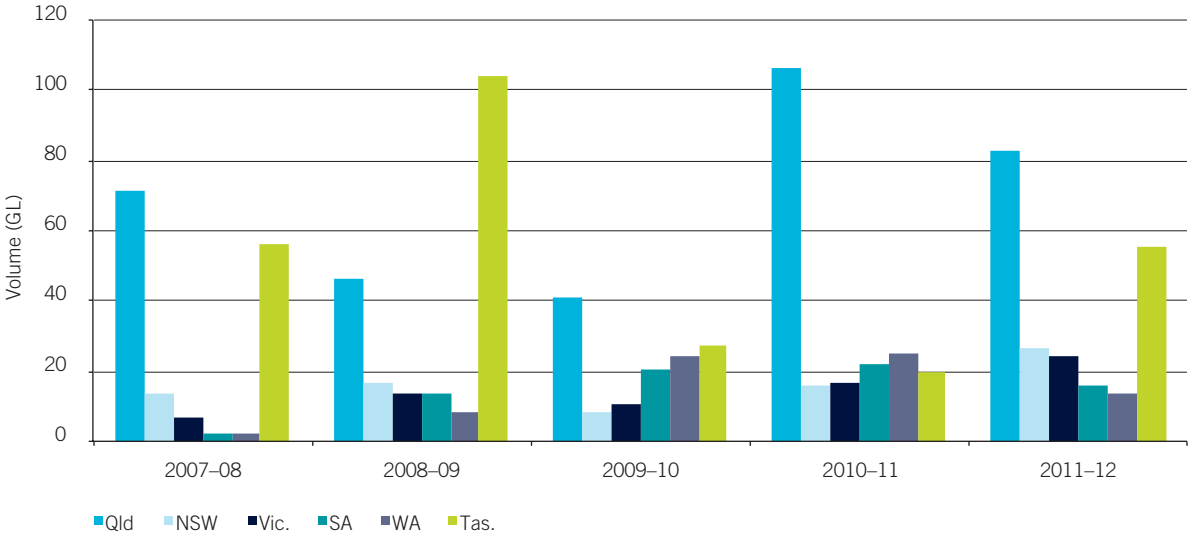
Source: *AWMR* series.

2.1.4 Water entitlement markets outside the MDB

Entitlement trading outside the MDB increased from 205 GL in 2010–11 to 218 GL in 2011–12, mainly as a result of increased trading in Tasmania (Figure 2.9). Trading in Tasmania increased from 20GL to 55GL. Increases also occurred in New South Wales and Victoria, but trading decreased in Queensland, South Australia and Western Australia.

As the water markets outside of the MDB are relatively shallow, it is difficult to identify the key reasons for the changes in entitlement trading. In a shallow market, the actions of a few can have substantial impacts on market outcomes, making it difficult to attribute changes in trading levels from year to year to a particular market driver or influence.

Figure 2.9: Entitlement trades outside the MDB, 2007–08 to 2011–12 (GL)



Note: Data for trading outside the southern MDB before 2007–08 was not available for this report. 2010–11 and 2011–12 data includes groundwater trades in Victoria for the first time.

Source: *AWMR* series.

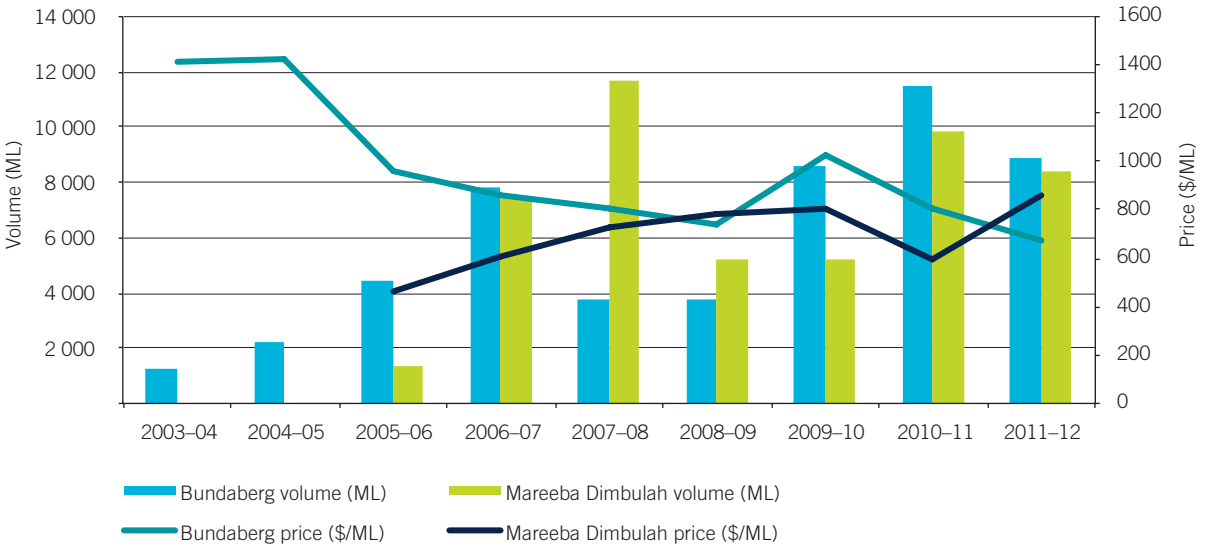
Queensland

Queensland typically has the greatest volume of entitlement trading outside the MDB. The entitlement trade in Queensland decreased to 82 GL in 2011–12 from 106 GL in 2010–11.

The Bundaberg and Mareeba Dimbulah water supply schemes have some of the longest available time-series of data from Queensland (Figure 2.10). After some initial fluctuations from 2003–04 to 2005–06, the average price of medium-security entitlements in Bundaberg has been relatively stable. The average price in Mareeba Dimbulah, however, has followed a steadily increasing trend, particularly in 2010–11 when it rose by 50% compared to the previous year. Under a draft amendment to the Barron Resource Operations Plan, released in 2010, the Queensland Government indicated that it intended to extend trading opportunities to include unsupplemented water users in the region. Uncertainty about the issue may have been one reason for increased prices in 2009–10. Following the release of the resource operations plan amendment in October 2011, the trading of unsupplemented water was included, which may have caused prices to decrease. This shows that entitlement prices in isolated areas can move in quite different directions depending on local factors.

The volume of entitlement trading in both schemes rose considerably in 2010–11, particularly in the Mareeba Dimbulah scheme, where trade increased by 87% before decreasing again in 2011–12.

Figure 2.10: Medium-reliability entitlement trades in the Mareeba Dimbulah and Bundaberg water supply schemes, volumes and average prices, 2003–04 to 2011–12



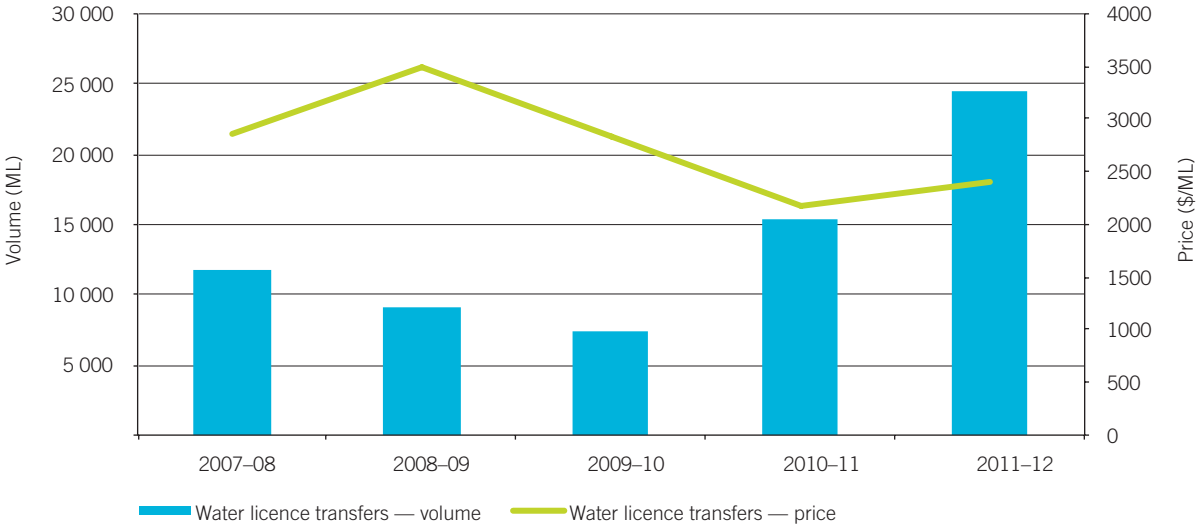
Source: *AWMR* series.

New South Wales

Entitlement trading in the Hunter Valley in New South Wales increased from 16 GL to 26 GL from 2010–11 to 2011–12 (Figure 2.11). The Hunter is one of the main trading districts in New South Wales outside the MDB.

The Hunter typically has much higher entitlement prices than other areas in times of water shortages. This is due to the requirements of grape producers and their inability to obtain water from other basins. However, when water is plentiful, prices decrease to levels much more consistent with those elsewhere in New South Wales.

Figure 2.11: Entitlement trades in the Hunter Valley, volumes and prices, 2007–08 to 2011–12



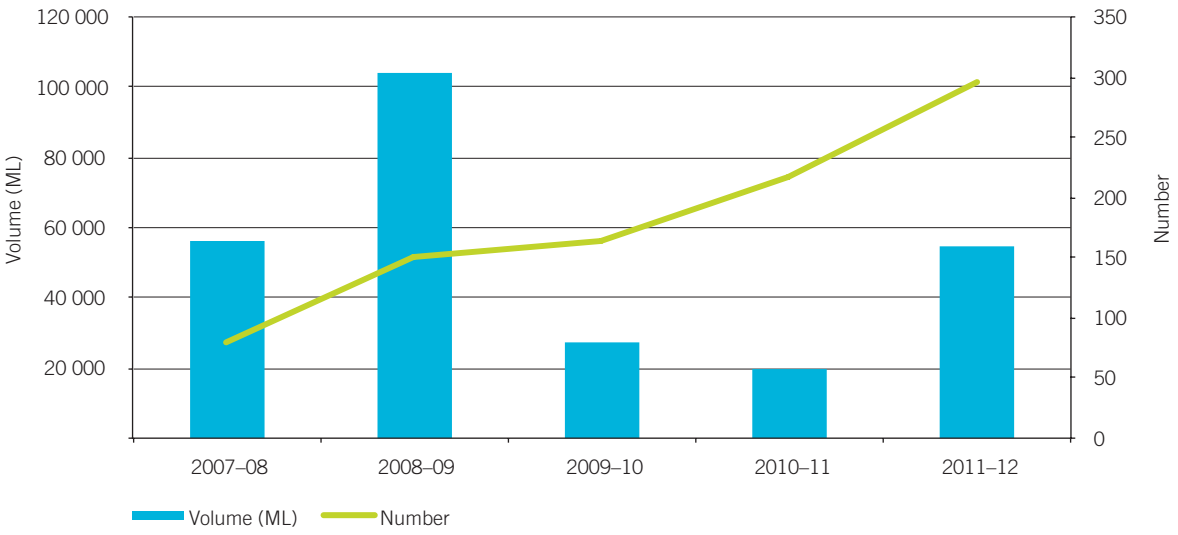
Source: *AWMR* series.

Tasmania

Tasmania's water markets are constrained by limited connectivity between water systems. To date, most trades have occurred within major irrigation schemes as a result of property sales.

There has been an upward trend in the number of entitlement trades, with some fluctuation in volumes traded (Figure 2.12). The record volume of trade in 2008–09 was the result of three trades of more than 20 GL each that were all part of property sales. If those trades were excluded, entitlement trading in that year would have been similar to trading in 2007–08. There was little change in entitlement trading in Tasmania from 2009–10 to 2010–11, but both the number of trades and the volume of trade increased in 2011–12. The volume more than doubled from 20 GL in 2010–11 to 55 GL in 2011–12, mainly as a result of the inclusion of information from irrigation infrastructure operators for the first time.

Figure 2.12: Water licence transfers in Tasmania, numbers and volumes, 2007–08 to 2011–12

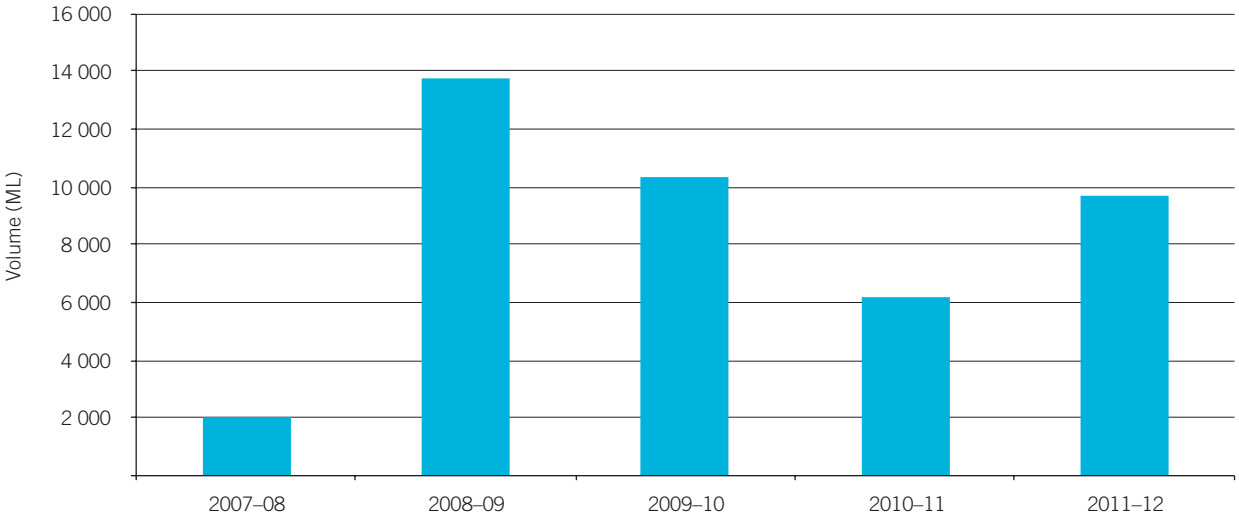


Source: *AWMR* series.

Victoria

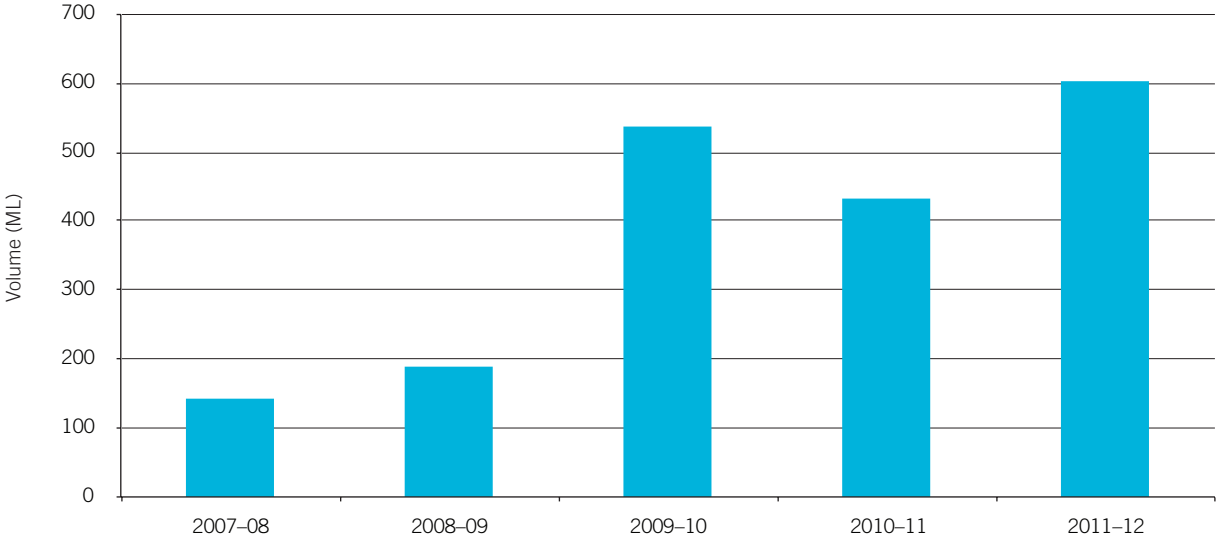
Water entitlement trading in Victoria outside the MDB occurs in Southern Rural Water's Werribee, Bacchus Marsh and Macalister districts. In recent years, most trading has occurred in the Macalister district, as water availability in the Werribee and Bacchus Marsh districts has been low. The volume of water entitlement trading in Victoria increased from 16 GL in 2010–11 to 26 GL in 2011–12. In the Macalister district, a long-term decline related to increased water availability from 2008–09 to 2010–11 (Figure 2.13). Consistent with the statewide trend, the volume of entitlement trading in the Macalister district increased in 2011–12. The volume of trade in Werribee and Bacchus Marsh districts also increased to a record high volume (Figure 2.14).

Figure 2.13: Entitlement trades in the Macalister district, 2007–08 to 2011–12 (ML)



Source: *AWMR* series.

Figure 2.14: Entitlement trades in the Werribee and Bacchus Marsh districts, 2007–08 to 2011–12 (ML)

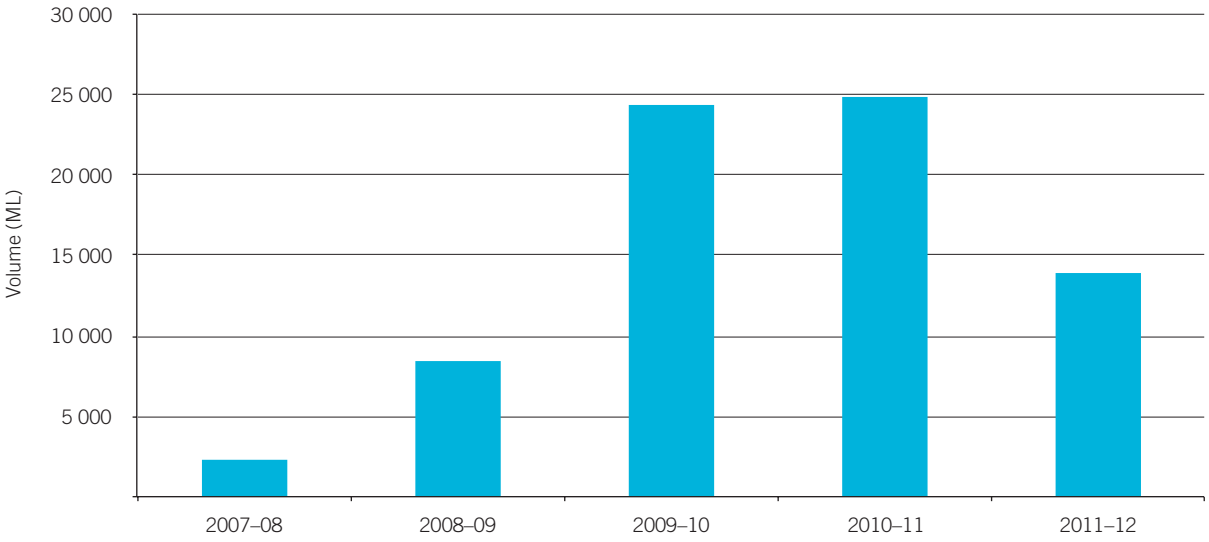


Source: *AWMR* series.

Western Australia

The volume of entitlement trading in Western Australia decreased from 25 GL in 2010–11 to 14 GL in 2011–12 (Figure 2.15). The total volume of permanent water traded in the state increased from 2007–08 before decreasing in 2011–12 in response to dry seasonal conditions. The 2010–11 water year was a particularly dry season, in which the Department of Water actively promoted water trading as a mechanism for licence holders to secure water from alternative sources.

Figure 2.15: Water licence transfers in Western Australia, 2007–08 to 2011–12 (ML)



Source: *AWMR* series.

In 2011–12, the average price for water licence transfers in the three Harvey Water irrigation districts decreased to $631/ML from $964/ML in 2010–11, while the average price for water allocation trades remained about the same. At the same time, the numbers of trades remained low over the five-year period to 2011–12 (between 30 and 58 trades).

Table 2.2: Water licence transfers within Harvey Water irrigation districts, 2007–08 to 2011–12

Irrigation district	2007–08		2008–09		2009–10		2010–11		2011–12	
	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)
Waroona	2	34	5	89	1	14	0	0	0	0
Harvey	20	1000	26	1030	42	3187	27	1315	23	1357
Collie	10	718	9	820	15	1358	7	868	8	589
Total	**32**	**1752**	**40**	**1939**	**58**	**4559**	**34**	**2183**	**31**	**1946**

Note: Includes transfers as part of property sales.

Source: Harvey Water.

In 2011–12, surface water licence transfers managed by the Department of Water increased in volume by 38% to 900 ML, from 654 ML in 2010–11 (Table 2.3). There was much greater variation in the average size of groundwater trades compared to surface water trades.

Table 2.3: Groundwater and surface water licence transfers in areas other than irrigation cooperatives, Western Australia, 2007–08 to 2011–12

	2007–08		2008–09		2009–10		2010–11		2011–12	
	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)
Groundwater	14	486	64	2282	82	17 635	78	21 990	68	11 004
Surface water	n.a.	n.a.	6	4270	9	2166	8	654	15	900

Source: Department of Water.

Groundwater

Trading of groundwater entitlements is relatively limited in most jurisdictions for a number of reasons. The most important is that aquifers often have limited hydrogeological connections. Along with a lack of physical infrastructure linking groundwater areas, this restricts trading to within individual aquifers.

However, there are also many administrative and management reasons why trading is limited, including the following:

- In many areas, groundwater entitlements are yet to be fully unbundled.
- While all states have legislation that enables groundwater trading, in some areas the provisions relating to groundwater licensing and trading are relatively recent and the market has not yet had time to fully develop.
- In some cases, there is uncertainty about the definition of individual groundwater management units. For a market to be established, it is important to be able to physically define the relevant water system. In many areas, work to better define aquifer system boundaries is still ongoing. Without certainty about boundaries, jurisdictions have been reluctant to allow unfettered trade.
- Groundwater rights continue to be available on application in some areas.
- In some areas, particularly where surface water is plentiful, there is limited demand.

Around 49% by number and 21% by volume of entitlements on issue in Australia are groundwater entitlements. By volume, most groundwater entitlements are in New South Wales, Queensland and Western Australia (Table 2.4). In Western Australia, there are about 10 times more groundwater entitlements than surface water entitlements on issue. There are no groundwater entitlements on issue in Tasmania.

Groundwater is a significant source of water for consumptive use across much of Australia. In some jurisdictions (notably Western Australia and the Northern Territory), groundwater is the main water source. In the other mainland states, groundwater is important to markets as a substitutable source of water, particularly when there is low surface water availability. However, for a range of reasons, trading of groundwater entitlements and of allocations (where they apply) has so far been limited.

Table 2.4: Groundwater entitlements on issue at 30 June 2012

Jurisdiction	Number	Volume (GL)
New South Wales	47 835	2056
Queensland	8153	1008
Victoria	8956	950
Western Australia	11 400	1713
South Australia	4911	620
Tasmania	0	0
Northern Territory	232	125
Australian Capital Territory[a]	262	76
Total	**81 719**	**6596**

a Australian Capital Territory entitlements referred to as 'surface water and groundwater' entitlements have been classified as surface water for the purposes of this table.

Note: Includes water access entitlements or their jurisdictional equivalents.

Source: *AWMR* series.

Available data suggests that groundwater entitlement trading accounts for around 12% of total entitlement trading in Australia, while groundwater allocation trading (which occurs only in New South Wales and Victoria) makes up around 1% of total allocation trading (Table 2.5). However, those figures are likely to understate trading because reporting of groundwater trading is less well developed than reporting of surface water trading.

Table 2.5: Groundwater entitlement trading in 2011–12

	Qld	NSW	Vic.	SA	WA	NT	Tas.	ACT
Number	0	208	304	202	68	0	0	0
Volume (ML)	0	84 377	35 325	15 725	11 004	0	0	0

Source: *AWMR* series.

2.2 Trends in water allocation markets

A number of factors had a large influence on allocation trading in 2011–12. Aside from increased water availability and allocations, the key drivers were:

- environmental allocation trading
- differences in carryover arrangements between jurisdictions
- the suspension of trading into and out of certain zones
- agricultural market factors, in particular decisions by irrigators in the northern and southern MDB to plant rice and cotton crops.

A detailed discussion of these drivers is in Chapter 3 of this report.

2.2.1 National and basin-level water allocation markets

Nationally, allocation trading volumes increased from 3493 GL in 2010–11 to 4297 GL in 2011–12, an increase of 23%. This was driven by significant increases in allocation trading in New South Wales, Victoria, South Australia and Queensland. There was continued growth in trading in the Murray–Darling basin over the five-year period from 2007–08 to 2011–12 (Table 2.6). The main drivers of trading have changed over time (this is discussed in Section 3).

Table 2.6: Water allocation trading volumes, Australia, 2007–08 to 2011–12

	2007–08 (GL)	2008–09 (GL)	2009–10 (GL)	2010–11 (GL)	2011–12 (GL)	% change since 2010–11
MDB						
Regulated	1376	1663	2118	3340	4127	24
Unregulated and groundwater	17	290	183	76	89	17
MDB total	1393	1953	2301	3417	4216	23
Other water systems						
Other water systems	201	205	194	77	81	5
Total Australia	**1594**	**2158**	**2495**	**3493**	**4297**	**23**

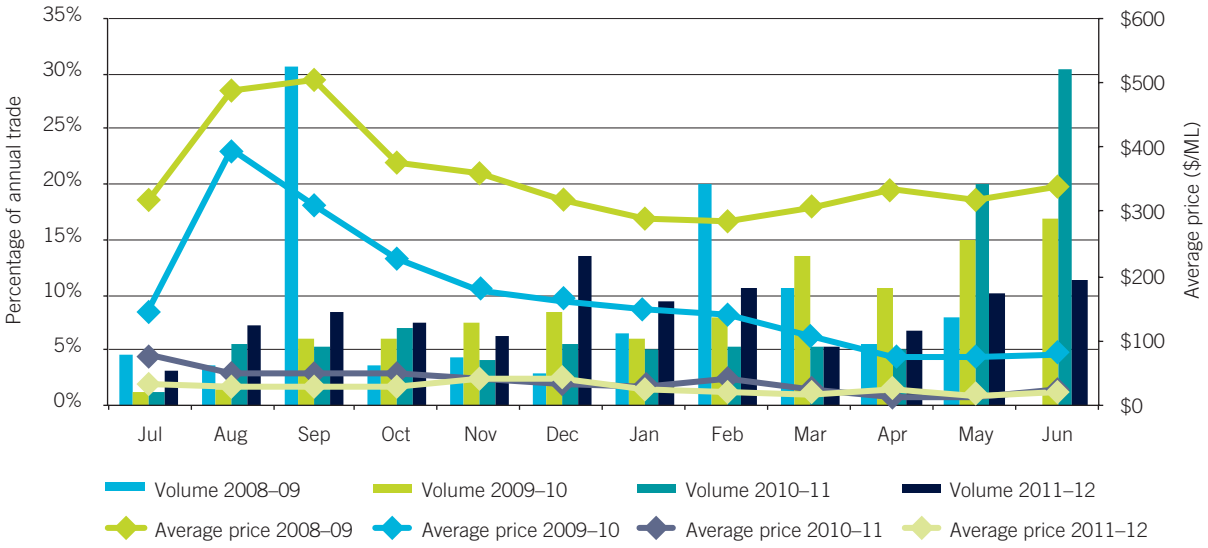
Source: *AWMR* series.

In the MDB, the timing of trading varies between years (Figure 2.16). In 2009–10 and 2010–11, there was an increasing trend in later season trading. With increasing allocations in those years compared to very dry preceding years, growers were looking to carry over larger volumes to secure their water requirements for the following seasons. For many irrigators, this meant seeking to access the better carryover arrangement available in Victoria at the time. Even though it was permitted to carry over up to 50% of entitlement levels in some New South Wales systems (similar to provisions to Victoria in 2009–10), licence conditions can limit the total amount that can be used. For example, in the NSW Murray, the maximum volume of allocation and carryover able to be received is 110% of water entitlements (for a more detailed discussion on carryover arrangements, see Section 3.3.4).

In July 2010, Victoria removed limits on the amount of carryover, which led to large volumes of late-season trade from New South Wales to Victoria. Even when Victoria suspended trade from New South Wales, irrigators responded by trading allocations through South Australia and back into Victoria as a work-around to the trade suspension.

In 2011–12, suspensions of trade were more widespread than in 2010–11, which prevented the late-season trading pattern recurring in 2011–12. For a more detailed discussion of the trade suspensions, see Section 3.3.5.

Figure 2.16: Water allocation trades in the MDB, percentage of annual volume traded and average prices, by month, 2008–09 to 2011–12

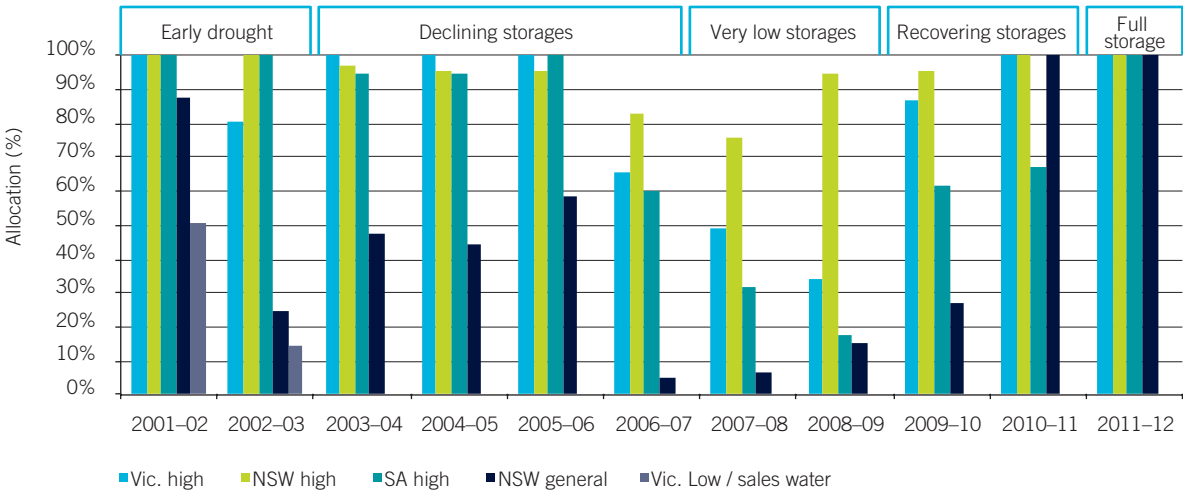


Source: *AWMR* series.

2.2.2 Water allocation markets in the southern MDB

Water availability is still the main driver of allocation trade volumes and prices in the southern MDB (Figure 2.17). In 2001–02, during the early stages of drought, volumes in storages began to fall and continued to do so over the following years. From 2009–10, storage volumes in all systems increased, reaching full capacity in all significant storages in 2011–12.

Figure 2.17: End-of-season allocations to high- and low-security entitlements in major systems in the southern MDB, 2001–02 to 2011–12 (%)

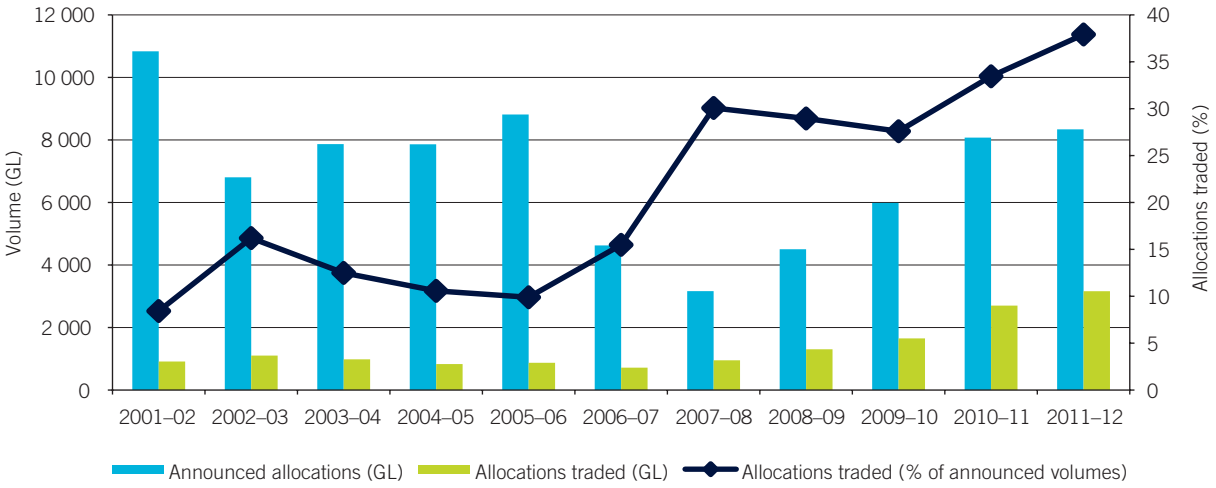


Notes: Water systems included in this chart are Vic. Murray, Goulburn, NSW Murray, Murrumbidgee and SA Murray. Victorian low-reliability water shares were created on 1 July 2007. Before that time, 'sales water' existed. No low-reliability allocations were made between 2007–08 and 2010–11. Allocation levels are the average annual allocations received by a trading zone for regulated entitlements. Aggregation includes only tradeable regulated entitlements. Allocation levels are calculated as (volume allocated to regulated entitlements) ÷ (volume of regulated entitlements on issue). See Appendix A for end-of-season allocation levels by reliability of entitlement.

Sources: NWC (2010b), *AWMR* series.

There has historically been a broadly inverse relationship between water allocation volumes and the proportion and volume of water allocations traded (Figure 2.18). As the volume of water allocated fell from 2001–02 to 2007–08, the percentage of the total allocation that was traded almost quadrupled, from 8% to 30%. More recently, however, water allocation volumes and the proportion and volume of water allocations traded have risen in concert. Demand for trading was relatively robust from 2008–09 to 2011–12, given improved water availability and resulting higher allocation volumes. This indicates that allocation trading has become an increasingly important tool for water users (irrigators and environmental parties) to optimise water use in both dry and wetter seasons.

