New water for Western Australian rural towns

Jo Pluske

School of Agriculture and Resource Economics, The University of WA

Abstract

The Rural Towns –Liquid Assets (RT-LA) project commenced in 2004 with the aim of developing integrated water management plans for a number of Western Australian towns at risk from salinity. One of the major outcomes of this program is to produce a new source of long-term water for these towns. In addition, the costs and benefits derived from implementing the program must be inclusive of the whole system, from the planning stage to the time when the water is used. However, water allocation and pricing need to be established so as to determine these costs and benefits. The efficient price depends on factors such as property rights, the community, heritage, culture and the environment. This paper investigates issues associated with pricing water and suggests the costs and benefits that need to be considered when deciding on efficient water management plans for rural towns involved in the RT-LA project. An important finding from this work is that the marginal opportunity cost can be used to establish price but for it to be effective, all of the parameters that make up this cost should also be considered. Policy makers can then attempt to set prices and other conditions to these new water sources. Attracting an industry to use this water and identifying the benefits and costs associated with this industry is the final part of assessing the net benefits of the complete water management plan for a rural town.

Introduction

Saline ground water is a problem in many rural towns in Australia with 38 Western Australian towns incurring costs resulting from damage caused by salinity (Pridham et al. 2004). As the water table rises, due to changes in the vegetation or human usage of water altering the water balance, ecosystems become threatened and damage to buildings, roads and other infrastructure may occur. Williams et al. (2002) reiterate the severity of salinity, stressing that it will damage drinking water supplies with serious economic, social and environmental consequences for rural and urban communities. Moreover, Sexton (2003) states that many rural Australian towns endure a decline in population growth, poor industry expansion, lack of employment opportunities and a lack of community development because they do not have a suitable water supply.

The Western Australian Department of Agricultural began addressing these issues in 1997 (DAWA, 2005) and commissioned a study in 2000/01 to investigate the benefits of salinity control programs in six rural towns. The authors concluded that the cost of extracting ground water for these towns was not cost effective except when the extracted water could be used as a resource (RTMC, 2001). In concluding, RTMC (2001) stressed the importance of an integrated management program and the need for more research into the use of saline ground water for commercial purposes.

Pannell (2002) suggested that desalination of saline water may be an option for rural towns especially if water can be desalinated locally and used instead of high cost imported water, or local fresh water sources that are equally expensive. He further emphasized the need for development, testing and economic analyses of improved systems for making productive use of salinised resources that would otherwise be incurring costs to the community. As an example of this process, (for the eastern Australian towns of Wagga Wagga and Dubbo) Intelink (2002) found that the costs of pumping groundwater, desalinating it by reverse osmosis and removing specific salts were less than the aggregate benefits derived from reducing damage to infrastructure in and around the town, and from selling the water.

In response to positive findings regarding the use of saline water as a resource, the Rural Towns –Liquid Assets (RT-LA) project commenced in 2004 with the aim of developing integrated water management plans for a number of Western Australian towns at risk from salinity. Integral to this program is the use of both ground and surface water. The Department of Agriculture, CSIRO, 16 local Shires, and the National Action Plan for Salinity and Water Quality, as well as the Cooperative Research Centre for Landscape Environments and Mineral Exploration, the WA Chemistry Centre and the University of Western Australia have all been involved in this multidisciplinary project.

In support of the recommendation put forward by RTMC (2001) it is important to develop a rational basis for sharing the costs [and benefits] of improved water management between public and private sectors. However, such a seemingly simple directive opens up a myriad of questions. Questions exploring the issues associated with water property rights, water pricing, the community, heritage, culture and the environment. How each step of the water management process is conducted is significant for the long-run viability of the whole system.

