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Residential water tariffs in New Zealand

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Abstract

Freshwater in New Zealand is considered to be abundant by international standards, due to the plentiful rainfall experienced across the country and the comparatively low population density. Yet there is very little information in New Zealand about how we use water in the home. Aside from that, there are 67 territorial authorities (unitary authorities, city and district councils) charging for water services through a variety of mechanisms, making it difficult to compare how the supply of water is charged across New Zealand.

Whilst geographically close, the tariff structures and charging mechanism used by territorial authorities (the water service providers) are independent of each other and can vary significantly within the same region.

The majority of residential properties in New Zealand are not metered, and the predominant form of charging is by way of a targeted fixed rate. For those properties that are metered, a combination of fixed and volumetric charges is the most common approach. Of those councils that implement residential metering, just over half implement an extraordinary water use charge.

Wastewater charging follows a similar trend, with targeted fixed rates accounting for the majority of charging throughout the country. Stormwater, however, is more variable with either targeted fixed rates, incorporating the charge into the general rates, or variable rates using cost per capital value being used across the country.

Keywords

Residential water use, water services, water meters, metering, water supply tariffs, charges, drinking water, potable, wastewater, stormwater.

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Glossary

City council	City councils in New Zealand have the same function as district councils but serve a population of over 50,000.
Council-controlled organisation	Any organisation in which one or more local authorities owns or controls 50% or more of the voting rights or has the right to appoint 50% or more of the directors, trustees and so on.
District council	District councils in New Zealand have the same function as city councils but serve a population of less than 50,000.
Regional council	A regional council is one type of local authority. Regional councils' responsibilities include: • managing the effects of using freshwater, land, air and coastal waters • developing regional policy statements and the issuing of consents • managing rivers, mitigating soil erosion and flood control • regional emergency management and civil defence preparedness • regional land transport planning and contracting passenger services • harbour navigation and safety, oil spills and other marine pollution. Some district and city councils also have the powers of regional councils. These are referred to as unitary authorities.
SUIP	Separately used or inhabited part of a rating unit.
Territorial authority	This is a type of local authority. They are unitary authorities, city or district councils, and there are no differences in the way that they operate. Territorial authorities' responsibilities include: • the provision of local infrastructure, including water, sewerage, stormwater, roads • environmental safety and health • district emergency management and civil defence preparedness • building control • public health inspections and other environmental health matters • controlling the effects of land use (including hazardous substances, natural hazards and indigenous biodiversity) • noise • the effects of activities on the surface of lakes and rivers.
Unitary authority	A unitary authority is a territorial authority that has the responsibilities, duties and powers of a regional council conferred on it. This is either by the provisions of any Act or by an Order in Council giving effect to a reorganisation scheme. There are six unitary authorities in New Zealand: Auckland, Nelson City, Gisborne District, Marlborough District, Tasman District and Chatham Islands Councils.

1. Introduction

Freshwater has been described as New Zealand's most valuable asset (Ministry for the Environment, 2016). Access to clean water is considered a fundamental human right (United Nations, 2010).

Freshwater in New Zealand is largely considered to be abundant by international standards due to plentiful rainfall experienced across the country and comparatively low population density (Ministry for the Environment, 2007). Annual rainfall and snowfall contribute 500,000 million cubic metres of water in total (New Zealand Business Council for Sustainable Development, 2008), of which 2% (10 trillion litres) is extracted (New Zealand Government, 2017). Freshwater availability per capita is ranked fourth amongst members of the Organisation for Economic Co-operation and Development (OECD) (New Zealand Institute of Economic Research, 2014). However, water availability in New Zealand is spatially and temporally variable. It has been reported that New Zealand uses two to three times more freshwater per capita than other OECD countries (Ministry for the Environment, 2007).

In accordance with the Resource Management Act 1991 (RMA), most abstractions from either groundwater or surface water stocks require a resource consent. There are over 20,500 consented freshwater abstractions in New Zealand, and approximately 200 of these are for non-consumptive uses such as hydroelectricity generation (Ministry for the Environment, 2010b). Figure 1 shows the breakdown of consent applications by region and primary use.

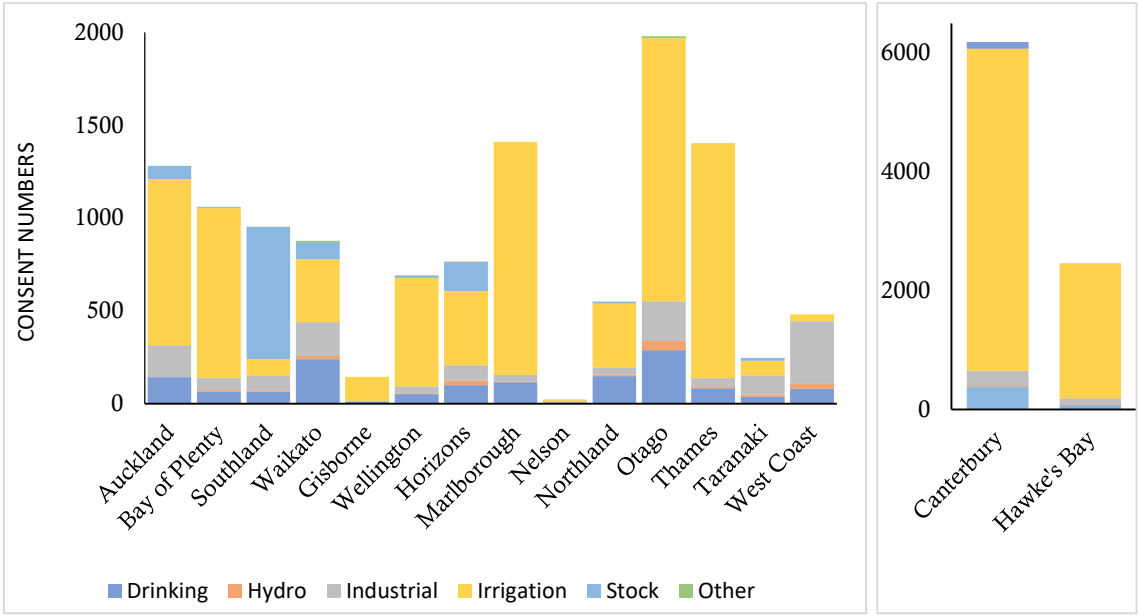

Figure 1. Consent numbers by region and primary use (2009/10) (Ministry for the Environment, 2010b).

Figure 2 shows a summary of how this freshwater is distributed across the main water user groups in New Zealand. Irrigation accounts for the majority of consents at 75%, followed by drinking water and water for industrial purposes at 9% each.

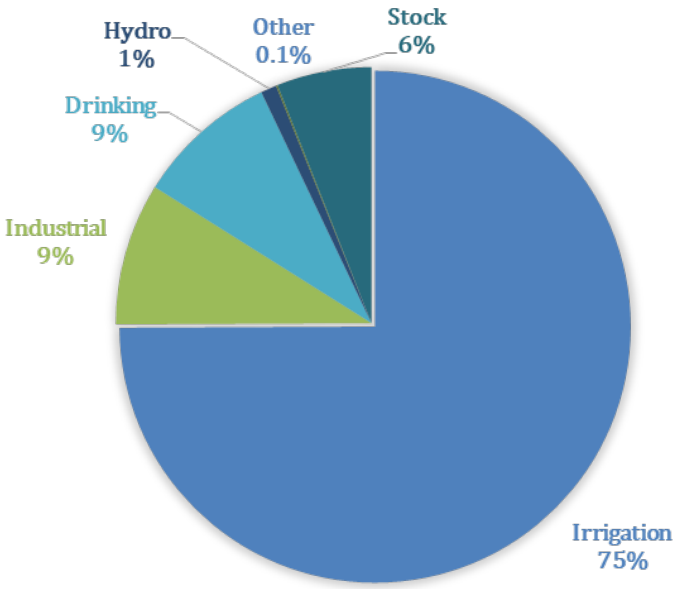

Figure 2. A summary of water abstraction consents by use (2009/10) (Ministry for the Environment, 2010b).

The total annual allocation for consumptive use across New Zealand is nearly 27 billion cubic metres per year (Bm^3/year).[1] Overall, allocations including non-consumptive abstractions account for 193 Bm^3/year.

1.1 The provision of water services in New Zealand

The management of New Zealand's freshwater resource is ultimately controlled by the Crown. Yet there is some debate as to who, if anyone, has ownership of the water resource (Waiology, 2013). At an institutional level, it is acknowledged that no one owns water, and there is currently no fixed cost or price allocated to the physical resource of water itself. Whilst water is widely considered free, the infrastructure required to provide water in an adequate quality for human consumption can be costly to install and has ongoing maintenance costs. The provision of urban water services is mandated by complex statutory frameworks (Water New Zealand, n.d.). It is the RMA that allows local councils, who have authority over water allocations, to charge for water services to recover the costs involved in treating, transferring, maintaining and operating water infrastructure through the Local Government (Rating) Act 2002.

In essence, water is a free resource, but when it is acquired, treated and transferred directly to consumer taps as safe drinking water or safely disposed of as wastewater, consumers are required to pay for this service much like any other service – for example, electricity.

Water service providers in New Zealand are responsible for the provision of drinking water as well as wastewater and stormwater disposal, commonly referred to as the three waters. On a per capita basis, New Zealand has a large number of water service

[1] Southland's water consumption is dominated by a single hydropower plant that discharges directly to the ocean. For the most part, hydroelectric abstractions in New Zealand are non-consumptive as the water is returned to source.

providers and treatment facilities. The Ministry of Health requires a register of drinking water suppliers to be published annually. In 2017, the register documented 977 suppliers (Table 1):

Table 1. Registered drinking water suppliers at 4 April 2017 (Ministry of Health, 2017).

	Suppliers	Supplies	Population
Network suppliers	284	685	3,815,731
Specified self-suppliers	693	789	106,973
Total	961*	1,474	3,922,704

*Total is less than the column sum because a supplier's supplies can span multiple categories.

In general, the provision of water supply and sanitation in New Zealand is provided by local government. Around 87% of the population receives drinking water from local authorities, in particular, the territorial authorities (Controller and Auditor-General, 2010). In urban centres, this responsibility falls to each of the 11 city councils and, in rural centres, to each of the 50 district councils and/or the six unitary authorities in charge of water supply and sanitation (Local Government New Zealand, 2017) (Figure 3). The majority of councils provide these services directly. Exceptions are Auckland and Wellington who use council controlled-organisations to deliver their water services. In Auckland, water and wastewater service delivery is managed by Watercare, an asset-owning entity that reports to Auckland Council (who have retained stormwater management responsibilities). In Wellington, drinking water, wastewater and stormwater assets are managed by Wellington Water on behalf of Wellington City, Upper Hutt City, Lower Hutt City, Porirua City and Greater Wellington Regional Councils, who retain ownership of their assets.

In some rural areas of New Zealand communities are independent from the network and therefore collect rainwater for water supply and use septic tanks for sewage disposal.

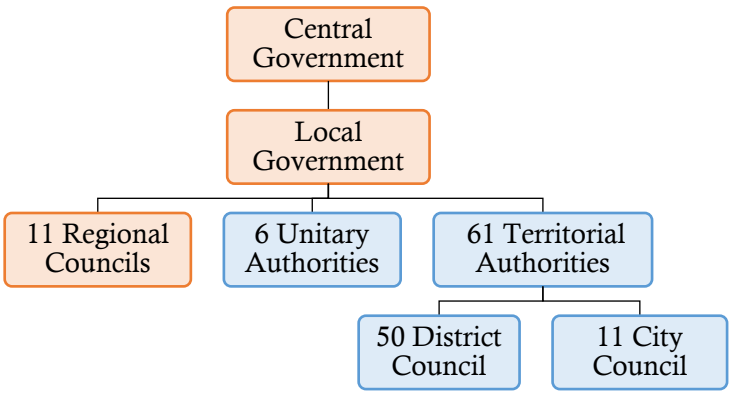

Figure 3. Hierarchy of government in New Zealand. Blue indicates those responsible for water service provision.

Figure 4 indicates the regional and district boundaries observed in New Zealand. In regard to freshwater management, regional councils are in charge of managing the effects of using freshwater and development of policy, whilst district and city councils are responsible for provision of adequate infrastructure (Department of Internal Affairs, 2011b).