Figure 2.18: Allocations in the southern MDB, volumes announced and volumes and proportions traded, 2001–02 to 2011–12

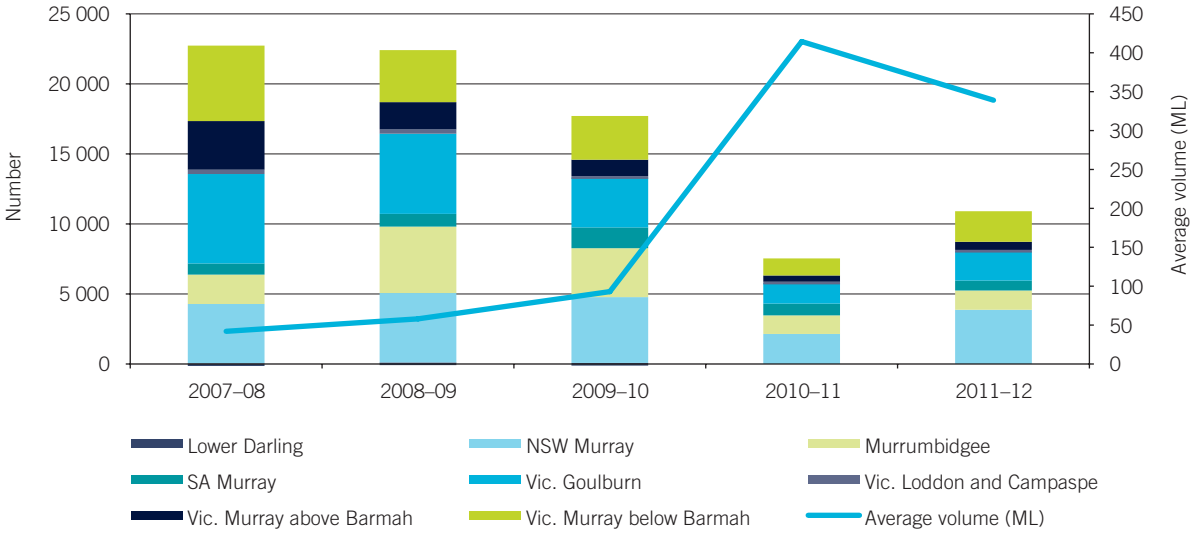


Note: Includes only trades of regulated water from the Lower Darling, NSW Murray, Murrumbidgee, SA Murray, Victorian Murray, Goulburn and Campaspe–Loddon systems. Excludes trades internal to irrigation districts.

Sources: NWC (2010b), *AWMR* series.

In 2011–12, there was a large growth in the volume of allocation trading in the NSW Murray, Vic. Goulburn and Vic. Murray below Barmah compared to the previous year (Figure 2.19). While the total volume of trade increased, the average size of trades declined from 2010–11 to 2011–12. This was a return towards historical trade levels. From 2007–08 to 2009–10, both the numbers and the average volumes of allocation trades were relatively large and remained constant. In 2010–11, however, the number of allocation trades declined by almost 60% compared to the previous year, while the average size of trades increased more than fourfold. As noted above, the decline in trade volume in 2010–11 can be explained by the high availability of water. Even with full storages and high water availability in 2011–12, there was growth in the number of trades. It is likely that this was driven largely by Commonwealth environmental water trading in the allocation market.

Figure 2.19: Allocation trades in the southern MDB, numbers and average volumes, 2007–08 to 2011–12

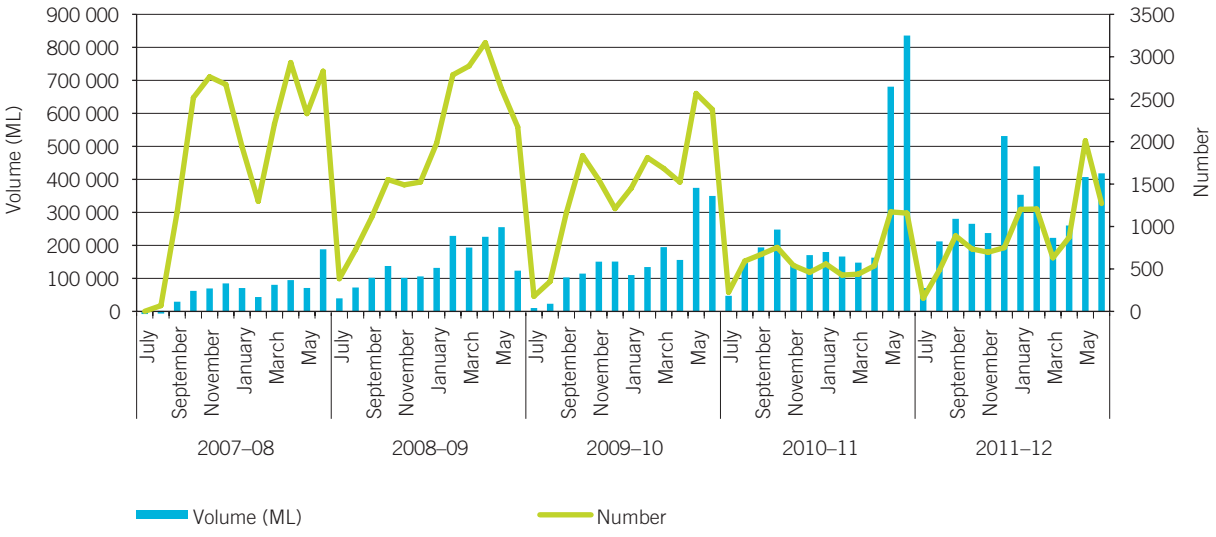


Note: To avoid double counting, the numbers of trades and volumes used to calculate the average size of trades are based on internal trades plus trades out of each water system.

Source: *AWMR* series.

Figure 2.20 shows monthly volumes and numbers of allocation trades from 2007–08 to 2011–12, highlighting the low number of trades in 2010–11 compared to previous years. It also shows that record volumes of allocation trading occurred in the last two months of the 2010–11 water year: 681 GL and 836 GL were traded in May and June 2011, respectively (see discussion on carryover in Section 3.3.4). In 2011–12, the number of trades began to rise, although it remained significantly lower than in 2007–10. Trade volumes were more consistent across 2011–12, but there was an unprecedented peak in December. This was linked to trades for environmental water deliveries (see Section 3.4.2).

Figure 2.20: Allocation trades in the southern MDB, volumes and numbers, by month, 2007–08 to 2011–12

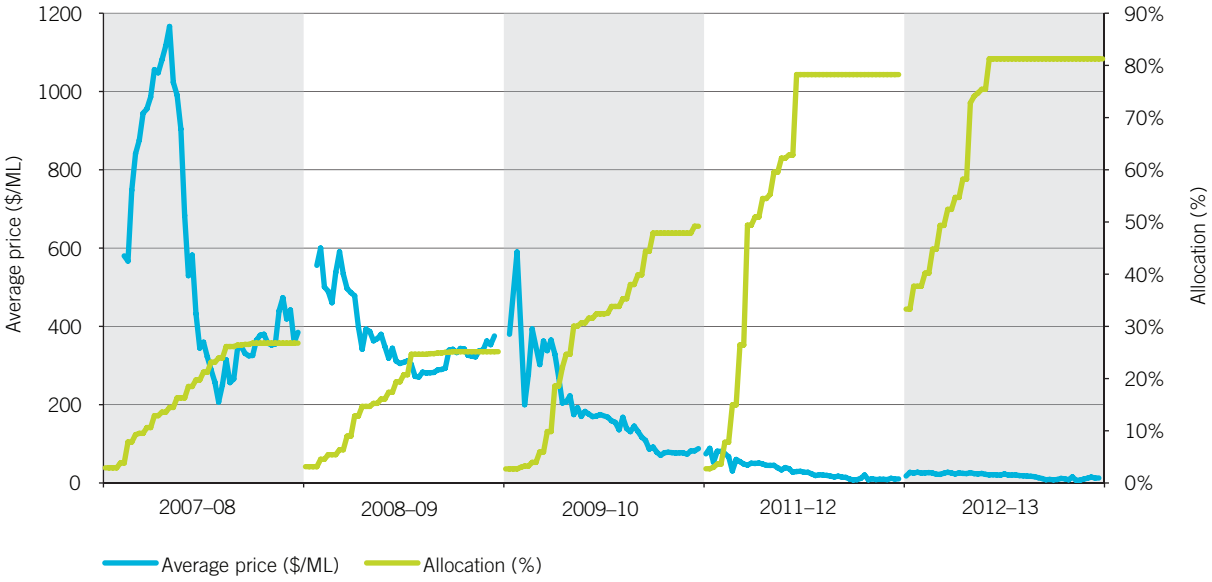


Note: Victorian groundwater trades have not been included in this chart.

Source: *AWMR* series.

Declining prices for water allocations from 2009–10 reflected the recovery of water storage volumes (Figure 2.21). Typically, water allocation prices in the MDB are more volatile at the beginning of each water year before becoming more stable as the year progresses (see Section 3.51 for a fuller discussion of the price spike in 2007–08). However, in 2010–11 and 2011–12 prices were relatively stable throughout the year (although following a downward trend). This was likely to have been due to the relative certainty of high allocation levels. Allocation prices were at historical lows in late 2010–11 and in 2011–12, when allocations reached 100%.

Figure 2.21: Allocations in the southern MDB, allocation levels and average prices, 2007–08 to 2011–12

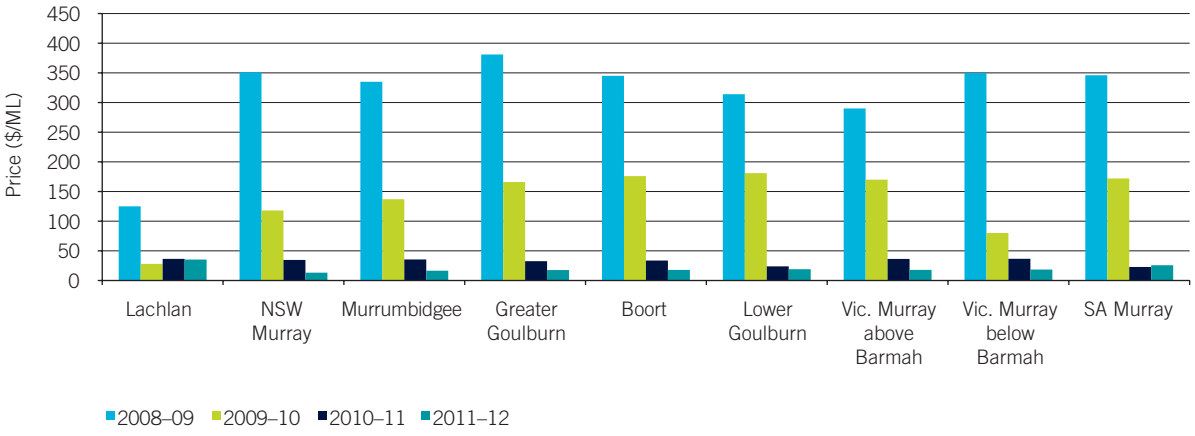


Note: The method for calculating the allocated amounts for the 2010–11 water year in last year's report was incorrectly reported because the volume of low-security entitlements was not included in the calculation. That error has been corrected in this report.

Source: *AWMR* series.

An overall decline in allocation prices in the major southern MDB water systems has generally reflected high rainfall and allocations (Figure 2.22). Across all years from 2008–08 to 2011–12, prices were markedly similar throughout the system. This suggests that there are few barriers to the establishment of a uniform clearing price.

Figure 2.22: Average allocation prices in selected water systems, 2008–09 to 2011–12 ($/ML)



Source: *AWMR* series.

A significant feature of water allocation trading in 2011–12 was an increase in internal trade compared to interstate trading for New South Wales, where internal trade volume grew from 83% in 2010–11 to 92% in 2011–12. In South Australia, for the first time in four years, internal trade volumes decreased while interstate trade increased (Table 2.7).

Table 2.7: Internal versus interstate allocation trading as a proportion of trading in the southern MDB, by state, 2007–08 to 2011–12 (%)

	NSW		Vic.		SA		Total	
	Internal	Interstate	Internal	Interstate	Internal	Interstate	Internal	Interstate
2007–08	74%	26%	87%	13%	99%	1%	83%	17%
2008–09	58%	42%	94%	6%	96%	4%	67%	33%
2009–10	75%	25%	81%	19%	81%	19%	77%	23%
2010–11	83%	17%	77%	23%	35%	65%	73%	27%
2011–12	92%	8%	73%	27%	49%	51%	81%	19%

Note: To avoid double counting, interstate trade comprises only trades out of each state. For example, the substantial volume of trade that took place in 2008–09 from New South Wales into South Australia is included as New South Wales, rather than South Australian, interstate trade.

Source: *AWMR* series.

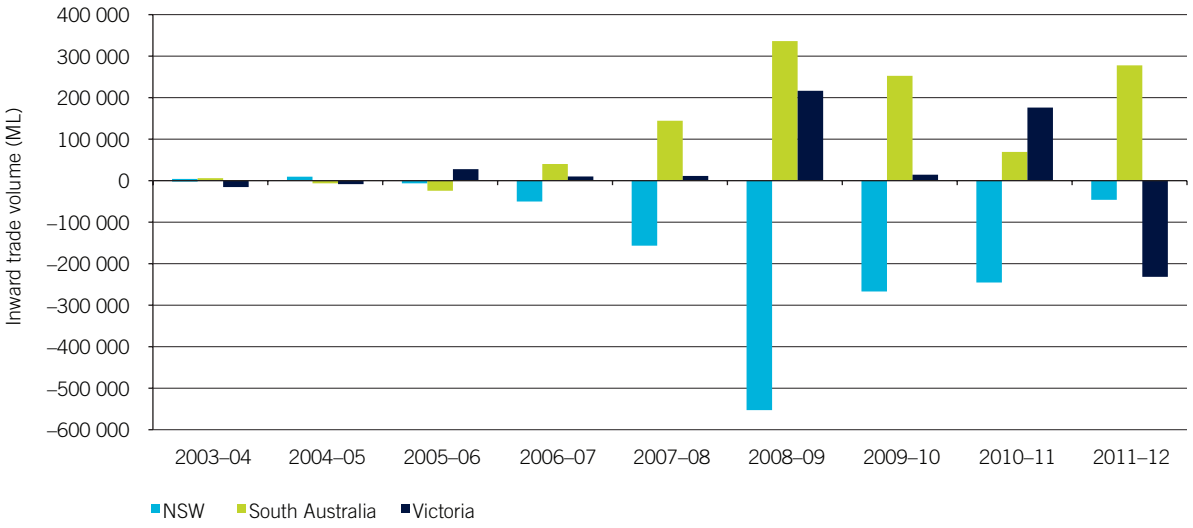
Interstate trading

In net terms, some allocation volumes were traded interstate from 2003–04 to 2006–07; however, even greater volumes of interstate trade occurred from 2007–08 to 2011–12 (Figure 2.23). For the first time since 2004–05, Victoria became a net exporter in 2011–12 (this was linked to environmental trades; see Section 3.4.2).

South Australia continued to be a net importer of allocations in 2011–12, when its net imports increased by over four times to 278 GL from 63 GL in 2010–11 (again, this was largely linked to environmental trades). In 2011–12, net imports comprised imports of 507 GL and exports of 229 GL.

New South Wales has been a net exporter since 2006–07; the most substantial volume was exported in 2008–09. Over 60% of New South Wales' exports in 2010–11 were to South Australia. In 2011–12, its net exports reduced significantly as high allocations to general-security entitlement holders and relatively low prices for water saw a significant increase to rice production in the NSW Murray, Murrumbidgee and Coleambally regions.

Figure 2.23: Net interstate allocation trades in the southern MDB, 2003–04 to 2011–12 (ML)

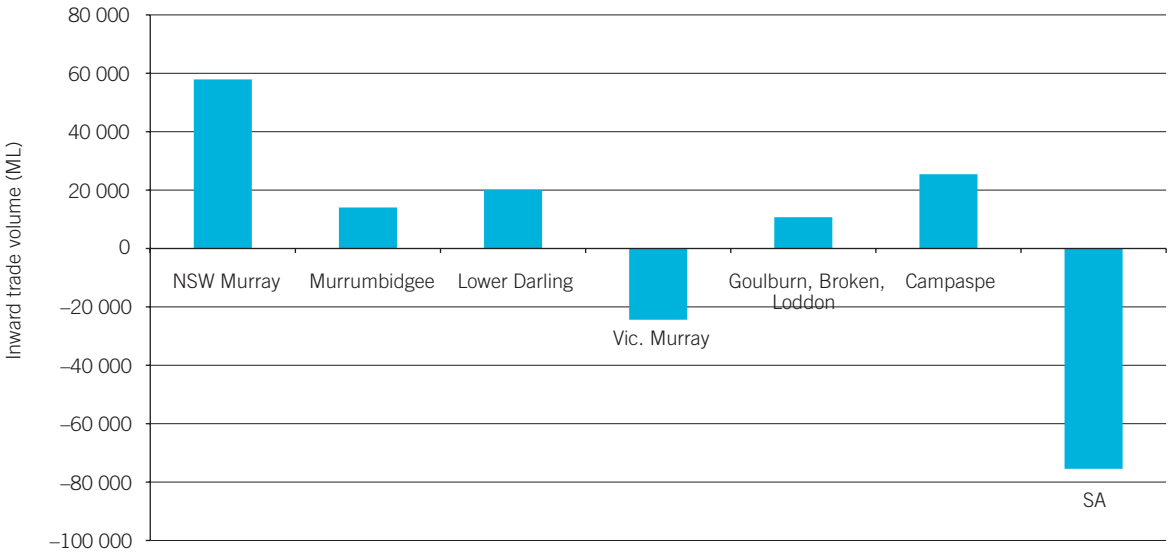


Note: This figure understates the volume of interstate allocation trading, as it shows only each state's net trade in (trade in minus trade out). Excludes trades into or out of Queensland.

Sources: NWC (2010b), *AWMR* series.

The trading patterns for non-environmental interstate trades are quite different from the overall patterns (Figure 2.24). When environmental trades are excluded, South Australia was a net exporter (75 GL) and New South Wales and Victoria were both net importers (92 GL and 12 GL, respectively). Note that these figures do not consider trades between environmental and non-environmental parties. These patterns are consistent with increased water use for rice growing in New South Wales and for horticulture, the dominant irrigated planting in the SA River Murray Prescribed Water Course. Water users in those regions are typically not large purchasers of allocations in relatively wet years, and may have allocations surplus to their requirements, which they are able to sell. (For further discussion on these industries, see Section 3.5.1).

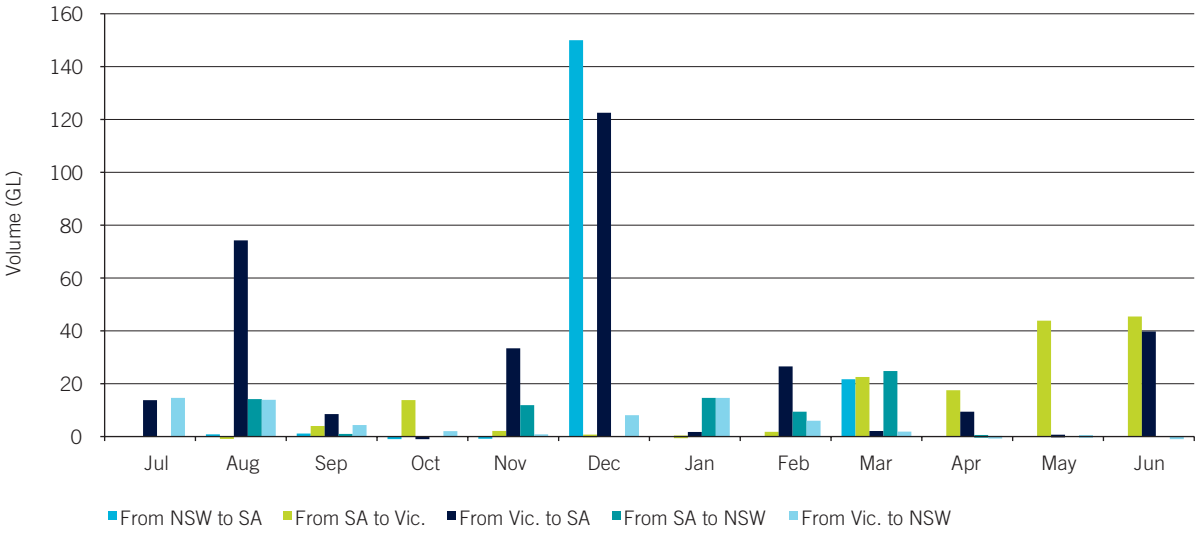
Figure 2.24: Net interstate allocation trades (excluding environmental trades) in the southern MDB, 2011–12 (ML)



Source: MDBA.

Record volumes of allocation trading occurred in August, December and June in the 2011–12 water year (Figure 2.25). Combined trade from New South Wales to South Australia was 174 GL in total, 150 GL of it during December. The largest volume of trade was from Victoria to South Australia (333 GL), but this was offset somewhat by 143 GL of trade from South Australia to Victoria. The largest monthly volume (123 GL) was traded in December. These record volumes were a result of environmental delivery trades (see Section 3.4.2).

Figure 2.25: Interstate allocation trades in the southern MDB, by month, 2011–12 (GL)



Note: Trades from New South Wales to Victoria have not been included, as there was a negligible volume of trade in that direction in 2011–12.

Source: *AWMR* series.

Interzone trading

Figures 2.26 to 2.30 show the largest sources and destinations for water allocation trades for each southern MDB trading zone from 2007–08 to 2011–12.

There was a consistent movement of water into the SA Murray from the Murrumbidgee, NSW Murray and Lower Darling zones from 2008–09 onwards, although this overall trend weakened in 2011–12. (Trade into or out of the Lower Darling was not possible in 2007–08.)

Figure 2.26: Significant interzone allocation trading in the southern MDB, 2007–08

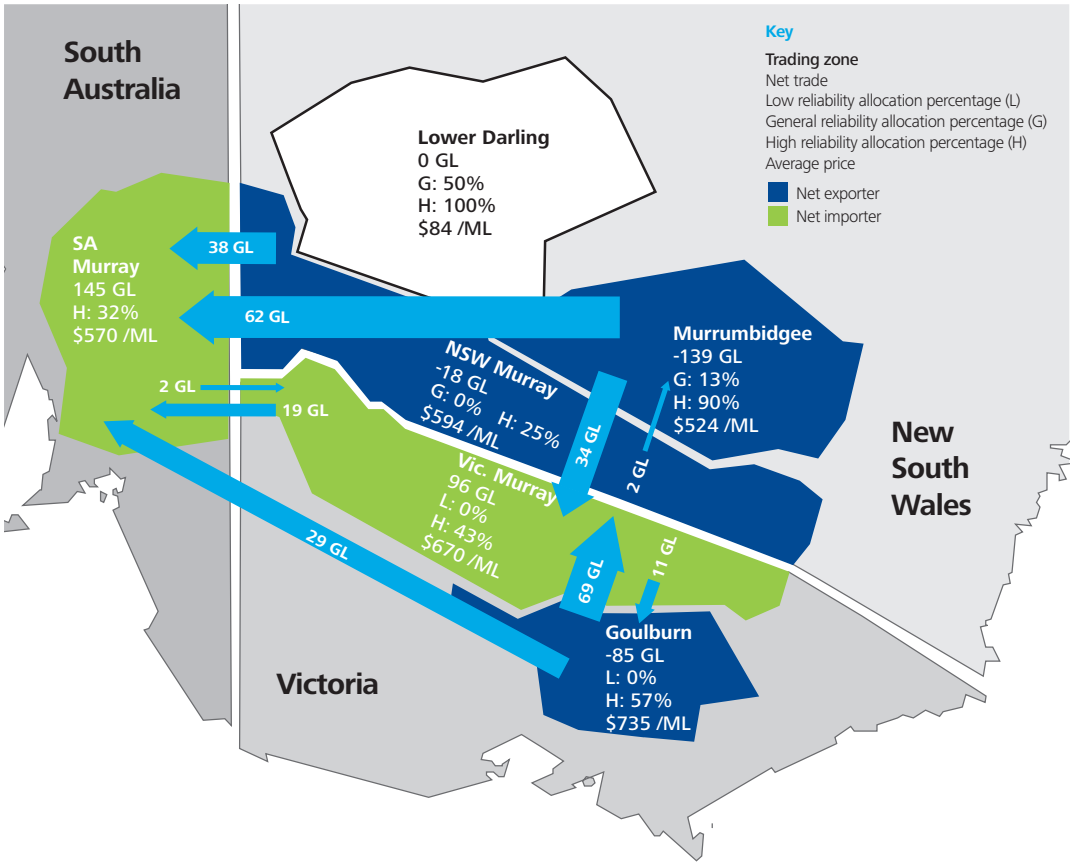


Figure 2.27: Significant interzone allocation trading in the southern MDB, 2008–09

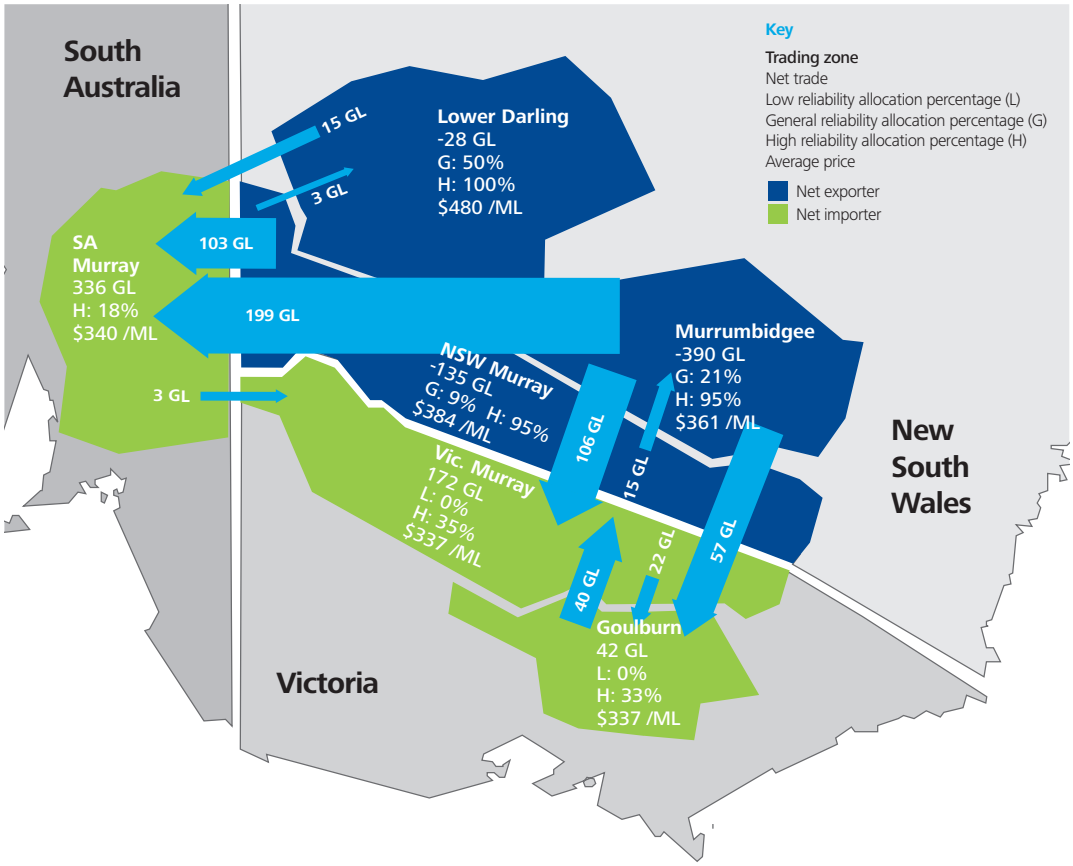


Figure 2.28: Significant interzone allocation trading in the southern MDB, 2009–10

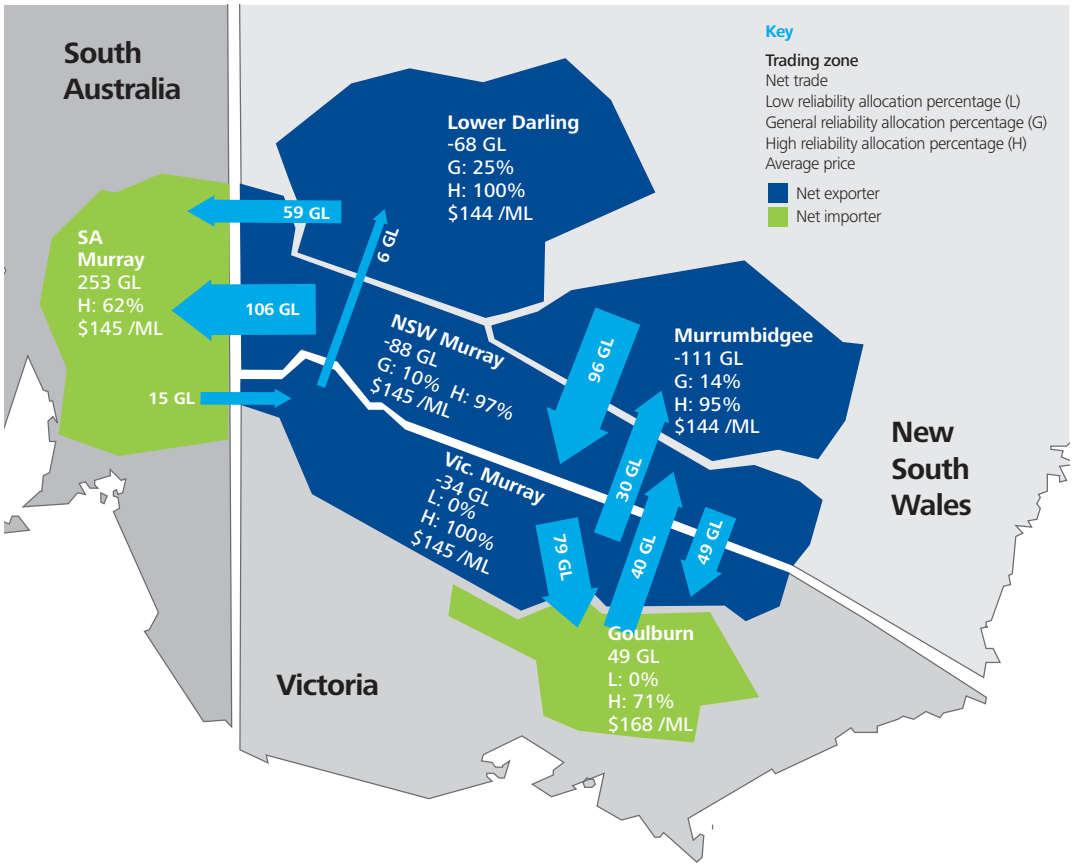


Figure 2.29: Significant interzone allocation trading in the southern MDB, 2010–11

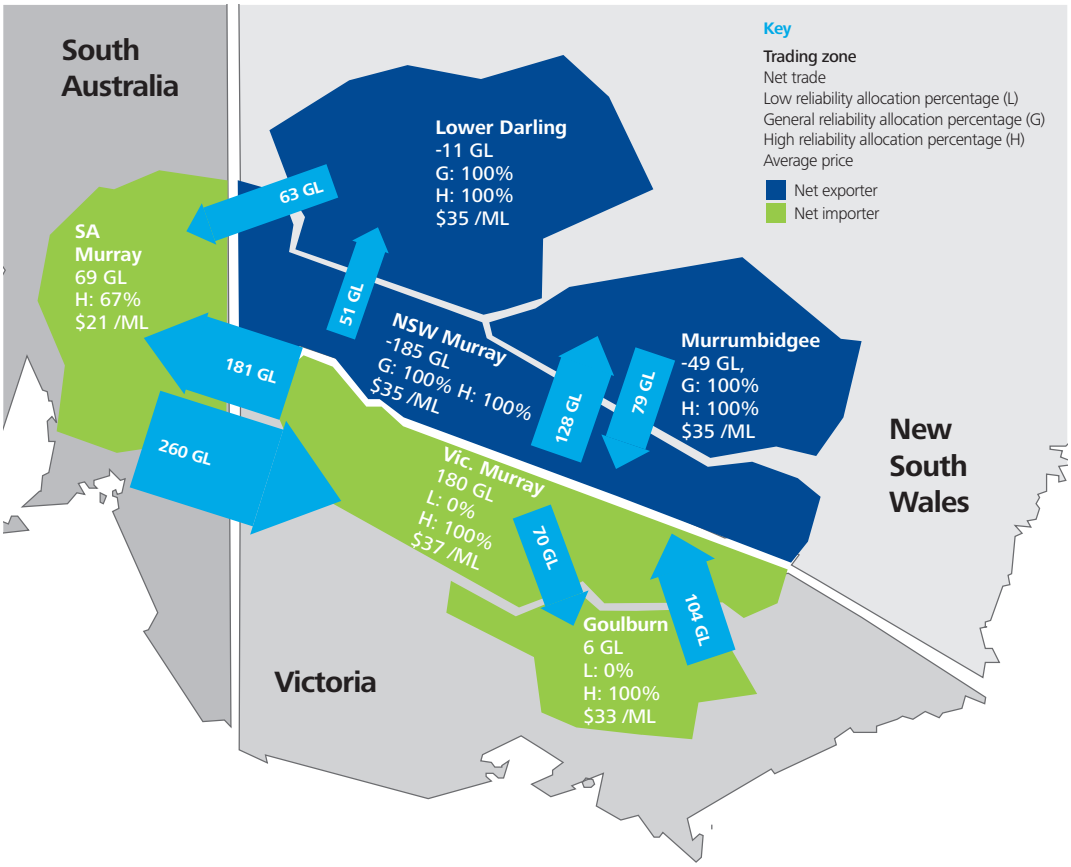
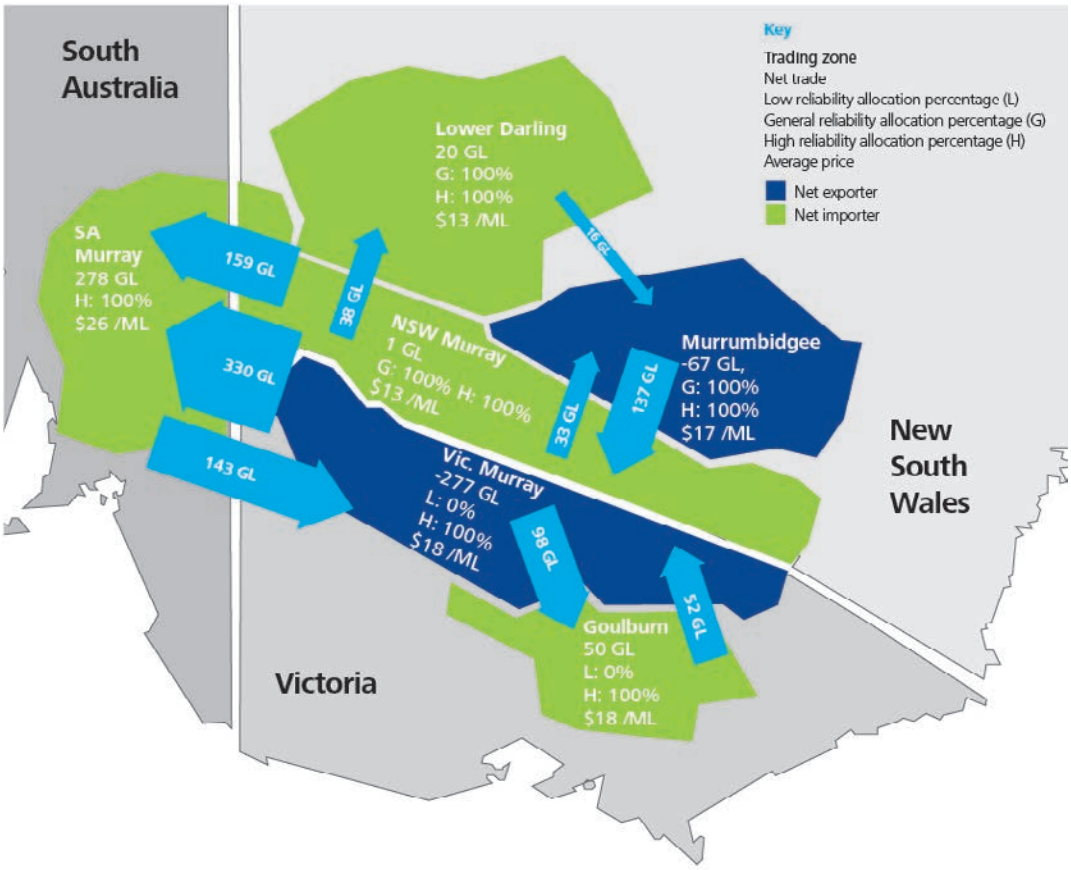


Figure 2.30: Significant interzone allocation trading in the southern MDB, 2011–12



Notes for figures 2.26 to 2.30:

1 Zones are stylised representations of aggregated water trading zones. They are not to scale.

2 Arrows are shown only for the largest import and largest export for each zone. They do not include all imports and exports.

