ABARE submission to the Senate Rural and Regional Affairs and Transport References Committee Inquiry into Water Policy Initiatives

November 2005

Summary

The NWI recognises the value of expanding permanent trade to bring about more profitable water use and the need to use cost effective and flexible methods to recover water to achieve environmental outcomes.

- Provided water entitlements are properly specified, trade in permanent entitlements, temporary allocations and longer term leases is effective at giving rural water users the ability to respond to changes in economic signals and to changes in river systems that alter the pool of water resources, whether due to long term climate change or the clawing back of water by government for environmental flows.
- Where rights are not properly specified, water trade can lead to third party effects such as:
    - deterioration in water quality;
    - stranded assets; and
    - reduction in the reliability of supply and delivery.
- Specifying water property rights properly means creating an explicit entitlement for each of the implicit rights that irrigators currently have, where it is appropriate to do so. These implicit rights generally include:
    - rights to off farm delivery infrastructure including natural waterways and built channels;
    - rights to apply water to land for most purposes in most quantities;
    - rights to allow unconsumed water to flow back to the system; and
    - rights to the quantity of water needed to convey the irrigator's entitlement downstream.

  By 'unbundling' rights, managers can use levies, subsidies or exchange rates more precisely to overcome third party effects instead of having to constrain or prohibit trade altogether.

- There are a number of methods available to government to claw back water to achieve environmental outcomes. These include:
    - purchasing permanent entitlements;
    - selling options contracts; and
    - promoting water use efficiency.
- Clawing back water for the environment by purchasing entitlements can be done at least cost when irrigators can trade to offset any reductions in their entitlements. After government intervention, high value users can purchase water from low value users.
- Depending on the environmental objective, managers may not need to hold permanent entitlements to generate environmental flows. Options contracts can be used to give managers access to water at low cost during high flow events, while allowing irrigators to retain their permanent entitlements. However, in most cases a portfolio of options contracts and permanent entitlements might still be needed to meet different environmental objectives.
- Importantly, all decisions relating to appropriate policy tools should be made with regard to the scale and location specific nature of the issue being addressed, as these are likely to affect the costs and benefits of policy reform. Net benefits should take into account the costs of establishing and maintaining institutions to support reform, and adjustment costs imposed on existing water users.

Introduction

ABARE's intention in making a submission to the Senate Committee Inquiry is to provide insight about possible policy approaches under the National Water Initiative (NWI), rather than to provide an overview of State and Territory policies. Comments are directed at the Committee's terms of reference relating to:

- the development of water property titles;
- methods of protection for rivers and aquifers; and
- the implications for agriculture of predicted changes in patterns of precipitation and temperature.

1. Development of water property rights

The NWI calls for the progressive removal of barriers to trade of water entitlements and the broadening and deepening of markets for these assets. As competition between consumptive and environmental uses increases, an efficient system of allocating water becomes more important also.

Markets are an important tool for allocating water entitlements from an economic efficiency standpoint because they allow rights to gravitate over time to those users who can make the greatest profit from them. However, trade can also lead to third party effects when rights are not properly specified. These effects include congestion, deterioration of water quality and stranded assets. The NWI proposes a number of solutions to these third party effects including the unbundling of rights and the use of tagging and exchange rates. In many cases these solutions are appropriate, but governments should consider how regional differences affect the relative costs and benefits of these initiatives.

Unbundling of rights

In general terms, existing rights lead to third party problems because trade can generate *public costs* and *public benefits* that are not accounted for in the decision-making process of those engaged in water trading. Third party effects arise when those engaged in trade only take into account the *private costs* and *private benefits* of the transaction.

A step toward addressing third party effects lies in recognising that a water right entitles a holder to more than just a volume of water. Implicitly, it also confers:

- a right of access to delivery infrastructure;

- a right to the water needed to convey the holder's entitlement to land (known as conveyance losses);
- a right to apply water to land; and
- a right to return unused (and possibly polluted) water to the river system.

