NEW ZEALAND
INFRASTRUCTURE
COMMISSION
Te Waihanga

Providing and paying for infrastructure – What's fair?

Te whakarato me te utu mō ngā hanganga
– He aha tēnei mea te tautika?

Tewaihanga.govt.nz

New Zealand Infrastructure commission / Te Waihanga

Te Waihanga seeks to transform infrastructure for all New Zealanders. By doing so our goal is to lift the economic performance of Aotearoa and improve the wellbeing of all New Zealanders.

We are an autonomous Crown entity, listed under the Crown Entities Act 2004, with an independent board. We were established by the New Zealand Infrastructure Commission/Te Waihanga Act 2019 on 25 September 2019.

Information on the Commission is available at tewaihanga.govt.nz

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Providing and paying for infrastructure – What's fair?

We might not always realise it, but our infrastructure networks are vital to our quality of life. We need access to safe transportation, reliable electricity, mobile phone and internet services, and clean water. But not all New Zealanders have the same level of access to our infrastructure services for a range of reasons, for example, because of where they live or what they can afford.

While infrastructure alone can't remove the underlying causes of disadvantage, it can reduce the impacts by improving access to more jobs, online education and health services, and greater recreational opportunities.

Over the course of 2023, the New Zealand Infrastructure Commission, Te Waihanga, will be carrying out a 'deep dive' into the topic of fairness in the provision and funding of infrastructure. This paper is an introduction to that topic, and lays out some of the issues and questions Te Waihanga will be exploring over the coming months.

There are three main factors that drive concerns about fairness in infrastructure – where we live; who we are; and the legacies we pass on to future generations.

How infrastructure is planned, provided, paid for and used, matters for how fairly and easily different people can access infrastructure services and for ensuring that the community as a whole gets the greatest value from its infrastructure investments. Because of the long life, size and scale of our infrastructure, our investment decisions now can have an impact for decades, with intergenerational effects.

At the same time, after decades of underinvestment, New Zealand faces a number of infrastructure challenges that need to be met. We have to keep current services running, accommodate growth and improve efficiency and effectiveness, and create new services and opportunities. Simply maintaining current service levels may become harder and more expensive as we face the impacts of climate change.

As part of our role in providing advice to the Government and others to strengthen our infrastructure, Te Waihanga is keen to encourage more debate about fairness and infrastructure. As part of this, we are undertaking research to provide insights into how infrastructure provision and funding affects different people.

This project ultimately aims to provide practical advice that will lead to better decision-making. It will help inform the next New Zealand Infrastructure Strategy.

Throughout this work, we'll be looking for opportunities to connect with organisations and individuals throughout Aotearoa New Zealand. If you have views that you would like to share or would like to receive regular updates on this work, please contact us at **whatisfair@tewaihanga.govt.nz**.

Te whakarato me te utu mō ngā hanganga – He aha tēnei mea te tautika?

Kāore pea tātou e mōhio i ngā wā katoa, engari he mea nui ō tātou whatunga hanganga ki tō tātou kounga ora. Me whai āheinga tātou ki te ikiiki haumaru, ki te hiko pono, waea pūkoro me ngā ratonga ipurangi, me ngā wai mā. Engari he rerekē te taumata o te āheinga o ngā tāngata katoa o Aotearoa ki ō tātou whatunga hanganga, ā, he maha ngā take e pēnei ana, hei tauira, ko ngā wāhi e noho ana rātou, he aha rānei ngā mea ka taea e rātou te hoko.

Ahakoa kāore e taea e te hanganga anake te whakakore i ngā take o te mate, ka taea e te hanganga te whakaheke iho i ngā pānga mā te whakapai ake i te whai wāhi ki ngā mahi, ki te ako tuihono me ngā ratonga hauora, me ngā āheinga ki ngā mahi whakatā pai ake.

Hei roto i te tau 2023, ka whakahaerehia e Te Waihanga he 'ruku hōhonu' ki te kaupapa o te tautika i roto i te whakarato me te whakapūtea i te hanganga. He whakaurunga tēnei pepa mō tērā kaupapa, ā, ka whakatakotoria ētahi o ngā take me ngā pātai ka tirohia e Te Waihanga hei ngā marama e tū mai nei.

E toru ngā take mātuatua whakamāharahara mō te tōkeketanga i te hanganga – ō tātou wāhi noho; ō tātou tuakiri; me ō tātou waihotanga mō ngā whakatupuranga e whai ake nei.

He mea nui te pēheatanga te whakamahere, te whakarato, te utu, me tōna whakamahia, ki te ngāwari me te tautika anō hoki o te whai wāhi o ngā tāngata rerekē ki ngā whatunga hanganga, me te whakarite kia whiwhi te hapori katoa i te uara nui mai i ngā haumi hanganga. Nō te roa o te ora, o te rahi me te korahi o tō tātou hanganga, ka whai pānga ā tātou whakatau haumi pūtea o te wā nei ki ngā ngahurutau e tū ake nei, me ngā pānga tuku iho.

Heoi, i muri iho i ngā ngahurutau o te iti o te haumi pūtea, he maha ngā wero hangahanga e arohia ana e Aotearoa kia whakatutukitia.Me whakahaere tonu tātou i ngā ratonga o te wā, ki te whakarite i te tupu me te whakapai ake i te whāomotanga me tōna whai huatanga, me te hanga i ngā ratonga me ngā āheinga hou. Ka uaua ake pea, ka nui ake anō hoki pea te utu o te pupuri noa i ngā taumata ratonga o te wā nei i a tātou e aro atu ana ki ngā pānga o te āhuarangi hurihuri.

Ko tētahi haepapa o mātou he tuku tohutohu ki te Kāwanatanga ki ētahi atu anō hoki e pakari ake ai tō tātou hanganga, ā, e hīkaka ana a Te Waihanga ki te whakatenatena i ētahi atu ki te tautohetohe mō te tautika me te hanganga. Hei tāpiri, e whakahaere rangahau ana mātou ki te whakatakoto i ā mātou kitenga mō te pānga o te whakarato hanganga me tōna whakapūteatanga ki ngā tāngata rerekē.

