Potable Water Savings

Economic Values in IWM Evaluation – May 2023

Economic Values in IWM evaluation factsheets provide planners with guidance on the selection of values for estimating the economic value of benefits from integrated water management (IWM) projects. The economic values in these Fact Sheets have been chosen so they are directly relevant to investments in the Greater Melbourne area.
These economic values can be used to establish high-level estimates of the potential benefits of proposed IWM and blue-green infrastructure investments. You can then use these high-level benefit estimates in economic analyses, including cost-benefit analysis. The factsheets are a joint initiative by Melbourne Water, Greater Western Water, South East Water and Yarra Valley Water for consistency in collaborative IWM investment evaluation.

The economic benefit of potable water savings

Integrated Water Management (IWM) projects often reduce potable water consumption through demand management or through the supply of alternative water for the same end use (e.g. substituting potable water with recycled water, rainwater or treated stormwater). There are several ways to value the economic benefits associated with these potable water savings.

What are the different values that can be used?

There are two key values that can be considered when an IWM project results in a potable water savings.

1. **Deferred or avoided capital and operational expenditure for bulk water supply**: This refers to savings from deferring (or avoiding) investment in bulk water supply infrastructure that would otherwise be needed to maintain the water supply system. This value will is derived from deferred capital expenditure and long term operational expenditure.

- Melbourne Water has developed a *Bulk Water Supply Cost Calculator* (BWC) to estimate the financial value of potable water savings for the Melbourne water supply system assuming a reference infrastructure trajectory, under a range of climate, demand and infrastructure cost scenarios. Estimating these savings is highly uncertain as it adopts long term forecasts of future climatic conditions, demands profiles, infrastructure costs, system operating rules etc for up to 50 years. The BWC estimates the present value of the cost of future infrastructure for a range of pre-determined plausible scenarios.
- Melbourne Water has also calculated the long run marginal cost (LRMC) of bulk water supply for each of the scenarios developed in the BWC. The LRMC provides a marginal value, a rough estimate of the value of avoiding a given volume of potable water use ($/ML). LRMCs are allowed in preliminary high level options analysis. For such purpose Melbourne Water recommends the use of a reference LRMC (high water demand and high climate change). Because of its uncertainty in inputs and climate, it is a requirement to test the sensitivity of the project to LRMC values for plausible climate scenarios (low, medium, high). The BWC and LRMCs are updated every 4 years.
- The LRMC is acceptable for early project planning (e.g. high-level shortlisting of options) and for projects with smaller potable water savings (<1GL/year). Larger projects are recommended to adopt the net present cost method using the BWC as they progress to the business case, which requires greater accuracy.

2. Avoided capital and variable operating expenditure for transfer and distribution: This refers to capital and operating costs (e.g. electricity for pumping, chemicals for treatment, labour etc.) associated with either expansion or with the existing water supply system that can be avoided if potable water consumption is reduced.

   Distribution, transfer and treatment costs may vary based on the geographical location, site specific conditions and terrain, length of pipe required to service an area, changes in hydraulic head and the source of water. As such, it is often difficult to provide a single average figure for estimating the economic value of avoided variable operating expenditure.

   The transfer system consists of pipe sizes between DN900 to DN2100 and design flows between 100ML/d to 800 ML/d. Potable substitution with capacity less than 30 ML/d or 10GL/year is unlikely to impact the transfer system infrastructure. Furthermore, as a service requirement, the transfer system is designed for full capacity backup for alternative water sources such as third pipe systems and rainwater tanks. Consequently, potable substitution will not result in avoided capital costs in the transfer system. But it could impact the distribution capital costs and potentially on operating costs for both transfer and distribution.

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How and when to use each value?

