6 Recovering water through non-market means

Key points

- Water for the environment can be recovered through market means (for example, purchases from willing sellers) or non-market means (for example, uncompensated administrative decisions, compulsory acquisition and funding infrastructure upgrades). The best approach to take varies according to the circumstances.
- Current arrangements require water users to bear the cost of reductions in water availability in some cases, including where climate change reduces inflows. Uncompensated administrative decisions to reduce consumptive use of water are appropriate in these cases.
- Recovering water through compulsory acquisition does not appear to offer any significant advantages over purchasing water from willing sellers in regulated systems, but it does have disadvantages (including that it does not target irrigators who value their water least). Compulsory changes to entitlement conditions, accompanied by compensation, may have a role to play in unregulated systems.
- The *Water Act 2007* (Cwlth) appears to require the overall proportion of water allocated to the environment to be determined without explicitly taking into account the values that the Australian community places on environmental outcomes, the opportunity cost of water or the role of other inputs such as land management.
- Decisions about irrigation infrastructure investments and their funding are best left to irrigators, irrigation infrastructure operators and their financiers.
- Funding infrastructure upgrades is generally not a cost-effective way for governments to recover water for the environment. It is also likely to be inefficient and inequitable.
- Government programs to recover water through funding infrastructure, such as the Sustainable Rural Water Use and Infrastructure (SRWUI) program, can cause a range of problems, including: upgrading infrastructure that subsequently becomes underutilised; and decreasing reliability for water users downstream from the project area (by limiting return flows).
- Rigorous approval processes should be applied to all projects under the SRWUI program. This is likely to result in the budget being underspent. This money should either be reallocated to Restoring the Balance or to other government priorities.

While this study is primarily about market-based mechanisms for recovering water for the environment, it is important also to consider non-market approaches for two reasons. First, the Restoring the Balance program is being implemented within a broader policy agenda that includes non-market water recovery (through government funding for infrastructure upgrades and the Basin Plan). This chapter looks at the implications of these broader plans for market-based water recovery.

Second, the terms of reference ask the Commission to identify effective, efficient and appropriate market mechanisms for purchasing water entitlements. To meet these criteria, a market mechanism needs to be superior to other methods, including non-market methods that could be used instead. Accordingly, this chapter assesses non-market approaches and identifies the circumstances under which it is appropriate to use them.

6.1 Administrative approaches

In Australia, governments set the rules for the operation of water markets and one aspect of this is specifying environmental water allocations. As explained in chapter 2, this is achieved at present mainly through a cap on water extractions from the Basin and state-based water plans (in some cases these plans provide entitlements for specific environmental assets). The amount and proportion of water allocated to the environment via these processes vary according to how wet the year is and other factors. This section discusses altering these rules to recover extra water for the environment.

Recovering water through administrative approaches

Once a decision has been made to increase the amount of water for the environment, there are various types of administrative approaches that can be used to reduce the consumptive use of water. These are summarised in table 6.1 and those relating to regulated and unregulated river systems are explained in greater detail below.

In regulated systems, the simplest approach is to allocate less water per entitlement in years when water is scarce, or in all years if that is deemed necessary. This would result in seasonal allocations being lower on average than they would have been otherwise, because a smaller pool is shared across a given number of entitlements. This approach reduces the average reliability of entitlements, but not necessarily the maximum quantity that can be delivered against them. For example, the original maximum might still be achieved in wet years (figure 6.1, option 1). Note that

climate change may result in the reliability of entitlements decreasing without any administrative recovery of water.

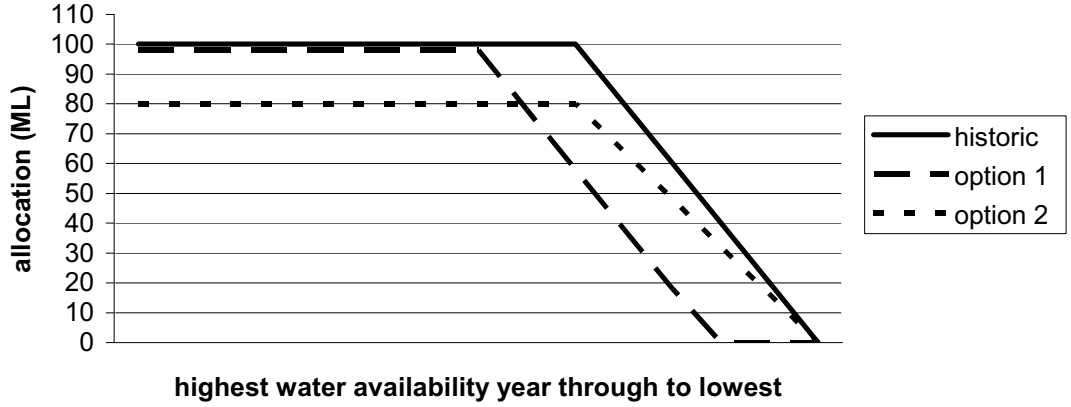
Table 6.1 **Administrative approaches to recovering water**

Type of system	*Possible administrative approaches*
Regulated river systems	• allocate less per entitlement (eg. when water is scarce)
	• reset entitlements to a lower level (with or without transfer of entitlements to the environment)
Unregulated river systems	• change flow-based rules
	• reset entitlements to a lower level
Overland flows	• place greater restrictions on the structures that can be built to harvest overland flows
	• introduce or tighten licence controls on the volume of water that may be harvested
Groundwater	• reset entitlements to a lower level

A second approach is to adapt to a reduced consumptive pool by resetting entitlements to a lower level. For example, a 100 megalitre (ML) entitlement could be reset to 80 ML. Entitlements would then be allocated a quantity of water each year that was lower than it would have been if the resetting had not occurred (figure 6.1, option 2). One variation on this approach is to transfer a proportion of consumptive-use entitlements to an environmental manager. These environmental entitlements would then be allocated water according to the same rules applied to other entitlements. This method, when combined with compensation, is usually what is meant by compulsory acquisition of water entitlements.

Figure 6.1 **Options for administratively recovering water**[a]

Regulated systems



[a] In this example, prior to recovery there is 100 ML of entitlement and allocations of 100 per cent in about 70 per cent of years. Note that variations on the two options shown are possible.

The first option, which reduces entitlement reliability, and the second, which reduces the maximum entitlement volume, can be calibrated so as to provide the same average split between consumptive and environmental water, but with some year to year differences. The choice between them, therefore, would normally be made taking into account which option resulted in the most fit-for-purpose entitlements for irrigators and the temporal variations in environmental water demand. For example, if irrigators were generally of the view that the reliability they were accustomed to was well suited to their businesses they would tend to favour the second option.

The approaches that could be used in unregulated systems are somewhat different. Water entitlements (or licences) in such systems are supplied from the flow of rivers (rather than from water held in storages) and are generally subject to flow-based rules governing when and how much water can be taken. One approach to recovering water in these systems is to make the flow-based rules more restrictive. For example, increasing the flow rate or river height at which water is allowed to be taken, or by creating multiple flow-rate thresholds. An alternative is to reset the volumetric limits of entitlements in a similar way to that described above for regulated systems. For unregulated systems, however, this only reduces consumptive use (and increases environmental flows) in some years. This is because holders of such entitlements are usually only able to take close to their full entitlement quantity in relatively wet years, due to the flow-based rules.

For each of the administrative approaches described, there are further options relating to:

- timing — should changes be made immediately or delayed until the scheduled expiry of water plans?
- compensation — should compensation be paid to entitlement holders, and if so, how much?
- targeting — should the approach be applied equally across all entitlement holders, or targeted based on: location; use to which water is currently being put; or other criteria?

Plans to use these approaches

Administrative approaches have been used to recover water for the environment to a limited extent in recent years. The National Water Commission reported that such approaches have been used successfully in South Australia to address overallocation and overuse (NWC 2009b). Another example is the Goulburn-Murray Water Recovery package, which has been assessed as recovering 120 gigalitre on a

long-term cap equivalent basis. As explained in box 6.1, this was a complex arrangement that involved the creation of a new type of water entitlement, a proportion of which was allocated to the environment, and compensation (some of which was provided in the form of upgrades to infrastructure). As discussed in chapter 2, there are also recent examples of governments reducing allocations of water to the environment through administrative decisions to suspend water plans.

For the next few years, the focus will be on recovering water through purchases and infrastructure upgrades under Water for the Future. Administrative approaches are, however, likely to be used as the Basin planning process unfolds.

The Basin Plan will set sustainable diversion limits (SDLs) for each of the water resource plan areas that make up the Basin (the boundaries of these areas often align with catchment boundaries). The Basin Plan (through the SDLs) will set the water recovery task, but will not specify the means for recovering water. At present, water purchases and infrastructure upgrades are being used in anticipation that there will be substantial gaps between current diversions and the new SDLs. This underpins the 'no regrets' approach adopted by the Department of the Environment, Water, Heritage and the Arts (DEWHA):

> Water entitlements are being purchased using a conservative 'no regrets' approach ahead of the Basin Plan being introduced. This is being done by directing purchases to catchments with the highest environmental need whilst also ensuring that water is not acquired in excess of the estimated reduction in diversions required by the new lower sustainable diversion limits expected in the Basin Plan. (sub. 56, p. 4)

Box 6.1 **Goulburn-Murray Water Recovery Project**

The Goulburn-Murray Water Recovery Project in Victoria involved the creation of a new tradeable, low reliability, water entitlement to replace 'sales water', which was previously made available through administrative decisions. This change was designed to provide greater certainty for irrigators when making investment decisions. Twenty per cent of this new entitlement has been allocated to the environment as a water recovery measure under The Living Murray Initiative. This equates to an estimated increase in water available to the environment of 120 gigalitres per year on a long-term cap equivalent basis. Much of this water will be available to the environment in wetter years (to date no water has been provided). The cost of implementing this measure ($43 million) includes offsets negotiated with stakeholders, such as upgrades of headworks.

