

Auckland Plan 2050 Evidence Report

Transport and Access

June 2018



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Auckland Plan, Strategy and Research Department

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1 Introduction

1.1 Purpose

The Auckland Plan sets out a comprehensive long-term strategy for Auckland's growth and development. This paper provides the basis for the development of the policy framework for the Transport and Access outcome of The Auckland Plan. It sets out the supporting evidence behind:

- the challenges and opportunities facing Auckland's transport network over the next 30 years,
- the rationale behind the policy directions and focus areas to address these challenges, and
- the sequencing of major transport investments, which is detailed in the Development Strategy of the Auckland Plan.

The information has been drawn from a wide range of sources including feedback from consultation with Aucklanders during two rounds of engagement in 2017 and public consultation in 2018. Key partners and stakeholders who have provided feedback include central government, mana whenua, mataawaka, community and environmental organisations, the private sector, professional bodies and industry associations. The evidence in this report has been gathered since the 2012 Auckland Plan was adopted, and is current as at the date of publication of this document.

The strategic approach of the Auckland Transport Alignment Project (ATAP) is a key component of the Auckland Plan 2050, informing the strategic direction of the Transport and Access section as well as the sequencing of major transport investments in the Development Strategy. ATAP (including the 2018 update to ATAP) is referenced extensively throughout this paper.

The Transport and Access outcome covers infrastructure matters that have a strong interrelationship with the land use planning decisions and policy of The Auckland Plan. This report is one of a set of interrelated background papers prepared to support the Auckland Plan 2050. The Auckland Plan 2050 sets the strategic direction for Auckland and collectively these evidence reports provide the foundational background information that also may assist in the future development of policy positions.

1.2 Outcome description

1.2.1 Outcome sought

"Aucklanders will be able to get to where they want to go, and will have choices about how they get around"

1.2.2 Scope

The Transport and Access outcome relates to how we provide for the physical movement of people, goods and services in three key ways:

- between different parts of Auckland
- between Auckland and other parts of New Zealand (inter-regional connectivity)
- between Auckland and other parts of the world (international connectivity).

The physical movement of people, goods and services is increasingly being complemented by the digital movement of information. Digital access and connectivity is discussed in the Opportunity and Prosperity outcome.

1.2.3 Transport success: Access to opportunities

Connectivity and accessibility are the hallmarks of all successful cities. Road, rail, footpath, cycleway, port, airport and broadband networks are required to move people, goods and services between different parts of Auckland, New Zealand and the world.

For Auckland to be successful it must be an accessible city, where everyone can easily reach 'opportunities' such as employment, education, healthcare, shopping, services, recreation and the myriad of other activities people undertake in their daily lives (Litman, 2017). Accessibility is influenced by land use patterns as well as the quality, range and affordability of travel options.

Improving accessibility requires many aspects of the transport system to operate effectively, to ensure travel speeds are high enough, that wait times for public transport are short enough and that the capacity of the system is sufficient to cope with demand. It also requires integration between land use and transport, principally to support effective access between residential areas and key employment areas.

Auckland's significant future population growth creates opportunities to increase productivity and help improve the prosperity of Auckland and the rest of New Zealand. Population growth also adds vibrancy, supporting a greater diversity of social and cultural opportunities that makes Auckland a more exciting and attractive place to live. However, these benefits will only be realised if Aucklanders have the ability to access new opportunities in a reliable, affordable and timely manner. Therefore, it is essential for Auckland to proactively support and enable this growth with the right investment.

1.2.4 Importance of access to achieving the vision for Auckland

For Auckland to benefit from the region's growth, it is essential for people from all parts of Auckland to have good access to the employment, education and other opportunities that growth creates. Our continued prosperity is dependent on the convenient, affordable, safe and sustainable movement of people, goods and services within Auckland, and with the rest of New Zealand and the world.

Improving access to employment and education is particularly critical to boosting Auckland's economic productivity and overall prosperity (Ministry of Transport, 2014). To

be productive, businesses need a wide choice of potential employees. Similarly, workers need a wide choice of potential jobs within a reasonable commute time to best match their skills and to reduce their vulnerability to long-term unemployment in the event of job loss.

1.3 Links to other parts of the Auckland Plan 2050

Access is an enabler of other key outcomes rather than an end in and of itself. Therefore, the connections between this outcome and other Auckland Plan outcomes and the Development Strategy are crucial for the Plan to be an overall success.

Key relationships with the other outcomes are outlined in the diagram below:

Outcome	Key Relationships
Belonging and Participation	<ul style="list-style-type: none"> • Ensuring all Aucklanders have access to opportunities and addressing access equity issues. • Improving travel choices to improve the affordability of travel. • Creating quality urban environments, including through Universal Design. • Reducing harm and improving health through encouraging active transport modes and reducing vehicle pollution.
Māori Identity and Wellbeing	<ul style="list-style-type: none"> • Ensuring parts of Auckland with high Māori populations have access to a large number of opportunities is critical to improving Māori social and economic wellbeing. • The design of transport infrastructure provides an opportunity to reflect Auckland’s unique Māori identity. • Māori have a critical role to play in the resource management process for transport improvements.
Homes and Places	<ul style="list-style-type: none"> • Transport infrastructure and services are key enablers of growth. • Transport corridors make up a large part of Auckland’s public space and good street design and the careful balancing of movement and place outcomes is critical to delivering quality public spaces.
Environment and Cultural Heritage	<ul style="list-style-type: none"> • The transport system creates a number of environmental impacts that need to be reduced. • Transport is the largest contributor to greenhouse gas emissions in Auckland. • Runoff from the transport system contributes to pollution of Auckland’s waterways.
Opportunity and Prosperity	<ul style="list-style-type: none"> • Access to employment and education is a key determinant of economic productivity and overall prosperity. • The efficient movement of goods and services has significant economic benefits. Delays and poor reliability create real costs that are borne by us all.

Transport and Access also links strongly with numerous parts of the Development Strategy, which sets out how Auckland will develop in the future, including how we will sequence development growth and the infrastructure needed. Transport investment needs to support intensification in the existing urban area, growth in new urban areas and improve connection between newly developing areas with the rest of Auckland. Similarly, housing and employment growth needs to be located in areas with better transport connections, enabling shorter commutes and reducing pressure on the transport network. Section 4.3.2 of this report provides more information on the sequencing of major infrastructure investments.

2 Context

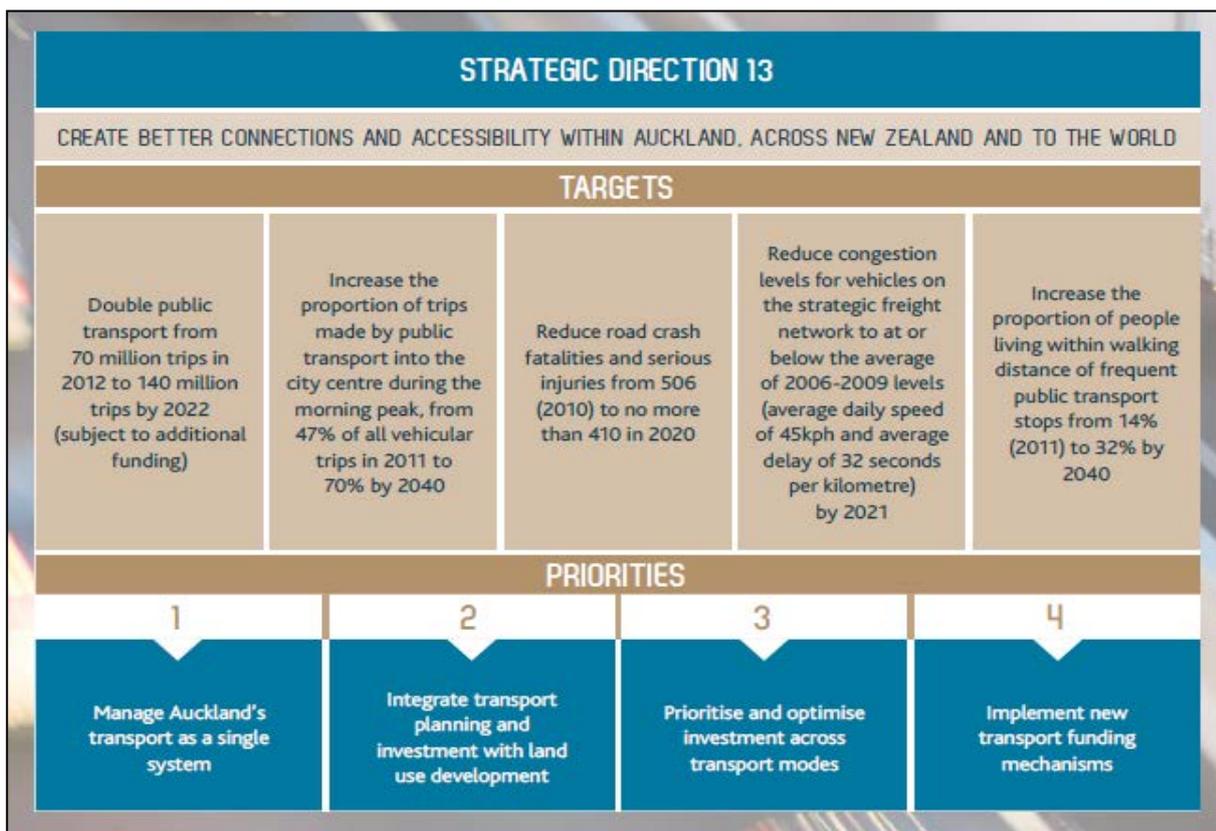
This section outlines the context within which the Transport and Access outcome was developed. It provides an overview of the relevant policies, strategies, plans and key legislative requirements that play a role in how the Transport and Access outcome aspirations will be delivered, and the key trends that have an impact on transport and access.

2.1 2012 Auckland Plan direction

Chapter 13 of the 2012 Auckland Plan outlines the strategic approach to transport in Auckland (Auckland Council, 2012b). This is based on the direction to “create better connections and accessibility within Auckland, across New Zealand and to the world”.

Targets and priorities are outlined in the diagram below:

Figure 1 2012 Auckland Plan direction¹



A number of different strategic planning documents gave effect to this strategic direction for transport, which ultimately informed investment decisions in the 2012 and 2015 Long-term Plans, as well as a number of key initiatives like the City Rail Link.

¹ Diagram sourced from Auckland Council (2012b), Auckland Plan.

Over time the direction articulated in the 2012 Auckland Plan was updated and adapted through further detailed analysis. This evolution of strategic transport plans over the 2012-2018 period is shown below:

Figure 2 Evolution of Auckland’s strategic transport plans, 2012-2018



Major initiatives, plans and strategies advanced over time, while transport technology has also developed rapidly over the past six years. Together, this has meant the 2012 Plan became increasingly out of date. Some of these advances are outlined below:

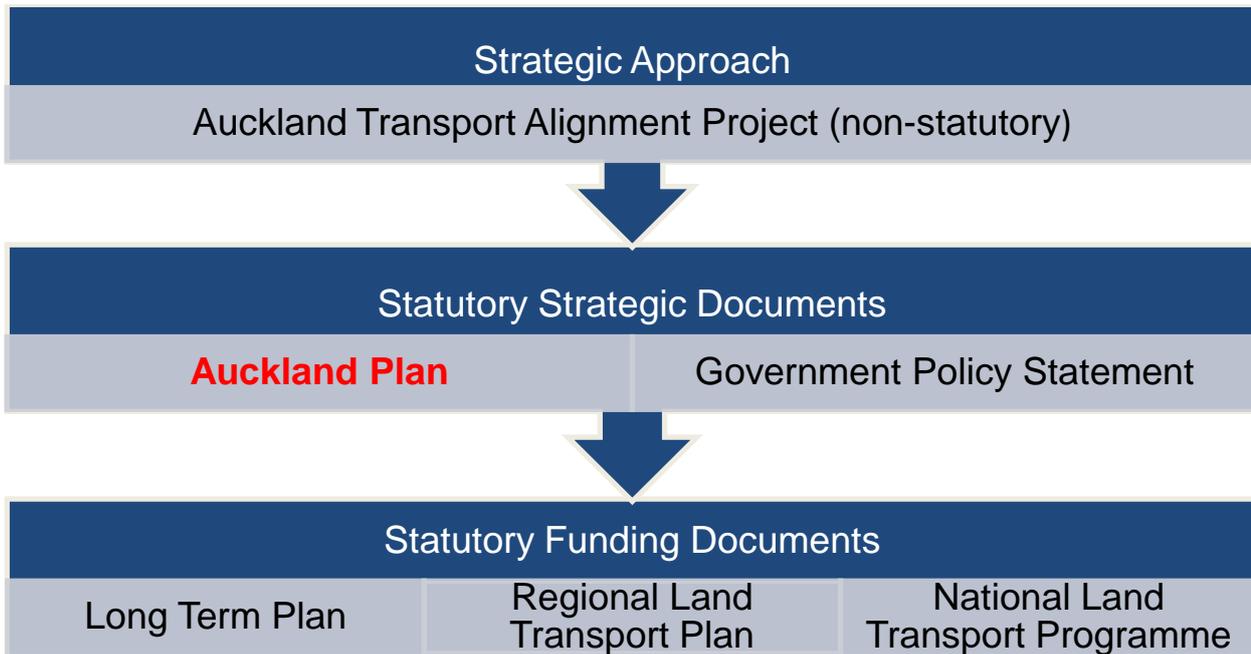
Table 1 Transport advances in Auckland since the 2012 Auckland Plan

Major initiatives	New Plans & Strategies	Developing Technologies
<ul style="list-style-type: none"> • Rail electrification • City Rail Link • Western Ring Route • New public transport network • Urban cycleway programme 	<ul style="list-style-type: none"> • Auckland Transport Alignment Project (ATAP) • Transport for Future Urban Growth (TFUG) • Unitary Plan • Low Carbon Auckland • Future Urban Land Supply Strategy • Several transport plans & strategies (Integrated Transport Programme, Regional PT Plan, etc.) • Port Future Study 	<ul style="list-style-type: none"> • Development of connected and autonomous vehicles • Ridesharing applications

2.2 Relationship to other plans

The Auckland Plan forms part of the transport planning framework in Auckland. The relationship of the Auckland Plan to these other key documents is summarised in the diagram below:

Figure 3 The relationship of the Auckland Plan with other plans



2.2.1 Auckland Transport Alignment Project

In 2015 and 2016 Auckland Council and Central Government worked together, through the Auckland Transport Alignment Project (ATAP) (Ministry of Transport, 2017a) to develop a long-term aligned strategic approach to addressing Auckland’s transport challenges. This approach has three key integrated elements, each with three key components. This is illustrated below:

Figure 4 ATAP strategic approach²



² Chart sourced from ATAP (2016i), Recommended strategic approach

The ATAP strategic approach is a key component of the Auckland Plan 2050, informing the strategic direction of the Transport and Access outcome as well as the sequencing of major transport investments in the Development Strategy.

ATAP also identified the most significant transport challenges over the next decade as:

- enabling a faster rate of housing growth, particularly in Special Housing Areas and greenfield areas live-zoned in the Auckland Unitary Plan
- addressing projected declines in access to jobs for people living in large parts of the west, and some of the south
- addressing increasing congestion on the motorway and arterial road network during peak periods, and increasingly at other times of the day, which adversely affects the efficient movement of freight and services
- increasing the share of travel by public transport, particularly along high volume, congested corridors
- continuing to improve road safety, walking and cycling.

Delivering ATAP's strategic approach requires an increase in transport funding from 2017/18 levels. The ATAP "indicative package" of investments for 2018-28 was updated in August 2017 to reflect higher than expected population growth (ATAP, 2017). This updated the funding gap to around \$5.9 billion for the 2018-28 period, an increase from the original \$4 billion funding shortfall.

In February 2018 the new government and Auckland Council signed a Terms of Reference to update the ATAP indicative package (ATAP, 2018) to take into account the challenges identified in ATAP as well as give effect to the new government's priorities, which are:

- accelerating the development of Auckland's rapid transit network, particularly to unlock housing and urban development opportunities
- encouraging walking and cycling and making these active modes safer for Aucklanders
- delivering improvements in health, safety, the environment and access, including disability access
- ensuring the indicative package delivers the best possible value for money, including broader non-monetary costs and benefits.

The new government's priorities to improve travel choices and reduce transport's adverse effects mean the strategic directions of ATAP and the Auckland Plan 2050 are now further aligned.

2.2.2 Government Policy Statement

The Government Policy Statement on land transport 2018/19 – 2027/28 (GPS) aligns the government's investment priorities with the ATAP strategic approach (Ministry of Transport, 2018). The four strategic directions of the GPS are:

- safety: a safe system that is free of deaths and serious injuries

- access: an accessible transport system that provides transport choice, and is resilient
- environment: better environmental outcomes that reduce the adverse effects on the climate, local environment and public health
- value for money: to achieve the best outcomes for every dollar spent.

2.2.3 Key legislative requirements

The key acts that guide the planning and funding for transport are the Local Government Auckland Council Act 2009 (LGACA), the Local Government Act 2002 (LGA) and the Land Transport Management Act 2003 (LTMA).

The LGACA requires the Auckland Plan to contribute to Auckland's social, economic, environmental, and cultural well-being through a comprehensive and effective long-term (20- to 30-year) strategy for Auckland's growth and development. It is intended to enable coherent and co-ordinated decision-making by the Auckland Council and other parties in determining the future location and timing of critical infrastructure, services, and investment within Auckland. This includes services relating to transport.

The LGA guides matters relating to funding growth-related infrastructure which supports having the right infrastructure in place. The LGA does this through development contributions, which allows the council to require a payment for growth-related infrastructure.

The LTMA sets out the planning and funding framework that channels central government funding annually into roading, public transport and traffic safety.

2.2.4 Statutory Funding Plans

The Auckland Plan has an important relationship with statutory funding plans. The role of each plan is outlined below:

- the Regional Land Transport Plan (RLTP) is prepared by Auckland Transport³. It is a shared plan across all transport agencies in Auckland and must set out the region's land transport objectives and include a 10-year programme of prioritised activities that deliver upon these objectives.
- the Long-term Plan (LTP) is prepared by Auckland Council⁴. It sets out Auckland Council's budget for the next 10 years including major areas of expenditure and the ways in which revenue will be raised.
- the National Land Transport Programme (NLTP) is prepared by the NZ Transport Agency⁵. It outlines the way in which funding from the National Land Transport Fund will be distributed to give effect to the GPS.

³ As required under the Land Transport Management Act, 2003

⁴ As required under the Local Government Act, 2003

⁵ As required under the Land Transport Management Act, 2003

A strong link between the Auckland Plan and the RLTP is particularly important, as both plans outline outcomes for the entire transport system in Auckland – albeit at different timescales (30 years compared to 10 years) and at different levels of detail.

2.3 Key trends affecting transport and access

The most important trend relevant to transport and access is the scale and pace of Auckland's population growth and its impact on travel demand. Other important trends include:

- land-use changes (i.e. where population and employment growth is occurring)
- technological advancements
- demographic changes (an ageing and increasingly diverse population).

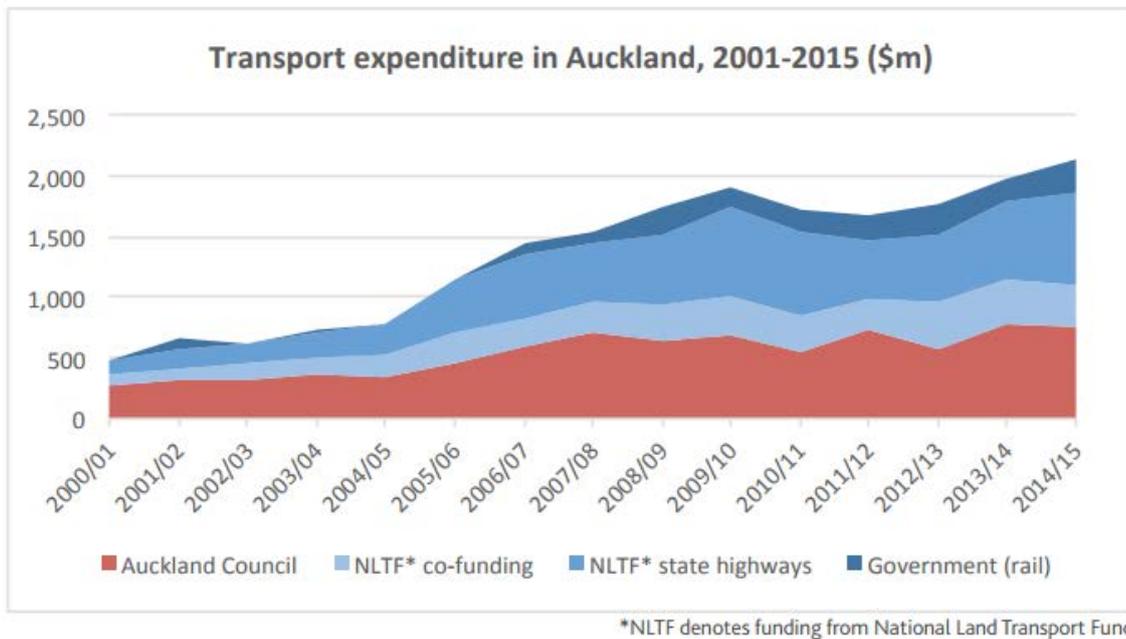
Auckland's transport history also has a key role to play in the challenges we face today.

Over the second half of the 20th century Auckland became one of the most car dependent cities in the world (Coleman, 2010). The development of a motorway system and the almost complete lack of investment in public transport, walking and cycling meant that for almost all trips, private vehicles were the only viable travel option. This was a major factor underpinning Auckland's development into a relatively low-density and dispersed city (Auckland Regional Council, 2010a).

While the advent of the new century brought with it a more proactive approach to transport planning and investment, the legacy of underinvestment is still felt today with many projects that were first planned decades ago only now being undertaken. The City Rail Link, for example, was first proposed in the 1920s. Consequently, it is difficult to address current transport challenges, let alone prepare for the future, because much of our investment continues to focus on delivering projects first needed decades ago.

There has been a substantial increase in overall transport investment over the last two decades (see Figure 5). This has enabled completion of the motorway network and the beginnings of a high-quality strategic public transport network of rail and busways. More recently, investment in high quality cycling infrastructure has brought about the first steps towards cycling becoming a safe and attractive travel option for more than a hardy few.

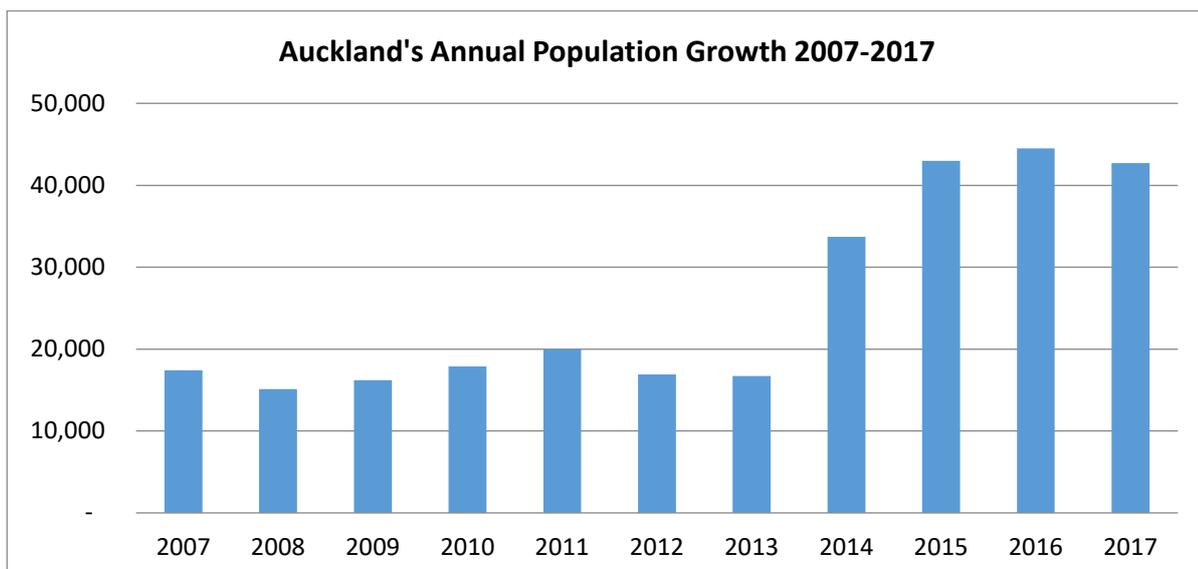
Figure 5 Transport expenditure in Auckland, 2001-2015 (\$m)⁶



While Auckland has benefitted enormously from these improvements, ongoing rapid population growth has meant efforts are barely keeping up with growing demand. Despite major expansion, our roads are as congested as ever (Chitale and Norman, 2017) and our improving public transport services are frequently overcrowded (Wilson, 2017).

In the past few years Auckland has experienced record levels of population growth and is now one of the fastest growing cities in the developed world with an annual growth rate approaching 3% (Statistics NZ, 2017). This upswing in growth is shown in Figure 6 below:

Figure 6 Auckland's annual population growth, 2007-2017⁷



⁶ Graph sourced from ATAP (2016i), Recommended strategic approach.

⁷ Graph sourced from Statistics NZ (2017b), Subnational population estimates.

