Cap and Trade versus Water Recovery

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Abstract:
The National Water Initiative and earlier water reforms have committed Australian governments to redressing environmental degradation caused by excessive extraction from rivers and groundwater systems. To date, the states, territories and commonwealth have identified a range of alternatives for achieving the requisite resource re-allocation. Unfortunately, there has been a predilection amongst policy makers to treat voluntary acquisition of access rights from irrigators as a 'last resort' in the suite of options. This paper explores the rationale for this approach and questions the use of incomplete information by bureaucrats, policy makers and water lobby groups in this context.

INTRODUCTION

The reformation of water policy reform is a social phenomenon insomuch as it represents a reconfiguration of the established modes of human activity that govern the distribution of the resource. In addition, contemporary water policies and the institutional changes that have emerged in Australia over the past few decades are symptomatic of the realization that the costs attending the status quo exceed the likely costs of change. Treated in this way, several important questions emerge about the motivations for water reform and the processes adopted to accomplish it.

First, what was the information that made it unacceptable to maintain the current arrangements, and what factors prompted the necessity for reform? Second, given that water reform amounts to a reallocation of a scarce resource between competing uses and users, what techniques are available to accomplish this restructure? Third, if we accept that policy change is always costly, in one way or another, what are the types of costs that accompany each of the mechanisms for achieving the required redistribution? Fourth, what is the likely magnitude of these costs and how are they to be measured and compared, and by whom?

Answers to these fundamental questions provide a foundation for considering in greater detail the operation of water markets, the need for an adaptive approach on both policy and management fronts, and the role of technology in this context. Collectively, these topics provide an overview of the main coping strategies employed by governments to ameliorate the costs of policy change.

The remainder of this paper is organized into four parts. In section two the function of information and its interaction with the reform processes are addressed. In this section, the information collection and dissemination processes employed in the *Living Murray* are explored and then contrasted with groundwater management planning in Western Australia. Section three offers a simple typology of reallocation mechanisms and positions these in the context of the objectives emanating from the various water planning processes in different states. The costs and benefits of each generic reform program are briefly examined in section four with examples drawn from the current initiatives. Finally, areas for potential policy improvement are identified in section five, accompanied by some brief concluding remarks.

INFORMATION AND THE MOTIVATION FOR WATER REFORM

The study of information and its role in the formulation of rules and policies has long fascinated scholars and analysts alike (see, for instance, Simon 1976). Of particular interest in the context of water policy is the response of legislators to incomplete and emerging information, and the interaction between policy makers and the community at large when the outcomes of policy are manifestly uncertain (see, Quiggin, 2006). In this environment conventional behavior by political leaders, who prefer to proffer the 'immutable truth' to the electorate, is challenged. An alternative policy stance is required.

Elsewhere (see, for instance, Crase 2006), a major transformation in Australian society, in the form of increased awareness of environmental degradation and a shift away from the 'developmentalist' ethos that focused solely on the productive and extractive benefits of water resources, has been noted. However, this fundamental shift is not evenly spread across all elements of the community. Moreover, the heterogeneity of preferences for enhanced environmental outcomes from water policy has fuelled acrimonious debate about the veracity of the scientific information that underpins decision-making (see, for instance Marohasy 2003).

At a more general level, this reflects the practical difficulty of applying the notion of the precautionary principle in an environment where rights may be reassigned in an effort to provide a largely uncertain environmental improvement. The challenge confronting policy makers is to achieve the necessary redistribution of the resource in the face of criticism from those in the community with intense preferences for maintaining the status quo. Invariably, these groups resort to condemnation of the incomplete scientific information which points to the need for change, and offer their own competing interpretation of available data (see, for instance, Benson 2003).

In Australia, the National Strategy for Ecologically Sustainable Development (ESD) is the central document that guides policy formulation in these circumstances and incorporates most of the principles articulated in the Rio Declaration of 1992. In February 1992, the Intergovernmental Agreement on the Environment between the Commonwealth, State and Territories and the Australian Local Government Association committed all governments to following the precautionary principle as part of the overall commitment to ESD. More specifically, the Agreement states that:

> Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, public and private decisions should be guided by: (i) careful evaluation to avoid, wherever

> practicable, serious or irreversible damage to the environment; and (ii) an assessment of risk weighted consequences of various options. (IGAE, 1992)

Despite these noble ambitions, two fundamental and important questions emerge from this policy approach: What is the state of scientific water knowledge in Australia? And how are 'the risk weighted consequences' of alternative policy responses to potential environmental harm to be assessed?

