

Published by Murray-Darling Basin Commission
Postal Address GPO Box 409, Canberra ACT 2601
Office location Level 4, 51 Allara Street, Canberra City
Australian Capital Territory

Telephone (02) 6279 0100 international + 61 2 6279 0100
Facsimile (02) 6248 8053 international + 61 2 6248 8053
E-Mail info@mdbc.gov.au
Internet <http://www.mdbc.gov.au>

For further information contact the Murray-Darling Basin Commission office on
(02) 6279 0100

This report may be cited as: *Brief assessment of the merits of purchasing water entitlements during a time of low water availability.*

MDBC Publication No. 31/08

ISBN 978 1 921257 71 1

© Copyright Murray-Darling Basin Commission 2008

This work is copyright. Graphical and textual information in the work (with the exception of photographs and the MDBC logo) may be stored, retrieved and reproduced in whole or in part, provided the information is not sold or used for commercial benefit and its source (*Brief assessment of the merits of purchasing water entitlements during a time of low water availability*) is acknowledged. Such reproduction includes fair dealing for the purpose of private study, research, criticism or review as permitted under the Copyright Act 1968. Reproduction for other purposes is prohibited without prior permission of the Murray-Darling Basin Commission or the individual photographers and artists with whom copyright applies.

To the extent permitted by law, the copyright holders (including its employees and consultants) exclude all liability to any person for any consequences, including but not limited to all losses, damages, costs, expenses and any other compensation, arising directly or indirectly from using this report (in part or in whole) and any information or material contained in it.

The contents of this publication do not purport to represent the position of the Murray-Darling Basin Commission. They are presented to inform discussion for improvement of the Basin's natural resources.

Front cover images: (top) John Baker, (lower inset) Arthur Mostead.

Social and Economic Reference Panel¹

Brief Assessment of the Merits of Purchasing Water Entitlements during a Time of Low-Water Availability

I. Scope of the Brief

The SERP has not been requested to offer advice on the general merits of market-based water recovery to achieve the objectives of TLM but rather on the merits of such purchases during a time of low-water availability. Consequently, the brief only examines those issues that are pertinent or relevant to times of low-water availability. For instance, there could be concerns about the possibility of ‘Third Party Effects’ from the purchase and removal of water entitlements from a region (such as increased water delivery charges for remaining irrigators when water is sold out of an irrigation district). This issue is addressed in the brief only in so far as there is a different impact from such purchases at times of low-water availability versus times of greater water availability.

The Living Murray and Market-based Water Recovery

In June 2004 the Council of Australian Governments approved the Intergovernmental Agreement on Addressing Water Overallocation and Achieving Environmental Objectives in the Murray-Darling Basin. This agreement sets out arrangements for a ‘Living Murray’ program to return 500 GL of water per year to the Murray River by 2009. The success of these initiatives is to be judged, over time, from environmental improvements at six icon sites along the Murray River chosen for their conservation, recreational, cultural and economic value.

The 500 GL target is expected to be achieved by infrastructure investments to improve water efficiency that should deliver between 300-350 GL of water and the purchase of water entitlements which could contribute around 200 GL of water. The water entitlements could be purchased by several government buyers, including government departments and the MDBC. Water entitlements to be purchased under the TLM are statutory rights of access to water (Fisher 2006) which can vary in their reliability in terms of the quantity of water assigned to them each season.² The amount of water physically allocated to a water entitlement in a season is called the seasonal allocation and is not a fixed quantity. It depends on a number of factors including the level of inflows and storage levels.

Water Entitlements and Seasonal Allocations of Water

The market price for seasonal allocations is the price for actual quantities of water that can be delivered in the current season. The market price of water entitlements depends on two things:

- the expected physical amount of water allocated to an entitlement in the form of seasonal allocations, and
- the expected price of seasonal allocations in the current and future irrigation seasons.

Water entitlements vary according to their reliability so their price will also differ. High reliability water entitlements, all else equal, will command a higher price than low reliability water entitlements. This is because the higher the reliability of an entitlement the greater is the chance that it will receive its full seasonal allocation in any given season.

In periods of low water availability, the price of seasonal allocations will rise as there is physically less water available to be traded. While the price of seasonal allocations only depends on the current season's circumstances, the prices of water entitlements are determined by:

- the current price of seasonal allocations
- expectations about the allocation to those water entitlements into the future (including carry over allocations from the current season) and
- the price of seasonal allocations in future seasons.

Low-water Availability

In 2007, the MDBC began implementation of The Pilot Environmental Water Purchase Project. This trialled the purchase of water entitlements by buying up to 20 GL of water from willing sellers, providing some insight into the implications of purchasing at a time of low-water availability.

