

Economists at Large

Economists – Rod Campbell and Francis Grey, www.ecolarge.com

Ph 03 9562 4472, Rod Campbell mob 0438 503 249, email rod@ecolarge.com

Submission to the Standing Committee on Finance & Public Administration,

Inquiry into the Business Case for Water Infrastructure

Introduction

Economists at Large are concerned that Victoria's recent decisions on water infrastructure have been made without proper enquiry into the economics of water supply options. The Victorian Government has not presented any cost-benefit analysis, or levelised cost assessment of its water supply priorities, set out in *Our Water Our Future—The Next Stage of the Government's Water Plan* (Victorian Government 2007). We agree with the Auditor General of Victoria's findings that the government should "explain to the community the level of rigour underpinning project costs and benefits when publishing information on committed projects" (Victorian Auditor-General 2008 p3). We are particularly concerned that the Wonthaggi Desalination Plant may not be an economically justified option for Victoria, again agreeing with the Auditor-General, that the plant "requires...further value for money analysis"(ibid p22).

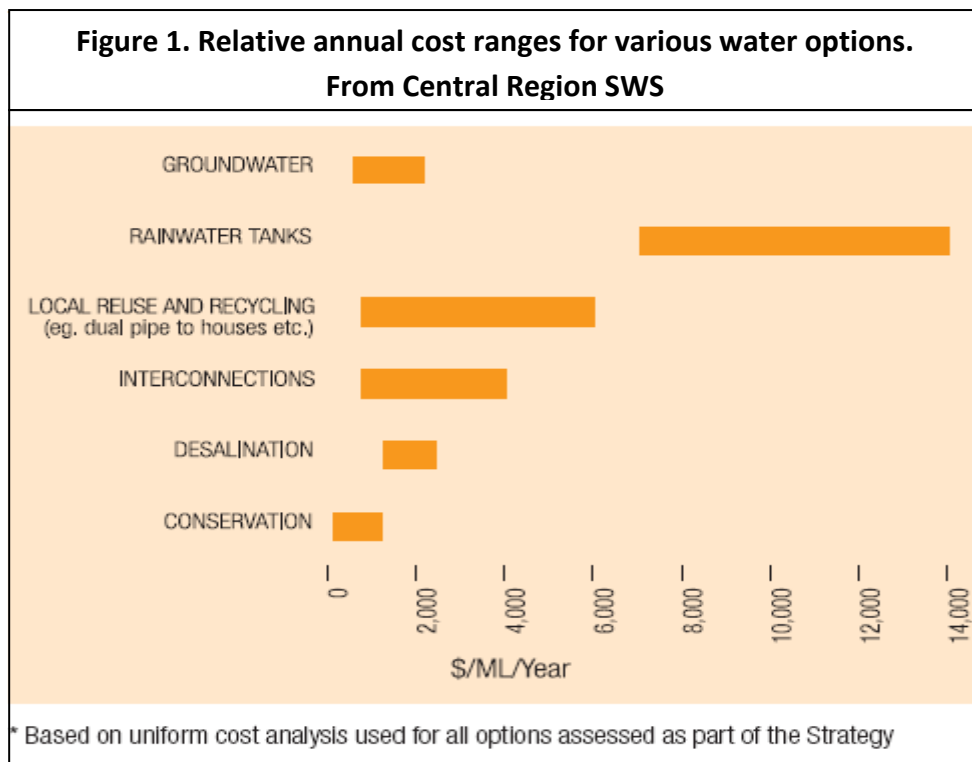
In our submission we present

- A brief summary of recent water policy and its lack of economic assessment.
- A suggestion for what analysis should be made publically available – levelised costs of each water supply option – and an explanation of levelised cost methodology.
- Estimates of levelised costs from other studies and our own calculations.
- Our conclusion based on these figures that desalination is not the most efficient option for Victoria.

Summary of water policy in Victoria:

In 2004 the government published *Securing Our Water Future Together* (SOWFT, aka *Our Water Our Future*, “the white paper”), setting out a framework for water policy in Victoria, largely based on conservation and water re-use (Victorian Government 2004). In SOWFT the link between water and the economy is frequently mentioned and a chapter is devoted to water pricing, however there is no economic analysis of supply or demand management options.