Ko te whāinga matua o te kaupapa he hoatu tohutohu whaikiko e pai ake ai ngā whakataunga. Ka riro anō hoki hei āwhina ki te whakamōhio i te Rautaki Hanganga o Aotearoa e tū mai nei.

I roto i ēnei mahi, ka rapu tātou i ngā huarahi ki te hono atu ki ngā whakahaere me ngā tāngata takitahi puta noa i Aotearoa. Mēnā he whakaaro ōu e hiahia ana koe ki te whakapuaki, e pīrangi ana rānei koe ki te whiwhi pānui hōu putuputu mō tēnei mahi, me īmera mai ki a mātou i **whatisfair@tewaihanga.govt.nz**.

About Te Waihanga – infrastructure for wellbeing

Mō Te Waihanga – he hanganga mō te oranga

The New Zealand Infrastructure Commission, Te Waihanga, is the Government's lead advisor on infrastructure. We work to ensure that New Zealand has a world-class infrastructure system by promoting better decision-making, improved funding and financing, a more enabling planning and consenting framework, greater use of technology, and stronger workforce capacity and capabilities. By doing so, our goal is to lift the economic performance of Aotearoa and improve the wellbeing of all New Zealanders (Figure 1).

Figure 1: Infrastructure matters for wellbeing

Project overview

Tirohanga whānui

For our ‘Providing and paying for infrastructure – What's fair?’ project, we are focusing on four infrastructure networks – energy, water, land transport and telecommunications (Box 1). We’ve chosen these networks as they are foundational to our whole infrastructure system and to modern life. These four networks underpin the provision of other important services and opportunities, such as education, health and employment.

We are interested in the interactions and trade-offs across these four networks and the wider infrastructure system, especially where more than one can play a role in the delivery of services. For example, as the COVID-19 pandemic revealed, telecommunications infrastructure can play a role in the delivery of education (for example, online learning) and health (for example, telehealth) services. Some networks can replace or take some of the load off the role of others, for example, many people have been able to take up flexible working arrangements and use the telecommunications network (to connect to office ICT systems), thereby reducing or replacing the daily commute on transport networks.

Box 1: Infrastructure networks considered in this project

Heat, power and light (energy infrastructure)

Water for drinking, cooking and washing, wastewater and stormwater (water infrastructure)

Roads and passenger rail, public transport (land transport infrastructure)

Communications and entertainment (telecommunications infrastructure)

Fairness isn't the only goal...

Ehara i te mea ko te tika anake te whāinga...

Overall, we need to ensure that the community gets the greatest value from its investments in infrastructure, but New Zealand faces many challenges. The New Zealand Infrastructure Strategy Rautaki Hanganga o Aotearoa identifies five main goals that our infrastructure networks need to support to achieve a thriving New Zealand:

- enabling a net-zero carbon emissions Aotearoa
- supporting towns and regions to flourish
- building attractive and inclusive cities
- strengthening resilience to shocks and stresses
- moving to a circular economy.

These goals all come with costs, which will have to be paid for one way or another.

In some cases, these goals may run up against fairness objectives. For example, policies that seek to achieve the net zero emissions goal may put pressure on low-income households that do not have the means to switch to lower-carbon transport or energy options. However, changes in technology are creating more ways to respond to these challenges. For example, improvements in the reliability and affordability of batteries could help provide cheaper and more secure electricity supply.

...and infrastructure isn't the only solution

...ā, ehara i te mea ko te hangahanga anake te otinga

Because infrastructure services are so crucial to wellbeing and prosperity in modern societies, how easy those services are to access, along with the quality of service provided and how much the services cost clearly matters for fairness. But infrastructure provision and pricing is only one response to fairness concerns. The Government plays a more central role in promoting social fairness through its tax and spending policies (Box 2).

Box 2: Fairness and the distribution of wealth

Ideas of fairness are often linked to the distribution of resources and opportunities within a society. In all modern societies, financial resources such as incomes and wealth are not equally distributed.

One measure of how equally incomes are distributed in societies is the Gini coefficient. Gini coefficients range from zero to one. A zero score would indicate that every household earned the same amount, whereas a score of one would mean that one household earned the entire country's income. In 2019, the Gini coefficient for New Zealand households' market (so, pre-tax) incomes was 0.453.

Governments reduce these inequalities through taxes and transfers (such as welfare benefits and tax credits), which lower incomes for wealthier households and increase them for poorer families. As a result, the disposable incomes that households receive after taxes and transfers are significantly more equal. Other forms of government spending – such as education and health – help even out opportunities and protect vulnerable households from shocks.

We want to better understand what fairness in infrastructure means

Kei te pīrangi mātou kia pai ake tō mātou mārama he aha te tikanga o te tika i roto i te horopaki o te hanganga

Three main factors drive concerns about fairness in infrastructure:

- where we live, work and play
- who we are
- the legacy for future generations.

Where we live, work and play

Kei hea tatou e noho ana, e mahi ana, e takaro ana

Location can create three types of fairness issues:

- unequal access to infrastructure services
- localised costs and unearned benefits
- whether or when infrastructure should just be funded by local users.

Unequal access to infrastructure services

Te whai wāhi takatahi ki ngā ratonga hanganga

To thrive, New Zealand needs good infrastructure. However, in parts of New Zealand this can come with challenges.

- It can be difficult to pay for costly, large-scale investments in places with small or declining populations.
- The costs of providing infrastructure services to dispersed populations can be high and made more challenging by New Zealand's geography.
- Ageing populations in many places mean a rising share of people on fixed incomes. This places pressure on the way infrastructure is currently funded.

These difficulties can limit the viability of infrastructure services in some places. They might mean higher prices, lower service quality or even missing services. For example, public transport options can be limited or non-existent, internet and mobile service coverage may be patchy.

Even within cities – where it may be more economically feasible to have similar levels of access and quality across the city – there can be significant gaps in access. These gaps can be especially pronounced in transport.

