Stormwater harvesting or desalination?

Is our love affair with stormwater harvesting emotional or can it be supported by rational scientific arguments? Guenter Hauber-Davidson runs the numbers.

Recent scientific work by the author, drive in part by significant enhancements in the energy efficiency of desalination, has revealed some small rainwater harvesting systems already use more energy than modern desalination plants.

Comparing capital costs in terms of $/kL produced over a project’s lifetime adds further impetus to the urgency of addressing the question: Which option provides a more sustainable water supply solution: stormwater harvesting or desalination?

A quick tally shows probably close to half a billion dollars has been spent on stormwater harvesting. Yet, despite the massive investment few serious efforts have been made to see if we are spending the money wisely and whether the solutions we have come up with are truly sustainable.

Little solid data seems to exist to answer this question. Hence, all we can do for now is to paint the framework we should use, including some early indicative analysis. It must be emphasised, that the data used is more for the sake of creating a lively discussion rather than claiming to be a strong reference point.

For a true cradle to grave analysis a range of factors need to be considered (see Key Facts), but to simplify things we could look just at cost and carbon footprint.

THE COST EQUATION
Using figures published from various stormwater funding projects, I have calculated their capital costs relative to their expected annual water yield.

This provides a $/(kL/yr) figure, which is the capital cost for every kL/yr created through stormwater harvesting. It must be noted, that many of these figures are from funding applications and not from actually achieved, tested and monitored real life results. Yields stated in funding applications have often been overestimated.

The average cost seems to be around $30-40/(kL/yr), but this varies widely, from as little as $3.60 to as much as $115. In contrast, figures quoted for desalination seem to be in the $20/(kL/yr) range - except when we use something like the Sydney desalination plant and cite the expected production as opposed to its nominal capacity, resulting in figure of $150/(kL/yr).

Let’s take this approach further to see if benchmarking stormwater harvesting against desalination can help us define what is at least more sustainable. Desalination is generally seen as the alternative with the highest environmental footprint. Often, people also believe it is the highest cost alternative.
These costs are calculated on basis of: experience with executed large commercial rainwater harvesting projects; an assumed average cost of $3,500 for a typical domestic rainwater harvesting system yielding 30KL/yr; published costs for desalination; and the operating costs stated.

The bar chart below shows the NPV (at 6% interest) of the various options in terms of $(kL/yr).

![Indicative NPV of Alternative Water Supply Options in $(kL/yr)](image)

Figure 1: Comparison of NPV of various alternative water sources

Whilst caution must be exercised referring to these figures due to the lack of depth in research to establish them, the lack of data in particular with regards to operating costs, and the one dimensional view where other external costs have not been considered, it paints a surprising picture that goes against popular belief.

Domestic rainwater harvesting, for the assumptions stated, has the highest NPV – bar the Sydney Kurnell desal plant when based on the amount of water it is expected to generate.

A well designed and operated commercial rainwater harvesting system can be on par with desalination’s capacity cost, but most stormwater harvesting schemes would appear to cost a fair bit more than desalination.

_Guenter Hauber-Davidson is MD of the Water Group, a specialist in corporate water savings through consulting, contracting and smart metering._

_Next week: Inside the comparative carbon footprints of desalination and stormwater harvesting._

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