



Goal 3

Our homes and natural and built environments are healthy and robust

Access to safe, warm, affordable and physically robust housing is a basic human right. Providing this for all Wellingtonians will boost quality of life across our city, supporting better health and education, particularly among our most vulnerable. Our homes will be supported by the right mix of assets and infrastructure - one in which natural and built assets work together in the face of a changing climate to sustainably meet Wellingtonians' basic needs, such as clean air, safe drinking water and energy.

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We will work with infrastructure owners to ensure flexibility and robustness of transport and energy services in Wellington.



Programme 3.1

Homes and telecommunication

We will support initiatives that contribute to Wellington homes forming the cornerstone of the city's resilience.

Safe, warm housing is a basic human need, but meeting this need can be expensive in Wellington. Nationally, New Zealanders spend around 23 percent of their gross disposable income on housing (seventh among OECD countries - OECD, 2015), while in Wellington City housing is considered severely unaffordable due to median prices approaching six times the median household income. It is estimated the city will need an additional 21,400 houses by 2043 to meet demand (WCC, 2015b).

Despite the high prices, the standard of housing for many Wellingtonians is inadequate. Wellington's hilly terrain means some areas do not receive much

sun, and housing can be cold, damp and prone to mould and borer. It is well documented that poor quality housing drives significant health and energy costs across the country, although the scale of the problem is not well understood in Wellington. The greatest concerns about housing quality are most often about rental properties, which are the homes of our most vulnerable citizens including immigrants, students and young families. In many cases these homes are also the least resilient to earthquakes.

Improving the quality of these homes will not be cheap, and limited insurance literacy means that restoring homes following

a major shock event may prove difficult for many. This stems from recent changes to house insurance, where only a fixed sum is insured, rather than the total replacement cost. The result is that many Wellingtonians may not have sufficient cover to resume the same standard of living following a shock like a major earthquake. In addition, research by Massey University (2013) found that only 21 percent of New Zealanders had income protection or disability insurance, meaning most would have limited income if a major shock disrupted their place of employment.

Our homes should be spaces to feel safe and recover following a major seismic event, but at the moment many cannot serve this function. The central city could be compromised

and people might need to work from home at a large scale. At this point, we are not sure if our homes and telecommunications networks can support this.

The Mayoral Taskforce on Housing acknowledges our future challenges - as does the Future Central City project. These initiatives complement the Resilience Strategy and will be linked through the Resilience Steering Group.

If the central city was **significantly** damaged in a major shock event

107,000

people would need to work from another location.



for many of them, working from home is the next best option.

Wellington City Council has established an earthquake prone buildings programme.

