ECONOMIC INSTRUMENTS IN THE MANAGEMENT OF AUSTRALIA'S WATER RESOURCES: A CRITICAL VIEW

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ABSTRACT: The era of environmental concern ushered in by the World Conservation Strategy and the Brundtland Commission in the 1980s was given renewed impetus following the United Nations Conference on Environment and Development (UNCED) in 1992 and the adoption of Agenda 21. Water was a key resource singled out for attention and governments around the world have made a commitment to ecologically sustainable management of the resource. Australia is no exception and a number of processes are under way aimed at ensuring the sustainability of the country's limited water endowment.

In recent years the Australian water industry increasingly has become under criticism as the perceived source of widespread resource degradation and extensive impairment of riverine environments. At the same time, growing demands for alternative uses of water have arisen for a wide range of environmental purposes. Addressing these criticisms and satisfying these demands have prompted moves for far-reaching adjustment to water allocation systems and a new approach to water management, a key component of which is the use of economic instruments to bring about change.

Among measures introduced to improve water management are the establishment of water markets and tradeable water entitlements, and the rationalisation of water pricing. These measures have had a mixed reception from water users, particularly in the irrigation sector, and have come under scrutiny in regard to their rationale and effectiveness in promoting efficiency and equity in rural water use. The challenge remains to identify the most appropriate mix of incentive-based and regulatory mechanisms for the management of Australia's water resources.

An even more searching question from the perspective of this Symposium is the extent to which Australia's experience in the use of economic instruments in water management can be applied in other parts of the developed and developing world.

Keywords: Australia, irrigation, economic instruments, water markets, tradeable water entitlements, water pricing

Introduction

Scarcity and variability remain common themes in Australia's water situation. Despite its large size and latitudinal extent, Australia is, overall, the driest, inhabited continental land mass (Figure 1). Given the variable nature of Australia's water resources, it is hardly surprising that water occupies such a prominent place in the history of the nation's development. Australia stores more water per capita than any other country in the world and irrigated agriculture makes the heaviest demands on the resource, accounting for over 70 per cent of all water used. It is only in the recent past that attitudes to water have begun to change in Australia and serious economic and environmental questions have been directed at further storage construction, stream regulation, and development of water resources for consumptive use.

In a maturing water economy like Australia, economic, social and political realities frequently require that changes in water systems are needed. Water no longer holds its special place in public sector decision making and unquestioned endorsement of further water resources development cannot be assumed. Project proposals increasingly are assessed against an array of environmental concerns, economic constraints, social values and political priorities.

Emerging attitudes to water as a multifunctional resource, coupled with an altered decision environment have placed great pressure on water management agencies in Australia. New organisational structures have become necessary to accommodate markedly different policies, and to coordinate planning and operations in the face of changing and often conflicting demands for water. These changes have been accompanied by a shift away from structural solutions for perceived resource inadequacy towards more efficient management of existing water supplies. In particular, greater reliance on market forces, linked to an enforceable system of property rights, is seen as preferable to rule-based and often subsidised management of water resources (Pigram, 1986)

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Policy Shifts

The impetus for water reform in Australia can be linked to a number of policy shifts about the role of government and the public sector in resource management, along with attitudinal changes in the community to the perception and value of water resources.

