The Allen Consulting Group

Saying goodbye to permanent water restrictions in Australia's cities

Key priorities for achieving water security

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Preface

The current water shortages facing most Australian capital cities has brought forth a groundswell of public debate on our approach to water management in urban areas. Beyond addressing the immediate crisis, there are conflicting views on what should be done at a strategic level to be better prepared for a potentially drier climate.

Some say that water conservation measures are the answer and that city dwellers should adapt to a regime of lower water availability. This point of view reasons that Australia is one of the world's driest continents and therefore we need to use water more responsibly. While nobody would argue with the need to use water sensibly, there needs to be equal recognition among policy makers across State and Territory governments that supply is not necessarily finite and additional supply can be developed to ease water restrictions.

In this paper we take the view that there are plenty of technical solutions available to alleviate water scarcity, and it is a matter of getting the right market incentives in place to unleash investment and innovation in supply. For example, desalination and recycling are available to supply as much water as we desire, albeit at a potentially higher cost than traditional sources.

A number of questions need to be asked about the current system of urban water management and supply. For example, why should all water users be saddled with permanent restrictions if there are potential solutions available to augment supply – and there is a willingness to pay for additional water? Is it a sensible policy to curb water use and potentially impede the economic and social benefits that water can deliver to the Australian community?

This paper presents a case for removing metropolitan water restrictions by 2012. To achieve this goal, water industry reform will need to be pursued on a number of fronts. We propose three immediate actions, based on a clear distinction between water for essential uses (hygiene, cooking and basic living) and water for discretionary use — that is, water linked to lifestyle choices such as swimming pools and exotic gardens. The three actions are:

- *Create a market for discretionary water*. This requires a consistent, national approach to water pricing that embodies the principle of 'user pays', thus ensuring that the majority of users pay the true cost of their discretionary water consumption.
- *Promote maximum competition in the market and build a service culture*. This requires the removal of statutory impediments to new water providers, opening up monopoly infrastructure to third party access and, where appropriate, by restructuring the industry to encourage diversity of supply and contestability among retail businesses.

- *Facilitate water trading to meet real demand.* Broaden the existing water market to include the urban sector by removing institutional constraints, assigning tradable water entitlement to large commercial users and competing retail water businesses and extending existing trading mechanisms/frameworks to allow rural-urban water transfers.

The pathways towards achieving these reforms, and the principles underpinning each action item, are set out in this paper.

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Chapter 1

Introduction

1.1 The need for urban water reform

Most of Australia's cities are facing critical water shortages this summer. With the exception of Darwin and Hobart, all cities have introduced restrictions on household water use as a means of rationing available supplies. In the face of severe drought this is the only effective short term option that water utilities have.

But well before the current drought, State and Territory governments have relied on restrictions to help balance demand with available supply. Many have had a policy of maintaining low-level permanent restrictions and other water conservation measures.

By taking this approach it is assumed implicitly that urban water consumers are willing to bear the cost of restrictions and that these costs are less than the cost of developing new sources of supply. These assumptions are made despite the lack of information about the economic cost of restrictions to users, the comparative costs of alternative options and public debate about what is an acceptable level of water security for urban populations.

Over the past decade or so, the decision by State and Territory governments to, by and large, adopt demand management approaches in place of investment in new supplies has resulted in reduced drought preparedness in our cities. In 2005 the Water Services Association of Australia reported no major investment in new sources of urban water supply in Australia for the past 20 years, except in Perth.[1] It is only recently that this long term trend has changed, with most States and Territories now moving to invest in new supply options, including dams, desalination, recycling etc. Industrial users have also begun to invest in water efficient technology.

The new wave of investment by State and Territory governments is significant and welcome, and will need to be continued in an integrated and strategic way, consistent with national policy objectives, if Australia is to meet future demand for water by a growing economy and a rising population.

1.2 Australia's adoption of water restrictions

Eighty per cent of Australian city dwellers are now subjected to long term restrictions.[2] How has this situation arisen?

The Australian community has been sold the concept that water is a finite and scarce resource. Governments have marketed the messages that to use an 'excessive' amount of water is bad for the environment, inappropriate social behaviour and that there are few other options but to reduce water use.

[1] Water Services Association of Australia, Testing the Water, WSAA Position Paper No. 1, Water Services Association of Australia, Melbourne, October 2005.

[2] Business Council of Australia (2006), Water Under Pressure.

These messages have been issued with good intent but are largely distracting from the main debate which is meeting demand for water in a sustainable and efficient way. There are numerous options for increasing supply, and these options are becoming increasingly cost-competitive compared with traditional supplies as technology improves. For example, in coastal cities desalination provides a practically infinite source of potable water, albeit at a higher cost than traditional sources. Many inland urban centres could access relatively vast amounts of water that is currently used for relatively low-value irrigated agriculture. It is therefore misleading to argue that water is scarce for urban use.

There are concerns over the environmental impacts of additional supply development, such as desalination plants. These concerns in many cases may be well founded, but they need to be kept in perspective - particularly as policy makers seek to establish sustainable long term solutions that involve diversifying water supply without a sole reliance on rain. In most cases, potential impacts can be addressed through technical solutions and the cost of these measures incorporated into the price of water. For example, the Western Australian Water Corporation has sought to offset all of the carbon emissions generated through powering its new desalination plant through the purchase of carbon credits. Similarly, planning approval for the proposed desalination plant for Sydney requires that the plant source all its energy from renewable sources and that impact on the marine environment be minimised through sound management.

Another factor leading to restrictions has been the reluctance of governments to treat water as a commodity. Unlike other products, such as electricity, food and petrol, water has historically been viewed differently. Quantity restrictions rather than pricing have been used to signal scarcity of water. As will be explained later in this report, the practice of setting urban water prices below the unit cost of sourcing new water has resulted in under investment in water infrastructure and inadequate feedback about customer willingness to pay for water security. The community would not accept quantity restrictions on other basic commodities like electricity, food or petrol (except perhaps in extreme circumstances like, for example, times of war).

1.3 Why permanent restrictions are poor policy

Restrictions are a poor long-term policy tool for balancing supply with demand because they impose costs on water users. The burden of restrictions is shouldered by all users despite the fact that users with a high value for discretionary water may be willing to pay for greater water security.