Unbundling, or making explicit the rights that are implicit in the original entitlement, gives managers greater control over the movement of these rights into and out of various regions. For example, levies, subsidies or exchange rates can be applied to shift private costs and benefits to reflect accurately the true costs of the trade. Furthermore, the new explicit rights can be traded to those who will put them to their highest value use (and will therefore have the greatest capacity to pay).

While unbundling rights has benefits, managers should consider whether completely defining a property right is justified. In some cases, the costs of establishing, administering and enforcing unbundled rights might be prohibitive or the gains from trade in these rights might be small.

Many states have made progress in separating the water rights from land holdings. In Victoria, for example, plans have been made to unbundle rights into water shares, delivery shares and water use licences by mid 2007.

Related ABARE work

Goesch, T. and Beare, S. 2004, 'Water rights and trade: meeting the water reform agenda', Australian Commodities, vol.11, no. 1, Canberra, March.

Heaney, A., Dwyer, G., Beare, S., Peterson, D. and Pechey, L. 2005, Third-party effects of water trading and potential policy responses, Paper to the American Agricultural Economics Association, Rhode Island, 25-27 July 2005.

Providing appropriate protection for third party interests

The NWI tasks States and Territories with providing appropriate protection for third party interests. This section presents a number of third party effects identified by the NWI, and discusses solutions.

Protecting water quality

Applying water to land can result in salt and other pollutants being returned to a river system through surface and groundwater flows. These return flows affect both the environment and the yields of downstream water users. By changing where water is applied, trade can change the location and have an impact on return flows. There are at least three methods for overcoming this problem:

- Managers can take advantage of *use rights* to limit the volume of water that can be applied per hectare to a particular crop in a particular region. Scientific information will be needed to specify use rights appropriately.

- Managers could ensure that trade in water rights takes place through an exchange rate or other mechanisms to create appropriate incentives to protect water quality. Regions with high salt concentrations might have exchange rates that reduce the yield of entitlements traded into the region, with the difference being used to dilute return flows in the system.

- Managers can impose conditions on a *right to return flows* to ensure that pollutant levels are acceptable. If used in conjunction with a system of transferable pollution credits, this system could encourage users who can easily reduce the pollutants in their return flows to do so, and then trade their entitlements to those who face greater costs of abatement.

Usually, the information required to properly assess the volume and quality of return flows will be substantial. This means managers should carefully consider how information and transactions costs compare with the costs of third party effects relating to polluted return flows. For example, managers might find that exchange rates are only appropriate in some areas.

Related ABARE work

Goesch, T. and Beare, S. 2004, 'Water rights and trade: meeting the water reform agenda', Australian Commodities, vol.11, no. 1, Canberra, March.

Heaney, A. and Beare, S. 2001, 'Water trade and irrigation: defining property rights to return flows', Australian Commodities, vol.8, no. 2, Canberra, June.

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Newby, J, Mollard, W., Heaney, A. and Beare, S. 2004, Addressing Externalities Through Water Charges, ABARE Final Report Prepared for the Queensland Department of Natural Resources, Mines and Energy, Canberra.

Protecting the reliability of supply

The reliability of supply can be defined as the probability that an entitlement will receive a volume of water in a given season (Heaney et al., 2005). For example, an entitlement might generate at least 1000 ML in 80 per cent of seasons, but less than 700 ML in 10 per cent of seasons. Trade has the potential to influence the volume of water that others' entitlements 'yield' in a given year.

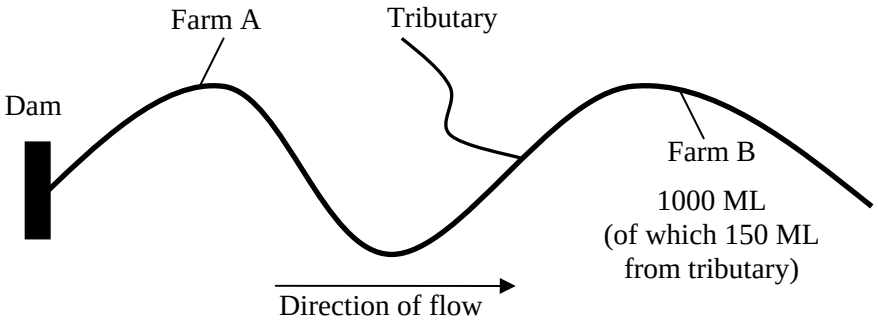
Managing trade across inflows

A vestige of land and water rights having been previously bundled is that water rights are defined at the point of delivery, and not the source. This distinction becomes important when water is traded from downstream users (whose water may have originated in many different places before making its way to the river), to upstream users, whose water supply may be sourced solely from a dam.