In some cases, it can be difficult to access infrastructure at all. This is an issue with some Māori-owned land that is 'landlocked' (meaning surrounded by other properties and without legal access). Iwi and hapū in this position either need to negotiate access arrangements with their neighbours or, if voluntary agreement is not possible, apply to the Māori Land Court. This requires considerable time and money (Stewart, 2022). Non-existent, or limited, infrastructure services can make it difficult for Māori to prosper while living in the rohe of their hapū or iwi.

Where we live, work and play: Sector close-ups

Kei hea tatou e noho ana, e mahi ana, e takaro ana: Tiro tata ki te rāngai

Drinking water in rural New Zealand

Te wai inu i te tuawhenua o Aotearoa

People living in rural regions are more likely to need to provide water services themselves (for example, rain collection for drinking water, septic tanks for wastewater). In 2019/20, around 944,000 people supplied their own drinking water from rainwater or bores, or from very small (fewer than 100 people) community sources (Ministry of Health, 2022, p. 1). This can have implications for determining acceptable service levels (Government Inquiry into Havelock North Drinking Water, 2017, pp. 192–202).

Providing infrastructure to distant settlements can be expensive, and it can be difficult to repay the fixed costs of infrastructure in places where there are few ratepayers. For example, while Auckland's Watercare can spread the cost of its water network across 1.5 million residents, the Hauraki District Council has seven separate wastewater schemes, and a number of those schemes service towns with fewer than 1,000 people (New Zealand Productivity Commission, 2019, p. 63).

Transport disadvantage and transport poverty

Te whakatiki ikiiki me te pōhara ikiiki

Fairness issues with transport occur through two inter-related channels – transport disadvantage and transport poverty. Transport disadvantage occurs because of a lack of access to transport options, such as the absence of regular and local public transport routes. Transport poverty occurs because of an inability to pay for transport services, regardless of how available they are.

Transport disadvantage can be a particular issue for people with disabilities. Almost one in four New Zealanders have a disability (Statistics New Zealand, 2018). People with disabilities are much more likely to report facing difficulties travelling by foot or car, and often face barriers to using public transport. These barriers include physical impediments (for example, a lack of step-free entries into vehicles), poor or unclear signage, limited availability, and lower-quality travel options which make users feel stigmatised (MRCagney, 2020).

Transport disadvantage and transport poverty interact in parts of New Zealand, and especially in areas such as West and South Auckland. These areas have higher proportions of people with lower incomes, who have difficulty walking or who do not own a car. As a result, some people in these neighbourhoods may have limited access to jobs, education and other services. Some people own cars to get around, but then have to cut back on other expenditure. The share of household spending devoted to transport is consistently higher for lower-income groups. These impacts are disproportionately felt by Māori, Pacific peoples, people in lower-income households and people with disabilities (MRCagney, 2020).

Tackling issues of unequal access to infrastructure services is not always straightforward. As the discussion of localised costs and benefits below illustrates, access to amenities such as public transport is reflected in property prices.

People often choose where to live based on what they can afford, and those on lower incomes may live in areas with lower levels of service because these locations fit within their budgets.

Efforts to raise service levels in specific areas through targeted investments may actually increase local housing costs, putting pressure on low-income households. Alternatively, some people may prefer the other amenities that areas with low levels of infrastructure service provide (for example, more space or less noise).

Telecommunications and bridging the digital divide

Ngā whitimamao me te whakakī i ngā āputa matihiko

Digital technology can offer alternatives to the services people need from infrastructure. It can mean that instead of using transport connections for work or study, people can work remotely online. In the health sector, there are opportunities to move service delivery closer to the regions using digital technology, which allows the use of small and repurposed buildings.

As the Digital Strategy for Aotearoa highlights, however, while digital technology and data bring opportunities, they can also have negative impacts on equity. 'If people or communities cannot join in digitally, they can lose access to opportunities and services' (New Zealand Government, 2022a).

Better technology comes at a cost and it's not always economically feasible for private providers to roll it out to parts of regional New Zealand without government support. Despite 86% of New Zealanders being connected to digital services, broadband quality varies across regional New Zealand and there are still significant gaps within rural communities (New Zealand Infrastructure Commission, p. 72).

The 2022 KPMG Agribusiness Agenda report showed that agribusiness industry leaders stated that 'deliver broadband equality to all' was their third highest priority behind biosecurity and quality trade agreements (KPMG New Zealand, 2022).

Energy equity

Tautika pūngao

New Zealand scored fifteenth in energy equity against 127 other countries surveyed by the World Energy Council (World Energy Council, 2022).[1] That's good news for New Zealand overall, but issues remain.

The Energy Hardship Expert Panel has identified five 'kete' to hold conversations on priority problems in energy, including energy accessibility – accessing energy regardless of income or location. Issues in this area range from network connection and poor credit, to new technologies and the availability of different energy sources (Energy Hardship Expert Panel, 2022).

Looking to the future, the transition to a low-emissions economy could disadvantage low-income consumers, those on fixed incomes such as older people, and people with disabilities and health needs. Petrol and gas prices are expected to increase significantly over the next 30 years and the daily fixed charge for electricity is estimated to increase by more than 200% by 2050 (Climate Change Commission, 2021). These increases could disproportionately affect low-income households and those who live in parts of the country where it is hard to reduce their use of petrol and diesel for transport.

[1]This measure assessed 'a country's ability to provide universal access to reliable, affordable, and abundant energy for domestic and commercial use' (World Energy Council, 2022).

Localised costs and unearned benefits

Nga utu rohe me nga painga kore whiwhi

While infrastructure networks provide services to the broader community, they can also create local costs and benefits. These local costs and benefits can occur even before the infrastructure has been built (Box 3).

Box 3: Transport infrastructure and land prices

Infrastructure decisions can create winners and losers, especially for people who own real estate. This can be seen in some Auckland transport projects. Auckland's Western Line rail upgrade was announced in 2005 and included double-tracking the existing rail line to enable more frequent services, redevelopment of train stations along the route and other urban renewal works. The announcement led to increases in house and land prices near the route before the construction work had been completed (the rail upgrades were completed in late 2010 and the analysis of house prices covered the period March 2007 through December 2009).