In addition to the direct costs of administering the policy (for example, advertising and compliance), restrictions impose significant costs on households, businesses and the general community. These costs are seldom quantified or measured in dollar terms. The costs include

- time and inconvenience costs (for example, hand watering the garden at specific times on specific days, and washing the car by bucket);
- household investment in alternative, high cost water sources to maintain gardens (for example, garden bores, rainwater tanks and domestic recycling systems);

- reduced amenity value from green areas around the house and in public parks and gardens;
- foregone recreation values due to damage to sporting fields (and the associated cost of restoring damaged fields and/or potential for injury to participants);
- direct costs to businesses reliant on large volumes of water as an input to production; and
- indirect or flow-on costs to businesses as a result of reduced household demand for services (for example, impacts on garden nurseries and turf farms).

Few estimates are available of the cost of water restrictions to households. A report prepared for ACTEW Corporation by the Centre for International Economics estimated that an average Canberra household is willing to pay between $198 and $769 per year to avoid restrictions, depending on the severity and frequency of restrictions.[3] When aggregated to the ACT population, this estimate amounts to $20 to $77 million per annum. The implied cost of restrictions for other capital cities based on this Canberra valuation is set out in Table 1.1. Summing these costs across all cities that are currently experiencing restrictions equates to between $0.8 and $3.1 billion per annum.

Table 1.1

ESTIMATED COST OF WATER RESTRICTIONS TO CAPITAL CITY HOUSEHOLDS[A]

Capital city	Amount households willing to pay to avoid water restrictions ($ mill per annum)
Canberra	20 to 77
Sydney	297 to 1154
Melbourne	238 to 923
Adelaide	77 to 300
Perth	103 to 400
Brisbane	65 to 254
Total	**800 to 3107**

[A]Based on an extrapolation of estimates of Canberra residential willingness to pay to avoid water restrictions (The Centre for International Economics, 2005, *Economic benefit cost analysis of new water supply options for the ACT*. A report for ACTEW Corporation).

[3] Centre for International Economics (2005), Economic benefit cost analysis of new water supply options for the ACT. A report for ACTEW Corporation.

The cost to the commercial and industrial sectors in Canberra was estimated by the Centre for International Economics to be between $3.4 and $4.5 million per annum depending on the severity and frequency of restrictions. In a similar study relating to Brisbane's water supply, the Allen Consulting Group estimated the potential cost of restrictions to Brisbane's commercial and industry sectors to be approximately $70 million per annum for a 30 per cent reduction in water availability, assuming businesses adopt water efficiency technologies and the restrictions are differentiated across businesses depending on the value of water as an input to production. The cost is considerably greater ($136 million) if uniform restrictions are imposed.[4]

Restrictions are an expensive way of saving water when compared to other options. With reference to the Canberra study, Stage 3 restrictions were estimated by ACTEW Corporation to save approximately 143 kL per household. Using a mid-range cost estimate of $360 per household, this equates to a cost of $2.50 per kL of water saved (before considering the direct costs of administering the policy). Desalination, by comparison, costs between $1.20 and $2.20 per kL — and provides a potentially limitless supply of potable water.[5] Of course, desalination is not an option for Canberra. But it is an option for coastal cities and the per kilolitre cost of water restrictions is likely to be similar in other cities.

Despite these significant costs, restrictions are frequently viewed by governments as a low cost way of managing supply shortfalls. The misconception arises because rarely is a full benefit-cost analysis undertaken of the impact of restrictions and the costs are spread across millions of users. Nor is there any thought given to the lost opportunities for new water supply technologies and industries to develop and the magnitude of foregone economic growth. Of course, these costs are felt by households and businesses directly, and do not appear as a direct cost on the government's balance sheet.

A further shortcoming of permanent restrictions is that the achievable demand reductions are limited. There are two reasons for this. Once households have adopted water saving technologies and/or practices in response to restrictions, the scope for additional reductions is minimal. Another reason is that compliance with restrictions relies largely on community goodwill. It is possible that householders will eventually tire of being on an 'emergency footing' and doing the right thing when it becomes known that restrictions are here to stay. Once this happens, restrictions would be costly to enforce.

1.4 No permanent water restrictions by 2012

A key goal of national water reform should be that: *by 2012, no Australian city should experience permanent water restrictions.*

Put simply, there are more efficient ways of managing water than relying principally on demand management. Greater focus is needed on the supply side and overcoming impediments to private investment in new infrastructure.

[4] Uniform restrictions are more costly than differentiated restrictions for achieving a target reduction in water because it neglects the possibility that some businesses have higher values for water than others. A uniform restriction requires all users to take on an equal share of the water reduction target irrespective of the cost this imposes on each user.

[5] Cost estimates based on Marsden Jacob Associates (2006) *Securing Australia's Urban Water Supplies – Opportunities and Impediments*.

This is not to say that periodic restrictions do not have a role to play as a tactical tool for managing demand in years of extreme drought. In exceptional circumstances, it may be prudent to implement restrictions as a one off measure rather than spending millions on a supply system capable of meeting demand in 100 per cent of years. For example, the community may be willing to live with the risk of a one in fifty year restriction 'event' if it means paying less each and every year for water. This is very different to adopting restrictions on a permanent basis.

This paper maps out the key elements of good urban water management and provides some tangible examples of these principles can be (and are being) put into practice here in Australia and overseas. The paper explains how institutional factors are currently constraining investment in water infrastructure — not the lack of capital. We conclude by outlining three high-priority actions that should be undertaken in the next eighteen months to achieve the goal of removing water restrictions.

Chapter 2

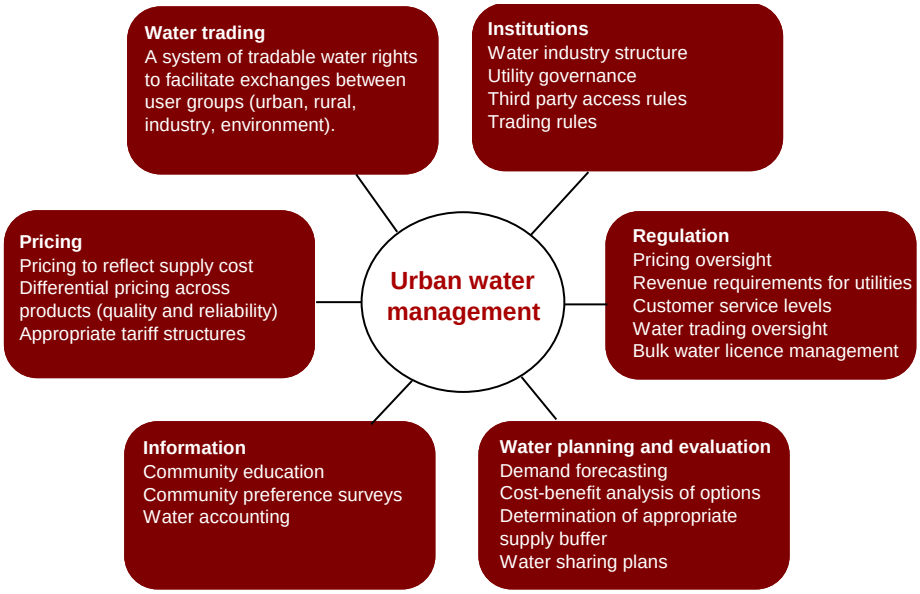
Elements of sound urban water management