3 Allocation levels are for the relevant classes of entitlement in each state. For instance, there are no low-reliability entitlements in New South Wales, so only general and high-reliability allocation percentages are shown for New South Wales zones.

Source: *AWMR* series

In 2007–08, limited water was available and water prices were high (Figure 2.26). Rice-producing regions such as the NSW Murray and Murrumbidgee and the dairying region of the Goulburn zone were large exporters of water, and SA Murray was a large importer.

In 2008–09, allocations were lower than in the previous year in Victoria and South Australia and higher in New South Wales (Figure 2.27). Therefore, the Goulburn region became a net importer of water and the Murrumbidgee continued to export significant volumes, particularly to the SA Murray, in that year.

In 2009–10, a water trading limitation was placed on the Murrumbidgee, which resulted in a reduction of water exported compared with the previous year (Figure 2.28). Consequently, the SA Murray imported allocations from other sources—notably the Lower Darling.

In 2010–11, the Goulburn zone and South Australia decreased their net imports, the Vic. Murray zone became a significant net importer of allocations and the Murrumbidgee continued to be an exporter, but net exports declined (Figure 2.29). Trade into the SA Murray may have been partly driven by variations in allocation levels between the states; South Australian irrigators received 67% allocations, compared to 100% for Victorian high-security and New South Wales high-security and general-security entitlements. This may have led to South Australian water users purchasing water allocations from other states to supplement their comparatively low allocations.

In 2010–11 and 2011–12, the Murrumbidgee's sharply lower net exports coincided with resurgence in the area's rice production (discussed further in Section 3.5.1).

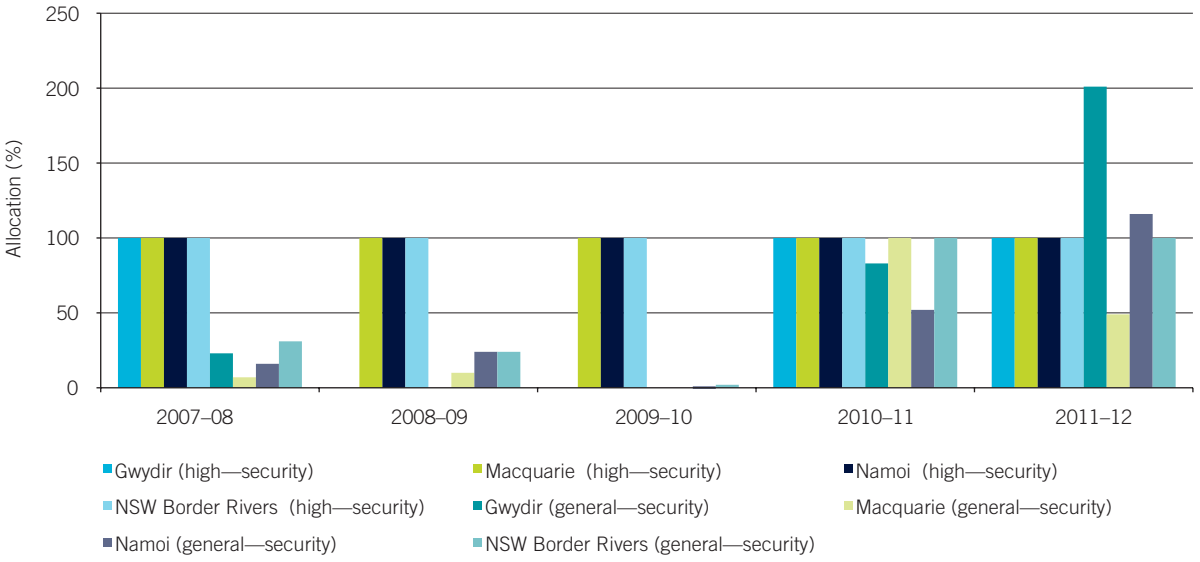
With South Australian irrigators receiving 100% allocations in 2011–12, net imports into that state were largely driven by environmental deliveries (see Section 3.4.2).

2.2.3 Water allocation markets in the northern MDB

In the northern MDB, high water availability resulted in a record high allocations in 2011–12 (Figure 2.31). This was in marked contrast to the previous five years, during which only Namoi and NSW Border Rivers high-security entitlements received full allocations. Allocations to other entitlements (Gwydir high-security and Gwydir general-security entitlements) reached zero at some points. In 2009–10, allocations reached their lowest point when six of the eight entitlements shown received allocations of 10% or less.

As a result of significantly higher rainfall in 2010–11 and 2011–12, there was a marked recovery in allocations in 2010–11, and all entitlements except for Gwydir and Namoi general-security entitlements received full allocations. In 2011–12, all entitlements except Macquarie general-security entitlements received full allocations or exceeded full allocations. Gwydir general-security allocations more than doubled, to 200%.

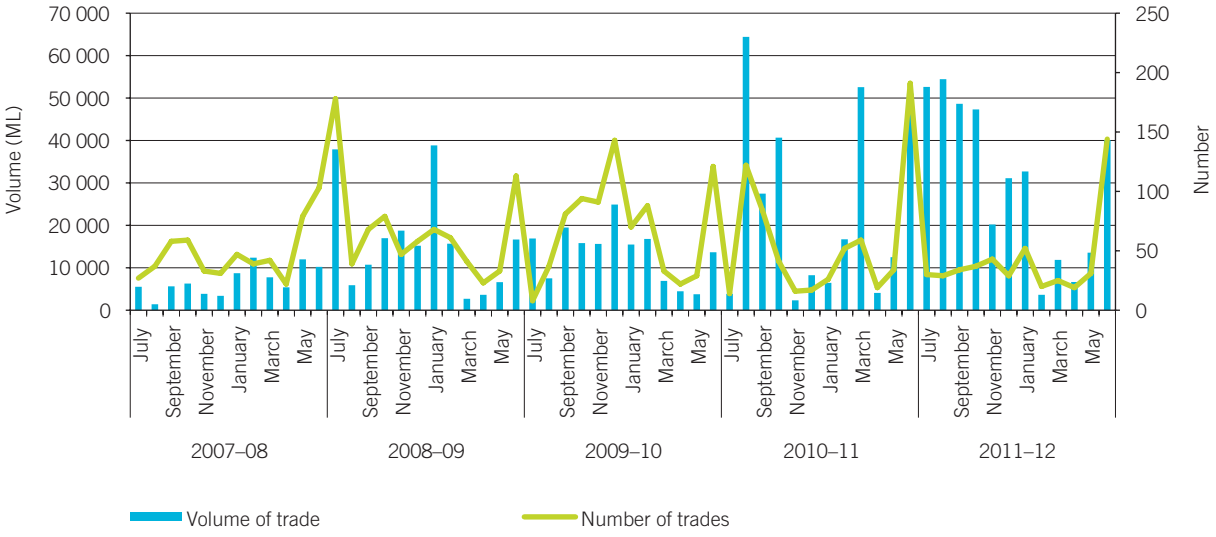
Figure 2.31: End-of-season allocations to high- and low-security entitlements in the northern MDB, 2007–08 to 2011–12 (%)



Source: *AWMR* series.

The total annual volume of allocation trading in the northern MDB has followed an increasing trend over the past five years, from 83 GL in 2007–08 to 363 GL in 2011–12 (Figure 2.32). In both 2010–11 and 2011–12, the volume of trade peaked in August.

Figure 2.32: Allocation trades in the northern MDB, numbers and volumes, by month, 2007–08 to 2011–12

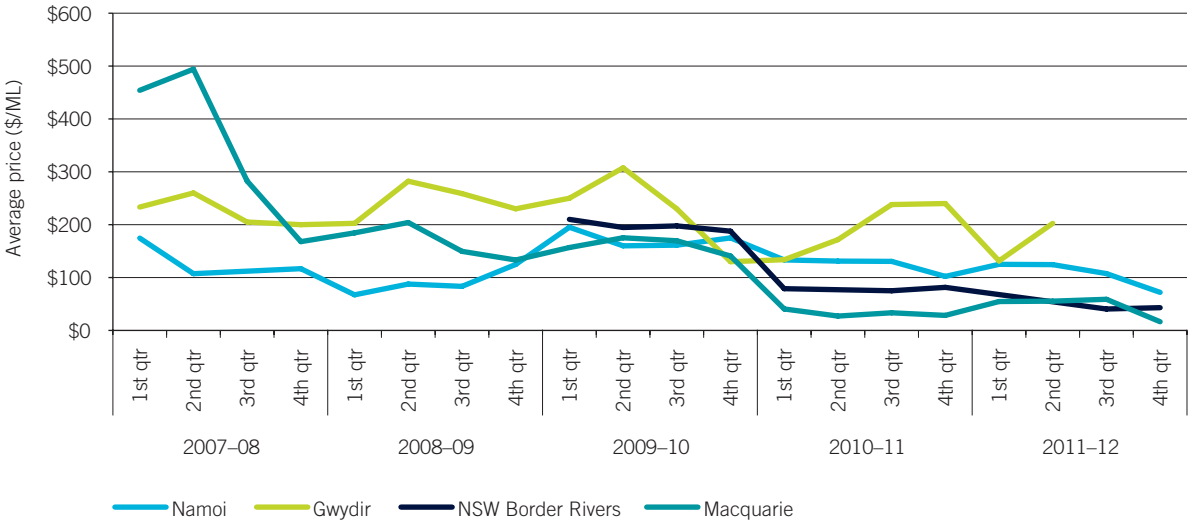


Note: Groundwater trades have not been included in this chart.

Source: NWC (2010b), *AWMR* series.

From 2007–08 to 2011–12, although there was some variation in average water allocation prices in the Namoi and Gwydir systems, prices started and finished the period at similar levels (Figure 2.33). Prices in the Macquarie system, however, decreased steadily over the period to average $36/ML in 2010–11, less than one-tenth of prices in 2007–08. Average prices in the NSW Border Rivers zone followed a similar decline during 2009–10 and 2010–11. In 2011–12, average prices declined and began to partly converge. The price volatility in these systems is partly explained by a lack of market depth, meaning that individual trades can have substantial impacts on average prices.

Figure 2.33: Allocations in the northern MDB, average prices, by quarters, 2007–08 to 2011–12 ($/ML)



Note: Allocation prices for each year are quarterly averages.

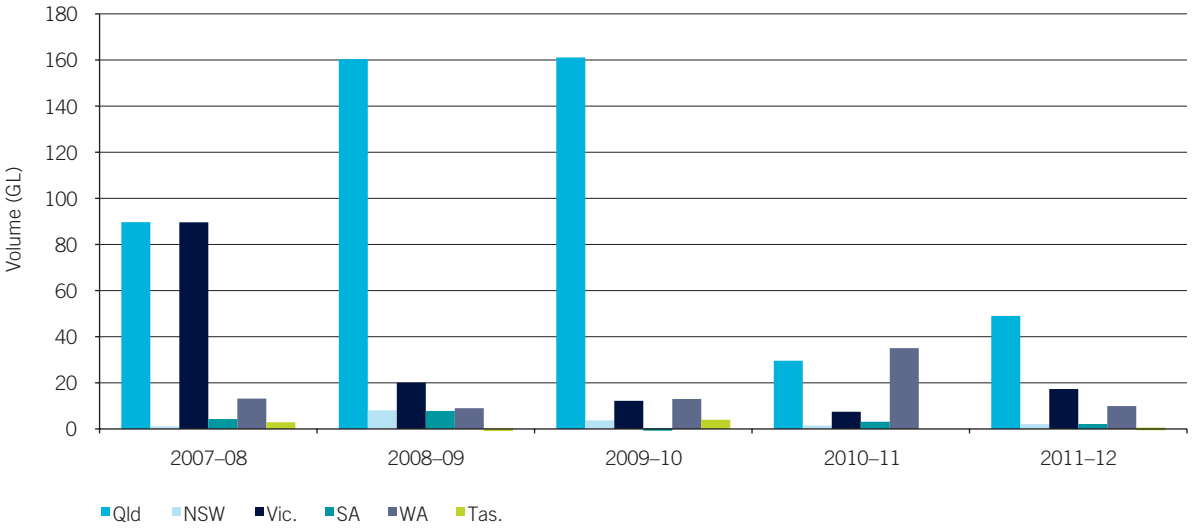
Source: *AWMR* series.

2.2.4 Water allocation markets outside the MDB

Allocation trading outside the MDB increased only marginally from 2010–11 to 2011–12, driven by an increase in trade in Queensland (Figure 2.34). After three years of total allocation trading at around 200 GL, the volume fell to only 77 GL in 2010–11 and improved only slightly in 2011–12 to 81 GL. The main reason for the drop in 2010–11 was a reduction in allocation trading in Queensland (from 161 GL in 2009–10 to 30 GL in 2010–11, with a marginal increase to 49 GL in 2011–12). The reduction is largely explained by the floods during the second and third quarters of 2010–11, which most affected the central and southern parts of Queensland and resulted in three-quarters of the state being declared a disaster zone. The sudden increase in water availability caused by the floods meant that water users had little need for water allocation trading, resulting in a sharp decline in demand. This was most evident in the market for supplemented water allocation trades in the Mareeba Dimbulah, Burdekin–Haughton, Bundaberg, Dawson Valley and Nogoa–Mackenzie schemes, where allocation trading volumes fell significantly between 2009–10 and 2010–11.

Trade in Western Australia increased in 2010–11 as a result of increased allocation trading in the Harvey Water district.

Figure 2.34: Allocation trades outside the MDB, 2007–08 to 2011–12 (GL)



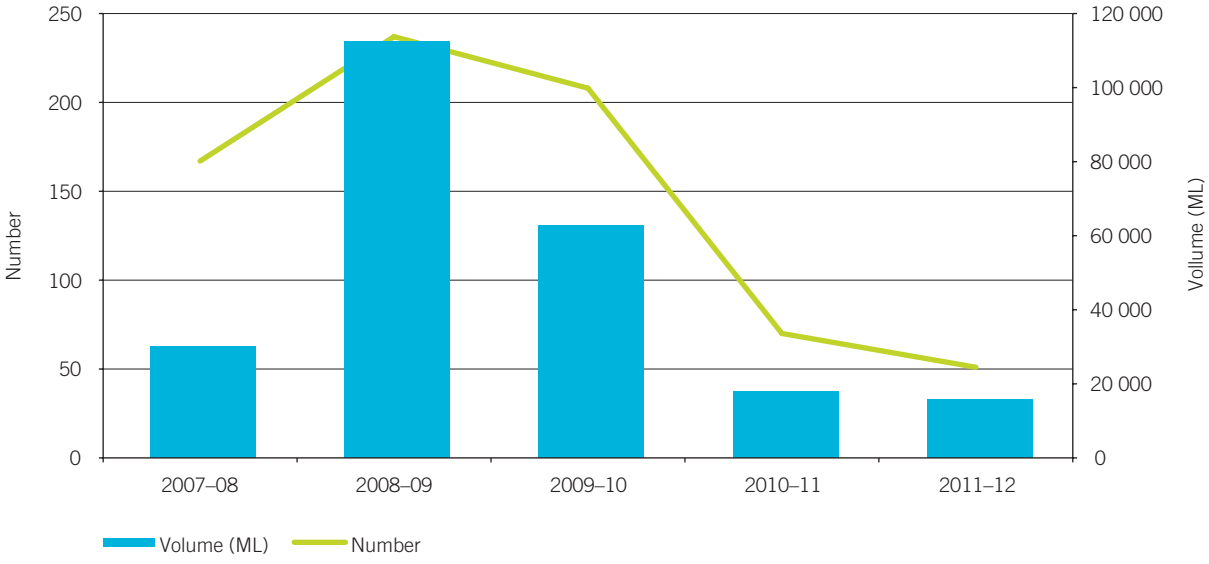
Source: *AWMR* series.

Further discussion on allocation trading in different regions outside the MDB is below. The information presented varies by region, depending on the availability of data.

Queensland

Due to the high rainfall and subsequent severe flooding in south-east Queensland in 2010–11, the volume of allocation trading in non-MDB Queensland declined significantly compared to the previous year. Total allocation trading was just 30 ML in 2010–11, compared to 161 ML in 2009–10 (Figure 2.34). This contrasts with the volume of entitlement trading, which was relatively stable over the two years. There was an increase in allocation trading between 2010–11 and 2011–12, which may signal a return to more historical levels during recovery from the floods. However, that recovery is not yet evident in the Nogoa–Mackenzie water supply scheme in the Fitzroy Basin (Figure 2.35), which recorded the largest volume of supplemented seasonal assignment trades in 2011–12 (16 GL), but well below volumes traded in 2008–09 (112 GL).

Figure 2.35: Supplemented seasonal water assignment trades in Nogoa–Mackenzie, numbers and volumes, 2007–08 to 2011–12



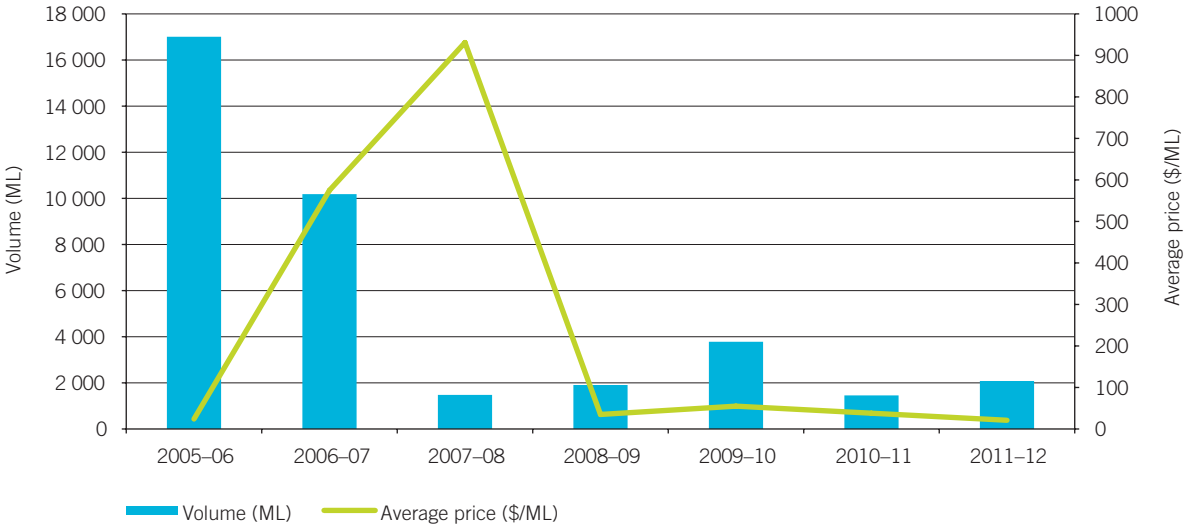
New South Wales

The volume of allocation trading in New South Wales increased only marginally from 1.5 GL in 2010–11 to 2 GL in 2011–12 (Figure 2.34). The main trading district in New South Wales outside the MDB is the Hunter Valley.

The Hunter typically has much higher allocation prices than other areas in times of water shortages. This is due to the requirements of the region's grape producers and their inability to obtain water from other basins. However, in times of more plentiful water, prices decrease to levels much more consistent with those in the southern MDB.

The volumes and prices of allocation trades remained low in 2010–11, even with increased agricultural production (Figure 2.36). ABARES has estimated that Hunter Valley wine grape production was around 34% higher in 2010–11 than in 2009–10 (ABARES 2011b:28). The increase was mainly due to high rainfall in 2010–11. Precipitation in the centre of the region at Muswellbrook in 2010–11 was around 50% higher than the median annual rainfall.

Figure 2.36: Allocation trades in the Hunter Valley, volumes and prices, 2005–06 to 2011–12

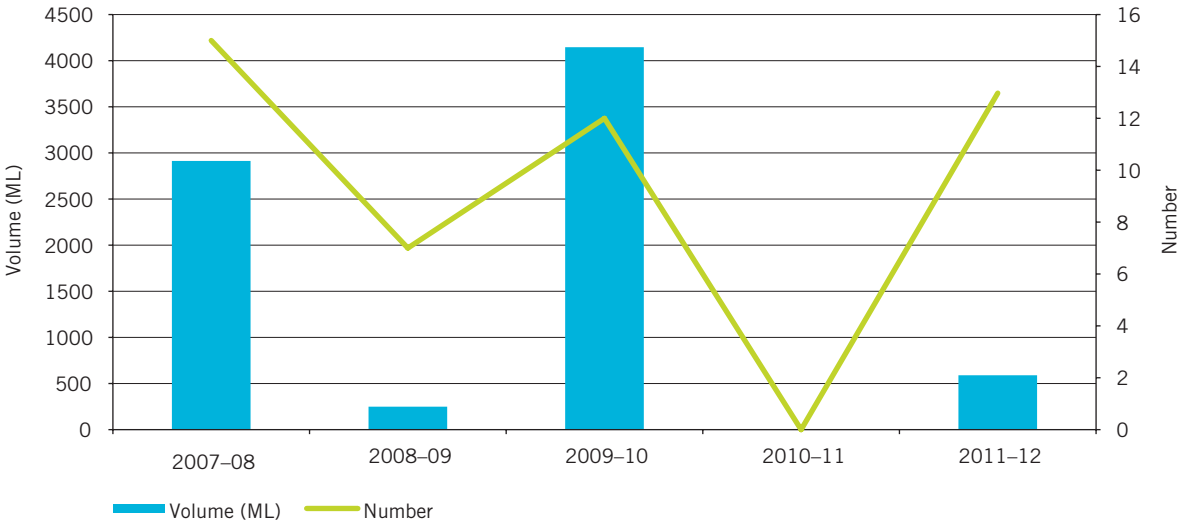


Source: *AWMR* series.

Tasmania

Tasmania's water markets are physically constrained by the scale of the catchments and the limited connectivity between them. Trading can occur within irrigation schemes (a number of schemes have only recently been commissioned and expanded). No allocation trading occurred in Tasmania in 2010–11, and only 590 ML was traded in 2011–12 (Figure 2.37).

Figure 2.37: Water allocation trades in Tasmania, volumes and numbers, 2007–08 to 2011–12



Note: Excludes ML/day defined water allocation trades.

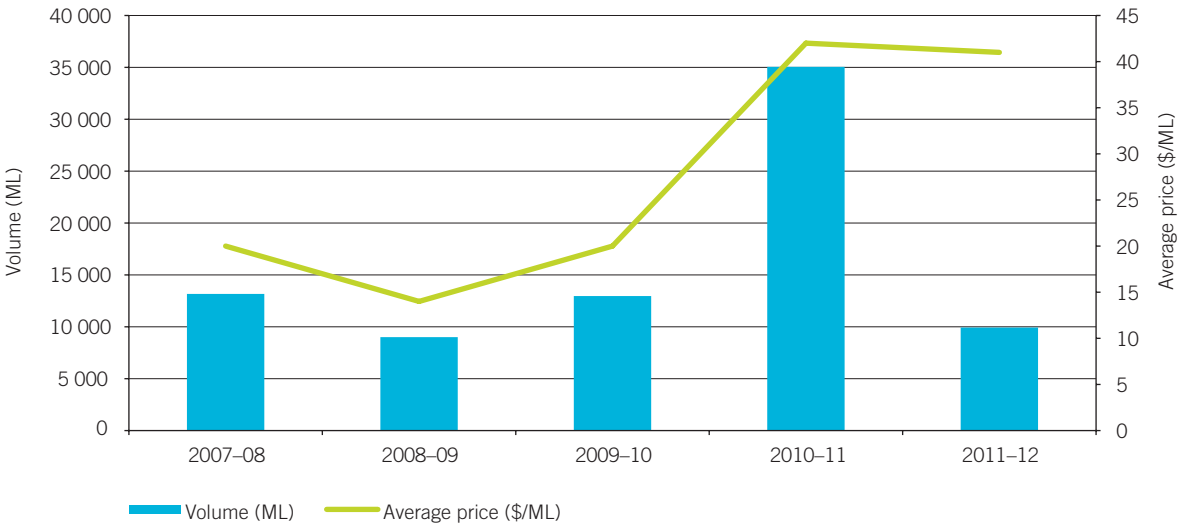
Source: *AWMR* series.

Western Australia

Water allocation trading in Western Australia occurs only through allocation transfers between and within the three Harvey Water irrigation districts (Harvey, Collie and Waroona).[1]

Trade volumes increased in 2010–11 partly as a result of the Water Corporation making available 7.5 GL of allocations, which were auctioned to Harvey Water irrigators in two stages in November 2010 and February 2011. The auctions accounted for around 20% of total trading for the year (Figure 2.38).

Figure 2.38: Water allocation trades in Western Australia, volumes and average prices, 2007–08 to 2011–12



Source: *AWMR* series.

1 Harvey Water is a private irrigators' cooperative about 100 kilometres south of Perth. A variety of crops are grown (including vegetables and citrus), but around two-thirds of the area is devoted to dairy and beef pasture.

Numbers and volumes of allocation trades increased significantly in the Harvey Water irrigation area from 2008–09 to 2010–11 as allocation levels fell, particularly in the Waroona and Harvey districts. While allocation levels were 85% or higher in each of the three districts in 2008–09 and 2009–10, they fell to 34% in Waroona and Harvey in 2010–11 and 45% in 2011–12. The lower allocations resulted from very low inflow into dams during the winter. They pushed up average allocation prices, which more than doubled in the Harvey district from $20/ML in 2009–10 to $44/ML in 2010–11 and $43/ML in 2011–12. Notably, allocation trade volumes fell by over 70% (from 35 050 ML in 2010–11 to 9927 ML in 2011–12). As shown by allocation trade volumes in the three years from 2007–08 to 2009–10, the decrease in trade in 2011–12 represented a return to more normal trade volumes. The significantly higher volume of trade in 2010–11 was driven by the extremely dry winter of 2010, which resulted in low allocations and higher demand for water allocation trades. Prices in 2010–11 and 2011–12 were also considerably higher than in previous years, reflecting the scarcity of water. The Department of Water also heavily promoted the benefits of water trading as an alternative source of water in response to the extremely seasonal conditions 2010–11.

Victoria

The volume of allocation trading in Victoria increased from 8 GL in 2010–11 to 17 GL in 2011–12 . Trading increased marginally (by around 900 ML) in Macalister Irrigation District; greater increases were seen in the Werribee and Bacchus Marsh districts.

Water in the Macalister district is sourced from the Thomson River and Lake Glenmaggie. Most is used for dairy pasture. The volume of water available to irrigators depends, in part, on when and whether Lake Glenmaggie spills. If spills occur, all water taken before the spill is recredited to irrigators' accounts.

The lake spilled in August, and by the end of the season 100% allocations were in place for both high- and low-reliability water shares in the Macalister district.

While there are high allocations in Southern Rural Water's Macalister Irrigation District, trading continues to be subdued (Figure 2.39). This reflects:

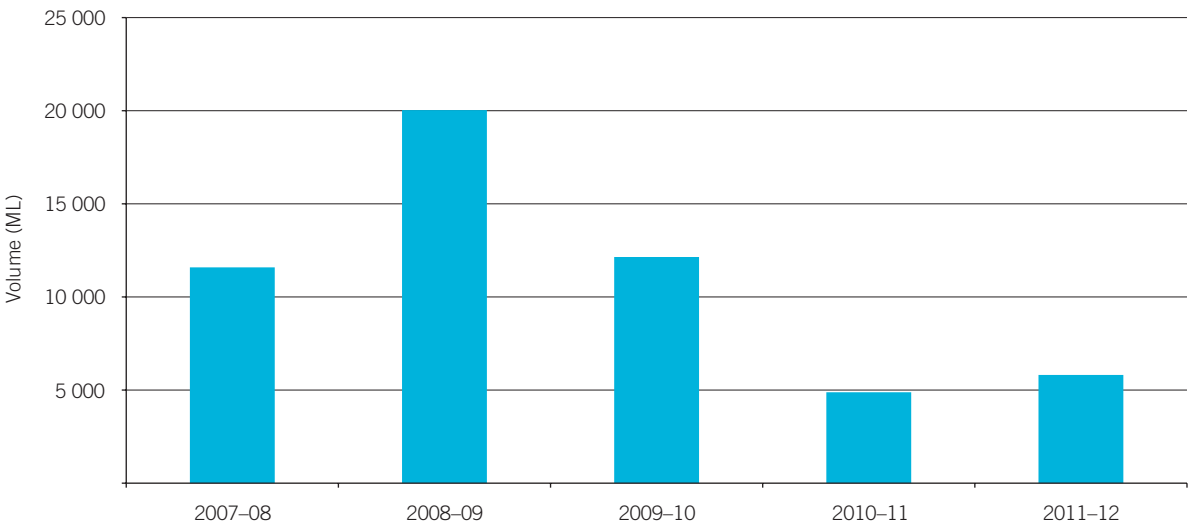
- continued high rainfall (heavy summer rains in 2011–12 followed floods in 2010–11)
- limited opportunities to trade to other areas.

As Southern Rural Water noted in its 2011–12 annual report:

> Persistent rain during February and March resulted in below average water deliveries, with total deliveries for the season being approximately 86 300 ML, well below our delivery budget of 163 000 ML and well below our past five year average of 154 800 ML. (SRW 2012:23)

Allocation trading volumes in 2010–11 (about 4800 ML) and 2011–12 (about 5800 ML) were considerably lower than the volume in 2008–09 (over 20 000 ML).

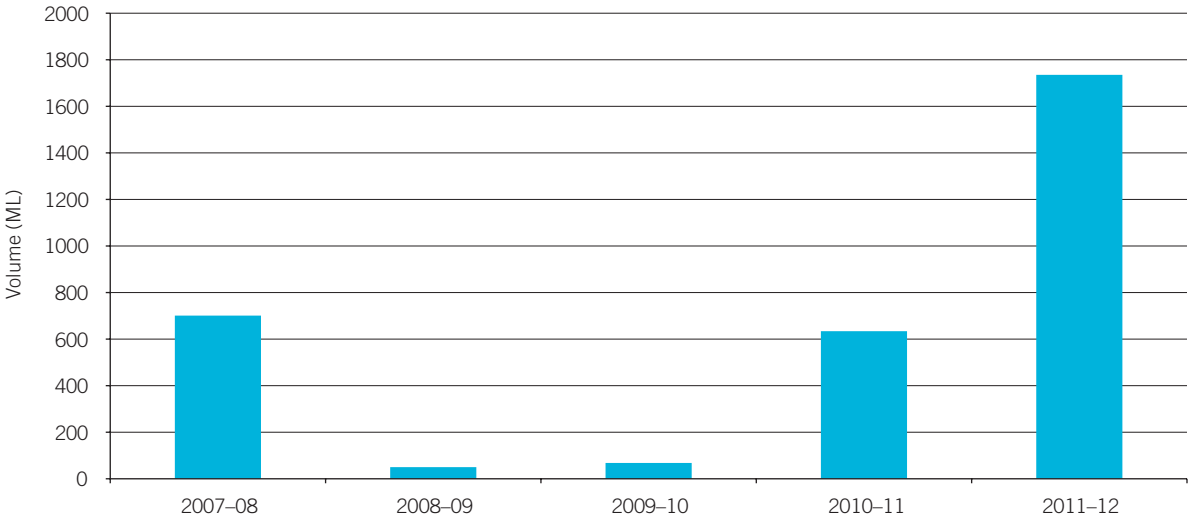
Figure 2.39: Allocation trades in the Macalister district, 2007–08 to 2011–12 (ML)



Source: *AWMR* series.

For the Werribee and Bacchus Marsh districts, seasonal allocations were very low from 2007–08 to 2009–10 (from 8% to 14%), which resulted in very limited volumes available for use or for trading. For 2010–11 and 2011–12, allocations to high-reliability water shares were 100%, but low-reliability shares received allocations of only 55%–75%. The increase in allocation trading from 2010–11 (Figure 2.40) could be attributable to irrigators seeking to supplement allocations and to Southern Rural Water encouraging water trading as an irrigation efficiency measure to expand production in 2011–12 (SRW 2012).

Figure 2.40: Allocation trades in the Werribee and Bacchus Marsh districts, 2007–08 to 2011–12 (ML)



Source: *AWMR* series.

Groundwater

Groundwater allocation trading in Australia (Table 2.8) is relatively confined because of the lack of hydrological connectivity between systems. As for groundwater entitlement trading, there are also a number of administrative barriers to allocation trading. For example, groundwater allocations are not fully unbundled from land titles.

Table 2.8: Groundwater allocation trading, Australia, 2011–12

Jurisdiction	Qld	NSW	Vic.	SA	WA[a]	NT	Tas.	ACT
Number	62	134	97	41	29	0	0	0
Volume (ML)	3688	26 972	7524	2147	4255	0	0	0

a Western Australian allocation trades are leases.

Source: *AWMR* series.

New South Wales has the largest volume of trading and, as water sharing plans in New South Wales are renewed, new unbundled groundwater licences are coming into effect. These licences are fully tradeable.

Section 3

Water market drivers

3 Water market drivers

Many factors influence water allocation and entitlement demand and supply, and therefore prices. This chapter provides detailed commentary on some of the main drivers of observed water market activities at varying scales.

In addition to seasonal conditions, storages and commodity production, changes in the way markets are governed also influence the ability to trade and trading patterns.

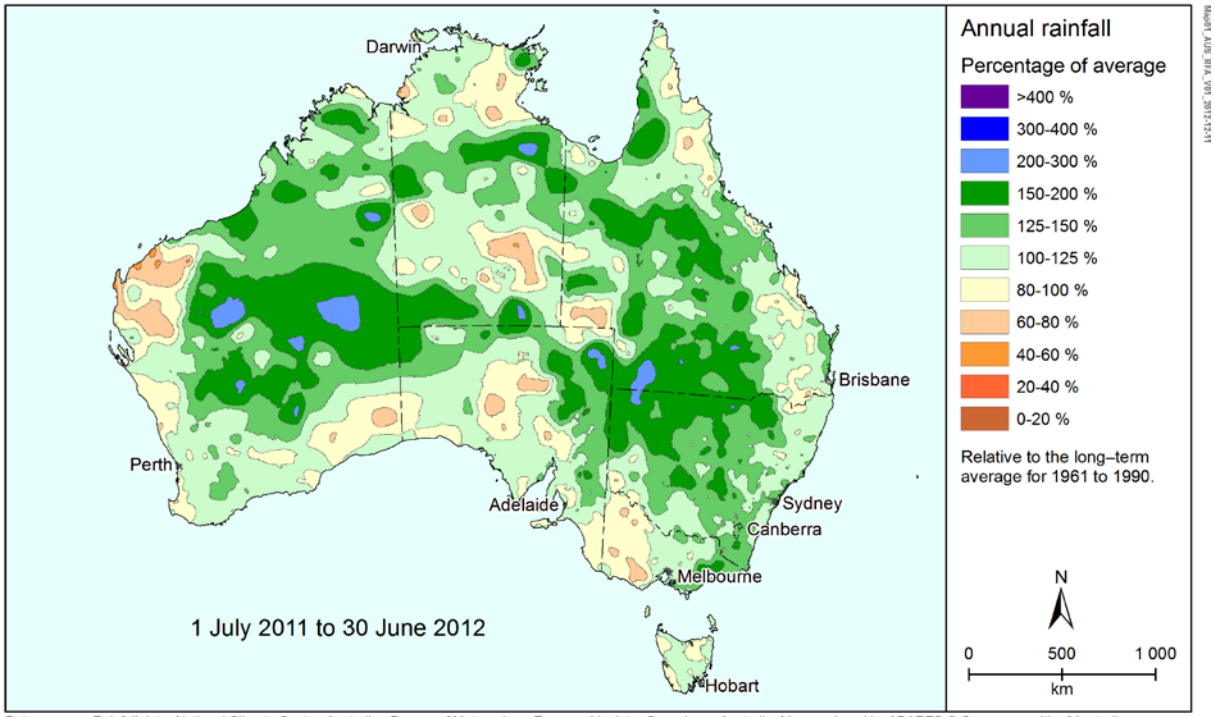
The MDB is the site of most of Australia's irrigated agriculture and main water markets, accounting for more than 94% of the volume of entitlements and allocations traded in Australia in 2011–12. Most of the market drivers discussed here are related to drivers in the MDB.

