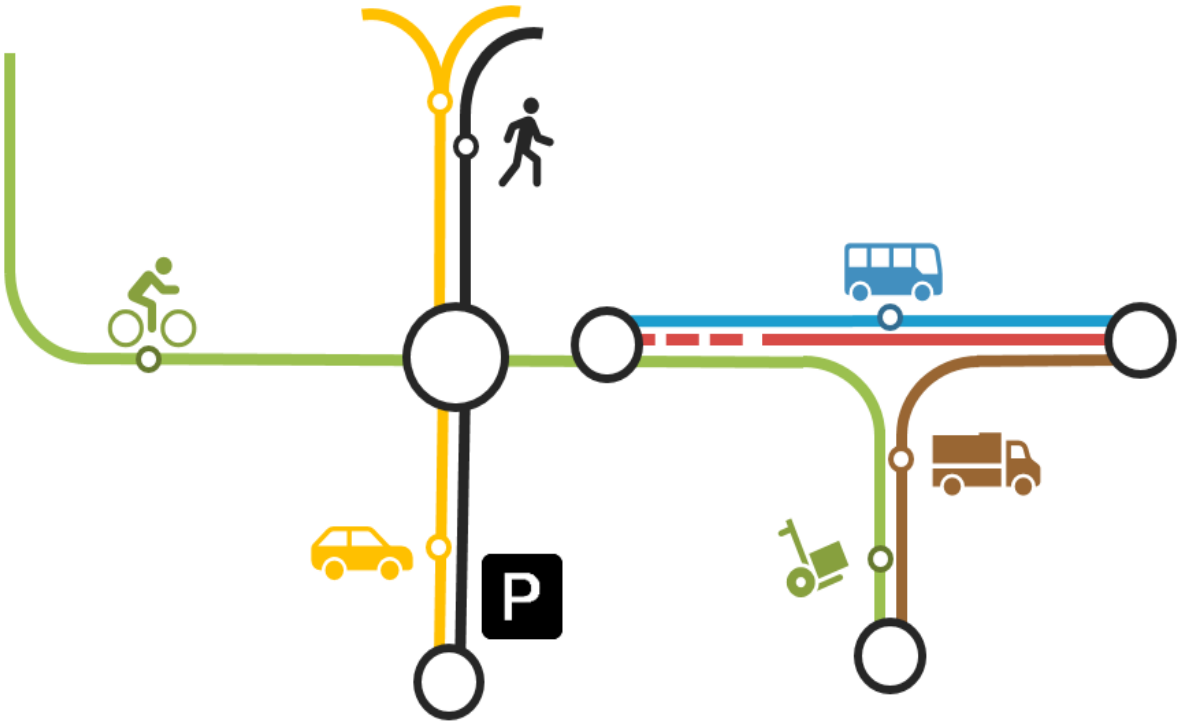
Auckland Region Transport Strategic Case 2021-2031

Future Connect | RLTP | ATAP



FINAL

WAKA KOTAHI NZ TRANSPORT AGENCY

Auckland Council
Te Kaunihera o Tāmaki Makaurau

Auckland Transport
An Auckland Council Organisation

Document Control History and Approval

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Disclaimers

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EXECUTIVE SUMMARY

Introduction and Purpose

This Auckland Region Transport Strategic Case is a technical background document outlining the problems and opportunities facing Auckland's transport system. Its development informed the Regional Land Transport Plan 2021-31 (RLTP) investment programme. It is intended to inform, but also streamline the work necessary for subsequent business cases stemming from the RLTP by providing a common starting point.

The Strategic Case updates and elaborates on partner's strategic objectives, and provides the problem statements and investment objectives that guided the initial stages of the Future Connect (FC), Auckland Transport Alignment Project (ATAP) and the RLTP development process. It documents transport problems and opportunities on a regional scale, assisting in the alignment of transport planning and investment. This includes developing an investment story that:

- outlines the transport problems, with supporting evidence
- explains the benefits of addressing these problems (outcomes)
- provides the rationale for transport investment for the benefit of all Aucklanders.

Ultimately, the purpose of the strategic case is to outline the challenges that need to be addressed by Auckland's transport plans and specific project business case – but it does not go into solutions. Consequently, the information presented in this business case presents these challenges before the impact of investment through ATAP, the RLTP or specific projects and shouldn't be seen as reflecting on the outcomes from these later documents.

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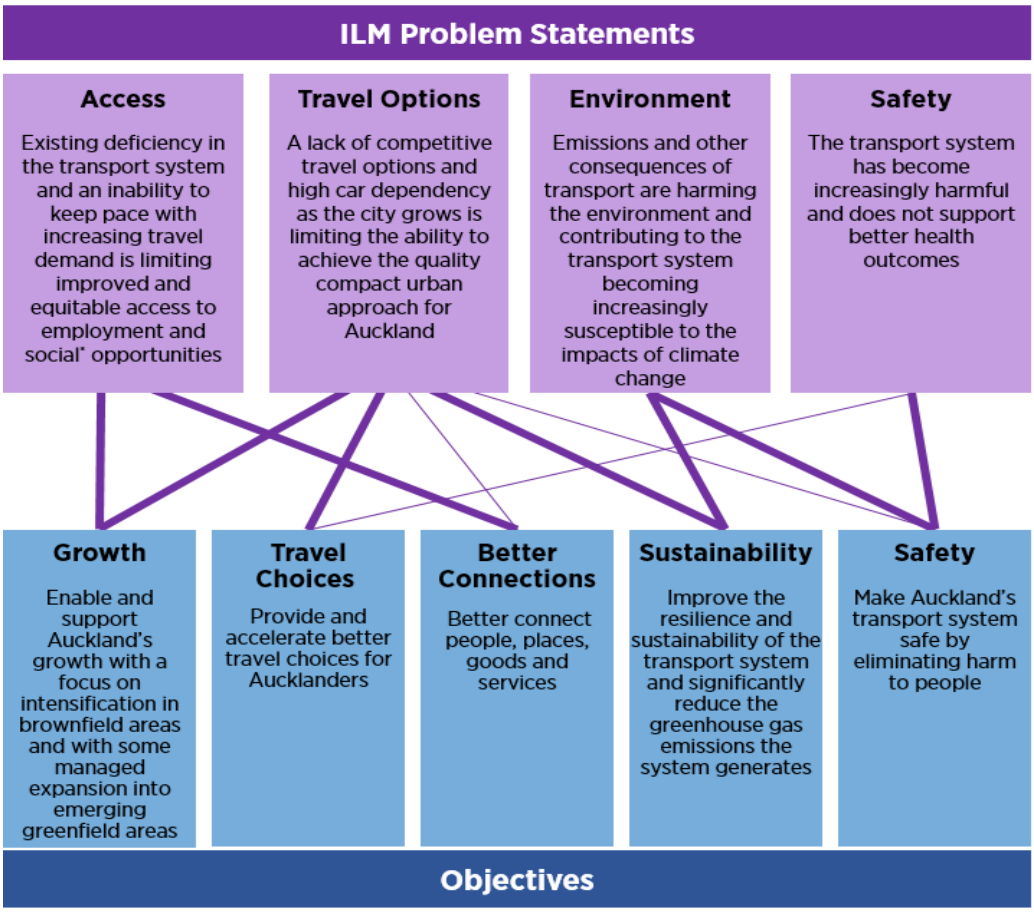
Problems and Opportunities Assessment Summary

Working closely with partners, and within the wider policy context, the Strategic Case was developed based on an Investment Logic Map (ILM) process resulting in the four main overarching problem areas below. The Objectives were finalised through partner processes.



Evidence

The following provides a summary of the evidence underpinning each problem area – the details and evidence supporting these statements can be found within sections 2.1 and 3.4.

As noted, these problems are based on the assumption of a 'do minimum' type scenario and therefore do not take into account the benefit of further investment through the 2021-31 RLTP or other policy interventions.

Geography

Auckland is New Zealand's largest urban area, having developed historically through outward expansion over a discontinuous topography and waterways. This makes the integration of land use and transport more challenging at a regional scale.

Auckland lies at the heart of the north island economy necessitating good connections to other regions and internationally.

As parts of Auckland intensify over time, achieving quality compact city ideals is made more difficult by dependence on car travel which is generally more space intensive, especially when public transport and active modes could provide adequate access. Unfortunately, the gradual trend of growth away from more central locations into outer areas that are harder to serve with PT risks driving increased reliance on car travel.

Population

Auckland is forecast to experience strong population growth over the next decade, leading to a forecast increase in overall travel demand. Despite the impact of COVID-19 in the short term, full economic recovery is expected by 2025. This will result in sections of the strategic road networks being more severely congested over the next decade, with a consequent impact on freight and other

trip types that depend on private vehicle movement. This is despite the significant investment in road and public transport over the last 15 years, and strong PT patronage growth (pre-COVID) over the last 5 years.

Emissions and car dependency

Auckland Council has declared a climate emergency. A transport system that is built on fossil fuel powered car dependence generates more greenhouse gas emissions, which drives negative climate change impacts. A historic lack of integrated transport and land use development limits opportunities for viable high-quality PT systems and active mode choices. 80% of all the on-road transport greenhouse gas emissions is produced by cars and light commercial vehicles. Despite improving fuel efficiency and increasing PT use, CO_2 emissions have been increasing as a result of economic and population growth.

Looking forward, increased travel by internal combustion engine vehicles as a result of population growth will see continued increases in Auckland's transport greenhouse gas emissions. Without substantial and effective action, Auckland's transport system will fall far short of the reductions needed to minimise the impact of climate change – for example the 64% reduction included in Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan.

Incentivising movement to low-emission vehicles, reducing the need for private vehicle travel and improving the attractiveness of sustainable alternatives to ensure mode change are vital to achieving overall climate change goals and supporting a more integrated urban form. Recent market research suggests Aucklanders are open to alternatives, including electric vehicles as a key to reducing emissions, and especially PT if better choices were available[1].

The impacts of climate change such as more severe storms, landslides, and sea level rise, will result in more frequent disruption of transport operations and damage to infrastructure. Without preventative action, this will undermine the resilience of the transport system, lead to increased costs and ultimately impact the economy.

Employment and social access

Without investment, significant increases in congestion and increasing travel times will limit improvements in access to employment. This, in turn, will limit the size of the available labour force and limit the returns to scale that Auckland could otherwise expect from population growth.

There are also significant variations in access to employment across Auckland, reflecting both transport issues and the underlying patterns of job location. In general, access to employment declines as distance from the city centre increases. The isthmus has a high level of access reflecting its location between the city centre and key employment centres in the south. The inner south is well served by private vehicle access, but significantly less by public transport. The North Shore has relatively strong public transport access and is the only place in Auckland where this exceeds access by private vehicle. Meanwhile the west has poor access to employment by both car and public transport, partially reflecting the limited employment in the area.

Some areas of socio-economic deprivation that require affordable transport are not well serviced by PT services, especially south of the isthmus, Point England and pockets out west. On the positive side, access to essential social destinations such as primary schools and doctors are typically better distributed within urban areas than employment.

Travel Time Reliability

Current travel time reliability on bus and general traffic networks is low, with Auckland experiencing travel time delays amongst the worst in Australasian cities. This undermines the attractiveness of PT and increases the cost of moving freight.

Public Transport

PT is not yet a competitive alternative to the private vehicle for most trips for most Aucklanders. The exception is the city centre and fringe, where the combination of higher service-frequencies, rapid transit options, higher parking prices and congestion for car users mean that public transport is

[1] Source: Understanding Aucklanders attitudes towards climate change in a Transport Context, June 2021, AT Market Insights

competitive for many trips. Outside of these areas, around 80% of trips to major employment areas are made by car. PT mode share is however significant for commuting in parts of Auckland where PT services have priority (a separate right of way in rail and ferry services or significant bus priority). Achieving mode shift out of peak hours in Auckland is more difficult due to dispersed trip patterns, less traffic congestion and abundant cheap parking.

A recent survey revealed that for Aucklanders by far the most important priority for short term investment is a more reliable, frequent and better connected PT system[2].

Active Modes

For shorter trips it is noteworthy that increases in cycling commuting in central city areas has occurred where safe separated infrastructure has been introduced. Overall however, cycling and micromobility mode share is still currently low. The design of infrastructure and the transport system creates barriers which reduces people's willingness to walk or cycle (e.g. safety concerns). This contributes to low levels of physical activity and poorer human health outcomes. Increased commitment to providing facilities for active modes over the coming years is anticipated to increase active mode share significantly.

Safety

Auckland has a transport safety problem. The transport system harms people directly through crashes increasing deaths and serious injuries, or indirectly through the air and noise pollution it produces. Safety risks are higher for an individual car-based transport system rather than utilising public transport systems to move the same number of people. To respond to the safety challenge, Auckland Transport and its partners have adopted a Vision Zero approach, which states that no death or serious in injury on the transport system is acceptable. However, there are many challenges to achieving this vision. A number of key safety issues, such red light running highlighted by a recent survey of Aucklanders[3], can only be addressed effectively through a partnership approach.

The most significant factors contributing to DSIs in Auckland are excessive vehicle speed, drug / alcohol abuse and failure to use seatbelts. This is exacerbated by some unsafe road and intersection layouts, and insufficient safe pedestrian crossings and cycleways. Vulnerable user groups such as cyclists, motorcyclists, pedestrians and certain community groups, are also more likely to be harmed whilst using the transport system.

Alignment of Partner Outcomes

The problem areas derived from the ILM process were developed with project partners to ensure alignment with key identified issues for the RLTP, FC and ATAP. The table below shows alignment across the key frameworks.

MoT TOF	Waka Kotahi Benefits Framework	RLTP/Future Connect
Outcome area	Benefit area	Investment objective
High level outcomes – national focus	*Detailed business case support – national focus*	*ATAP/Regional Transport Committee updated Objectives*
Economic prosperity	Impact on network productivity and utilisation	• Better connecting people, places, goods and services • Enabling Auckland's growth through a focus on intensification in brownfield areas, and with some
	Wider economic benefit	
	Impact on system reliability	

[2] Source: RLTP Public Preferences Study, 2021, Auckland Transport Customer Voice
[3] Source: Public Perceptions of NZ Road Safety: Penalties and Enforcement (including Auckland), July 2021, AT Marketing Insights

MoT TOF	Waka Kotahi Benefits Framework	RLTP/Future Connect
Outcome area	Benefit area	Investment objective
		managed expansion into emerging greenfield areas
Inclusive access	Access to opportunities	• Accelerate better travel choices for Aucklanders • Sound asset management (additional RLTP Objective)
	User experience	
	Mode choice	
	Liveability of places	
	The Māori World	
Environmental sustainability	Impact on greenhouse gas emissions	• Improving environmental resilience and sustainability of the transport system, and significantly reducing the greenhouse emissions it generates
	Impact on land and biodiversity	
	Impact on water	
	Impact on resource efficiency	
Resilience and security	Impact on system vulnerabilities and redundancies	• Sound asset management (additional RLTP Objective)
Healthy and safe people	Changes in user safety	• Make the transport system safe by eliminating harm to people
	Perceptions of safety	
	Human health	

Through the process undertaken by the project partners, the benefits of investment in Auckland's transport system have been aligned.

Currency of this Document

The Auckland Region Transport Strategic Case will be updated as part of the transport planning process through provision of:

- a common basis of data and evidence
- relevant and accepted problem statements to provide guidance for the transport planning process
- a resource that is intended to guide and support future business case work by minimising duplication of foundation work required for business cases for new projects

This version of the Strategic Case was intended to be released in parallel with the 2021-31 RLTP, but has been delayed by resource availability. The document will be updated and revised to inform ATAP/RLTP on a 3-yearly cycle.

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1 INTRODUCTION AND BACKGROUND

1.1 Purpose

This Auckland Region Transport Strategic Case (the 'Strategic Case') is a technical background document outlining the problems and opportunities facing Auckland's transport system. Its development informed the Regional Land Transport Plan 2021-31 (RLTP) investment programme. It is intended to inform, but also to streamline, the work necessary for subsequent business cases stemming from the RLTP by providing a common starting point.

The Strategic Case updates and elaborates on partner's strategic objectives, provides problem statements and investment objectives that guided the initial stages of the Future Connect (FC), Auckland Transport Alignment Project (ATAP) and the RLTP development process. It documents transport problems and opportunities on a regional scale, assisting in the alignment of transport planning and investment. This entails, developing an investment story that:

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1.2 Background

This Strategic Case, as part of the Business Case Approach, provides an investment story to assist in better targeting transport investment in Auckland.

The development of the Strategic Case investment story is guided by the Auckland Plan and ATAP 2018. The Auckland Plan provides the vision for Auckland across all sectors, including transport.

Future Connect is a system planning tool developed by Auckland Transport to improve planning and investment across all transport modes by identifying focus areas on strategic networks[4]. Future Connect develops both a current and future network plan for all strategic networks. Together with the RLTP investment programme, Future Connect is AT's strategic integrated network plan.

ATAP develops packages of investment solutions which could be implemented to address these problems and opportunities.

The RLTP 2021-31 then outlines the preferred package of works, which constitutes the agreed investment programme for transport in Auckland over the next 10 years.

The RLTP brings together all the transport investment priorities and programmes for partners in Auckland including Auckland Transport, Auckland Council, KiwiRail, and Waka Kotahi New Zealand Transport Agency (Waka Kotahi).

[4] Information about Auckland Transport's Future Connect project can be found here https://at.govt.nz/about-us/transport-plans-strategies/future-connect-auckland-transports-network-plan/

This Auckland Region Transport Strategic Case has been developed together with investment partners.

1.3 Strategic Case support for Future Connect / ATAP/ RLTP

The Strategic Case provides an up-to-date assessment of transport problems and evidence for future business case development, supporting the delivery of the ATAP/RLTP programme. The intent is to streamline future business case processes, in order to minimise future Strategic Case work for new projects that come out of the ATAP/RLTP programmes. In particular, the Strategic Case provides:

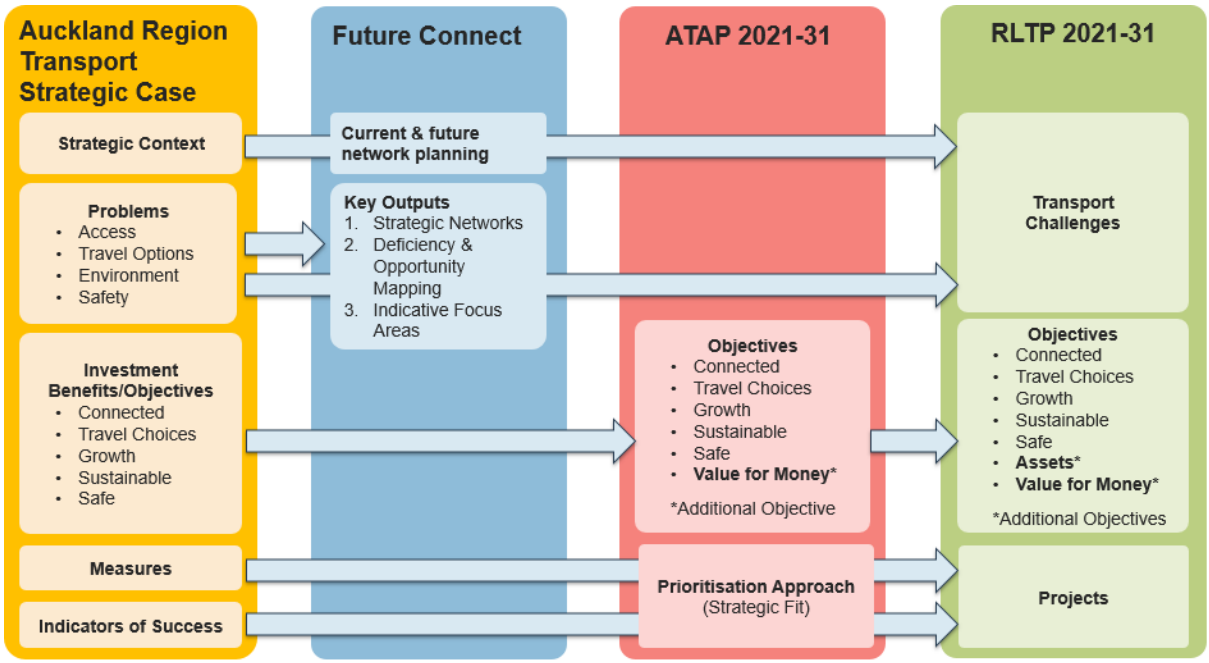
- updated problem definitions which align to AT and partner strategic objectives and priorities through an Investment Logic Map (ILM) process,
- a strategic assessment of the problems facing Auckland's transport system,
- articulation of the benefits of investing to address the problems,
- developing performance measures that enable an evaluation of progress towards agreed objectives.

The Future Connect project used the four main problems identified in the ILM to develop indicators to highlight critical deficiencies and opportunities on all Strategic Networks in Auckland. These were used to develop Indicative Focus Areas within the transport system for future investigation, to support better system integration in the transport planning and investment process.

The ATAP 2020 process provided the forum to achieve the necessary agreement on investment priorities between Government and local partners for the period 2021-31. The prioritisation process linked projects to investment objectives back to the original problems in the Strategic Case.

Figure 1 summarises the main Strategic Case linkages between FC, ATAP and RLTP. The Strategic Case will be updated and revised to inform ATAP/RLTP on a 3-yearly cycle.

Figure 1 - Auckland Region Transport Strategic Case linkages to FC, ATAP and the RLTP



The following chapters describe the Strategic Context and Strategic Assessment of the four main problems areas.

2 STRATEGIC CONTEXT

2.1 Auckland Context

The following sections provide the broader context which is integral to the four overarching problem statements. The particular geographic, demographic, social, and economic characteristics of the Auckland region covered in this chapter are intertwined with the more focussed problem assessments outlined in Chapter 3.

2.1.1 Population Growth

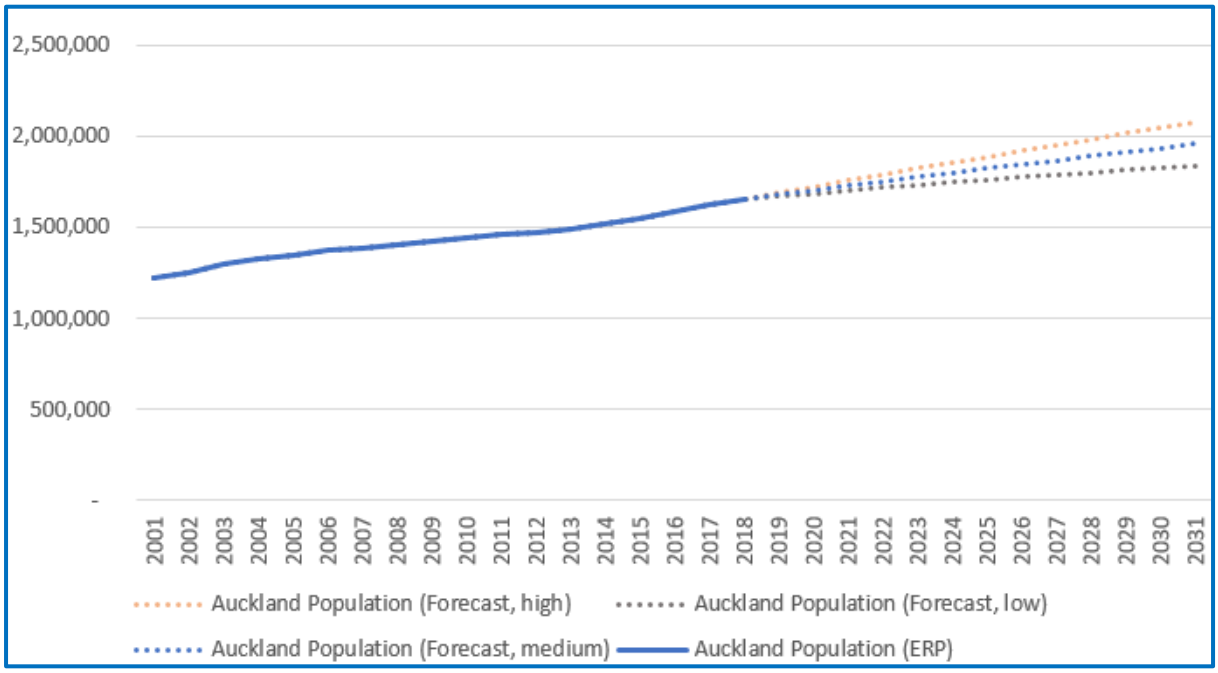
Past growth in Auckland has been a very significant driver of travel demand, with forecasts indicating continued population growth over the next 10 years.

Auckland is home to about 1.7 million people, representing one-third of New Zealand's total population. The 2018 Census recorded 1,572,000 usual residents and about 500,000 private occupied dwellings in the Auckland region.

Figure 2 shows predicted population growth based on 'estimated resident population' census information adjusted by Statistics NZ high, medium and low scenario parameters. Even with some recalibration to recognise the potential impact of COVID-19 on growth forecasts, Auckland is still anticipated to grow by around 300,000 people (medium forecast) between 2018 and 2031.

If current travel patterns continue, this rapid population growth will lead to a commensurate increase in demand for travel putting pressure on the road and public transport networks. However, the growth also presents an opportunity for land use change, which could strengthen our public transport and active mode networks.

Figure 2 - Projected Auckland Population Growth[5]



The rate of population growth has increased significantly, as shown in Table 1, with the rate of growth from 2013 significantly exceeding the preceding census period.

[5] Source: based on estimated resident population (ERP), Subnational Population Projections, March 2021, Statistics NZ

Table 1 - Population Growth in Auckland[6]

Year	Population count	% change census to census	Average Annual Increase
2006	1,304,958	-	-
2013	1,415,550	8%	15,800
2018	1,571,718	11%	31,200
2031 (forecast)	1,957,800	-	29,699

Auckland will continue to grow, and the transport system will need to respond to the resulting increase in travel demand and changes in travel behaviour.

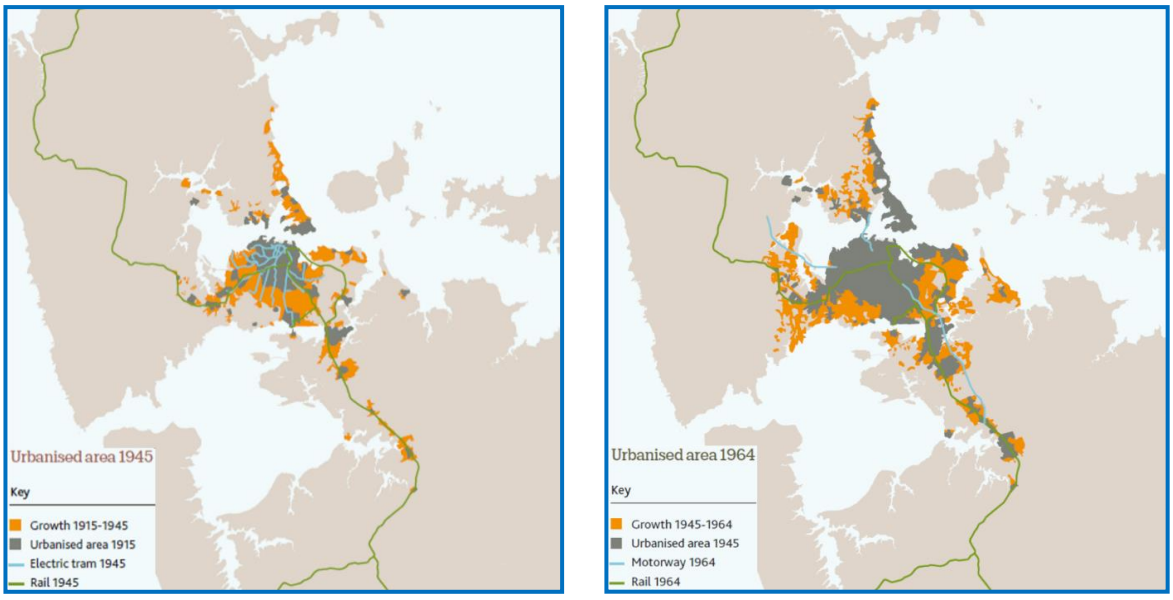
2.1.2 Geographic and Urban Context

The historic outward expansion of Auckland over an irregular physical topography poses particular challenges for the integration of land use and transport.