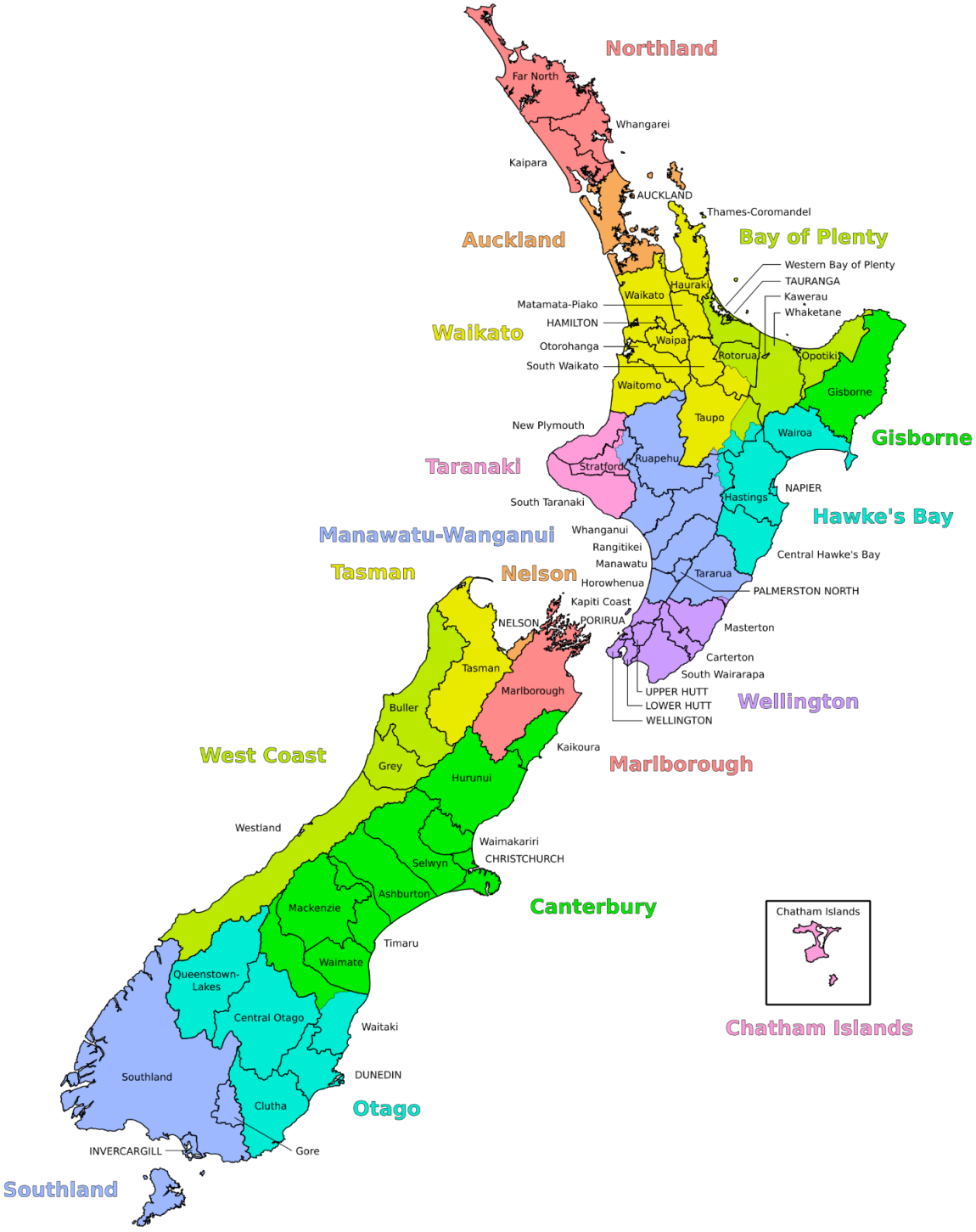

Figure 4. Map of New Zealand regions (coloured) with territorial authorities delineated with black lines. City names are upper case and district names have initial capitals.

2. Water tariffs

Water is a human right, but it is also an economic good (Kropac & Ricato, 2010). Water tariffs are economic tools used around the world. Tariffs do not account for the price of the water itself (these occur in a few countries and are called water abstraction charges) but for the cost of the infrastructure and ongoing maintenance required to provide water to homes and businesses. Tariffs also apply to the disposal of wastewater and stormwater. A water supply tariff can be an important tool for resource management. It can be used to promote economically and environmentally sustainable water use. As with all economic tools, behaviour change occurs because there is a desire to achieve maximum benefits at minimal costs (Kropac & Ricato, 2010). In some instances, however, water tariffs are set too low to account for ongoing maintenance costs. This requires subsidies to maintain the necessary infrastructure or results in a loss of supply (World Health Organization, 2000).

2.1 The principles of water tariffs

According to the National Water Supply and Sanitation Council (2010), there are six key principles that should be accounted for when developing an appropriate tariff for water supply (Figure 5), these are:

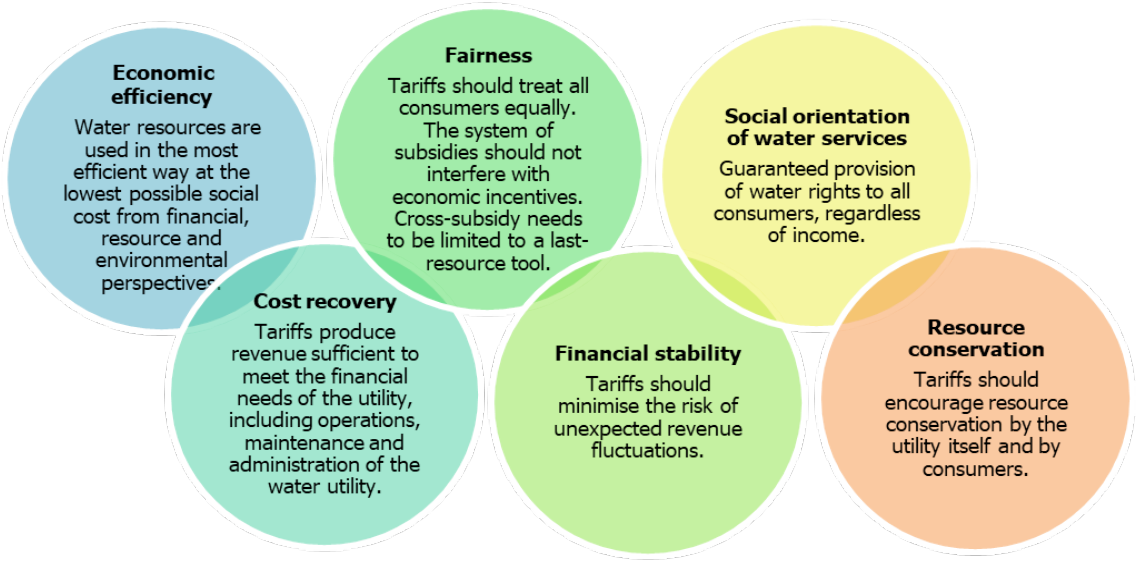

Figure 5. The six key principles of tariff setting (National Water Supply and Sanitation Council, 2010).

Setting a charge for water services is a complex task. There are many key stakeholders that are affected, and setting a tariff that is suitable for all can result in a system that is socially, environmentally and economically sustainable. Figure 6 examines how high the price of water services should be.

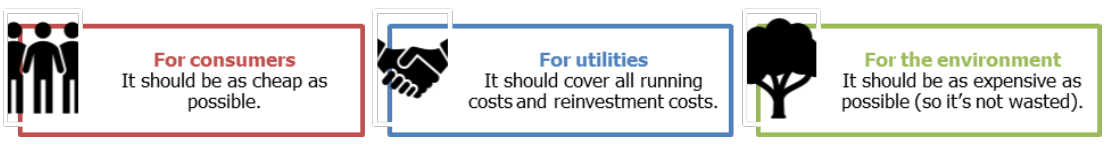

Figure 6. How high should the price for water be? (Kropac & Ricato, 2010).

2.2 Tariff structures

There are many different strategies and mechanisms employed across the globe for water tariffs. However, there is no consensus on which tariff structure best balances the objectives of the utility, consumers and society (Kropac & Ricato 2010). The type of tariff best suited to a particular place depends on a range of factors, and what works for one area may not work for another. Some of the key charging strategies are discussed below. Figure 7 shows types of tariff structures commonly adopted by utilities:

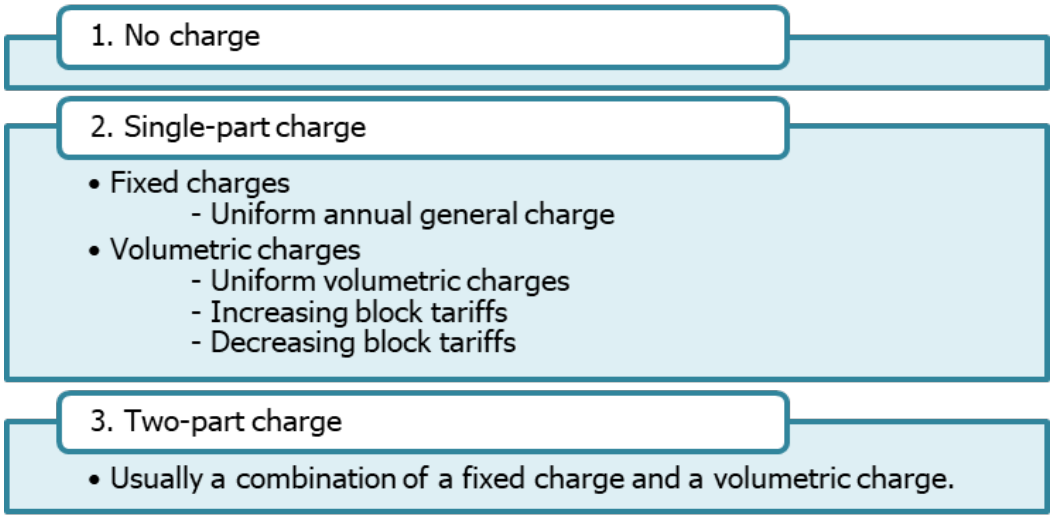

Figure 7. Types of tariff structures commonly adopted by utilities (Kropac & Ricato 2010).

2.2.1 No charge (free access)

Where there is no charge, water is essentially a free resource. The cost of infrastructure and maintenance involved in the supply of water is covered by the local government. As there is no charge for water, there is no requirement for metering in these regions. The advantages and disadvantages of using a free access model can be seen in Table 2.

Table 2. Advantages and disadvantages of no water charging (Kropac & Ricato, 2010).

Advantages	Disadvantages
Water is available for all users regardless of income.	There is no emphasis on the value of water, nor are there any incentives for conservation.
No metering and low administrative overheads.	Cost recovery is impossible, thus the risk of deteriorating services and disruptions to supply are high.

Blue is directly related to utilities, red the consumer and green the environment.

In Australia, where free allocations were removed and replaced with a two-part tariff structure, a consistent pattern of reduced water consumption was observed (National Water Commission, 2011). This charging mechanism does not exist in New Zealand and will not be discussed further in this report.

2.2.2 Single-part charge

Fixed charges

Uniform annual general charges

A uniform annual general charge (UAGC) is a fixed charge applied to every rating unit (Department of Internal Affairs, 2011a). A UAGC, for example, applies to buildings that are not charged based on consumption and/or are not metered. Instead, they pay an annual supply cost, based on a flat fee within the annual rating valuation system. In most cases, this will be one of the following:

- A fixed charge regardless of property value or size.
- A percentage of the capital value for the property.
- A percentage of the land value for the property.
- A cost per number of pans (i.e. a charge per number of toilets in a property), which is usually for wastewater only.

The advantages and disadvantages of having a UAGC are shown in Table 3.

Table 3. The advantages and disadvantages of having a UAGC (Kropac & Ricato, 2010).

Advantages	Disadvantages
There are no requirements for water metering systems so are easy to administer.	There is no emphasis on the value of water, nor are there any incentives for conservation.
Provides a stable and steady cash flow (if set at an appropriate level).	Cost recovery difficult if charge is set incorrectly.
	In developing countries, in particular, water might be sold at a higher price by street vendors

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In New Zealand, the UAGC is incorporated into the annual council rates to ensure that each ratepayer makes a minimum contribution to council services (Water New Zealand, 2017).

Volumetric charges

Uniform volumetric charges

A uniform volumetric charge means the charge per volume of water will remain the same regardless of how much water is consumed. Figure 8 shows an example of a fixed volumetric charge where the charge is consistently \$1.30 /m^3.

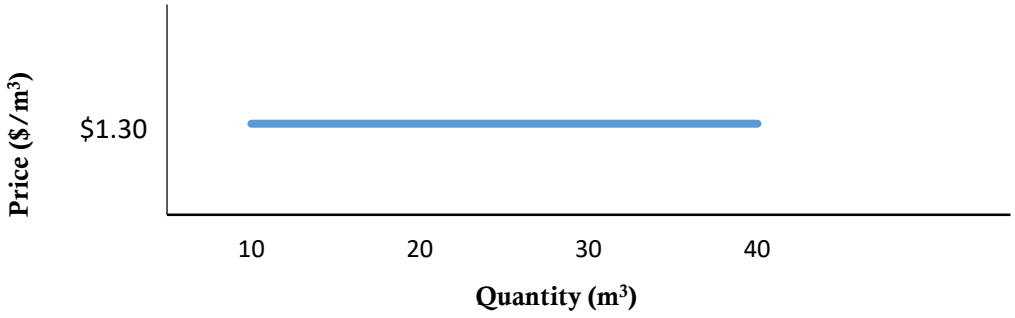

Figure 8. An example of a fixed volumetric charge.

This type of tariff system is often combined with a basic fixed charge (such as a UAGC) and is most common in OECD countries (Kropac & Ricato 2010).

The advantages and disadvantages of using a fixed volumetric charge can be seen in Table 4.

Table 4. The advantages and disadvantages of having a fixed volumetric charge (Kropac & Ricato, 2010).