3.1 Changes in seasonal conditions

Climate is arguably the biggest determinant of water supply and demand. The key factor is rainfall, but other factors (such as temperature and evaporation rates) are also important. Storage levels (including in reservoirs and aquifers) are a key determinant of water availability for consumptive use and a major determinant of allocation levels. However, even if there is little water available in storages and river systems, good rainfall with good spatial and temporal distribution in agricultural areas can sharply reduce demand, placing downward pressure on prices.

After the end of the Millennium drought in 2010–11, most of the nation had well above average rainfall in the 2011–12 season (figures 3.1 and 3.2). Many parts of the MDB experienced widespread flooding (particularly in New South Wales and northern Victoria).

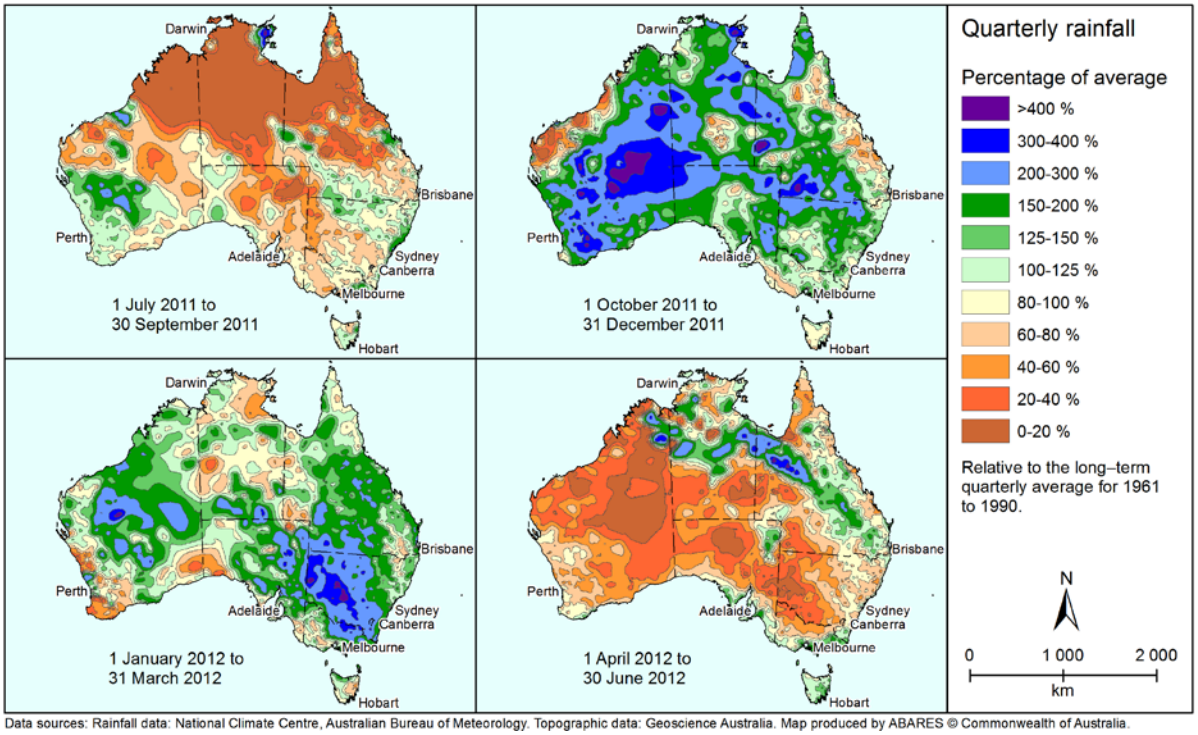
Figure 3.1: Annual rainfall relative to the long-term average, Australia, 2011–12 (%)



Data sources: Rainfall data: National Climate Centre, Australian Bureau of Meteorology. Topographic data: Geoscience Australia. Map produced by ABARES © Commonwealth of Australia.

Figure 3.2 shows that rainfall was distributed more heavily during the spring and summer, which aligned with typical high irrigation requirements for summer crops.

Figure 3.2: Quarterly rainfall relative to the long-term average, Australia, 2011–12 (%)



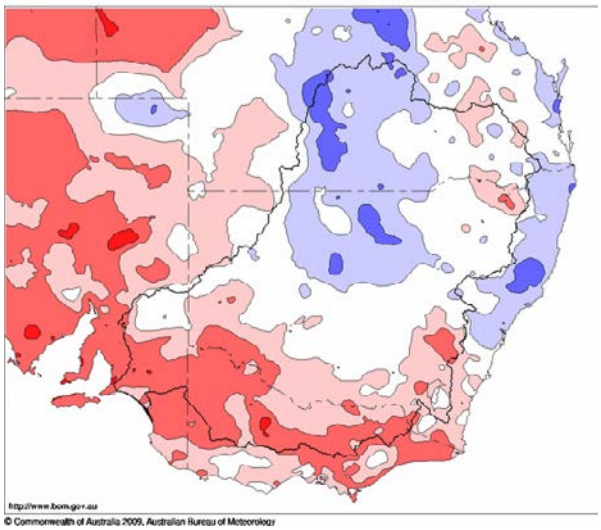
Data sources: Rainfall data: National Climate Centre, Australian Bureau of Meteorology. Topographic data: Geoscience Australia. Map produced by ABARES © Commonwealth of Australia.

In 2007–08 and 2008–09, the northern MDB experienced average rainfall, while much of the southern basin had below-average rainfall (Figure 3.3). In 2009–10, average or above-average rainfall occurred across almost all of the MDB. In 2010–11, both south-east Queensland and north-west Victoria had the highest rainfall on record, and most of the MDB experienced very much above-average rainfall.

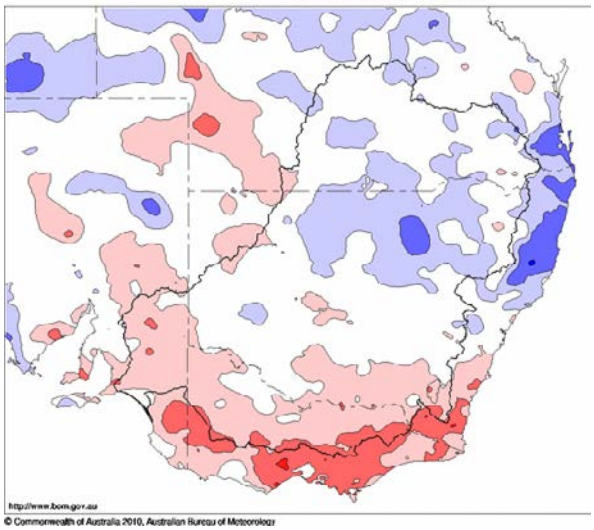
The high rainfall in 2010–11 and 2011–12 across much of northern and eastern Australia was associated with one of the strongest La Niña events ever observed over eastern Australia. This led to extremely high rainfall and subsequent widespread flooding in many regions between September 2010 and February 2011 and in 2012. 2011 included an extremely wet spring (the wettest on record for the MDB), so many catchments were already wet before the flooding rain during the summer. The floods' extent, impact and severity were among the most significant in Australia's recorded history (BOM 2011).

Figure 3.3: Murray–Darling Basin rainfall deciles, 2007–08 to 2011–12

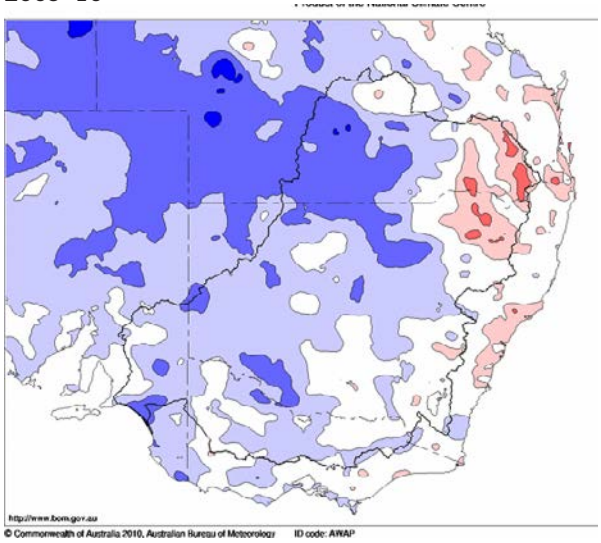
2007–08



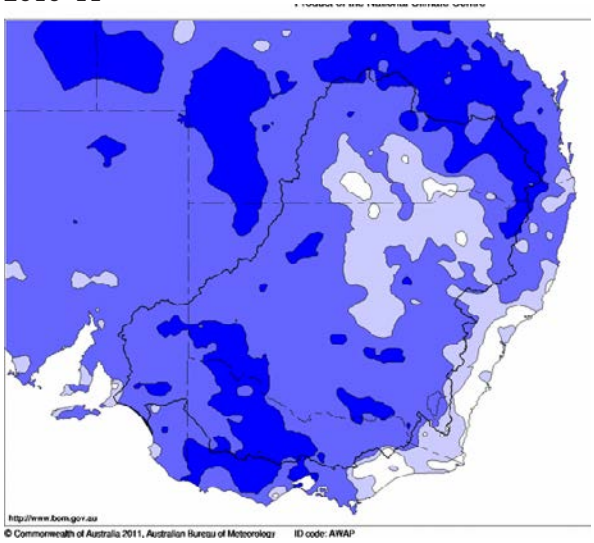
2008–09



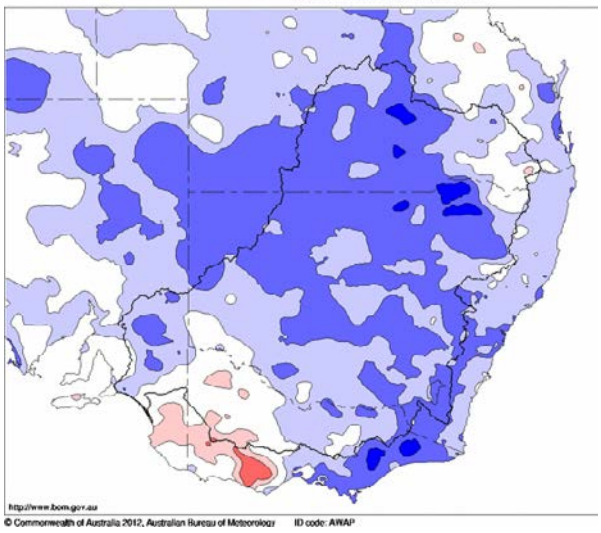
2009–10

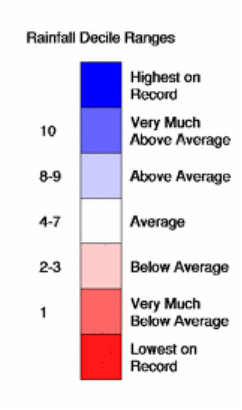


2010–11



2011–12





Source: Bureau of Meteorology.

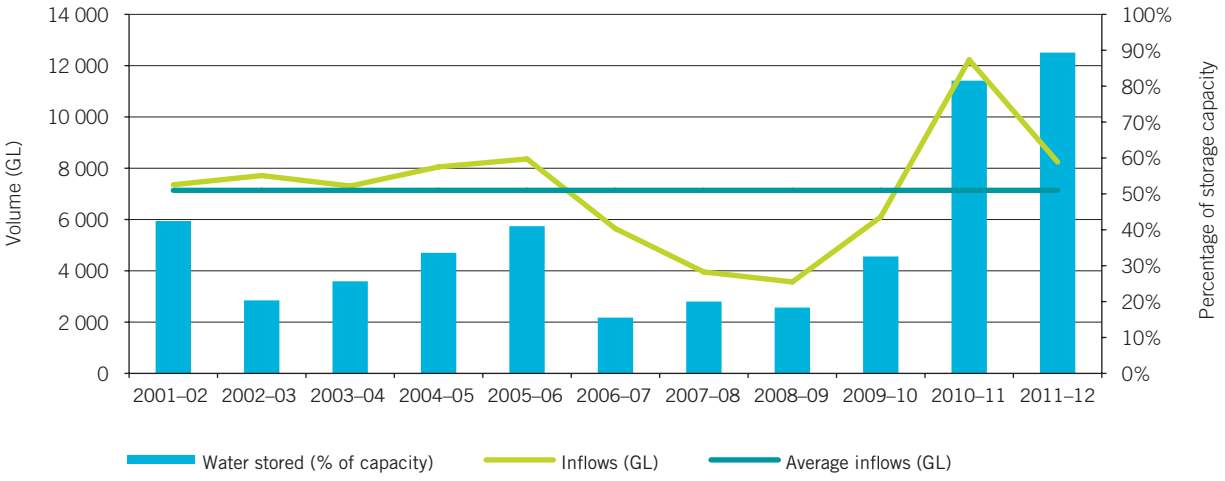
3.2 Storages

Water availability is a primary driver of water trading volumes and prices. Water availability is determined by seasonal forecasts, soil moisture and storage levels, which respond most directly to increased inflows from rainfall.

3.2.1 Southern Murray–Darling Basin

The weather detailed in Section 3.1 explains the increases in storage levels in key southern MDB dams from 2010 to 2012 (Figure 3.4).

Figure 3.4: Storage levels and inflows, major dams in the southern MDB, 2002 to 2012



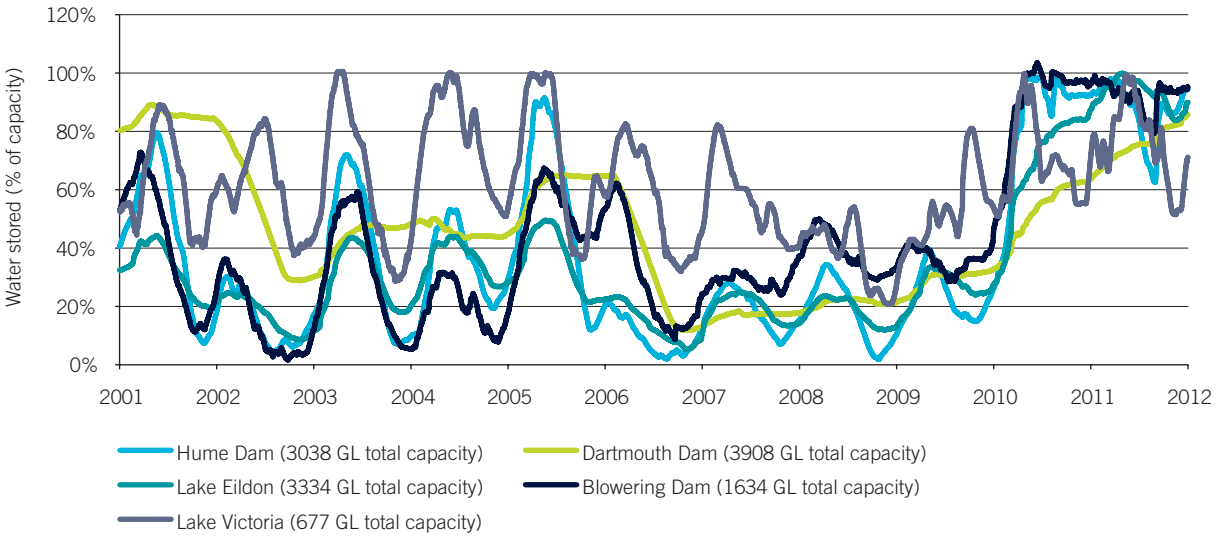
Note: Major dams are Dartmouth, Eildon, Hume, Blowering and Lake Victoria. Storage levels are as at 30 June each year.

Sources: MDBA, Goulburn–Murray Water, NSW Office of Water, SA Department of Environment, Water and Natural Resources.

By June 2011, storages in the southern MDB were at 82% of combined capacity (Figure 3.5), and many dams were spilling or conducting pre-releases. Storage volumes had increased by more than 6000 GL over the previous year.

Hume Dam started and finished 2011–12 at close to 100% capacity. Dartmouth dam, after experiencing very rapid changes in stored volume in September 2010, continued to fill steadily over the years.

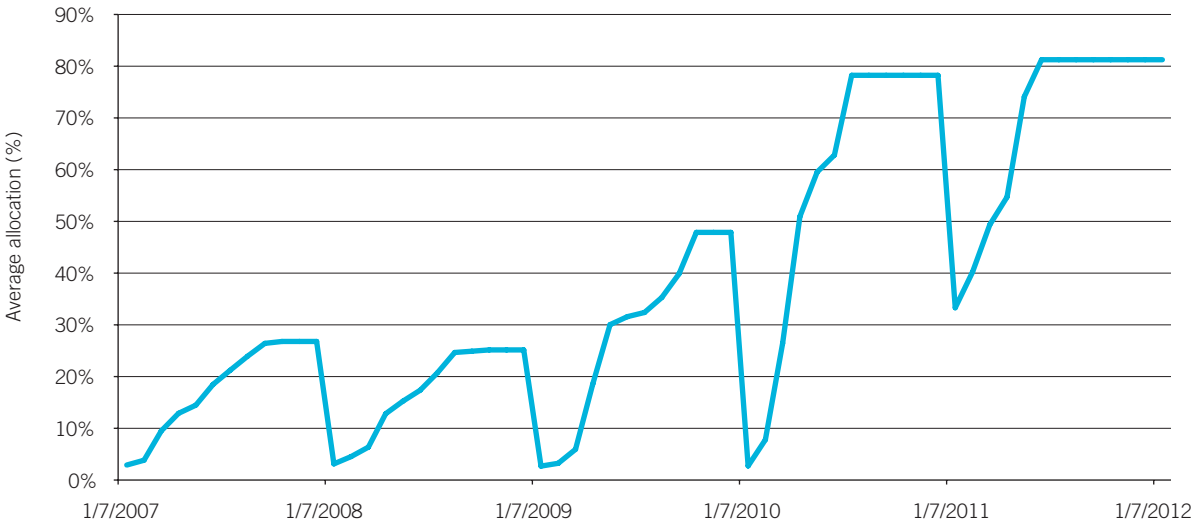
Figure 3.5: Storage levels for key southern MDB storages, 1 July 2001 to 1 July 2012 (% of capacity)



Source: NSW Office of Water, Goulburn–Murray Water, SA Department of Environment, Water and Natural Resources.

There is an obvious correlation between storage levels and allocations to water access licence holders (Figure 3.6).

Figure 3.6: Average allocation announcements in the southern MDB, 2007–08 to 2011–12 (%)

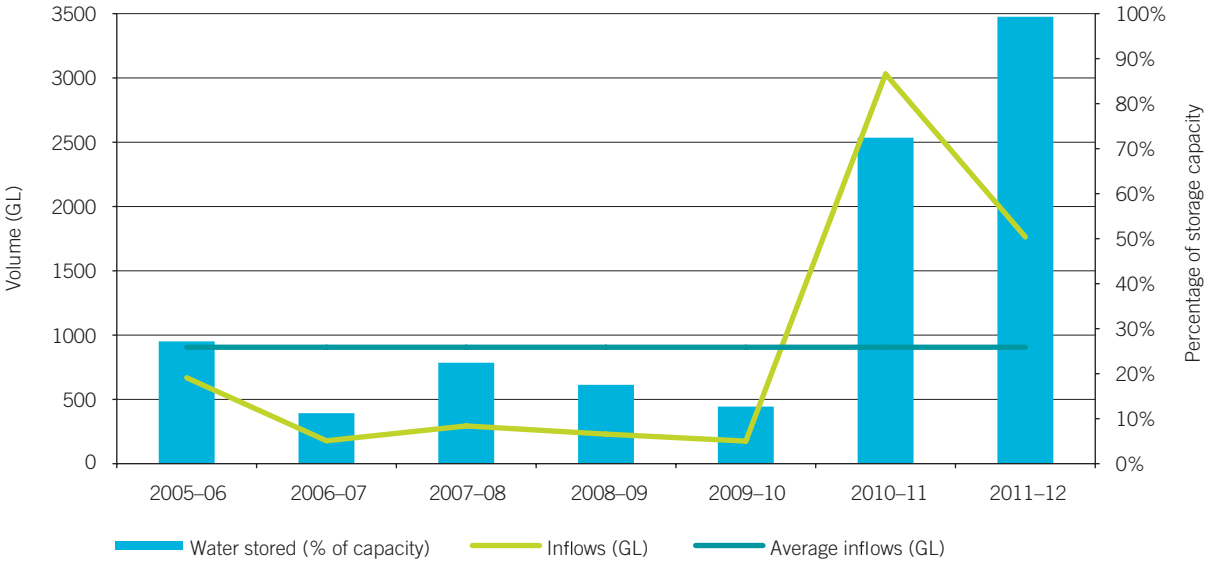


Source: *AWMR* series.

3.2.2 Northern Murray–Darling Basin

The weather described in Section 3.1 also affected inflows and storage levels in dams in the northern MDB (Figure 3.7).

Figure 3.7: Average storage levels and inflows, selected dams in the northern MDB, 2006 to 2012

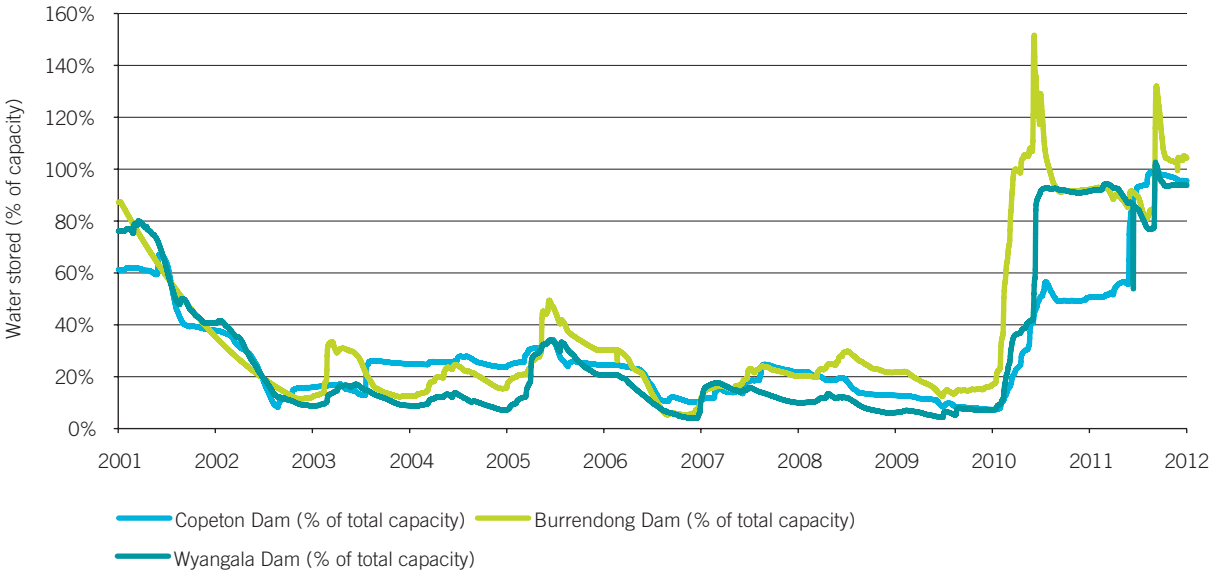


Note: Dams are Burrendong, Copeton and Glenlyon. Dams were selected based on data availability and are not necessarily the largest dams in the northern MDB. Storage levels are as at 30 June each year.

Source: NSW Office of Water.

Northern storages ended 2011–12 at close to or above 100% capacity (Figure 3.8). Particularly large increases occurred during the first half of 2010–11, while storage volumes stayed relatively stable from February to June 2011. In 2011–12, there were large increases in storages at the beginning of the year. The Burrendong Dam again exceeded 100% capacity in late 2011.

Figure 3.8: Storage levels in key northern MDB storages from 1 July 2001 to 1 July 2012 (% of capacity)

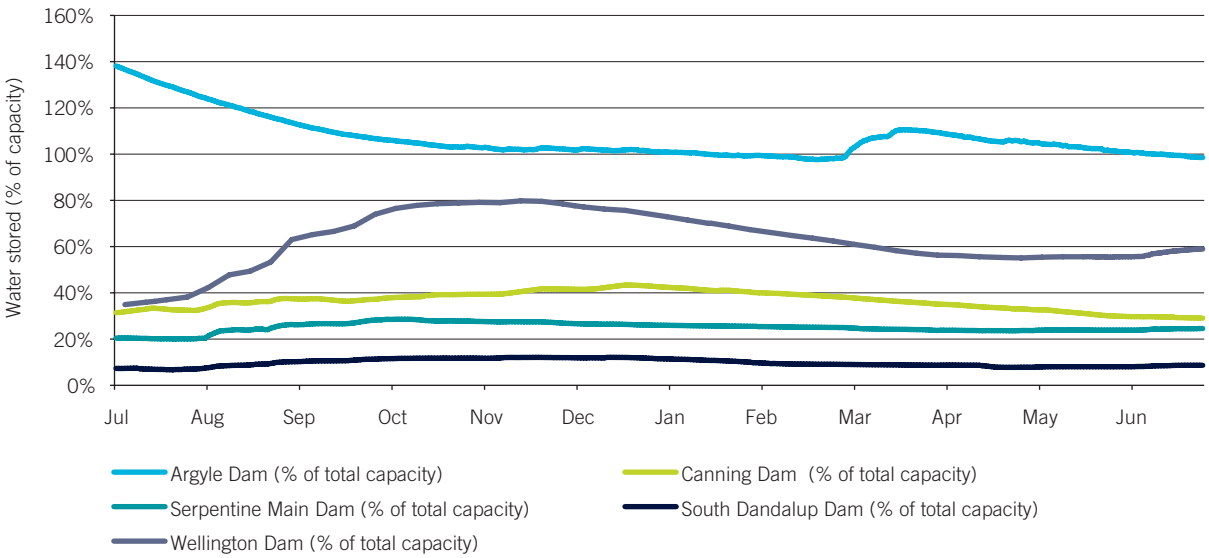


Source: NSW Office of Water.

3.2.3 Outside the Murray–Darling Basin

The 2010 winter was the driest on record in the western and southern parts of Western Australia. The 2011 winter was also very dry with the exception of Wellington Dam, which supplies the Collie Irrigation Area, storage levels either remained steady or trended downward during the year (Figure 3.9). Wellington Dam started the year at 35% of capacity, peaking at 80% in November 2011 before finishing the year at 59%.

Figure 3.9: Water levels in key storages in Western Australia, 2011–12 (% of capacity)



Note: Argyle Dam is considered to be at 100% capacity when its full supply level of 10 756 GL has been reached. However, its maximum flood storage exceeds 30 000 GL. This allows the dam to reach peak storage levels of over 100%.

Source: Water Corporation.

Western Australia relies heavily on groundwater as a source of water for urban, rural and mining uses. Excluding the Ord River, around 80% of the state's allocated water resources are groundwater. Therefore, it is misleading to use rainfall inflows to dams as the only indicator of seasonal water availability.

Some Western Australian aquifers are overallocated and have falling water levels or bore pressures. As is the case for surface water, where there is no connection between groundwater systems it is not possible to trade water between areas with relatively less or more water. In addition, individual irrigation areas in Western Australia tend to be relatively homogeneous in the types of crops they produce, resulting in little opportunity for trading and a water market in which trading is relatively fragmented.

3.3 Changes in governance and administration

This section summarises significant policy developments, reform initiatives, events and announcements between 2007–08 and the end of 2011–12. It also refers to some more recent events where they are relevant, up until the publication of this report, to provide the reader with more up to date information. Some have long-term implications for the water market, while others were changes to trading conditions that applied only for a particular water year.

3.3.1 The Murray–Darling Basin Plan

Under the *Water Act 2007* (Cwth), the Murray–Darling Basin Authority (MDBA) is required to prepare a strategic plan for the integrated and sustainable management of water resources in the MDB to manage the basin's water resources in the national interest.

The Murray–Darling Basin Plan was prepared over a number of years and finalised in November 2012. As has been well documented in the media, there was a high level of uncertainty on the part of irrigators and water market participants during that period. With the making of the Basin Plain November 2012, this may now lower uncertainty levels experienced during the development of the Basin Plan, although there is still a transition period until it is fully implemented in 2019.

In the plan, surface water use in the basin is limited to 10 873 GL/year on a long-term average. This represents a reduction in water use of 2750 GL/year compared to 2009 baseline diversions. Long-term average sustainable diversion limits are to be effective from 1 July 2019.

In 2010, the Australian Government committed to bridging the remaining gap between volumes of water already recovered for the environment through announced funding programs and the volume required to be returned by the Basin Plan, without affecting entitlement or allocation reliability.[2] Water to reach the sustainable diversion limits will be recovered over the intervening period through a combination of water purchases and water savings derived from investments in water infrastructure. By 30 April 2013, water entitlements that will deliver, on average, 1600 GL each year had been recovered through infrastructure investments, state programs and water purchases (MDBA 2013). This is about 58% of the proposed 2750 GL reduction in surface water diversions.

As part of the Basin Plan, new water trading rules come into force on 1 July 2014. The rules are intended to provide greater clarity and consistency in the operations of the water market in the MDB. The aim is to ensure free trade in surface water, except where there are defined allowable restrictions. Among other things, the rules also require information to be readily available about the characteristics of different allocations and entitlements, trading prices and the trading rules used by the states and irrigation infrastructure operators.

2 MDBA website, http://www.mdba.gov.au/annualreports/2010-11/report_ceo_review.html (accessed 4 June 2013).

3.3.2 Transformations and terminations

A significant proportion of the volume of water access entitlements in the MDB is held by irrigation infrastructure operators (IIOs) in irrigation areas (in basin New South Wales and South Australia, they hold about 22% of entitlements on issue). Irrigators in those areas hold irrigation rights to access water from the operator, rather than holding statutory rights (entitlements) themselves. Irrigation rights cannot be traded without the operator's consent, while statutory water access entitlements can be traded subject to restrictions imposed by state law.

'Transformation' is the process whereby an irrigator transforms their entitlement to water under an irrigation right into a water access entitlement. Irrigation rights can only be traded outside an irrigation network once they have been transformed into water entitlements.

To prevent IIOs from unreasonably delaying or preventing trading in entitlements (irrigation rights) from their areas, the Australian Government has made rules under the *Water Act 2007* (the Water Market Rules 2009) to ensure that rights held by irrigators within an IIO's area can be transformed into separately held water access entitlements. Once irrigators hold their statutory entitlements directly, the operator cannot restrict trade.

The ability to transform rights was given effect by the Water Market Rules on 23 June 2009, and included a transitional period until 31 December 2009. Thus, 2009–10 was the first year in which the rules were in effect. Because of the nature of irrigation across the MDB, the rules have most the impact in New South Wales and South Australia.

The Australian Competition and Consumer Commission (ACCC) is required to provide the Minister for Sustainability, Environment, Water, Population and Communities with an annual water monitoring report on regulated water charges, transformation arrangements and compliance with the Water Market Rules and the Water Charge Rules. The *ACCC water monitoring report 2011–12* (ACCC 2013) indicated that there had been considerable transformation and termination since 2009–10: 335 GL of irrigation rights had been transformed and 281 GL of water delivery rights had been terminated in New South Wales and South Australia (Tables 3.1 and 3.2). Although this only represents about 10% of transformations by volume, some large IIOs have now experienced significant levels of transformations and/or terminations (for example, Central Irrigation Trust in South Australia has reported that over 27% of irrigation rights have been transformed since 2009).

While transformation enables irrigators within IIOs to trade out of the IIO area directly, it does not necessarily mean that trading or termination will occur. The ACCC (2013) found that the relationship between transformation and termination varied between IIOs. Many irrigators did not transform all of their irrigation right or terminate all of their water delivery right. In 2011–12, 80% of irrigators who transformed an irrigation right did not terminate any delivery rights immediately after transformation. This shows that many irrigators are maintaining an involvement with their IIO and not exiting irrigated agricultural production altogether.

The National Water Commission has found that some irrigators who had transformed their irrigation right in order to sell the water access entitlement have retained the delivery right and rely on purchasing seasonal water allocations (NWC 2012).

There may also be a delay or deferral in terminating the delivery right due to the termination fees involved. The broad range of transformation and termination behaviour observed shows that irrigators now have more flexibility to tailor their water holdings and use to their individual needs and circumstances.

The decrease in the volume of irrigated rights transformed in 2011–12 is due mainly to the cessation of the Small Block Irrigators Exit Grant and a reduction in entitlement purchases under water buyback measures (Table 3.1). With just over 10% of irrigation rights transformed and able to be traded, at present without transformation most water in New South Wales and South Australia cannot be permanently traded outside of an IIO's network.

Table 3.1: Number and volume of transformations, 2009–10 to 2011–12

Year	Number of transformations	Volume of transformations
2009–10	480	157 GL
2010–11	318	102 GL
2011–12	320	76 GL

Source: ACCC (2013).

If an irrigator wishes to modify or permanently reduce access to an irrigation network, they may wish to terminate some or all of their water delivery rights. In 2011–12, there were 280 terminations relating to approximately 93 GL of water delivery rights in the MDB (Table 3.2). The number of terminations and the volume of water delivery rights terminated in 2011–12 decreased significantly from 2009–10, but increased from 2010–11. Overall, just 3% of water delivery rights have been terminated since 2009. Most of the terminations occurred in 2009–10 (ACCC 2013).

Table 3.2: Number and volume of terminations, 2009–10 to 2011–12

Year	Number of terminations	Volume of terminations
2009–10	554	129 GL
2010–11	202	59 GL
2011–12	280	93 GL

Source: ACCC (2013).

3.3.3 Administrative changes in Tasmania

There was little change in entitlement trading in Tasmania from 2009–10 to 2010–11, but both the number of trades and the volume of trade increased in 2011–12. The reported volume of entitlement trading more than doubled from 20 ML in 2010–11 to 55 ML in 2011–12, mainly as a result of the inclusion of information from irrigation infrastructure operators for the first time.

In April 2011, the Tasmanian Irrigation Development Board (now Tasmanian Irrigation Pty Ltd, a state-owned enterprise) began selling water entitlements from the proposed $88 million Midlands Water Scheme. By August 2011, around 22 GL out of a possible 38.5 GL had been sold to irrigators. Smaller water entitlement sales have also occurred in other proposed schemes, including Whitemore, Winnaleah, Headquarters Road Dam and Sassafras Wesley Vale. At present, irrigators are only entering into irrigation right purchase contracts—formal rights to water entitlements will not be provided until scheme commissioning. As a result, none of those entitlement sales are included in the data in Figure 2.12.

The Midlands Water Scheme entitlement sales are occurring on an 'unbundled' basis (that is, entitlements are separate from land and are being separated from delivery rights). Furthermore, if the initial allotment of entitlements is not sold to landowners, the entitlements are to be offered for sale to non-landowners. This approach has encouraged the development of the water market.