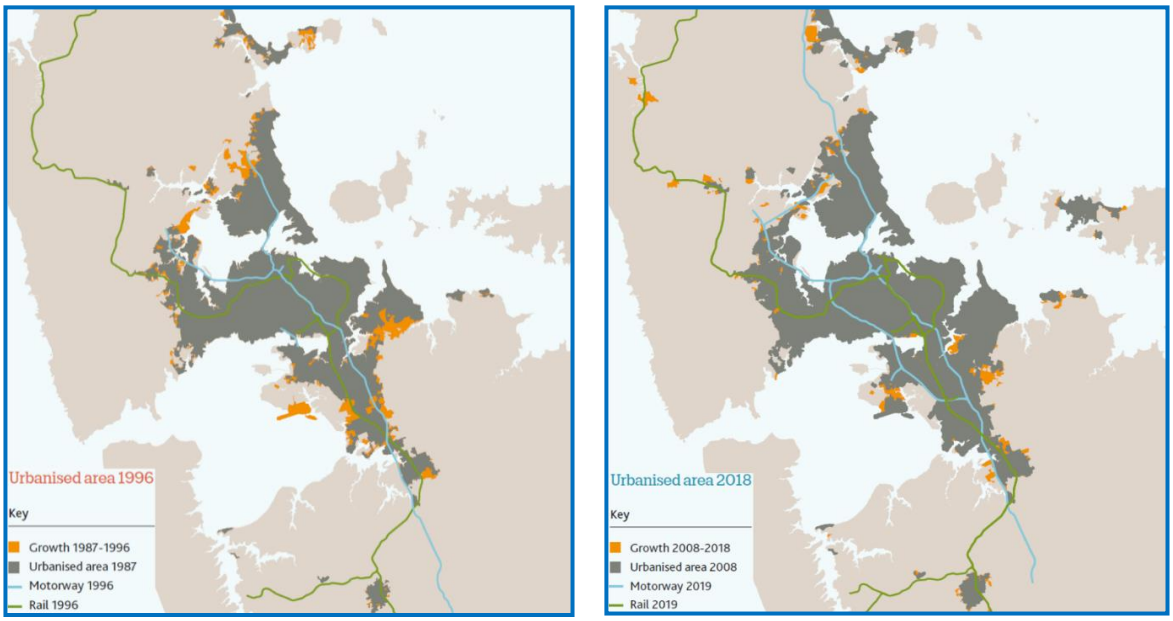
The urban form of the Auckland region is shaped by a discontinuous physical topography and many waterways which disrupt easy transport connections between areas.

Figure 3 shows how Auckland has seen periods of rapid expansion, especially post-World War 2; with the urban area expanding beyond the central isthmus, removal of the tram network, construction of motorway extensions, and the growth of significant peripheral settlements. Transport networks have developed to support a growing urban Auckland and inter-regional links.

Figure 3 - The growth of Auckland and its transport networks over time[7]

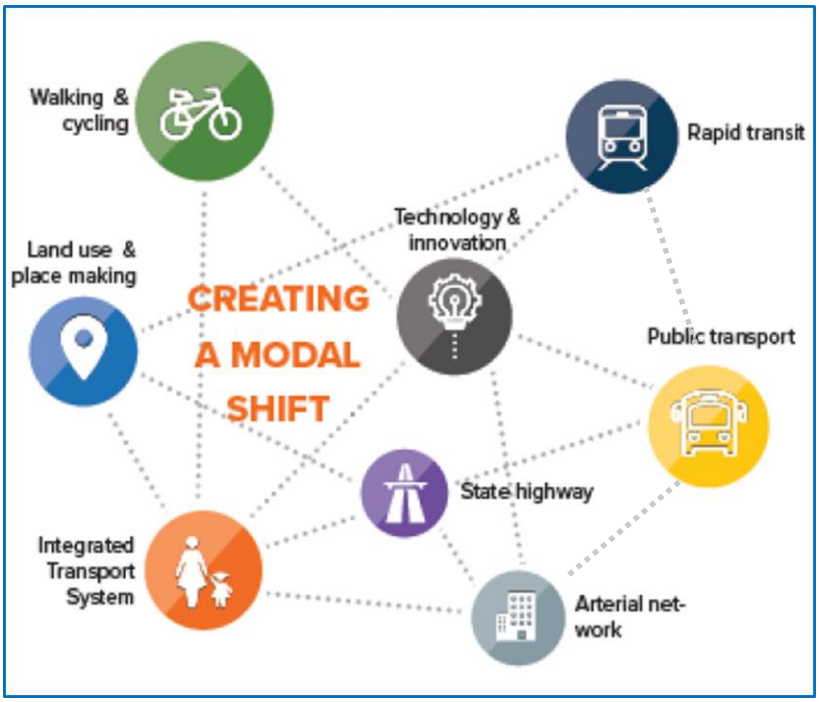


[6] Source: 2006, 2013, 2018 Censuses, with 2031 forecast based on estimated resident population, 'medium scenario' Subnational Population Projections, March 2021, Statistics NZ
[7] Source: A brief history of Auckland's urban form, 2019, RIMU, Auckland Council



The legacy of outward expansion into greenfield areas and the development of many peripheral settlements without investment in multi-modal outcomes, has meant that much of the Auckland region is car dependent. Figure 4 illustrates the challenges of integrating various land use and transport elements to provide households with attractive alternatives to car dependency.

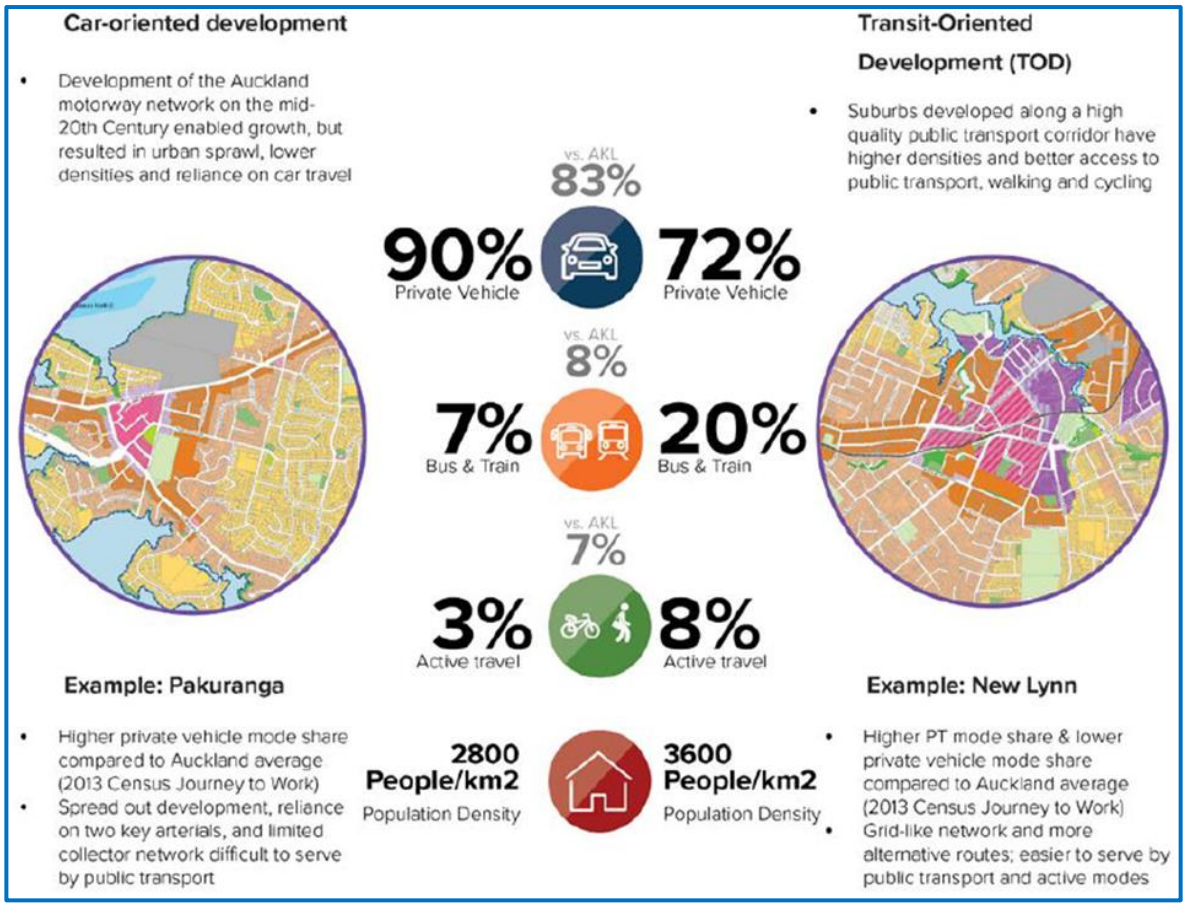
Figure 4 - Integrating urban elements to create a mode shift[8]



The Auckland Plan 2050 signals that, in the longer term, the multi-nodal nature of Auckland will need to become further embedded, requiring improved transport connections to serve metropolitan centres for local communities. As shown in Figure 5, the form of development, particularly the quality of land use and transport integration, will have a significant role in shaping travel patterns over the next decade.

[8] Source: North Indicative Business Case, Strategic Case, Supporting Growth, Dec 2018

Figure 5 - Impacts of Development Type on Transport Outcomes[9]



Household density, the road network layout, and the nature of relationships between land use and transport options, have a significant impact on the potential for more sustainable transport options.

2.1.3 Environmental Context

Transport activities can negatively affect our natural environment and, in turn, contribute to the negative effects of climate change on the transport system.

Climate change – mitigation versus adaption

Greenhouse gas (GHG) emissions linked to human activity are causing the Earth to heat up to an alarming level. Growing GHG concentrations in the atmosphere are causing changes to the climate, including greater occurrences of extreme drought, heat, rainfall and coastal inundation[10]. Scientific evidence of the influence of humans on climate has become undeniable: "Human influence on the climate system is clear. This is evident from the increasing greenhouse gas concentrations in the atmosphere, positive radiative forcing, observed warming, and understanding of the climate system"[11].

Through its development and operations the transport sector is a significant source of GHG emissions globally. Interventions to address this fall into two broad categories:

[9] Source: South Indicative Business Case, Strategic Case, Supporting Growth, 2018
[10] Source: https://www.mfe.govt.nz/climate-change/why-climate-change-matters/evidence-climate-change
[11] IPCC, 2013:15 Summary for Policymakers in Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

a) strategies to reduce GHG released into the atmosphere (mitigation), and

b) strategies to reduce the impacts of climate change on the transport system (adaptation).

Climate change targets – current status

Auckland Council has declared a climate emergency and committed the Auckland region to deliver action consistent with the objectives of the Paris Agreement and play its part in limiting the increase in temperature from climate change to within 1.5 degrees Celsius above pre-industrial levels[12]. The Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan adopted in 2020, reflects what climate science requires to meet this goal. The Plan aims to halve Auckland's greenhouse gas emissions by 2030, and transition to net zero emissions by 2050.

The decarbonisation pathway in Te Tāruke-ā-Tāwhiri includes a modelled 64% reduction in transport emissions by 2030 against a 2016 base year. The steeper pathway for transport reflects the relative difficulties in reducing emissions at-scale in other sectors.

Auckland's GHG emissions profile is very different from the rest of the country. The nation's most significant source of GHG emissions is agriculture, while road transport is the largest contributor to Auckland's emission profile.

The Climate Change Commission provided its final advice to Government to inform its future emissions budgets in June 2021, including a recommended interim target of a 47% reduction in net carbon dioxide emissions (on 2019 levels) by 2030. The Commission's final advice does not propose interim emissions reduction targets specific to transport but its approach to reaching net zero emissions by 2050 under the Climate Change Response Act 2019 includes moving towards a zero carbon transport system.

While Auckland Council shares the goal of a zero emission transport system by 2050, the pathway it has adopted differs from that recommended by the Climate Change Commission. Significant and rapid action to deliver decarbonisation of the transport system is expected.

Auckland Council and Auckland Transport are jointly developing a regional transport emissions reduction plan that identifies potential pathways to reducing 64% of Auckland's transport emissions by 2030. This work is anticipated to be available by mid-2022.

The government's Emissions Reduction Plan will be completed in December 2021.

Biodiversity

Auckland's natural environment is especially sensitive, containing approximately 20% of New Zealand's threatened birds, reptiles and plants. There are substantial areas of environmental significance, including freshwater and coastal habitats, sprawling ranges of native bush, and productive rural land. Many of these areas are located adjacent to transport corridors or urban development, making them particularly susceptible to adverse impacts that arise from human activity.

2.1.4 Social Context

Auckland's diverse population has varying socio-economic status with different employment and household requirements which affects where households locate, their travel choices and their ability to pay for transportation.

Ethnic Diversity

The population of the Auckland region is very culturally diverse, representing well over a hundred different ethnicities. This is evidenced by the fact that 42% of Aucklanders were born overseas. Table 2 below shows historic trends in major ethnic groups over the last decade.

[12] the C40 group of cities, of which Auckland is a part, has also endorsed this target.

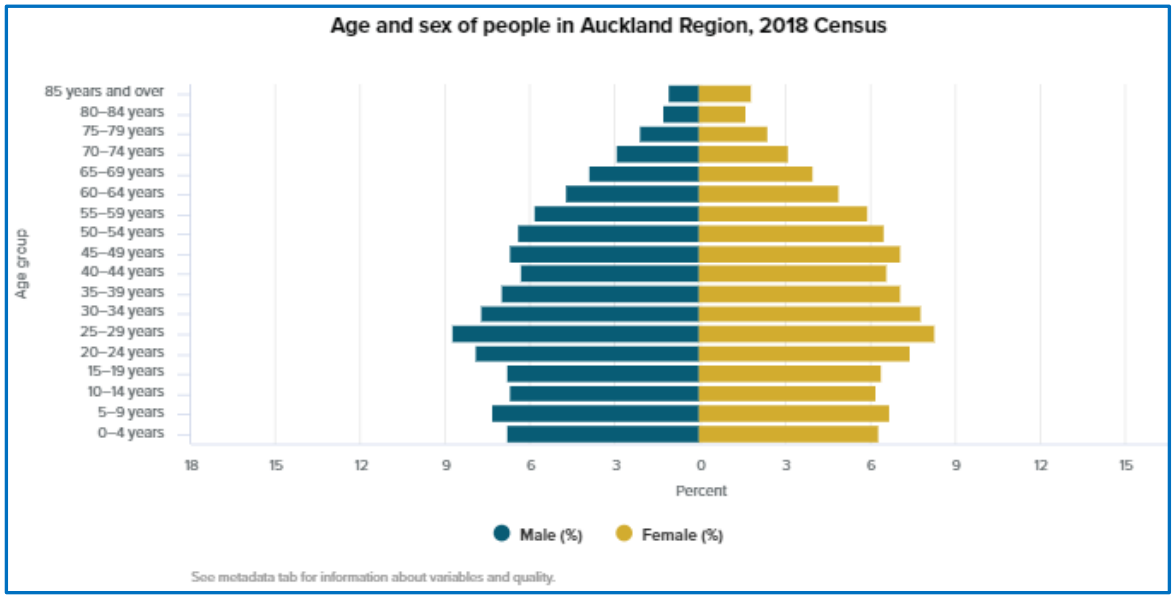
Table 2 - Ethnic Diversity in Auckland[13]

Ethnic groups	2006 (%)	2013 (%)	2018 (%)
European	56.5	59.3	53.5
Māori	11.1	10.7	11.5
Pacific peoples	14.4	14.6	15.5
Asian	18.9	23.1	28.2
Middle Eastern/Latin American/African	1.5	1.9	2.3
Other ethnicity	8.1	1.2	1.1

Age and Sex

The population pyramid in Figure 6 below illustrates that Auckland has a relatively young, but well distributed population across sex and age groups.

Figure 6 - Age and sex breakdown of Auckland population

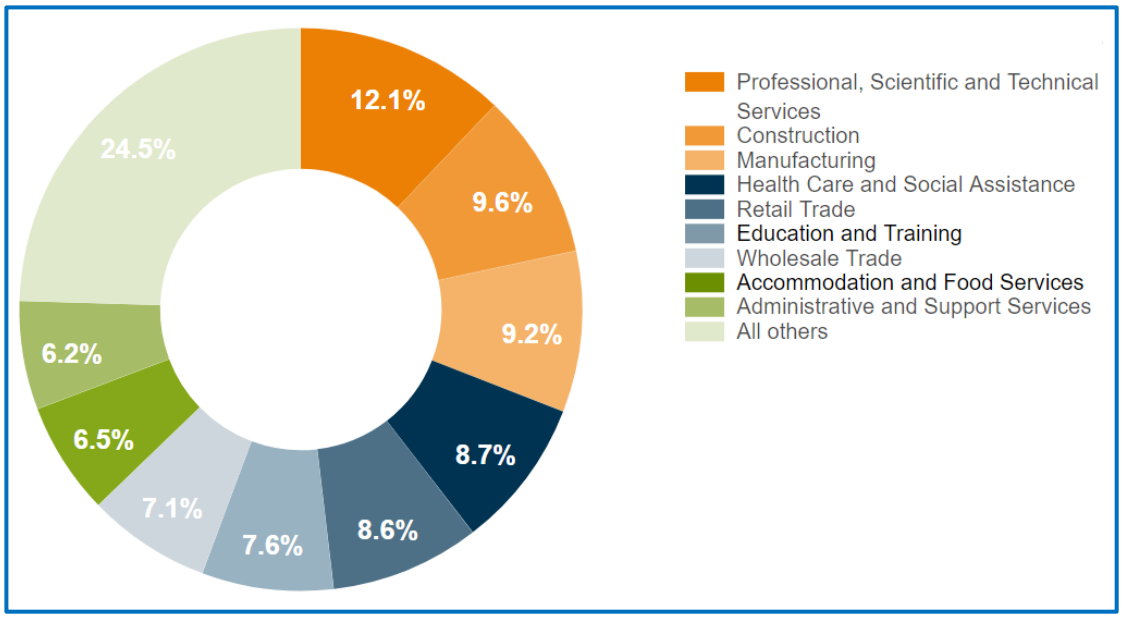


Employment

Auckland is a global city which attracts a workforce from around wider New Zealand and the world. The employment profile is well diversified as shown in Figure 7 below.

[13] Source: 2018 Census, Stats NZ. Note: anomalies in totals are due to changes in Census methodologies and thus times series data should be interpreted with care.

Figure 7 - Proportion of filled jobs by industry, 2019[14]



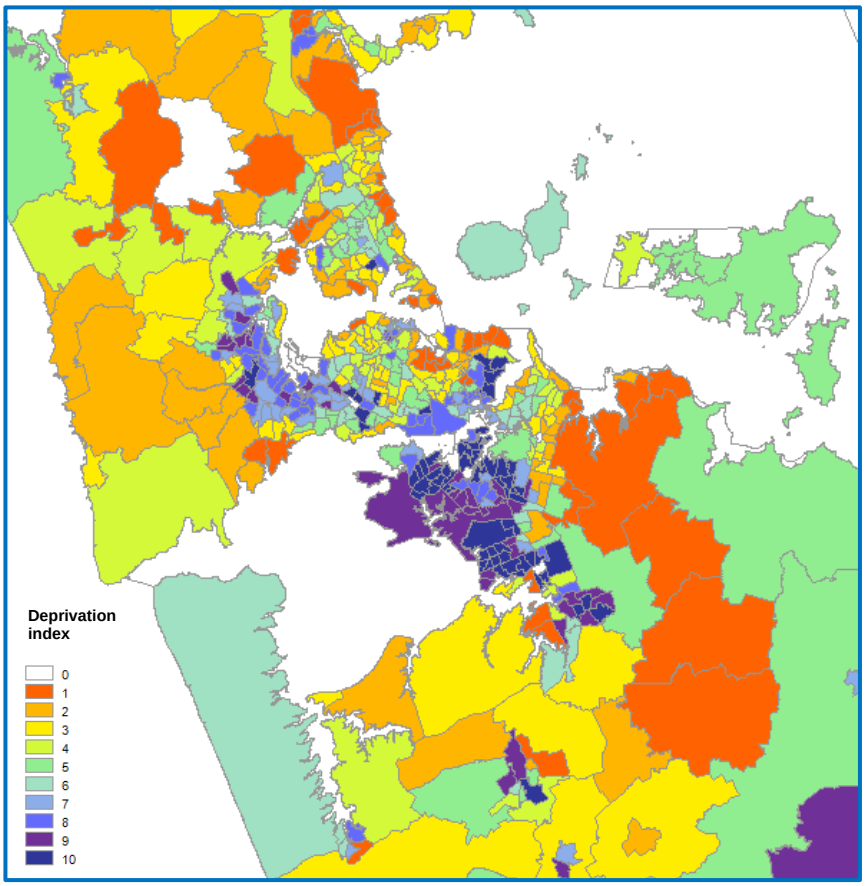
Fifty two percent of Auckland's population are employed full-time, about 30% are not in the labour force and about 4% unemployed. These figures are comparable to averages across New Zealand as a whole.

Income

Incomes in Auckland are generally low when compared to the cost of living, with the median income at $34,400 per annum and only about 20% earning more than $70,000 per annum[15]. Figure 8 shows clear concentrations of socio-economic deprivation in the South and West with pockets elsewhere across Auckland. Any transport solution should be cognisant of these realities in planning and investment.

[14] Source: Australian and New Zealand Standard Industrial Classification (ANZSIC)1-digit industries https://ecoprofile.infometrics.co.nz/Auckland/Employment
[15] Source: 2018 Census, Stats NZ

Figure 8 - Socio-economic deprivation across Auckland[16]



Equity of access to employment, education, healthcare, social and recreational services is becoming a key focus for Auckland Transport, Waka Kotahi and Auckland Council. Work on defining and monitoring access for different socio-economic groups will contribute to investment choices in the transport system in the future.

2.1.5 Economic Context

The impact of COVID-19 is significant on the short-term economy, with residual effects likely for the next decade. Recovery is largely expected by 2025 with associated increases in travel demand. As the heart of the upper north island economy, Auckland requires reliable and efficient freight connections internally, with other regions and the world, to support growing economic activity.

Auckland is the gateway to New Zealand for both people and goods, and fulfils a nationally significant freight function. More than 70% of all visitors to New Zealand arrive at Auckland Airport, while the Port of Auckland receives the largest value of imports in the country.

Significant inter-regional freight linkages with Auckland include:

- New Zealand's most important freight corridor – road and rail links with Hamilton
- the East Coast Main Trunk rail line, which carries over a third of New Zealand's rail freight
- road links north to Marsden Point's deep-water port, which is a critical overnight link to Auckland for freight.

[16] Source: Map based on Atkinson J, Salmond C, Crampton P (2019). NZDep2018 Index of Deprivation, Interim Research Report, December 2019. Wellington: University of Otago. Note that the higher the number, the higher the level of social deprivation. These measures broadly combine measures of income, education, and housing ownership / condition.

Significant levels of freight are moved into and within the Auckland region by road and rail, with inland ports such as Wiri being major distribution hubs.

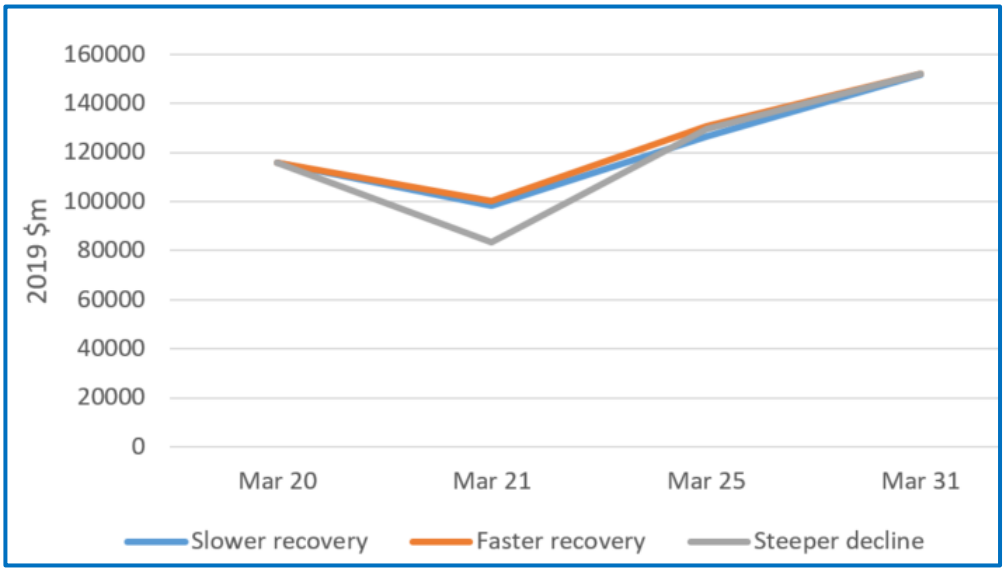
The recent global COVID-19 pandemic has had the immediate effect of substantially reducing international tourists, international students and migrants. The medium to long-term effects on the economy are less clear. Waka Kotahi summarises the impact for the upper north island economy and Auckland during 2020[17]:

> *"By 2043, Auckland was projected to grow by 37% creating knock-on effects for Hamilton, Tauranga and Northland. …. Border closures will significantly reduce the inflow of migrants, overseas students and international tourists into Auckland. In the short to medium-term this is expected to slow population growth, reduce pressure on housing and infrastructure in Auckland and slow 'overspill' of people and businesses across the UNI [Upper North Island]. Whether inward migration returns to pre-COVID-19 levels over the medium to long-term depends on the duration of border restrictions, and New Zealand's economic performance relative to other countries"*

> *"[There] may be an increase in internal migration [within Auckland] as people seek employment opportunities from elsewhere plus a reduction in outward migration as housing market and business relocations cool"*

Figure 9 shows Gross Domestic Product forecasts for Auckland over the next ten years under three potential scenarios completed (Arataki version 2, 2020). The impact of COVID-19 is apparent in the short to medium-term, with recovery assumed to be underway for all scenarios by about 2025.

Figure 9 - Auckland GDP Forecasts[18]



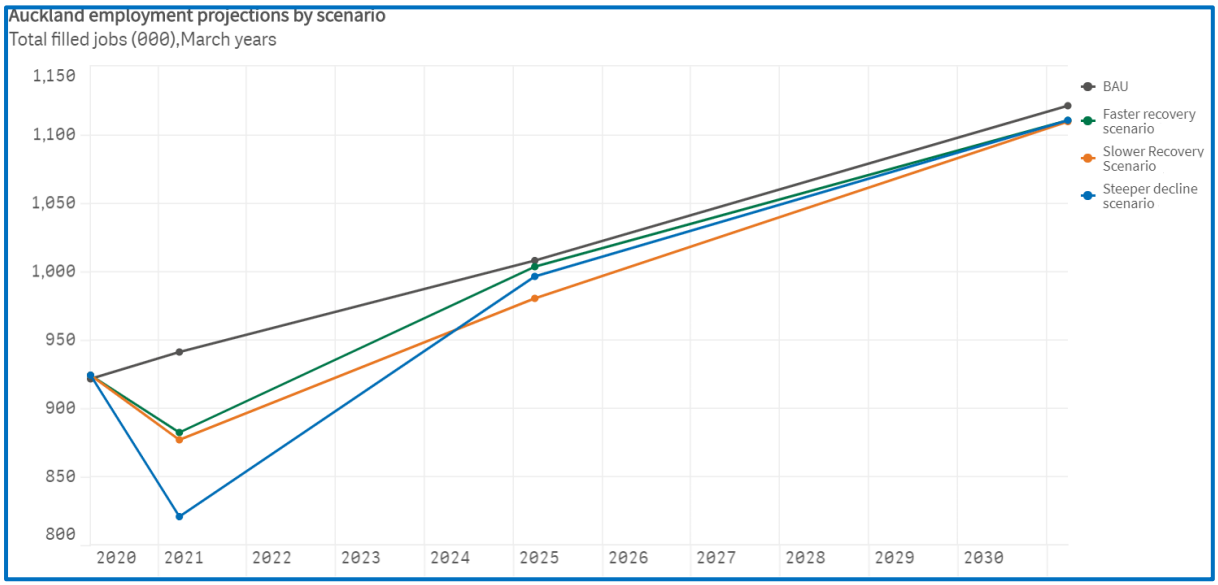
The 'slow recovery scenario' has been identified as the most likely by Waka Kotahi, given continuing high levels of uncertainty regarding global efforts to manage the pandemic, and the duration and scale of the resulting economic downturn.

