
7 Designing a portfolio of water products for environmental watering

Key points

- There is no 'one size fits all' solution in the choice of water products to address environmental watering needs in the Murray-Darling Basin. Different products are needed for different circumstances.
- Restricting the water recovery to water entitlements is likely to reduce the effectiveness and efficiency of environmental watering policy.
- Water entitlements are most suited to meeting constant environmental demands, as well as providing a means of keeping water in storage to address emergency needs and watering demands outside irrigation seasons.
- Seasonal allocations are well suited to addressing immediate environmental needs in the short term and, in the longer term, can be used to target variable and uncertain environmental needs during the irrigation season.
- Leases on entitlements are a viable substitute for outright purchases of entitlements, and offer some advantages due to their flexibility.
- Options contracts are potentially a more effective and efficient way of delivering environmental objectives than outright acquisition of entitlements. However, the case for using this product before the environmental demands are clearly formulated, is weak.
- Covenants on entitlements are a relatively ineffective and high cost method of achieving environmental outcomes.
- Purchases of changes to licence conditions in unregulated systems will often be an ineffective and high cost method of delivering environmental outcomes. Group proposals or administrative approaches might be necessary to address such impediments.
- The acquisition of land and water packages is generally a high cost way of achieving environmental outcomes.
- Contracts for environmental services could be an effective and low cost way of delivering environmental outcomes on private land.

As discussed in chapter 1, one of the objectives of the Restoring the Balance (RTB) program is to obtain water for the environment. The choice of water products will influence the effectiveness and efficiency of environmental water recovery. This chapter applies the effectiveness and efficiency criteria developed in chapter 5 to analyse the relative merits and potential application of the following products:

- water entitlements
- leases on water entitlements
- seasonal allocations
- options contracts
- covenants on entitlements
- changes to licence conditions in unregulated systems
- land and water packages
- contracts for environmental services.

7.1 Purchasing of entitlements

Entitlements are one of the two most commonly traded water products (along with seasonal allocations) in the Murray-Darling Basin (the Basin). Environmental water purchasing programs to date have almost exclusively relied on the acquisition of water entitlements (appendix B).

The focus of RTB has also been on acquiring water entitlements, with significant volumes of entitlements of varying reliability already purchased in different locations (chapter 1).

Effectiveness

Targeting

The targeting of environmental objectives through the purchasing of entitlements is likely to be difficult.

First, the factors influencing the volume of water allocated under an entitlement will often differ from the factors influencing environmental water demands (chapters 2 and 4). Consequently, the timing and size of the environmental demand may be poorly aligned with the availability of water under an entitlement. For example, some environmental demands may be countercyclical to water availability (more

water is demanded by the environment in seasons when the allocations accruing to entitlements are low) while others are cyclical (more water is demanded when the allocations are high). The environmental watering needs are often dependent on rainfall over several previous years while entitlements yield allocations largely on the basis of the current season's rainfall. Also, some environmental watering needs are very sporadic, while most entitlements would yield a relatively reliable supply of allocations in non-drought years.

The Australian Government may have some capacity to develop a portfolio of entitlements of varying reliability that align with particular environmental demands. Freebairn and Quiggin (2006) demonstrated that being able to acquire entitlements of different levels of reliability significantly improved the ability to target particular water demands. Indeed, past and present water recovery programs, including RTB, have acquired a mix of entitlements of varying reliability, although the reliability weightings differ between programs (appendix B). The Department of the Environment, Water, Heritage and the Arts (DEWHA, sub. DR85, p. 8) argued that, in undertaking 'no regrets' purchasing under Restoring the Balance, it 'consults with the MDBA [Murray-Darling Basin Authority] on implementation of the RTB program and endeavours to prioritise water purchasing in a way which will result in a portfolio of environmental entitlements which is consistent with the direction and content of the Basin Plan'. However, DEWHA has not provided the Commission with any evidence that would enable an assessment of whether and how it has targeted a particular mixture of entitlements to align with specific environmental demands.

The strategy of purchasing a portfolio of entitlements places very high information demands on the Australian Government and requires:

- an ex-ante assessment of the timing and volume of future water allocations accruing to particular entitlements
- an ex-ante assessment of the timing and size of future environmental water needs, taking into account future climatic conditions and the contribution of other factors to the environmental outcome.

This implies that for variable and uncertain environmental demands, there will be periods in which the entitlement holding will be poorly aligned with the actual environmental needs.

Second, despite recent improvements, trade in entitlements is still subject to significant delays (chapter 10), making it an ineffective strategy for addressing short-term variations in environmental demands or engaging in adaptive management.

Diversification strategies

The uncertainty surrounding the allocations under particular entitlements and the variability of particular environmental demands may be reduced by adoption of some diversification strategies. Diversification could be pursued through:

- purchasing a portfolio of entitlements from different but connected systems — this may produce a more predictable stream of annual water allocations
- using a particular entitlement holding for watering a diverse set of environmental assets — an aggregate of several environmental demands is likely to be less variable and hence more predictable than each of the components.

Both of those strategies will likely be applied to some extent to improve the effectiveness of the buyback. However, several factors are likely to limit the effectiveness of diversification:

- Due to deliverability constraints in some parts of the Basin (chapter 4), there is limited substitutability between entitlements in different locations for meeting a particular environmental demand, and there is limited substitutability of environmental demands that could be met by a particular entitlement. In some cases, such as in parts of the Northern Basin, diversification may not be possible at all.
- There is likely to be some correlation between allocations under different entitlements (limiting the gains from diversifying the entitlement holding) and between different environmental demands (limiting the gains from diversifying environmental demands). For example, a prolonged drought affecting the entire Basin has increased many environmental water demands and reduced most allocations.
- There is no ‘clean slate’ in environmental watering needs. At the outset of the buyback, there were many environmental assets requiring urgent watering (chapter 4). Meeting these short term needs will likely require a different portfolio of entitlements to what will be needed in the longer term.

Thus entitlements are best suited to meeting environmental demands that are known at the time of the purchase and are relatively constant over time.

Benefits from storage rights

An important feature of the type of entitlements DEWHA has sought and purchased is the ability to manage the storage of the water over time.¹ Carryover provisions allowing entitlement holders to store some of their allocation for future use have been introduced in most systems. This may give the Commonwealth Environmental Water Holder (CEWH) some ability to accumulate water in storages, allowing timely release in the future when the environmental need arises or is identified. This capacity to access water across years could also allow the CEWH to meet short-term environmental needs arising outside the irrigation season, when the ability to purchase water is extremely limited. Most irrigation infrastructure operators allow delivery of stored water between seasons, although this right is typically subject to maintenance work not being undertaken at the time. The National Farmers' Federation disputed the importance of out of season access to water for watering environmental assets:

Irrigation seasons usually run from August to end of April. This leaves only around three months from late autumn to winter. Typically this time is used to run regulated rivers low in an effort to 'mimic' natural flows. In particular, it provides an opportunity to establish stream bank vegetation. The proposal [of] using this for environmental flows has two drawbacks – it will increase system losses ... and for the southern Basin, water environmental assets at the wrong time. (sub. DR88, p. 12)

More generally, there are constraints on carryover rights — for example, the carryover limit is 50 per cent of the nominal entitlement volume in Victoria and New South Wales (NWC 2009b). These limits are imposed to address third-party effects arising from storing the water, such as the risk of storage overflows.

An alternative way of improving the temporal flexibility of water entitlements is by assigning the rights to storage to entitlement holders via a capacity sharing scheme (chapter 10). However, these systems have only begun to emerge in the Basin and their relevance to the buyback (at least in the short term) is limited.