In relation to the first of these questions elementary knowledge about the extent of national water resources has been found wanting. Answering questions like "how much water we have, where it is, where it is going, what it is being used for, and who is entitled to it" (NWC 2005, 1) requires baseline data that is still being assembled under the National Water Initiative. Clearly, our understanding of the present resource allocation is incomplete.

The significance of this knowledge gap should not be understated. By way of example, consider the level of understanding that confronts policy makers in Western Australia, a state that relies heavily on groundwater for its water needs and is predicted to face amongst the most severe consequences of climate change (see, for instance, Pittock 2003, 1). One of the major groundwater resources in this state is the Gnangara Mound located north of Perth. The Mound provides almost 60 per cent of Perth's water needs, sustains a large horticultural region and supports valuable ecosystems, such as cave systems and coastal lakes and wetlands. Notwithstanding the prominence of the Mound, and the marked recent decline in the availability of the resource, simply quantifying the rate of extraction has proven difficult. Until recently, only those users extracting 500 megalitres or more per year were required to report or meter their use. Clearly,"the lack of information on water use has hindered attempts to manage the problems of the Mound" (IRSC 2005, 15).

In addition to the uncertainty circumscribing the quantum of water resources in numerous settings, there is a dearth of scientific knowledge about the relationship between water availability and the operation of ecosystems. In this context the Department of Industry, Science and Tourism's (1996, 67) identified the following 'knowledge gaps' in the management of surface water to achieve environmental enhancements:

- The significance of flows relative to other environmental variables - especially the water quality and structural habitat issues, such as in-stream barriers, snag removal and siltation- affecting aquatic ecosystems.
- Long-term data sets that allow comprehensive assessment of the role of flow regimes in the recruitment processes of native and introduced fish species.
- Measures of river flows that take into account both instantaneous flows and variability across periods of time, and correlation of these measures with other measures of environmental health.

Notwithstanding these information deficiencies, the various levels of government have notionally applied the precautionary principle and commenced a program of reassigning water for environmental purposes, particularly where the evidence of environmental stress is convincing. To illustrate the variety of approaches adopted by policy makers, two specific cases are considered here; the *Living Murray* initiative and the assignment of environmental water provisions for the Gnangara Mound.

The Living Murray

In response to growing concerns about the environmental health of the River Murray, the Murray-Darling Basin Ministerial Council (MDBMC) released its *Living Murray* discussion paper in July 2002. The overriding purpose of the *Living Murray* process was to dedicate more water for environmental purposes and the document itself was designed to "start community discussion about whether or not water should be recovered from water users for the environment" (MDMC 2002, 29). Three main reference points were proffered as a means of framing this discussion; namely 350, 750 and 1500 gigalitres.

The *Living Murray* followed other substantial reforms that had impacted on the management of this iconic river. These included the 'cap' on water diversions at 1993/94 levels, after an audit in 1994 revealed significant growth in water extractions resulting in deleterious impacts on the riverine environment (DLWC 1997, 1); the CoAG Agreement on Water Resource Policy (or Water Reform Framework) in February 1994, and later the Competition Principles Agreement in April 1995, and; numerous legislative changes at the state level which were sympathetic to the thrust of the initial CoAG reforms.

The *Living Murray* was purportedly premised on 'community engagement processes' under the auspices of the Independent Community Engagement Panel. The process itself was divided into three main stages. Stage 1 was assigned the title of 'Inform and Engage' and focused ostensibly on those communities most likely to be severely impacted upon by any reallocation decision. This stage was intended to "inform the community of the work and knowledge that ha[d] led to the recognition of the need for the Australian community to consider what it wants for the future of the River Murray" (MDBC 2002, 51). Simultaneously, it was also anticipated that this stage should "inform the MDBC of [the community's] knowledge, values, aspirations, issues, information needs and concerns". Stage 2 emphasized the development of alternative propositions to address the issue of environmental flows in the River Murray. However, this stage was to have employed a broader focus, relative to stage 1, by seeking to include the views of "the wider Australian community" (MDBC 2002, 51). Stage 2 also envisaged that the community and government agencies would collaboratively evaluate the implications of the three environmental flow reference points (350, 750 and 1500 gigalitres), offer ways to progress towards a preferred option, and establish the requirements for monitoring and managing the impacts of any decision. This stage was to culminate in an informed decision being made by the MDBMC in October 2003. 'Implementation' was the focus of stage 3 of the community engagement strategy and consisted of a plan to negotiate details and timeframes for enacting the final decision (MDBC 2002, 8).