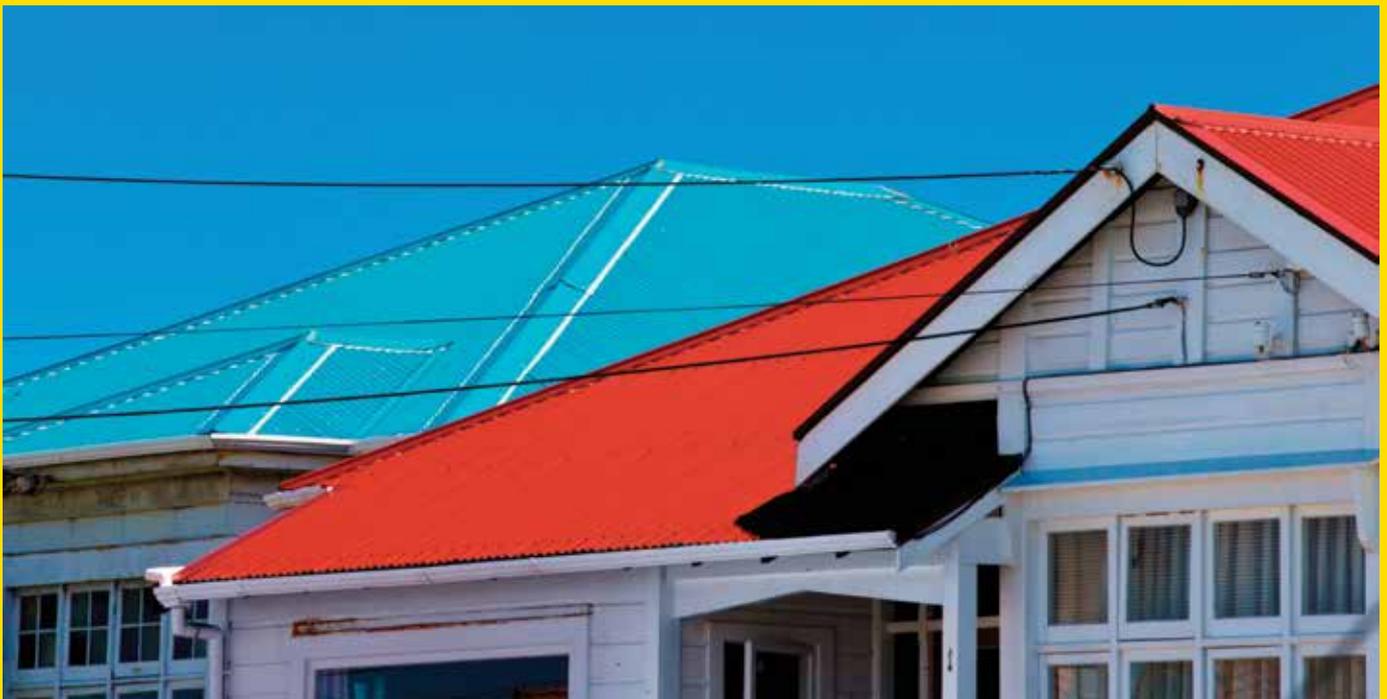
Since it started

5,500

buildings have been assessed

720

have been deemed earthquake prone and in need of structural changes



Help make homes warm, safe and dry

Lead

WREMO

Key partners

BRANZ, Earthquake Commission, insurance sector

New Wellington City project

We will investigate options to improve the resilience of Wellington's new and existing housing stock so that homes can better withstand earthquakes and storms, and can be used post-event as workplaces.

Action

The Council will lead two work streams: new homes and existing homes.

We will investigate regulatory and non-regulatory options for improving the resilience of new homes. This will include the potential requirement for new homes to be constructed with emergency water tanks, collection of grey water, solar panels and for multi-unit buildings to have "connected" or "bumping" spaces where people can meet and work together.

We will also investigate regulatory and non-regulatory options and tools for existing homes. This will include the potential requirement for subfloor, foundation and roof bracing within structures to be secure, dry and adequately ventilated. In addition we will promote chimneys to be seismically secure and undertake analysis of the extent and risk of borer infestations. Existing homeowners will also be informed of other co-benefits linked to a variety of seismic strengthening options available, which will increase the resilience of their home. We will investigate opportunities to link earthquake strengthening to interventions improving the health of home environments through ventilation, insulation and double glazing.

Both work streams will work closely with the Mayoral Housing Taskforce. We will widely communicate the lessons learned from Christchurch. We will develop a housing warrant of fitness for owners to ensure they understand the level of maintenance needed to keep homes warm, resilient and dry. We will work with banks and insurers to explore incentives for home owners. This project will enable the Council to better evaluate the risk to the city of doing nothing. More widely, it will also improve guidance for working on older homes and develop training models on home renovations through the Building and Construction Industry Training Organisation.

This project is closely connected to the telecommunication sector assessment to enable large-scale working from home (Project 23) and improving access to household resilience items (Project 1).



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Resilience co-benefits

The project will give home owners, tenants, insurers and planners confidence that housing stock can withstand a moderate level earthquake so that people can remain in their homes, and possibly work from home in the event that commercial buildings are compromised (Projects 18, 19, 23).

Improving the quality of our homes - making them warmer, safer and healthier - can also generate benefits in terms of productivity and education, becoming spaces where people can build their personal resilience to any shocks or stresses (Projects 1, 2). The project will also strengthen communities by providing an opportunity to design resilience into shared spaces (Project 5).

Our homes should be the
cornerstone of our resilience.





New Orleans

Inspiration from 100RC network

- Warm, safe and dry homes in New Orleans

We know that Wellington's homes leave a lot to be desired. We can deal with new homes through regulations, but most of our homes are already built, and are very difficult and expensive to retrofit to make warm, dry and safe to natural hazards. Typically, the people who are most vulnerable in their homes are those who can least afford to do anything about it.

Through its Resilience Strategy, New Orleans has developed ways to encourage and support home owners in vulnerable areas to modify their homes to the effects of flooding. In particular, we noted the financial incentives and levers New Orleans has successfully implemented to change home owners' behaviours, and we are keen to explore similar options to achieve warmer, drier and safer homes in Wellington.

Support insurance literacy campaign

Lead

WCC

New regional project

We will support home, business and asset owners to make informed decisions about their insurance cover.