Institutional and administrative impediments

A number of institutional constraints apply specifically to trade in entitlements. These include:

- a 4 per cent limit on net annual trade out of an irrigation area
- some property rights in water being poorly defined:

¹ DEWHA has generally shown little interest in purchasing 'rules based' entitlements and has focused on storage-based entitlements.

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- some water entitlements are still bundled with land
 - some rights to water are bundled with delivery and use rights
 - some irrigators are constrained in their ability to separate their share of a bulk entitlement (where the entitlement accruing to a district is defined in bulk terms)
- trades can take a long time to settle.

These impediments are discussed in chapter 10. In most instances, the preferred approach is to reduce the constraints. However, in some cases the constraints may be difficult to remove in a timely manner. In those cases, the purchasing strategy may need to accommodate the constraints by switching to a different water product.

Efficiency

Transaction costs

The trading of entitlements is associated with significant transaction costs for both parties. The categories of transaction costs include:

- government taxes, fees and charges
- approval times
- brokerage fees
- irrigation infrastructure operator fees (PC 2006).

The Allen Consulting Group (2006, p. 19, cited in PC 2006) estimated that the government and brokerage components of transaction costs associated with straight forward trades of entitlements in Queensland and New South Wales constituted 3.5 per cent of the value of the trade.

In addition, sellers of entitlements may bear other conveyance costs such as the cost of discharging a mortgage on the entitlement. Several participants indicated that the buyback was resulting in the acquisition of water from financially distressed sellers (National Irrigators' Council, (sub. 24); National Farmers' Federation, (sub. 50)), potentially elevating the importance of this category of costs.

A significant component of the transaction costs is likely to be fixed for each transaction. For example, some fees are levied on a transaction (rather than water volume or value) basis. Thus, the transaction costs per megalitre are lower for larger transactions.

Another key consideration in the context of the buyback, is the extent to which subsequent adjustment to the portfolio is required in future years to improve alignment with environmental watering needs. Transaction costs rise if the entitlement portfolio poorly targets the environmental demands. As discussed earlier, this is a significant risk where the environmental demands are not already clearly identified.

Opportunity costs

The cost of an environmental water portfolio consisting entirely of entitlements would be greater than necessary if the water allocated under those entitlements was not required for environmental watering in some periods. This is likely to be the case for meeting environmental demands that vary over time.

Scoccimarro and Collins (2006) presented a case study on the costs of meeting the periodic and highly variable environmental demands in the Gunbower Koondrook Perricoota Forests using different water products. They found that the budgetary cost of acquiring entitlements was \$200 million, compared to a cost of \$19 million, if the Government combined entitlement acquisitions with trade in allocations to achieve exact alignment with the environmental demand.

This estimate is likely to overstate the true cost of sourcing water through entitlement purchases because it did not take account of the various ways of improving the accuracy of targeting of environmental demands through entitlements. Using a particular entitlement to target several environmental demands in different years and carrying over unused water would reduce the opportunity costs of the water. However, even taking these factors into account, the cost of meeting environmental demands solely through entitlement purchases is likely to be high.

As discussed earlier, uncertainty about future environmental demands and the future allocations of water under entitlements makes it difficult to align the entitlement holding with the environmental demands, and there are constraints on reducing the variability through diversification. Carryover provisions could reduce the cost of the entitlement portfolio. However, in the above case study, a very significant carryover provision of 150 per cent of the entitlement volume only reduced the cost by around 50 per cent.

Scoccimarro and Collins (2006) concluded that to reduce the cost of meeting the environmental demand, an entitlement holding would need to be combined with significant subsequent trade in seasonal allocations. There is a provision under the

Water Act 2007 (Cwlth) allowing the CEWH to trade seasonal allocations. However, this power appears to be limited (discussed later).

Another component of the cost of buying entitlements for the environment is the risk premium attached to this product by irrigators. Of the two major water products currently being traded — entitlements and seasonal allocations — seasonal allocations exhibit by far the biggest fluctuation in prices over time (chapter 3). Risk averse irrigators seek to insure themselves against this price risk by holding some water entitlements. The price of entitlements (particularly high reliability entitlements) may attract a risk premium in addition to the value of the water available under the entitlement. The estimates by Scoccimarro and Collins (2006) show the internal rate of return on entitlements in the New South Wales and Victorian Murray regions to be 6 per cent, compared with the opportunity cost of capital of 7 per cent (implying a risk premium of 1 per cent).

On the other hand, the Australian Government is generally better able to absorb the price risk than an individual irrigator, due to the size and diversity of its aggregate expenditure. Consequently, it may be able to take advantage of this and reduce the opportunity cost of the buyback in the longer term by purchasing products that carry a higher level of price risk, avoiding the risk premium built into the market price of entitlements by irrigators.

To summarise, the informational demands of aligning a water entitlement with an environmental demand are significant, thereby limiting the effectiveness of environmental watering that relies exclusively on entitlements. The delays in executing transactions could also render the strategy ineffective for engaging in adaptive management. This inflexibility will manifest itself in a high opportunity cost of holding water that is occasionally surplus to environmental demands. Targeting could be improved, and the opportunity cost of the water reduced, by subsequent trade in seasonal allocations accruing to the entitlements (and the CEWH has some ability to engage in such trade). However, this would increase transaction costs if significant future adjustment is required to the entitlement holding to improve its alignment with environmental needs. Used on their own, entitlements are likely to be most effective in targeting known and constant environmental demands, and in providing a means of storing water for use in emergencies and outside irrigation seasons, when water can not be sourced from trade.

7.2 Purchasing of seasonal allocations

Seasonal allocations are (along with water entitlements) one of the two widely traded water products in the Murray-Darling Basin (chapter 3). However, they have been rarely utilised in past and current environmental water buybacks. There are some exceptions, for example the Riverbank program, where seasonal allocations can be acquired to meet urgent environmental needs.²

Submissions to this study indicate a range of views on whether the Government should purchase seasonal allocations for the environment. The Gwydir Valley Irrigators Association (sub. 29), the Queensland Farmers' Federation (sub. 35), and Murrumbidgee Irrigation (sub. 39) supported such purchases in some circumstances. On the other hand, the National Irrigators' Council (sub. 24) opposed the purchase of allocations at the initial stages of the buyback, while the NSW Irrigators Council (NSWIC, sub. 32) considered that this strategy would impose significant costs on irrigators, rural and broader communities.

Effectiveness

Targeting

Compared with water entitlements, the acquisition of seasonal allocations has several advantages in the targeting of environmental watering demands. First, allocation trades are executed more quickly than entitlement trades (chapter 3). This allows some flexibility to engage in adaptive management, rather than having to anticipate future environmental demands. Second, in contrast to entitlements, the purchase is of a known volume of water, improving the ability of the manager to align the allocation with the environmental demand. The certainty of obtaining the purchased volume of water also makes allocations a suitable product for targeting any immediate environmental needs that have accumulated in the Basin. Third, the temporary nature of seasonal allocations allows better targeting of highly variable or sporadic environmental demands. A case study of the purchase of physical water to stimulate a rare bird breeding event in the Narran Lakes illustrates the potential effectiveness of temporary water purchases (appendix B). The temporary nature of allocations also allows some experimentation in the face of scientific and economic uncertainty. Fourth, it is very unlikely that the CEWH or anyone else can create an 'over the bank' flood event for wetlands using just what they have in storages, from

² However, even in that program, the ability to purchase seasonal allocations is limited, because the acquisitions can only be funded with the proceeds from the sale of unneeded allocations that accrued to entitlements held by the environmental manager (appendix B).

entitlements, even with substantial carryover. Hence, some purchases of seasonal allocations may be required to go with the release of water held under entitlements.

