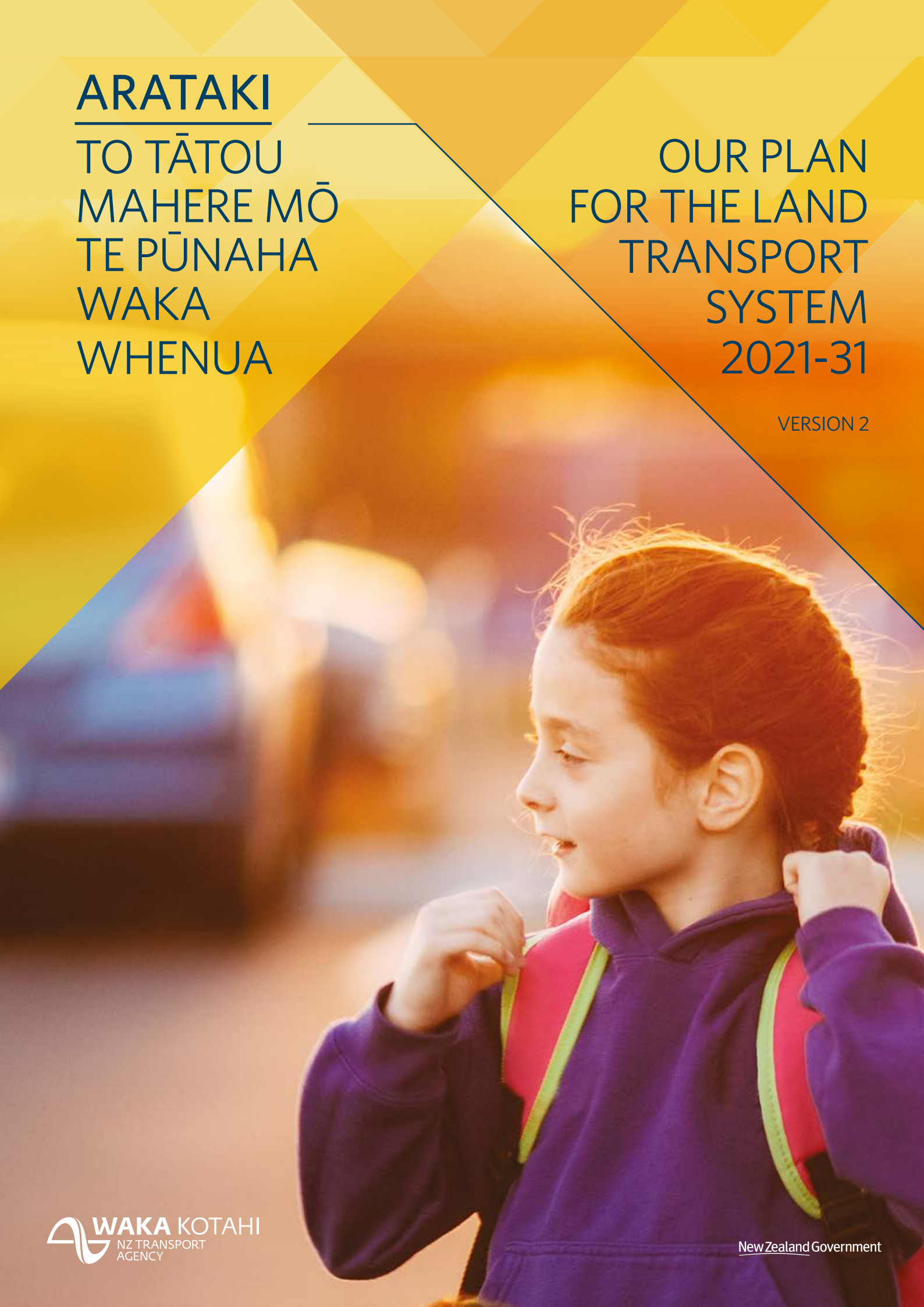
ARATAKI

TO TĀTOU MAHERE MŌ TE PŪNAHA WAKA WHENUA

OUR PLAN FOR THE LAND TRANSPORT SYSTEM 2021-31

VERSION 2



WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

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Waka Kotahi NZ Transport Agency
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COVID-19 OVERVIEW

COVID-19 is, hopefully, a once in a lifetime pandemic which has significant social, cultural and economic consequences. COVID-19 is impacting immigration, New Zealand's economic structure and customer preferences among many other things. It will also present funding and financing challenges for the public and private sector. While we cannot predict the full extent or duration of these impacts, we have played forward the most likely scenario developed by the Treasury and considered assessments by various experts to understand the likely implications and choices over the next decade. These insights, and the underpinning evidence, will be useful for Waka Kotahi and the sector as we plan for the next 10 years. Links to the research and initial insights can be found **here**.

Waka Kotahi commissioned research[15] about the regional impacts of COVID-19 pandemic over the next 10 years on economic structure and demographic change, as these are two key drivers on the land transport system. The research projects that:

- at the global level, restrictions put in place across countries mean that international travel is likely to be heavily restricted for at least 18 months
- global supply chain disruptions resulting from trade restrictions and reductions in airline capacity are likely to continue in the short to medium-term
- these factors will contribute to a substantial contraction in New Zealand's export and import volumes over the short-term (except for food), with only a slow recovery of volumes likely over the medium-term
- the impact of COVID-19 will be affected by our recovery trajectory relative to Australia and the ability to free up travel between the economies
- there may also be a lengthy and delayed effect of COVID-19 on GDP, employment and unemployment, lasting several years
- the structure of the economy will alter in the short to medium-term because of the significant negative impact of COVID-19 on key service industries, such as tourism, retail and professional and personal services, while other industries such as dairy and health are insulated
- considerable uncertainty remains about the medium to longer-term economic impact of these events.

With this backdrop of uncertainty, the projections at an industry level suggest that:

- the loss of jobs in tourism-related and other service industries creates opportunities for labour to be redeployed into other industries over the medium-term. The industries that benefit the most from this are agriculture, forestry, parts of the manufacturing industry, and construction
- over the next five to 10 years:
  - several construction, manufacturing and primary industries are expected to have higher shares of employment relative to what they otherwise would have under a business as usual scenario
  - most key transport industries are expected to have recovered close to or be ahead of business as usual projections
  - there is likely to be a decline in tourism's contribution to the economy and a slowing of the decline of the contribution of manufacturing to the economy, but not necessarily significant change to the economy's structure.

The impact of COVID-19 will also fall unevenly across regions and groups:

- Regions reliant on tourism will be hit the hardest, particularly areas in the South Island that are primarily focused on international visitors and have limited other industries.
- Major metros that have had higher levels of inward net migration over recent years, particularly the upper North Island, Canterbury and Otago, are expected to experience a slowing of population growth due to a sharp decrease in immigration.
- Much of the lower North Island is expected to hold its own over the medium-term.
- Parts of the upper North Island may not return to their pre-COVID-19 trends over the medium to long-term.
- The movement of workers towards primary industries or manufacturing will benefit several provincial areas in the medium-term where employment is projected to be above its pre-COVID-19 trend.

The impact of COVID-19 on different communities:

- Migrant workers will be significantly affected over the short to medium-term.
- Young people are likely to be more affected by the crisis, particularly in urban areas where the number of youth not in employment, education or training (NEETs) is already relatively high.
- Historically, economic shocks have had a disproportionately negative impact on Māori and Pasifika (because of both a concentration in lower-skilled occupations and self-employment in vulnerable industries) and women for similar reasons (part time, etc).

IMPLICATIONS FOR THE LAND TRANSPORT SYSTEM

1. The **six key drivers** impacting the land transport system that are identified in Arataki remain valid, although many play out differently in the short to medium-term. In the longer-term, trends of urbanisation and a shift towards a service-based economy continue, albeit more slowly than pre-COVID-19.
2. Slower population growth is expected in each of the **major metros**, due to a sharp decline in immigration, but the need to better integrate land-use and transport remains unchanged. Arataki insights support the potential need to review growth projections and assumptions about the speed of recovery post-COVID-19.
3. **Slower levels of growth** in both freight and passenger movements are also expected over the next decade. However, no significant changes are expected in the **location of transport demand** (key origins, destinations and flows of people and goods) through the upper North Island, lower North Island or South Island in 10 years' time.
4. There will be an ongoing need for transport services to support COVID-19 recovery by **improving access** to **employment, education and essential services** for urban Māori, youth and other transport disadvantaged.
5. There will be **ongoing pressure on transport funding and financing** as a result of the COVID-19 lockdown, requiring smart prioritisation.
6. COVID-19 and the resulting supply/delay issues have highlighted New Zealand's **heavy reliance on the private sector for the delivery of public projects**, through an outsourcing model. Having the right capacity and capability to support delivery of transport system activity and the achievement of step changes identified in Arataki is key.

IMPLICATIONS FOR RESPONSES

1. The five **step changes** identified in Arataki V1 remain valid as areas where a changed response is needed in order to deliver the long-term outcomes the government wants. Not surprisingly, the step changes need to be applied slightly differently to support the recovery from COVID-19. Most obviously, the geographical focus of the **regional development** step change has moved from the government's six 'surge' regions to those regions hardest hit by the impacts of COVID-19. Our approach to supporting regional development (primarily through cross government collaboration via the Provincial Growth Fund, government stimulus programme etc) remains largely unchanged.
2. Where funding allows, Waka Kotahi and the sector should seek to **prioritise** achievement of these step changes to lock in opportunities and position the land transport system for the future. This is particularly the case in the major metros where there is a short-term opportunity to help achieve mode shift and related climate change mitigation, and to improve urban form while development pressures have eased.
3. The existing key drivers, overlaid with the socio-economic impacts of COVID-19, have amplified the need to consider **issues of equity** to ensure everyone has access to the land transport system as we move towards a COVID-19 recovery phase. Urban Māori and youth will be hit the hardest by job losses as a result of COVID-19. We need to consider how to deliver to these groups and the current transport disadvantaged. Issues include access to health care, education and employment, access to digital connectivity (20% of New Zealanders have no smartphone which are increasingly needed to access real-time information and pay for services), affordability of using the system and physical constraints for transport disadvantaged.
4. **Funding and financing** will be particularly challenging during the COVID-19 recovery phase, both for providers of infrastructure, platforms and services as well as for many users of the transport system. These challenges highlight the need to make the most of what we have got and make smart, integrated decisions. It will be important to use available evidence and insights so the level of investment reflects projected transport demand, including where this is less than was projected pre COVID-19.
5. The response to and recovery from COVID-19 will occur through multiple channels and involve multiple parties, each with their own objectives and ways of doing things. The impacts and responses to COVID-19 have amplified the need for organisations to **work together** in an integrated way in order to recover well as a country and support wider outcomes across systems. For example, between the land-use and transport systems, strong seamless connections between modes, services and digital platforms.
6. There is still a high level of **uncertainty** around the ongoing effects of COVID-19. Waka Kotahi will continue to monitor the situation closely and work with others to understand the impacts so we can respond appropriately.

TIROHANGA WHANUI OVERVIEW

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

TIROHANGA WHANUI OVERVIEW

Arataki presents Waka Kotahi NZ Transport Agency's 10-year view of what is needed to deliver on the government's current priorities and long-term outcomes for the land transport system. It shares the evidence-base that informs our view and it helps us (and others) to better understand how our joint decisions and choices will shape the future land transport system.

Arataki informs and shapes the way we partner with others through planning and investment tools, such as spatial plans, network plans, Regional Land Transport Plans (RLTPs) and the National Land Transport Programme (NLTP). It is used to jointly plan for growth, manage change and ensure that together we develop a land transport system that is safer, better connected and supports greater transport choice.

It also helps inform our decision-making and enables us to respond to the changing needs of the land transport system.

Arataki shapes our engagement with local government and our other partners on the types of activities we consider are needed to deliver the future land transport system.