Auckland is forecast to be harder hit than other upper north island centres because of its gateway role, its reliance on tourists and international students, and high volumes of migrant labour, all of which are forecast to drop sharply, at least in the short to medium-term.

Figure 10 shows that employment projections for the three recovery scenarios will take, at least, until 2030 to reach the Business as Usual (BAU) projection.

[17] Source: Arataki v2 Upper North Island summary, 2020:5, NZTA and COVID 19 - implications for land transport (summary), 2020:11, NZTA: subject to future updates
[18] Source: NZTA employment modelling (Arataki v2, 2020), Treasury scenarios, Infometrics forecasts

Figure 10 - Auckland Employment Projections[19]



The strength of Auckland's economy will drive travel demand for both people movement and the movement of freight. Depending on the economy's resilience to COVID and other global economic factors, some transport projects may be prioritised to respond appropriately.

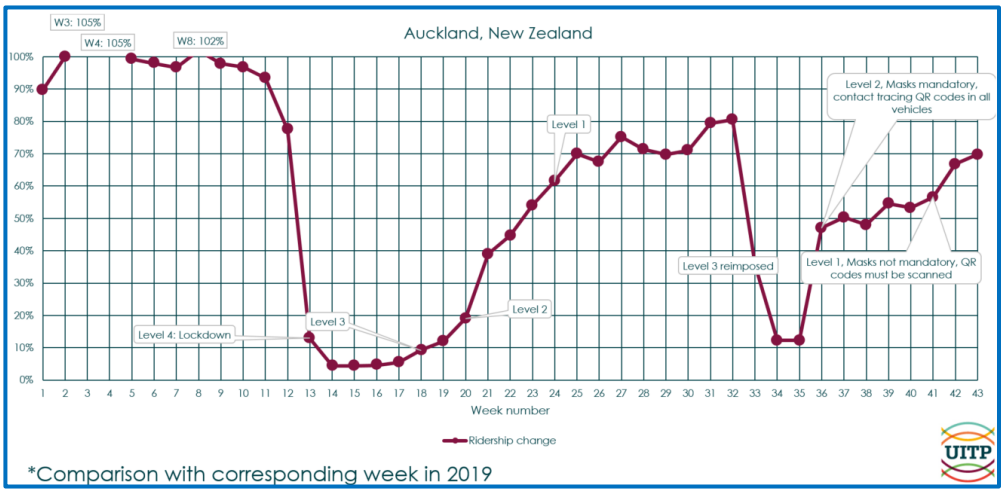
2.1.6 Greater Uncertainty

Planning and funding future transport solutions is more challenging in a less certain environment. The potential for disruption of established systems requires an enhanced ability to adapt and respond with appropriate solutions.

The emergence and impacts of COVID-19 have highlighted the potential for major disruptions and uncertainty. In the short-term, the impact of COVID-19 has had a dramatic effect on the transport system, with a severe decline in demand reshaping transport operations and significantly reducing Auckland Council and government revenues[20].

Figure 11 summarises the impact of COVID-19 on patronage, and recovery trends for all public transport (PT) modes under various Lockdown Levels.

Figure 11 - COVID-19 Impacts on Public Transport Patronage in 2020[21]



[19] Source: NZTA employment modelling (Arataki v2), 2020
[20] Evidence presented is the best available at the time
[21] Source: COVID-19 ridership evolution – flash update, Nov 2020, UITP

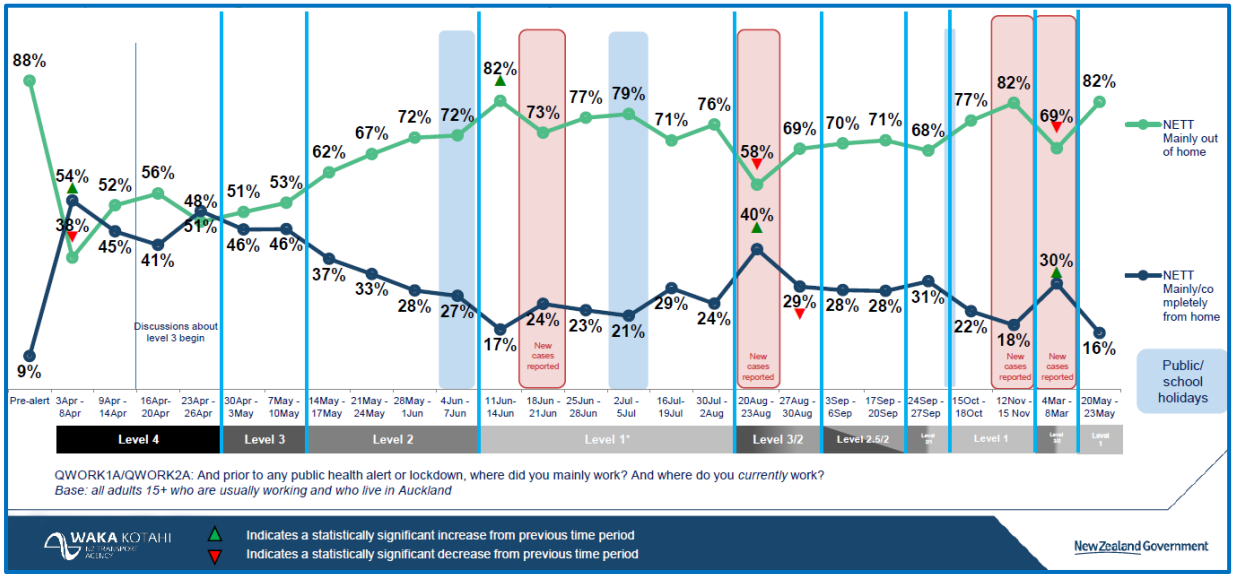
Beyond the gradual, if unsteady, anticipated recovery of travel demand, key uncertainties remain. These include:

- how significantly travel demand may be reduced or reshaped
- potentially unforeseen travel behaviour changes
- whether urban growth slows and how long it takes to rebound
- effects on capex and opex funding, along with the impact on programme and project delays, especially over the first decade.

In addition to national uncertainties, the impact of the pandemic on the global economy affects Auckland as a global city and the gateway to New Zealand. Some of the uncertainties surrounding economy and people movements is alluded to in the previous section. The planning of future transport solutions and funding in Auckland is more challenging in a less certain environment[22].

One of the most important potential changes to travel behaviour is around the propensity to 'work from home' (WFH) impacting for instance, PT patronage and active mode use. Ongoing research monitoring the impact of COVID-19 lockdowns on travel behaviour suggests WFH has increased over the 2020-21 period from around 9% to roughly double that (refer to Figure 12).

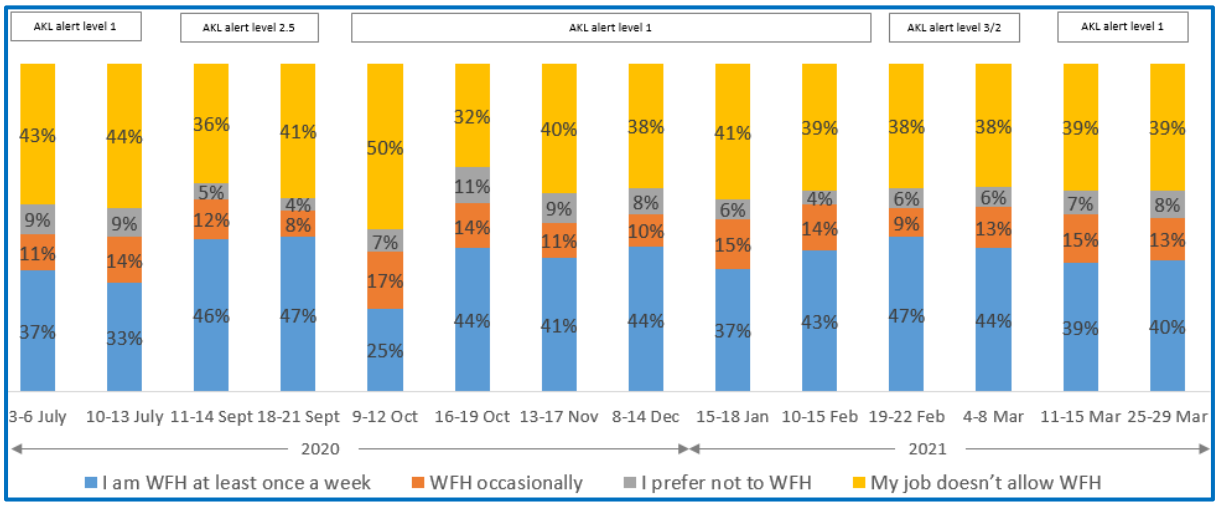
Figure 12 - Proportion working in or out of home (Auckland 2020-21)[23]



Further granularity is shown in Figure 13 around the propensity to WFH. It shows that around 40% of surveyed workers WFH one day a week or more. This suggests that WFH will remove upwards of 8 percent of commuting trips, which is roughly consistent with the 9.7% share for WFH in the 2018 Census. Monitoring trends with regular data updates becomes more important in a less certain environment. However, it should be noted that the fundamentals of transport drivers, such as the distribution of land use, remain slow to change.

[22] The more enduring context is the growing challenges facing land transport funding and revenues in Auckland. This would include a key recommendation of the 2020 Independent Review of Auckland Council Controlled Organisations that Auckland Transport and Auckland Council work with Ministry of Transport and Waka Kotahi to streamline funding processes.
[23] Source: Waka Kotahi COVID-19 transport impact: fieldwork waves 1-25 core report, 31 May 2021, Waka Kotahi

Figure 13 - Propensity to Work from Home[24]



The impact and responses to climate change, and other emerging trends, add further uncertainty and the potential to disrupt the transport system over the next decade. For example, advances in technology have significant potential to both enhance transport operations and services, whilst also supporting new on-demand and shared mobility which could disrupt established services. The ability to adapt and respond with appropriate solutions is key to success.

2.2 Policy Context

To develop this Strategic Case, Auckland Transport worked with key partners and stakeholders who have a role in creating, improving, and funding Auckland's transport system.

2.2.1 Partners

The role and interests of key partners in the Auckland Region Transport Strategic Case are outlined below:

Auckland Council

Established in November 2010, Auckland Council is the territorial authority responsible for local government functions in the Auckland region. The Council is responsible for the Auckland Plan, which provides strategic direction for developing and managing the Auckland Region towards a better future. Council is the primary funder of Auckland Transport's investment in the transport system and seeks to ensure that the Strategic Case aligns with Council's priorities and problem assessments. As partner, Council's role in the Strategic Case is extensive, involving development of the Investment Logic Map (ILM) (refer to Appendix A); engagement on the development of the problem assessments, benefits, performance measures; and endorsement of the document.

Waka Kotahi

Waka Kotahi is the Crown Entity responsible for fulfilling the expectations of the government's transport investment priorities through the Government Policy Statement on land transport. It is responsible for managing, planning and development of the state highway network and motorway corridors. It also allocates funding to eligible transport projects undertaken by Auckland Transport. Waka Kotahi seeks to ensure alignment with the Business Case process and requirements for funding. To do so, it has developed a benefits framework for use across the Investment Decision-Making Framework (IDMF) process. These benefits are mode-neutral and aligned to the Ministry of Transport's Transport Outcomes Framework (TOF). As partner, Waka Kotahi's role in the Strategic Case is extensive, involving development of the ILM (refer to Appendix A); engagement on the

[24] Source: Ipsos Coronavirus tracker, 2020/21, Auckland Transport. Note: the sample is representative of part-time or full-time workers in Auckland (age, gender and region) and has a 2 week stand down period which means a respondent will only do the survey a maximum of once every 2 weeks.

development of the problem assessments, benefits, performance measures; and final endorsement through the business case process.

Auckland Transport

Auckland Transport is a Council Controlled Organisation responsible to Auckland Council and is the 'Problem Owner' and primary developer of the Strategic Case. Auckland Transport is responsible for all of Auckland's transport system (excluding state highways) including:

- designing, building and maintaining Auckland's roads, ferry wharves, cycleways and walkways;
- co-ordinating road safety and community transport initiatives; and
- planning, funding and operating bus, train and ferry services across Auckland.

Mana Whenua

Mana Whenua are Treaty of Waitangi partners who have special interests in the outcomes of transport investments for Māori. Auckland Transport engages with Mana Whenua on its key outputs which influences RLTP programme prioritisation.

2.2.2 Stakeholders

Stakeholders in the outcome of the Strategic Case are numerous as the area of influence is large and highly connected to a wide range of programmes and workstreams. Ultimately, every Aucklander and visitor to Auckland are stakeholders. Key stakeholders include:

The Ministry of Transport (MoT)

MoT are the Government's principal transport adviser responsible for providing advice to ministers, supporting the development of legislation and regulation, and managing funds invested in transport. The Ministry seeks to ensure overall alignment with Government policy and investment direction. The Ministry's TOF makes clear what the government aims to achieve through the transport system.

KiwiRail

KiwiRail is a limited liability company and state-owned enterprise, playing an important role in rail freight and supply chain industries. In Auckland, KiwiRail works with Auckland Transport and Waka Kotahi to improve passenger rail and inter-regional freight services. KiwiRail is primarily responsible for building, improving and maintaining rail infrastructure, while Auckland Transport has 'above track' responsibilities, such as rail stations. KiwiRail's role in the Strategic Case involves development of the ILM (refer to Appendix A), engagement on the development of the problem assessments, benefits, and performance measures.

Other Stakeholders

Other stakeholders include:

- Kāinga Ora
- Panuku
- Freight Reference Group (Auckland Transport, Ports of Auckland, Automobile Association, Waka Kotahi, Ministry of Transport, Road Transport Forum, Road Transport Association, National Road Carriers Association, Heavy Haulage Association, Auckland International Airport, Mainfreight, NZ Couriers and PostHaste)
- Tāmaki-Makaurau Road Safety Leadership Group (Auckland Transport, Auckland Council, New Zealand Police, Waka Kotahi, Auckland Regional Public Health Service, Accident Compensation Corporation and Ministry of Transport)
- Bike Auckland
- Living Streets Aotearoa
- and many others.

2.2.3 Objectives and Outcomes

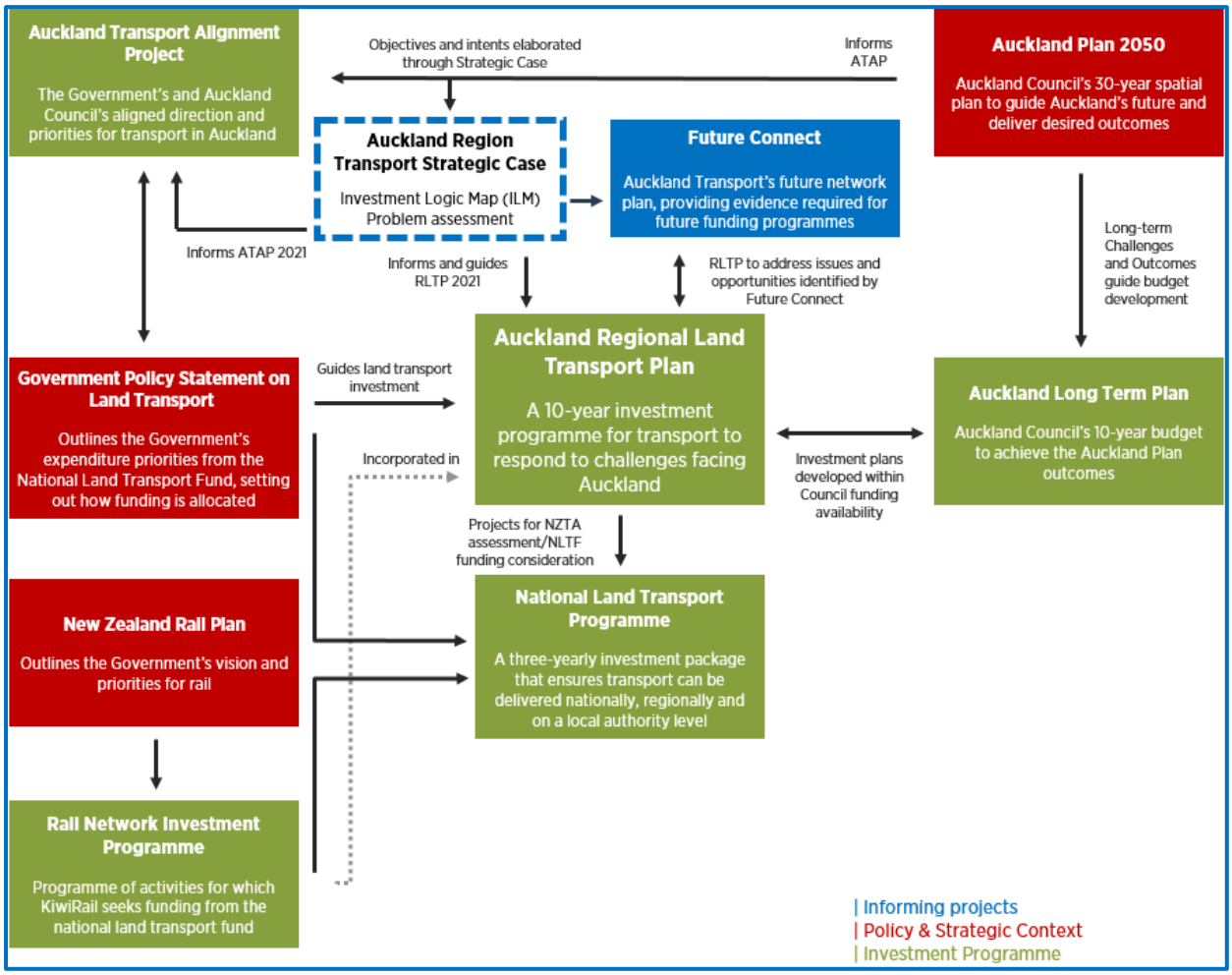
This section outlines the strategic objectives and outcomes of partners and how they relate to the Auckland Region Transport Strategic Case.

Regional Land Transport Plan 2021-31

The Land Transport Management Act 2003 (LTMA) requires an RLTP to be prepared which contributes to an effective, efficient and safe land transport system in the public interest. Auckland Transport develops the RLTP, which sets out a 10-year programme of transport investment activities across all modes. This is a statutory plan that directs, co-ordinates and prioritises investment programmes and projects based on agreed objectives. The RLTP is developed every 3 years in conjunction with Auckland Council, Waka Kotahi and KiwiRail.

The RLTP is a key consolidated transport document for the Auckland region. Figure 14 provides an overview of how the RLTP interacts and aligns with strategic policy documents and partner investment programmes. It is important that transport partners ensure that their respective planning is co-ordinated towards achieving agreed objectives.

Figure 14 - RLTP Relationship with Policy and Strategic Framework



A number of documents provide strategic direction to transport investment in Auckland. The strategic objectives and intent of these key documents are outlined below.

Auckland Plan 2050

The Auckland Plan 2050 is a long-term strategy for managing Auckland's growth and development over the next 30 years, bringing together social, economic, environmental and cultural objectives. Auckland Council undertook a refresh of the Auckland Plan in 2018.

The Auckland Plan identifies the three major challenges facing Auckland:

- population growth and its implications
- sharing prosperity with all Aucklanders
- reducing environmental degradation.

These challenges are addressed through six integrated outcomes that are spatially reflected in a development strategy (refer to Figure 39). Although transport contributes to all six outcomes, it mostly relates to the three strategic directions of the 'Transport and Access' outcome outlined in the table below.

Auckland Plan Direction	Focus Area
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	**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

Government Policy Statement on Land Transport (GPS) 2021

The purpose of the GPS 2021 is to guide investment in land transport over the next 10 years by providing a longer-term strategic view, and by setting out where the government intends to focus its resources. The GPS 2021 outlines the responsibilities of relevant parties with respect to land transport investment.

The GPS 2021-31 is guided by four strategic priorities:

- **Better Travel Options** – providing people with better transport options to access social and economic opportunities
- **Safety** – developing a transport system where no one is killed or seriously injured

- **Improving Freight Connections** – improving freight connections for economic development
- **Climate Change** – developing a low carbon transport system that supports emissions reductions, while improving safety and inclusive access.

Auckland Transport Alignment Project

Auckland Council and the government worked together to develop an aligned strategic approach to the development of Auckland's transport system for the next 30 years. In 2016, a recommended strategic approach was agreed to, based on three integrated components:

- making better use of existing networks
- targeting new investment to the most significant challenges
- maximising new opportunities to influence travel demand.

In 2018, the strategic priorities of ATAP were updated to reflect new government priorities, with a vision to deliver the following benefits for Auckland:

- 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 above priorities contributed to the starting point of the development of an ILM with partners in early 2020. A new ATAP investment programme was published in early 2021 with the same objectives as the RLTP and Future Connect:

- enabling and supporting Auckland's growth, focusing on intensification in brownfield areas and with some managed expansion into emerging greenfield areas
- providing and accelerating better travel choices for Aucklanders
- better connecting people, places, goods and services
- improving the resilience and sustainability of the transport system, significantly reducing the greenhouse gas emissions the system generates
- making Auckland's transport system safe by eliminating harm to people.

##Ināia tonu nei: a low emissions future for Aotearoa

The Climate Change Commission (CCC), an independent Crown entity, provided Government with advice on achieving a low emissions future in New Zealand in June 2021.

The CCC recommends three areas for Government to focus on to reduce emissions for transport:

1. Reducing the reliance on cars (or light vehicles) and supporting people to walk, cycle and use public transport.
2. Rapidly adopting electric vehicles (EVs). Aotearoa should import more efficient vehicles until EVs are widely available and affordable.
3. Beginning work now to decarbonise heavy transport and freight, including moving more freight by rail and sea, and encouraging the production and use of low-emissions fuels.

The Government will develop specific policies, allocate the first three emission budgets up to 2035 and develop an Emission Reduction Plan by mid-2022.

Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan 2020

Auckland Council's adopted Auckland's Climate Plan addresses the climate emergency. Its core goals are to:

- halve Auckland's emissions by 2030 and reach net zero by 2050
- adapt to the impacts of climate change.

Auckland Council has committed itself to contribute to worldwide efforts under the Paris Agreement to limit global temperature increases. To achieve 1.5 degree Celsius compliance, fundamental shifts are required in transport and travel, infrastructure assets, and how land is developed.

The document highlights that leadership is needed from Auckland Council, Auckland Transport and central government to deliver on actions related to transport. Key actions are outlined for transport's role:

- changing the way we all travel
- make travelling by public transport more appealing than using personal vehicles
- rapidly increase access to bicycles, micro-mobility devices and the safe, connected, and dedicated infrastructure that supports their use
- rapidly improve safety, connectivity, and amenity of walking infrastructure
- accelerate the transition of our passenger and light commercial vehicle fleet to low emissions vehicles
- make heavy freight systems more efficient and low carbon
- enhance the resilience of our transport network.

Auckland Council and Auckland Transport are jointly developing a Transport Emissions Reduction Plan (TERP) that will set out pathways to Te Tāruke-ā-Tāwhiri's target of a 64 percent reduction in Auckland's transport emissions by 2030.

National Policy Statement on Urban Development 2020 (NPS-UD)

The NPS-UD directs local authorities to enable a greater supply of development fundamentals, such as infrastructure, and ensure that planning is responsive to changes in demand. The NPS-UD seeks to ensure that new development capacity enabled by councils is of a form, and in locations, which meet the diverse needs of communities and encourage well-functioning, liveable urban environments. It also requires councils to remove overly restrictive rules that affect urban development outcomes in our cities. It came into effect on 20 August 2020.

The NPS-UD is part of the Urban Growth Agenda, which aims to create conditions where the market can respond to growth, and bring down the high costs of urban land by addressing the fundamentals of:

- land supply
- development capacity
- infrastructure provision.

Auckland is regarded as a Tier 1 urban environment. This is determined by population size and growth rates and is therefore subject to the most directive policies, especially around intensification.

Key implications for transport are:

- providing for higher density development, especially adjacent to rapid transit services
- supporting the development of land with adequate infrastructure
- responding and managing 'out of sequence' development

- managing the impacts of removal of Minimum Parking Requirements such as potential spill over of car parking onto streets.

Wider Strategic Direction

Other important documents providing strategic direction to investment are outlined below:

Document	Strategic direction
NZ Rail Plan 2021 **(MoT)**	The New Zealand Rail Plan is a non-statutory planning document that sets out the Government's strategic direction for rail and priorities for investment over the next 10 years. The Rail Plan will guide investment in the overall rail system, including via National Land Transport Programme (NLTF) and Crown funding decisions. The Government is committed to seeing rail play its part in a multi-modal transport system (freight and passenger services). Strategic priorities for rail are in two parts: **Part A** • Establishing a new long-term planning and funding framework under the LTMA 2003 **Part B** • Investment priorities for a resilient and reliable rail network – investing in the national rail network to restore rail freight and provide a platform for future investments for growth • Investing in the metropolitan rail network to support growth and productivity in our largest cities These priorities will guide investment considered through the new planning and funding framework, and the development of the Rail Network Investment Programme (RNIP).
Rail Network Investment Programme **(KiwiRail)**	Auckland's RLTP proposes land transport activities to the RNIP affecting Auckland's metropolitan rail services. The RNIP is prepared by KiwiRail every three years, and could be partially or fully funded by the NLTF.
Hīkina te Kohupara **Transport Emissions: Pathways to Net Zero by 2050** **(MoT)**	MoT's discussion paper released in May 2021 sets out a system wide approach to reducing transport emissions. It will contribute to the Government's Emission Reduction Plan. MoT has developed a set of key principles to shape their advice to Government to transition to a zero carbon transport system: • The transport sector will play a lead role in meeting our 2050 net zero carbon target. • We need to focus on moving to a zero carbon transport system, rather than offsetting emissions. • We need to take a strategic approach to reducing transport emissions. • Co-ordinated action is required across the transport system to avoid and reduce emissions.

Document	Strategic direction
	• To ensure a Just Transition we need to manage the impacts and maximise the opportunities brought about by changes to the transport system. • We need to forge a path to zero transport emissions by 2050, while recognising that there is not one way to get there. • Innovation and technologies will play an important role in reducing emissions, but people are the key to our future.
Auckland Transport Statement of Intent (2021/22 – 2023/24)	Auckland Transport's has ten Strategic Objectives below to deliver on its functions and operations: 1. Making Auckland's transport system safe by eliminating harm to people 2. Providing an excellent customer experience for all services and customers 3. Providing and accelerating better travel choices for Aucklanders 4. Better connecting people, places, goods and services 5. Enabling and supporting Auckland's growth, focusing on intensification in brownfield areas and with some managed expansion into emerging greenfield areas 6. Improving the resilience and sustainability of the transport system and significantly reducing the greenhouse gas emissions it generates 7. Support the council group's contribution towards Māori outcomes 8. Collaborative partnering with our funders, partners, stakeholders and communities 9. Our operating model is agile, financially sustainable and delivers economic benefits 10. Enabling and enhancing our culture and capability.
Arataki 2020 (Waka Kotahi)	Arataki is Waka Kotahi's 10-year view of what is needed to deliver on the government's current priorities and long-term objectives for the land transport system. The five step changes identified for Auckland as the basis for action are: • Improve urban form • Transform urban mobility • Significantly reduce harms • Tackle climate change • Support regional development.
Regional Public Transport Plan 2018-28	The Regional Public Transport Plan (RPTP) describes the public transport network that Auckland Transport proposes for the region. It identifies the services that are integral to that network over a 10-year

Document	Strategic direction
(Auckland Transport)	period and sets out the policies and procedures that apply to those services. The Plan outlines five desired outcomes: • A continuously improving customer experience • Services that integrate with surrounding, and planned, land uses and contribute to place making • Affordable and equitable travel • An increasingly safe, secure and sustainable system • Improved monitoring and value for money.
Auckland Freight Plan 2020 **(Auckland Transport)**	The Auckland Freight Plan identifies the critical challenges for freight movement, desired outcomes, and an action plan to achieve those outcomes. The plan outlines 6 desired outcomes for freight movement: • Productivity – the importance of freight movement results in its movement being efficient • Competitiveness – the full supply chain is cost effective and reliable • Safety and security – removing risk in moving freight. • Sustainability – freight moves to a more environmentally friendly set of technologies • Acceptance – the needs of freight are considered in the planning system • Smart freight – being innovative and customer focused.

