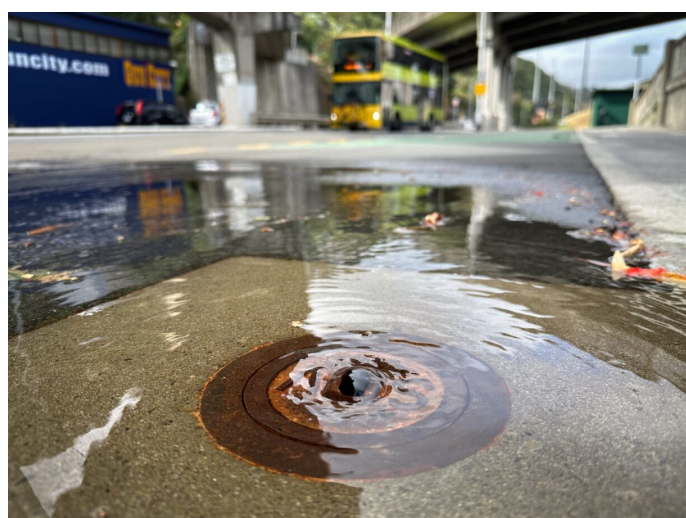


Money down the drain: The high cost of leaking water pipes

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Summary

Access to clean drinking water is one of the most fundamental components of good public health. Leaking water infrastructure poses a threat to this basic necessity and wastes precious funds. In regions where water is metered in Aotearoa New Zealand, we calculate the median price of water charged to households is \$2.13 per cubic meter. Based on this figure, we estimate that the cost of the nearly 20% of reticulated water leaking from pipes is around \$122 million per year. Central and local government need to act to address this wastage and lack of resiliency in the water supply. This includes mechanisms for improved funding of local government, as well as greater use of water metering with equity safeguards.

Introduction

Piped (reticulated) water supply is an extremely efficient way to supply towns and cities with clean water, compared to individual household roof collection. But leakage from such reticulated systems occurs and can be a problem for many reasons (see Box). This Briefing

aims to explore one of these problems: the economic cost of water leakage.

Box: The various health and other problems arising from water system leaks

- **Water contamination:** When a water system leaks, it can create a pathway for contaminants to enter the system. As such “broken or leaking water mains” can cause waterborne disease outbreaks (as reviewed for the United States setting¹). One such outbreak from broken water mains resulted in cases of bloody diarrhoea and four deaths from *E coli* infection.² The risk to public health of reticulation systems running low on water and needing to take “water beyond the conditions of the existing resource consents”, is acknowledged by Aotearoa New Zealand (NZ) authorities.³
 - **Water loss:** The most obvious problem is the loss of water, which can be particularly critical at times of scarcity, often the summer months in NZ localities. At times of water scarcity citizens may have to go out of their way to save water and spend money on storage tanks and purchase of additional water. Water scarcity can also result in drought damage to parks and gardens (including vegetable gardens supplying food).
 - **Economic cost:** Water treatment and distribution involve significant costs – and so leakage is a cost to Councils and rate payers. Water shortages may increase costs to urban businesses and to the peri-urban agricultural sector that is connected to reticulated supplies.
 - **Infrastructure damage:** Continuous leakage can potentially undermine the structural integrity of the water distribution infrastructure. This can be via soil erosion around pipes, destabilising them, and resulting in more significant and costly damages. It can also lead to flooding, slips, or contribute to the deterioration of road and footpath infrastructure (eg, a major slip in NZ in 2023⁴).
 - **Resource diversion/opportunity cost:** Dealing with leakages diverts resources, both human and financial, from other necessary maintenance or improvement projects that local government workers need to attend to.
 - **Trust and credibility impacts:** The inability of Councils to maintain water systems may add to public mistrust in the overall quality and safety of these systems – driving some people to use water filters or buy bottled water. Also, if leakage rates are high, it can make it difficult for these authorities to argue that citizens need to do more to save water during periods of heightened water scarcity.
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Our methods

We took national water leakage volume data from Water New Zealand at 57.058 million cubic metres (m³) in fiscal year 2022.⁵ This amount represents “nearly 20% of all water supplied to networks”. We then multiplied this by our estimate of the median charging price to domestic users in the 14 localities we identified where water metering is used (see Appendix).