In figure 1, farm B is situated below an inflow and has a water entitlement for 1000 ML, of which 150 ML is effectively sourced from a tributary. A transfer of

farm B's entitlement to farm A causes third party effects for those between farm A and the tributary because 1000 ML must now be sourced solely from the dam. The reliability of entitlements around farm A is reduced, but the reliability of entitlements around farm B is increased.

Figure 1. A hypothetical regulated river system.



Trade of farm A's entitlement to farm B is less likely to cause third party effects because farm B has an additional inflow (the tributary) from which it can source the amount of farm A's entitlement.

Conveyance losses

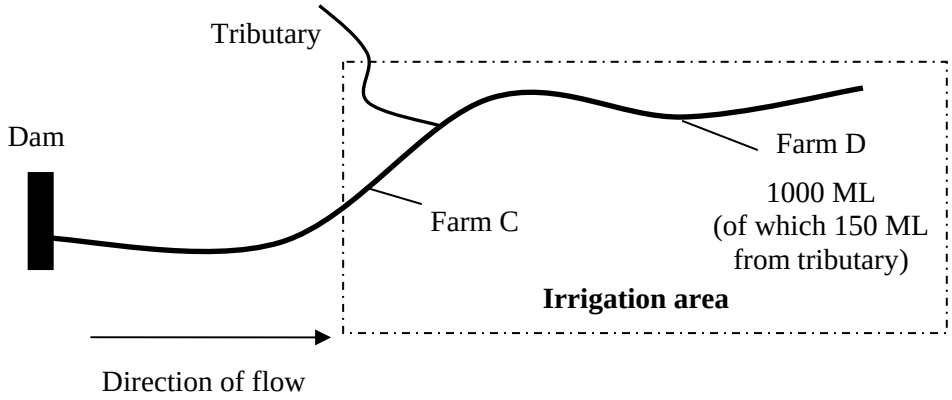
Trade can affect reliability when conveyance losses are significant. For example, a manager might need to release 900 ML from the dam to deliver 850 ML to farm B (figure 1) because of evaporation and seepage. If farm B's entitlement is traded upstream to farm A then more water is available for everyone because the conveyance loss is not incurred. Overall, marginal changes in conveyance losses associated with water trading may be small if seepage and evaporation losses are largely the same.

Tagging has been proposed as an approach to addressing the problem of upstream and downstream trade and conveyances losses affecting reliability. *Source tagging* specifies entitlements as the right to a volume of water at the point of origin of the flow, rather than at the farm offtake. In figure 1, farm B could hold a portfolio of entitlements because more than one source contributes to the flow past its offtake, whereas farm A has only one. Source tagging can mitigate reliability problems related to upstream trading – for example, farm A could not purchase or lease water from the inflow because the tributary is downstream of farm A. Source tagging also encourages rights to move as far upstream as possible; an allocation of 900 ML at the dam wall delivers more water to farm A than to farm B because of conveyance losses due to distance. These conveyance losses mean that trade will be more effective the further upstream an entitlement is moved.

Downstream tagging is similar to source tagging, but rather than specifying rights at the point of origin (such as the dam wall) the right is specified at an irrigation area or some other point downstream from where the flow originates. The yield and reliability at the irrigation area is a combination of the effects of all the inflows and sources leading into the area. Importantly, downstream tagging is effective when water is

traded downstream, but cannot overcome third party effects when water is traded upstream. In figure 2, farm D has an entitlement defined at the irrigation area. Trade within the irrigation area to a point above the tributary (say, farm C) would cause third party effects around farm C because the entire amount of farm D's entitlement (which included a component inflow from the tributary) must now be sourced prior to the inflow.