The exact scale, timing and location of Auckland's future population growth is highly uncertain. The Auckland Council's land use scenario i11 forecasts that the total population of Auckland could reach nearly 2.38 million by 2048 – an increase of 720,000 people from 2018.⁸ Statistics NZ projections suggest an additional 700,000 to 1 million people may live in Auckland by 2043 (Statistics NZ, 2017a)⁹.

Around two-thirds of this growth is expected to be accommodated within existing urban areas, with the remaining growth occurring in new urban areas, the expansion of rural towns and villages, and through some growth in countryside living in rural areas.

Rapid population growth places pressure on the transport system in a variety of ways:

- substantial transport investment is required to enable growth in new urban areas, through upgrading rural roads to urban standards, constructing major new roads, walking and cycling facilities, and public transport infrastructure, as well as providing public transport services.
- a larger population leads to increased travel demand, placing pressure on existing networks, resulting in congestion, overcrowding and ultimately longer and less reliable travel times.
- increased travel demand can result in more impact from the transport system on people and the environment and greater conflict between movement and place outcomes on urban streets.

Growth also creates opportunities to improve the transport system, making substantial investments worthwhile and making improved public transport services viable. Harnessing the benefits of growth and addressing its challenges is key to achieving transport success.

2.3.1 Travel demand

The scale and pace of Auckland's population growth translates into large forecast increases in travel demand, placing pressure on our transport networks. Despite a likely reduction in per capita travel, overall daily travel is projected to increase from around 30 million to over 40 million kilometres by 2046 (ATAP, 2016k). This creates a number of specific transport challenges including declines in access to employment, growing congestion on motorways and arterial roads and an ongoing need to increase public transport mode share.

Past, current and projected demand

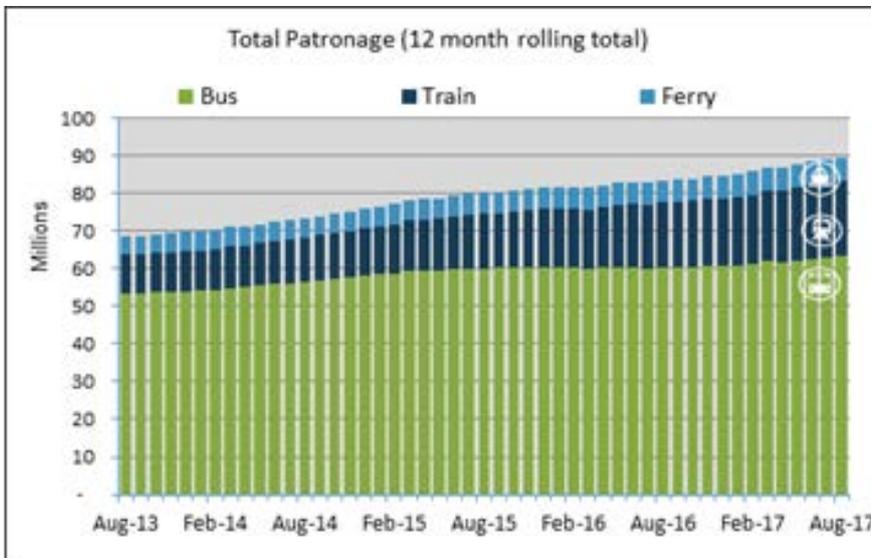
Public transport use has increased substantially in recent years, growing from 50 million to 90 million annual boardings since 2005 (Figure 7) (Auckland Transport, 2017b). There has been an increase in public transport mode share for journeys to work and more people at

⁸ The forecasted population for 2048 has been interpolated from the 2046 and 2051 figures, as the i11 scenario only provides 2046 and 2051 figures. The figures used were as follows – a forecasted population of 2,338,564 at 2046, and a forecasted population of 2,433,922 at 2051. The difference between these two counts (95,358) was divided by 5 and multiplied by 2 to ascertain a count for 2048. This represents an increase of 720,061 from an estimated population of 1,656,646 in 2018.

⁹ Stats NZ sub-national projections medium series indicate that Auckland's population could reach 2,326,200 by 2043. Please note that the Stats NZ projections extend to 2043, while the Auckland Council land use scenario i11 extends to 2051. As noted in the footnote above, the 2048 figure for i11 was extrapolated from the data.

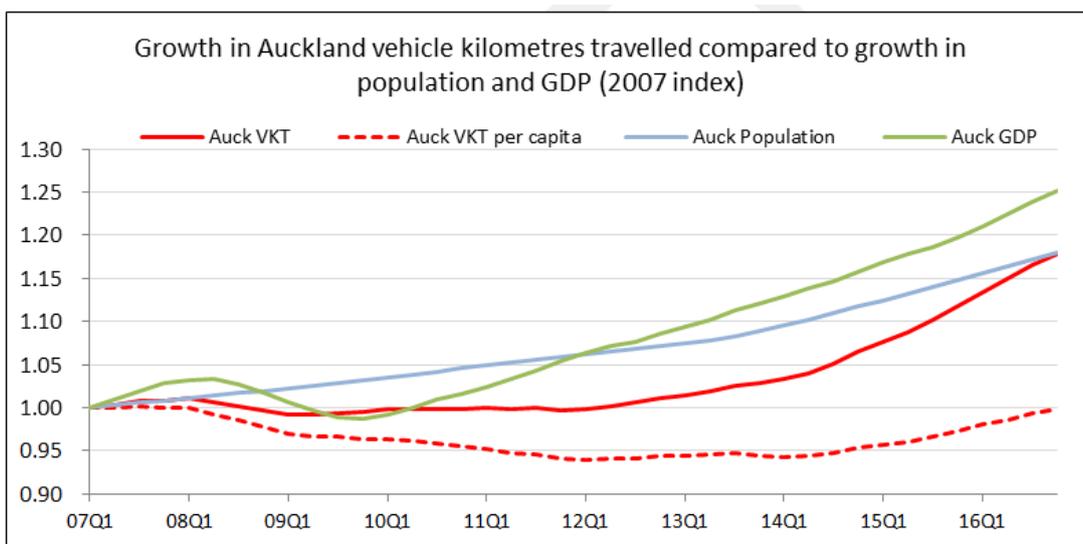
peak times now enter the Auckland city centre by public transport than private vehicle (Davis, 2017).

Figure 7 Public transport boardings in Auckland, 2013-2017¹⁰



For most of the past decade, vehicular travel grew relatively slowly in Auckland and declined on a per capita basis. However, over the past three years rapid population growth, lower fuel prices and a buoyant economy has led to substantial growth. Total vehicle travel has grown by around 10% in the past three years (Figure 8), which equates to around 360,000 more trips each day (NZTA, 2017e).

Figure 8 Auckland travel demand, 2007-2016¹¹



On the motorway network, this growth has contributed to average peak time travel speeds declining by around 9% because of growing congestion (ATAP, 2016k). In some parts of Auckland, such as the southern section of the Southern Motorway and parts of the Northwestern Motorway, increases in congestion have been particularly significant. Bus

¹⁰ Graph sourced from Auckland Transport (2017b), AT Metro patronage report.

¹¹ Graph sourced from NZTA (2017d), Transport use.

services have also faced significant overcrowding, especially on isthmus routes serving the city centre.

While making long-term travel demand projections is difficult, modelling undertaken as part of ATAP provides a broad indication of the scale of demand growth over time – largely expected to be driven by population growth (ATAP, 2016e):

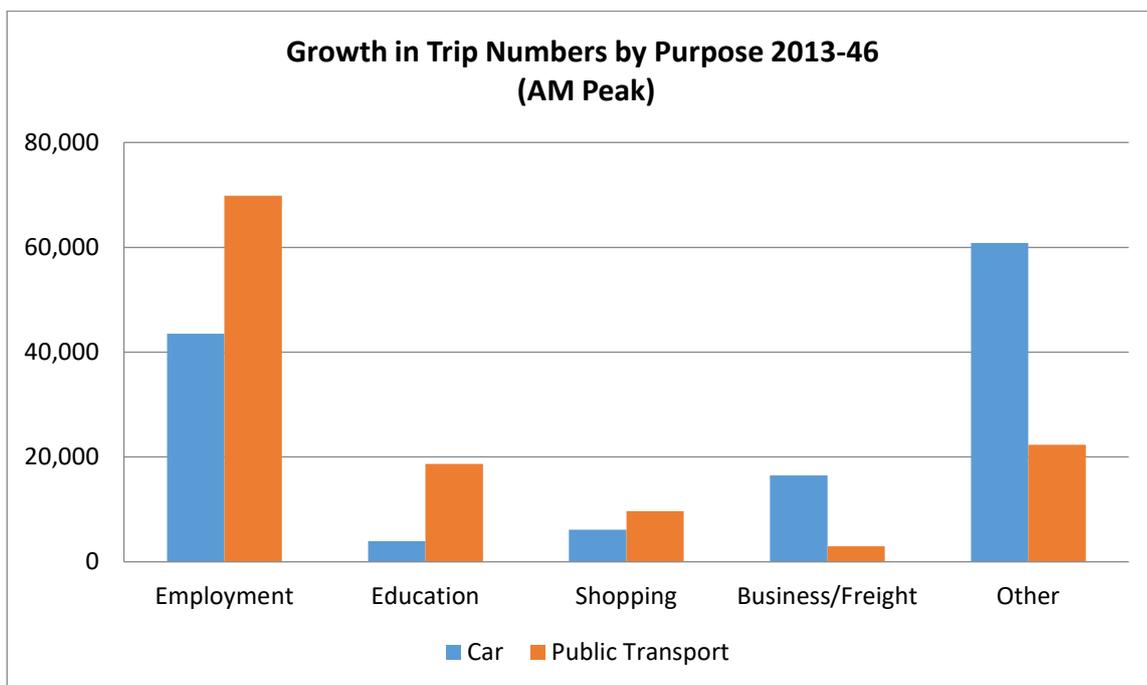
- vehicle travel during the morning peak is projected to grow by 2.3 million kilometres from 2013 to 2046, a 46% increase
- morning peak public transport passenger kilometres are projected to grow by 1.3 million kilometres over the same time period, an increase of 190% on 2013 levels
- heavy vehicle trip numbers in the morning peak are projected to grow by 65%, from 26,000 in 2013 to 43,000 by 2046.

Different types of travel demand

Over the next 30 years, growth in travel demand is projected to occur across all travel purposes: commuting to employment or education, shopping, business and freight trips, and trips for other purposes (visiting friends and relatives, undertaking errands, etc.) (ATAP, 2016e).

During the morning peak, when the transport system is under the greatest pressure, the greatest projected increase in travel demand is for trips to employment, followed by trips for other purposes.

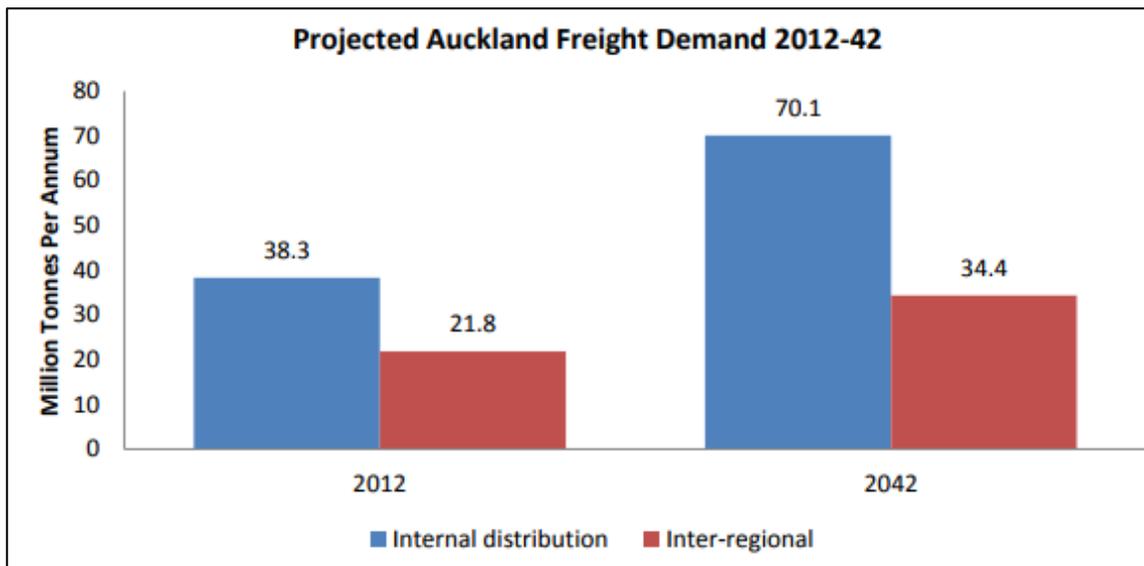
Figure 9 Growth in trip numbers by purpose, 2013-2046¹²



¹² Information obtained from the ATAP modelling of the Auckland Plan Transport Network

Around 25% of New Zealand's freight has an Auckland origin or destination, with 95% of the freight task undertaken by road (ATAP, 2016f). Auckland's freight task is projected to increase by 78% over the next 30 years, with a significant majority of freight and commercial travel consisting of internal distribution within Auckland (ATAP, 2016f). Continued strong growth in travel demand to and from the port and the airport will place pressure on Auckland's transport network connecting people and goods to the rest of New Zealand and its overseas market.

Figure 10 Projected Auckland freight demand, 2012-2042¹³

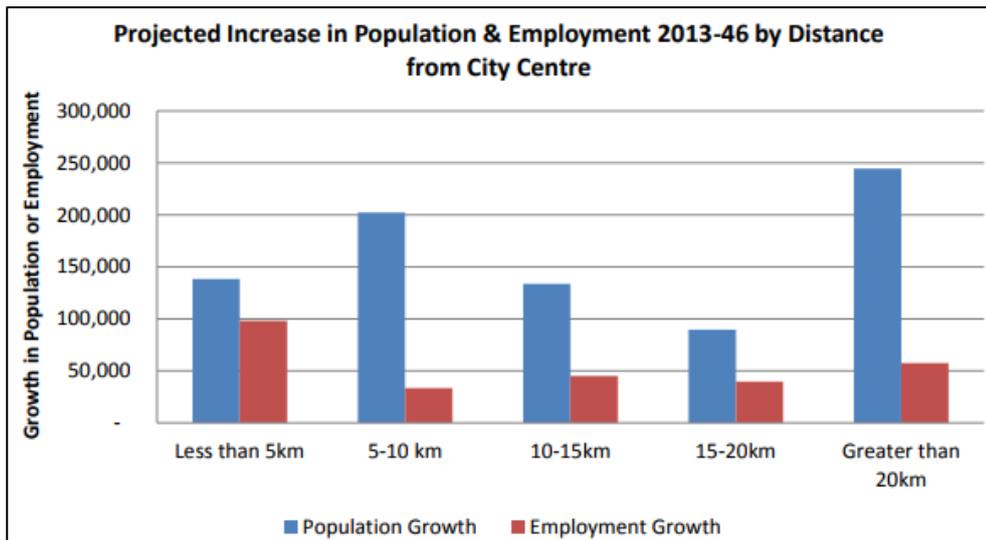


2.3.2 Land-use changes

Alongside the scale of population growth, the likely location of population and employment growth over the next 30 years lies at the heart of Auckland's future transport challenges:

1. projected population growth is spread throughout Auckland's urban area and extends into major future urban growth areas to the north, northwest and south. Nearly a third of population growth is projected to occur in areas beyond 20km of the city centre (ATAP, 2016e)
2. projected employment growth is highly concentrated in a few locations, particularly the city centre, the airport and other regional metropolitan centres. Driven by an on-going shift to service-sector employment, over a third of employment growth is projected to occur within 5km of the city centre (ATAP, 2016e).

¹³ Graph sourced from Ministry of Transport (2012), National freight demand study.

Figure 11 Projected increase in population and employment, 2013-2046¹⁴

The patterns of travel demand generated by this projected land-use place significant pressure on the transport network through longer trip lengths, especially to the city centre and other major centres.

Furthermore, Auckland's geography creates challenges in serving trips between different parts of the region, as there are only a limited number of connections able to be used (e.g. the Auckland Harbour Bridge, crossings of the Tamaki River, etc.). Trips accessing the city centre also face challenges, due to the limited number of access points and very high, competing demands for limited street space.

2.3.3 Emerging transport technologies

We are on the cusp of a paradigm shift in transport technology. Emerging technologies have the potential to significantly improve the performance of Auckland's transport network over the next 30 years and to better meet our travel needs (ATAP, 2016I). The outcome could be much more efficient use of existing transport infrastructure and the ability to defer or reduce the quantum of future infrastructure investment. However, the future is uncertain. Just when new technologies can be implemented in Auckland, and what their real-world impact will be, is difficult to predict. Realising benefits from technology will require us to focus on trials, safety, enabling regulation and supporting infrastructure (ATAP, 2016I).

Emerging transport technology presents a significant opportunity to improve the performance of Auckland's transport network in a cost-effective manner (ATAP, 2016I). The question is how we respond to this opportunity to capture benefits as quickly as possible, while managing early implementation risks. The result is likely to have significant implications for future funding requirements.

Traditional distinctions between transport modes are likely to break down over time as ride-sharing applications, drones, connected and autonomous vehicles, e-bikes and

¹⁴ Graph sourced from ATAP (2016e), Foundation report.

emerging public transport technologies creating the potential to fundamentally reshape how transport is provided and consumed (RethinkX, 2017).

3 Challenges and opportunities

3.1 Introduction

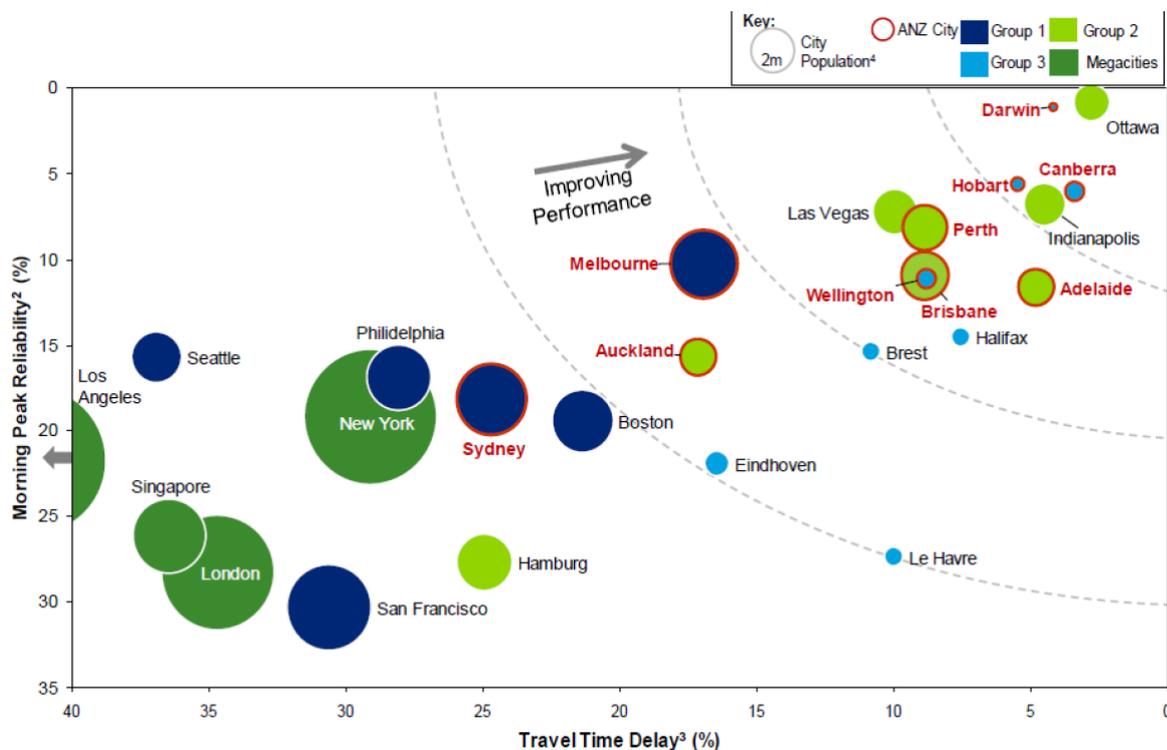
This section identifies the challenges and opportunities facing Auckland’s transport network over the next 30 years. This section informs the development of the directions and focus areas outlined in the Transport and Access outcome of the Auckland Plan.

The analytical work presented here includes analysis of past trends, current conditions and modelling of possible futures. It looks at the challenges facing Auckland from the perspective of those who live and work in the city, as well as in terms of the operation of the transport network itself.

3.2 Growing congestion

Congestion is a by-product of growth and economic success (Sweet, 2013). Internationally large and economically successful cities tend to experience higher levels of congestion, especially if they are experiencing rapid growth (Figure 12).

Figure 12 Travel time delay in Auckland compared to other cities¹⁵



Source: Deloitte Touche Tohmatsu, 2016

While Auckland’s congestion challenges are not unexpected and reflect our success, the delays and travel variability created by congestion has the potential to affect Auckland’s economic success and quality of life in a number of ways. These include:

¹⁵ Graph sourced from NZIER (2017), Benefits from Auckland road decongestion.

- adding significant costs to doing business and moving freight. NZIER estimated the economic cost of congestion in Auckland as being between \$480-840 million per year in 2016 (NZIER, 2017) (see table below)
- longer travel times can reduce access to opportunities and thereby reduce economic productivity through shrinking labour pools (Prudhomme and Lee, 1999)
- long and unreliable travel times can significantly reduce quality of life (Stutzer and Frey, 2008).

Accurately quantifying the impact of congestion requires an agreed understanding of what congestion is. A number of studies over the past few years, undertaken by NZTA (Wallis and Lupton, 2013), NZIER (2017) and the Let's Get Welly Moving project (Grimmond, 2017) all recommend defining congestion as the extent to which demand of the road exceeds its capacity, rather than comparing travel conditions against an unrealistic 'free-flow' counter-factual. Using this definition, the NZIER has measured the total cost of congestion in Auckland as somewhere between \$0.9 billion and \$1.3 billion (1% to 1.4% of Auckland's GDP) (NZIER, 2017, see Table 2).

Table 2 Summary of the benefits of decongestion¹⁶

\$ millions; 2016; Economic benefits are in real terms

Benefits	Capacity		Free-flow	
	Lower bound	Upper bound	Lower bound	Upper bound
Economic	\$488	\$842	\$735	\$1,266
Social	\$439	\$439	\$658	\$658
Total	\$927	\$1,281	\$1,392	\$1,924
% of Auckland GDP				
Economic	0.52%	0.90%	0.79%	1.35%
Social	0.47%	0.47%	0.70%	0.70%
Total	0.99%	1.37%	1.49%	2.06%

These estimates include direct time-savings impact on freight and commuters. They accrue to all businesses that use transport and employ workers who commute, and to households who waste their scarce time in traffic jams. They also include the social costs of congestion, like carbon emissions. The figures do not include overall liveability impacts of congestion in Auckland, or wider economic impacts from reduced accessibility that may constrain choice for business locations, or poorer skill matching for workers.

As New Zealand's largest city Auckland has a nationally significant logistics function in the production and distribution of freight to the rest of New Zealand. While the movement of large containers is the most visible, the vast bulk of freight and commercial in Auckland is

¹⁶ Chart sourced from NZIER (2017), Benefits from Auckland road decongestion.

by smaller vehicles travelling within Auckland. Travel delays and poor reliability create genuine and substantial costs to businesses that are ultimately borne by us all.

3.2.1 Current and projected trends

Between 2003 and 2014 congestion levels in Auckland remained constant, with investment keeping up with the 300,000 additional people added over that time period (ATAP, 2016e). However, in more recent years growth has accelerated, resulting in an increase in congestion across Auckland:

- average peak time travel speeds on Auckland's state highway network declined from 64 to 55 km/h between 2014 and 2016 (Auckland Council, 2017a)
- 24% of the arterial road network is now congested at peak times, up from 18% three years ago (Auckland Council, 2017).

Under previous transport plans¹⁷, congestion was projected to become significantly more widespread and severe over the next 30 years. Growing congestion was particularly evident on the motorway network, spreading beyond the traditional weekday peak into inter-peak times. As congestion increases travel time variability is also likely to grow.

Annual per capita delay from congestion is highlighted by the Auckland Plan as the key way of measuring congestion. This measure has been chosen for a variety of reasons:

- it is meaningful and easily understood by the public. It tells the story about “how many hours a year you, as an average Aucklander, might expect to be delayed due to congestion”
- by being a per capita measure, it should help with understanding whether transport investment and initiatives are keeping up with growth (i.e. per capita delays are reducing) or struggling to keep up with growth (i.e. per capita delays are increasing)
- the impact of people moving from travel modes that experience congestion (i.e. private vehicles) into those that can avoid congestion (public transport on dedicated corridors, walking or cycling) are captured.

Consistent with the methodology used by NZTA, NZIER and the Let's Get Welly Moving project, delays are measured as the difference between actual performance and performance of the system at capacity, rather than comparing against free-flow conditions.