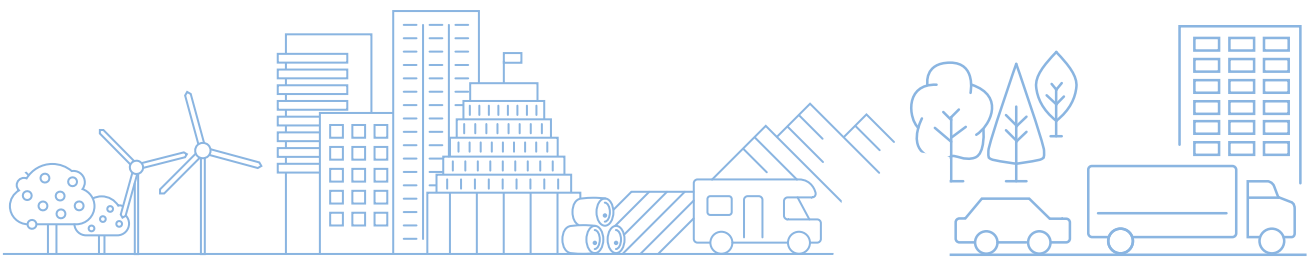
We rely heavily on collaboration across central and local government, with co-investment partners and the wider development sector to deliver the outcomes and results expected. This includes developing integrated packages of responses that include levers that others lead.

Arataki represents our best and most current view of the challenges and opportunities facing the land transport system over the next decade. **Arataki version 2 has been updated** to reflect initial research and analysis regarding the regional impacts of COVID-19 on the land transport system and identify the post-COVID-19 challenges and opportunities over the next 10 years. It also provides additional insights about the role that technology (including information and data) is expected to play over the next decade as a key driver on the land transport system.

We cannot anticipate the full extent or implications of COVID-19 on New Zealand or how we will need to respond. We will continue to develop our understanding of what is needed for the land transport system to support communities and the economy, including our understanding of the implications of COVID-19, technology disruptors and climate change.

Over time, we also want to better understand the needs of different communities, including Māori and the transport disadvantaged. We will also update Arataki in line with new census information from Statistics NZ as it is released.

Arataki informs our decision-making and shapes our engagement with local government and our other partners



TE TAKE Ō TE MAHERE ARATAKI PURPOSE OF ARATAKI

We know our communities and the economy rely on a land transport system that keeps people safe and connected; provides access to employment, education and health services; gets goods to market; and helps our regions prosper. Our land transport system can impact on our health and the environment, making it important that we plan for growth and have an integrated land transport system.

Arataki acknowledges that we need to shift our thinking when it comes to how people and goods move around, particularly when you consider that globally mobility in urban areas is set to double by 2050.

We need to make the following changes to meet future challenges:

FROM	TO
No shared evidence base for decisions	Shared evidence and insights as a basis for engagement with partners
Uncertainty about where Waka Kotahi proposes to invest nationally	A clear view of where we will target investment for the best national outcomes
Bottom-up planning and investment driven by what's ready now	Targeted and staged investment and other levers to deliver shared outcomes
Short-term focus driven by current priorities	Long-term approach to deliver government objectives and ensure the land transport system meets future needs
A land transport network perspective	A place-based approach that ensures integrated land-use and transport planning.

WAKA KOTAHI STRATEGIC APPROACH

Figure 01

UNDERSTANDING ARATAKI

Arataki is our 10-year view of what is needed to deliver on the government's current priorities and long-term objectives for the land transport system.

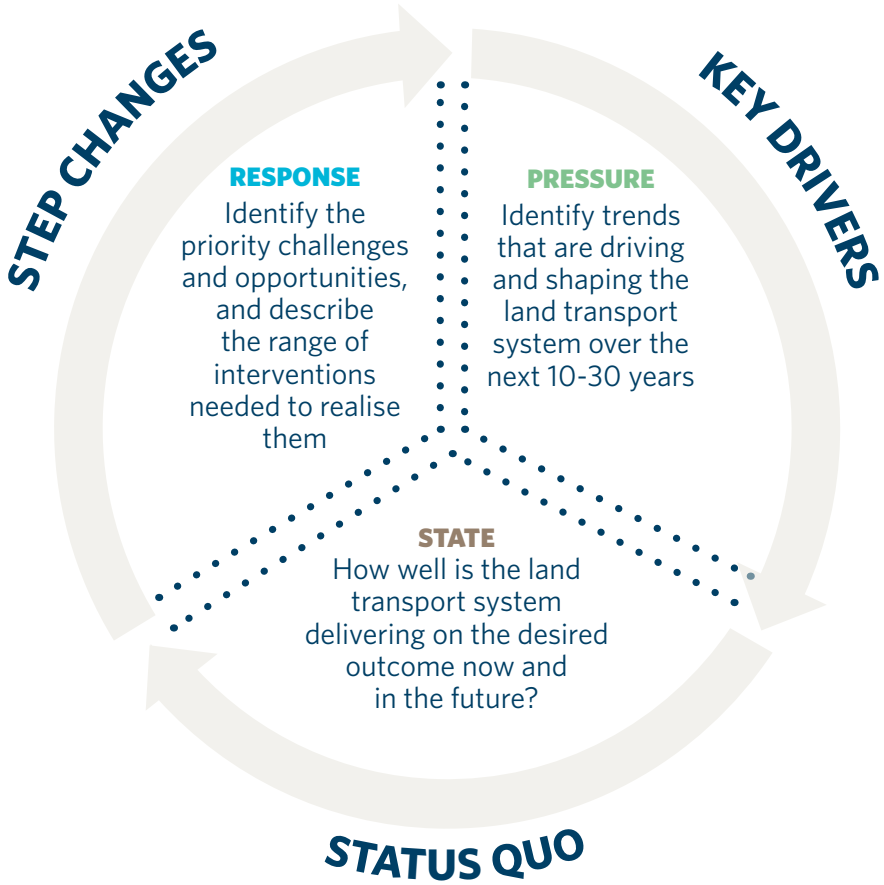
As we look to the future, we need to ensure our transport system is integrated and able to adapt to the evolving demands and changing needs of our customers.

Arataki Version 2 reflects initial findings on the impact of COVID-19 on the land transport system and identifies the post-COVID-19 opportunities. In doing so, Arataki:

1. outlines the context for change, current and future pressures on the land transport system, how these pressures will shape the land transport system and the challenges and opportunities that Waka Kotahi and its partners will need to consider. These are the **key drivers**
2. identifies the changes in existing responses that we consider are needed to deliver on the government's current direction and long-term outcomes for the land transport system. These are the **step changes**
3. describes how Waka Kotahi will use levers in partnership with others and the range of plans that we will shape and implement in partnership at a national, pan-regional and regional level
4. sets out **national, pan-regional and regional summaries** to guide our implementation of Arataki. The summaries will provide an overview of the key areas of focus and potential types of intervention (across the six broad levers) that we consider are needed to respond to **key drivers** and achieve **step changes**.

UNDERSTANDING THE LOGIC OF ARATAKI

Figure 02



NGĀ WHAINGA MATUA
KEY DRIVERS

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NGĀ WHAINGA MATUA
KEY DRIVERS

While we cannot predict the future, we can identify emerging trends that will influence the choices and trade-offs we need to make.

Understanding the challenges and opportunities that New Zealanders are likely to face over the next decade is the first step in preparing for change. This will ensure we are better prepared for the future, avoid the cost of poor decisions and are well positioned to better shape the land transport system.

We have summarised the **six key drivers** that will shape the future land transport system as:

1. demographic change

2. climate change

3. technology and data

4. customer desire

5. changing economic structure

6. funding and financing challenges.

The themes are not new but in the context of Arataki, the key drivers set a clear focus for achieving step change. The COVID-19 pandemic will impact on a number of the key drivers, particularly over the short to medium-term.

Technological change and managing the impacts of climate change are the most significant drivers that will shape the future land transport system over the next decade

IMPACTS OF COVID-19 ON KEY DRIVERS

The key drivers most impacted by COVID-19 are:

- **Changing economic structure:** with declining employment and economic activity in New Zealand and globally, and international tourism and related sectors impacted most negatively in the short to medium term.
- **Funding and financing challenges:** exacerbated as a result of reduced revenues.
- **Demographic change:** driven largely by a slowing of migration into and around New Zealand.
- **Customer desire:** with wider uptake of more flexible working arrangements and ongoing developments in e-commerce and delivery options, which will be monitored for their impact over the medium to longer-term.

We have considered how these key drivers will impact on the land transport system and the way people use it at a national, pan-regional and regional level as we identify what is needed to make sure our land transport system meets future needs.

DEMOGRAPHIC CHANGE

Population growth is closely linked to transport growth.

Population growth results in an increased number of journeys to access employment, commercial and social services, education and recreation. It also results in increased freight movement and business travel.

During the past decade, New Zealand and particularly the upper North Island, experienced strong, sustained population growth, driven largely by high levels of inward migration. During 2018/19, Auckland and Gisborne were the only regions that grew more by natural increase than by net migration. Northland, Waikato, Bay of Plenty, Canterbury and Otago had over two thirds population growth from migration. The Wellington region had a relatively even split between growth from natural increase and growth from net migration.

As a result of the COVID-19 response and associated border restrictions, migrant arrivals are expected to fall significantly over the next few years. While net migration will fall, the decline will be alleviated in part by fewer departures and a potential increase in returning New Zealanders. There will be limited, if any, population growth over the short to medium-term resulting from net migration.

The duration of border restrictions will depend on external factors including the ability of other countries to control the virus and the possible development of a vaccine. It seems likely that significant border restrictions will remain in place for up to 18 months, although there may be potential for a trans-Tasman bubble enabling movement between New Zealand and Australia, and potentially the Pacific Islands. The performance of the Australian economy will also have a big impact on migration levels over the medium-term.

The slowdown in immigration-driven growth will be felt most strongly in Auckland and in centres with a strong reliance on tourism. Modelling indicates that while these impacts will be strongest in the short to medium-term (1-4 years), it may take up to 10 years for growth rates to return to pre-COVID-19 levels, if at all. A reduction in the 'spill over' effects from Auckland into surrounding regions is also anticipated. This will result in slower growth in cities and districts across the upper North Island.

Figure 03 indicates where population growth was forecast to locate pre-COVID-19 based on Statistics NZ population projections. While the scale of population growth is expected to slow due to the impacts of COVID-19, these maps retain some value in showing the relative size of the urban centres, which highlights the importance of delivering the **improve urban form** and **transform urban mobility** step changes.

Before COVID-19, domestic and international tourists increased the number of people in some centres at particular times of the year. With over 3.9 million international visitor arrivals during 2019, significant demand and pressure was placed on the land transport system in these areas. With border closures, there has been a significant reduction in numbers of international visitors, which will continue for some time. While the reduction in overseas visitors may be partly offset by more New Zealanders holidaying at home, this will not fully offset the drop in international arrivals.