Results

The median price being charged to water meter users, in the 14 localities identified around NZ, was \$2.13/m³ and the range was \$1.19 to \$3.40 (see Appendix). Using this median value, we estimate the cost of reticulated water leaking out of pipes nationally at around \$122 million per year. Most of this cost will be related to leakage of Council-owned piping, but some will be due to leaks from piping on people’s property (that these property owners are responsible for).

While this analysis has the benefit of using “real world” water prices set by Councils, it is not clear whether these prices reflect average costs, marginal costs, or if some Councils have used artificially low prices as part of phasing in water meters (see Appendix for further discussion). Regional variation in the economic waste will also vary by levels of leakage eg, Wellington has particularly high leakage rates (at 40-50%⁶).

Another limitation of our analysis is that it uses leakage levels for 2022 and the situation may have got worse more recently in some localities. Also, our analysis doesn't include various other costs from leakage such as infrastructure damage from leaks (see *Box*). It also puts no monetary value on any adverse human health and wellbeing impacts associated with water contamination or water scarcity crises that leakage can contribute to.

What central government, local government and citizens need to consider

This situation with leaking water reticulation in NZ reflects chronic under-investment in basic water infrastructure.⁷ Such problems were also highlighted with the extensive damage to water systems from Cyclone Gabrielle.⁸ While it is encouraging that the new government has announced a \$1.2 billion Regional Infrastructure Fund, this is only a very tiny step toward addressing the country's massive infrastructure deficit of around \$210 billion estimated by Treasury.⁹

Central government: The new Government has recently replaced the former government's “Three Waters” reforms (later renamed “Affordable Waters”). It needs to ensure that the new law effectively allows local government bodies to work collectively to raise low-interest loans to invest in water infrastructure (a key requirement for progress¹⁰). In addition, it probably needs to increase funding for local government, for example by returning some of the locally generated GST revenue to Councils.⁷ In addition, central Government could give Councils the legal capacity to raise their own revenue through a wider range of mechanisms (the Auckland regional fuel tax being a recently abandoned example of this).

Local government: Councils need to expand the use of water metering where this is cost-effective. Meters help identify leaks in the system, including on individual's properties.¹¹ The NZ experience is that metering can reduce water system wastage and lower operational costs.¹² A recent survey indicated that 72% of NZ respondents felt it was fair to pay for water.¹³ To avoid adverse equity impacts,¹¹ charging can begin after a basic free allocation is used, as already done by some Councils (see Appendix).

Citizens: New Zealanders need to elect and hold to account central and local government politicians who have a long-term perspective,¹⁴ and who therefore support building long-term resiliency into basic infrastructure.

What's new in this *Briefing*

- Using real-world pricing data for NZ, the estimated cost of reticulated water leaking from pipes nationally is \$122 million per year (for an estimated national leakage level of nearly 20%).
- Some of the many problems associated with leaking water supply systems are highlighted.

Implications for public policy and practice

- Central government needs to ensure that local government can efficiently raise low-interest loans to invest in water infrastructure, along with other mechanisms to increase funding for local government.
- Local government needs to expand the use of water metering where this is cost-effective and with a free base allocation to protect equity.
- Citizens need to elect central and local government politicians who have a long-term perspective and who support building resiliency into basic infrastructure.

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Appendix

Additional notes on the limitations of this analysis

This analysis is somewhat simplistic as we did not perform in-depth research to determine if the water metering prices used by various Councils are based on average costs, or marginal costs, or if some Councils have used artificially low prices as part of phasing in water meters. To explain the relevant issues in more detail:

Average cost: This is the total cost of producing a certain quantity of water divided by that quantity. It includes both fixed costs (ie, water supply infrastructure, pipe maintenance and treatment facilities) and variable costs (ie, energy for pumping and treatment with chlorine and adding fluoride). As more water is produced, the average cost will typically decrease due to economies of scale. When leakage rates are around half of all water supplied (eg, as per Wellington in 2024), there can be a case for using the average cost in costing analyses, rather than the marginal cost.