2.1 Introduction

There are six fundamental elements of 'best practice' urban water management (Figure 2.1). Current management practices in Australia embody most of these elements but to varying degrees. There is scope for considerable improvement, as discussed below.

Figure 2.1

THE SIX ELEMENTS OF SOUND URBAN WATER MANAGEMENT



2.2 Pricing

For all commodities bought and sold in competitive markets, the prices 'discovered' by these markets provide an efficient means of balancing supply with demand. Consumers decide how much of the commodity they will consume based on price, and the price offered by producers represents the least cost method of supplying the commodity.

But in an urban setting, water is not traded in retail markets. There are particular characteristics of urban water that inhibit a competitive retail market in water supply to households and small businesses being established .

On the supply side, most urban water services have characteristics of natural monopolies. That is, significant infrastructure is required to store, treat and deliver water. Due to the high fixed costs of constructing and operating this infrastructure, it is generally uneconomic for multiple water delivery companies to operate because the cost of duplicating infrastructure would be too costly. This results in a lack of competition and consumers having only one water company to physically deliver their water.

On the demand side, individual households and small businesses do not have a tradeable entitlement to water and thus cannot participate in a water market in their own right. While it may be possible, in theory, to establish a system of tradeable entitlements for individual users (as has been done in the non-urban sector), the cost of establishing and administering full retail competition in entitlements for small customers may well be prohibitively high. However, water retail businesses could trade entitlements to bulk water, as could large commercial and industrial businesses.

In the absence of a market for retail water, administered prices are substituted for market-derived prices. The setting of prices by government or a regulator should take into consideration the two main roles of pricing:

- first, prices should generate sufficient revenue for water companies to cover their efficient cost of supplying water (including operating, capital and a rate of return on and of assets); and
- second, prices should signal the scarcity value of water to consumers and to investors. This is achieved by setting prices equal to the cost of servicing an additional unit of demand over a long time horizon, where capital or infrastructure can be varied to meet changes in the supply and demand balance (this cost is known as the long run marginal cost of supply — see Box 2.1 for details). Setting price equal to long run marginal cost would provide the right financial incentives for efficient investment in additional supply and convey to consumers the true cost of their discretionary water use choices.

Box 2.1

A NOTE ON LONG RUN MARGINAL COST (LRMC)

Marginal cost is defined as the change in total cost that results from increasing production or output by an additional unit. The marginal cost of providing water includes two components: (i) changes in infrastructure operating costs resulting from a unit increase in demand; and (ii) the capital cost of expanding capacity to cater for increases in demand, including the operating costs associated with increased capacity and the required commercial rates of return.

The first of these components reflect short run marginal costs (SRMC) — defined as the cost of providing an additional unit of water on the assumption that all physical infrastructure is fixed. SRMC in the water industry is very low because most of the costs are fixed in the short run. The second component reflects a longer time horizon over which capital and physical infrastructure can be varied to meet changes in the supply-demand balance. These longer-term costs are, by definition, not included in SRMC. If water was priced at SRMC, prices would fluctuate through time following a saw tooth pattern.

An alternative is to set prices equal to long run marginal cost (LRMC). This is a forward-looking cost concept. It signals to consumers the present value cost that a unit increase in per capita demand would have on the need to bring forward the timing of supply augmentation in order to keep supply in balance with demand. The rationale for setting volumetric prices at LRMC is as follows:

- The concept of LRMC provides a means of incorporating scarcity values into the administered price of water, which would otherwise be incorporated through market forces. Thus, LRMC aims to correct for a market failure that caused by the lack of a market for bulk water. (In this regard, water is quite different to some other essential services. For example, prices charged by gas utilities incorporate a scarcity value because there is a market for gas access entitlement and utilities pass on this cost to customers).
- The cost of consumption is signalled to users and enables them to signal their demand preferences to water providers, which in turn facilitates an efficient level of investment in source development.
- Pricing according to LRMC promotes efficient investment by households in durable water-using goods (pools, gardens, reticulation etc.) because consumers can make more informed purchasing decisions based on the long run cost of supply.
- Short term price fluctuations, which would arise if water was priced at SRMC, could confuse customers about the longer term cost of water provision. Customer habits and demand are largely influenced by long-term considerations.

The water reforms to date have focused mainly on the first of these two roles. According to the Water Services Association of Australia, the prices for urban water in capital cities are at or near 'upper bound', which is defined by the National Water Initiative as the price that recovers all capital, operating and maintenance costs associated with water supply, plus a commercial rate of return on capital. That is, we pay for its storage, treatment and transport — but not for the water itself.

The adoption of upper bound pricing does not necessarily produce prices that represent the scarcity value of water. In order to reflect scarcity, the price should be based on the long run costs of meeting an incremental increase in demand (the long run marginal cost) and will depend on

- the water company's long term infrastructure program;
- the forecast increase in demand over the period under consideration and any projected reductions in per capita consumption due to demand management measures;

- the desired level of water security (or the size of buffer needed to reduce the incidence of restrictions to a specified frequency and severity); and
- the mix of water supply alternatives available to meet demand and the respective costs of these alternatives (including the cost of any negative environmental impacts[6]).

Most major water businesses have adopted, or are in the process of adopting, a volumetric price for water based on an estimate of long run marginal cost. However, the assumptions and methodologies used to calculate these prices is neither transparent nor consistent across the jurisdictions. Therefore, it is difficult to determine whether the prices charged truly reflect scarcity value.[7]

Furthermore, while some cities have adopted a rising block tariff (prices that rise with the volume of water consumed), the majority of households are charged prices that do not reflect the cost of their discretionary use on the supply system. Only high-volume users are exposed to prices that represent the incremental cost of developing new supplies. This has arisen partly because governments and economic regulators have appropriately sought to take into account social policy objectives by providing discounts to pensioners and keeping prices low for households consuming below (or at) the average volume of water.[8] The challenge of pricing is to accommodate these social objectives while not diluting efficient pricing signals.

