



Groundwater Trading

Occasional Paper

Water

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NATURAL RESOURCE MANAGEMENT STANDING COMMITTEE

In June 2001 the Australian Commonwealth and State/Territory governments created several new Ministerial Councils from the amalgamation and redirection of the work of several existing Councils. These changes saw the winding up of the Agriculture and Resource Management Council of Australia and New Zealand, the Australian and New Zealand Environment and Conservation Council and the Ministerial Council on Forestry, Fisheries and Aquaculture, and the establishment of several new Councils among which is the Natural Resource Management Ministerial Council. The objective of this new Council is:

“to promote the conservation and sustainable use of Australia’s natural resources”.

The Natural Resource Management Ministerial Council, which consists of Australian Federal, State/Territory and New Zealand Ministers responsible for natural resources management policy issues has principal responsibility for, amongst other things, water issues.

The Council is supported by a permanent Standing Committee, titled the Natural Resource Management Standing Committee. Membership of the Standing Committee comprises relevant heads/CEOs of Commonwealth, State/Territory and New Zealand government agencies.

The Standing Committee agreed to release this occasional paper, *Groundwater Trading* as advice to jurisdictions to progress implementation of trading, at its second meeting in November 2001.

FURTHER INFORMATION

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1. Introduction

The ARMCANZ/ANZECC High Level Steering Group on Water (HSLG) has identified a number of issues, which are considered to require national attention in order to improve the level of groundwater management. They are related to the following principles associated with sustainable use:

- Groundwater allocation and use are within environmentally sustainable limits
- Groundwater use is efficient, and
- Groundwater quality is protected to ensure the resource is suitable for its proposed use.

As a means of dealing with the issues, a project titled “Opportunities for Improving Groundwater Management in Australia” was developed by the HSLG. The project was divided into four sub-projects addressing issues of: environmental water provisions, groundwater trading, managing over-allocated systems, and groundwater quality protection.

This report addresses the second issue: Groundwater Trading. The HSLG has identified a need to propose policies related to groundwater trading to enable jurisdictions¹ to improve groundwater management.

Groundwater trading is a market-based instrument that can be used to reallocate scarce resources to uses with higher economic benefit, to achieve more efficient use of water resources and to assist regional economic development. The concept has been developed for some time, but has not been applied to anywhere near the same extent as with surface water, apart from in a small number of local areas. There are difficulties involved in introducing trading effectively to groundwater, as there are a number of technical, social, and political impediments which are both in common with surface water, and also peculiar to groundwater.

This project is aimed at clearly identifying the benefits of groundwater trading, and, examining why trade has not occurred to a greater extent, and what needs to be done to increase trade. In doing this it hopes to assist jurisdictions with developing strategies, guidelines and rules to overcome the difficulties and impediments to trade.

Groundwater trading concepts were initially presented as a discussion paper for a workshop at which the policies in this document were developed.

¹ In this paper the term “States” is used to denote States and Territories; “Jurisdictions” denotes States, Territories, and the Commonwealth.

2. The Benefits of Groundwater Trading

Water is a scarce commodity in many areas of Australia. Within these communities there is frustration at the lack of access to water. On the one hand, surface water is at an advanced stage of management and development. On the other, groundwater is less developed and management systems are less well developed.

Australia cannot afford to let groundwater management languish behind surface water. If it does, the maximum economic benefit that could otherwise be derived from the optimal development of all available water resources will not be obtained. In addition, over-reliance on surface water in areas where groundwater is available will only serve to exacerbate social and environmental problems resulting from the over-development of surface water.

Trade can improve groundwater management by enabling the more efficient use of water. The efficient use of groundwater can provide economic, social, and environmental benefits. Trade is also a redistribution mechanism and can be used to reduce conflict. Trade has a number of other desirable attributes. It is optional; people are not forced to trade. It also creates flexibility for users and does not involve the government in choosing between competing potential water users. Nonetheless, government does have a role in the development of market rules and principles.

Trading is only possible in systems that are over allocated, fully allocated or approaching full allocation. The economic benefits from trade include optimising the overall use of groundwater by freeing up unused allocations ('sleeper licences') and allowing more efficient users to gain greater economic opportunity, all of which enhances the local economy.

From a social perspective there are benefits from redistribution. For example, allowing restructuring from areas of low economic output to high economic output. Notably, with groundwater, disbenefits of redistribution often associated with surface water do not apply to the same extent because groundwater can generally only be traded within the one groundwater system.

The environmental benefit that can be obtained is that there is less encroachment on the environmental shared water because users have a way of obtaining water by trade. Trade can provide a "pressure relief" mechanism in relation to environmental demand for water.