Document	Strategic direction
Vision Zero for Tāmaki Makaurau 2019 **(Auckland Transport)**	Vision Zero has set a target for no more than 250 annual deaths and serious injuries by 2030. Priorities for the strategy are: • Reducing transport deaths and serious injuries, especially for vulnerable transport users • Providing a safe transport environment by increasing investment in safe infrastructure, technology and speed management • Supporting safe transport user behaviour through education, training, enforcement and travel demand management • Creating safe and healthy streets through safe active modes including access to public transport, schools and town centres • Ensuring Māori participation and representation in governance decision-making and leadership • Expanding Te Ara Haepapa Māori designed and led programmes including sustainable funding pathway and development of a monitoring and evaluation framework • Delivering safe end-to-end public transport journeys • Providing Vision Zero leadership, capability, policies, safety management tools and systems • Ensuring safety is equitable regardless of age, ethnicity and socio-economic status • Increasing public awareness of successful Vision Zero principles and practice • Embedding Vision Zero in land use planning, placemaking and design • Integrating safety into procurement, vehicle fleets and workplace health and safety • Establishing better data, monitoring and research into systemic causes of road trauma and its prevention.

The Auckland Region Transport Strategic Case provides high level problem statements and other information for the key transport partners in Auckland. Through the ILM process the strategic objectives and outcomes of partners have been reviewed and aligned as far as possible to relevant policies and priorities.

3 STRATEGIC ASSESSMENT

The Auckland region is the largest urban area in New Zealand and is growing rapidly. This is creating significant transport challenges, including related safety and environmental challenges, both now and into the future. As the transport system evolves, a robust evidence-base is key to making better decisions and interventions by Auckland Transport and its partners for the benefit of Auckland, its people, economy and environment.

3.1 Investment Logic Mapping

An initial ILM was finalised in February 2020 (refer to Appendix A) with Waka Kotahi and Auckland Council (partners) and key stakeholders (Ministry of Transport and KiwiRail). This elaborated on ATAP 2018 and the Auckland Plan to outline the problems and opportunities facing Auckland's transport system in order to guide integrated land transport planning and investment.

The ILM process involved 2 stages:

- **Stage 1 workshop** included representatives from Auckland Council, Waka Kotahi, KiwiRail and Auckland Transport (November 2019). The focus was on a review and refinement of a 'strawman' prepared in advance based on ATAP 2018, RLTP 2018 and Auckland Plan with supporting and background information provided beforehand.
- **Stage 2 workshop** included senior decision-makers and representatives from Auckland Council, Waka Kotahi, KiwiRail and Auckland Transport (February 2020). The focus was on a review and refinement of the draft ILM from Stage 1.

The ILM was subsequently updated to bring investment objectives in line with the ATAP and RLTP processes (refer to Appendix A: updated ILM). An additional RLTP investment objective was added to address asset management, which was out of scope for the original ILM process. Problems and objectives have been finalised as part of partner process. Note that the Measures and Indicators of Success are to inform the assessment of the 2021-31 RLTP.

3.2 Problem statements

Below are the four key problems identified in the ILM (refer to Appendix A).

- **ACCESS** – Existing deficiencies in the transport system and an inability to keep pace with increasing travel demand is limiting improved and equitable access to employment and social opportunities
- **TRAVEL OPTIONS** – A lack of competitive travel options and high car dependency as the city grows, is limiting the ability to achieve the quality compact urban approach for Auckland
- **ENVIRONMENT** – Emissions and other consequences of transport are harming the environment and contributing to the transport system becoming increasingly susceptible to the impacts of climate change
- **SAFETY** – The transport system has become increasingly harmful and does not support better health outcomes

It should be noted that the underlying cause and effect of the first two problems - "Access" and "Travel Options" are closely related. For example, equitable access to work is closely related to the quality of available travel options in an area.

The following sections examine data, where available, on both current and future problems anticipated by 2031. **Future problems are examined without the benefits of RLTP 2021-2031 investment, or policy interventions.**

3.3 Alignment of Transport Outcomes in Auckland

Government agencies measure the outcomes and benefits of investment in Auckland's transport system through different frameworks. Table 3 below summarises the high-level relationship between the Ministry of Transport's Transport Outcomes Framework, Waka Kotahi's Benefits Framework and RLTP's Investment Objectives as updated by the ATAP process. Although frameworks have different foci, there is broad alignment overall.

Table 3 - Alignment of Transport Outcomes

MoT TOF	Waka Kotahi Benefits Framework	RLTP/Future Connect
Outcome area	Benefit area	Investment objective
High level outcomes – national focus	*Detailed business case support – national focus*	*ATAP/Regional Transport Committee updated Objectives*
Economic prosperity	Impact on network productivity and utilisation	• Better connecting people, places, goods and services • Enabling Auckland's growth through a focus on intensification in brownfield areas, and with some managed expansion into emerging greenfield areas
	Wider economic benefit	
	Impact on system reliability	
Inclusive access	Access to opportunities	• Accelerate better travel choices for Aucklanders • Sound asset management (additional RLTP Objective)
	User experience	
	Mode choice	
	Liveability of places	
	The Māori World	
Environmental sustainability	Impact on greenhouse gas emissions	• Improving environmental resilience and sustainability of the transport system, and significantly reducing the greenhouse emissions it generates
	Impact on land and biodiversity	
	Impact on water	
	Impact on resource efficiency	
Resilience and security	Impact on system vulnerabilities and redundancies	• Sound asset management (additional RLTP Objective)
Healthy and safe people	Changes in user safety	• Make the transport system safe by eliminating harm to people
	Perceptions of safety	
	Human health	

3.4 Problems and Evidence

The following sections examine the underlying evidence of the four key problems identified in the ILM.

3.4.1 PROBLEM 1: Access

ACCESS – Existing deficiencies in the transport system and an inability to keep pace with increasing travel demand is limiting improved and equitable access to employment and social opportunities

Future problems and opportunities are assessed without the benefit of interventions whether through policy changes or RLTP 2021-2031 investments.

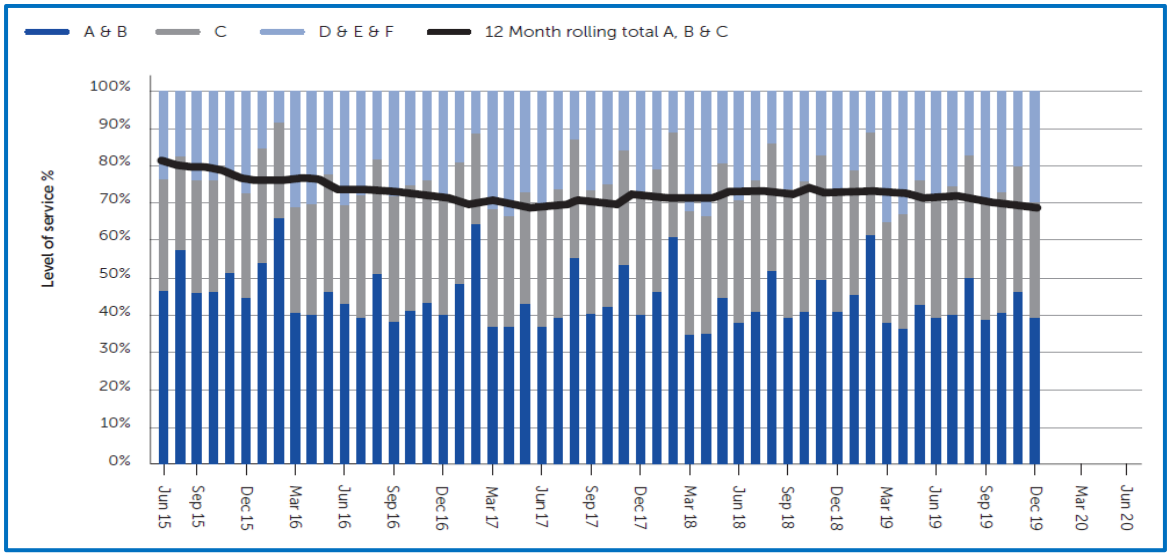
Demand for travel is increasing

With a population forecast to grow by about 22% between 2016-2031, travel demand across all transport modes is increasing in Auckland[25].

The distance travelled by Aucklanders has been steadily increasing over the past decades, with 47% observed growth in vehicle kilometres travelled (VKT) by Auckland's fleet occurring between 2001 and 2019. This growth exceeded the level of population growth in the region. Almost all of this growth occurred in two periods of stronger economic growth between 2001-2006 (14%) and 2011-2019 (28%).

Figure 15 shows a record of past level of service on Auckland's arterial road network over the last 5 years (prior to the impact of COVID-19 lockdowns in 2020). The rolling 12-month trend line shows an overall gradual decline in performance of the network (excepting the temporary improvement associated with the Waterview Tunnel opening in July 2017). Level of service D-F broadly represents 'congested' conditions.

Figure 15 - Auckland arterial road level of service (AM peak) [26]



Without intervention, we can expect VKT to increase in line with population or more, depending on economic growth and changes in average trip distance. Under an expected growth scenario and without effective shift to sustainable modes, time spent in congestion is projected to increase from 32% in 2016 to well over 36% during the AM peak in 2031. Inter-peak period congestion can also be expected to increase with additional demand.

In addition to delay and frustration for motorists and higher costs for freight and business related travel, increases in congestion are also likely to impact Auckland's wider economic outcomes. In particular, the slower travel times associated with congestion will mean that access to the available

[25] Source: Macro Strategic Model, land use v11.6, Auckland Forecasting Centre.
[26] Source: The Congestion Question - Technical Report, April 2020:22, Ministry of Transport, Auckland Council, Waka Kotahi, Auckland Transport, The Treasury, State Services Commission

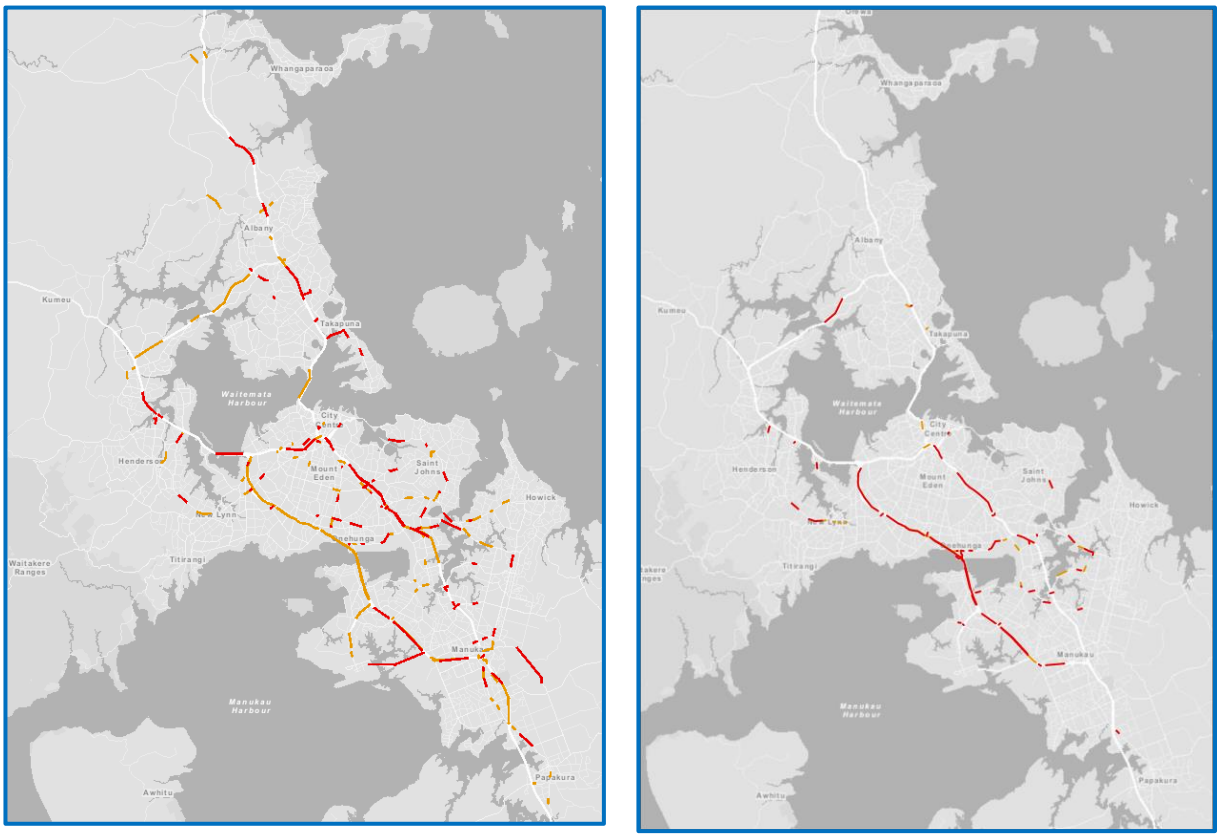
labour force will increase more slowly over time despite the increasing working age population due to Auckland's growth. This effectively means that Auckland risks diminishing economic and productivity returns to increasing scale as a result of transport network limitations.

Note that actions on climate change in the future are likely to require a reduction in private VKT and these projections will require revision when climate change interventions and actions are agreed upon.

Travel demand impact on modal networks

The growing travel demand is leading to deficiencies across all transport networks. Figure 16 displays locations on the General Traffic and Freight Strategic Networks that are expected to be over capacity in 2031. Despite investment in the transport system from the 2018 RLTP, large sections of the Strategic Networks will be congested and operating at overcapacity by 2031.

Figure 16 - Future volume / capacity deficiencies on General Traffic & Freight Strategic Networks[27]



General Traffic Strategic Network **Freight Strategic Network**[28]

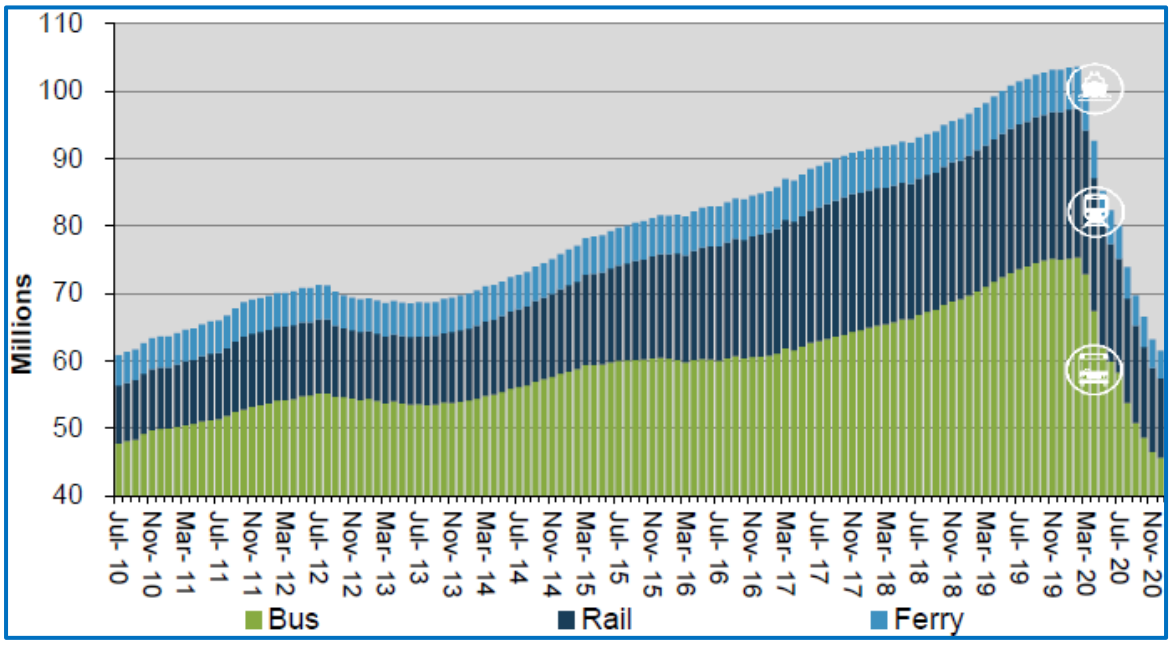
Indicator: Volume / capacity change 2018 versus 2031 (AM Peak)
High Over capacity (>=85%) in 2018 and worse in 2031
Moderate Under capacity (<85%) in 2018 but over capacity (>=85%) by 2031

Over the last 5 years, there has been strong growth in PT patronage, albeit from a fairly low baseline. Figure 17 shows total patronage (12 months rolling total) for PT in Auckland. HOP Card, integrated fares, the new PT network and rail / busway improvements have all contributed to overall boardings increasing from 60 to over 100 million per year during the past decade.

[27] Source: Future Connect Mapping Portal, Auckland Transport. Note that forecasting to 2031 is based on ATAP2 scenario to 2028 (August 2019, Auckland Forecasting Centre) adjusted for population and employment growth to 2031
[28] Note: only applies where % of HCV greater or equal to 10%

A recent customer survey revealed that Aucklanders believe a more reliable public transport system going to more places and more frequently as key to easing the city's congestion issues. This was, by far, regarded as the number one priority for short term investment[29].

Figure 17 - Rolling Annual Public Transport Boardings July 2010 to November 2020[30]

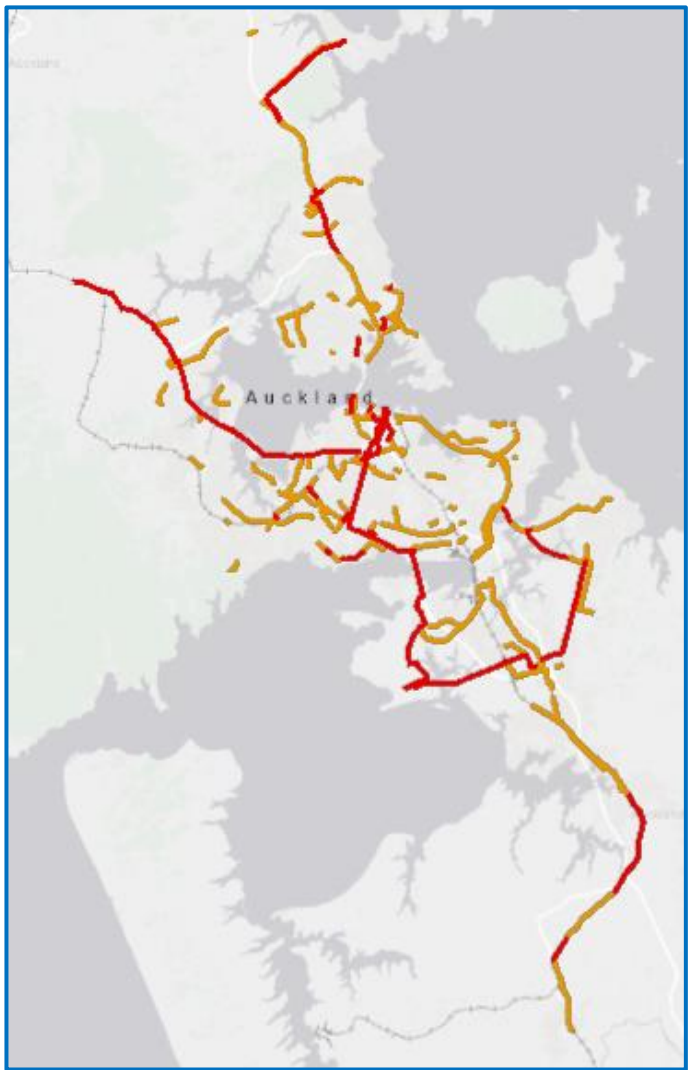


COVID-19 created several short-term constraints for the PT network, with reduced services, reduced demand as a result of lockdowns, and social distancing requirements driving down annual boardings. However, ongoing monitoring indicates that this trend is reversing as restrictions ease, and the economy recovers, with significant growth in boardings still anticipated over the next decade.

PT patronage is expected to increase across all modes over the next decade. The analysis shown in Figure 18 reveals particular parts of the PT network that is expected to experience increasing demand to 2031.

[29] Source: RLTP Public Preferences Study, 2021, Auckland Transport Customer Voice
[30] Source: Monthly Indicators report 2020/21, Dec 2020, Auckland Transport

Figure 18 - Public Transport volume increases forecast to 2031 (with capacity unconstrained)[31]

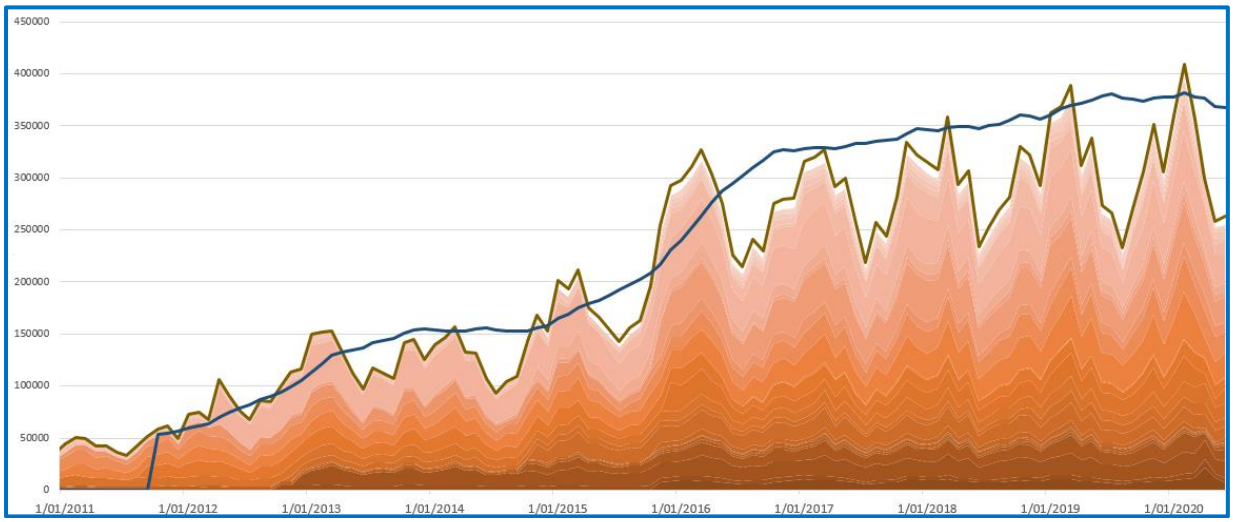


Indicator: Public Transport volume change 2018 versus 2031 (forecast[32])
High Over capacity (>=85%) in 2018 and worse in 2031
Moderate Under capacity (<85%) in 2018 but over capacity (>=85%) by 2031

2018 Census data shows a modest 7% increase from 2013 in bicycle commuting trips, with a large share of these in central city areas (refer to Figure 31). Cycle trips have also increased, most significantly in locations where new infrastructure has recently been delivered. Figure 19 shows cycle trips over the past 10 years. New cycleways, especially when connecting into and expanding existing networks, have contributed to cumulative cycling growth rates of nearly 8% per annum in the recent years.

[31] Source: Future Connect Mapping Portal, Auckland Transport
[32] Forecast unconstrained demand based on Macro Strategic Model, ATAP 2, land use v11.5, Auckland Forecasting Centre

Figure 19 - Monthly Cycle Movements past selected Count Sites in Auckland[33]



It is difficult to forecast future increases in cycle trips, but there is a clear relationship with the provision of safe and high quality infrastructure. This indicates a significant opportunity to increase cycling through investment in effective and attractive safe cycling facilities.

Existing Deficiencies in the Transport System and inability to keep pace with increasing travel demand

Auckland's geography is constrained by the Waitemata and Manukau harbours, limiting the amount of land available for development near the centre. Development has stretched across nearly 50 kilometres north-to-south and over 30 kilometres east-to-west influenced by planning and funding decisions over time. Infrastructure and transport demand are focused into a small number of narrow corridors, creating pinch points on the network.

Significant investment in the Auckland transport network has occurred over the past 15 years. This has been aided by the amalgamation of legacy territorial authorities into the Auckland Council, and the creation of Auckland Transport, providing a single set of objectives for transport. Improvements have been made to the State Highway network, including the completion of the Western Ring Route, alongside capacity improvements to SH1 and SH16. Investment in PT, such as the Northern Busway, double tracking of the Western line, electric trains and electrification of the rail network, has also occurred in this period. Investment in the quality and capacity of the PT system has borne fruit with significant patronage growth (refer to Figure 17).

The 2018 RLTP represented a step-change in transport investment in Auckland, with a transformational investment package agreed amongst partners to address existing and future deficiencies. However, available funding and resources will not resolve all the issues. COVID-19 has also had a significant fiscal impact on local and central government budgets which has exacerbated existing shortfalls in investment. For example, some current projects to address backlogs in PT capacity, or address significant road congestion, or burgeoning growth areas, have been deferred. The consequences of limited investment are that existing deficiencies are not addressed, and future requirements of the transport system will not meet the needs of Aucklanders.

Although investment in past transport projects has generally resulted in major improvements, especially in the PT network, deficiencies remain. These deficiencies occur across all modes, including:

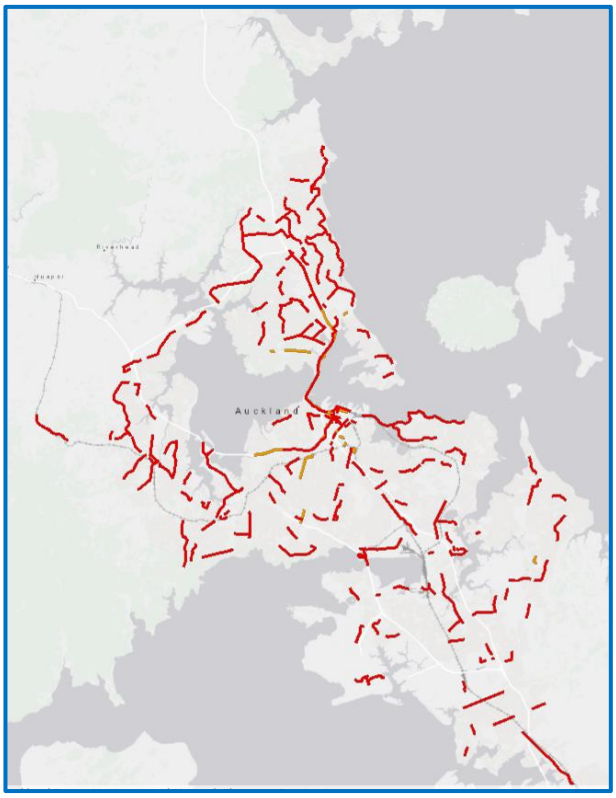
- **Public transport** – lengthy journey times and low travel time reliability on some bus routes where the bus operates in general traffic - which reduces the attractiveness of PT to customers, particularly when compared to car travel

[33] Source: Cycle movements past designated cycling counters, Auckland Transport

- **Walking, cycling and micromobility** – a lack of safe and appropriate facilities limits the attractiveness of active modes (refer to Figure 35)
- **General traffic** – congestion and low route productivity which reduces the efficiency of the road network and travel time reliability while increasing overall costs
- **Freight** – travel delays and a lack of journey time reliability for freight within the region and inter-regionally which creates significant costs for businesses that are ultimately carried by the wider region.