From SOWFT, the Central Region Sustainable Water Strategy was developed (Victorian Government 2005), involving a public submissions process and a panel assessing submissions. The Central Regions Strategy presents one graph addressing costs of water options, on page 36:



The source for this graph is not noted, but seems to be appendix two of the supporting documents to the strategy, although the figures do not quite match. No working is shown, although it is clear that the values are “annualised” costs rather than levelised costs. Annualised costs are not an ideal value to use here as “annualised cost does not account for unutilised capacity in large scale schemes, systematically under representing actual costs. By using levelised cost this inherent bias is removed” (Fane et al. 2003 p185).

While less than ideal, the CRSWS did provide a starting point from which real analysis could have been launched, leading to transparent, sound policy. No such analysis was presented in *Our Water Our Future* – the next stage of the government’s water plan, made public in 2007 (Department of Sustainability and

Environment 2007). Despite this lack of further analysis and the CRSWS's investigation providing only dubious economic endorsement of desalination, desalination was made the "keystone of Victoria's water plan" in Our Water Our Future (Department of Sustainability and Environment 2008).

No further economic comparison of desalination with other water options has been made public. The CRSWS called for the government to "complete a feasibility study for desalination options for Melbourne and proceed to business case if appropriate (Victorian Government 2005 p66)". The feasibility study was completed by consultants GHD in June 2007. This study does not contain levelised cost comparison, or any cost benefit analysis of desalination. It does not compare desalination to other water policy options or examine where desalination might fit into wider water policy. The study only compares costs and impacts of large scale seawater desalination in different locations in Victoria and assesses these options' feasibility from an engineering perspective. It found Wonthaggi to be the preferred location. (GHD 2007)

While the feasibility study was completed, no business case seems to have been compiled. Economists at Large have communicated with Melbourne Water, GHD, DSE and the desalination project office in Wonthaggi to try and find such a document. We are still waiting for any details.

The Environmental Effects Statement included an Economic Impact Study in technical appendix 11. This study investigates the impact of building the plant on the Wonthaggi local economy. As part of the EES, the study was "not required to examine: - strategic options for augmenting water supplies to Melbourne" (Victorian Government 2008). This Study essentially investigates the impact of spending \$3.1 billion dollars in Wonthaggi, and unsurprisingly concludes that there would be local economic growth and job creation. A similar economic impact assessment was conducted by the Centre of Policy Studies, Monash University (2007).

None of the reports and studies mentioned above can be considered adequate analysis of the government's water policies. The Auditor-General of Victoria reached a similar conclusion, saying:

It is incumbent on the Government to provide full, accurate and timely information on its financial commitments and projects put before the community. The Victorian water plan did not provide this information. There were widely varying levels of rigour around the plan's costs and expected water savings benefits. The documentation did not explain this. This is essential information, especially when an emergency situation requires streamlined processes.

The Department should address these issues by clearly setting out the processes it is pursuing to verify project estimates and by publishing more rigorous information as it becomes available. Where necessity forces the Department to skip project steps or to publish figures and estimates of varying reliability, the Department should inform the community (Victorian Auditor-General 2008, page 2).

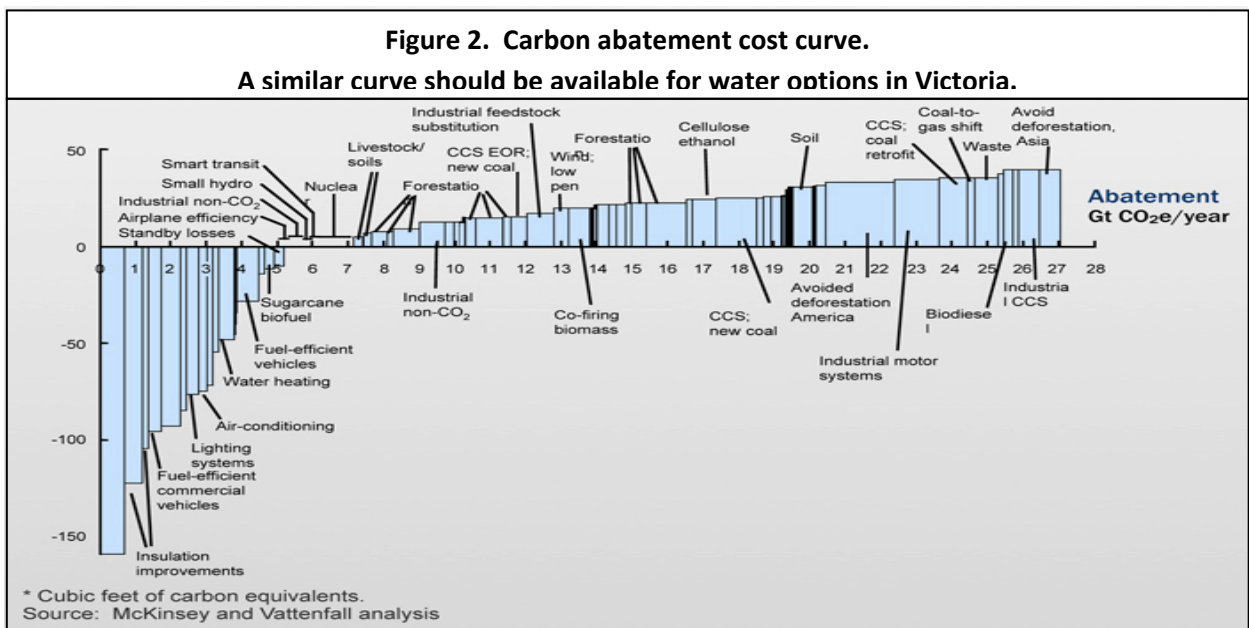
What analysis should be available?