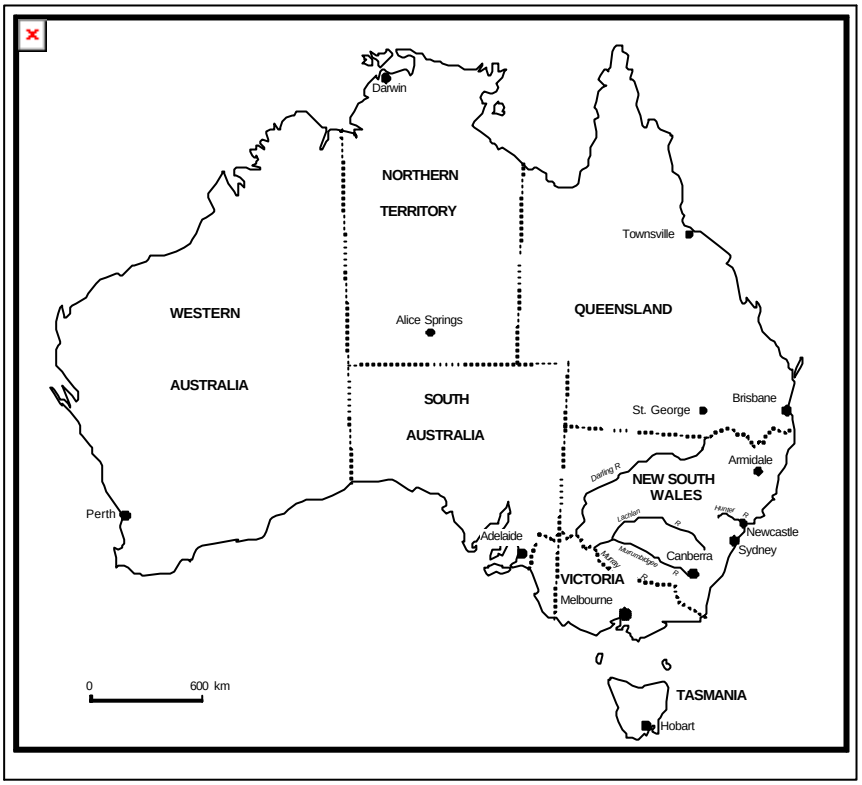

Figure 1 - Australia: the driest inhabited continental land mass

These changes have been prompted, in part, by growing difficulty in identifying further hydrologically feasible and cost-effective sites for harnessing additional water resources. Development has also been constrained by pressing economic and environmental realities, and financial constraints arising from intensified competition for public funds. Added to these circumstances has been growing support for smaller government and a decreased role for the public sector, and consequently, greater opportunities for private sector involvement in water management.

Reflecting these policy shifts is the trend towards corporatisation (and ultimately privatisation) of major water authorities, and the transfer of government-run rural irrigation schemes to private management bodies controlled by the irrigators. With these administrative changes has come the transfer of financial responsibility and accountability to the new managers. The restructuring of water administration has been reinforced by comprehensive reviews of water law and updated legislation enacted in several states. A common element is willingness by public agencies to endorse alternative institutional arrangements to the previous regulatory (command-and-control) approach to water allocation and management. The end-result is a lessening in the degree of discretion left to water authorities and an increasing requirement to accommodate economic instruments and market-based approaches in water allocation and use. Foremost among these are the rationalisation of water pricing and establishment of water markets and tradeable water entitlements.

Drivers of Reform

The forces driving change in the water industry, and influencing the rate, direction and scale of water reform in Australia began with the prominence given in the 1980s to the findings of the Brundtland

Commission and the endorsement of the World Conservation Strategy at the national level. The reform process was given renewed impetus following the United Nations Conference on Environment and Development (UNCED) in 1992 and the adoption of Agenda 21.

The pace of reform accelerated in Australia following the release, also in 1992, of an Industry Commission report on Water Resources and Waste Disposal (Australian Industry Commission, 1992). The Commission examined institutional, regulatory and other arrangements which contribute to inefficient and unsustainable resource use, and to emerging environmental problems, and recommended ways to revise these arrangements. A key finding was the need for an integrated approach in which policies directed at the efficient provision of water services must be tied in with policies to achieve sustainable water use.

Council of Australian Governments

The Industry Commission Report was followed in February 1994 by the Water Policy Agreement put in place by the Council of Australian Governments (COAG). The Council endorsed the findings of its Working Group on Water Resource Policy regarding deficiencies in water use and management and associated degradation of the resource base. In particular, the Working Group targeted (Council of Australian Governments, 1994):

- allocation of water to the environment and the need for balance between environmental and developmental concerns
- adoption of an integrated catchment management approach to water resource management
- pricing reform, including full cost recovery, the removal of cross-subsidies, and provision for asset maintenance and refurbishment
- adoption of tradeable water entitlements
- clarification and consistency of property rights to water
- institutional and organisational reforms
- structural adjustment consequences and social impact of reform, and
- community consultation and education programs.

The Agreement is seen as signalling a new urgency on the part of governments, both state and federal, to promote efficient, sustainable use of water in Australia. The Strategic framework adopted by the Council for the reform of the Australian water industry was reinforced in April 1995 by its endorsement of the Second Report of the Working Group on Water Resource Policy (Council of Australian Governments, 1995). This report documented the significant progress which had been made in implementing the 1994 Agreement. All states, along with the Murray-Darling Basin Commission, are now pursuing water reform (Figure 1).

National Competition Policy

At its meeting in April 1995, the Council of Australian Governments also endorsed the implementation of a National Competition Policy. The policy and associated reforms arose out of the report of the Hilmer Committee, and extend trade practices legislation to state and local government business enterprises. Competition is now encouraged, if not required, in the business activities of governments and other sectors of the economy.

Essentially, the aims of the National Competition Policy are:

- to remove unnecessary barriers to trade and competition
- to ensure that no buyer or seller acts against the public interest by engaging in anti-competitive behaviour
- to require all businesses (including governments) to operate with the same market rules
- to allow anti-competitive behaviour only if it is in the public interest, and
- to reduce complex regulations and administrative duplication between governments.

The policy complements the view of the Council of Australian Governments that many public sector businesses in Australia, including water authorities and management agencies, lack the necessary element of competition to drive improvements in customer service and efficiency gains.