Source: MDBC (nd).

The proposed Basin Plan will guide water recovery efforts (including the water purchases that are the focus of this study) from its release in mid-2010. More

definitive guidance will be available when the first Basin Plan is approved by the Commonwealth Minister for Water, due in 2011.

Approval of the Basin Plan will not trigger an immediate requirement for diversions to be brought into line with the new SDLs. This is not required until new state water resource plans (which must be consistent with the Basin Plan) are implemented from 2014 (and 2019 in Victoria). Even then, the Basin Plan allows for 'temporary diversion provisions', which may allow diversions to be above the SDLs for a further period of up to 5 years.

Statements by the Commonwealth Minister for Water imply that the water recovered through Water for the Future is unlikely to fully cover the gap between current diversions and the new SDLs (Wong 2009d). This is consistent with the expectations of those study participants who expressed a view on this matter. It is this remaining gap that seems likely to be, at least partly, recovered through administrative means.

At present, there is no definitive information on how this remaining gap will be addressed and decisions on this may not be made until after the Basin Plan is finalised. However, the risk assignment provisions contained in the *Water Act 2007* (Cwlth) go some way to defining the options that may be used (box 6.2). These provisions allow the risks (and by implication, the costs) associated with the gap between current diversions and the new SDLs to be apportioned between water users, state governments and the Australian Government. As discussed later, water recovery through administrative means, without compensation, is appropriate where water users have already agreed to bear the risks.

What are the implications of these plans for market-based water recovery?

The preceding discussion implies that Restoring the Balance is largely a program to assist irrigators and communities with the transition to the Basin Plan. The main implications of this for water purchasing are examined below.

Any deficiencies in the Basin Plan's SDLs will be inherited by the purchase program

Given that DEWHA intend to use the Basin Plan to guide future purchasing decisions, any deficiencies in the plan's SDLs will affect the effectiveness and efficiency of Restoring the Balance. Having examined the available information on

Box 6.2 **Risk assignment**

The National Water Initiative (NWI) contains a risk assignment framework for future reductions in the availability of water for consumptive use. This framework was to apply after states had addressed known overallocation and/or overuse through their water planning processes. The following part of this framework (sometimes referred to as the 'specific NWI risk assignment provisions') is included in the *Water Act 2007* (Cwlth).

> 48. Water access entitlement holders are to bear the risks of any reduction or less reliable water allocation, under their water access entitlements, arising from reductions to the consumptive pool as a result of:
>
> (i) seasonal or long-term changes in climate; and
>
> (ii) periodic natural events such as bushfires and drought.
>
> 49. The risks of any reduction or less reliable water allocation under a water access entitlement, arising as a result of bona fide improvements in the knowledge of water systems' capacity to sustain particular extraction levels are to be borne by users up to 2014. Risks arising under comprehensive water plans commencing or renewed after 2014 are to be shared over each ten year period in the following way:
>
> i) water access entitlement holders to bear the first 3% reduction in water allocation under a water access entitlement;
>
> ii) State/Territory governments and the Commonwealth Government to share one-third and two-thirds respectively reductions in water allocation under water access entitlements of between 3% and 6%; and
>
> iii) State/Territory and Commonwealth governments to equally share reductions in water allocation under water access entitlements greater than 6%.
>
> 50. Governments are to bear the risks of any reduction or less reliable water allocation that is not previously provided for, arising from changes in government policy (for example, new environmental objectives). In such cases, governments may recover this water in accordance with the principles for assessing the most efficient and cost effective measures for water recovery [these principles are set out in a later clause].

The Water Act specifies that these provisions are to be read in conjunction with the July 2008 Agreement on Murray-Darling Basin Reform, which stipulates that for Basin states that choose to apply the above framework, the Commonwealth will assume all of the risk associated with 'new knowledge' above the first 3 per cent (which remains the responsibility of entitlement holders). As this implies, Basin states can choose not to apply this framework. They can do this through the following clause in the NWI.

> 51. Alternatively, the Parties [the governments who have signed the NWI] agree that where affected parties, including water access entitlement holders, environmental stakeholders and the relevant government agree, on a voluntary basis, to a different risk sharing formula to that proposed in paragraphs 48 - 50 above, that this will be an acceptable approach.

The National Water Commission reported:

> New South Wales and the Commonwealth (in the context of the Murray–Darling Basin) are the only jurisdictions that have adopted the specific NWI risk assignment provisions. Queensland and the ACT have stated that they intend to amend legislation to adopt the NWI provisions as a result of recent changes to the *Water Act 2007*. Other jurisdictions have adopted (or intend to adopt) alternative risk assignment approaches, or have not yet decided their approach. (NWC 2009b, p. xi)

how the SDLs will be set, the Commission's main concern in this regard is the lack of a suitable tradeoff framework.

The objects of the Water Act (s. 3), in part state:

> The objects of this Act are … to promote the use and management of the Basin water resources in a way that optimises economic, social and environmental outcomes

However, the Water Act (s. 23) requires the Murray-Darling Basin Authority (MDBA) to set SDLs that 'reflect an environmentally sustainable level of take', where this is defined as follows.

> environmentally sustainable level of take for a water resource means the level at which water can be taken from that water resource which, if exceeded, would compromise:
>
> (a) key environmental assets of the water resource; or
>
> (b) key ecosystem functions of the water resource; or
>
> (c) the productive base of the water resource; or
>
> (d) key environmental outcomes for the water resource. (s. 4)

The Commission's interpretation is that, despite an apparent conflict with the objects of the Act, this means that the allocation of water between environmental and consumptive uses in the Basin will be determined largely on the basis of scientific assessments of what is required to avoid compromising key environmental assets, ecosystem functions, environmental outcomes and the productive base. While the Commission has not sought legal advice on this interpretation it appears to be consistent with the MDBA's issues paper on SDLs (MDBA 2009c). This paper explains that socioeconomic factors will be considered in decisions on the timing of environmental water provision and on the contribution of each valley, but there is no suggestion that these factors will be taken into account in determining the overall allocation of water between environmental and consumptive uses.

As discussed in chapter 4, scientific assessments of how ecosystems and water quality respond to different watering regimes are extremely important, but are an insufficient basis on which to make decisions about environmental water allocations.

More water for the environment means less water for consumptive use and decisions about this tradeoff should take into account the valuations and preferences of the Australian community. As discussed in chapter 4, this is challenging as it requires an assessment of how highly the community values particular environmental outcomes so that these can be weighed up against the opportunity costs of foregone agricultural production. Nonetheless, it is necessary to do this if the net benefits to the community from the Basin's water resources — broadly defined to include environmental and social outcomes — are to be maximised. The

'science' has no normative content about what should be done, but rather provides information about the consequences of different choices.

This important, but limited, role for science is widely recognised, including by many in the scientific community. For example, an expert reference panel who reported to the Murray-Darling Basin Ministerial Council on environmental flows and water quality requirements for the River Murray system stated:

> It was not the role of the Expert Reference Panel, or scientists in general, to decide upon the compromise between the competing values of production, ecosystem services and the natural environment. (Jones et al. 2002, p. 4)

There may be no major problem in using scientific information alone to set the minimum environmental flows necessary to maintain basic ecosystem functions (for example, the prevention of a serious and ongoing decline in water quality). Beyond this, ignoring preferences is likely to serve the community poorly, for example in situations where:

- deciding not to water some relatively low value, or irreversibly degraded, environmental sites could enable high value consumptive uses to be undertaken
- there are significant recreational, aesthetic and/or cultural values that are not recognised in scientific assessments.

While many submissions on the draft report broadly agreed with the Commission's assessment of this issue (Gwydir Valley Irrigators Association, sub. DR69; Murray River Group of Councils, sub. DR74; National Irrigators' Council, sub. DR65; National Farmers Federation, sub. DR88; SA Government, sub. DR90), two objections were raised. The first, raised by DEWHA, relates to the role of Parliament:

> The Department considers that the procedure set out in the Water Act 2007 for allocating water between environmental needs and consumptive users is a reflection of community preferences in that it is a procedure mandated by Parliament. (sub. DR85, p. 17)

The inference is that the community's preferences, as expressed in the Act and endorsed by Parliament, are to allocate water to the environment above all else, and that it is inappropriate for the Commission to question this. The Commission's role and independence (established by Parliament), however, frequently require it to question whether provisions contained in Acts are in the public interest.

Overall, the Australian community seems to have a clear preference for redirecting some water in the Basin to the environment, but it also benefits from irrigated agriculture, and will have preferences for watering some environmental assets over others. People also have preferences concerning the future of rural settlements.

Satisfying these preferences in a way that maximises net benefits requires consideration of tradeoffs and is what sound water policy should be all about. It is incumbent on the Commission, with its charter to provide policy advice in the public interest, to raise concerns when legal and institutional arrangements threaten to compromise this.