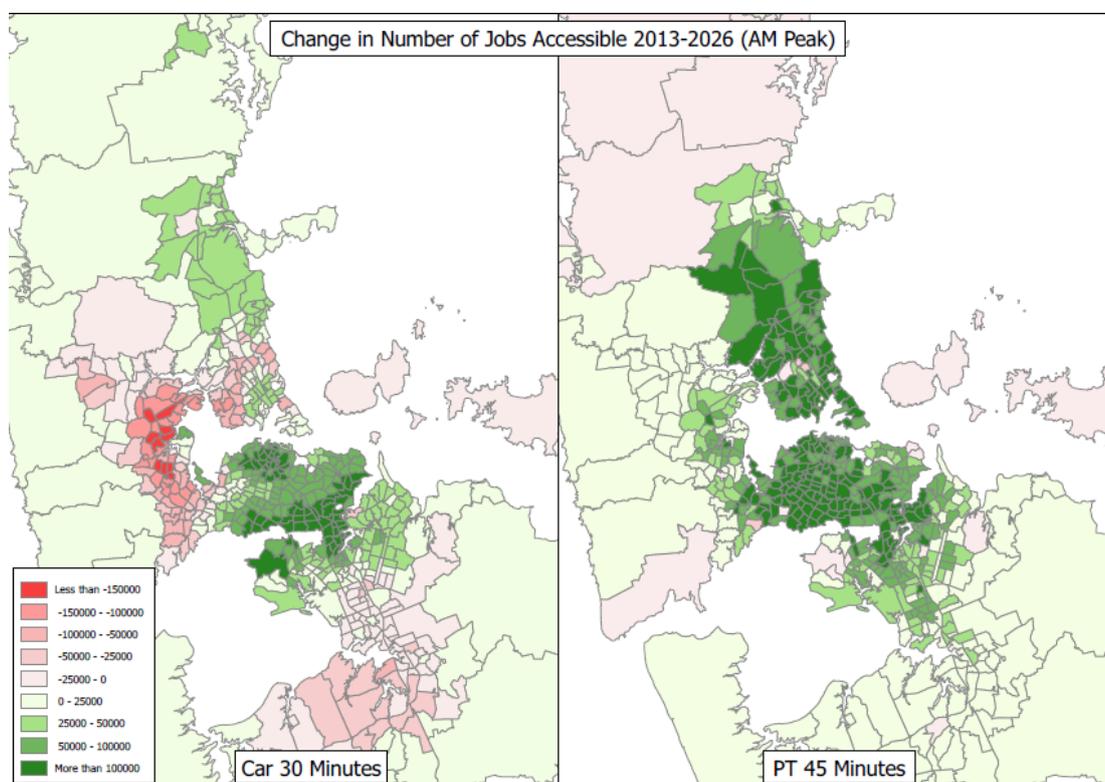
¹⁷ “Previous transport plans” refers to the Auckland Plan Transport Network assessed in the ATAP Foundation Report (ATAP, 2016e)

3.3 Sub-regional differences in employment accessibility

The ATAP Foundation Report highlighted significant accessibility challenges in west and south Auckland over the next 10 years, in part due to their distance from where employment growth is expected to occur (Figure 13). In comparison, access to employment by car and public transport for those living in the central part of Auckland appears to improve throughout the next 30 years, reflecting the growth in employment as well as its projected centralisation.

With more than a million people projected to be living in the western and southern parts of Auckland by 2046, there are significant implications in the areas being excluded from the benefits of Auckland's expanding employment base, particularly in light of these areas' higher levels of deprivation.

Figure 13 Change in accessibility to jobs, 2013-2026 (AM Peak)¹⁸



Part of the decline in access to employment by car is related to trips destined for the city centre. This decline is not unexpected due to the significant constraints on increasing private vehicle access to this location. However, there are also major challenges for trips accessing jobs in the south, especially to the Airport area.

Changing the mix of transport interventions has been found to bring sub-regional improvements. For example:

¹⁸ Graph sourced from ATAP (2016e), Foundation report.

- advancing Northwest rapid transit contributes to increasing 2026 West Auckland public transport accessibility by around 60% (45,000 more jobs within a 45-minute public transport commute) (ATAP, 2016g)
- reconfiguring the widening of the Southern Motorway contributes to increasing South Auckland car accessibility by around 12% (34,000 more jobs within a 30-minute car commute) (ATAP, 2016g).

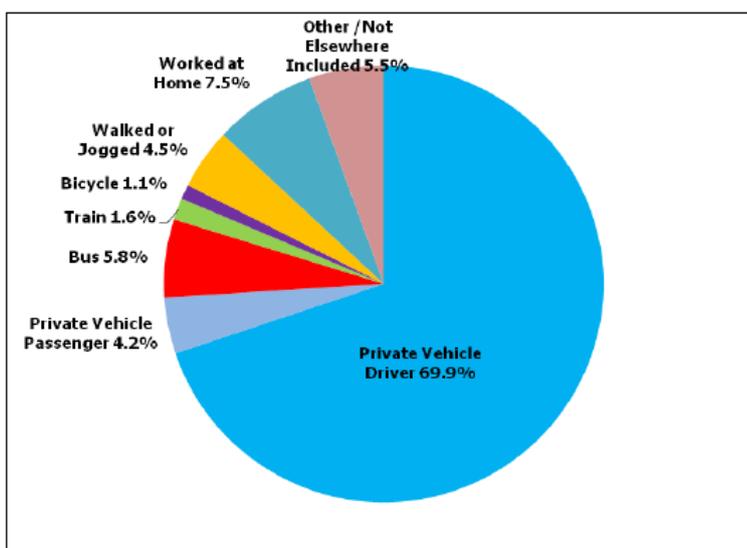
With growing demand channelled into a few constrained corridors, adding new roads or widening existing ones is becoming increasingly expensive and impractical. Focus Area 1 in the Auckland Plan 2050 expands on this in greater detail. Improving travel choices is key to enabling people to avoid road congestion and travel in the way that best suits their particular circumstances (see Section 3.4 below).

3.4 Low rates of public transport, walking and cycling

Auckland remains a highly car dependent region, despite recent progress in improving the attractiveness of public transport, walking and cycling. Our car dependency has led to an inefficient use of our transport network; poor travel choice, particularly within the poorest parts of Auckland; public health costs as a result of inactivity; as well as unacceptable harm to our people and environment.

The 2013 census found private vehicle use accounted for 74 per cent of commuting trips in the Auckland region. Public transport (bus and train) accounted for about 7.5 per cent, while walking and cycling accounted for about 6 per cent (Figure 14).

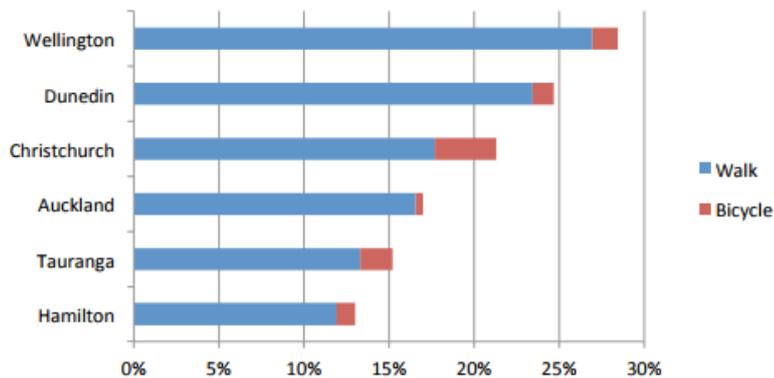
Figure 14 Aucklanders' commuting trips by mode, 2013¹⁹



Compared to other New Zealand cities, Auckland has a low rate of walking and cycling (Figure 15).

¹⁹ Graph sourced from Ministry of Transport (2013), Household travel survey.

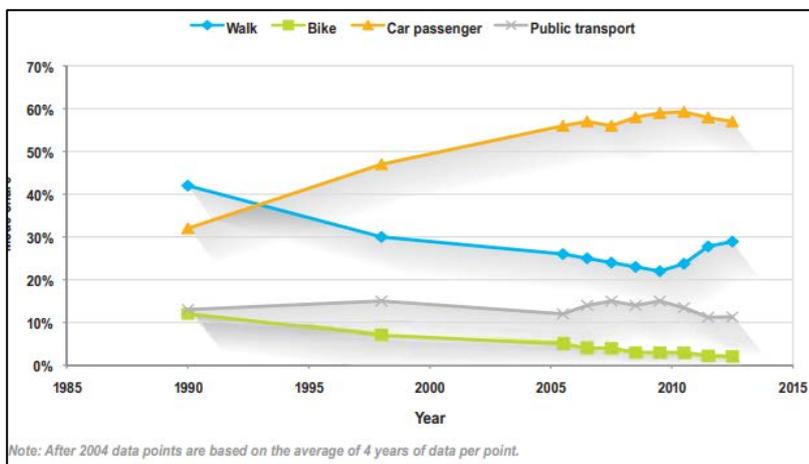
Figure 15 Proportion of trips taken by cycling and walking, 2013²⁰



Just under half of car trips in the morning peak period in Auckland are 6km long or less²¹. These trips are within a 30-minute bike ride, and can easily be replaced by the bicycle.

Concern for children’s safety on the road has seen the number of primary school children who walk and cycle to school plummet in the last 25 years (Mackie, 2009). In contrast, the number of similar-aged children travelling by car to school increased from 32% to 57% over the same period (Figure 16) (Ministry of Transport, 2015a). Designing safer streets that cater to vulnerable users such as children will help to boost levels of walking and cycling (see Transport and Access Focus Areas 4, 5, and 6).

Figure 16 Travel to school (mode share) – ages 5-12 years, 1989-2014²²



Increasing the number of people walking, cycling and taking public transport can reduce a number of important negative impacts of Auckland’s current transport system, including:

- reducing negative health impacts associated with high dependence on motorised transport and sedentary lifestyles (see Focus Area 4) (Celis-Morales, C. et al., 2017)

²⁰ Graph sourced from Ministry of Transport (2013), Household travel survey.

²¹ ART3 modelling undertaken in ATAP using 2013 base level data and 2046 CEE4 data.

²² Graph sourced from Ministry of Transport (2015a), 25 years of New Zealand travel: New Zealand household travel 1989-2014.

- reducing air, noise and greenhouse gas emissions that impact on local environments and contribute to climate change (see Focus Area 7) (Macmillan, A. et al., 2014).

3.4.1 Genuine travel choice versus basic choice

While private vehicles are and will remain the most convenient travel option for many trips, improving genuine travel choices is key to enabling people to use the option that works best for their particular circumstances.

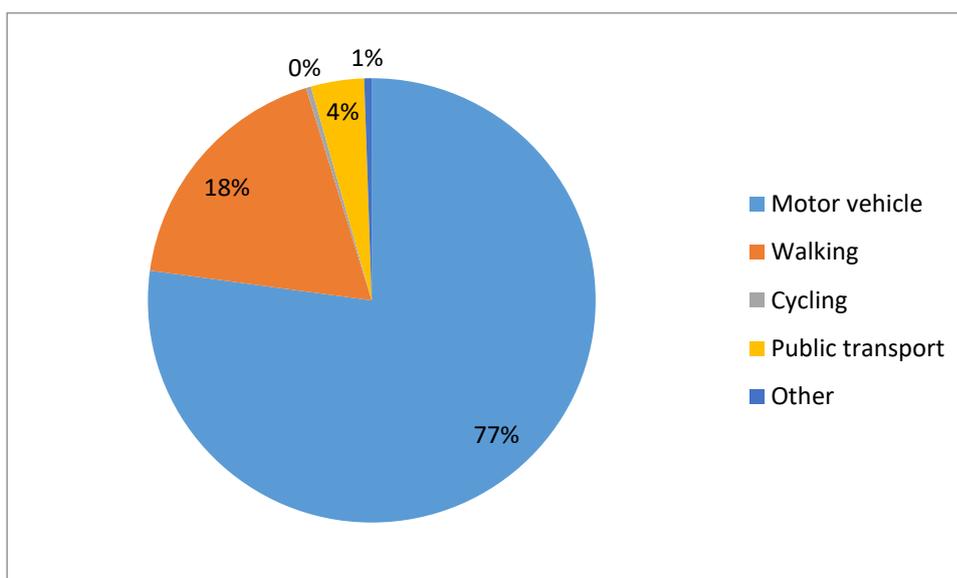
While most Aucklanders have access to some form of public transport (Wallis, 2013) or could, in theory, walk or cycle more (Auckland Transport, 2013a), these options are often too slow, unreliable, infrequent or simply unsafe to be viable for the majority of trips. Improving the efficiency, reliability, safety and convenience of these travel options will provide genuine choice for Aucklanders.

Furthermore, Auckland's dependency on private vehicles will be increasingly difficult to cater for over time, with growing demand channelled into a few constrained corridors and the increasing difficulty of adding or widening roads (ATAP, 2016e). Increasing the share of travel by public transport, walking and cycling will provide Aucklanders with the choice of avoiding congestion in their daily travel.

3.4.2 Lack of emphasis on walking

Walking has traditionally been overlooked when planning for transport, even though it is a key component of our transport system (NZTA, 2009). It is the second most common transport mode in Auckland, making up 18% of all trips (Figure 17). Walking is also an integral part of many trips primarily made by other modes i.e. all public transport trips, and many car trips, will begin and/or end with a walk to the stop or car park .

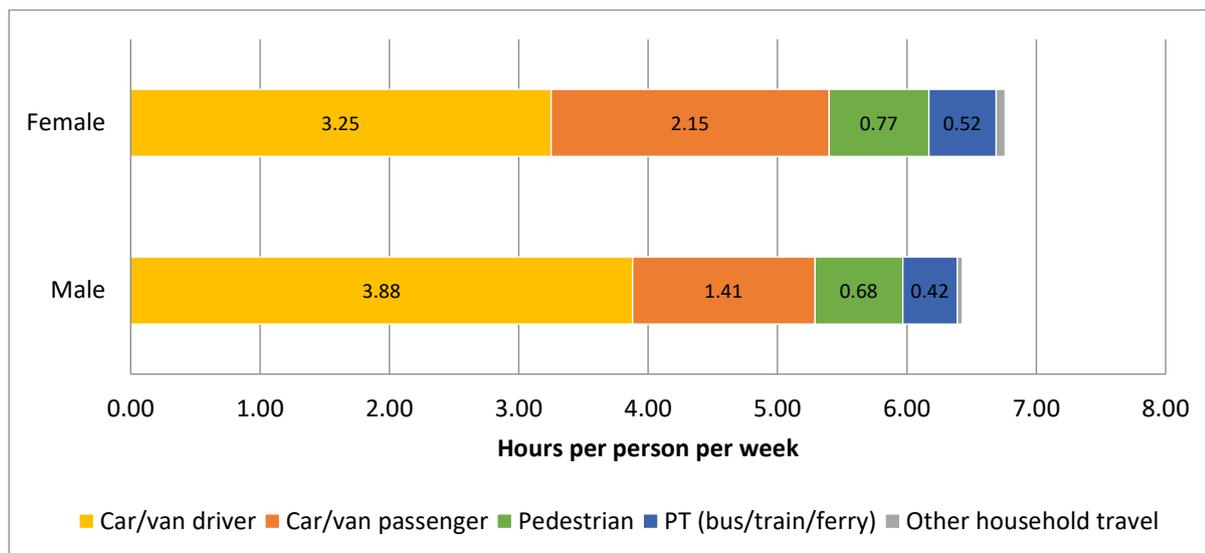
Figure 17 Proportion of all trips taken by mode in Auckland, 2013²³



²³ Graph sourced from Ministry of Transport (2013), New Zealand household travel survey.

For those in households without car access and for those who cannot, or choose not to drive, walking is an especially vital mode of transport. Overall, women, young people and older people make the most walking trips (New Zealand Centre for Sustainable Cities, 2016). Women may be more likely to accompany children on trips to school and may have less access to the family vehicle, as seen by their higher rates of travelling as car and van passengers (Figure 18).

Figure 18 Time spent travelling by mode and gender, Auckland region, 2015-17^{24,25}



3.5 Unpleasant and unsafe transport environments (including streets and public spaces)

The way we design our transport environments (e.g. streets, public spaces, and public transport waiting areas) has an impact on how they are used by the public. If they are not pleasant, or if they make people feel unsafe, people seldom return (Ministry for the Environment, 2005).

3.5.1 Impacts of roads and streets on the safety and health of communities

Roads and streets form the bulk of our urban public space, performing functions that go far beyond simply moving people and goods from A to B. They have a strong influence on Auckland's lifestyle and travel behaviour. How we use and design our roads and streets directly influence accessibility, public health, social equity, inclusivity and local and regional economies (Auckland Transport, 2017c).

The scale and pace of growth in Auckland, combined with the development of new urban areas, are placing increased pressure on an already constrained strategic transport network and limited road space. The increasing pressure on Auckland's road and streets demands a new approach to how we manage these aspects of our infrastructure. If

²⁴ Graph from Ministry of Transport (2017b), New results from household travel survey

²⁵ Gender breakdowns not yet available to the public – information obtained via email from Ministry of Transport staff.

Auckland is to reach its full potential, roads and streets need to perform beyond the traditional norm of moving traffic and providing access for vehicles to local destinations. Roads and streets must provide multi-modal transport choices and better access for people of all ages and levels of physical mobility.

Street environments that are unpleasant and unsafe have the greatest impact on our more vulnerable road users. Shortfalls in the physical environment are the most obvious deterrent to walking and cycling (NZTA, 2009). This includes missing footpaths, poor-quality lighting, poor-quality walking surfaces, speeding traffic, traffic fumes and noise, lack of rest areas and seating, lack of shade and shelter from inclement weather, lack of interesting features on the route, and safe and convenient crossing points.

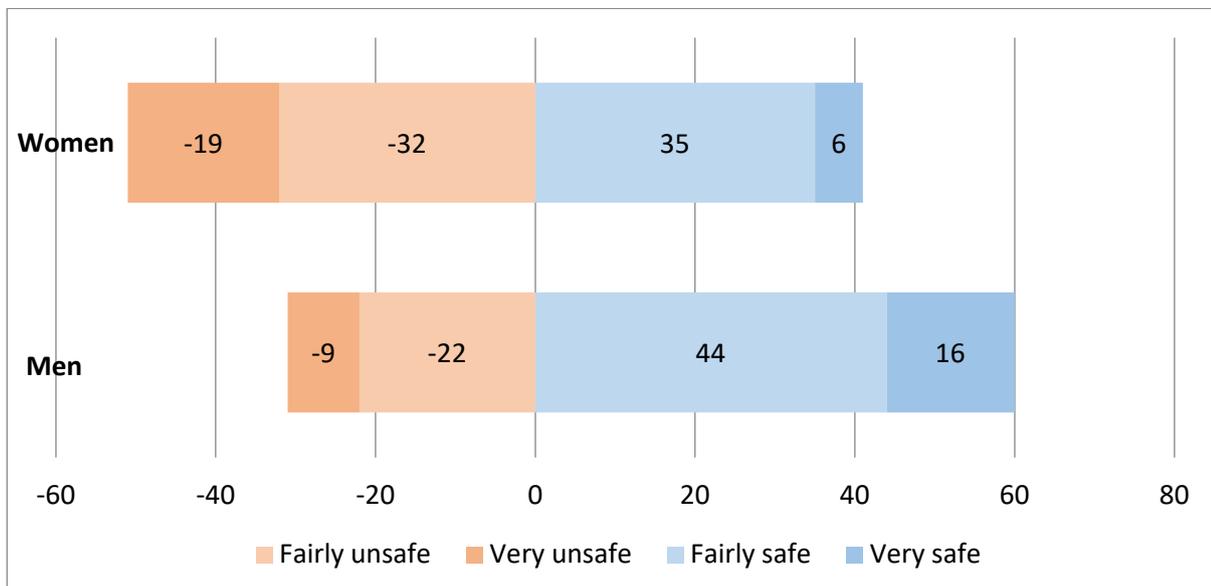
3.5.2 Safety concerns leading to social exclusion

Fear of crime can be a significant deterrent to travel by public transport, walking and cycling, particularly for groups such as women, people with disabilities, seniors and children (Kennedy, 2008). In general, people dislike public transport and station designs that make them feel enclosed or vulnerable.

As an example, while women walk and use public transport at higher levels compared to men (see Figure 18 above), they also experience higher safety concerns while using these methods, particularly after dark. Travel surveys indicate that women frequently adjust their behaviour and travel patterns to avoid public environments that make them feel unsafe (Loukaitou-Sideris, 2014).

On a local level, an Auckland Council (2012) study found that Auckland women experience much higher safety concerns while waiting for the bus after dark (Figure 19). Left unaddressed, these safety concerns can lead to lower rates of walking, cycling and public transport, as well as social exclusion.

Figure 19 Perceptions of safety while waiting for the bus after dark, by gender, Auckland, 2012²⁶



²⁶ Information from Auckland Council (2012c), Public perceptions of safety from crime in the Auckland region

3.6 Inequitable distribution of travel choice

Of particular concern is that travel choice is often poorest in parts of Auckland with high socio-economic deprivation. Communities in South Auckland, West Auckland, and the outlying parts of the Auckland isthmus are among the most socioeconomically deprived (see Figure 20, where orange and red are the most deprived). These areas are also the areas with less transport choice, resulting in a high reliance on private vehicles and lower use of public transport (see Figure 21, where light green indicates low public transport mode share).

Figure 20 New Zealand Deprivation Index in Auckland, 2013²⁷

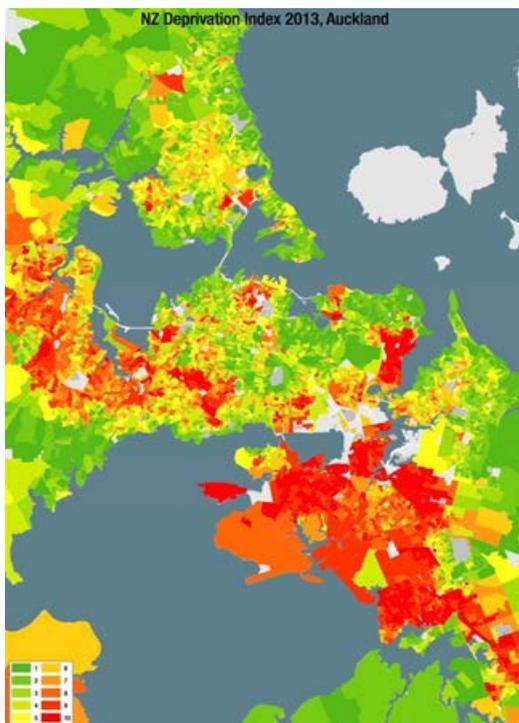


Figure 21 Public transport mode share for journeys to work, 2013²⁸



Many households cannot make the most efficient travel choices, resulting in transport making up a large and unaffordable part of their budgets and using up substantial parts of their precious time (MRCagney, 2013). Rural areas also tend to have poor travel choice as long trip lengths and a lack of facilities make walking and cycling less viable, while the low density of activities makes public transport difficult to provide efficiently (see Figure 21).

As mentioned in Section 3.3, ATAP highlighted that parts of Auckland – especially in the west and south – face a future where the number of jobs within a reasonable commute time may reduce over the next ten years as Auckland’s economy evolves and as congestion lengthens travel times. As the west and south contain some of the most deprived communities in Auckland and expect to see significant growth, focused effort is required to improve access for these parts of Auckland.

²⁷ Graph sourced from University of Otago (2013), Socioeconomic Deprivation Indexes.

²⁸ Graph sourced from Statistics NZ (2013), 2013 Census.

3.7 Impacts of transport on public health

Auckland's reliance on private motor vehicles impacts negatively on our public health and in several ways:

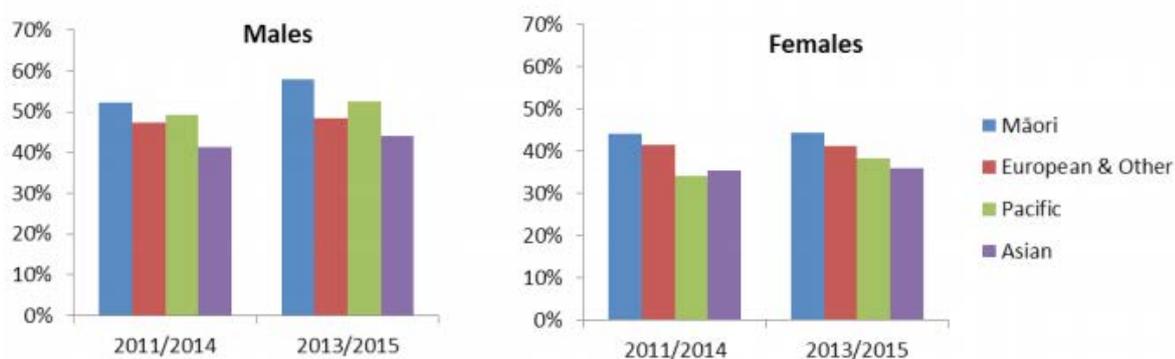
- increasing levels of obesity caused by physical inactivity (Healthy Auckland Together, 2017)
- decreasing life expectancy caused by long-term exposure to air pollutants (Briggs, et al., 2016).