Implications for the Water Sector

Australia is now firmly engaged in a wideranging process of water reform directed towards promoting economic efficiency in water use in a competitive environment, within the context of ecologically sustainable management of the resource. The primary instruments driving the reform process are the agreed targets set by the Council of Australian Governments and the provisions of the National Competition Policy. It should be noted that these are mandated policy determinations, not mere recommendations. Substantial payments to the states from the Federal Government are contingent upon the implementation of the reforms. Neither the COAG directives nor the competition policy reforms are negotiable, if the responsible state authority wishes to retain its share of the contingency payments.

The generic commitments to reform and national milestones set down relate to surface water and to groundwater, and both urban and rural water systems and services. Core activities covered are in five broad groups as follows (Task Force on COAG Reform, 1995):

- Cost recovery and pricing
- Institutional reform
- Allocation and trading of sustainable water entitlements
- Environmental aspects and water quality
- Public consultation and education

No sector of the water industry and no water agency or organization remain unaffected. The reforms are ongoing and the progress of each state and territory and the Murray-Darling Basin Commission towards implementation of the reform agenda and timetable is monitored annually. The State of Victoria appears foremost in reform of administrative structures, whereas rapid progress towards full cost recovery and rationalization of water prices is clearly evident in New South Wales. Water trading is also well developed in that State and in South Australia which pioneered the practice of transferable water entitlements.

Different conditions of water availability and use, and contrasting political perspectives on resource development have slowed the progress of reform in some states. Western Australia, for example, only began to formalize procedures for the allocation and transfer of water rights in 1997 (Water and Rivers Commission, 1997). The State of Queensland remains committed to further development of its water resources and is pushing ahead with plans to invest A$1000 million in a series of major dams, weirs and irrigation projects. It is open to question whether these works will satisfy the criteria of full cost recovery and the absence of subsidies, or their transparency as set down in the COAG Agreement.

In an island continent as large as Australia, with marked variations in water supply and access to the resource, it is not surprising that differences occur in attitudes to water in the procedures and institutions in place to manage the resource. Each state and territory has developed its own unique system and differing priorities have meant that water resource development has proceeded at a different pace and for different purposes under different jurisdictions. Biophysical contrasts have only added to this diversity. For example, the latitudinal extent of the Australian landmass essentially means that, from the perspective of water resources, in the eastern part of the continent, there are at least "two Australias". The southern half, including the island of Tasmania, the State of Victoria, and the southern half of New South Wales, enjoys more dependable precipitation with a winter maximum. Further north in New South Wales and sub-tropical Queensland, rainfall is more variable with a summer maximum, therefore calling for a different response to water use.

Again, as noted above, the State of Queensland at least, remains in developmental mode with respect to its water endowment, with serious questions being directed towards its commitment to the implementation of pricing and other reforms by target date 2001. Elsewhere, the developmental phase is closing and the opportunity is there for most water authorities to endorse the COAG water reform agenda fully and meet the generic milestones and the schedule set. Further challenges to the prospect of achieving a consensual approach to water reform are presented by differing political agendas and the many adjustments to water policy and practice sequentially, as a result of changes to the state and federal political science.

Despite these contrasts, some useful insights into the Australian experience can be gained from a critical examination of selected aspects of the reform process. The following discussion focuses on two of the core activities identified under the COAG Water Reform Framework:

- Cost Recovery and Pricing, and
- Allocation and Trading of Sustainable Water Entitlements

The discussion is concerned primarily with the approach adopted to implement these reforms and the reaction by water users to the measures put in place, in the most populous state, New South Wales, in the southeast of the Australian continent.

Water Pricing and Cost Recovery

Water is owned by the Crown (i.e. the State) in Australia and abstractions are made under licence. Whereas marked differences in water prices and tariff structures exist, prices for irrigation water have generally been low. Apart, perhaps, from ricegrowing, water does not yet figure as significant a factor of production as other inputs such as fuel, fertiliser and chemicals.

The arguments for upward adjustment of prices for water are compelling, both on grounds of promoting greater efficiency in use, and recovering costs of supply. In regard to the latter issue, questions arise as to which costs are to be recovered and how they are to be measured. In particular, a central concern is the extent to which prices would reflect the typically large capital costs invested in storage construction and water delivery. It has been argued that, since these ("sunk") costs have long since been capitalised into land and irrigation infrastructure, and the assets themselves have zero opportunity costs, adjusting water prices to recover capital costs is not appropriate (Musgrave, 1996). However, there is general agreement that beneficiaries should meet future capital costs, or at least enter into joint ventures with government for the funding of new works (Pigram, 1997).

In New South Wales, the government currently meets the full costs of operating and maintaining irrigation storages and regulatory works, although these are progressively being passed to state-owned, but corporatised, irrigation areas and districts. Costs incurred in "running the rivers", i.e. water delivery from storage downriver to the point of diversion, are shared between extractive users and the state, on the principle that there are other beneficiaries involved. Sharing of operations and maintenance costs associated with diversion and reticulation remains a point of contention. Such costs are wider than simply operating water storages and regulated rivers, and include a range of activities designed to maintain and manage river systems to achieve predetermined management plans (Independent Pricing and Regulatory Tribunal , 1996).