In the past, the pursuit of social objectives has come at the cost of reduced efficiency. However, the two objectives need not be in direct conflict. Government-funded measures to provide targeted concessions to particular households have been utilised in the competitive electricity retail markets. Furthermore, multi-part tariff structures can be designed to ensure that discretionary water is priced to reflect the economic cost of supply, while lower prices apply to water consumed for essential use. This strategy is consistent with good economic policy as pricing need only influence the consumption decisions of households using water for discretionary purposes. Efficiency problems only arise when prices for discretionary water are set too low.

The social impact of raising water prices needs to be kept in perspective, as current prices for water and wastewater services constitute a very small proportion of average household expenditure, estimated by the Australian Bureau of Statistics to be 0.7 per cent (or $311 per annum) in 2003-04. By comparison, expenditure on electricity, gas and other domestic heating/cooking fuels absorb 2.6 per cent of an average household's budget (or $1196 per annum).[9]

2.3 Water trading

Trading facilitates the transfer of water to regions and sectors that value water the most. The free and open trade in bulk (untreated) water between water using sectors (particularly urban-rural) and between water basins is a basic principle of efficient water allocation.

6 Also known as environmental externalities

7 Marsden Jacob Associates (2006) Securing Australia's Urban Water Supplies: Opportunities and Impediments. A discussion paper prepared for the Department of Prime Minister and Cabinet, November 2006.

8 Another social policy has been mandated uniform tariffs across geographic regions, regardless of differences in the cost of supplying customers in each region.

9 Australian Bureau of Statistics (2005) Household Expenditure Survey, Australia: Detailed Expenditure Items, 2003-04. Cat. No. 6535.0.55.001

At present, there are only limited opportunities for water trade between rural and urban users, despite the fact that infrastructure already exists in some cities to facilitate inter-sector transfers of water and mechanisms for trading irrigation water are well established.

A study by CSIRO has demonstrated that water trading offers the potential for urban water utilities to obtain new sources of water at significantly lower cost than alternative options and that without trade, Australia's GDP would fall by 0.6 per cent by 2032 (assuming no major new sources of water are developed).[10] Furthermore, the amount of water that would be needed to satisfy urban demands represents just a fraction of current irrigation use — estimated by CSIRO to be less than 1.5 per cent.

Opening the bulk water market up to trade would not necessarily involve a permanent transfer of water to urban areas. Irrigators may find it profitable to lease or sell seasonal allocation to urban municipalities at time of the year when they can extract a premium price from the urban market. Alternatively, they could sell 'water options' to municipalities, which would give municipalities the option (but not the obligation) to purchase seasonal water allocation from irrigators when and if needed.

Whilst the allocation of tradeable entitlement to individual householders is unlikely to be a practical (or efficient) proposition, there is scope for bulk water to be traded between water business retailers and between large commercial and industrial users. At present there are institutional barriers to this trade in some States.

2.4 Institutions, industry structure and governance

Institutions include the decision-making entities responsible for managing water resources and the rules governing transactions between participants in the water industry.

Both are critical for efficient urban water management. Getting the institutional structure right is important for promoting private investment in the water industry, competition in the supply of bulk water and for enhancing the development of new technologies through the right mix of financial rewards.

An effective institutional structure for urban water is one in which monopoly components of a water business are separated from contestable, retail functions and regulatory functions are separated from resource management roles. At present, it is common in Australia for some elements of these roles to be undertaken by the same entity.

Government-owned water businesses are the typical vehicle for urban water supply. This presents challenges for water governance because State and Territory governments have multiple roles, including

- a shareholder role — governments have an interest in the financial performance of the water utility;

[10] CSIRO (2006) Without Water: The economics of supplying water to 5 million more Australians.

- a policy role — the policies applied to government business enterprises are often vague and conflicting due to the many strands of policy that governments are responsible for (industry, regional development, environment, budget etc.); and
- a regulatory role — including economic, environmental and occupational health and safety regulation.

There are potential conflicts between these roles in the context of water management. Sound governance calls for separation and clarity in these roles across government so that each is well represented. Clear objectives are required so that businesses know what they are expected to work towards. The boards and managers of government-owned utilities should have operational autonomy to deliver on these objectives.

One of the possible reasons that water restrictions have been adopted as a strategic management tool by many governments in preference to other, more cost effective and efficient ways of balancing supply with demand is the failure, on behalf of governments, to tease apart the price-setting role from the social policy role. Restrictions have been viewed as more palatable to the community (on social and environmental grounds) than raising prices and investing capital in new water supply infrastructure. The lack of separation between these roles has masked the trade-offs that accompany the decision to adopt restrictions, including losses in economic growth and welfare losses to the community in general.

2.5 Regulation

Economic regulation of natural monopoly service providers has become an accepted practice in Australia, but a variety of models exist across the country (which range from regulators that have a price-setting role to bodies that only have an advisory role). Sound regulation of water businesses requires the regulator to be independent of the regulated businesses and independent of government. It should have the role of:

- examining the revenue requirements of utilities;
- reviewing prices;
- performance benchmarking;
- developing financial incentives for utilities to improve the efficiency of their operations and capital investment programs;
- inquiry into the utility's water supply plans — in relation to the economic trade-offs associated with different options to balance supply with demand; and
- ensuring that customer service levels and standards are met.

There is also a need for regulatory oversight of water trading, infrastructure access by third parties, water quality and environmental quality. Third party suppliers should be subject to common regulation that preserves health and safety standards consistent with current government requirements.

2.6 Water planning and evaluation

Bulk water resource management and planning is another key element of sound water management. The development of water allocation plans and whole-of-state water demand-supply planning is principally a government role because water is a publicly owned resource (the rights to access the resource are allocated to users).

The allocation of water between consumptive use and the environment is typically a function of government due to the public good nature of environmental benefits associated with water.

Water management and future supply strategies needs to be underpinned by a clear understanding of the costs and benefits of different options for meeting urban demand (including an evaluation of environmental and social impacts) and information about community demands for water security. These evaluations need to be undertaken against the backdrop of changing community values and advances in technology.

