

RESOURCE ALLOCATION IN THE WATER INDUSTRY

The Role of Market Forces

Paper presented to a workshop held at the Canberra College of Advanced Education
24 May 1986

An adequate water supply has been a basic requirement of major urban and industrial centres of concentration. Some governments have chosen, for regional development purposes, to invest in substantial public works in order to convey water to areas which would otherwise remain essentially -undeveloped. The development of irrigation schemes was encouraged by the fact that Australia is a dry continent, and the UK market provided a profitable and stable outlet for the products of intensive irrigated agriculture. The development of the Western States of the USA virtually depended solely on the development of very substantial irrigation and water supply schemes.

Public investment decisions were made in an entirely different context in these earlier years. An important issue is how do we change or modify our policies and institutions in this relatively educated and sophisticated society to provide for the greatest benefit to the community as a whole.

Randall⁽¹⁾ described the water economy as going through two basic phases, the expansionary phase and the mature phase:

1. Expansionary, with relatively low costs associated with expanded water use in both total cost and marginal cost terms. The 'externalities' such as rising water tables and increasing salinity are not evident. During this phase the main public policy issues are concerned with the rate of expansion, the appropriate scheduling and timing of new projects and the level of public subsidisation. Thus, the pricing of water is viewed simply in terms of the level of public subsidy rather than the efficient use of limited supplies of water.
2. Mature, where the marginal cost of providing additional water is sharply rising, there is increasing competition between different kinds of users, and more obvious evidence of undesirable externalities and a greater appreciation of the

costs of these to the community. In addition, infrastructure replacement becomes a significant problem.

With regard to the economic issues involved in water resource allocation, the value of water may be defined in terms of resource cost, social cost or opportunity cost.

Resource cost is the cost of providing the water itself.

Social cost is the true cost to society.

Opportunity cost is the value of water in the best alternative use.

In economic terms, in an efficient system all these costs should be equal at the margin and equal to the price of water. We recognise, of course, that this particular state does not exist in practical terms.

Let's have a look at these three approaches to the value of water.

1. Resource cost involves two different concerns; namely, the economics of water delivery systems, and the economics of expanding water supply.

For a given water delivery system of fixed capacity, marginal delivery cost is relatively low and fairly constant until the capacity constraint is reached. Fixed costs are high, thus average delivery cost decreases until the capacity constraint is reached. However, as the relatively low cost opportunities for supplying water have been exhausted, and the supply can only be expanded by high-cost works, then taking both the cost of water delivery and the cost of storage together, the long-run marginal cost of delivered water increases. It should be recognised though that the nature of the process is 'lumpy' and that the considerable variation over time of water storage and delivery, precipitation, water inflow and demand, results in a very complex management requirement both physically and in financial terms. Ideally, the water agency needs to implement a system of administered prices generally involving increasing block tariffs which, in the long run, will raise sufficient revenue to cover the total cost of water storage and delivery. However, it should be recognised that, taken to its limit, this would effectively remove public subsidisation, and raise important equity considerations across all users.

2. Social cost diverges from resource or opportunity cost to the extent that there are unpriced, adverse or beneficial effects of water supply and use, sometimes termed externalities. Ideally market transactions should take these effects into account, but in the 'real' world this does not occur. This is frequently given as the reason for government intervention, to redress some particular market failure. The best known externality problem in Australia in relation to water is the effects of salinity on the River Murray and the increasing impact of this externality on downstream users. A similar problem exists in the Colorado River Basin in the USA. A range of alternative cost-sharing mechanisms, or economic incentives, have been studied by Gardner⁽²⁾ as a means of encouraging changes in irrigation methods to reduce salt discharges. Irrigation system subsidies, salt discharge taxes, constant and increasing block water taxes, and water conservation subsidies were examined. Irrigation system subsidies involve a sharing of costs between irrigator and government of improved irrigation management saving water and hence reducing salting return flows. A salt discharge tax requires some capacity to measure salt outflows. In this case, all costs would be borne directly by the irrigator. Constant and increasing block water taxes reflect an additional charge on water to cover the externality. Water conservation subsidies are aimed at reducing the amount of water used - in effect, the government rents the water and leaves it in the system with the beneficial effect on dilution of salinity.

3. Opportunity cost - reflecting the value placed on water by the user implies that a market in delivered water be established. This would involve allocating entitlements to water amongst users, and allowing transfers between users either by outright sale or leasing. Thus, water entitlements would be legal property instruments, vested in the individual and negotiable independently of the land. There are a number of issues which need to be resolved, such as accommodating the variability of water availability, time and place of delivery and conditions under which entitlements can be transferred, particularly those involving changes in the time and location of water demand. The initial distribution of water entitlements could be handled in several ways. For instance, entitlements to all water could be auctioned by the water agency, entitlements could be given to existing holders for current water rights and

allotments and excess water auctioned as available, or all entitlements distributed free to existing holders. To support a properly functioning market in water entitlements, the charges levied by the water agency ideally needs to be known in advance and reasonably predictable into the future. Since in a system of marketable entitlements the water would be priced at its opportunity cost to the user, it would tend to be efficiently used. However, it is unlikely that opportunity cost would equate with resource cost at the margin. The extent to which this would occur could be influenced by the pricing policies followed by the water agency.

