

Benefits of rainwater and greywater systems in New Zealand houses

There are benefits that apply to all households and those that apply just to houses in particular locations or circumstances. Not all benefits can be measured in financial terms. For those that can, costs must also be considered – in some cases, they may outweigh the simple financial benefit.

RAINWATER HARVESTING systems typically collect rainwater from a house roof and store it in a tank for future use. That use could range from garden irrigation to toilet flushing and clothes washing or, with suitable treatment, to meet all the water needs of a household.

Greywater reuse systems, by contrast, take wastewater from baths, showers and hand basins and, in some cases, from laundries and store it in a smaller tank. Greywater use (after filtration) is usually limited to irrigation or toilet flushing.

Benefits of rainwater systems

In rural areas, most houses have a rainwater harvesting system for all water supply.

Even in towns and cities, many local authorities require or are supportive of rainwater being harvested for non-potable uses such as garden irrigation or toilet flushing. In at least one district, rainwater tanks are mandatory with new house builds.

BRANZ surveys have found that most people favour installing rainwater systems for cost savings and environmental reasons. Improving a building's resilience – ensuring that it can function properly during and after a natural disaster – is another reason.

The cost-effectiveness of rainwater harvesting systems depends largely on:

- how water and wastewater services are charged for by local authorities
- local rainfall levels – particularly summer rainfall.

BRANZ has calculated payback periods for installing rainwater harvesting systems in six locations. (Payback is the cost of the system divided by the annual savings in water



costs.) In financial terms, a 15-year payback represents a rate of return of about 5% on the initial cost. A simple payback of more than 15 years is considered uneconomic (but may have a 'feel good' factor).

Auckland and Nelson had payback periods of less than 15 years, while Wellington was just on 15 years (assuming use of 180 litres/per person/per day). Tauranga was 16 years

and Dunedin 17 years. Christchurch had a very high payback period of 28 years, due to a combination of relatively low council charges for water use and lower summer rainfall.

Payback periods are typically longer still for smaller households.

In areas where the cost of water and wastewater is not directly linked to usage volumes, there are limits to potential



financial savings from rainwater harvesting and limited incentives for homeowners to install these systems. This is the case for most areas outside Auckland – Kāpiti District Council charges for water but not wastewater. The wastewater volume charges are relevant because wastewater volumes are typically based on a proportion of water use volumes.

Households for whom reducing cost is the sole concern may find that focusing on water efficiency gives better results than installing a rainwater tank. BRANZ research has estimated that just two steps could together reduce water use by up to 33% for high water users:

- Switching from a top-loading washing machine to a front-loading washing machine.
- Changing from a standard showerhead to a low-flow model and limiting shower duration.

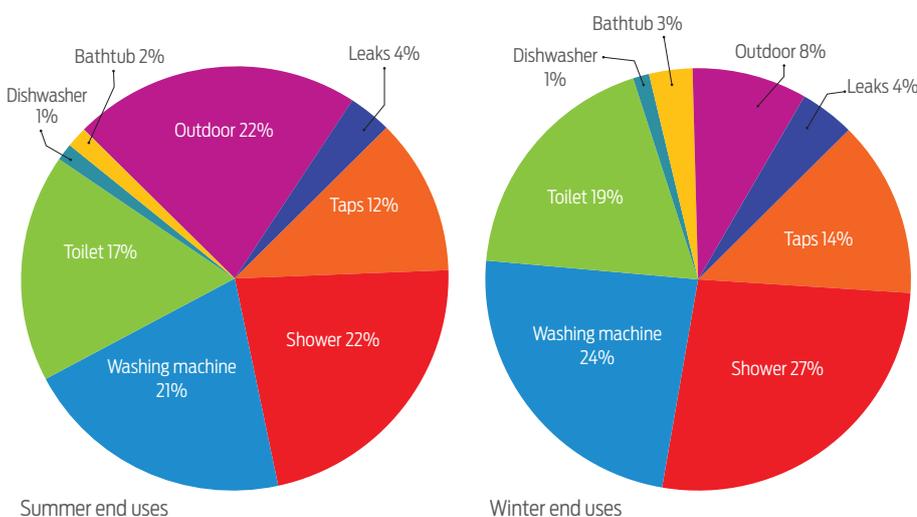
The costs and benefits of household rainwater tanks have also been analysed at a larger scale by a number of regional authorities. A report commissioned by Greater Wellington Regional Council, for example, compared savings from reduced water charges with the cost of installing rainwater systems for outdoor usage and toilet flushing. It modelled a range of household sizes, roof areas and tank sizes. The average cost for installing systems with 5,000 L and 10,000 L tanks for a quarter of Wellington City properties was \$153 million, and the average total savings over 5 years would be \$10.7 million. Tank systems would not pay for themselves through reduced water charges under the current charging regime.