Figure 20 below displays existing travel time reliability issues on the PT and General Traffic Strategic Networks, and travel speed deficiencies on the Freight and General Traffic Strategic Networks.

Figure 20 - Current Deficiencies on the Strategic Transport Networks[34]

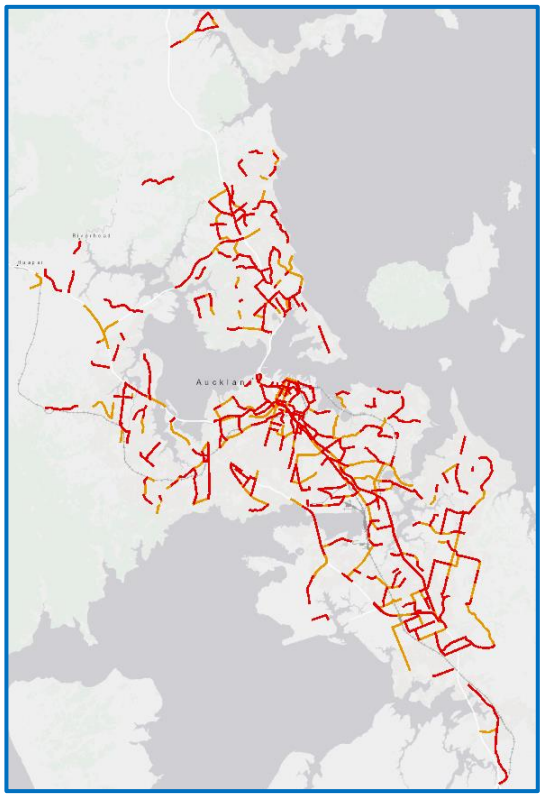


Current deficiency on Bus network: Reliability[35]

Indicator: Bus travel time reliability LOS (AM or PM Peak)

High LOS F

Moderate LOS E



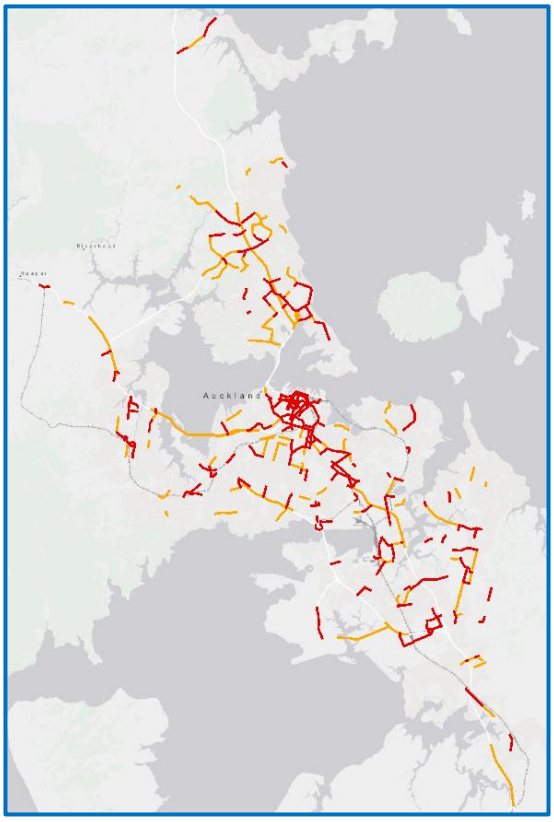
Current deficiency on General Traffic network: Reliability[36]

Indicator: General Traffic travel time reliability LOS (AM or PM Peak)

High LOS F

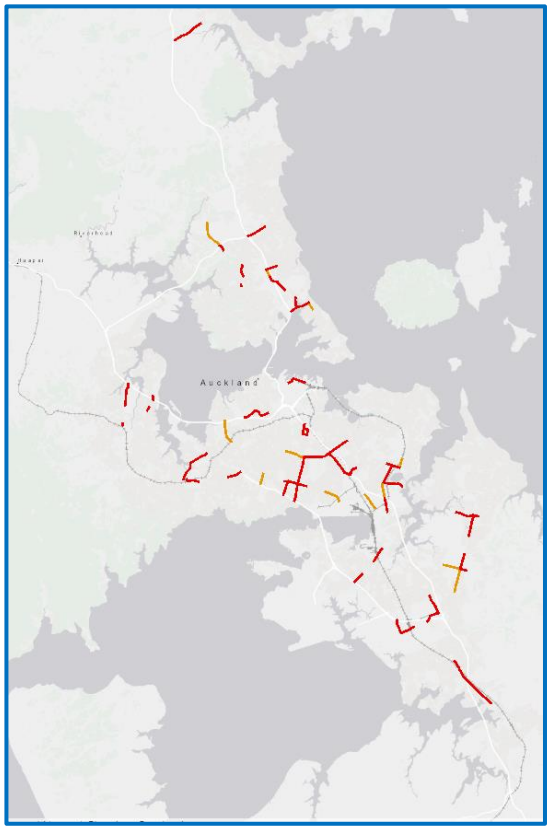
Moderate LOS E

[34] Source: Future Connect Mapping Portal, Auckland Transport
[35] Source: Smartrak March 2019, Future Connect Mapping Portal, Auckland Transport
[36] Source: Snitch Nov 2019, Future Connect Mapping Portal, Auckland Transport



Current deficiency on Freight network: Travel Speed[37]

Indicator: Travel Speed LOS (AM Peak & Inter Peak)
High Interpeak LOS D,E,F
Moderate AM Peak LOS E,F



Current deficiency on General Traffic network: Travel Speed and Productivity[38]

Indicator: Travel Speed and Productivity LOS (AM & PM Peak)
High Both peak periods LOS F, or one E and other F
Moderate AM and PM peak periods: LOS E

Resilience

Major transport projects which have a local focus will not be enough to rectify deficiencies on regional transport networks. The normal functioning of the transport system is subject to short term shocks which disrupt services, or generic network bottlenecks which occur at traffic signals or intersections.

To ensure the resilience of the network in the short term, there is an increasing need for effective network management and incident response to get the most out of existing infrastructure investment and to improve the flow of all road-based modes. Multiple smaller scale interventions (such as intersection treatments, priority lanes, signal optimisation) and general management of the network (such as deploying better technology) can have a significant role to play.

The following two figures show the challenges of improving network management for variable demand over a typical weekday. Figure 21 shows significant variability of traffic volumes based on time of day (general and commercial traffic).

[37] Source: Snitch Nov 2019, Future Connect Mapping Portal, Auckland Transport
[38] Source: Snitch Nov 2019, Future Connect Mapping Portal, Auckland Transport

Figure 21 - Distribution of General and Commercial Vehicle Activity by Time of Day[39]

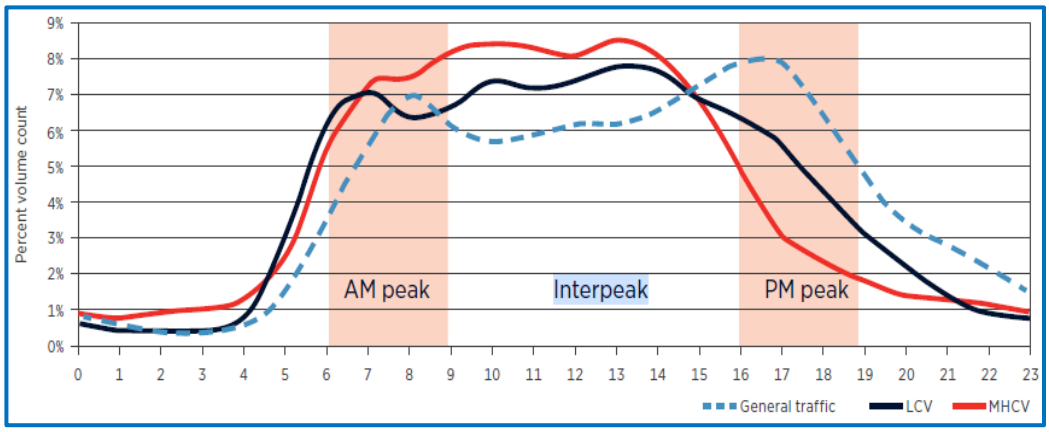
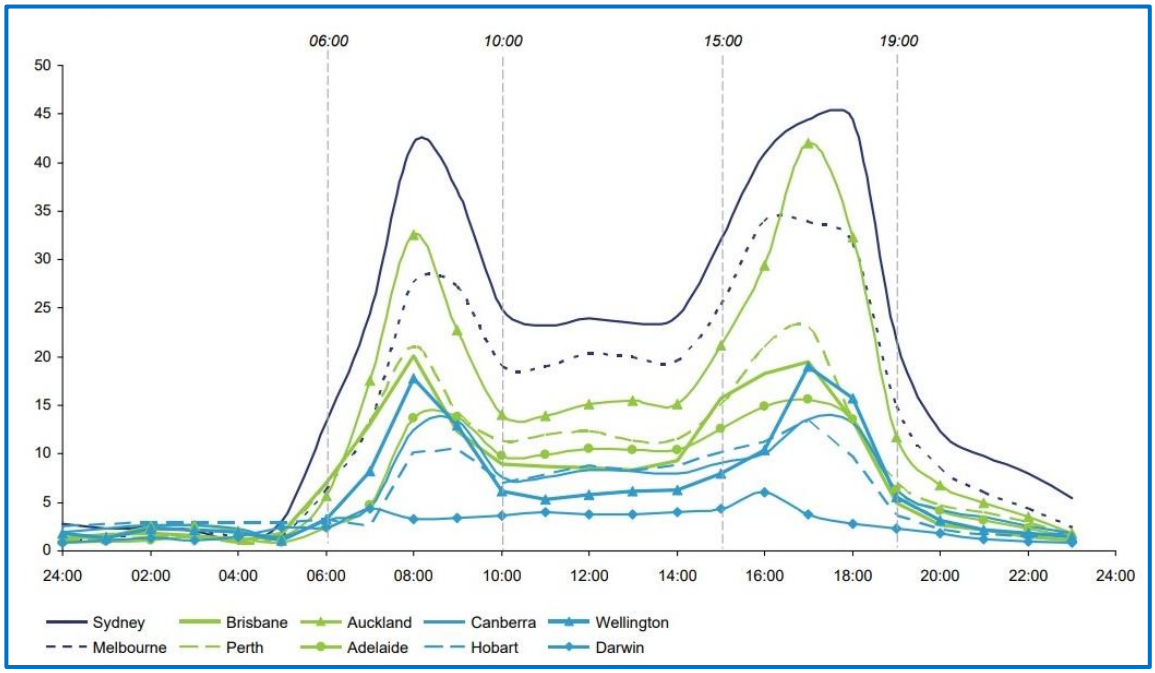


Figure 22 shows that Auckland experiences some of the highest travel time delays in Australasia, even when compared to much larger cities.

Figure 22 - Travel Time delays in Australasian cities by time of day (weekdays) [40]

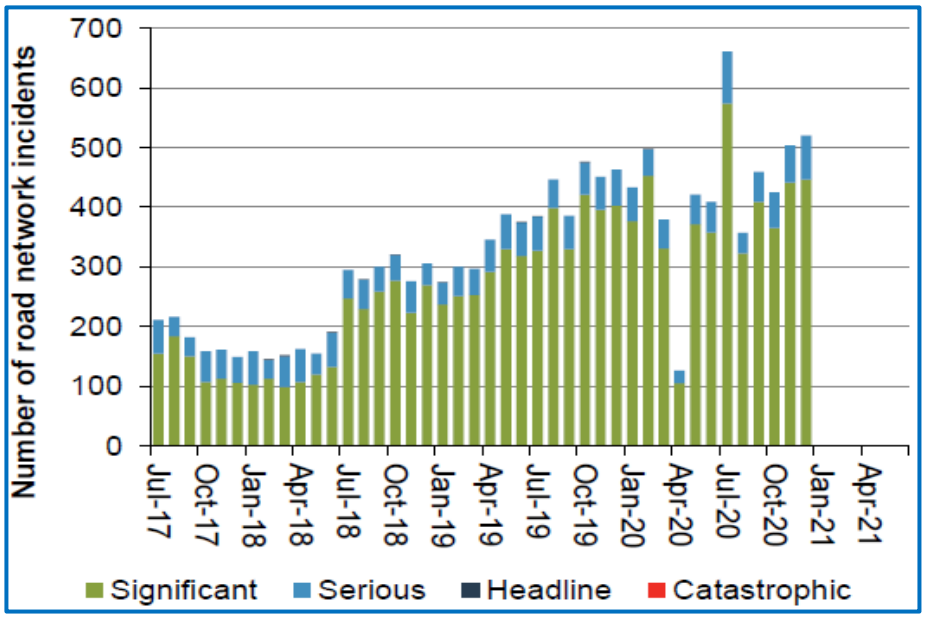


Managed Incidents

Increased volumes of traffic are related to an increase in the frequency of significant traffic incidents. and seriousness of managed traffic. Data collected by ATOC (Figure 23) shows that Managed Incidents have more than doubled between 2017 and 2020, demonstrating a clear need for a continued focus on traffic management planning and resources.

[39] Source: data based on sample of 1 million+ commercial trips in March 2017 (Auckland Freight Plan, Sept 2020, Auckland Transport)
[40] Source: Congestion and Reliability Review Summary, 2016:23, Deloitte Touche Tohmatsua Limited (Austroads Research Report AP-R533-16)

Figure 23 - Network Incidents July 2017 to January 2021[41]



Access to Employment and Social Opportunities

Geographic realities mean that it is very hard to provide truly equitable access for households[42] across Auckland. Access to the City Centre will always be significantly greater from the immediately surrounding suburban areas than the outer urban areas. However, differences in network performance and underlying land use are contributing to equity issues in areas where comparable levels of access could be expected[43].

Figure 24 below displays the number of jobs forecast to be accessible in a reasonable travel time across the transport network by PT or car in 2031. The pattern of access generally reflects the dispersion of employment in the city, with areas closest to the City Centre having access to the greatest number of jobs – which largely reflects the concentration of employment in the city centre itself. The level of access reduces as distance from the City Centre increases in a generally concentric pattern, but this is heavily influenced by the distribution of major employment areas, particularly the large employment areas in the inner South (e.g. Penrose). As employment is not evenly distributed across the region, some areas of comparable distance to the City Centre have significantly different levels of access. Transport access does, however, have an impact – for example with the north shore benefitting from higher public transport access due to the effectiveness of the northern busway system.

The following table provides access to employment forecasts from suburbs located within 6-10 kilometres of the city centre and then within 15 kilometres, demonstrating the differences in access by location and mode.

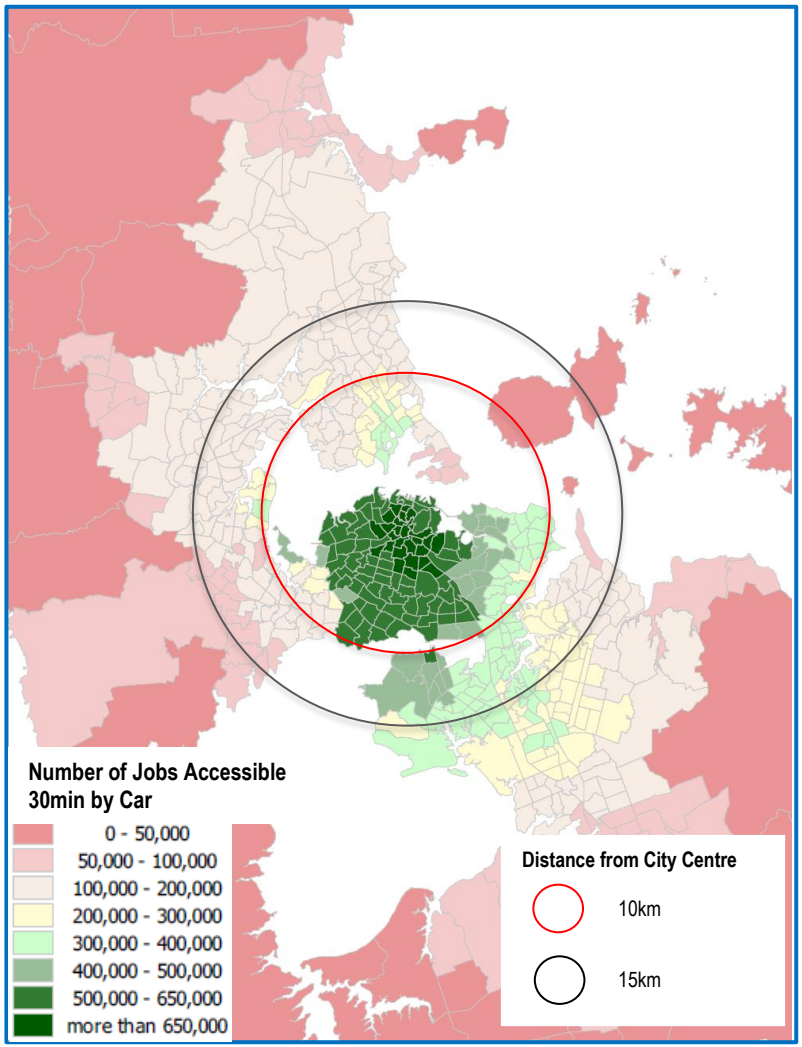
[41] Source: Monthly Indicators report 2020/21, Dec 2020, Auckland Transport. Note that ATOC changed their reporting system in 2018, meaning any observed trend cannot be wholly reliable across that period.
[42] Where 'equitable access' refers to the benefit of accesses being evenly distributed; recognising that households have different needs.
[43] It should be acknowledged that remote access to some essential opportunities is now possible through widespread technological advances (e.g. The ability to work from home online in certain employment).

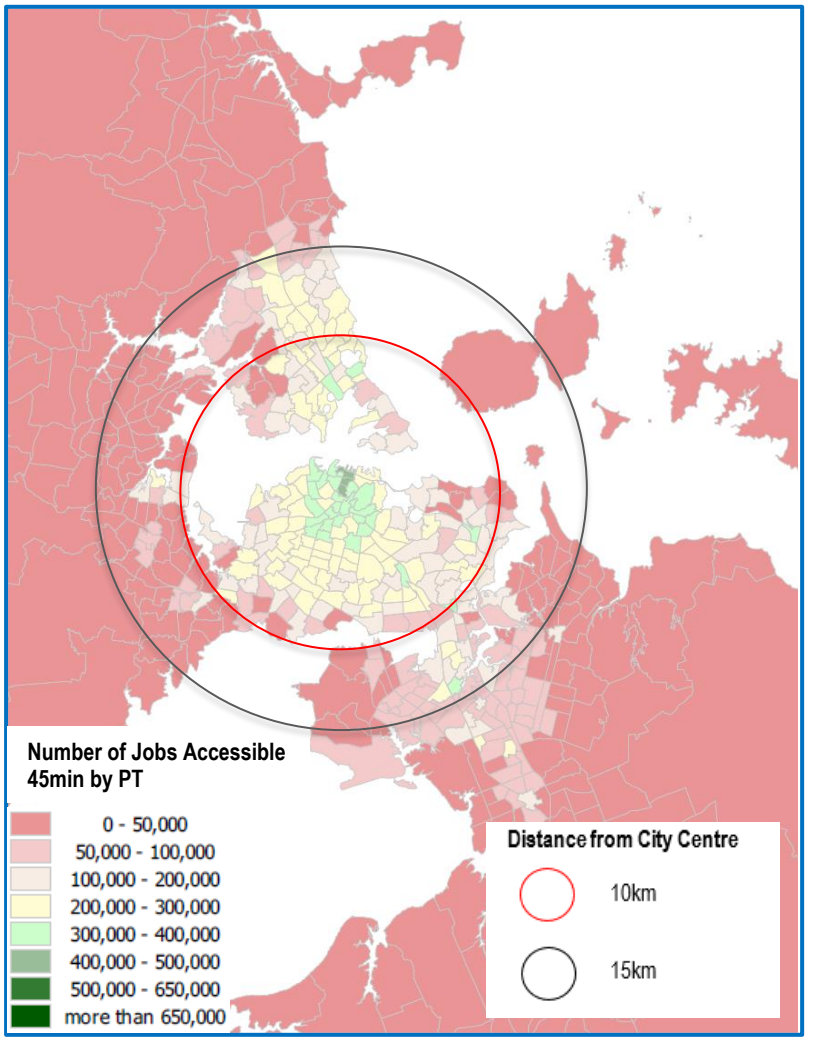
Distance from City Centre	Residential Location	Number of Jobs (30 min by car; 45 min by PT)
Within 6 to 10 kilometres	Jobs accessible from Takapuna	by car: 200,00 to 300,000 by PT: 300,000 to 400,000
	Jobs accessible from central New Lynn	by car: 100,000 to 200,000 by PT: 100,000 to 200,000
	Jobs accessible from Mount Roskill	by car: 500,000 to 650,000 by PT: 200,000 to 300,000
	Jobs accessible from Kohimarama	by car: 300,000 to 400,000 by PT: under 50,000
10 to 15 kilometres	Jobs accessible from Mangere	by car: 400,000 to 500,000 by PT: under 50,000
	Jobs accessible from Titirangi	by car: 50,000 to 100,000 by PT: under 50,000
	Jobs accessible from Botany Downs	by car: 100,000 to 200,000 by PT: under 50,000
	Jobs accessible from Albany	by car: 100,000 to 200,000 by PT: 200,000 to 300,000

General observations of access to employment reveals (with reference to Figure 24 below):

- the relative advantage of PT access over the car on the North Shore, in those areas served by the Northern Busway
- stark contrasts in access by PT versus car in the Inner South - access to employment by car is several times higher than by PT. Access by car from the Inner South is also higher than the Inner West or North Shore - principally reflecting the relatively large numbers of jobs in the South rather than in the North or West
- strong advantage of car access across the isthmus, which enables access to employment in City Centre (although in practice limited by parking costs), and south towards extensive employment areas around Penrose, East Tamaki, Manukau and the Airport
- areas of relatively high public transport access extending outwards along the rapid transit network to the south, north and west
- Areas with limited access to employment are:
    - West Auckland - especially the inner West given the relative proximity to major employment hubs. Access by PT is particularly problematic with under 50,000 jobs accessible
    - South of Manukau - access by both PT and car south of Manukau is low, with under 100,000 jobs accessible even by car south of Takanini. This situation is likely to be further impacted by significant residential growth areas in the far south.

Figure 24 - Number of Jobs Accessible by Mode from locations within Auckland (2031)[44]



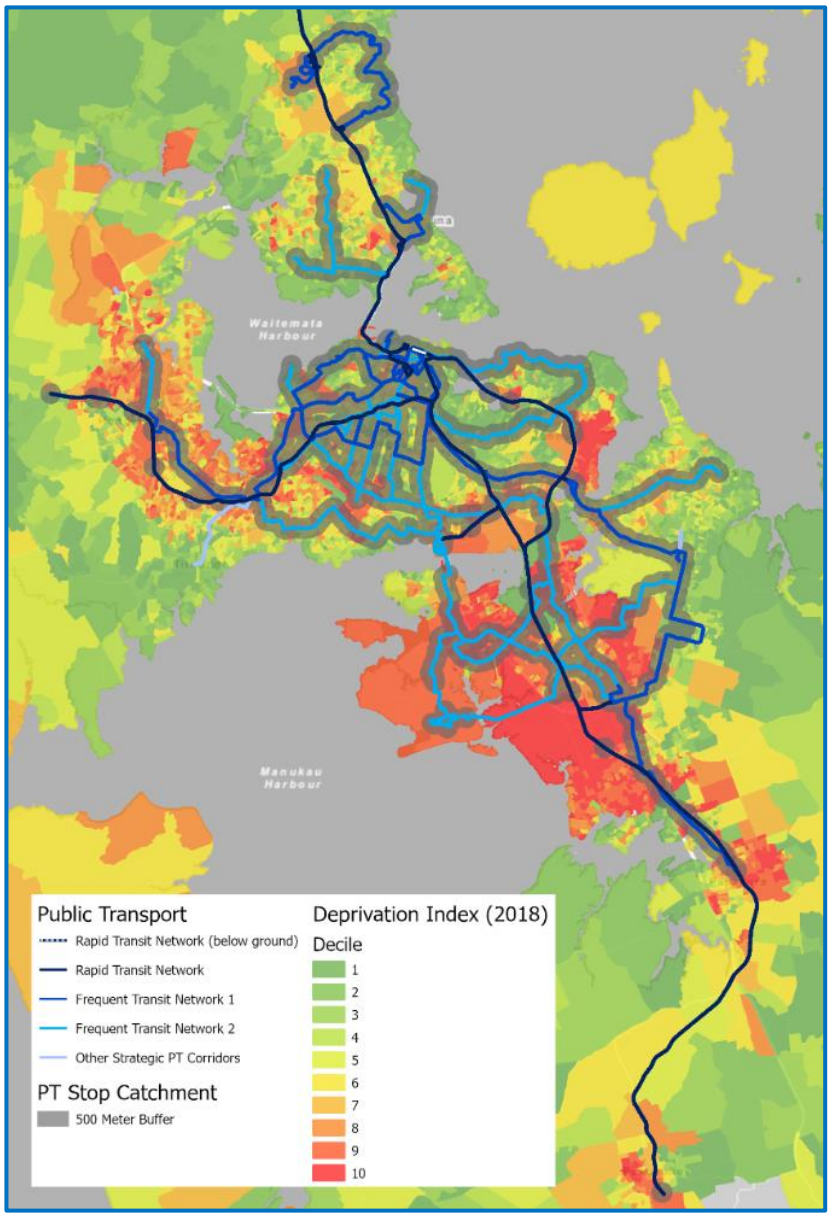


[44] Source: Macro Strategic Model, ATAP 2, land use v11.6, Auckland Forecasting Centre. NOTE: modelling assumes some of the projects that are included in the RLTP 2021-31 programme of investment at this point in time

PT services have improved dramatically with the ongoing upgrades to the Rapid Transit Network along with the recent re-organisation of the bus network, which delivered an extensive increase in the Frequent Transit Network (FTN) catchment. However, access to quality PT from lower socio-economic areas of Auckland remains comparatively low.

Figure 25 shows 500 metre catchments from rail stations or bus stops on the all-day FTN and RTN across deprivation areas. The majority of Auckland is not within walking distance of a frequent service, particularly locations outside of the western isthmus. Areas of high deprivation around Manukau, Manurewa, Otara, Point England, Papakura and Ranui are among those that have limited access to all-day frequent PT. This reflects the trade-offs between patronage, service coverage and cost of PT provision which has led to a focus on higher demand/patronage routes serving the employment concentrations in the City Centre. While Auckland Transport has signalled a desire to expand the provision of frequent transport network services more widely across Auckland in the 2018 Regional Public Transport Plan, funding availability for additional bus services remains a key constraint.