Advantages	Disadvantages
Simple, relatively easy to administer.	Rich and poor pay the same price for water indifferent of their ability to pay
Provides stable cash flow if set at an appropriate level.	High initial cost if metering is installed.
People can limit their bills by reducing consumption, acting as an incentive to reduce water use and improve water conservation.	

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Increasing block tariffs

Increasing block tariffs are a method of volumetric charging. They are based on the premise that those who consume more water pay a higher rate than those who use less water (Kropac & Ricato, 2010).

An increasing block tariff system is based on blocks of water use. As the volume of water consumed increases, so does the cost but at set volumetric thresholds. Often the lowest block threshold is set to allow for affordability of the lowest-income households. This method is used, for example, in some states of Australia such as Victoria.

Figure 9 shows that, as the volume of water consumed increases, so too does the price per unit of water (m^3).

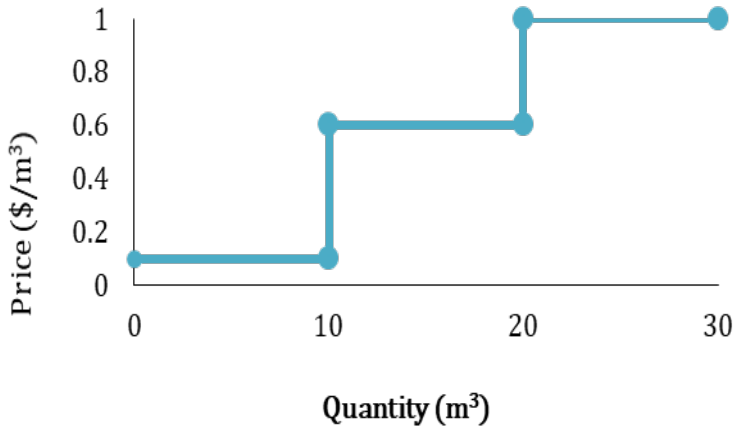

Figure 9. An example of an increasing block tariff system (Kropac & Ricato, 2010).

The advantages and disadvantages of using an increasing block tariff structure can be seen in Table 5.

Table 5. Advantages and disadvantages of increasing block tariffs (Kropac & Ricato, 2010).

Advantages	Disadvantages
Ensures cost recovery if the block sizes are well designed.	Tariff design is complex.
Lower-income households connected to the network are assured affordable water.	Difficult to implement, especially if there is no metering in place.
Promotes water conservation, as those that use more pay more.	Consumers do not pay based on the effect their water use has on the utility (only the volume of water used).
	May penalise lower-income households with more people and/or a shared connection.

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Decreasing block tariffs

Decreasing block tariffs work on the opposite premise as the increasing block tariffs. When a decreasing block tariff structure is in place, the cost of water decreases with increasing consumption.

There is a trend to move away from this type of tariff structure as it promotes higher levels of water consumption.

In some regions that suffer from water scarcity, this can be harmful to both the environment and to the future sustainability of the resource (Kropac & Ricato, 2010).

Figure 10 shows that, as the volume of water used increases, the price per unit of water (m^3) decreases, thus making it cheaper to consume more water.

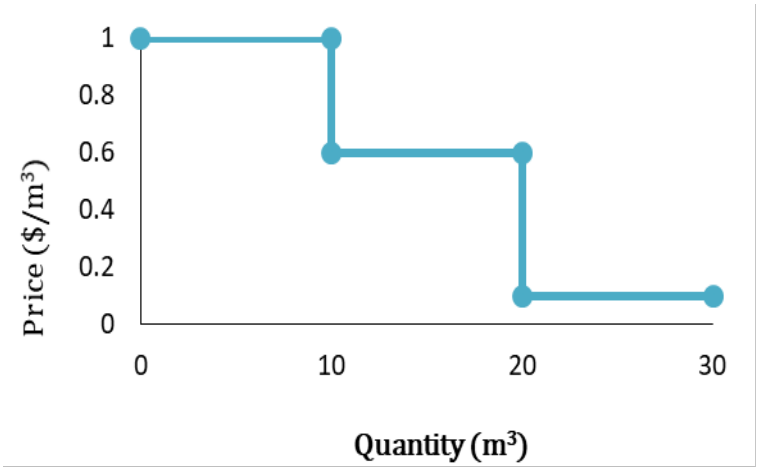

Figure 10. An example of a decreasing block tariff system (Kropac & Ricato, 2010).

The advantages and disadvantages of using a decreasing block tariff structure can be seen in Table 6.

Table 6. Advantages and disadvantages of decreasing block tariffs (Kropac & Ricato, 2010)

Advantages	Disadvantages
Allows cost recovery if the size and height of the blocks are well designed.	Encouraged to use more water, putting pressure on the resource.
Advantageous for bulk consumers.	Penalises those with low consumption (usually lower-income households).
	People do not pay according to the cost their water consumption puts on the water utility itself, merely on the volume of water consumed.

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2.2.3 Two-part charge

Combined charges

Combined charging mechanisms usually have a fixed charge component plus a variable charge depending on the volume of water consumed. As an example, a residential property in a metered area could be charged a UAGC. The volume of water consumed (m^3) could then be added to this and billed on a monthly, quarterly or annual basis. Two-part tariffs are promoted by the World Bank (Olivier, 2006). The advantages and disadvantages of using a combination of fixed and volumetric charging can be seen in Table 7.

Table 7. The advantages and disadvantages of having a fixed plus a uniform rate.

Advantages	Disadvantages
All units (m^3) are priced at the same rate, independent of total consumption so it's relatively easy to administer.	There is limited incentive for higher water users to reduce/monitor their water consumption.
Stable cash flow (if set at an appropriate level).	Can require a metering system, which has a high initial cost.
Pay for what you use (social equity).	The same rate per unit of water is applied regardless of household income and ability to pay.
There is a conservation incentive. People reduce their water bills by reducing the volume (m^3) of water they consume.	

Blue is directly related to utilities, red the consumer and green the environment.

2.3 How do tariffs affect pricing?

The type of charging mechanism has an effect on how much is charged for water consumption. Figure 11 shows the price of water versus the quantity of water used for selected tariffs alongside the monthly water bill versus the quantity of water used. For some tariff structures such as the increasing block tariff structure, the cost of increased water consumption is shown as an increase in the monthly water use bill. Tariff structures such as the uniform charge show a gradual increase in cost as the volume of water use increases. Depending on the tariff structure imposed, the effect of a user's water bill can vary depending on usage.

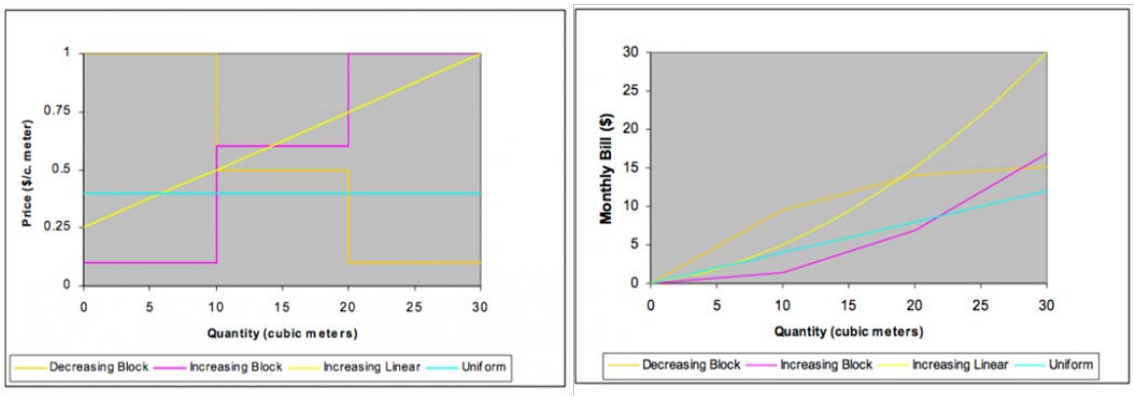

Figure 11. The price of water versus the quantity of water used for selected tariffs alongside the monthly water bill versus the quantity of water used for selected tariffs (Whittington, 2006).

2.4 International examples

There is no standardised method for setting an appropriate water tariff, because the methods for developing water tariffs and charges are location specific. Thus, there is a lot of variation in both methods and charges internationally and within a country. During 2007/08, the OECD and Global Water Intelligence (GWI) conducted a survey of 184 utilities in OECD countries, looking at the differing tariff structures employed (Organisation for Economic Co-operation and Development, 2009). The results can be seen in Figure 12, where most utilities sampled used an increasing block tariff structure, followed by a combination of volumetric and fixed charges.

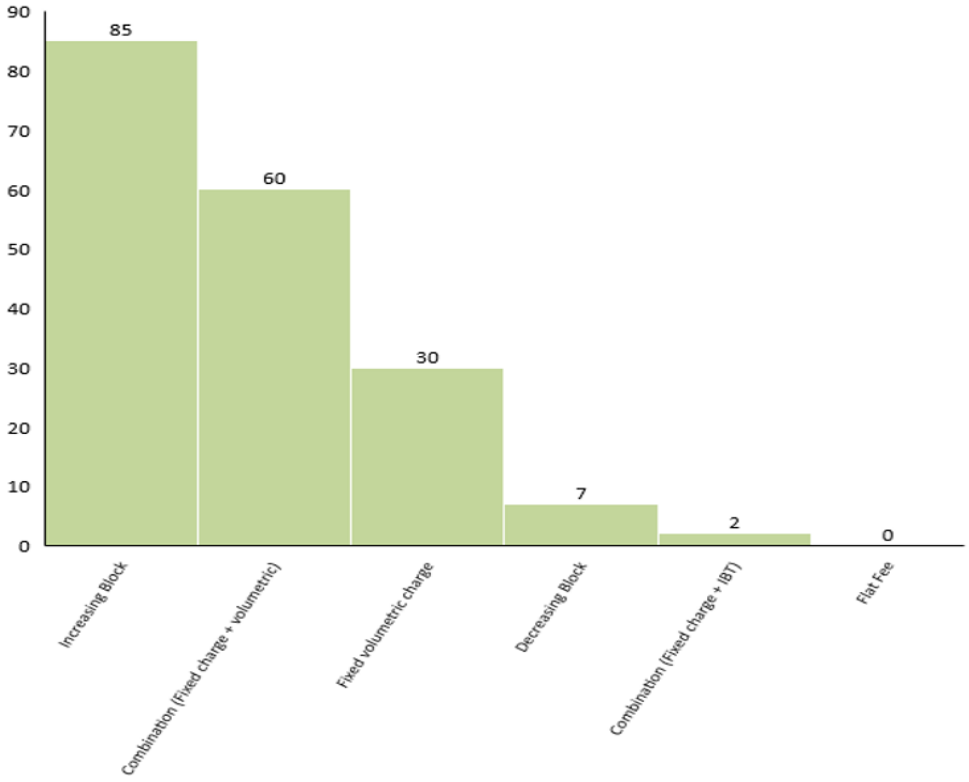

Figure 12. Water tariff structures of 184 utilities in the OECD (Organisation for Economic Co-operation and Development, 2009).

It should be noted that this survey found no utilities used a flat fee. However, the use of flat fees is still reported to be used in Canada, Mexico, New Zealand, Norway and the United Kingdom, despite not appearing in the survey (Organisation for Economic Co-operation and Development, 2009).

A study of 308 cities in 102 countries found that higher water tariffs are correlated with lower per capita consumption, smaller local populations, lower water availability, higher demand and a lower risk of shortage (Zetland & Gasson, 2013).

3. New Zealand's water resource

3.1 Legislative background

It has been suggested there may be up to 130 separate pieces of legislation that affect urban water systems and water services in New Zealand. At least 60 Acts of Parliament affect the water supply or drainage of individual localities (Parliamentary Commissioner for the Environment, 2000). Figure 13 indicates how legislation affects different parts of a typical system for supplying people with drinking water. Interactions between various legislations can be seen. For example, the act of resource extraction is legislated by the RMA, the installation of infrastructure in the home is legislated by the Building Act 2004 and water quality is mandated by the Ministry of Health.