It is also not clear that the government of the time intended the outcome that now appears to be unfolding. Statements by the National Farmers Federation (NFF) are relevant in this regard:

> … in NFF direct representations made to the then Minister for Environment and Water Resources regarding changes to the provisions for the Basin Plan to ensure that social and economic considerations had equal weighting in the Bill, the Minister advised that this wasn't necessary as the Basin Plan must comply with the objects of the Act which were clearly to provide equal weighting and consideration of social, economic and environmental issues. (NFF 2009, pp. 7–8)

The second objection is that the Commission may have misinterpreted the Water Act and that, in fact, social and economic factors will be given an appropriate role in setting SDLs. This view seems to be expressed by the MDBA, which draws attention to the object of the Act referred to above. However, the MDBA go on to say:

> The MDBA will ensure that environmental water requirements and socioeconomic impacts are considered together, with the social and economic analysis being used initially to inform how, where and when water can be delivered to meet environmental requirements at least social and economic cost. (sub. DR87, p. 2)

This statement is consistent with the Commission's understanding, and serves to confirm rather than dispel the concern that environmental and consumptive benefits will not be considered within a tradeoff framework designed to optimise net benefits to the Australian community. This is unless the word 'initially' implies that the social and economic analysis will somehow be used later on in determining tradeoffs. In simple terms, it seems the MDBA will use social and economic analysis in determining 'how, where and when' environmental water will be sourced, but not in determining 'how much' will be provided.

In consultations for this study, it has also been suggested to the Commission that the best available science will not be able to precisely define environmental water requirements and that, therefore, the MDBA will need to exercise considerable judgement in setting SDLs. It is further argued that in this process the MDBA is likely to weigh up environmental, social and economic factors in coming to a position on questions such as which environmental assets are 'key', what is required to avoid them being 'compromised' and what is needed to avoid compromising the productive base of the water resource. This might involve accepting that

environmental assets should be watered on a less than ideal frequency where the consumptive benefits of this outweigh the environmental cost.

While it seems highly likely that there will be some scope for judgement, the Commission has found no indication in statements by the MDBA that social and economic factors will play a significant role in making these judgements. In the Commission's view it is highly desirable that they should, but the process needs to be transparent and a robust tradeoff framework, designed to maximise net benefits to the Australian community, applied. The Commission encourages the MDBA to take this approach to the maximum extent permitted under the Water Act.

Another aspect of the tradeoff between environmental and consumptive uses of water relates to land management. In the development of the Basin Plan, the MDBA does not appear to be required to consider whether:

- continuation of current land management practices will compromise the environmental assets (regardless of how much water is applied)
- land management practices that do compromise environmental outcomes are appropriate (that is, whether the net benefits from this management exceed the benefits of moving to a more environmentally-oriented management regime)
- steps are likely to be taken to bring about a change in land management.

Failure to consider these issues could result in public money being spent to recover water that does not achieve significant environmental benefits. The potential for this to occur is perhaps greatest where environmental assets are on private land. Cotton Australia stated:

> One of our fears would be delivering water to high value environmental assets that are privately owned e.g. Macquarie Marshes and Gwydir Wetlands. This would only encourage overstocking and further degradation and distress for these and similar areas. (sub. 25, p. 2)

The Commission acknowledges that requiring the MDBA to consider these additional issues in developing the Basin Plan would add an extra layer of complexity to what is already a very difficult task. The reality, however, is that not considering them may result in a substantial waste of public funds and unwarranted disruption to rural communities for little (if any) environmental benefit.

FINDING 6.1

The Commission's interpretation of the Water Act 2007 (Cwlth) is that it requires the Murray-Darling Basin Authority to determine environmental watering needs based on scientific information, but precludes consideration of economic and social costs in deciding the extent to which these needs should be met. This means that the overall proportion of water allocated to the environment is to be determined without explicitly taking into account the Australian community's environmental preferences, the opportunity cost of foregone irrigation or the role of other inputs such as land management. There is a risk that this approach will impose unnecessarily high social and economic costs.

RECOMMENDATION 6.1

The Murray-Darling Basin Authority should set sustainable diversion limits (SDLs) in a way that balances environmental, social and economic tradeoffs. This approach would appear to be consistent with the objects of the Water Act 2007 (Cwlth), but may not be consistent with the specific provisions defining how SDLs are to be set. If it is inconsistent, the Water Act should be amended.

There is choice as to how inter-valley environmental water contributions are determined

Many environmental sites in the Basin could be supplied with water recovered from more than one catchment. For example, the Coorong and Lower Lakes could be supplied from the Murrumbidgee, Murray, Goulburn-Broken and a range of other catchments. The Basin Plan is required to set SDLs for each catchment and in doing this, decisions will need to be made on how much water each is to contribute to such environmental sites. An issues paper released by the MDBA states that social and economic consequences need to be considered in determining these contributions (MDBA 2009c). The MDBA plans to conduct socioeconomic analysis of the communities in the Basin, in part, to inform this consideration.

The difficulties in using such an approach is illustrated by the following hypothetical example. Imagine that there are two catchments, A and B, that could each supply a downstream environmental site. Analysis finds that there are likely to be negative social and economic consequences from reducing diversions in each of these catchments, but that they are more pronounced in catchment A than in B. This finding could be used to support a decision to take most or all of the required water from catchment B. If this were done, the decision would be likely to be strongly contested by communities in catchment B, who might not only question the accuracy of the analysis but also the appropriateness of a central authority deciding

that socioeconomic conditions in one area should suffer in order to protect another area.

An alternative approach would be to allow the buyback to determine the contribution that each catchment makes to supplying the environmental needs of downstream sites. This would require the environmental benefit per unit of water from each catchment to be determined and used in setting the prices that would be accepted in the buyback. For example, if water from one catchment incurred greater evaporative losses before reaching the site, the price offered in this catchment would be lower than for the others (other things being equal).

This market-based approach has appeal because of its potential to recover water to achieve environmental objectives at least cost to the Australian community. There are, however, reasons against giving this role to the buyback, including that:

- the potential for the buyback to produce a more efficient outcome is undermined by barriers to trade that vary across jurisdictions (discussed in chapter 10)
- it would mean that some Basin communities would need to wait longer before knowing how much water the government's activities will remove from their region.

The Commission considers the second of these disadvantages to be particularly important because consultations for this study indicate that irrigators and rural communities want to know the SDLs for their catchment as soon as possible, so they can plan for the future with greater certainty.

Accordingly, while having the MDBA determine the contribution that each catchment makes to supplying the environmental needs of downstream sites is unlikely to be economically efficient, it may be the best available method.

The Commission, however, is not convinced that incorporating socioeconomic analysis into this determination is helpful. Where water from multiple catchments can provide approximately equal environmental benefits it may be that pro rata contributions (possibly based on natural flows) is the most equitable approach. Subsequent trade between catchments would tend to limit the efficiency cost of this approach, as it would allow water to be reallocated to higher value uses where this is possible.

Alignment between water purchasing and the Basin Plan is needed to avoid inequitable results between regions

To date a much greater proportion of water entitlements have been purchased in some areas, such as the Gwydir Valley, than others, such as the Condamine-Balonne region. Some study participants are concerned that areas where little purchasing has occurred could be subject to steep administrative cuts in water extractions when the new SDLs come into force (Brimblecombe, sub. 12; National Irrigators' Council, sub. 24). That is, that these areas will not have fully benefited from the buyback as a transitional measure. For example, the National Irrigators' Council stated:

> … while the Gwydir Valley has provided rich pickings for the buyback, at the other end of the scale no purchases have been made from the mid and upper Condamine region in Queensland and very few entitlements have been purchased from the Border Rivers area. This leads to concern that those areas may be disadvantaged if their new Sustainable Diversion Limit (SDL) is cut significantly under the Basin plan. (sub. 24, p. 3)

The lack of purchases in the Condamine-Balonne region can be explained by delays in implementing the Resource Operations Plan for the region and other factors (chapter 10). Once these impediments are overcome, it would be expected that Commonwealth water recovery could proceed. Accordingly, slow progress in purchasing in particular catchments is not necessarily an indication that entitlement holders located there will be disadvantaged in the longer term.

Taking a Basin-wide perspective, a DEWHA submission to this study stated:

> The Department is likely to review the approach to purchasing, particularly the environmental watering priorities guiding purchase decisions, when the proposed Basin Plan is released in 2010. (sub. 56, p. 9)

This suggests that users in particular catchments are unlikely to face disproportionately high administrative cuts (relative to other catchments) as a result of the pattern of purchasing under the buyback.

Unwarranted constraints on adaptive management need to be avoided

Once the Basin Plan's SDLs and the Environmental Watering Plan are in force, they will largely override the influence of the Restoring the Balance purchases on environmental outcomes. This is not entirely the case, however, because active management of entitlements and any other water products held by the Commonwealth Environmental Water Holder (CEWH) could be used to improve environmental outcomes over and above what is achieved by the Basin Plan.

One aspect of this is that, as new information becomes available on environmental responses to different watering regimes and on the value placed on particular environmental outcomes, it should be possible for the CEWH to improve overall environmental benefits through trade. This could involve:

- selling water allocations or entitlements in one catchment and purchasing them in another where the environmental benefits are expected to be greater
- selling allocations in one year and buying them in a later year to supplement a natural flooding event
- selling allocations when the price is high and buying them when the price is lower
- selling entitlements and buying options contracts.

These are examples of adaptive management, the importance of which is discussed in chapter 5.

The Water Act includes provisions that enable the CEWH to trade to improve environmental benefits, in certain circumstances. The extent to which these provisions will be able to be exercised, however, may depend on how trading by the CEWH interacts with the SDLs.

Water held by the CEWH will not be limited by the SDLs — in other words, it is outside the SDLs (MDBA 2009c). Accordingly, water sold by the CEWH to consumptive users may go from being outside the SDLs to inside the SDLs (and vice versa for water purchased). There are a range of possibilities for how these trades might be treated in order to avoid third-party impacts and other adverse consequences.