The purpose of this paper is to explain issues associated with pricing, costs and benefits (inclusive of the whole system from the planning stage to the time when the water is used) associated with delivering new sources of long-term water for rural towns. In the following section, property rights associated with this new water is discussed along with issues associated with setting prices for this water. A complete set of suggested costs and benefits relevant for determining the viability of a water management plan follows. Brief recommendations for how decision makers might interpret a water management plan are then presented before the conclusion to this paper.

Who owns the water and other issues

In the following discussion it will be assumed that surface and ground water can be harvested from a rural town precinct to provide ‘new’ water. The ground water is saline and will require treatment to eliminate salts and just as for surface water, it may require further treatment depending on what it is to be used for.

Property rights

In Australia, the State owns the water on behalf of the community but individuals have property rights to access and use the water under varying circumstances (ATF, 2004). The framework for water allocation and management in Western Australia is provided in the Water and Irrigation (RIWI) Act 1914 (amended in 2001). The two main licences, ‘take groundwater’ and ‘take surface water’, are held by service providers (e.g. the Water Corporation) and private users (eg mining companies,) in proclaimed areas (ATF, 2004). Although water is non-tradeable in this case, it can usually be taken from unproclaimed areas without a licence and water storage facilities can be built on private land provided they are not on a water course.

Therefore, for the purpose of this discussion it will be assumed that private individuals will not harvest this new water but rather local government on behalf of the community will manage the water and either, local government or an alternative, contracted, service provider will harvest, treat and distribute the water.

The question then is what is the most efficient process for local government to manage their water? Water management is costly and water supply can be irregular with ill-defined property rights that result in a lack of market institutions capable of generating prices and allocating water (Ward and Michelsen, 2002). Therefore should the already established Water Corporation be involved as a service provider? If it is decided that the Water Corporation should be involved then it would be assumed that it would treat and distribute the water at a price that is similar to the water it currently provides. In which case, ERA (2006) suggests prices for water provided as part of the Integrated Supply Scheme. However, should this not be the case, how should price be decided?

How to set the price of treated water?

In calculating the net benefits of a water management system in Wagga/Dubbo, Intelink (2002) suggested that water would have to be sold at a competitive price ($100 to $200 per megalitre for irrigation water and $200 to $500 per megalitre for freshwater). However, they also recommended that a more detailed financial and economic analysis should be completed once a definitive plan had been put in place. These analyses would be contingent upon pricing policies for this new water and to date these policies appear to be adhoc. For example, extracted ground water from under the Merredin town site has been sold for use in local road construction but this price was set before any economic analysis could be completed as part of the RT-LA project.

If it is decided that price is to be decided outside the market system then establishment of prices (that may include subsidies) need to ensure that water use will be efficient. Varela-Ortega et al. (1998) describe different pricing policies for water and found that the influence that these policies can have on efficient water use depend on price elasticity of demand for water that in turn is determined by factors such as industry and region. Becker (1995) explains that in Israel poor decisions associated with water allocation, and more specifically with price set at more than half the real cost of supply, meant that farmers were not efficient in their water use and shortages arose. Dinar and Subramanian (1998) emphasise that suppliers of water must also be efficient and prices may be set to recover operation and maintenance costs and at least a portion of capital costs, as well as reflect water quality and reliability of supply.

An efficient price, that maximises the social value of water, is set at a level greater than or equal to the marginal cost of producing the water (Becker 1995). The marginal cost can de defined more specifically as the marginal opportunity cost so that not only the marginal production (or private) cost is included but also the marginal user (or depletion) cost and the marginal environmental (or external) cost (Warford, 1997). Water would be consumed only by users for whom the value of water is greater than or equal to the price, or marginal opportunity cost.