In contrast, active transport (such as walking and cycling) and public transport have positive health benefits, such as:

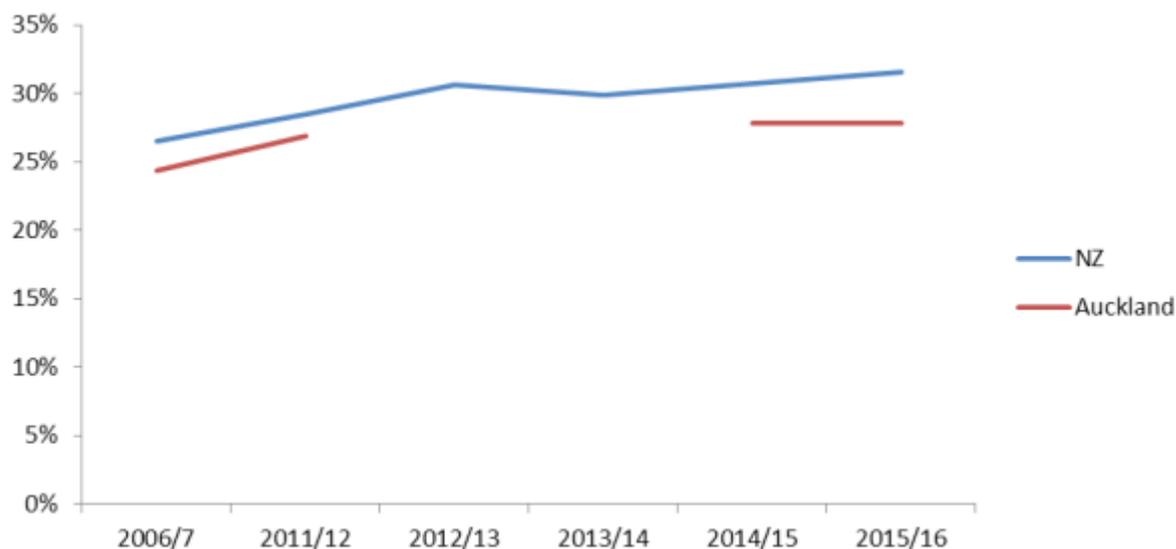
- improved mental health
- a reduced risk of premature death
- prevention of chronic diseases such as coronary heart disease, stroke, type 2 diabetes, osteoporosis, depression, dementia and cancer (British Medical Association, 2016).

Adults need at least 150 minutes and children 420 minutes of physical activity a week to stay healthy and reduce their risk of common, preventable diseases (Ministry of Health, 2017). Around half of New Zealanders are not getting the recommended amount of weekly exercise (Figure 22). As a result, the rate of obesity in the adult population in Auckland has been slowly rising over the last decade, mirroring global trends (Figure 23).

Figure 22 Proportion of Auckland adults meeting physical activity guidelines, 2011-15²⁹



²⁹ Graph sourced from Health Auckland Together (2017), 2017 HAT Monitoring Report.

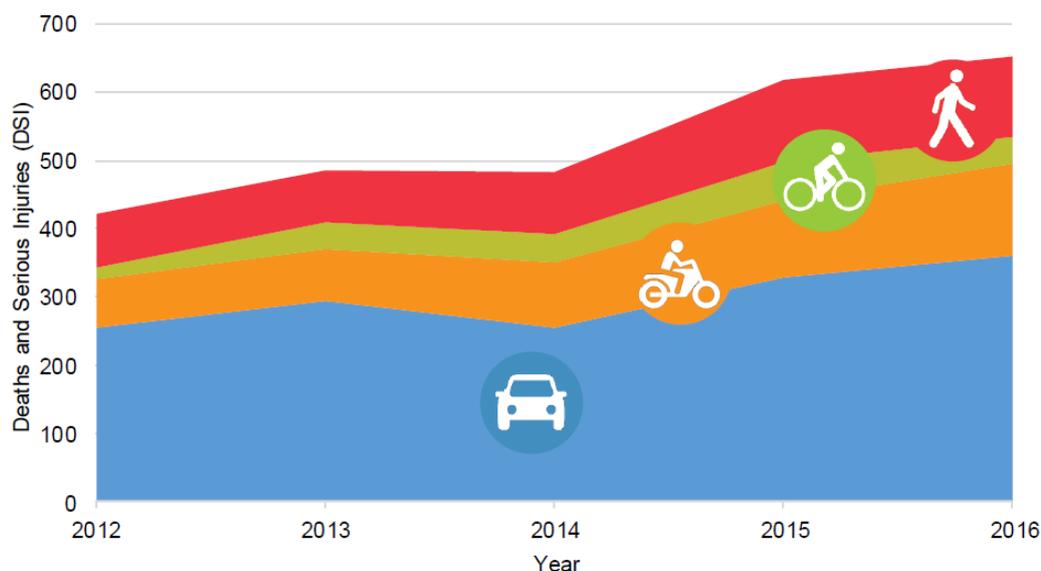
Figure 23 Prevalence of adult obesity in Auckland, 2006 – 2016³⁰

Physical inactivity in the Auckland region is estimated to cost \$402 million per year (Market Economics, et al., 2013). Increasing our levels of walking and cycling would yield further public health benefits.

3.8 Rising road deaths and serious injuries

Auckland road harm costs \$1.14 billion per year in social costs (Ministry of Transport, 2016c), which is like the lost productivity costs of Auckland's congestion (\$0.9 billion to \$1.3 billion per year) (NZIER, 2017). The number of deaths and serious injuries on the transport network has increased in recent years, reversing a decades-long trend of decline. In 2017 there were 813 deaths and serious injuries on Auckland's transport networks, representing a near doubling over five years (NZTA, 2017a) (Figure 24). This indicates that current approaches to improving safety on Auckland's transport network are not as effective as they once were.

³⁰ Graph sourced from Health Auckland Together (2017), 2017 HAT Monitoring Report.

Figure 24 Auckland road deaths and serious injuries, 2012-16³¹

3.8.1 Impacts on vulnerable road users

Due to Auckland's highly urbanised environment and the intense use of our transport system, vulnerable users (motorcyclists, cyclists and pedestrians) account for a higher proportion of transport-related deaths and serious injuries in Auckland (43%) than the rest of New Zealand (33%) (NZTA, 2017a).

On the region's urban roads, pedestrians account for:

- nearly a third of road fatalities
- one in six reported injury crashes
- a quarter of the social cost of road crashes.

Our transport system also creates inequitable outcomes, as road deaths and serious injury rates tend to be higher among Māori, Pacific children, and people living in more socio-economically deprived neighbourhoods (Auckland Transport, 2013b). Central Auckland, South Auckland, and rural areas tend to have higher traffic injury rates (Figure 25).

³¹ Graph sourced from Auckland Transport (2018), Safe roads – draft RoadSafe Auckland strategy 2018-23.

Figure 25 Road traffic injury deaths and hospitalisations by local board area in Auckland, 2000-08³²

3.8.2 Rural roads

Auckland's road network includes both urban and rural roads. Rural roads have a different safety profile to the urban parts of the network. Road safety on our rural roads is an increasingly important issue as rural population growth and the increasing number of lifestyle blocks mean more people are using rural roads, often at faster speeds compared to urban roads.

3.8.3 Existing road safety system no longer effective

New Zealand's existing road safety system is guided by the Safer Journeys strategy, which has a vision of a safe road system increasingly free of death and serious injury (Ministry of Transport, 2010) (Figure 26). The strategy is implemented through a series of action plans which allocate responsibilities to the Ministry of Transport, the New Zealand Transport Agency, New Zealand Police, Accident Compensation Corporation and local government.

³² Graph sourced from Auckland Transport (2013b), Social and geographical differences in road traffic injury in the Auckland region.

Figure 26 Principles of New Zealand's road safety system³³

The strategy is based on high-profile measures directed at the road user and progressive improvements to the road system, and uses many of the traditional road safety tools such as road safety promotions, intersection upgrades and enforcement. Speeding and drink driving measures seem to be the main areas that have created the success in reducing the number of fatalities and injuries in the beginning of the 1990s.

However, the strategy does not clearly articulate the trade-offs between safety and other outcomes (such as travel time). As such the value put on travel time savings can often outweigh that placed on improved safety outcomes.

The scale of Auckland's road safety challenge and the rapid increase in deaths and serious injuries in recent years means that approaches which consider human deaths or serious injuries as the inevitable consequence of road traffic accidents need to be changed. Reversing recent increases in deaths and serious injuries on our transport network will require a new approach to safety that aims to eliminate the risk of deaths and serious injuries caused by road crashes, not just reduce the number of crashes. This approach needs to be more consistent with how health and safety is managed across other sectors in New Zealand, and with the international emergence of "Vision Zero" that aims to eliminate transport related deaths and serious injuries. Section 4.9 further elaborates on the concept of 'Vision Zero'.

3.9 The environmental harm of transport

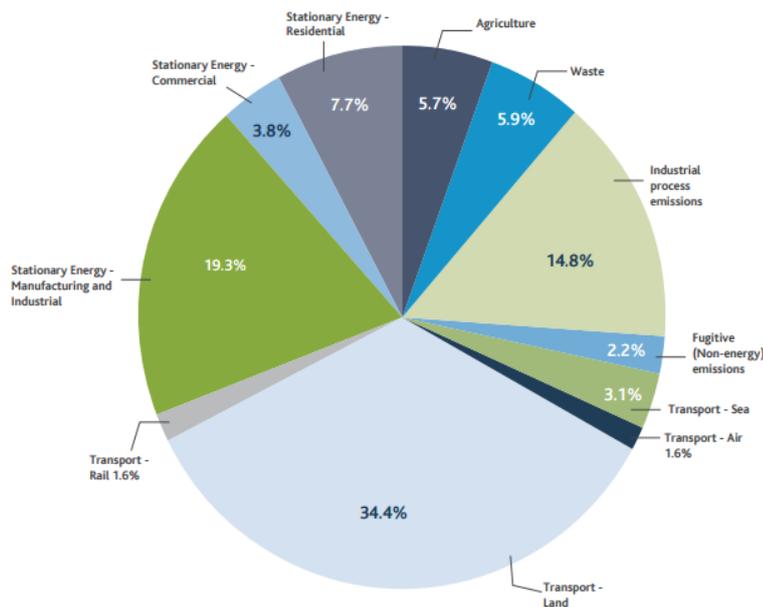
Aucklanders remain highly dependent on private vehicles as their primary method of transport. The environmental impacts of Auckland's transport system are significant and include the production of greenhouse gas emissions, air pollution, noise pollution, resource use, and the effects of waste disposal on the natural environment.

³³ Graph sourced from Ministry of Transport (2010), Safer journeys: New Zealand's road safety strategy 2010-2020.

3.9.1 Greenhouse gas emissions

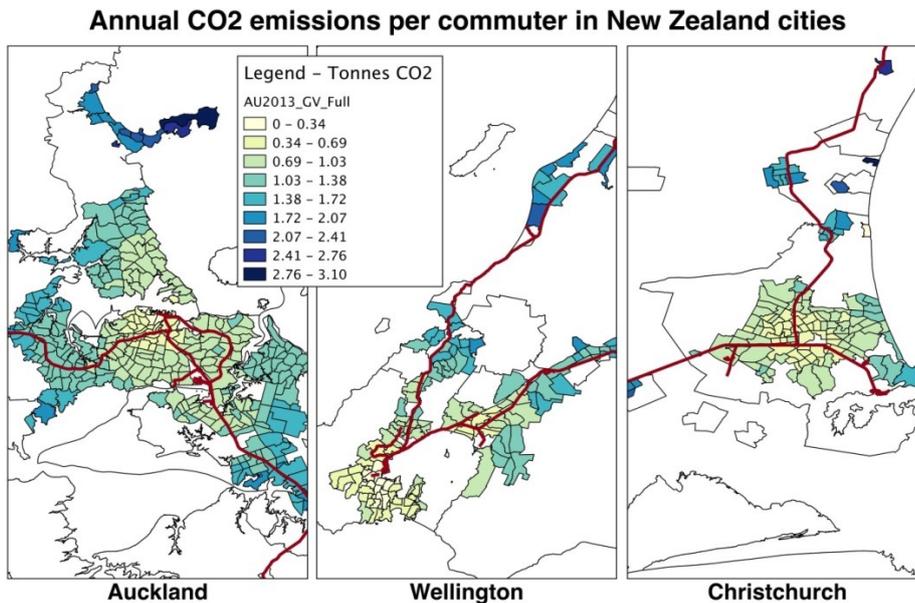
Today our fossil fuel-dependent transport system accounts for nearly half of Auckland’s greenhouse gas (GHG) emissions - by far the largest source of GHG emissions (see Figure 27). Projections indicate that unless interventions occur, Auckland’s GHG emissions could increase by up to 46 per cent by 2025, a faster rate of growth than New Zealand as a whole (Auckland Council, 2012a).

Figure 27 Auckland’s emissions profile³⁴



Studies have found that cities which offer better transport and housing choices tend to have much lower per-capita transport emissions (Hoornweg, Sugar and Gomez (2011). Within Auckland, studies show that carbon emissions are higher for commuters residing in the urban fringe (Figure 28). In particular, the outer suburbs and growth areas in Auckland tend to have a much higher level of transport emissions than inner Auckland due to the lower availability of public transport, greater reliance on cars, and greater distances travelled to reach activities and services in those areas (Auckland Council, 2014).

³⁴ Graph sourced from Auckland Council (2014), Low carbon Auckland: Auckland’s energy resilience and low carbon action plan.

Figure 28 Annual CO2 emissions per commuter in New Zealand cities³⁵

3.9.2 Air pollution

Motor vehicles are the single greatest contributor to urban air pollution in Auckland, being responsible for approximately 27% of total annual particular emissions and 55% of total nitrogen oxide emissions on an annual basis (Sridhar, Wickham and Metcalfe, 2014).

Particulate matter (PM10) is the pollutant of the most concern due to its health effects and elevated concentrations that have occasionally exceeded the National Environmental Standards. In Auckland, the amount of PM10 emitted into the air is equivalent to 200 bags of cement per day (Auckland Council, 2016a).

Vehicle-related air pollution in Auckland is estimated to cause approximately 260 premature deaths per year, with an annual social cost of \$1.1 billion (Auckland Council, 2016a).

3.9.3 Storm water quality and runoff

Pollutants from motor vehicles that collect in the runoff from roads are a major source of storm water contamination. These contaminants can be harmful when discharged to aquatic receiving environments, particularly sensitive marine receiving environments such as harbours and estuaries.

The key contaminants associated with Auckland's transport network are listed in Table 3 below (Auckland Council, 2016b).

³⁵ Chart sourced from Nunns, P. (2014), Climate change and New Zealand cities. Greater Auckland.

Table 3 Key transport contaminants associated with Auckland's transport network

Key contaminant	Characteristic
Total Suspended Sediment (TSS)	High trafficked roads discharge significantly higher levels of TSS compared to low trafficked roads
Total Copper (TCu)	The transport network is a significant contributor of copper to Auckland's receiving environment, typically resulting from tyre wear and tear.
Total Zinc (TZn)	Aside from roofs, vehicle traffic is the second largest urban source of zinc. Similar to copper, there is substantial benefit to be had from treating roads and other vehicle activity areas.

Increased urbanisation, particularly low-density development, leads to an increase in impermeable surfaces. Rising storm water runoff caused by an increase in impermeable surfaces is increasingly impacting adversely on the transport network, causing flooding, slips, and affecting the structural integrity of the road corridor assets (Tetterroo and Irwin, 2015).

3.10 Conclusions: The directions we need to focus on

To address the challenges listed in this section (and achieve the Transport and Access outcome sought) we need to direct our efforts to:

Better connect people, places, goods and services (Direction 1)

Efficiently connecting people, places, goods and services is critical to Auckland's prosperity and success. Current and future growth places pressure on our transport networks, increasing congestion and reducing performance (ATAP, 2016d). Left unaddressed or without alternatives for travel, congestion will reduce the opportunities that Auckland's growth can provide.

Integration between different forms of transport is needed so that travel from one end of a journey to the other is straightforward and seamless for people and freight, with effective links between modes.

Increase genuine travel choices for a healthy, vibrant and equitable Auckland (Direction 2)

Many Aucklanders lack access to attractive, reliable, safe and affordable travel choices, leading to an ongoing dependence on private vehicles. Throughout the second half of the 20th century Auckland became one of the more car dependent cities in the world through that investment approach that almost completely ignored public transport, walking and cycling (Coleman, 2010). Much has changed over the past 20 years, but this legacy of underinvestment and the development patterns it created means many Aucklanders still do not have access to safe, reliable and affordable travel choices.

We must also transform how we design the transport network, so it's about people and places, not just moving vehicles. The way we design our streets needs to create attractive, suitable and enjoyable public spaces for residents, workers and visitors, particularly when travelling by foot. This will require a change in the way we design, manage and operate our streets and transport networks to better reflect the role they play in making up a large part of our public space and in shaping Auckland's character and the way we live.

Maximise safety and environmental protection (Direction 3)

Transport is a major source of adverse effects on Auckland's natural and physical environment and influence on the safety of communities. Increasing travel demand and changing travel patterns have exposed safety gaps in Auckland's transport network. Aucklanders remain highly dependent on private vehicles as their primary method of transport. The environmental impacts of Auckland's transport system are significant and include the production of greenhouse gas emissions, air pollution, noise pollution, land use, resource use, and the effects of waste disposal on the natural environment.

The diagram below summarises the interrelationship between the challenges that Auckland's transport network will face over the next 30 years and the directions that we need to focus on to address these challenges and achieve the transport and access outcome.

Transport and Access outcome:							
<i>Aucklanders will be able to get where they want to go more easily, safely and sustainably.</i>							
Auckland's rapid growth translates to large forecast increases in travel demand, placing pressure on our transport networks. Without further action, congestion will worsen, inequity increase, and the state of our environment, public health and safety continue to decline. Nonetheless, our growth also brings considerable benefits to Auckland and New Zealand. By addressing these transport challenges, we can harness the benefits that growth brings while minimising its disbenefits.							
We face a number of key challenges:							
The delays, travel variability and accessibility issues caused by growing congestion	The lower levels of projected employment accessibility in the south and west	Excessive car dependence and low rates of public transport, walking and cycling	Unpleasant and unsafe transport environments (including streets and public spaces)	Inequitable distribution of transport choice	The public health crisis caused by physical inactivity	Rising road deaths and serious injuries	The environmental harm of the transport system
To achieve the outcome we need to manage these challenges by directing our efforts to:							
Direction 1: Better connect people, places, goods and services		Direction 2: Increase genuine travel choices for a healthy, vibrant and equitable Auckland			Direction 3: Maximise safety and environmental protection		

4 The Strategy – Focus Areas

4.1 Introduction

This section outlines the evidence base for the Focus Areas that are included in the Transport and Access outcome of the Auckland Plan 2050. It outlines *how* different interventions will help achieve the Directions and *why* there is a need to focus on these areas to achieve the outcome sought.

This section draws heavily from the Auckland Transport Alignment Project (ATAP) which undertook considerable technical analysis throughout 2015 and 2016. In particular, the options analysis phase in ATAP assessed a range of different options to find the right mix of policies and interventions to address Auckland’s transport challenges. Appendix A provides further information on this process.

The findings from ATAP substantially informed the Auckland Plan’s focus areas, particularly Focus Areas 1, 2 and 3. The diagram below illustrates the Transport and Access focus areas, and how they address Auckland’s key transport challenges as detailed in Section 3 of this report.

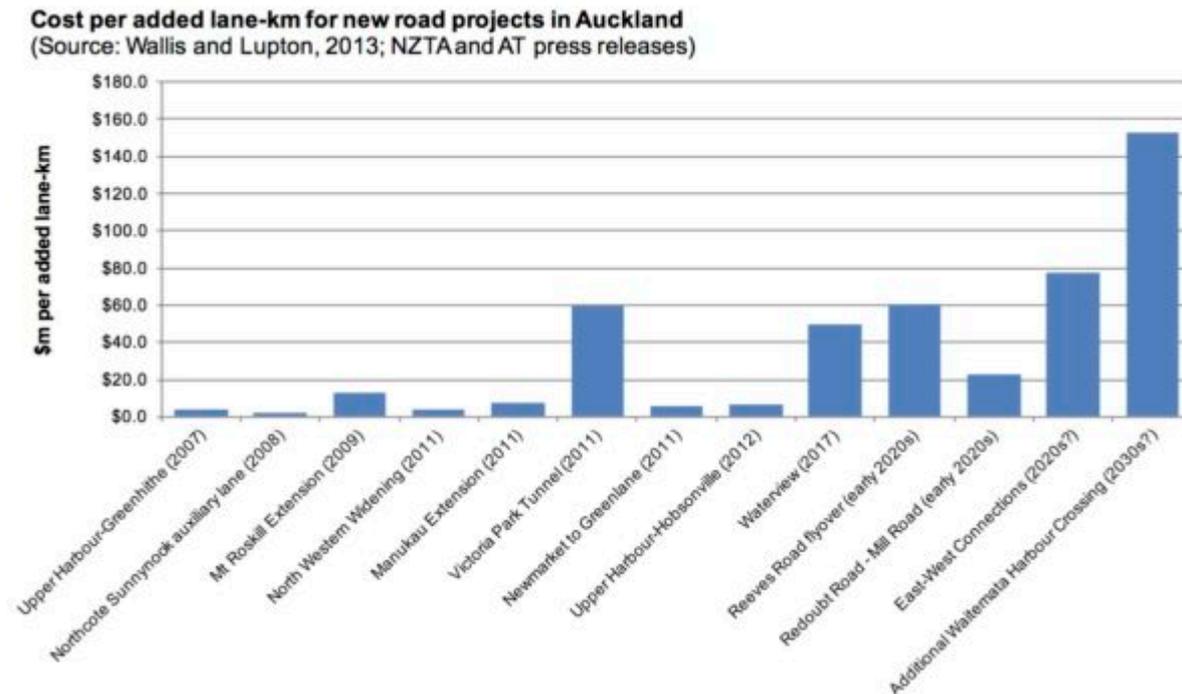
We face a number of key challenges:							
The delays, travel variability and accessibility issues caused by growing congestion	The lower levels of projected employment accessibility in the south and west	Excessive car dependence and low rates of public transport, walking and cycling	Unpleasant and unsafe transport environments (including streets and public spaces)	Inequitable distribution of transport choice	The public health crisis caused by physical inactivity	Rising road deaths and serious injuries	The environmental harm of the transport system
The following focus areas provide interventions to address these challenges:							
Focus Area 1: Make better use of existing transport networks	Focus Area 2: Target new transport investment to the most significant challenges	Focus Area 3: Maximise the benefits from transport technology	Focus Area 4: Make walking, cycling and public transport preferred choices for many more Aucklanders	Focus Area 5: Better integrate land-use and transport	Focus Area 6: Move to a safe transport network, free from death and serious injury	Focus Area 7: Develop a sustainable and resilient transport system	

4.2 Make better use of existing transport networks (Focus Area 1)

Opportunities to add new transport corridors within our existing urban areas are limited and becoming more expensive over time. Corridors that were previously protected (e.g. motorway routes included in 1960s transport plans) have now mainly been utilised, meaning new projects require significant land acquisition or major engineering structures, such as bridges and tunnels. There are also major ongoing costs involved in maintaining,

operating and renewing these assets. A cost comparison of recent and planned major roading projects is outlined in Figure 29 below³⁶.

Figure 29 Cost per added lane-km for new road projects in Auckland, 2013³⁷



Work undertaken through the ATAP options analysis process highlighted the difficulty of addressing Auckland's transport challenges through new investments alone and suggested a strong need to make better use of existing networks. A specialist workstream report on Arterial Roads (ATAP, 2016a) provided some further information about the opportunities to make better use of existing networks.

The Arterial Roads report outlined the following key findings:

- interventions focused on increasing network productivity could generate significant value for money (ATAP, 2016a)
- the biggest challenge for the arterial roads network is how to achieve improvements in productivity (throughput of people, goods and services) while balancing different user requirements, and addressing conflicts between through-movement and amenity
- a strong strategic framework for addressing these conflicts is necessary. Auckland Transport's Roads and Streets Framework (Auckland Transport, 2017c) has been developed to guide this process but it is also necessary to identify which parts of the arterial road network have strategic functions
- evidence based decision-making processes can be particularly challenging when it comes to making trade-offs between different uses of the road network. This is because they often involve removing on-street parking which is highly valued by

³⁶ Nunns, P. (2017), The escalating costs of building roads. Greater Auckland.

<https://www.greatauckland.org.nz/2017/08/01/escalating-costs-building-roads/> [accessed 22/11/2017]

³⁷ Graph sourced from Nunns (2017), The escalating costs of building roads. Greater Auckland.

local retailers, or extending bus lane hours which involves complex trade-offs between public transport users and drivers. Better decision-making processes are required to address these issues

- a relatively small proportion of the transport budget is currently dedicated to network optimisation and increased funding in this area is likely to generate value for money
- it would be important to maximise gains from new and developing technology, including both developing vehicle technologies and ridesharing that made it possible to increase vehicle occupancy levels.

These findings formed a key part of the ATAP strategic approach, particularly the need to optimise key routes to improve their productivity and has been incorporated into the Auckland Plan's Transport and Access section.

The 2018 ATAP package includes a substantial increase in investment into network optimisation (ATAP, 2018). This will include initiatives such as traffic light optimisation, dynamic lanes, freight lanes and other priority measures, intersection improvements such as roundabout metering, and improvements to support bus priority or higher vehicle occupancy, such as T2 and T3 lanes.

Part of making better use of existing networks is also ensuring that we look after our existing assets in a cost-effective way. As part of ATAP a specialist report (ATAP, 2016h) on maintenance, operations and renewals was prepared that calculated the long-term funding requirements for these activities. This information informed the ATAP financial analysis process, making up over half of the 30-year transport investment requirements.

ATAP also identified a need to improve alignment between Auckland Transport and NZTA on appropriate levels of service and funding requirements for asset management. A relatively large proportion of local roads maintenance and renewals expenditure currently does not receive funding from NZTA because of these issues (ATAP, 2016i).