The development of the schemes is done in partnership between Tasmanian Irrigation and private landholders, using $220 million of funding set aside by the Australian and Tasmanian governments. Of the 24 irrigation schemes planned, half are currently operational, while the remaining schemes are in the pre-feasibility, feasibility, construction or water sales phases. All schemes developed by Tasmanian Irrigation are designed to last 100 years and deliver water at an average reliability of greater than 95%.

Before each scheme becomes operational, Tasmanian Irrigation conducts water entitlement sales during an offer period, using either a tender or a direct sale process.

In the tender process, applicants submit bids for a quantity of water entitlements at a price. The water right being tendered is allocated in order of highest bid price down to the higher of system capacity of the scheme or the set reserve price.

Once a scheme becomes operational, irrigators require the following to access their water:[3]

- an irrigation right (water entitlement)
- a zoned flow delivery right (the capacity to draw water in a specified zone)
- a connection agreement (the right to receive water at a connection point and use it in accordance with an approved water access plan).

3 http://www.tasmanianirrigation.com.au/index.php/about/about-trading-water/ (accessed 11 January 2013).

In operational schemes, the following types of trade may take place:

- permanent transfer, where the rights arising under a water entitlement in an irrigation district are permanently transferred to another party
- temporary transfer, where volume is transferred between irrigation rights and flow rate between delivery rights, and can either be:
  - limited term transfers, which are transfers for one or more irrigation season, or
  - short term, which are within-season transfers.

As these new schemes become more established, water trading is likely to increase in Tasmania. However, because the schemes are typically not connected to one another, trade will be within districts.

3.3.4 Carryover arrangements

Carryover enables entitlement holders to carry over unused allocations from one water year to the next. In the absence of carryover arrangements, unused allocations may be forfeited. With increased water availability in 2010–11 and 2011–12, carryover amounts can equate to significant volumes of water (Table 3.3). Total carryover in Victoria increased from 801 GL in 2010–11 to 2522 GL in 2011–12.

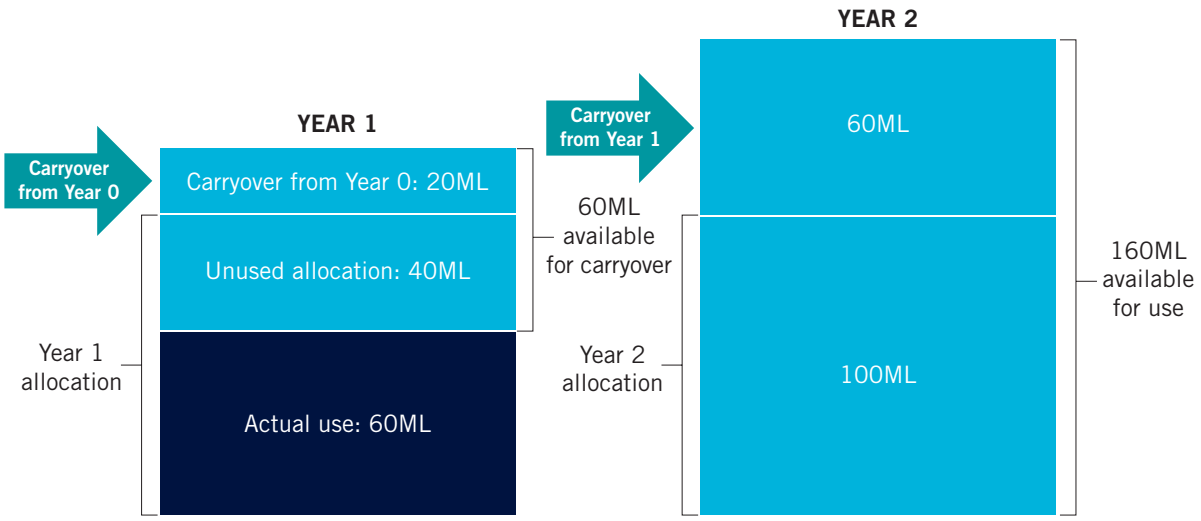
Table 3.3: Net carryover by water shares, Victoria, 2011–12

Water system	Carryover by water shares (GL)	Equivalent high-reliability water share allocation
Murray	1383	103%
Goulburn	1072	97%
Campaspe	42	108%
Broken	10	57%
Loddon	14	54%
Bullarook	1	64%
Total	**2522**	

Source: Department of Sustainability and Environment.

Figure 3.10 illustrates the carryover concept for an irrigator with a 100 ML entitlement, water use in Year 1 of 60 ML, and allocations in years 1 and 2 of 100%. If there are no limits on carryover, the irrigator could carry over 60 ML from Year 1 to Year 2, comprising 20 ML carried over from Year 0, plus unused water in Year 1 of 40 ML.

Figure 3.10: Carryover example



Carryover limits are often applied. They can take the form of limits on volumes that can be carried over, or limits on the maximum volume of carryover plus new season allocation that may be held in an allocation account. In the example in Figure 3.10, if there were a carryover limit of, say, 50% of entitlement volume, the irrigator could only carry over 50 ML and the remaining 10 ML would be forfeited.

Carryover has a number of benefits. Its key advantage is that it gives water users greater flexibility in managing their risk and water use over time. It also encourages efficient water use, as water savings are not forfeited at the end of one year but can be used in the next year.

Market evidence suggests that the availability of carryover can have a material impact on demand for allocation trading and therefore on market outcomes. For example, when the availability of carryover in the SA River Murray was announced in February 2008, the volume and average price of allocation trades picked up substantially. Late-season allocation trading volumes spiked in 2010–11 as irrigators sought to take advantage of carryover provisions available in Victoria.

Carryover obligations have also been cited as a reason for suspending allocation trading[4], amid concern that high carryover obligations at the start of a year can affect the availability of water in storages for the coming season's allocations. It can also increase the risk of a spill from the storage, which may have third-party impacts depending on spill arrangements.

Variation in carryover policies across the MDB

Carryover has been available in some systems since the 1990s. However, 2007–08 was the first year in which carryover provisions were available in all three southern MDB states. In that year, holders of some classes of entitlements in South Australia, Victoria and New South Wales were able to carry over unused water into the 2008–09 season.

As water availability improved in 2010–11, carryover policies in most jurisdictions were adjusted. This resulted in quite different arrangements being applied across the southern MDB.

In December 2010, the South Australian Minister for the River Murray announced that the policy of providing carryover of water volumes to South Australian entitlement holders would end on 30 June 2011, as a result of improved water resource conditions in 2010–11. This resulted in allocation prices dropping 30% in 24 hours.

In New South Wales, the reinstatement of key water sharing plans in July 2011 (discussed below) limited the ability to carry water over between 2011–12 and 2012–13. For example, no carryover would be possible for high-security entitlements in areas including the Murrumbidgee, Lower Darling and NSW Murray. On the other hand, general-security entitlement holders in those valleys would have access to carryover between 2011–12 and 2012–13, but this would be decreased from 100% to 50% carryover. In New South Wales, most water users are general-security entitlement holders, so most have access to carryover.

Victoria continues to offer carryover to most of its water users, having amended the carryover rules in February 2009 to increase the limit on carryover from 30% to 50% of entitlement volume. This allowed entitlement holders in all water systems in northern Victoria to carry over up to 50% of entitlement into the next water season, provided that water carried over combined with that season's allocation does not exceed 100% of entitlement volume. Carryover arrangements in the Murray, Goulburn and Campaspe systems in Victoria also differ from those of other jurisdictions, as water users in those systems have access to a 'spillable water account'. This allows entitlement holders to retain carryover once allocations and carryover are equal to 100% of entitlement volume while there is available capacity in the storage, and therefore to store water above the volume of their entitlements. These provisions are set to change from mid-2014, when new spill rules on the Hume Dam and a 100% limit on carryover are to be implemented.

In Queensland, carryover arrangements are allowed within specified limits in resource operations plans.

The development of carryover policies in the MDB states is summarised in Table 3.4.

4 http://waterregister.vic.gov.au/Public/News.aspx (accessed 4 June 2013).

Table 3.4: Summary of carryover policies in MDB jurisdictions

2007–08	2008–09	2009–10	2010–11	2011–12
NSW				
General-security licence holders were allowed to carry over unused water from one water year to the next (with an upper limit of 50% of entitlement volume). The availability of carryover would be announced at the beginning of the year, taking into account available water. However, water sharing plans could limit the total amount of water that can be used. For example, in the NSW Murray and Lower Darling the limit would be 110% of licence volume. Therefore, if allocations were, say, 100%, then only 10% carryover could occur and any additional carryover would be forfeited.	In 2008–09, carryover of unused water allocations from 2007–08 was permitted where enough water was available. For example, on 15 July 2008, the only water available in the Murray and Murrumbidgee valleys was water carried over from 2007–08, which was required to meet critical human needs. There was zero allocation for high-security and general-security entitlements in both valleys at the time.	No significant changes made to carryover rules.	No significant changes made to carryover rules. However, the reinstatement of key water sharing plans from July 2011 would significantly limit the ability to carry water over between 2011–12 and 2012–13. No carryover would be possible for high-security entitlements from 2011–12 into 2012–13 in areas including the Murrumbidgee, Lower Darling and NSW Murray.	In March 2011, the NSW Office of Water (NOW) advised that there would be no carryover for high-security entitlements from 2011–12 into 2012–13. This coincided with the end of severe water shortages, which were the main reason for NOW originally introducing the carryover provisions. Carryover provisions for general-security entitlements in NSW Murray and Lower Darling will be limited to 50% instead of 100%.
Vic.				
Carryover was introduced in March 2007 as an emergency response to drought and made permanent in December 2007.	Carryover rules were amended in February 2009 to increase the limit on carryover from 30% to 50% of entitlement volume.	No significant changes made to carryover rules.	Northern Region Sustainable Water Strategy reforms were introduced in the Vic. Murray, Goulburn and Campaspe systems to allow the use of 'spillable' water accounts, allowing users to retain carryover once allocations and carryover were equal to 100% of entitlement volume while there is available capacity in the storage.	Carryover review committee recommended new spill rules for the Hume Dam and a 100% limit on carryover. The new provisions are to start in July 2014.

2007–08	2008–09	2009–10	2010–11	2011–12
Qld				
Carryover was allowed within specified limits, as set out in each water supply scheme's resource operations plan. While carryover rules are usually subject to volume and time limits and incorporate a deduction to cover losses, they vary between schemes.	No significant changes made to carryover rules.	No significant changes made to carryover rules.	No significant changes made to carryover rules.	No significant changes made to carryover rules.
SA				
Carryover was introduced for the River Murray Prescribed Water Course in 2007–08 as a temporary drought response.	Carryover continued as drought persisted.	Carryover continued, allowing for up to 100% of unused water in 2008–09 to be carried over to 2009–10. 207 GL of unused water was carried over for use in 2009–10.	In December 2010, the Minister for the River Murray announced that carryover would end on 30 June 2011 as a result of improved water resource conditions in 2010–11.	In December 2011, it was announced that the South Australian Government and stakeholders had developed a new private carryover policy that allowed up to 20% of a water access entitlement to be carried over from one water year to the next. This policy was due to become operational from the 2012–13 water year. The actual volume of carryover available for allocation in any year will be dependent on the South Australian Government's ability to store entitlement flow in upstream storages.

Introduction of products allowing the purchase of temporary carryover water

In 2010–11, the differences in carryover policies affecting irrigators in Victoria, New South Wales and South Australia led to the development of new water products to enable irrigators in regions with limited carryover to benefit from more liberal carryover arrangements in other areas.

At least two water broking companies were offering products that allowed irrigators with surplus allocations, including carryover capacity, to sell that water and carryover capacity to buyers without carryover capacity. Water would be held securely in the seller's water account, carried over from one year to another, and then provided to the buyer. This effectively allows an allocation to be purchased in one state and 'stored' on an entitlement in another state where there is provision for carryover. The water allocation can then be accessed by the purchaser during the next water year.

Those products, combined with the Victorian trade suspension from mid-April 2011 (discussed below), resulted in substantial late-season allocation trading into Victoria, particularly from South Australia.

Differences in jurisdictional carryover policies have resulted in some perverse outcomes, such as water trading not being used as a mechanism to move water to its highest value use but rather to maximise available carryover.

3.3.5 Barriers to trade

The 4% limit in Victoria

The 4% limit in Victoria restricts the net trade of entitlements out of each irrigation area to a maximum of 4% per year (defined as a percentage of the volume of water access entitlement associated with land in an irrigation area), subject to certain exemptions.

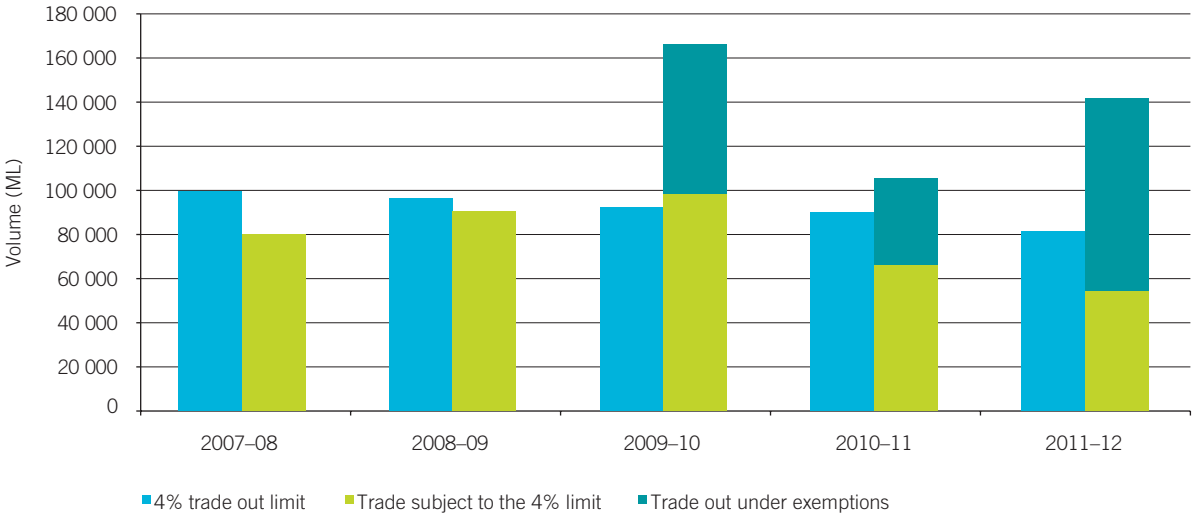
Before 2008–09, the 4% limit restricted entitlement trade out of most districts. In 2009–10, the Victorian Government announced a number of exemptions to the limit. The 2009–10 exemptions related to water entitlements being sold to the Australian Government for environmental purposes and were associated with land in an area that was not a priority for irrigation modernisation. Before then, exemptions were only available for mortgagee sales. The additional exemptions allowed a significant increase in trading out of the affected districts; entitlement trading doubled in 2009–10 compared to 2008–09 (Figure 3.11).

In 2011–12, trading was again higher than in 2008–09, but less than in 2009–10. Limits were reached for high-reliability water shares in seven districts. The volume of trade out under the exemptions was more than in 2010–11, reflecting increased Australian Government purchases in 2011–12 compared to 2010–11.

While additional exemptions have permitted increased entitlement trading in northern Victoria, they only allow materially increased sales to the Australian Government. The 4% limit continues to restrict all other potential buyers and sellers. Goulburn–Murray Water, the approval authority for entitlement trades in the Victorian part of the MDB, operates a ballot system in areas where demand for trading would exceed the 4% limit. In 2010–11, it reported that it was able to approve 588 of 877 applications received, including 512 applications for trades of high-reliability water shares involving more than 69 800 ML and 74 low-reliability water share applications involving nearly 5384 ML. Assuming that the average sizes of approved and unapproved trades were the same, this suggests that around 39 GL of trade was unable to proceed due to the 4% limit, in addition to trades not subsequently submitted. This is equivalent to about 13% of the total entitlement trade in Victoria in 2010–11.

In 2011–12, the Victorian Department of Sustainability and Environment reported that 858 applications had been submitted for the ballot (representing about 130 GL). Of those, Goulburn–Murray Water reported that it was able to approve just over 400, which represented about 54 GL. Trade out permitted under exemptions equalled about 87 GL (an increase from 39 GL in 2010–11). Data was unavailable for the number and volume of trades that were unable to proceed under the 4% limit in 2011–12. This has made it difficult to assess how restrictive the limit was in that year.

Figure 3.11: Trade out of irrigation areas in Victoria affected by the 4% trade-out limit, 2007–08 to 2011–12 (ML)



Source: *AWMR* series.

A study by the Commission to assess the impact of water trading in the southern MDB (NWC 2012) found that restrictions on inter-regional trade were adversely affecting market outcomes and arbitrarily disadvantaging both buyers and sellers. A survey of irrigators undertaken as part of the study found that most (57%) believed that limits on permanent water access entitlements trading should be removed.

In June 2009, the Victorian Government announced that it would start phasing out the 4% limit in July 2011. This phasing out has not substantially occurred, and it remains to be seen whether the 4% limit will be removed by July 2014, when the trading rules under the Murray–Darling Basin Plan come into effect.

The 3% New South Wales trade cap

Although the NSW Government's announcement of a 3% trade cap on 15 January 2013 did not occur in the 2011–12 water year, discussion has been included in this report because the cap is a departure from commitments to remove impediments to trade to promote more open and efficient water markets.

The NSW Government announced that a 10-year, 3% per valley limit will apply on further buybacks of New South Wales water licences for environmental purposes in the MDB. Current annual extraction limits for consumptive use in each catchment or groundwater area are set out as baseline diversion limits in the Basin Plan. From 15 January, further trading of New South Wales surface water entitlements (licences or licence shares) for environmental purposes will be restricted to 3% of the baseline diversion limit within each valley in the New South Wales portion of the MDB. Once the 3% limit is reached, licence or licence share purchases for environmental purposes will be prohibited. While the NSW Government has reported that the aim of the 3% cap is to better facilitate adjustment to the new sustainable diversion limits identified in the Basin Plan, the cap could penalise individual water holders who are looking to manage their risks through the marketplace.

Evidence from the Commission's investigations clearly indicates that irrigators are using markets and trading as a business and risk management tool. Trading plays a major role in maintaining capital, employment and investment in the southern MDB. Limiting buying and selling options limits irrigators' flexibility to choose their optimal risk management strategies. In addition, excluding potential buyers from a market can also have the effect of dampening entitlement prices, lowering the value of entitlements as assets.

Suspension of water sharing plans in New South Wales

In January 2011, it was announced that New South Wales water sharing plans suspended in the recent drought because of severe water shortages would recommence in July 2011. The recommencement of the plans came after significant improvements in water availability throughout all of inland New South Wales, where high-security allocations reached 100% in all regulated river systems. The affected plans were for the Macquarie and Cudgegong Regulated Rivers (suspended July 2007), the Murrumbidgee Regulated River (suspended November 2006), the Lachlan Regulated River (suspended July 2004) and the NSW Murray and Lower Darling Regulated Rivers (suspended November 2006).

Because the plans were suspended and in order to give general- and high-security water users greater flexibility in managing their water needs, alternative rules set out in the *Water Management Act 2000* (NSW) came into effect. With the plans recommenced, the carryover rules specified in the plans applied. For example, there would be no carryover allowed for high-security users, and the carryover for general-security users in the NSW Murray and Lower Darling would be limited to 50% of entitlement from 2011–12 to 2012–13.

The trade rules specified in each of the plans now also apply. The rules outline any restrictions that may apply to the various types of water licences associated with each water source. For example, in the Murrumbidgee, the total volume of undelivered water for intervalley trading is limited to 100 GL. This limit was not active while the Murrumbidgee plan was suspended, which allowed irrigators to trade out their water as an alternative to using it to grow a crop. Net external trades well over 100 GL occurred from 2007–08 to 2009–10, reaching almost 400 GL in 2008–09. However, as rice growers re-entered the market in 2010–11, net exports reached only 49 GL for that year, and 67GL in 2011–12.

Because the plan was reinstated from 1 July 2011, intervalley and interstate trade are again limited to 100 GL.

The Commission's biennial assessment (NWC 2011i) raised concerns about the lack of clarity about what the suspension decision would mean to users, including water market participants, and their decision-making in the medium or long term. At the time of the suspension, there was no publicly available information about the suspension timelines or the conditions under which the plans would be reinstated.

Trade suspensions

From 11 April to 1 July 2011, the Victorian Water Minister approved changes to the trading rules to suspend allocation trading. New restrictions applied on water trades from New South Wales to Victoria and from the Goulburn, Campaspe and Loddon systems to the Victorian River Murray system, or to interstate. The suspension was the result of high storage levels in Victorian storages, large volumes of unused irrigation water and Victorian carryover rules. In this situation, there was concern that additional allocation trading would lead to reduced water availability to Victorian irrigators in the next irrigation season.

After the trade suspension was imposed in 2011, New South Wales irrigators could not sell allocations directly to Victoria, but trades could still occur indirectly by selling first to South Australia and then on to Victoria. Trading from South Australia to Victoria was not restricted, as it was not subject to the same water storage availability constraints as trading from New South Wales to Victoria. This trading process appears to have allowed New South Wales water users to bypass the suspension, and also to take advantage of Victorian carryover arrangements through the products described in Section 3.3.4 of this report.

Record volumes of allocation trade occurred in April, May and June 2011 (Figure 2.20). Combined trade from New South Wales to South Australia in the last few months of the water year equalled 188 GL, and trade from South Australia to Victoria was 279 GL. We suggest that these record volumes were a result of the market response to both the trade suspension and the differential in carryover arrangements.

Due to concerns about the impacts of additional allocation trading on the next season's allocation for Victorian irrigators, a trade suspension was again enforced by Victoria from 19 March to 30 June 2012.

On 22 March 2012, the NSW Government temporarily suspended the trading of allocations from the NSW Murray and Lower Darling systems into South Australia from 1 April to 30 June 2012. The justification for this suspension was to minimise negative impacts on licence holders for the 2012–13 season. There was concern that there would be a repeat of the previous year's surge in late-season trading from New South Wales into Victoria via South Australia (taking advantage of states' different carryover arrangements), which delayed the allocation of water to New South Wales licence holders the following season.

The South Australian Government also temporarily suspended water allocation trading for a week at the end of March 2013 to protect South Australia's entitlement flow for the following year.

The potential impact of suspensions on market activity and water users include the following:

- The suspensions have caught out some water users (including irrigators) and hindered their water management decisions. For example, when intervalley allocation trading is suspended, environmental deliveries that rely on allocation trading (such as Murray in-river deliveries and deliveries to Living Murray Icon sites) cannot occur.
- The series of relatively ad hoc suspensions has reduced the ability of water users to rely on water allocation markets across the connected southern MDB, and reduced confidence in the market.

Under the current arrangements for interstate allocation trading, there is likely to be a motivation to impose such suspensions in the future in order to manage third-party impacts.

In the Commission's 2011 biennial assessment, we raised concerns over the operation of carryover provisions appearing to necessitate a suspension in water trading. Our finding was that effective carryover specifications and management should be in place to enable the delivery of commitments under all inflow scenarios.

3.4 Commonwealth environmental water purchases

3.4.1 Commonwealth entitlement purchases

As part of its 'bridging the gap' commitment related to the Murray–Darling Basin Plan, the Australian Government has been active in the water market for the past five years, purchasing entitlements for environmental purposes under the Restoring the Balance in the Murray–Darling Basin program. Across the entire MDB, the volume of trade registered as Commonwealth environmental water purchases increased from zero in 2007–08 to a cumulative total of 1343 GL at the end of 2011–12 (Table 3.5). The Commonwealth now holds the largest portfolio of entitlements in the MDB.

Table 3.5: Commonwealth environmental water purchases and registrations in the MDB, 2007–08 to 2011–12 (GL)

	2007–08	2008–09	2009–10	2010–11	2011–12
Purchases secured during year	22	426	415	189	274
Cumulative volume of secured purchases at end of year	22	448	863	1052	1327
Registered during year[a]	0	65	659	255	364
Cumulative volume registered at end of year	**0**	**65**	**724**	**979**	**1343**

a Registered volumes include water not purchased from the market, such as gifted water and acquisitions through the Sustainable Rural Water Use and Infrastructure Program. Note that purchases are not always registered in the year after they are acquired.

Note: Includes 14.6 GL and 8.1GL of non-tradeable *Water Act 1912* (NSW) licences that were registered by the Commonwealth in 2010–11 and 2011–12, respectively, as part of land purchases.

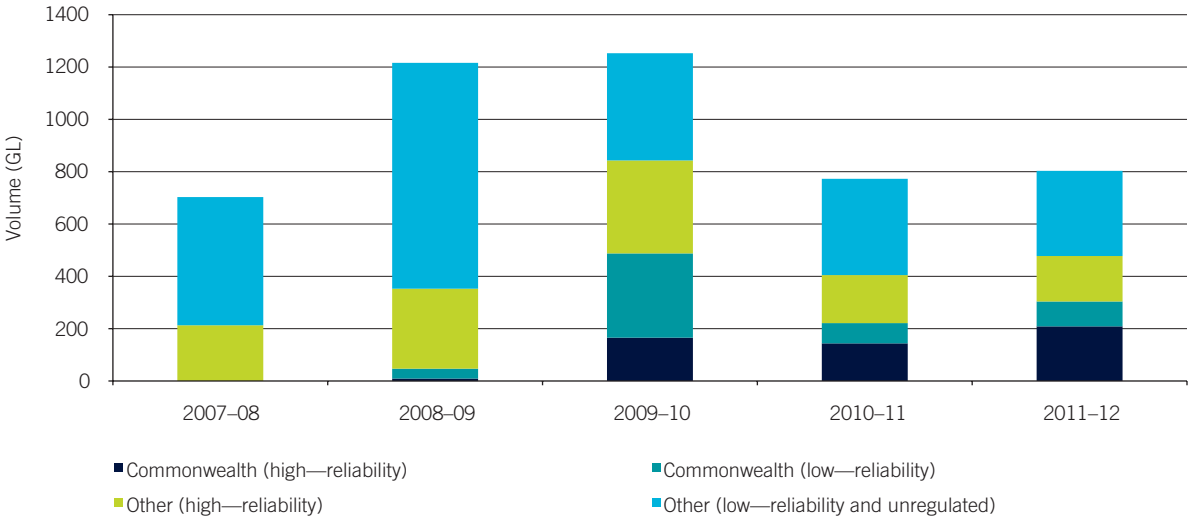
Source: *AWMR* series.

Volumes of entitlements secured for the environment in 2010–11 and 2011–12 were somewhat lower than in 2008–09 and 2009–10. In the earlier years, such purchases represented 24%–27% of entitlement trading in the MDB. In 2010–11 and 2011–12, this dropped to 21%–22%. This shows that environmental purchasing was an important factor in water markets over those four years. In February 2011, in response to irrigators' concerns about the pace of purchasing, the Australian Government instigated smaller, more consistent purchasing aimed at giving communities confidence in a steady pace of water purchases. The Australian Government endeavours to make information about its purchasing activities available to inform potential sellers and the market more generally, so as not to undermine confidence in the market.

Total registered Commonwealth environmental purchases in the southern MDB increased from 221 GL in 2010–11 to 304 GL in 2011–12 (Figure 3.12). The types of entitlements purchased by the Australian Government in 2011–12 were similar to the types bought in 2010–11. There was a move in both years towards higher security entitlements;

two-thirds of Commonwealth purchases in the southern MDB in 2009–10 were of lower security entitlements, compared to 34% in 2010–11. The greatest increase in environmental water purchases from 2010–11 to 2011–12 was in southern MDB high-reliability entitlements, which increased by 45%. Most of the high-security purchases were made from the Goulburn and Vic. Murray areas.

Figure 3.12: Entitlement trades (by purchaser and reliability class) in the southern MDB, 2007–08 to 2011–12 (GL)

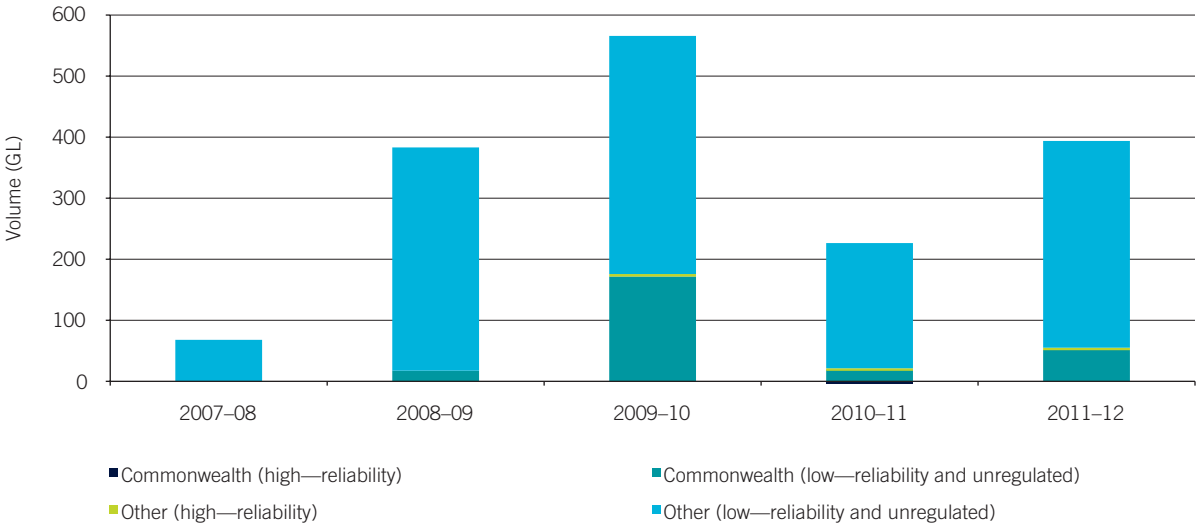


Note: The trade volumes shown here vary from those in Figure E1, as this chart includes trades internal to irrigation districts while Figure E1 does not. This is because data on irrigation trades is available only for the five years shown here. Entitlement trade in this chart is registered trade. Registered volumes for the Commonwealth include water not purchased from the market, such as gifted water and acquisitions through the Sustainable Rural Water Use and Infrastructure Program.

Source: *AWMR* series.

In 2011–12, total registered Commonwealth purchases in the northern MDB increased by 74% from 2010–11 (Figure 3.13). The main registered purchase was 14 GL of general-security entitlement in the Macquarie zone. In the northern MDB, Commonwealth purchases have been almost exclusively of low reliability entitlements, in contrast with the southern MDB, where entitlements of high and low reliability have been purchased.

Figure 3.13: Entitlement trades (by purchaser and reliability class) in the northern MDB, 2007–08 to 2011–12 (GL)



Notes: No trade of high-reliability entitlements occurred before 2009–10. In 2009–10, 4 GL of high-reliability entitlements was traded by non-Commonwealth parties, and 2.2 GL was traded in 2010–11; both values are too small to be visible on this chart. High-reliability water entitlements in the northern MDB were purchased by the Commonwealth for the first time in 2010–11. The volume purchased was 375 ML, and is not visible on this chart. The chart excludes 14.6 GL and 8.1 GL of non-tradeable *Water Act 1912* (NSW) licences that were registered by the Commonwealth in 2010–11 and 2011–12, respectively, as part of land purchases.

Source: *AWMR* series.

3.4.2 Environmental water allocation trading

Significant volumes of water entitlements have now been secured by the Australian Government and state governments through measures such as the Restoring the Balance in the Murray–Darling Basin program, the Sustainable Rural Water Use and Infrastructure Program and the Living Murray Initiative. Annual water allocations to those entitlements are now being used to deliver on environmental water objectives articulated in environmental watering plans.

The purpose of environmental watering is to protect and restore the resilience of MDB rivers, wetlands, floodplains and lakes, along with the animals and plants, including red gum forests, that depend on them. Many parts of the river have been in decline over the past 30 years, and many floodplain ecosystems were stressed and close to collapse during the Millennium drought.

To maximise benefits to the environment, environmental water holders use the water trading system to deliver water to environmental assets in different parts of the MDB. They also undertake coordinated environmental watering actions. For example, the Commonwealth Environmental Water Office transfers water to the Victorian Environmental Water Holder's water licences in order to deliver water, by agreement, to rivers and wetlands in the Victorian part of the MDB.

To make it easier to move water to different parts of the basin, water allocations are sometimes transferred or traded between environmental water holders. These trades, which are known as environmental water allocation trades, may be either within-environment (within or between accounts of environmental parties) or private-to-environment (from a private party to an environmental party), and can be between or within trading zones. They can also include environment-to-private trades, such as trades by the NSW Riverbank program to generate returns to fund its operations.

Environmental water allocation trades where both parties are environmental water holders do not generally involve payment. They may occur for a number of reasons, including:

- storing and delivering environmental water to where it is needed most (examples include the delivery of 343 GL to the Murray catchment to provide fish refuge, provide additional inflows to the Lower Lakes and Coorong and provide replenishment flows to reduce the impact of blackwater events[5]) (CEWH 2012:169, CEWO 2013)
- trades between different delivery points within a zone.

The *Water Act 2007* defines a trade of a water allocation as an assignment from one authorised water user to another, or between water accounts held by the same water user, with or without a change in location. While the movement of water between accounts held by the same legal entity could arguably not be counted as a water trade in the *AWMR* series, the registers and information systems maintained by the states and territories typically do not identify such dealings separately from other transactions. This means that trades between environmental parties (which typically involve no payment) affect the reported volumes but not reported prices, because transactions with a zero price are excluded from pricing data.

Within-environment trades may be between environmental water holders or between the accounts of a single environmental water holder. For example, because Victorian environmental waterings are often carried out by the Victorian Environmental Water Holder in partnership with the Commonwealth Environmental Water Office, trades between those parties are common. In 2011–12, the Victorian Environmental Water Holder delivered 516 GL of environmental water to 35 river reaches and 10 wetlands (VEHW 2012).

The past two years were the first years in which environmental water holders were major participants in the water allocation market. It is estimated that in Victoria in 2010–11, 671 536 ML of within-environment water allocation trades took place. Of those trades, 323 289 ML was intrastate (23% of Victoria's total allocation trade), while 348 248 ML (25% of total trade) was interstate.

In 2011–12, around 540 500 ML of within-environment water allocation trades took place. Of this, 310 235 ML was intrastate (19% of Victoria's total allocation trade), while 230 265 ML (14% of total trade) was interstate. Almost all of the interstate trade was to South Australia, which was a major contributor to Victoria becoming a net exporter of allocations for the first time in six years and SA Murray's net imports climbing to 278 GL.

5 Blackwater is the result of a natural process that occurs following the decay of organic material, such as leaf litter, that is washed into wetlands and waterways by floods. As the organic matter decays, oxygen held in the water is sometimes consumed faster than it can be replenished. The decay process darkens the water, turning it black. Blackwater with low dissolved oxygen is termed 'hypoxic blackwater'. The resulting low levels of dissolved oxygen in the water can stress or kill fish and other aquatic animals.