In the case of the RT-LA project, ground water pumping, so producing positive externalities in terms of reduced damage, followed by desalination, may be a viable water production option for a town (as may be the case for Merredin and Wagin). That is, benefits can be derived from producing water and therefore the price could be referred to as the marginal cost of producing water after the marginal benefits have been accounted for. The marginal production costs include all of the financial costs incurred to produce the water. In simple terms, the marginal user cost accounts for the cost that arises out of using the water now and so not having it for later use but as a consequence of this water use, flow-on benefits to the community may also accrue. The marginal environmental cost essentially accounts for externalities that arise as a consequence of a water management plan being in place, for example disposal of waste products into the environment. However, there may also be benefits to offset these costs, for example a reduction in infrastructure damage in a rural town. As Warford (1997) alludes to, valuing some of these economic costs and benefits can be difficult but nevertheless an attempt should be made to do so.

In short, if new industries, such as aquaculture at Merredin or a beef feedlot at Moora, are to be encouraged then knowledge regarding price and reliability of water supply is important. If the price of water is set at the marginal opportunity cost of production (adjusted for associated benefits accrued) then decision makers in local government have to decide how important that industry is to the whole water management plan in deciding whether to set the price at this level or at a higher level. If the price is set at a higher level then the new industry will contribute to providing a proportion of the ‘funding’ of public benefits that may be accrued as a result of the water management plan. However, if as a consequence of the water price the new industry is not an economically viable proposition (see Pluske and Schlink 2006) then the water management plan, inclusive of that industry, will also not be a viable option.

What are the costs of water management in a rural town?

In constructing a water management plan for a rural town in Western Australia, the RT-LA project requires a detailed scientific investigation of the expected long-term availability of water together with engineering analyses that examine water harvesting, treatment and associated costs. Other costs to consider include those associated with regulatory conformance and liability insurance.

There may also be irregularity in demand for water (e.g., failing of industries relying on the water) and supply of water (including ground and surface water contamination), and therefore to account for these potential costs, contingencies need to be included in the analyses. Chakravorty and Zilberman (2000) and Parker (2000) highlight the need to consider the use of chemicals and the subsequent effects that they may have on water being supplied. Policies addressing water use and any ensuing effects on the environment, ground and surface water will need to be carefully addressed when using this new water.

Contingencies for changes in operating costs also need to be considered, especially for electricity costs. Currently in Western Australia the high cost of electricity (significantly higher than in other Australian States) and the need for improved reliability are the main drivers of electricity reform in the State (Gallop, 2005). Dale (2004) found that the price of electricity required to produce and transport water certainly influenced the cost of water supply in Southern California. Given the present uncertainties regarding electricity costs and supply in Western Australia it would be pertinent to account for potential fluctuations in electricity prices.

Negative environmental impacts within the townsite or further downstream may also arise from harvesting the water and if so, should be included as a cost. So too should any negative impacts on heritage and culture that may result as a consequence of implementing a water management plan.

What are the benefits of a new water management plan?

Should a proposed water management plan be implemented, it is expected that benefits will also accrue. As water is treated as a resource, additional water may be available for parks, gardens and sportsgrounds, hence beautifying the town and making it a better place to live for current and future residents of the town and the surrounding rural area. Furthermore, additional water for new industries may be available so potentially increasing employment for current and future residents of the town and surrounding rural area and creating flow-on benefits for the town and region. In estimating demand for water though, contingencies may need to be considered to account for possible climate change. Due to greenhouse gases, temperature may increase by 2°C and rainfall fall by 20% in southern Western Australia over the next 30 years (Ash, 2001).

An adapted version of the USEAP model (developed by RTMC, 2001) is used in the RT-LA project to estimate the direct benefits derived from a reduction in damage to infrastructure arising from a particular plan (refer to Section 2.2). There may also be indirect benefits from reducing damage such as benefits associated with wellbeing and especially those associated with health. Somerville et al. (2000) and Mercer (2003) both found that cold damp houses were likely to contribute to ill-health in adults and children and that people living in warm dry houses had better health and hence missed less work and school days. Australia has one of the highest rates of asthma and allergies in the world but could be improved by especially reducing moisture levels in buildings to acceptable levels Woolcock (1999).