The numbers go in favour of tanks for those very small towns around the country with falling populations and supply systems reaching the end of their life or where water is charged for. In these cases, supplying residents with rainwater collection tanks may be more cost-effective for ratepayers than replacing the town-supply system, given the relatively low and declining population numbers involved.

Resilience and other benefits

Building resilience does not rank highly in survey respondents' perceptions of the benefits of rainwater harvesting systems, but in fact it is a key benefit, especially for areas with high earthquake risk.

Wellington's water network crosses fault-lines at many locations. After a big earthquake, normal supply may not be available for 2 months. Residents in some locations may



Summer end uses

Winter end uses

Auckland residential water use (BRANZ study).

have to wait over 3 months. Wellington Region Emergency Management Office (WREMO) has encouraged homeowners to install rainwater tanks on their properties. WREMO and local councils came up with a relatively low-priced (\$105) 200-litre rainwater tank. The tanks are sold by local councils in the region.

Other benefits of rainwater harvesting include:

- taking the pressure off water treatment and supply networks (see Fact sheet 7)
- the environmental benefits when untreated locally collected rainwater is used to irrigate the garden rather than water that is taken from a dam or river and put through a treatment plant
- reduced stormwater discharge to council drainage systems.

Benefits of greywater systems

Surveys have found people generally have a lower understanding of greywater reuse systems than rainwater harvesting systems. Environmental benefits were the most frequently quoted reason in favour of greywater reuse systems.

For households with on-site sewage treatment systems, reusing greywater has the enormous advantage of reducing the volume of liquid waste requiring treatment. This takes pressure off the sewage treatment system, letting it give better performance.

For all houses, greywater can provide a significant volume of water for garden irrigation and/or toilet flushing. This reduces the demand on water from other sources, including town supply where there may be a charge. A drawback is that the storage time for greywater is limited unless the water is treated.

BRANZ monitored water use in 51 Auckland houses and found that, in summer, 17% of water used by a household was for irrigation and other outdoor purposes. A further 18–19% of a household's total water use is in toilet flushing. Reusing greywater for these purposes alone can therefore reduce usage of mains water by over a third.

Where households have no town supply and rely completely on harvested rainwater, reusing greywater means they can save their tank water for potable water needs.

How easily greywater can be reused depends partly on the attitude of the local authority.

Some local bodies make this very difficult, while others are more encouraging. New houses in Kāpiti Coast District Council's jurisdiction must either install a 10,000 L rainwater collection tank or a smaller tank and a greywater system, the latter for garden irrigation.

System design and maintenance

The benefits described above assume that the rainwater harvesting and greywater recycling systems have been competently designed and are well maintained. In particular, keeping the systems clean and replacing filters as required is necessary to keep them operating properly.

More information

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

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

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

Fact sheet 6 *What is holding back rainwater and greywater systems in New Zealand?*

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

BRANZ Facts: *Valuing Sustainability #2 – Cost-effectiveness of water conservation measures and rainwater tanks in New Zealand houses*. November 2016.

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.

Page, I. (2016). *The value of sustainability – costs and benefits of sustainability and resilience features in houses*. BRANZ Study Report SR346. Judgeford, New Zealand: BRANZ Ltd.

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