A review by the Allen Consulting Group found that until very recently, few jurisdictions have articulated explicit water security targets in terms of the supply buffer required to reduce the incidence and severity of restrictions to a particular probability. This is a basic starting point for developing a water supply strategy and for determining an efficient scarcity price for water associated with discretionary purposes.

2.7 Information

Decisions by government, private sector participants in the water industry and water users should be informed by the best available information. It is critical that information is provided to promote functional markets in bulk water. The following are examples of information needs:

- Competition in water supply can be inhibited if information is not made available to potential new entrants wishing to gain access to existing urban markets and infrastructure.
- Information is required to assist users make decisions about their demand for water — for example, community education about water efficiency measures, pricing policies and the cost of alternative water sources;
- Information is required by economic regulators to assess the total revenue requirements of water utilities against their operations, and to review the appropriateness of proposed prices.
- Water planners require information about water stocks, flows and losses in the system (water accounting). Bulk water users also need this information as it relates to their allocations in a particular year.
- In the absence of retail markets, information is required on community preferences and values surveys — for example, estimating willingness to pay for water security, values for service quality and preferences for various water products.

Formal provisions for ensuring these information flows occur may be required in some circumstances in an easy and accessible manner. It is desirable that all this data is made available in the public domain in a standardised format to enable decisions to be made rationally.

Chapter 3

Putting the principles into action

Securing water supplies in our cities for future growth will require a mix of pricing adjustments, institutional reforms, good planning and governance. This chapter presents a number of practical examples of how these elements can be combined to produce efficient infrastructure solutions for meeting urban water demand. We draw on case studies from Metropolitan Perth in Western Australia, Israel and California to illustrate some of these solutions.

- The Western Australian case study illustrates the benefits of long term planning, investing in new supply in response to growing demand and significant reductions in rainfall, pricing reform, rural-to-urban water transfers and the development of new water sources via competitive procurement.
- In Israel, the focus is on innovation in water supply technologies, including desalination, recycling and rehabilitation of depleted aquifers. This country has also adopted an institutional system that allows the agricultural sector to contribute to urban water needs in times of high demand.
- The Californian case study illustrates the emphasis this State places on long term water resource planning. It has a portfolio of 25 management strategies out to 2030, including recycling and aquifer storage recovery. It is an example of government-driven investment in water supply, combined with incentives for the private sector.

The chapter concludes with an overview of the potential for increased private sector involvement in the provision of water.

3.8 Securing Perth's water supply

Compared to other Australian capital cities, Perth has a relatively long experience of dealing with supply shortfalls. Since the mid 1970s, the population of Perth has more than doubled, yet in the last thirty years average runoff into Perth dams has fallen considerably. This is particularly so for the last nine years, over which time average inflows have been about one third of pre-1970s levels. Some of this supply reduction has been met by increased groundwater use, which currently constitutes about 60 per cent of Perth's water consumption. The Water Corporation (Perth's sole water supplier, and a corporatised government agency) has developed plans in conjunction with the State Government aimed at ensuring long-term water security.

Long-term water source planning

The Water Corporation's planning and strategy is underpinned by a number of considerations.

- Water planning is based on an assumption of a nine-year rainfall scenario which is characterised by much lower rainfall than the 100-year rainfall scenario as commonly used by water planners in other capital cities;

- Water planning is designed such that the frequency of total sprinkler bans is a 1 in 200 year event whereas water planners in other Australian capital cities commonly adopt a 1 in 25 year sprinkler ban scenario; and
- Rigorous sensitivity analysis is conducted in relation to future demand trends and the likelihood of meeting demand management targets.

The Water Corporation periodically updates its long-term source development plan. The 2005 Source Development Plan contains a range source development options and includes estimates of the potential water yield from source options, capital costs and operating costs. Table 3.1 contains details of some of the source development options currently under consideration.

The recently completed and commissioned desalination plant is an example of alliance between the Water Corporation and the private sector. The desalination plant was built under a 'Design Build Operate' type contract. The desalination plant provides a water source that is independent of rainfall but is more costly than traditional water source options. These costs are passed on to consumers.

Another innovative strategy for securing additional water has been the purchase of irrigation water from Harvey Water, a rural water supply utility located approximately 150 kilometres south of Perth. In 2004 the Water Corporation provided funding to Harvey Water for the upgrading of its distribution system in exchange for the water saved due to the upgrade. Since the project commenced, 10 GL of water have been transferred to the Water Corporation at a cost of approximately $0.50 per kL and another 7 GL is expected to be achievable.

Table 3.1

SOURCE DEVELOMENT OPTIONS FOR PERTH

Project	Estimated yield potential (GL per year)	Estimated cost ($ per kL)	Level of confidence
Seawater desalination stage 1	45	$1.11	Project complete
Water trading stage 1	17	$0.50	High
Yarragadee groundwater	45	$0.85	High
Returning Wellington Dam to potable source	12 to 17	$0.33	Medium
Eglinton groundwater	15 to 17	$0.70	Medium
Yanchep groundwater	9 to 11	NA	Medium
Gnangara Mound harvesting	20	$0.20	Low
Catchment management	40	$0.22	Low
Karnup groundwater	22	NA	Low
Gingin groundwater	20 to 30	NA	Low
Brunswick River	25 to 30	NA	Low

Source: Water Corporation 2005 Source Development Plan

Pricing of water

The Western Australian Economic Regulation Authority has an oversight role in respect of water pricing. While not able to determine water prices, the Authority is called on by the State Government to provide advice on the appropriate level of prices and related institutional arrangements. A recent report by the Economic Regulation Authority[11] recommended that a number of adjustments be made to Perth's water charges, including

- rebalancing the two-part tariff such that the fixed charge constitutes a smaller proportion of the total average bill (one third of the bill down from approximately one half);
- increasing the volumetric charge to reflect the estimated long run marginal cost of delivering water supplies to the metropolitan area (estimate to range between $0.82 to $1.20 per kilolitre);
- replacing the existing five-block inclining tariff with a simpler, two-block tariff with the step set at 550 kilolitres (that is, water consumption up to 550 kilolitres would be charged at $0.82 per kilolitre and consumption over this amount would be charged at $1.20 per kilolitre).

This proposed structure effectively exposes most customers to the lower estimate of long run marginal cost, thus strengthening the scarcity price signal. The structure would result in decreased revenue to the Corporation through fixed charges but this revenue loss would be offset by higher volumetric charges for most customers.

