

## DRIVERS OF CHANGE

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As we look to the next 30 years, we need to ensure our transport system is integrated and able to adapt to the evolving demands and changing needs of our customers. Collectively, we need to identify and understand drivers of change in our communities, nationally, and globally, so that we can maximise opportunities and mitigate risks. The View has been informed by the Transport Outlook (Future State) produced by the Ministry of Transport.

Traditionally population growth and change in the economy have been the strongest drivers of transport demand in New Zealand. As we look to the future population and economic change are still expected to drive the scale of transport demand, but changes in technology and changes in the environment (particularly climate change) will increasingly shape the transport system and how people and goods move (including whether they need to move at all). Each of these elements is discussed on the following pages.



## Population change

Growth in transport demand is tied to population growth. A growing population makes an increased number of trips to access employment, services and amenities which also results in an increase in freight and business trips. When population growth is driven by strong migration from overseas, it introduces different expectations in terms of lifestyle and transport needs.

By 2043, we expect another 1.5 million people to live in New Zealand.<sup>1</sup> This increase will not be evenly spread across our country. Much of this growth will be in the Upper North Island, with 73 percent occurring in Auckland.<sup>1</sup>

Auckland's growth projection over the next 30 years will place considerable pressure on an already congested road network and rapid transit services, and there will be demand for transport infrastructure to service new homes and businesses in entirely new communities.<sup>2</sup> Achieving an effective and efficient transport system for Auckland is central to maintaining and improving the city's contribution to the national economy.

In contrast to Auckland and other growing urban areas, some parts of New Zealand are forecast to experience slow, low or negative population growth. By 2043, 16 of New Zealand's 67 territorial authorities are projected to have fewer residents than they did in 2013.<sup>1</sup> Regions projecting decreases are primarily rural areas that do not contain a main urban centre.

In areas forecast to experience declining population the land transport system is likely to play a critical role in supporting the economic and social well-being of people, business and communities. But there will be challenges. A declining population means a reducing rates base, making it more difficult for regions to pay their 'local share' of necessary transport investment. At the same time, the nature of transport demand in these areas is likely to shift, particularly as local populations age and the shape of local economies evolves. We need to understand the changing nature of transport demand in these areas, and ensure that the land transport system can respond appropriately and enable innovative solutions.

New Zealand's population is also ageing due to declining birth rates and better health care, leading to people living longer lives. In a number of territorial authorities the percentage of population aged over 65 is projected to be over 35% by 2043. These include Thames-Coromandel, Horowhenua, Tasman and the Central Otago District.<sup>1</sup> Conversely, the percentage of the population over 65 in some of our larger centres including Auckland, Hamilton and Wellington is projected to remain below 20 percent.<sup>1</sup>