One option, that in the Commission's view should be avoided, is disallowing trades on the grounds that they would be inconsistent with the Basin Plan. The Basin Plan will be developed using the information available at the time. Inevitably, new information will be gained over time and insisting on the Basin Plan taking precedence over the trading opportunities of the CEWH would prevent full use of this information to improve environmental outcomes. The resolution of this issue is likely to lie in building an appropriate degree of flexibility into the Basin Plan.

RECOMMENDATION 6.2

Some new information on how to improve environmental outcomes from watering will inevitably become available after the Basin Plan is made. To enable such information to be fully utilised, the Murray-Darling Basin Authority should ensure that the Basin Plan is sufficiently flexible to allow the Commonwealth Environmental Water Holder to trade water allocations and entitlements in ways that improve overall environmental outcomes.

How do these plans rate using the assessment framework?

As stated above, there are no major plans to use administrative approaches to recover water over the next few years, but they may be used when state water resource plans are introduced from 2014.[1] How does this approach rate against the assessment framework detailed in the previous chapter? Under what circumstances should administrative approaches be favoured over water purchases and vice versa?

Administrative approaches without compensation

In determining the appropriate means of recovering water for the environment, it is necessary to establish who is to bear the cost. Where governments are responsible, water recovery approaches that may be appropriate include voluntary or compulsory water purchases. Where entitlement holders are to bear the cost, some type of administrative approach without compensation is the appropriate option. The NFF (sub. DR88) equated water recovery without compensation to theft by the government. However, this is at odds with what has been agreed under the National Water Initiative (NWI).

The risk assignment provisions contained in the Water Act are likely to play an important role in determining how the costs associated with achieving the reductions in consumptive use required under the Basin Plan, are to be shared across water users and governments. The MDBA is required to use these provisions in quantifying the Australian Government's responsibilities, and these will be set out in the Basin Plan. The Basin states are taking different approaches to risk assignment and, in some cases, are developing their own approach as allowed for under the NWI (box 6.2).

[1] In this context, the Basin Plan is taken to be a means for setting targets for water recovery, rather than an administrative approach to recovering water.

The Water Bill 2007 Explanatory Memorandum states:

> The Commonwealth will meet its responsibilities as far as is practical by investing in works and measures to reduce water wastage and improve the efficiency of consumptive water use and water delivery and by purchasing entitlements. (p. 23)

It might be inferred from this that the Australian Government plans to meet its responsibilities largely through recovering water via the Restoring the Balance and SRWUI programs, but the government has not explicitly acknowledged this.

At present, neither the quantity of water to be recovered or the proportion to be assigned to the Australian Government is known, as the Basin Plan is still being developed. What is known is that the Australian Government plans to pay for the recovery of a considerable quantity of water directly through purchases and indirectly via infrastructure upgrades. A relevant question to ask, therefore, is whether this is consistent with the legislated risk sharing provisions.

It seems that this question cannot be definitively answered because there is considerable uncertainty about how risks are to be assigned. This is partly because the approach to risk assignment that will be taken by the Basin states is not fully resolved. More importantly, there is uncertainty about how the risk assignment provisions in the Water Act are to be interpreted.

The NWI states that these provisions were intended to be applied after known overallocation and/or overuse had been addressed by the states. It is unclear, however, the extent to which this has occurred, and the extent to which the Basin Plan will resolve this overallocation. Untangling this issue is difficult because, as the National Water Commission notes, there is no agreement among jurisdictions on what overallocation means and very few water resource plans introduced since the NWI explicitly address overallocation (NWC 2009b).

Accordingly, there is potentially a large slice of the water recovery that will be required under the Basin Plan that could be attributed to ‘overallocation’, or alternatively could be assigned to either ‘policy change’ or ‘new knowledge’. The former is a state issue and, at least in some cases, state-based water legislation allows overallocation to be addressed without compensation (NWC 2009b). Reductions in the water available for consumptive use due to policy change (under the Basin Plan) would be a Commonwealth issue and is compensable. Risk assignment for reductions due to new knowledge about a water systems’ capacity to sustain particular extraction levels is different again (box 6.2).

The uncertainty surrounding these issues has implications for the efficient conduct of the buyback. In consultations for this study, many participants expressed views similar to the following:

> Irrigators remain uncertain about entering a tender to the buyback when the loss of an unspecified amount of water allocation on a permanent basis will occur when the Basin Plan is finalised. (Western Murray Irrigation, sub. DR76, p. 3)

FINDING 6.2

Considerable uncertainty exists about the application of the risk assignment provisions set out in the Water Act 2007 (Cwlth) in respect of compensation that might be payable to irrigators upon the implementation of the Basin Plan. This is impeding the ability of irrigators to plan for the future and is affecting the efficient conduct of the buyback.

RECOMMENDATION 6.3

All Basin jurisdictions should clarify how the risk assignment provisions in the Water Act 2007 (Cwlth) will apply to the reductions in water availability that are likely under the Basin Plan. This should occur as soon as possible.

Because of the current uncertainty regarding risk assignment, it is possible that the Australian Government's water recovery activities (through its water purchasing and infrastructure programs) in the lead up to the Basin Plan will exceed its obligations. This would amount to paying for water recovery that irrigators and/or state governments had agreed was their responsibility.

The current approach of acquiring a considerable quantity of water through compensated means, therefore, may err on the side of generosity towards entitlement holders. On the other hand, it might be considered reasonable because:

- it helps maintain confidence in the property right arrangements for water and this confidence is necessary for long-term investment in irrigated agriculture
- the use of administrative approaches without compensation would probably need to be delayed until new state water plans are introduced, and this delay could have serious environmental consequences.

It will be fortuitous, however, if the budgets allocated to the Restoring the Balance and SRWUI programs recover a quantity of water that aligns closely with the quantity needed to meet the Australian Government's responsibilities overall. This is because the budgets were set before the MDBA even began the process of developing the Basin Plan and setting SDLs. If these budgets prove inadequate, the government will need to allocate further expenditure either to recover water or compensate water users for reduced (or less reliable) allocations (a process

anticipated in the Water Act). If the expenditures are in excess of what is required, the Australian Government may bear costs that should have been borne by water users and/or state governments.

It is clear that entitlement holders should bear risks associated with reductions in water availability due to climate change. Purchasing a water entitlement does not guarantee access to a set quantity of water each year. The nature of these property rights is that allocations depend on inflows to river systems and other factors. Where there is year-to-year variability in inflows, allocations can be affected, something that is well understood by irrigators. The same applies where there are longer term variations in inflows, whether this is due to human-induced climate change, or other causes such as bushfires. This is unambiguously recognised in the legislated risk assignment provisions.

Administrative approaches with compensation

Some commentators have argued that even if recovering water through administrative means warrants compensation, this may still be better than using voluntary water purchases (Young and McColl, sub. 5). Leaving aside issues that arise only in unregulated systems, the two main (interrelated) arguments for this are that it would be quicker, and cause less disruption to water markets and the irrigation sector.

Theoretically, a move to a lower level of water extraction could be made quickly through compulsory acquisition of a proportion of all entitlements. However, this outcome could also be achieved through voluntary acquisitions, as indeed the Australian Government's now greatly accelerated buyback appears intent on achieving (chapter 8).

There would also appear to be no reason to expect that a quick voluntary buyback would be more disruptive to water markets and the irrigation sector than compulsory acquisition. Voluntary purchases tend to recover water from those irrigators who value their water least, while compulsory acquisitions are indiscriminate in this regard. Accordingly, compulsory acquisitions would be expected to be followed by a higher level of trade as some irrigators sought to regain some or all of the water acquired, prompting others to choose to leave irrigated agriculture. This might be perceived as being disruptive to the market.

In any case, there is a question mark over whether recovering water is best done quickly. On the plus side, faster-paced water recovery is likely to achieve environmental benefits more quickly. On the negative side, it is likely to cause greater adjustment pressures for rural communities and businesses that service

irrigated agriculture. Fast-paced water recovery is also likely to be more expensive for governments. These issues are discussed more fully in chapter 8.

While compulsory acquisition in regulated systems appears to have no significant advantages over voluntary acquisition, there are disadvantages. First, water is recovered from those who value their water most as well as those who value it least, without discrimination. Second, some irrigators are likely to be, or feel that they have been, made worse off. By their nature, voluntary sales do not produce this result for those selling. Another disadvantage is that the level of compensation could be subject to dispute and this may be played out in lengthy and costly court cases.

FINDING 6.3

Purchasing water products from willing sellers is generally the most effective and efficient means of acquiring water, where governments are liable for the cost of recovering water for the environment.

In unregulated systems, administrative water recovery accompanied by compensation does have some potential advantages. Water trading is generally not well established in unregulated parts of the Basin (chapter 3). One reason for this is that changing the location of extraction (or trade from an extractive use to a non-extractive use) can interact with the flow-based rules that govern water extraction in ways that have significant third-party impacts.

For example, trade can lift the flow rate immediately downstream of the seller (from what it would otherwise be) and this can allow entitlement holders located there to legally extract more water. If the buyer is located a considerable distance downstream (or the buyer is an environmental manager who wants the water delivered to a downstream site) the water purchased might not reach them. Accordingly, purchasing water for the environment in these systems can be ineffective, unless there is an ability to 'shepherd' the water past other users so that it reaches its intended destination.

Administratively changing the flow-based rules for all entitlements in a system can overcome this problem. If all users face more restrictive rules regarding when they can extract water, and the rate of extraction, there will be more water left in the system for environmental purposes (providing it was the original rules and not overall limits on the volume of extraction that was previously limiting extraction).

