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Market-based opportunities to improve environmental flows



SCOPING REPORT TO:
Environment Australia

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June 2000

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MARKET-BASED OPPORTUNITIES TO IMPROVE ENVIRONMENTAL FLOWS: A SCOPING PAPER

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1.0 Introduction

Recent changes to the management of water have included both, the formal recognition of water for the environment, and the need for widespread trade of water entitlements. To date, trade in water allocations has mainly been limited to water for consumptive use. Nevertheless, there is an opportunity to extend trade to the management of water for environmental purposes. Banking of environmental allocations presents a further opportunity to achieve the long-term goal of most efficiently managing the water needs of both the environment and consumptive use.

Accordingly, the objective of this paper is to promote discussion relating to the trading and banking of environmental water allocations in the context of the Australian water industry.

The paper discusses issues essential to the definition of environmental allocations as well as several approaches for increasing the size of environmental allocations. It then focuses on the direct market based mechanisms of trade in and banking of environmental flows and identifies issues requiring further investigation.

2.0 Ensuring ecosystem stability - Environmental allocations

Ensuring the ongoing sustainability of ecosystems supported by Australia's surface and groundwater resources requires the allocation of water to these ecosystems. Providing water for the environment is an integral element of the Council of Australian Governments (COAG) Strategic Framework for Water Reform. The framework requires all jurisdictions to give priority to formally determining allocations or entitlements to water, including allocations to the environment as a legitimate user of water. A framework for providing water to ecosystems has been developed by ARMCANZ and ANZECC National Principles for the

Provision of Water Ecosystems, 1996. The Principles state,

“The goal for providing water for the environment is to sustain and where necessary restore ecological processes and biodiversity of water dependent ecosystems.”

Whilst it has been generally observed that the environment has been receiving too little water as a result of human activity, there are circumstances where this is not the case. That is, at some times and in some locations the environment is allocated more water than it needs. More recently, resource managers have recognised the needs of the environment do not remain constant. Rather, periods of flood and drought that more closely replicate former conditions of river and groundwater systems are necessary for the stability of ecosystems.

As such, timing, quantity and duration of flows must all be taken into consideration when determining environmental requirements. Other factors that should be considered in the determination of an environmental allocation include rainfall, land use, diversions, transmission losses, daily flows, and seasonal variation. It is important to note that ecologists raise concerns regarding the specification of minimum environmental flows necessary to maintain the health of water resources. These concerns relate both to a lack of experience and a lack of information available for determining water requirements. As yet, there does not appear to be general agreement on appropriate methods to determine environmental water requirements in Australia for any type of water system. Investigations to date have tended to focus on large permanent rivers. Ecological understanding of environmental water requirements for seasonal and episodic streams and groundwater-dependent systems is especially poor.

A key issue in determining the size of the environmental allocation is the question of whether the environment has a right that is prior to consumptive uses of water.

A choice must be made between two models of environmental rights:

1. Environment has a prior right to be satisfied before water allocation decisions; or
2. Environment has a competitive right that allows trade-off among economic, social and environmental objectives.

That is, does the environment - the ecosystems of the river and groundwater resources supported - have a prior right to water? Or, do environmental flows requirements have to be resolved in competition with the needs of irrigators, stock and domestic users, urban water users, and plantation¹ growers? Current practice, as distinct from the legal expression and policy statements, suggests that some dimensions are treated as prior rights, while other dimensions are managed as attributes that can be traded off against the needs of other water users. Under the prior right model, allocations are made without payment of compensation to other water users as they only hold a right to that not needed for environmental purposes. Mixed models are possible with some rights defined as prior rights and some as a competitive right.

Historically in Australia, the rights of the environment to water have been defined in terms of quantity or physical entitlement. That is, we define 'use' rights but not environmental rights. To date 'water allocation policies have focused on defining diversion rights to irrigators and other commercial users. Since the State Governments hold the constitutional right to water resource management, the policies governing water allocations differ significantly...'.² This approach to regulating in-stream flows has disrupted important flow patterns and has contributed to significant damage to riverine ecosystems.