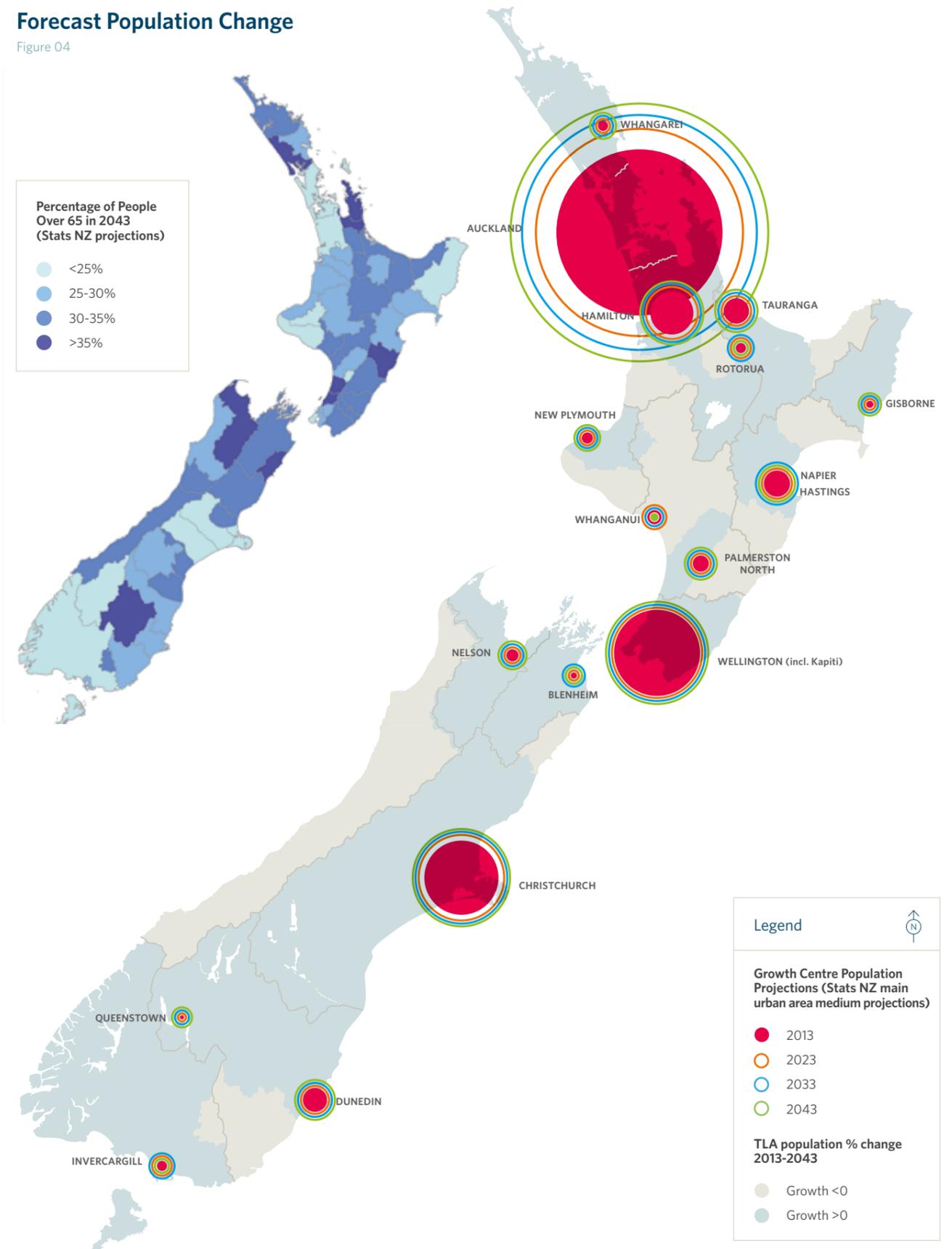
An ageing population is likely to result in more households on fixed incomes. Over time this may impact on some council's ability to raise revenue for infrastructure and services, particularly in areas where an ageing population is forecast to coincide with an overall decrease in population. Councils will need manage the impacts of de-population and ageing populations over the medium to long term.

Research tells us that there is a significant decrease in overall travel at age 65, as work related travel declines. There is a further sharp decrease in overall travel (time and distance) for those aged over 75.<sup>3</sup> Many of the communities experiencing an ageing population are within small territorial authorities with limited scope for alternative transport services.

There are trends that may change current travel patterns of those age groups over 65. For example, as they remain healthier for longer, more people in the 65-74 age bracket are choosing to continue working. The arrival of new, affordable and more flexible mobility services could also result in an increase in travel demand for older age groups.

## Forecast Population Change

Figure 04



## Economic change

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

New Zealand's economic performance is dominated by the increasing contribution of the service sector (particularly business and financial services). The service sector accounted for around 65.6 percent of GDP in 2015<sup>4</sup> and the overall shift in the economy towards the service sector is expected to continue.

In geographic terms, the service sector is closely tied to main urban areas, which are correspondingly expected to perform most strongly in GDP growth over the coming decades.

In comparison, growth in mining, manufacturing and primary industries is currently flat and forecast to remain so.

Current economic growth is driven by historically high levels of immigration (and comparatively low emigration rates) and strong tourist numbers. Both of these trends are forecast to continue.

A growing number of immigrants creates a need for more housing and demand for more services. As a result, the majority of economic growth is currently in the construction industry (including the Christchurch rebuild) and businesses that service this sector.

Because immigrants tend to be drawn to larger urban centres, particularly Auckland, economic growth (in the short term at least) is expected to be focused in these areas. Growth in employment trips, business trips and freight movement is therefore expected to be strongest in these areas.