Nevertheless, there are some constraints on the capacity to target environmental demands through the purchasing of seasonal allocations. While transactions are generally timely, using the water already held in storage under an entitlement is an even more expeditious option. In some cases, where the water is required on very short notice and finding sellers of seasonal allocations is difficult, keeping some water in storage under an entitlement may be more practical. There are also some constraints on the periods during which water could be sourced and used. There is very limited water trade between irrigation seasons and the ability to keep an allocation in storage between seasons is also likely to be limited. For example, Goulburn-Murray Water (2009b) does not allow carryover of seasonal allocations unless the irrigator also holds or leases a water entitlement in the system. Thus, seasonal allocation purchases may be more effective in targeting environmental demands arising during the irrigation season.

Institutional and administrative impediments

Trade in seasonal allocations is generally subject to fewer impediments than the trade in entitlements (chapter 3).

Some participants argued that acquiring seasonal allocations under the RTB could be inconsistent with the terms of the National Water Initiative. The Australian Conservation Foundation observed:

The water is not available in perpetuity and hence does not strictly fulfil the NWI criteria for environmental water ... (sub. 41, att. 2, p. 5)

There does not appear to be a specific requirement for the environmental water recovery to be undertaken through acquisitions of permanent water products, in either the National Water Initiative, or the Agreement on Murray-Darling Basin Reform. Further, if the objective is to achieve environmental outcomes in perpetuity, there are other means of insuring this outcome. For example, a permanent budget can be allocated for ongoing acquisitions of seasonal allocations.

Efficiency

Transaction costs

Transaction costs for trade in seasonal allocations include:

- state government fees

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- brokerage fees
 - approval times (PC 2006).

In dollar terms, the cost of a trade in seasonal allocations is significantly lower than that of entitlements (chapter 3). However, a valid comparison of the transaction costs needs to take into account that the purchase of an entitlement involves a single transaction, while recovering water through seasonal allocations would involve repeated trade into the future. The Allen Consulting Group (2006, cited in PC 2006) estimated that the transaction costs of allocation trades as a proportion of the value of the trade was 2–3 per cent in New South Wales, Victoria and Queensland, compared with 3.5 per cent for entitlement trades in New South Wales and Queensland. This suggests that the transaction costs of yearly trade in allocations may be lower than the cost of a single transaction to acquire an equivalent volume of water through an entitlement.³ The cost advantages of trading in seasonal allocations increase where the environmental demands only arise in some years, and yearly trade is not required. Also, when purchasing entitlements there will be periods when the entitlement holding does not match the environmental demand (discussed above). Subsequent trade to account for this would shift the balance further in favour of allocations.

Opportunity costs

The capacity to target environmental benefits more directly than through entitlement purchases could result in substantial savings in the cost of water. In other words, purchasing the water as and when needed would typically have a lower cost than if the water were held in the form of entitlements that were at times underutilised. In addition, acquiring seasonal allocations to address specific identified environmental needs is a more transparent approach than the purchasing of permanent water rights on the basis of predicted future needs. Consequently, it could impose greater discipline on the environmental manager to avoid acquiring surplus water. Finally, as discussed previously, seasonal allocations would not attract the risk premium associated with entitlements.

Several participants were concerned that the Australian Government's involvement in the seasonal allocations market could distort the market and drive up the costs to a greater extent than if the Government only purchased entitlements. For example,

³ If the price of an entitlement reflects the expected net present value of the stream of allocations (chapter 3), then the net present value of 3 per cent of the price of allocations incurred every year would be equivalent to 3 per cent of the price of the entitlement. This assumes that equivalent volumes of water per trade are acquired.

the NSWIC argued:

... the temporary market, particularly in dry periods, is vital to the operation of irrigated agriculture, and the entry of a participant of the size of the Commonwealth will devastate both the market and the businesses that rely on it. (sub. DR72, p. 11)

DEWHA contended:

Entering the allocation market would immediately inflate the price for everyone in the market, adversely affecting irrigators who are looking to buy water to sustain their crops in the current drought. (sub. DR85, p. 19)

As discussed in chapters 3 and 5, the market for seasonal allocations can not be viewed independently of the market for water entitlements. The price of an allocation depends on the volume of water in the consumptive pool. In this context, acquiring an entitlement for the environment would reduce the supply of allocations available for consumptive use in the same way as if the water was acquired directly in the seasonal allocations market, and the impacts on the price of allocations should be equivalent.

It could be argued that by acquiring entitlements, the Australian Government would provide a clearer signal and longer-term notice to the market of its environmental watering demands, than if it entered the seasonal allocations market every year. For example, if purchases of seasonal allocations by the environmental manager created sudden and unanticipated large spikes in the demand for allocations, irrigators may face high adjustment costs. This could drive up the opportunity cost of water. However, this argument rests on the assumption that in purchasing entitlements, the Government has clearly and accurately communicated the future environmental watering demand to the market. If (as would be likely) significant subsequent trade is required in the future, acquiring entitlements would have a similar impact on the prices of seasonal allocations to direct purchases of allocations.

Comparing entitlements and seasonal allocations

Achieving environmental objectives

As the previous discussion illustrates, acquiring seasonal allocations offers a flexible and relatively low-cost way of responding to identified environmental watering needs. The strategy has some practical limitations (outlined above). However, where it is practical to use seasonal allocations, it would often be a superior alternative to the purchasing of entitlements (table 7.1).

Table 7.1 Comparing entitlements and seasonal allocations

<i>Criterion</i>	<i>Entitlements</i>	<i>Allocations</i>
Effectiveness	Medium	Medium-high
Targeting	Flexibility in sourcing water throughout the year due to storage rights. Difficult to target variable environmental demands – requires anticipation of timing and size of future environmental demands and of allocations under the entitlement. Unsuitable for adaptive management due to long transaction periods and high individual transaction costs.	Potentially highly accurate – a known volume of water is acquired to address an identified environmental demand. Relatively quick transactions allow adaptive management. Temporary nature of the product facilitates experimentation. Limited carryover rights and difficult to source between irrigation seasons.
Institutional constraints	Caps on net trade out of irrigation areas. Poorly defined property rights in some districts.	No explicit constraints at present.
Efficiency	Medium	High
Transaction costs	Relatively low if no subsequent adjustment to the holding is required. High, if subsequent adjustment is required to improve targeting.	Relatively low – cost of individual transactions is low and only the transactions necessary for addressing the environmental demand need to be undertaken.
Opportunity costs	Unnecessarily high if the entitlement delivers water that is not needed by the environment. Irrigators use entitlements as a price risk management tool, resulting in a price premium relative to allocations.	Reacting to an identified need reduces the risk of holding unneeded water.

Addressing the transitional objective

The preceding discussion focused on the suitability of water entitlements and seasonal allocations to directly address environmental watering objectives. DEWHA (sub. DR85, p. 19) argued that the primary objective of the RTB program was to achieve a ‘permanent rebalancing of the system, to improve the health of the Basin system over the long term’. Consequently, it contended that the buyback should focus exclusively on water entitlements or similar permanent water products.