If the level of groundwater management increased to the same level as surface water, trade will follow on as a matter of course and groundwater use will increase. When a trading environment is created, people readily adapt to it and become very innovative and imaginative in the trading that occurs. There is however some community resistance to trade, due to concern over windfall gains, and possible social disruption.

The extent of trade depends on economic drivers such as the availability of excess water, the complementarity of permanent crops and annual crops, and varying gross margins of

crops which can generate short term demand for water, and seasonal and climatic variation creating supply as well as demand.

Trade can therefore be thought of as having huge potential in Australia and to obtain the benefits it needs to be recognised that trade in groundwater can occur. To enable trade it is vital to have a high level of awareness in the community about trading opportunities, and the support structures available to facilitate trade. The framework in which trade can operate also needs to be made clear.

Conclusion 1 – Groundwater Trading Can Occur

States should recognise that trading in groundwater is a substantial tool that is available to achieve improved groundwater management.

A critical aspect of the trading framework is the definition of trading boundaries. Trading in groundwater can only occur within a Groundwater Management Unit (GMU)² as intra-aquifer trading. Trade between GMUs (inter-aquifer trading) is not feasible.

² Groundwater Management Units are hydraulically connected groundwater systems where flow can occur within one part of the system to another part. As such they tend to be more localised than surface water basins.

3. Key Reforms

3.1 Pre Conditions for Trading

3.1.1 Allocation Limit

A groundwater allocation can be defined as a “legal authority to take a specified amount of groundwater”. Allocations are normally made formally (usually as a licence) for high yielding bores in order to manage the bulk of the groundwater use. This typically excludes Domestic and Stock (D&S) bores, which are low yielding. However, where the total amount of D&S use becomes a significant proportion of the sustainable yield, they should be included in the formal allocation process.

Within a groundwater system, the total allocation should not exceed the sustainable yield³. The reason for this is that if allocation is greater than the sustainable yield, use may exceed the sustainable yield. It is highly undesirable to allow use to exceed the sustainable yield because it will mean that use will have to be reduced, with direct and immediate social and economic impact on individual users and the community.

Because of these potential impacts, and the uncertainty of the sustainable yield calculation, it may be prudent to cease allocation in some aquifer systems below the level of the sustainable yield, as a precautionary measure.

Clearly on this basis, where the total allocation is presently at or above the sustainable yield in a groundwater system then there should be no further allocations made.

Conclusion 2

Further allocation should cease where allocations are at or above sustainable yield.

3.1.2 Form of Entitlement

An allocation issued as a groundwater licence is a legal entitlement. The entitlement is to a specified amount of groundwater, available for use over a given period of time. The most common form of the entitlement is a licence specifying that an amount of groundwater can be extracted in a year. Licences are granted for a set period, usually for somewhere between 1 and 15 years. In addition, licences may specify a variety of other rights and conditions such as maximum allowable daily pumping rates and volumes, and the extraction of additional water during a drought. They are often issued with an expectation of renewal.

In most jurisdictions, the rights to the flow, use and control of groundwater are vested in the Crown and the property right to the groundwater is separate from other property rights

³ The sustainable yield of a groundwater resource is defined as: “The groundwater extraction regime, measured over a specified planning time frame, that allows acceptable levels of stress and protects dependant economic, social and environmental values.”

such as land. There is also generally a legislated ability to amend licences, both during the period of the licence in certain circumstances, or on renewal.

Where the water property right is not a separate right, for example, where it is tied to land, the freedom and flexibility necessary to enable trade is seriously restricted. To maximise the potential for trade it is therefore necessary that the tradeable water right is separated from land and that what parts of the entitlement are tradeable is clearly specified.

Conclusion 3

Entitlements to groundwater should be in the form of a clearly specified water property right separated from land, which may contain fixed and/or variable elements. Entitlements to groundwater should define which elements are tradeable. This should include renewal and amendment conditions.

3.1.3 Amending Entitlements

To provide certainty for the purpose of enabling trade, it is necessary to specify the rules under which the entitlements to groundwater may be amended, particularly when there is a change in the estimation of the sustainable yield.

In most groundwater systems it will be inevitable that the sustainable yield estimation will change over time, due either to a refinement of the calculation as more and better information becomes available, and as the aquifer system is stressed.

In the case of a reduction in the sustainable yield, there will be need to be a reduction in entitlement which will raise a number of issues such as equity in the way entitlements are reduced, and compensation.

Equity issues relate to whether the reduction is made “across the board” or whether it is targeted to certain areas or classes of use. In response to plans to reduce use there are likely to be claims made for compensation. As a general principle it needs to be appreciated that compensation should not be paid as a result of a reduction in the estimation of the sustainable yield based on new information. The reason for this is that groundwater in most States is a publicly owned resource and a reduction in the estimation of the resource, made on the basis of the best available information and in good faith, should not be compensated.