Tourism is also forecast to grow strongly over the short to medium term. International visitor numbers are forecast to increase from 3.5 million (2016) to 4.9 million (2023).<sup>5</sup> The tourism sector has very direct links to transport demand due to the requirement to move people to and from key entry points, and between major visitor centres and attractions. This will create increased demand on networks within and between the main tourist centres such as Queenstown, Rotorua, and the key overseas entry points of Auckland and Christchurch.

We have seen a shift in how tourists get around with more tourists choosing to drive themselves which can bring with it a range of challenges given the different road environment and language barriers. New Zealand is also now being promoted internationally as a top destination to cycle. The New Zealand Cycle Trail rides are attracting overseas and domestic tourists and are driving an increase in the number of people travelling around New Zealand on bike

Increasing visitor numbers will trigger national and regional initiatives to influence tourist flows and economic activity. These will seek to create a wider range of tourism experiences to spread visits more evenly, both spatially and across seasons.

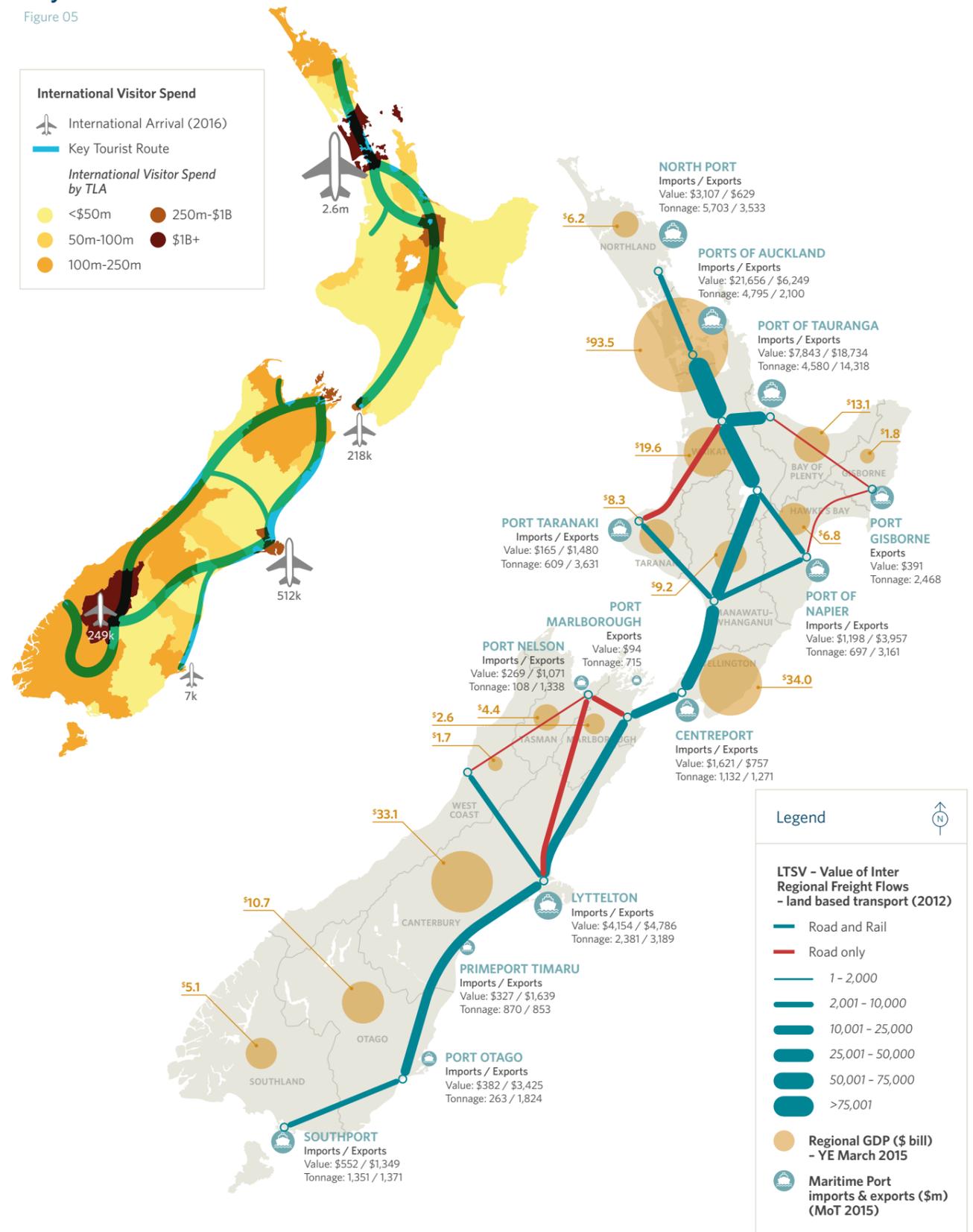
Looking at the shape of our economy, exports contribute around 30 percent of New Zealand's GDP, driven largely by the production and export of primary commodities.<sup>6</sup> Ensuring efficient access to our key import and export ports is critical to support export trade and the wider economy.