Table 3.6: Effect of within-environment trades on Victoria's allocation trades, 2010–11 and 2011–12 (GL)

		Internal trades	Trade in	Trade out	Net change	Total volume traded
2010–11	Total trades	754	405	229	176	1388
	Non-environmental trades	430	256	31	225	717
	Environmental trades	323	150	199	–49	672
2011–12	Total trades	1064	161	393	–232	1618
	Non-environmental trades	754	158	166	–9	1078
	Environmental trades	310	4	227	–223	541

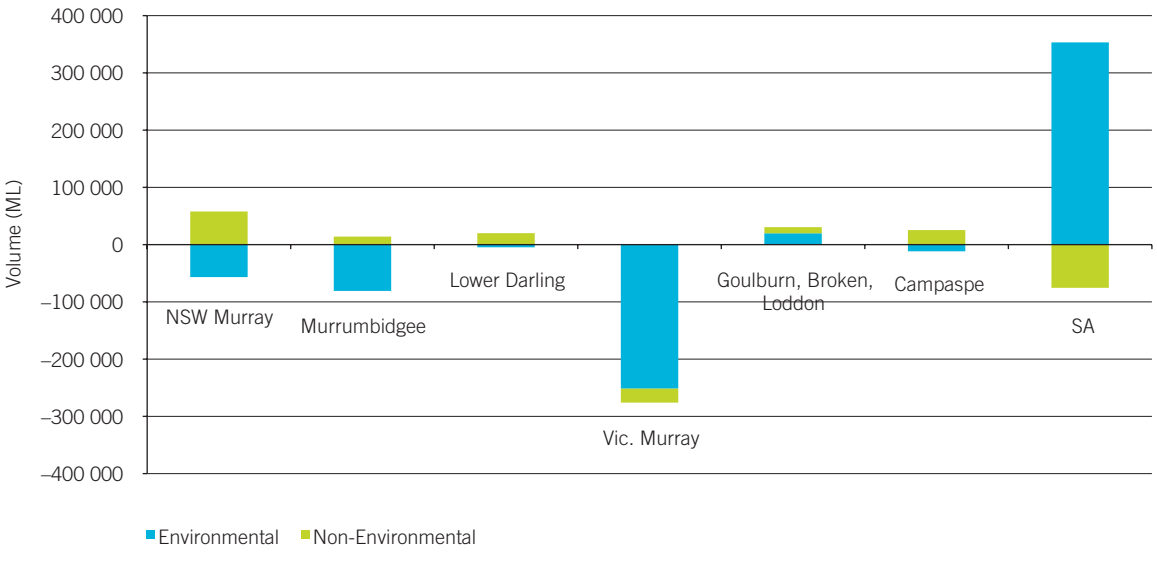
Note: Excludes private-to-environment trades. Total volume traded is the sum of internal trades, trades in and trades out. Differences between the sums of non-environmental and environmental trades and total trades reported are due to rounding.

Source: DSE.

Environmental trades constituted significant proportions of Victoria's total allocation trade in 2010–11 and 2011–12 (Table 3.6). While environmental trade into Victoria was only 4 GL (from the NSW Murray), intrastate environmental trade and environmental trade to South Australia together accounted for 37% of the state's trade.

For South Australia, targeted environmental deliveries to the state were 353 265 ML out of a total of 506 661 ML traded in South Australia in 2011–12 (Figure 3.14). This suggests that at least 70% of reported trades into South Australia are associated with environmental trades.

Figure 3.14: Net change in intervalley and interstate trade for environmental and non-environmental sectors, 2011–12 (ML)

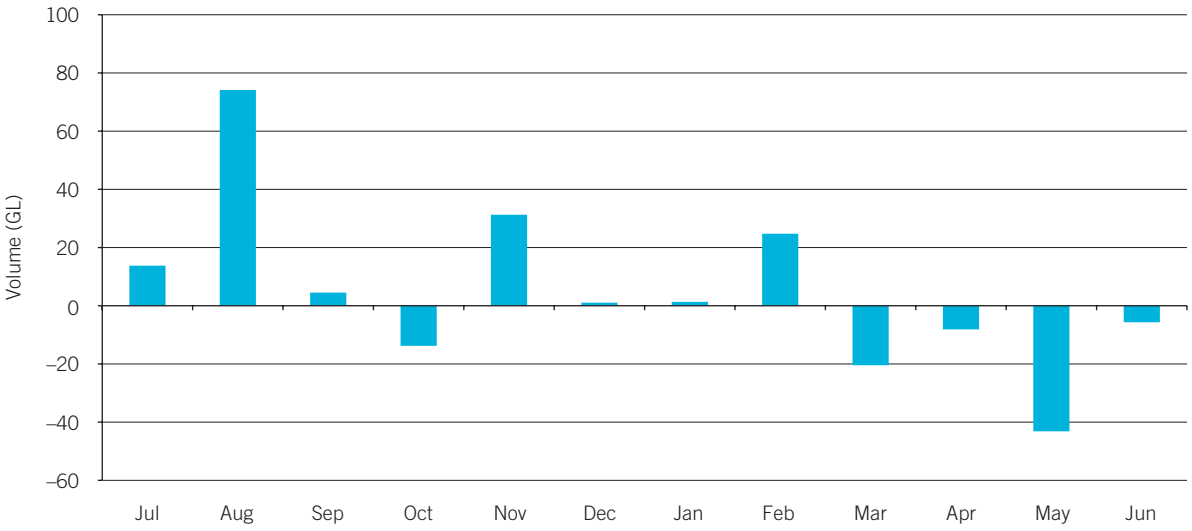


Source: MDBA.

These volumes might not necessarily represent commercial trades and might instead be transfers between environmental holders or transfers to account for water flowing downstream to South Australia above the volumes stipulated under the relevant legislation. For that reason, they may be masking the behaviour of the majority of market participants. In the absence of these environmental trades from Victoria, Victoria's volume of net exports in 2011–12 decreases to 9 GL and South Australia's net imports of 278 GL becomes a net export of 75 GL.

In Figure 3.15, in which these identified environmental trades have been removed from the profile of net interstate trade into South Australia from Victoria, a much clearer and more ordered pattern emerges. In the early part of the water year, South Australia was a net importer of water from Victoria—presumably for consumptive purposes; in the latter part of the year, it was a net exporter of water into Victoria. It is likely that the export of water into Victoria from South Australia was the result of the selling of water not required for horticulture, or the selling of water in response to the more favourable carryover conditions in Victoria. In the main regulated systems in Victoria, depending on conditions and available storage capacity, all of the allocation in linked allocation accounts on 30 June 2012 was eligible for carryover in spillable water accounts, while no carryover was available in South Australia at that time.

Figure 3.15: Victoria's net interstate trade to South Australia, 2011–12 (GL) (excluding environmental trades)



Source: Deloitte.

In addition to their impacts on the reporting of water market volume information, environmental water deliveries also have potential impacts on water market outcomes and on trading opportunities for other water users.

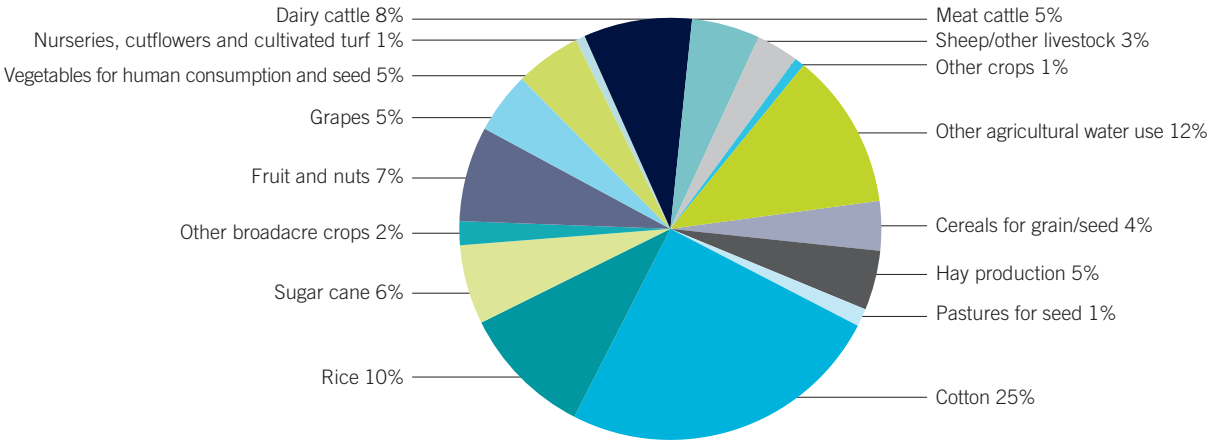
The small number of environmental water allocation trades taking place each year means that they do not affect processing times for private trades in the water market. As with any large allocation trade, however, the significant volumes of some environmental allocation trades have the potential to adversely affect private traders. If they involve areas of constrained channel capacity, such as the Barmah choke, the physical delivery of water associated with other trades could potentially be 'crowded out'. However, there is no evidence that this has occurred. Moreover, many environmental trades occur at different times of year from trades for agricultural uses, so their potential impact on channel capacity is reduced.

3.5 Agricultural production and markets

Changes in agricultural commodities

The availability and price of water are key factors in the production of most irrigated agricultural commodities. Figure 3.16 shows that cotton, rice, dairy and horticulture producers are the main users of irrigation water in Australia. Consequently, the timing and direction of water allocation trading in the MDB are strongly driven by those industries, particularly by the rice, horticulture and dairy sectors in the southern MDB and the cotton sector in the northern MDB.

Figure 3.16: Water consumption by agricultural activity and water type, 2010–11 (% of total volume applied)



Source: ABS (2011).

This section discusses the interactions between these key agricultural sectors and the water market in the MDB.

3.5.1 Agriculture in the southern MDB

Fruit and nut production takes place in most areas of the southern MDB, whereas cereals and rice are produced mainly in the NSW Murray and Murrumbidgee areas (Table 3.7). Most dairy production takes place in southern New South Wales and northern Victoria, in particular in the Goulburn and Vic. Murray zones.

The following sections examine these three industries in more detail.

Table 3.7: Key irrigated agricultural industries in the southern MDB, by trading zone

Irrigated agricultural industry	Trading zone							
	Lachlan	Lower Darling	NSW Murray	Murrum-bidgee	Goulburn	Vic. Murray below Barmah	Vic. Murray above Barmah	SA Murray
Cereals for grain and seed	•	•	√	√	•	•	•	•
Cotton	√	•	•	•	•	•	•	•
Rice	•	•	√√	√	•	•	•	•
Fruit and nuts	√	√√	•	√	√√	√	√	√√
Grapes	√	√√	•	√	•	√	√	√√
Vegetables and seed	√	•	•	√	•	•	•	√
Dairy farming	•	•	√	•	√√	√√	√√	•
Meat cattle	•	•	√	•	•	•	√	•

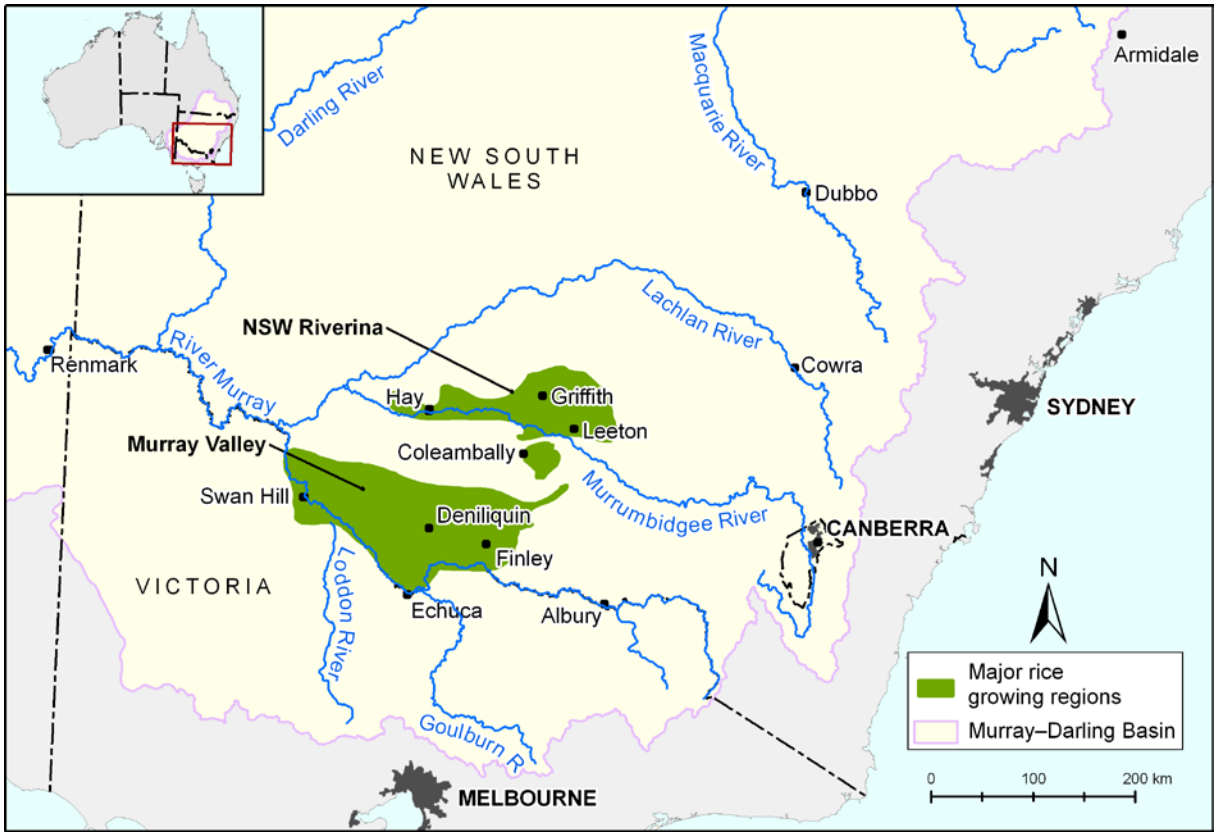
Note: The number of ticks reflects the prevalence of the industry in the zone, based on the industry's contribution to the zone's gross value of irrigated agricultural production.

Rice

Rice production in Australia is concentrated in the New South Wales Riverina, along the Murray and Murrumbidgee rivers (Figure 3.17).

The main irrigation districts where rice is grown are Murray Irrigation, the Murrumbidgee Irrigation Area and the Coleambally Irrigation Area. There are also a large number of private surface water diverters and a smaller number of groundwater users who grow rice in the Riverina.

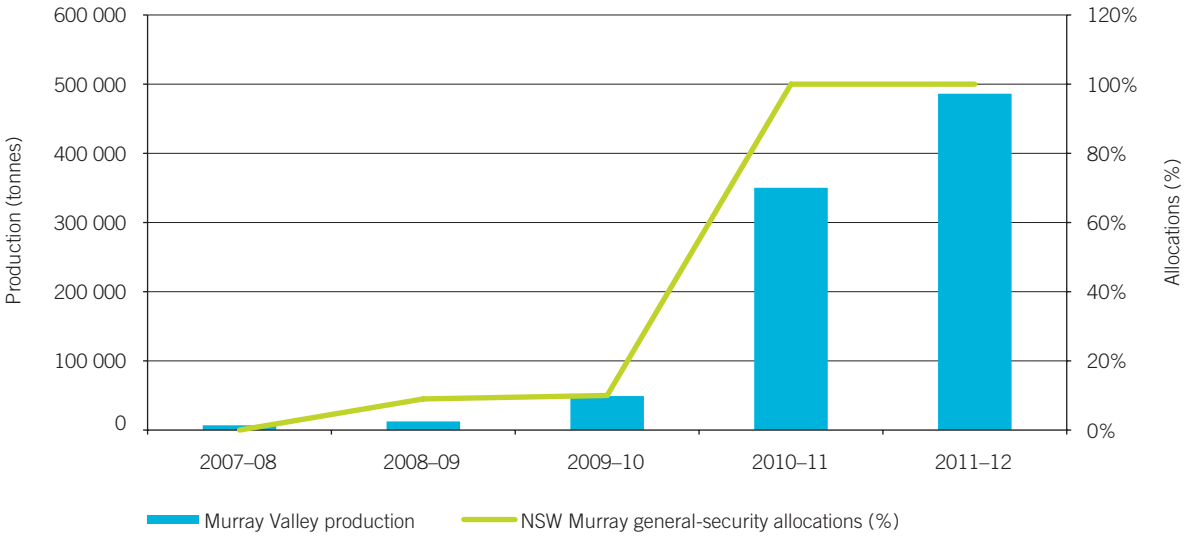
Figure 3.17: The New South Wales Riverina



Water use and rice production

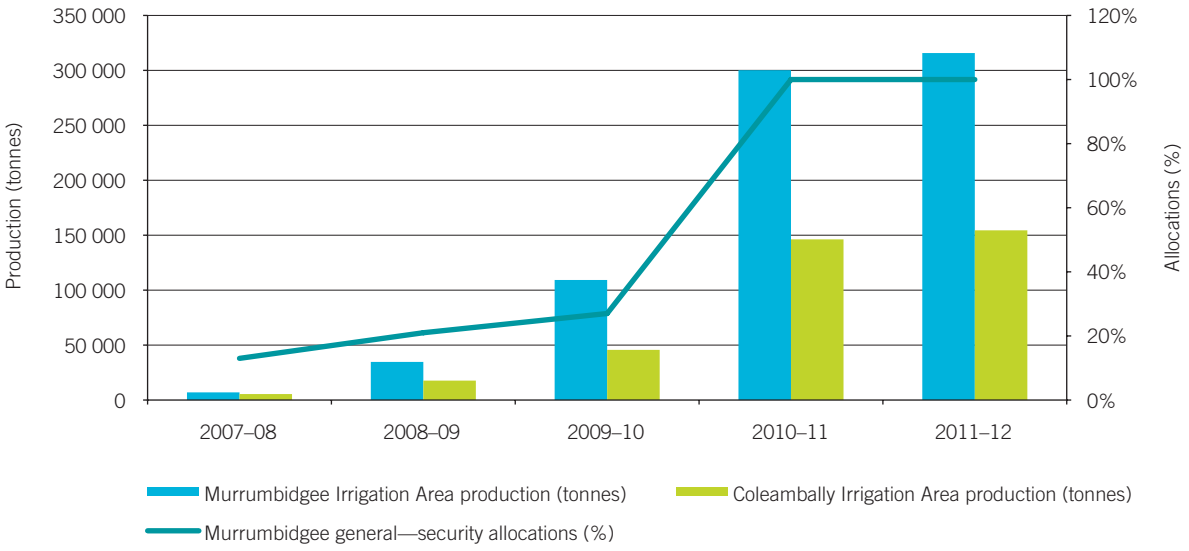
Irrigation water is a necessary input in rice production. Most rice growers hold NSW general-security entitlements in the Murray or Murrumbidgee systems. Production is extremely dependent on allocations against these two entitlement types (Figures 3.18 and 3.19).

Figure 3.18: Riverina rice production and end-of season general-security water allocations in the NSW Murray, 2007–08 to 2011–12



Sources: RMB (2011), NSW Government (2011a), SunRice (2012), ABARES (2012), *AWMR* series.

Figure 3.19: Murrumbidgee rice production and end-of season general-security allocations, 2007–08 to 2011–12



Sources: RMB (2011), NSW Government (2011a), SunRice (2012), ABARES (2012), *AWMR* series.

Seasonal conditions and allocations

During the Millennium drought, general-security water entitlement holders in the Murray and Murrumbidgee regions received very low or zero allocations, resulting in very little rice production from 2007–08 to 2009–10 (Figure 3.20). In 2007–08, 38 farmers produced 19 000 tonnes of rice in the Riverina. While rice prices increased, the drought meant that there was not enough water available to grow a crop.

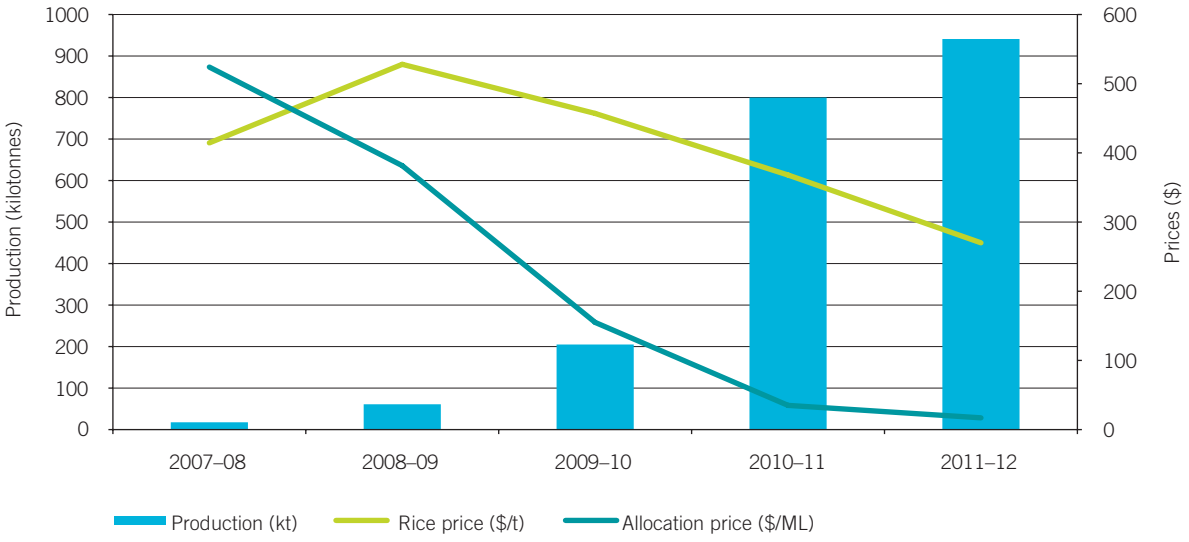
Higher rainfall in 2010–11 and 2011–12 and improved water allocations in the Murray and Murrumbidgee systems from 2010–11 resulted in much higher water usage by rice growers in 2011–12 (Table 3.8). Rice production rose to about 940 000 tonnes and number of growers increased to 1536 in that year.

Table 3.8: Irrigation infrastructure operator water usage, 2009–10 to 2011–12 (ML)

Irrigation infrastructure operator	Total volume of water supplied at customer service points (ML)			Percentage change in 2011–12
	2009–10	2010–11	2011–12	
Murray Irrigation Limited	161 473	400 079	901 827	125%
Murrumbidgee Irrigation	368 269	490 329	752 845	54%
Coleambally Irrigation	117 938	252 923	467 105	85%

Source: Deloitte.

Figure 3.20: Rice production, rice prices and water allocation prices, Murrumbidgee, 2007–08 to 2011–12



Sources: Rice—SunRice (2012) and ABARES (2012); water prices—NWC (2013).

Rice growers' seasonal water allocation trading is largely driven by the expected return from each megalitre of water. If the market price for water allocations goes above the threshold determined by the grower to be viable for rice production, they are likely to sell allocations. As a rough guide, when the water price is above about $150–$200/ML, rice growers get a bigger return from selling their water allocations than they would if they grew rice.

In the Murrumbidgee and Murray valleys:

- in 2008–09, when 390 000 ML was traded out, the mean water price was $375/ML while the expected gross margin for rice was $260/ML
- In 2011–12, when 1188 ML was traded into the Murray Valley, the mean water price was $13/ML while the expected gross margin for rice was $59/ML.

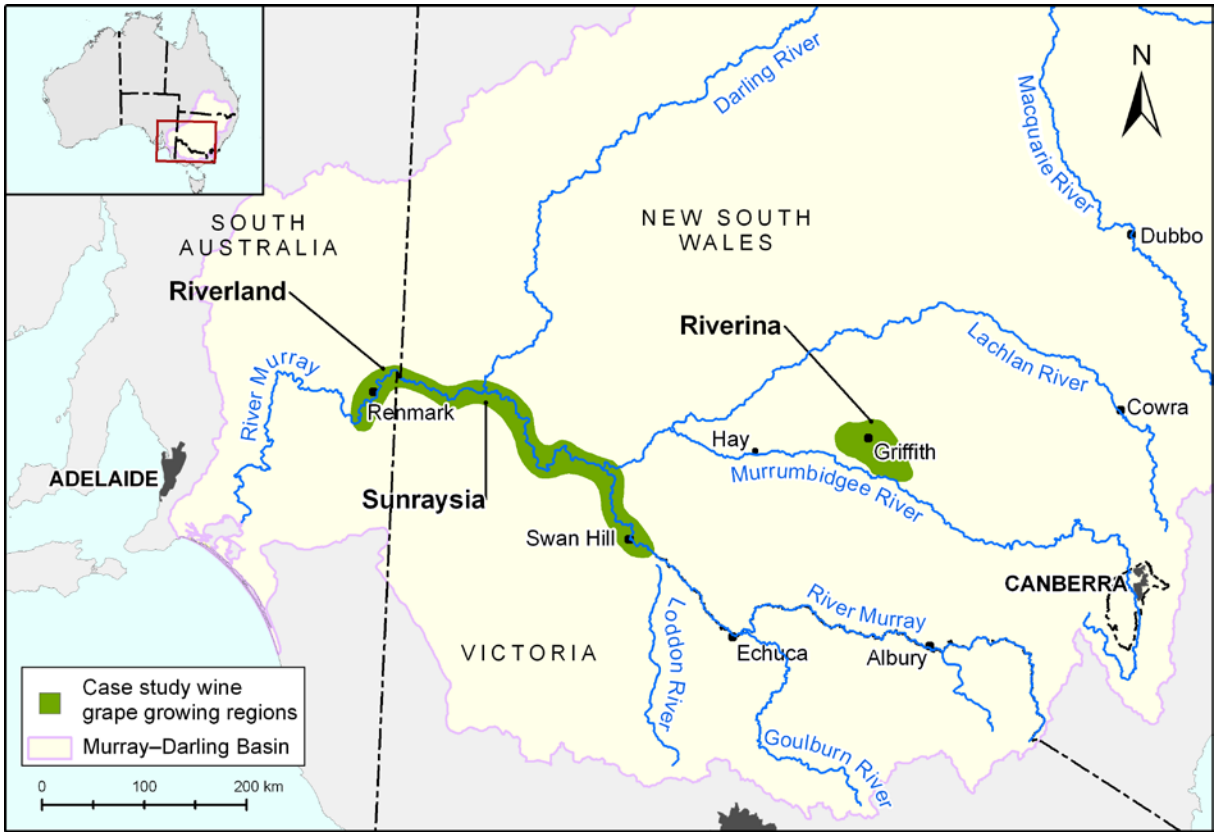
Water trading, particularly in seasonal water allocations, is essential for rice growers. It gives them flexibility to determine their best production strategy each year. There is a strong correlation between the price of water allocations and the volume of water allocations traded out of rice-growing regions, especially the Murrumbidgee. For example, in 2008–09, when allocation prices were high, 389 753 ML moved out of the Murrumbidgee system, in net terms. With a return to high allocations and low allocation prices in 2010–11 and 2011–12, New South Wales's net exports declined significantly from 269 GL to 72 G in 2011–12, reflecting the retention of water in the state for agricultural purposes (including rice growing). The NSW Murray became a net importer in that year, after net exports of 185 GL in 2010–11.

Horticulture: wine grapes and almonds

Wine grapes and almonds are significant horticultural industries in the southern MDB. The gross value of irrigated grape production (in total, for table and wine grapes) was around $1 billion in 2007–08 and $600 million in 2008–09 (ABS 2011a). About three-quarters of Australia's wine grapes are produced in the MDB. The almond industry has a current farmgate value of $250 million (projected to reach $600 million by 2016). Of the area in Australia planted to almonds, 93% is in the southern MDB (Almond Board 2011).

This section focuses on the major wine grape and almond growing regions of Sunraysia, Riverina and SA Riverland (Figure 3.21)

Figure 3.21: Wine grape and almond growing regions in the MDB



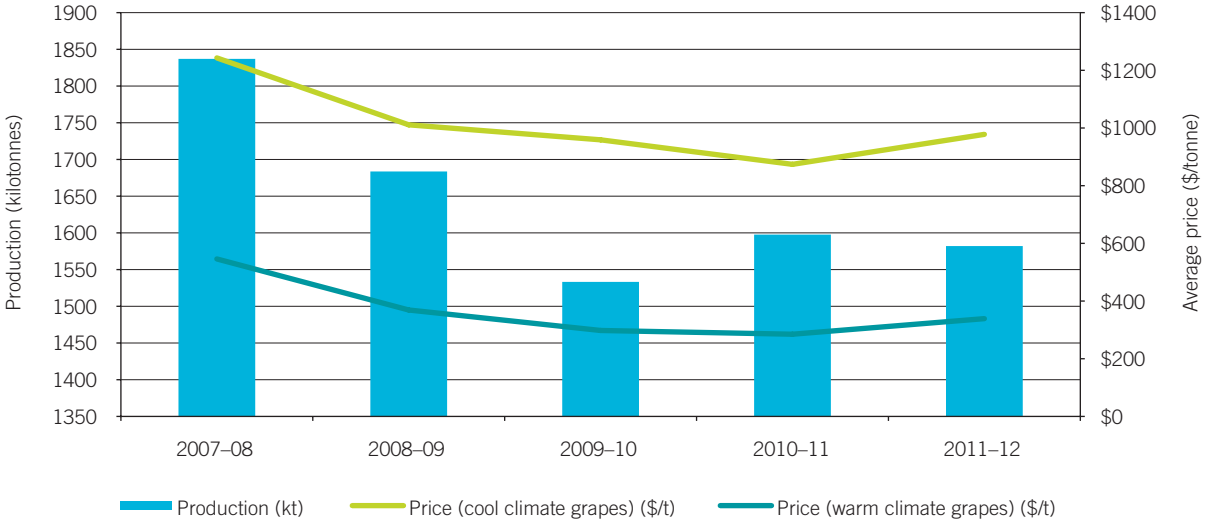
Water use and production

Wine grapes and almonds have relatively fixed water demands. Unlike annual crops, such as rice, vines and almond trees are perennial and must be kept alive from one season to the next. In the hot, dry climate of Sunraysia, Riverland and the Riverina, in most years there are no alternatives to irrigation. Failing to meet water requirements reduces production in the short term and risks the plant's health and survival in the longer term.

Industry drivers and water entitlement trading

Since 2007–08, a number of factors have led to a decline in wine grape production and a slowdown in the expansion of almond production. Wine grape prices have decreased by over 20% since 2007–08 (Figure 3.22). A number of large-scale managed investment schemes involving significant investments in agricultural ventures have collapsed.

Figure 3.22: Wine grape production and prices in cool and warm climates, 2007–08 to 2011–12



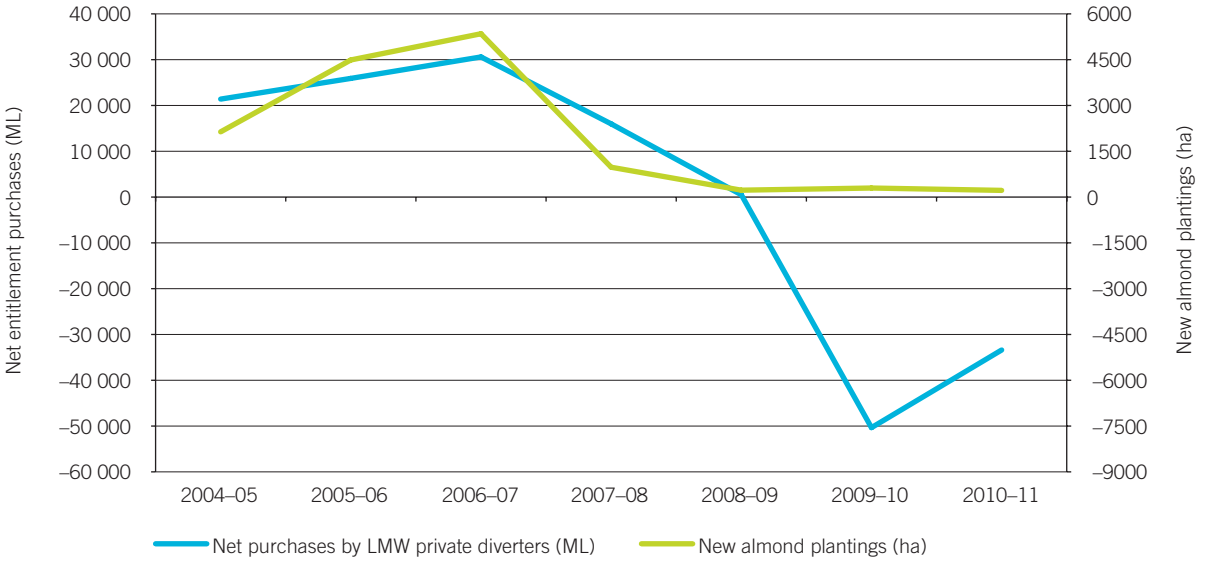
Source: ABARES.

For almonds, prices have dropped back to historical levels, there has been increased international competition and the Australian dollar has appreciated against the US dollar, all of which have had a negative impact on the Australian industry's profitability. As a result, since 2007–08 there has been significant 'churn' in the ownership of Victorian water shares in areas such as Sunraysia, where almond-related land and water assets have changed hands.

Of the Victorian Murray high-reliability water shares held by private diverters, 201 224 ML was transferred within the region in 2009–10, compared with 22 755 ML in 2007–08. In addition, the global financial crisis precipitated significant changes in the ownership and management of almond plantations owned by managed investment schemes. In 2009–10, two transactions transferred 11 853 hectares of planted almond orchards and about 89 GL of high-reliability water shares. The collapse of the managed investment scheme industry has led to a substantial increase in reported activity in the water entitlement market.

Climatic conditions also took their toll on these industries. Prolonged drought increased costs and reduced productivity. In contrast, the wet conditions in late 2010 and early 2011 caused flash flooding of vineyards and almond orchards in north-west Victoria. Figure 3.23 shows the correlation between the expansion of the almond industry and regional purchases of entitlements to underpin production in the early to mid-2000s. The drought and the decrease of almond prices, wine grape prices and investment schemes since 2007–08 were largely responsible for the decline in water purchases and the significant net sales of entitlements in 2009–10.

Figure 3.23: Almond plantings and net entitlement purchases in the Victorian Sunraysia region, 2004–05 to 2010–11



LMW = Lower Murray Water.

Sources: Lower Murray Water (various years); NWC 2011j.

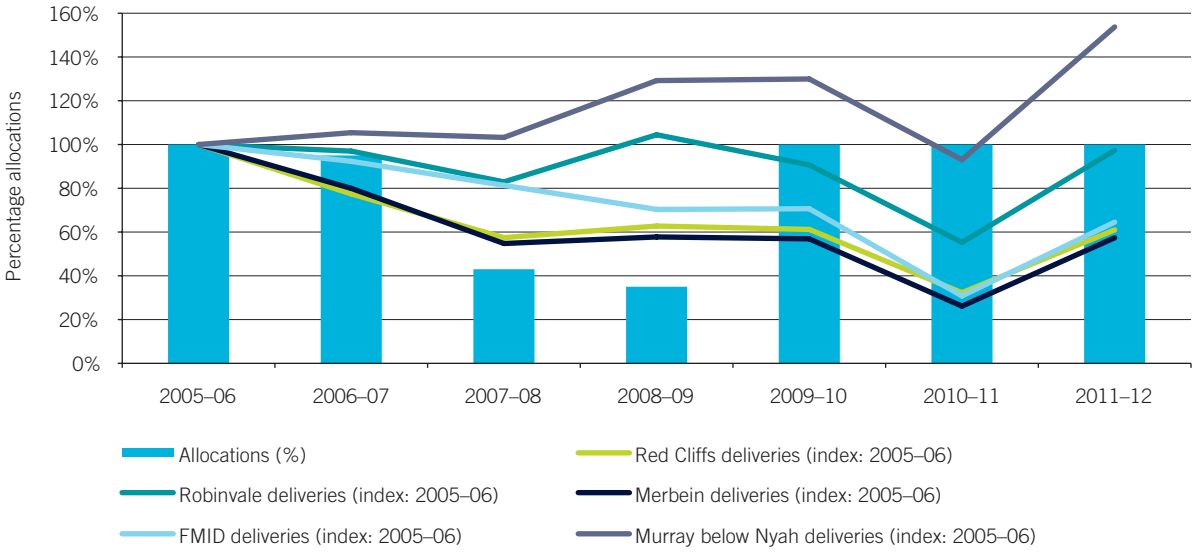
Since 2007–08, some almond and wine grape producers have sold entitlements, including to the Australian Government, to reduce their debt. The further development of complementary water risk management tools, such as the Victorian carryover and system reserve policies, has enabled these producers to become more reliant on the allocation market. There are examples of almond growers who are now totally reliant on buying allocations to meet their entire needs each year. However, without owning entitlements, storing and obtaining access to carryover and purchased allocation water is more difficult.