As part of the *Living Murray* consultation process additional information was to be garnered by policy makers on several fronts. First, a scientific reference panel was assembled to provide information on the ecological consequences of alternative water allocation and flow regimes. The scientific reference panel set about investigating the ecological potential of the three reference points under three different operational scenarios. The first scenario represented the operational status quo (i.e. high summer flows for irrigation with extractions capped) whilst options 'b' and 'c' modeled the ecological benefits of flow regimes to target various ecosystem locations and ecological indicators (SRP – MDBC 2003, 6). Whilst the interim report provided "a basis for discussion amongst scientists, government officials and the broad community" (SRP –MDBC 2003, 6) the final report, which was scheduled for delivery in mid-2004, was not published by the MDBC.

The second genre of information to undergird the *Living Murray* related to the social impacts of reassigning additional water to achieve ecological changes. In this regard a social impact assessment framework was devised and tested but was not operationalized on a broader scale (see, for instance, EBC – MDBC 2003). Similarly, scoping of social impacts occurred but progress to 'stage 2' of a full social impact assessment never materialized.

The third form of information dealt specifically with the economic implications of assigning water to the environment. These analyses comprised two main types; investigation of the economic impacts on agriculture, given that most of the resource would need to be diverted from this sector, and, the economic value of additional environmental flows. Poignantly, the latter study was to have comprised the application of a Choice Modeling technique to a wide cross-section of the community. This was to have included commentary on the ecological implications of the three reference points, some indication of the economic ramifications of resource reallocation and acknowledgement that the wider community would need to pay to achieve change. In effect, such a technique would have provided policy makers with a measure of the preferences of the wider community and simultaneously raised awareness of the consequences of any decision. This phase of the information gathering process was truncated by the bureaucratic and political players in the *Living Murray* debate. A prominent member of the MDBC at the time of these decisions later publicly mused that the bureaucracy was able to work out the community's preferences without the need for the information from a choice model (Chloe Munroe, 12 February 2004, pers. comm).

Importantly, the outcome from the *Living Murray*, referred to as *the first step*, became an integral component in the National Water Initiative with the announcement that member jurisdictions of the Murray-Darling Basin would allocate $500 million over the next five years to address the declining health of the Rivers in the Basin, particularly the River Murray (CoAG 2003,1). Coincidentally, this represented the equivalent of about 500 gigaliters of water at current market rates, a quantum of water not considered as a reference point in any of the preceding scientific analysis.

These events provide a salient reminder that information gathering and water policy formulation do not operate in a linear manner with the former solely designed to enlighten the latter. Rather, vested interests and lobby groups may prefer that information remain imperfect for fear of undermining their influence over resource allocation. In addition, if the science is irrefutable and the preferences of the community well articulated, politicians and the bureaucracy must then run the risk of severe ridicule if they choose an allocation that aligns with their own ambitions rather than those of the broader community. Put simply, economically efficient outcomes that adequately encompass the full spectrum of community preferences should not be confused with those that are selected as being politically efficient at a particular point in the electoral cycle – particularly in the context of water.

The Gnangara Mound

As with the *Living Murray* decision, actions designed to redress the degradation of the Gnangara Mound have been circumscribed by information deficiencies. Thus, whilst "there is recognition of the need to take pressure off the Mound" there is also a lack of information capable of "[q]auntifying how much water needs to be saved and by whom". However, in line with the Intergovernmental Agreement on the Environment, the Western Australian water strategy argues that "the absence of this knowledge should not prevent action to save water from being taken now" (IRSC 2005, 15). Thus, like the policy makers dealing with the decline of the River Murray, the West Australian experience is typified by progressive policy amendments as a reaction to emerging information.

It is possible to trace the evolution of the reassignment of Gnangara groundwater to 'the environment' over several decades of information revelation and policy change. Groundwater extraction in this region began in earnest in the early 1970's. In 1987 an Environmental Review and Management Program was developed by the then Western Australian Water Authority, which placed some environmental conditions on further abstractions. As part of this policy, there was a necessity to develop a management and monitoring program which prompted increased ecological research into the impacts of altering the groundwater regime throughout the early 1990s. Findings from this research work were subsequently employed to determine the requirements of these wetlands that were dependent on the level of the groundwater in the Mound. In effect, the information from several studies into plants, aquatic invertebrates and waterbirds was integrated to provide an indication of the requirements to prevent further degradation, manifested in maintenance of the current vegetation distributions (DEH 2001, 9).