Prices grew faster the further the house was from the central business district. These increases reflected the fact that people at the fringes of Auckland would now have better access to the central city. Prices in the outer suburbs tended to grow fastest for properties that were located 2 to 4 kilometres from the rail stations (Grimes & Young, 2013). Research by Auckland Council found a different pattern in the eastern isthmus, where closeness to rapid transit networks had a narrower impact on property prices. Property price gains were highest at a 260-metre walking distance from a transit station (Auckland Council Chief Economist Unit, 2018).

Road improvements also created localised benefits. The extensions to Auckland's northern motorway in the late 1990s led to significant land value increases in areas near the new motorway exits. Grimes and Liang (2010) estimated the total land value increase at $2.3 billion, compared to the construction cost of $366 million.

This creation of private gains in the form of higher property prices has led some to call for taxes or other tools to 'capture' some of this value, so that the people who directly benefit from infrastructure help pay for it. International examples of this include Hong Kong funding its metro railway by selling development rights around stations and London recovering part of the cost of the Crossrail train line from business levies (Terrill & Emslie, 2017).

Linking the funding of infrastructure to the value it creates could help encourage governments to pick the highest-impact projects. However, while the concept of value capture can be appealing, implementing it can be challenging. Property prices may not rise at the levels or in the areas expected. Land value changes also seldom have a relationship to the cost of the infrastructure project, and so may not recoup much of the expense (Terrill & Emslie, 2017).

As well as creating localised benefits, infrastructure investments can create concentrated costs. For example, improvements to public transport services (such as better stations, more frequent services) can increase use, which creates congestion and noise in the nearby neighbourhoods. People are generally not compensated for these negative effects.

Whether or when infrastructure should be funded by local users or by everyone

E tika ana rānei kia utua te hanganga e ngā kaiwhakamahi o te rohe, e te katoa rānei, ka mutu, āhea anō hoki ka tika kia utua

The third fairness issue related to place is whether, and in what circumstances, everyone should contribute to paying for infrastructure not just the users or local residents. Much infrastructure in New Zealand is developed on the basis that the costs should be met by those who benefit from its use. In recent years, however, central government has agreed to fund several major transport projects from general taxation.

Funding a major infrastructure project from taxation may sometimes be the most efficient or appropriate option. Some investments may create benefits beyond the immediate users or may be beyond the means of local communities to fund. Funding through taxation also avoids the need to set up new revenue collection tools (for example, tolls, targeted rates) and spreads the costs and risks across a larger number of people. But it can raise questions of fairness, such as whether people who will never use a particular project should be expected to bear its costs.

Who we are affects our access to infrastructure services

Ka pāngia tō tātou whai wāhitanga ki ngā ratonga hanganga e tō tātou tuakiri

When done well, infrastructure improves our quality of life, serves as the backbone of a thriving economy, and can support efforts to protect and improve our environment. But there are many factors that determine how infrastructure is accessed and used, including income, age, ethnicity, gender, disability status and other personal characteristics. Some people face barriers to accessing infrastructure services or are negatively affected by existing infrastructure.

Current New Zealand infrastructure policies deal with individual or household circumstances in different ways. The different approaches partly reflect the fact that infrastructure is delivered by many different entities, in both the private and public sectors, and at different levels of government. Below are just a few examples.

- Government policy effectively establishes universal access to telecommunication services through a combination of a universal service obligation and targeted investments.
- People on low incomes are assisted to meet living costs (including infrastructure services) through government income support such as the Job Seeker Allowance, New Zealand Superannuation and the Accommodation Supplement. The government provides additional payments or subsidies to selected groups to meet energy costs (the Winter Energy Payment) and transport costs (the SuperGold Card).
- There are discounts, concessions and rebates available for water fees or rates or public transport services, with scale and eligibility criteria varying by region.

Who we are affects our access to infrastructure services: Sector close-ups

Ka pāngia tō tātou whai wāhitanga ki ngā ratonga hanganga e tō tātou tuakiri: Tiro tata ki te rāngai

Water networks

Ngā whatunga wai

When infrastructure, such as our water networks, fails or performs poorly, it's often the disadvantaged who feel it most acutely since they have fewer options. Those with resources may be more easily able to fund rain- or grey-water collection systems, for example. These options aren't available to people on lower incomes who can't afford to pay for alternative solutions.

Historically, the way we planned and built infrastructure also had impacts for Māori (Marr, 1997). An example is the Ōrākei wastewater scheme, constructed in Auckland in 1914, which disposed of untreated sewage from Auckland's growing suburbs into the Waitematā Harbour (Watercare Services Ltd, n.d.). Sewage outflows contaminated shellfish beds belonging to local iwi, Ngāti Whātua, which had unsuccessfully opposed the scheme (Dann, 2010). The completion of the Māngere wastewater treatment plant in 1960 allowed the Ōrākei outflow to be closed, but still caused pollution in Manukau Harbour (New Zealand Infrastructure Commission, 2022, p. 77).

Transport

Te Ikiiki

New Zealanders have internationally high rates of car ownership (Ministry of Transport, 2022) and infrastructure investments have often encouraged reliance on private cars for transport.

Non-drivers sometimes need to make difficult transport choices, where they face heightened risks to their personal safety or need to go to great lengths to mitigate those risks (Russell et al., 2021). Non-drivers are often in marginalised or disadvantaged groups, including Māori and Pacific peoples, people with a disability, people on lower incomes, women, LGBTQI+, and ethnic minorities (Walker, 2021).

Individuals can face barriers on more than one front. As noted in the discussion paper The Fair Path, these barriers 'frequently intersect with, and exacerbate, other forms of disadvantage like low-income, inadequate housing, or lack of digital access' (Walker, 2021, p. 6).

Telecommunications

Ngā Whitimamao

One of the aims of the Digital Strategy for Aotearoa is that everyone is empowered to participate in our digital society (New Zealand Government, 2022a). The pandemic emphasised the importance of digital inclusion, for example, 17 district health boards collectively experienced a 100-fold increase in telehealth consultations, to 34,500 per week in April 2020 (eHealthNews, 2020).