Pricing Principles

In its 1996 deliberations, the Tribunal identified a number of pricing principles that should be followed in setting changes for bulk water services in New South Wales (Independent Pricing and Regulatory Tribunal, 1996b, 2):

- Water charges should be based on the most efficient way of providing water services.
- Administration of water resources should achieve financial stability and deliver a sustainable level of water services.
- Pricing policy should encourage the best overall outcome for the community from the use of water and the other resources used to store, manage and deliver that water.
- The cost of water services should be paid by those who are responsible for causing, or benefit from, those services. Those who cause more services to be required, or benefit more, should pay more.
- Pricing policy should promote ecologically sustainable use of water and of the resources used to store, manage and deliver that water.

Based on these principles, the Tribunal developed a number of recommendations which should be implemented in the interests of water reform. A key recommendation was that irrigation water pricing should reflect the full cost of making the water available efficiently, including environmental costs. Other recommendations referred to the removal of cross subsidies; measures to improve operational efficiency;

a charge to cover future asset refurbishment and replacement; and improvements to monitoring of extractions from unregulated rivers and from groundwater.

In 1997, the Tribunal introduced a simplified two-part tariff system by combining a number of previous charges and levies into fixed charges based on licensed entitlement, and variable charges based on total water use (Independent Pricing and Regulatory Tribunal, 1997). Further revisions of water charges were released in July 1998 following the completion of more comprehensive assessments of economic benefits, operational and maintenance costs, and environmental externalities, in order to allocate joint costs on the basis of impactor or beneficiary pays principles. Whereas the general thrust was towards even higher prices for water, price reductions have been recommended in some regions, presumably because of lower costs of water delivery (Independent Pricing and Regulatory Tribunal, 1998).

At the same time, it should be borne in mind that variability in water supply is another "cost" reflected in the charges for water, particularly for irrigators. In effect, lack of reliability of supply is an *additional* cost which, in other water using sectors, would normally be compensated for by a *reduction* in price, not an increase.

The imposition of higher charges for water has been justified in part, as a means of achieving full cost recovery for water services by 2001, in keeping with the COAG Water Policy Agreement. However, at the same time the Council warned against increasing prices too quickly especially if not:

> "... accompanied by a range of supporting measures including the achievement of water delivery cost savings and more efficient demand practices by users" (Council of Australian Governments, 1994, 4-17).

It would seem that such complementary conditions are receiving relatively less emphasis in the drive for increased levels of cost recovery.

On the question of cost reductions, whereas some progress has been made, for example, in efficiency gains and costs savings in water delivery systems, agreement has still to be reached about the categories and appropriate levels of costs to be recovered. Moreover, irrigation groups argue that ongoing costs resulting from past inefficiencies should be written off and not charged against current water users. They maintain that the present generation of irrigators should not have to pay for refurbishment of infrastructure which previous management allowed to deteriorate.

A further cause for concern is the extent to which irrigators are being asked to pay for benefits of resource management measures where the beneficiaries are the wider public and general community. The 1994 COAG Agreement on Water Policy was heavily qualified subsequently with a key recommendation from the Working Group that:

> "... the costs of public benefits/impact management which are unable to be attributed and charged to specific beneficiences/impactors be treated as community service obligations" (Council of Australian Governments, 1995)

In announcing the new charges, the Minister for Water Resources at that time stated:

> "The new charges will be put straight back into the State's rivers ... The money will be spent on improving dam safety, improving water quality and on community action activities such as Rivercare Groups ... " (Ministerial Media Release, September 6, 1995)

Clearly, such benefits relate to the general community and the costs associated with them should not be charged to irrigators specifically, but should be borne by the community as a government responsibility.

Turning to demand management and the possibility of using water charges to promote "more efficient demand practices by users," it is of some concern that, at no point, have increases in water charges been justified as a means of demand management in a situation of water scarcity. A study for the Dairy research and Development Corporation suggests strongly that the policy changes may have had more to do with revenue raising than economic principles (Watson, 1995).

Yet, it seems highly likely that more realistic pricing of water should lead to a number of improvements in water use and ultimately to the health of river systems. The aim should be increase the price of water to the point where the cost is considered as a significant factor of production along with other essential inputs, but not to the point where it threatens economic viability. Applied in this way, higher water prices should contribute to reduced water demand through the adoption of more efficient irri-

gation practices, reduction of waste in water use through greater efficiency and recycling, and reduction in overwatering and salinity problems.

However, pricing is only one aspect of water management and price increases and cost recovery measures, alone, are insufficient to secure efficiency gains in allocation and use of water. Pricing reforms need to be accompanied by and integrated with other measures to remove or offset institutional and regulatory impediments to industry restructuring. An important advance in this direction in Australia has been the emergence of water markets and the introduction of tradeable water entitlements.

