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Water Trading – a means to improve the quantity and quality

Australia's water management still leading the way

Good afternoon ladies and gentlemen. My name is Roger Bate and I'm a fellow at the American Enterprise Institute and a Director of an NGO Africa Fighting Malaria. And as that name implies, I spend most of my time analysing disease in developing countries – much of which is related to water quality, in one way or another. But I did my PhD research on water markets over a decade ago in Southern Africa – and I maintain an interest in how water is used – and more often misused.

I'm going to discuss some of the water markets I've come across in my travels and research, but I'll start by mentioning the drought in Australia (which has broken recently but rainfall levels over the past five years are way down on historic averages). I believe this drought provides a foretaste of things to come for many of us. Either because of possible climate change, and more certainly because of mismanagement of water resources, water shortages are set to increase. Water quantity and water quality are distinct issues, but are often interlinked – shortages of volume usually leading to lowering of quality.

Lets start by simplifying the problem. There is enough water in every country on earth for people and the ecosystems in which they live, but water is being used inefficiently almost everywhere, and at current rates it will run so low as to cause major problems. Improving allocations of water, especially the allocation of water for agricultural use is singularly the most important, but often overlooked, intervention required. About 70% of the world's consumptive water use is in agriculture, so improving use in farming is vital.

Of course there are vast variations in water allocations around the world. Canada has over 137,000 cubic yards of water per person, whereas Tunisia had only 654, Algeria 817 and South Africa 1,831cu.yds. Some countries have vast supplies of water, but it's in the wrong place for the activities humans require or desire. This is the case for many parts of the worlds, such

Western US, much of India and China, and regrettably these areas are also prone to floods.

Sumita Dasgupta, a water expert from the Delhi-based Center for Science and Environment, underscores this point when she notes: “We’re in an extremely fragile situation. Access to clean drinking water is a problem for tens of thousands of people in India.”¹ To this end, these countries and many others, have undertaken, or are about to undertake, huge water storage and diversion projects. China has 50% of the world’s large dams, and other countries are trying to catch up.

In poorer countries, agricultural water use as a percentage of total water use is at least 75 percent; in some countries the figure is closer to 90 percent (Table 1). To make matters worse, countries with high agricultural water needs because of low rainfall tend to be countries where water is extremely scarce.

In richer countries, agriculture uses 45 percent of available water. Water for domestic purposes take up the smallest proportion in all countries. It is therefore, important to improve efficiency of agricultural water use, since it has a greater impact on overall freshwater supply than any other form of intervention.

Table 1: The Prominence and Value of Agriculture in Water Use

	Agricultural water use as percentage of total water use	Agriculture as percentage of GDP
United States	41	>1.6
Japan	62	>1.5
Germany	20	1.2
Italy	45	2.7
Brazil	62	6
Russian Federation	18	5.2
China	68	14.8

¹ “India to Import Water by 2025” *Sify News*, Thursday, Feb, 19,2004. Available at: <http://www.consumeronline.org/guest/focus/linkDetails.asp?ID=%7BD5E4F18A-1847-4999-AA42-862FBD74C028%7D>, accessed 09/12/2005.

Ethiopia	93	41.8
Guinea-Bissau	91	69
Niger	95	40
Sierra Leone	93	52.5
Tanzania	93	43.4
Cambodia	98	35.6
Myanmar	98	59.9
Nepal	96	40.1
Haiti	94	27.1
Guyana	97	30.8
Senegal	90	16.9

Sources: World Bank, 2000; Food and Agricultural Organization of the UN, 2000

Improving use is vital because the global irrigated area is increasing every decade. Of the 274 million irrigated hectares of the world, 207 million are in rich countries and only 67 million in the far more populous poorer nations. While most of the resources for irrigation have been tapped in the richer countries, the potential for growth in poorer nations is still high, especially in Africa. Many countries are already water poor, and improvements in crop selection and irrigation technology, which allow less water to be used efficiently per irrigated hectare, are urgently required, otherwise, water shortages will accelerate even more rapidly than today.

If water was used better in agriculture there would be far more water available for non-commercial uses and for the poor. But water use in farming is often dictated by historic use and bureaucratic control, which often allow for little in the way of flexibilities – but farmers are not wedded to particular crops and change their cropping patterns regularly. However, when they do not really need to use their water quota they nearly always use it anyway – up to the point that there is no yield benefit from doing so, which is usually way beyond the economic benefit of applying the water for irrigation. The reason they use the water is they have no incentive not to. However, if they could sell the water to other users (include instream flow users), they do have an incentive to conserve water.

Indeed in countries where rights have been defined and traded, water for the rural poor has increased in volume and lowered in price; the best example is

probably Chile.² Aside from the obvious economic sense such a policy makes, there is a moral imperative for pushing for this reform — better quality water reduces disease and death – and can improve instream flows.

So whose policies are making sense?