But we have some catching up to do to reach that aim. Some estimates suggest up to 1 in 5 New Zealanders cannot, or do not wish to, engage online (New Zealand Government, 2022a). The consultation for the Digital Strategy in 2021 revealed that some communities, for example, Māori, Pacific peoples, other ethnic groups, older people and people with disabilities are at higher risk of digital exclusion. If people or communities are not digitally included, they may lose access to a range of opportunities and services (New Zealand Government, 2022b).

Energy

Pūngao

As the Electricity Price Review notes, New Zealand residential prices on average ranked tenth lowest among 35 OECD countries in 2017. However, residential consumption was the sixth highest, suggesting that many of New Zealand's homes are not energy efficient. This means that 'reducing power bills will therefore be as much about improving housing quality and how electricity is used as lowering prices' (New Zealand Government, 2019, p. 2).

A significant number of households in New Zealand struggle to pay for infrastructure services like energy. In 2018/19:

- 134,000 households (7.6% of all households) reported being unable to keep their homes adequately warm
- 100,000 households (6% of all households) paid 10% or more of their incomes on domestic energy costs
- 99,000 households (5.6%) had been late paying their power, gas, rates or water bills more than once (MBIE, 2021, pp. D1-18).

While the numbers have fallen over the past few years, several thousand households have their electricity disconnected for non-payment every quarter (Electricity Authority, 2022).

During the Electricity Price Review, energy hardship emerged as one of the most pressing issues with more than 100,000 households. The Ministry of Business, Innovation and Employment (MBIE) defines energy hardship as 'the situation when individuals, households and whānau are not able to obtain and afford adequate energy services to support their wellbeing in their home or kāinga' (MBIE, 2022).

The legacy for future generations

Te taonga tuku iho mo nga reanga e haere ake nei

Infrastructure assets have long lives and can have enduring impacts on local communities. Their benefits and costs can also last for several generations, so choices about the type of asset, its location, size, and how its funded and financed matter not only for people living now, but for those in the future. Choices made now can either improve the wellbeing of future generations or limit their options and opportunities.

Underinvesting in infrastructure now pushes costs out onto future generations. These costs can be very 'lumpy' (for example, happen all at once), especially when it comes to replacing an asset at the end of its life and owners have not made provision for the replacement costs. The Auditor-General (2022) has repeatedly raised concerns about the adequacy of local government spending on renewing assets.

On the other hand, overinvesting now can create large debt financing or operating costs on current and future generations, and limit the funds available for other, possibly more beneficial, projects. Getting this balance right is difficult, because future generations are not represented when investment decisions are made and as a result, decisions may be too short-sighted and not make the greatest long-term contribution to wellbeing.

A related challenge is how to spread the costs of new or upgraded infrastructure in a way that fairly reflects the distribution of benefits. Because many infrastructure assets provide services over a long period, it often makes sense to finance their provision through debt and then repay these costs through charges on current and future beneficiaries (for example, through additional fees to connect to a water service, or through targeted rates on properties that use or adjoin the asset).

In practice, there can be barriers to this approach. Lenders and credit rating agencies put limits on the total amount of debt councils can incur without affecting their ratings and interest costs. Even if councils can borrow at a reasonable cost, local voters may oppose debt increases out of concern about the impacts it would have on future rate bills. One alternative is to use upfront charges to meet infrastructure costs, such as development contributions. Either way, homeowners end up bearing the final cost, usually through their mortgages (Box 4).

Another important example of intergenerational fairness issues in infrastructure is managing the impacts of climate change. Investment decisions now can affect the opportunities available to future generations and their resilience to climate events. A 2019 study estimated that $8 billion worth of local government infrastructure is at risk from 1.5 metres of sea-level rise (Simonson & Hall, 2019).

Higher temperatures are already putting pressure on infrastructure assets.

- Summer heat in Wellington during 2017 dried the ground, putting stress on old water pipes and causing a record number of leaks (Lawrence et al., 2018).
- Higher temperatures in summer have led to temporary speed restrictions being imposed on the rail network, in case the heat leads the tracks to become misaligned (Ministry for the Environment & Statistics New Zealand, 2020, p. 51).

Box 4: Infrastructure funding and financing

The Infrastructure Funding and Financing Act 2020 aims to ease financial constraints to councils investing in additional infrastructure by allowing distinct entities to be established that take responsibility for the new assets and charge levies to fund their construction. These entities would sit outside council balance sheets, and so would not put pressure on local authority debt levels and credit ratings.

The risks and costs posed by climate change to infrastructure are not evenly distributed across the country. Canterbury, Hawke's Bay and Auckland have the largest amount of exposed council infrastructure. More assets are exposed in the North Island (because of its higher population) but the per-capita replacements costs in the South Island are higher (New Zealand Productivity Commission, 2019, p. 226).

The impacts of climate change raise questions now about the levels of risk and service that future generations should bear or expect.

The anniversary weekend flooding in Auckland and Northland, and the effects of Cyclone Gabrielle in the Hawke's Bay and Tairāwhiti regions in early 2023 have brought many of these questions to the fore, such as:

- What level of storm should infrastructure be built to withstand (for example, a 1-in-100 year storm or more severe events)?
- Is it reasonable, feasible or cost-effective to plan on services being maintained throughout severe climate events, or should the priority be on limiting the scale and severity of disruption?

Different service and risk levels have different cost implications, and choices now can shut off or limit options later, particularly as it can be very expensive to retrofit infrastructure to meet higher standards.

Improving New Zealand's resilience to climate change is the focus of the national adaptation plan (NAP), which was released in August 2022. The NAP includes several actions 'to reduce the vulnerability of existing assets and ensure new infrastructure is fit for a changing climate'. But as the NAP notes, the motivations to take adaptation action vary across sectors.

Other countries have tried to bring the perspectives of future generations into decisions

Ko etahi atu whenua kua ngana ki te kawe i nga tirohanga o nga reanga kei te heke mai hei whakatau

While the interests and preferences of current residents can be incorporated into investment decisions, including those of future generations is harder. Some countries have attempted to do this by establishing institutions to consider and reflect their interests. For example, the Welsh government established a Commissioner for Future Generations in 2015 (Box 5) and Scotland's government has recently announced an intention to follow suit.