Allocation and Trading of Sustainable Water Entitlements

Until relatively recently, entitlements to water in Australia had been tied to a specific parcel of land. The only way in which water could be readily transferred from one area or one purpose to another was by purchase of the land to which the water right was attached.

Identification of an irrigation licence with place of use restricts high-productivity would-be users from entering a water market to bid away water rights from lower-productivity licensees, in accordance with their preferences as to the quantity desired and the risk to be incurred. Under a system of trading or unrestricted transferability of water rights, individual users can exercise the right to purchase, sell, or lease part, or all of their water allocation according to the estimated marginal value of the water to them compared with the ruling market price. (Pigram and Hooper, 1990).

Operated in this way, markets provide flexibility to a water licence allocation system, particularly where there is an embargo or restrictions on the issue of new licences. Moreover, they encourage efficient use of water by attaching an opportunity cost to holding and using an entitlement, rather than disposing of it through the market. Water markets also provide opportunities for (Pigram, et al, 1992):

- New and expanding users to gain access to the resource
- Existing users to realise the value of efficiency gains in water use
- Water to transfer to higher value uses
- Users to exit the water industry through sale of their licence
- Government to enter the market to acquire water licences and subsequently retire them.

Since the early 1980s trading in water licences has occurred on regulated rivers in New South Wales. Initially introduced as a drought relief measure and on a temporary (seasonal) basis, trade was somewhat restrained. However, activity in recent years has increased and between 200,000 and 700,000 megalitres of licensed allocation have been traded annually on a temporary basis. Permanent transfers were introduced in 1989 and trading on unregulated streams will also be permitted under new rules announced in 1998. Furthermore, a pilot scheme for interstate trade in water is now under way (see below).

Effective operation of a water market assumes the existence of clear, enforceable property rights to water. A well defined property rights framework will underpin rationalisation of water use and enable the resource to move to its highest value use both within specific water sectors and intersectorally. Put simply, participants must be sure of the entitlements they are trading, and of any conditions on the rights being transferred, if the market is to function effectively.

Clarification of property rights to water is a key element in the COAG package of reform measures and considerable research has been undertaken into the development of a workable system (Claydon 1995). The Task Force on COAG Water Reform (1995) set down a number of principles for the implementation of a strategic framework for water property rights. These stipulated that water entitlements be clearly specified in terms of:

- Rights and conditions of ownership tenure
- Share of the resource being allocated
- Details of agreed standards of services to be delivered
- Constraints on transferability: and
- Constraints on resource use or access.

Water for the Environment

A particular issue that has arisen in the State of New South Wales and elsewhere in Australia is the question of provision of water for the environment and how this relates to allocation and transfer of

water for consumptive use. (Pigram and Hooper, 1992). Whereas there is general agreement on the need for a better basis for protecting the environmental value of river systems and wetlands, early moves to remedy the stressed state of some waterbodies attracted considerable criticism. In situations where water needs of diverse components of a riverine environment are not well specified, arbitrary and unilateral allocation of water to satisfy ill-defined and unsubstantiated environmental requirements was seen as counter-productive.

Moreover, where water resources are already fully committed, a fundamental issue arises in regard to supplying water for the environment. Environmental groups and some government agencies argue that environmental requirements must be satisfied first, before other water uses are supplied. Apart from the vague nature of these requirements, such a policy has serious implications for users of water for economic purposes, such as irrigators. In the northwest of New South Wales, for example, economic losses from reduced cotton production alone would amount to millions of dollars. Added to this is the enormous investment in on-farm storage of water which would be inoperable without opportunist access to streamflow (Pigram, 1995).

What is needed is an appropriate and rational balance between consumptive uses and environmental needs of a healthy river system. To make such a balance operational, consistent methodologies are called for to specify and justify scientifically, water allocations to the environment. These methodologies could be derived from the National Principles for the Provision of Water for Ecosystems endorsed by the Agricultural and Resource Management Council of Australia and New Zealand. The principles are set out in Table 1 and provide useful policy directions for incorporating environmental water requirements into a workable water management system.

Of note is the recognition (Principle 3) of the need for a legally specified water entitlement for environmental purposes. This implies that environmental water provisions would be enshrined as explicit entitlements in a tradeable property rights regime, as proposed for other water uses and users.

As Claydon puts it (Claydon, 1995, 17-18):

> "If water for environmental purposes to be recognised as a legitimate use of water - as legitimate as any other use - the environmental water provisions will need at least as strong recognition under law as the provisions for any consumptive uses in planning frameworks or property rights regimes."