However, the conclusion that a permanent rebalancing of environmental and consumptive uses of water could only be achieved through the buyback of permanent water products, is not self-evident. For example, as observed earlier, allocating a permanent budget to yearly acquisitions of seasonal allocations could achieve a similar outcome. This strategy would also be more cost effective, given that the price of an entitlement is likely to exceed the (discounted) price of the future stream of allocations due to a risk premium, and that the superior targeting of

environmental demands through allocations would lead to lower transaction costs. Further, the rebalancing achieved by the RTB will at any rate not be permanent, because the CEWH in exercising its powers to manage the portfolio of water products (discussed below) will be likely to trade water after the buyback. This will change the balance between consumptive and environmental uses in different regions.

Ultimately, however, even if it were accepted that water entitlements were the most appropriate product for pursuing the transitional objective, it is important that the objective of addressing short term environmental needs is not compromised or forgotten. In addressing those needs, there is a strong case for utilising seasonal allocations in a portfolio of water products.

FINDING 7.1

Purchasing seasonal allocations offers a transparent, flexible and low-cost means of addressing urgent, short-term environmental watering needs. Where practical, this product should be included in the portfolio of water products.

The power of the Commonwealth Environmental Water Holder to purchase allocations

The *Water Act 2007* (Cwlth) allows the CEWH to trade seasonal allocations in some circumstances. The effect of these provisions is not clear, but this power may be limited (box 7.1).

Also, purchasing entitlements and then engaging in subsequent adjustment trade in seasonal allocations under those entitlements will have greater transaction costs than simply acquiring allocations if and when required. It would be appropriate that, in addition to the mix of entitlements acquired under the RTB program, the CEWH is given funding for acquiring seasonal allocations (and other products), at the outset.

regular renewals on agreed conditions. They can also be for all or part of the allocations accruing to an entitlement, and can also be specified to include or exclude other rights associated with the entitlement, such as storage and delivery rights.

Several participants, for example, Tandou Limited (sub. 28) and Murrumbidgee Irrigation (sub. 39) suggested that leases should be acquired as part of the portfolio. Scoccimarro and Collins (2006), in a survey of irrigator attitudes, discovered that irrigators generally supported the acquisition of leases, because it could reduce the reliance of the environmental manager on seasonal allocation purchases and also make the environmental acquisitions more visible to the market.

Effectiveness

Targeting

The effectiveness of targeting environmental demands through leases would depend largely on the term of the lease. Long-term leases with no provision for renegotiation would operate similarly to outright ownership of entitlements, and would be subject to similar targeting problems. Reducing the duration of the lease or allowing the renegotiation of some terms would improve their flexibility in targeting environmental needs. However, this would increase transaction costs.

If storage rights are included in the lease, the flexibility of the lease in targeting environmental needs would improve (as in the case with outright purchases of entitlements).

Institutional and administrative impediments

Generally, trade in leases on entitlements is subject to fewer institutional and administrative constraints than trade in entitlements. Further, to the extent that leases are a close substitute for full ownership of entitlements, they could offer a way of overcoming some of the constraints applying to entitlement trade. For example, leases could be acquired if the 4 per cent limit on net annual trade of entitlements out of an irrigation area is reached.

Efficiency

Transaction costs

There are little data on the transaction costs associated with entering into entitlement leases. The limited trade in private markets suggests that the costs of setting up a purchase scheme and then identifying potential sellers, and negotiating with them, may be higher than for purchases of entitlements or seasonal allocations. These costs would increase if the leases are diverse in nature. Furthermore, if the leases are of short tenure or allow renegotiation, some of these costs would be ongoing. There may also be increased administrative costs of managing a portfolio of leases of differing characteristics and with different termination dates.

Nevertheless, leases are generally not a complex product and appear to be well understood and supported by irrigators. The Commission has previously observed that the transaction costs associated with similar products, such as leases on farm equipment, are not great (PC 2006). The transaction costs for leases on water entitlements are, therefore, unlikely to be prohibitive.

Opportunity costs

The flexibility in aligning the acquired water with environmental demands, offered by shorter term and renegotiable leases, would manifest in lower costs, compared with the acquisition of entitlements.

The benefits from acquiring short-term flexible leases would need to be balanced against the likely increases in transaction costs. Nevertheless, the ability to trade off transaction and opportunity costs is likely to reduce the aggregate costs of leases, compared to outright purchases of entitlements.

To summarise, the acquisition of leases, rather than outright purchasing of entitlements, could improve the ability of the Australian Government to align the acquired water with environmental demands, and hence reduce the cost of water. There are fewer administrative impediments to trade in leases than to trade in entitlements, and leases appear to be supported by the community. This suggests that entering leases on entitlements is a feasible complement to the outright purchase of entitlements.

7.4 Purchasing of options contracts

An options contract is a derivative product that attaches to a water entitlement and typically involves an agreement for future access to a particular volume of water provided certain conditions are met (a trigger is activated). The contract usually provides for a payment of a ‘premium at the time of signing’ and an exercise price if the option is exercised. Options contracts could also be utilised in unregulated systems (discussed in section 7.6).

Options contracts are widely utilised in many markets, such as the electricity market and the share market, as a mechanism for managing risk (Scoccimarro and Collins 2006). In the United States, short term options contracts are also utilised in environmental water recovery programs (appendix C). However, their application in the Australian water market has been limited to date.

The Murrumbidgee River Reach pilot project — funded by the Australian Government, Murrumbidgee Irrigation, and the Murrumbidgee Catchment Management Authority — aims to demonstrate the potential benefits of such products. It has operated for several years, but has made limited progress in developing water derivative products. In the private market, there have also been some attempts to establish a market for this product. The National Water Commission reported:

... the Sydney Futures Exchange has created SFE State Water Indexes with a view for the trading of futures contracts on each regional index to be a mechanism to hedge financial risk associated with water availability. The indexes were established in August 2005. The market, although originally expected to be established during 2006-07, has yet to commence. (NWC 2009b, p. 152)

The Gwydir Valley Irrigators Association also suggested:

... there has been a small, but informal option market for Gwydir supplementary water for a number of years, and it offers some risk sharing advantages for those wishing to access supplementary water, and this could be of interest to an environmental water manager. (sub. 29, p. 10)

Surveys by Scoccimarro and Collins (2006) and Murrumbidgee Irrigation (sub. 39) indicate that irrigators support the use of options contracts by the Government. Participants in this study (for example, NSW Irrigators Council, sub. 32, National Irrigators’ Council, sub. 24) also generally supported the use of options contracts.

Effectiveness

Targeting

An options contract could provide significant flexibility in targeting environmental outcomes. There is flexibility in selecting:

- the duration of the option
- the frequency of the option's exercise over its life — this could reflect the periodic nature of the environmental demand
- the nature and level of the trigger that would activate the option and the volume of water that would become available if the trigger is met, for example:
 - a trigger could be selected to align with the environmental objective and could be based on, for example, storage levels, rainfall, or the volume of allocation under the relevant entitlement (Scoccimarro and Collins 2006)
 - multiple triggers (with different volumes of water associated with them) could be specified on one option, or a trigger could be made contingent on particular events (for example, the contract could specify that the threshold for activating the option is lowered after several seasons of low rain).

Increasing the complexity of the option would increase transaction costs (discussed below). However, in theory, the only constraints on accurate targeting of environmental outcomes are the uncertainty surrounding the future water allocations accruing to the underlying entitlement, and the information requirements of aligning the option trigger with the environmental watering needs. The uncertainty arising from the allocations under the entitlement can be addressed by writing the options contracts on high reliability entitlements. The information requirements of aligning the option trigger with environmental watering could be reduced by shortening the duration of the option.