While the details of the purchasing strategy in the pilot remain 'commercial-in-confidence', the market price of each entitlement was independently assessed, and water entitlements purchased only if offer prices were sufficiently close to market prices. The trial secured offers of water entitlements for 20 GL in four weeks with most of the offers of sale coming from the Murray Valley. These offers of sale were pursued at a time of extremely low water availability such that, as of December 2007, inflows into the Murray River were at record lows and total water storage was only 20% of capacity and well-below normal seasonal allocations of water to irrigators. This low-water availability led to a sharp increase in the price of seasonal allocations of water in the second half of 2007. High prices for seasonal allocations and low water availability have raised a number of possible concerns about the merits of market-based water recovery at times of low water availability. These concerns include:

- Reduced cost-effectiveness of purchasing water entitlements compared to infrastructure investments at times of higher than normal prices, especially for seasonal allocations of water;
- Exacerbated third-party impacts whereby sales of water entitlements impose market costs (such as higher water delivery charges, changes in property values) and social costs (reduced ability to pay for community services) from where the water is supplied, that are accentuated at times of low-water availability;
- Adverse economic impacts from purchases of water entitlements particular to times of low-water availability.

This brief reviews each of these concerns and what they imply in terms the merits of undertaking purchases of water entitlements at times of low-water availability.

II. Cost Effectiveness of Market-Based Water Recovery

A water entitlement is a statutory right that provides the owner with a share of a consumptive pool that, in turn, generates a seasonal allocation to divert a given volumetric quantity of water. The actual amount a water entitlement holder receives in a seasonal allocation is not fixed and depends on:

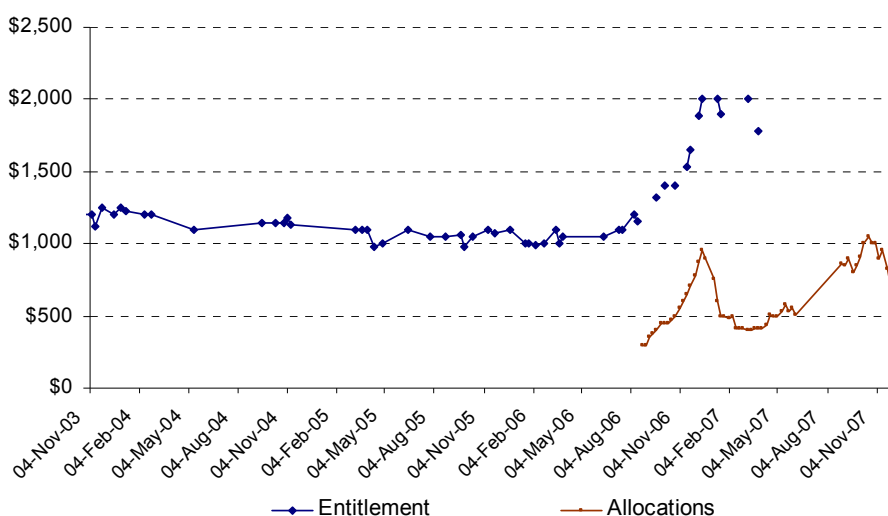
- the water entitlement's level of reliability (such as 'High Security' or 'General Security' entitlements determining the preferential access to the consumptive pool)
- the overall Cap for the basin
- diversion limits by catchment
- expected inflows and water storage levels.
-

'High Security' water entitlements have traditionally been defined in terms of their reliability estimated to be between 95-100%, where an entitlement with 95% reliability is expected to receive its full seasonal allocation 95 years in 100. By contrast, 'General Security' water entitlements in New South Wales have a much lower reliability and in the past two seasons have received zero seasonal allocations.

The price of seasonal allocations will vary much more than the price of water entitlements because seasonal allocations associated with water entitlements represent the permissible volumetric diversions in a given year while water entitlements represent the statutory right to receive a share of an administratively determined consumptive pool this year, and also into the future. In other words, the price of water entitlements reflects long term expectations of the value of seasonal allocations against those entitlements.