Figure 25 - Current deprivation levels and access to all-day Public Transport[45]

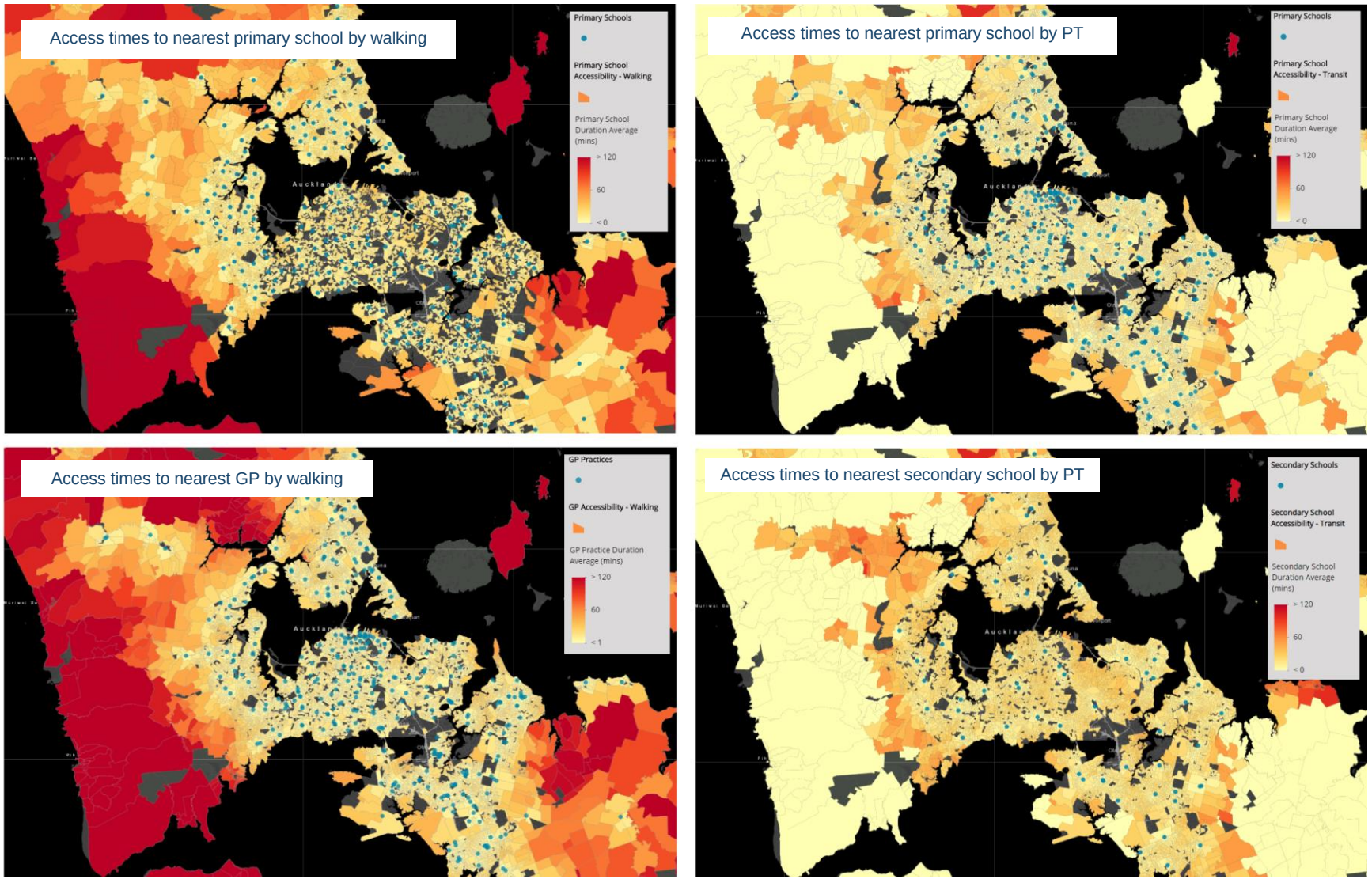


In terms of access to wider opportunities, past trends show that average home to work journey distances have increased the most out of all journey purposes over the last 30 years[46]. However, accessibility to social destinations appears to be better distributed within urban areas when compared to employment which varies more by location. Figure 26 maps travel times to schools and doctors by walking or PT. Within 15 minutes:

- 79% can walk to a primary school
- 85% can get to a primary school using PT
- 34% can get to a secondary school in 15 minutes using PT
- 71% can walk to a General Practitioner in 15 minutes.

[45] Source: developed from 2018 Deprivation data (Otago university) and current FTN and RTN networks, Jan 2021, Auckland Transport. The higher the decile, the higher the level of socio-economic deprivation in the area. Note that some areas with high deprivation are largely industrial/business areas with low populations.
[46] Source: 30 years of the Household Travel Survey – Auckland trends presentation, Oct 2020, Ministry of Transport

Figure 26 - Travel times to access key social destinations by walking or public transport[47]



[47] Source: Outcome maps to inform investment decisions – 2020 baseline presentation (draft), Nov 2020, NZTA

Summary of Problem 1 Evidence

Overall problems and opportunities for Problem 1 are summarised below. These exclude the effect of policy changes or RLTP 2021-2031 investments.

Problems	Key evidence
PROBLEM 1: Existing deficiencies in the transport system and an inability to keep pace with increasing travel demand is limiting improved and equitable access to employment and social opportunities	• Auckland has grown rapidly over the last decade, with travel demand increasing significantly over this period (47% growth in VKT 2001-2019) • Despite strong growth in PT patronage over last decade, and cycle trip gains, large sections of the Strategic Networks currently have low travel time reliability • Travel demand is anticipated to increase as Auckland's population grows over the next 10 years • The time spent in severe congestion is forecast to increase from 32% to well over 36% (AM peak), and large parts of the Strategic Network are forecast to operate over capacity by 2031. This is likely to mean that Auckland will not see the full economic and productivity returns to scale that it could otherwise expect from a growing population. • Shaped by the distribution of employment centres, access to employment varies significantly across the region with clear network deficiencies restricting the ability to improve access (notably in the West and far South) • Even with an expanded FTN catchment and RTN expansion into electric trains over the last decade, access to quality PT in lower socio-economic areas of Auckland is still limited • The resilience and efficiency of the transport system is threatened by increasing demands on a constrained network, variable time of day flows and increasing network incidents which need to be managed.

3.4.2 PROBLEM 2: Transport Options

TRAVEL OPTIONS – A lack of competitive travel options and high car dependency as the city grows, is limiting the ability to achieve the quality compact urban approach for Auckland

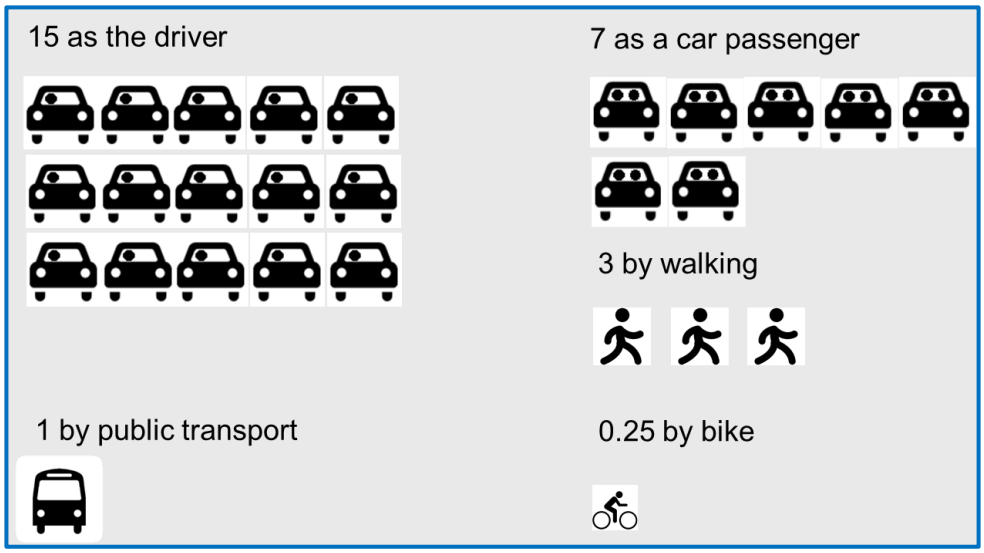
Future problems and opportunities are assessed without the benefit of interventions whether through policy changes or RLTP 2021-2031 investments.

A lack of competitive travel options and high car dependency

Time is precious and consequently one of the main factors people consider when choosing how to travel is which option is fastest. For travel options to be attractive, they need to offer time, cost comfort, or convenience benefits over the alternatives. The pattern of development and / or the expansion of roading capacity in Auckland through the second half of the 20th century has typically supported a car-dominant transport system. As a result of this pattern of development and subsequent investment in the general traffic network, travel by car remains the fastest and most convenient travel choice for most journeys. Figure 27 shows the proportion of trips (for all purposes) by mode in Auckland. The average Aucklander currently makes about 25 trip-legs[48] per week, with over 80% of these being by car.

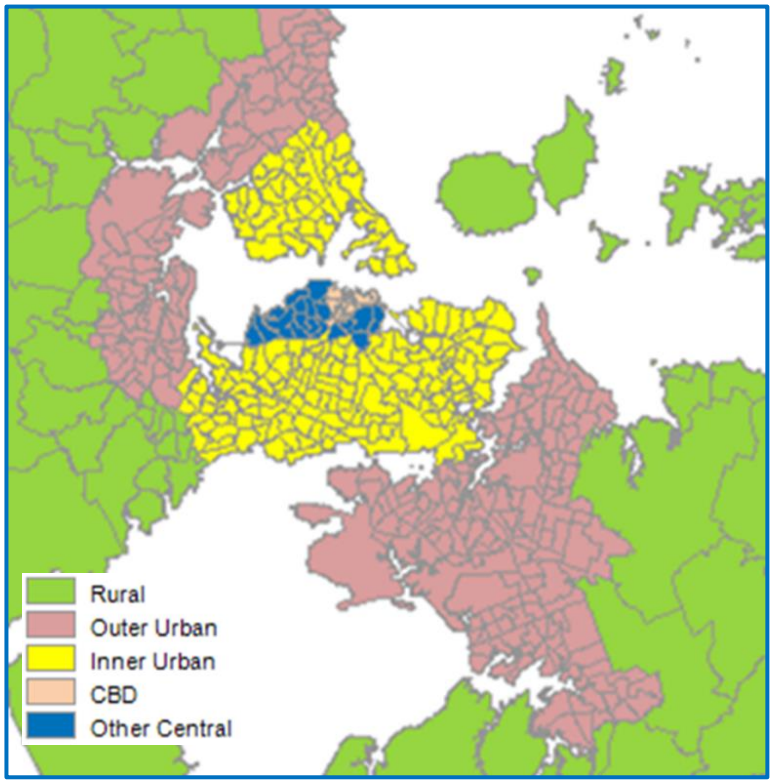
[48] A trip leg is a portion of a complete journey. Thus a single journey may be made up of multiple legs.

Figure 27 - Trip-legs per person a week (2015-18)[49]



Travel options available to Aucklanders are influenced by the overall spatial distribution of demand. The commuting sectors are as defined in Figure 28 below.

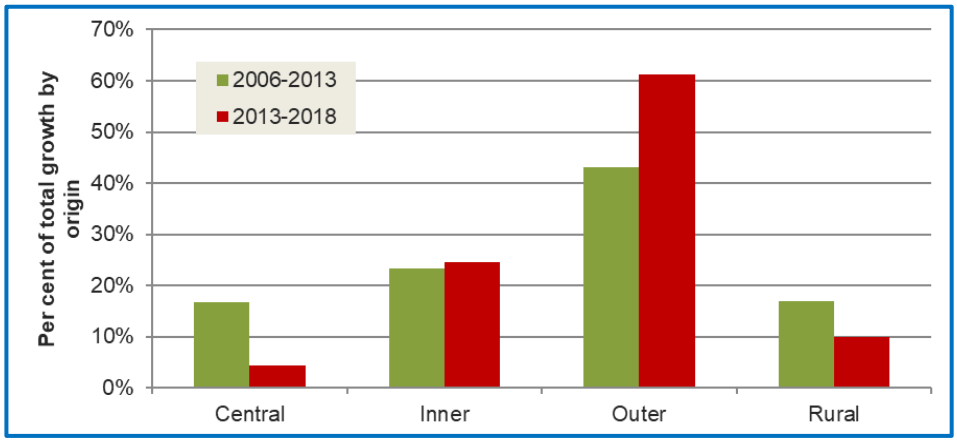
Figure 28 - Auckland Commuting Sectors



Between 2013 and 2018 more than 60% of the growth in commuting trip origins, and 50% of commuting destinations, occurred in the outer urban areas of Auckland[50]. This includes significant residential development in areas such as Hobsonville Point, Millwater and Flatbush. Figure 29 displays the location of trip growth in Auckland by commuting sector over the last decade.

[49] Source: 30 years of the Household Travel Survey – Auckland trends presentation, Oct 2020, Ministry of Transport
[50] Source: Analysis of the 2018 Census Results: Travel to work and travel to education in Auckland, Oct 2020, Richard Paling Consulting

Figure 29 - Growth in commuting trips by origin[51]



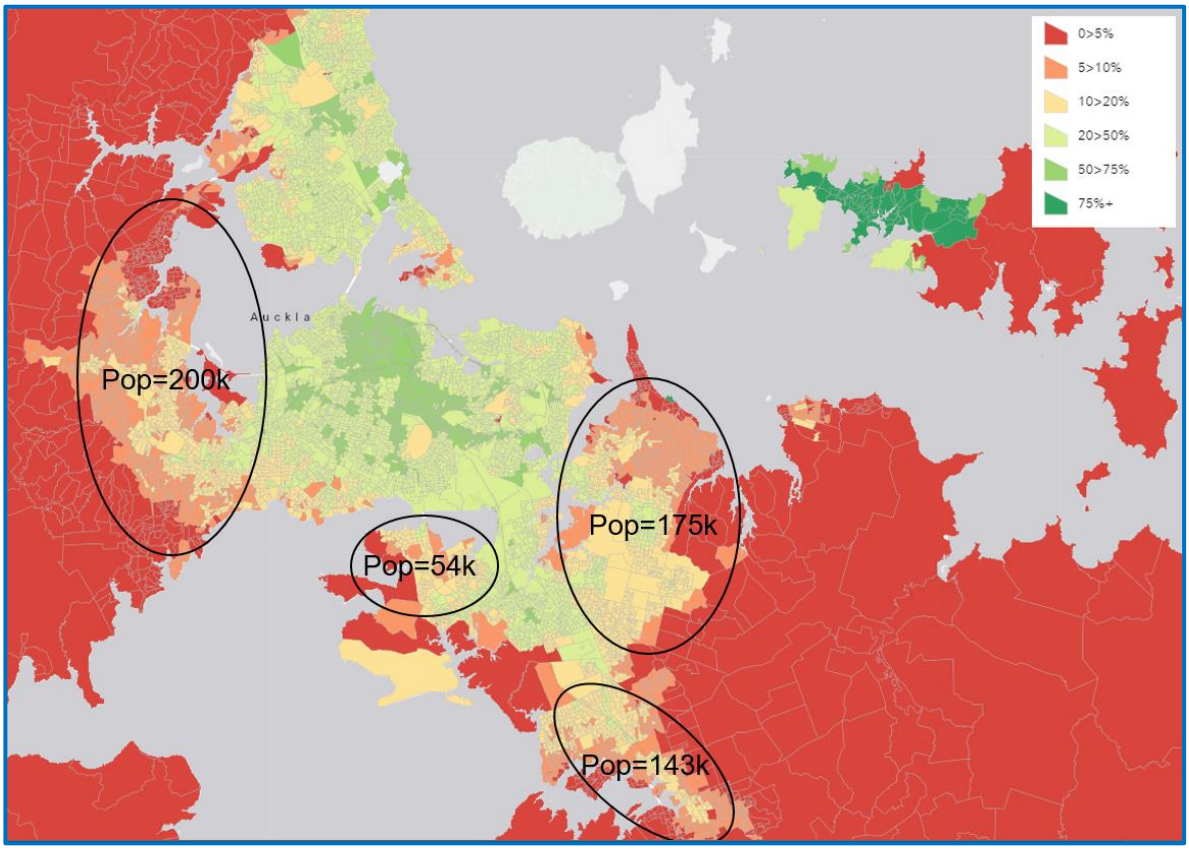
This trend makes it more challenging to operate viable PT services as there is a lower patronage base, with services running longer distances to more destinations leading to a lower Farebox recovery. It is likely that greenfield expansion on the periphery of the urban area has been one of the key contributing factors to increasing VKT over the past five years.

Comparing the travel time competitiveness of PT versus private car is a key indicator of household choice. Figure 30 shows where PT / walking access is equivalent to car access in Auckland, based on theoretical travel times through the network on an average weekday (AM peak). The circles highlight areas where it is much faster for a commuter to drive their car to work than accessing PT services. The circled areas make up about 35% of Auckland's population. Commuting to employment that is not local often necessitates trips concentrated into a limited number of corridors thereby increasing congestion and travel times. Without priority, PT cannot compete. Even in the light-green areas, PT is theoretically only 50-75% as fast as driving.

These figures show the importance of providing rapid and frequent public transport services that are more time competitive with private vehicle travel. Success in this area will be critical to achieving mode change and contributing to reducing greenhouse gas emissions.

[51] Source: Analysis of the 2018 Census Results: Travel to work / education in Auckland, Oct 2020, Richard Paling Consulting

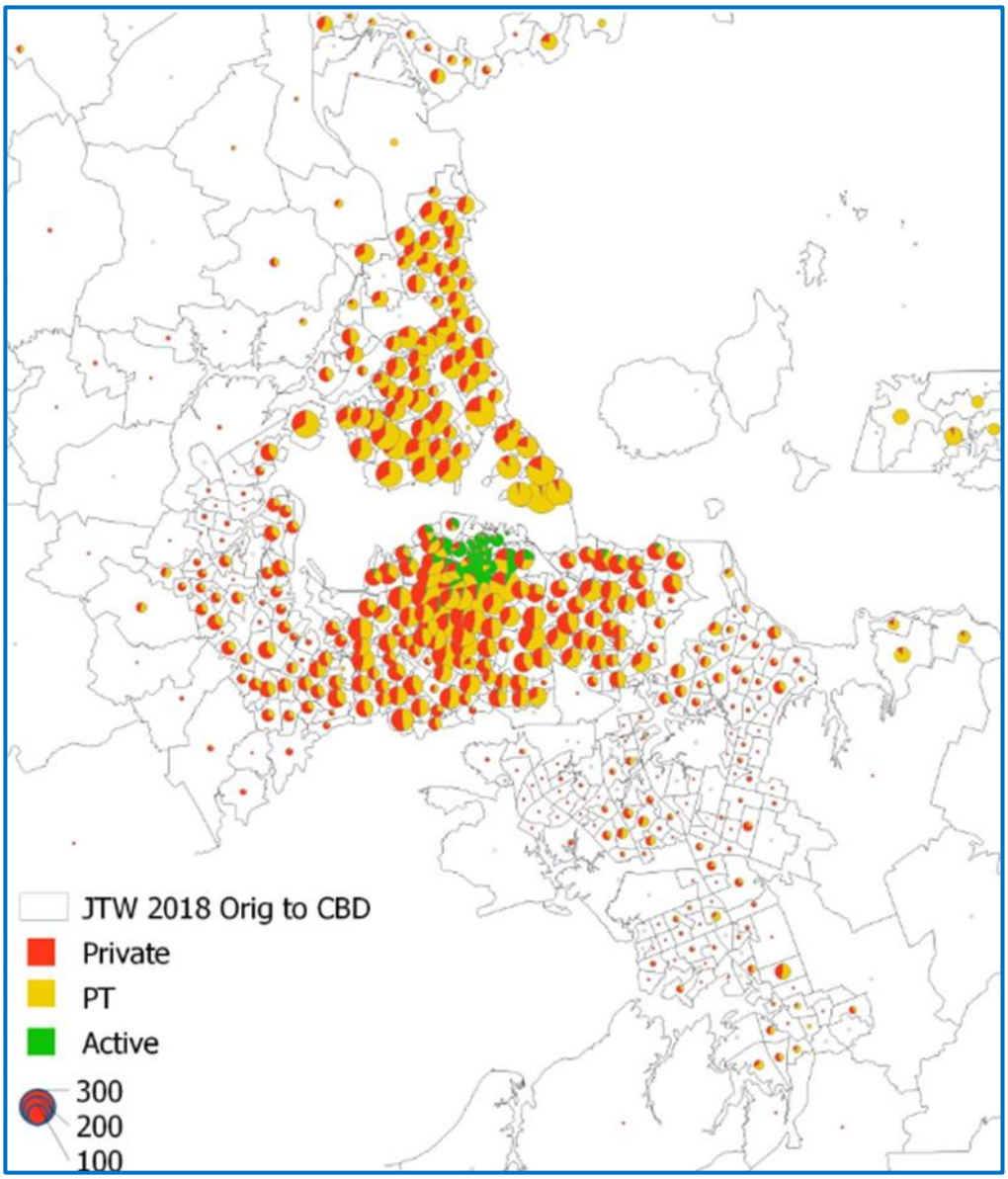
Figure 30 - Theoretical comparison PT/walking versus car access to employment (AM peak)[52]



The potential for public transport to support peak period mode change is demonstrated by the success of public transport into the city centre. Figure 31 shows that PT mode share to the City Centre and central areas is significant on the North Shore and the Isthmus, along with parts of west and south Auckland close to the rail network. Areas close to ferry terminals also enjoy significant PT mode share. These are generally areas where public transport travel times are more competitive with private vehicle travel. Also noteworthy is the concentration of active mode commuting, predominantly encompassing walking to the City Centre from adjacent central areas where trips are shorter, and walking is more competitive.

[52] Source: Outcome maps to inform investment decisions – 2020 baseline presentation (draft), Nov 2020, Waka Kotahi. Travel times are theoretical. Map is based on travel time analytics based on multiple data sources (SA1 2018 Census for O-D, car driving time (Tom-Tom Multinet-R), PT based electronic schedules and simulated walking/wait/transfer times, StatsNZ jobs data (LEED). Map shows how many jobs can be reached via 45 min PT journey (door-to-door) divided by how many jobs can be reached by a 30 min car drive time.

Figure 31 - Modal shares for trips commuting to the Central City / City Centre[53]

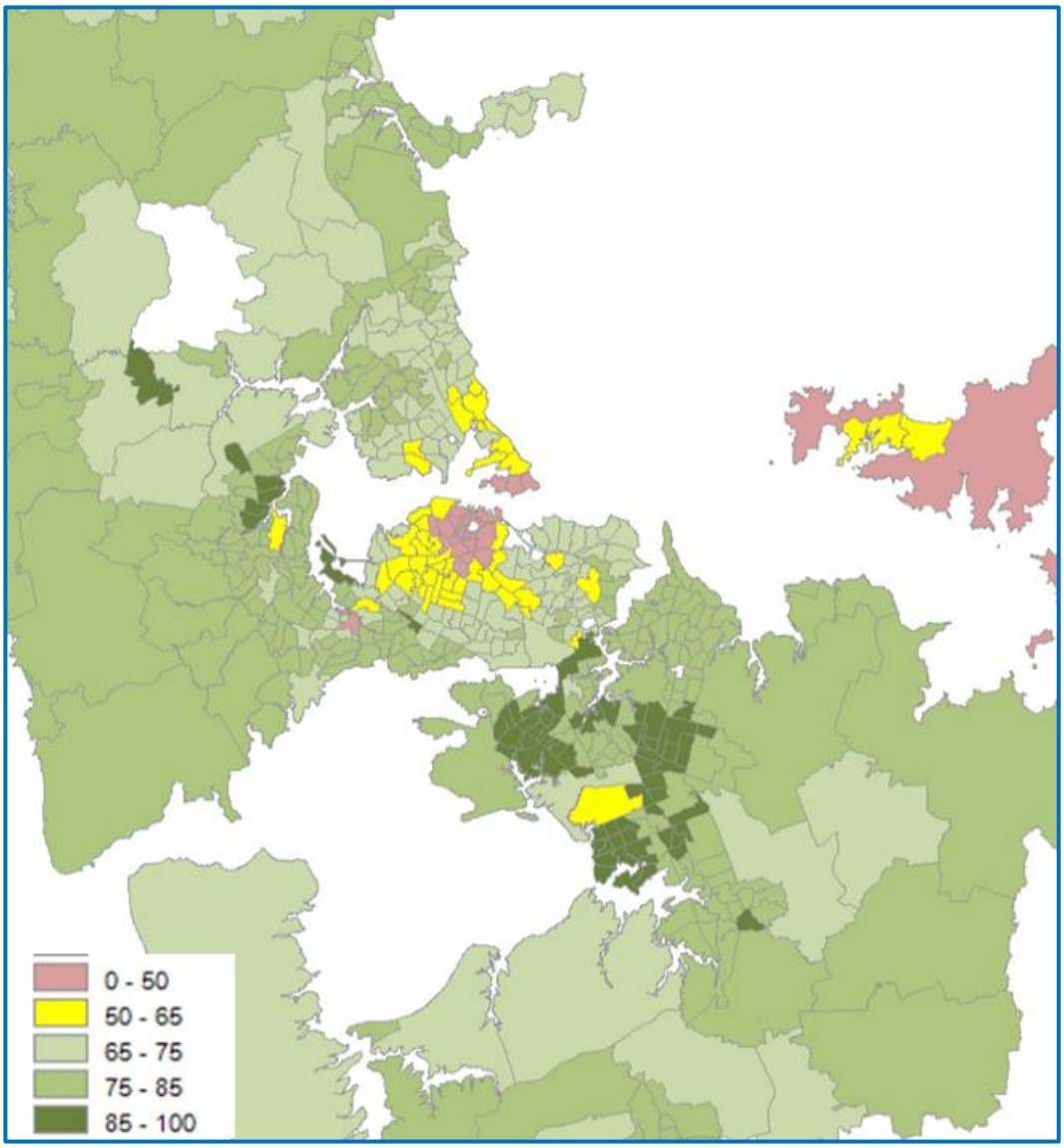


The importance of time competitive travel is also demonstrated by overall mode share figures for the region (see Figure 32). The areas of lowest car mode share are generally those where a significant share of people work in the cite centre or fringe and benefit from good PT connections. Examples, include:

- Rail – New Lynn, Panmure, Meadowbank, Manukau, Henderson, Ellerslie stations
- Bus – Birkenhead (Onewa Road FTN and priority), Takapuna (FTN), Mt Eden (FTN)
- Ferry – Birkenhead, Devonport / Stanley Bay.

[53] Source: Analysis of the 2018 Census Results: Travel to work and travel to education in Auckland, Oct 2020, Richard Paling Consulting

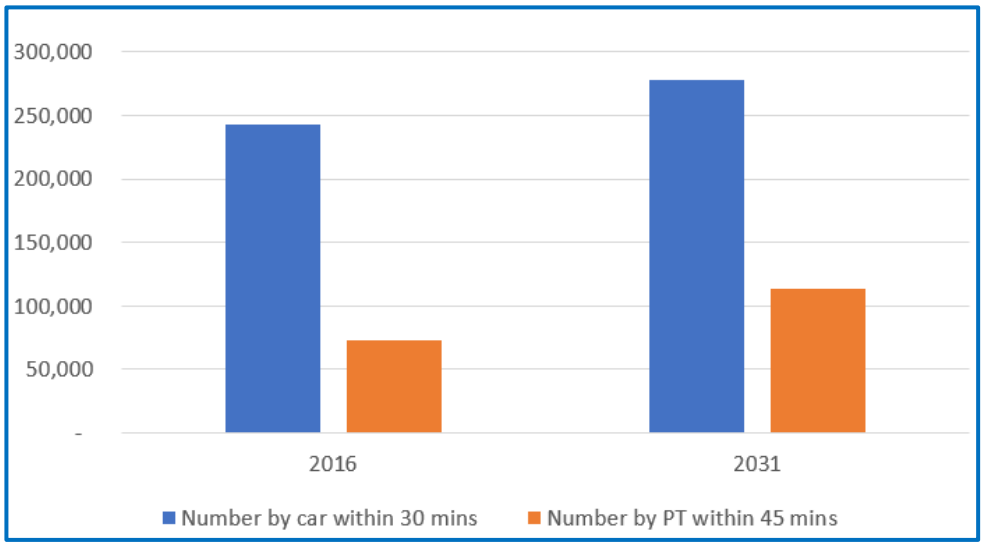
Figure 32 - Journey to Work Mode Share by Car (%)[54]



Despite the success of PT into the city centre, much more needs to be done to support changes in wider commuting mode share. For the average Aucklander, more than three times as many jobs are currently accessible within a reasonable travel time by car than by PT. Figure 33 shows there are currently about 170,000 more jobs accessible within a 30-minute car trip than a 45-minute PT trip. Looking ahead over the next decade, the situation is forecast to remain similar about 165,000 jobs more accessible by car than PT. This demonstrates that sole reliance on the existing PT network alone would result in a significant loss of employment opportunities for most Aucklanders and a major reduction in available labour force for most employers. Consequently, significant investment and effort is needed to bring the accessibility performance of public transport closer to that of private vehicles if mode change outcomes are to be achieved without a loss of opportunity.