Since ATAP's completion, further work has been undertaken as part of preparing Auckland Transport's 2018 Asset Management Plan (Auckland Transport, 2017a). This has led to agreement on funding requirements for asset management activities over the next ten years and considerable cost savings from earlier cost projections. There will be considerable ongoing work over time to ensure assets are maintained and renewed in a cost-effective way.

4.2.1 Greater focus on influencing travel demand

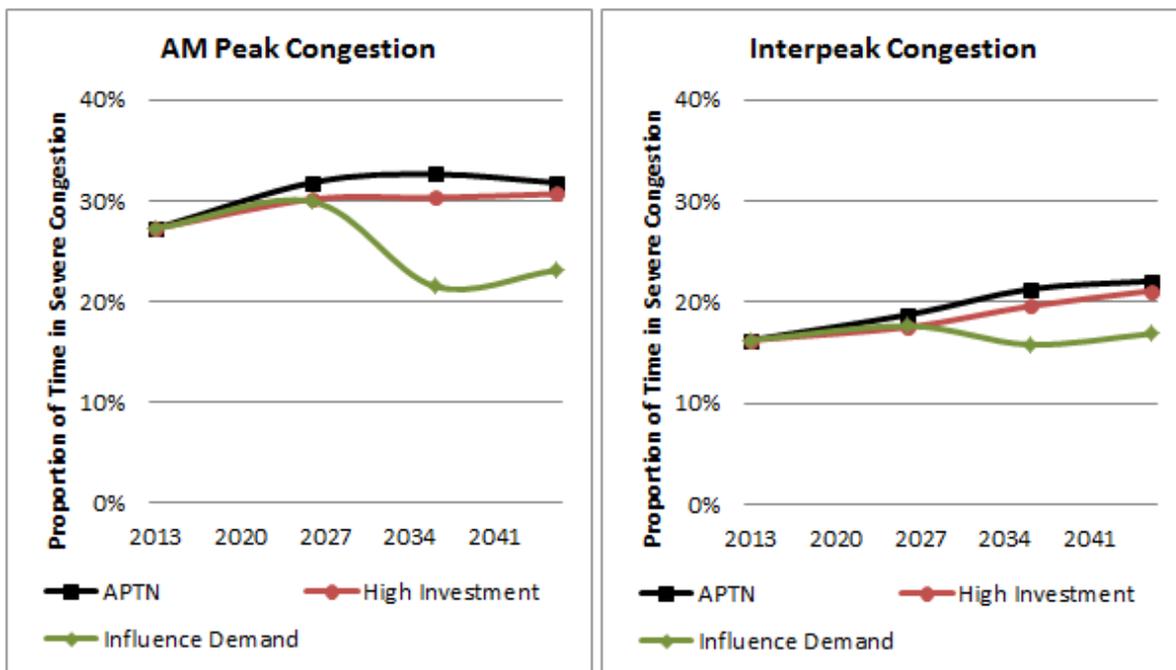
In common with most developed new world cities, the main response to growing travel demand in Auckland over time has been to increase road capacity and (to a lesser degree) to provide public transport, walking and cycling infrastructure and services. Relatively little attention has been paid to influencing travel demand.

Transport modelling from ATAP (2016i) and phase one of the Congestion Question (2018) project shows that simply increasing investment to build our way out of the problem is unlikely to be cost-effective in the long run and will struggle to deliver significant access and congestion improvements (ATAP, 2016i). Access challenges are expected to become

more significant in the west and some parts of the south due to lengthening travel times and a relative lack of local employment (see Section 3.3).

In part, this is due to Auckland’s fast rate of growth and challenging physical geography, which means providing new transport infrastructure in existing urban areas will be increasingly expensive due to costly land acquisition or tunnelling. Transport modelling undertaken in Round 3 (package refinement) of ATAP (and outlined in Appendix A of this report) highlights the importance of influencing travel demand to achieve better transport network performance – in this case through reducing congestion (in Figure 30, APTN refers to the baseline plan that preceded ATAP).

Figure 30 AM peak and interpeak congestion, 2013-2046³⁸



Source: ART3 model outputs, ATAP round 3

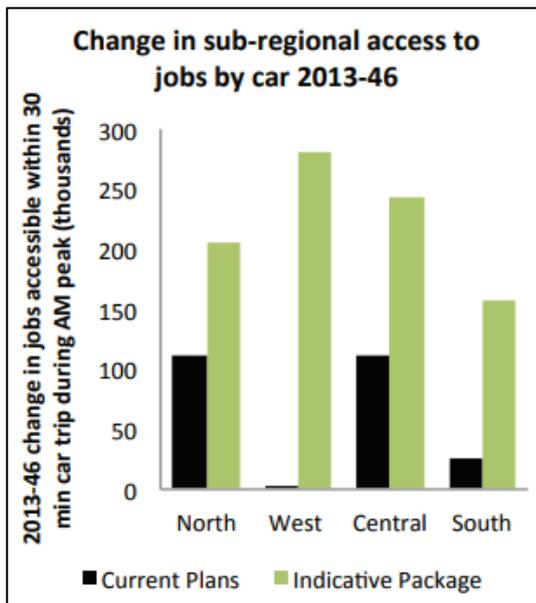
4.2.2 Progressively shifting to smarter transport pricing

Without the introduction of some form of smarter transport pricing that accurately reflects the actual cost of travel and manages the level of demand, there will be little to no improvements in accessibility in Auckland (The Congestion Question, 2018). For instance, access to employment from west Auckland by a 30-minute car trip is projected to barely change over the next 30 years, despite Auckland’s employment growth (ATAP, 2016e). There is also very little improvement for the south, while the north and central areas see much greater accessibility gains.

³⁸ Graph sourced from ATAP (2016d), Evaluation report.

Modelling undertaken as part of ATAP indicates that the implementation of a smarter pricing scheme (shown as the Indicative Package in Figure 31) could create significant transport network performance benefits, with the west and the south experiencing the greatest gains in employment accessibility (ATAP, 2016i). This may be because pricing is particularly effective at reducing congestion along the routes serving these areas, bringing them back within a 30-minute travel time of the substantial employment opportunities in the central area.

Figure 31 Change in sub-regional access to jobs by car, 2013-2046³⁹



In some cases, the same modelling also showed substantial additional travel costs to users. Analysis of the balance between travel time savings and increased financial costs suggested that the prices charged would exceed the value of the time gained for the average road user.

However, this analysis was a necessarily coarse approximation of how pricing might be applied, which means that some uncongested roads were subject to the same charge as congested routes. Furthermore, the analytical tools used for the process were not able to consider the likelihood that some users would place a much higher value on travel time savings than others.

As such, the development and analysis of a more detailed scheme is still required to understand the potential impacts of road pricing and make an informed decision as to whether to introduce it in Auckland. Any improved levels of accessibility will have to be evaluated against any increase in the cost of travel so that the equity impacts (including the affordability of travel to different groups, and the impact of pricing on access to jobs, education and services) can be understood and any necessary mitigation developed (ATAP, 2016k).

³⁹ Graph sourced from ATAP (2016d), Evaluation report.

The first phase of The Congestion Question (2018) project, set up following ATAP to investigate and make a recommendation on whether to introduce pricing for demand management purposes in Auckland, begins this more detailed investigation. The work to date includes a review of international examples and identifies several lessons broadly in line with the conclusions reached in ATAP, including:

- internationally, congestion pricing is being used successfully to influence travel demand and ease congestion. However, a bespoke approach reflecting Auckland's geographic, social and transportation characteristics will be required to replicate international successes
- while a scheme that applies across the entire road network, as envisaged by ATAP, may be the best long-term solution, the findings to date suggests a staged implementation starting with smaller scale options and evolving over time is likely to be the best approach.

The phase one report concludes that “congestion pricing shows real promise as a means to help Auckland's transport challenges”. This work is continuing and will inform the extent to which congestion pricing is used to influence travel demand.

Some elements of influencing travel demand are discussed further in other focus areas. This includes better integrating land-use and transport (Focus Area 5) and increasing vehicle occupancy levels through new technologies (Focus Area 3).

4.3 Target new transport investment to the most significant challenges (Focus Area 2)

As detailed in Section 2.3, transport investment in Auckland has increased substantially over the past 15 years – both in real terms and as a proportion of Auckland's economy. Transport is Auckland Council's largest area of expenditure (Auckland Council, 2015) and central government's fourth largest (The Treasury, 2017). The large and escalating cost of transport improvements emphasises the need to ensure an ongoing focus on ensuring value for money is delivered from investment into the transport system. Over the same time, the cost of making improvements to Auckland's network has also increased, as covered in Focus Area 1.

Auckland has many transport challenges but limited resources. This means funding must be carefully prioritised to ensure value for money. This section discusses the evidence behind the approach to ensuring investment targets the most significant challenges as well as the process undertaken (mainly through ATAP) to develop a sequenced 30-year investment package.

4.3.1 Approach

The analysis undertaken through ATAP highlighted the challenge of ensuring value for money from transport investments (ATAP, 2016k) as well as the wide range of transport challenges facing Auckland (ATAP, 2016e). As a fast-growing region with a legacy of under-investment and therefore a wide variety of transport needs, Auckland requires robust and transparent processes to prioritise investments.

Key components of the investment approach outlined in ATAP and continued in the Auckland Plan are outlined and explained further below:

Table 4 Key components of ATAP investment approach

Component	Explanation
Target investment to the greatest challenges	<ul style="list-style-type: none"> • Round 3 of the ATAP options analysis process highlighted additional investment delivered relatively small regional impacts but could deliver significant gains at a more local level (ATAP, 2016k). • The ATAP Foundation Report (ATAP, 2016e) highlighted a mismatch between where the greatest challenges were occurring (access to the west and south) and where transport planning effort had been focused (north and central areas). This highlighted the need for effort to be based on regionwide analysis of the transport challenges Auckland faces.
Identifying the right solution in the right part of the network at the right time and or the right size.	<ul style="list-style-type: none"> • Round 2 of the ATAP options analysis looked at different mixes of investment based on two different approaches to prioritisation (ATAP, 2016e): <ul style="list-style-type: none"> • Prioritising by where the greatest capacity constraints were projected. • Prioritising by the greatest improvements to access to areas with large numbers of jobs and where the greatest jobs growth was anticipated. • Analysis of these packages indicated that neither approach created a step-change improvement in performance on existing plans, but also that both approaches created more local improvements where interventions were well targeted to specific issues. • This emphasised the importance of using the “right tool for the job” and continuing to focus on the optimal timing of investments. • Round 3’s finding that a large-scale acceleration of investment brought relatively small benefits (ATAP, 2016d) reinforced the need to right-time and right-size improvements.

Component	Explanation
Ensuring investments provide value in a variety of different futures	<ul style="list-style-type: none"> • The ATAP technology report (ATAP, 2016l) highlighted the potentially transformational impacts of developing technology on Auckland's transport future. The report also highlighted the very high level of uncertainty about the timing and real world impact of these changes. • Other strategic work undertaken by the Ministry of Transport in recent years, particularly the Future Demand project (Ministry of Transport, 2016b) highlighted the uncertainty that exists in the transport sector about the future. • The significant impact of smarter transport pricing on network performance was also recognised in ATAP as having a substantial influence on what future investments would be required (ATAP, 2016k).

Upgrading and expanding strategic transport networks requires very significant investments. These road, rail and public transport networks are the most critical elements of Auckland's transport system and it is crucial they continue to operate effectively in the face of growing demand.

Strategic transport networks also have long-term impacts on the way Auckland grows, with their speed and capacity leading to substantial changes in accessibility for the places they serve. Conversely, these major corridors can also create substantial impacts on the environment and create severance. This means having long-term certainty over where strategic networks will be located is critical in guiding the shape of Auckland's growth.

ATAP developed long-term strategic road and public transport networks to provide this certainty and these networks have been incorporated into the Auckland Plan. The description of each network, and our approach to their development, is outlined in the table below:

Table 5 Strategic road and public transport networks

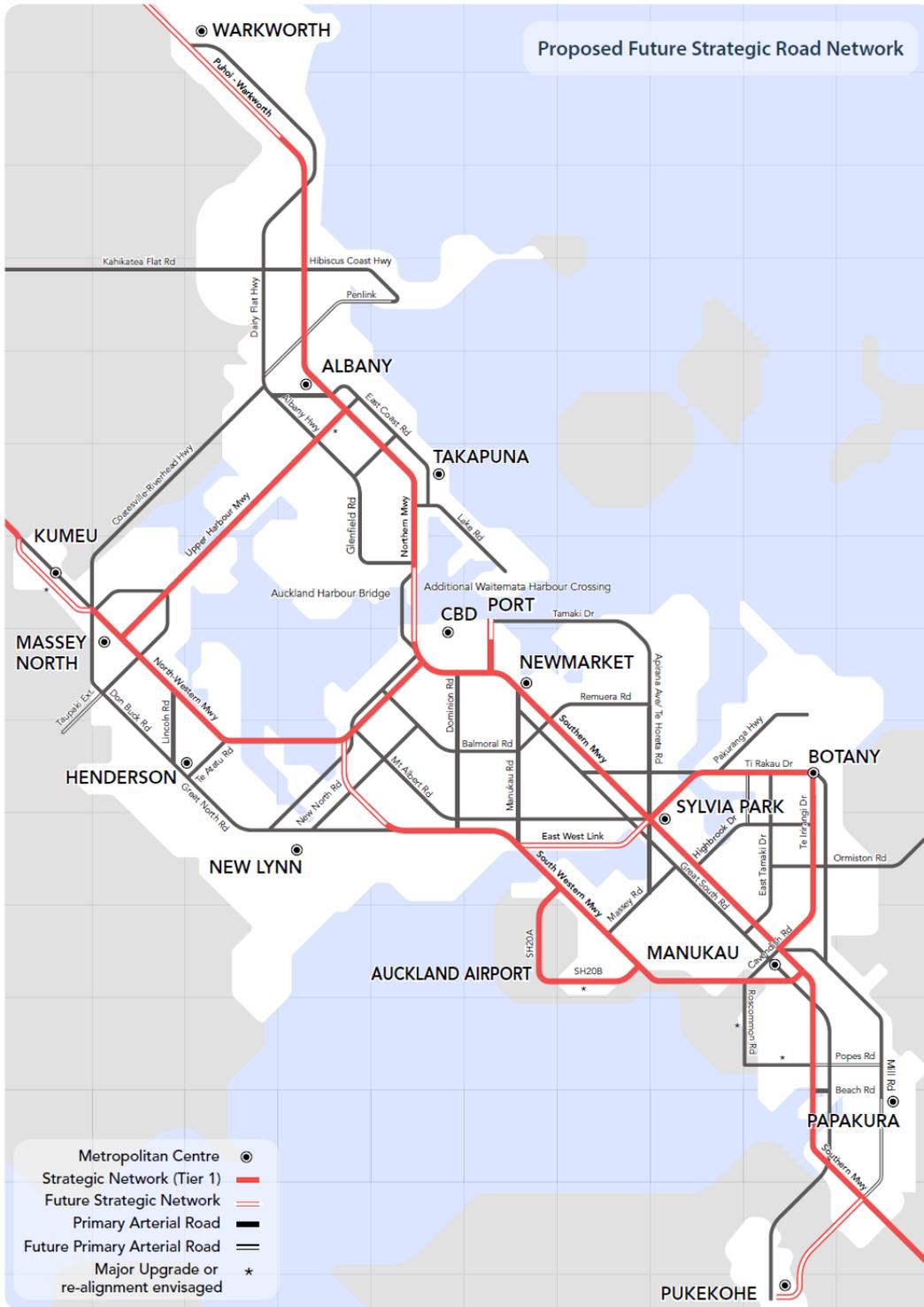
Strategic Road Network	Rapid Transit Network
Description	
<ul style="list-style-type: none"> • Backbone of the road network, providing for a wide variety of travel and the highest traffic volumes. • Core links between major parts of Auckland and the rest of NZ, carries heaviest freight volumes and provides access to Port and Airport. • Through-movement of people and goods is primary consideration and access is limited or controlled. 	<ul style="list-style-type: none"> • Backbone of the public transport network, providing for high volumes of travel to major employment centres, especially into the central area. • Frequent, high capacity services operating along corridors separated from private vehicles and unaffected by road congestion. • Passenger rail network shares corridor with freight

Approach

- Primarily focus on improving the efficiency of existing corridors by better balancing demand and capacity.
 - Provide new corridors in greenfield areas to support growth and improve connections to existing urban areas.
 - Focus additional capacity primarily on outer parts of the network, along the Western Ring Route and improving Port and Airport access.
 - Maximise benefits from new technology to increase vehicle throughput and occupancy levels.
 - Two key drivers for prioritising development of the strategic public transport network:
 - Addressing emerging capacity constraints as demand increases
 - Expanding the network to improve overall corridor efficiency and throughput
 - Mode choice for strategic network improvements should be driven by capacity requirements to meet forecast demand, integration with the wider network and achieving value for money.
-

The 30 year strategic networks are shown in the following maps. ATAP noted that further work was required to understand which primary arterial roads have strategic functions.

Figure 32 Proposed future strategic road network⁴⁰



⁴⁰ Map sourced from (ATAP, 2016i), Recommended strategic approach.

Figure 33 Potential future rapid transit network⁴¹



4.3.2 Investment sequencing

The sequencing of investments in ATAP was determined through a framework that focused on identifying early priorities through a two-step process:

- assessing the extent to which an investment targets the most significant first decade challenges
- assessing the extent to which an investment would be likely to deliver value for money in the first decade through considering its cost and the scale of its impact.

Combining these two tests enabled the following matrix to be used for prioritising first decade projects (ATAP, 2016j).

⁴¹ Map sourced from (ATAP, 2018), Auckland Transport Alignment Project

Figure 34 ATAP investment sequencing framework⁴²

		Potential to deliver value for money in first decade		
		High	Medium	Low
Extent to which the investment targets the most significant first decade challenges	High	Highest priority to be progressed in the first decade	Secondary priority to be progressed in the first decade	Unlikely to be first decade priority
	Medium	Secondary priority to be progressed in the first decade	Unlikely to be first decade priority	Not a first decade priority
	Low	Unlikely to be first decade priority	Not a first decade priority	Not a first decade priority

The most significant first decade challenges were identified in the ATAP Foundation Report (ATAP, 2016e) as being:

- the need to improve access to employment, particularly for the west and south
- the need to address growing congestion, particularly during interpeak times and on the motorway network
- the need to increase public transport mode share, particularly to attract longer trips off the motorway network.

A further key challenge was highlighted around the need to support a faster rate of housing growth. This would create investment requirements in greenfield areas, where new infrastructure and services would be required to enable growth to occur in the first place.

In August 2017 an update to the sequencing of major investments took place (ATAP, 2017). This update was required because new growth projections had been released in February 2017 that took new information into account that had not been available when ATAP was first published. Better information was now available on the timing of new growth areas (particularly the earlier development of areas around Silverdale in the north) as well as higher overall projected growth for Auckland.

This update led to some projects which had previously been sequenced in the second decade being advanced into the first decade.

4.3.3 2018 Update to Auckland Transport Alignment project

ATAP was updated in 2018 to reflect the Government’s and Auckland Council’s transport priorities for Auckland (ATAP, 2018).

Updated investment priorities

The updated ATAP report reflects a view shared by Government and Auckland Council that transport investment decisions must deliver broad economic, social, environmental and cultural benefits to Auckland and New Zealand by providing safe, reliable and sustainable access to opportunities. This means:

⁴² Chart sourced from ATAP (2016j), Recommended strategic approach.

- easily connecting people, goods and services to where they need to go
- providing high quality and affordable travel choices for people of all ages and abilities
- seeking to eliminate harm to people and the environment
- supporting and shaping Auckland's growth
- creating a prosperous, vibrant and inclusive city.

The following objectives from the ATAP Terms of Reference place greater weight on the following priorities:

- accelerating the development of Auckland's rapid transit network, particularly to unlock housing and urban development opportunities
- encouraging walking and cycling and making these active modes safer for Aucklanders
- delivering improvements in health, safety, the environment and access, including disability access
- ensuring the indicative package delivers the best possible value for money, including broader non-monetary costs and benefits.

New funding arrangements

The 2018 update to ATAP confirms a major increase to transport funding in Auckland and enables a \$28 billion ten-year transport programme. This represents an increase of around \$4.6 billion on 2015 funding plans. This increase is from the proposed Regional Fuel Tax, Crown Infrastructure Partners and extra funding from the National Land Transport Fund. Because the ATAP package fits within this planned and assumed funding level, there is no funding gap to deliver it.

Updated ATAP package

The updated ATAP package represents the best mix of investments within available funding to deliver on the strategic direction over the next ten years. Compared to the previous ATAP it places a greater focus on public transport (especially rapid transit), walking and cycling, safety and broader health, environmental and growth outcomes.

The major projects included in the ATAP package are:

Committed Projects

- City Rail Link
 - Puhoi-Warkworth motorway
 - Additional electric trains
 - Manukau-Papakura motorway widening
 - Northern corridor improvements and Northern busway extension to Albany
-

New Projects

- Light rail (City-Airport and Northwest corridor)
- Eastern busway (Panmure-Botany)
- Airport-Puhinui state highway upgrade, bus/rail interchange and bus priority improvements
- Lower cost East West Link
- Pukekohe electrification, third main Westfield-Wiri and further new electric trains
- Papakura-Drury motorway widening
- Mill Road (first phase)
- Penlink toll road and Albany-Silverdale bus improvements
- Significant safety programme
- Enhanced walking and cycling, bus priority and network optimisation programmes
- New infrastructure to enable greenfield growth

4.3.4 Inter-regional connections

ATAP did not focus on inter-regional transport issues, with the main evidence supporting the Auckland Plan being the Long-Term Strategic View, prepared by NZTA as a 30-year picture of future investment requirements across the whole of New Zealand (NZTA, 2017b).

a) Auckland to Northland (NZTA, 2017c)

State Highway 1 and the North Auckland rail line together form the main transport corridor connecting Northland to Auckland. There is one major port located at each end of the journey. The journey is critical to freight, both in terms of getting exports to port, and also for the distribution of imports arriving from overseas. Northport is largely associated with the import of oil and the export of logs from Northland forests.

There needs to be a reliable, resilient and safe link between Auckland and Northland. Challenging topography, difficult geology and high impact seasonal rainfall in the region present particular challenges for the maintenance and operation of this journey.

At present the state highway corridor between Auckland and Whāngārei is often subject to disruption. Its alignment is comparatively unsafe by national standards (108 deaths and serious injury crashes in 5 years to June 2015) and is susceptible to landslips due to frequent heavy rainfall and the short, steep and unstable geology.

The North Auckland rail line is an integral part of the Auckland passenger transport system as far as Swanson, but only freight services are scheduled north of the area. The line does not currently carry significant volumes of freight and will require considerable capital expenditure to upgrade it in the future.

The GPS 2018 reflects a significant lift in ambition for improving the safety of the land transport system. It also promotes a strategic shift away from building new state highway capacity. Instead, the focus is on optimising the efficiency of the existing system where possible and improving the network where needed to address issues with safety, access to social and economic opportunities, and resilience (Ministry of Transport, 2018).

Efforts over the next 30 years to improve the inter-regional connection between Auckland and Northland will consider the Government’s priorities of improving safety and resilience, to support regional economic development and make the network more resilient to weather events (NZTA, 2018). This includes:

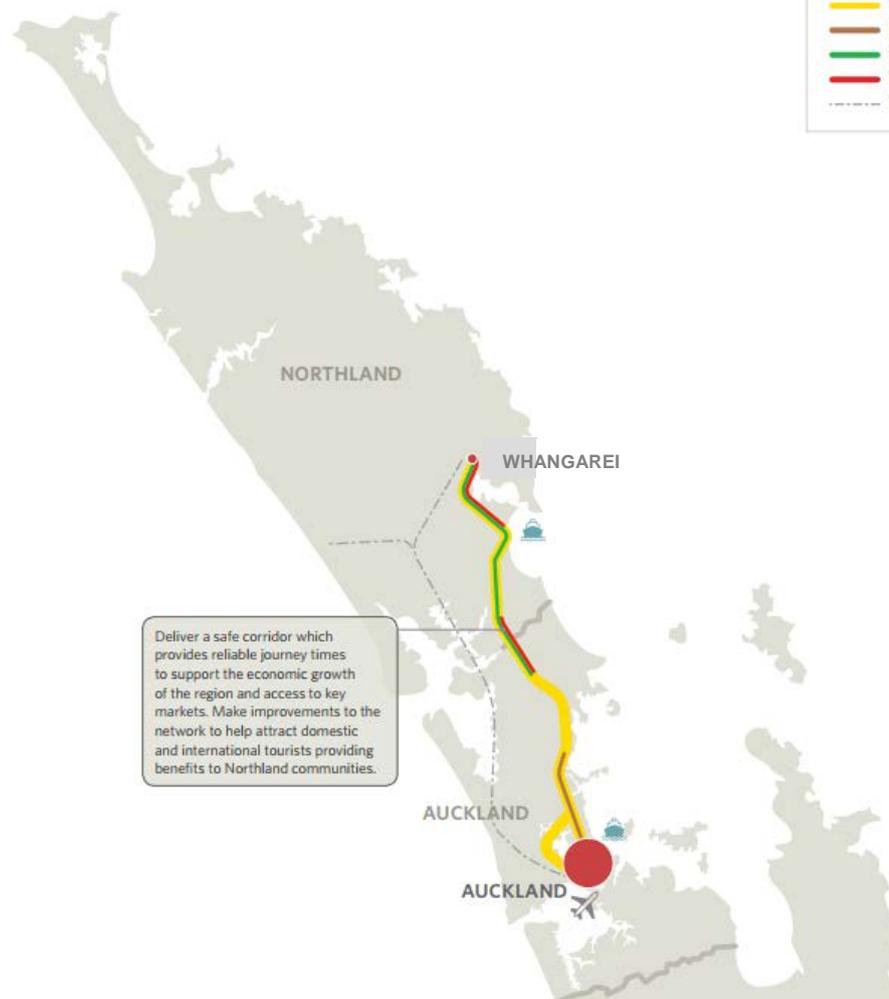
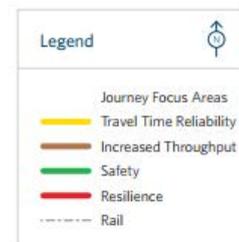
- progressively upgrading State Highway 1 between Auckland and Northland, particularly focused on improving safety, resiliency and supporting Northland’s economic growth
- upgrading the North Auckland rail line to play a greater role in meeting future freight requirements, particularly if Northport expands its role in New Zealand’s freight supply chain.