Seasonal conditions and allocation trading

During the Millennium drought, and particularly from 2007–08, water allocation trading played a much greater role in the wine grape and almond industries. In 2007–08 and 2008–09, allocations to River Murray high-reliability entitlements dropped significantly. For example, allocations to SA River Murray entitlements only reached 18% in 2008–09. Although wine grape prices were dropping at the time, there was still some optimism about the industry, a strong desire to keep vines alive and a need to ensure that volume-based contracts were met. Even through allocations dropped in 2007–08 and 2008–09, water deliveries in those years stayed high as horticulturalists entered the market to buy allocations to make up the shortfall (Figure 3.24).

Generally, wine grape and almond growers bought allocations from rice growers, mixed farmers and dairy farmers in Victoria and New South Wales, who had more flexible production systems. Wine grape and almond growers needed the water; dairy farmers and rice growers could reduce their demand at times of shortage by reducing production, using substitute inputs (such as purchased fodder), or both.

Figure 3.24: Fluctuations in water deliveries to horticultural regions and allocations to Vic. Murray high-reliability water shares, 2005–06 to 2011–12



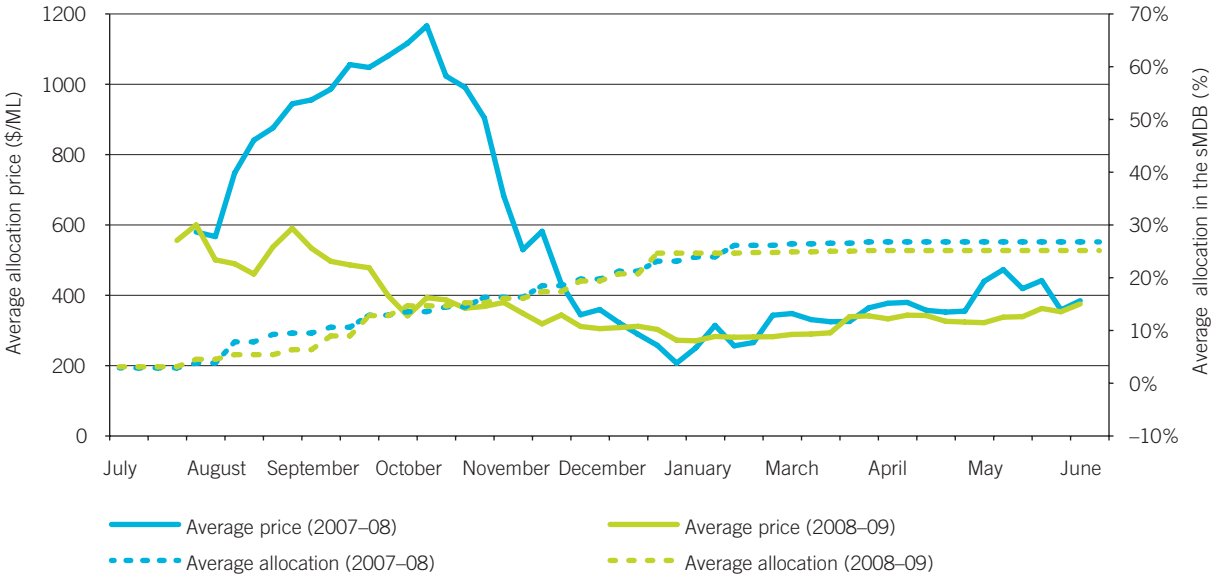
FMID = First Mildura Irrigation District.

Note: All water delivery data is based on 2005–06 levels. Very low irrigation demand in Lower Murray Water regions in the 2010–11 season was due to unseasonably high rainfall during the summer.

Source: Water deliveries—Lower Murray Water 2011–12 annual report; Allocation—Goulburn–Murray Water 2011–12 annual report.

In the rush to secure their water supplies for 2007–08, it appears many wine grape and almond growers entered the market at the start of the season, contributing to very high prices in the first months of the 2007–08 water year (Figure 3.25). Although water was just as scarce in 2008–09, the extremely high prices of 2007–08 were not repeated, perhaps because the growers had learned from the previous season and spread their water purchases more widely across the season.

Figure 3.25: Average allocation levels for the southern MDB and average prices in the Victorian Murray (Barmah to SA border), 2007–08 and 2008–09



Source: NWC (2011c).

Due to unseasonal rainfall during summer, the 2010–11 season saw very low irrigation demand in Lower Murray Water regions. Record rainfalls were recorded in summer (particularly in December 2010 and February 2011), which lead to irrigation demand to be at its lowest on record for 30 years. Lower Murray Water irrigators received 100% water allocations in October 2010 and November 2011 and had very large balances left at the end of the season to carry over into 2011–12.

For wine grape growers in South Australia's Central Irrigation Trust, there was a small increase in production in 2011–12 (Table 3.9) but a large increase in water usage (43%).

Table 3.9: Water deliveries, Central Irrigation Trust, South Australia, 2009–10 to 2011–12

	Total volume of water supplied at customer service points (ML)			Percentage change in 2011–12
	2009–10	2010–11	2011–12	
Central Irrigation Trust	77 793	68 326	97 786	43%

Source: Deloitte.

Although wine grapes are permanent plantings and require a consistent amount of water each year to be kept alive, in years prior to 2010–11 growers may have carried out the minimal amount of watering required to sustain their permanent plantings. Furthermore, the significant rainfall experienced in the region in 2010–11 meant that a larger proportion of irrigators' water demand was met through rainfall rather than water deliveries. There were markedly different levels of summer rainfall in Berri, CIT's largest irrigation district, in 2010–11 and 2011–12 (Table 3.10). The lower rainfall in 2011–12 probably required irrigators to increase watering significantly above the previous year.

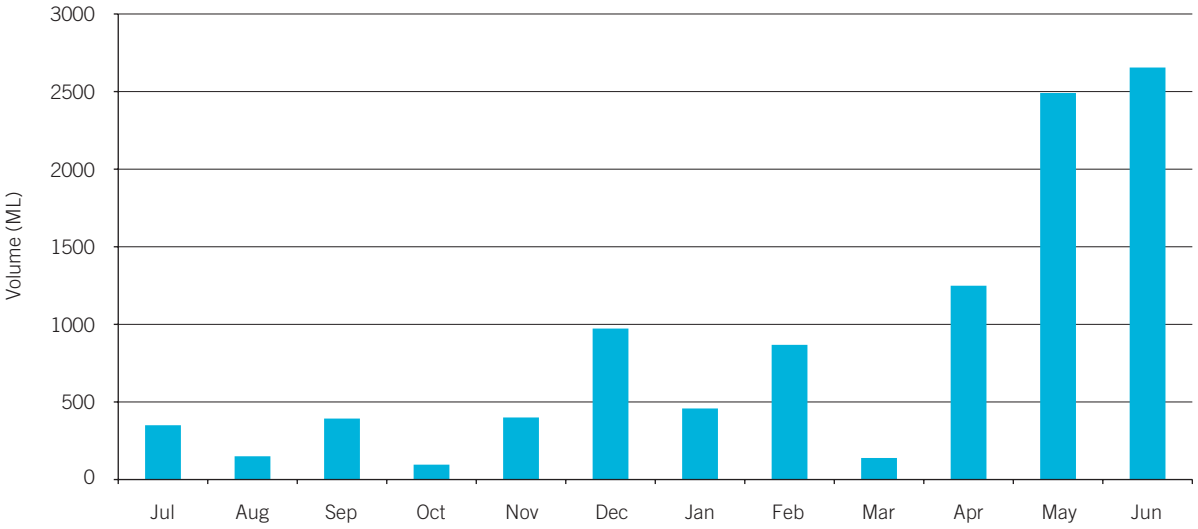
Table 3.10: Berri, rainfall, summer 2010–11 and 2011–12 (mm)

	Dec	Jan	Feb	Total
2010–11	105	68	0	173
2011–12	46	25	6	76
Long-term average	**21**	**20**	**15**	**56**

Source: Deloitte.

More than 60% of internal allocation trading in the CIT area occurred between April and June 2012 (Figure 3.26).

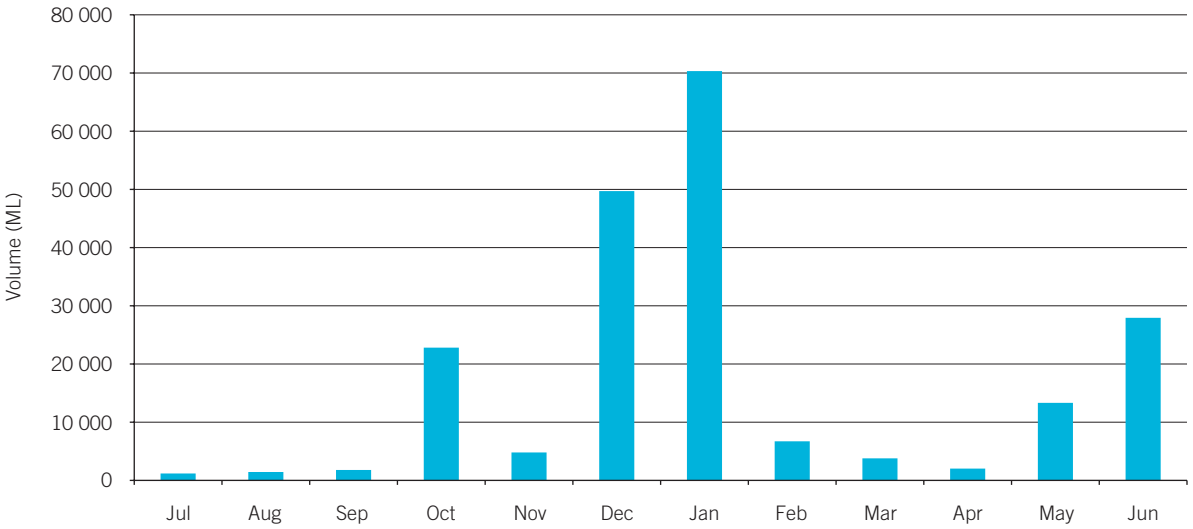
Figure 3.26: Internal allocation trade in the Central Irrigation Trust, 2011–12 (ML)



Source: *AWMR* series.

Intrastate allocation trading volumes in the SA River Murray spiked in December and January 2011, as well as in June 2012 (Figure 3.27).

Figure 3.27: Intrastate allocation trade in the SA Murray, 2011–12 (ML)



Source: *AWMR* series.

The large increase in trade in the middle of the water year was likely to be a function of seasonal demand. The carryover announcement on 21 December may also have spurred increased water trading at this time.

The spike in trading activity during June was probably a function of both the availability of carryover and suspensions of allocation trading (Figures 3.26 and 3.27) (DSE 2012):

- from the Goulburn, Campaspe and Loddon systems to interstate, from 19 March to 30 June 2012
- from New South Wales to South Australia, from 23 to 31 March 2012
- between New South Wales and South Australia, from 1 April to 30 June 2012.

The trade suspensions would have meant that irrigators attempting to secure volumes of water to be carried over had to do so using water obtained from sources within the state. Hence the spike in late-season intrastate and internal trade.

Dairying

Dairy farming occurs in regions across eastern, southern and south-western Australia, to meet the needs of the local fresh milk and export markets.

In 2010–11, irrigated dairying accounted for about 8% (627 GL) of total irrigated agricultural water use (ABS 2011), making it Australia's third largest sector in terms of irrigated water use.

This section focuses on the export-oriented irrigated dairying industry in northern Victoria and southern New South Wales (Figure 3.28). The main irrigation areas where dairy farming is common are the Goulburn–Murray Irrigation District in Victoria (serviced by Goulburn–Murray Water) and the areas serviced by Murray Irrigation in New South Wales.

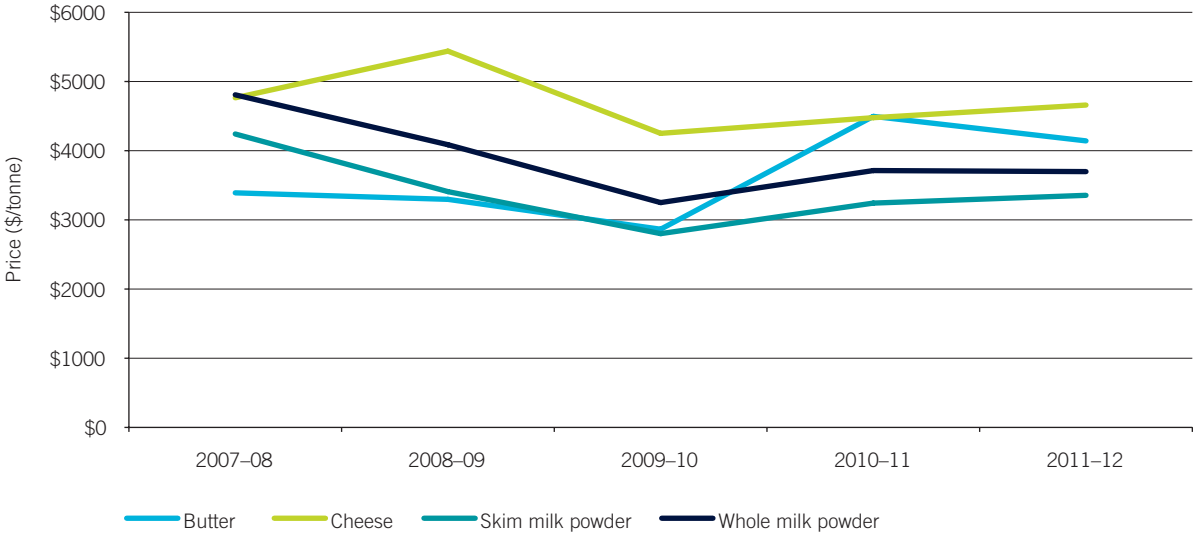
The region Dairy Australia defines as 'Murray Dairy' is one of the largest dairying regions in Australia, straddling the Murray and Goulburn rivers from the Australian Alps to Swan Hill. Total milk production in the region in 2011–12 was about 2.2 billion litres, or about 23% of Australian milk output. Farmgate production in the Murray Dairy region in 2011–12 was valued at an estimated $883 million (Murray Dairy 2012).

Figure 3.28: Irrigated dairy farming regions, northern Victoria and southern New South Wales

Drivers of the irrigated dairy industry

Milk production and farm numbers have been affected recently by economic conditions and prolonged drought, from which they are now recovering. Being export-oriented, the irrigated dairy industry is also affected by changes in foreign exchange rates and global commodity market conditions. Prices for dairy products increased from October 2006 until July 2008, when the global financial crisis led to a decline in prices of about 40% (Figure 3.29). Prices began to recover from later in 2009.

Figure 3.29: Average export prices for Australian dairy products, 2007–08 to 2011–12 ($/t)



Source: ABARES 2012, NWC 2011k.

Although water availability was low in 2007–08, the high prices before the global financial crisis helped irrigators pay for supplementary feed and encouraged them to keep producing. However, the sudden 30% drop in milk prices in the middle of the 2008–09 season meant that many dairy farms in northern Victoria and southern New South Wales could not cover the operating costs of production, let alone provide a return on capital.

As a result, many operators made significant adjustment decisions, including to leave the industry.

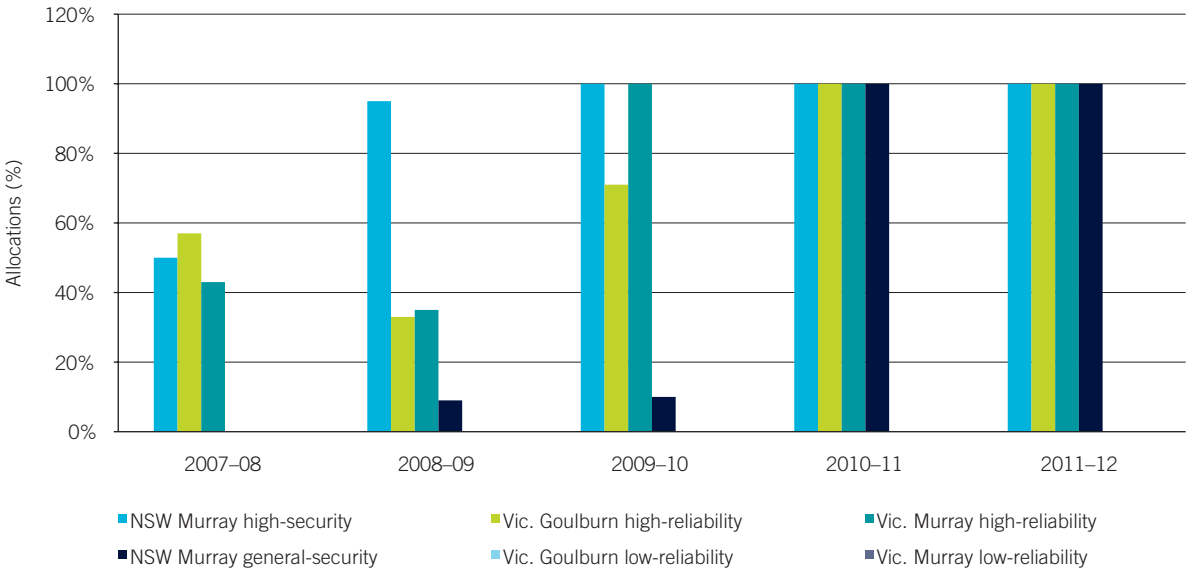
Water use and dairy production

Irrigated dairying is a 'semi-interruptible' production process. Dairy irrigators can avoid using water to grow fodder by buying fodder, agisting cattle and varying the herd size. Dairy farmers can also switch between annual and perennial pastures, based on water availability risk.

In northern Victoria, most dairy farmers hold a mix of high- and low-reliability water shares in the Goulburn and Murray systems. Most dairy farmers in southern New South Wales hold general-security entitlements in the Murray system, which is that system's most common type of entitlement.

These products were adversely affected by the drought, particularly from 2007–08 to 2009–10 (Figure 3.30). With improved seasonal conditions in 2010–11 and 2011–12, allocations for high-security and New South Wales general-security products were 100%.

Figure 3.30: End-of-season allocations to dairy farmers, 2007–08 to 2011–12 (%)



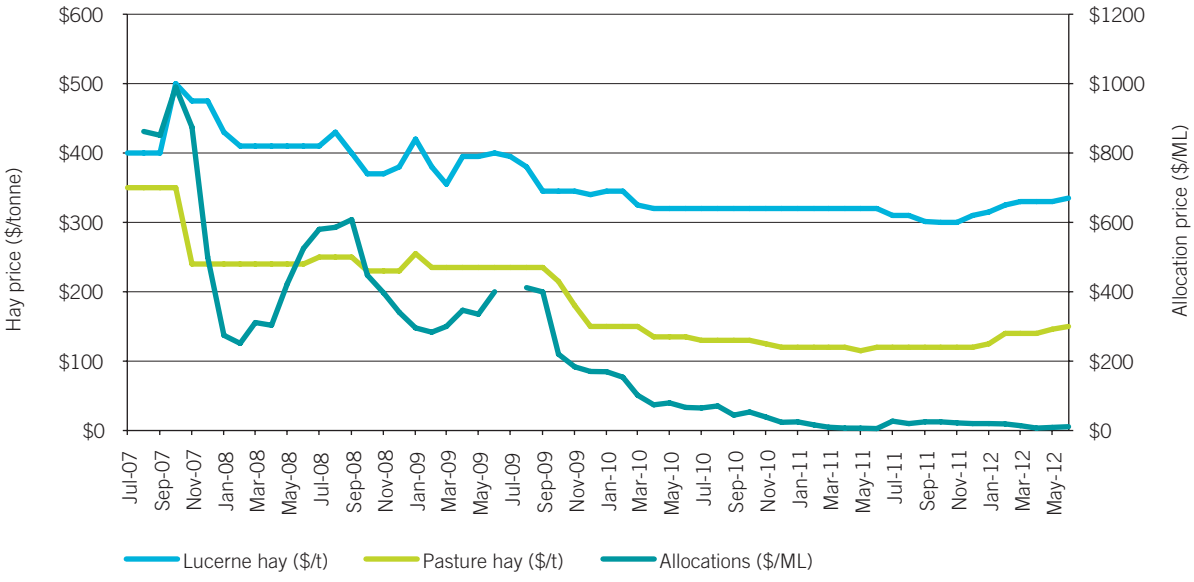
Sources: Victorian and New South Wales governments.

Seasonal conditions, allocation trading and optimising farm management

Dairy farmers aim to optimise their short-term farm management decisions, particularly during low allocation seasons. For example, from 2007–08 to 2009–10 many moved from perennial to annual pastures to increase their flexibility to respond to seasonal conditions and to capitalise on periods of high marginal value for irrigation water in autumn and spring.

Given the substitutability of irrigated pasture and purchased fodder as feed sources in dairy production, the water trading behaviour of dairy producers depends on both water allocation prices and prevailing fodder prices (as well as milk prices). Water and feed prices are somewhat correlated (Figure 3.31). Both prices peaked in early 2007–08, remained relatively high in 2008–09 and then dropped through 2009–10 and 2010–11.

Figure 3.31: Water allocation and fodder prices, 2007–08 to 2011–12

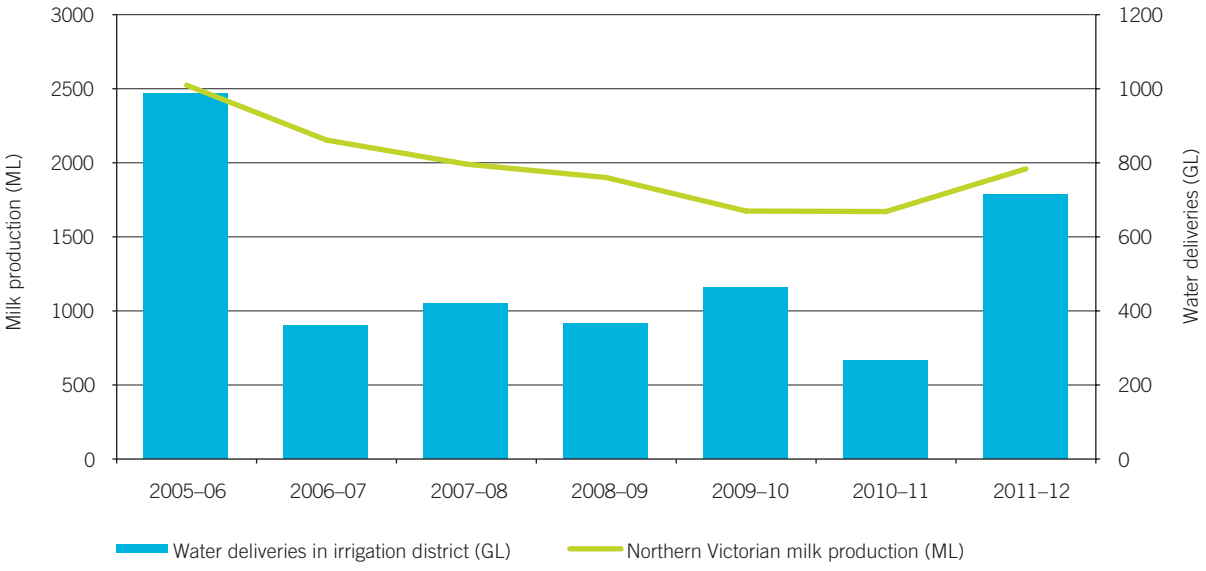


Source: NWC 2011k, Victorian Water Register, Dairy Australia.

Most dairy farmers understand the price in the water allocation market at which they should move from buying more water to selling water. The breakeven point depends on the prevailing price of alternative feed sources and the milk price.

Milk production and water use also appear to be correlated, although in northern Victoria from 2005–06 to 2011–12 the proportional reduction in milk production was much less than the reduction in water availability (Figure 3.32). This was primarily due to the potential to purchase fodder, at a cost. Price signals in the water market helped irrigators make the best possible decisions about their input mix.

Figure 3.32: Milk production in northern Victora and water use in the Victorian Goulburn Irrigation District, 2005–06 to 2011–12



Sources: Dairy Australia, Goulburn–Murray Water (various years).

The dairy industry and entitlement trading

The drought and lower commodity prices have had a detrimental impact on northern Victorian dairy farmers. The pressure to adjust has combined with the emergence of demand for entitlements from the Australian Government's water buyback program, which has resulted in a significant increase in entitlement trading in the dairy industry since 2008–09. For example, entitlement trading in Victorian Goulburn high-reliability water shares increased from 75 GL in 2007–08 to 126 GL in 2011–12 (NWC 2008, 2013).

In 2009–10, Commonwealth purchases accounted for 58.2% of entitlement trade volume in the NSW Murray, 61% in the Victorian Murray above the Barmah choke, and 45.6% in the Goulburn system (DSEWPAC 2011, NWC 2010b).

Many have seen the buyback program as an opportunity to reduce debt and change their farming strategy. Some have stopped or reduced irrigation, while the remaining irrigators have generally become more dependent on annual purchases of water allocations and carryover. Allocation and entitlement trading are often used as part of a combined strategy. Many irrigators buy allocations at the end of one season and carry them over to the next season to manage water-related risk, particularly at the start of the irrigation season.

Dairy farmers now employ very sophisticated water trading strategies and are highly reliant on the water market.

3.5.2 Agriculture in the northern MDB

Cotton is the principal irrigated crop grown in the northern part of the MDB, while fruit, nuts and grapes are also produced in the Macquarie region (Table 3.11).

The discussion below analyses aspects of the cotton industry as it relates to demand for water.

Table 3.11: Key irrigated agricultural industries in the northern MDB, by trading zone

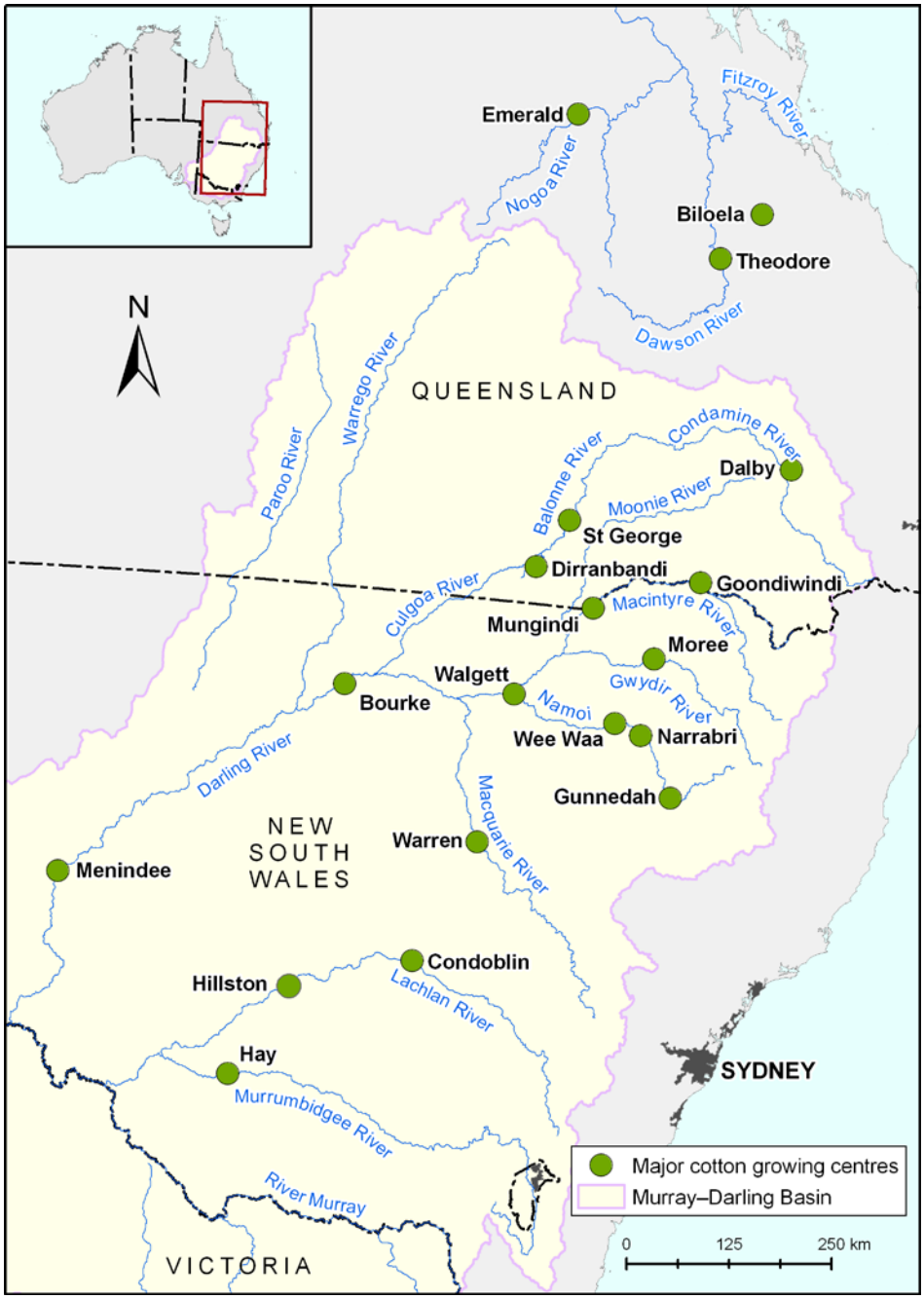
Irrigated agricultural industry	Macquarie	NSW Border Rivers	Namoi	Condamine–Balonne	Qld Border Rivers
Cotton	√√	√√	√√	√√	√√
Fruit and nuts	√	•	•	•	•
Grapes	√	•	•	•	•
Vegetables and seed	•	•	•	√	•
Meat cattle	•	√	√	√√	√

Note: The number of ticks reflects the prevalence of the industry in the zone, based on the industry's contribution to the zone's gross value of irrigated agricultural production.

Cotton

Cotton production is concentrated in the northern MDB, with some production also in the Lachlan and Murrumbidgee (in the southern and mid-basin) as well as central Queensland (such as around Emerald) (Figure 3.33).

Figure 3.33: Australian cotton-producing regions



The price received by cotton producers in Australia is determined by world markets because most cotton production is exported. Producers are exposed to volatility in the world price, as well as exchange rate fluctuations.

Water use and cotton production

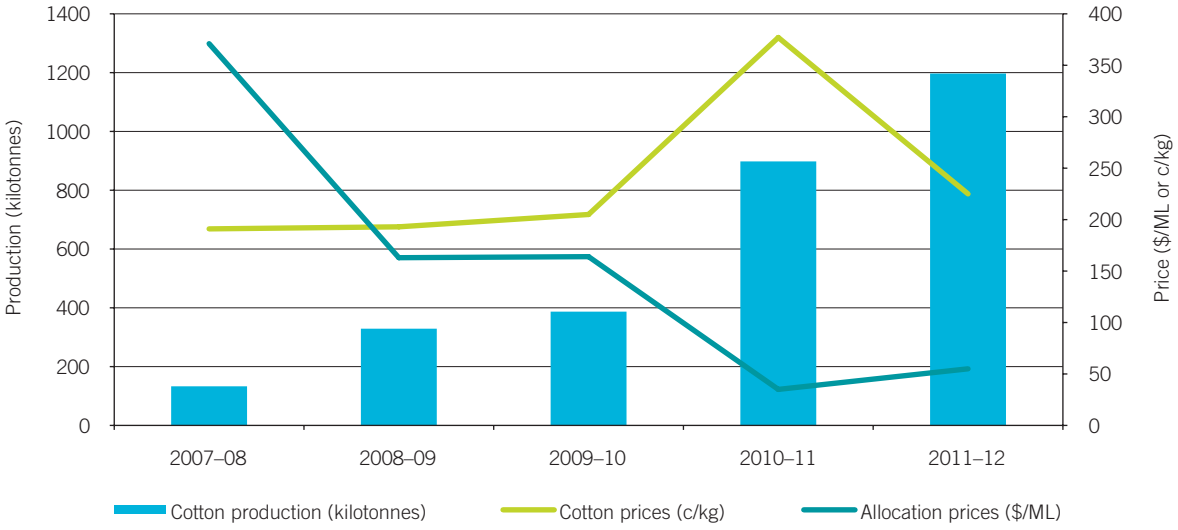
Cotton grows better in hot summers with low humidity and maximum sunshine (Cotton Australia 2011). It is generally grown in regions with summer-dominant rainfall. This means that the growing season coincides with the rainfall and inflows expected to provide water for the crop. Consequently, crop demand for irrigation water depends on rain during the season. This is markedly different from rice farming, in which all the required water is often secured before the crop is planted.

Cotton farms often have large on-farm storages and the ability to intercept overland flow. Irrigation water for cotton production can be surface water, groundwater, or both.

Cotton farming is a typical example of opportunistic cropping to manage variable water availability. As an annual crop, cotton can be widely planted when water is abundant, but plantings can be reduced or forgone if water availability is limited. This is shown by the inverse relationship between water allocation prices and production (Figure 3.34). The area planted and the production thus vary significantly between years. With water availability increasing in 2010–11 and 2011–12 (Figure 3.35), cotton production has expanded rapidly.

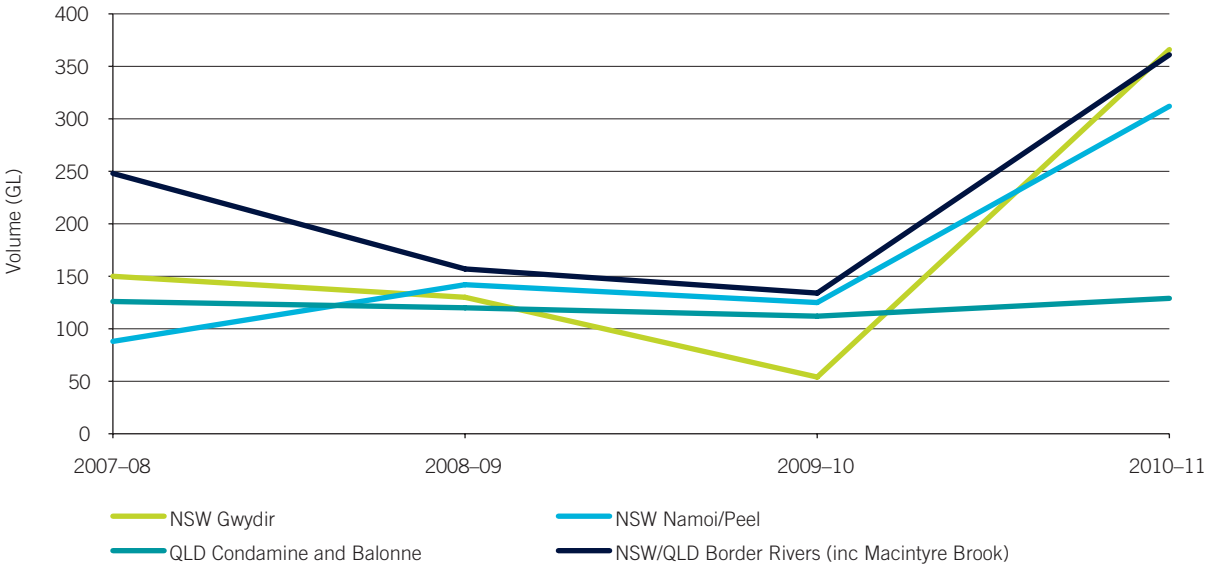
Market conditions also influence the area planted to cotton. For example, the reduction in cotton production during 2008 was exacerbated by relatively high wheat prices, which caused irrigators to switch crops.