[54] Source: Analysis of the 2018 Census Results: Travel to work and travel to education in Auckland, Oct 2020, Richard Paling Consulting

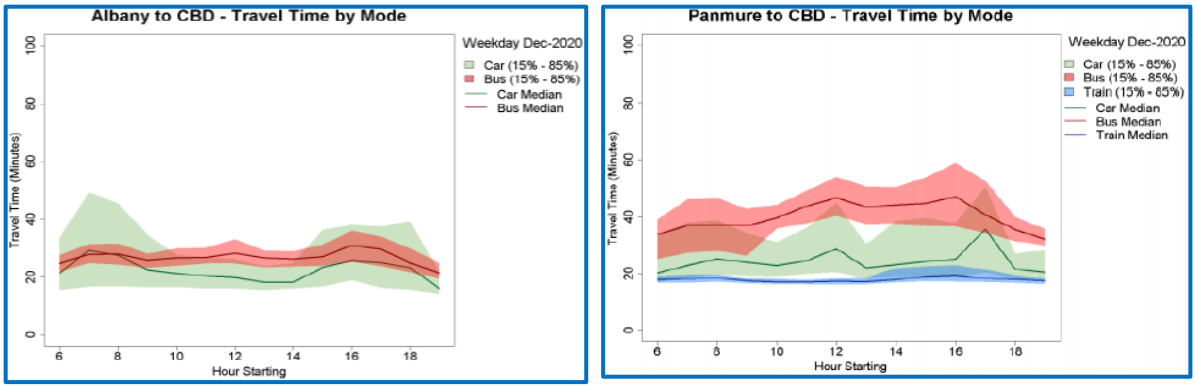
Figure 33 - Access to Labour Force within acceptable Travel Times by Mode[55]



Although access by public transport is lower that private vehicle on average, there are key examples where effective investment can change the situation. Figure 34 shows average travel times and reliability for travel on two key routes into the city centre by the different modes. Observations are:

- Albany to CBD – Northern Busway services are travel time competitive in the AM peak but lose competitiveness slightly against the car in inter-peak periods. If buses were able to operate completely free of traffic congestion from Albany to the City Centre the gap would likely narrow. Note that out of the key arterials monitored by Auckland Transport this route shows buses at their most time competitive against the car even if operating only in a partial right-of-way
- Panmure to CBD – Modes depending on the road network (bus services or car) are far less travel time reliable and slower than grade separated train services at any time of day. It is interesting to note the rough tracking of these road dependent modes' median travel times that spike at busy times of the day (AM peak, Lunchtime, PM peak)
- Initiatives to combat CO_2 emissions may accelerate PT projects to increase travel time advantages over the private vehicle through bus priority measures and rights-of-way.

Figure 34 - Travel time reliability of PT versus car over time of day[56]

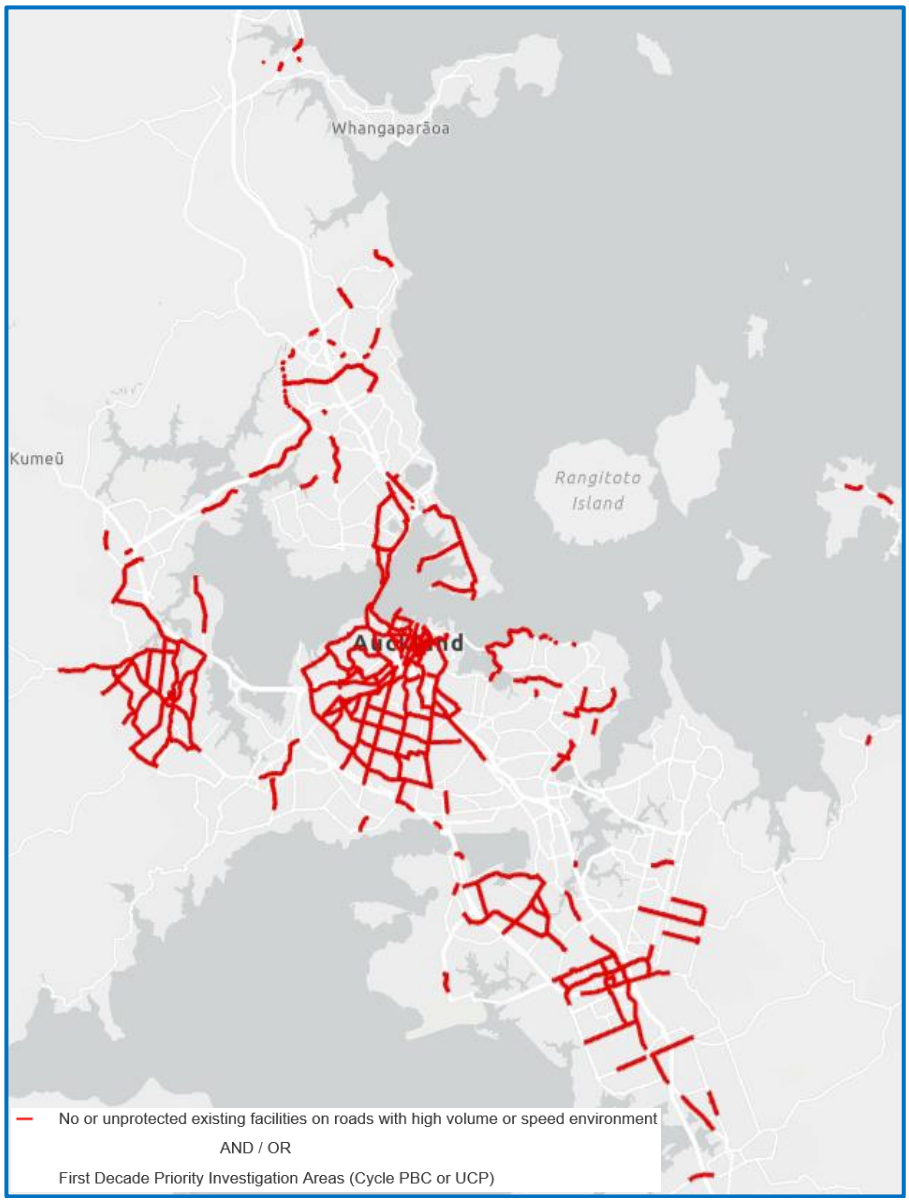


For cycling and micromobility, the availability of safe, separated infrastructure is critical to competing with other modes. Figure 35 shows high deficiencies where there are no cycle facilities or unprotected

[55] Source: Macro Strategic Model, ATAP 2, land use v11.6, Auckland Forecasting Centre. NOTE: modelling assumes some of the projects that are included in the RLTP 2021-31 programme of investment at this point in time.
[56] Source: Monthly Indicators report 2020/21, Dec 2020, Auckland Transport

facilities on roads with high volumes / speeds, or are networks part of PBC priority areas, many of which connect to important urban centres.

Figure 35 - Cycle & Micromobility: Current High Strategic Network Deficiencies[57]



Travel outside of the peak period

Travel outside of the peak periods presents a key challenge in achieving mode shift away from private vehicles, particularly in terms of emissions reduction. Interpeak, off-peak and weekend trips are typically less impacted by congestion and parking charges, go to more diverse destinations and are more likely to involve multiple destinations in a single trip and the carriage of passengers or goods. These trips are consequently more difficult to substitute with sustainable modes, particularly public transport which also typically runs at lower frequencies outside of the peak periods. Consequently, as Figures 36 and 37 demonstrate, travel by private vehicle dominates the interpeak and off-peak periods, accounting for over 90% of the distanced travelled over these periods.

[57] Source: Future Connect Mapping Portal, Auckland Transport

Figure 36 - Average distance travelled by mode 2015-18 weekdays[58]

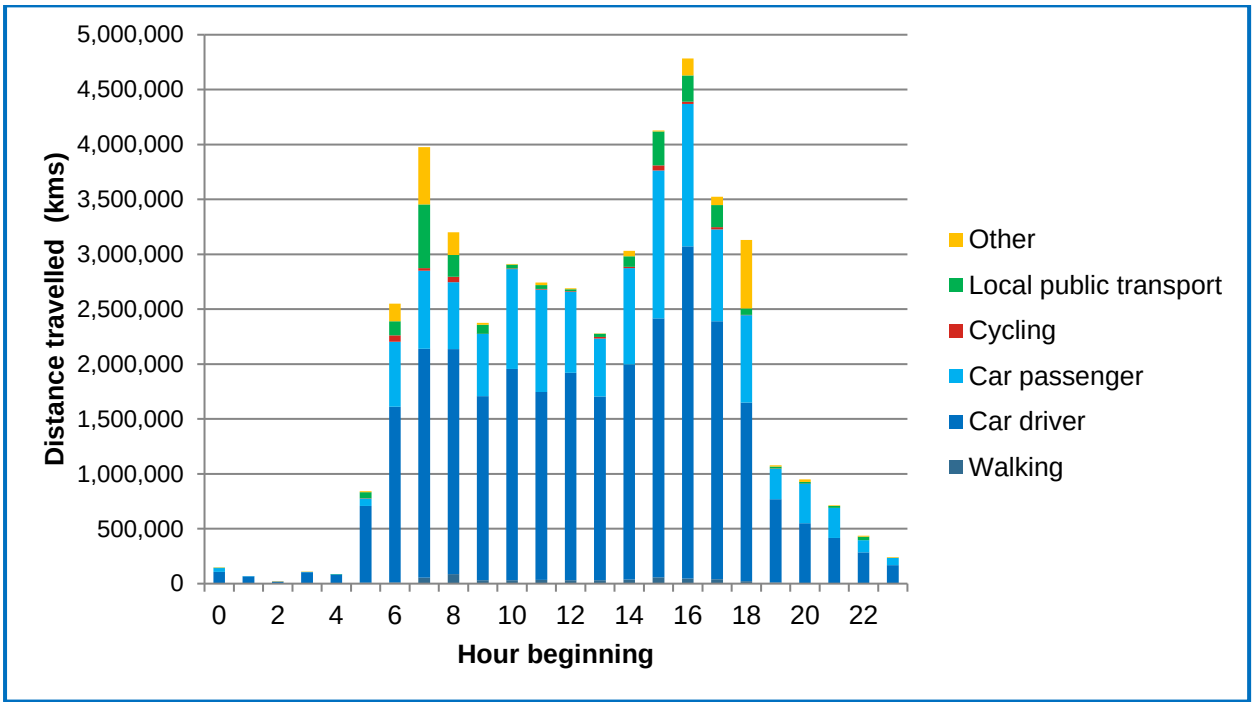
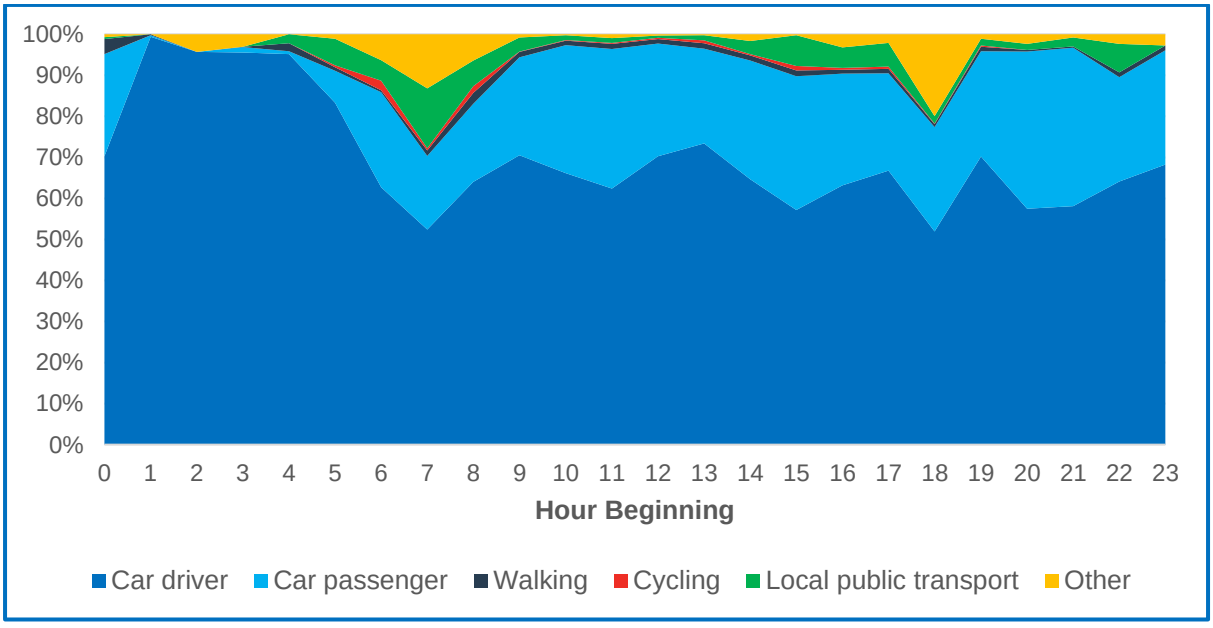


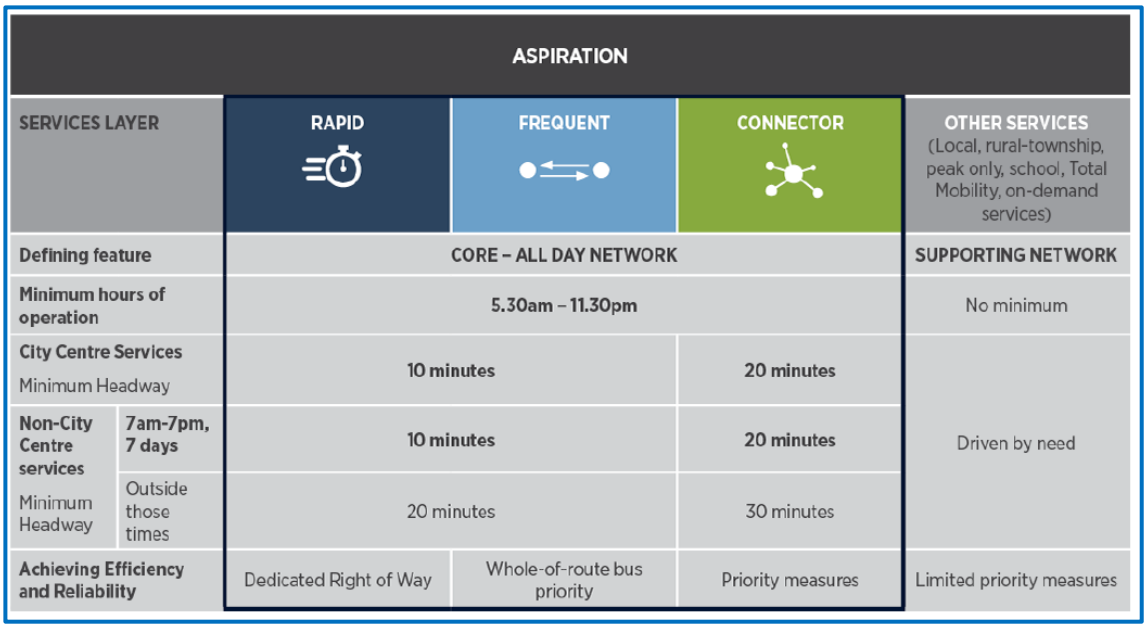
Figure 37 - Share of average distance travelled by mode 2015-18 weekdays[59]



To help address this issue, the aspiration for the core PT network is for a minimum service frequency of 20 minutes and a minimum operating period of 18 hours a day (refer to Figure 38 below). This will help to make public transport more attractive across the day, but the ability to provide high frequency services is limited by funding availability.

[58] Source: New Zealand Household Travel Survey, 2020, Ministry of Transport
[59] Source: New Zealand Household Travel Survey, 2020, Ministry of Transport

Figure 38 - RPTP Service Aspirations 2028[60]



ASPIRATION					
SERVICES LAYER		RAPID	FREQUENT	CONNECTOR	OTHER SERVICES (Local, rural-township, peak only, school, Total Mobility, on-demand services)
Defining feature		CORE – ALL DAY NETWORK			SUPPORTING NETWORK
Minimum hours of operation		5.30am – 11.30pm			No minimum
City Centre Services Minimum Headway		10 minutes		20 minutes	Driven by need
Non-City Centre services Minimum Headway	7am-7pm, 7 days	10 minutes		20 minutes	
	Outside those times	20 minutes		30 minutes	
Achieving Efficiency and Reliability		Dedicated Right of Way	Whole-of-route bus priority	Priority measures	Limited priority measures

A Quality Compact City

Previous data (Figure 3) shows that the development of Auckland over time has produced a dispersed urban area, most of which is low density. To counter this legacy, Auckland Council has set the strategic direction for growth in Auckland, with 62% to 70% of population growth to be accommodated within existing urban areas and 30% to 38% within new greenfield locations. For this growth to be supportive of viable PT services, integration with sufficient residential density is essential. Figure 39 below shows the Auckland Plan Development Strategy sequencing of brownfield and greenfield areas anticipated over the next 30 years.

[60] Source: Regional Public Transport Plan 2018-2028, Auckland Transport

Figure 39 - Auckland Plan Development Strategy[61]

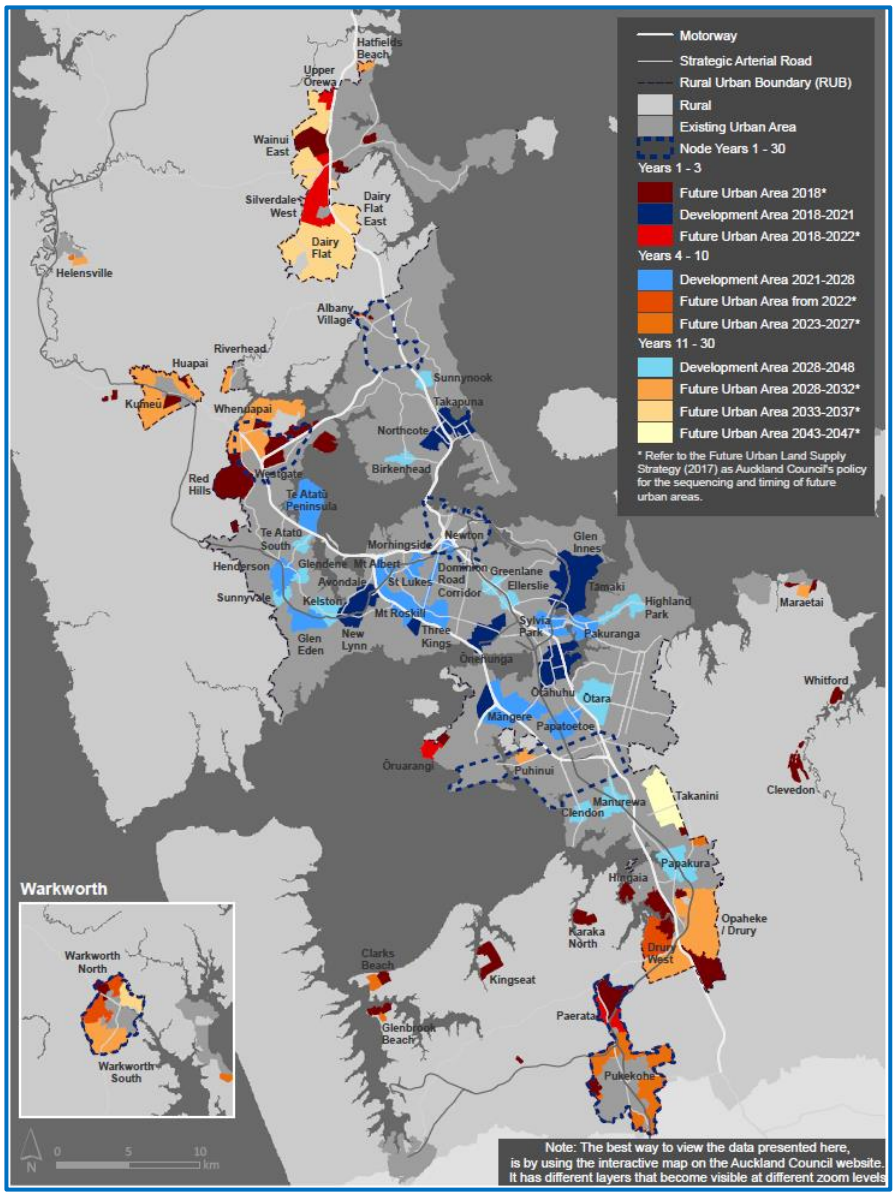
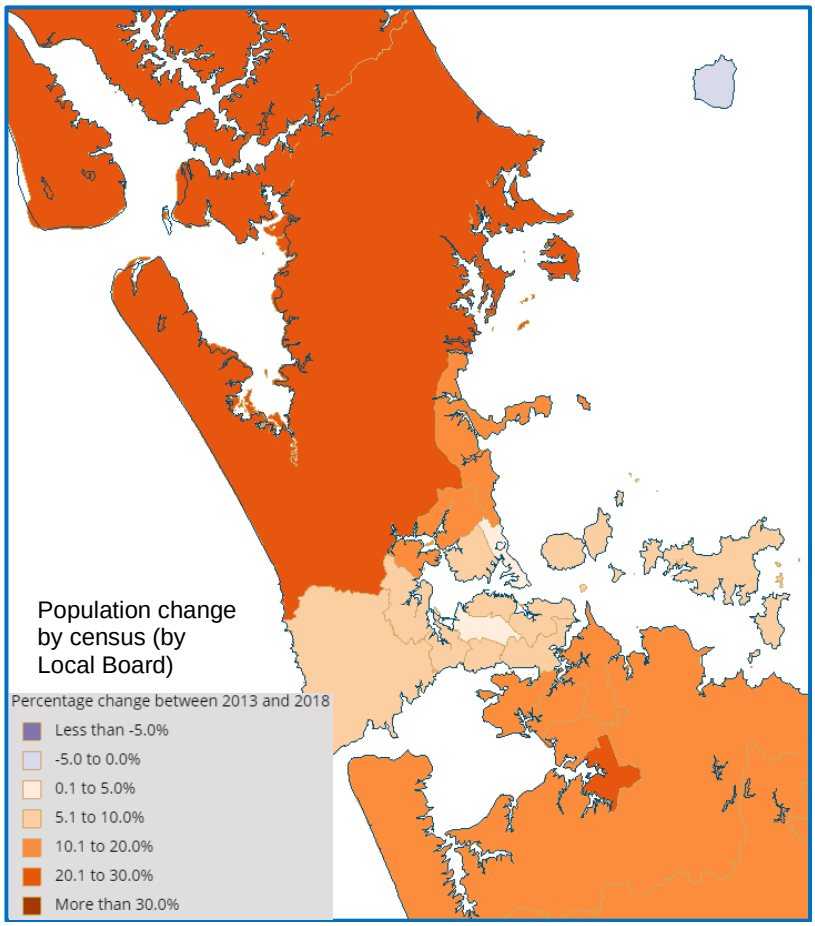


Figure 40 shows that between 2006 and 2018 significant changes in population have occurred away from more central locations. This change often relates to increases in population into areas that are harder to serve with PT[62]. Although there are new pockets of higher density settlements away from central areas, such as the growth of Hobsonville Point, many new areas do not have a competitive alternative to car-based trips.

[61] Source: Auckland Plan, 2018, Auckland Council
[62] Note that this does not mean absolute population numbers are significant

Figure 40 - Population Change between 2013 and 2018 Censuses[63]



The development of new settlements on the periphery of the existing urban area, even if they are quality compact environments themselves, may lack the integration with the rest of the city and the opportunities that this brings. Over the last 30 years, travel patterns for all trip purposes show an increase in travel speeds (partly due to a shift from walking to faster motorised modes such as PT or car), and a rise in average distances travelled by about 15%[64]. This has tended to further imbed the dominance of car travel for many trip purposes, especially in the outer parts of the region where its flexibility and convenience is difficult to match. Competitive travel options are required to reduce the reliance on private vehicles, relieve pressure on the road network and support more compact development.

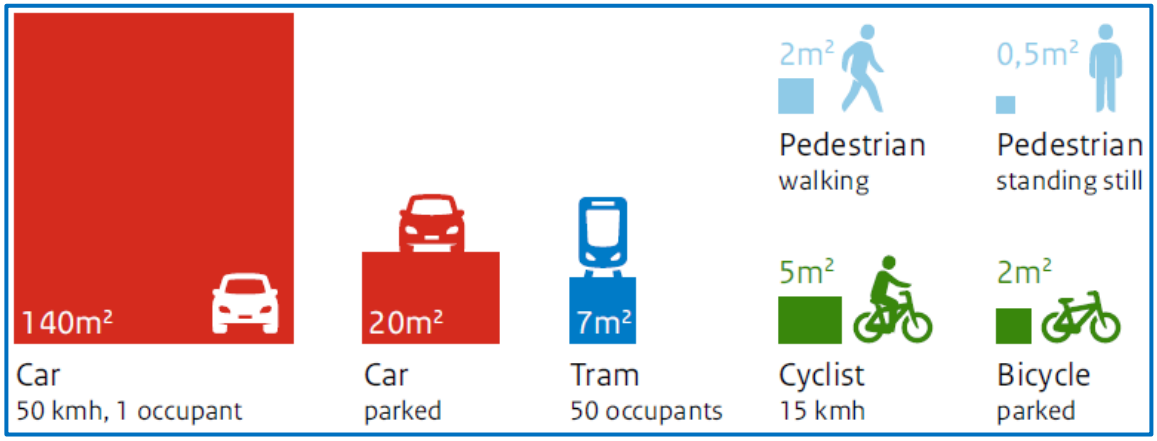
Over the long-term Auckland is likely to continue to have a strong City Centre, but with a multi-nodal structure strengthening over time[65]. As intensification occurs over time, metropolitan centres and other activity nodes that serve local areas require better transport connections and integration with alternatives to car dependency.

As urban densities increase, the private car becomes the most space intensive form of transport. As shown in Figure 41, a car travelling at 50 km/h requires 28 times more space than a person travelling at 15 km/h on a bike. A parked car requires 10 times as much space as a parked bicycle. As parts of Auckland intensify over time, achieving quality compact city ideals is undermined by dependence on car travel, which can be an inefficient use of space due to the need to provide wide roads, large interchanges and space dedicated to car parking when comprehensive and well used public transport and active modes could provide adequate access. In addition, car dependency is creating congestion on limited road space, vehicular noise, pollution and safety concerns, which undermines the quality compact city ideals of walkability and high public amenity. Ultimately, an increasingly car-based

[63] Source: Stats NZ ArcGIS, 2020
[64] Source: New Zealand Household Travel Survey Analysis of the Auckland results for the period 1989-2018, initial findings, Richard Palling, Oct 2020
[65] Source: Auckland Plan 2050, 2018, Auckland Council

transport system will reduce the amount of space available for other uses, while adding to transport costs for government and households.

Figure 41 - Amount of space occupied by various modes[66]



With limited space available in brownfield areas, the development potential of this land needs to be maximised to achieve the goal of up to 70% of growth being accommodated within the Rural Urban Boundary (RUB). Without competitive travel alternatives, developments will need to provide substantial amounts of car parking. The high price of parking[67] increases the cost of new housing, reduces housing profitability and affordability, and pushes development to places where the land is cheaper to develop but more expensive to provide viable PT services, thus undermining compact city goals. Consequently, competitive travel choices and innovative / alternative approaches to parking are required to reduce the reliance on private vehicles and support more compact development.

Significant infill developments, such as those being developed by Kāinga Ora in the short and medium term, require viable non-car transport alternatives for future residents to access essential destinations (Figure 42). Without proper integration between transport and land use, PT and active mode infrastructure / services and user requirements, the opportunity for significant mode shift could be wasted.