Flow-based rules currently play an important role in meeting environmental objectives in unregulated systems in the Basin. Where improved environmental outcomes are sought, making these rules more restrictive (and providing

compensation where appropriate) may, in some cases, be the best option. Chapter 7 provides a full discussion of these issues.

6.2 Infrastructure upgrades

Funding irrigation infrastructure upgrades that produce water savings is a non-market approach to water recovery that features prominently in the Australian Government's Water for the Future plan. The study terms of reference requires the Commission to consider how to maximise synergies between water purchasing and the government's infrastructure program.

Recovering water through infrastructure upgrades

Investment in irrigation infrastructure can take many forms, including lining channels, installing automated water management systems, and laser grading paddocks used for irrigation. These investments can reduce the amount of water needed to grow crops and pasture, and provide a range of other benefits, such as labour savings. Irrigation infrastructure operators and farmers have strong incentives themselves to invest in cost-effective irrigation infrastructure projects as a normal part of running their businesses.

Governments can also become involved in funding or co-funding irrigation infrastructure projects. This does not in itself recover any water for the environment. For example, a farmer benefiting from government funding might be left with water that is surplus to what is needed to complete their normal irrigation program, but could choose to either sell this water to another farmer, or use it to irrigate more land. For governments to recover water for the environment through infrastructure upgrades, they need to gain ownership of some or all of the water savings in return for the funding they provide. Where they do this, governments are effectively buying water, but with the requirement that the payment they provide be used to invest in irrigation infrastructure.

Infrastructure upgrades frequently produce water savings at the farm or irrigation district level. Due to hydrological realities, however, these savings can be at least partly at the expense of downstream water users and/or ecosystems (box 6.3). These broader effects need to be taken into account when assessing the merits of recovering water through infrastructure upgrades.

Box 6.3 **Issues in assessing water savings**

From the perspective of an individual irrigator, or an irrigation infrastructure operator, it can be reasonably straightforward to define and measure water savings that arise from upgrading irrigation infrastructure or changing management practices. For example, if an on-farm infrastructure upgrade means that a given crop can be grown with 70 megalitres (ML) of water instead of 100 ML, the irrigator has achieved a 30 ML water saving. Similarly, if lining a channel means that an operator only has to release 105 ML, rather than 135 ML, of water to supply users with 100 ML, the operator has achieved a 30 ML saving.

Complexities arise, however, when water savings are looked at from a catchment perspective (as is necessary in managing the Basin's water resources). In the examples given, the 30 ML of water 'saved' might otherwise have ended up as a mix of return flows to a river, recharge to groundwater, water entering a local wetland and evaporation. Not all of these represent true savings at the catchment scale.

Reducing return flows does not generally represent a saving from a whole-of-catchment perspective as this water would have been available for other uses. In some cases, however, return flows are of low quality and so reducing them is not always to the detriment of downstream users. Also, reducing groundwater recharge may or may not be a true saving, depending on whether the groundwater is accessible and/or saline (there may also be delays in the water becoming available for reuse). Reducing flows to a local wetland is not a saving if that water would have improved the condition of a site that is valued by the community (although it may be that the water could have been used to produce a greater benefit if applied to a different site and/or at a different time). This leaves reduced evaporation as the only component that is clearly a saving from a catchment perspective.

As an additional complexity, any water savings achieved through upgrading infrastructure may be reduced from what was expected if the infrastructure becomes underutilised as a result of climate change and/or water being traded out of the area.

A number of studies point to the need to understand these complexities when examining claims for how much water can be saved through actions such as upgrading irrigation infrastructure, and related claims that water is being wasted or that water use can be made more efficient (Crase and O'Keefe 2009; Molle and Turral 2004; Perry 2007; PC 2006). Two overlapping themes in this literature are that: water savings achieved within one area often reduce the amount of water available downstream; and apparent water savings can prove to be illusory when examined at the appropriate scale.

One study, Qureshi et al. (2010), estimated the reductions in return flows that were likely to arise when water for the environment was recovered through irrigation infrastructure subsidies in the Murrumbidgee catchment. They found that failure to account for changes to return flows could lead to substantial overestimates of water savings (25 per cent in one scenario, higher in others). They also found that the degree

(Continued next page)

Box 6.3 (continued)

of overestimation was higher when the apparent water savings were shared between irrigators and the environment (such sharing is a common feature of Sustainable Rural Water Use and Infrastructure projects).

Improving the accuracy of water metering is another activity that is sometimes claimed to save water. Introducing more accurate metering will result in water users extracting less water against a given set of allocations, if the previous metering tended to understate water use. This brings about a reallocation of water rather than water savings. Those water users whose meters have been replaced get less water (and so will produce less, unless they enter the market to buy replacement water) while more water is available in the system for other uses, including environmental uses. While there can be good reasons for introducing more accurate water metering, achieving water savings is not among them.

Plans to use this approach

In recent years, Australian governments have relied heavily on infrastructure upgrades as a means of recovering water for the environment. During the course of the Living Murray Initiative, however, high costs and long delays experienced when using this approach eventually led to a switch towards greater use of market-based measures (appendix B). The lessons learned from the Living Murray Initiative appear to have had some influence on the design of the Water for the Future plan, with substantial funding allocated to market-based water recovery. Still, a substantially greater sum has been allocated to recovering water through infrastructure upgrades under the SRWUI program.

The $5.8 billion SRWUI program is focused mainly on reconfiguring and upgrading irrigation infrastructure to increase water use efficiency in rural Australia, predominately in the Basin (table 6.2). The objectives of the program are to:

- deliver substantial and lasting returns of water for the environment
- secure a long-term future for irrigation communities
- deliver value for money in the context of the first two tests.

DEWHA report:

> More than $4.4 billion has been committed to date under SRWUIP to significant state-based water infrastructure projects and investment, most of which in return for a share of water savings, in modernisation of privately owned irrigation operations in the Murray-Darling Basin. This figure includes election commitments funded under the National Partnership Agreement on Water for the Future, as agreed by First Ministers. (sub. DR85, p. 12)

Table 6.2 **Components of the Sustainable Rural Water Use and Infrastructure program[a]**

Project or program	*Funding ($ m)*	*Description*
State priority projects[b]		
NSW: project 1	up to 650	Upgrades to private irrigation operators infrastructure
NSW: project 2	up to 137	Piping stock and domestic supply systems
NSW: project 3	up to 300	Modernising on-farm infrastructure
NSW: project 4	up to 221	Water metering scheme
NSW: project 5	up to 50	Modifications to floodplain infrastructure
Vic: project 1	up to 1000 or 90% of project value	Northern Victoria Irrigation Renewal Project Stage 2
Vic: project 2	up to 103	Sunraysia Modernisation Project
Qld: project 1	up to 115	Community level irrigation planning and infrastructure investment
Qld: project 2	up to 40	Upgrade Sunwater's water delivery systems
Qld: project 3	up to 5	Feasibility study on using coal seam gas water
SA: project 1	up to 120	Integrated pipelines project
SA: project 2	up to 100	Improve river management
SA: project 3	up to 110	Upgrade irrigation infrastructure
SA: project 4	up to 200	Lower Lakes and Coorong Recovery project
ACT: project 1	up to 85	Salt Reduction Strategy project
Other components		
On-Farm Irrigation Efficiency Program	300	Assistance to irrigators in the southern-connected Basin to modernise on-farm irrigation infrastructure
Menindee Lakes Project	up to 400	Project to reduce evaporation, secure Broken Hill's water supply and protect the environment
Strengthening Basin Communities	up to 200	Grants to local governments for community-wide planning for a future with less water and investing in water saving initiatives
Water Meter Test Facilities	Up to 7	Provision of water metering test facilities

a This table includes the main elements of the SRWUI program. It does not include a number of smaller projects. **b** Project amounts are in principle with funding subject to due diligence assessment.

Sources: COAG (2008a); DEWHA (2009l); DEWHA (unpublished).

Funding for the state-based projects mentioned (known as 'state priority projects') is subject to a 'due diligence' assessment of their social, economic, environmental, financial and technical aspects (COAG 2008a).

What are the implications of these plans for market-based water recovery?

Coordination becomes important

If buybacks were conducted in the absence of a government program to recover water through irrigation infrastructure upgrades, market incentives would be expected to effectively coordinate the mix of water recovery activities. Irrigators (and irrigation infrastructure operators) could look at all options for freeing up water to sell it into the buyback. These might include: changing to less water intensive crops; investing in water saving infrastructure; and exiting irrigated agriculture. Each irrigation business could decide whether to sell water after weighing up the costs, benefits and risks of each option.

The existence of a very large infrastructure program, such as the SRWUI program, introduces the need for governments to ensure proper coordination. The two main issues here are sequencing water purchasing and infrastructure upgrades, and dealing with proposals that seek to access funds from both programs.

Sequencing is important so as to avoid the inefficiency of upgrading infrastructure that subsequently becomes underutilised or made redundant. This outcome could be avoided in the following ways.

- In the main, committing to infrastructure projects only after a majority of water purchasing has been completed. It would seem that this outcome is at least being partly achieved due to lengthy lead times in developing infrastructure proposals and the acceleration of the buyback.
- Subjecting project proposals to rigorous assessment that considers possible impacts of the buyback and the SDLs on the value of the upgraded infrastructure.
- Ensuring that unwarranted premiums are not paid for water recovered through infrastructure upgrades. Avoiding such premiums increases the incentives for irrigators and irrigation infrastructure operators to craft proposals very carefully, taking into account the risk of future underutilisation.