Figure 2. Downstream tagging on a hypothetical river system



Although it may appear unrelated to unbundling, tagging is not. As with all unbundling, it decomposes implicit rights into constituent explicit rights. Presently, a water right gives implicit rights to each of the separate flows that pass a farm.

Of course, specifying rights at a dam wall or an irrigation area can be costly. The contribution of each source at various points along the river must be estimated, along with the reliability of each. Existing legislation defining rights would need to be changed, and stakeholders would need to be informed about how the new system functions. These costs should be weighed against the benefits before a manager considers either form of tagging. At the very least, the decision should consider the number of inflows that trade is likely to span, and the conveyance losses at various points in the system. These will differ from region to region.

Efficiency of water application and return flows

In some cases, water applied to a crop can make its way back to the river system in the form of drainage, surface water runoff and ground water flows. Together these sources are known as return flows. At present, downstream users have an implicit right to these flows because managers use them to meet downstream users' allocations. Both the crop type and the application method will affect the return flow, so transfers between regions can affect the reliability of water for other users.

There are two ways of managing changes in return flows. The first involves unbundling existing entitlements to make the rights and responsibilities relating to returning water to the system more explicit. This could be done by specifying a water right as an entitlement to a certain quantity of water, net of returns. To achieve this, the return flows for different application rates at different times of the year would

have to be estimated for various regions. The transaction costs of setting up the necessary systems may outweigh the value of the gains.

The second (and more practical) way is for *use rights* to specify application rates, restrictions on use for particular activities and standards for water use efficiency. This would give managers greater control over the size of return flows, so that trade between two irrigators is less likely to affect the reliability of supply for other water users.

Related ABARE work

Heaney, A., Dwyer, G., Beare, S., Peterson, D. and Pechey, L. 2005, Third-party effects of water trading and potential policy responses, Paper to the American Agricultural Economics Association, Rhode Island, 25-27 July 2005.

Protecting the reliability of delivery

Reliability of delivery refers to the timeliness of delivery of an irrigator's allocation, or, in other words, the probability that a farmer receives his or her allocation when it is needed. Water for irrigation is transferred along river systems and delivery infrastructure, both of which are limited in terms of the volume of water they can transfer in a given period. For example, the Barmah Choke on the Murray River near Echuca in Victoria can pass a maximum of only 8500 ML per day without flooding surrounding areas [MDBC website (2005)].

Trade into a congested region can affect the reliability of water supply for other users during peak periods, particularly when agricultural activities in an area have similar irrigation demands. Allocating water on a first come, first served basis can be economically efficient if farmers are growing the same crops and therefore give similar values to an extra unit of water. However, congestion can cause inefficiencies when both high-value and low-value crops require water from the same delivery infrastructure at the same time. This is because the value to each crop type of an extra unit of water might be very different. For example, applying insufficient water to a horticulture crop has the potential to jeopardise not only the current season's crop but also all future crops.

The problem of congestion affecting the timeliness of delivery can be addressed in two ways. The first is by unbundling access rights to infrastructure from a water entitlement. The new right would entitle the holder to some control over when they can have their water delivered. If these rights are tradable, then high value users have the option of purchasing access rights from low value users, and thereby receive priority access to delivery systems during peak periods.

If unbundled rights are not justified because of establishment and administration costs, managers could instead allocate water by applying a fee for access during congested periods. Provided the fee is set appropriately, access will gravitate to those who can put the water to its highest value use. Essentially, the manager is attempting to create the same incentives as would exist under tradable rights, but without the market determining the optimal fee.

An inappropriate access fee will not compel irrigators to prioritise themselves on the basis of marginal value. For example, if the fee is too low then every irrigator in the congested system will be prepared to pay for access, leading to a transfer of economic rents to the infrastructure provider and no rationing of resource access. Where there is little competition for delivery services, these rents can discourage the infrastructure provider from investing to increase capacity.