An important ingredient of this information/policy interaction was the establishment of Ecological Water Requirements (EWRs) and Environmental Water Provisions (EWPs) as part of the statewide policy amendments of 2000. EWRs are defined as "the water regimes needed to maintain ecological values of water dependent ecosystems at a low level of risk" whilst EWPs represent "the water regimes that are provided as a result of the water allocation decision-making process" (WRC 2000, 2). Importantly, in the case of EWPs there is a necessity to take into account "ecological, social and economic impacts…[such that EWPs] may meet in part or in full the ecological water requirements" (WRC 2000, 2). Clearly, in this context there is a need for social and economic information to inform the formalization of EWPs.

In recognition of the absence of information to account for social and economic values and the potential conflict between the fulfillment of EWRs and the economic and social objectives, the Water and Rivers Commission placed considerable emphasis on 'community involvement' as part of the determination process. In this instance community involvement in decision-making would appear to have been conceptualized by the bureaucracy as being a less august process than that applied in the case of the *Living Murray*. In general, this amounted to the establishment of water resource management committees as a vehicle for engendering community/stakeholder involvement. Minimum requirements were established as part of statewide policy and encompassed "notification of the preparation of a draft plan; call for public submissions and the preparation of a summary document; referral of the plan, as modified as a result of submissions, to bodies which the Commission considers may be affected or should view the plan for any reason; and a further opportunity to provide submissions on the modified plan" (WRC 2000, 10).

Clearly, the foreshadowed mechanisms for gathering additional information to inform policy decisions regarding the Gnangara Mound are less elaborate than those employed in the case of the *Living Murray*. At least two propositions account for this disparity. First, the proposed mechanisms in Western Australia may have been adjudged adequate to inform policy making and avoid the potential loss of control by decision makers who might potentially be threatened by an overly-informed electorate. A second explanation resides in the perceived importance of water scarcity at the time. More specifically, the Water and Rivers Commission observed that:

> While some eastern states are already in the situation where water has been over-allocated in many areas and there is an urgent need to greatly reduce consumptive use to provide more water for ecosystems, Western Australia is fortunate that this is not expected to be a major problem. (WRC 2000, 16).

Nevertheless, these comments stand in stark contrast to the more recent and increasing disquiet expressed in some quarters about the environmental sustainability of the Mound. For instance, Yesertener (2002) has noted a steady decline in the Superficial Aquifer storage between 1979 and 2000, whilst Vogwill (2004) shows this trend continuing between 2000 and 2003, thereby adversely affecting most wetlands (McCrea 2004). Reports that the level of groundwater storage has fallen by as much as 12 metres are common in the media (see, for instance, de Blas 2004) and a number of Water Corporation bores have been shut down in the areas of greatest concern

(IRSC 2005, 5). The Western Australian government is now committed to an 'integrated solution' to the problems of the Mound, encompassing landuse change, adjustments to water allocations, expanded metering and the use of market arrangements to buy back water. However, the implementation and assessment of these various measures is likely to prove problematic on several fronts – not least because of the necessity to establish a metric capable of measuring the effectiveness of alternative approaches and the potential need for future adjustments as additional information emerges.

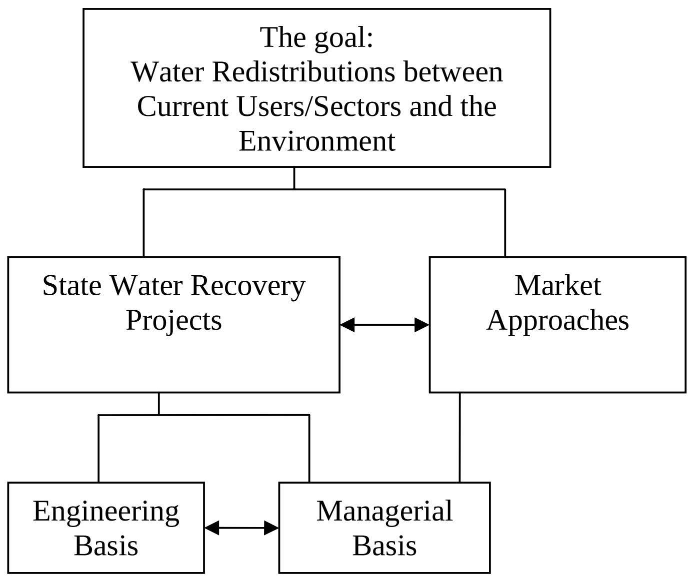
A TYPOLOGY OF WATER REALLOCATION MECHANISMS