During times of low-water availability the market price for seasonal allocations can rise dramatically. For instance, seasonal allocation prices rose from less than \$500 per ML to more than \$1,000 per ML in the Goulburn Valley in the second half of 2007 (Figure 1). This price increase has arisen from lower overall availability (2006 and 2007 was the lowest ever recorded two-year inflow period in the River Murray) and a short-run demand for water that is price inelastic, especially for perennial crops where minimal volumes of water are required for trees or vines to ensure production beyond the current season.³

Figure 1: Greater Goulburn water entitlement and seasonal allocation prices



Source: Watermove

Over the 2006-2007 period, the price of 'High Security' water entitlements rose by about \$1,000 per ML in both the Greater Goulburn and South Australia. The increase in the market price of 'High Security' water entitlements reflects underlying increases in water prices in the physical water (seasonal allocations) market and expectations that these prices may continue in the near term because dam reserves are very low. Higher entitlement prices for 'High Security' water may also reflect the expectation of generally lower water availability in the future and an expectation that any reduction in seasonal allocations against such entitlements will be more than offset by increased water prices in the physical water (seasonal allocation) market. By contrast, 'General Security' water entitlements have not changed in price in the past two years. This is probably because the 'General Security' entitlements have had zero seasonal allocations in the past two years, and also because of the expectation that any change in future water availability increasing seasonal allocations to 'General Security' entitlements will be fully offset by lower prices of seasonal allocations.

Farmers who require greater water security (such as horticulturalists and viticulturalists) are more likely to value high reliability water entitlements as a hedge against substantial price increases in times of low water availability. If such farmers expect the current low-water availability to be a harbinger of a longer-term drying trend then their preference for holding high reliability entitlements over lower reliability water entitlements will continue. Thus, unless expectations about future water availability change, 'High Security' water entitlement prices are unlikely to return to pre-2006 levels even if seasonal allocations return to more typical volumes.

A relevant issue is whether market-based water recovery remains cost effective in periods of low-water availability. An alternative to achieving the 30 June 2009 target of recovering 500GL of water per year is to make investments that reduce water losses in on and off-farm infrastructure projects. The estimated costs (\$/ML) of water saved from such investments are presented in Table 1. The water cost savings vary by the type of investment and location but in most cases exceed the price of water entitlements offered for sale under the Pilot Environmental Water Purchase project.

Table 1: Estimated Water Cost Savings (\$/ML) from Infrastructure Investments

Infrastructure project	Current estimate of the approximate \$ per ML of Long Term Cap Equivalent	Reliability of water recovered
Great Darling Anabranch Pipeline	\$1,000/ML	High
Coleambally Main Canal – Seepage and Leakage Savings Project	Up to \$2,700/ML	High
Shepparton Irrigation Area Modernisation Project	\$2,860/ML	High
NSW Wetlands Water Recovery – Stage 1	\$2,500/ML	High
Water Recovery from SA River Murray Wetlands – Stage 2: the feasibility of generating water savings and environmental benefits	\$4,000/ML	High
Metering accuracy, water use efficiency study and evaluation of infrastructure options for water recovery for the West Corugan Private Irrigation District in Southern NSW	\$5,000/ML	High
Investigation of the potential to recover water by the construction of a 30GL en-route storage ‘The Drop’ on the Mulwala Canal in the Murray Irrigation Ltd area of operation	>\$5,000/ML	High
Ricegrowers’ Association	>\$2,500/ML	Mix

Based on the information available in Table 1 and the offer prices for water entitlements in the Pilot Environmental Water Purchase, the panel finds that the purchase of water entitlements — even in a period of low-water availability — still remains as of April 2008 one of the most cost effective methods of achieving the TLM target by 30 June 2009. As the Living Murray 500 GL/year target for water savings is to be achieved in less than 18 months and because some infrastructure projects may take several years to be realised, the target will probably not be achieved without substantially more market-based water recovery.

III. Exacerbated Third Party Effects

Heaney *et al.* (2006) and Frontier Economics (2007) identify a number of third-party effects related to water trade, where the costs or benefits of trading are not fully captured by holders of water entitlements. These include, but are not limited to:

- possible impacts on reliability of supply and delivery
- higher storage and delivery charges, and
- water quality issues associated with sale of water out of an irrigation district.⁴

The issue, however, is whether third party effects are exacerbated at times of low-water availability. In other words, does buying water entitlements during periods of low-water availability magnify the third party impacts compared to purchasing entitlements in a wetter period?

Third party effects are triggered from the sale of water entitlements from one region to another. Normally these effects are defined in terms of the irrigation district where the water is sold but may also include effects in the district where the water is transferred. Community concerns about third party effects, however, focus on the sale of water entitlements out of a region rather than the sale of seasonal allocations (Frontier Economics 2007). If market-based water recovery is no greater in low-water availability periods than in wetter periods, then third party effects of water entitlement purchases for environmental purchases should not be exacerbated during low-water availability.