While there is no shortage of statistics relating to water demand and supply in Victoria, there are few that allow meaningful comparison between policy options. When investigating the economics of utilities, economists tend to use levelised costs to allow comparison between different provision options. Levelised cost takes the present value of the cost of an option to the community and divides by the present value of the projected annual demand supplied or saved by the option. Costs should include environmental and social costs. Expressed algebraically,

$$LC = \frac{PV(costs)}{PV(water\ demand\ conserved\ or\ supplied)} = \frac{\sum C_t / (1+r)^t}{\sum W_t / (1+r)^t}$$

Where C_t is the cost (capital and operating) of the option in the year t , W_t is the water demand conserved or supplied or in year t and r is the discount rate (Fane et al. 2003). Considerable discussion of how each value is derived should also be supplied, preferably giving a range of values for each water option. The ranges of each option's levelised costs under different assumptions would then allow comparison between them.

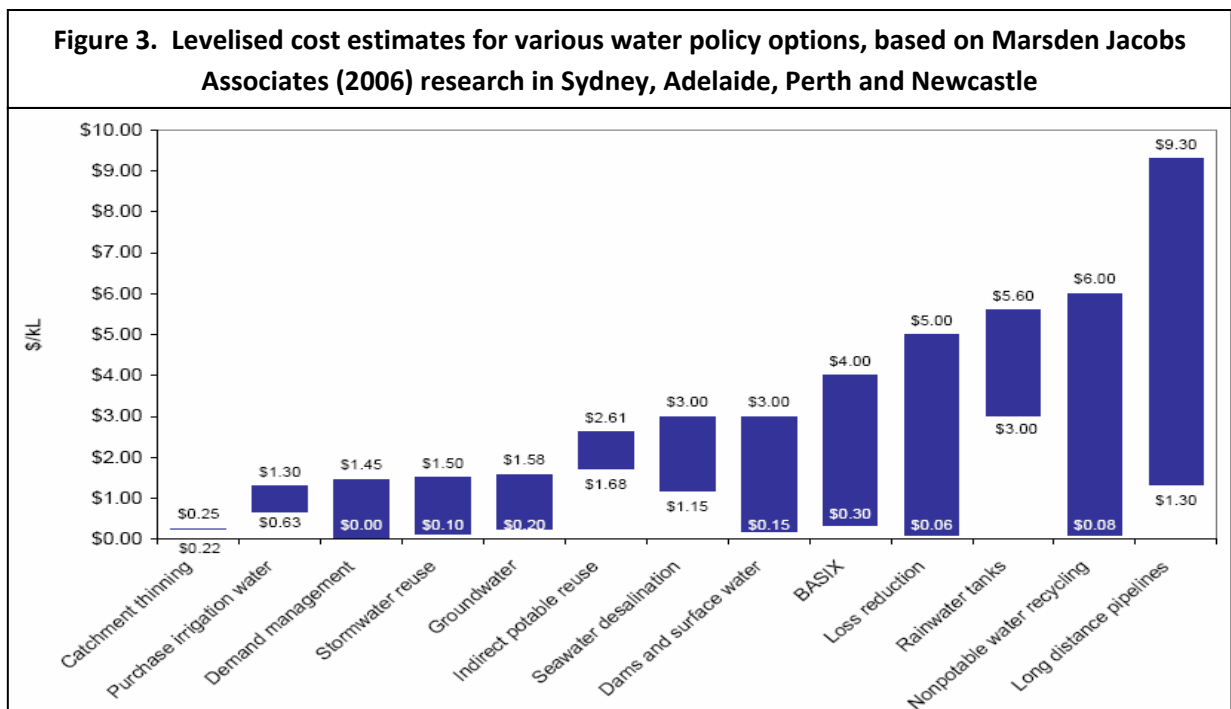
A good example of how such analysis can be used to pick efficient policies is displayed below. This graph, prepared by the McKinsey Global Institute, examines different options for reducing carbon emissions on a global scale. The curve created is in effect a cost curve for reducing carbon emissions, showing where different options are placed on the curve.