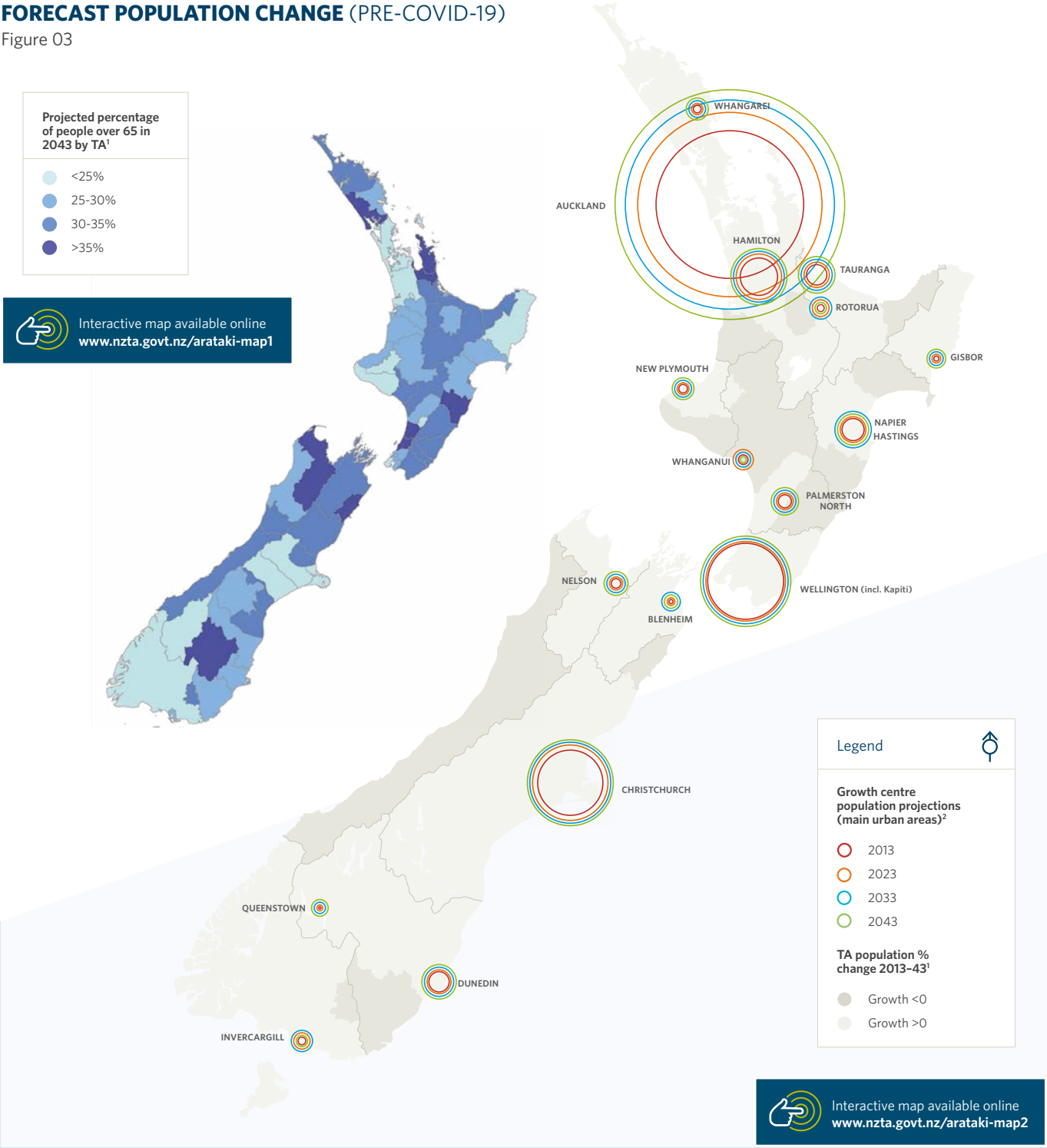
In parts of the country where the population is forecast to decline or remain static, the land transport system will continue to play a critical role in supporting the economic and social wellbeing of these communities and businesses. There will also be changes in travel demand in most affected areas.

In many regions, the percentage of our population aged over 65 is projected to be more than 35% by 2043.[1] While these projections pre-date COVID-19, they remain valid as the expected slowdown in population growth will not fundamentally alter the age profile of New Zealand's population. Age profile has an impact on the demand for travel, with seniors spending less time travelling per week, especially those over 75 years.[2] While time spent travelling to work may decrease at age 65, working past this age is becoming the norm. Older people are travelling more for physical and social activities. Accessible and reliable transport options, along with well-maintained urban spaces, footpaths and crossing points will be key as our population ages. New transport technologies could create both opportunities and risks for older people. For example, on-demand services create more available transport options, but new modes like e-scooters, which share the same public footpaths as pedestrians, can create increased risks for seniors.

The land transport system will need to respond to this growth of our older, more diverse population, each of which presents different needs and demand for travel.

FORECAST POPULATION CHANGE (PRE-COVID-19)

Figure 03



CLIMATE CHANGE

Climate change will be one of the most significant drivers influencing the land transport system during the next decade.

Between 1990 and 2018, New Zealand's greenhouse gas emissions (GHG) increased by 24%. Fuel use in road transport (carbon dioxide) is one of the largest contributors to GHG. Transport accounts for nearly 20% of New Zealand's total GHG, of which 90% is road transport.[4] Light vehicle emissions are the fastest growing of these, overwhelmingly concentrated in large urban areas.[5]

Changing weather patterns with more extreme weather, rainfall intensity combined with sea-level rise, will impact the transport network's infrastructure. Sea level is expected to rise by an average of 20 to 30cm by 2040.[6] Severe weather will increasingly impact our environment, communities and infrastructure including roads, rail, community facilities and both water supply and management.

Most New Zealanders live within a few kilometres of the coast and many next to rivers and lakes. As sea levels rise, tides, waves, storm surges and elevated groundwater will reach further inland in many areas, causing more frequent and extensive flooding. Along some coasts, erosion will increase and shorelines will recede. Sea level rise will also increase the rate of coastal erosion and the frequency of coastal flooding events. Over the last century the average coastal sea levels in New Zealand have risen by 0.17 metres.[7] Long-term, we need to plan for sea level rises of more than 1m.

Hotter temperatures and wild fires can damage our transport infrastructure and cause buckled railway lines and damaged roads, resulting in subsequent disruption and repair costs. More extreme weather will also impact vulnerable areas of the land transport system, causing disruption from slips, flooding and wash-outs.

As parts of our country become warmer, drier or wetter, the nature and location of our primary production may change, bringing downstream impacts on the location of businesses and the freight movements that support them.

The effects of climate change will continue for decades, even if aggressive mitigation strategies are undertaken to reduce greenhouse gas emissions

The effects of climate change will continue for decades, even if aggressive mitigation strategies are undertaken to reduce GHG.[8]

We know we cannot build our way out of all these challenges, so we need to ensure that infrastructure and services, and the communities that rely on them are more resilient and adaptable to change. Appropriate land-use planning will be critical to avoid development of communities and transport corridors in vulnerable locations and to adapt to our changing environment.

Climate change adaptation must be integrated into future planning and investment in the land transport system.

The ***Climate Change Response (Zero Carbon) Amendment Act 2019*** provides a framework for New Zealand to develop and implement clear and stable climate change policies. These will contribute to the global effort under the Paris Agreement to limit the global average temperature increase to 1.5° celsius above pre-industrial levels. Global GHG emissions must fall by 7.6% every year from 2020 to 2030 to keep temperature increases to less than 1.5°C.[9] The act requires the government to develop and implement policies for climate change adaptation and mitigation. It will also have a significant impact on land transport investment and decision-making.

Emissions budgets arising from the Climate Change Response (Zero Carbon) Amendment Act will require significant change in land-use patterns, the supporting land transport system, the vehicle fleet and our travel choices, particularly in urban areas. Under the Climate Change Response (Zero Carbon) Amendment Act we expect the land transport system will be subject to challenging targets for reducing its GHG. The land transport system will need to play its part in reducing emissions to as close as possible to zero by 2050 in line with the act.

The next decade will be critical to lay the foundation for meeting targets. This will require a significant shift in transport modes away from private, carbon-fuelled vehicles towards shared, energy-efficient vehicles and changes to the way we plan and develop our urban areas

Interventions that reduce GHG will also reduce local air pollution and improve public health through increased physical activity as a component of travel choice.

CLIMATE CHANGE IMPACTS ON NEW ZEALAND[10]

Figure 04

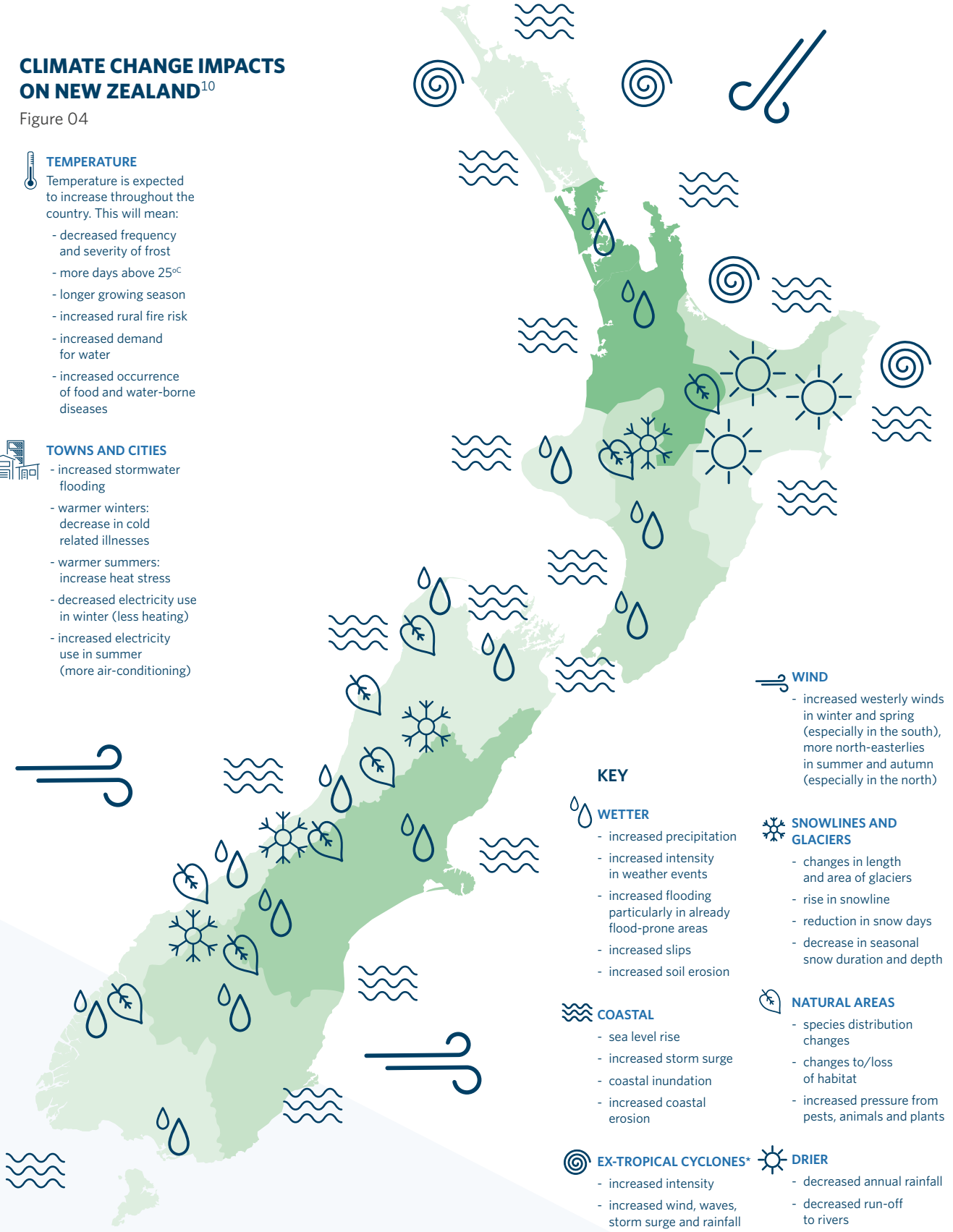
TEMPERATURE

Temperature is expected to increase throughout the country. This will mean:

- decreased frequency and severity of frost
- more days above 25°C
- longer growing season
- increased rural fire risk
- increased demand for water
- increased occurrence of food and water-borne diseases

TOWNS AND CITIES

- increased stormwater flooding
- warmer winters: decrease in cold related illnesses
- warmer summers: increase heat stress
- decreased electricity use in winter (less heating)
- increased electricity use in summer (more air-conditioning)



KEY

WETTER

- increased precipitation
- increased intensity in weather events
- increased flooding particularly in already flood-prone areas
- increased slips
- increased soil erosion

COASTAL

- sea level rise
- increased storm surge
- coastal inundation
- increased coastal erosion

EX-TROPICAL CYCLONES*

- increased intensity
- increased wind, waves, storm surge and rainfall

*Tropical cyclones, in travelling to NZ change their character, becoming slightly less intense but causing damage over a much wider area

WIND

- increased westerly winds in winter and spring (especially in the south), more north-easterlies in summer and autumn (especially in the north)

SNOWLINES AND GLACIERS

- changes in length and area of glaciers
- rise in snowline
- reduction in snow days
- decrease in seasonal snow duration and depth

NATURAL AREAS

- species distribution changes
- changes to/loss of habitat
- increased pressure from pests, animals and plants

DRIER

- decreased annual rainfall
- decreased run-off to rivers
- increased evaporation
- increased frequency and severity of drought
- increased irrigation demand

TECHNOLOGY AND DATA

Technological advances are occurring rapidly in the land transport sector and increasingly disrupt the way we use and manage the system.