Better water management may also result in benefits arising from preservation of biodiversity that would otherwise be affected by a high water table. An effective water management plan may also deliver benefits in terms of encouraging rural community preservation as well as reducing reliance on the State water scheme thereby enabling more water to flow to areas of short supply.

Directions for new water in rural towns

When water is scarce, water allocation policy should not only consider the public interest (including endangered species) but also allocate water for agricultural, residential, industrial, recreational, and other uses that will make the most productive use of the water (Ward and Michelsen, 2002). As explained by Pannell (2004) efficient and effective policies have been difficult to develop for dryland salinity. However, he is also confident that with new knowledge, better communication and more debate within the community, better policy will be implemented.

Hence it is important that the objectives for the RT-LA project are widely known to all partners involved in the project as well as those external to the project. There should also be enough research done into the issues described above so that decisions are not based on misinformation or lack of information. As many of the costs and benefits as possible should be identified (for example as in Figure 1) and made clear to decision makers so that they understand how the results of the economic analyses have been derived.

Identifying direct benefits and costs associated with a water management plan is relatively straight forward. Policies affecting some parameters, such as electricity costs, will need to be considered when estimating long term net benefits of a plan. Estimating the indirect costs and benefits will no doubt require further research or the creation of sound assumptions based on other research and local and State government policies.