A similar curve should be prepared for water options in Victoria, using levelised cost analysis.

Estimates of levelised costs of water.

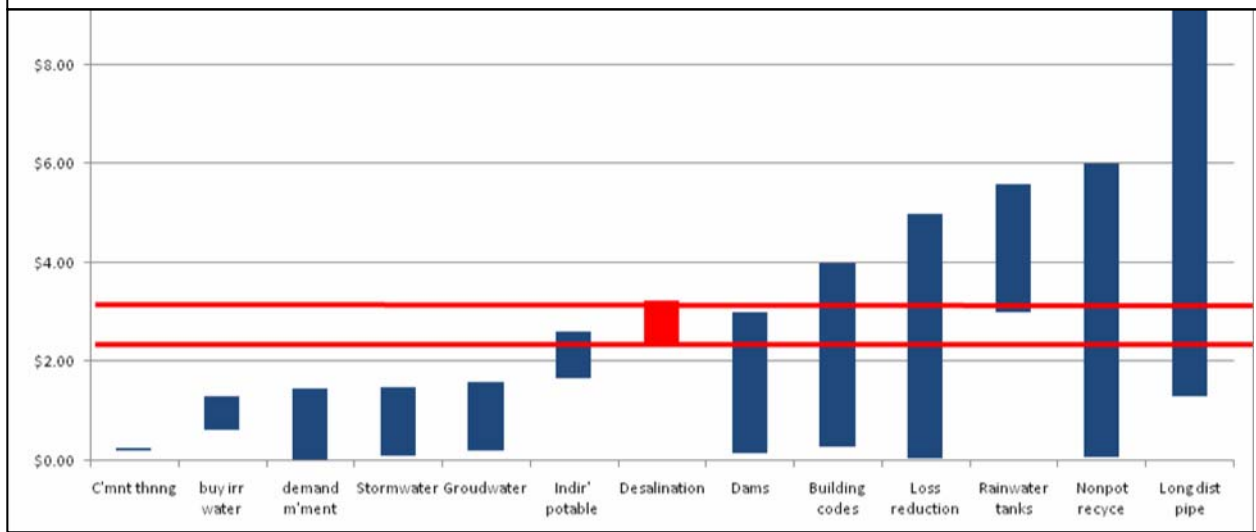
While no such curve of levelised costs has been prepared in Victoria, a basic comparison of levelised cost of water options has been prepared in other locations in Australia. A study by Marsden Jacobs Associates (2006) presents results from Sydney, Adelaide, Perth and Newcastle. Marsden and Jacobs also noted that no similar costings were available for Melbourne (p24).



This graph shows a range of levelised costs per kilolitre for each water option. We see that demand management, loss reduction, non-potable recycling and stormwater reuse present options with levelised costs of 10cents per kilolitre or less. The cheapest options should be exhausted before policy makers begin to explore more expensive options. Note that as desalination has a minimum value of \$1.15/KL, suggesting it should be among the last options explored in Sydney, Adelaide, Perth and Newcastle.

To allow comparison with other water options in the above analysis, Economists at Large have calculated a range of levelised cost values for the Wonthaggi Desalination plant, under various scenarios. We have found that the Wonthaggi plant would deliver water at least in the upper range of desalination costs listed above, and possibly considerably higher. In the graph below, the desalination values found by Marsden Jacobs in Sydney, Adelaide, Perth and Newcastle have been replaced by Economists at Large calculations for Wonthaggi.