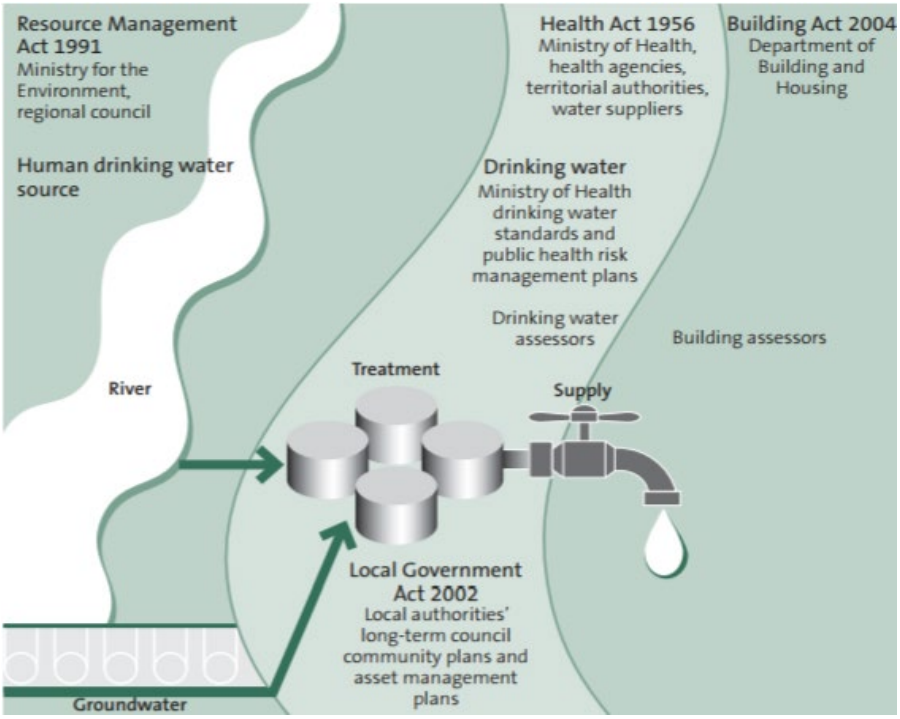

Figure 13. Legislation across the drinking water system, adapted from Ministry for the Environment (2009)[2].

To abstract water in New Zealand generally requires a resource consent under the RMA. The exceptions to this are scenarios which are deemed permitted activity. These include water takes for domestic use, firefighting and stock drinking water. Anyone undertaking water abstractions that exceed 5 litres per second is required to install a meter and provide a continuous record of water abstraction to their regional council (Ministry for the Environment, 2010a). In New Zealand, the charging powers of local government bodies that allow them to recover the operational and maintenance costs

[2] The Department of Building and Housing refers to the now Ministry of Business, Innovation and Employment

of waste and wastewater services is set out in the Local Government (Rating) Act (2002), with the main charging options of:

- general rating
- flow-based charging
- uniform annual charges
- pan charges (i.e. a charge per toilet).

3.2 Freshwater allocation

New Zealand, through the RMA, has a first in, first served policy when it comes to the allocation of freshwater. In 2008, the New Zealand Business Council for Sustainable Development estimated that, by 2012, all the available freshwater resource in New Zealand's most economically significant regions would be fully allocated. They continued to project that, when this happens, the only way for people to secure a right to water would be through purchasing of land with an existing water right (New Zealand Business Council for Sustainable Development, 2008). The sale of water via permit trading is currently practised in some areas of New Zealand.

The first in, first served approach to water allocation in New Zealand has been reported to have two main drawbacks. Firstly, it allocates water on the basis of who applies first and does not consider who can make the best use of the water resource. Secondly, it is inflexible because it does not provide a mechanism to reallocate water, either through administrative transfer or market transactions. It is summarised that a poor initial allocation with little flexibility leads to inefficient water use across New Zealand and a reform of the initial water allocation mechanisms is required (New Zealand Institute of Economic Research, 2014).

Figure 14 shows the allocation pressures in rivers across New Zealand. Regions such as Canterbury and Southland are reaching the limits of availability for surface freshwater.

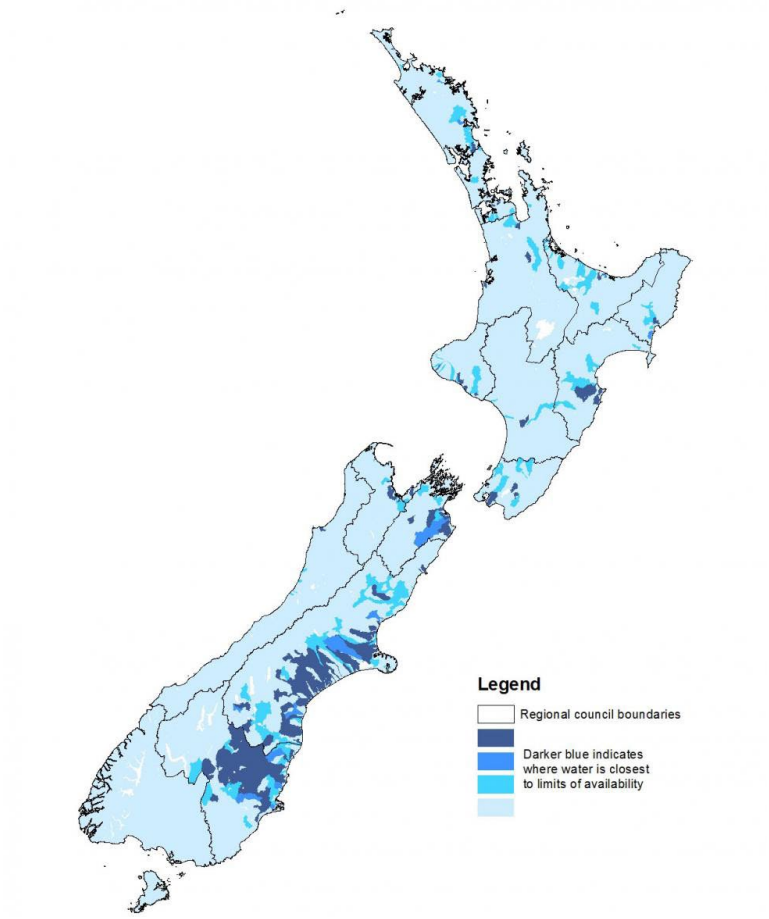

Figure 14. Potential allocation pressure for surface freshwater (Ministry for the Environment, 2013).

Due to inconsistent data on the actual water abstractions at a national level, the consented volume of water is used as an indicator of the potential impacts of freshwater abstractions on New Zealand rivers (Ministry for the Environment & Stats NZ, 2017). However, in 2010, research was conducted that estimated the actual use of water, per region, based on consented abstractions data. It was found that, on average, 65% of a region's maximum consented water use was physically abstracted (Ministry for the Environment, 2010b). This varied per region, as can be seen in Figure 15. Therefore, whilst some catchments in New Zealand are reaching overallocation, the actual volume consumed is potentially much less than the volume allocated.

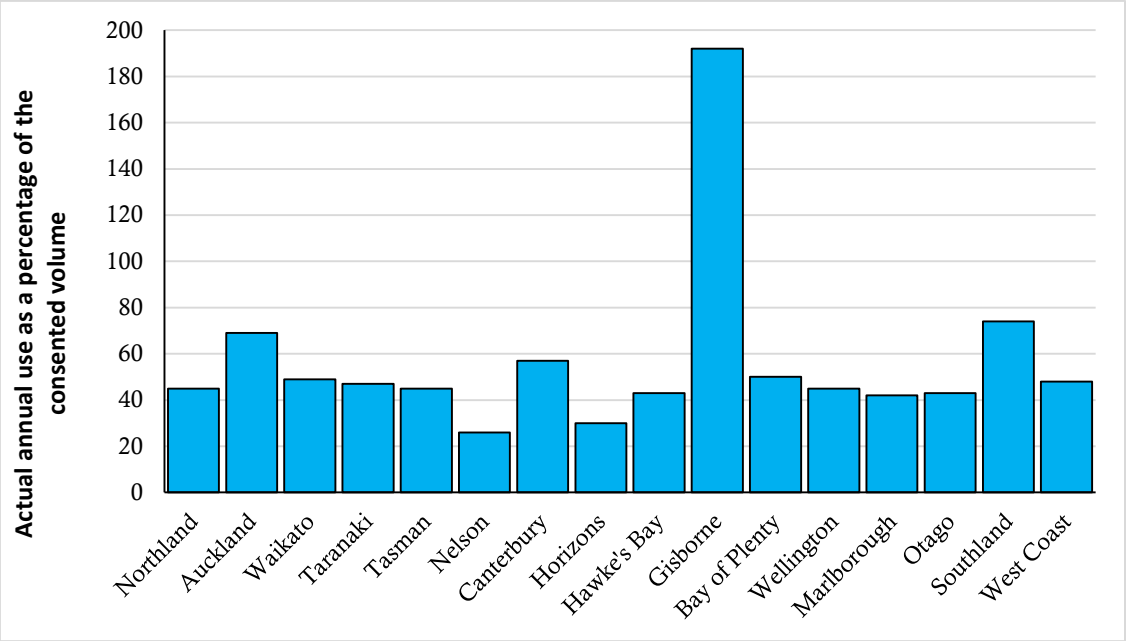

Figure 15. Annual water use as a percentage of the consented volume, per region (Ministry for the Environment, 2010b).

3.3 Residential water metering in New Zealand

Charging for the service of water provision to New Zealand homes and businesses is in most instances a fixed charge administered through council rates. However, in some centres where there is universal metering, water is charged volumetrically based on the measured amount consumed by a rating unit. Of the participants that contribute towards the National Performance Review (Water New Zealand, 2017), for the 2015/16 period, 19% reported universal water metering (100% coverage) of residential connections. A further 68% of water service providers had less than 50%-meter coverage of residential properties. The percentage of residential connections with meters for participating water service providers can be seen in Figure 16.

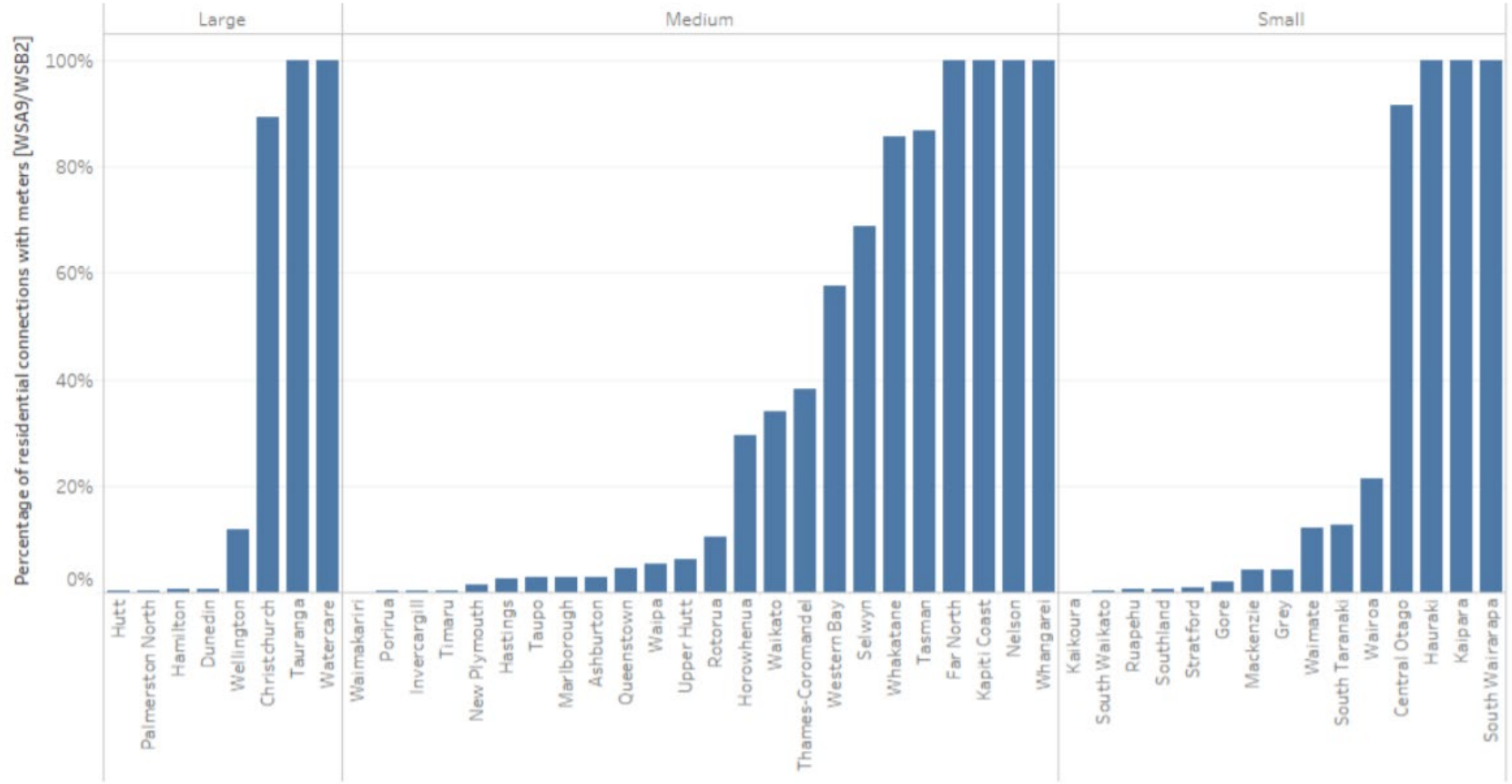

Figure 16. Residential water metering coverage (Water New Zealand, 2017).

It has been reported that the number of participating councils with water meters on residential properties is increasing. The National Performance Review reports that, for the 2016/17 period, 12,000 residential water meters were added to participants' systems. It is reported that, in addition to water metering, 20 councils across New Zealand have also installed 25,770 water restrictors to their systems (Water New Zealand, 2018).