¹ Plantation growers are included because tree planting can reduce recharge and run-off. Where this change in land-use occurs it can decrease the volume of water available for environmental purposes and for consumptive uses like irrigation.

² D. Brennan & M. Scoccimarro, (1999), *The Australian Journal of Agricultural and Resource Economics*, 43:21, pp 69-89.

As shown in table 1, current legislation in most jurisdictions indicates that the environment now has prior right – that is, legislation provides that the environment should always receive an allocation necessary to sustain the resource. The residual amount is available for consumptive use. Typically, water needed for domestic and livestock grazing purposes are also allocated a prior right although this is changing. Urban water supply agencies are considering purchasing water from irrigators.

Table 1: Summary³ of Environmental Flow Management Characteristics
(by jurisdiction)

	Environmental Flow Allocation (explicit or implied)	Trade in Environmental Flows	Right to the Environment	
			Prior Right to Environment	Competitive Right to Environment
Jurisdiction				
South Australia	✓	✗	✓	✗
New South Wales	✓	✗	✓	✗
Victoria	✓	✓	✗	✓
Queensland	✓	✗	to be determined	to be determined
Western Australia	✓	✗	✓	✗
Tasmania	✓	✗	✓	✗
Northern Territory	✓	✗	✗	✗
Australian Capital Territory	✓	✗	✓	✗

However, putting this principle into practice requires a decision to be made regarding whether the prior right is defined volumetrically, or as a share of the available resource.

³ Table constructed from information supplied in the High Level Steering Group Report to COAG Senior Officials : A national summary of jurisdictional plans to implement comprehensive water allocation systems, trading regimes and the provision of water for ecosystems.

As shown in Table 1, most jurisdictions have policies specifying that the environment has a prior right to water. Therefore, the following discussion outlines the various ways this principle can be used to provide more water to the environment.

3.0 Activating environmental allocations

Several options are available to communities and Governments to provide increased allocations of water to the environment. These options range from investment in large scale engineering solutions to the development of innovative economic frameworks.

Investment in infrastructure rehabilitation both on and off farm coupled with the application of best practice management offers an opportunity to provide substantial volumes of water to the environment. In addition, Governments could regulate to reduce consumptive allocations by prohibiting or implementing pro-rata reductions in allowable extractions from ground and surface water resources. Alternatively, governments could use an awareness raising approach that encourages communities to voluntarily reduce consumption. Similarly, a system under which a portion of the water to be traded is returned to the environment (ie taxing water trades) would have the effect of increasing the water available for the environment but would discourage trading. Depending on the tax rate and the degree to which trading results in environmental improvement, there may be no net gain.

Although such approaches are generally perceived as being fair, they can lead to an inefficient use of society's resources. For example, under a pro-rata reduction on all water users those producing goods more highly valued by society are penalised to the same extent as those producing goods of lesser value to society.

Approaches that use market mechanisms have the potential to achieve the desired environmental outcomes but to reduce some of these losses in efficiency. This has been recognised in the United States and Europe, where markets have been created to help control chemicals entering water ways and the atmosphere. Indeed, the COAG strategic reform framework supports a market-based approach by encouraging the

establishment of property rights for the extraction and allocation of water and supporting the trade of these allocations.

Such concepts could be extended to ensure the effective and efficient management of environmental flows, however the extent of the opportunities to do so is largely determined by the way rights are defined.

Both indirect and direct approaches could be employed according to the needs and characteristics of a particular resource or region. Many factors impact on the health or condition of water environments and ecosystems. Salinity levels are of particular concern in relation to many Australian water resources. The presence of salt does, however, present another control point that could support the establishment of a market. By establishing tradeable salinity credits, environmental flows could be influenced indirectly.