Figure 4. Levelised cost of water from Wonthaggi Desal Plant compared with other water options



The values for desalination in the graph above were based on a range of scenarios:

Scenario 1 takes its values from the desalination plant feasibility study by (GHD 2007). This should be considered an absolute best case scenario, as it includes the original capital cost estimate of \$2.9bn and operating costs at \$130mn/year without any consideration of environmental values and no flexibility for changes in energy costs. The time frame of 30 years and discount rate of 5.5% were used as they were used in cited water studies by Marsden Jacobs and are in line with conventional calculations for water infrastructure. The resulting levelised cost of \$2.31/KL places even this best-case scenario in the higher end of desalination costings above.

Scenario 2 is the same as scenario 1, but uses the now widely cited capital cost of \$3.1billion. All other variables are the same, levelised cost increases to \$2.37/KL.

Scenario 3 takes the same values as scenario 2, but increases operating costs to \$150million/year to reflect uncertainty in operating costs such as energy and incorporate environmental and social costs that have not been incorporated in the feasibility study estimates.

Scenario 4 takes the same values as scenario 3, but with zero capacity from the plant every ten years. A frequent criticism of cost estimates, particularly annualised cost estimates, for large-scale infrastructure is that they do not reflect the possibility that the plant may not need to run at full capacity all the time. If Victoria experiences a good rainfall year every ten years, the extra capacity provided by the plant may not be required.

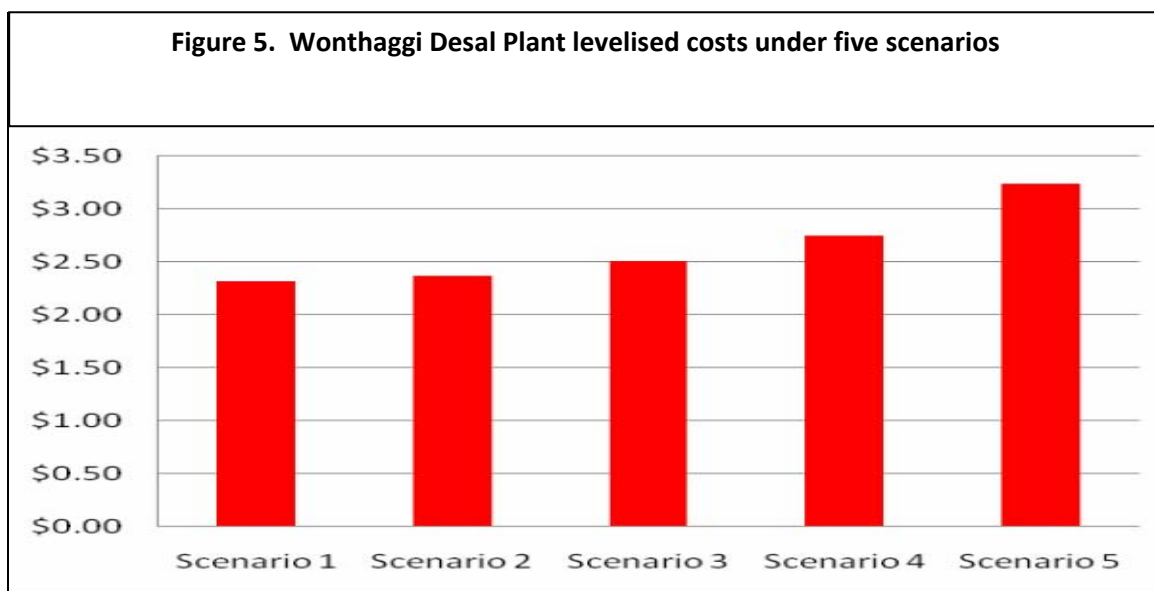
Scenario 5 takes the same values as scenario 4, but applies an 8% discount rate. It is necessary to discount values in the future to express them in today's terms - most people would rather be given a dollar today than in a years

time, so the future dollar is worth less than a dollar today. A discount rate is the rate at which future benefits or costs are discounted to calculate their value today.

Discount rates make a large difference to the net present value of any project. Different discount rates are used for different scenarios. A full discussion of discount rates and their calculation is beyond the scope of our submission, though we would be happy to expand on this topic at a hearing of the enquiry. In cost-benefit analysis, it is customary to provide values across a range of discount rates. A discount rate of 8% for a public private partnership, as is proposed for the desalination plant would not be considered particularly high.