3.4 Revenue versus expenditure

In 2009, the infrastructure used to provide clean drinking water was valued at NZ$11 billion. For the years 2009–2019, local authorities' average annual operational expenditure for supplying drinking water was projected at NZ$605 million and average annual capital expenditure at NZ$390 million (Controller and Auditor-General, 2010).

In Water New Zealand's 2016/17 National Performance Review, the total revenue generated by the 50 participating councils was $1.8 billion. It is reported that the majority of revenue was collected as operational revenue through rates or direct charges for services (Water New Zealand, 2018). Figure 17 shows how reliant each of the council-led water services are on water rates. For most of the water service providers over 50% of their water revenues are derived from their rates charges (Local Government New Zealand, 2014).

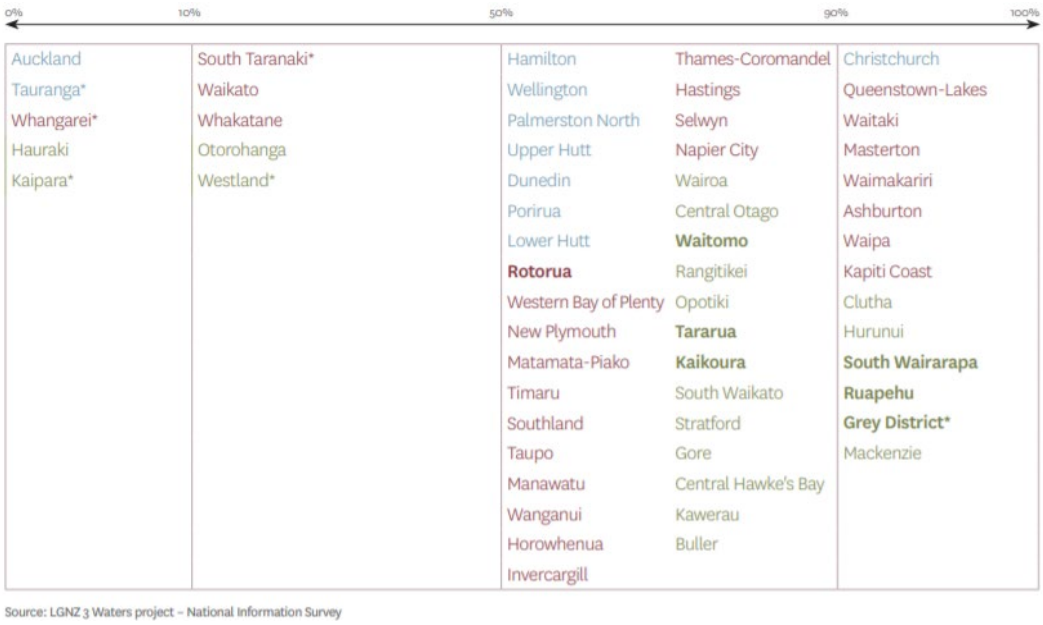

Figure 17. Councils' reliance on rates as a percent of water revenues – blue = metro, red = provincial, green = rural councils) (Local Government New Zealand, 2014).

For the same period, participating councils reported NZ$2 billion of expenditure on the three-water networks, suggesting a deficit of approximately NZ$200 million between revenue and expenditure. Of the NZ$2 billion of expenses, nearly 10% is reported to be related to interest payments (Water New Zealand, 2018). For the 2015/16 period and concerning only those water service providers that contribute towards the National Performance Review, NZ$810 million was spent on operational expenditure across the three-water networks. Capital expenditure totalled NZ$978 million.

4. Residential water tariffs in New Zealand

In New Zealand, there are a range of water tariff structures and charging mechanisms, and their use varies between water service providers. As discussed in section 2.2, there are multiple ways that water services can be charged, including free allocations, fixed charges, increasing/decreasing block tariffs and combined charging.

Under the Local Government (Rating) Act 2002, water service providers in New Zealand can recover the cost of water provision. Charging mechanisms can include targeted rates, general rates and variable rates – for example, based on dollar per capital value of a separately used or inhabited part of a rating unit.

The impact of the variation in charging mechanisms across New Zealand is that it is difficult to make accurate price comparisons between councils and sometimes districts (Water New Zealand, 2017).

As the majority of New Zealand's residential water use is not metered, it makes it difficult to gain an accurate understanding of how water use varies between regions.

Figure 18 through to Figure 21 bring together rating information from respective council's annual plans and long-term plans (in some instances) to compare tariff structures and charging mechanisms for potable (drinking) water, wastewater and stormwater.

All councils were contacted via an email survey to provide information on residential water tariffs. An aggregation of these responses and an analysis of the relevant annual plans was conducted.

The tariff structure and charging mechanism used by each individual water service provider are presented for both non-metered and metered properties (where relevant) alongside an indication of whether an extraordinary water use charge applies for a particular water service provider.

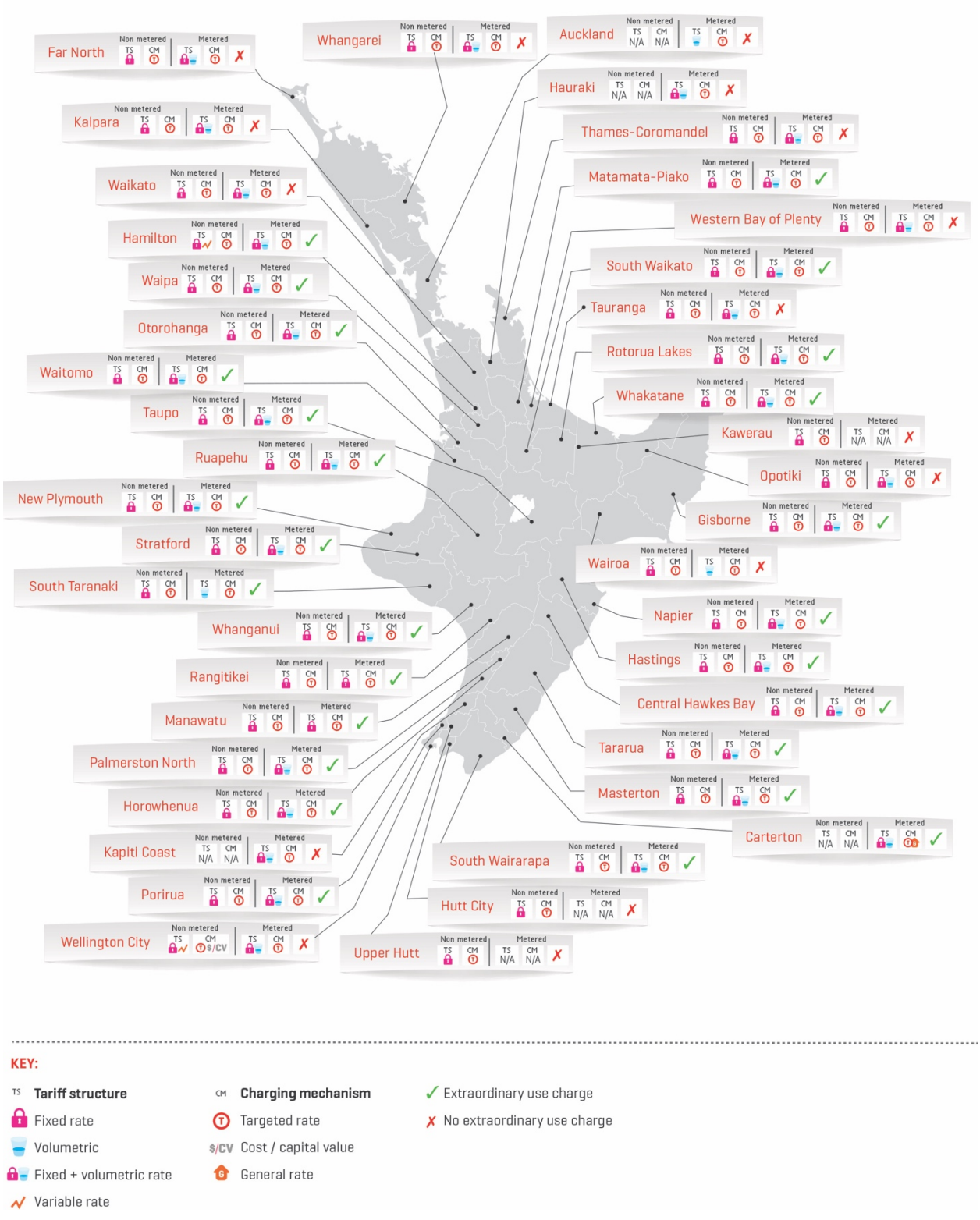

Figure 18. Residential drinking water tariff structures and charging mechanisms in the North Island.

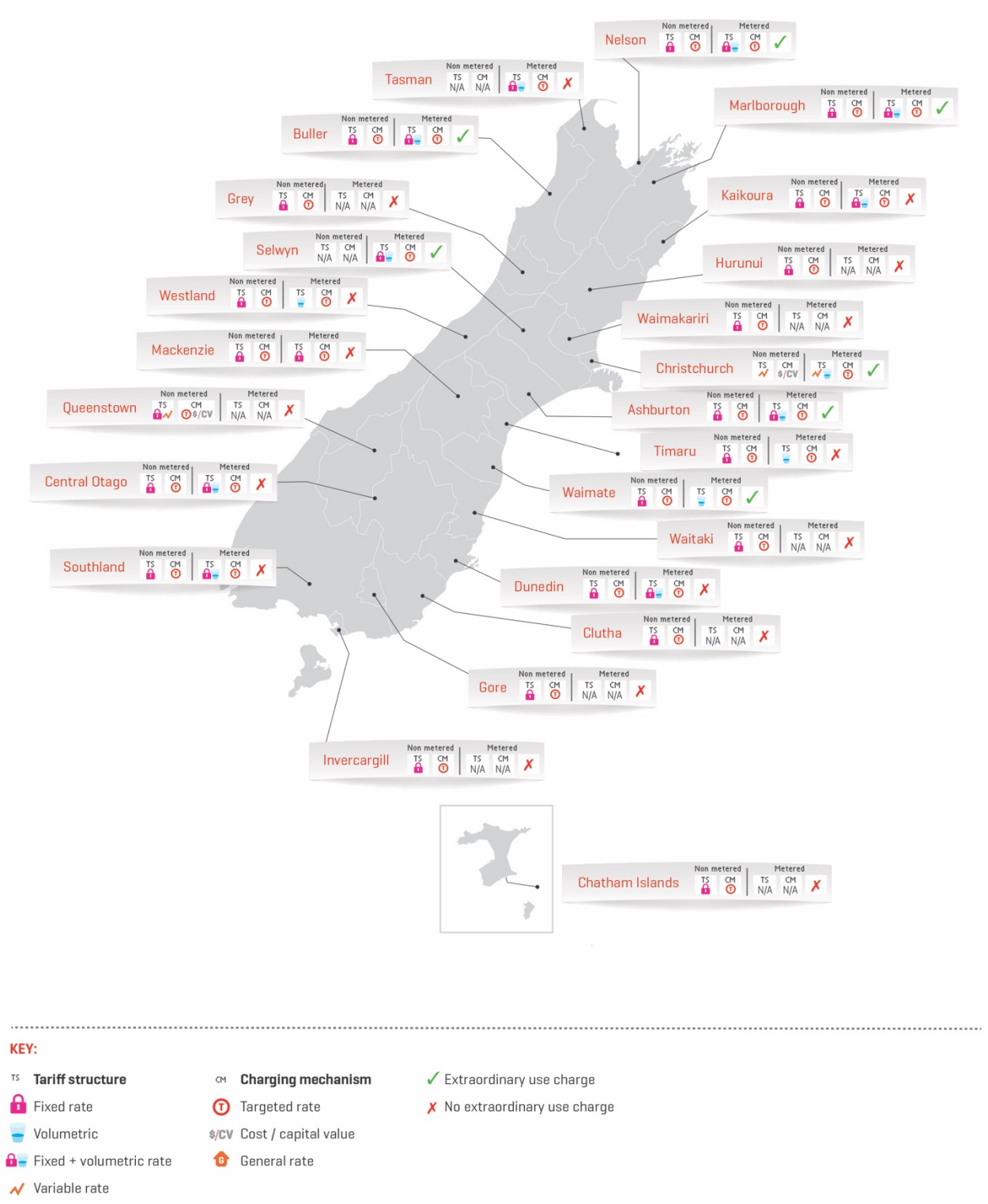

Figure 19. Residential drinking water tariff structures and charging mechanisms in the South Island.