The Swedish government included a Minister for the Future between 2014 and 2016, who focused on issues such as the future of work, the green transition and global cooperation, with the long-run objective of keeping Sweden competitive in the future (Government Offices of Sweden, n.d.; Mucci, 2015).

Box 5: Considering future generations in Wales

The law which established the Commissioner sets out seven 'well-being goals' [2] for Wales and a duty on public bodies to 'carry out sustainable development', which includes:

a. setting and publishing objectives ('well-being objectives') that are designed to maximise its contribution to achieving each of the well-being goals, and b. taking all reasonable steps (in exercising its functions) to meet those objectives (Section 3(2), Well-being of Future Generations (Wales) Act 2015).

The Commissioner acts as the 'guardian for the interests of future generations in Wales', advising and encouraging public bodies, conducting research, carrying out reviews, making recommendations and monitoring progress.

[2] 'A prosperous Wales, a resilient Wales, a healthier Wales, a more equal Wales, A Wales of more cohesive communities, a Wales of vibrant culture and thriving Welsh language, and a globally responsible Wales.'

These institutions have influenced infrastructure decisions. The Welsh government cancelled a large road-building project following a challenge from the Future Generations Commissioner that it was an attempt to address '21st century transport issues with 20th century solutions' and would contribute to higher carbon emissions (Morris, 2018). The Commissioner instead proposed an alternative package of public and active transport investments.

We have choices
He kōwhiringa ā tātou

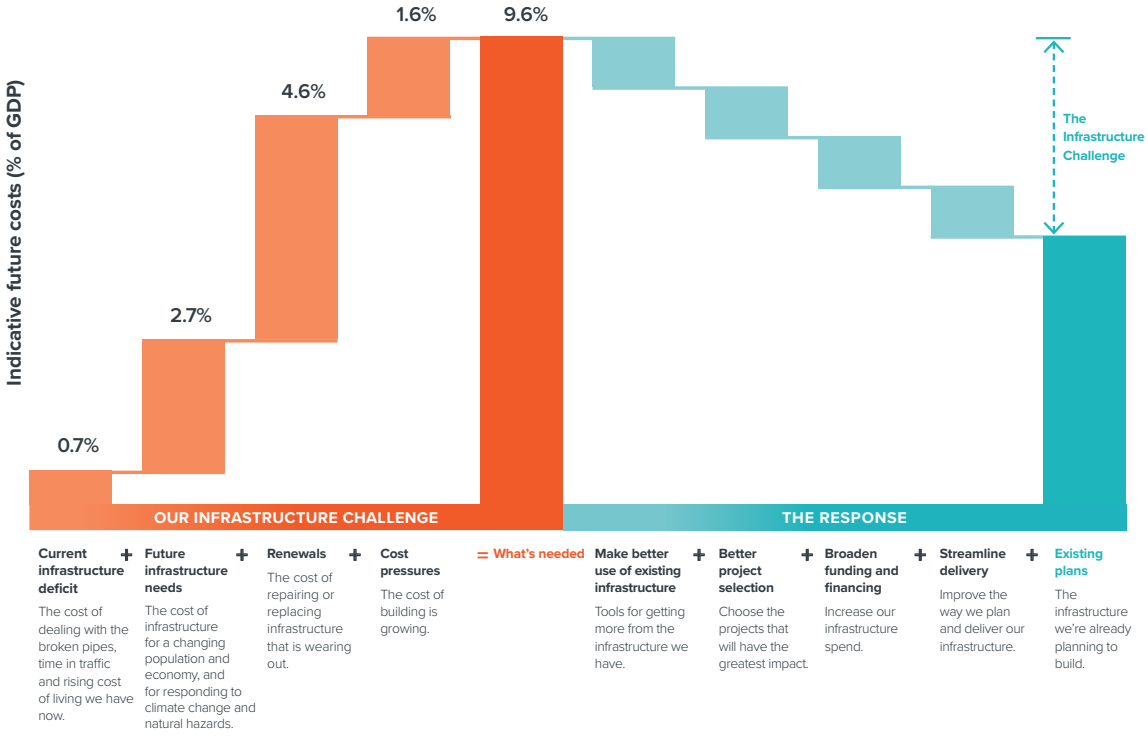
Because we have limited resources with which to build, operate, maintain and renew infrastructure, we can't invest everywhere at once. Improving infrastructure in one area can mean leaving needs unmet in another. A careful prioritisation of investment is needed when deciding where, when and how much to invest (Figure 2).

When faced with options to manage congestion on an infrastructure network for instance, an operator may charge more at peak periods to spread the load across time and avoid the need for expensive new physical assets and ongoing operational costs. This is an example of a lever that makes better use of existing infrastructure. It can be an effective way to manage costs. For instance, Transpower estimates that without a peak-demand charge for electricity transmission, the scale of physical investment would need to be around 2-9% higher (Transpower, 2018). This would be reflected in higher electricity prices for everyone.

Implementing peak pricing in public infrastructure has proven challenging. As a result, some communities face lower service quality (for instance, rising traffic congestion) or require greater infrastructure investment, which comes at a cost to users, ratepayers or taxpayers and may have implications for fairness.

Decision-makers face choices between the appropriate response (better use of existing infrastructure, project selection, streamlining delivery, and funding and financing) and the service quality that communities will experience. If we select the wrong projects, the funding required to address our infrastructure challenges may be higher. If we deliver projects inefficiently or slowly and don't make better use of existing infrastructure, service quality may fall. Depending on the type, reach and networked nature of the infrastructure, these trade-offs can impact local communities, cities, entire regions or the whole country. The New Zealand Infrastructure Strategy assumes that we'll need to improve how we use all four responses to maintain and increase the value we gain from infrastructure (New Zealand Infrastructure Commission, 2022).