Figure 3.34: Cotton production, cotton prices and water allocation prices, Macquarie, 2007–08 to 2011–12



Source: Cotton data— ABARES (2012); water allocation prices—NSW Office of Water.

Figure 3.35: Water availability in selected cotton-producing valleys, 2007–08 to 2010–11 (GL)



Source: MDBA (various years).

Cotton production has varied the most in regions that rely on surface water, such as the Border Rivers region. Regions with greater access to groundwater (such as Namoi) are able to maintain cotton production in drier years because groundwater access is not as seasonally variable. In areas where surface water and groundwater are both accessible, surface resources are often used in preference due to the reduced pumping costs.

Water availability and commodity prices are the prime determinants of cotton production. In the northern MDB, water is generally traded within each valley because of the limited hydrological connectivity between valleys (a notable exception being the Border Rivers Macintyre Brook system). These physical limits mean that water is not traded over large distances, as it is in the southern MDB, so there is a smaller pool of potential trading partners.

Water entitlement trading

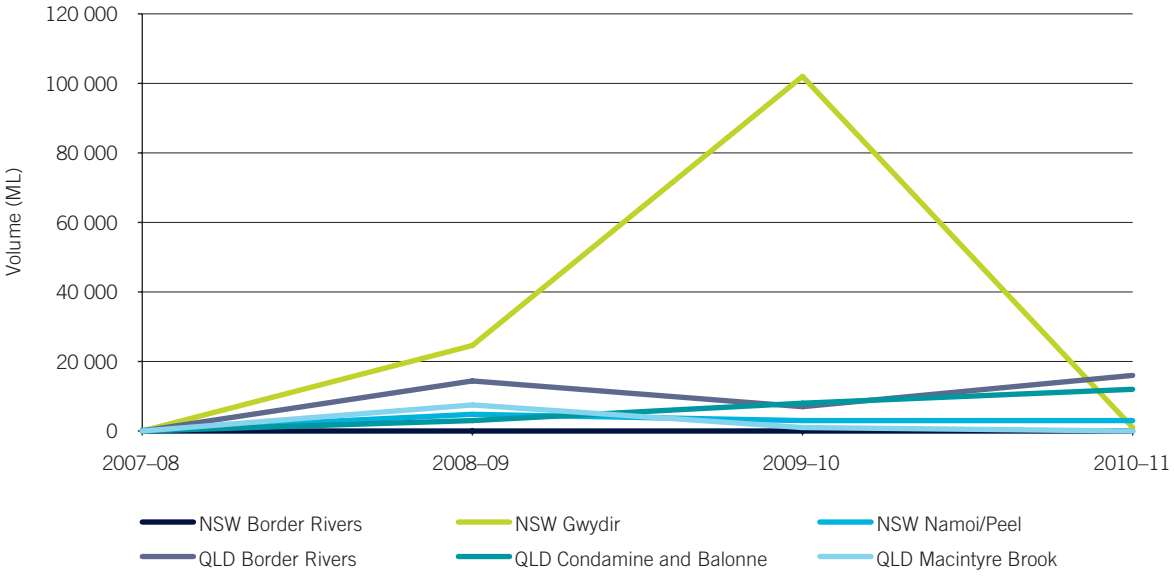
Buying water entitlements can allow a cotton producer to reach (or maintain) an efficient size, given the significant economies of scale in cotton growing. Purchases have also been used to adjust to water planning changes. In regions that are largely groundwater-dependent such as Namoi, Macquarie and Gwydir, state water resource planning processes have decreased groundwater entitlements and reduced the expected volume available to cotton producers, given the water entitlements they own. Some cotton producers have bought water entitlements to regain access to the water to match farm requirements.

Some cotton producers have sold large water entitlements to the Australian Government. For example:

- in late 2008, the Australian Government provided financial assistance to the NSW Government to purchase Toorale Station near Bourke, involving entitlements to harvest 14 GL from the Warrego and Darling rivers and rights to harvest water from the floodplain
- in 2009, the Australian Government purchased 240 GL of water entitlements for $303 million from the Twynam Group, which holds properties in the Murrumbidgee, Lachlan, Macquarie, Gwydir and Barwon river systems (DSEWPAC 2009).

The total volume of entitlement trading has increased in recent years, largely driven by the Australian Government buyback program. The dramatic increase in sales in the Gwydir Valley (Figure 3.36) can be attributed to the government increasing its holdings of general-security entitlements from 11 664 ML at 30 June 2009 to 89 525 ML at 30 June 2012. Commonwealth holdings of supplementary-type water entitlements in the Gwydir increased from zero to 19 100 ML in the same period.

Figure 3.36: Water entitlement trades in selected regions, 2007–08 to 2010–11 (ML)

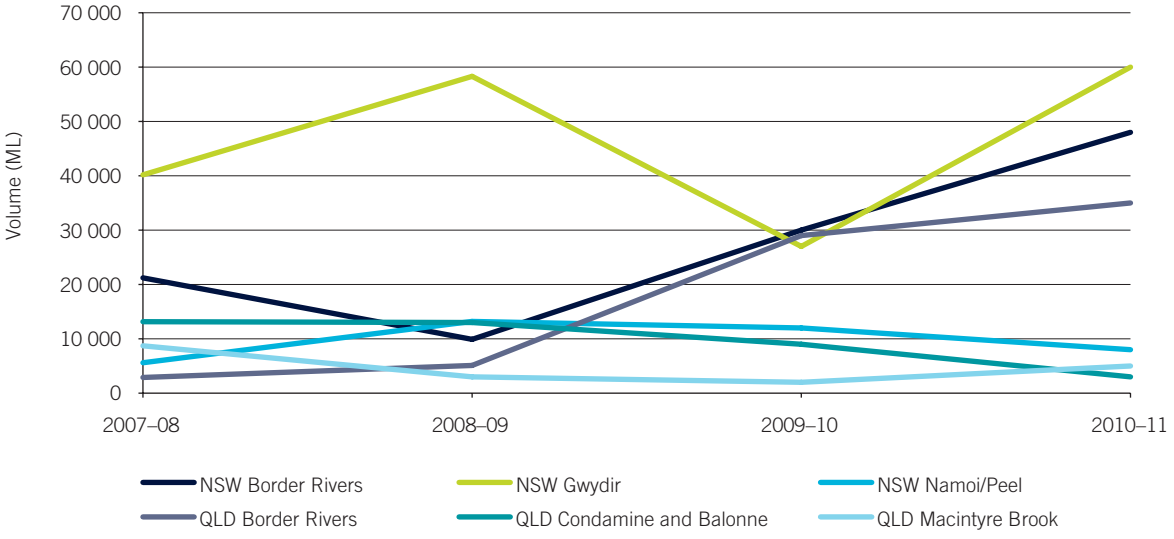


Source: MDBA (various years).

Seasonal water allocation trading

Water allocation trading enables cotton producers to make the best of available water, transfer water between properties to diversify water availability risk and vary water use within a season to support production decisions. There is some water allocation trading within cotton-growing regions (Figure 3.37). With increased water availability and low allocation prices in 2010–11 and 2011–12, water trading was an important factor in the significant expansion in cotton production in those years.

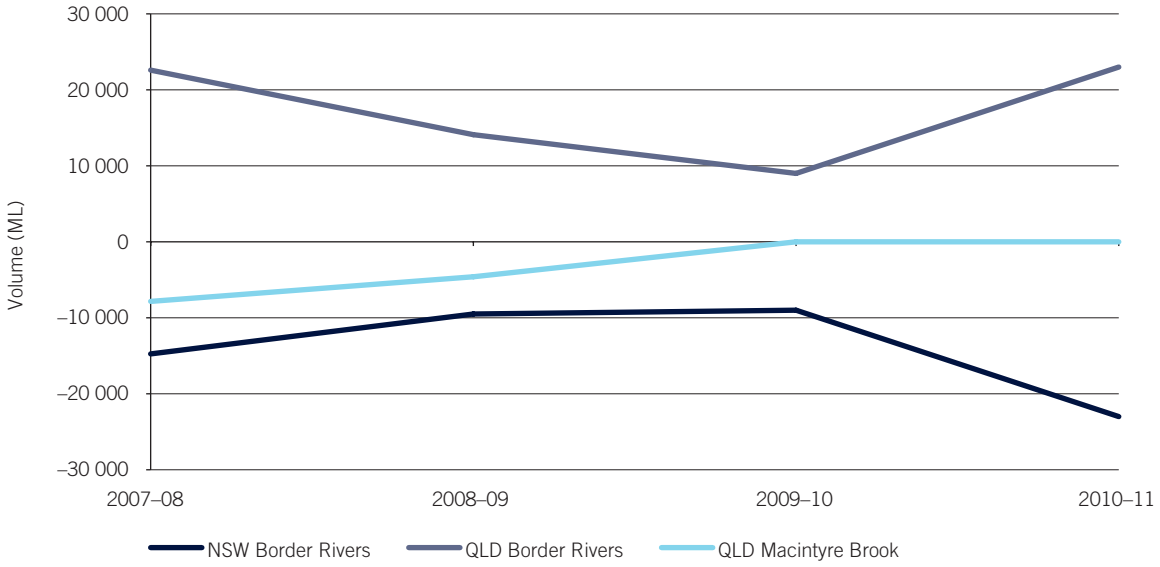
Figure 3.37: Water allocation trades in selected northern MDB river systems, 2007–08 to 2010–11 (ML)



Source: MDBA (various years).

Water allocation trading between regions is very restricted in the Borders Rivers / Macintyre Brook water system on the New South Wales – Queensland border. Trading is only possible when a cotton producer holds water assets in different parts of this system and can transfer water within their own accounts (Figure 3.38). Although it can be argued that this should not be considered water 'trading', because the owner of the water is not changing, the transferability of water between locations is important to the cotton industry.

Figure 3.38: Transfers of allocations in the Border Rivers region, 2007–08 to 2010–11 (ML)



Source: MDBA (various years).

Appendix A: Raw data

Appendix A: Raw data

Table A.1: Volume of water trading in major market segments, 2011–12 (GL)

	Allocation trading	Entitlement trading
Southern MDB	3844	825
Northern MDB	372	394
Outside the MDB	81	218

Table A.2: Storage levels and inflows to major dams in the southern MDB, 2002 to 2012 (GL)

Year	Total inflows	Total storage	Average inflows
2002	7 355	5 344	7139
2003	7 715	2 561	7139
2004	7 307	3 229	7139
2005	8 052	4 229	7139
2006	8 362	5 162	7139
2007	5 644	1 956	7139
2008	3 955	2 520	7139
2009	3 567	2 309	7139
2010	6 104	4 100	7139
2011	12 227	10 266	7139
2012	8 241	11 251	7139

Note: Major dams are Dartmouth, Eildon, Hume, Blowering and Lake Victoria. Storage levels are as at 30 June each year.

Table A.3: Storage levels and inflows to selected dams in the northern MDB, 2006 to 2012 (GL)

Year	Total inflows	Total storage	Average inflows
2006	668	756	906
2007	178	312	906
2008	294	624	906
2009	230	487	906
2010	176	353	906
2011	3030	2014	906
2012	1763	2762	906

Note: Dams are Burrendong, Copeton and Glenlyon. Dams were selected based on data availability and are not necessarily the largest dams in the northern MDB. Storage levels are as at 30 June each year.

Table A.4: End-of-season allocations to high- and low-security entitlements, major systems in southern MDB, 2001–02 to 2011–12 (%)

	Vic. high	NSW high	SA high	NSW general	Vic. low/sales water
2001–02	100	100	100	88	100
2002–03	81	100	100	25	29
2003–04	100	97	95	48	0
2004–05	100	96	95	44	0
2005–06	100	96	100	58	0
2006–07	65	83	60	5	0
2007–08	49	76	32	7	0
2008–09	34	95	18	15	0
2009–10	87	96	62	27	0
2010–11	100	100	67	100	0
2011–12	100	100	100	100	0

Table A.5: Volumes of allocation and entitlement trading, southern MDB, 2001–02 to 2011–12 (ML)

	Volume of allocation trades	Volume of entitlement trades		
		Regulated entitlements	Internal irrigation trades	Unregulated trades
2001–02	912 858	77 209	–	–
2002–03	1 102 680	62 193	–	–
2003–04	982 612	96 107	–	–
2004–05	831 268	75 656	–	–
2005–06	871 943	40 359	–	–
2006–07	716 214	139 169	–	–
2007–08	951 598	549 841	119 783	26 783
2008–09	1 304 119	1 128 640	163 285	63 260
2009–10	1 652 013	792 400	281 015	37 324
2010–11	2 701 206	320 524	164 107	67 776
2011–12	3 844 000	317 835	142 654	60 425

Note: Entitlement data prior to 2007–08 does not include internal irrigation and unregulated entitlement trades. Includes only trades of regulated water from the Lower Darling, NSW Murray, Murrumbidgee, SA Murray, Victorian Murray, Goulburn and Campaspe–Loddon systems. Excludes trades internal to irrigation districts.

Table A.6: Water allocation levels and proportions traded, southern MDB, 2001–02 to 2011–12

	Announced allocation volumes (ML)	Allocations traded (ML)	Allocations traded (% of announced allocations)
2001–02	10 835	913	8
2002–03	6 805	1103	16
2003–04	7 867	983	12
2004–05	7 861	831	11
2005–06	8 814	872	10
2006–07	4 626	716	15
2007–08	3 164	952	30
2008–09	4 504	1304	29
2009–10	5 987	1652	28
2010–11	8 074	2701	33
2011–12	8 339	3161	38

Note: Includes only trades of regulated water from the Lower Darling, NSW Murray, Murrumbidgee, SA Murray, Victorian Murray, Goulburn and Campaspe–Loddon systems. Excludes trades internal to irrigation districts.

Table A.7: Numbers and average volumes of allocation trades, southern MDB, 2007–08 to 2011–12

	2007–08	2008–09	2009–10	2010–11	2011–12
Lower Darling	49	110	75	n.a.	n.a.
NSW Murray	4235	4957	4700	2145	3872
Murrumbidgee	2098	4743	3493	1326	1375
SA Murray	797	909	1485	842	711
Vic. Goulburn	6385	5725	3567	1463	2072
Vic. Loddon and Campaspe	311	308	87	98	116
Vic. Murray above Barmah	3471	1945	1179	447	579
Vic. Murray below Barmah	5387	3715	3123	1217	2183
Average size of allocation trades (ML)	**42**	**58**	**93**	**414**	**339**

Table A.8: Volumes and numbers of allocation trades, southern MDB, 2007–08 to 2011–12

	2007–08		2008–09		2009–10		2010–11		2011–12	
	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)
July	1	7	385	39 497	178	10 194	225	47 179	155	70 691
August	68	1 481	727	72 350	353	23 125	593	147 446	486	212 067
September	1171	29 319	1111	101 829	1163	102 851	671	193 915	890	280 447
October	2518	62 180	1553	137 542	1836	114 503	754	247 901	736	265 375
November	2764	69 478	1491	101 496	1550	150 664	541	143 799	697	237 341
December	2674	84 778	1524	106 012	1211	150 951	460	170 518	751	531 290
January	1940	70 771	1982	131 825	1452	110 098	559	179 904	1202	353 299
February	1297	43 513	2787	228 766	1812	134 359	428	166 265	1206	439 518
March	2208	80 484	2891	193 426	1684	194 701	439	147 723	631	222 781
April	2932	94 781	3167	226 004	1523	155 894	538	162 758	872	260 215
May	2330	70 973	2621	255 186	2568	374 299	1172	680 834	2011	407 033
June	2830	188 081	2173	123 441	2379	349 806	1158	835 756	1271	418 302

Note: Victorian groundwater trades have not been included in this table.

Table A.9: Average water allocations and average allocation prices, southern MDB, 2007–08 to 2011–12

	2007–08		2008–09		2009–10		2010–11		2011–12	
	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)
July	n.a.	3	n.a.	3	n.a.	3	75	7	18	33
	n.a.	3	n.a.	3	380	3	88	10	27	33
	n.a.	3	n.a.	3	n.a.	3	53	13	25	38
	n.a.	3	556	3	590	3	81	13	27	38
	n.a.	4	600	5	n.a.	3	81	34	25	38
August	580	4	501	5	200	3	75	34	26	40
	567	8	490	5	278	3	67	52	27	40
	748	8	460	5	393	4	31	52	25	45
	841	9	538	5	n.a.	4	60	68	22	45
September	876	10	591	6	303	6	55	68	22	49
	944	10	534	6	362	6	48	83	25	49
	956	11	497	9	338	10	46	83	27	52
	986	11	486	9	365	10	50	83	26	52
October	1056	13	478	13	329	19	50	85	23	55
	1048	13	398	13	271	19	51	85	26	55
	1081	14	342	15	204	22	49	87	24	58
	1117	14	393	15	207	25	45	87	24	58
	1166	14	387	15	222	25	45	89	26	73

	2007–08		2008–09		2009–10		2010–11		2011–12	
	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)	Average price ($/ML)	Average allocation (%)
November	1023	14	363	15	175	30	45	89	24	74
	991	16	369	15	192	30	39	91	23	75
	904	16	380	16	170	31	33	91	24	75
	683	16	349	16	183	31	39	91	22	75
December	530	18	319	17	176	32	36	91	21	81
	582	18	344	17	170	32	28	96	21	81
	432	20	311	19	171	32	29	96	20	81
	345	20	305	19	175	32	30	96	20	81
January	360	21	308	21	n.a.	32	27	96	23	81
	322	21	312	21	168	33	27	96	20	81
	289	23	303	25	159	34	23	96	20	81
	258	23	272	25	155	34	19	96	21	81
	207	24	271	25	136	34	21	96	19	81
February	251	24	283	25	168	35	20	96	18	81
	314	26	281	25	139	35	19	96	18	81
	256	26	282	25	131	38	17	96	17	81
	266	26	282	25	145	38	15	96	16	81
March	343	26	289	25	132	40	17	96	13	81
	348	26	290	25	117	40	15	96	11	81
	331	27	293	25	109	44	14	96	8	81
	325	27	339	25	87	44	10	96	9	81
	326	27	341	25	92	48	8	96	8	81
April	364	27	333	25	79	48	9	96	9	81
	377	27	344	25	71	48	12	96	12	81
	380	27	342	25	77	48	20	96	11	81
	357	27	326	25	78	48	8	96	8	81
May	352	27	324	25	78	48	11	96	16	81
	355	27	322	25	76	48	9	96	7	81
	440	27	338	25	77	48	10	96	7	81
	473	27	339	25	77	48	9	96	10	81
June	419	27	363	25	74	48	9	96	12	81
	442	27	353	25	82	48	12	96	15	81
	359	27	375	25	82	49	10	96	13	81
	385	27	n.a.	25	88	49	10	96	13	81

Table A.10: Net interstate allocation trading, southern MDB, 2003–04 to 2011–12 (ML)

Year	NSW	South Australia	Victoria
2003–04	4 219	6 010	–15 400
2004–05	9 592	–1 630	–8 351
2005–06	–3 251	–24 290	27 743
2006–07	–50 232	40 128	10 104
2007–08	–156 602	144 375	11 380
2008–09	–552 796	336 263	216 533
2009–10	–266 975	252 585	14 390
2010–11	–245 353	69 245	176 108
2011–12	–46 124	277 805	–231 681

Table A.11: Interstate allocation trading volumes, southern MDB, 2011–12 (GL)

	From NSW to SA	From SA to Vic.	From Vic. to SA	From SA to NSW	From Vic to NSW
July	n.a.	n.a.	13.8	0.0	14.6
August	0.8	0.1	74.2	14.2	14.0
September	1.1	4.0	8.5	1.0	4.4
October	0.0	13.8	0.0	0.0	2.1
November	0.2	2.1	33.4	11.9	1.0
December	150	0.7	122.5	0.0	8.1
January	n.a.	0.4	1.7	14.6	14.6
February	n.a.	1.8	26.5	9.4	6.0
March	21.7	22.5	2.1	24.8	1.9
April	n.a.	17.5	9.4	0.6	0.3
May	n.a.	43.9	0.7	0.0	0.6
June	n.a.	45.4	39.8	0.0	0.0

Table A.12: Rice production, rice prices and water allocation prices, Murrumbidgee, 2005–06 to 2011–12

		2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Rice price	$/tonne	283	346	414	528	457	368	270
Rice production	kilotonnes	1003	163	18	61	205	800	941
Water allocation price in Murrumbidgee	$/ML	37	194	524	382	155	35	17

Sources: Rice—SunRice (2011) and ABARES (2010); 2007–08 to 2010–11 water prices—NWC (2010a); 2006–07 water prices—Waterfind (2009:12); 2005–06 allocation prices—Sunraysia Water Exchange website (www.waterexchange.com.au/hosted/sunraysia/).

Table A.13: End-of-season allocations to high- and low-security entitlements, northern MDB, 2007–08 to 2011–12 (%)

	2007–08	2008–09	2009–10	2010–11	2011–12
High-security entitlements					
Gwydir	100	0	0	100	100
Macquarie	100	100	10	100	100
Namoi	100	100	100	100	100
NSW Border Rivers	100	100	100	100	100
General-security entitlements					
Gwydir	23	0	0	83	201
Macquarie	7	10	0	100	49
Namoi	16	24	1	52	116
NSW Border Rivers	31	24	2	100	100

Table A.14: Volumes and numbers of allocation trades in the northern MDB, 2007–08 to 2011–12

	2007–08		2008–09		2009–10		2010–11		2011–12	
	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)
July	27	5 524	178	37 904	8	16 903	14	3 856	30	52 624
August	37	1 404	39	5 894	37	7 515	122	64 416	29	54 445
September	58	5 628	68	10 724	81	19 490	84	27 476	34	48 644
October	59	6 284	79	16 973	94	15 819	41	40 668	37	47 317
November	33	3 861	47	18 755	91	15 628	16	2 330	43	20 201
December	31	3 391	58	15 195	143	24 903	17	8 250	29	31 111
January	47	8 724	68	38 840	70	15 481	26	6 448	52	32 700
February	39	12 383	61	15 676	88	16 798	52	16 713	20	3 634
March	42	7 757	41	2 695	33	6 910	59	52 569	25	11 861
April	22	5 399	23	3 632	22	4 466	19	4 079	19	6 652
May	79	11 988	33	6 613	29	3 764	34	12 501	31	13 560
June	103	10 218	113	16 661	121	13 660	191	51 058	144	40 088

Table A.15: Cotton production, cotton prices and water allocation prices, Macquarie, 2005–06 to 2011–12

		2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Cotton price	c/kg	178	177	191	193	205	372	225
Cotton production	kilotonnes	597	301	133	329	387	898	1197
Water allocation price in northern MDB	$/ML	150	135	371	163	164	35	55

Table A.16: Average allocation prices, northern MDB, 2007–08 to 2011–12 ($/ML)

	Quarter	Namoi	Gwydir	NSW Border Rivers	Macquarie
2007–08	1st qtr	175	233	n.a.	454
	2nd qtr	107	260	n.a.	494
	3rd qtr	n.a.	205	n.a.	283
	4th qtr	117	200	n.a.	168
2008–09	1st qtr	67	203	n.a.	185
	2nd qtr	88	282	n.a.	204
	3rd qtr	83	259	n.a.	150
	4th qtr	125	230	n.a.	133
2009–10	1st qtr	195	250	210	157
	2nd qtr	160	308	195	175
	3rd qtr	161	230	198	170
	4th qtr	175	130	188	141
2010–11	1st qtr	133	134	79	41
	2nd qtr	131	172	n.a.	27
	3rd qtr	131	238	75	33
	4th qtr	102	240	81	28
2011–12	1st qtr	125	132	n.a.	55
	2nd qtr	124	203	n.a.	55
	3rd qtr	108	n.a.	41	59
	4th qtr	72	n.a.	43	16

Table A.17: Total entitlement trading in the southern MDB, 2007–08 to 2011–12, by reliability class (%)

	2007–08	2008–09	2009–10	2010–11	2011–12
High reliability	38.80	29.84	44.64	46.68	51.15
General reliability	49.62	62.57	50.44	40.55	38.44
Low reliability	11.58	7.59	4.92	12.77	10.41

Table A.18: Numbers and average sizes of entitlement trades, southern MDB, 2007–08 to 2011–12

	Numbers of entitlement trades				
	2007–08	2008–09	2009–10	2010–11	2011–12
Lower Darling	20	15	109	n.a.	n.a.
NSW Murray	152	383	659	232	506
Murrumbidgee	73	411	536	138	459
SA Murray	180	313	700	426	472
Vic. Goulburn	1140	1337	1465	1303	1624
Vic. Loddon and Campaspe	30	55	96	398	80
Vic. Murray above Barmah	320	440	387	352	420
Vic. Murray below Barmah	716	996	1094	1025	1148
Average size of trade (ML)	**209**	**189**	**172**	**140**	**153**

Table A.19: Numbers and volumes of entitlements traded, southern MDB, 2007–08 to 2011–12, by month

	2007–08		2008–09		2009–10		2010–11		2011–12	
	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)	No.	Vol. (ML)
July	4	38	291	51 246	376	61 798	240	27 984	327	89 835
August	24	10 722	336	56 867	523	224 121	326	42 348	447	70 972
September	117	11 240	494	81 517	733	137 463	552	70 283	564	86 751
October	304	52 543	451	120 329	454	78 571	310	34 361	310	54 755
November	281	26 365	420	134 536	555	110 660	421	69 566	379	42 298
December	247	28 418	332	75 000	559	115 747	349	23 461	401	63 271
January	290	26 904	291	293 823	525	102 085	246	31 445	317	39 185
February	259	31 561	269	60 161	444	133 364	285	43 982	402	60 083
March	271	22 924	349	174 929	562	146 782	266	25 615	499	59 494
April	231	17 919	293	83 956	385	50 841	239	25 204	272	33 314
May	257	19 705	352	195 881	261	38 545	264	54 075	279	33 673
June	288	31 042	293	27 008	362	52 117	377	93 490	512	85 022

Table A.20: Average entitlement prices in the southern MDB, 2007–08 to 2011–12 ($/ML)

	2007–08			2008–09			2009–10			2010–11			2011–12		
	High reliability	General security	Low reliability	High reliability	General security	Low reliability	High reliability	General security	Low reliability	High reliability	General security	Low reliability	High reliability	General security	Low reliability
July	1717	750		1322	886	85	1591	774	157	2003	1111	145	1809	828	172
August	1679	877	100	1702	631	144	1828	1063	169	2101	1079	180	1786	851	141
September	1787	869	138	1679	877	158	2012	1067	173	2020	1025	155	1790	889	133
October	1581	759	224	1384	1040	160	2038	649	231	1968	923	175	1767	836	131
November	1579	955	244	1537	932	123	2106	1045	176	1948	1025	157	1757	819	157
December	1626	766	184	1636	1141	159	1868	955	176	1782	855	158	1739	816	140
January	1740	737	194	1246	905	131	1820	1096	159	1756	880	147	1772	749	143
February	1787	863	204	1642	1058	110	1972	1146	183	1836	727	149	1747	864	167
March	1815	910	211	1706	1050	208	1827	1140	183	1809	1070	134	1771	849	157
April	1738	845	250	1517	939	260	1791	1242	172	1834	1119	148	1693	769	134
May	1745	888	171	1527	1118	113	1646	1201	204	1781	823	144	1671	866	143
June	1841	895	231	1740	1043	136	1601	1106	195	1785	954	148	1674	860	154

Table A.21: Average entitlement prices in the southern MDB, 2007–08 to 2011–12, by state and reliability class ($/ML)

	2007–08	2008–09	2009–10	2010–11	2011–12
Vic. low reliability	209	182	180	155	146
Vic. high reliability	1678	2165	2140	1932	1750
NSW general security	1139	1157	1189	911	840
NSW high security	2722	2424	2776	2218	1813
SA high security	2286	2316	2068	1855	1786

Table A.22: Commonwealth and other entitlement purchases in the southern MDB, 2007–08 to 2011–12 (GL)

		2007–08	2008–09	2009–10	2010–11	2011–12
Commonwealth environmental water purchases in the southern MDB	(high reliability)	0	9	166	144	209
	(low reliability)	0	38	322	77	95
Other entitlement trade in the southern MDB	(high reliability)	213	306	355	184	174
	(low reliability and unregulated)	490	863	410	368	326

Note: Entitlement trade in this table is registered trade. Registered volumes for the Commonwealth include water not purchased from the market, such as gifted water and acquisitions through the Sustainable Rural Water Use and Infrastructure Program.

Table A.23: 4% trade-out limit and total trade out of affected irrigation areas in Victoria, 2007–08 to 2011–12 (ML)

	4% trade out limit	Trade subject to the 4% limit	Trade out under exemptions
2007–08	99 534	79 846	–
2008–09	96 125	90 383	–
2009–10	92 030	98 532	67 809
2010–11	90 097	66 483	39 216
2011–12	81 485	54 503	87 192

Table A.24: Entitlement and allocation trade volumes in the northern MDB, 2007–08 to 2011–12 (ML)

		2007–08	2008–09	2009–10	2010–11	2011–12
Allocation trade in the northern MDB		91 857	173 662	136 573	290 362	362 837
Entitlement trade in the northern MDB	Commonwealth	0	17 471	171 756	19 183	59 543
	Other water users	67 967	365 683	394 077	207 308	334 233

Note: Entitlement trade in this table is registered trade. Registered volumes for the Commonwealth include water not purchased from the market, such as gifted water and acquisitions through the Sustainable Rural Water Use and Infrastructure Program. Registered trade includes 14.6 GL and 8.1 GL of non-tradeable *Water Act 1912* (NSW) licences that were registered by the Commonwealth in 2010–11 and 2011–12, respectively, as part of land purchases.

Table A.25: Average entitlement prices in selected northern MDB zones, 2007–08 to 2011–12 ($/ML)

	2007–08	2008–09	2009–10	2010–11	2011–12
Gwydir general security	1557	2033	2216	2192	1908
Macquarie general security	911	1256	1114	1063	1200
Namoi general security	723	1773	1788	1855	1653

Table A.26: Commonwealth water purchases in the northern MDB, 2007–08 to 2011–12 (GL)

		2007–08	2008–09	2009–10	2010–11	2011–12
Commonwealth environmental water purchases in the northern MDB	(high reliability)	0	0	0	0	0
	(low reliability)	0	17	172	19	51
Other entitlement trade in the northern MDB	(high reliability)	0	0	4	2	4
	(low reliability and unregulated)	68	366	390	205	339

Note: Entitlement trade in this table is registered trade. Registered volumes for the Commonwealth include water not purchased from the market, such as gifted water and acquisitions through the Sustainable Rural Water Use and Infrastructure Program. Registered trade excludes 8.1 GL of non-tradeable *Water Act 1912* (NSW) licences that were registered by the Commonwealth in 2011–12 as part of land purchases.

Table A.27: Allocation trading outside the MDB, 2007–08 to 2011–12 (GL)

	2007–08	2008–09	2009–10	2010–11	2011–12
Queensland	89.8	160.4	161.1	29.6	49
New South Wales	1.1	8.1	3.7	1.5	2.1
Victoria	89.6	20.1	12.2	7.5	17.3
South Australia	4.3	7.8	0.4	3.1	2.1
Western Australia	13.2	9.0	13	35.1	9.9
Tasmania	2.9	0.3	4.1	0.0	0.6

Table A.28: Entitlement trading outside the MDB, 2007–08 to 2011–12 (GL)

	2007–08	2008–09	2009–10	2010–11	2011–12
Queensland	71.4	46.1	41.0	106.1	82.5
New South Wales	13.5	16.4	8.4	16.2	26.3
Victoria	6.5	14.0	10.5	16.4	23.9
South Australia	2.0	13.8	20.2	22.2	16.2
Western Australia	2.2	8.5	24.4	24.8	13.8
Tasmania	56.5	103.7	26.9	19.6	55.3

Table A.29: Trade volumes and prices, Western Australia, 2007–08 to 2011–12

	2007–08	2008–09	2009–10	2010–11	2011–12
Water allocation trades—volume (ML)	13 169	9 004	12 964	35 050	9 927
Water licence transfers—volume (ML)	2 238	8 491	24 360	24 827	13 850
Water allocation trades—average price ($/ML)	20	14	20	42	41

Table A.30: Trade volumes and prices, Tasmania, 2007–08 to 2011–12

	2007–08	2008–09	2009–10	2010–11	2011–12
Water licence transfers—volume (ML)	56 515	103 679	26 913	19 611	54 755
Water allocation trades—volume (ML)	2 913	249	4 146	0	590
Water licence transfers—number	79	150	163	218	295
Water allocation trades—number	15	7	12	0	13

Table A.31: Allocation and entitlement trading volumes, Macalister, Werribee and Bacchus Marsh districts, 2007–08 to 2011–12 (ML)

		2007–08	2008–09	2009–10	2010–11	2011–12
Werribee and Bacchus Marsh	Volume—water shares	144	190	537	434	603
	Volume—allocation trades	701	50	68	634	1735
Macalister	Volume—water shares	2 031	13 781	10 349	6229	9685
	Volume—allocation trades	11 588	20 033	12 145	4882	5812

Table A.32: Volumes and average prices of medium-reliability entitlement trades, Mareeba Dimbulah and Bundaberg water supply schemes, 2003–04 to 2011–12

	Bundaberg WSS—volume (ML)	Bundaberg WSS—price ($/ML)	Mareeba Dimbulah WSS—volume (ML)	Mareeba Dimbulah WSS—price ($/ML)
2003–04	1 237	1408		
2004–05	2 258	1426		
2005–06	4 485	956	1 354	458
2006–07	7 857	858	7 401	610
2007–08	3 756	806	11 664	733
2008–09	3 760	744	5 183	786
2009–10	8 578	1021	5 232	804
2010–11	11 498	804	9 801	593
2011–12	8 842	669	8 439	858

Table A.33: Entitlement and allocation trade volumes and prices, Hunter Valley, 2005–06 to 2011–12

	2005–06	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Water licence transfers—volume (ML)	–	–	11 681	9151	7311	15 455	24 491
Water allocation trades—volume (ML)	17 009	10 184	1 478	1907	3782	1 456	2 081
Water licence transfers—price ($/ML)	–	–	2 868	3483	2829	2 171	2 400
Water allocation trades—price ($/ML)	24	575	931	35	55	38	21

Table A.34: Groundwater and surface water allocation trade volumes, Namoi, 2006–07 to 2011–12 (ML)

	2006–07	2007–08	2008–09	2009–10	2010–11	2011–12
Groundwater allocations	12 155	12 543	10 210	9 102	6 096	3 997
Surface water allocations	n.a.	5 598	12 581	12 151	17 516	23 462

References and Abbreviations and acronyms

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Abbreviations and acronyms

ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
ACCC	Australian Competition and Consumer Commission
***AWMR* series**	*Australian water markets reports* series
GL	gigalitre
IIO	irrigation infrastructure operator
MDB	Murray–Darling Basin
MDBA	Murray–Darling Basin Authority
ML	megalitre