Various states are moving towards establishing markets in water entitlements. The establishment of a market entitlement system changes the relationship between the water agency and users. The administrative costs would change in form but not necessarily in magnitude. However, the main objection concerns the problem of infrastructure and the impact of changing demand. Given that transferees should be obliged to pay any additional costs, this leaves the remaining issues of reorientating planning procedures of the water agencies, which should not be an insurmountable problem.

Before discussing some of the changes being made in Australia in water transfer and pricing policies, we should note that Randall estimated the efficiency loss by price-induced misallocation of water in the Murray Darling Basin to be \$18 million annually (at 1977 prices).

In South Australia the Water Resources Act 1976-83 vests the right to the use and flow, and to the control of all waters of the State, in the Crown. The Act provides for any watercourse to be declared a Proclaimed Watercourse and for any area of the State to be declared a Proclaimed Region in respect of groundwater resources. When a watercourse or region is proclaimed, no water may be diverted or withdrawn unless authorised by licence.

The River Murray is the only proclaimed natural watercourse which is utilised for irrigation purposes. Until 1979 only where land with a licence was certified as unsuitable for irrigation could water rights be transferred to other land and then only if the parcels of land were under common ownership. In 1979 transfers were allowed

between parcels of land under common ownership, provided the transfer would not significantly increase saline inflows into the River.

In 1983 a transferable water input system was implemented, allowing transfers to include water entitlements for irrigation, industrial and recreation/environment purposes. Recreation/environment water allotments cannot be transferred to other uses. However, other than that particular restriction, transfers may take place between users. As at September 1984, the consideration ranged from 20 cents/kl to 45 cents/kl. There had also been a few auctions of water rights, subject to approval of the Minister.

In August 1984 a transfer policy was established for the North Adelaide Plains Proclaimed Region. The approach is essentially the same as for the River Murray except that the constraint of adverse hydrogeological effects rather than adverse effects on salinity inflow to the River Murray is applied.

This groundwater basin had total withdrawals at about three times the annual natural recharge, and an additional policy is that only 90 per cent of any amount can be transferred, the balance reverting to the Crown. Recent policy changes include an even greater transfer to the Government when a change in land use occurs, say to urban development.

In Victoria in recent years the Public Bodies Review Committee has been very active in inquiry into the administration of the water industry, and a number of reports have been prepared⁽³⁾. A whole range of investigations and reports⁽⁴⁾ have been commissioned by the Salinity Committee of the Victorian Parliament which also have considerable bearing on the overall issue of water pricing and policies.

Finally, some brief comments on the urban and industrial area. As Randall⁽⁵⁾ indicates, pricing and allocation procedures for urban and industrial waters are even more complex and confusing than for irrigation. Schedules of charges vary widely, and many local authorities have made little use of the price mechanism to restrain demand. In many cases, revenue is basically collected through a water rate which is, in effect, a property tax.

The Perth Metropolitan Water Authority recently commissioned a study into domestic

water use⁽⁶⁾. For many years each domestic property was charged a water rate based on the gross rental value of the property (ratable value) and received an annual allowance directly proportional to the rates paid. When annual water exceeded the allowance a charge per kilolitre for excess water was applied. Under this tariff structure many households had large allowances and little incentive to conserve water. Since 1978 a system of pay-for-services/pay-for-use has been instituted, involving a fixed charge for each household, an allowance of 150 kilolitres/annum, and a further charge for each kilolitre of water used in excess of the allowance.

In general, urban water authorities are now implementing various demand management strategies which encompass, to a greater or lesser extent, improved regulations covering the design and use of appliances, water pricing policies, and publicity and education programs.

With regard to agricultural and other non-urban uses, the general policy approach gradually being adopted by the water management agencies in Australia involves a combination of progressively increasing the water charges to more closely approach resource cost, and hence reduce the level of public subsidy, and, at the same time, where possible establishing a market in water entitlements.

Overall, considerable progress has been made in recent years in not only opening up the public issue of water resource management, but in encouraging the introduction of policies which allow greater opportunity for market forces to play a role in influencing the more efficient allocation and use of that scarce resource, water.

End Notes:

- (1) A very good general exposition of the subject is given by Randall, A., 'Property Entitlements and Pricing Policies for a Maturing Water Economy', Journal of Agricultural Economics, Vol. 25, No. 3, December 1981. I have drawn on this paper substantially.
- (2) Gardner, Richard L., 'Economics and Cost Sharing of Salinity Control in the Colorado River Basin', a PhD dissertation, Colorado State University, Fort

Collins, Colorado, USA, 1983.

- (3) Report on Irrigation Management in Victoria by Neilson Associates for the Public Bodies Review Committee, 1981, which examines the efficiency and effectiveness of the State Rivers and Water Supply Commission; and 'Distribution of Costs and Benefits of Victoria's Irrigation Systems', a report by the Centre of Policy Studies, Monash University, 1983.
- (5) Randall, A., op. cit., p. 206.
- (6) 'Domestic Water Use in Perth', Western Australia Metropolitan Water Authority, ISBN07244661