In contrast to the need to reduce entitlements, there may also be a situation where a review of the sustainable yield could result in additional water becoming available.

In an active trading market, the release of additional groundwater will need to be handled in a manner that recognises the monetary value of existing entitlements. In this situation it is considered that additional water should be released onto the market by tender or auction.

This approach will, however, need to include consideration of entitlements that may have previously been reduced without compensation.

In relation to the real possibilities that entitlements may need to be reduced in response to changes in the estimation of sustainable yield, or that additional water may be made available, it is necessary to have well established rules in place for altering entitlements.

Stakeholders and the community should be made aware of the potential for the sustainable yield to alter, and the rules under which entitlements will be amended.

Conclusion 4

Established rules are necessary for the alteration of entitlements when there is a change in the sustainable yield.

3.1.4 Risk Associated with Trade

In over-allocated and under used systems the consequence of allowing trade and hence increasing use to above the sustainable yield should be assessed using a risk based approach. This will involve consideration of the impacts on Groundwater Dependent Ecosystems (GDEs) and other groundwater users (typically interference). The broad scale risk assessment will normally be part of a Groundwater Management Plan, however approval of individual trades will also be required. Management rules, or transfers rules, should be in place to ensure that trading does not cause unacceptable impacts on GDEs. The market should be aware of these possible constraints. Defining the interference management rules, both for GDEs and other users should be a prerequisite to the establishment of a market in any GMU.

Conclusion 5

Trade may be allowed in over-allocated and under-used systems where the consequential risk of over-use is assessed and managed. This should include the development of transfer rules to minimise unacceptable impacts.

3.1.5 Trading in Over-used Systems

There are a limited number of groundwater systems in Australia where there is over-use, that is, where use is greater than the sustainable yield. In these systems it is imperative to reduce use to within the sustainable yield and to do so within a designed time frame. This time frame will need to balance the need to prevent further damage to the groundwater

resources and the associated groundwater dependent environment with the need for reasonable transition arrangements for affected users.

Where the required reduction in over use is substantial, governments may need to provide structural adjustment assistance.

On first reflection, it would appear that trading should not be permitted in a groundwater system where there is over use, because it could send the wrong messages that in some way over use is sanctioned, and because it may complicate any proposed reduction strategy.

On closer examination trade can be seen as facilitating the reduction in over use. First, trade can result in redistributing use from less efficient users to more efficient users enabling use to be reduced. Second, and more importantly, since trade shifts water from lower to high value users, trade can reduce dramatically the cost of production lost to landholders as the result of across the board cut backs in over use. Third, the same mechanism means that trade facilitates structural adjustment, consolidation and exit in the over used aquifer.

Reducing use through surrendering part of each entitlement that may be traded is a frequently suggested approach. However, the application of reduction factors to volumes traded should only be considered in concert with other strategies to reduce use and should be explicitly tested (prior to introduction) against relevant existing criteria including effectiveness and minimising the cost of lost production.

This is necessary because volumes traded are typically very small compared with volumes used in over allocated systems and the proportional reduction factors must be low if trade is not to be curtailed. As a result, this method of reducing over use has only a very limited effect on the problem.

The risk of an easy but ineffective strategy is that it may distract attention and resolve from more effective but harder strategies.

Conclusion 6

Trading in over-use situations should only be allowed where it is part of an overall management plan, which includes a strategy to reduce use to within the sustainable yield.

Trading should not be used alone to manage down over-allocation. Where trading is used it must be compatible with the overall allocation reduction strategy.

The application of reduction factors to volumes traded should only be considered in concert with other strategies and explicitly tested prior to introduction against relevant criteria including effectiveness and minimisation of the value of lost production.

3.1.6 *Community Awareness*

The community needs to be informed of the opportunity to trade in groundwater. This includes raising awareness over the fundamental issue that groundwater trading can in fact occur, and provision of information on the opportunities available and how to obtain water by trading. In some States there is resistance to groundwater trading because of a lack of understanding that it can occur. Information such as the nature and extent of flow in a groundwater system needs to be provided to people to convince them that, in essence, water exists under the ground in a “bucket” and that groundwater may be extracted from any part of the bucket but collectively only up to the limit of the ‘sustainable yield’ of the bucket.

This limit on extraction is the fundamental driver of trade as no further allocation should occur beyond the sustainable yield. This means the only avenue to obtain water is through redistribution of existing allocations, which can be efficiently achieved through trade.

Information should be provided on:

- What water can be obtained and where it can be obtained
- How the groundwater trading market works
- What are the processes and procedures involved in conducting trade.

This information should ideally be packaged in a brochure providing details in relation to particular groundwater systems, as well as case studies of where and why trading has worked successfully and the benefits derived.