Key partners

Insurance Council of New Zealand, Earthquake Commission (EQC), banks

Action

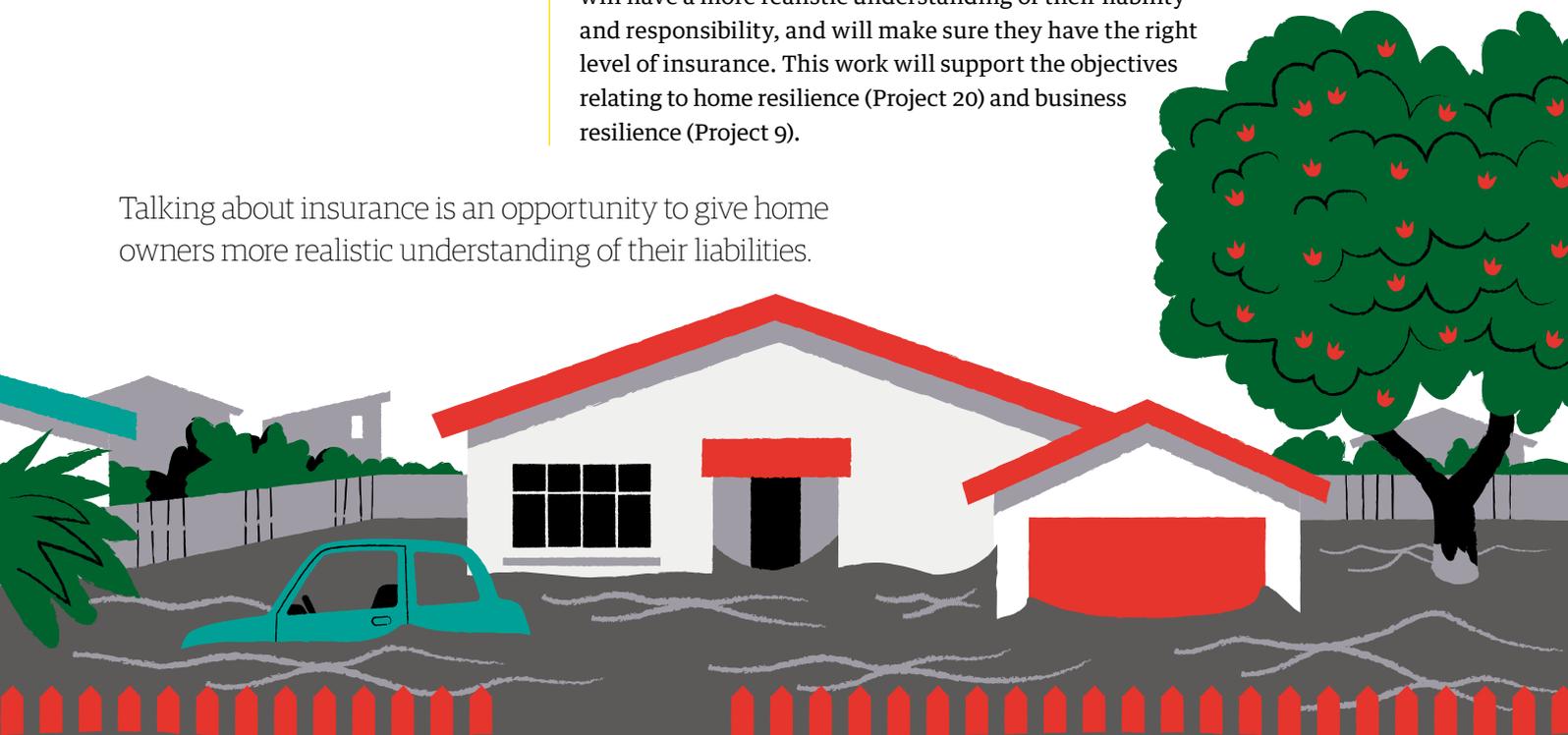
The Insurance Council of New Zealand (ICNZ) will conduct a survey to test the level of knowledge about insurance and better understand the social consequences of underinsurance. We will also assess people's ability to access insurance. Depending on survey results, ICNZ will undertake a targeted campaign to make home and asset owners aware of the gap between assumption and reality, with advice on where to find out more information, and what to consider when calculating the right level of insurance cover.

Resilience co-benefits

Reflecting on Canterbury, better information about insurance will allow systems to be integrated with response, recovery and risk reduction planning. It will open doors to debate on other tools to build resilience into Wellington's homes. EQC will be able to better communicate its role and responsibilities.

It is also an opportunity to engage with communities, and to connect them to key information and knowledge so they can make better decisions. Home owners will have a more realistic understanding of their liability and responsibility, and will make sure they have the right level of insurance. This work will support the objectives relating to home resilience (Project 20) and business resilience (Project 9).

Talking about insurance is an opportunity to give home owners more realistic understanding of their liabilities.



Understand the scale of the non-weather-tight homes problem

Lead

WCC

New Wellington City project

We will undertake a study of Wellington homes to assess the risk of water ingress in our new and existing housing leading to health issues resulting from cold, dampness and mould.

Key partners

Ministry of Business Innovation and Employment

Action

The Council will undertake a targeted analysis to determine the scale of weathertightness issues in Wellington's housing stock. The project report will provide recommendations or actions required for home improvements, and be accompanied by guidance developed for home owners; promoting regular maintenance, adequate insulation and ventilation and outlining options for cost-effective repairs.

The project will provide information to support discussions with central government and the building sector to address this issue. It will also support a balanced public debate and provide an opportunity to talk with communities and offer them key information to make better decisions.