Institutional and administrative impediments

The absence of an active market for water options makes it difficult to assess whether trade in this product would be subject to significant constraints and, in particular, how the impediments to trade that apply to currently traded water products would apply to options contracts. The lack of legislative or administrative recognition of water options contracts might, however, be construed as a constraint on trade.

Efficiency

Transaction costs

The absence of a market for water options contracts makes it difficult to assess the likely transaction costs associated with this product. However, there are indications that costs could be significant. First, the establishment of an options market would inevitably involve some set-up costs, such as the costs to the parties (including the market intermediaries) of familiarising themselves with the new product, and the costs of developing the institutional support for the product.

At a minimum, developing the institutional support for options contracts would involve the design of the contracts. However, it would also likely require that water options are recognised as a property right and that state water registers are adapted to accommodate them. Scoccimarro and Collins (2006) recommended statutory amendment to support the operation of option contracts.

Murrumbidgee Irrigation (sub. 39, att., p. 26) estimated that the cost of establishing the institutional infrastructure of a RiverReach scheme in the four Basin jurisdictions would be \$1 million. It is not clear how this estimate was derived, but current experience with harmonising state water market registers suggests that this may be a significant underestimate.

Second, the economic literature (see for example, Michelsen and Young 1993, Leroux and Crase, sub. 9) suggests that specifying the option and determining its price is a complex task, which is subject to uncertainty over and above that affecting the value of the underlying water product. The uncertainty would increase as the complexity of the option conditions and the duration of the option increase. Consequently, trading in options is likely to involve high negotiation costs, particularly at the outset, when the market for options is thin. Thin markets would also persist if there is significant heterogeneity in the options contracts.

Opportunity costs

By delivering a better alignment between the environmental demand and the water acquisition, options contracts could lead to lower opportunity costs than from purchases of entitlements. This is because the option would reduce the periods when the water is available but not needed for environmental watering. Further, where the environmental water demand is countercyclical to the water demands of irrigators, options contracts could take advantage of the complementary nature of the competing demands, resulting in lower costs.

ABARE modelling of the potential cost of recovering water through options contracts demonstrated that, in the presence of countercyclical demands, there could be significant cost savings relative to the purchasing of entitlements (Heaney and Hafi 2005). For options triggered by high allocations (in other words, where the value of additional water for irrigation may be low) the cost of the water was estimated to be between \$12–30 per megalitre. This compared with the cost of \$46 per megalitre if the water was sourced through general reliability entitlements. The NSW Government (sub. 51, p. 9) observed that unpublished modelling by Industry and Investment NSW also demonstrated significant potential savings from countercyclical trading in options.

Heaney and Hafi (2005) also observed that options contracts could reduce the cost of a buyback, because they allowed irrigators to retain entitlements and use them as a risk management mechanism (see earlier discussion).

However, the potential benefits of options contracts are likely to depend on particular circumstances. The modelling by ABARE and Industry and Investment, NSW, referred to above, did not demonstrate the existence and extent of environmental demands that could be targeted by countercyclical trade. Scoccimarro and Collins (2006) modelled the potential costs of using options to target environmental watering demands in the Gunbower Koondrook Perricoota Forests. It concluded that, in that particular case, environmental and irrigation watering demands were generally not countercyclical, and the highly variable nature of environmental watering demands made it difficult to design an efficient options contract.

Finally, some of the benefits of options contracts could be captured by using other products. For example, purchasing seasonal allocations and, to a lesser extent, low reliability entitlements would also confer the advantages of countercyclical trade.

In summary, the market for water options trade between irrigators has not developed thus far, despite their theoretical appeal and the absence of any explicit administrative impediments. A survey of irrigators by the BDA Group showed that:

Irrigators generally held the view that the development of risk management tools would occur as required and that there were no obvious constraints to this should such tools be commercially viable. (Scoccimarro and Collins 2006, p. 56)

This suggests that currently the transaction costs of options contracts may exceed the benefits of switching from trading in existing water products.

Transaction costs may be reduced through addressing the underlying impediments to water trade in general. This should be the priority avenue for government

involvement, as it may facilitate the private development of a water derivatives market.

Improved communication by the Australian Government of its environmental watering needs could also facilitate the private development of such products. The NSW Irrigators Council observed that:

... a centralised exchange servicing a robust market will develop the derivatives – or provide the source entitlement – to any significant buyer that is clear about what they want and/or need. (sub. 32, p. 13)

The absence of a market need not preclude the use of options contracts altogether. There may be some scope for DEWHA to include simple option contracts in a tender process. However, generally, the effectiveness and efficiency advantages of options contracts would be significantly undermined by the current absence of clear environmental targets or requirements, against which the options contracts could be calibrated.

7.5 Purchasing of covenants on entitlements

One way to recover water for the environment is by changing the property rights on existing water products. A covenant could be placed on a water entitlement restricting the use of allocations under that entitlement. The remainder of the allocation would be used on environmental needs.

Covenants on water entitlements are currently not traded privately and have not, to the Commission's knowledge, been utilised in environmental water buybacks to date. However, this approach has been utilised to deliver conservation outcomes on land, for example through various projects under the Natural Heritage Trust. Typically, this involves a revolving trust mechanism, where a property is purchased by the environmental manager, an environmental covenant is placed on it, and the property is resold.

Participants to this study have generally opposed the use of covenants in environmental water recovery. For example, the National Irrigators' Council noted:

We are unconvinced on the merits of covenants – irrigators would be opposed if the characteristics of entitlements purchased for the environment were to change. (sub. 24, p. 7)

Similarly, the NSW Irrigators Council stated that:

NSWIC has maintained a policy position over many years that the underlying characteristics of a licence must not be altered based on ownership ... In light of that, NSWIC is wary of covenants ... (sub. 32, p. 12)

Effectiveness

Targeting

In theory, a covenant could be specified to align with anticipated environmental watering demands. For example, a covenant prescribing the conditions under which the allocation associated with the entitlement would be shared between the irrigator and the environment, could operate similarly to an options contract.

However, in practice, the effectiveness of covenants is likely to be limited. The covenant conditions would need to be specified for future environmental demands, placing a high information demand on the Government. Further, covenants are typically permanent and are not easily reversed. This, coupled with the prescriptive nature of this product, would result in poor adaptability to uncertainty about environmental demands or changing circumstances. In view of this, covenants are likely to be less effective in targeting environmental demands than their closest substitute — an options contract.

Institutional and administrative impediments

As observed by Scoccimarro and Collins (2006), the acquisition of covenants would create a new class of entitlements. This would require state government involvement. If the Australian Government acquires a diverse set of covenants (as it may need to do to address diverse environmental goals), the administrative complexity at district and state level would rise correspondingly. The Commission has previously observed (PC 2006) that unless a Torrens titling system was developed for water rights,⁴ it would be difficult to implement and enforce covenants. Given the challenges in harmonising state approaches to defining and managing water rights, there are likely to be significant difficulties in implementing a universal system of covenants.

Efficiency

Transaction costs

The acquisition of covenants is likely to involve high transaction costs. First, in the absence of a private market for covenants, there would be some set-up costs.

⁴ Under a Torrens titling system, only the property rights recorded on the title register can affect the title holder. This is in contrast to a register of deeds system, where there may be unrecorded property rights that affect the title holder.