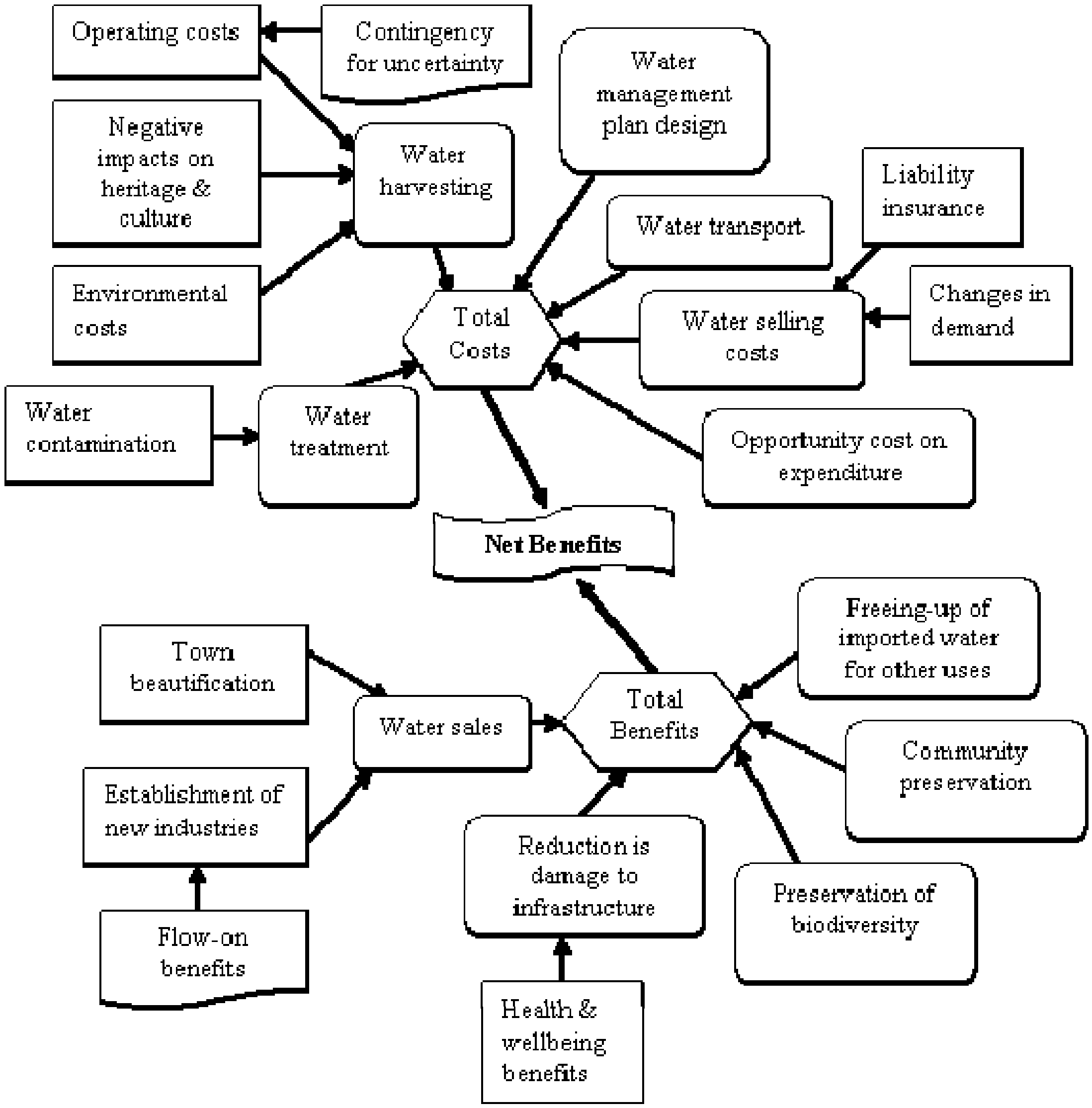

Figure 1: The costs and benefits that need be considered before the implementation of a RT-LA water management plan in a Western Australia rural town.

However, policies associated with water allocation and pricing need to be addressed with greatest urgency. In the water management plans delivered so far in the RT-LA project, the results have been expressed as the marginal opportunity cost of water. Explaining why the results are stated in this way and what they mean is important to communicate to decision makers so that they can establish a water price and hence decisions can be made on the best options for using this water. Only then is it possible to calculate the net benefits of the water management plan.

Conclusion

Developing a water management plan for a rural town within the guidelines of the RT-LA project requires that water is harvested and used as a resource. The costs and benefits derived from implementing a plan must be inclusive of the whole system, from the planing stage to the time when the water is used. Foremost, there must be decisions made regarding water allocation and pricing. Additional policies concerning related benefits and costs may also need to be addressed so that they can be estimated with some confidence. If investments by those wishing to develop and use the new water are to be made then investors must have confidence in returning net benefits from their investments. Making sure that these investors have the information and knowledge to ascertain net benefits in the string of investments that make up a water management plan is an integral component of the RT-LA project so that the economic analysis of the whole system is complete.

Acknowledgements

The author wishes to acknowledge financial assistance from CSIRO and the University of Western Australia. Comments on this paper provided by Professor Alfons Weersink and Associate Professor Michael Burton are greatly appreciated.

References

Ash, A., 2001. Climate change impacts for Australia. CSIRO Brochure. Retrieved 16th September 2005: http://www.marine.csiro.au/iawg/impacts2001.pdf

ATF, 2004. An effective system of defining water property titles. ACIL Tasman in association with Freehills, Research Report, Land and Water Australia, Canberra. Retrieved 16th November 2005:
http://www.lwa.gov.au/downloads/publications_pdf/PR040675.pdf

Becker, N., 1995. Value of moving from central planning to a market system: lessons from the Israeli water sector, Agric. Econ. 12, 11-21.

Chakravorty, U. and Zilberman, D., 2000. Introduction to the special issue on: Management of water resources for agriculture, Agric. Econ. 24, 3-7.

Dale, L., 2004. Electricity price and Southern California's water supply options, Resources, Conservation and Recycling, 42, 337-350.

DAWA, 2005. Towns involved in the rural towns program. Department of Agriculture, Western Australia, Retrieved 16th November 2005:
http://www.agric.wa.gov.au/servlet/page?_pageid=449&_dad=portal30&_schema=PORTAL30

Dinar, A. and Subramanian, A., 1998. Policy implications from water pricing experiences in various countries, Water Policy 1, 239-250.