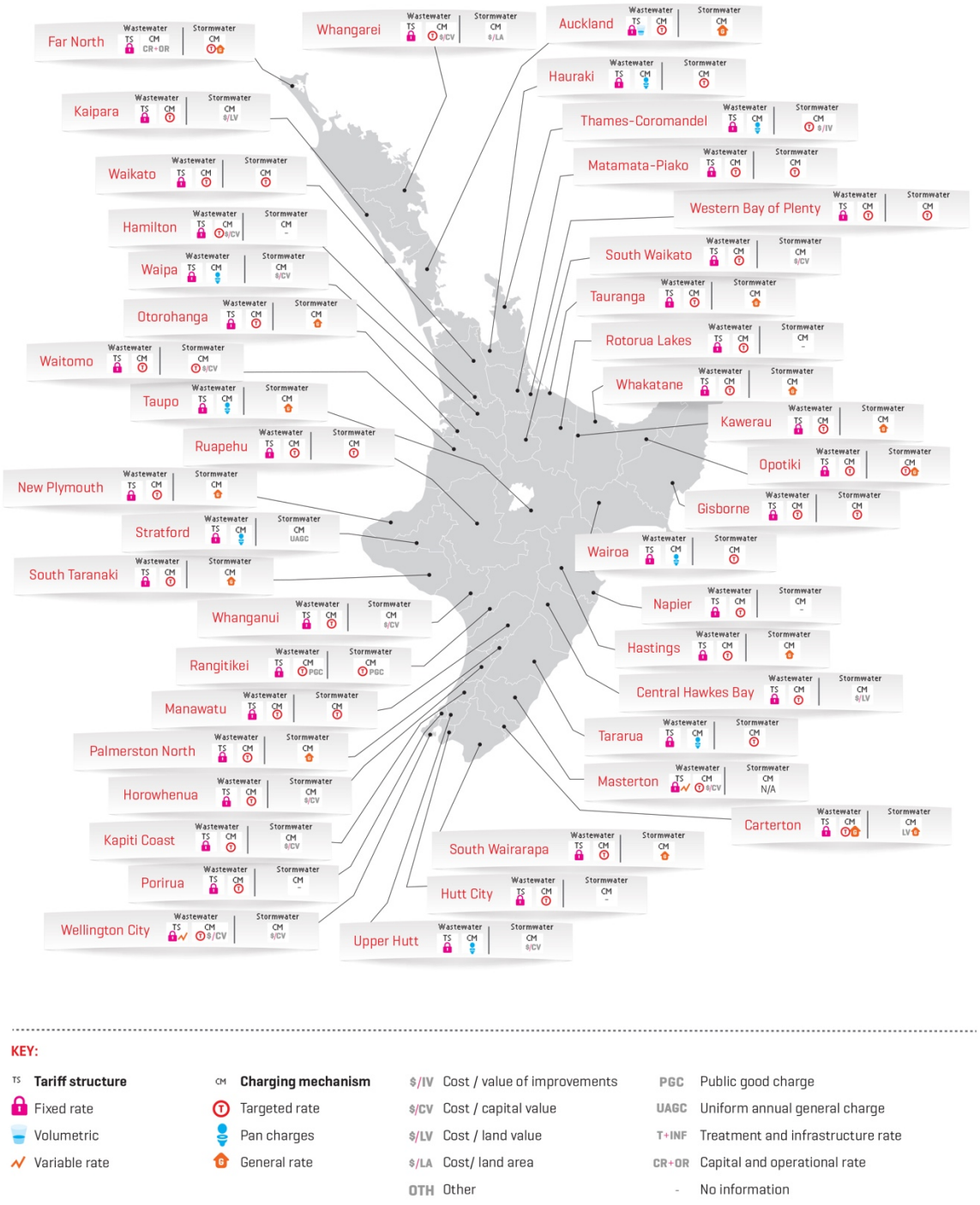

Figure 20. Residential wastewater and stormwater tariff structures and charging mechanisms in the North Island.

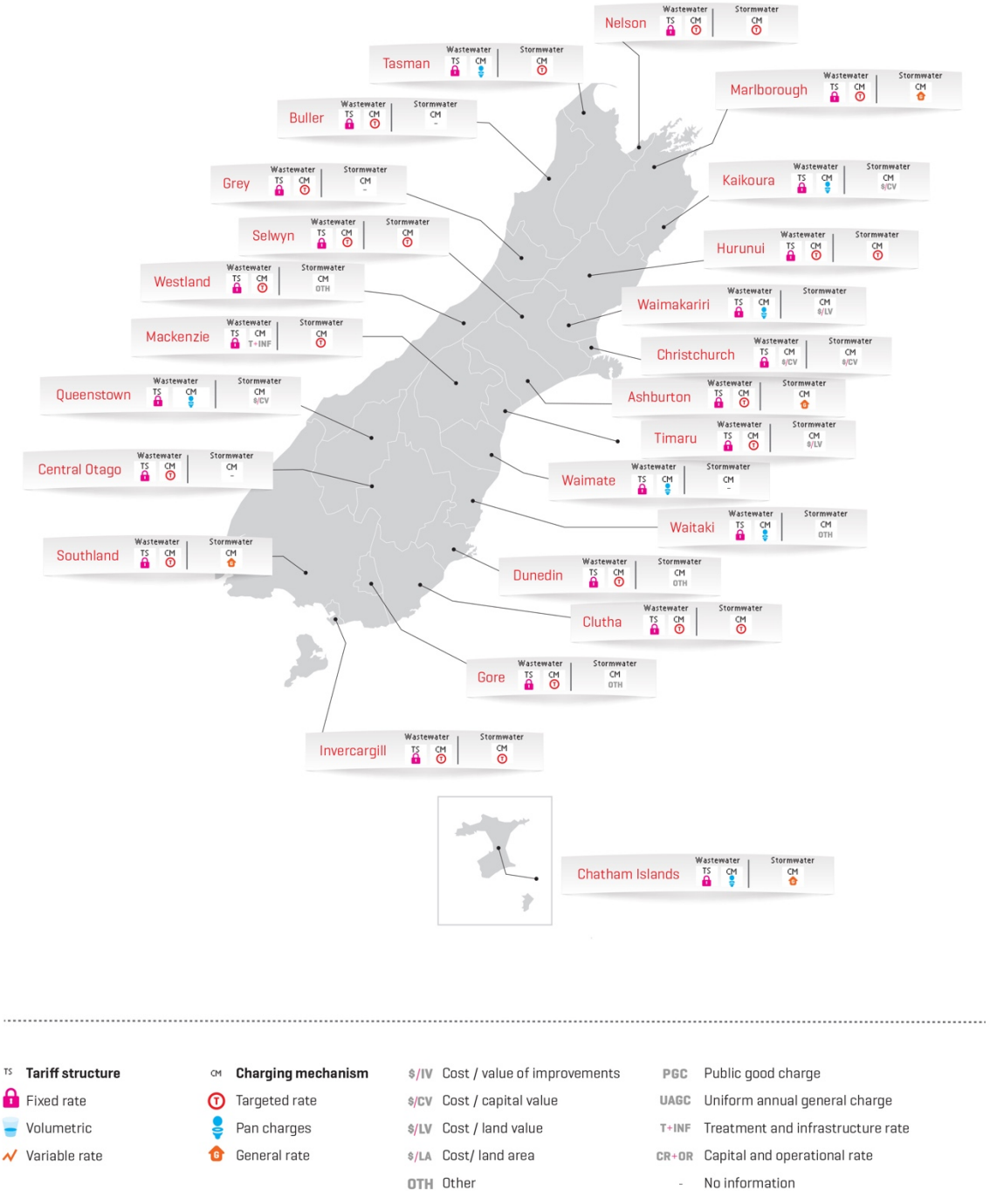

Figure 21. Residential wastewater and stormwater tariff structures and charging mechanisms in the South Island.

5. Discussion

5.1 Residential drinking water

Non-metered residential properties

As can be seen in Figure 18 and Figure 19, there are a range of tariff structures and charging mechanisms implemented by water service providers across New Zealand. For the supply of potable water, the most common tariff structure used for the 2017/18 period and for non-metered properties was a single fixed charge (sometimes referred to as a flat fee).

Figure 12 shows the tariff structures of 308 cities in the OECD. The most common tariff structure was found to be an increasing block tariff, followed by a combination of volumetric and fixed charges. As previously discussed, none of the cities referenced used a flat fee, but these were reported elsewhere to be used in Canada, Mexico, New Zealand and Norway (Organisation for Economic Co-operation and Development, 2009).

Of the 67 water service providers, the supply of potable water to non-metered properties was most commonly via a single fixed targeted rate per separately used or inhabited part of a rating unit (SUIP) or a combination of fixed rate components. Fixed rate components accounted for the charging mechanism of 85% of water service providers (for non-metered properties) as can be seen in Figure 22 (see Appendix A for definitions of charging mechanisms). Water service providers that used a combination of fixed rate components accounted for 15%.

All but four implemented a single fixed rate or a combination of fixed rate components. Hamilton City Council, Queenstown-Lakes District Council and Wellington City Council implemented fixed rates plus variable charges. Hamilton City Council's variable charge for the 2017/18 period was based on dollars per land value of the rating unit, whilst Queenstown-Lakes District and Wellington City Councils' variable charge for the same period was based on dollars per capital value. Christchurch City Council charges residential properties solely based on dollars per capital value of the rating unit.

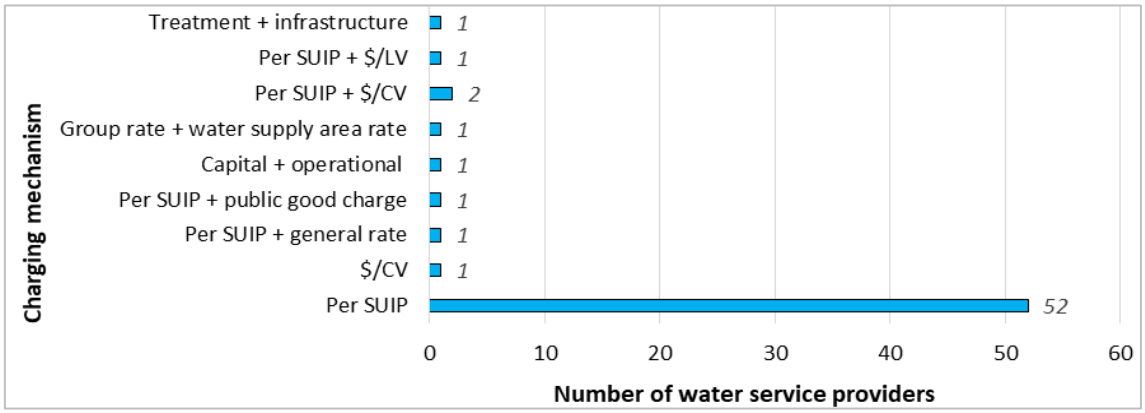

Figure 22. Charging mechanisms for non-metered residential properties in New Zealand.

In New Zealand, it is common that there are two uniform charges for drinking water. One is set for rating units that are connected to the local water network, and the other is for rating units that are not connected but are available for connection (serviceable). If set on a differential basis, these prices can vary depending on the property location or scheme. For example, a price differential can be applied to serviceable units, often set at 0.5, which means the charge is half the cost of the connected charge. Differentials are commonly applied by councils throughout the country.

Metered residential properties

There are very few districts in New Zealand that implement universal water metering for residential properties. Of those water service providers that participate in the National Performance Review (Water New Zealand, 2018), it can be seen in Figure 16 that only nine participating district councils have implemented universal metering. A further six councils have implemented metering to over 50% of their residential connections, whilst 32 councils have less than 50% of residential connections metered.

Whilst a fixed (or flat) fee was the most common tariff structure for non-metered residential properties, for those with a meter installed, a combination of a fixed and volumetric charge was found to be the most common tariff structure. A few councils used solely volumetric charging, including Watercare (an Auckland Council-controlled organisation) and Wairoa District, Timaru District and Westland District Councils (as can be seen in Figure 23).

Other councils have some residential meters but do not charge on a volumetric basis. Manawatu District Council charges metered properties 3-monthly based on the size of the connection. Only extraordinary users or those who have voluntarily opted in to having a water meter are charged in this way (Manawatu District Council, 2017). Christchurch City Council is the only water service provider to charge for drinking water based solely on dollars per capital value. Residential properties with a water meter in the Christchurch City Council jurisdiction pay for water use over their water allowance. The water allowance is effectively the amount of water paid for under the targeted rate (i.e. total water rate payable) divided by the cubic metre cost (specified in the annual plan) divided by 365 to get the daily water allowance. Water use above the calculated threshold is charged volumetrically (Christchurch City Council, 2017)

It is important to note that some councils only install water meters to those properties that are considered extraordinary users – for example, Palmerston North City, Porirua City and Kaikoura District Councils – so the charging mechanisms for metered residential properties will not apply to all residential properties.

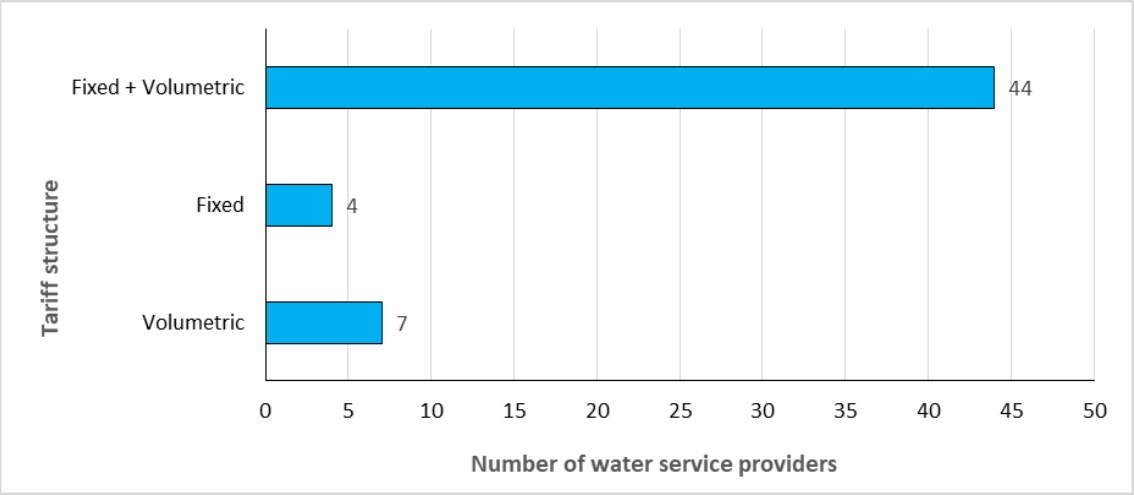

Figure 23. Tariff structure for metered residential properties in New Zealand.