Second, the most practical method of implementing covenants is through a revolving trust system. This involves two transactions, compared with the single transaction necessary for acquiring other water products. And the costs of individual transactions may also be high due to thin markets and the opposition of the irrigators to the use of covenants. Third, the administrative costs of managing a complex portfolio of covenants are likely to be high. Finally, in the absence of an adequate titling system, such as a Torrens system, introducing an additional layer of complexity on the water market, would increase the transaction costs of private trades. Purchasers of entitlements would incur potentially significant additional costs in having to verify that the entitlements are not encumbered in any way.

To summarise, acquiring covenants on entitlements is an inflexible and high cost method of addressing environmental watering demands, and has little merit where markets for other products are well developed. However, a covenant-style arrangement may be a practical option in some unregulated systems, where the nature of the pumping rights attached to water licences and third-party effects mean the water markets are thin or do not exist (discussed below).

7.6 Purchasing water in unregulated systems

The purchasing of water licences or changes to the conditions of licences in unregulated stretches of river systems has been considered by governments as a mechanism to maintain or increase environmental flows. There are, however, limited examples of governments using this option in practice. One example is the streamflow tender in Melbourne catchments in which the Victorian Government purchased water in unregulated parts of the Yarra system to increase environmental flows (appendix B.4). Under the tender, participants submitted bids to surrender their licences altogether or to change conditions of their licences, such as reducing the annual volume extracted or changing the timing of access to water. The Northern Victoria Irrigation Renewal Project (sub. 38) suggested a similar tender could be used by the Australian Government as part of the mechanisms to support recovery of environmental flows.

The NSW Government (sub. 51) and the Queensland Government (sub. 54) suggested that mechanisms for recovering water could be broadened to include use of options or lease contracts, or the use of covenants to target environmental outcomes in unregulated systems. These could be used, for example, to limit pumping from certain events under pre-defined conditions.

As discussed in chapter 3, trade in unregulated systems can be difficult because of physical limitations in transferring water, the potential for conveyance losses, and

extraction by downstream users. These factors can limit the effectiveness and efficiency of governments using this option.

Effectiveness

Targeting environmental assets

The effectiveness of purchasing water in unregulated systems depends on the nature of the environmental objectives being targeted. These might include achieving permanent reductions in diversions, maintaining river flows in times of water scarcity, or supplementing beneficial flooding to floodplains and wetlands.

Purchasing individual licences in unregulated systems may provide little flexibility, both temporally and spatially, in targeting environmental objectives because of limited control over environmental flows in the absence of infrastructure or storage facilities. The potential to use the water recovered from purchasing entitlements in unregulated systems to target a particular environmental asset will depend on geographical proximity and the potential for conveyance losses and extraction by downstream users.

That said, purchasing changes in licence conditions, such as cease-to-pump rules or rostering rules, might be an effective means of shepherding water resulting from a high-flow event through a river system for environmental benefit, such as to water a terminal wetland.

The use of options or lease contracts in unregulated systems could provide flexibility in targeting environmental objectives where these can be clearly identified and aligned with the conditions of such contracts (for example, linking cease-to-pump triggers to river height or flow-rate thresholds).

Institutional and administrative impediments

The potential impediments to acquiring water in unregulated systems are largely related to the complexity involved in administering a change in water licences and the shepherding of water downstream, including across trading zones or jurisdictional borders.

In a Memorandum of Understanding signed in September 2009, the Commonwealth and NSW Governments committed to negotiate a bilateral agreement in relation to shepherding of Commonwealth environmental water holdings throughout New South Wales and from the Queensland border. The objective is to provide the

capacity to deliver water to environmental assets, or in the case of in-stream environmental watering, to provide protection for environmental flows to pass through the system as far as conveyance losses allow. A joint taskforce will determine what provisions will be contained in the agreement to facilitate this.

The purchase of water upstream will result in an increase in river flows that, in some cases, might increase the reliability of downstream licences or activate sleeper and dozer licences. This can occur where downstream users are not extracting water up to the limits specified by their licence and hence are able to capture water purchased upstream for environmental benefits, thus limiting the effectiveness of the purchase. The Northern Victoria Irrigation Renewal Project commented:

The major challenge in unregulated systems is to quarantine the environmental flow benefit, so that purchase from one diverter does not merely increase the security of supply for the remaining diverters. (sub. 38, p. 3)

A way around this might be to change access conditions so that extraction limits or cease-to-pump triggers for downstream licences are reduced sufficiently to prevent extraction of the additional environmental flows in the system. This would require negotiation with state and catchment water resource managers and the affected downstream licence holders, as well as monitoring of compliance with changes to extraction limits.

Shepherding of environmental water might be achieved with the voluntary cooperation of downstream licence holders. However, such cooperation may be easier to achieve if it involves only a temporary change to diversions by downstream irrigators. The NSW Government observed:

In unregulated systems, purchasing ‘pumping opportunity’ could be achieved through the purchase of extraction rights to reduce pumping from single flow events, if irrigators are contracted and/or agree (collectively) to let the purchased volumetric proportion of each event flow through without pumping. (sub. 51, p. 8)

In the Narran Lakes example in appendix B, water purchased from private on-farm storages upstream was shepherded down the river and across the state border for a single bird breeding event. This was achieved with the cooperation of downstream licence holders who withheld from pumping the water for the time it took for it to pass through each weir, even though commence-to-pump rules had been triggered.

There are possible mechanisms that may avoid or reduce shepherding issues. The Queensland Government (sub. 54) recommended that greater consideration be given to group proposals to adjust access conditions in unregulated systems. A group proposal could maximise environmental outcomes, while minimising impacts on other water licence holders by simplifying shepherding of water to achieve environmental outcomes.

The institutional and administrative impediments will depend on the level of management of unregulated systems. Those with a small number of licence holders may have informal management rules to facilitate trade. In contrast, unregulated systems that involve a large number of users and licences can have complex management rules and enforcement mechanisms.

Efficiency

Transaction costs

Given there are thin markets for trade in unregulated systems, there are limited data available on the magnitude of the transaction costs involved. Notwithstanding this, the transaction costs of the Australian Government purchasing changes to individual licences in unregulated systems is likely to be high, and by necessity, must involve state governments. This includes the costs associated with:

- obtaining information on licence conditions within trading zones (for example, maximum extraction rates, daily pumping rates, cease-to-pump triggers and monitoring of flow variability)
- tendering for bids to surrender or change licence conditions
- negotiating with state and regional water resources managers and downstream licence holders to shepherd the water downstream
- monitoring and enforcement of changes to licence conditions.

Administrative changes to flow rules

There can be substantial administrative and transaction costs associated with the complexity of purchasing changes to individual licences. In some cases, these impediments might be reduced with the voluntary cooperation of downstream licence holders or through the use of group proposals.

If such options are not feasible, as discussed in Chapter 6, an alternative might be to undertake administrative changes to minimum environmental flow rules under state and regional water resource management plans and provide compensation to all licence holders. Rather than accepting offers from individual licence holders to surrender or change the conditions of individual licences, the Australian Government could supplement the provisions for environmental flows that already exist in water resource plans for unregulated catchments. For example, the maximum extraction limits could be lowered or cease-to-pump rules changed, either temporarily or permanently, for all licences within a defined unregulated system.

Compensation could be allocated to all licence holders based on the price per megalitre forgone.

Changing the extraction limits on all licences simultaneously would reduce the impediments to shepherding water through unregulated systems, particularly where there are a large number of licence holders. This option is likely to incur lower transaction costs than those involved in negotiating changes in individual licences and will facilitate more effective targeting of environmental objectives by virtue of the greater control of flows throughout an entire catchment.