The *Living Murray* and Gnangara Mound cases are illustrative of a broader trend in Australian water policy, which has seen increased emphasis on the necessity to redirect water resources to maintain or rehabilitate the health of water-related ecosystems. Similar examples can be found in most other states with the extent of extractive over-allocation varying in line with the degree of enthusiasm applied under the original 'developmentalist' ethos. Even in Tasmania, where diversions on average account for about 1 percent of the mean annual flow (NLWRA 2001), it has been necessary to put in place 'water use sustainability projects' that attempt to deal with over-allocation problems in specific streams and aquifers (see, for example, DPIWE 2005, 46). Guided by the themes expressed in the national agenda, most states and territories have now embarked on programs that have, as their stated goal, the redistribution of water to achieve environmental ends.

Confronted with the need to reallocate water for environmental or in-stream benefits, policy makers have two basic approaches to achieve this goal. First, all consumptive users could have their access rights unilaterally reduced to account for the needs of the environment. Second, water withdrawals undertaken by specific users can be reduced to achieve the necessary environmental gains. In the case of the latter approach, this might occur on the basis of some selective mandate by the state or, alternatively, it could be achieved through voluntary surrender of access rights using market instruments. As noted elsewhere (see, for example, Quiggin 2001), governments have been generally reluctant to reduce all access rights for fear that this would undermine the general sanctity of private rights. This has left policy makers choosing between state-selected projects for reducing water consumption and self-selected mechanisms via markets.

In many instances these programs have been euphemistically termed 'water-recovery projects' or 'water saving projects' (see, for example, Deamer 2005). In some cases the use of water markets to purchase water from willing sellers for environmental purposes has been included within this genre of strategy (see, for instance IRSC 2005, 16). However, the use of markets to 'recover' water to achieve a redistribution for environmental ends has also attracted criticism from several quarters, and is frequently dismissed by some politicians and lobby groups as a 'last resort' because of its potential to produce 'adverse impacts' on industries and communities (see, for example, Miell 2003; Truss 2005). In line with this latter observation, it may therefore be more useful, to categorize mechanisms designed to redistribute water to achieve environmental outcomes into two main forms; water recovery projects which operate independently of voluntary acquisition of water rights, and activities with a water market orientation. In addition, a range of solutions exist within the 'water recovery project' typology and these broadly fall into 'engineering' and 'managerial' initiatives. It is also potentially feasible for some managerial initiatives to involve active participation in the water market. For example, options contracts might provide a vehicle for combining managerial and market mechanisms to achieve an environmental outcome (see, for example, Hafi et al. 2005). A diagrammatic representation of this typology appears as Figure 12.1 and provides a framework for considering several contemporary examples.

Figure 12.1: A Typology of Policy Mechanisms for Redistributing Water in Favor of the Environment



State Water Recovery Projects
The defining characteristics of these projects are their reliance on achieving reallocation by non-market technique and a strong involvement by the bureaucracy in -making. By and large, projects of this nature aim at "preventing losses between water leaving the dam (or aquifer) and use by plants or animals" (Deamer 2005, 1). More generally, these projects concentrate on the technical efficiency of water use, particularly in irrigation.

The Murray-Darling Basin has provided the setting for numerous projects of this genre, primarily driven by the acute need for environmental re-allocations in this region - diversions as a percentage of mean annual flow presently run at about 210 percent (NLWRA 2001). Deamer (2005, 4) offers a review of water saving projects in the Basin and groups them into seven main types: evaporation projects, metering, delivery system technology, piping supply on natural channels, piping supply on man-made channels, managing the flooding of wetlands, relocating excess water to the environment in wet years, and, on-farm efficiencies. Notable examples of these types of initiatives include the piping of water for stock and domestic supplies in the Wimmera-Mallee in Victoria, and the decommissioning or reduced use of inefficient storages, like Menindee in New South Wales and Lake Mokoan in Victoria. Other projects include channel automation in irrigation districts in central Victoria, and the construction of levees to return ephemeral wetlands to their natural winter-spring flooding cycle. In essence, these works require two main ingredients which vary in relative importance between projects. First, there is an expanded engineering contribution to the mechanisms of water delivery and use. Second, projects of this type entail alternative management of water flows to meet environmental objectives. In sum, evaporation and seepage losses that formerly attended aged infrastructure or outdated management are 'saved' and are then presumably garnered on behalf of the environment.

