



What is desalination?

Desalination is a water supply option that is used widely around the world and involves taking the salt out of water to make it drinkable. Many countries use desalination as a way of creating a more reliable water supply that is not dependant on rain.

Is desalinated water safe?

Drinking water produced by desalination plants is monitored and tested in the same way as water from a filtration plant and must meet the standards of the Australian Drinking Water Guidelines (2006).

How does it work?

There are two main methods that are used to produce desalinated water distillation and membrane processes.

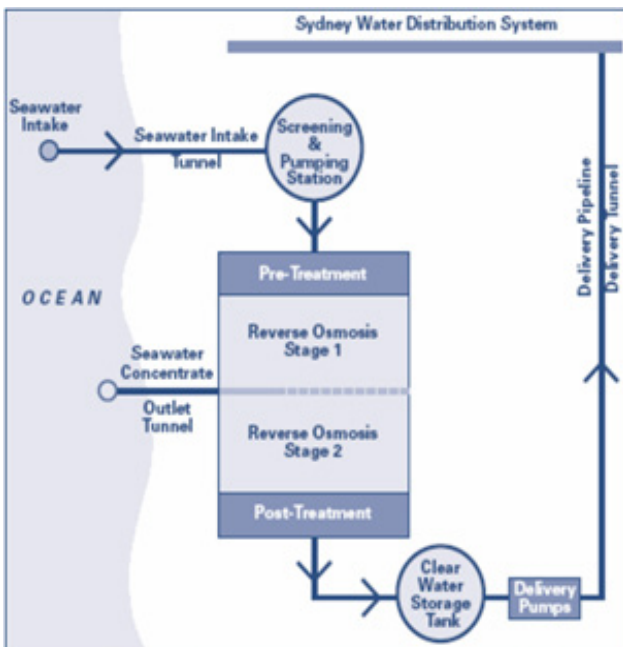
Distillation

This occurs naturally through evaporation or through very simple methods such as boiling salty water and condensing the steam. Commercial desalination plants using this process have been in operation for decades.

Membrane Processes

A more recent and now more widely used method relies on a semi-permeable membrane with pores so tiny that they separate the salt from water, this is reverse osmosis and it relies on natural processes and membranes.

Figure 1: The process of desalination through reverse osmosis at Sydney Water



Source: Desalination Fact Sheet - Fishers For Conservation Inc.
http://www.ffc.org.au/FFC_files/desal/Whatisdesalination-factsheet-1.pdf

Desalination in Australia

Table 1: Summary of Australian desalination plant

Jurisdiction	Desalination Plant/s	Initial investment \$m	Capacity GL/year	Completion date	Further Information
Western Australia	Perth Seawater Desalination Plant (Kwinana)	387	45	2006	http://www.watercorporation.com.au/water-supply-and-services/solutions-to-perths-water-supply/desalination/perth-seawater-desalination-plant
Western Australia	Southern Seawater Desalination Plant (Binningup)	1400	100	2012	http://www.watercorporation.com.au/water-supply-and-services/solutions-to-perths-water-supply/desalination/southern-seawater-desalination-plant
Queensland	Gold Coast Desalination Plant (Tugun)	1200	49	2009	The plant's intake and outlet structure are located approximately 1.5 kilometres out to sea and have become artificial reefs, which are home to a variety of local sea creatures. More information on this desalination process can be found here
South Australia	Adelaide Desalination Plant (Port Stanvac)	1830	100	2012	The Adelaide Desalination Plant began producing drinking water in October 2011. Up to the end of September it has produced approximately 113.3 billion litres of water. In September it produced 2.02 billion litres. http://www.sawater.com.au/sawater/whatsnew/majorprojects/adp.htm
Victoria	Victorian Desalination Plant (Wonthaggi)	3500	150	2012	The plant was built for the Victorian Government by AquaSure through a Public Private Partnership managed by the Department of Environment and Primary Industries. The plant has been mothballed since December 2012. More information can be found here .
New South Wales	Sydney's Desalination Plant (Kurnell)	1890	90	2010	Sydney's Desalination Plant can supply up to 250 million litres a day, which is up to 15% of its water needs. The plant is 100% powered by renewable energy. More information can be found here .

Below is a summary of the surface water storage, desalination capacity, desalinated water supplied and recycled water supplied by region.

Table 2: Surface water storage, desalination capacity, desalinated water supplied and recycled water supplied by region.