However, there may be political, social and institutional impediments to achieving such an outcome. In unregulated systems where water trade is thin or non-existent, establishing a fair market price for the water recovered is likely to be difficult. Further, administrative changes to environmental flow rules may not result in the most efficient outcome if an across-the-board reduction in diversions does not lead to water being recovered from where it is least valued. Nonetheless, such an approach is likely to be a more effective means of recovering water in unregulated systems than purchasing changes to individual licences.

FINDING 7.2

Purchasing water entitlements in unregulated systems can provide environmental managers with different environmental watering possibilities to holding storage-backed entitlements. Although less reliable, holding entitlements in unregulated systems can help managers to restore environmental flows in river systems. However, their effectiveness and efficiency can be compromised by complexities involved in shepherding environmental water downstream. These third-party effects may need to be addressed through negotiating with groups of irrigators, or through administrative changes to environmental flow rules.

7.7 Purchasing of land and water packages

Various past and present environmental water recovery programs have allowed the acquisition of land and water packages (appendix B). The most notable example is the Water for Rivers program that has operated from 2003. Under the Water for the Future initiative, in August 2008, the Australian Government announced the allocation of \$50 million to co-fund the purchase of northern Basin irrigation properties and their water entitlements by state governments (Rudd 2008). So far, several properties have been acquired by the NSW Government, the largest purchase being Toorale Station for \$23.75 million. Toorale station holds entitlements to extract 14 GL of water from the Warrego and Darling Rivers and the right to harvest water from the floodplain.

There are three grounds for acquiring water and land rights simultaneously:

- the water is needed to address environmental watering needs, while the land is needed to address unrelated objectives
- the water and the land are both inputs into a common environmental objective
- the water right has not been unbundled from the land, and it is not possible to acquire the entire water licence without also acquiring the land — this may be the case in unregulated systems in the northern Basin.

The first justification is outside the scope of this study, while the effectiveness and efficiency of acquiring water and land for the remaining two reasons are analysed below.

Effectiveness

Targeting

If the water and land are acquired simultaneously solely due to the difficulty of unbundling the property rights, the inclusion of the land in the purchase should have no impact on the effectiveness of the targeting of environmental watering needs.

On the other hand, if the land is one of the inputs into the environmental outcome, its inclusion in the acquisition would improve the alignment with the environmental objective. This may occur if the environmental asset is located on the land, or if the land has other features that could contribute to the achievement of the environmental outcome, such as onsite water storage. For example, Tandou Limited observed:

Ability to carry over large volumes due to on farm storage ... adds value to the entitlement. Therefore land and water packages should be considered in the right circumstances. (sub. 28, p. 5)

The Gwydir Valley Irrigators Association argued:

... it is absolutely critical that the Government funds, either directly or indirectly, the purchase of core wetland sites in the Gwydir, so as to ensure the management of those sites is entirely in keeping with maximising environmental outcomes. If 5% of the funds spent on water purchases had been strategically spent on property purchase, fully integrated environmental management could occur. (sub. 29, p. 10)

But establishing the right circumstances appears to be difficult. For example, the National Irrigators' Council observed:

NIC does not oppose the purchasing of land and water entitlements in the market place, but submits that it is sub-optimal and has so far been notable for a lack of clear strategy and measurable outcomes. (sub. 24, p. 6)

Ultimately, however, the key consideration with such purchases would be their high cost (discussed below).

Institutional and administrative impediments

The potential to include this option in the buyback would appear to be limited by the *Lands Acquisition Act 1989* (Cwlth), which stipulates that the Australian Government may only acquire land for a ‘public purpose’. The effect of this requirement on the buyback is not clear. However, one way of circumventing it is to co-fund the acquisitions of land by state governments, which are not subject to this constraint (as has been done so far).

Efficiency

Transaction costs

There may be significant transaction costs associated with identifying and negotiating with potential sellers of land and water packages. The diverse nature of such acquisitions necessitates significant individual negotiation for each transaction. A streamlined tender process would not be practical, while opportunistic purchasing of properties that come on the market would limit the effectiveness of the environmental targeting. Thin markets would also increase negotiation costs.

After the properties are purchased, the Government would also face administrative costs of managing the acquired land. The Commission has previously argued that private management of land for environmental outcomes is often more cost effective, due to local knowledge (PC 2004).

Opportunity costs

The acquisition of land and water packages would terminate all current private activity on the land and would typically be less cost-effective than mechanisms that allow joint production of private benefits and environmental outcomes. Experience with contracts for environmental services (discussed below) indicates that, in some cases, a small payment to the landholder is sufficient to deliver the outcome, because the landholder also retains most of the productive use of their land and water. The risk of poor outcomes would be particularly great, where the land and

water packages are acquired solely because the water could not be unbundled from the land. In those cases, the acquisition of land would have an opportunity cost, but would not contribute to the environmental outcome.

In its earlier report, the Commission concluded:

Where environmental values of land are high relative to alternative uses, and public management of the land would be more cost-effective than private stewardship, government purchase of entire properties (or part thereof) may be efficient. However, it is likely that, for a majority of agricultural land, it will be more efficient to leave land in private ownership and encourage joint production of environmental services and commercial outputs. (PC 2004, p. 219)

In the context of the buyback, the Commission considers that there are typically lower cost alternatives to the acquisition of land and water packages.

7.8 Contracts for environmental services

Government programs utilising environmental service contracts, have been a popular policy tool for pursuing environmental outcomes in the United States and the European Union for a number of years. More recently, this policy approach has gained prominence in Australia. Several programs have been implemented including, for example, the BushTender (and its several offshoots, such as River Tender) in Victoria, the Liverpool Plains program (run in partnership with the World Wildlife Fund Australia) in New South Wales, and the Onkaparinga Catchment conservation program in South Australia.

Typically, such programs involve a contract between a government and an individual, where the individual is paid to provide a particular environmental service, usually on their land. The environmental services acquired through these programs are not traded privately and there are no existing market platforms, necessitating the use of alternative acquisition methods by the government. Fixed rate payments and individual negotiation are sometimes utilised, but most commonly the contracts are acquired through a tender.

Participants in this study (for example Cotton Australia, sub. 25 and GVIA, sub. 29) have generally supported the use of this policy tool.

Effectiveness

Targeting

Potentially, contracts for environmental services could result in highly accurate targeting of the environmental objectives. In practice, however, much depends on the way the contract is specified, and in particular, whether the obligations imposed on the individual are prescriptive or based on the achievement of particular environmental outcomes. A contract requiring the achievement of particular environmental outcomes, without prescribing the means of achieving them, would result in the greatest alignment with the environmental objective and provide the individual with the greatest flexibility to utilise their local knowledge in achieving the outcome. However, such contracts typically come at high cost and pure performance-based contracts are usually not practical.

The alternative is to specify the contract on the basis of the inputs required to achieve an environmental objective, such as the volume and frequency of water delivery and specific land management practices. Most of the environmental contract programs to date, including the BushTender have been heavily reliant on prescriptive specification of the inputs. The effectiveness of such contracts depends on how well the prescriptive requirements align with the outcome. The contracts would impose similar information requirements on the Australian Government to the purchases of water rights, because the Government would need information about the linkages between the inputs and the outcomes. The information requirements and the potential for misalignment with the environmental outcome would increase as the duration of the contract increases. Typically, longer term contracts are negotiated due partly to the transaction costs. For example, 97 per cent of BushTender contracts are negotiated for 6 years or longer (DSE 2008a). This is likely to limit the capacity of an environmental contract program to engage in adaptive management.