Western United States as well as Chile, South Africa and Australia provide the best examples of how trading can take place. All locations have seen improvements in farm output, benefits for the poor and for the environment. The Western US States have decent systems of rights and rules for trading of them. But environmental concerns about individual trades and concerns about rights being bought up destroying local communities (a hangover of Owens Valley) limits trading so much that few benefits result. I will return to this topic shortly.

So far the greatest environmental gains from significant trading are probably the examples of South Africa and Chile, where dams, to augment water supplies, were not built because of improved efficiency in water use. Although, the market value of water trading in South Africa is relatively small (a few million dollars),³ the indirect costs from efficiency gains were greater. The Mountain View Dam proposed for the Elands River (South Africa) and the Puclaro Dam in the Limari Basin of Chile were not built. This saved tens of millions of dollars and probably lowered ecological stress (I'm certain it did so on the Elands river in South Africa). It is possible other examples where trading has led to a declining demand for dam development exist; as of now those instances are yet to be reported. It is interesting to note however that China with nearly half the world's number of large dams has no water trading.

The Australian Model

Australia's trading system along the Murray Darling Basin (MDB) is the most sophisticated and effective water trading system in the world.

² Hearne, R. R. 1998. Institutional and Organisational Arrangements for Water Markets in Chile. In Easter, K. W., Rosegrant, M. W. and Dinar, A., eds. *Markets for Water: Potential and performance*. Massachusetts, USA: Kluwer Academic Publishers.

³ Bate, R., Tren, R. and Mooney, L. 1999. An Econometric and Institutional Economic Analysis of Water Use in the Crocodile River Catchment, Mpumalanga Province, South Africa. *Water Research Commission Project K5/855*, Pretoria.

A study of trades in South Australia State and the Goulburn-Murray Irrigation District (GMID) in Victoria State,⁴ both of which first experimented with trading in 1987, demonstrates the demand for and benefit from adopting a market-based system. Trades in South Australia have doubled since 1994, both in terms of volume and number, and prices have steadily risen.⁵ Progress is perhaps best exemplified by the ‘Watermove’ website (www.watermove.com.au) now operating in the GMID. This sophisticated system allows users to trade water on the internet. Moreover, it breaks down the right to water into its constituent parts, including access and distribution.⁶ In the early years of this century dairy farmers propagated strong demand for available water.

Regardless of which specific sector buys the water, the clear pattern has been a shift to higher value production and more efficient water use. Trading in both areas promoted a reduction in low-value cropping activity like cereal production, as dairy farmers purchased 69 percent of all water sold in the GMID. Vineyards, horticulture, and non-farming enterprise owners bought the bulk of traded water in South Australia.⁷

The increased economic efficiency from allowing water trading benefits the entire region where the market exists. Indeed, the annual net benefit to trade in Victoria alone is estimated at a present value of over US \$100 million.⁸ Likewise, in New South Wales, a conservative estimate places the figure between US \$60 million and US \$100 million per year in agricultural output.⁹ Importantly, the transfers in these regions represent not only a shift to higher value economic activities, but also a shift to more efficient water use. Water purchasers in South Australia were ten times more likely to use

⁴Bjornlund, H. and McKay, J. 2002. Aspects of Water Markets for Developing Countries: Experiences from Australia, Chile and the US. *Environment and Development Economics* 7: 769-95.

⁵*Ibid.*

⁶ Turnbull, M. 2006. *New Ideas for Australia’s Oldest Challenge: Water Policy for the 21st Century*. The Policymakers speech. St Leonards: Centre for Independent Studies, 22 February 2006.

⁷ Bjornland and McKay (2002)

⁸ Department of Natural Resources and Environment, *The Value of Water: A Guide to Water Trading in Victoria*, December 2001, p. 17.

⁹ ACILTasman Economic Policy Strategy. 2003. “Water Trading in Australia: Current Trends and Prospective Instruments to Improve Water Market Function” Prepared for the Water Reform Working Group, June 2003 (Original Source: Marsden Jacob Associates (1999), *Water Trading Development and Monitoring*, report prepared for the Department of Land and Water Conservation)

drip irrigation than water sellers, and three times more likely to use sophisticated irrigation scheduling techniques, because of the incentives created by trading¹⁰

- - In another study examining all trades conducted in the MDB, Sturgess and Wright (1993) report an increase in farm income resulting from water transfers along the Murray-Darling River basin. The number of water transfers, total area transferred and income gained for each year over the corresponding time frame, demonstrates the efficiency potential of water markets, especially during periods of scarcity (Table 2). Sturgess and Wright concluded that, “If benefits of this scale can be obtained by a system of water transfers circumscribed by regional barriers, the benefits that would flow from redefinition of water property rights to allow the free transfer of water between regions... would be greater still.”¹¹

Table 2: Total Change in Farm Income Resulting from Water Transfers - Murray-Darling River Basin

Year	Number of Transfers	Total Area (Acre-Feet)	Increase in Income (A\$ millions)
1987/88*	687	0.28	17
1988/89	280	0.07	5.6
1990/91	435	0.1	10

* Represents the worst drought years.