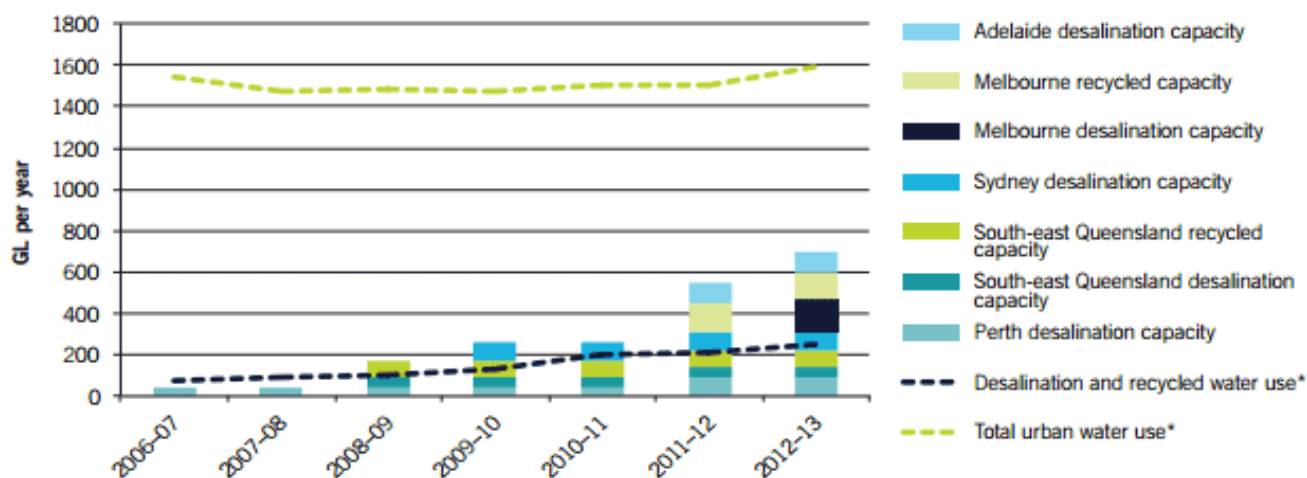
Region	Surface water storage/urban water supply in 2012-13 (years of supply)	Desalination capacity (% of 2012-13 urban water supply)	Desalinated water (ML) supplied to urban water system in 2012-13	Recycled water (ML) supplied to urban water system in 2012-13
Adelaide	0.5	62	36 470 (22%)	4 865 (3%)
Canberra	3.8	N/A	N/A	195 (<1%)
Melbourne	1.4*	37	0	19 915 (5%)
Perth	0.6	46	95 770 (29%)	7 505 (2%)
SEQ	10.1	18	2 805 (1%)	17 550 (7%)
Sydney	5.2	17	0	22 590 (4%)

Note: *includes water from Thompson Reservoir, which is outside the region.

Source: Bureau of Meteorology, National Water Account 2013 Summary, pg 13, <http://www.bom.gov.au/water/nwa/2013/documents/summary.pdf>

Figure 2 compares the capacity of large-scale desalination and recycled water plants for major Australian capital cities with overall use of water in those cities from desalination and recycled water. In 2012-13 all plants were running on average at around one-third capacity because there was abundant surface water. In Perth the desalination and recycled water plants were running at near full capacity.

Figure 2: Supply capacity of large-scale desalination and recycled water plants for major capital cities versus total urban water use, 2006-07 to 2012-13 (GL/yr)



Notes: Capacity-related data was derived from the 2009-10 Urban NPR (pp. 7-8_ and the Water Services Association of Australia (WSAA) report card 2009-10 (p. 5). Data includes only major projects that have a supply capacity of at least 40 GL. *Use data was sourced from the 2012-13 Urban NPR dataset and is the total for Sydney, Melbourne, south-east Queensland, Perth and Adelaide. Where data was missing for these utilities over the time series, the most recent year of data was assumed for the missing years. Source: National Water Commission, National Performance Report 2012-13, http://www.nwc.gov.au/_data/assets/pdf_file/0015/36411/Urban-Performance-Report-2012-13.pdf

Benefits of desalination

Desalination provides a climate-independent source of water for critical human needs and economic development (industry and agriculture in particular). It is an effective way to secure water supplies against the effects of climate change, a growing population and drought.

The cost of desalination

The cost of producing and reticulating desalinated water is a function of a number of factors, including plant capacity, process power use efficiency, energy source, proximity to source water an end users and project financing model. As a result, costs (\$/KL to end user) are highly variable. For large-scale municipal seawater desalination projects in Australian, the approximate range is \$1-\$4 per kilolitre.

Desalination and energy use

- Desalination requires significantly more energy than existing conventional water treatment processes. This makes it expensive and contributes to greenhouse gas emissions.
- For seawater desalination, energy use can represent 50-70% of total operating costs.
- Desalination plants are complex systems, with pre-treatment filters, high pressure pumps, energy recovery devices and chemical cleaning systems. With appropriate material selection, equipment lifespan is comparable with that for conventional water treatment.
- Desalination requires sophisticated plants that have high capital costs, significant maintenance requirements and shorter operating life than traditional water treatment plants.
- The saltier the water the more expensive it is to desalinate, so it may be cheaper to desalinate brackish (slightly salty) water or wastewater rather than seawater.
- Many Australian desalination plants use accredited 'Green Power' by using wind energy to power desalination plants. This can result in a significant increase in operating costs, due to the premium attached to the use of renewable energy. The benefit is reduced GHG emissions, with corresponding environmental benefits.