Nevertheless, prescriptive contracts may offer better targeting of environmental outcomes than simple water acquisitions, by virtue of incorporating other inputs necessary for achieving the desired outcome. This would be particularly important for environmental assets located on private land, where the land use may be significantly different from what is required to achieve the environmental outcome.

Cotton Australia argued:

It is apparent that, despite significant increases in high security entitlement allocation, the Macquarie Marshes in NSW are still largely considered to be a distressed natural asset. It is clear to many that the increased managed environmental water flows are contributing to regular (planned) overgrazing and subsequent degradation of the marsh

system. Therefore the amount of environmental water is not the only determining factor of the condition of this wetland; clearly land use practices will also be a key determinant of the NRM [natural resource management] outcome. (sub. 25, p. 4)

The Gwydir Valley Irrigators Association, similarly, observed:

... we know much can be achieved through better riparian zone management, enhancing fish passage, reducing cold water pollution, restoring natural hydrological cycles etc. It is highly likely that obtaining additional water will form part of the solution, but should not be seen as the whole solution. (sub. 29, p. 4)

Institutional and administrative impediments

Contracts for environmental services are a widely used policy tool in Australia and there do not appear to be significant constraints specifically applying to this product. However, the impediments to the acquisition of water, such as the 4 per cent limit on net entitlement trade out of a district, may play a role, if additional water needs to be sourced to comply with the contractual obligations.

Efficiency

Transaction costs

The transaction costs of contracts for environmental services are influenced by whether the contract is prescriptive or performance-based. Pure performance-based contracts involve the largest transaction costs. In a review of the international experience, Latacz-Lohmann and Schilizzi (2006) suggested that the difficulties of observing and measuring environmental outcomes, and various random events interfering with the achievement of the outcome, would make complete specification of such contracts virtually impossible. On the other hand, poorly specified contracts create a risk of litigation. Performance-based contracts also place a large risk on the individual and significantly reduce participation for a given program budget. Latacz-Lohmann and Schilizzi concluded that, currently, prescriptive contracts were the only practical option.

However, prescriptive environmental contracts may also generate high transaction costs. Latacz-Lohmann and Schilizzi (2006) observed that the information disadvantage of the government relative to the provider of the environmental service (information asymmetry) could be significant and result in various types of costs.

One such cost arises from an incentive for individuals not to comply with their contractual obligations, because their performance is not easily observable by the government. There is evidence of poor compliance in some European programs. For example, one study found that 24 per cent of the participants in the UK Land Stewardship Scheme were not meeting their obligations, while another reported that over 30 per cent of participants in a German conservation scheme were not complying with their contracts (Land Use Consultants 1995; Latacz-Lohmann 2000). Difficulties in observing compliance would require significant monitoring and enforcement effort by the government and impose a cost on the individual of demonstrating ongoing compliance. In contrast, DSE (2008a) reported that 97 per cent of the landholders were meeting their obligations under the BushTender program.

Another issue is the bias in selecting low cost proposals regardless of the environmental benefit they bring, if the government cannot distinguish between the environmental benefits offered by different providers. The problem can be significant because the individuals would have an incentive to exaggerate the environmental benefits their proposals would generate. This could require the development of more accurate environmental benefit indexes and the investigation of the claims made under the proposals.

A study of administrative costs to governments of environmental contracting schemes in eight European states showed that they ranged between 6–87 per cent of payments to landholders (Falconer and Whitby 1999). In the case of the BushTender trial program, the labour and travel costs of program staff identifying, negotiating and executing contracts (but not including subsequent monitoring and enforcement costs) constituted around 20 per cent of payments to landholders (DSE 2008a, pp. 30, 39).

Opportunity costs

Depending on how they are specified, environmental contracts may have some advantages over the purchase of other products. First, to the extent that the environmental service is provided by a landholder who retains ownership and use of their land, the contracts allow joint production of private and public benefits. The irrigator could maintain some agricultural production on the land and also derive some private benefit from the improved environmental outcomes, and may, therefore, require only a small payment to enter the contract (PC 2004). If the contracts are delivered through a competitive mechanism such as a tender, the irrigator has an incentive to reduce the cost of their bid by maximising those synergies. The BushTender trial program paid landholders an average of \$114 per hectare of land on which the conservation services were provided — a substantially

lower cost than if the land had been acquired outright and then managed by Government employees (DSE 2008a).

Second, such contracts could reduce the cost of achieving particular outcomes through utilising local knowledge. If landholders are given some flexibility in selecting the mix of inputs they employ to achieve the environmental outcome, they would use their knowledge to select the least-cost method. There would also be a clear incentive to innovate and improve the efficiency over time. These benefits are more likely to arise in the case of pure performance-based contracts, which, as discussed above, are unlikely to be practical. However, even in the case of prescriptive contracts, there would be some flexibility to adopt low-cost methods for achieving the outcome. Allowing the individuals to select the mix of inputs as part of their proposal (as is done in the BushTender, for example) would create an incentive to minimise the cost. Reducing the contract duration or allowing periodic renegotiation could reduce service provision costs over time (however, it may also increase transaction costs).

In summary, environmental service contracts can play a niche role in delivering environmental outcomes on private land, where the community net benefits are positive. Information asymmetries and the challenges in observing and measuring environmental outcomes have largely limited such contracts to a prescriptive specification of inputs into the environmental outcome. This, in turn, limits the potential effectiveness and efficiency advantages of this policy tool. Even so, there is likely to be some scope for the contracted parties to seek out the lowest cost solutions.

7.9 Establishing a portfolio

The previous discussion has shown that there is no ‘one size fits all’ solution in the choice of the water product to address environmental watering needs. Different products would be effective and efficient depending on the circumstances (table 7.2).

Table 7.2 A portfolio of instruments for environmental watering

<i>Product</i>	<i>Effectiveness</i>	<i>Efficiency</i>	<i>Most appropriate application</i>
Entitlements	Medium	Medium	Addressing constant known watering needs; using water in storage to address emergency needs and watering demands outside of irrigation seasons. Less efficient than seasonal allocations in addressing short term needs.
Leases on entitlements	Medium	Medium	Addressing less certain environmental demands; replacing entitlements when there are administrative constraints on trade in entitlements.
Seasonal allocations	Medium-High	High	In the short term, addressing current urgent environmental needs, in the longer term addressing variable, uncertain environmental demands during the irrigation season.
Options contracts	Medium-High (long term)	Medium-High (long term)	As water markets develop in the longer term, replacing some of the entitlements and leases in the portfolio.
Covenants	Low	Low	In regulated systems (but rules-based approaches of options contracts might be more appropriate).
Changes to unregulated licences	Low-Medium	Low	To achieve shepherding of water through unregulated systems (might need to be implemented in conjunction with states).
Bundles of land and water rights	Medium	Low	When the same objectives could not be achieved through changes to unregulated entitlements or environmental services contracts (needs to be implemented in conjunction with states).
Environmental services contracts	Medium-High	Medium-High	Environmental assets on private land.

A conclusion that follows from this is that restricting the recovery of water for the environment to water entitlements (or more specifically, storage-based entitlements) is likely to compromise the efficient achievement of specific environmental objectives.

RECOMMENDATION 7.1

In recovering water for the environment, the Australian Government should develop a portfolio of water products, and not focus solely on entitlements. Other products (such as seasonal allocations, leases on entitlements, options contracts and contracts for environmental services) have advantages in specific contexts and should be considered.