Resilience co-benefits

The project will improve the Council's understanding of the scale of the problem. This will enable decisions to be made around what, if any, action is required to ensure these homes can withstand future shocks from seismic and extreme weather events. Warmer and drier homes lead to better health and comfort for the occupants, improving their chances in regards to social, educational and economic outcomes. The outcomes of this project will inform our work on resilient homes (Project 20).



Assess the capacity for large-scale remote working

Lead

WCC

New regional project

We will assess the telecommunications sector's capability to support high numbers of people working from home after a seismic event or other significant shock. This initiative is undertaken in conjunction with Project 5 - supporting community spaces for wellbeing and post-disaster roles.

Key partners

Vodafone, Spark, Porirua and Hutt councils

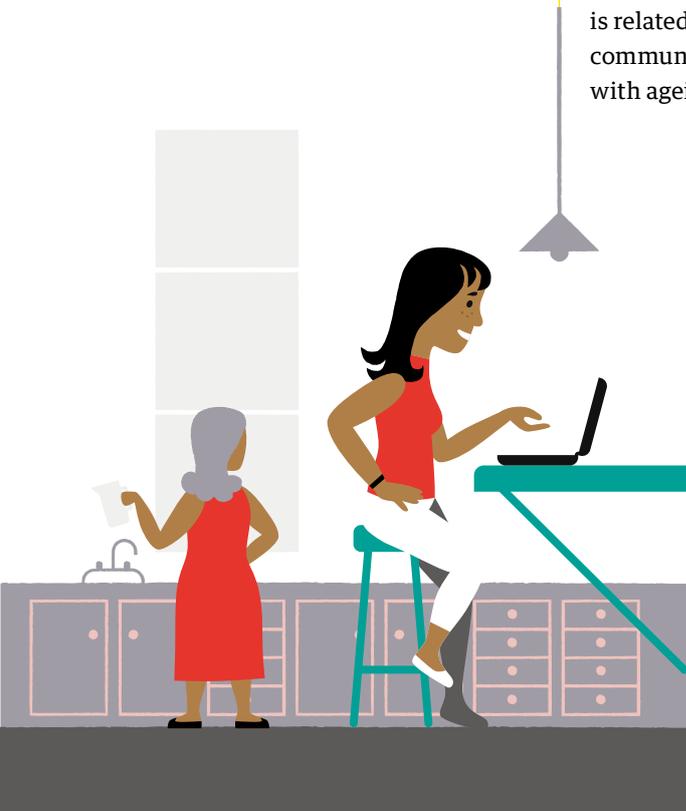
Action

WCC and other councils will work with the asset owners to assess the telecommunications sector's ability to support remote working for a large number of Wellingtonians over a prolonged period, based on a common understanding of levels of service. The assessment will make recommendations on any gaps identified.

Resilience co-benefits

This project will help us understand the gaps we need to fill to ensure a large percentage of Wellington's workforce and economy can continue operating after a major shock. At the same time, this work could also see a reduced need for travel and encourage more flexibility in ways of working, even when not faced with a disruptive event. This could benefit employers and employees, potentially reducing an existing barrier to workforce participation; for example, by enabling more part-time work by those caring for children or returning from maternity leave, as well as older people or those with mobility constraints. This project is related to promotion of new economic hubs (Project 8) and development of community spaces for post-disaster roles (Project 5) and has relevance to work with ageing population (Project 3).

Well-connected homes provide more flexibility during disruptions and are more inclusive for people who can't or don't want to travel to work.



Programme 3.2

Water and natural environment

We will ensure that Wellingtonians always have access to water services, in a way that enhances our natural environment.

It is estimated that in the event of a significant earthquake, water supply in Wellington will not be restored for up to 70 days in some locations. Most Wellingtonians only store water for 3 days. Rainwater collection could significantly improve levels of self-sufficiency, but very few houses are equipped for this. This also represents a missed opportunity to future-proof our water supply from threats that may seem remote today, but could arise in an uncertain future, such as droughts.

Population growth will put further pressure on our wastewater infrastructure, which is already at capacity, posing a risk for human health and the environment. Wellingtonians are not prepared to manage their wastewater without reticulated wastewater infrastructure. Any disaster is likely to be compounded by health risks related to contamination of public spaces with untreated sewage.

Climate change is expected to bring more intense rainfall, which will put additional stress on our highly modified (by culverts, for example) urban water systems. Urban intensification in response to population growth in our city is also generating demand for available land, placing increased pressure on our natural assets, while increasing demand for fresh water and generating more wastewater and runoff.

WREMO recommends

people store a minimum of



7 days'

worth of emergency drinking water,



20 litres

per person.