Access to technology and data is increasing, as are customer expectations that transport will be tailored to their needs and information about transport options and routes will be provided in real-time. For example, New Zealand had 3.8 million mobile phones with active internet connections in 2017, up from 3 million in 2014, an increase of 29%.[11] Users are increasingly expecting to be able to plan, book and pay for transport through apps.[12]

New products and business models are being created from the convergence of emerging and existing technologies which are being powered by vast amounts of data. These include ridesharing, on-demand transport and web-based mapping and navigation applications.

Concepts such as big data, machine learning and artificial intelligence are already core components of these technological changes. Together they are transforming how we interact with and manage our technology, while also enabling systems to improve over time and providing new ways of thinking about problems. Existing uses include network optimisation, real-time travel information, unplanned incident management and planned network activities.

Technology and data are changing how we regulate and manage access to the land transport network through new platforms, services and providers. Technology and data are also enabling risk-based and intelligence-led regulation which can lead to reduced compliance costs for both the regulators and users of the system.

Some emerging technologies have the potential to transform our land transport system. These include:

- **Mobility as a Service**, usually enabled by a single app integrating different travel options, allows a person to plan, book and pay for an end-to-end journey tailored to their needs. This could involve one or several forms of transport, including public transport, ridesharing, micro-mobility and active modes. Customers may have the option of paying per trip or subscribing to a monthly plan.
- **On-demand transport**, when provided in the form of a public transport service consisting of shared shuttles with routes that can be changed in response to passenger demand, booked and paid for usually via an app. It can provide a more sustainable public transport service in places where demand peaks and is predictable at certain times but is inconsistent or low at other times.
- **Connected vehicle technologies,** which enable vehicles to 'talk' to each other, infrastructure and other road users using wireless communications. These have the potential to deliver benefits for both road safety and network optimisation.
- **Automated vehicles,** which use in-vehicle technologies and sensors, such as cameras and Lidar, and artificial intelligence to scan and navigate their way as they are driving. Levels of automation range from having some driver assistance features such as adaptive cruise control to full automation, which is where the system can undertake all aspects of the dynamic driving task under all road and environmental conditions. Automation has the potential to deliver benefits for road safety.

More detail on these key technologies and timing of them can be found in the **Resources** section.

DATA

Over the next 10 years, there is expected to be a massive growth in data that will be generated by, and used in, the transport sector especially as the cost of sensors and smart phones come down. Advanced analytics can help identify the most efficient travel routes and modes, allowing transport operators to match supply with the need for on-demand transport, or reducing crash risk by analysing very complex datasets to identify what contributes to crashes.

Through digital engineering, it is now possible to create fully detailed, data-rich, virtual models of everything that we survey, conceive, design and deliver in the land transport system, also known as digital twins. Digital twins and building information modelling (BIM)/common data environments which support digital engineering for transport are enabling the development of smart cities and driving huge efficiency gains in the transport and construction sectors that enable real-time asset and network management, end-to-end digital lifecycle management and resource optimisation. These models can be continually re-used and leveraged to unlock significant benefits. These benefits include:

- **Construction, operations and maintenance:** efficiencies within transport infrastructure projects, including avoiding variations and reduced whole-of-life asset costs, as a result of improved planning and coordination, or enabling strategies like demand management (ramp metering, bus priority, ride sharing) to reduce pressure on the network.
- **Supply chain improvements:** significant savings are possible through a more strategic and better informed approach to purchasing and procurement.
- **System resilience:** digital engineering will improve our ability to identify opportunities and threats ahead of time through better quality data and analytics while at the same time helping us manage our response and adaption to climate change.
- **Productivity of investment:** evidence-based investment will support informed prioritisation decisions, ultimately providing improved outcomes for customers.
- **Network optimisation:** modelling travel demand in digital twins can support existing use of technology and data to plan and manage networks, as well as understand the interconnectedness of our transport systems, for example our network operating framework and integrated land-use planning.

Insights from using analytic tools such as artificial intelligence and machine learning will help us make better decisions across the land transport system over time. For example, predicting how people want to use the network could lead to improved planning of transport infrastructure integrated with land-use, using behavioural insights could support better customer service and analysing the causes of accidents could help us learn how to protect people better. Digital solutions also enable us to respond either locally or nationally to our challenges by allowing us to more quickly adapt to changes and improving our responses faster than any other approach

THE CHALLENGE

It is difficult to accurately forecast which new products and business models will be commercialised and when. It will be important to use foresight techniques and approaches such as horizon scanning to identify what might emerge and share this information in a timely way. This will help us understand how the needs of transport customers might change and identify the opportunities or risks for the land transport system. There may be a role for the public sector or local government in using levers to create an environment that either maximises the public benefits or minimises the social costs that might occur.

Ongoing investment in future-proofed physical and digital infrastructure, such as fibre optic networks and cellular reception will be essential. This will enable functions and services to be delivered through existing technologies and data. It will also enable a flexible, fit-for-purpose transport system that is more readily able to respond to, and realise the benefits of, disruptive technologies.

Transport agencies and network operators will need to know where on the network autonomous vehicles will likely operate and manage the infrastructure requirements needed to support their safe operation and integration into our transport system. Similarly, we need to be thinking about where in our transport system connected vehicle technologies could improve both network optimisation and road safety.

Towns and cities will need to be planned collaboratively, involving a range of interests and disciplines, and drawing on developments such as smart building and intelligent transport systems. This will help deliver future-proofed physical shape and land-use patterns that support the introduction of expected technologies and business models. These can in turn contribute to shaping urban form so that it supports good urban outcomes.

Road controlling authorities will need to understand what data is required, have access to it, and invest in infrastructure to process it. Governance and management of data will be important also to ensure the security and privacy of users.

Trialling in real-world environments will be necessary before large-scale investments or national rollout of some technologies can occur. Testing and trialling will help us to understand how new technologies respond to, and integrate with, our transport system as well as inform future regulation. Trials will likely require collaboration of capabilities and resources across central and local government and the education and research sector (such as universities) and private sector technology providers.

The 'digital divide' will need to be considered in the design and implementation of transport services so that those who have less access to digital technologies are able to access education, employment and essential services. This will be particularly important for Māori and Pasifika over the next 10 years as they are also most likely to experience unemployment as a result of COVID-19.

The land transport system, including both the public and private sectors and organisations that provide services to them, will need to ensure there is sufficient supply of workers with the right skills over the next 10 years to develop, maintain and operate the new technologies and collect, manage and analyse the large volumes of data expected.

CUSTOMER DESIRE

Customer needs and wants influence how people choose to travel and will drive change across the land transport system in tandem with technological change.

Our cities and urban areas are becoming increasingly populated by younger, more ethnically diverse and techno-savvy residents. Many are choosing to delay getting a driver licence and/or purchasing a vehicle.

The changing nature of work arising from advances in technology and shifts in workplace culture have been underway for some time. COVID-19 accelerated this change with all but essential workers working from home during the lockdown period. The relative success of the working from home period may result in many businesses and organisations reviewing their need for communal office space and providing staff with increased flexibility to work remotely or with flexible hours. Shifts in the nature of work for professional services and a rise in e-commerce could also result in the 'hollowing out' of central business districts in our cities – a trend for which there is already early indications in New Zealand and overseas.

While there are high levels of uncertainty regarding the degree that working remotely will continue over the longer-term, these changes in behaviour provide scope to reduce or shift the demand for travel, particularly peak period trips to the centre of our main urban areas.

With the increasing popularity of inner-city living, demand will increase for walking and cycling infrastructure and public transport. Public transport currently has a small share of all national travel, at just 3% of household trips.[13] While the use of public transport is projected to increase, especially in Auckland, its share will remain below 10% without a significant change in behaviour.[13] Cycling is increasing in some urban areas, particularly Christchurch.

COVID-19 alert levels 2,3 and 4 restricted choices about when and how people could travel, particularly on shared modes where suitable levels of hygiene and physical distancing needed to be maintained. Following lockdown, travel choices and mode share have largely returned to pre-COVID-19 patterns. Almost all travel modes saw an increase in levels 2 and 1, with every public transport mode also reporting increased usage.[14] Any downturn in public transport use during alert levels 3 and 4 is not expected to impact on long-term trends.

The way people communicate, shop and socialise continues to evolve. Consumers are increasingly shopping online with goods being delivered to the home – a trend that may be accelerated as a result of people needing to shop online and access essential services virtually during alert levels 4 and 3 of the COVID-19 lockdown. This presents considerable opportunities and challenges for the freight sector and land-use planning which must adapt to meet this new demand and delivery needs.

There is also an international and national groundswell of concern about the impacts of travel on the climate. Over time, this may result in people choosing lower emissions transport options or choosing not to travel. These actions will influence transport and land-use planning in the next 10 years and beyond.

COVID-19 and the associated lockdown period has required significant changes in how people live, work, study and socialise, with flow-on impacts on travel demand and the modes used. There is a high degree of uncertainty as to whether these changes will remain post-COVID-19 or there will be a return to pre-COVID-19 patterns.

We will continue to monitor customer perceptions, travel patterns and use of different transport modes over coming months, to better understand the degree to which these perceptions continue post-COVID-19 and how they might shape travel behaviour and urban form over the medium to longer-term.

CHANGING ECONOMIC STRUCTURE

The trend towards a service industry-based economy is leading to greater urbanisation, more intense urban development and in transport demand. This trend is expected to continue, despite the short-medium term disruptions from COVID-19.

The economy is both shaped by, and a shaper of, our land transport system. Economic changes impact on wages, consumer demand and the prices of raw materials. Higher income growth usually signals higher consumer spending, leading to increased business spending and demand for goods and services. The performance of the land transport system can impact on the efficiency with which businesses are able to bring goods and services to market.

Almost all businesses and industries have been negatively impacted by the COVID-19 lockdowns. There will be a significant and sharp reduction in employment and economic activity. There may also be a lengthy and delayed effect of COVID-19 on economic activity, employment and unemployment, lasting several years.[15]

The nature, scale, duration and location of the economic impacts of the current COVID-19 pandemic are still uncertain, although the New Zealand Treasury notes that the scale of the contraction, both in New Zealand and abroad, is substantially greater than that experienced during the global financial crisis in 2007/08.[16]

Research into the impacts of COVID-19 based on changing economic structure and demographic change in New Zealand can be found **here**.

Current information indicates that COVID-19, responses internationally and the national lockdown in New Zealand, will see contracted economic activity for one to four years. It could take 10 years to return to the level of activity expected before COVID-19. This will impact the nature and scale of both passenger transport and freight as a result of factors including:

- reduced demand and supply of goods and services in the domestic market due to lower economic activity, business closures and higher unemployment
- a significant reduction in world trade in goods and services, which will result in a substantial contraction in New Zealand's export and import volumes over the next four years (except for food) reducing freight demand, with only a slow recovery of volumes after that
- global supply chain disruptions resulting from travel restrictions and reductions in airline capacity, which are likely to continue for the next four years. Manufacturing moving closer to domestic economies and sourcing imports from more diverse markets may impact on the nature and origin-destination of domestic freight movements and trade flows between New Zealand and other markets over the long-term
- lower immigration over the next four years, with fewer migrants, students and visitors reducing transport demand in growth areas and tourism-dependent regions
- people moving within and between regions and across the country for employment as a result of lower overseas immigration and changing job opportunities.

For some time, New Zealand's economic growth has been focused in large urban areas, in particular Auckland. These centres attract the highest number of immigrants and growth in employment trips, business trips and freight movement have been strongest in these areas. Economic and population growth in large urban areas will slow to a degree due to COVID-19 over the next four years as key urban-based service industries are impacted more than primary industries and health.