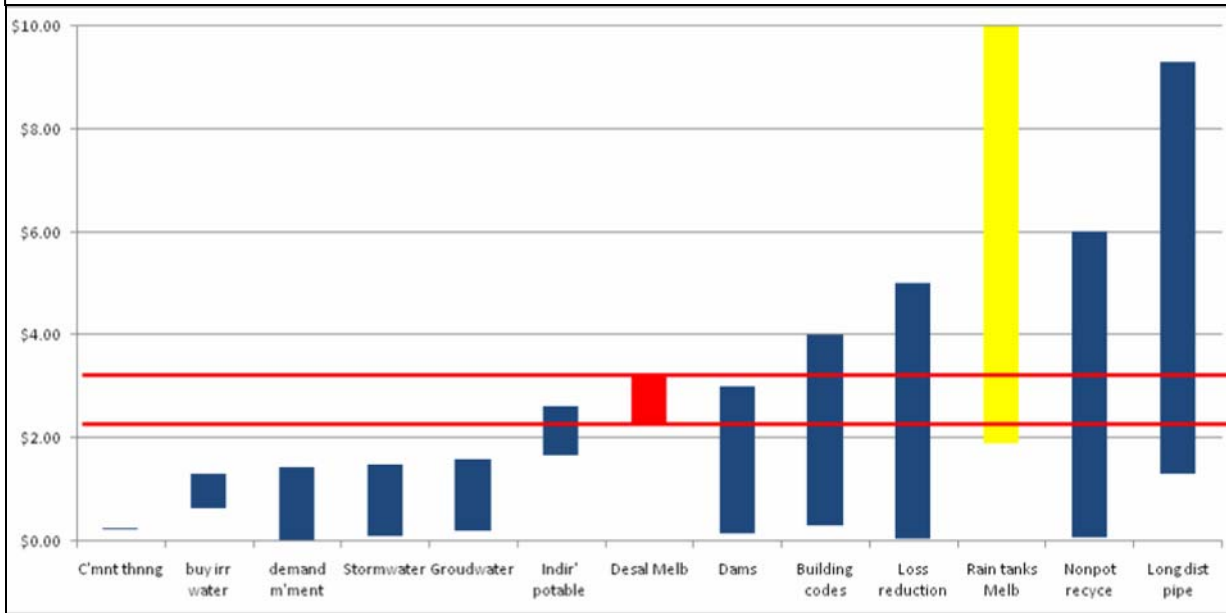
The following table and graph summarise these scenarios and cost valuations.

	Capital Cost (\$bill)	Operating costs (\$mill/year)	Capacity (GL/year)	Time frame	Discount rate	Levelised cost (\$/kilolitre)
Scenario 1	\$2.9	\$130	150	30 years	5.5%	\$2.31
Scenario 2	\$3.1	\$130	150	30 years	5.5%	\$2.37
Scenario 3	\$3.1	\$150	150	30 years	5.5%	\$2.50
Scenario 4	\$3.1	\$150	150 zero every 10 th yr	30 years	5.5%	\$2.75
Scenario 5	\$3.1	\$150	150 zero every 10 th yr	30 years	8%	\$3.23



The following graph incorporates these calculations into the Marsden Jacobs graph shown earlier. Also changed for Melbourne is the range of levelised costs for rainwater tanks in Melbourne. These figures are from a subsequent investigation by Marsden Jacobs and associates (Marsden Jacobs 2007)

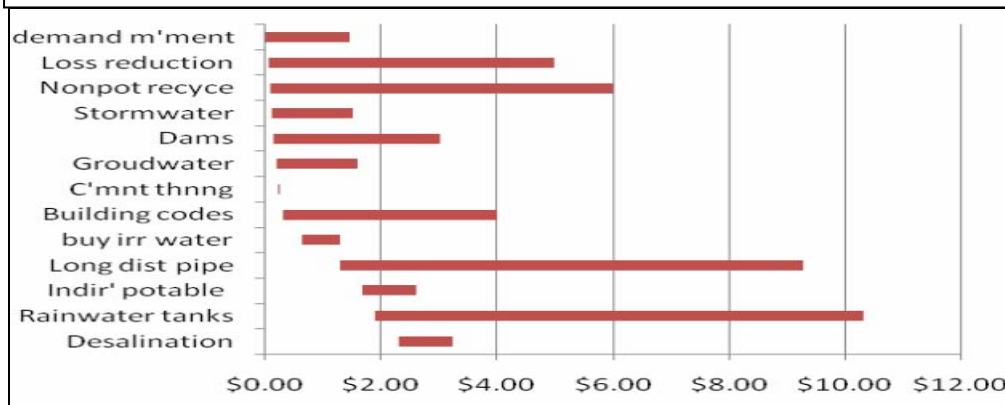
Figure 6. Levelised costs of water options, based on Marsden Jacobs analysis and Economists at Large calculations