Figure 2: The challenge, the response



Source: (New Zealand Infrastructure Commission, 2022)

Where decisions about infrastructure are made

Te wāhi e whakamanahia ana ngā whakataunga

Decisions about infrastructure investments and funding are made by a range of organisations and vary among the infrastructure networks discussed in this paper:

- telecommunications and energy infrastructure decisions are largely made by for-profit businesses, within the constraints set by the law[3]
- water infrastructure is primarily decided by local government
- transport infrastructure decisions are shared between local and central government.

Local government has the primary responsibility for assets where the beneficiaries are mainly local residents and can be easily identified (for example, through user charges, rates bills or utility connections). Central government has the lead for assets where services can have impacts on the wider community (for example, schools, hospitals) or where the beneficiaries cannot be easily identified.

Local and central government collaborate over land transport investment, as it has benefits for both local residents and the wider community; beneficiaries can sometimes – but not always – be identified, and some users come from outside the region.

These arrangements in New Zealand satisfy the 'beneficiary pays' conception of fairness and create opportunities to match investment decisions with local preferences. For example, people living in rural areas may not wish to have the level of water and transport infrastructure services on offer in cities because of concerns about the expense and the small number of ratepayers available to bear the costs. However, these arrangements can create other fairness concerns, particularly where local decisions create costs for others.

One example is the infrastructure required to enable land for housing (such as water and transport). Decisions that slow the provision of this infrastructure (for example, to manage the costs to current ratepayers or preserve current neighbourhood 'character') can constrain the supply of new housing, increasing house and rental prices and putting pressure on lower-income families. The complexity of the planning system can also make it hard for people with limited resources to participate in decisions. These 'spillover' effects are one reason central government has taken a more active role in urban planning, housing and infrastructure policy over the past decade.

[3] Gas, telecommunications and electricity services and investments are regulated by the Commerce Act, Gas Act, Electricity Act, Electricity Industry Act, Telecommunications Act and a range of secondary legislation. The national electricity grid is owned by a State-owned enterprise (Transpower), but that organisation is required to 'operate as a successful business'.

Fairness is factored into infrastructure decisions in different ways

He maha ngā huarahi e whakaurutia ana te tautika i ngā whakatau hanganga

Fairness plays a role in most infrastructure decisions, although the issues that are considered and the ways in which they factor into decisions differ by service type and who is responsible.

Decisions about energy and telecommunications infrastructure are made primarily on commercial grounds within a regulatory environment determined by government that includes considerations of fairness.

Decisions about the types and amounts of infrastructure investment in local government are guided by the relevant council's Long-Term Plan (LTP), which describes the council's activities and the outcomes it will pursue over the coming 10 years. These outcomes are developed in consultation with the community and reflect the statutory purpose of local government: 'to promote the social, economic, environmental, and cultural well-being of communities in the present and for the future' (Local Government Act 2002, section 10(1)(b)).

All councils have fairness objectives in their LTP outcomes, although they vary in their focus and nature. The 2021-2031 Christchurch City Council LTP, for example, includes the outcome of '[a] well-connected and accessible city promoting active and public transport', where '[r]esidents have equitable access to public transport and cycleways across the city' (Christchurch City Council, 2021, pp. 22–23).

For land transport infrastructure, decisions about priorities – including how fairness might be incorporated – are made through the Government Policy Statement (GPS) on land transport, which is reviewed and updated every three years. All major land transport investment decisions need to be consistent with the GPS. Three of the four current strategic priorities in the GPS relate to fairness:

- providing people with better travel options to access places for earning, learning, and participating in society
- developing a transport system where no-one is killed or seriously injured – the GPS states that the lack of safe infrastructure limits travel options for some people
- transforming to a low-carbon transport system that supports emissions reductions aligned with national commitments, while improving safety and inclusive access.

The GPS states that the actions which will lead to lower emissions – transport mode shift; mixed-use, higher-density and transit-oriented urban development – will have wider fairness benefits, for example, more housing, more accessible public transport services (Government of New Zealand, 2020, pp. 6, 22).

Building fairness into the funding equation

Te hanga i te tautika ki te whārite tahua putea

Improving the way infrastructure is funded and financed means we can deliver more, and more fairly, and better meet our communities' needs.

As the New Zealand Infrastructure Strategy notes, at times the funding and financing of infrastructure need to explicitly consider issues of fairness. For example, for some types of infrastructure, like public transport, there are wider social and environmental benefits that can justify public subsidies (New Zealand Infrastructure Commission, 2022, p. 127). There are also instances where vulnerable groups, such as those on lower incomes or with high needs, require some level of public subsidy. For example, in the energy sector, Work and Income administer the Winter Energy Payment that helps with the cost of heating over the winter months for beneficiaries and pensioners (Work and Income, n.d.).

There are many ways of thinking about 'fairness' in funding. When we were developing the New Zealand Infrastructure Strategy, we heard through public consultation and stakeholder engagement that a clearer and more consistent approach to funding and financing infrastructure was required across the system. The New Zealand Infrastructure Strategy identifies six funding and financing principles, all of which have direct implications for fairness (Table 1).

The challenge and opportunity of demand management

Te wero me te āheinga o te whakahaere popono

Demand management policies can be powerful tools for getting the best value out of infrastructure assets, managing negative effects, and avoiding unnecessary costs. For example, the introduction of traffic congestion charging in London saw increases in public transport use, cycling and walking, and reductions in congestion and air pollution levels (Pike, 2010).

Because of these benefits, the New Zealand Infrastructure Strategy recommends greater use of demand management tools such traffic congestion charging and water pricing in New Zealand.

Demand management can also reduce costs to some consumers and ensure a fairer allocation of those costs (for example, by reducing cross-subsidies). The move from a flat water rate to including a volumetric charge on the Kāpiti Coast resulted in 75% of ratepayers paying less for water than they would have under the previous approach and allowed the Kāpiti Coast District Council to defer the need for a new dam by 40 years (New Zealand Productivity Commission, 2019, p. 283; Office of the Controller and Auditor-General, 2018, p. 9).

But greater use of price-based tools can put financial pressure on some people. As discussed previously, a significant number of households in New Zealand already struggle to pay for infrastructure services like energy.