Initial indications that almost all industries are forecast to record a drop in employment over the next year, with the largest declines occurring in retail, tourism-related and media industries. In contrast, agriculture, food manufacturing, government and health industries are expected to be less affected. By 2025, primary industries, non-food manufacturing and construction are forecast to do better than expected before COVID-19 but tourism, education, and arts and recreation would remain weak, freeing up labour for other industries. A similar situation is forecast for 2031, but the evidence assumes a permanent step down in demand for international tourism. Industries like tourism-related services, media, financial services, and arts and recreation are forecast to employ fewer people as a result.

COVID-19 border closures led to an immediate and steep decline in international tourism, which was previously forecast to grow for some years. This was exacerbated by pandemic management that restricted domestic travel. The evidence available shows that the effects of border closures could continue for some years. This will reduce pressure on the land transport system in some areas in the short term. We will continue to monitor the long-term implications as uncertainty remains about the duration of international border closures (either by New Zealand or other countries) and how much air travel will remain after COVID-19.

COVID-19 will alter the structure of the economy in the short-medium term, in terms of the contribution of different industries. Over the long-term, however, the trend towards a services-led and urban-based economy is likely to continue without significant structural change, although there may be a slowing of the decline in the contribution of manufacturing to the economy.

It is also anticipated that the recession will have a significant impact on young people, Māori and Pasifika. These vulnerable segments of society tend to be more transport disadvantaged. There is likely to be a sharp increase in young people who are not in employment, education or training (NEETs) over the next four years, as they are more likely to be in casual employment and heavily affected industries such as food service or retail. This could exacerbate the situation for regions that have a high NEET rate already. There is also expected to be a large increase in Māori unemployment, more concentrated in some regions. Experience from previous recessions and economic shocks suggests a disproportionately negative impact on Māori. There are higher numbers of Māori engaged in lower-skilled occupations and vulnerable industries such as tourism. Likewise, our Pasifika population are also vulnerable in recessions, for much the same reasons, although the impacts can be even more severe.

Stimulus responses that have begun already are intended to reduce the effect of these negative impacts on households and communities in the short-term and support economic recovery over the next 10 years.

There is a need to continue to monitor how COVID-19 will influence the structure of the economy and the implications for demand for the movement of people and freight in the land transport system over the next 10 years.

FUNDING AND FINANCING CHALLENGES

Step change is required and will need to be supported by appropriate investment and financial levers.

Investment must be prioritised to deliver the most effective, long-term solutions to move people, goods and freight. The increase in capital costs, such as managing the effects of climate change, will impact the amount of funding available to central and local government for the land transport system.

Funding for land transport was under pressure prior to the COVID-19 pandemic. Some districts are facing ongoing funding pressures because of forecast declining population. These declines are often combined with aging populations on fixed incomes, resulting in communities that are less able to cope with significant rates increases.

Local government funding for the land transport system may also be constrained as the sector faces significant investment in three waters (drinking water, wastewater and stormwater) and other infrastructure during the next 10 years.

The COVID-19 pandemic has compounded these pressures on councils' revenues, as communities recover from the direct impacts of the lock-down and subsequent economic headwinds. Council revenues will be impacted by reductions in revenue from rates, fees and charges, fines and infringements, and fuel tax (Auckland). The councils likely to face the greatest challenges are those with high tourism dependency, high levels of growth and/or that rely on significant revenue from investment and dividends.[7] The scale of impacts will vary from council to council and will take some time to flow through into councils' revised plans. It is therefore too early to forecast, with any accuracy, changes to councils' co-investment in the land transport system in coming years.

The lockdown also significantly reduced trip numbers, resulting in a decline in revenue into the National Land Transport Fund (fuel excise duty (FED) and road user charges (RUC)) for the 2021–24 NLTP period. There is some uncertainty as to how long it will take trip numbers to return to pre-COVID-19 levels, potentially reducing transport revenue over a longer period.

In the short-term, pressure on revenue streams (including ability to raise local share) may prevent moving quickly to harness the positive outcomes of the reduced travel during the lockdown period. Initiatives such as innovative measures to manage travel demand, supporting uptake of active or shared transport options, or making public spaces more attractive to people who walk or cycle.

As New Zealand emerges from the COVID-19 lockdown, investment in land transport will come from a variety of sources (in addition to the NLTF) as the government uses a range of tools to support social and economic outcomes around New Zealand. This includes Crown investment in the NZ Upgrade Programme, the Provincial Growth Fund and the broader economic stimulus package. Over the longer-term consideration is required of the full range of funding and financing options (such as debt financing and third-party funding) to support a sustainable revenue system for both local and central government.

In addition, there are a number of other things that could influence funding and financing of transport over the coming decade, that we will need to keep an eye on. These are:

- Shifts in transport options and changes in the way people pay for transport because of new technology, could impact revenue and provide increased opportunity for travel demand management.
- While freight volumes are forecast to increase, improvements in efficiency, electrification of the heavy fleet and changes in travel choice could impact revenue.
- Changes in household transport preferences such as fewer people choosing to own a private vehicle, coupled with greater fuel efficiency and increased uptake of alternative fuels, which reduce revenue from the current, consumption based, funding mechanism (FED).
- Requirements to reduce transport carbon emissions, which will change transport mode and fuel choices. The current tax revenue model (which is based on carbon-based fuel use) will need to be reviewed to reflect (and potentially incentivise) increased uptake of low-carbon vehicles and transport options, and to enable travel demand management.

NGĀ HAKAHURINGA MATUA
STEP CHANGES

WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

NGĀ WHAKAHURINGA MATUA
STEP CHANGES

The **step changes** respond to the key drivers to ensure we manage, adapt to, and harness key trends and influences on the land transport system to deliver the long-term outcomes the government wants. The step changes identify where we consider a **change in response** is needed, taking into account the current state of the land transport system and the key drivers.

We have identified **five step changes** as the **basis for action**:

1. **Improve urban form** – enhance transport's role in creating land use and urban form that provide connections between people, product and places.
2. **Transform urban mobility** – shift from our reliance on single occupancy vehicles to more sustainable transport solutions for the movement of people and freight.
3. **Significantly reduce harms** – transition to a transport system that is free of deaths and serious injuries and improves public health.
4. **Tackle climate change** – support the transition to a low-emissions economy and enhance communities' long-term resilience to the impacts of climate change.
5. **Support regional development** – optimise transport's role in enabling regional communities to thrive socially and economically.

How each step change is used at a national and regional level is set out in the national and regional summaries as the areas of focus.

The step changes are inter-related, giving us an opportunity to prioritise responses that deliver across a range of outcomes with shared results in our cities and regions. Focusing on the levers that deliver across a range of step changes will have the most effective results.

Successfully delivering on the step changes requires a system approach that reflects the inter-relationship between each change. This will enable us to recognise where actions to support one step change can impact on the delivery of other step changes and identify win-win solutions. When trade-offs are required, it is important that they are made with a full understanding of the likely impacts across all the step changes.

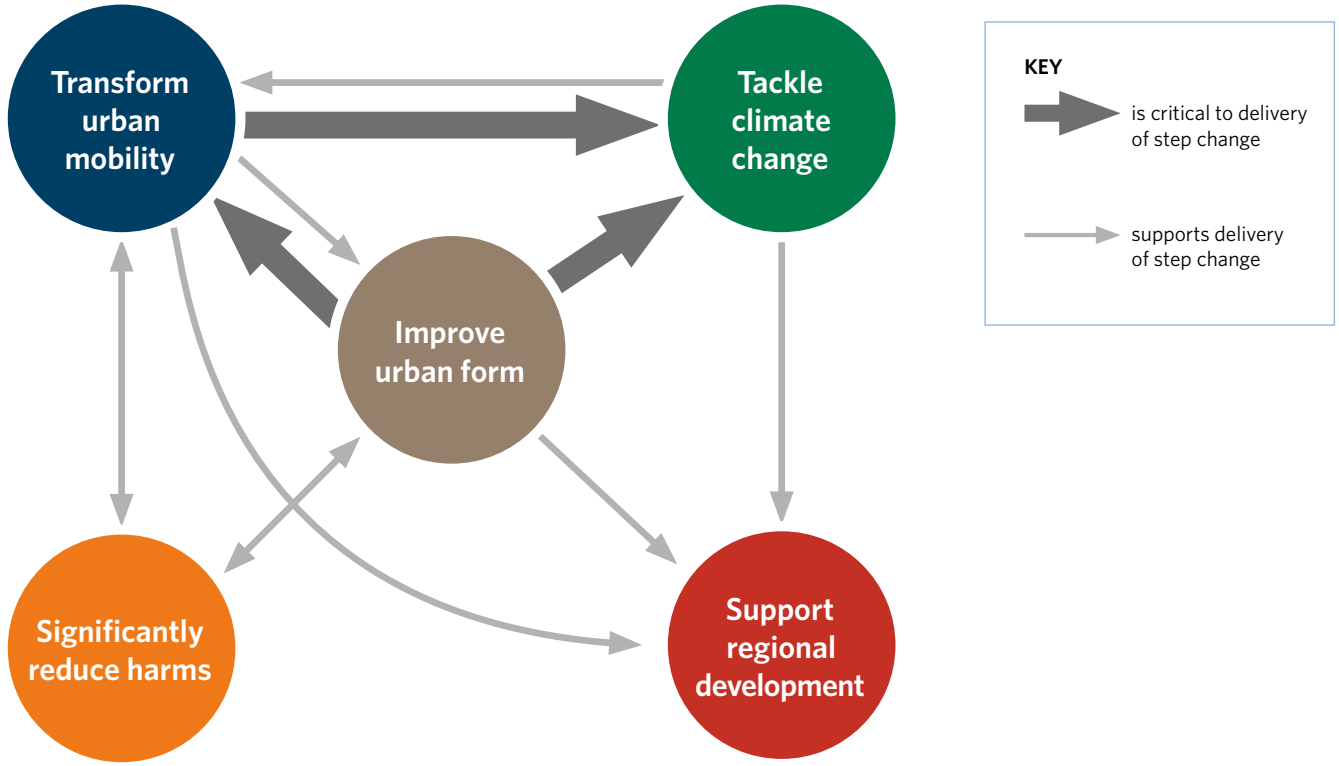
As we progress, we will more clearly define our role in achieving each of the step changes. Our new investment principles will also encourage and support a more deliberate approach to designing and investing for multiple outcomes.

The step changes are inter-related, giving us an opportunity to prioritise responses that deliver a range of outcomes.

The scale of the inter-relationship between improve urban form and transform urban mobility, and the significance of their contribution to a range of other step changes, means we will continue to pursue integrated land-use and transport planning as a high priority.

HOW THE STEP CHANGES WORK TOGETHER

Figure 05



WE WILL KNOW WE HAVE ACHIEVED THE STEP CHANGES WHEN WE HAVE:

- urban form and land-use that reduces the need to travel
- urban mobility options that are designed to make shared and active travel choices the preferred choice for most daily travel needs
- optimisation of networks to prioritise the movement of active and shared modes for people and improve the efficient movement of freight
- significant uptake of electric light vehicles and decarbonisation of the heavy vehicle fleet to enable the transition to a low carbon vehicle fleet
- a safe land transport system where no one dies or is seriously injured
- communities that are less exposed and better prepared, to deal with the impacts of natural hazards, climate change and other disruptive events on the transport system
- regional communities that are connected, self-sustaining and have access to employment and services.

IMPROVE URBAN FORM

Enhance transport's role in creating land-use and urban form that provide connections between people, product and places

Improving urban form is central to addressing all other step changes, particularly **transform urban mobility** and **tackle climate change**. The layout of our urban centres determines the distance people need to travel to access jobs, education and other essential services, and the transport options they have to make those trips.

Improving how we plan land-use with an integrated transport system will make our communities safer and healthier places to live. Evidence from international urban centres demonstrates that, in many cases, compact, mixed land-use development improves accessibility and transport options, reduces environmental harm and improves health outcomes by offering walking and cycling access to essential services. Improved urban form will help to **reduce harms, tackle climate change and transform urban mobility**.