The educational material also needs to provide the current understanding of the resource, given that there is always some level of uncertainty in the determination of the sustainable yield and that it is likely to change over time as the groundwater system is stressed.

A great deal of time, effort and resources are required to convey the complexities of groundwater to the community in a way that can be well understood, in order to create the confidence and security needed to support a strong groundwater trading market.

Conclusion 7

States should develop education materials that include both the current technical understanding of the resource, estimation of the sustainable yield of the resource, the process for continued refinement of the estimation and the implications for that refinement.

The methodology used to determine the sustainable yield should be well communicated to groundwater users to enable users to have confidence in the determination.

Education programs to explain the benefits and processes involved in groundwater trading should also be developed.

3.2 Trading Regime

3.2.1 *Transparency of Trade and Information*

To facilitate trade, computer based trading information systems need to be developed. These systems should provide the types of basic data available in other mature commodity or financial markets such as volume, date, price and location of trade.

Further the systems should be transparent and open, and be able to be readily understood and accessed by users.

In addition to basic data the systems should provide information on, for example: price trends, where water is available, what the local management regime is, what conditions may apply to entitlements, and whether government assistance is available. They should also contain a register of existing licences.

It is considered that these systems should be best developed within individual States, however there will need to be a nationally consistent approach to enable potential developers to determine water availability and price, in different parts of the country, without difficulty. In this regard there should be a common language used between systems, and a national protocol for the development of the individual systems.

There are significant costs involved in developing such systems and collating and inputting data. States need to be aware that sufficient resources will need to be made available for this task.

Conclusion 8

- Groundwater licence and water usage details need to be made available on a public register. This may require the change of legislation in some States.
- Resources need to be invested in making information on trading readily available.
- There should be a national Protocol for groundwater trading information.

3.2.2 *Access to Temporary and Permanent Trade*

Both temporary and permanent trading have specific advantages and disadvantages in different hydrogeologic and social environments. It is important that both types of trade are allowed, and facilitated by the States.

Conclusion 9

Where a trading regime applies, it should include provision for both temporary and permanent trade.

3.2.3 *Metering*

Metering of use is an essential part of a groundwater trading environment. It is necessary to be able to accurately establish the level of use and to provide evidence that licensed volumes are being complied with.

There are many groundwater systems in Australia which are currently over-allocated (or fully allocated) but under-used. Trade in these systems will increase use. The fact that the systems are over-allocated presents a risk that use could increase above the sustainable yield. A primary consideration in over-allocated systems is to be able to manage the risk of over-use occurring while the over-allocation is ramped down. Metering forms a key element in being able to manage the risk. It is also important where trading occurs in over-use systems, to ensure use reduction targets are being achieved.

Compliance and monitoring is important to ensure confidence among users who have purchased an allocation at considerable cost, that other users are not abusing the system by exceeding their allocation. Whilst metering is only one means of ensuring compliance, it provides greater accuracy than other methods such as: area watered or pump power consumption.

Conclusion 10

Metering of groundwater extractions is necessary within Groundwater Management Units where trading occurs.

3.2.4 *Cost of Groundwater Management and Tariffs*

The introduction of trading to the management of a groundwater system will bring with it increased costs associated with the development of information systems and the administration of trade.

Principles and policy regarding the necessary groundwater management costs have been enunciated in a previous ARMCANZ publication. The recommendation made in this previous document still applies. However, with the inclusions of trading into the management environment, the costs to be recovered will be increased.

States will need to consider the appropriate tariff to facilitate trade. Tariffs could be set using a two component system with a higher percentage of the rate being set on the entitlement and the smaller percentage being set on the volume of extraction. By setting a high rate for entitlement, users would be discouraged from holding and not using groundwater. By setting a low rate on extracted water, users would not be discouraged to use water.

Conclusion 11

Recommendation 9 of the National Framework for Improved Groundwater Management in Australia (ARMCANZ 1996) needs to be implemented.

3.2.5 *Establishment of Brokerages*

Potential traders need confidence in an established and transparent process. States are encouraged to facilitate the establishment of local brokerages to provide a mechanism for trade to occur.

Conclusion 12

There is a need to establish brokerages to facilitate trade.

3.2.6 *Monitoring and Evaluation*

To ensure groundwater trading is generating the expected economic, social and environmental benefits, it will be necessary to monitor and evaluate the effects of trade. There is a need to also monitor the possible negative impacts of trade.

National guidelines specifying how trade should be monitored and evaluated are needed. These guidelines should clearly state the objectives of trading, information to be collected, the methodology to gauge economic, social and environmental benefits, and co-ordination between States. The assessment of effects should be undertaken at a State level.

Conclusion 13

National guidelines for monitoring and evaluating the effects of trade are needed. They should specify the information to be collected on the social, economic and environmental benefits, any negative impacts, and include co-ordination arrangements between States.