Claydon advocates explicit rights for the provision of water for the environment and that such rights be tradeable within a water market. Such a system would (Claydon, 1995, 43):

- make the environment an equal partner in water allocation and management
- give clear title to and protection of water provided for environmental purposes
- improve the level of management, and accountability for environmental water provisions, and
- enable environmental managers to participate in water trading

Table 1. National Principles for the Provision of Water for Ecosystems

Basic Premise of Principles	
Principle 1	River regulation and/or consumptive use should be recognised as potentially impacting on ecological values
Determining Environmental Water Provisions	
Principle 2	Provision of water for the environment should be on the basis of the best scientific information available on the water regimes necessary to sustain the ecological values of water dependent ecosystems
Provision of water for the environment	
Principle 3	Environmental water provisions should be legally recognised
Principle 4	In systems where there are existing users, provision of water for the environment should go as far as possible to meet the water regime necessary to sustain the ecological values of aquatic ecosystems whilst recognising the existing rights of other water users
Principle 5	Where environmental water requirements cannot be met due to existing uses, action (including reallocation) should be taken to meet environmental needs
Principle 6	Further allocation of water for any use should only be on the basis that natural ecological processes and biodiversity are sustained (i.e. ecological values are sustained)
Management of environmental water allocations	
Principle 7	Accountabilities in all aspects of management of environmental water provisions should be transparent and clearly defined
Principle 8	Environmental water provisions should be responsive to monitoring and improvements in understanding of environmental water requirements
Other Uses	
Principle 9	All water uses should be managed in a manner which recognises ecological values
Principle 10	Appropriate demand management and water pricing strategies should be used to assist in sustaining ecological values of water resources
Further research	
Principle 11	Strategic and applied research to improve understanding of environmental water requirements is essential
Community involvement	
Principle 12	All relevant environmental, social and economic stakeholders will be involved in water allocation planning and decision-making on environmental water provisions

Source: Prime Minister's Science and Engineering Council, 1996, 39. (as endorsed by the Agricultural and Resource Management Council of Australia and New Zealand and the Australian and New Zealand Environment and Conservation Council)

Claydon warns that potential conflicts of interest between consumptive water users and those seeking to make provision for environmental water requirements "are likely to be stark, unavoidable and pervasive" (Claydon, 1995, 45). However, he sees significant benefits from making environmental water entitlements tradeable, given the dynamic nature of economic production systems responding to changing technology, market demands and seasonal conditions, and the varying requirements of natural ecosystems in terms of seasonality.

The extent to which market forces can be harnessed to service environmental water requirements and the potential and the limitations of economic instruments for environmental protection, are now being actively canvassed in Australia. Opportunities undoubtedly exist for the wider application of market-based approaches for the acquisition of environmental property rights. However, attention needs to be directed to an effective system for allocating water which incorporates these rights, along with those for other purposes, and ensures that the security and reliability of entitlements are not eroded over time. Capacity sharing has been put forward as an innovative approach to the allocation of water property rights in highly variable climatic regimes which characterise much of Australia.

> "Capacity sharing is a water allocation system by which users are allocated a share of the capacity of the storage as well as inflows and seepage and evaporation losses. In effect, the storage is partitioned into substorages which are credited with a volume of water according to the hydrological behaviour of the storage and its catchment. Users have non-attenuated rights in this water and can direct the manager of the storage concerning its retention or release." (Musgrave, 1991,7)

Capacity sharing is seen to have advantages over the traditional method of water allocation, which might be termed "release sharing". By partitioning the entitlements to water at source, rather than at the point of delivery, the conditions for an efficient water market can be satisfied and transaction costs minimised.

Capacity sharing offers the potential for individual control of the water in the substorages, as might be preferred by irrigators, or operation of a shareholding as a group. The latter arrangement might appeal to community groups acquiring shares for environmental purposes, e.g., replenishment of wet-

lands. Flood mitigation beneficiaries may also wish to act together in controlling a share of air space in the storage.

Proponents of capacity sharing believe that it achieves a desirable integration of water supply and demand and is superior to traditional methods of allocation. Property rights to shares in capacity are specified and secure, and freely tradeable. Transferability of stored water between the substorages facilitates exchange of water between individuals and groups according to their requirements. In the longer term, permanent transfers of shares of reservoir capacity and/or inflows would reduce uncertainty, and permit structural adjustment and more efficient use of water. In recent systems modelling, the concept has been expanded to include percentage sharing of unregulated tributary flows downstream from the reservoir (N. Dudley, personal communication).

Although water managers have expressed reservations about the acceptability of such a novel system, water agencies have expressed interest and the state of Victoria, in recent legislation, has provided for capacity sharing as an optional allocation system, at the bulk water distribution level. Claydon (1995) sets out several options under which sectoral groups e.g. environmental interests (or even individuals), could hold capacity shares and be responsible and accountable for management of water entitlements held.