In provincial areas where primary industry makes up a large proportion of the economy, economic performance will continue to be closely tied to international commodity prices, and realising opportunities for value-add processing.

Substantial areas of New Zealand are forecast to experience flat or negative population growth (often tied to the modest economic performance of these areas). While this is likely to result in modest (if any) growth in travel demand, transport investment will still be needed to support efforts to improve economic performance in these areas.

## Key Economic Flows

Figure 05



\* Port data from MoT Ports and Imports 2016/2017

## Technological change

Technological innovation will change the way we travel, how services are delivered and how we invest in the transport system, in ways we cannot now predict. Technology may also remove the need to travel for some activities.

There is a real opportunity to leverage emerging technologies to help address some of our biggest transport challenges and significantly improve the performance of the transport system for customers. How customers choose, or are enabled, to embrace technology will be critical in shaping the future transport system. Convenience and affordability will be the key drivers of change, and technology the means of enabling change.

Smart phones have changed customers' expectations of their transport providers. People now expect real-time, personalised, and connected information that enables them to make the best transport choice for their needs.

To ensure we are enabling innovations and supporting the delivery of universal and inclusive transport services, we need digital infrastructure which connects to physical transport systems. Ideally this will be supported by a single, connected, digital infrastructure for the transport network. One live platform, that processes and analyses data as quickly as the customer expects – would truly enable both central and local government, and transport providers, to harness new technology as quickly as our customers do.

New technology will continue to rapidly transform all modes of transport, but the unpredictability of this transformation means that government (both national and local) will need to focus on quickly responding to technology shifts, rather than predicting which will succeed and when.

### INFORMATION AND TECHNOLOGY

Information and technology are becoming a crucial part of transport infrastructure and the transport system.

Technology and data together will increasingly build intelligent transport systems that can respond in real time to customer demand and external conditions, and start to predict and avoid disruptions for customers. They will also help us to sense and measure the health of physical assets, enabling radical new ways to monitor and maintain the transport system.

Information and technology also offer the potential to truly understand what our customers want from the transport system, allowing us to better meet their needs.

### AUGMENTED REALITY

Advances in augmented reality (AR), will result in large scale changes to how people work and may reduce the need to travel to a physical location each day for work.

The implications for network demand are potentially immense, particularly during peak periods. AR technology will also open up new ways to interactively connect with customers

### PERSONALISED TRANSPORT SYSTEMS

Customers lives and livelihoods change and evolve more rapidly than ever before. An effective transport system keeps ahead of trends in that evolution to continuously offer customers sensible choices and adapting to meet new demands.

Through the internet of things and personal communication technology individuals now have real-time access to personalised transport information and services. That information transforms how customers consume transport, allowing them to make choices that influence the services and business models used by transport operators.

To enable customers to access all available transport choices, Mobility as a Service (MaaS) combines journey options from many providers in a single digital platform (e.g. an app), where customers can view, compare, book, and pay for their journeys in one place, thus removing the need to own a personal vehicle.

In 2017 New Zealand launched the world's first open mobility marketplace in Queenstown. A real-time platform powers this open marketplace that all (legal) transport providers are invited to participate in.