Marginal cost: This is the cost of producing one additional unit of water and it primarily includes variable costs, while being less affected by fixed costs. In a well-managed water

reticulation system, the marginal cost will typically be lower than the average cost, especially when the system is operating below its maximum capacity. When leakage rates are low, this would be the most relevant cost to use in costing analyses.

Under capacity utilisation: If the water reticulation system is operating under its full capacity, the marginal cost may be lower than the average cost. That is, additional water production can be achieved without significant increases in fixed costs, and the variable costs are typically relatively low.

Over capacity utilisation: If the system is operating at or near full capacity, the marginal cost can rise sharply. This is because producing additional water might require significant investment in expanding the system's capacity or incurring higher operational costs. This situation may be relevant to some NZ cities where the population is expanding and where new water sources need to be added in (eg, when Auckland needed to add the Waikato River water to its reticulation system in 2002).

Water metering charges in localities around NZ

Table A1: Localities with water meter charging for domestic users (based on Water New Zealand documents,¹⁵¹⁶ media searches, and searches of Council websites covering the 10 largest urban population centres)

Local government entity	Water metering charges (\$ per m ³)	Comments / data sources
Auckland City	\$1.998	https://wslpwstoreprd.blob.core.windows.net/kentico-media-libraries-prod/watercarepublicweb/media/watercare-media-library/fees-charges/domestic_charges.pdf
Carterton District	\$1.90	For usage greater than 225 m³ per year (the annual allocation of water). https://cdc.govt.nz/your-council/fees/
Christchurch City and Banks Peninsula	\$1.35	For every 1000 litres used over the average limit of more than 900 litres a day per household. https://ccc.govt.nz/services/water-and-drainage/water-supply/water-reporter/watercharges
Hamilton City	\$1.95	https://hamilton.govt.nz/your-council/fees-and-charges/water-supply/
Kapiti District	\$1.19	https://www.kapiticoast.govt.nz/services/a-z-council-services-and-facilities/waters/water-supply/metering/reading-your-meter/
Nelson City	\$2.345	For the 0-10,000 m ³ per year range of use (with different rates for higher usage). https://www.nelson.govt.nz/services/fees-and-charges/#watercharges
New Plymouth District	No charge yet	Meters are currently being rolled out. Charging to start in 2024/2025. https://www.npdc.govt.nz/home-and-property/water-wastewater-and-stormwater/water/water-meters/
Rangitikei District	\$2.42	For: Marton, Taihape, Ratana, Bulls and Mangaweka. https://www.rangitikei.govt.nz/files/general/Fees-Charges/Schedule-of-Fees-and-Charges-2023-2024.pdf
Tasman District – excluding Motueka	\$3.16	For urban metered water connections. https://www.tasman.govt.nz/my-property/rates/how-rates-are-set/
Tasman District – just Motueka	\$3.37	See above.
Tauranga City	\$3.40	https://www.tauranga.govt.nz/living/property-and-rates/water-rates#:~:text=How%20are%20water%20rates%20charges,2023%20to%2030%20June%202024
Waikato District	\$2.27	https://www.waikatodistrict.govt.nz/services-facilities/water/water-supply/water-meters/how-much-am-i-charged-for-water
Waipa District	\$1.8141	https://www.waipadc.govt.nz/repository/libraries/id:26zg4o7s1cxbyk7hfo7/hierarchy/our-services/rates/ratingvaluation/documents/Waip%C4%81%20District%20Council%20Rates%202023-24.pdf
Western Bay of Plenty District	\$1.24	https://www.westernbay.govt.nz/transportation-roads-and-water/water/water-meters-and-charges
Whangarei District	\$3.21	Standard domestic charge. https://www.wdc.govt.nz/Council/Council-documents/Fees-and-Charges/Water-Fees
Median of the above	\$2.13	For all 14 localities above. Used in our calculations of the national cost of water leakage.
Average of the above	\$2.26	For all 14 localities above.

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