Social, environmental and economic issues

In general, desalination is often the last resort to address water supply security and/or quality. This is due to the higher cost of production, compared with traditional water resources, except when the latter is scarce due to drought and/or political situation. Key barriers to increasing adoption of desalination technology for municipal water supplies include:

- Capital and operating costs
- Public perception (energy use, environmental impact)
- Environmental impact (energy consumption, management of waste saline concentrates, disposal of large quantities of membrane modules)
- Lack of transparent assessment of desalination plant versus treatment of natural catchment supplies with respect to water security
- Lack of centralised repository of information pertaining to the use, performance and lessons learnt from existing desalination plants in Australia

Criticism of Australia's desalination plants

In its review of Australia's urban water sector, the Productivity Commission found that while some of the investment in desalination plants (Table 1), 'might have been appropriate in the circumstances to maintain security of supply, there is sufficient evidence available to conclude that many projects could have been:

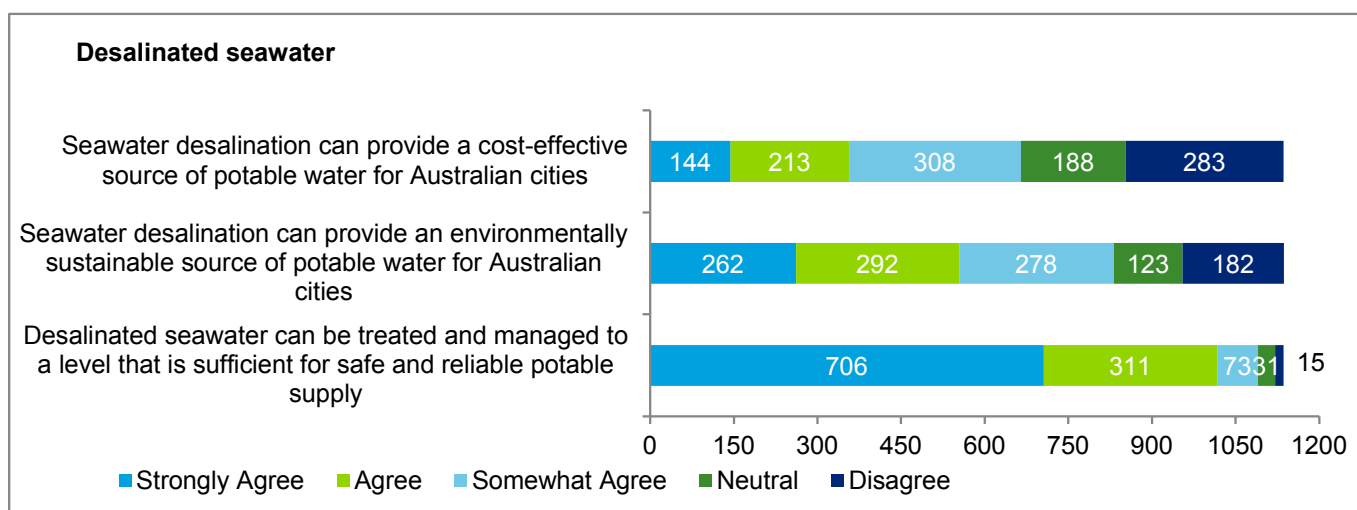
- Deferred for a number of years
- Smaller in scale
- Replaced with investment in lower cost sources of water'

Where lower cost sources of water supply can include rural-urban trade and aquifers.

Support for desalination

In the [AWA/Deloitte 2014 State of the Water Sector Report 2014](#) an overwhelming number of respondents (96%) believed that desalinated seawater can be treated and managed to a level that is sufficient for safe and reliable potable supply (Figure 3). However views on whether it is an environmentally sustainable and cost effective source of potable water varies across jurisdictions.

Figure 3: The Australian water sector's views on desalination



Source: AWA/Deloitte 2014 State of the Water Sector Report, http://www.awa.asn.au/uploadedfiles/State_of_the_Water_Sector_Report_2014_FINAL.pdf

Ensuring secure water supplies

In the face of growing challenges of climate and population growth the whole portfolio of supply augmentation and demand management options should be assessed for a system. Good, robust collaborative planning between the industry, regulators and communities is also required.

For more information about desalination in Australia

National Centre of Excellence in Desalination

<http://desalination.edu.au/>

International Desalination Association

<http://idadesal.org/>

Water Corporation (WA)

<http://www.watercorporation.com.au/water-supply-and-services/solutions-to-perths-water-supply/desalination>

Water Secure (Qld)

<http://www.segwater.com.au/water-supply/water-treatment/desalination>

Water for Good (SA)

<http://www.sawater.com.au/sawater/whatsnew/majorprojects/adp.htm>

Melbourne Water (Vic)

<http://www.melbournewater.com.au/whatwedo/supply-water/Pages/Desalination.aspx>

Sydney Water (NSW)

<http://www.sydneywater.com.au/sw/teachers-students/facts-about-water/secondary-students/how-does-water-get-to-our-taps-/desalination/index.htm>