Industry structure

The Water Corporation is a vertically integrated business and has responsibility for bulk water supply, water catchments, distribution, treatment and retail. There are no arrangements in place to facilitate third party access to water infrastructure. But the Water Corporation has indicated that it will consider water source proposals put forward by the private sector, provided they meet criteria such as cost-effectiveness, reliability of supply and social and environmental impacts. There is scope in Perth to increase the role of the private sector in water supply through privatisation of some discrete infrastructure assets, such as the desalination plant and possibly some future groundwater assets.

3.9 Israel — a world leader in desalination

Israel is located in a semi-arid climatic zone and its natural fresh water resources are severely limited. Over the past 20 years water consumption has been increasing steadily due to population growth and rising standards of living. The Israeli Government has taken a proactive approach to ensuring the existence of an adequate water supply. The country is regarded as a world leader in the implementation of water technologies and in particular desalination technology.

[11] Economic Regulation Authority (2005) Final Report: Inquiry on Urban Water and Wastewater Pricing, November 2005.

Water supply in Israel is dominated by Mekorot — a government-owned, yet independently operated, utility that operates the nationwide water system. Mekorot supplies around 65 per cent of the water consumed in Israel. A large part of the remaining share of water consumption is provided by water associations that have been incorporated into the water supply network to supply water to the agricultural sector (in most cases the associations are owned by farmers). Local authorities and private farmers with production rights also make contributions to national water supply.

Prior to 2000, Israel relied heavily on water sourced from lakes and aquifers, however these sources are no longer sufficient to meet current levels of demand. The Government is now focussing on developing a range of alternative water options, including desalination, to ensure that long term water demands are met.

Desalination

In 2000, the Israeli Government launched the Desalination Master Plan. The Plan called for the construction of a series of desalination plants along the Mediterranean coast to enable the production of 400 GL per year by 2005 (equivalent to 45 per cent of domestic consumer water demand and 19 per cent of the country's total water needs). According to the Plan, desalinated water production will rise to 750 GL by 2020.

Most desalination projects are to be (or have been) executed through 'Build, Own, Operate and Transfer' (BOOT) or 'Design Build Operate' (DBO) agreements between water suppliers and the private sector. Government guarantees of minimal water purchase quantities and availability charges are common features of these agreements.

The Government contract for the Ashkelon desalination plant — the first in the series of large-scale seawater desalination plants — was awarded in September 2001 and serves as a good example of the nature of the BOOT agreements. The contract to build and operate the plant was awarded by the Israeli Government to a joint venture made up of IDE Technologies (based in Israel), Veolia Vivendi Water (based in France) and Dankner-Ellern Infrastructure (based in Israel).

Under the agreement, the joint venture is required to finance and construct the desalination plant on Government-owned land. The joint venture party operates the plant as a private business and sells the water to Mekorot at a pre-defined price. At the end of the 25-year contract period, the plant is handed over to the Government.

Construction of the Ashkelon plant cost $US250 million and was completed in 2005. In 2006 the plant was awarded the title of 'Desalination Plant of the Year' at the Global Water Awards.

With an annual production capacity of 108 GL, the Ashkelon plant is the world's largest desalination plant. Being more than twice the size of similar desalination plants, the Ashkelon plant has been recognised as proving that technology can meet the challenges of large-scale municipal supply in a cost-effective manner. The plant was completed on time and within the budget, while meeting all design and product parameters imposed by the Israeli Government. The plant produces water at the factory gate at a cost of around $A0.83 per kilolitre.

Other water technologies

The Israeli Government is active in supporting companies operating in other areas of water technology such as drip irrigation and water purification. The Israel Industry and Trade Minister recently decided to fund a number of innovative water projects at the early stages of product development. In addition, Mekorot has agreed to serve as a testing ground for new technologies and is currently testing about 12 new locally-developed technologies for which it will commit to purchase if appropriate.

Other Government water initiatives in Israel were identified in a 2002 water master plan and include rehabilitation of polluted and depleted aquifers, importation of water from Turkey and an increased use of water recycling.

The rate of water recycling in Israel is already amongst the highest in the world. About 65 per cent of wastewater produced in Israel is reclaimed for agricultural use. The Israeli Government has an objective to treat 100 per cent of its wastewater to a level enabling unrestricted irrigation by 2010 without risk to soil and water resources.

3.1 Water planning the Californian way

Demographic and environmental factors in California present a number of challenges to the operation of an effective water supply network. The majority of the State's rainfall and snow accumulate in the northern regions while the bulk of the population resides in the western and southern semi-arid regions. High variability in year-to-year rainfall causes frequent flooding and drought and within-year variability is also high with around 75 per cent of rainfall occurring during summer months.

The main component of the Californian water supply network is a series of dams that capture and store water in the northern part of the State for transport to the south via canals and aqueducts. An extensive network of canals and aqueducts has been constructed to transport water from north to south — the channels are capable of transporting 11 500 gigalitres of water per year. Around 30 per cent of the State's water comes from groundwater sources though this portion is higher during drought years.

The Californian agricultural sector consumes about 80 to 85 per cent of total water supplied while urban water users consume about 10 per cent and the residual is allocated to industry.

California's water is supplied by a variety of different agents at a federal, state and local government level. Water planning, however, is predominantly done at a State level. The Californian Department of Water Resources is responsible for planning future water requirements of the State. As part of its role, the Department regularly updates the California Water Plan. The 2005 Water Plan contains 25 resource management strategies designed to meet water management objectives out to 2030 and is representative of the multi-faceted and long-term approach adopted by the Californian Government to handling the State's water needs.

Key strategies are classified according to whether they reduce water demand, increase water supply or improve operational efficiency and water transfers.

- Reducing water demand — includes various strategies for improving agricultural and urban water efficiencies.
- Increasing water supply — includes measures such as desalination, rainfall enhancement (cloud seeding technology), water recycling, increasing surface water storage capacity and conjunctive management measures (referring to the joint management of surface water and groundwater by taking advantage of the ability of surface storage to capture and temporarily store water and the ability of aquifers to serve as long-term storage).
- Improving operational efficiency and transfers — includes measures to improve the effectiveness and efficiency by which water is transported to areas where it is needed.

The table 3.2 summarises the potential contribution of each strategy to meet the water needs of California and the approximate cost of each strategy. A number of these strategies are currently being implemented. Water projects are being underpinned by innovations in water pricing, low interest loans to the private sector, rebates and public-private cost sharing arrangements.