Wellington City has



4
botanic gardens



340
kilometres of walking
and mountain bike trails

Wellington region has

over **33,000^{ha}** of land
including



5
regional parks



water catchment areas



swimming holes

Areas managed by the Department of Conservation

include large tracts of intact indigenous forest, pest-free offshore islands and marine reserves

We depend on a healthy natural environment to provide a range of benefits known collectively as “ecosystem services”, which include water and air purification, recreation and wellbeing, and pollination. The biodiversity that contributes to these services exists in our reserves, parks, urban gardens, waterways, wetlands and coast. While some of this may be under increasing pressure, Wellington is fortunate to have abundant natural assets.

A key element in the City Resilience Framework used across the 100RC network is protecting and enhancing these natural assets. This is especially relevant for adapting to rising sea levels and increased storm surges - “soft” measures, such as dune nourishment and protecting natural kelp beds, can be highly effective for dissipating wave energy and reducing the extent and severity of erosion and inundation. From an urban resilience perspective, the

great advantage of these approaches is the opportunity for co-benefits - natural defences can provide recreational values, generate habitat for indigenous biodiversity, and make an area more attractive. They may also be combined with harder defences to provide flexible community spaces and active transport corridors along a raised shoreline.

Improve water systems through ecological interventions

We have an opportunity to improve the quality of our urban spaces, enhancing biodiversity and our wellbeing, while at the same time improving our city's ability to cope with heavy rainfall or earthquakes.

Lead

WCC

New Wellington City project

We will integrate ecological interventions into how we manage Wellington's water system to improve the quality of stormwater entering our streams and coast, improve resilience to flash floods and enhance urban biodiversity.

Key partners

The Nature Conservancy, Wellington Water

Action

The Council's urban ecology team will reduce the barriers to the uptake of water sensitive urban design (WSUD) by delivering a series of studies and demonstration projects in partnership with infrastructure managers and environmental groups.

Specifically, we will assess the costs and benefits of ecologically enhanced stormwater systems, investigate alternative financing instruments and map existing expertise. We will also develop a large-scale demonstration project in a number of hydrologically linked locations in urban settings and bigger open public spaces. The project will also include a series of training seminars delivered by international experts from The Nature Conservancy and other 100RC cities.

Resilience co-benefits

The project will improve understanding of the feasibility and value case for applying ecological interventions in fresh water management, including stream daylighting, developing wetlands, and other WSUD such as rain gardens, ponds and tanks, permeable pavements, and green walls and roofs. It will provide an opportunity for traditional water engineers and landscape designers to collectively develop effective, place-based approaches by learning from each other and international experts.

Effective WSUD slows down rainwater flow and improves its quality by capturing contaminants. As a result, it minimises damage associated with slips and erosion and reduces need for water treatment. This type of measure is likely to form part of our climate Adaptation Plan (Project 16). In addition, better capture of rainwater provides an efficient alternative to expensive infrastructure development and reduces impact on water sources in our regional parks. WSUD will also improve the quality of urban spaces for our communities (Project 5), enhancing our biodiversity and our wellbeing, as well as being increasing our robustness and resilience in a seismic event (Project 18).



Melbourne

Working with Platform Partners - Conserving nature with The Nature Conservancy

Wellingtonians love nature. As a port city, we especially acknowledge Tangaroa and te mana o te wai⁵. As the city grows and changes, we will need to work hard to retain and maybe enhance what we have for future generations.

The Nature Conservancy, one of the 100RC Platform Partners, will be an important partner in helping us improve water systems through ecological interventions.

The Nature Conservancy has a wealth of experience in this area, and we have looked to the work undertaken with the city of Melbourne in biodiversity to understand the strength of this opportunity. We are looking to make better use of Wellington's natural resources through initiatives such as transforming some stormwater pipes into open streams, enhancing the city's biodiversity and amenity while managing hydraulic flows.

Urban SOS

Victoria University students' future vision for a water sensitive Wellington has been shortlisted from 200 participants in a global competition, Urban SOS: Fair Share, which is run jointly by 100RC, AECOM and Van Alen Institute.

⁵ Tangaroa is the Māori god of the sea. The concept of te mana o te wai reflects the recognition of fresh water as a natural resource whose health is integral to the social, cultural, economic and environmental wellbeing of communities.

Explore options for sewage sludge disposal

Lead

WCC

New Wellington City project

We will reduce carbon and landfill liability related to sewage management.

Key partners

Veolia, Wellington Water

Action

The Council will undertake an options assessment for sewage sludge disposal to identify preferred options.

Resilience co-benefits

This project directly addresses the stress on infrastructure, and puts in place a suite of investment options that mitigate future capacity issues. At the same time, the city's financial exposure to carbon markets will be reduced.

Additionally, a better sludge disposal operation can be linked to energy production, making Wellington less dependent on external energy supply. Finally, the status quo is not consistent with how Wellington perceives itself environmentally. A better disposal option will bring Wellington's aspirations into alignment with what actually happens on the ground.

A city waste disposal system needs to be in line with its environmental aspirations.