Alternatively, the assignment of tradeable allocations to a body representing the environment would directly influence trade in environmental flows. However, it is unlikely that the presence of a body representing the environment would, by itself, encourage irrigators to preferentially trade a significant part of their allocation to the environment. Some extra incentive would be required. Banking has the potential to provide this incentive as irrigators can deposit a part of their allocation in the bank during years when water is plentiful, watch their allocation grow over time and then withdraw it when water is scarce. This provides several incentives to trade with the environmental body. First, unlike permanent trade of their allocation they are certain of getting back their allocation when they need it and without the need to invest heavily.

These market-based approaches are discussed further below.

4.0 Market based management

Any decision to use a market-based approach to environmental management requires a decision to move, at least in part, from a prior right model in the determination of the most appropriate allocation of water to the environment. This has considerable risks but also offers considerable

opportunities that can not be fully assessed in a scoping paper of this nature.

4.1 Trading in environmental flows

Water Trade for Consumptive Use

The application of market principles to the management of natural resources has become an increasingly valuable technique for achieving sustainable outcomes. In both Australia and the United States, the establishment of markets for bulk water entitlements has allowed greater control over and more efficient use of available resources. Clause 5 of the COAG Strategic Framework on Water Reform commits Australian States and Territories to introducing mechanisms to allow for trade in water entitlements. Jurisdictions have implemented water allocation and trading mechanisms to differing degrees. The development of an integrated approach to trading based on nationally agreed principles is currently being undertaken through the auspices of the High Level Steering Group on Water.

In most cases, water trading occurs within the context of a legislative framework that creates rights to extract water from surface or groundwater resources, usually in the form of a license, and generally separate from land title. Governments allocate water to license holders in accordance with the provisions of a regional or catchment based resource management plan. Best practice indicates that licenses should be based on percentage share of available water, and licenses may have conditions attached to their use, such as the requirement to take water only at certain times. Allocations may then be traded. Trade is occurring on a permanent basis and, as is more often the case in Australia, on a temporary basis. Temporary trades usually occur when a license holder has access to water in excess of requirements in a particular year.

Trade in Environmental Flows

To date, trading has mainly applied to water for consumptive use. That is, while allocation decisions may have given consideration to the environmental health requirements of ecosystems, the environment is usually not considered to be a legitimate trader in established markets for water.

Establishing a market in water allocations for the explicit purpose of creating environmental flows would change this. In the same way as rights are assigned for water extraction, so rights could be assigned for environmental flows.

While functional legislative and planning arrangements have been established, in most cases in-stream uses of water do not have rights in the form of an allocation such as irrigators or water service providers are able to identify as an asset. In most circumstances no official prior right is recognised in the form of a license or allocation that may be traded.

Rights to environmental allocations would need to be assigned in the form of a licence or title to a Government or independent body responsible for managing those rights. These resource managers would then be able to buy and sell allocations. The advantage of such a system is that the resource managers may be better able to more actively and adaptively determine optimal use of water among competing environmental objectives and changing riverine and aquifer requirements. For instance, if the environment has a given volumetric right, the water not needed for environmental purposes could be sold to irrigators generating funds that could be used to buy flows in other time periods.

Irrespective of how the right is defined, any water entitlement assigned to the environment may need to be assigned to a body able to represent and make decisions on behalf of environmental interests. Currently, the use of this water is managed by the relevant Minister in each jurisdiction. However, this need not be the case in the future as water for environmental purposes could be assigned to an independent body.

Necessary Conditions for Trade in Environmental Flows

Legislative arrangements and trade agreements would need to be developed to ensure that the trading framework operates efficiently and cost effectively, and that trading occurs in such a way so as to ensure environmental objectives are met. It is anticipated that such legislation and agreements would be developed along the lines of current legislation facilitating trade in water for consumptive use. In addition, a series of necessary conditions need to be considered:

A *first necessary condition* is to determine whether the environment has prior rights or competitive rights. As discussed above, this step has largely been taken as legislation in most jurisdictions assigns prior right to the environment. Movement from this position would create a situation where irrigators could seek compensation for reduction in their water entitlements to increase environmental water allocations. It will also be important to determine whether the allocation will be based on a 'fixed share' of the resource, or whether a volumetric allocation will be made.