Table 3.2

OPTIONS FOR CALIFORNIA

Initiative	Effective addition to water supplies (GL per year)	Estimated cost ($A per kL)
Urban water use efficiency	Up to 3,800	Up to $A0.82
Joint management of surface and ground water resources, including aquifer storage and recovery	Up to 2,500	Up to $A0.94
Recycled municipal water	Up to 1,700	Up to $2.04
Increased surface water storage	Up to 1,200	NA
Agricultural water use efficiency	Up to 1,000	Up to $0.70
Desalination (ocean and brackish water)	Up to 600	$A0.39 to $A3.13
Transportation efficiencies	Up to 500	NA
Rainfall enhancement	Up to 500	$A0.03

Source: California Department of Water Resources (2005) California Water Plan Update 2005.

3.2 Potential scenarios for private sector provision of water

The private sector has been involved across the water supply network in Australia. For example, the desalination plant in Perth highlighted in the case study above was commissioned using a 'Design Build Operate' scheme. Similarly, approximately 90 percent of Sydney's water is treated at plants operated under BOOT schemes (Design, Own, Operate and Transfer). However, there is far greater scope for the private sector to directly apply its innovation in the provision of water.

Public-private partnerships in developing water infrastructure projects can help State governments commission new infrastructure in a timely and efficient manner. They can help transfer risks away from the state including construction costs and timing, operational costs and reliability, project management and delivery, as well as foster innovation in design and technology. As outlined earlier in the report, common regulation can be applied to maintain the integrity of health and safety standards in the provision of water by the private sector.

The Government must continue to set the conditions for service delivery, but the private sector has a proven capacity to meet these challenges, including:

- a demonstrated record in service delivery (ie: the water treatment plants in Western Sydney and the Illawarra);
- project management expertise to ensure new infrastructure is delivered on time and on budget;
- risk management skills relevant to water infrastructure, including the volatile environmental exposure associated with a changing climate and the link between pricing and consumer use; and
- the introduction of innovative and smart technology.

Aside from public-private partnerships, there are three main fronts on which the private sector can become more actively engaged in supplying water. First, incumbent water businesses could establish new bulk supplies through competitive procurement of from private suppliers. Second, monopoly water and wastewater infrastructure should be opened up to third party access, under an appropriate set of regulatory controls. And third, opportunities should be made available for allowing private water retail businesses to compete with incumbent providers for customers in niche markets (for example, embedded utilities).

Figure 3.1 presents a conceptual diagram of how these arrangements could facilitate the provision of new water supplies and wastewater services. There are probably a variety of other configurations and scenarios that could be developed. For example, AGL has proposed to recommission disused gas and water pipes to transport new sources of recycled water.[12]

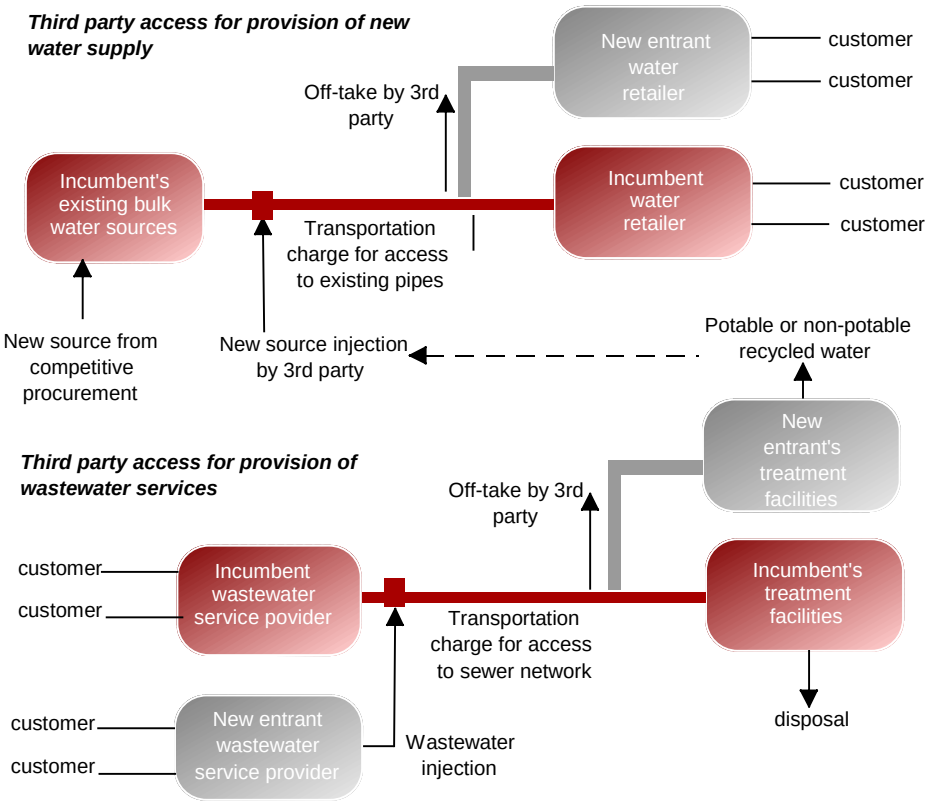
At present, there are very few examples of third party access in Australia and overseas. In the United Kingdom, the economic regulator responsible for water (Ofwat) requires water companies to establish access arrangements and post the terms and conditions of access. The framework only applies to water supplies – it does not cover access to sewerage infrastructure. To date, these arrangements have not had significant uptake by the private sector.[13]

[12] Marsden Jacob Associates (2006) Securing Australia's Urban Water Supplies: Opportunities and Impediments. A discussion paper prepared for the Department of Prime Minister and Cabinet, November 2006.

[13] Marsden Jacob Associates (2006) Recent developments in third party access in water and wastewater. Paper prepared to Water '06 Conference, 2 March 2006.

Figure 3.1

CONCEPTUAL THIRD PARTY ACCESS SCENARIOS



New South Wales has established a third party access regime under a new piece of State legislation — the *Water Industry Competition Act 2006*. This was partly in response to a proposal by a private firm (Services Sydney) to treat and recycle Sydney's wastewater in competition with Sydney Water. At present, terms of the access agreement between Services Sydney and Sydney Water are under negotiation.