Table 1: Core principles for infrastructure decision-making

Infrastructure funding and financing principles	
Principle 1:	Those who benefit pay – Infrastructure services should be paid for by those benefiting from the services (the benefit principle) or creating a need for the service (the causer principle).
Principle 2:	Intergenerational equity – Funding and financing arrangements should reflect the period over which infrastructure assets deliver services and be affordable for current and future generations.
Principle 3:	Transparency – There should be a clear link between the cost to provide infrastructure services and how services are funded. Wherever possible, prices should be service-based and cost-reflective.
Principle 4:	Whole-of-life costing – Funding requirements should include the ongoing costs to maintain and operate an infrastructure asset and the cost to renew or dispose of it at the end of its life as well as the up-front cost to construct or purchase it.
Principle 5:	Administratively simple and standardised – Administrative costs for both providers and users should be minimised unless there are clear benefits from more complex funding and financing arrangements.
Principle 6:	Policies for majority of cases – Funding and financing policies should be written to work for the majority of cases. If needed, alternative or supplementary mechanisms should be added to provide flexibility and ensure fairness.

We recognise that there are inherent tensions between some of these principles. One of the aims of this project is to take a closer look at these principles and ensure they are fit for purpose.

This means there may be changes to these principles.

Congestion charging in Stockholm

Many jurisdictions try and accommodate fairness concerns associated with demand management policies through discounted prices.

- London's congestion charge provides exemptions or discounts for emergency vehicles, buses and coaches, taxis and private hire vehicles and disabled drivers. People who live within the congestion cordon area are eligible for a 90% discount (Transport for London, n.d.).
- English and Welsh water companies offer a 'social tariff', which reduces the per-unit rate, or a WaterSure programme that caps overall water bills, for eligible people (UK Water Services Regulation Authority, 2023).
- Some local authority water services in New Zealand provide rebates on water bills for selected groups of people or households.

There is a wide range of household circumstances that can be reflected in fairness-based price discounts. The urban toll scheme in Trondheim, Norway, applied a rule whereby drivers could only be charged once per hour to cross the cordon. This was introduced in response to complaints that people dropping off and picking up children were being charged multiple times (Ecola & Light, 2009).

However, too many exemptions or discounts will reduce the ability of demand management tools to improve efficiency or limit negative effects. Traffic conditions have recently deteriorated in London, in part, because of the growth in private hire vehicles, which are exempt from the congestion charge (Auckland Council et al., 2020). Exemptions or price discounts may also create other fairness issues, such as increased prices on people whose incomes are low but fall outside the eligibility thresholds.

In practice, how demand management tools affect fairness depends not just on pricing levels and exemptions, but also on how the revenue raised through the tools is used. Many traffic congestion pricing schemes 'recycle' the revenue raised to improve public transport services or provide other amenities. When done well, demand management schemes can have quick impacts and gain sustainable public support.

How Stockholm introduced congestion charging

Big questions and how you can help

Ngā patai nui, ā, pēhea ai koe e āwhina

We know that New Zealand has an infrastructure challenge and we have choices about how we want to address it, but all of these involve making trade-offs.

We also know that responding to the infrastructure challenge laid out in the New Zealand Infrastructure Strategy poses big issues about fairness. Here are some examples:

- Congestion charging and other demand management tools will be important for raising the efficiency of our infrastructure networks, delay or avoid having to build more assets, and improve service quality. Yet demand management policies often raise concerns about their impacts on particular groups, such as people on lower incomes. ***How should any adverse impacts of policies to manage demand be mitigated?***
- Meeting New Zealand's net-zero climate change goals will require increasing electrification and raising the prices of fossil fuels like petrol and gas. Some households will be better able to offset these costs, by investing in electric vehicles, solar panels and batteries. ***How should we achieve these climate change objectives while also ensuring access to essential services for all?***
- A number of communities face growing risks to infrastructure services from climate change effects, such as more frequent flooding and storms. ***Who should pay to improve their resilience from these effects?***
- A number of areas and communities experience limited access or quality levels for some infrastructure services, such as public transport. ***Should future investments prioritise reducing these access gaps or improving service levels and reliability for existing users?***

Although fairness isn't the only goal, how New Zealand approaches and deals with fairness in meeting our infrastructure challenge is important. Te Waihanga will be undertaking research with the aim of:

- better understanding how New Zealanders view fairness in infrastructure, including the trade-offs that communities are willing to make to deliver future infrastructure
- building greater understanding about the fairness implications of how infrastructure is currently provided and funded
- providing advice to the Government and other decision-makers on how to manage and deal with fairness issues in infrastructure and infrastructure services, now and in the future.

Over the course of this project, we want to ensure that our advice and findings are well-grounded in evidence, and are keen to meet with officials, NGOs and other groups that work on issues associated with infrastructure policy and delivery or equity. If you have views that you would like to share or would like to receive regular updates on this work, please contact us at **whatisfair@tewaihanga.govt.nz**.

Key research questions for this project

Ngā pātai rangahau mātua mō tēnei kaupapa

1. What are the key issues with regards to fairness and infrastructure provision and funding in New Zealand?
2. To what extent does the current infrastructure system (such as policies, structures, legislation) reflect fairness?
3. What level of access to quality infrastructure and infrastructure services do New Zealanders have? How does this differ by location and socio-demographic characteristics (such as age, household composition, income, disability status)?
4. How much do New Zealanders pay for infrastructure services (including through rates and taxes)? How do costs differ by location and socio-demographic characteristics (such as age, household composition, income)?
5. What do New Zealanders think is 'fair' with regards to infrastructure provision and funding? Do these views differ between different groups?
6. What trade-offs are New Zealanders willing to make with regards to infrastructure provision and pricing, including to fund and deliver future infrastructure?
7. What does the relevant literature say about 'equity' and 'fairness' with regards to infrastructure provision and funding?
8. How can infrastructure help and/or hinder fairness? How could the infrastructure system (such as policies, structures, legislation) be designed to support fairness in practice?
9. What options are available to government and others to mitigate current inequities, and avoid future inequities, including for future generations? What are the benefits and disbenefits of each of these options?
10. How should fairness be best considered when making infrastructure decisions, and what lessons can be taken from previous decisions to better inform future decision-making?

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