Figure 35 Northern region focus area⁴³

INTER-REGIONAL JOURNEY: CONNECTING THE NORTHERN REGIONS

FOCUS AREAS

The focus will vary across the length of the journey.



⁴³ Map sourced from NZTA (2017b), Long term strategic view: the Northern regions.

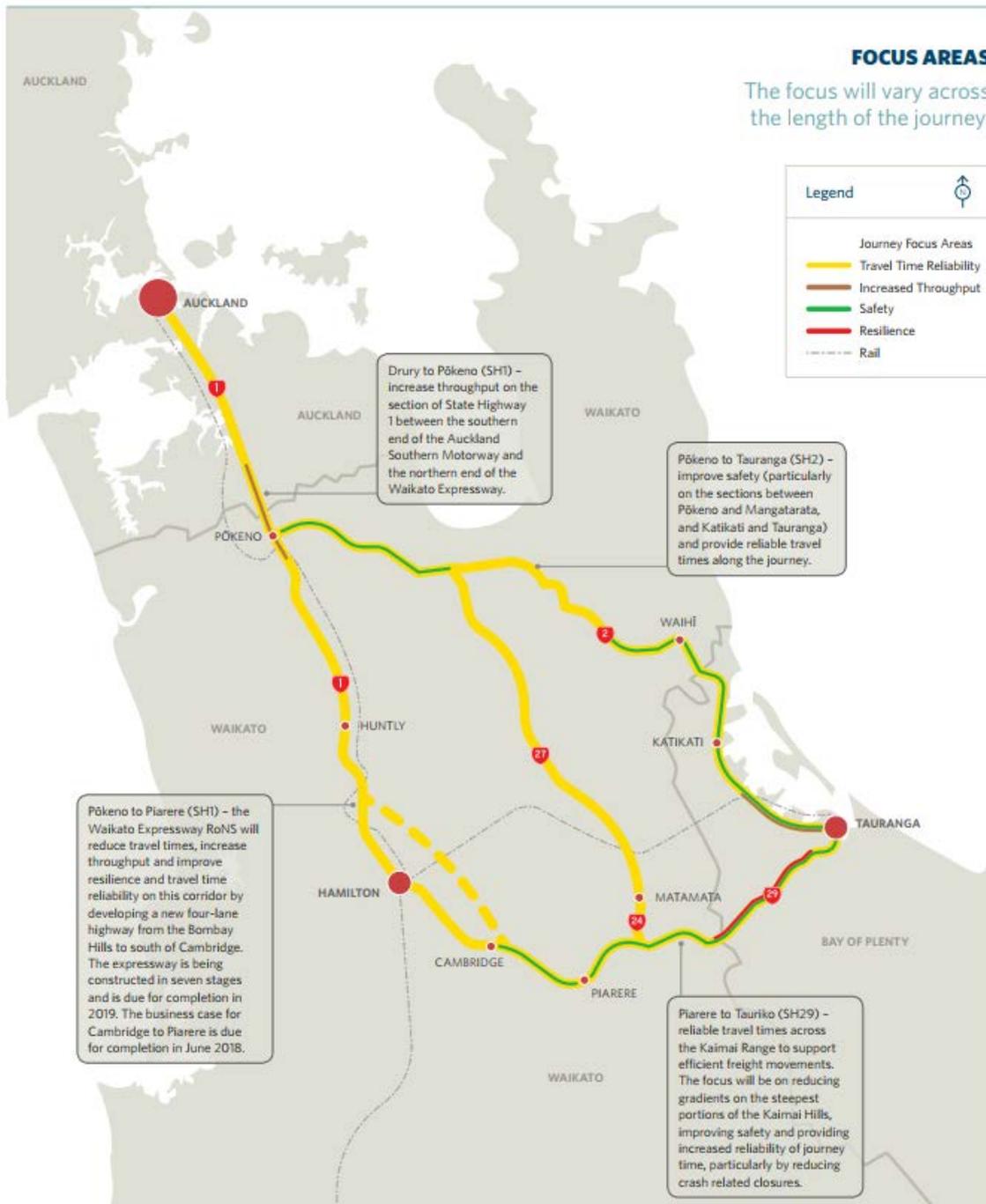
b) Auckland to Waikato (NZTA, 2017d)

Connections between Auckland, Hamilton and Tauranga are critical to New Zealand's economic and social success because they:

- provide connections between the major centres in the upper North Island, New Zealand's fastest growing area
- carry most of our people and goods (outside main metro centres). Approximately 65 per cent of New Zealand's freight is transported between Auckland, Hamilton and Tauranga and is forecast to double over the next 20 years
- link together Auckland, the two biggest ports in the country (Auckland and Tauranga), the inland ports at Wiri and MetroPort, and New Zealand's largest international airport
- connect key tourist destinations.

Figure 36 The upper North Island focus areas⁴⁴

INTER-REGIONAL JOURNEY: CONNECTING THE UPPER NORTH ISLAND



The Auckland to Port of Tauranga via Hamilton route is a nationally strategic high-volume route for both the movement of people and freight. It is complemented by the North Island Main Trunk and East Coast Main Trunk railway lines, which carry over a third of New Zealand's rail traffic.

The Waikato expressway has been the focus for investment over the past decade and is due to be completed in the next few years. It will create a four-lane highway that bypasses

⁴⁴ Map sourced from NZTA (2017b), Long term strategic view: the upper North Island.

the main urban centres, delivering reduced travel times and safer, more reliable journeys. The Waikato Expressway will be complemented by on-going improvements on Auckland's Southern Motorway intended to increase throughput on the key southern route into Auckland.

Route resilience will improve through route duplication while journey reliability will improve through using a designated corridor that bypasses four urban centres.

4.4 Maximise the benefits from transport technology (Focus Area 3)

Transport and communications technologies are changing quickly (RethinkX, 2017). New vehicle technologies, big data applications, ride-sharing and car-sharing technologies have the potential to make far-reaching changes to the way in which we travel. These could have potentially significant impacts on future travel demand, and the safety, efficiency and capacity of our transport networks. However, there is considerable uncertainty attached to the nature and timing of technological developments in the New Zealand context, and the resulting impacts on the Auckland transport system (ATAP, 2016j).

Through ATAP considerable analysis of the potential impacts of new technologies was undertaken. This was primarily in the form of:

- a specialist technology report (ATAP, 2016l) that sought to understand the potential impacts of intelligent network management, emerging vehicle technologies and shared mobility on Auckland's transport system and their implications for transport investment over the next 30 years
- transport modelling that sought to simulate the possible impacts of developing vehicle technologies and higher vehicle occupancy rates (to reflect shared mobility) on network performance (ATAP, 2016k).

The technology report was prepared by officials from the Ministry of Transport, the New Zealand Transport Agency, Auckland Council and Auckland Transport. Analysis was peer reviewed by AECOM experts in the United States and New Zealand.

This work reached the following key conclusions in relation to the likely impacts of new technologies and the steps we should take to maximise their potential benefits:

Table 6 Key conclusions from the ATAP specialist report

Technology	Key findings
Intelligent network management	<ul style="list-style-type: none"> • Benefits include improved optimisation of existing transport infrastructure (for example by managing traffic flows in response to congestion or incidents); better targeting of maintenance and renewals expenditure; and better planning of new infrastructure investment. • The current state of network management in Auckland is comparatively mature but there is significant room for improvement. • Initial analysis indicates that additional investment into intelligent network management would provide good value for money. • Additional investment would enable Auckland to take better advantage of the latest advances in transport technology and prepare the network for the roll-out and management of connected and automated vehicles.
Emerging vehicle technologies	<ul style="list-style-type: none"> • Connected and automated vehicles (CAVs) have the potential to significantly improve network performance by increasing lane capacity (through shorter following distances and mitigation of start-stop shockwaves), improving safety (by removing human error, the cause of around 80% of traffic accidents), and improving travel time reliability. • However, the extent of these impacts will depend on what proportion of the fleet are CAVs, and the degree to which efficiency benefits are offset by induced demand. For example, fully autonomous vehicles may stimulate demand by making travel easier for certain groups (e.g. the elderly, disabled or children) or they may encourage more travel as time spent in the vehicle can be used for other purposes. In addition, fully autonomous vehicles could add to congestion through re-positioning trips to pick up new users or park. • It is difficult to accurately estimate the uptake and impacts of CAVs in Auckland. It is likely to be at least 10 years before they start to make a significant difference to network performance. When they do arrive in significant numbers, their impact on increasing lane capacity will be much more prominently felt on the motorway network than on local roads (due to the effect of intersections, interactions with those walking and cycling, and more complicated vehicle movements on local roads). • Increased throughput on motorways and arterial roads from connected and autonomous vehicles was estimated to be approximately: <ul style="list-style-type: none"> • on motorways, between 20% and 65% by 2046 • on arterial roads, between 7% and 22% by 2046.

Technology	Key findings
Shared mobility	<ul style="list-style-type: none"> • Potential benefits of shared mobility include: <ul style="list-style-type: none"> • reducing congestion by increasing vehicle occupancy at peak times • extending public transport catchment areas through better first and last leg connections • providing greater access and choice to users of the transport system. • In the long run, shared mobility may extend to the widespread use of shared autonomous vehicles if they present a more cost-effective travel option than private vehicle ownership for the public. The elimination of most labour costs with driverless vehicles may result in shared autonomous vehicles providing a compelling alternative to private vehicle ownership and some public transport services. • Shared mobility is also key to uptake of ‘mobility as a service’ – the concept that urban travel can be consumed as a service, rather than provided through personally owned modes of transportation. Mobility as a service could work by combining public transport and shared mobility options through a single system (for example a smart phone app), which recommends, manages and pays for the trip. • More work is needed to further investigate the behavioural drivers behind decisions to share transport and what both central and local government could do to facilitate a widespread shift.

Transport modelling focused more on analysing the potential impacts of these technology advancements on overall network performance. This looked at:

- increasing vehicle occupancy rates
- the uptake of connected vehicles.

The uptake of ride-sharing is expected to vary by trip purpose. Due to their recurrent and regular nature, coupled with low existing occupancy levels, the greatest increase in occupancy rates is expected to be in trips to and from work. Two scenarios were developed, based around a 50% and a 100% increase in occupancy rates for work-related trips. Changes in occupancy for other trip types were adjusted accordingly, as shown in the table below.

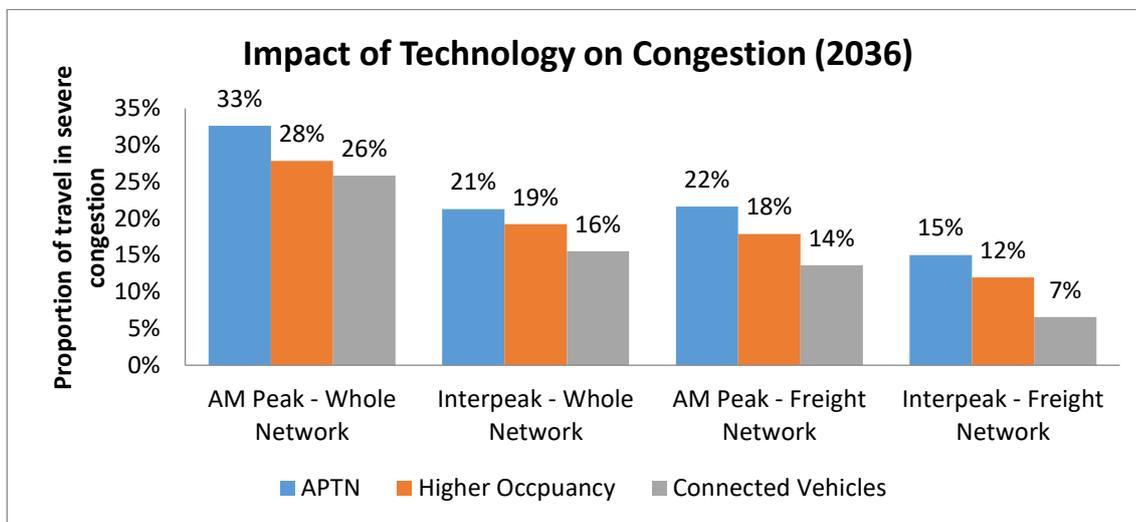
Table 7 Changes to car occupancy rates under two scenarios

Trip Purposes	Car occupancy rate increase
Work Related	50%-100%
Education Related	10% - 20%
Shopping Related	10% - 20%
Other Purposes	10% - 20%
Employer’s Business	5% - 10%

The potential impacts of increasing connected vehicle use were tested in the strategic transport modelling tools by increasing road-lane capacity and reducing the extent of lost time per phase at signalised intersections (i.e. interventions which increase network productivity through improved vehicle throughput). Advancements in ITS will also improve the operation of signalised intersections. A 75% uptake of connected vehicles by 2036 was assumed for the purpose of this test.

The main areas where connected vehicles and higher occupancy rates improve performance against the project objectives are in relation to congestion (Figure 37) and car accessibility (Figure 38).

Figure 37 Impact of technology on congestion, 2036⁴⁵

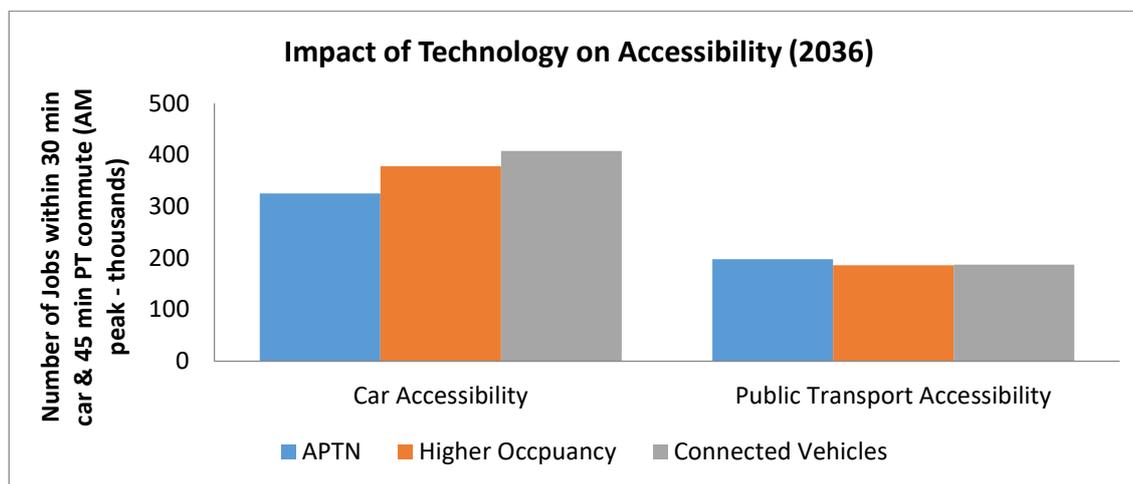


Connected vehicles appear likely to have a larger effect on reducing congestion than increases in vehicle occupancy, although analysis also showed that these impacts were independent and therefore cumulative if increased occupancy rates and connected vehicles occur simultaneously, as can be expected. Congestion reduction from connected vehicles was most significant on the motorway network, because this is where vehicle connectivity is projected to result in the greatest throughput increase due to fewer intersections and less interaction with pedestrians, cyclists and other vehicles.

⁴⁵ Graph sourced from ATAP (2016d), Evaluation report.

Potential technology-related congestion improvements translate directly into equivalent accessibility gains. The modelling indicates the accessibility gains could be greater than what could be achieved through infrastructure investments alone. This is likely to reflect the region-wide assumptions of technology improvements to Auckland's private motor vehicle fleet, road network and uptake of ridesharing.

Figure 38 Impact of technology on accessibility, 2036⁴⁶



The strategic modelling tools were being used for very different tasks than what they had been designed for. This was particularly the case for increased vehicle occupancy rates.

Some general conclusions were possible though:

- the benefits of developing vehicle technologies are likely to be substantial, and strongest on the motorway network
- increasing vehicle occupancy rates can help reduce congestion and improve car accessibility. Impacts on public transport are more complex, but seem more likely to affect demand in lower density areas more than along core strategic corridors
- ride-sharing also has the potential to complement road pricing by offering practical alternatives for commuters where public transport is unlikely to be a realistic option under any of the packages we have analysed.

4.5 Make walking, cycling and public transport preferred choices for many more Aucklanders (Focus Area 4)

Getting public transport, walking and cycling to play a greater role in meeting Auckland's transport needs is critical to achieving a number of key outcomes:

- providing better travel choices that enable people to travel in the way that best meets their needs, including the ability to avoid long and unreliable commutes affected by congestion (Direction 2)
- supporting a more efficient transport system through the use of more "space-efficient" modes, especially when accessing higher intensity locations or along high demand corridors (Focus Area 1)

⁴⁶ Graph sourced from ATAP (2016d), Evaluation report.

- reducing environmental effects (Auckland Council, 2017c) from the transport system and supporting a healthy population and vibrant urban places (Focus Area 7)
- supporting the introduction of smarter transport pricing by providing travel options of sufficient quality that people can change their mode of travel to avoid paying extra travel costs, without facing substantially longer or more inconvenient journeys⁴⁷ (Focus Area 1).

The updated 2018 ATAP report places a greater weight on public transport (especially rapid transit), walking and cycling (ATAP, 2018). Having public transport, walking and cycling meet a greater proportion of Auckland's transport task will benefit all people using the transport system. All modes of transport are best suited to particular types of trips and many of Auckland's transport challenges stem from using private vehicles for trip types that are better suited to other modes. ATAP identified (ATAP, 2016i) the types of trips public transport (including rail), walking and cycling should focus on attracting:

- public transport – access to concentrated activity centres like the city centre and major employment areas
- rail – providing a dual function of high capacity public transport backbone and strategic freight connections, especially to/from the Ports of Auckland and Tauranga
- walking and cycling – serving higher intensity areas, short-to-medium length trips and extending the reach of strategic public transport corridors.

Increasing the proportion of these types of trip undertaken by public transport, walking and cycling will help free up the roading network for trips that are less suited to these modes, especially freight and commercial travel.

4.5.1 Public transport

One of ATAP's objectives is improving public transport mode share, particularly along high volume, congested corridors (ATAP, 2016e). Public transport carries a significant number of people efficiently along corridors of high demand, using space efficiently when compared to private vehicles. This attribute is particularly important in more intensive locations such as major centres where space is very valuable. Conversely, public transport often struggles as an attractive, cost-effective transport option in lower density areas, particularly when serving dispersed or low-intensity employment areas.

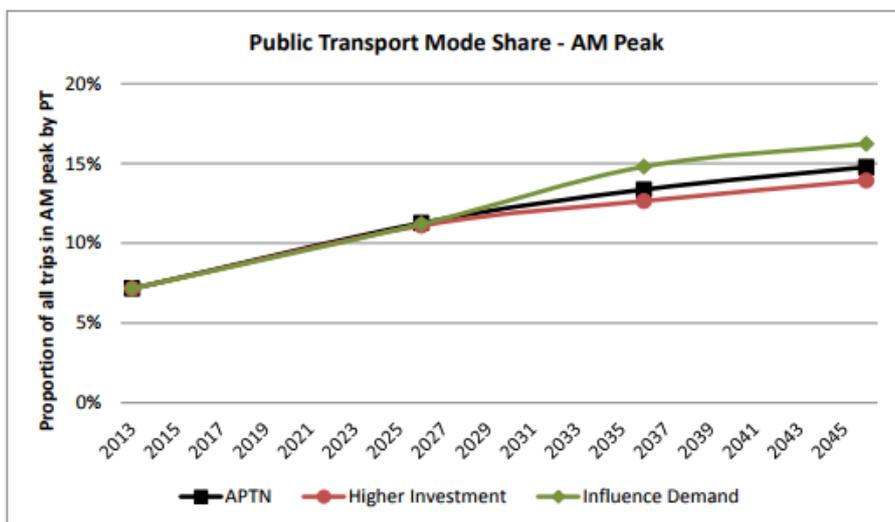
Rapid transit is a key component of the 2018 ATAP package, where it forms the backbone of Auckland's public transport network, providing fast, frequent and high capacity services along corridors that are separated from general traffic and therefore unaffected by road congestion (ATAP, 2018). Rapid transit can also have a particularly significant impact on shaping urban form and development. Transport modelling undertaken in Round 3 (package refinement) of ATAP suggests that accelerating the delivery of the strategic

⁴⁷ Road pricing has the potential to significantly reduce congestion, using price to incentivise people to change the way they travel. The better the travel options are, the lower the price that can be charged to achieve a shift in travel patterns. Better travel options also create a substantial benefit for those who continue to travel and 'pay the price', as they will pay a lower price for the same network performance gain.

public transport network to coincide with the implementation of smarter pricing will provide the greatest increase in public transport mode share (Influence Demand package) (ATAP, 2016k). On the other hand, the acceleration of roading projects in the Higher Investment package results in a lower level of public transport use, even though the package includes a number of additional public transport investments (Figure 39).

Overall, the more significant modal shift to public transport that occurs in the Influence Demand package throughout large parts of Auckland appears to make an important contribution to the much lower levels of congestion in this package.

Figure 39 Public transport mode share (AM peak), 2013-2046⁴⁸



Source: ART3 model outputs, ATAP round 3

4.5.2 Walking and cycling

Walking and cycling for transport is one of the best ways to stay active and healthy as it provides regular physical activity integrated into people's daily routines. These active transport modes contribute to a wide range of important outcomes, including health benefits, reducing pollution and providing alternatives to traffic congestion (Ministry of Transport, 2008). ATAP highlighted that walking and cycling had potential to make positive contributions to the transport network. It identified these modes as being well suited to "serving higher intensity areas, short-to-medium length trips, and extending the reach of strategic public transport corridors" (ATAP, 2016i)

Furthermore, ATAP suggested that walking and cycling had the potential to increase transport system capacity in the central area, where transport corridors are physically constrained and where higher person throughput is a high priority.

Within the city centre, where there is an estimated 500,000 walking trips every week day, improving walkability has been found to positively contribute to economic productivity (Davis, 2017). A recent Auckland Council study found that a 1% increase in walkability

⁴⁸ Graph sourced from ATAP (2016d), Evaluation report.

leads to an increase of approximately \$42 million in productivity (Mehmaz and Grant, 2017).

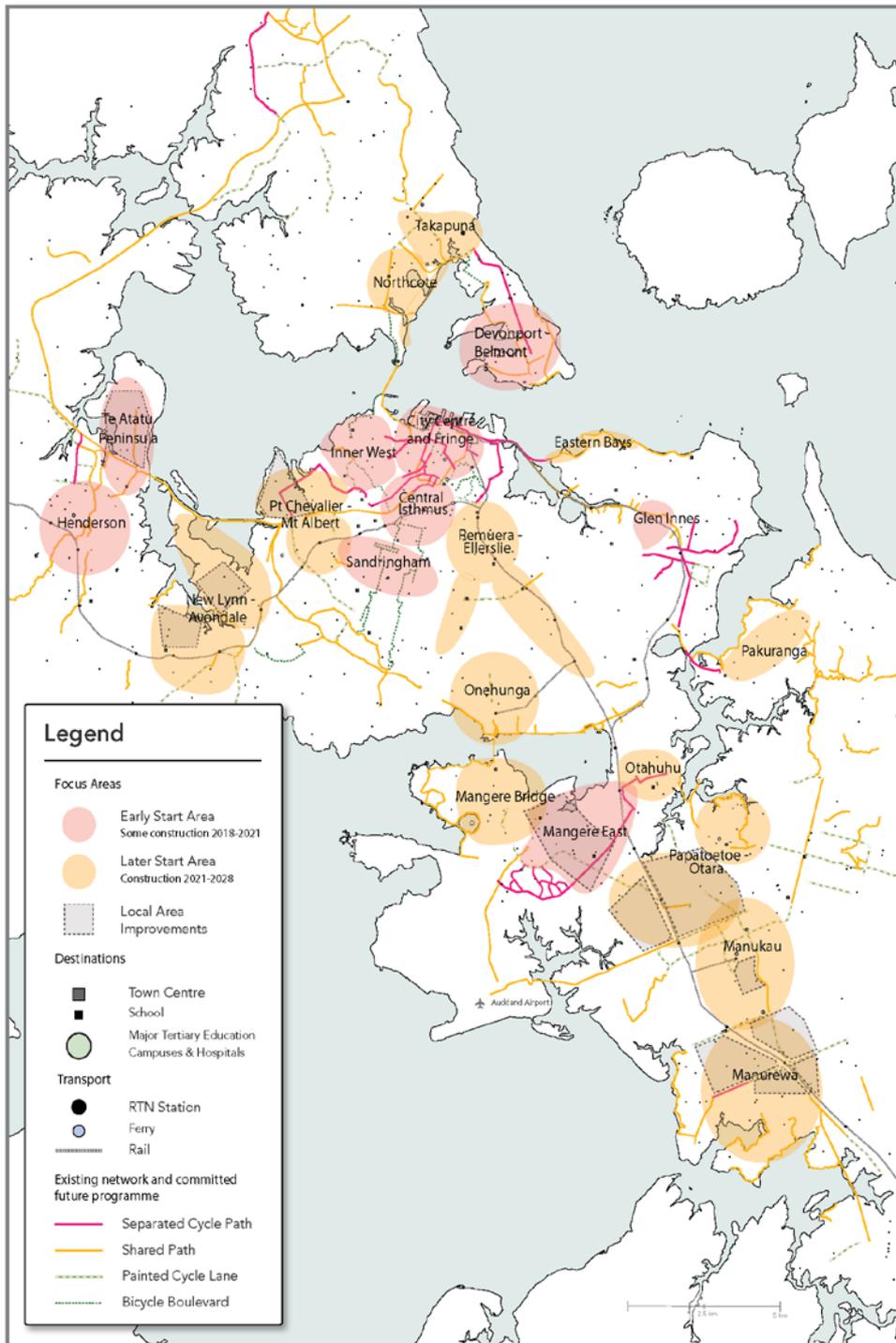
Cycling

There is significant opportunity for cycling to play a more substantial role in contributing to a more effective transport system for Auckland. When high quality cycling infrastructure has been provided and concerns about the safety of cycling addressed, Aucklanders have responded by cycling more (Auckland Transport, 2017d).