A range of scenarios are presented below to illustrate how and when to use the values described above.
Note that Melbourne Water updates the LRMCs every 4 years and the next update is planned for the end of 2021
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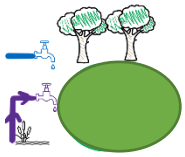
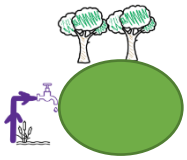
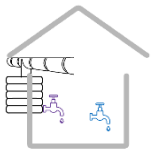
Scenario	Value(s) to Consider		
	1. Deferred or avoided capital and operational expenditure for supply	2. Avoided variable operating expenditure for transfer and distribution	Notes
 Irrigate an existing oval with recycled water. The oval is currently irrigated with potable water.	**Yes** Use the LRMC, as the scale of the project and reuse doesn't warrant use of the BWC.	**Yes** If a suitable value is available.	If irrigation will increase at the site due to the provision of recycled water, then care needs to be taken to avoid over-valuing the potable water savings. For example if Council currently irrigate the oval with 10ML/yr of potable water, but would increase irrigation to 12ML/yr if it was supplied with a cheaper recycled water supply then potable water savings can only be counted for the 10ML/yr of potable water that will no longer be used.
 Irrigate an existing oval with recycled water. The oval is currently not irrigated.	**No** There is no existing potable water use so there are no savings to the potable water network (capital or operating, in the long or short term).		Not applicable
 Install a rainwater tank on ten new residential buildings for toilet flushing and garden irrigation.	**Depends** Use the LRMC, as the scale of the project and reuse doesn't warrant use of the BWC.	**Depends** If a suitable value is available.	Under a business-as-usual development scenario, toilet flushing and garden irrigation would have to be supplied with potable water from the Melbourne Water supply system. Therefore, supplying rainwater for toilet flushing and garden irrigation could result in potable water savings. However, the performance of rainwater tanks is uncertain due to the lack of data on home-owner maintenance. A conservative estimate of potable water savings associated with the use of rainwater tanks should consider this uncertainty. This requires examining the sensitivity of

Scenario	Value(s) to Consider		
	1. Deferred or avoided capital and operational expenditure for supply	2. Avoided variable operating expenditure for transfer and distribution	Notes
			rainwater tank performance using low, medium, and high performance values. Note that potable water supply and transfer system is designed to provide back-up to manage rainwater availability risks.
 Supply treated stormwater for toilet flushing and garden irrigation in 2,000 residential and 500 commercial buildings.	**Yes** The scale of this project may warrant use of the BWC. However, the LRMC may be used in initial options refinement during the early planning stage.	**Yes** If a suitable value is available.	Under a business-as-usual development scenario toilet flushing and garden irrigation would have to be supplied with potable water from the Melbourne water supply system. Therefore, supplying stormwater for toilet flushing and garden irrigation will result in potable water savings.
 Supply recycled water for agricultural uses. This supply replaces extraction of river water.	**No** There is no existing potable water use so there are no savings to the potable water network (capital or operating, in the long or short term).		There are no potable water savings associated with this project, however, there may be other non-market economic benefits that can be considered.

What values are appropriate to use?

1. Deferred or avoided capital and operational expenditure (values subject to change)				
Project type	**Method**	**Estimate for medium demand scenario (2019 projections)**	**LRMC Value ($2022) at 4% discount rate**	
			25yr NPV	**50yr NPV**
Projects in an early planning stage (e.g. high-level shortlisting of options) OR	Use the long run marginal cost for the reference scenario. Consider sensitivity of the project to the LRMC values for the population forecast and plausible climate	Low[1]	$1,766 per ML	$2,512 per ML
		Reference[2]	$5,572 per ML	$4,329 per ML

[1] Based on the lower quartile value for all LRMC values, Melbourne Water, 2022a.
[2] Based on the high climate (RCP8.5 high), medium population and demand (HCMP LRMC scenario, Melbourne Water, 2022a.

Projects with smaller potable water savings (e.g. <1GL/year).	scenarios with low, medium and high climate change. Make sure that the volume of potable water savings is discounted.	High[3]	$4,221 per ML	$4,152 per ML
		Post-1997 (drought)[4]	$3,087 per ML	$3,571 per ML
Expected potable water savings from the projects > 1 GL/yr	Contact Melbourne Water to arrange access to the Bulk Water Supply Cost Calculator.			