A *second necessary condition* is that the property rights are well defined. Markets require well-defined property rights in order to function efficiently. '*Without the full definition of water resource property rights, the determination of environmental allocation policy is significantly constrained*'.⁴ Where property rights are not assigned or well defined, the market fails to deliver an efficient outcome, this is particularly the case in relation to natural resources. There is a substantial body of literature on how water rights need to be defined to maximise the benefits associated from trade. That literature will not be repeated here. However, in defining the property rights it will be necessary to decide whether the water entitlements are specified volumetrically or in terms of a share of the resource.

A *third necessary condition* is to define who can manage right on behalf of environmental interests. Should responsibility, for example, reside with the Minister responsible for the relevant legislation or should a body be created to take responsibility for environmental water allocations. Options include creation of an environmental flow NGO or a statutory body empowered to buy and sell environmental water on either a temporary or permanent basis. A question to be asked is that of whether or not individuals should be free to purchase water rights and donate them to the body with responsibility for managing environmental allocations. Similarly, it would be important to decide if revenue earned from buying and selling allocations could be hypothecated.

⁴ D. Collins and M. Scoccimarro, (1995), '*Economic issues in the creation of environmental water allocations*', *Outlook 95*, ABARE, pg 243.

A *fourth necessary condition* is that there should be explicit and transparent rules for trading that are communicated well to industry participants. The success of a market frequently relies on the strength and reliability of the information available to potential participants. The market for environmental allocations would be no exception.

Lack of knowledge about environmental flows and difficulties in specifying them in a quantitative manner means that a full trading approach to the environment may be problematic. Trading as a means to encourage efficiency in decision making at the margin is possible. Trading requires access to a pool of money or assets sufficient to achieve the desired outcome. For allocative efficiency, this means that the initial allocation must give environmental managers a starting position that is, at least, of greater value than the cost of buying sufficient water in the worst case scenario. Assuming a commitment to sustainable development, even a large allocation of this nature was made, governments may have to fund recovery from trading mistakes.

4.2 Banking water

Banking as an Extension to Trade

As an extension to a system of environmental allocations and the introduction of a trading mechanism, the establishment of a water 'bank' would encourage private water users to enter the market for environmental flows.

Water security is a primary consideration for Australia's water users. A water bank could be established as a form of insurance against times of drought. In years of high water availability, licensed users could deposit allocations in the bank. The bank would then guarantee the availability of these allocations, after appropriate adjustment for losses, during drought. In addition, some water could become available for lease by irrigators and other users.

Such a 'bank' could be established and operated by resource managers. A water banking program has been successfully implemented in California in the United States. The goal of the *Drought Water Bank* program was to meet critical water needs that were severely curtailed because developed water supplies were significantly reduced as a result of drought or other

unanticipated conditions. The Californian Department for Water Resources bought water allocations from willing sellers or paid water users to forego use of a portion of their allocation, and re-marketed the water to buyers under specific critical needs allocation rules.

Necessary Conditions for Banking of Environmental Flows

Similar to establishing a system of tradeable water entitlements and assigning water to the environment, the establishment of a banking framework would require considerable care. In particular the following conditions (in no specific order) would need to be met.

A *first necessary condition* is that participants need to know the conditions for investment. For instance, what is the 'rate of interest' they can expect to receive from their investment, (i.e. by how much will their entitlement grow), how long they have to or are able to leave the entitlement in the bank, and what, if any, penalties are associated with early withdrawal.

A *second necessary condition* is that participants need to be aware of any conditions regarding the use of the water that they bank. In period of drought, should a deposit need to be called upon, investors would need to know whether this allocation could be used for consumptive or environmental purposes.

A *third necessary condition* relates to the question of ownership of the bank. In the first instance it is possible for the bank to be owned and operated by the government. As such it could be run by the same agency that has the responsibility of managing the environmental water allocation. Alternatively it could be a separate corporate entity.