Paris

Working with Platform Partners - Talking rubbish with Veolia

Wellington aspires to be an eco-city that is a leader in environmental practice. One of the biggest differences the city can make is to improve the way we dispose of organic waste - currently this makes up the largest proportion of the Council's carbon emissions inventory.

Facilitated by 100RC, Veolia and Wellington Water have come together to examine the opportunity to change the current practice, and are developing proposals to convert organic waste, and sewage sludge in particular, into energy. This would not only solve several complex waste management issues, but also build redundancy into Wellington's vulnerable energy supply chain.

Veolia is one of the 100RC platform partners. It works with hundreds of diverse cities around the world on water, energy, and waste management.

Ensure emergency water supply for Wellington Hospital

Lead

WCC

Existing Wellington City project

We will ensure robust emergency water supply for Wellington Hospital in Newtown.

Key partners

Capital and Coast District Health Board

Action

The Council will work with Wellington Water, the District Health Board and relevant Central Government agencies to agree on delivery methods and funding for the emergency water supply for Wellington Hospital and implement the project.

The project will investigate synergies related to restoration of existing watercourses and irrigation of urban agriculture projects in the neighbourhood.

Resilience co-benefits

This project improves the likelihood that Wellington Hospital will be able to function after an earthquake and may also identify water efficiency opportunities for the day-to-day operation of the hospital.

The project presents an opportunity to create a new amenity in Newtown, perhaps connecting with some of the local streams (Project 24) and providing irrigation for the local urban farm (Projects 5 and 6).

While creating emergency water storage we can also create new amenity and an irrigation system to support urban agriculture.



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Invest in water and wastewater resilience and awareness

Lead

Wellington Water

Scaling up of existing regional project

We will accelerate investment in water resilience and promote emergency water and sewage preparedness options to citizens, businesses and institutions to encourage them to take action and be self-sufficient for at least 7 days following a disaster.

Key partners

WCC, WREMO

Action

Wellington Water will design and implement an accelerated investment programme supported by an initiative that reinforces the need for all individuals, communities and institutions to take responsibility for their own emergency water and sewage. This includes further promotion of household emergency water tanks and increased use of grey and rain water. The communication will also aim to grow awareness of the sewage disposal challenge if reticulation is unavailable.

Resilience co-benefits

The project will improve Wellington’s ability to cope with a shock, and the ability of Wellingtonians to withstand a water and a sewage network outage for longer periods of time. This will be beneficial in the immediate response during a disaster and recovery minimising health risks and contamination of the environment (Project 18).

At the same time, promotion of grey water use and rainwater retention measures will reduce demand for water from the mains network, reducing pressure on water supply, as well as reducing costs of water treatment and pumping. This will also have a beneficial effect for stormwater management (Project 24), slowing down the runoff during the flash floods expected as a consequence of climate change (Project 16).



Programme 3.3

Transport and energy

We will work with infrastructure owners to ensure flexibility and robustness of transport and energy services in Wellington.

The current and future prosperity of Wellington relies on mobility of people, goods and information. Despite higher levels of cycling and walking than most other parts of New Zealand, Wellington remains highly reliant on road transportation. Seventy-one percent of trips were made by car in the Wellington region between 2010 and 2014, and 70 percent of freight was moved by road in 2012.

The way our region's transport corridor is shaped means it can be easily disrupted. Around 27% of workers in Wellington use it each day, and if it is closed, even briefly as it was after the Kaikoura earthquake, traffic comes to a standstill. Projects like the Transmission Gully motorway are important for the robustness of our region's transport networks, but we also need to look at other approaches for generating

flexibility and relieving congestion. While Wellington Harbour is also important for inter-island transport between Aotea Quay and Picton, it is also the main backup point of entry should land access be compromised. The Kaikoura earthquake has highlighted the fact this is a significant vulnerability for Wellington.