Given a system of secure property rights, a water market could then become operational to permit the acquisition and transfer of water allocations for a range of environmental purposes. These include (Pigram and Musgrave, 1998):

- maintenance of stream flows for ensuring sustainability of aquatic ecosystems and other instream values including water-related recreation;
- use of dilution flows for enhancement of water quality;
- management of water pollution through a system of tradeable emission rights for discharge of irrigation drainage water;
- management of groundwater resources in conjunctive use with surface water allocations; and
- in areas, subject to waterlogging and salinity, management of depth to the water table.

Cross-Border Water Trading

A well defined property rights framework will also be needed to underpin interbasin and interstate water trading. In southeast Australia, a pilot project launched in November 1997 will allow permanent trade in water entitlements across state borders in the predominantly horticultural Mallee Region of the Murray Valley (Figure 2). Prior to this, water trading between states was a rare event and had only taken place on a temporary short-term basis.

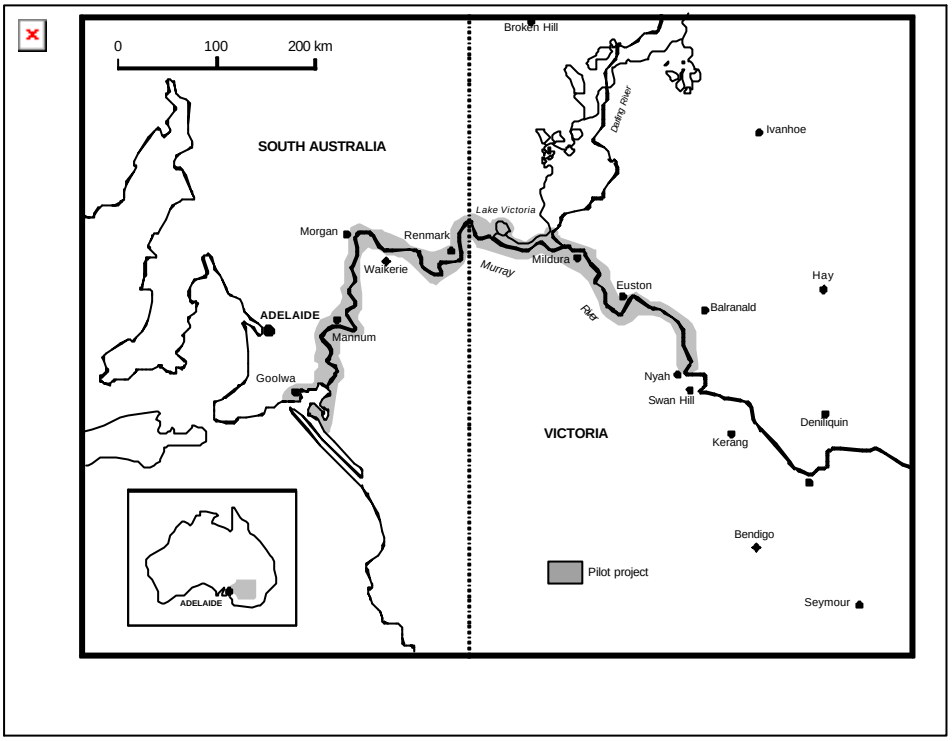

Figure 2 - Mallee Region of the Murray Valley

The Mallee Region was chosen for the pilot project partly because of similiarity of irrigated agricultural activities dependent on high security water entitlements, and also because the price of water in the three states involved is relatively uniform. (Murray-Darling Basin Commission, 1998).

Essentially, the project establishes a "free trade zone" or "common market" to provide a focus and experience in addressing cross-border issues. This reflects the concern of the Council of Australian Governments with some of these issues. The Council stressed that:

> "... where cross-border trading is possible..trading arrangements be consistent and facilitate cross-border sales where this socially, physically, and ecologically sustainable." (Council of Australian Governments, 1994,29)

The Council also emphasised the need for consistency in approaches to property rights, pricing and cost recovery, and environmental considerations, if the trial was to succeed and interstate trade was to be extended to other border areas and to intersectoral market participants. Among the impediments recognised is lack of consistency in determining property right regimes. In the absence of consistency, there is potential for outcomes that are inequitable and sub-optimal from socioeconomic and environmental perspectives. Distortions in trade could also occur from differentials in water pricing policies, subsidies, legislation and regulations, land tenure, transport and infrastructure deficiencies, and groundwater and salinity conditions.

Water Markets and Government Intervention

Water reforms are well advanced in Australia and the application of economic instruments has been a feature of the reform process. In New South Wales, the price mechanism has been used to try to correct perceived shortcomings in the recovery of resource management costs and provision of services related to the use of water. Water markets are gaining strength and trading in water entitlements, both temporary and permanent, and eventually cross-border, is well established.

Given the perceived advantage of a market-based approach to allocation and use of water, and the trend towards deregulation of economic and financial structures in Australia, water pricing reforms based on the principle of beneficiary/impactor pays represent sound economic practice. Moreover, the evolution of a system of water markets and enforceable property rights is seen as a logical outcome of growing pressure for more efficient, ecologically sustainable management of scarce water supplies.