In the absence of market-based water recovery, low-water availability might be expected to increase the quantity of water entitlements offered for sale. This is because in these conditions reduced seasonal allocations lower the profitability of irrigation farming that may, in turn, encourage some farmers to sell their water entitlements and exit from the industry. This would tend to reduce the price of water entitlements, at least in the short term, given the adjustment time required to invest effectively in alternative and more profitable uses of water.

Market-based water recovery will help maintain water entitlement prices in the presence of increased entitlement sales. This then allows for a more orderly exit and adjustment process as well as generating distributional consequences. For example, farmers leaving the industry will be better off in terms of compensation for water entitlements sold, whereas those farmers seeking to expand production or to buy additional entitlement to improve water security will be worse off. Any impacts from market-based water recovery, however, will be restrained by the 4% season limit on total trades of water entitlements out of irrigation areas. This is intended to be a government safeguard on third party impacts.

Given that society has placed a high value on environmental water uses through its investment in The Living Murray, the process of market transfers of water from low to higher-valued environmental and commercial use still remains desirable even in periods of low-water availability. In summary, although market-based recovery may increase community concerns over the sale of entitlements, the panel does not find that there is compelling evidence that third party effects are exacerbated due to water entitlement purchases during low-water availability.

IV. Adverse Economic Impacts

The purchase of water entitlements for environmental purposes increases the demand for water entitlements, all else equal, and thus would tend to increase their market price. However, the current market price of water entitlements does not explicitly account for the external costs of consumptive use on the environment. Consequently, market-based water recovery can still be beneficial overall, even if it raises the market price of water entitlements.

The issue at hand, however, is whether market-based water recovery leads to adverse economic impacts at times of low-water availability. This depends on when the water entitlement is delivered by the sellers for water recovery and how the water recovered is allocated between use and non-use purposes at these times. The Pilot Environmental Water Purchase Project conducted by the Murray-Darling Basin Commission in 2007 has typically allowed the sellers of water entitlements to use the associated seasonal allocations until 30 June 2008. The default policy for most future market-based measures in The Living Murray is that the seasonal allocations of purchased water entitlements be available for use by the sellers until the end of June 2009. Thus, in terms of actual water use, the purchase of water entitlements by the MDBC at a time of low-water availability does not appear to be imposing an added burden on irrigators in the irrigation season immediately following the sale of the water.

The sale of seasonal allocations assigned to water entitlements purchased for environmental purposes would lower the current cost of market-based water recovery. Government holders of Living Murray water cannot, however, currently sell the associated seasonal allocations for environmental water entitlements until a protocol is established on the ‘trade of environmental water’ under The Living Murray Business Plan. The primary consideration in any sales of seasonal allocations would be to ensure such sales do not jeopardise the environmental goals of The Living Murray. If the water held by an environmental manager is not placed on the seasonal allocation market in 2009-10 (when it otherwise would have been), then market-based water recovery may raise the price of seasonal allocations. Relevant considerations here include whether dam storage and allocation levels have recovered by 2009-10 and whether the farmers selling entitlements have been sellers of allocations during the present drought. They may instead have been users of water on irrigation land that is retired as a result of an entitlement sale.

The key issue is not whether market-based water recovery occurs at times of low or high water availability but on when the right to use the associated seasonal allocation is allocated to the buyer and what an environmental manager chooses to use the water for at time of low water availability. That is, the more relevant issue is not when the entitlements are purchased but how and when they are activated for environmental purposes. For instance, in periods of low water availability in the future, will the seasonal allocations allocated to water entitlements under the control of environmental managers be sold to irrigators if permitted under the Living Murray Business Plan, or be used to maintain or increase environmental flows? This is an important question that needs further research on future water yields and the commercial and environmental trade-offs of different environmental flows under wet and dry conditions.⁵ As this issue can potentially generate near-term impacts for market-based water recovery, the Panel recommends that this research question be given its full attention. In summary, the panel finds no compelling reason on economic grounds to justify the cessation or delay in market-based water recovery to achieve the 500 GL goal of The Living Murray in a period of low-water availability.

V. Summary of Advice

The price of water entitlements is determined by expectations of demand and supply over many years while the price of seasonal allocations depends on actual market (supply and demand) for a given season. While the price of seasonal allocations only depends on the current season's circumstances, the price of water entitlements is determined by the current price of seasonal allocations, expectations about the allocation to those water entitlements into the future (including carry over allocations from the current season) and the price of seasonal allocations in future seasons.