The Auckland Cycling Programme Business Case (PBC) directs investment for cycling in the Auckland region for the period 2018 to 2028 (Auckland Transport, 2017d). It recommends a \$600 million investment in cycling infrastructure, delivering approximately 150km of new cycleway over the course of the programme. This would be accompanied by a \$35 million investment in complementary activities, including training, end-of-trip facilities and bicycle share.

Recommended focus areas for 'early start' on construction during the 2018-21 period include network development in the City Centre and Fringe and in selected suburban hubs such as Māngere and Henderson (Figure 40). This will improve accessibility to major jobs and education centres, fill network gaps and build off recent investment. Areas for later start include the lower North Shore, New Lynn/Avondale, the Newmarket-Ellerslie corridors and selected centres in South Auckland.

Figure 40 Investment focus areas in the Auckland Cycling Programme Business Case, 2018-2028⁴⁹



The Cycling PBC shows that increased cycling activity in Auckland has the potential to contribute to a more effective and efficient regional transport system in several ways:

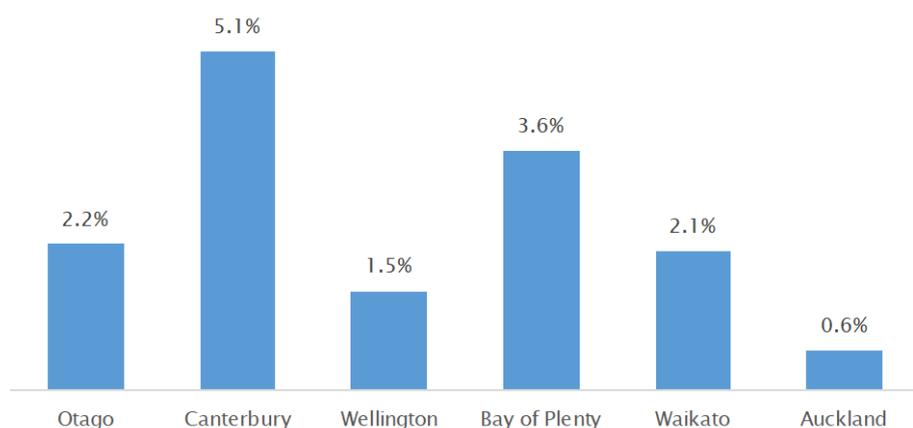
1. *Play an increased role for short-medium distance commuting trips (1km-7km), with particular value where it can shift trips off congested road and public transport networks*

Cycling has potential to serve short-medium distance passenger transport trips (1km-7km), with very short trips more likely to be undertaken by walking, and longer trips more likely to

⁴⁹ Map sourced from Auckland Transport (2017d), Cycling programme business case.

be more suitably served by public transport or private vehicles for most users. The average household trip length is 7.6km (Ministry of Transport, 2015b), which is approximately 30 minutes by bicycle. Household travel survey data shows that cycling is only used for 0.6% of household trips of less than 5km, suggesting a large potential for increased use of cycling for short to medium trips (Figure 41).

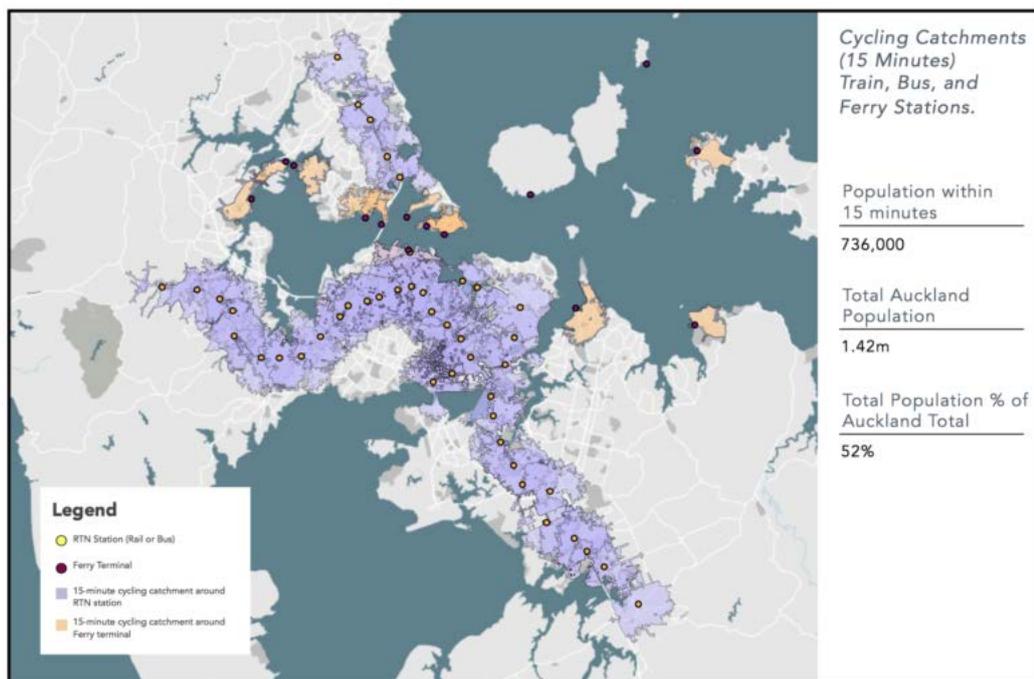
Figure 41 Cycle mode share for trip chains of less than 5 kilometres, 2013⁵⁰



2. *Provide connectivity to Auckland's developing Rapid Transit Network, increasing the reach and transport accessibility to jobs and other opportunities provided by public transport*

In addition to serving short to medium distance trips, cycling also has the potential to extend the reach of Auckland's rapid transit network by serving first and last-leg trips to our public transport stations. Figure 42 maps the 15-minute cycling catchment around all Auckland rail and busway stations, showing that much of the urbanised area is within cycling distance of rapid transit. Using cycling to support access to Auckland's rapid transit network can contribute to the wider benefits associated with the mode shift to public transport including congestion alleviation, improved accessibility and environmental benefits.

⁵⁰ Map sourced from Ministry of Transport (2015b), Household travel survey.

Figure 42 15 minute cycling catchments to Auckland's Rapid Transit Network⁵¹

3. *Improve transport accessibility for groups with lower levels of transport choice, including providing a low-cost, convenient transport option for children and young people and other people with poor access to public transport or private vehicle choices*

As outlined in Direction 2, the areas in Auckland with higher rates of socio-economic deprivation are also areas that tend to have lower levels of transport choice. Communities in South Auckland, West Auckland, and the outlying parts of the Auckland isthmus are among the most socio-economically deprived.

Targeting cycling investment in the more socio-economically deprived areas of Auckland will make cycling a realistic transport option, giving people a cheap and reliable way to access the opportunities they need. These areas are also where many young Aucklanders live and where many schools are located.

4. *Provide a convenient transport choice for everyday household trips, taking pressure off networks serving key Auckland centres*

Cycling can also play a role in contributing to a more effective regional transport system by increasing total transport capacity on congested corridors and relieving pressure on congested parts of the road and public transport network. Bus capacity constraints currently exist on several central routes (e.g. Mt Eden Road buses) and shifts to cycling on these routes can reduce capital and operational expenditures associated with providing additional buses and attempting to cater to peak demand periods (Auckland Transport, 2017d). When cycle facilities are well utilised, they can enable more people to access key destinations without requiring more space for travel or parking.

⁵¹ Map sourced from Auckland Transport (2017d), Cycling programme business case

4.5.3 Designing streets and public spaces that prioritise walking, cycling and public transport

People are more likely to walk and cycle and take public transport if they see the environment as convenient, safe and pleasant, with direct routes that minimise travel time. Characteristics of the urban environment that are particularly important to increase the attractiveness of these modes are connectivity, density, mixed use, safety and high quality public spaces (NZTA, 2009). Focus Area 5 provides further information on the importance of the urban environment.

Increasing the numbers of Aucklanders walking and cycling will require national and local government policies, and potentially law changes, that prioritise pedestrian and cyclist safety and the development of communities with high walkability. Making the economic case for such policies can help to strengthen the case.

4.6 Better integrate land use and transport (Focus Area 5)

Land use lies at the heart of travel demand patterns. The accessibility issues highlighted in Section 2.3 show the difficulty in providing for increasingly concentrated employment growth coupled with widespread dispersed population growth. Imbalances between the location of household and employment growth will increase pressure on the transport system.

Improving accessibility requires integration between land use and transport to support effective access between residential areas and key employment areas. Integrating land use and transport is necessary to:

- fully realise the economic benefits from population and employment growth
- ensure the transport network can continue to operate effectively as Auckland grows
- ensure value for money and good utilisation of new infrastructure and services.

Better integration of land use and transport to support quality urban living will be achieved by:

- encouraging housing and employment growth in areas with better transport connections. This will enable shorter commutes and reduce pressure on the transport system.
- prioritising transport investment that supports intensification in the existing urban area, supports growth in new urban areas and improves connections between these newly developing areas and the rest of Auckland
- designing and managing streets in a way that makes it easier for people to get around and enjoy the places in which they live and work, using good design to manage any trade-offs between vehicle movement and placemaking functions.

4.6.1 Focusing Growth

We can improve transport network efficiency through better land use decisions. These decisions should aim to:

- encourage housing growth in areas with better access to employment and more transport options, such as around the strategic public transport network and on the isthmus
- encourage employment growth where transport connections and options are strongest and where additional jobs would reduce reliance on long commutes across major transport bottlenecks, such as in the west and south
- enable the consolidation of freight movements, minimise amenity impacts and ensure efficient connections to the strategic network.

The Development Strategy (Section 1.3) encourages this form of development, enabling 60% to 70% of future growth to be accommodated within the existing urban area with greater intensification in and around centres, transport nodes and corridors. Significant employment growth is also provided, particularly in major centres.

4.6.2 Prioritising transport investment

Transport investment needs to be prioritised to enable and support population and housing growth in new and existing urban areas and improve connections between these newly developing areas and the rest of Auckland. This requires a more flexible and responsive approach to the planning, funding and staging of infrastructure services to better integrate with the location and timing of development. This includes supporting the market attractiveness of residential development and successful centres through early investment in enabling infrastructure.

4.6.3 Street design

Integrating land-use and transport is also required at the street level. An attractive environment is regarded as increasingly important from an urban-economic perspective, as it is assumed to be a prime condition for the development of a creative service economy (Florida, 2002). As such, planning and design of our streets must support quality, vibrant urban amenity and good living environments.

Vibrant places are spaces where people want to be. They are destinations, attracting people to live and work in them. As well as supporting good transport choices, people feel safe and connected in them. In contrast, car-oriented design that favours mobility and the speed at which cars can move about, tends to create places that are not pleasant to be in.

The location, design and use of our roads and streets have a significant impact on our urban form and the quality of the environment of areas they pass through. They can function as simply movement corridors or play an important placemaking role in connecting a community and providing opportunities for meet and connect. In Auckland this is especially pertinent as many of our centres have a major road running through them which can act as a connector and meeting place, or as a severance. In many cases there will be difficult trade-offs between movement and place that will need to be made in a clear and consistent way. A crucial part of this process will be identifying and agreeing the location of routes where movement of people and goods needs to be prioritised (and the

best way of doing so) and those locations where a greater focus on place is required. Our increasing growth and limited road space means these challenges will not easily be resolved. The transport system must integrate with, and support, the quality compact urban form that forms the heart of the Auckland Plan.

4.7 Move to a safe transport network free from death and serious injury (Focus Area 6)

Auckland has a high number of road deaths per capita compared to other international cities (International Transport Forum, 2016). Road-related deaths and reported serious injuries have been trending upwards in recent years, reversing the downwards trend over the past 30 years.

4.7.1 New approach required

As outlined in Direction 3, reversing the recent increase in deaths and serious injuries will require new approaches and interventions, including a greater emphasis on vulnerable road users.

Crashes have to be prevented from leading to fatalities and serious injuries by designing roads, vehicles and transport services in a way that forgives human mistakes on our roads. New road safety approaches need to be brought together cohesively to inform infrastructure design, investment decisions and education initiatives. They must also be consistent with national-level safety strategies and initiatives. These new approaches will need to reconsider how safety is prioritised against other transport outcomes.

Auckland can draw on the experiences of other cities around the world including the emergence of the 'Vision Zero' movement, which aims to eliminate transport-related deaths and serious injuries (see Figure 43 below). Closer to home, we can also learn from what works in health and safety initiatives across other sectors in New Zealand.

Figure 43 Vision Zero

Moving towards Vision Zero (Centre for Active Design, 2017)

The concept of Vision Zero first originated in Sweden in 1997, when the Swedish parliament adopted it as the official road policy. Founded on the belief that loss of life is not an acceptable price to pay for mobility, Vision Zero takes a systems approach to enhancing safety. Rather than exclusively faulting drivers and other users of the transportation system, Vision Zero places the core responsibility for accidents on the overall system design, addressing infrastructure design, vehicle technology, and enforcement.

The approach has led to a dramatic decrease in road deaths and serious injuries – Sweden has one of the lowest annual rates of road deaths in the world (2.7 out of 100,000 (The Economist. 2014) compared to 7 in New Zealand (Ministry of Transport, 2016a)). In addition, pedestrian fatalities have fallen by almost 50 per cent in the last five years.

There is a marked difference between traditional road safety approaches and Vision Zero, as shown below.

	Traditional	Vision Zero
<i>What is the problem?</i>	Accidents	Fatalities and serious injuries
<i>What causes the problem?</i>	Human factors	Humans make mistakes Humans are fragile
<i>Who is responsible?</i>	Individual road users	System designers
<i>What is the ultimate goal?</i>	Optimum number of fatalities and serious injuries	Eliminate fatalities and serious injuries

The public health imperative behind Vision Zero is clear – increasing the safety of our streets not only saves lives, but also makes it easier and more attractive for people to walk and cycle in their daily lives.

4.7.2 Appropriate speed limits

Speed plays a big role in the harm sustained by vulnerable road users. At the default urban speed limit of 50km/hour, there is an 85 per cent likelihood of a person on foot or bicycle being killed in a collision with a motor vehicle (Auckland Council, 2017b). If this collision occurred just 10 km/hour slower, at an impact speed of 40km/hour, this drops dramatically to 30 per cent (WHO, 2004). If that same person were hit at 30km/hour, there would be a 90 per cent chance of survival (Figure 44).

Figure 44 Relationship between speed and risk of fatal injury⁵²



The only radical way to reduce road deaths and serious injuries is to reduce travel speeds. Vision Zero recommends the following maximum travel speeds related to the infrastructure, given best practice in vehicle design and 100 per cent restraint use (Tingball and Haworth, 1999) (Figure 45).

Figure 45 Recommended travel speeds according to Vision Zero best practice⁵³

Type of infrastructure and traffic	Possible travel speed (km/h)
Locations with possible conflicts between pedestrians and cars	30
Intersections with possible side impacts between cars	50
Roads with possible frontal impacts between cars	70
Roads with no possibility of a side impact or frontal impact (only impact with the infrastructure)	100+

Adopting a more gradual and evidence based approach, rather than the current one size fits all one of primarily 50km/hour limits in urban areas and 100km/hour in rural areas, would help ensure our roads are safe places to use. Introducing appropriate speed limits in high-risk locations, particularly residential streets, rural roads and areas with high numbers of pedestrians and cyclists, can drastically reduce road deaths and serious injuries in the event of collision.

⁵² Image sourced from Auckland Council (2017b), Darren Davis on road safety and pork chops. Auckland Design Manual Blog.

⁵³ Chart sourced from Tingball and Haworth (1999), Vision Zero – an ethical approach to safety and mobility

4.7.3 Improving personal safety and security

Enhancing the real and perceived safety of public spaces and public transport hubs will encourage the greater use of public transport, walking and cycling, particularly for groups such as women, seniors, children, and people with disabilities. The use of Crime Prevention through Environmental Design (CPTED) principles can help to improve real and perceived safety by changing the built environment to reduce criminal opportunities and to foster positive social interaction (Auckland Council, 2018).

4.8 Develop a sustainable and resilient transport system (Focus Area 7)

4.8.1 Sustainable transport system

Reducing transport pollutants and greenhouse gas emissions is essential to improving Auckland's air quality, public health, and mitigating the effects of climate change. Low Carbon Auckland, Auckland's Energy Resilience and Low Carbon Action Plan, focuses on four key areas to achieve this goal (Auckland Council, 2014):

- reducing travel demand
- increasing the use of public transport, walking and cycling
- improve transport efficiency to reduce fuel consumption
- move away from the use of fossil fuels.

New ways of reducing environmental harm from transport must be pursued. Vehicle emissions can seriously harm Aucklanders' health, especially through contributing to respiratory diseases, while transport is the largest contributor to Auckland's greenhouse gas emissions. A multi-pronged approach to dramatically reducing greenhouse gas emissions is outlined in the Low Carbon Action Plan. Pollutants and particulate emissions must equally be managed to comply with and exceed national and regional-level air and water quality standards.

Activities on our roading network represent the biggest opportunity to reduce harmful discharges such as copper and zinc into sensitive marine receiving environments from storm water runoff (Auckland Regional Council, 2010b).

The use of low impact design principles is important to better manage the harmful effects of storm water on the transport system and other sources of pollution (Figure 46). This includes measures that reduce development impacts; conserve natural areas (particularly sensitive areas like riparian buffers and unfilterable soils); and reduce site runoff rates by maximising flow paths and infiltration opportunities (Auckland Regional Council, 2000).

Figure 46 Storm water swales illustrates low impact storm water treatment⁵⁴



4.8.2 Resilient transport system

Improving short-term resilience requires expanding travel options so viable alternatives exist in the event of common disruption or damage and reducing their occurrence. This involves providing additional route and mode options to reduce the impact of disruption or damage in one area from having network-wide impacts.

Over the longer term, the transport network's resilience to the effects of climate change, fuel shocks and disruptive technologies will be an ongoing challenge. The future of transport is perhaps more uncertain than it has been for nearly a century, yet we must be proactive in our responses to this uncertainty. Investments need to be robust and provide value for money under a variety of futures to avoid stranded assets or being 'caught out' by rapid change. Improving our resilience to these types of change requires a more adaptive, scenarios-based approach to decision-making.

The Indicative Package in ATAP improves resilience in the following ways (ATAP, 2016k). Firstly, pricing of the road network reduces vehicle kilometres travelled on the road network by about 10 per cent, which could result in less diversion and impact in the event of disruption to the road network. Secondly, there is greater capacity in the public transport network, enabling public transport to take additional people in the case of disruption. Thirdly, the optimisation of technology provides choice and information during a disruption.

⁵⁴ Image sourced from Auckland Regional Council (2010b), Auckland Regional Land Transport Strategy 2010-2040.

5 Stakeholder and Public Feedback

The Transport and Access outcome has been informed by feedback from partners, stakeholders and the public between May 2017 and March 2018. The outcome was also informed by central government priorities as documented in the updated ATAP and the GPS.

5.1.1 Stakeholder engagement 2017

Engagement with partners and stakeholders in 2017 occurred in two phases.

The first phase of engagement occurred between May and Jun 2017. The purpose of this phase was to provide opportunities for early input into the direction of the plan before formal consultation. It helped test whether the identified challenges and proposed direction of the plan were valid.

Table 8 below provides a summary of the feedback received in the first round of engagement.

Table 8 Key stakeholder feedback to Transport and Access outcome from Round 1 of the engagement process

Key areas of feedback

1) Access

- a) There were concerns about the disparities of access to transport networks across the region.
- b) There were also concerns about disparities in access to technology given network constraints, affordability and capability differences.

2) Public transport

- a) There was feedback to focus more on public transport, particularly on creating an integrated all-day network that is punctual and reliable; considering inter-regional connectivity; and improving safety and affordability.

3) Safety

- a) The need to improve safety was raised in a number of areas (e.g. on rural roads, through more pedestrian-only spaces and by generally decreasing road accidents (i.e. Vision Zero).

4) Supporting infrastructure

- a) There was feedback on the need to have a wider range of supporting infrastructure (e.g. park and rides, wifi on public transport, and bike share programmes).
- b) There was feedback on the need to use technology to improve transport performance.

5) Funding

- a) There were concerns about how transport infrastructure would be funded and how the funding gap would be addressed.

6) Resilience

- a) There was interest in more innovation in the transport space (i.e. using green fuels) and further exploration of how to deal with disruptive technological changes.
- b) There was feedback on the need to incentivise emissions reduction as well as addressing private vehicle dependency.

The second phase of engagement occurred between July and October 2017. The key purpose of this phase of engagement was to:

- continue the conversation on Auckland's long-term future
- tell the story of what has changed since the first plan was adopted in 2012, seek early feedback and any additional perspectives from the stakeholders
- share evidence and identify challenges and future direction
- seek input into the drafting of the plan
- recognise the critical implementation and partnering role the stakeholders will play.

Table 9 below provides a summary of the feedback received in the second round of engagement. It groups the feedback received into nine broad themes and summarises some of the changes to the document made because of that feedback.

In general, there was a good deal of support for the proposed directions in the Transport and Access chapter, although a number of specific suggestions for change to some of the details were put forward.

A mix of feedback was received on the overall vision set out in the chapter. While most feedback was supportive of a strong focus on public and active transport, with several stakeholders urging an even bolder approach in this regard, a minority of respondents suggested the focus of the chapter needed to better reflect the likelihood that the private vehicle will still provide for most trips in Auckland over the course of the next 30 years. However, on the balance of feedback, and because of direction provided by the Planning Committee, the changes made to the chapter since the targeted consultation took place by and large strengthened the focus on public transport to improve accessibility, transport choice and in support of a quality urban form.

Of the other feedback themes listed below the most change to the document was in relation to rural transport and inter-regional connectivity. The need to better differentiate between the transport needs of rural and urban areas was a consistent theme of stakeholder feedback and several changes to the text were made because of this, particularly in the safety and transport choice focus areas. References in several places within the document to the importance of inter-regional connectivity, through improved road and rail connections, were also strengthened partially in response to feedback received.

Table 9 Key stakeholder feedback and resulting changes to Transport and Access outcome from Round 2 of the engagement process

Key areas of feedback	Key changes because of feedback
<p>1) Strategic alignment & vision</p> <ul style="list-style-type: none"> a) Need for more overt alignment with ATAP, specifically by way of the strategic directions and key challenges. b) Differences in feedback as to whether the narrative is too bold on public transport, not bold enough or just right. c) Need for more evidence on some key statements (e.g. that more travel choice necessarily offers poorer areas lower cost travel options). 	<ul style="list-style-type: none"> a) We have strengthened references to ATAP, with a side bar now specifically devoted to it including listing the key challenges. ATAP directions are reflected in the focus areas rather than the strategic directions as they are more about how we do things rather than where we want to be in 30 years. b) Clear direction provided by planning committee that early version of the draft was not bold enough on public transport, providing a 30 year vision and active transport. Multiple changes were made to the tone and content of the document in response to this feedback including, for example, inclusion of references to vision zero in respect of road safety, bolder language on improved travel choice, and more emphasis on transport’s key role in place making. c) Some additions (particularly around safety) but generally questions of detailed evidence to be addressed in supporting documents (such as this evidence report) rather than the narrative itself.
<p>2) Access to opportunities</p> <ul style="list-style-type: none"> a) Lots of feedback agreeing improved access to opportunities is important for all Aucklanders. b) Several stakeholders talked about disparities in access on basis of geographic areas, on socio-economic grounds, disabled, elderly. c) More local employment cited a few times as best means of improving access to opportunities and reducing need to travel. d) Several items of feedback related to specific pieces of infrastructure or transport services to address specific accessibility issues. 	<ul style="list-style-type: none"> a) No response required b) References to reducing these disparities, including universal design, have been strengthened in the current narrative. c) Text acknowledges need for local jobs, but this must be balanced against tendency for employment (particularly high skilled jobs) to cluster in centres and the agglomeration benefits this can generate. d) Given its high-level nature and 30 year focus the narrative does not typically make reference to specific examples of transport infrastructure (with a few exceptions – generally elements of the strategic transport network).