Even if a fee is set appropriately, it will not be effective when infrastructure is continually congested.

Related ABARE work

Heaney, A., Dwyer, G., Beare, S., Peterson, D. and Pechey, L. 2005, Third-party effects of water trading and potential policy responses, Paper to the American Agricultural Economics Association, Rhode Island, 25-27 July 2005.

Protecting investments in infrastructure

Regardless of the location of built infrastructure for the delivery of water, it is usually characterised by long economic life, low salvage value and almost complete immobility. This *asset fixity* constrains irrigators' ability to respond to changes in the setting in which they make investment decisions. These decisions could include whether to relocate, invest in new technology or leave the industry.

The reason asset fixity makes irrigators unresponsive to market signals is that the present value of future agricultural returns from a site is usually much greater than the price a farmer would receive if the delivery assets were sold. This means farmers have to use delivery infrastructure for a long time to receive a return on their investment.

Managers seeking to retire agricultural activity have to overcome the 'hurdle' of asset fixity to change farmers' incentives. They can do this partly by shifting the private costs and benefits of irrigators so that moving an enterprise or investing in new technology is profitable, even when assets on the existing site may have life remaining. Shifting costs and benefits can be accomplished with either levies or relocation subsidies, and both have different effects on farmers' returns. However, after investigating the asset fixity problem in the Sunraysia region of Victoria, ABARE concluded that significant relocation subsidies or levies would be needed to shift vineyards to new sites.

Economic 'wedges' such as levies and subsidies are likely to work most quickly and at least cost when targeted at regions where infrastructure is nearing the end of its economic life. Ultimately, whether levies or subsidies are appropriate will depend on the problem being addressed, and how quickly action needs to be taken.

Stranded assets and infrastructure costs

Irrigators who trade out of an irrigation area are usually not liable for the remaining fixed costs related to the off farm delivery infrastructure. This increases the costs for those who remain in the area because the fixed costs of delivery must now be spread

over fewer water users. Progressively, more users may find the costs of remaining prohibitive and decide to leave also. To prevent irrigation assets becoming stranded in this way, some irrigation authorities have imposed restrictions on out-of-scheme trade. This is rarely the best policy from an economic efficiency standpoint. Instead, managers could consider exit fees or long-term contracts that specify both fixed and variable costs. Importantly, exit fees should be payable annually or in a lump sum, to prevent irrigators viewing cash flow issues relating to paying a lump sum as an impediment to trade.

Related ABARE work

Goesch ,T. 2001, 'Delivery charges for water: their impact on interregional trade in water rights', Australian Commodities, vol.8, no.4, Canberra, December.

Gordon, W., Heaney, A. and Hafi, A. 2005, Asset fixity and environmental policy, ABARE paper to the OECD Workshop on Agriculture and Water: Sustainability, Markets and Policies, Adelaide and Barmera, 14-18 November.

2. Methods of protection for rivers and aquifers

One aim of the National Water Initiative is 'to develop pathways for returning overallocated and overdrawn systems to environmentally sustainable levels of extraction'. In many cases, this means managers will have to transfer water from existing irrigators so the water can be used for environmental flows. The NWI specifies that governments should '[consider] all available options…including purchasing water in the market, by tender or other market based mechanism' and that the most appropriate method should be based on cost effectiveness and a balancing of socio-economic impacts.

Usually, discussions about how managers could claw back water for environmental flows focus on purchasing water from irrigators. However, this is not the only option. Improvements in the efficiency of on-and off-farm delivery infrastructure can also generate savings that could then be allocated to the environment. A tender system in which irrigators are invited to nominate projects that would increase water use efficiency on their farm would allow managers to choose those projects that yield the greatest third party benefit. However, ABARE research suggests that there may be only limited opportunities to source water in this way at less than $1000 per megalitre (Goesch and Heaney 2003).