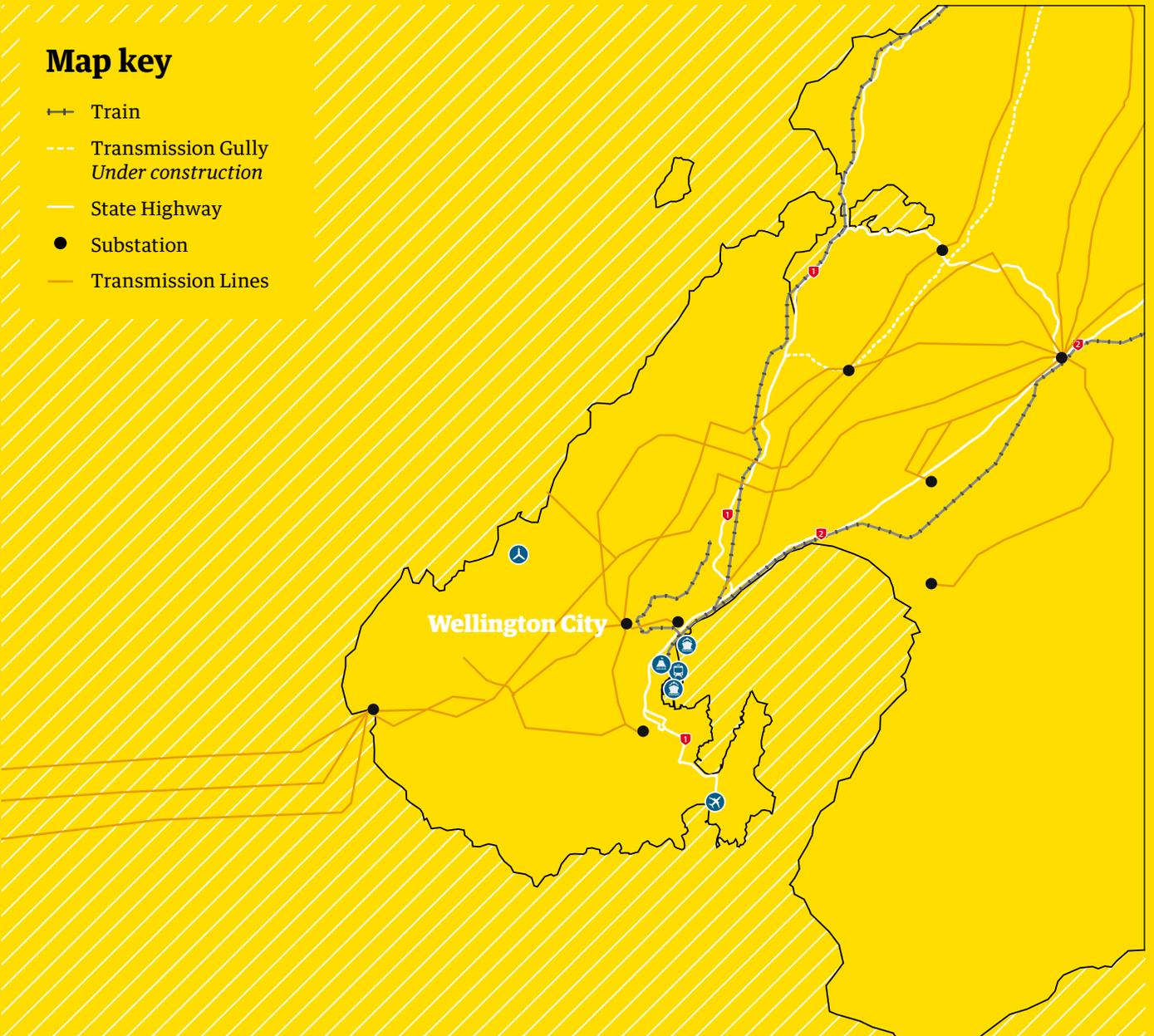
Wellington's public transport continues to improve, but it is likely that private vehicle travel will remain important in Wellington. There is a trend towards types of vehicle that are less reliant on our vulnerable fuel supply chains and also produce fewer emissions. As 82 percent (MBIE, 2016) of Wellington's electricity comes from renewable sources - chiefly from a windfarm located within the boundary of Wellington City - we are especially well positioned for use of electric vehicles.

Wellington's strong use of renewables is a great asset for our ability to cope with oil price shocks and breakdown in supply chains, but we know that our electricity distribution network is vulnerable to high winds, earthquake, fires and other natural and manmade hazards. Most citizens are unaware of the high degree of vulnerability, or of how reliant our economy is on its power supply. While we are currently looking to build robustness into the physical network, Wellingtonians are also increasingly discussing the idea of distributed infrastructure such as mini hydro, solar and wind generators. Distributed generation infrastructure builds our ability to cope with fuel and power supply disruptions following major shocks, and in the future may be able to help relieve the pressures on households from rising energy costs.



Map key

- +— Train
- - - Transmission Gully
Under construction
- State Highway
- Substation
- Transmission Lines



Support flexible energy supply

Lead

WCC

New regional project

We will work with Wellington's electricity sector to build in redundancy and flexibility into our energy supply.

Key partners

Wellington Electricity, Transpower

Action

The Council will work with Wellington Electricity and the Commerce Commission to make the network less vulnerable and perform to the agreed service levels. This will include investigation into incorporating network resilience in price setting mechanisms. We will also investigate options for incentivising uptake of technology that will build household energy independence, which could include microgeneration, battery packs, solar roofs, small-scale wind, tidal energy and neighbourhood microgrids.

Resilience co-benefits

The project seeks an energy network that is robust and flexible. A more decentralised network that includes multiple small-scale generation sources will perform better in an earthquake or a storm (Project 18), and will have an added benefit of reducing reliance on fossil fuels.

This approach can also generate economic opportunity, positioning Wellington as a leader in alternative technologies and building on our existing reputation as a low-carbon city (Projects 8,10).



A more decentralised network that includes multiple small-scale generation sources will perform better in an earthquake or a storm, and will have an added benefit of reducing reliance on fossil fuels.