In order to achieve the coordination necessary to bring ventures of this nature to fruition, each of the state governments in the Basin has assigned bureaucracies the tasks of identifying and assessing potential projects. In addition, the New South Wales, Victorian and Commonwealth governments collaboratively sponsored the formation of a private company, *Water for Rivers*, which has the goal of securing water to be returned as environmental flows to the Snowy River and River Murray. The combined environmental water target from the *Living Murray* initiative and the restoration of the Snowy River is 782 gigalitres over the next ten years.

Importantly, the financial cost of water recovery projects varies considerably, in both aggregate and per megalitre terms. For instance, for a modest public investment of $1 million in the Edward River Gulpa Island State Forest, simple engineering works have been employed to return the area to an ephemeral wetland. This investment simultaneously yielded over 19 gigalitres of 'environmental' water at an average cost of only $52 per megalitre. By way of contrast, replacing the 17,500 kilometres of open earthen channel in the Wimmera-Mallee district of Victoria with pipes will cost over $500 million, save an estimated 103 gigalitres of water and yield 'environmental' water at $4,860 per megalitre (Deamer 2005, 2-3).

On the basis of these data and the current market value of water rights held by irrigators, it would appear that financial costs represent only one criterion upon which competing water recovery projects are assessed by the bureaucracy. Permanent water access rights can presently be purchased in many catchments for far less than $4,000 per megalitre, often between $850 and $1,000 (ACIL Tasman 2003, 1). More specifically, the political acceptability of water recovery projects would appear to influence decision-making. The political appeal of water recovery projects stems from the perception that the wider costs of structural adjustments that attend such projects are less than those that attend the acquisition of access rights in a market setting.

Market Approaches

Notwithstanding the relative political strengths of state water recovery projects, market mechanisms remain an important element of the policy framework. Moreover, ACIL Tasman (2003, 1) observe in their report on the mechanisms for gaining environmental flows as part of the *Living Murray* initiative that “[t]he information available indicates that there are limited opportunities for water use efficiency savings at a marginal cost of less than $1000/megalitre, except perhaps for reuse generally and for certain applications in horticulture”. Similarly, and in the context of on-farm activities, ACIL Tasman (2003, 1) contend that “it is also likely that those [projects] that are currently economic have been (or are being) implemented”. Put simply, it seems unlikely that the quantum of water required to adequately restore environmental health will be achievable via the politically-palatable state water recovery project options, at least in the case of the Murray-Darling Basin.

In the case of the Gnangara Mound discussed earlier, recovery of water for environmental purposes is in its early stages. However, prospects for the employment of true market mechanisms appear remote. A recently announced government initiative allocated $29 million to enable Harvey Water (the main irrigation entity drawing water from the Mound) to replace open channels with a pipe network. Funding for these arrangements has been provided by the urban water authority (the Water Corporation) with water savings accruing to the urban Integrated Water Supply System. The Western Australian government has described these arrangements as a “trade agreement” (WAGPD 2005, 12), despite lying within the ‘state water recovery project’ genre in the context of Figure 12.1. The heavy reliance on bureaucratic decision-making and the absence of a true expression of the relative value of the 17 gigalitres entailed in this ‘agreement’ suggests that attempts to invoke true market mechanisms to gain water for the environment are unlikely to be evidenced in the near future in this state.

In addition, the willingness of the state to support engineering-centric ‘water recovery projects’, without resorting to market buy-back, is evidenced by the sponsorship of programs that attempt to artificially restore environmental water. For instance, the Department of Conservation and Land Management has recently undertaken a ‘recovery project’ that involves refilling the Yanchep caves, located in the western precinct of the Mound. The caves have suffered from declining water levels since the 1970s and the project aims to ensure that the aquatic root mat that underpins the caves survives into the future. Paradoxically, the project involves the construction of an underground pipeline and pumping groundwater back into five of the caves in the area with the intention of creating “a localised ground water mound that will become self-sustaining” (CALM 2005, 1). The willingness of governments to support projects of this nature in preference to using voluntary acquisition of water for environmental purposes is arguably indicative of the perceived political costs of activating market mechanisms in this context.