Water trading systems are still disparate among states but greater collaboration has helped harmonize systems with conflicting institutions. Additionally, the system has shed some clarity on trading rules¹² and has illuminated two particular features which make Australia's trading system well worth emulating: First, an exchange rate system for interstate trades ensures that prices reflect the inherently higher security of rights in downstream states (like South Australia)¹³ and second, the MDB Authority

¹⁰Bjornlund and McKay (2002)

¹¹ Sturgess, G. L. and M. Wright. *Water Rights In Rural New South Wales: The Evolution of a Property Rights System*. St. Leonards, Australia: The Centre For Independent Studies, 1993: 23-4.

¹² Byron, N. Personal Communication with Roger Bate, November 15th 2004

¹³Since the water rights structure in Australia is for a catchment of serial rivers, the further downstream a user is situated, the greater the number of water sources available to supply him with water. Hence,

created a separate entitlement to accommodate conveyance losses as water travels south, from trades from NSW and Victoria to South Australia to overcome Australia's high evaporation rates.¹⁴ Though still a work in progress, Australia's transformation from a centralized allocation system to a flexible, market-oriented one has already reaped dividends, both economically and environmentally.

Australia is an advanced nation and is better poised to sustain an efficient trading system than less developed countries. However, Australia is also the driest continent and it has already done the hard work needed to establish a successful model; a model that arid countries, and regions of countries, such as South Western US, need to learn from.

Australian Government's Drought Response

Australian Governments have overseen significant improvements in water allocation – driven by the changes in institutional structures they put in place. However, a crisis, such as the recent drought, tests whether apparently beneficial changes can sustain.

Perhaps the most remarkable response from the Howard administration has been its modest restraint from pandering to farmers, a powerful special interest with acute problems. There is a brutal honesty in the debate over water in Australia (and especially so during a drought). In most other places, such as Britain and France, US and Mexico and especially in the Middle East, water debates are couched in terms of food security (why farmers must be subsidized further), the sanctity of water (and hence why water should be free as a human right), the importance of national ownership of water resources. But most of these arguments are largely bogus. The result in many of these places is almost universal state control of water and often farm output, continued wastage of water with pandering to special interests and no vision of the long term problems for retaining the status quo. But in Australia, with a few rhetorical exceptions, the debate is about how to allow markets to work, to help increasingly destitute farmers in non-price distorting ways, and to provide water to its most valued uses.

water rights in South Australia (the Southernmost state) are more 'secure', meaning they have a higher probability of being met in a given year than water rights further upstream in NSW and Victoria (Byron, personal communication 2004).

¹⁴Most trades are sufficiently small that adjustments for conveyance losses are not required (Byron personal communication, 2004).

As an outsider it is encouraging to see the way that Australia is tackling the drought and long-term water shortages. Others must learn from the overwhelmingly sensible Australian policies or face the dire consequences themselves in the years to come.

The American West – increasing trades.

I mentioned before I'd discuss the American West more. The law has provided opportunities for markets to develop here as well, especially to restore stream flows for fish, wildlife and other ecosystem purposes. According to Brandon Scarborough of PERC, between 1998 and 2005 approximately \$300m was spent in over 1,000 voluntary water transactions throughout ten western states. The amount of water involved is over 6m acre feet (that is New Hampshire under a foot of water). 90% of the volume of transactions is undertaken by Bureau of Reclamation and various state agencies. But in terms of the number of transactions private actors have the upper hand – with groups like Oregon Water trust and Trout Unlimited buying up rights to water.

In Montana, Oregon and Washington markets have flourished because individuals have taken advantage of sensible laws to allow trading. In NM, AZ, NV, UT and Wyoming political, legal and social barriers prevent trade. Wyoming remains the only western state to prohibit state or private entities from buying or leasing water for instream uses. This should change.

Where change needs to occur today across the US is for farmers and other entities, such as mines, municipalities and corporations to be able to trade, which is either prevented by law or social norms. Water is becoming scarcer across most of the Ogallala Aquifer and selling water rights is one way to allow inefficient farmers to leave the profession with dignity.

If, and I say if, Climate Change proves to be a major problem, one likely outcome will be to reduce snowmelt in spring and early summer in places like Montana. We need a system where if climate changes our resource use can change quickly too – and even if the climate doesn't change – increasing immigration, productivity growth and economic advances will put greater squeeze on existing resources.

And this is where I think the lessons of Australia are most germane – allowing for more sophisticated movements of water from low to high

valued uses is essential. Water trading is only one part of improved water use, but with trading come better price signals, which drive farmers and other users to adopt newer more water efficient technologies where it makes financial sense to do so.