What is holding back rainwater and greywater systems in New Zealand?

For a country where droughts are a regular weather feature and there is growing pressure on metropolitan water supply systems, relatively few rainwater and greywater systems are being installed.

RAINWATER HAS been harvested from New Zealand buildings for centuries. Despite the apparent benefits, rainwater collection systems are not a feature in most new urban houses. Greywater reuse systems are even rarer. Both types of systems are held back through cost issues, lack of knowledge, health concerns and, in some areas, local authority regulations.

Out of more than 41,000 non-residential buildings, for example, just 370 are thought to have a rainwater harvesting system. On residential buildings, too, there are few new installations unless they are essential (in rural areas or where installation is a local authority requirement). There are even fewer greywater reuse systems being installed.

> Rainwater harvesting systems catch rainwater on rooftops, while greywater is the wastewater taken from baths, showers and hand basins and, in some cases, from laundries. Greywater is typically reused after filtration/treatment for outdoor uses or toilet flushing.

Existing systems are often not located in areas of water shortages but simply where mains-supplied water is not available.

A larger uptake of these systems could bring potential advantages that include:

- for property owners – where there are volumetric charges for water and wastewater, reduced building running costs
- for local and regional authorities – reduced pressure on water supply services
- for both property owners and authorities – improved resilience and a greater ability to cope after a natural disaster.

If households, businesses and public authorities could all potentially benefit from a greater uptake in these systems, why are so few being installed?

Barriers to uptake

One BRANZ survey in 2014 and another in 2016 looked at attitudes to rainwater and greywater systems and included questions around what may be holding them back in New Zealand.

2014 survey

There appears to be public acceptance for the use of these systems for some purposes but not others. Part of the 2014 survey looked at end-use acceptability for rainwater:

- Around 90% of respondents agreed that rainwater could be used for toilet flushing, laundry and garden irrigation.
- Around 70% believed it could be used for hand washing, showering and bathing.
- Almost 60% believed it was acceptable for use in HVAC systems.
- Around half thought it was acceptable for drinking, cooking and food preparation.

The figures were considerably lower for acceptable uses of greywater:

- Around 70% thought it was suitable for irrigation and toilet flushing.
- Just over 10% accepted it use for laundry.
- Fewer than 5% of respondents thought it was suitable for any other uses.

A greater understanding of rainwater than greywater was apparent through more respondents failing to answer greywater-focused questions.

Cost, storage and education (lack of information) were seen to be the three biggest barriers with rainwater (Figure 1). For greywater, the biggest barriers were education and the lack of or prohibitive regulations.

2016 survey

The 2016 survey only looked at drivers for and barriers to uptake of rainwater harvesting and greywater reuse systems in non-residential buildings. This survey targeted more industry members in the non-residential market. Architects, designers and engineers made up 58% of the respondents.

Cost, storage and education were perceived as the biggest barriers for uptake of rainwater harvesting systems (Figure 2). For greywater reuse, cost was regarded as by far the biggest barrier, with education a distant second.

The cost barrier

There are two ways that cost can be assessed as a barrier to uptake of these systems:

- At a household level, a homeowner may consider the costs of installing a system in their house against the amount and timeframe of financial savings
- At a local or regional level, local authorities or water service providers may look at large-scale installation of these systems and consider the costs against potential savings in developing, expanding or upgrading water infrastructure.

BRANZ calculated payback periods for household rainwater harvesting systems in six locations. A 15-year payback represents a rate of return of about 5% on the initial cost. A payback of more than 15 years is regarded as uneconomic. There is anecdotal evidence that many householders expect a payback period of significantly less than 15 years.

Nelson had a payback period of 10–11 years (the lower time here and most other cities was where there was higher household water use). Auckland's payback time was 13–14

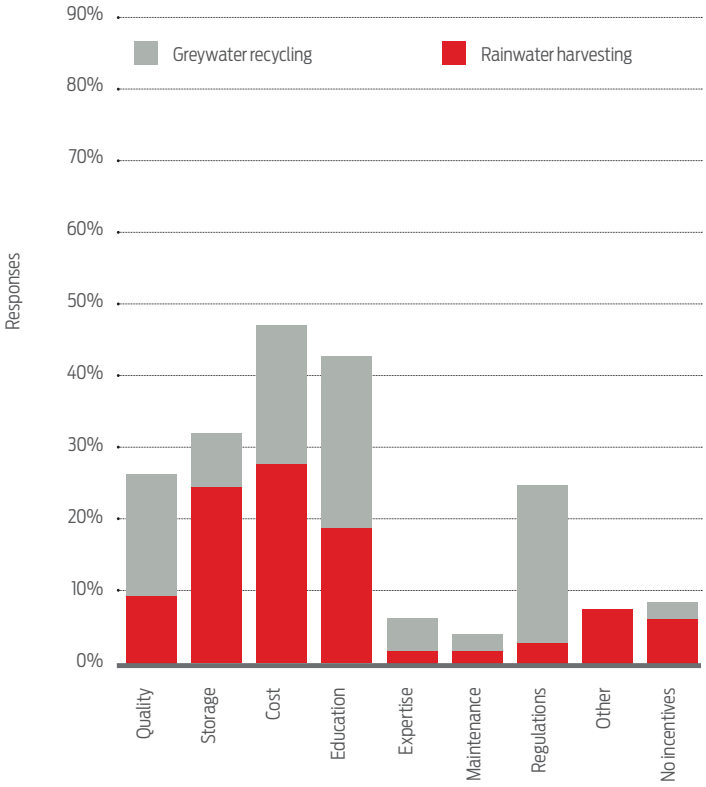

Figure 1. 2014 survey barriers to uptake.