### HOW WE PAY FOR TRANSPORT

Currently, charging for motor vehicles is based on the cost of providing and maintaining roads. This does not reflect differences in the true cost of travel for the user by time, location and mode. The Auckland Transport Alignment Project found that a more sophisticated approach to pricing could play a key role in more effectively influencing and shaping demand and making better use of the transport system.

Data on travel patterns is a growing source of intelligence on customer needs and preferences, allowing better predictions of demand. This will enable more intelligent approaches to dynamic pricing to make the best use of the transport system and its capacity.

Account based systems will allow people to create transport profiles and pay for their services in one way, regardless of mode or location. In the digital age, tickets may become a thing of the past. This change is accelerating across transport, and ticketless travel is now commonplace for metro services and road tolling.

### REGULATION AND ENFORCEMENT

We need to respond to safety opportunities and risks as vehicles in New Zealand's fleet become increasingly autonomous and reliant on software.

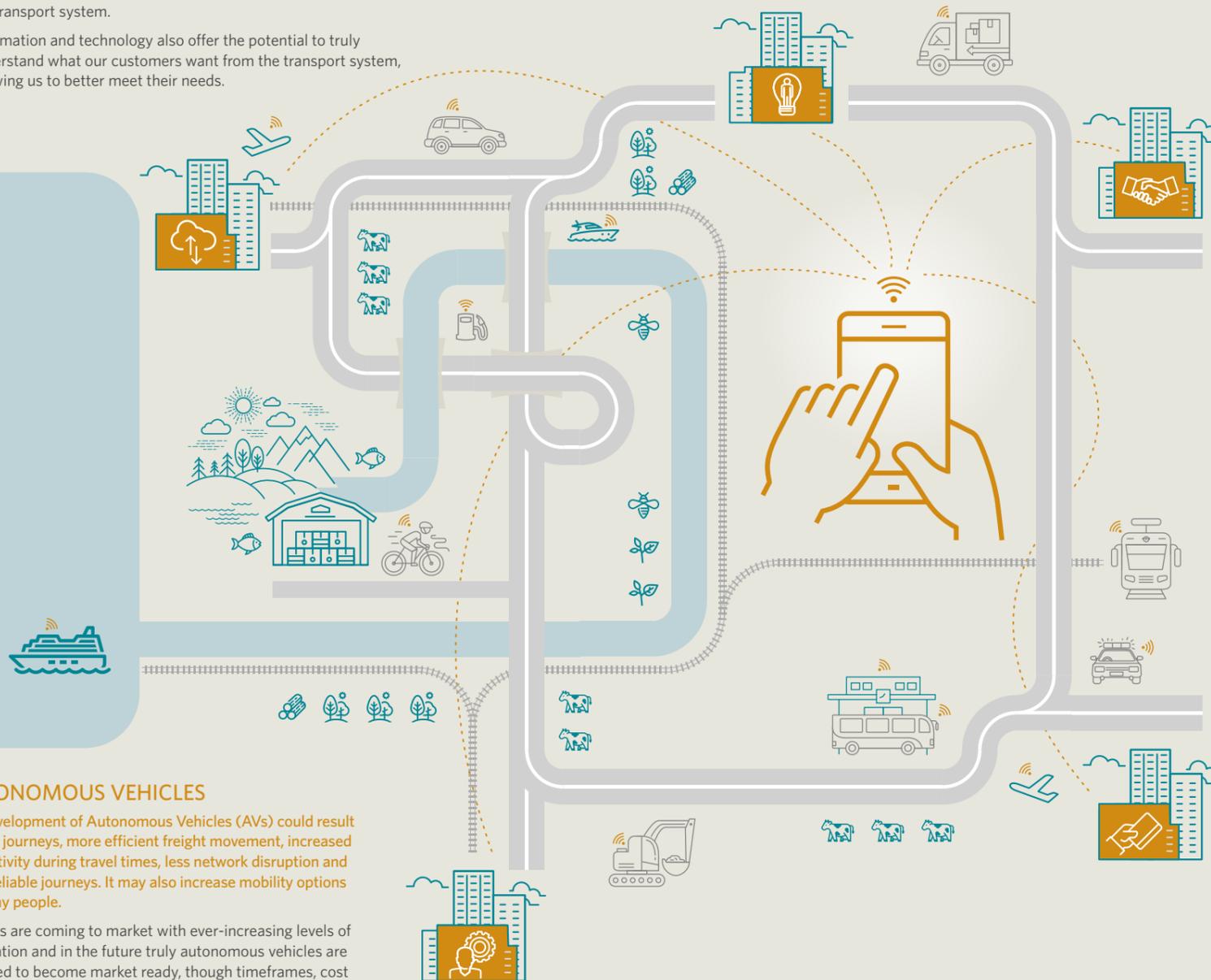
The regulatory framework and settings need to support greater responsiveness to change (including an expected increase in new entrants to the market) and harness new technologies. This must be balanced with an assurance that all transport solutions offered to customers are compliant and integrated with the transport system.