2. Avoided variable operating expenditure		
Project type		**Note**
Potable water transfer	Bulk Transfer (MW managed)	Deferral of capex for the transfer system is unlikely. The transfer system is designed for full capacity backup for alternative water sources, such as third pipe and rainwater, to manage water availability risk. Avoided opex: use the bulk transfer charge in the MW's price submission (2022$ 266.9 per ML)
	Distribution Network (Retailer Managed)	Consult each retailer (depends on what gets built, location etc.)
Potable water treatment		Unlikely that this will be relevant in the Victorian metro setting (as bulk water treatment costs are captured in the LRMC/bulk water calculator). There may be certain instances where one may consider project-specific treatment costs, but it is important to consider possible double-counting.

Useful resources

Department of Environment, Land, Water and Planning (DELWP), Melbourne Water, City West Water, South East Water, Yarra Valley Water. (2015). Avoidable System Costs Project, Metropolitan Melbourne.

Iftekhar, M.S, Gunawardena, A., Fogarty, F., Pannell, D. and Rogers, A. (2019). INFFEWS Value tool: Guideline (Version 2): IRP2 Comprehensive Economic Evaluation Framework (2017 – 2019). Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities.

Melbourne Water, 2018. Methodology for estimation of headworks and desalinated water costs and long run marginal costs for planning. February 2018.

Melbourne Water, 2022c, Interim Bulk Water Supply Costs Calculator (BWC_version 24b) for future centralized infrastructure planning (interim release – confidential) – Quick reference guide, 21 July 2022.

Melbourne Water, 2020b, Briefing note – Guidance on Melbourne water supply costs and investment evaluation for long-term planning, January 2020, File name: 2020 MWC Bulk Water supply cost guidance -January20.pdf

How to evaluate economic values in IWM evaluation in 'todays dollars'?

All of the economic values in this Fact Sheet are presented in $2022 dollars.

[3] Based on the upper quartile value for all LRMC values, Melbourne Water, 2022a.
[4] Based on Post-1997 step change climate scenario and medium demand and population scenario, 2022a.

It is essential that the costs and benefits used in an economic analysis are compared on an equal footing. This means all costs and benefits should either include or exclude inflation. When transferring values from the Fact Sheets you will need to make this adjustment to include or exclude inflation yourself.
Typically, cost benefit analysis is undertaken using a real discount rate (i.e. excluding inflation). This means that the discount rate applied does not consider how the value of money will change into the future due to inflation. Instead, all costs and benefits, both now and in the future, are presented in 'todays dollars'. With 'today' representing the year of the analysis.

For example, imagine an IWM business case is being prepared in 2023 to consider the costs and benefits associated with a recycled water project. It is proposed that the project will be constructed in 2025, the cost estimate for the project was prepared in 2019 and the potable water saving benefits due to project are expected to be realized in 2030.
This project's costs and benefits should both be expressed based on their value in 'todays dollars', i.e. in real dollars based on the year of the analysis (in this case 2023). This means that the:

- Cost estimate from 2019 needs to be adjusted to reflect the inflation from 2019 to 2023. This can be done based on the Consumer Price Index (CPI) published by the Australian Bureau of Statistics (ABS), by using the Reserve Bank of Australia's Inflation Calculator or the ESC's CPI converter[5].
- The Long Run Marginal Cost (LRMC) used to monetize the potable water savings should be adjusted to reflect the inflation. For example, if the values are in $2019, they need to be inflated to $2023.

IWM economic valuation community of practice

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Keep up to date with what's happening

Last update December 2022. For more information about this factsheet please contact your water utility representative

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Greater Western Water: e: sam.innes@gww.com.au
Yarra Valley Water: e: rita.kale@yvw.com.au/ e: janet.wade@yvw.com.au
South East Water: e: David.Cappellari@sew.com.au
Barwon Water: e: Vicki.Pinder@barwonwater.com.au

[5] For the ESC's CPI converter (2021) contact MIEG