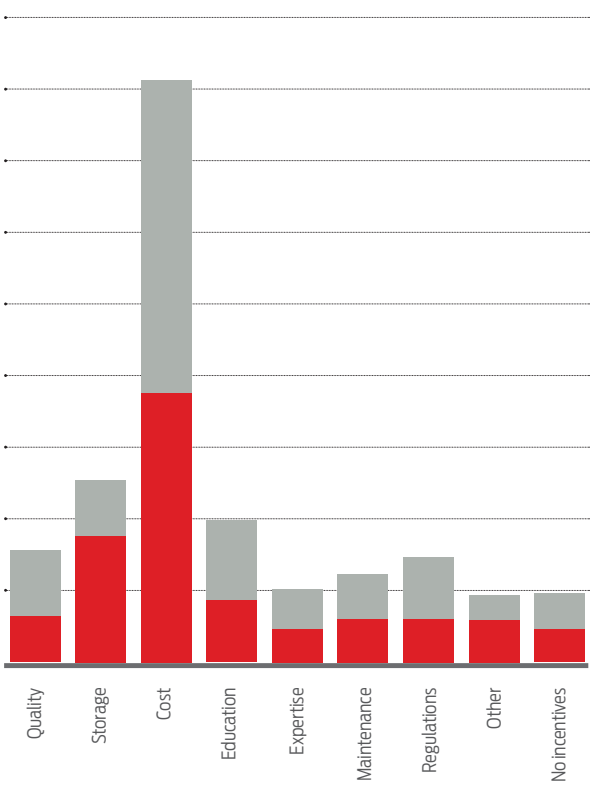

Figure 2. 2016 survey barriers to uptake.

years, Wellington 13–15 years and Tauranga 13–16 years.

Dunedin and Christchurch followed a different pattern, with payback times longer where water use was higher. Christchurch's payback period was 28–42 years and Dunedin 17–21 years, in each case due to a combination of relatively low council water charges and lower summer rainfall.

In areas where the cost of water and wastewater is not directly linked to usage volumes, cost will often outweigh financial savings and act as a clear barrier to uptake. This is the case for most areas outside Auckland. Wastewater volume charges are relevant because wastewater volumes are typically based on a proportion of water use volumes.

Cost-benefit analyses on a local or regional level have also shown mixed results.

A report commissioned by Greater Wellington Regional Council, for example, compared savings from reduced water charges with the cost of installing rainwater systems for outdoor usage and toilet flushing. Its model found the cost of installing tanks for a quarter of Wellington City properties was $153 million, while savings over 5 years would be just $10.7 million.

Rainwater systems can have financial benefits for very small settlements with falling populations and ageing water supply systems. Supplying residents with rainwater collection tanks may be more cost-effective for ratepayers than replacing the town-supply system.

Health concerns

The 2016 survey also asked about primary concerns with rainwater harvesting or greywater reuse systems. This can be regarded as a type of barrier to uptake if the systems are regarded unfavourably. Water quality, health and waterborne disease were by far the biggest perceived issues. For greywater specifically, respondents mentioned health, cross-contamination with potable water, cleanliness of the system and society's perception of 'dirtiness'.

Local regulatory barriers

Local authority requirements around water harvesting and greywater reuse systems vary enormously around New Zealand. In some cases, an authority's attitude or requirements are seen as a barrier to uptake.

For example, as at the start of 2018, greywater systems in Auckland must comply with TP58 *On-site wastewater management systems: design and management*. The restrictions in this document have been regarded as a barrier for implementation of greywater reuse systems. However, this document is due to be replaced by a new document (GD06). Water New Zealand says that Auckland Council has given it permission to use the new document as a national Water New Zealand technical guidance document.

A few local authorities are very supportive of rainwater and greywater systems. The most positive is Kāpiti Coast District Council, which requires all new houses to have a water tank or a water tank and greywater system. Rainwater can supply toilets, laundry and outdoor uses, while greywater from the laundry and bathroom is used for garden irrigation.

More information

Fact sheet 1 *Rainwater harvesting systems in New Zealand houses*

Fact sheet 2 *Greywater reuse systems in New Zealand houses*

Fact sheet 3 *Rainwater harvesting in non-residential buildings*

Fact sheet 4 *Water quality in New Zealand rainwater harvesting systems*

Fact sheet 5 *Benefits of rainwater and greywater systems in New Zealand houses*

Fact sheet 7 *Potential network savings from rainwater and greywater systems in New Zealand*

Beban, J., Stewart, C., Johnston, D. M. & Cousins, W. J. (2013). *A study of the role of rainwater tanks as an emergency water source for the Wellington region following a major earthquake on the Wellington Fault.* GNS Science Report 2013/16. Wellington, New Zealand: Institute of Geological and Nuclear Sciences Ltd.

Bint, L. (2017). *Performance of commercial rainwater and greywater systems.* BRANZ Study Report SR383. Judgeford, New Zealand: BRANZ Ltd.

Bint, L. & Jaques, R. (2017). *Drivers and barriers to rainwater and greywater uptake in New Zealand.* BRANZ Study Report SR382. Judgeford, New Zealand: BRANZ Ltd.

Garnett, A. & Bint, L. (2017). *Calculating potential network savings through employing rainwater and greywater systems.* BRANZ Study Report SR384. Judgeford, New Zealand: BRANZ Ltd.