Our main urban centres make up just 2% of New Zealand's land area but are home to more than 70% of New Zealanders.[18] To remain liveable, our urban centres must avoid sprawl as they grow. Experience from across the world indicates that integrated planning and operating of the land-use and transport system is essential for creating safer, better connected and more accessible communities.

Shaping our urban form and the transport system that supports it is one of the most lasting impacts on the environment we make. We must therefore ensure that the urban patterns created across New Zealand in the 21st century support long-term goals and challenges, as well as supporting current lifestyles.

Strong growth in recent years has increased pressure on housing supply and affordability, while also impacting on the environment and the ability of people and business to move around easily and affordably. Current approaches to urban development have generally resulted in low-density, car-based development without enough consideration of where people live, work, study and play.

To address these issues the government, as part of its Urban Growth Agenda, is partnering in spatial planning initiatives in the largest, and fastest growing urban centres (Auckland, Hamilton, Tauranga, Wellington, Christchurch) and Queenstown. The key premise behind spatial planning is that well-planned and managed urban growth should result in improved environmental outcomes for existing communities, while supporting better access to jobs, improved travel choices and more affordable housing. This work recognises the importance of integrating land-use and transport planning.

The following goals for urban form have emerged through our draft *Better planning places* to better capture what 'good' should look like through urban development and spatial planning work:

- Compact cities and shorter trips.
- Connected communities with sustainable transport choices.
- Integrated urban system design and operation.
- Optimising movement of people, goods and services.
- Designed for people, place and environment.

The goals are designed to bring focus to the complexity of urban trends and can be applied at all scales of urban planning, particularly in the fastest growing centres.

Current urban form in our main urban areas has existing challenges associated with climate change, safety, access and economic resilience, among others. These are ongoing challenges. Creating a step change in urban form means taking a hard look at our current practices, processes and outcomes, and evaluating which of these will address our ongoing challenges.

A large component of this step change will build on existing opportunities, including taking a lead role in jointly planning for growth in the six largest and fastest growing urban centres. While the focus is on these key areas, we recognise that integrated planning in other urban centres is also necessary to deliver similar benefits and community wellbeing.

TRANSFORM URBAN MOBILITY

Shift from a reliance on single occupancy vehicles to more sustainable transport solutions for the movement of people and freight

This step change is most relevant to the urban areas of Auckland, Hamilton, Tauranga, Wellington, Christchurch and Queenstown. These are the places where there is the greatest need and opportunity to respond to growth and align urban development and land transport.

During the past 70 years, New Zealanders have become increasingly reliant on private vehicles to meet their travel and freight needs. While private vehicles are well suited for many trips, relying on private vehicles to meet such a high proportion of our travel needs has created a range of problems. These include congestion, poor quality urban environments, pollution, increasing GHG emissions and poor health and high travel costs. These problems are felt most acutely in our larger towns and cities and will only increase with forecast population growth. Transforming urban mobility is about moving more people (and goods) with fewer vehicles. Reducing our reliance on private vehicles will make an important contribution to our long-term transport outcomes.

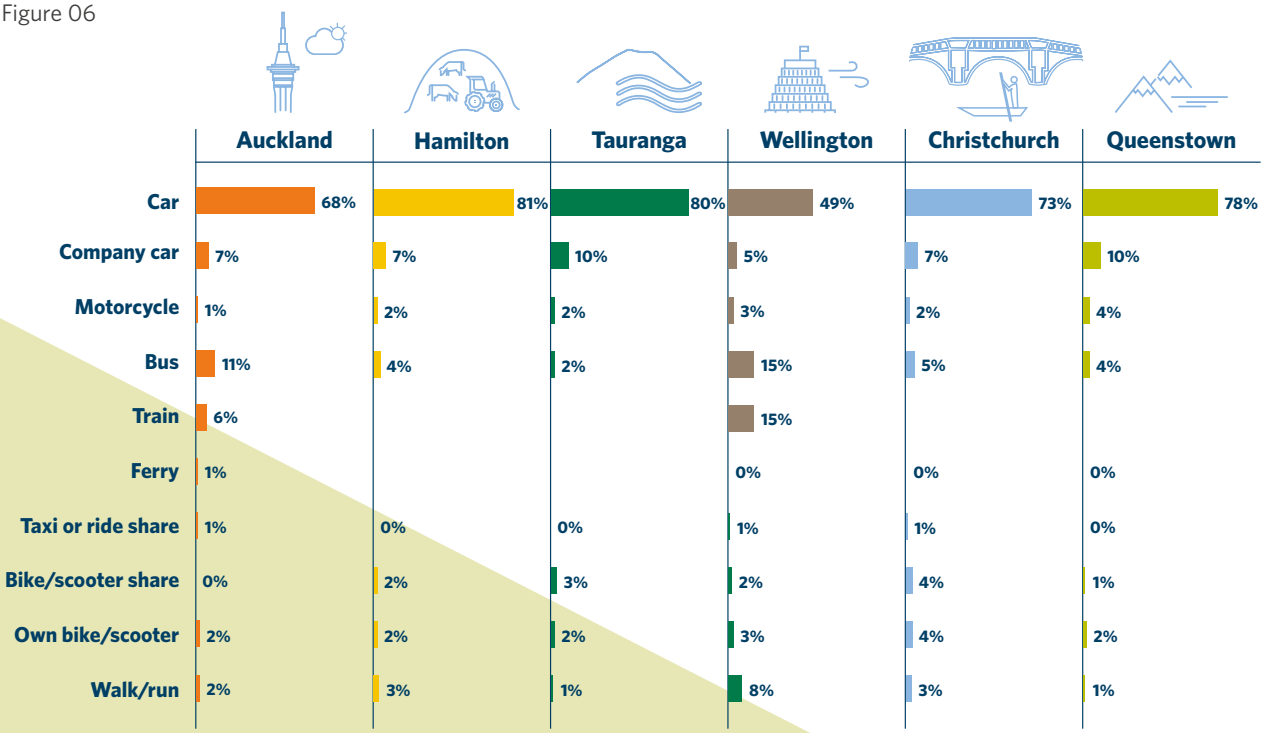
For urban areas to thrive, people need to be able to move around easily and have a range of choices about how they get to work, connect with family and friends, and access services. We need to build a modern transport system with a mix of reliable transport options that help keep people and products safely moving. It also means land-use and transport need to support and encourage convenient trip options so that more people can meet most of their needs locally and become less reliant on private vehicles.

Providing better transport choices will ultimately benefit all New Zealanders by allowing people in our cities, towns and rural areas to have easier and more affordable access to work, education, health and social opportunities.

Transforming urban mobility has a strong interrelationship with **tackling climate change** and **improving urban form**. Mode shift can be a powerful cross-cutting approach to creating vibrant cities. Successful mode shift also leads to reduced GHG by reducing the number of trips made by light vehicles, especially for shorter journeys of less than 5km. This contributes to **reduced harms** with shifts to public transport and by improving safety for cyclists and pedestrians through high quality facilities.

PRIMARY MODE OF TRAVEL[19]

Figure 06



SIGNIFICANTLY REDUCE HARMS

Transition to a transport system that is free of deaths and serious injuries, and improves public health

On average, one person dies on New Zealand's roads every day and another is injured every hour.[20] Since 2013 the number of people dying on New Zealand roads has been rising.[21] This toll on human life is unacceptable and New Zealand now ranks in the bottom quarter of the Organisation for Economic Co-operation and Development (OECD) countries for road safety.[22] While New Zealand is committed to the internationally proven Safe System approach for reducing deaths and serious injuries from the land transport system, proven interventions are not being implemented on a scale or at a pace sufficient to reverse the trend.

In addition, land transport has a range of impacts on public health. Poor air quality has been linked to premature deaths. About 38,000 people are exposed to high levels of noise from state highways and major local roads in New Zealand.

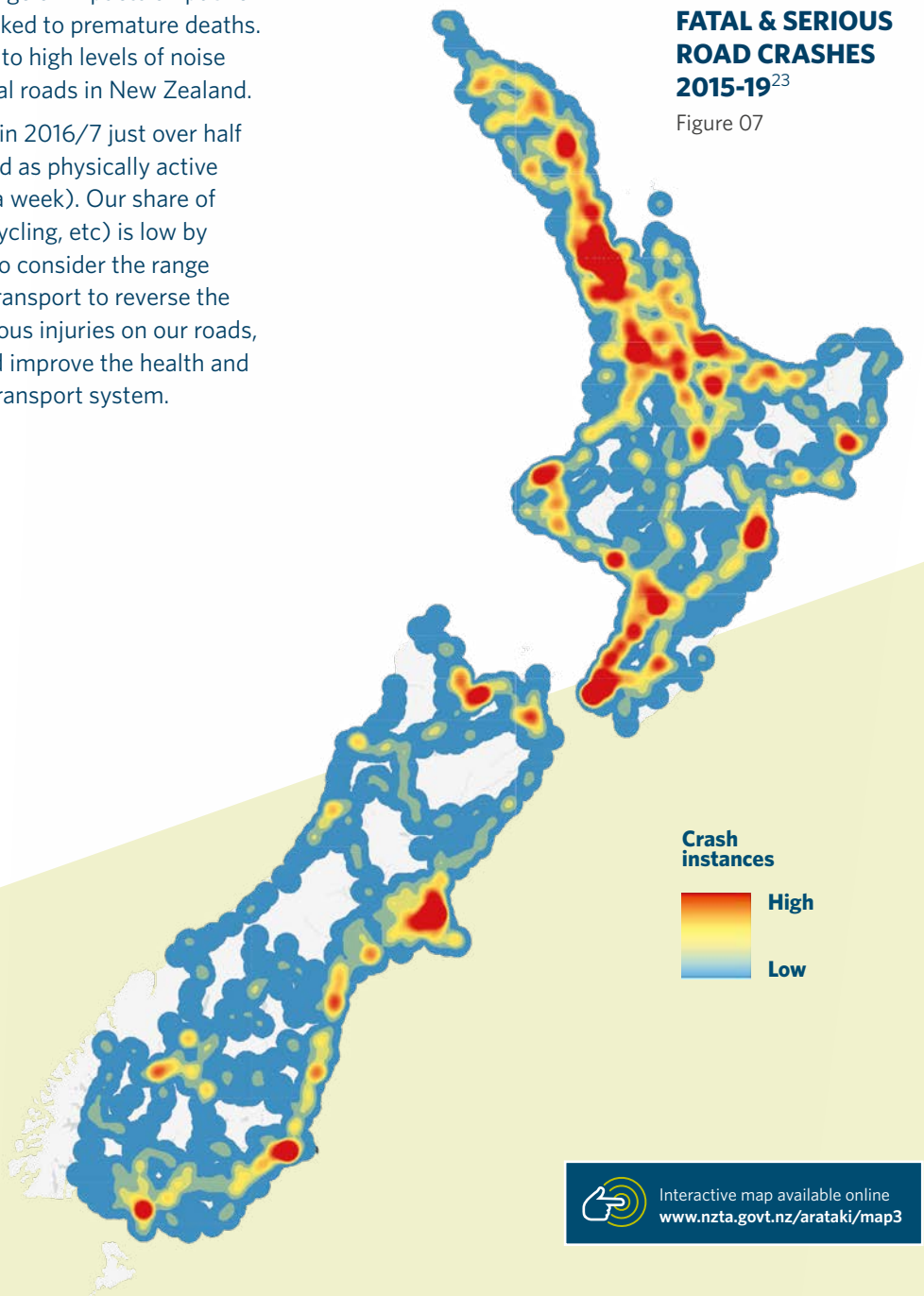
In terms of physical activity levels, in 2016/7 just over half of New Zealand adults were defined as physically active (30 minutes of exercise, five days a week). Our share of active transport modes (walking, cycling, etc) is low by international standards. We need to consider the range of benefits and harms created by transport to reverse the trend of increasing deaths and serious injuries on our roads, provide safer transport options and improve the health and safety of everyone using our land transport system.