Other examples of third party access in Australia have involved negotiated agreements outside a formal regulatory framework. In South Australia, irrigators on the Barossa have negotiated access to SA Water's infrastructure. Access by Barossa Infrastructure is an example of access under a cooperative arrangement to use existing infrastructure to serve new markets. In Queensland, local councils have negotiated with Brisbane Water to use its treatment plant and pipeline infrastructure.

Competitive procurement of new bulk sources of water has not been practised widely in Australia. Perth's Water Corporation has called for proposals from the privates sector but has not proceeded with any of the proposals received.

In future, the fostering of greater involvement by the private sector will require transparent pricing policies (with respect to access pricing and regulated prices), information disclosure about commercial risks and a basis for sharing risks between the incumbent and the private party. These issues are taken up in the next chapter.

Chapter 4

Key priorities for achieving the goal

Necessary policy reforms for achieving the goal of 'no permanent water restrictions by 2012' constitute a mix of both short and long term actions. In the next eighteen months, the priority foci of governments should be the following.

- *Creating a market for discretionary water*. This requires a consistent, national approach to water pricing that embodies the principle of 'user pays', thus ensuring that the majority of users pay the true cost of their discretionary water consumption (that is, consumption in excess of basic household needs).
- *Promote maximum competition in the market and build a service culture.* Competition and technological innovation should be promoted by removing statutory impediments to new entrants, separating regulatory/policy functions from commercial functions, opening up monopoly infrastructure to third party access and, where appropriate, by restructuring the industry to encourage contestability among retail businesses.
- *Trading water to meet real demand* in the urban sector by removing institutional constraints, assigning tradable water entitlement to large commercial users and competing retail water businesses and extending existing trading mechanisms/frameworks to allow rural-urban water transfers.

4.1 Priority 1 — Creating a market for discretionary water

First and foremost, this requires the setting of a clear public policy goal — that is, the removal of metropolitan water restrictions by 2012. Consensus around this goal can be built by articulating the benefits of security of supply, the extent of drought proofing possible in metropolitan areas and the pricing principles that can see the public policy goal achieved. It should also recognise that the purpose of private sector participation in the provision of water is to deliver innovation, certainty and a service-based culture to support cost-effective water supply.

Raising prices for volumes of water in excess of basic non-discretionary purposes will eventually remove the need for permanent restrictions. Higher prices may reduce demand to some degree but, more importantly, pricing water at the true cost of meeting additional demand will send the right signals for efficient levels of infrastructure investment.

Actions

- Establish a national, consistent approach to water pricing that embodies the following principles:
  - Discretionary water should be viewed as a commodity and priced according to its scarcity (i.e. the incremental cost of developing new water supplies) and at a level that allows water providers to recover their efficient costs associated with servicing existing levels of demand.

  - In the absence of a competitive market, administered prices should be set to reflect the *future* costs of meeting demand (the long run marginal cost), plus recover a return on *existing* assets.
  - In circumstances where water customers have a choice of provider, *market-determined prices* should be allowed to sit alongside the administered prices determined for incumbent water businesses (supplier of last resort model).

- An inclining pricing structure should be used for volumetric tariffs. A typical structure would comprise
  - a base volume of water for essential (*non discretionary*) use (say, up to 150kl per household per annum) to be provided at below-cost to take into account social policy objectives and the essential-service nature of water; and
  - volumes consumed in excess of the base volume (representing *discretionary* use) to be charged at long run marginal cost (LRMC).
- Safety net discounts could be provided to low income and large family households consuming volumes in excess of the base volume, but these should be applied to the fixed component of the charge or through a direct form of assistance so as not to distort the pricing signals provided through the volumetric tariff.
- The fixed component of the tariff should be set to recover only the 'residual' costs, in instances where LRMC pricing returns a revenue that is less than the utility's total efficient cost (the residual typically includes a return on existing assets).

4.2 Priority 2 — Promote competition in the market and build excellence in customer service

Competition in the retail supply of water is virtually absent in water industry at present. Opening up the industry to competition will give rise to greater technological innovation, reduce the cost of service delivery over time and result in new supplies coming on-line to meet community demand for water. Governments can still realise public policy objectives and frame the behaviour of (and sanctions for) participants in the market.

Actions

- Remove statutory impediments to competition, such as laws restricting the supply of bulk water to a private entity for re-sale and the inability of private sector entities to obtain various planning, construction and property access approvals (which are otherwise available to the incumbent government-owned water business).

- Require wholesale water businesses to develop new water supplies through competitive procurement — that is, require wholesalers to call for proposals from private sector firms to deliver a particular supply outcome (volume, quality, location, time and environmental considerations), without prescribing the delivery approach. Accompanying this is the need for appropriate contracting processes to be established that can optimally allocate risks between water businesses and private sector providers.
- Facilitate the opening up of monopoly infrastructure by establishing third party access regimes in each state based on a nationally consistent framework with regards to access pricing, service quality, governance and regulation. Access arrangements should facilitate access to both sewerage pipes and potable water pipes.
- Separate roles within government that may conflict with each other: price and access regulation, water sector policy and planning, environmental and safety management, infrastructure ownership and operation.
- Conduct a state-by-state review of opportunities for, and potential efficiency gains from, industry restructuring, for example
  - horizontal disaggregation (separate providers for different geographic regions);
  - vertical disaggregation (split bulk-supply functions from retail functions and/or tease apart functions that are potentially competitive from those that are natural monopolies); and
  - embedding sub-networks or sub-utilities in urban centres (to facilitate competition for the right to supply a particular market).
- Develop a national regulatory and management framework for the use and pricing of alternative water supplies — recycled water, groundwater and stormwater that is fit for purpose.

4.3 Priority 3 — Trading water to meet real demand

Allowing the spatial redistribution of water, through trade, to meet the growing demands of users in areas currently denied access to water is an essential part of resolving the current water shortages in our cities. Allowing market forces to redistribute water to areas and sectors where it is most highly valued leads to a more efficient use of the resource and could, in some situations, be cheaper than developing new sources.

Actions

- Remove institutional impediments for trade between rural users and urban water providers (for example, restrictions on the amount of water that can be traded out of an irrigation region, rules that disallow non landholders from owning water entitlement etc.).
- Investigate water options as an instrument to facilitate seasonal trade in water allocations between rural and urban users.
- Develop a rural adjustment policy for those regions that experience significant social impacts from water traded out of the region.

- Assign tradeable bulk water entitlements to large commercial and industrial urban water users and to retail water businesses in connected systems.