High costs of improving water use efficiency may mean that managers view purchasing entitlements as the best way to source additional water for environmental flows. ABARE has investigated two options relating to how water can be purchased for environmental flows. They involve:

- purchasing entitlements and then using the seasonal allocation for environmental flows when needed; and
- using options contracts to commit to purchasing water from users when water is abundant in order to augment high natural flows.

Purchasing entitlements

ABARE has worked with CSIRO to develop a model of the Murray Darling river system that examines the net cost to irrigators of water being clawed back from the lowest-value users in various regions. Heaney et al. (2002) used the model to examine the impacts of government purchases of entitlements when remaining water users are not able to trade with other regions to offset the reduction in their entitlements. Unable to source water, these users move to lower value agricultural activities, leading to foregone agriculture production of $976 million in net present value terms over 50 years (table 1). On the other hand, increasing environmental flows leads to a healthier river system with lower levels of salinity. This can improve the agricultural yields of downstream users and thereby offset some of the decreases in agricultural

values. These benefits are worth approximately $278 million, leading to a net cost of $697 million.

When trade is permitted, high value users can partly offset the reduction in their entitlements by purchasing water from low value users. This means that less high value agricultural production is foregone. After downstream benefits are incorporated, the net cost of purchasing entitlements when trade is permitted is $344 million. This is a reduction in costs of over 50 per cent. The research highlights the need for efficient trade in entitlements if the government is to purchase water at least cost to the economy.

Table 1. Costs and benefits of purchasing water under trade and no trade scenarios

		No trade	Trade
Costs	$m	976	614
(forgone agricultural production)	*$ per ML*	*640*	*403*
Benefits	$m	278	270
(reduced salinity for downstream users)	*$ per ML*	*183*	*177*
Net cost	**$m**	**697**	**344**
	$ per ML	***457***	***228***

Source: Heaney, Beare and Goesch (2002)

Related ABARE work

Goesch, T. and Heaney, A. 2003, *Government purchases of Water for Environmental Outcomes*, ABARE *e*Report 03.22 Prepared for the Natural Resource Management Business Unit of the Australian Government Department of Agriculture Fisheries and Forestry, Canberra, November.

Heaney, A. Beare, S. and Goesch, T. 2002, *Environmental flows and water trade*, ABARE Current Issues 02.3, Canberra, March.

Using options contracts

ABARE has also investigated a method for generating environmental flows without managers having to hold an expensive portfolio of permanent entitlements. Essentially, managers contract with water users to have them sell a portion of their allocation if particular allocation levels are reached.

Using options contracts to secure water for the environment may be appropriate when the manager wishes to supplement a natural high flow event with dam releases. Timing options contracts with high natural flows can be effective because it:

- makes clawing back water for the environment relatively cheap;
- allows irrigators to retain their permanent entitlements;
- allows managers to plan with greater certainty; and
- maximises the value of the high flow event by flushing the river effectively, temporarily flooding wetlands and re-connecting billabongs.

ABARE has estimated the cost and benefits of using an options based system to increase flows in the Murrumbidgee River. The gains from trading in options as oppose to holding permanent entitlements depend on the length of the options contract, the price of permanent entitlements and the prices specified in the options contract. However, a ten-year contract for buying water at $30/ML when the price of a permanent entitlement is $1000/ML can yield benefits of about $35.4/ML per year. This is 70 per cent less than the annualised cost of a permanent entitlement.

Related ABARE work

Beare, S., Hinde, R., Hillman, T., Heaney, A., Salbe, I. 2005, Meeting environmental outcomes: a planning framework, ABARE Conference Paper 05.27 to the OECD Workshop on Agriculture and Water: Sustainability, Markets and Policies, Adelaide and Barmera, 14-18 November.

Goesch, T. and Heaney, A. 2003, *Government purchases of Water for Environmental Outcomes*, ABARE *e*Report 03.22 Prepared for the Natural Resource Management Business Unit of the Australian Government Department of Agriculture Fisheries and Forestry, Canberra, November.