THE RELATIVE MERITS OF ALTERNATIVE POLICY APPROACHES

The penchant for state water recovery projects and relative reluctance to engage in market activities to buy back water for environmental services has manifested itself in a funding distribution skewed towards the former approach within the National Water Initiative. In September 2004 the Prime Minister announced the establishment of a $2 billion Australian Government Water

Fund. The fund comprises three main programs with one component, the Water Smart Australia Program, attracting most of the available funding ($1.6 billion). The aim of this program is to "accelerate the uptake of smart technologies and practices in water use across Australia …[with most support] directed to practical on-the-ground projects" (NWC 2005, s1-1). The Water Smart Australia Program is administered by the National Water Commission, which has listed nine main project types for which financial support is available. Notwithstanding that two of these project types have been assigned the broad headings of "improve river flows for better environmental outcomes" and "return groundwater aquifers to sustainable levels" (NWC 2005, s2-1), all remaining categories focus heavily on technical/managerial adjuncts for raising water use efficiency. For example, programs that lead to "improvements in irrigation infrastructure", or that "advance efficiency improvements on on-farm water use", or "develop water efficient housing design" (NWC 2005, s2-1) are all eligible for significant support. Tellingly, there would appear to be limited scope for market purchase of water from willing sellers under this program, regardless of the acknowledged limits to state water recovery projects (see, for instance, ACIL Tasman 2003).

In order to appreciate the enthusiasm for projects of this genre relative to the market alternative, it is necessary to review the merits and limitations of this policy approach. First, given that the majority of access rights to water resources are held by irrigators, any redistribution in favor of the environment requires this sector to forego or amend their consumptive behavior. State water recovery projects offer a low-transaction cost mechanism for coordinating behavioral adjustments within irrigation districts. Infrastructure and managerial changes of this magnitude are more easily coordinated at a superordinate level, thereby providing a policy justification for this approach.

Second, as has already been noted, projects of this type rarely attract high political costs. Those with strong claims on the resource (i.e. irrigators) are not required to relinquish those rights under water recovery projects. Moreover, they often stand to gain an improved service, in the form of a more reliable piped infrastructure. In addition, whilst such projects may *prima facie* appear more costly than the market purchase of access rights, any additional costs are spread across a wider population who are seeking to improve the status of the environment. The strong claims of the few to shore up existing rights will usually mitigate against the new but modest claims of the many, in a political sense at least.

Third, in the absence of any metric to adjudge the value of environmental flows, policy makers can still effectively argue that the additional expenses for water recovery projects are justified by invoking a version of welfare-enhancing logic. Put simply, policy makers can spend $4,800 per megalitre (as opposed to $1,000) to garner 'environmental' water because it is not possible to definitively prove that the community is unwilling to pay this amount, or more.

Fourth, water recovery projects avoid the complexity of third party effects that potentially attend market acquisition of access rights. At least four types of third party impacts complicate the choice of a market regime: salinity impacts; the effect of return flows from irrigation users; the notion of stranded assets, and; the impacts on system reliability (Brennan 2004, 18). Water recovery projects avoid some of these 'externalities', although enhanced efficiencies in delivery infrastructure and on-farm use clearly have the potential to incidentally alter salinity and return flows.

Notwithstanding the merits of water recovery projects, market-based techniques for acquiring environmental water also embody significant advantages. Brennan (2004, 1) observed in her review of the economic issues in the *Living Murray* that "market mechanisms that inherently involve competition between water sellers that participate voluntarily will be a preferred approach to across the board reductions in water access rights, and this is justifiable both in terms of social acceptability (from the social impacts statement), and on economic efficiency grounds". Arguably, the economic and social justification of voluntary market mechanisms also translates into advantages over state water recovery projects.

Leaving aside the potential budgetary advantages of purchasing water at a lower cost than is facilitated by some water recovery projects, the rationale for supporting voluntary market exchange in this context can be traced to other factors.

Firstly, a market setting for the purchase of water for environmental services would result in those who value access rights least, offering them for sale. Perhaps ironically, it was this same rationale (i.e. a water market moves the resource to its highest value use) that was used to underpin early CoAG reforms that broke the nexus between land and water rights, and the more recent National Water Initiative thrust for expanded trade and refinement of property rights. However, to date, trade to garner water for environmental purposes has largely been embraced only as a 'last resort' and in some circumstances depicted as the 'taking of water' from regional communities (see, for instance, Peatling 2003). Such an approach clearly ignores the basics of mutually beneficial exchange that underpins a market framework.