Avoiding unwarranted premiums is also important for proposals with both infrastructure and water purchase components. Premiums create an incentive for proponents to overstate the level of water savings that will be achieved through infrastructure works. This creates difficulties in assessing and monitoring proposals. There is also a risk that premiums could be used as an arbitrage opportunity, with successful applicants effectively selling water to the government at a premium price and then re-entering the market to purchase replacement water at the market price.

How do these plans rate using the assessment framework?

Study participants expressed a diverse range of views on the merits of governments recovering water through infrastructure upgrades. The Victorian Farmers Federation (sub. 31) advocated using infrastructure upgrades to recover all of the required water if possible, and only purchasing water as a last resort. Watson (sub. 11, p. 2) had a very different view, arguing that '[t]he case for public provision of the essential capital equipment, off-farm and on-farm, of the irrigation industry, ostensibly part of the private economy, is tenuous'. This section uses the framework outlined in chapter 5 to assess the plans to recover water through the SRWUI program.

Budgetary cost effectiveness

Recent experience is that the cost per ML of government efforts to recover water for the environment through infrastructure upgrades is highly variable, but in most cases exceeds the cost for recovery through purchasing. For example, a progress report on the Living Murray Initiative shows that infrastructure projects recovered water at an average cost of around $2200 per ML compared to $1700 per ML for market purchases, in both cases on a long-term cap equivalent basis (appendix B, table B.3). The majority of infrastructure projects recovered water at a cost that was nearly 50 per cent higher than the average cost for recovery through market purchases.

Because most SRWUI projects are in the planning stage, it is uncertain what their cost per ML of recovered water will be. As shown in table 6.2, some are state priority projects and the due diligence criteria that are to apply to these appear to suggest that budgetary cost effectiveness will be given appropriate attention. The criteria include:

> … projects must have a suitable dollar per megalitre benchmark against local/regional water market prices and represent cost- and time-effective strategies for achieving water savings. (Agreement on Murray-Darling Basin Reform, 3 July 2008, p. 55)

Information available on the largest project, the Northern Victoria Irrigation Renewal Project (NVIRP) Stage 2, however, seems to be at odds with the due diligence requirements. The website for this project suggests that for a contribution of up to $1 billion, the Australian Government will receive a half share in 200 GL of expected water savings (NVIRP nd). This means that if the full $1 billion is contributed, the government will contribute $10 000 for each ML recovered for the environment. NVIRP point out that the overall unit cost of water savings is much less, at $5000 per ML (sub. DR68). By comparison, high reliability Goulburn water entitlements were purchased under the Restoring the Balance program during

2007-08 and 2008-09 at an average price of $2382 per ML (equivalent to $2507 per ML on a long-term cap equivalent basis).

In cost-effectiveness terms, this implies that the Australian Government may pay up to four times as much for recovering environmental water through infrastructure upgrades than through water purchases. In other words, a premium of up to $7500 per ML may be paid for recovering water through infrastructure upgrades under the SRWUI program. (The offsetting benefits to irrigators and rural communities are discussed below.) Premiums of this magnitude greatly reduce the environmental benefits that can be obtained from a given level of government funding. For premiums to be warranted they need to provide at least commensurate benefits in addition to those from water recovery in a way that meets public policy objectives.

Several participants objected to the use of the NVIRP example, as they regarded it as extreme, implying that premiums paid for other SRWUI projects would generally be much less (Coleambally Irrigation Co-operative Limited, sub. DR77; NSW Irrigators' Council, sub. DR72). In the Commission's view, NVIRP is of particular interest because it is the largest SRWUI project. Also, while it seems likely that premiums for many other projects will be less, no specific examples of this were provided in submissions. Even where premiums are lower, they would still need to be matched by benefits to be warranted.

FINDING 6.4

Funding irrigation infrastructure upgrades is generally not a cost-effective way for governments to recover water for the environment.

Economic efficiency

Many submissions from irrigators and irrigator groups emphasised that government funding for infrastructure upgrades can produce a range of benefits in addition to water recovered for the environment (box 6.4). The existence of such benefits means that it is possible that an infrastructure upgrade could be economically efficient even if its budgetary cost effectiveness as a water recovery measure was poor.

This would occur if the overall benefits of investing in the upgrade exceeded the costs, from a community-wide perspective. This would require the premium paid by the Australian Government to be exceeded by:

- private net benefits for irrigators/irrigation infrastructure operators (net of the value of the entitlements transferred to the Commonwealth); plus

- external benefits (in addition to the environmental benefits from the acquired environmental water).

Box 6.4 Participant views on the benefits of government funded infrastructure upgrades

Victorian Farmers Federation

When Governments invest in infrastructure, the community maintains the economic benefits and the environment receives the water savings without damaging the important economic contribution of agriculture. (sub. DR78, pp. 9–10)

National Farmers Federation

The Commission's discussion regarding infrastructure, and its draft findings against infrastructure investment clearly do not or under-consider the wider benefits of infrastructure investment. As an example, a large program of on farm investment may be used as a means of support to drought ravaged communities. Farmers have mothballed farms and so it is the perfect opportunity to undertake significant change. Service providers who have lost business due to the drought (e.g. chemical sprayers) could have been diverted to laser levelling. Investment in locally produced and/or supplied infrastructure could keep local economies operating as well as local employment. There is considerable flow on benefits for the Commonwealth in terms of retention of services to rural communities and decreased costs for Commonwealth funded assistance programs (e.g. unemployment benefits). (sub. DR88, p. 10)

NSW Irrigators' Council

… a full and complete analysis of the [benefits of infrastructure works] … must be undertaken prior to a conclusion — and recommendation — being reached. In particular, we submit that an understanding of the value of the retention of rural productivity, employment and social benefits associated therewith be obtained forthwith. (sub. DR72, p. 8)

Murrumbidgee Irrigation

Water savings projects, when taking into account broader implications of asset redundancy and loss of economic activity can be more cost effective depending upon the nature and cost of the projects. (sub. DR86, p. 6)

Western Murray Irrigation

Western Murray Irrigation concurs that the payment of a premium per ML of water recovered is a form of subsidisation but also an incentive for irrigators to participate. The market price is a fair indicator, however, to encourage water use efficiency and water recovery a small premium to reflect net benefits to the community should be considered. (sub. DR76, p. 3)

Queensland Government

Queensland considers that, while investment in infrastructure may be less efficient than direct purchases of water entitlements, there may also be social benefits that are harder to quantify. (sub. DR75, p. 3)

Department of the Environment, Water, Heritage and the Arts

The Department believes that the benefits flowing from investing in rural water infrastructure include benefits beyond those considered in the draft report. (sub. DR85, p. 12)

If an investment was economically efficient purely on the basis of private benefits, this begs the question as to why irrigators or irrigation infrastructure operators would not have undertaken it without government involvement. In consultations for this study, the Commission was frequently told that water scarcity over the last decade had prompted those in the irrigation sector to look for every conceivable means of saving water cost effectively. For example, Cotton Australia reported that an environmental management program for growers has achieved 'huge improvements in water use efficiency' (sub. 25, p. 2).

Some participants have suggested that worthwhile irrigation infrastructure investments have gone unrealised because many irrigators are not able to access capital to undertake them, due to drought or other reasons (for example, Coleambally Irrigation Co-operative Limited DR77). In a recent inquiry, the Commission 'found no evidence that farmers' access to capital differed in any significant way from that faced by other small businesses', notwithstanding widespread drought conditions over recent years (PC 2009, p. XXXI). In the Commission's view, there is no failure in capital markets that would warrant government funding of irrigation infrastructure projects ahead of any other infrastructure. Governments could, however, help create an environment that was more supportive of private investment in irrigation infrastructure by reducing uncertainty about future water policy settings.

DEWHA argued that the case for government funding was related to:

> … [irrigation infrastructure operators'] … reluctance to impose adequate user charges to maintain the infrastructure in the face of protests from water users. These issues have seen some systemic market failures in infrastructure provision for at least three decades. (sub. DR85, p. 13)

It may be that some operators have failed to properly maintain their infrastructure, but this does not constitute a market failure. Even if it was considered a market failure, the solution is the imposition of the correct prices on irrigators, not large-scale scale subsidy of infrastructure upgrades, funded by taxpayers.

Given that knowledge about irrigation investments resides primarily with private agents, it seems unlikely, to say the least, that governments could identify billions of dollars worth of worthwhile projects that have been overlooked. If governments do have information unavailable to some irrigators, providing information, for example, through extension services, would be likely to be a more efficient policy approach than subsidies (Pannell 2008b).

This leaves the possibility of investments being economically efficient due to external benefits that cannot be captured by the private agents who might invest in them. But infrastructure works can also produce external *costs* and these also need

to be considered. An example is lower return flows to rivers reducing water availability for downstream users (box 6.3). Due to these external costs, the private incentives for investing in water saving infrastructure upgrades are sometimes higher than is socially optimal, even without a government subsidy.

Where it is believed that an infrastructure project may be economically efficient, this can be tested through cost–benefit analysis. When conducted properly, such analysis provides a means of weighing up all of the costs and benefits of a project, both private and external. Table 6.3 lists the main types of costs and benefits that should be included.

Several submissions argued that in addition to the costs and benefits shown in table 6.3, flow-on (or multiplier) benefits from infrastructure investments should also be taken into account. For example, the National Irrigators' Council argued:

> … from a taxpayer perspective, maintaining efficient and vibrant irrigation systems provides flow-on benefits for the rest of the community, particularly in employment. (sub. DR65, p. 6)

In a similar vein, Cotton Australia, contended:

> Infrastructure investment can help to maintain productivity and allows regional economies to thrive on the back of the 3.5 times multiplier that irrigated agriculture provides. (sub. 25, p. 7)

In the Commission's view, such benefits are often believed to be higher than they are in reality. Sometimes this is because flow-on benefits are acknowledged but not flow-on costs.