4.3 Opportunities arising

Any system developed to enable trade in and banking of environmental flows would need to demonstrate the following characteristics:

- *flexibility* : to account for the variability of needs demonstrated by the environment;
- *transferability* : given the inter-related nature of Australia's ground and surface water systems, trade

between surface water and groundwater systems would promote greater efficiency of resource use;

- *integration* : a key aspect of the success of the ability to integrate trades in environmental flows with the current market for water for consumptive use.

Formalising allocations to the environment in this way, and allowing for trade in such allocations could serve to elevate the status of water for environmental purposes. Accordingly, the pursuit of ecosystem stability becomes part of the mainstream market oriented approach to natural resource management rather than remaining external to the rapidly changing Australian water industry. Under a flexible, transferable and integrated framework, the following opportunities could emerge:

- A change in attitude could emerge where users begin to focus on environmental outcomes and ways to achieve environmental outcomes in a more efficient manner.
- There is the opportunity for the environment to create its own source of funding by strategically buying and selling water. For example, there may be opportunity to sell water in drought years and then buy it back in wet years when, for example, there is environmental interest in prolonging a flood event. Although some people would object to the practice, the proceeds from such transactions could be invested in research and development or infrastructure development or more wetlands.
- Alternatively, the funds could be used to achieve another objectives, such as buying land for the purposes of establishing or augmenting a national park, thereby enhancing the biodiversity of a region.
- Under this structure, Government continues to be the environmental steward on behalf of the community, but would be able to participate more actively in the market to better tailor environmental management of water resource use. Environmental allocations could be traded within a river or groundwater system to achieve the best outcome.
- Allowing for competition between the environment and other users

- Water users could compete for and purchase different levels of water quality by trading allocations up and down stream.
- Competitive mechanisms would create opportunities for individuals or non-government organisations to become stewards of the resource. Donations could be made to the environment under this system, allowing for philanthropic enterprise.
- In some circumstances, landholders who trap surface runoff and store it on-farm could be given credit for water that they would otherwise have extracted from the river or groundwater system.

However, the success of such a system is highly dependent on gaining a sound understanding of environmental water requirements. Irrespective of their ownership, there is also a risk that the manager of the environmental water may make wrong decisions leading to loss of the environmental allocation or a significant draw down of the agency's funds.

4.4 Issues arising

The above discussion raises the following issues that would require further consideration if trade in environmental allocations and the associated opportunities were to be pursued:

- Should the environment have a prior right to water, or is it satisfactory to nominate residual rights and allow room for some competition? This would need to be considered in light of studies suggesting a significant growth in demand for water for irrigation over the next decade.
- Can hybrid models be established? Would a system based on a minimum standard as a prior right but trading to deliver outcomes in excess of that right result in outcomes that are more consistent with social, economic and environmental outcomes?
- Which principles should be applied to trade in environmental flow credits (EFC's)? For instance, how would environmental flows be determined, where would trade be permitted, and what would the relationship be to planning mechanisms?

- How would trade be facilitated? Who would control trade? How would any funds generated by trade be managed? Consideration should be given to the necessity for establishing national or regional trade agreements to ensure equitable, efficient and sustainable outcomes.
- Is the establishment of mechanisms to allow for trade in environmental flows a cost-effective proposition? Will gains from trade be those anticipated? Will the cost of monitoring and administration be prohibitive?
- What are the views of the community in relation to trading in environmental flows? There has been some indication that there is fear and uncertainty regarding trading in environmental flows in the community. Is the community likely to embrace water trading?
- Is the banking of drought bonds a viable option? Could it result in the successes demonstrated in California?

5.0 Summary

This paper has been designed to promote discussion regarding the management of environmental flows, with a particular emphasis of the role of trading and banking of environmental flows. The paper discusses how environmental allocations are determined, discusses the necessary conditions for the establishment of trading mechanisms in environmental flows and banking options, suggests opportunities arising from the establishment of such systems, and highlights several key issues emerging from the discussion that require further clarification.

Ultimately, there is an opportunity emerging to enhance the management of environmental flows using the principles of market based mechanisms such as trading and banking to achieve more active and adaptive.

Figure 1 : Management Options