### AUTONOMOUS VEHICLES

The development of Autonomous Vehicles (AVs) could result in safer journeys, more efficient freight movement, increased productivity during travel times, less network disruption and more reliable journeys. It may also increase mobility options for many people.

Vehicles are coming to market with ever-increasing levels of automation and in the future truly autonomous vehicles are expected to become market ready, though timeframes, cost and rates of uptake are highly speculative.

Increasingly, autonomous vehicles will begin to converge air and land transport choices. Autonomous taxi drones are currently being tested as a new transport mode for both people and cargo. While there is an enormous opportunity to utilise air space above road corridors to move people and cargo efficiently, care will need to be taken with regulatory settings and infrastructure design to ensure all customers can undertake their journeys in safety and comfort.



## Climate Change

Most New Zealanders live no more than a few kilometres from the coast. As sea levels rise, tides, waves, storm surges and ground water intrusion will reach further inland than previously, causing more frequent and extensive flooding. Along some coasts, erosion will increase and shorelines will recede.

Whatever action is taken to reduce greenhouse gas emissions, it will make little difference to the rate of sea level rise for several decades. We are locked in to a sea level rise of approximately 20 centimetres by 2040. Beyond that the scale of sea level rise is difficult to predict, but could be in the range of 40-75 centimetres by 2100.<sup>6</sup>

There has been some analysis (Figure 07) of how main urban centres around New Zealand might be impacted by different levels of sea level rise. This analysis is not complete, but does give some indication of the scale of potential impacts.

The vulnerability of different coastal areas to rising seas depends on many factors. Height above sea level, the shape of the coastline, topography of the land and seabed, proximity to the sea, the presence of barriers such as sand dunes, and other local characteristics will affect outcomes in different coastal areas. It is therefore difficult to predict which locations are most vulnerable.

In addition to sea level rise, the warming climate will influence weather patterns in coming decades. As the atmosphere warms, it can hold more moisture – about 7 percent for every 1°C increase in temperature,<sup>6</sup> so the distribution of rainfall across New Zealand and its intensity are likely to change. Rainfall is projected to increase in the west of both islands and the south of the South Island. Northland and regions in the east of both islands are projected to become drier. It is also projected that heavy downpours will become more extreme.

Increases in the amount and intensity of rainfall in some catchments raise the risk of river flooding. Areas close to river mouths can experience heightened flows coinciding with the sea pushing its way upriver at high tide. As high tides become higher because of sea level rise, floods will become more likely.

The duration and intensity of winds drives the power of waves. As circulation patterns in the atmosphere change, westerly winds will become more prolonged and intense, especially in winter. Increased winds will lead to larger waves breaking on the shores of the west coasts of both islands.

Storm patterns are also likely to change as the atmosphere warms. The impact of storm surges will be increased by sea level rise. It is projected that cyclones that form south of New Zealand in winter will become more intense, leading to stronger winds and larger waves on shores exposed to the south. It is also projected that the intensity of cyclones elsewhere in the country will decrease.