Road to Zero: New Zealand's road safety strategy 2020–2030, seeks a 40% reduction in deaths and serious injuries by 2030. The *Road to Zero: action plan 2020–2022* outlines 15 immediate priorities to be actioned over the 2020–22 period. Arataki will support this by identifying the scale and type of safety risk in each region to inform action to deliver the strategy's objectives and the step change that is needed.

Reducing harms complements **transform urban mobility** which delivers safety benefits by reducing the number of private vehicles on the roads. Safety, and the feeling of safety, are important considerations when planning and investing in walking and cycling.

FATAL & SERIOUS ROAD CRASHES 2015-19[23]

Figure 07



Interactive map available online
www.nzta.govt.nz/arataki/map3

TACKLE CLIMATE CHANGE

Enhance communities' long-term resilience to the impacts of climate change and support the transition to a low-emissions economy

Responding to climate change requires a significant step change that addresses the design, delivery, operation and use of the land transport system. This needs to start early to minimise costs and reduce the potential for re-work in the future.

Tackling climate change focuses on two aspects: **adaptation** and **mitigation**. Adaptation addresses the impacts of climate change to ensure the land transport system is prepared for, and resilient to, climate change impacts such as sea level rise. Mitigation addresses the causes of climate change and focuses on reducing GHG emissions from land transport that contribute to that negative change. This step change is relevant to all regions.

Adaptation: Future sea level rise will greatly increase the frequency of coastal flooding, increase erosion and raise groundwater levels in some locations. Resilience planning will help us to avoid these impacts where we can and ensure we recover quickly when disruption occurs. A more resilient land transport network that can adapt to climate change is crucial to addressing these risks.

Our initial efforts will be on those areas most likely to face disruption from coastal inundation, flooding, weather-related hazards and intense storms. Early intervention is important to ensure we plan for the longer-term effects of sea-level rise and natural hazards arising from extreme weather events.

Effective climate change adaptation requires a collaborative effort that focuses on long-term planning and investment. This needs to be supported by clear guidance on dealing with short-term and emergency works. Community engagement and awareness are both critical to climate change adaptation to ensure we all understand the challenges and how those challenges may be addressed.

Climate change adaptation includes non-infrastructure options underpinned by **improving urban form** to ensure we avoid development in high-risk areas.

Mitigation: Transport accounts for about 20% of New Zealand's GHG emissions, 90% of which comes from land transport. The light vehicle fleet accounts for 75% of road transport emissions and is New Zealand's fastest growing source of GHG emissions.

Under the ***Climate Change Response (Zero Carbon) Amendment Act 2019***, New Zealand has committed to reducing GHG emissions to net zero by 2050 (except biogenic methane). From 2022 a series of national and sector-specific emissions budgets will apply, acting as stepping-stones to the net zero target.

Unless we act, ongoing growth in transport demand threatens New Zealand's climate goals. The challenge is immense and requires transformation in urban travel choice, where demand is highest, and to the vehicles we travel in. Significantly reducing land transport emissions will require coordinated action by multiple entities on several fronts as set out in ***Toitū Te Taiao***.

Decarbonising the light vehicle fleet is likely to make the largest contribution over time to reduce land transport emissions, but it will not be enough to achieve net zero land transport emissions by 2050.[69]

Decarbonising the heavy vehicle fleet and shifting from road to rail and sea will also contribute. On average, every tonne of freight moved by rail produces 66% less carbon emissions compared with heavy road freight, but the switch to new technology for these types of vehicles is less clear.

Tackling climate change is a key measure of success for all of the step changes. To be truly effective, climate change mitigation will need to be underpinned by **transforming urban mobility** and **improving urban form** to help people avoid or reduce the need to travel by private car and help people shift to active and/or shared modes of transport.

The greatest scope for reducing emissions is in the three largest urban centres (Auckland, Wellington, Christchurch) and the Waikato, because of the level of existing emissions and the potential to deliver significant shifts to lower-emission transport options and integrated land-use planning.

SUPPORT REGIONAL DEVELOPMENT

Optimise transport's role in enabling regional communities to thrive socially and economically

Urban centres play an important role in New Zealand's economy. The concentration of economic activity, services and job opportunities they provide are a drawcard for people and businesses alike. They also add value to the rural economy by processing primary products, providing social services and linkages to domestic and overseas markets. Provincial areas help shape the urban centres' economies and make a significant contribution to New Zealand through primary production and related industries.

However, growth in urban centres has led to lower employment, lower incomes and a decline in both population and essential services in some regions. Regions that have experienced this decline often struggle to retain and attract residents, investment and jobs. Urban centres also face their own challenges with some community segments facing social deprivation, lower employment and incomes and poor access to essential services.

The land transport system can help address the economic and social impacts of COVID-19 by optimising the stimulus package responses to support New Zealand's recovery over the next 10 years. This means focusing more on those communities where economic activity and employment are forecast to decline significantly and on those who are more impacted, including young people, Māori and Pasifika. This approach will help support the most vulnerable in society, by addressing some barriers to participating in social and economic activities.

The land transport system will work with tourism agencies to help support journeys for domestic visitors in the short-term and a more productive and sustainable industry in the long-term. It will also help communities to keep freight and workers moving, provide employment opportunities when they are most needed, build on their strengths and develop new advantages for sustained, high-value businesses.

Effective land transport infrastructure can support improved access to education, employment and essential services.

It can contribute to increased job opportunities by enabling growth, diversifying our economy and supporting new and existing industries to reduce GHG. It can also increase productivity by enabling the efficient movement of people and freight. Improving critical infrastructure increases regional and national resilience.

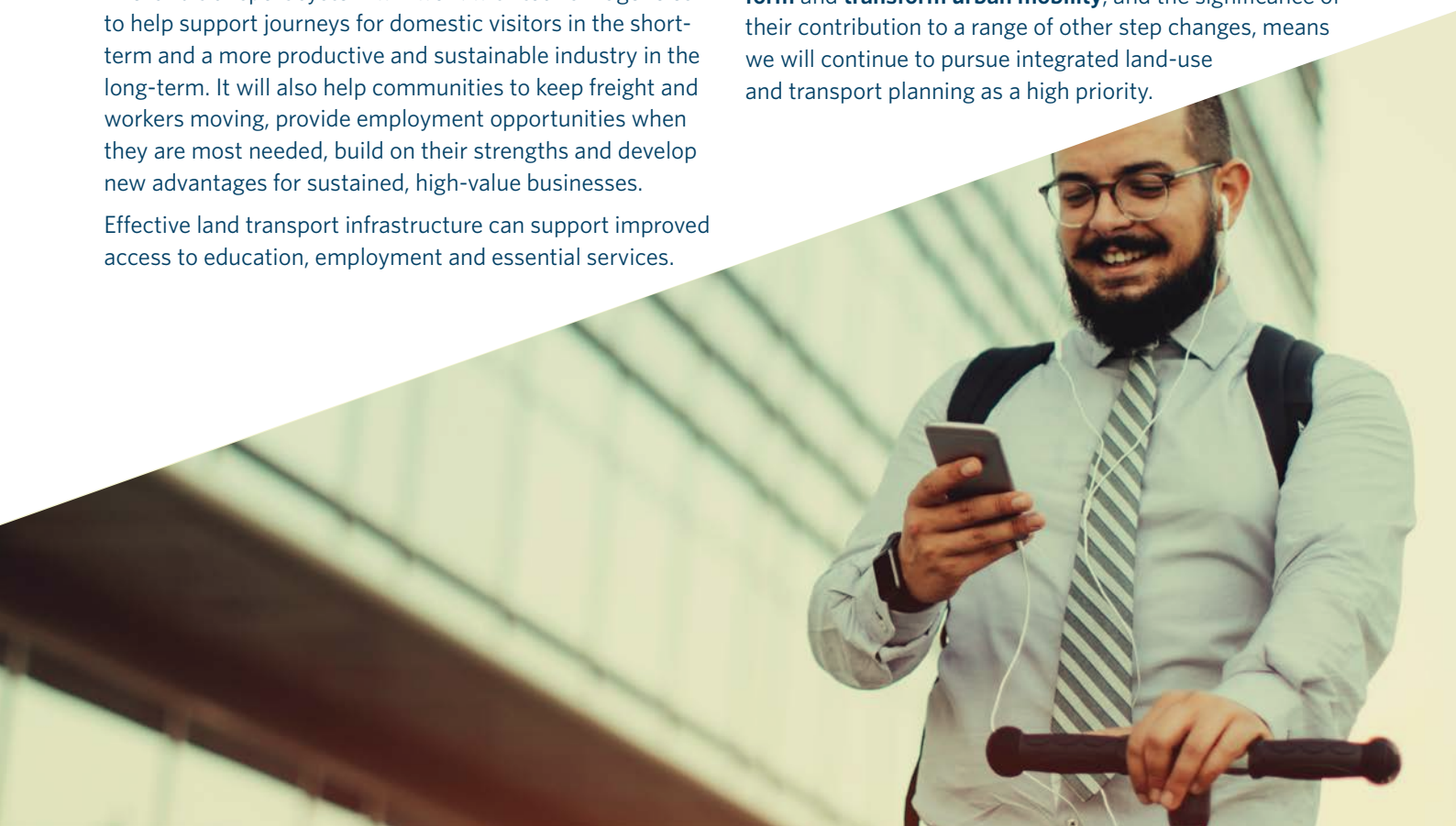
However, the land transport system cannot transform regions on its own. We need work collaboratively with our planning and co-investment partners to make all regions great places to live, work, study and play. This step change will help maximise the contribution of land transport infrastructure to support both New Zealand's short to medium-term recovery from the impacts of COVID-19 and long-term transition to a low-emissions economy.

INTER-RELATIONSHIPS BETWEEN STEP CHANGES

Successfully delivering on the step changes requires a system approach that reflects the inter-relationship between each change. This will enable us to recognise where actions to support one step change can impact on the delivery of other step changes and identify win-win solutions. When trade-offs are required it is important that they are made with a full understanding of the likely impacts across all the step changes.

Some of the step changes will not be achieved without coordinated delivery. Other step changes, such as supporting regional development, are less reliant on others.

The scale of the inter-relationship between **improve urban form** and **transform urban mobility**, and the significance of their contribution to a range of other step changes, means we will continue to pursue integrated land-use and transport planning as a high priority.