Support widespread adoption of electric vehicles

Lead

WCC

New Wellington City project

We will enable widespread use of electric vehicles (EVs) in Wellington, reducing dependence on the vulnerable fuel supply chain, as well as our carbon footprint.

Key partners

Wellington Electricity

Action

This project will see the Council lead by example by switching its fleet to EVs as they become due for replacement. We will give priority to contractors that use EVs, including waste, recycling and street cleaning contractors.

We will support use outside of the Council by investing in charging infrastructure across the city, as well as working with other regional councils to establish a broader charging network. Uptake of EVs will also be supported through the District Plan, particularly in regards to charging infrastructure for apartments and new homes.

Resilience co-benefits

A significant increase in electric vehicles will drive reductions in air pollution and noise, resulting in health benefits for all Wellingtonians. In the event of a major shock that disrupts fuel supply chains, EVs may provide ongoing mobility, particularly if they are able to be recharged through renewable and distributed sources of energy (Project 28). EV batteries may also be able to provide emergency household power sources in the event of a seismic emergency.

The project will also generate alternative income/business development opportunities in the clean technology industry (Project 8 and 10).

Electric vehicles are better for the environment, and in a disaster there are more recharging options. Their batteries could supply emergency power to households if the lines are down.





Mexico City

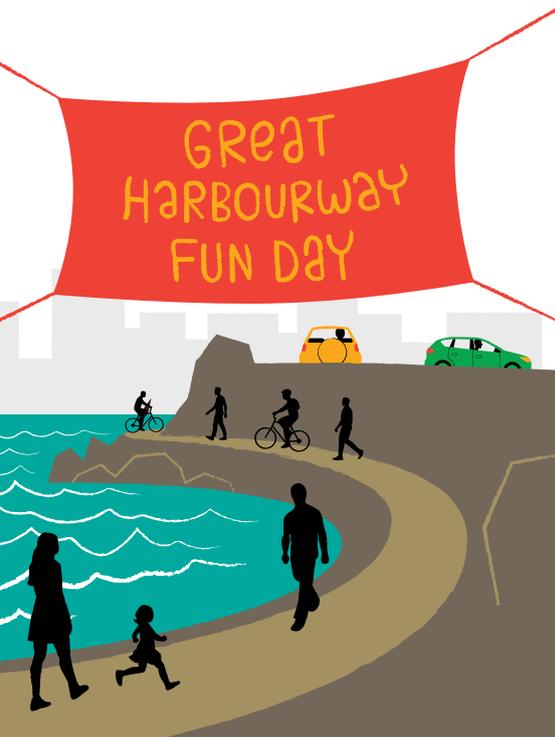
Inspiration from 100RC network - Mexico's integrated mobility system

Mexico's vision is to have an integrated mobility system that prioritises public transportation over private vehicles and provides a safe urban environment for pedestrians and cyclists.

Rather than accept traffic congestion, the city has decided to act decisively to promote an integrated mobility system to revitalise Mexico; discourage the use of private vehicles; create a safe and accessible city for pedestrians and cyclists; prepare the mobility system for the potential risks and effects of climate change, and promote the use of data to improve decision making on mobility.

Mexico City focusses on mobility, not cars, which resonates with many Wellingtonians, as does the explicit connection to climate change and revitalisation. Improved mobility also has a very real benefit in reducing air pollution and traffic congestion, with health and social co-benefits.

Leverage transportation investment to improve Wellington's resilience



Lead

New Zealand Transport Agency (NZTA)

Existing Wellington City project

We will work with NZTA to build and maintain resilient transport infrastructure for critical routes and all transport modes.

Key partners

WCC

Action

This project is effectively an advisory project, where the Council will be an active partner and resilience champion for the following projects:

- **Coastal cycleways:** improving cycle network and coastal defence
- **Petone to Ngauranga link:** addressing vulnerability of link between Hutt and central Wellington
- **Let's Get Wellington Moving:** reducing congestion in the central city
- **Future of the Port:** reducing vulnerability of the port

This will involve the Council strongly advocating for application of resilience principles in these projects. This could include greater inclusiveness through more meaningful engagement on end-user needs during project design and delivery, resourcefulness by encouraging infrastructure that serves multiple purposes, or robustness by ensuring that worst-case climate change projections are considered during project design phases.

Resilience co-benefits

As a group, these projects will improve access into the city for people and goods, as well as encouraging active lifestyles. All road users will benefit. It will provide redundancy in transport while improving everyday options. Advocating strongly for active use of resilience principles will ensure that co-benefits are maximised. Key projects that will connect with this initiative are encouraging adoption of electric vehicles (Project 29), undertaking recovery planning (Project 18) and developing a climate adaptation plan (Project 16).

A resilient transport network has inbuilt redundancy and flexibility to cope with disaster. It can also encourage an active lifestyle.