ERA (2006). Final report: Inquiry on country water and wastewater pricing in Western Australia. Economic Regulation Authority, Western Australia. 23 June 2006.

Gallop, G., 2005. A blueprint for business. The Premier of Western Australia's address to the WA Business News Breakfast, Hyatt Hotel, Perth. Retrieved 28th November 2005: http://www.premier.wa.gov.au/docs/speeches/220605_WABusinessNewsBreakfast_WEB.pdf

Intelink, 2002. Urban Salinity Salt Extraction and Re-Use Project: Final Report, Intelink Pty Limited and Dubbo City Council, Dubbo.

Mercer, J.B., 2003. Cold—an underrated risk factor for health, Environmental Research, 92, 8-13.

Pannell, D.J., 2002. National Economic and Policy Issues in the Productive Use of Salinised Resources, SEA Working Paper 02/05, School of Agricultural and Resource Economics, University of Western Australia, Crawley, Australia. Retrieved 16th November 2005: http://www.general.uwa.edu.au/u/dpannell/dpap0205.htm

Pannell, D.J., 2004. Politics and dryland salinity: history, tensions and prospects, Working paper, School of Agricultural and Resource Economics, University of Western Australia. Retrieved 16th November 2005: http://www.general.uwa.edu.au/u/dpannell/dp0401.htm

Parker, D., 2000. Controlling agricultural nonpoint water pollution: costs of implementing the Maryland Water Quality Improvement Act of 1998, Agric. Econ. 24, 23-31.

Pluske, J.M. and Schlink, A.C. (2006). Managing water as a scarce resource in beef feedlots. A Water for a Healthy Country Flagship discussion paper, CSIRO, Perth, Australia.

Pridham, M., Barron, O., and Pluske, J.M., 2004. Rural Towns-Liquid Assets: Turning a threat into a resource. In Engineering Salinity Solutions. 1st National Salinity Engineering Conference, Barton, Institution of Engineers, 1, 302-307.

RTMC., 2001. Economic impacts of salinity on townsite infrastructure. Rural Towns Management Committee, Bulletin No. 4525, Department of Agriculture, Western Australia.

Sexton, M., 2003. Silent Flood, Australia's Salinity Crisis. ABC Books, Sydney, 202 pp.

Somerville, M., Mackenzie, I. Owen, P and Miles, D., 2000. Housing and health: does installing heating in their homes improve the health of children with asthma? Public Health, 114, 434-439.

Varela-Ortega, C., Sumpsi, J.M., Garrido, A., Blanco, M. and Iglesias E., 1998. Water pricing policies, public decision making and farmers' response: implications for water policy, Agric. Econ. 19, 193-202.

Ward, F.A. and Michelsen, A., 2002. The economic value of water in agriculture: concepts and policy applications, Water Policy 4, 423-446.

Warford, J.J., 1997. Marginal opportunity cost pricing for municipal water supply, Special paper, International Development Research Centre, Ottawa, Canada. Retrieved 28th November 2005: http://www.idrc.ca/uploads/user-S/10536146490ACF298.pdf

Williams, J., Walker, G.R. and Hatton, T.J., 2002. Dryland salination: a challenge for land and water management in the Australian landscape. In: Haygarth P.M. and Jarvis S.C. (Eds) Agricultural Hydrology and Water Quality, Oxford University Press, Great Britain, pp. 457-475.

Woolcock, C., 1999. To study ecological and healthy buildings, in particular the effect of the built environment design on indoor air quality – USA, Norway, Sweden, Denmark and Germany. Final Report, The A.V. Jennings Churchill Fellowship, 25pp. Retrieved 28th November 2005:
http://www.churchilltrust.com.au/Fellows%20Reports/Woolcock%20Catherine%201999.pdf

---

[1] The author is from the School of Agricultural and Resource Economics, The University of Western Australia, Crawley, Western Australia.