For example, government investment in irrigation infrastructure could in some cases allow an existing food processing plant to continue operation, or encourage a new plant to be built. In this sense, the income generated by the plant is dependent on the infrastructure investment, but in generating this income additional costs are also incurred. If the plant was not maintained or built, resources would generally move to other beneficial activities. Most existing or prospective employees of the plant would in all likelihood find or retain alternative employment and at least some of the capital tied up in the plant would be used elsewhere. In some cases resources will move to another region and this has implications for the distribution of costs and benefits.

This is not to say that there are never any flow-on benefits from irrigation infrastructure investments, but rather that looking at gross, rather than net, benefits greatly overstates them. The idea of multiplier effects (whereby a new project multiplies its benefits by increasing demand in associated industries) is similarly flawed, because it ignores the fact that resources can be put to other beneficial uses.

Table 6.3 **Main types of costs and benefits associated with government-funded infrastructure upgrades**

Type of cost or benefit	*Description*	*Comment*
Costs		
Government project-related costs	The cost to government of funding the project. This could include project assessment, management, construction, administration and monitoring costs.	Costs associated with assessing and monitoring projects can be significant and it is important that these are included in addition to the funding provided for on-ground works.
Irrigator project-related costs	The cost to irrigators and/or irrigation infrastructure operators of the project. This could include costs associated with meeting government requirements for information and monitoring. Some project management and construction costs might also be borne by irrigators.	The transactions costs associated with meeting the requirements of government programs can be significant.
Costs from changes to hydrology	Irrigation infrastructure projects can change hydrology in ways that impose costs on other water users and the environment.	Such costs, particularly from reductions in return flows, can be substantial (box 6.3)
Benefits		
Environmental water	Environmental water recovered by the project is typically in the form of an entitlement that is transferred to the government.	The transferred entitlement should be valued at the current market price, or the value of the environmental improvement expected from the water, whichever is lower.
Irrigation water	A proportion of water savings created by the project are sometimes retained by irrigators.	This water should be valued at its market price (or an appropriate proxy if there is no functioning market). Water 'savings' from more accurate metering should not be included (box 6.3).
Other direct benefits to local irrigators	These could include reduced operational costs (eg. from automating gates) and improved service (eg. from reducing water ordering times).	
Benefits from changes to hydrology	Benefits from changed hydrology may relate to reductions in highly saline return flows or improving the condition of a wetland.	The Barren Box Storage and Wetland project is an example of an upgrade that appears likely to have produced such benefits (Murrumbidgee Irrigation nd).

It is also important to recognise that allocating government funds to one project means that these funds are not available for alternative uses that might also generate

flow-on benefits. There is often no strong reason to suppose that the flow-on benefits from the project under consideration will be larger than those associated with a different project, or with returning the funds to taxpayers.

For these reasons flow-on effects should generally not be included in the weighing up of overall project costs and benefits (but may be useful in identifying the distribution of costs and benefits). The case for including them in cost–benefit analysis is strongest where there are substantial barriers to resources moving to other uses (Boardman et al. 2001). If they are included, care needs to be taken to ensure that net, rather than gross, benefits are included. Australian Government publications, such as the *Handbook of Cost Benefit Analysis*, provide guidance on this issue (Commonwealth of Australia 2006).

While no formal cost–benefit analyses were submitted to this study, Iplex (sub. DR60) and Crane Group (sub. DR61) drew attention to studies that they claimed demonstrated the economic viability or cost effectiveness of government funded irrigation infrastructure projects (box 6.5 and 6.6). While these reports are generally internally consistent, and include a number of conclusions with which the Commission would agree (such as the need to consider all of the costs and benefits of infrastructure projects), they do not appear to support these claims.

Box 6.5 **ACIL Tasman (2008) Australia's Working Rivers**

This report identifies a range of government funded irrigation infrastructure projects for which the cost per megalitre (ML) of water recovered is in excess of the resulting private benefits but less than private and social (or external) benefits combined. The implication is that these projects are not privately financially viable, but are economically viable from a social (or government) perspective.

The report states that one of these, the Wimmera Mallee water supply system project, had a water recovery cost in excess of $4500 per ML long-term cap equivalent. Private benefits are estimated at $2000 per ML, with social (or external) benefits of over $2500 per ML. ACIL Tasman, however, did not analyse the social benefits in order to come up with this estimate, nor did it source the estimate from any such analysis. Rather, it observed the gap between the cost of the project and the private benefits and inferred that, since governments had decided to fund the project, they must have come to the conclusion that the social benefits were at least large enough to cover this gap. Given this methodology the Commission does not support Iplex's (sub. DR60, p. 2) contention that the report 'shows investment in water infrastructure is economically viable'.

(Continued next page)

Box 6.5 (continued)

At a broader level, the report calls for immediate action to investigate infrastructure projects as a means of managing the risk of the government paying too much under the buyback. Underlying the concern about this risk is the notion that entitlement holders are likely to be reluctant to participate in the buyback tenders, resulting in a steep bid curve (meaning that the government would need to pay high prices to meet its target). Since the report was written, events have played out quite differently. The tenders have been very heavily subscribed and bid curves have been relatively flat. In addition, substantial resources have been put into investigating infrastructure projects, but there has, so far, apparently been little success in identifying economically viable projects. In any case, the risk at issue could be adequately managed through altering the pace of the buyback (chapter 8).

Box 6.6 ACIL Tasman (2009) Regional economic effects of irrigation efficiency projects

This report builds on ACIL Tasman (2008), with the emphasis being on regional economic benefits from irrigation infrastructure investment, both during the construction phase and subsequently. The report states that the 'scope of the exercise and the available data did not allow for strong conclusions to be drawn as to the overall net value of the projects — nor was this the purpose of the study' (p. viii).

The main case study included in the report examines the benefits and costs of the proposed infrastructure upgrade of Lake Wyangan, near Griffith in New South Wales. ACIL Tasman estimate the costs of the project to be $56 million. Taking the upper bound estimate of water saving, the value of water savings from the project was estimated to be $23 million. Other direct benefits include around $1 million in reduced maintenance costs, as well as unquantified benefits from improved service and supply flexibility, and other environmental benefits. Thus, without considering flow-on effects, the estimated costs of the project exceed the benefits by $32 million, less unquantified direct benefits.

The report also estimates national flow-on (or indirect) benefits of $144 million, $16 million of which accrue to the region concerned. Of course, if these benefits could be added to the direct costs and benefits, overall benefits would exceed costs. The report, however, does not do this and with good reason — estimates of the flow-on costs that would need to be also included to make this calculation valid are not made.

Therefore, this report does not provide evidence that the proposed infrastructure upgrade provides net benefits to the Australian community and this is acknowledged in the report. What the report does, is examine regional benefits, which are relevant to understanding the distribution of costs and benefits of infrastructure projects. The report's claim that government funded infrastructure investments can produce flow-on benefits for the region in which they are made is uncontroversial.

Distribution of costs and benefits

The equity of the distribution of costs and benefits of irrigation infrastructure projects is also a relevant consideration. A large proportion of the costs are often borne by the broader community through taxation (some costs may also be borne by downstream water users). Water recovered for the environment through these projects can produce improved environmental outcomes that also benefit the Australian community (albeit that particular groups and regions may benefit more than others). The other benefits produced, however, generally accrue predominately to the irrigators serviced by the upgraded infrastructure, with some flow-on benefits to related businesses and nearby towns.

It is possible, therefore, for an irrigation infrastructure project to involve a significant transfer from taxpayers to irrigators in a particular locality. In effect, the Australian community pays for part of the cost of infrastructure that benefits irrigators.

This is inconsistent with the NWI, under which, Australian governments have agreed to recover the full cost of water storage and delivery services through the prices charged to users of rural and urban water systems. The Commission endorses this aspect of the NWI, which essentially puts irrigators in the same position as most other Australian businesses in being required to pay for their inputs. It also avoids inequities that can arise when subsidies are provided to some irrigation areas but not others.

The SRWUI program, therefore, is likely to produce an inequitable distribution of costs and benefits, unless steps are taken to avoid unwarranted transfers from tax payers to the irrigation sector. Transfers could be avoided by ensuring that the private benefits to irrigators and irrigation infrastructure operators are matched by private contributions towards the project. Such a requirement also guards against the private benefits being overstated for the purposes of gaining project approval.

What about rural communities?

It is argued earlier that the social and economic values provided by irrigated agriculture, including those accruing to rural communities, should be taken into account in the allocation of water between consumptive and environmental use. Once these decisions have been taken, however, the role of governments should be to assist individuals and communities to adjust to change, rather than to try to preserve the status quo. As argued in a recent Commission inquiry report, change is

an ongoing feature of rural Australia:

> Over the last 100 years, small rural towns have felt the impact of bigger and better machinery, farm amalgamations and the reduced need for on-farm labour …. Better roads and vehicles have made it easier for farmers to conduct their commerce in larger regional centres. Reliance on agriculture is falling in many rural areas relative to other economic activities. Growth from 'sea change' and 'tree change' is altering some rural profiles. (PC 2009, p. XXXVIII)

The Commonwealth and state governments have a range of policies to assist individuals and communities to adjust to changes in economic conditions and government policies. These include support for training and job search services, the social security safety net and the redistributive aspects of the tax system. There are also regional development policies that aim to promote business and industry development in changing environments. In addition to such generally available policies, governments sometimes implement measures to assist industries or communities to adjust to specific government reforms or economic changes.