Key areas of feedback	Key changes because of feedback
<p>3) Active transport / Balancing movement and place</p> <ul style="list-style-type: none"> a) Most feedback supportive of increased focus on walking and cycling. b) Request to strengthen link between active transport and better health c) Several references to need to make cycling and walking safer d) Concern from one stakeholder that references to streets as public spaces risked underplaying their primary function – to enable the movement of people. e) Request that local boards be empowered to play a stronger role in local transport and place making decisions. 	<ul style="list-style-type: none"> a) No response required. b) Accepted – narrative updated, including cycling case study. c) Accepted – throughout the narrative there is now a strong emphasis on the need to improve safety (most notably Focus Areas 4 and 5), including the need to ensure that street design reflects appropriate balance between movement and place. d) References to streets as public places amended rather than removed. e) This is a governance matter and beyond the scope of the narrative.
<p>4) Impact of technology on transport</p> <ul style="list-style-type: none"> a) Several suggestions that this section was weak, need for more targeted narrative. b) Suggestions for specific technologies to be mentioned. c) Smarter pricing – competing feedback received – remove reference to smarter pricing as it is not yet confirmed vs it will be an essential tool for travel demand management in the future and needs to be emphasised. 	<ul style="list-style-type: none"> a) Agreed – narrative has now been strengthened, particularly in terms of the potential benefits of new technology and with more specific references to Auckland. b) Generally not appropriate to mention specific technology given 30 year focus and inherent uncertainty. c) ATAP talks about progressive move to smarter pricing, so the reference in the narrative has been retained.
<p>5) Inter-regional connections</p> <ul style="list-style-type: none"> a) Several submitters suggested that more emphasis was required in the narrative on the importance of inter-regional links and the need to manage the upper North Island as an integrated whole from a transport point of view. b) Several stakeholders made particular mention of the need for better rail connections with neighbouring regions. 	<ul style="list-style-type: none"> a) References to inter-regional connections in the narrative have been strengthened. b) Reference to inter-regional connectivity mentions all modes, nothing specific about rail. However, an attachment to the narrative considers the possibility of regional commuter rail links to the Waikato and Bay of Plenty.

Key areas of feedback	Key changes because of feedback
<p>6) Māori impact</p> <p>a) Feedback received that the section on quality place-making in the narrative (Focus Area 5) needs to reference the importance of incorporating Māori design principles not only to support quality outcomes, but also to emphasise Auckland's unique point of difference.</p>	<p>a) Changes made to the text to include this reference. The narrative now also links to Te Aranga Design Principles</p>
<p>7) Minimise harm</p> <p>a) Some suggestion that the wording around network safety needed to be reconsidered as it may have significant funding implications (note that other submitters supported a Vision Zero approach).</p> <p>b) Several requests for wording in Focus Area 6 to emphasise importance of safety on rural road networks.</p>	<p>a) Not accepted – the whole thrust of narrative on safety is that we need to reverse recent increase in deaths and serious injuries. Funding decisions are a key part of prioritising safety.</p> <p>b) Narrative now includes references to safety on rural roads.</p>
<p>8) Rural</p> <p>a) Several pieces of feedback that the chapter is not nuanced enough to recognise differences between rural and urban areas, particularly in terms of travel choice, safety and connectivity.</p>	<p>a) Accepted – we have amended text at a number of points in the text to better make this differentiation.</p>
<p>9) Travel choice</p> <p>a) Lots of feedback supporting focus on improving travel choice particularly public transport, walking and cycling.</p> <p>b) Some feedback that we need to make stronger reference to role of ferries.</p> <p>c) Role of public transport in rural areas – some feedback that while the text should acknowledge the need to improve travel choice in rural areas it should also recognise that the level of service for public transport in rural areas will not be as high as in urban core.</p>	<p>a) Subsequent changes to text have further strengthened references to need for better travel choices across Auckland</p> <p>b) Partially accepted – we have inserted two references to ferries as part of an integrated public transport network. However, the role of ferries is not strongly emphasised in the narrative. While ferries provide a valuable niche service serving specific areas, they are generally not part of the strategic public transport network (aside from the Devonport to the City route).</p> <p>c) Agreed – text now nuanced in several places to recognise differences between rural and urban areas in terms of travel choice.</p>

5.1.2 Public and stakeholder engagement 2018

Auckland Council's Planning Committee approved the draft Auckland Plan 2050 for consultation. Formal consultation on the draft plan took place from 28 February to 28 March 2018, alongside the draft 10-year Budget. The material to support consultation was available online and in libraries, service centres and local board offices. It included a combined Auckland Plan 2050 and 10-year Budget consultation document, the draft Auckland Plan website (the digital plan), an overview document with translations, and full print versions of the whole draft plan.

The consultation document contained the following statement and question on the Transport and Access outcome:

People lack choice in how they get around and it can take a long time to get where they need to go. To better connect people and places, the Auckland Plan proposes an integrated transport system that accelerates progress on walking, cycling and public transport and makes better use of existing networks.

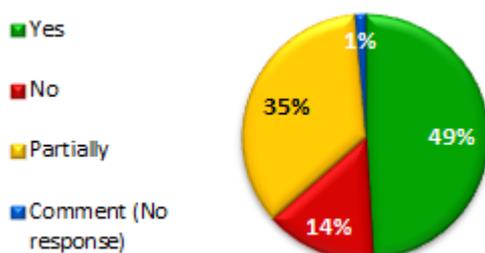
Do you think the seven focus areas identified in Transport and Access will achieve this?

Feedback was received on the consultation question as well as more generally on the content within the draft plan, via a range of channels:

- Public submissions – Provided in writing (including via an online feedback form) in person (over 50 Have Your Say events) and via social media.
- Stakeholder feedback – Feedback from CCOs (ATEED, Auckland Transport, COMET Auckland and Panuku) and other key stakeholders (e.g. Council advisory panels, advocacy groups and health providers).

Public submissions

There was strong public engagement with the Transport and Access outcome, as evidenced by the high number of public submissions received through a variety of channels during the March 2018 Have Your Say combined consultation process. Across the 15,821 written submissions that responded to the Transport and Access question, 49 per cent agreed with the focus areas proposed in the draft Auckland Plan, 35 per cent partially agreed and 14 per cent did not agree, and 1 per cent provided commentary relating to the consultation question but did not tick one of the yes/no/partial boxes.



In addition to the written submissions, there were 530 comments provided in-person.

32 per cent agreed with the focus areas proposed in the draft Auckland Plan, 14 per cent partially agreed, 12 per cent did not agree, and 41 per cent provided commentary relating to the consultation question but did not use the yes/no/partial categorisation.

The areas that received the highest levels of feedback were:

- overall transport vision
- public transport network
- road network
- cycling and walking
- harm reduction

Table 10 below further elaborates on the submissions under these key themes.

CCO and key stakeholder feedback

Council-controlled organisations (CCO) which provided feedback to the Transport and Access outcome include Auckland Tourism, Events and Economic Development (ATEED), Auckland Transport, Panuku Development Auckland and COMET Auckland.

In general, there was high level support for the Transport and Access outcome from each CCO, with some minor recommendations, mostly from Auckland Transport. The key themes were around the need to:

- make specific language improvements to the text to simplify and clarify the outcome
- link targets to the available investment if targets were to be used
- consider the potential unintended consequences of transport technologies
- refer to transport's role in facilitating economic growth through enabling density and agglomeration
- beef up references to parking policies and freight management
- reassess some of the maps used in the outcome.

A number of key stakeholders provided feedback to the Transport and Access outcome, including the Auckland Council Seniors Panel and Youth Advisory Panel, Greater Auckland, NZ Automobile Association, Te Whanau o Waipareira Trust and the Auckland Regional Public Health Services.

The key themes which emerged from the key stakeholder submissions were around the need to:

- promote safe transport that is free from discrimination and harassment, particularly for more vulnerable groups of people including seniors, people with disabilities, people from the rainbow community, and women
- prioritise design that is accessible for all ages and abilities, including references to universal design and the accessible journey
- promote the health benefits of active transport, including providing quality walking and cycling infrastructure in areas of high socioeconomic deprivation
- include the use of targets, particularly around Vision Zero, transport emissions and transport mode shares

- place greater emphasis on congestion management within the Transport and Access outcome.

Table 10 below provides an overview of the key feedback themes received and responses provided, including changes that were made to more closely align the Auckland Plan with new government priorities (see section 5.1.3 below).

Table 10 Key themes of the submissions received and changes made as a result

Key themes	Feedback and response
1) Overall transport vision	<p>Feedback</p> <ul style="list-style-type: none"> • Support for the general shift from cars to public transport, walking and cycling but a request for more ambition in making these more attractive choices. • Make better use of our existing transport networks before investing in new infrastructure. <p>Response</p> <ul style="list-style-type: none"> • Place greater emphasis on safety and reducing the environmental impact of transport as prioritised in ATAP. • Provide more detail on how we might make better use of existing networks, i.e. greater emphasis on network optimisation as prioritised in ATAP.
2) Public transport network	<p>Feedback</p> <ul style="list-style-type: none"> • Support for faster, cheaper and more frequent and reliable public transport. • Seeking more park and rides, highlighting the importance of public transport being affordable, and for public transport to be improved in the outer suburbs. <p>Response</p> <ul style="list-style-type: none"> • Include reference to public transport affordability and park and rides. • Place greater emphasis on the rapid transit network, as prioritised in ATAP. • Be more explicit about why there needs to be a focus on improving public transport to busy locations like the city centre, metropolitan centres and other major employment areas like Auckland Airport.
3) Road network	<p>Feedback</p> <ul style="list-style-type: none"> • Support for more and better roads, maximising traffic flow for cars, including not allocating any more road space to other uses such as cycle and bus lanes. • Invest more in public transport and stop building roads. • Greater recognition of the impact of congestion. <p>Response</p> <ul style="list-style-type: none"> • Reference impacts of congestion on Aucklanders' quality of life.
4) Cycling and walking	<p>Feedback</p> <ul style="list-style-type: none"> • Support for safer and more accessible cycling infrastructure to encourage more Aucklanders to cycle

	<ul style="list-style-type: none"> Views that cycling is not a suitable option for most Aucklanders. <p>Response</p> <ul style="list-style-type: none"> Reference the greater safety risks that cyclists, motorcyclists and pedestrians face, and emphasise there will be ongoing improvements to safety and accessibility of Auckland's cycling network. The Cycling Programme Business Case shows that Auckland is not more hilly or rainy compared to other cities with higher cycling mode share (e.g. Vancouver and Seattle).
5) Harm reduction	<p>Feedback</p> <ul style="list-style-type: none"> Support for the move towards Vision Zero although some views that zero deaths is unrealistic. Support shift towards public and active transport as means to reduce transport emissions. Greater recognition of personal safety and security risks of transport, including how these affect some groups (e.g. women, older people, younger people) more than others. <p>Response</p> <ul style="list-style-type: none"> Broaden concept of safety by replacing reference to road safety with transport safety, emphasising importance of personal safety and security.

5.1.3 New government priorities

The updated ATAP (see sections 2.2.1 and 4.3.3) and GPS (see section 2.2.2) outline the transport priorities of the Government. These documents place a greater weight on public transport (especially rapid transit), walking and cycling, improving safety, and realising environmental, health and growth outcomes.

The following changes are made to the Transport and Access outcome to better reflect central government priorities as expressed in ATAP and the GPS:

- greater emphasis placed on Auckland's rapid transit network, which is referenced in both ATAP and the GPS as a key priority, especially in terms of shaping Auckland's urban form
- greater emphasis on network optimisation to reflect the substantial increase in investment into network optimisation in ATAP
- greater emphasis on mode neutrality, (i.e. using "the best tool for the job") to reflect the government's approach that is articulated in the GPS
- greater emphasis on street design that creates vibrant and inviting places to reflect the government's priorities as articulated in ATAP and the GPS
- greater emphasis on the broader harms of transport to health, including personal security while travelling, to reflect the broader definition of safety in the GPS.

6 Conclusion

The previous sections of this report have explained the context, evidence base and key stakeholder feedback that have shaped the Transport and Access outcome of the Auckland Plan. This has informed the three directions and seven focus areas for the Transport and Access outcome, which are set out in this section.

Outcome

Access to opportunities is the most important outcome in Auckland’s transport system to achieve our vision for the city. Being able to easily reach the things that matter to Aucklanders, such as employment, education, community and services, is vital for Aucklanders to lead successful and enjoyable lives. Section 1.2 expands on this outcome.

Directions

To achieve the outcome of providing Aucklanders with access to opportunities, three directions are to be followed.

Direction 1: Better connect people, places, goods and services
A transport system that provides reliable, convenient, affordable and efficient travel is a pre-requisite for an accessible Auckland (Section 3.2). To achieve this, the entire transport system must be managed and developed as an integrated whole, across different networks (arterial roads, rail, motorways, local streets) and modes (private vehicle, public transport, walking and cycling). Addressing the sub-regional differences in employment accessibility, particularly in the south and west, is crucial to ensure all Aucklanders can prosper, and existing inequalities are not exacerbated. (Section 3.3).
Direction 2: Increase genuine travel choices for a healthy, vibrant and equitable Auckland
Despite recent progress, many Aucklanders still lack access to attractive, reliable, safe and affordable travel choices, leading to an ongoing dependence on private vehicles (Section 3.4). Of particular concern is that many of the more deprived parts of Auckland have the poorest choice of travel options (Section 3.6). Our reliance on private motor vehicles also impacts negatively on our public health (Section 3.7). Improving travel choices is key to enabling people to use the option that works best for their particular circumstances. Supporting healthy, vibrant and liveable communities also requires transformational change to the way we design and manage our transport network (Section 3.5).
Direction 3: Maximise safety and environmental protection
Moving people and goods around Auckland currently creates unacceptable harm to people (Sections 3.7 and 3.8) and the environment (Section 3.9). While some progress has been made over recent decades, particularly as vehicles have become cleaner and safer, transformational change is still required to reduce these impacts.

Focus Areas

The seven focus areas below outline how different interventions will help to achieve the three directions listed above, to meet the outcome sought for Auckland's transport system.

Focus Area 1: Make better use of existing transport networks
The majority of Auckland's likely future transport network already exists. While investment in new infrastructure will increase over time the existing network will need to accommodate much of the growth in travel demand over coming decades. Getting more out of what we already have is therefore essential, including a fundamental shift towards incentivising more efficient travel patterns. Sections 4.2 expands on this focus area.
Focus Area 2: Target new transport investment to the most significant challenges
Given the scale of the challenges Auckland faces, it is critical that we adopt robust and transparent processes to ensure that investment targets the most pressing issues and contributes to important strategic goals. Ongoing Auckland-wide strategic planning and strong processes to determine the right timing and sequencing of new infrastructure are particularly important. Where it makes sense, small-scale interventions that delay larger-scale investments must be investigated. Section 4.3 expands on this focus area.
Focus Area 3: Maximise the benefits from transport technology
We are on the cusp of a paradigm shift in transport technology. Emerging transport and related technology has the potential to significantly improve access over the next 30 years. These developments could enable much more efficient use of existing transport infrastructure, vehicles and services and better value for money from future infrastructure and service investments. However, there remains considerable uncertainty around the timing, rate of uptake and real-world impacts of these technologies. Section 4.4 expands on this focus area.
Focus Area 4: Make walking, cycling and public transport preferred choices for many more Aucklanders
Most Aucklanders, particularly in urban areas, have some form of public transport service and could theoretically walk or cycle for their travel needs. However, frequently these options are currently unattractive because they are too slow, too unsafe, too unreliable or too inconvenient to meet travel requirements. Increasing the share of travel by public transport will deliver the greatest benefits along high-demand corridors serving locations of intensive land-use, such as the city centre, metropolitan centres and town centres. The combination of people, vehicles and activities in these locations creates the need to shift more people in fewer vehicles and less space. Section 4.5 expands on this focus area.
Focus Area 5: Better integrate land-use and transport

Transport infrastructure and services are key ingredients for enabling and supporting growth in both new and existing urban areas. Furthermore, the planning and design of transport improvements must support a quality and vibrant urban form. Strong integration between land-use and transport decisions is required, particularly to encourage housing and business growth in areas with more travel options, and to encourage employment and living in the same areas to reduce commute distances. Section 4.6 expands on this focus area.

Focus Area 6: Move to a safe transport network free from death and serious injury

For most of the past 30 years, there have been substantial reductions in road-related deaths and serious injury despite a growing population and total travel. However in recent years, these trends have reversed, suggesting previous initiatives are not as effective as they were in the past. To reverse this trend and move to a network increasingly free from death and serious injury, we need new road safety approaches, including a greater emphasis on vulnerable road users. Section 4.7 expands on this focus area.

Focus Area 7: Develop a sustainable and resilient transport system

Reducing transport pollutants and greenhouse gas emissions is essential to improving Auckland's air quality, public health, and mitigating the effects of climate change. Section 4.8 expands on this focus area.

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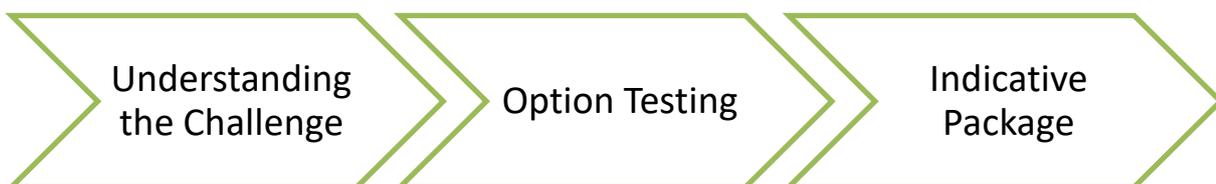
Appendix A – Auckland Transport Alignment Project

This section details the technical analyses undertaken in the Auckland Transport Alignment Project (ATAP), which led to the recommended strategic approach to address Auckland’s transport challenges over the next 30 years (see diagram below).



Specific ATAP reports are referenced throughout this section where relevant, but of particular importance are the ATAP Supporting Information Report (ATAP, 2016k) and the ATAP Evaluation Report (ATAP, 2016d).

The ATAP process was undertaken in three phases and sought to find the best mix of interventions to address Auckland’s transport challenges. The different steps of this process are shown in the diagram below:



Two main strategic transport models were used for much of ATAP’s technical analysis.

- The Auckland Regional Transport Model (ART3) provides regional outputs on private vehicle use and public transport trips. It also provides an indication of the likely changes to vehicle volumes and speeds on each major road and public transport route in the city.
- The Auckland Public Transport Model (APT3) provides more detailed information on public transport use resulting from infrastructure and service changes.

Each strategic modelling tool has strengths and weaknesses. Both tools, particularly ART3, are strongest at a 'high' regional level - rather than for providing detailed information at a 'street by street' level. Furthermore, utilising the APT3 model is necessary to simulate the impacts of public transport capacity constraints, as the capacity of buses, trains and ferries is not constrained in the ART3 model.

Strategic transport modelling was supplemented in ATAP with other information to inform decision-making. These “specialist reports” are published on the Ministry of Transport website (Ministry of Transport, 2017a) and are referred to in this section where relevant.

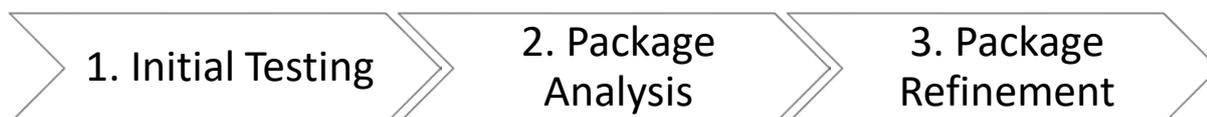
The table below shows the transport modelling tests undertaken at different stages of the project. In addition, various 'baselines' were used in each phase to help gain an understanding of the impact of the interventions tested.

Project Phase	Stage	Packages Tested	Pricing tests	Other tests
Understanding the Challenge		Auckland Plan Transport Network (APTN)		
Option Testing	Initial Testing (Round 1)	Individual project testing (particularly new ideas)	CBD cordon Motorway charge Peak/off-peak network charge	
	Package Development (Round 2)	'Capacity Constraints' package 'Employment Centres' package 'Smarter Pricing' package	"Smarter pricing" package tested a full network charge varying by time, location and route	Scenario tests: effect of connected vehicles, and effect of higher vehicle occupancy Test of new strategic corridor (eastern corridor)
	Refined Packages (Round 3)	'Higher Investment' package 'Influence Demand' package	Different pricing levels	Scenario tests: effect of higher population growth rate
Refinement & Prioritisation	Final Indicative Package	'Indicative Package'		

Model results were produced for 2026, 2036 and 2046. The results for these years are indicative of the conditions that are expected to prevail towards the end of each of the three decades under review (2018-28, 2028-38, and 2038-48).

Strategy options analysis

As detailed above, ATAP undertook a comprehensive options analysis process as part of developing its recommended strategic approach and associated package of interventions. This three step process is summarised in the diagram below:



Key relevant findings of the three phases are briefly discussed in this section with substantially more information available in the ATAP Supporting Information (ATAP, 2016k) and ATAP Evaluation reports (ATAP, 2016d).

Initial testing

There were four elements of this phase of ATAP's analysis:

- Testing possible project interventions (e.g. motorway widening, new roads, new public transport projects, accelerating or delaying planned investments etc.)
- Testing three initial pricing schemes (a city centre cordon, a motorway network charge and a whole of network scheme) (ATAP, 2016b)
- Testing the impact of developing transport technologies on vehicle occupancy rates and road lane throughput.
- Testing the impact and cost-effectiveness of a major new strategic roading corridor through eastern Auckland.

Key findings from each element of this analysis are included in the table below:

Phase 1 Test	Key findings
Project interventions	<ul style="list-style-type: none"> • Most interventions tested were carried forward to subsequent stages of the project. • Some projects were not carried forward (e.g. Karaka-Weymouth connection, rail station closures, public transport fare adjustments) • Warkworth-Wellsford project not considered further as part of ATAP as it related to inter-regional issues.
Initial pricing schemes	<ul style="list-style-type: none"> • Whole of network scheme had by far the biggest impact, but needed substantial refinement to avoid unfair cost impacts. • City centre cordon scheme had very localised benefits but could play a useful transition role to a broader scheme. • Motorway network charge generated large-scale diversion of traffic to local roads but could be merged with a network scheme to minimise these impacts.

Phase 1 Test	Key findings
Developing transport technologies	<ul style="list-style-type: none"> • Testing of developing transport technologies highlighted their potential for transformative impacts on network performance. • However, the testing methodology and the assumptions made as part of this testing were highly speculative, reflecting substantial uncertainty about real world impacts of new technology.
Eastern Strategic Roading Corridor	<ul style="list-style-type: none"> • A specific report was prepared by ATAP consultants on the impact of this potential project (ATAP, 2016c). • The analysis suggested potentially large impacts on network performance, but the project's extremely high cost meant it would almost certainly provide poor value for money.

These findings informed phase two of the testing process.

Package analysis

This phase of the analysis focused on two key tasks and informed the *Interim Report* (ATAP, 2016g) that was published in June 2016.

- Understanding the impact of changing the mix of investment (but not the level of investment) from previous plans on transport network performance.
- Refining the road pricing options analysed in the previous phase

Key findings from this work are included in the table below:

Phase 2 Test	Key findings
Changing the mix of investment	<ul style="list-style-type: none"> • Minor to moderate improvements in network performance were possible through changing the mix of investment. However, a step-change was not possible despite testing a fairly wide range of options. • Sub-regional improvements suggested merit in continuing to optimise the timing and priority of investments, particularly in addressing access challenges in the west and south.

Phase 2 Test	Key findings
Refined smarter pricing schemes	<ul style="list-style-type: none"> • Pricing offers the potential to achieve a step-change in transport network performance and should therefore form a core part of the strategic approach. • However, setting prices at the right levels is extremely challenging as performance improvement, travel time savings and increased travel costs need to be carefully balanced. • While some further work was undertaken to assess different pricing levels, much more sophisticated analytical tools will be required to undertake this work before implementation can occur.

Package refinement

In this phase of the analysis two refined packages of interventions were developed and tested.

- higher investment – this package tested a higher level of investment than under current plans, particularly in the first decade
- influence demand – this package included a refined pricing scheme and accompanying investment

Key findings from the analysis were:

- additional investment in the first decade did not appear to improve performance against the project objectives at a regional level, but some of these extra investments did have some important sub-regional effects. Therefore, development of the final package should adopt a more targeted approach to identifying early priorities which both align with the project objectives and appear likely to deliver value for money (refer to next section)
- the introduction of smarter pricing in the Influence Demand package has the most significant impacts on the project objectives, but unclear net benefits to users that would require more detailed analysis
- because of its significantly better performance against the project objectives, Influence Demand should form the base of the final package.

These findings highlighted the importance of carefully targeting investment at the most significant challenges as well as the need for smarter pricing to play a fundamental role in Auckland's future transport strategy (while also requiring substantial further investigation). Both these findings formed crucial parts of the overall ATAP strategic approach and substantially informed the Auckland Plan 2050's focus areas, especially Focus Area 1 (Make better use of existing networks, including an increase focus on influencing travel demand) and Focus Area 2 (Target investment to the most significant challenges).