Increasing reliance on economic instruments, however, does not preclude some degree of regulation, if only to underpin security of property rights and to monitor the exercising of them (Dudley and Musgrave, 1991). Even in the most competitive situation, market performance may be flawed. In the operation of water markets, the potential for market failure may be heightened by (Pigram, 1993,1318):

- the influence of large operators achieving significant economies of
- the presence of externalities or third party effects scale
- distortions to the market by taxes, subsidies and imperfect knowledge

Other factors may intervene to qualify the effective operation of a water market. Even where a high degree of nonattenuation of property rights is achievable, as with capacity sharing, the potential advantages may be outweighed by the additional information required and the management tasks involved in defining and enforcing property rights (Paterson, 1989). Transaction costs associated with implementing and administering more efficient policy options often help to explain the relatively slow adoption of conceptually appealing alternative institutional arrangements (Moy, 1991).

In Australia, hesitancy in endorsing a totally market-driven water industry is a reflection of the belief that some government intervention will always be necessary to regulate the location and type of economic activity and the contribution of water to social and economic stability. (Pigram and Hooper, 1990). In New South Wales, constraints on unfettered market operations are seen to include :

> "... the existence of social goals as well as those of economically efficient resource allocation, the very significant gaps in information, and the existence of external obligations - for example, to other governments in Australia." (Millington, 1991,1)

Despite these qualifications, there remains significant scope for the operation of market forces in helping to achieve the allocation of Australia's water resources to their highest valued uses in an ecologically sustainable manner.

> "It is not therefore a question of less or more market activity ... it is a debate about government doing what it is comparatively good at - defining and enforcing the rules - and withdrawing from what it is bad at - managing and owning enterprises - so that the private sector can profit from achieving goals within the government set rules". (Porter, 1991,4)

Self-interest, rather than command-and-control strategies, is seen as a more reliable way for generating efficiency, however defined. The challenge is to implement procedures, or "rules of the game", for management of river systems and irrigation enterprises which will maximise opportunities for individuals and groups to act in their own self-interest within logical limits set by regulatory agencies.

Projecting the Australian Experience in Water Reform

Australia is recognised as something of a pacesetter in the implementation of strategies directed towards efficient and sustainable management of water resources. Administrative restructuring, pricing reforms, establishment of water markets and trade, integrated resource management, and an emerging role for the private sector, are features of a more economically sound and environmentally compatible water industry.

The question arises as to the extent to which the Australian experience in the use of economic instruments in water management is applicable to the different and variable conditions of water availability and use in other parts of the developed and developing world. Contrasting political structures and national priorities, different living standards, cultural traits, and systems of land tenure, lower technological and literacy levels, and financial and infrastructural constraints, can all affect readiness for change and receptivity to new practices and organisations, especially when externally driven.

Despite the advantages which a market-based approach can bring to water use efficiency, governments, particularly in developing countries, tend to "consider water to be too precious a resource or too difficult a commodity to be left to the market" (Thobani, 1997,161). It is instructive to consider some of the many possible reasons put forward by Thobani for this hesitancy to endorse water markets as a suitable instrument for water resources management (Thobani, 1997, 171):

- Cultural or religious objections to the notion that acquisition of water should be bought and sold
- Equity and monopoly concerns regarding acquisition of water rights by large organisations and exclusion of the poor from access to water
- Concern that small-scale operators will sell their rights cheaply and lose their livelihood
- Fears that water transfers will damage the environment, cause aquifer depletion, and degradation of river systems
- Fear of change and loss of public sector control over water
- Need for new legal, regulatory and institutional frameworks
- Difficulty of defining, measuring and enforcing water rights
- Changes needed to infrastructure and delivery systems
- Difficulties of establishing or strengthening public and private institutions to facilitate a properly-functioning water market
- Challenge of convincing governments that the potential benefits from trading water in a market are sufficient to offset the costs of establishing tradeable water rights

Given these qualifications, caution needs to be exercised in applying approaches to water management from Australia and elsewhere too readily without adaptation and collaboration with the developing regions.

Conclusion

There is growing evidence that water authorities in Australia are prepared to work within a market-oriented resource management framework. Whereas the role of government, and the degree of supervision and monitoring seen as necessary, remain to be clarified, it is generally accepted that market forces can assist in resolving disputes, and can help achieve more effective allocation and use of the nation's water.

This paper has explored the impetus for water reform in Australia and some of the measures which have featured in the reform process. The challenge is to put in place institutional arrangements for the management of river systems which permit the balancing of environmental water concerns with economic demands and social considerations. This challenge, in turn, raises the question of the most appropriate mix of incentive-based mechanisms and regulatory approaches for the management of Australia's water resources, and their relevance to the resolution of water issues in other parts of the world.

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