After reviewing the available evidence the Social and Economic Reference Panel finds no reason to discontinue or delay the purchase of water entitlements for environmental purposes in periods of low-water availability. Justifications for continuing with market-based water recovery during a period of low-water availability are summarised below:

- (1) Removing water entitlements from the market has the potential to raise seasonal prices because it reduces the physical amount of water that can be traded. However, because most or all future market-based recovery will leave water with irrigators until June 2009, and because there is potential for subsequent trade of seasonal allocations to irrigation use if a protocol for trade of environmental water allows it, the planned market-based water recovery should have little impact on the market of seasonal allocations and actual water use in the short term;
- (2) A comparison of the costs of water recovery associated with infrastructure projects to the purchase price of water entitlements with the 2007 Pilot Environmental Water Purchase Project indicates that market-based water recovery – even in a period of low-water availability – is one of the most cost-effective methods of realising the 500 GL/year Living Murray target. Although the market price of 'High Security' water entitlements has increased substantially since 2006, and both current and also near-term expectations of higher prices for seasonal allocations help explain the increase in the market price of water entitlements, market-based water recovery still remains, as of April 2008, a cost-effective method relative to infrastructure investments;
- (3) Avoiding a "stop-and-go" approach based on water availability and pursuing instead a gradual, ongoing and "learning-by-doing" approach to market-based water recovery, even during a period of low-water availability will help avoid unnecessarily raising the price of water entitlements. This is the case if, as expected, there are to be very large purchases of water entitlements beyond 2008;

- (4) Third party effects from the transfer of water to its highest value in consumptive or environmental use will not be exacerbated by market-based water recovery at a time of low-water availability beyond what has been committed to under the Living Murray Initiative. Further, any purchases for environmental purposes still remain within the existing 4% irrigation area sale limits and, thus, constrain possible third party effects; and
- (5) The Living Murray target of recovering 500 GL of water per year by 30 June 2009 is unlikely to be achieved in the time available without substantial purchases of water entitlements over the next 18 months.

Cited References

Fisher, D. 2006. Water Law and Policy in Australia - An Overview. *Environmental Law Reporter*, 36(4): 10264-10276.

Frontier Economics in Association with Tim Cummins and Associates. 2007. The Economic and Social Impacts of Water Trading Case Studies in the Victorian Murray Valley. RIRDC Publication Number 07/121.

Heaney, A., Dwyer, G., Beare, S., Peterson, D. and Pechey L. 2006. Third-party effects of water trading and potential policy responses. *Australian Journal of Agricultural and Resource Economics* 50: 277-293.

Kirby, M., Qureshi, M.E., Mainuddin, M. and Dyack, B. 2006. Catchment Behavior and Counter-Cyclical Water Trade: An Integrated Model. *Natural Resource Modeling* 19(4): 483-510.

Wheeler, S., Bjornland H., Shanahan, M. and Zuo, A. 2008. Price elasticity of water allocations demand in the Goulburn-Murray Irrigation District. *Australian Journal of Agricultural and Resource Economics* 52: 37-56.

End notes:

1. The Social and Economic Reference Panel (SERP) was established by the Murray-Darling Basin Commission (MDBC) to provide, on request, independent high-level assessment of the social and economic impacts of The Living Murray (TLM) to the Living Murray Committee (LMC). Four individuals were officially invited to join the panel in December 2007 and their appointments were confirmed in January 2008. Current members of the SERP include: Dr Stephen Beare, Dr Donna Brennan, Professor Allan Curtis and Professor R. Quentin Grafton (Chair). This brief by the SERP, with input from the MDBC office, is in response to a 9 January 2008 request from the MDBC to the SERP to provide advice on the merits of purchasing water entitlements during a time of low water availability and high market price.
2. Water entitlements are often categorised based on reliability of entitlement. For a high reliability entitlement the full volume of the entitlements is expected to be available in almost every year (e.g., Murrumbidgee or Murray High Security Access Licence, Victorian High Reliability Water Share, South Australian Water Licence); for medium reliability entitlements some water available in almost every year, with full amount of water available in some years (eg. NSW General Security Access Licence); and for low reliability entitlements the water availability is more opportunistic, usually in wetter years (e.g., Victorian Low Reliability Water Share, NSW Supplementary Water Access Licence).
3. Wheeler *et al.* (2008) show that water demand and supply elasticities in the Goulburn-Murray irrigation district during drought years are much less elastic than in wetter periods and expect supply and demand elasticities to become more inelastic in 2007-2008.
4. Most storage and delivery charges imposed on irrigators are fixed or recurrent annual charges and should not, in principle, change with water availability.
5. Kirby *et al.* (2006) model the possibilities of counter-cyclical water trading and find that such trading would be a cost effective management system.