Second, market acquisition of access rights provides scope for the government to take advantage of existing spatial constraints to water trade as a means of exercising price discrimination. In the case of the Murray-Darling Basin, spatial constraints on trade make it feasible to target the purchases of water from those areas with known low-value water uses. Brennan (2004, 17-18) contends that "[p]erhaps most of the proposed benefits of a market approach to water acquisition will be able to be realized because of this spatial disparity in the value of irrigation water".

Third, there are significant informational advantages to employing market transactions to acquire water for environmental purposes. The market framework is conducive to an enhanced level of transparency on two fronts – it makes the benefits of exchange obvious to sellers and the budgetary costs of environmental decisions more apparent. The former information stands to improve irrigation communities' perceptions of the value of environmental services, insomuch as their members become the recipient of cash payments for access rights, some of which might be directed toward alternative local investments. In addition, the budgetary cost of environmental water acquisitions is clearer to the taxpayer. Unlike in the case of water recovery projects, employing extensive or elaborate infrastructure, it is difficult for bureaucrats to bundle a range of social objectives into a simple market acquisition of access rights.

Fourth, there are reasonable grounds to suggest that voluntary market acquisition is preferable on equity grounds. To reiterate, market acquisition is likely to be most appealing to those irrigators who value access rights least. Put differently, irrigation farmers who are unable to realize substantial profits from their current activities are more inclined to sell their access rights than profitable farmers. By way of contrast, water recovery projects frequently enable profitable farmers to become more profitable and capture more of the resource through re-use and the like. In this context, localized rules that deliberately restrain trade become a vehicle for perpetuating existing income disparities within irrigation communities, whilst market acquisition of access rights offers a form of income redistribution.

Notwithstanding the merits of market-based transfer of access rights to achieve environmental ends, this approach remains contentious, in part, because of its third-party effects. Perverse effects such as the activation of sleeper and dozer rights lie within these limitations (see, for example, Crase et al. 2004).

Current research effort is being directed at identifying alternative policy mechanisms that are capable of harnessing the benefits of market-based mechanisms without attracting third party effects. Work by ABARE into water trade that encapsulates salinity effects and the use of options contracts as a way of melding the benefits of trade with a solution to the stranded assets issue is illustrative of this approach (see, for example, Hafi et al. 2005). Unfortunately, a similar commitment to the market-based approaches is not yet evident at the political level, regardless of the caliber of the research work that points to its advantages.

CONCLUDING REMARKS

The information that circumscribes water policy choices is incomplete in several ways. The deficiencies in our understanding of the ecology of Australian rivers and groundwater systems, and their relationship to extractive use, is matched by the paucity of information about society's preferences for funding environmental enhancements. By definition, this creates a complex choice environment where political leaders must recognize the limitations of science, and reluctantly acknowledge their own human constraints when interpreting emerging trends.

Notwithstanding the difficulty of making policy decisions in this climate, care needs to be taken to prevent rent seeking by interest groups, and others, who might endeavor to exploit the information void to their own advantage.

Arguably, instances of this type of behavior can already be found in recent water policy decisions.

One of the major challenges confronting policy makers is the desire to reallocate water resources to achieve environmental ends. Whilst a range of strategies have emerged in this context, there is support for the view that many policy makers see the use of market-based approaches as a distinct genus of policy. Moreover, some political leaders have gone to extraordinary lengths to distance this approach from other water recovery projects: the latter being characterized by group or bureaucratic decision-making and a predilection for engineering and managerial mechanisms; the former being regarded as the policy of last resort.

The economic advantage of water recovery projects rests with the lower transaction costs of collective decisions and, in some instances, lower budgetary costs to garner ‘environmental’ water. In addition, these projects seldom attract political costs and, in this respect, represent the ‘low hanging fruit’ in the policy orchard.

By way of contrast, market-based mechanisms involving the voluntary acquisition of access rights have been received with less enthusiasm by policy makers to date. Regardless of the published advantages of this approach, and its documented support in emerging legislation, there has been only limited deployment of this technique to acquire water for environmental services. Undoubtedly, this reflects the higher political costs attending this policy apparatus.

It remains to be seen whether the modest use of market-based approaches to gain water for environmental services persists as the marginal cost of water recovery projects rises to a point where it becomes discernable to the general public. Hopefully, the significant investment that has already been undertaken into encouraging research focused on innovative market-based mechanisms will provide sufficient confidence for an expansion of this approach at a practical level in Australia.

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