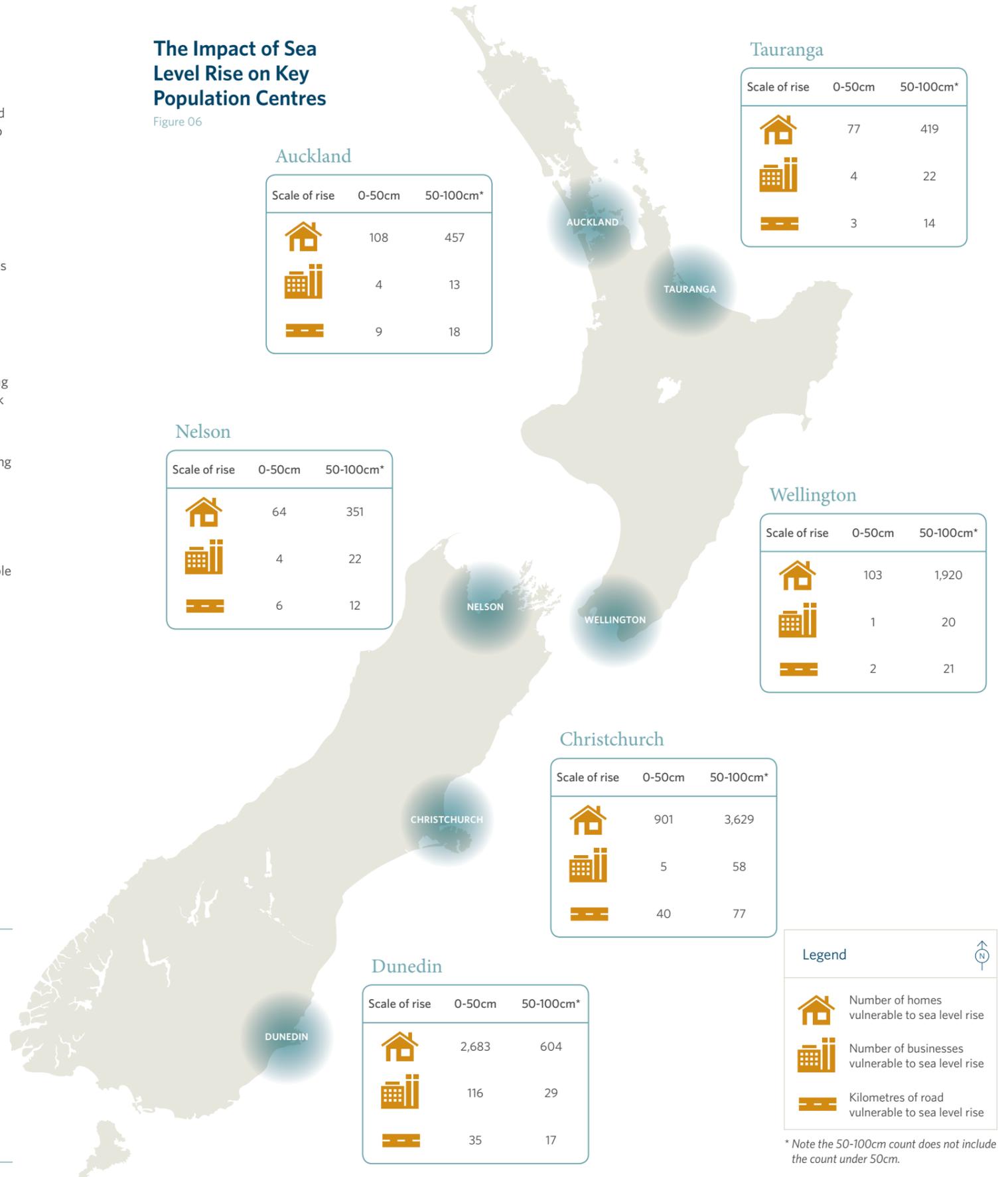
We are already seeing increasing pressure on the transport system from shifting weather patterns and trends related to climate change. The trend for increasing expenditure on emergency maintenance and repair work is expected to continue.

The transport system needs to be able to adapt to the adverse impacts of climate change, and focus on ensuring resilience and quickly restoring access to the transport system after unplanned events. These two dimensions – increasing the robustness of the transport system and decreasing the recovery time when things go wrong – are equally important. Both depend on having a clear understanding of those locations that are most vulnerable and then executing a plan to mitigate risk.

Appropriate land use planning also plays a vital part. Ensuring that intense land use and critical transport corridors are developed in less vulnerable locations will also mitigate the effect of climate change.

## The Impact of Sea Level Rise on Key Population Centres

Figure 06



### REFERENCE LIST

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