With regard to the tariff structure as described in section 2.2, volumetric charging can be a single volumetric charge regardless of the volume of water used or it can either increase or decrease as the volume of water consumption increases (increasing and decreasing block, respectively).

Several water service providers throughout New Zealand have established an increasing block tariff structure for those residential properties with a water meter installed. These include Horowhenua District, New Plymouth District, Ruapehu District and Masterton District Councils. In contrast, Hauraki District and Nelson City Council used a decreasing block tariff structure for the 2017/18 period. Interestingly, of the 67 water service providers, only Otorohanga District Council implements a peak season metered water charge for the Kāwhia community water supply area. Seasonal rates impose different charges per unit of water based on the time of year. Utilities could charge more during the peak water demand season and less during the low demand season (Alliance for Water Efficiency, 2014). During the period 20 December to 20 February, Otorohanga District Council charges a proportion of metered water use at a higher rate per cubic metre (Otorohanga District Council, 2017). Although not discussed in section 2.2, seasonal rates are a variation on increasing block tariffs.

5.2 Extraordinary use charges for residential properties

Commonly, water use in metered properties throughout New Zealand for the 2017/18 period was charged as a fixed rate up to a defined volume of water. Once exceeded, each subsequent unit of water incurred a volumetric charge, referred to as an extraordinary water use charge. Extraordinary water use charges were either a fixed price per cubic metre above the threshold or took the form of an increasing block tariff where increasing water use resulted in an increased cost per unit of water.

Table 8 provides a summary of the number of water service providers that implemented an extraordinary use charge as part of the 2017/18 water supply rates, presenting the median threshold in which extraordinary use charges applied and the average cost per cubic metre once the threshold was exceeded. It can be seen that there is almost an even split of councils that do and do not apply an extraordinary water use charge to their metered residential customers. Some councils reportedly only metered the extraordinary use properties, whilst others had extraordinary use charges

apply only if the property exceeded the ordinary use of water within that particular district. It is unclear in some instances how extraordinary use in non-metered areas is determined.

Table 8. Occurrence and pricing information of council extraordinary use charges for residential properties for the 2017/18 period.

Extraordinary use charge applied	Number of councils	Median threshold (m^3/year)	Average price ($/$m^3$)
Yes	34	300	1.44
No	33	-	-

Extraordinary water use charges varied from \$0.44/m^3 for every cubic metre over 375 m^3 (Selwyn District Council) to \$2.66/m^3 for urban water users considered to be extra-high users (South Taranaki District Council). The threshold in which extraordinary water use charges applied was found to vary from 75 m^3, where \$1.93/m^3 was subsequently charged (Ruapehu District Council), to 50,000 m^3 where, if exceeded, a \$1.13/m^3 charge applied (New Plymouth District Council). The average annual threshold in which extraordinary use charges applied across the 34 councils that implemented this charging was 300 m^3 and the average cost was \$1.44/m^3.

5.3 Residential wastewater tariffs

The charging of residential wastewater is similar to drinking water. Fixed charges are dependent on the connection or the serviceability of a rating unit. Where wastewater differs from drinking water is that the fixed charge may have a differential applied based on the number of pans/toilets or urinals in a separately used or inhabited part of a rating unit. However, where this charging method was used, it was common for councils to assess residential properties on the basis of a single pan/toilet charge and to only charge based on number of pans for commercial properties. Thus, residential properties commonly paid the base rate.

As with drinking water, wastewater charging mechanisms are predominantly a targeted rate per separately used or inhabited part of a rating unit, followed by charges based on the number of pans, as can be seen in Figure 20 and Figure 21. There were a few councils that used a combination of fixed charges, such as treatment and infrastructure rates (Mackenzie District Council) and fixed charges and a public good charge (Rangitikei District Council). Variable charges for wastewater were implemented by a few councils. For example, Christchurch City Council charges for wastewater (and potable water) as a rate of the capital value dollar of the property (connected or serviceable). Hamilton City Council uses a combination of a fixed charge and a variable charge based on land value. Only two water service providers were found to have volumetric components for wastewater charging (Figure 24).

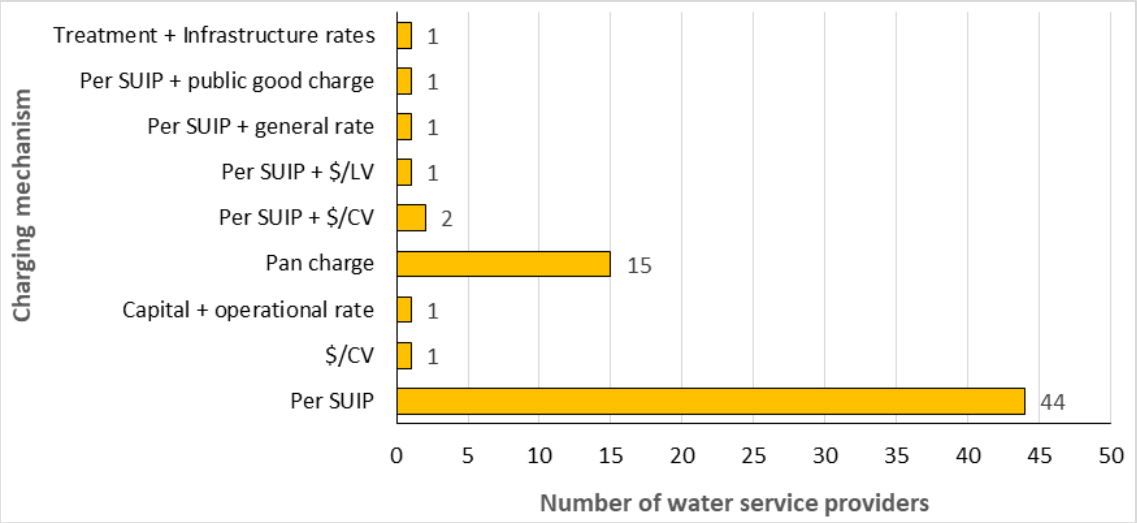

Figure 24. Charging mechanisms for residential wastewater in New Zealand.

In Auckland, metered rating units have a fixed charge and a volumetric charge set at 78.5% of the incoming water. The Auckland region is the only area in New Zealand to universally meter and charge residential properties volumetrically for wastewater. However, in the Manawatu District, those that are considered extraordinary users or have opted to be charged volumetrically are charged based on flowmeter reading or 80% of the water consumption. The wastewater charge is a fixed rate charged 3-monthly to these properties. Should discharge exceed a defined threshold (304 m^3 for the 2017/18 period), an additional charge is implemented to these properties. Interestingly, for potable water, Manawatu District Council appears to charge only a fixed price billed 3-monthly based on the size of the connection not the volume of water consumed, but charges are volumetric for wastewater.

There is no general trend that illustrates that wastewater is charged at a higher or lower rate than drinking water.

5.4 Residential stormwater tariffs

As can be seen in Figure 25, the charging mechanism for residential stormwater was highly variable, either charged as part of a council's general rate or a specific targeted rate or a combination in some instances. A few examples include stormwater charged as transitional rates (Hamilton District Council), communities of interest rates (Opotiki District Council) or local targeted rates (Southland District Council). Dunedin City and Gore District Councils combine stormwater in their wastewater charge, while others incorporated stormwater and drainage charges. It was common to include a variable charge for stormwater based on rateable capital value or land value in a few cases.

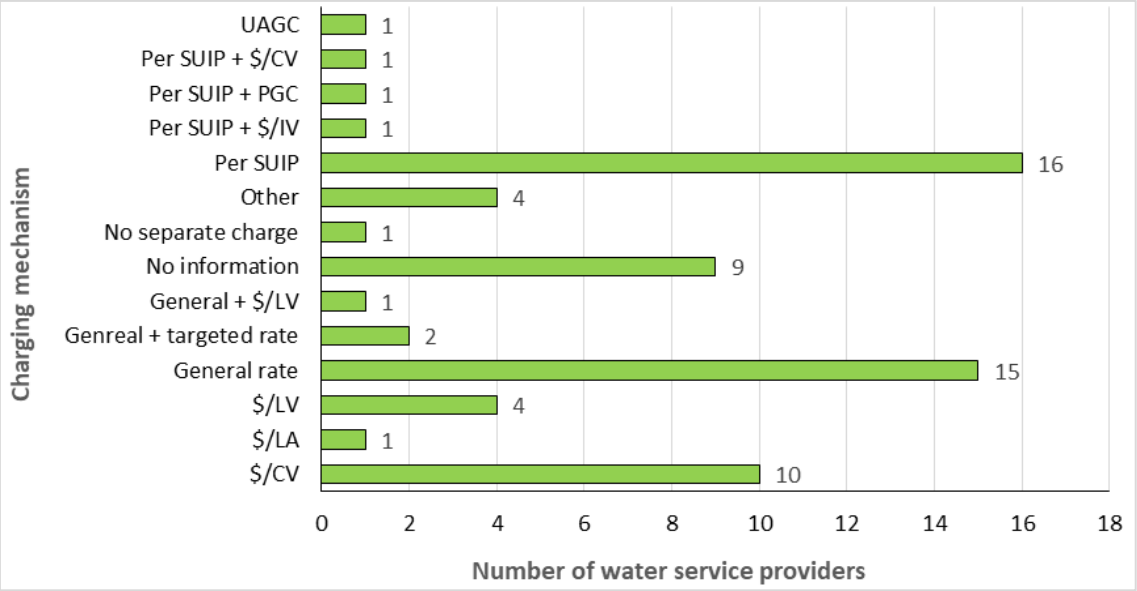

Figure 25. Charging mechanisms for residential stormwater in New Zealand.

The most common charging mechanism was a fixed charge per separately used or inhabited part of a rating unit followed by incorporation in the general rate and a variable charge based on dollar per capital value.

5.5 Affordability

There are some concerns around water pricing strategies if the water tariff is set too high or too low. In some instances, when water tariffs are set to low, pricing may lead to inadequate revenues that are not able to cover operational and maintenance costs. This in turn results in utilities that cannot guarantee access for all, resulting in inequity amongst users, although there are no reported instances of this occurring in New Zealand. Figure 26 shows the cycle of low water pricing. Inadequate income can lead to low investment and infrastructure deterioration, which ultimately results in a poor level of service (Kropac & Ricato, 2010).

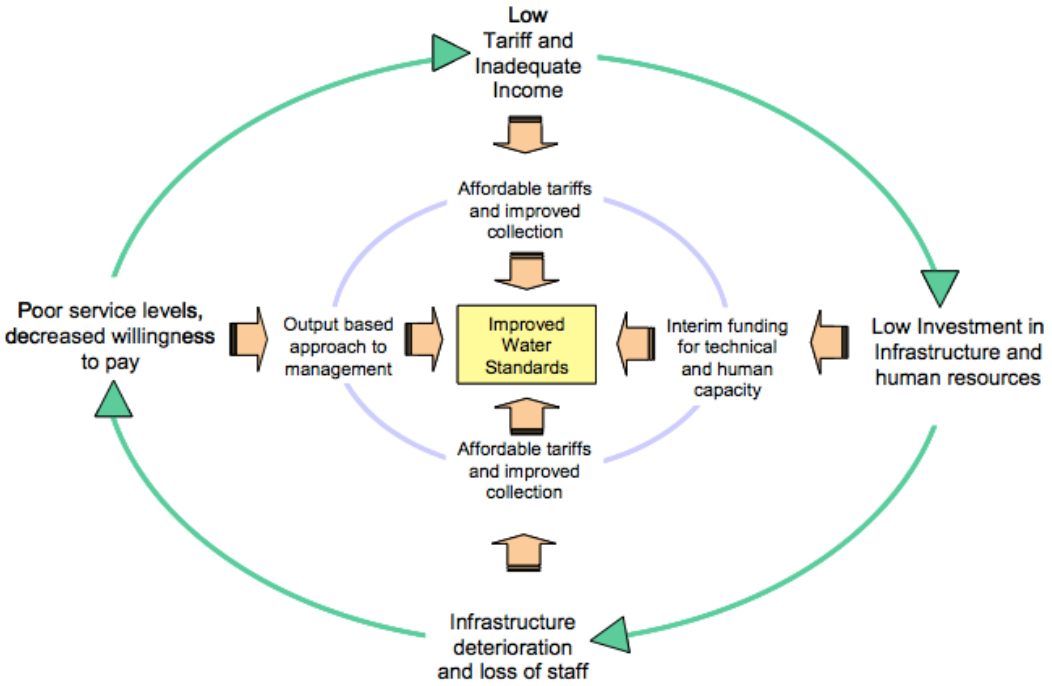

Figure 26. The cycle of low water prices (Kropac & Ricato, 2010).