Given its objectives, the SRWUI program can be seen as a hybrid measure to help achieve reform (recovering water for the environment) and assist with adjustment to the reform (securing a long-term future for irrigation communities through their adjustment to having less water for consumptive use).

Accordingly, it could be argued that despite the negative consequences of paying premiums to recover water through infrastructure upgrades discussed above, some premium is warranted to assist communities that depend on irrigated agriculture to adjust to a future with less water. The validity of this argument depends on:

- the case for providing specific adjustment assistance being sound
- subsidies for infrastructure upgrades being superior to other means of providing such assistance.

Is specific adjustment assistance warranted?

The scale of the impacts of reduced water availability on rural communities is an important consideration when deciding whether specific adjustment assistance is warranted. Where impacts are small it would be expected that individuals and communities would be able to adjust, assisted in some cases by the generally available government policies described above.

Appendix D examines the available quantitative evidence on the likely economic impacts of reductions in irrigation water on communities in the Basin. It concludes that uncompensated reductions clearly have a negative affect on regional economies, but that water buybacks could have a negative or positive impact. The

most robust modelling available estimates that the buyback will result in a small *increase* in real consumption in most southern Basin regions (Dixon et al. 2009).

The NSW Irrigators' Council (sub. DR72) argued that such modelling results defy common sense and expressed concern that the Commission accepted them. In fact, the Commission is aware that such modelling is based on a range of assumptions that may not always be accurate, and so does not accept that the results are necessarily good proxies for real-world outcomes. That said, the analysis by Dixon et al. (2009) appears to be more robust than analysis by RMCG (2009), which shows significant negative effects on regional economies (Appendix D estimates that RMCG's results imply that a 30 per cent reduction in irrigation water would result in roughly a 3 per cent reduction in gross regional product). This is mainly because the RMCG analysis has features which make it less useful for understanding the current situation in the Basin. For example, it does not account for buyback payments (which are a very real benefit to some members of regional communities) and uses very high regional multipliers without sound justification (appendix D).

In the Commission's view a balanced assessment of the various modelling results is that they indicate that a specific adjustment assistance package, operating across the entire Basin, is not warranted, at least where reductions in water availability are achieved through purchasing. The modelling results are, however, broad averages for large regions and there may be particular towns that suffer significant negative economic and social effects.

As discussed earlier, the reductions in water use that will be required by the Basin Plan are likely to be achieved through a mix of compensated and uncompensated means. The compensated reductions are occurring now, while the uncompensated component is likely to occur when state water resource plans that are consistent with the Basin Plan are introduced from 2014. The MDBA reported that they will:

> … assess the socioeconomic implications of any reductions in the long term average sustainable diversion limits and provide a report to the Murray–Darling Basin Ministerial Council along with the proposed Basin Plan. Governments will use this information to consider appropriate responses to social and economic impacts of the Basin Plan. (MDBA 2009k, p. 11).

In summary, the case for specific policies to assist individuals and communities to adjust to water reductions brought about by acquisitions of water for the environment appears to be weak. If any such assistance is provided, it would be best to target it to communities that are particularly affected. There may be a somewhat stronger case to provide assistance where uncompensated water recovery is

undertaken. There are plans to assess this case when the size of these reductions in diversion limits are known.

This discussion has focused on recovery of water for the environment and not the impact of the latest drought. There is no doubt that many farmers and rural communities across the Basin have experienced hardship as a result of the latest prolonged drought. At present, governments provide various types of drought support and the Commission made recommendations for reform in this area in early 2009 (PC 2009).

Are subsidies for infrastructure upgrades the best form of assistance?

When viewed as a structural adjustment assistance measure, subsidies for infrastructure upgrades have two important characteristics. First, the benefits they provide go mainly to irrigators in areas judged to have infrastructure projects that are worth supporting. This may not align well with areas that most warrant adjustment assistance. Second, they tend to reinforce the dependence of communities on irrigated agriculture.

On the latter issue, Environment Victoria commented:

> At present many incentives exist for Victorian farmers to remain in irrigation and improve their efficiency as governments invest $2 billion in infrastructure upgrades. Similar incentives do not exist for farmers and communities to transition away from irrigation to less water intensive industries … (sub. 23, p. 7)

Given that water availability is expected to decline and become more variable, reinforcing dependence on irrigated agriculture is unlikely to be a sound strategy for all areas. In fact, subsidies may impede autonomous adjustment away from such dependence.

These characteristics tend to reduce the efficacy of using subsidies for irrigation infrastructure as a form of adjustment assistance and highlight the need for their use to be assessed against alternatives. Possible alternatives (some of which are already being funded under Water for the Future) include:

- grants to local governments for community-wide planning for a future with less water
- grants to irrigation infrastructure operators to investigate rationalisation and modernisation options
- grants to irrigators for professional advice and training
- investment in other social and economic infrastructure.

What about food security?

The Commonwealth Minister for Water has indicated that the SRWUI program also has a food security objective:

> Central to our plan to getting the Murray-Darling Basin back onto a sustainable footing is investing in irrigation infrastructure to help our farmers and regional communities and protect food security. (Wong and MacDonald 2009)

At present, Australia exports around 60 per cent of all of its agricultural output in addition to providing the large majority of the food eaten by Australians (ABARE 2008). This is indicative of a very high level of food security. Also, the SRWUI program is only likely to make a small difference to Australia's agricultural production and general food prices, given that:

- irrigated agriculture in the Basin accounted for about 12 per cent of the gross value of Australia's agricultural production in 2005-06 (ABS 2008b)
- achieving the SDLs with the SRWUI program, rather than through buybacks and administrative reductions alone, is likely to increase the quantity of irrigation water in the Basin by only a modest proportion (perhaps around 5 to 10 per cent)
- the nature of the buybacks and opportunities for water trade will tend to result in the least profitable irrigation activities being reduced as water availability decreases
- food production will continue to be influenced by price signals, including those resulting from a decline in water availability.

Accordingly, Australia's high level of food security is very unlikely to be significantly influenced by the SRWUI program.

What about political reality?

A possible objection to moving away from the large subsidies to irrigators that appear likely to result from the SRWUI program is that they are simply the price that needs to be paid to achieve reform. That is, the program was needed to convince the states to agree to a truly Basin-wide approach to water planning and to elicit the irrigation sector's support for increasing environmental water allocations. But what the above analysis shows is that unless subsidies are kept to modest levels, the consequences are likely to be detrimental to the community as a whole. Subsidies not only transfer wealth from taxpayers to irrigators, they are also likely to lead to wasteful and inefficient investment.

The existence of such inefficiencies suggests that there may be better ways to accommodate political goals. An approach put forward by Grafton is to combine the Restoring the Balance and SRWUI programs and to spend these funds to ensure value for money in recovering environmental water. This would increase the quantity of water recovered for the environment and, therefore, could reduce or eliminate any uncompensated reduction under the Basin Plan. Accordingly, he argues that this 'would greatly assist farmers and their communities to autonomously adjust to lower diversions' (Grafton, sub. 81, p. 14). This approach would provide compensation to all irrigation areas affected by reduced diversions, including areas that would have had little prospect of benefiting from the SRWUI program because they had already upgraded their irrigation infrastructure.

Where to from here?

Ideally, there would be one government fund for purchasing water for the environment, rather than separate infrastructure and water purchase programs. As argued by Grafton and Jiang:

> A key reason for [the] cost effectiveness of water buybacks is that, in contrast to infrastructure subsidies, they provide farmers with flexibility as to how to use less water. Farmers that voluntarily choose to sell their water in a buyback and remain farming can employ deficit irrigation, change their land use and/or tillage practices or invest in improvements in irrigation efficiency. In the subsidy approach, water is acquired only through [irrigation water use] efficiency improvements whether it is the least costly method or not. (sub. 18, p. 4)

Similar arguments apply to irrigation infrastructure operators.

If there were one fund for water recovery, there might also be a case for some funds to be allocated to assist irrigators and related communities adjust to a future with less water. All forms of assistance, including subsidies for infrastructure projects, could then be considered on their ability to contribute to adjustment.

FINDING 6.5

Rather than having a $5.8 billion program focused predominately on infrastructure upgrades, it would have been more effective and efficient to:

- *use the sustainable diversion limits from the Basin Plan to determine the targets for reallocation in each catchment*
- *use the buyback program as the sole means of easing the transition to those targets*

- *consider establishing a much smaller program to assist irrigators and related communities adjust to a future with less water, through the most effective means available (not just subsidies for irrigation infrastructure).*

The roll out of the SRWUI program is, however, well underway and so the challenge is to find the best way forward from here. For the reasons discussed above, the SRWUI program, in its current form, has the potential to be ineffective, inefficient and inequitable. To minimise these problems rigorous project approval processes need to be applied.

Only projects that are reasonably expected to produce net benefits to the Australian community, and for which the government contribution is commensurate with public benefits should be approved. In practice this will usually mean that government funding should be no more than the value of the water recovered for the environment. The intention to take this approach should be clearly conveyed to irrigators and irrigation infrastructure operators to avoid them putting time and effort into project proposals that have little chance of being accepted.

RECOMMENDATION 6.4

Rigorous approval processes should be applied to all projects under the Sustainable Rural Water Use and Infrastructure (SRWUI) program. In particular, projects should only be approved where:

- ***properly conducted cost–benefit analysis shows there to be net benefits***
- ***government contributions are commensurate with public benefits (excluding private benefits to irrigators).***

Applying such approval processes is likely to result in the SRWUI program's budget being underspent. This money should be reallocated to Restoring the Balance or to other government priorities.