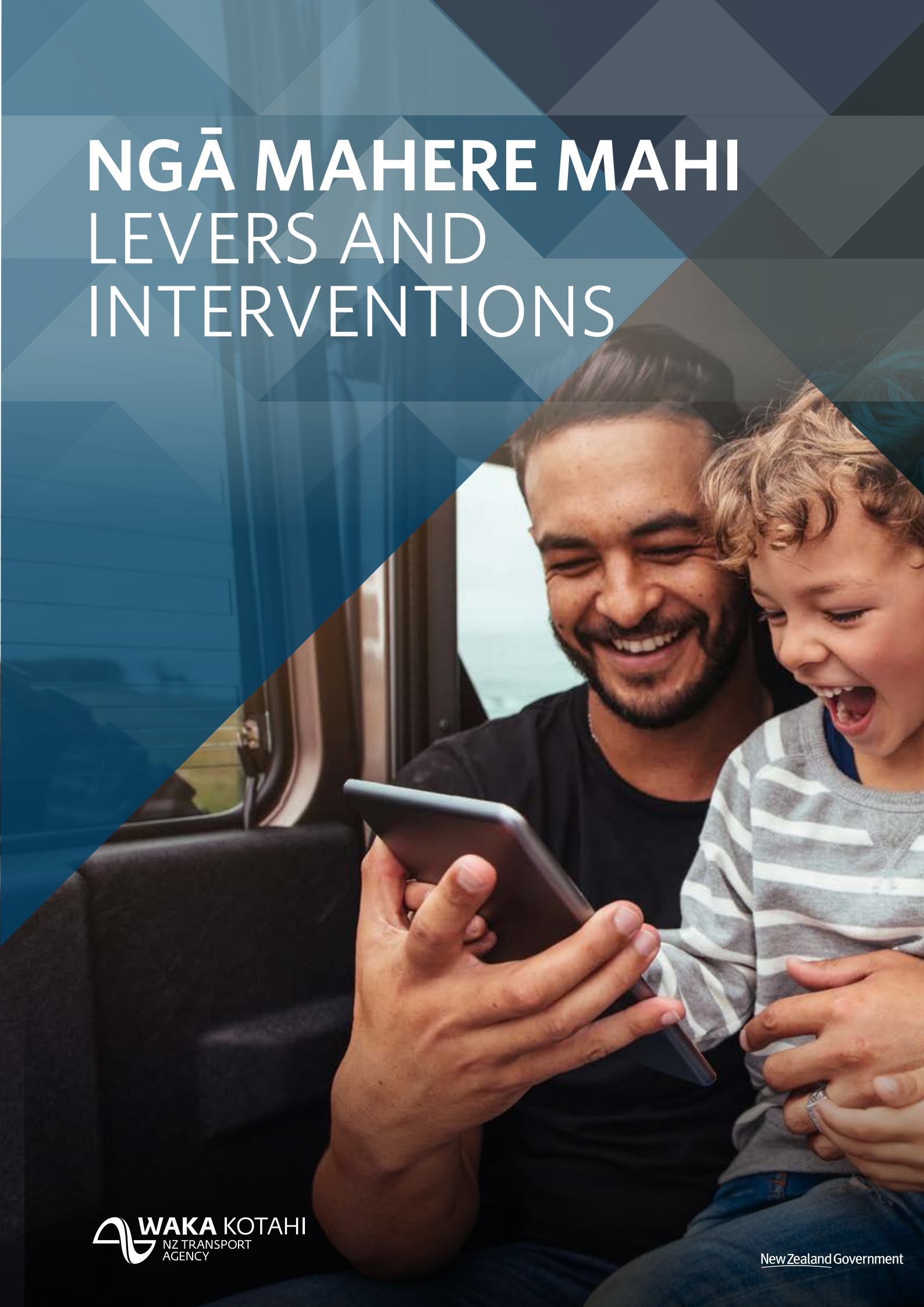


MEASURES

We have selected a subset of investment performance measures for the NLTP to measure how various activities impact step changes. This will strengthen the alignment between the government's objectives, Arataki and what we invest in/deliver. Monitoring the activities will enable the tracking of benefits and the fine-tuning of focus over time. These NLTP investment performance measures are shown in the table below. Information about the broader set of measures can be found on our **Planning and Investment Knowledge Base**.

STEP CHANGE	MEASURE
Transform urban mobility	***Access – access to key economic destinations (all modes)*** Proportion of population living within travel threshold (15, 30, 45 mins) of work by different modes (walking, cycling, public transport, private motor vehicle)
	Traffic – mode share Number of pedestrians, cyclists and motor vehicles by vehicle class, expressed as percentages
Improve urban form	***Access – access to key social destinations (all modes)*** Proportion of population living within travel threshold (15, 30, 45 mins) of education, health care, supermarkets by different modes (walking, cycling, public transport, private motor vehicle)
	Spatial coverage – public transport resident population % of recently built residential dwellings with access to public transport services (subset of number of people living within 500m of a bus stop or 1km from a rail or bus rapid transit station)
	People – mode share Average trip distance per person in urban areas
Significantly reduce harms	***Safety – deaths and serious injuries*** Number of deaths and serious injuries
Tackle climate change	***Pollution and greenhouse gases – CO_2 emissions*** Tonnes of CO_2 equivalents emitted
	Resilience – level of service (LoS) and risk Kilometres of road and rail infrastructure susceptible to coastal inundation with sea level rise (data set in place for 2021)
Support regional development	***Freight – throughput value*** Number of vehicles times average load per vehicle in NZD (data set in place around 2022)
	Access – access to key economic and social destinations (all modes) Proportion of population living within travel threshold (15, 30, 45 mins) of work, education, health care, supermarkets by different modes (walking, cycling, public transport, private motor vehicle)
	Availability of viable alternative routes Percentage of high-risk, high-impact routes with a viable alternative (data set in place for 2021)
	Temporal availability – road Number and duration of resolved road closures: urban >= 2 hours, rural >= 12 hours

NGĀ MAHERE MAHI
LEVERS AND INTERVENTIONS



WAKA KOTAHI
NZ TRANSPORT AGENCY

New Zealand Government

NGĀ MAHERE MAHI
LEVERS AND INTERVENTIONS

LEVERS

To progress the step changes outlined in Arataki, to deliver the government's current priorities and long-term outcomes, the interventions available to us can be grouped under six main levers.

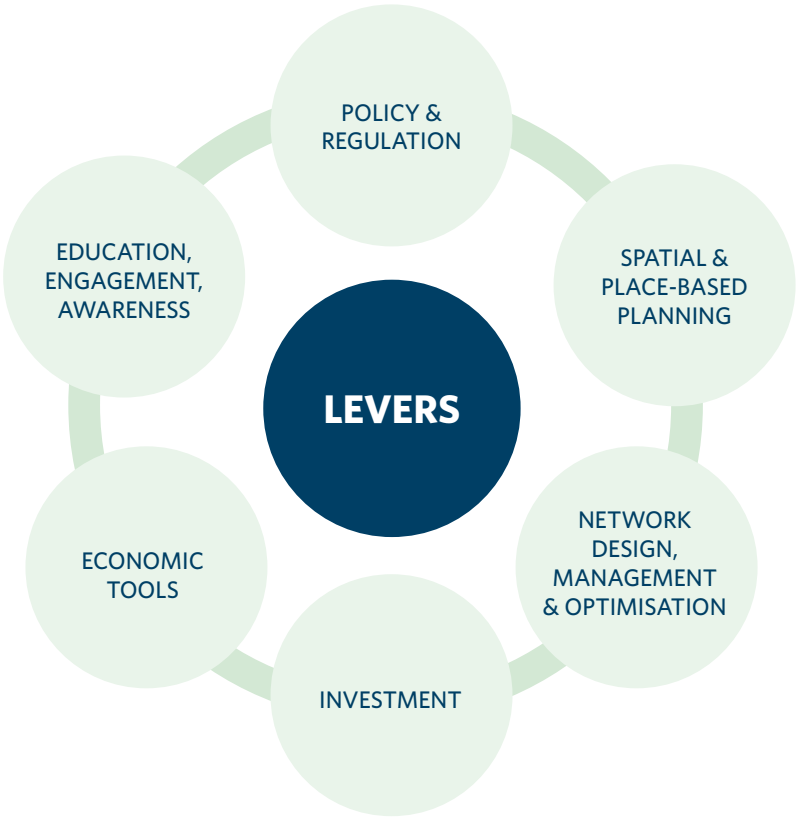
We don't control all the levers that will be required to deliver the step changes. Our success will depend on strong partnerships, integrated planning and decision-making, and co-investment with others. For example, KiwiRail, Kāinga Ora and Ministry of Housing and Urban Development (MHUD), our partners in local government, such as regional transport committees, regional councils and territorial authorities. In many situations a range of levers will be needed to deliver the desired step change.

The levers rely on an integrated and collaborative approach from all involved in operating, delivering and managing the land transport system. They allow us to take a systems response where all elements of the land transport system are considered. This will deliver multiple outcomes and benefits.

More work is needed to embed the six levers into the options development process across the sector and ensure we maximise the contribution of each lever to achieving step change.

SIX LEVERS TO SHAPE CHANGE

Figure 08



LEVER TYPE	HOW?
Policy and regulation	Providing detailed guidance for decisions or adjusting rules and regulations for planning, managing, investing in, and using the transport system. Undertaking the regulatory function
Spatial and place-based planning	Long-term integrated growth and infrastructure plans, and land-use decision-making
Network design, management and optimisation	Changing the form and function of the current land transport system so that it delivers the most effective and efficient transport solutions for the movement of people and goods
Investment (in infrastructure, platforms and services)	Improving the land transport system through new or enhanced infrastructure, technologies and services
Economic tools	Influencing access to and use of the land transport system through varying the cost of transport
Education, engagement and awareness	Working with others to raise sector capability, provide better information and support better decision-making

INTERVENTION HIERARCHY

The intervention hierarchy is currently used to shape the range of land-use and transport options available, in terms of their value for money, when responding to a challenge or opportunity. Integrating land-use and transport is the most cost-effective type of intervention for many problems and opportunities, and optimal responses will often include elements from other levels in the hierarchy (ie, a package or programme). For example, a local programme of incentives to encourage the use of shared and active modes may need to be combined with new or upgraded infrastructure where gaps in levels of service constrain potential demand and achieving key outcomes. Similarly, there will be occasions when lead infrastructure may be appropriate as a transformative intervention to deliver key outcomes.

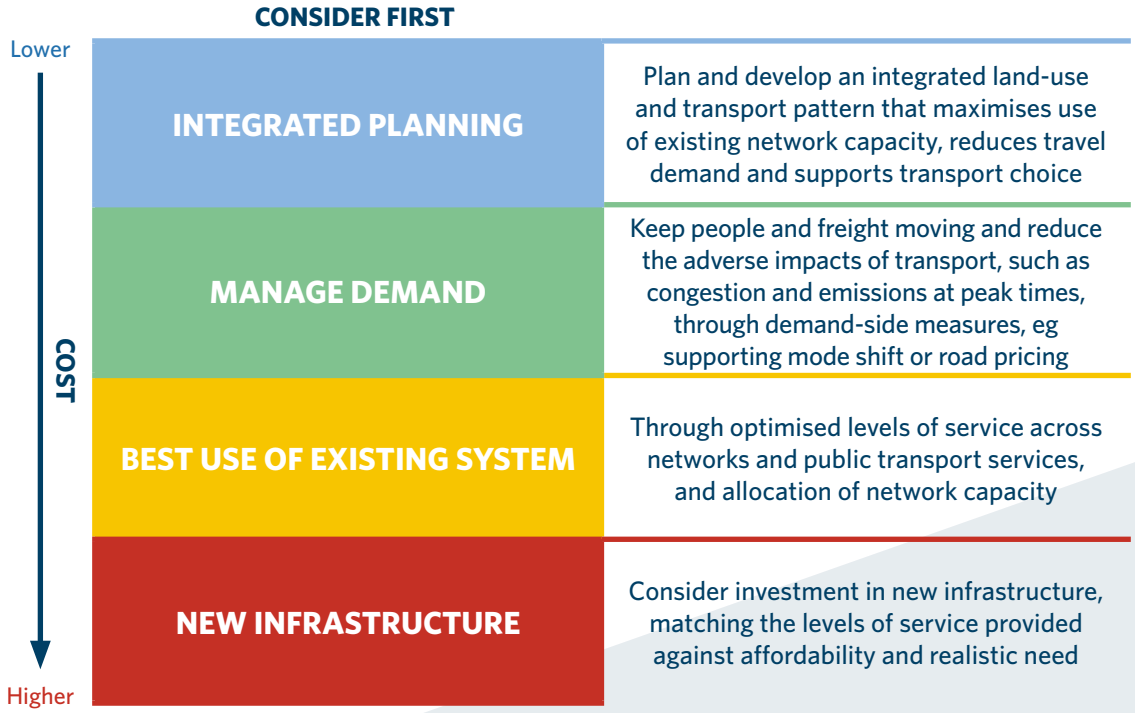
We will apply the intervention hierarchy to shape the appropriate mix of interventions for any opportunity or challenges.

With our co-planning and investment partners, we need to consider the full range of options to implement the right combination of responses. Our priority will always be to get the most from existing infrastructure and available travel options to avoid or delay the need to invest in new infrastructure.

Land-use and urban form have the greatest impact on our land transport system and influence how we transform urban mobility and tackle climate change. Integrated land-use and transport planning will remain a key focus along with using a range of levers.

The purpose of both the hierarchy and the Arataki levers is to promote system thinking, particularly around issues of growth management and network capacity. More work is needed to embed the six levers into the way we work across the sector, and we will continue to review the intervention hierarchy to shape the appropriate mix of interventions for any opportunity or challenges.

Figure 09



Number references can be accessed here
www.nzta.govt.nz/arataki-references