Analysing these prices, we see that if costs of other water options are similar to those in Sydney, Adelaide, Perth and Newcastle, the Wonthaggi desalination plant should be the last water option explored, as it's minimum levelised cost, is higher than the minimum levelised cost of all other presented water options.

Policy decisions should not be made on levelised cost alone. Consideration also needs to be given to other factors such as water quality and potential yield. Levelised cost is a useful tool for guiding policy in a least cost framework. The Victorian government should be producing analysis similar to what is presented above, and explaining to the public how it is obtaining maximum yield from each cost level, before moving on to more expensive options. As desalination has the most expensive minimum levelised cost, all options should be exhausted to the \$2.31 before the Wonthaggi desalination plant is built. If yield estimates in the CRSWS are correct, other options easily provide sufficient water yield to make the desalination plant unnecessary

Figure 7. Graph ranking water options by minimum levelised cost.



Conclusion

There has been inadequate analysis conducted on water policy in Victoria. The Our Water Our Future plan has not been subject to any serious, public economic analysis. Detailed studies should be made of all water options in Victoria in relation to their levelised cost of water provision. Levelised cost enables comparison between different water policy options, large or small, dispersed or centralised. Such analysis should be used to guide policy in providing least cost solutions to Victoria's water needs.

Economists at Large have calculated levelised cost for the Wonthaggi desalination plant, based on its feasibility study and other assumptions. We conclude that the levelised cost of water from the desalination plant is at least \$2.31/KL and possibly over \$3.00/KL. These costs are expensive when compared to costs for other water provision options, based on calculations in other states. On this basis, the construction of the desalination plant seems unjustifiable until further analysis can prove its efficiency.

References:

Centre of Policy Studies, Monash University, 2007. Wonthaggi Desalination Plant: Economic Impact Study.

Department of Sustainability and Environment, 2007. Our Water Our Future - the next stage of the government's water plan. Available at: http://www.melbournewater.com.au/content/publications/reports/water_supply_reports.asp [Accessed November 16, 2008].

Department of Sustainability and Environment, 2008. Our Water Our Future: Fact sheet, Available at: www.ourwater.vic.gov.au/__data/assets/pdf_file/0004/39775/Water-plan-Initiatives-fact-sheet.pdf.

Fane, S., Robinson, J. & White, S., 2003. The Use of Levelised Cost in Comparing Supply and Demand Side Options. Water, Science and Technology, Water Supply, Volume 3(no.3), 185-192.

GHD, 2007. Seawater Desalination Plant Feasibility Study. Available at: http://www.melbournewater.com.au/content/current_projects/water_supply/seawater_desalination_plant/seawater_desalination_plant.asp [Accessed November 16, 2008].

Marsden Jacobs, 2007. The economics of rainwater tanks and alternative water supply options, Commissioned by ACF, Nature conservation council and Environment Victoria.

Marsden Jacobs Associates, 2006. Securing Australia's Urban Water Supplies: Opportunities and Impediments, Department of Prime Minister and Cabinet.

Victorian Auditor-General, 2008. Planning for Water Infrastructure in Victoria, Available at: http://www.audit.vic.gov.au/reports_publications/reports_by_year/2008/2008_0409_water_infrastructure.aspx.

Victorian Government, 2005. Central Region Sustainable Water Strategy,

Victorian Government, 2004. Securing our water future together, Available at:
<http://www.ourwater.vic.gov.au/programs/owof>.

Victorian Government, 2008. Terms of reference for inquiry under section 9(1) of the Environment Effects Act 1978, Victorian Desalination Project, Available at:
<http://www.dpi.vic.gov.au/DSE/nrenpl.nsf/LinkView/5249619A2A213442CA2573BE007EEAA992FBC7C133A6F520CA2572DA007FAB8B>.

Victorian Government, 2007. The next stage of the government's water plan,
Available at: <http://www.ourwater.vic.gov.au/programs/next-stage>.