Hafi, A., Beare, S., Heaney, A. and Page, S. 2005, *Water Options for Environmental Flows*, ABARE *e*Report 05.12, Prepared for the Natural Resource Management Division, Australian Government Department of Agriculture, Fisheries and Forestry, Canberra, November.

Heaney, A. Beare, S. and Goesch, T. 2002, *Environmental flows and water trade*, ABARE Current Issues 02.3, Canberra, March

3. Implications for agriculture of predicted changes in precipitation and temperature

Climate change is expected to have significant impacts on hydrological cycles at a global, national and regional scale. This will, in turn, affect the availability and reliability of water resources and how these resources are managed. Predicting precipitation and temperature changes alone is difficult, and relating these unknown changes to evapotranspiration rates, water flows and agricultural returns is even harder. However, ABARE research shows that these parameters need not be known precisely for a suitable course of action to be identified.

Beare and Heaney (2002) used two climate change scenarios developed by the Intergovernmental Panel on Climate Change to show that water trade and improvements to water use efficiency have the capacity to significantly reduce the impacts of climate change on agriculture in the Murray Darling Basin. Under one scenario, trade reduced costs to rural water users by $155 million in net present value terms, or roughly 19 per cent. The model also showed that improvements to water use efficiency could be enough to offset reductions in flows due to climate change.

Related ABARE work

Beare, S. and Heaney, A. 2002, Climate change and water resources in the Murray Darling Basin, Australia – impacts and possible adaptation, Paper to the World congress of Environmental and Resource Economists, California, 24-27 June 2002.

4. Conclusion

The National Water Initiative compels States and Territories to facilitate trade in water entitlements through the unbundling of rights and the removal of barriers to trade. Trade is usually effective and efficient at giving rural water users the ability to adapt to significant changes in river systems, whether the change is due to climate change or the capture of water by government for environmental flows. However, trade also has the potential to generate third party impacts when rights are not properly specified. These impacts include:

- changes to water quality;
- changes to reliabilities of supply and delivery; and
- the 'stranding' of delivery infrastructure.

These problems are one motivation for the NWI stipulating that rights should be 'unbundled' or broken down so that rights that were previously implicit are made explicit. This means, for example, converting an implicit right to delivery infrastructure into a delivery access right, or converting an implicit right to apply water to land into an explicit water use right that specifies how much water can be applied in what manner and when. When these rights are unbundled, managers can more easily apply levies, subsidies or exchange rights to each, rather than having to ban trade altogether. Unbundled rights also allow rights to move to their highest value use.

Of course, unbundling rights can be expensive. Effectively, each of the new explicit entitlements must have appropriate rights and responsibilities attached, which may involve comprehensive scientific analysis and ongoing administration. The new rights must also be explained to water users. Finally, they must be enforcable. Therefore, managers should be fully aware of the costs and benefits of a proposed initiative for their irrigation area before embarking on reform.

Meeting the NWI's call for increased environmental flows on overallocated or overdrawn rivers will require governments to claw back water from irrigators. The NWI asks that this be done through the purchase of water on the market using a market-based mechanism, and that transfers be cost-effective and sensitive to socio-economic impacts. ABARE research shows that the costs of transferring water to the environment can be significantly reduced if options contracts are used. These also prevent the government having to hold a portfolio of long-term entitlements, allowing irrigators to hold them instead as a hedge against climate risks. If options are found to be unsuitable, then having an effective system for water trade in place before water is transferred can also reduce the impact on users, by allowing water rights to move to highest-value uses.

References

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Gordon, W., Heaney, A. and Hafi, A. 2005, Asset fixity and environmental policy, ABARE paper to the OECD Workshop on Agriculture and Water: Sustainability, Markets and Policies, Adelaide and Barmera, 14-18 November.

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MDBC (Murray-Darling Basin Commission) 2005, *Fact Sheet 6: The Barmah Choke*, available at www.mdbc.gov.au.

Newby, J, Mollard, W., Heaney, A. and Beare, S. 2004, *Addressing Externalities Through Water Charges*, ABARE Final Report Prepared for the Queensland Department of Natural Resources, Mines and Energy, Canberra.