Due to the high fixed cost of providing water services, the burden of meeting acceptable service levels is higher in small communities per customer than larger cities. It has been suggested that this may result in substandard service when compared with larger cities with greater populations (Water New Zealand, n.d.). The affordability of water services, in particular, water infrastructure, is an economy of scale in New Zealand to some extent. Some smaller communities in New Zealand do not have access to water services, and some remain on constant boil notices.

Macro-affordability

There are several methods for assessing the affordability of water charges. Macro-affordability indicators are calculated as national average household water charges to either average household income (disposable or gross) or average household aggregate expenditure. A global scale assessment by the OECD ranks New Zealand the sixth highest of 26 countries, as can be seen in Figure 27.

One of the greatest concerns when setting an appropriate tariff for water services is the affordability for lower-income households. The average water and wastewater bills in OECD countries are less than 1.4% of a household's average income, which can represent a significant share of disposable income for lower-income families. International water affordability metrics range from 2–5% of a household's income (Waddams & Deller, 2015). The World Bank has indicated that 3–5% of total household income/expenditure is the affordable range for water services. An affordability study in Portugal revealed 10.5% of the population were paying more than 3% of their income for water and wastewater services. As a result, the regulator showed flexibility and implemented solutions in municipalities where affordability was identified as an issue (Organisation for Economic Co-operation and Development, 2009).

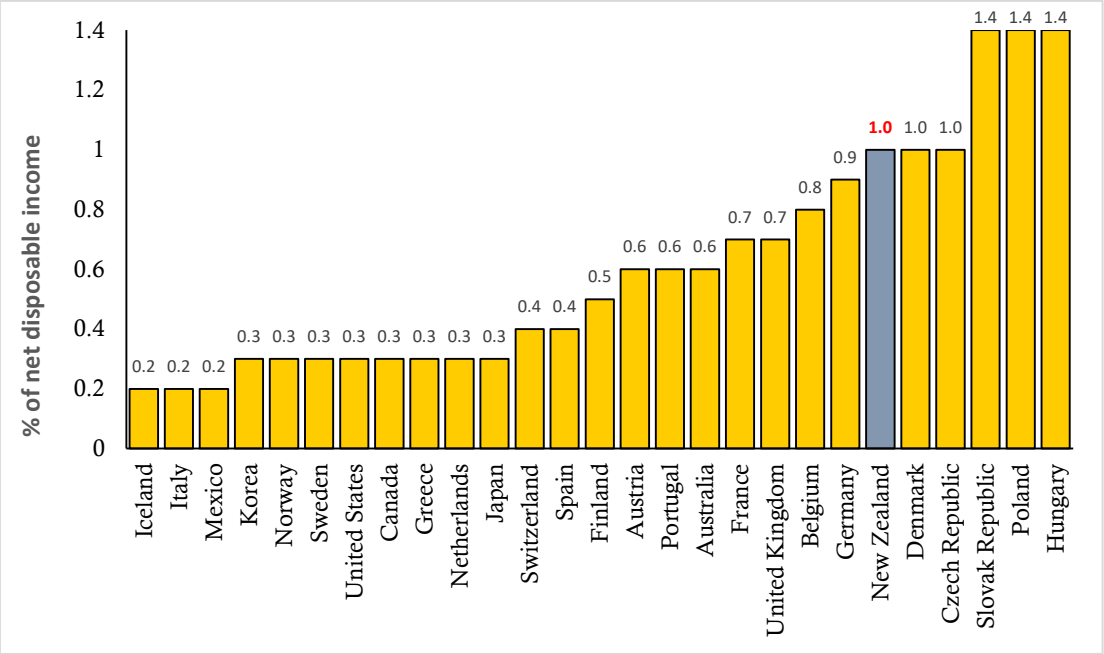

Figure 27. Average water and wastewater bills as a share of average net disposable income (USD) (Organisation for Economic Co-operation and Development, 2009).

The OECD assessed the water costs as a share of income for the lowest deciles of a population. Figure 28 shows New Zealand ranks 23rd of 29 countries, with a reported 3.3% of household income spend on water services. When compared with Australia and the UK, New Zealand's affordability rate for lower-decile populations is more than 1% higher. This broad-scale analysis suggests there might be factions of the New Zealand population that suffer from affordability issues for water services.

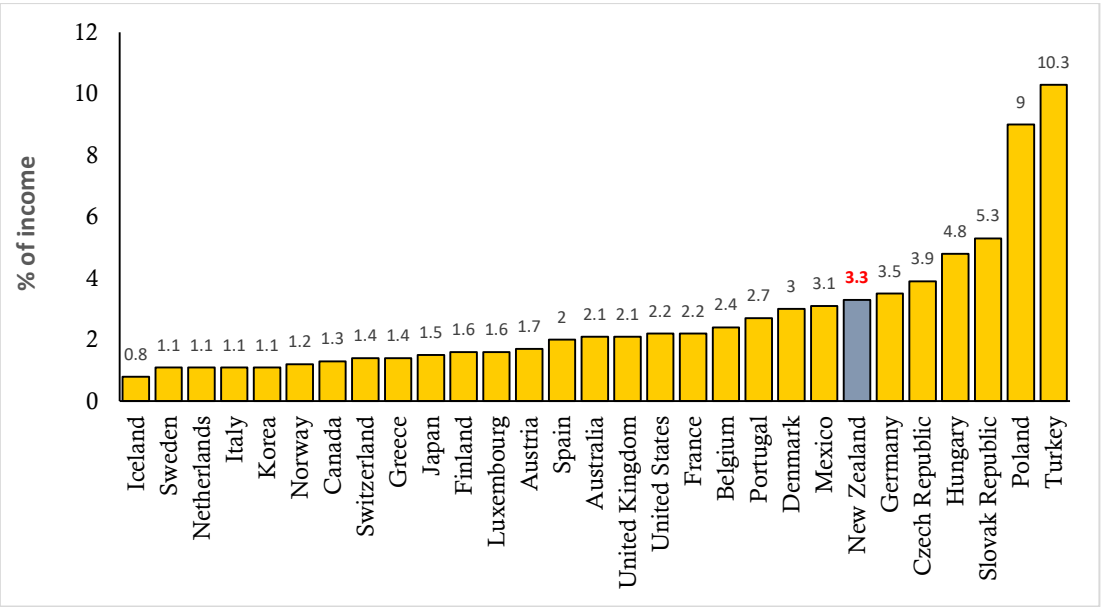

Figure 28. Average water and wastewater bills as a share of income of the lowest decile of the population (USD) (Organisation for Economic Co-operation and Development, 2009).

Micro-affordability

A district-scale assessment of the affordability of water service charges throughout New Zealand was conducted by Water New Zealand as part of their annual National Performance Review. Results for Water New Zealand's National Performance Review 2015/16 indicate that the three regions with the highest proportion of household income spent on three-water services are amongst the four regions with the lowest household incomes (Water New Zealand, 2017). In these instances, the collective bill for water, wastewater and stormwater services was greater than 3% of the average household income in these areas. Additionally, four participants also had charges exceeding the 3% threshold. Included in these was the participant with the lowest average household income.

Figure 29 shows the proportion of household income that is spent on water services compared alongside household income per participating water service provider. For most jurisdictions, the proportion of household income spent on water services in New Zealand is below 2%. There are a few jurisdictions, however, in which the proportion spent on water services is much higher. Seven councils reported over 3% of a household's average income was spent on water services. In the Far North District, for example, the average household is paying around 4% of household income.

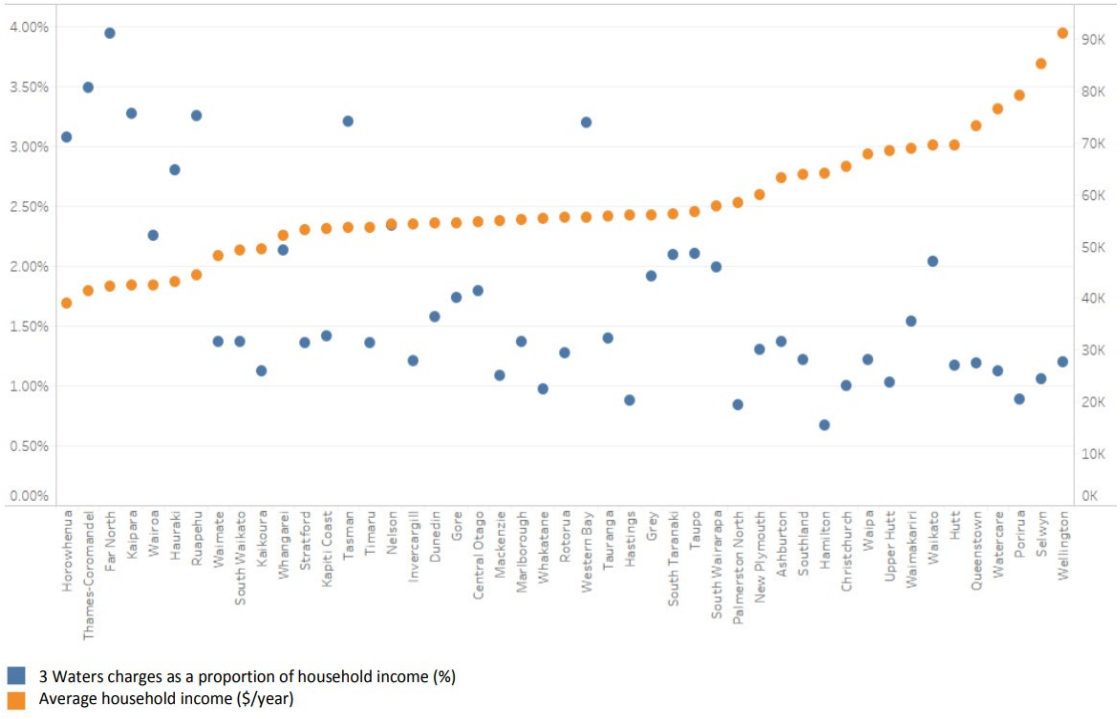

Figure 29. Micro-affordability of three-water services plotted against household income at the district scale (Water New Zealand, 2017).

6. Conclusion

Water tariffs and charging mechanisms are important tools for water conservation and management.

Localised water tariffs and charging mechanisms are complex. When tariff structures used in New Zealand are compared with utilities in OECD countries, the way in which water service provision costs are recovered differs significantly. In part, this is likely due to the fact that, in New Zealand, universal water metering of residential properties is not widespread. Of the councils that contribute to the National Performance Review (2015/16), 19% reported universal metering of residential properties and 68% reported having less than 50% of residential properties metered. Of the 184 OECD utilities surveyed, none used a fixed charge (flat fee) tariff structure.

The majority of residential properties in New Zealand are not metered, and the predominant form of charging is a targeted fixed rate followed by a combination of fixed rate components. For those properties that are metered, a combination of fixed and volumetric charges is the most common charging mechanism. Of those councils that implement residential metering, just over half implement an extraordinary water use charge above a defined threshold.

Wastewater charging follows a similar trend, with targeted fixed rates accounting for the majority of charging throughout the country. Stormwater, however, is more variable with targeted fixed rates, incorporation in the general rates and variable rates using cost per capital value being used across the country.

While water tariffs by their very nature are location specific, New Zealand has a high proportion of water service providers per capita, and there is a wide range of charging mechanisms implemented both across the country and also among districts in the same region.

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Appendix A: Definitions of charging mechanisms used for water services

Charging mechanism	Definition
Treatment + infrastructure rates	An urban water treatment rate (a fixed amount per SUIP) and an urban water infrastructure rate (fixed amount per SUIP) are charged
Per SUIP + $/LV	A fixed targeted rate per SUIP plus a variable charge of dollars per land value are charged
Per SUIP + $/CV	A fixed targeted rate per SUIP plus a variable charge of dollars per capital value are charged
Group rate + water supply area rate	Charged a fixed targeted group rate plus a water supply area rate
Capital + operational	Charged a fixed targeted capital rate plus an additional fixed targeted operational rate
Per SUIP + public good charge	A fixed targeted rate per SUIP + an additional public good charge
Per SUIP + general rate	A fixed targeted rate per SUIP + an additional general rate
$/CV	Variable charge based on dollar per capital value
Per SUIP	Charged a fixed targeted rate per SUIP
Pan charge	A charge based on the number of pans (toilets) in the home.
UAGC	Uniform annual general charge
Per SUIP + $/IV	A fixed targeted rate per SUIP plus a variable charge of dollars per improvement value
No separate charge	There is no separate charge
No information	No information could be found in the 2017/18 annual plan
General + $/LV	Charged as a component of the general rate plus a variable charge based on dollars per land value
General + targeted rates	Charged as a component of the general rate and a targeted rate
General rate	Charged as a component of the general rate
$/LV	Variable charge based on dollar per land value
$/LA	Variable charge based on dollar per land area