Figure 42 - Major Kāinga Ora development areas in Auckland

Northcote – 1,200+ homes proposed (plus an additional 1,000 apartments proposed in the Northcote town centre) (approx. 450% increase)

Tāmaki – upwards of 11,600 homes proposed (approx. 300% increase)

Oranga – upwards of 1,500 homes (approx. 200% increase)

Mount Roskill – upwards of 10,000+ homes (approx. 300% increase)

Māngere – upwards of 10,000+ homes (approx. 300% increase on existing homes)

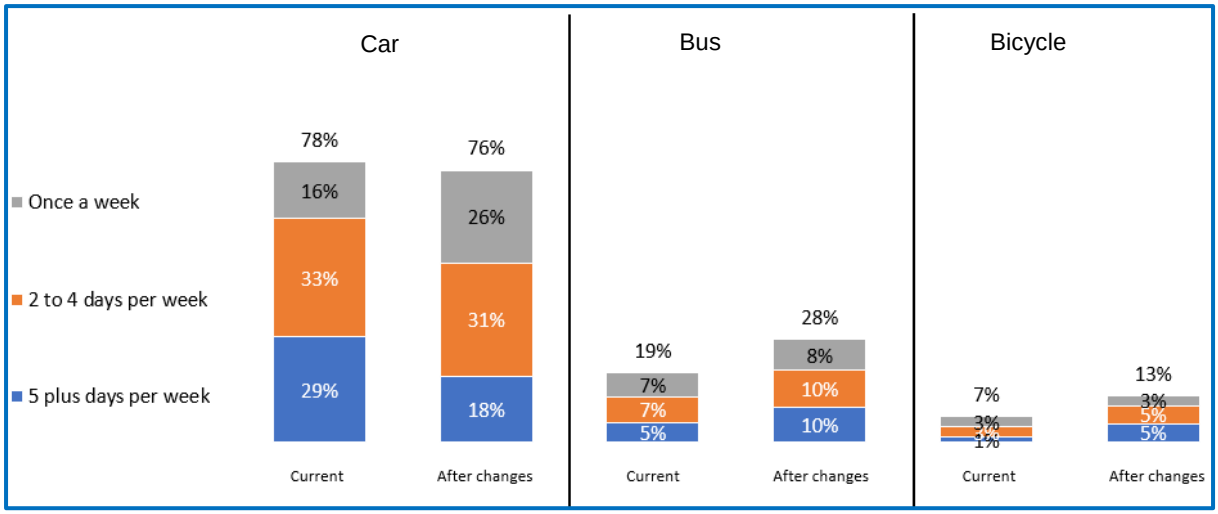
The responsiveness of households to mode shift opportunities is a key factor to ensure investment is

[66] Source: Harms, L. & Kansen, M. (2018). Cycling facts. Netherlands Institute for Transport Policy Analysis (KiM) Ministry of Infrastructure and Water Management, April 2018, The Hague, Netherlands
https://english.kimnet.nl/publications/publications/2018/04/06/cycling-facts

[67] Costs for parking can range from at least $11,500 at-grade to multi-storey as much as $63,000 per bay. Source: Papakura Rail Station Access Single Stage Business Case, 2019, Auckland Transport

worthwhile. Figure 43 shows an indication of the extent to which people are willing to change their modal choices if PT or cycling priority is improved or infrastructure is provided. The results show weekly bus use along key roads have the potential to increase from 19% to 28% and weekly cyclists from 7% to 13%.

Figure 43 - Customer willingness to change mode after changes to road space allocation[68]



Investment in travel alternatives to the car, well integrated with land use, is essential to combat the legacy of a dispersed low-density land use pattern which imposes a high travel cost on society. A car-based transport system reduces the amount of space available for housing, employment and social uses, while simultaneously imposing relatively high transport costs per trip. As an illustration, the theoretical number of motorway lanes required to provide for the total trip increase forecast by 2031, is 70 extra lane kilometres of motorway[69].

Access to high quality PT services with appropriate integration and safe walking/cycling/micromobility environments is key to underpinning the development of more quality compact areas where car dependence is not a necessity.

Summary of Problem 2 Evidence

Overall problems and opportunities for Problem 2 are summarised below. These exclude the effect of policy changes or RLTP 2021-2031 investments.

Problems	Key evidence
PROBLEM 2: A lack of competitive travel options and high car dependency as the city grows is limiting the ability to achieve the quality compact urban	• 80%+ of all household trips in Auckland are currently made by car • Growth in commuting trip origins has been in outer urban areas of Auckland over the last decade (West, South, East), reaching 60% between 2013 and 2018 • Over the last 3 decades, all trip purposes show an increase in travel speeds (partly due to a shift from walking to faster motorised modes), and a rise in average distances travelled by about 15% • Car mode share for travel to work is high across most of Auckland, with the exception of areas well located on the FTN or RTN networks.

[68] Source: Connected Communities Programme update, Oct 2020, Auckland Transport. Based on market research undertaken in March 2018 for 11 major routes subject to alternative street arrangements (not based on time of travel)

[69] Based on 147,672 additional trips divided by motorway lane capacity of 2,100 vehicles per hour. Forecast based on Macro Strategic Model, ATAP 2, land use v11.6, Auckland Forecasting Centre. NOTE: modelling assumes some of the projects that are included in the RLTP 2021-31 programme of investment at this point in time

approach for Auckland	• With the sole exclusion of the City Centre and Newmarket, car mode share to major employment destinations exceeds 80-90% • 170,000 more jobs are accessible within a 30-min car journey than a 45-min journey by public transport today (3 times as many), which is largely unchanged at 165,000 by 2031 • Evidence suggests buses could be travel time competitive with the car on major corridors if sufficient bus priority measures were in place (e.g. Albany to City Centre corridor (AM peak)), yet most key corridors lack these measures • Cycle, micromobility and walking networks have significant deficiencies connecting to important urban centres (e.g. no or unprotected facilities on high volume / speed roads) • Outside of the peak periods, distance travelled is heavily dominated by private vehicles making it very difficult to achieve an overall reduction in emissions • Up to 38% of population growth is permitted to occur in greenfield areas, and the distance to essential services from these areas will drive a reliance on private car travel • Continuing with a car dependent transport system that is voracious for space (wide roads, large interchanges, car parking) will undermine public amenity, viable public transport and the efficient use of land, and impose relatively high overall transport costs on society as Auckland intensifies • Market research prior to improvements on major transport corridors suggests weekly bus users could increase from 19% to 28% and the number of cyclists could almost double if mode priority is improved.

3.4.3 PROBLEM 3: Environment

ENVIRONMENT – Emissions and other consequences of transport are harming the environment and contributing to the transport system becoming increasingly susceptible to the impacts of climate change[70]

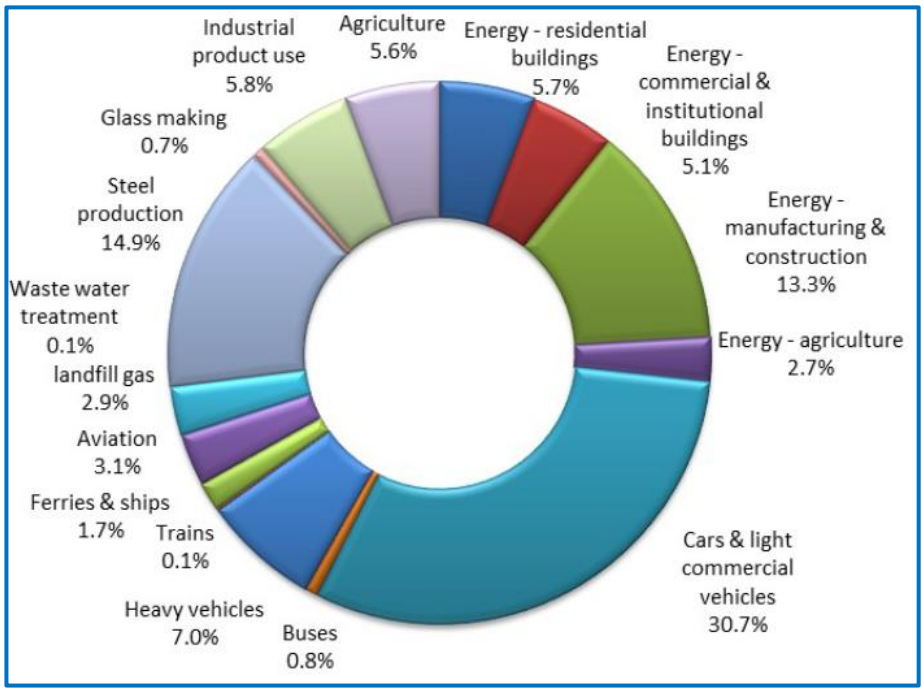
Future problems and opportunities are assessed without the benefit of interventions whether through policy changes or RLTP 2021-2031 investments.

Transport contribution to Emissions

The transport sector is a significant source of greenhouse gas (GHG) emissions and pollutants that degrade the natural environment and affect human health. Transport is the single biggest contributor to Auckland's overall emissions levels. On-road transportation alone generated 38.5% of Auckland's total emissions in 2018 (Figure 44), 80% of which were produced by cars and light commercial vehicles.

[70] Note emission from transport that are harmful to human health is discussed under PROBLEM 4.

Figure 44 - Sources of greenhouse gas emissions in Auckland (2018)



Emissions from the road transport system come from the combustion of fossil fuels by vehicles which emit carbon dioxide (over 97%), and small amounts of nitrogen dioxide and methane[71].

Between 2009 and 2018, the total emissions produced by Auckland's on-road transportation sector increased by about 11%[72]. While for Auckland as a whole, total emissions increased by 7% over the same period. By 2019, road transportation in Auckland accounted for around 5.5% of New Zealand's total GHG emissions. While Auckland as a whole accounted for 14% of total GHG emissions in New Zealand.

The growth in CO_2 emissions has largely been driven by increased population and economic activity, which has more than offset improving fuel efficiency over the last decade and significant increases in PT use. CO_2 emissions are likely to continue to increase in the short term unless significant action is taken.

Simply, the more we travel in internal combustion engine (ICE) vehicles and the less fuel efficient our vehicles, the greater the emissions.

The number and length of trips by cars, light commercial vehicles and heavy vehicles has increased VKT by about 47% between 2001-2019 (observed Auckland fleet). These trends are exacerbated by the many short trips undertaken by private vehicles, the substantial increase in heavy vehicle movements in recent years, and the fact that about 95% of Auckland's intra-regional freight movements are by road[73]. Reducing VKT by ICE vehicles is therefore critical.

New greenfield developments, even if they are higher-density, have the potential to increase VKT and thus emissions, if work, education, and retail are not nearby, and trips are primarily in private ICE vehicles.

Non-commuter trips outside of peak hours are more spatially distributed and are undertaken for a variety of purposes (social, business, personal), which means they are less affected by peak congestion and parking availability. Maintaining peak service levels for buses and trains throughout the day is fiscally challenging and therefore public transport has in the past generally not provided an attractive alternative to cars for many inter-peak journeys. These trips are overwhelmingly undertaken

[71] This Strategic Case acknowledges the problem of embodied carbon in the development of the transport system, but does not examine this complex area specifically
[72] Source: Auckland Council source including fuel purchases (RLTP 2021-31)
[73] Source: Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan, 2020, Auckland Council

by car (Figure 37 is illustrative in this regard). The inter-peak is estimated to generate about 67% of overall current VKT[74]. The impact on emissions is significant.

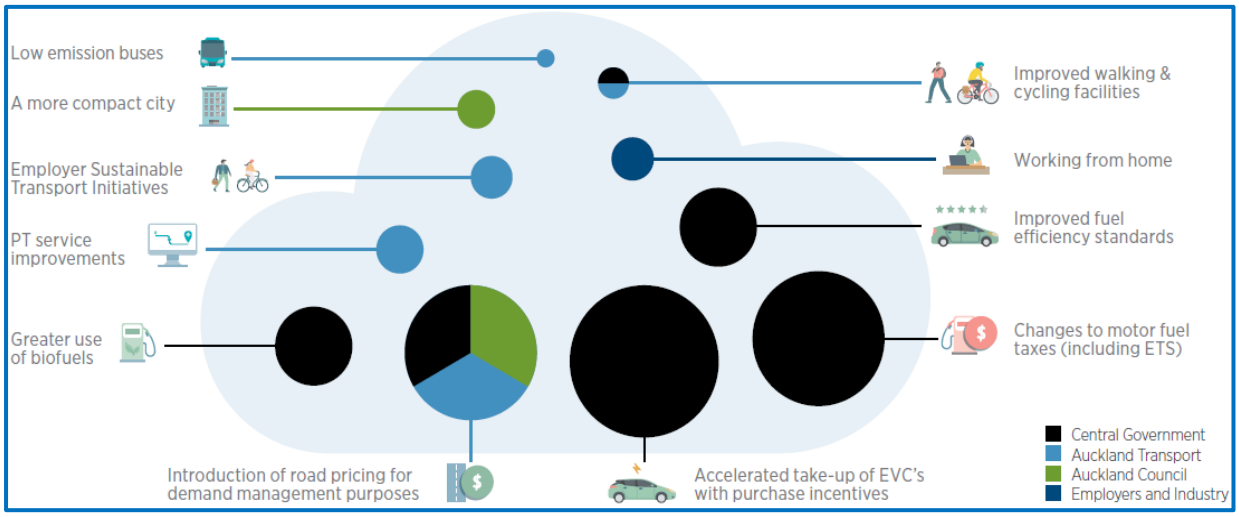
Future prospects of reducing CO_2 emissions

Auckland Council has declared a climate emergency. Council's Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan has a goal to reduce road transport emissions by 64% by 2030. The 64% target for transport represents a steeper pathway than the targeted 50% reduction for Auckland's overall emissions. This reflects the even greater challenges associated with achieving significant emissions reductions in other sectors of Auckland's economy. Given its scale and urban density the steeper pathway also reflects the fact that Auckland is potentially better placed than other parts of the Country to significantly reduce its transport emissions.

Achieving a transport emissions reduction of the magnitude required will be extremely challenging. Improvements to fuel efficiency, the growth in PT patronage and government policy interventions (such as the Clean Car Standard, EV feebates[75] and an emphasis on the use of biofuels), will have a positive impact. However, much more transformative change would be required now, and for many years to come, to achieve the transport emission targets.

Reducing emissions from transport requires a wide range of interventions from government, local government and the private sector. Figure 45 illustrates the breadth of actors and scope of the challenge to achieving significant reductions in total transport GHG emissions. For illustrative purposes, the size of the circle approximates the extent of the impact on GHG emission reduction – although these may change with further work on understanding and enhancing the impact of key interventions.

Figure 45 - Interventions required to significantly reduce GHG emissions[76]



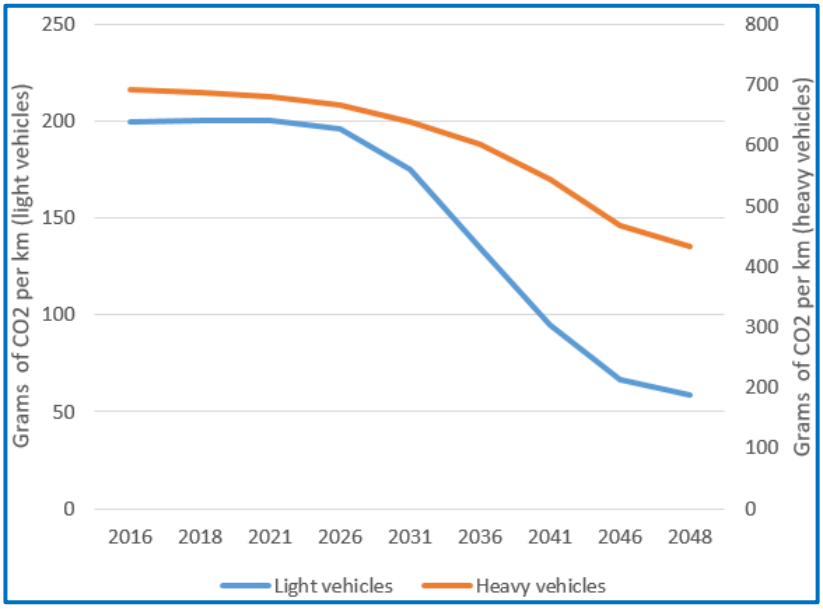
Recent market research focused specifically on attitudes to climate change suggests that Aucklanders do not fully appreciate the extent to which private vehicle travel impacts negatively on emissions, but are open to using alternative modes, especially public transport, if better choices were available to them. Most also believe that electric vehicles are key to reducing emissions, with 43% surveyed considering an electric vehicle for their next vehicle purchase[77].

The projected increase of electric vehicles[78] in the fleet towards the end of the decade, is a significant factor contributing to the positive reduction of average vehicle fleet emissions (refer to Figure 46). The trend to fleet electrification is noticeably slower for heavy vehicles where achieving 'fit for purpose'

[74] Source: Macro Strategic Model, 2016 Baseline, land use v11.6, Auckland Forecasting Centre
[75] Noting that the availability of cheap second-hand vehicle imports and the relative high cost of EVs will limit uptake in the short term
[76] Source: Graphic compiled from various sources for illustrative purposes only, Nov 2020, Auckland Transport
[77] Source: Understanding Aucklanders attitudes towards climate change in a Transport Context, June 2021, AT Market Insights
[78] EV registrations in Auckland have increased rapidly in recent years but from a low base – from just over 1,600 vehicles in 2017 to about 11,500 by mid-2021 (Source: https://www.transport.govt.nz/statistics-and-insights/fleet-statistics/sheet/monthly-ev-statistics)

zero emission vehicles is more difficult. The policy levers required to support a decarbonisation of the private vehicle fleet fall largely within the remit of central government.

Figure 46 - Forecast reduction in NZ vehicle fleet CO_2 emissions[79]



On their own, however, policies to promote electric vehicles will not be enough to achieve emissions reduction targets, particularly the 2030 target. Nor will fleet electrification support broader transport outcomes such as improved transport choice, access, decongestion and safety. Auckland Council and Auckland Transport have critical roles to play in reducing VKT through interventions that accelerate uptake of public transport and active modes and reduce average trip length.

While large scale infrastructure has a crucial role to play in enabling mode shift and emissions reduction, its planning and construction takes time. To achieve the scale of reductions associated with government and Council targets, other measures will be required. Smaller scale projects that reallocate road space to improve the attractiveness of sustainable modes will have an important role to play along with widespread parking management and increased parking costs. However, major reductions will require very strong interventions to reduce demand for private vehicle travel, including pricing schemes that dramatically increase the cost of travel.

Levers outside of the transport system also have a key role to play in reducing transport emissions. By focussing on urban intensification rather than greenfield expansion decisions on land use and urban development can support emissions reduction, particularly in the longer term, by better enabling Aucklanders to reduce the distance they need to travel to reach employment, education and other opportunities. As changes to urban form take time, land use decisions taken today will have only a limited impact on Auckland's emissions profile by 2030, but will be crucial to the longer term goal of a zero emissions transport system by 2050.

The forthcoming Auckland Transport Emissions Reduction Plan will incorporate the transport aspects of the government's Emissions Reduction Plan and set out a number of pathways to the 2030 target.

Impacts of climate change on the transport system

Climate change poses real threats to the transport system. Table 4 summarises the top ten risks to the transport system directly related to the physical impact of climate change in Auckland.

[79] Source: Vehicle Emissions Prediction Model (VEPM) v6.1, Sept 2020, Waka Kotahi and Auckland Council

Table 4 - Auckland future climate hazards and the top ten risks to transport[80]

Climate hazard	Impact area and top ten risks
Rainfall 	**Change:** Seasonal distribution of rainfall is projected to change with wetter autumns and drier springs. More extreme rainfall events are expected to increase while the number of rain days are set to decline.
	Risk 1: Increasing annual precipitation, along with increasing frequency and intensity of extreme rainfall events will lead to more landslips occurring (both over slips and under slips). This will cause both damage and disruption to roading networks.
Coastal 	**Change:** Rising sea level puts coastal communities and infrastructure at risk from inundation and erosion. Under RCP 8.5[81], 1m sea level rise is projected by the end of this century – by 2100 1.5-2.5% of Auckland's land area may be exposed to sea level rise[82]. Other coastal hazards will be exacerbated because of sea level rise.
	Risk 2: Increased incidence of coastal erosion, exposing footings and other buried structures, resulting in damage or potential collapse. Salinity stress can increase the susceptibility of concrete and steel reinforced structures to corrode. **Risk 3:** Coastal hazards damage seawalls and causeways exposing footings and eroding material (often associated with extreme weather events) and coastal flooding overtopping and damaging road formation and surfaces.
Flooding 	**Change:** As extreme and rare rainfall events are likely to increase the intensity of flood events is also expected to increase
	Risk 4: Elevated groundwater levels and coastal flooding causes damage to the road surface due to a saturated road base and surface. **Risk 5:** Risk to bus services: Coastal flooding causes disruption to bus services by blocking roads and restricting customer access to bus stops. **Risk 6:** Increased risk of flooding due to higher intensity rainfall events and insufficient capacity within existing drainage systems (catch pits, pipes, channels etc). This results in damage to the road surface.
Extreme weather (wind and storms) 	**Change:** Average wind speed and number of windy days are decreasing, and this is projected to continue. Intensity of tropical cyclones is expected to increase although there is a high degree of uncertainty associated with these projections.
	Risk 7: Extreme weather events cause debris to block train tracks resulting in disruption to services. While 100 kph winds cause speed restrictions to the service, 120 kph winds stop the service. **Risk 8:** High wind gusts and extreme weather close the harbour bridge results in debris on the network which disrupts the primary connection to the north.
Temperature 	**Change:** Increasing annual average temperatures and extreme temperatures with significantly more hot days each year – by 2100 it is estimated that there will be four times as many 'hot' days (over 25°C) per year[83]. Frosts are likely to become rare.
	Risk 9: Higher temperatures result in buckling of rails and cause derailment of trains. This presents a health and safety risk to customers.

[80] Source: Modified from Climate Change Risk Assessment (draft), June 2021, Tonkin & Taylor Ltd, prepared for Auckland Transport
[81] Representative Concentration Pathway for emissions where RCP 8.5 is the 'do nothing' worst case scenario
[82] Source: Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan, 2020, Auckland Council
[83] Source: Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan, 2020, Auckland Council

Climate hazard	Impact area and top ten risks
Behaviour 	**Change:** Increasing frequency and intensity of acute climate hazards (e.g. higher temperatures, inland and coastal flooding, and extreme weather events).
	Risk 10: Increasing frequency and intensity of acute climate hazards results in increased levels of aggressive behaviour from customers to customer facing staff. This may result in adverse mental and physical health outcomes for staff.

The Auckland transport system has developed with a reliance on a small number of corridors to provide strategic connections between communities and employment, meaning there is little resilience in the event of road closures.

110 kilometres of Auckland's Strategic Networks, roughly 7%, are located in areas that are susceptible to coastal inundation and erosion, including road and rail links that are crucial for freight movements and access to health, employment and education. Furthermore, about 1,012 kilometres of the entire local road network, roughly 13%, is vulnerable to a 1-in-100-year flood event. 360 kilometres of this is part of the Strategic Networks.

Recent examples of the impact of extreme weather, winds and flooding on the transport system are:

- Storm surges will exacerbate the impacts of sea level rise causing more flooding events similar to those experienced in January 2018 which closed sections of SH1 and Tamaki Drive (Figure 47). These two corridors form part of the Strategic Network for all transport modes, with limited alternative routes.

Figure 47 - Flooding on Tamaki Drive in 2018

- Extreme wind speeds increasing the likelihood of proactive road closures or disruption on the transport network. Damage caused by a truck colliding with the Auckland Harbour Bridge in September 2020 and subsequent closures in the weeks that followed to manage the risk of further incidents in high winds. The Auckland Harbour Bridge currently caters for the Freight, General Traffic and PT Strategic Networks and even a partial closure or reduction in capacity has significant ramifications on the ability to move people and goods across the city.
- Ferry services are also impacted during storm events, with disruptions and cancellations occurring during severe weather conditions. Increasing regularity and severity of storm events, as a result of climate change, will increase the frequency and likelihood of service disruption.

- Heavy rain and flooding increase the likelihood of landslides and inland flooding of low lying areas which causes greater disruption to the transport network, restricts access to core services and increases mitigation and asset maintenance costs.

Impact of transport on the natural environment from pollutants

Motor vehicles produce multiple contaminants from tyre and brake wear, exhaust emissions, oil, grease and coolants. Research shows that vehicles emit these contaminants onto the road surface, and beyond the road, although it is difficult to estimate the amount of contaminants coming from motor-vehicles[84].

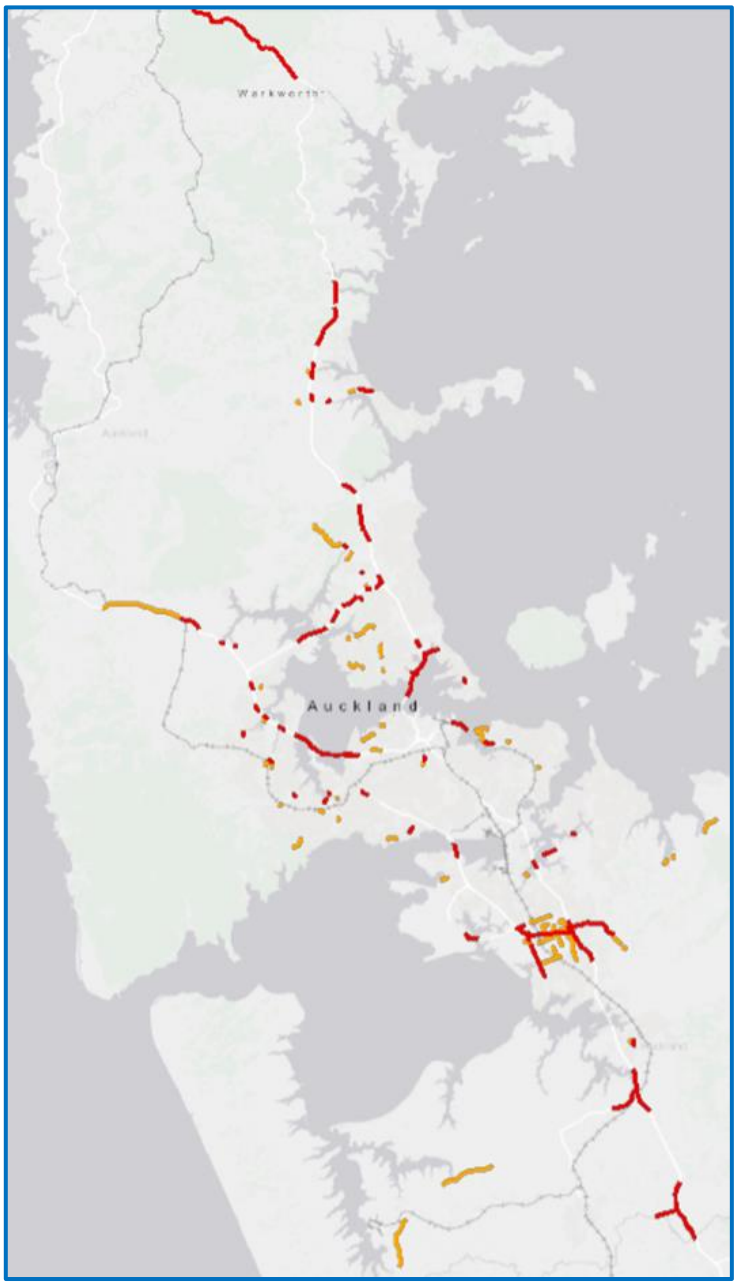
Without appropriate storm water detention treatment and systems, storm water transports particulate matter that has accumulated on the road surface (including heavy metals and organic compounds) into freshwater and estuarine / marine environments.

Storm water runoff has been shown to have chronic impacts on the growth of freshwater algae, and particulate matter from runoff in pond systems can have a toxic effect on organisms. There is also the potential for bioaccumulation of heavy metals in freshwater organisms. Contaminant concentrations in coastal environments have been shown to be elevated in the areas immediately around discharge points for storm water runoff from roads.

Figure 48 shows the storm water runoff deficiencies on the 2031 Strategic Networks where high vehicle volumes (forecast for 2031) discharge pollutants into stormwater sensitive areas.

[84] Source: The Effects of Road Transport on Freshwater and Marine Ecosystems, Ministry of Transport, 2003

Figure 48 - Stormwater run-off deficiencies on Strategic Networks[85]



Stormwater run-off deficiencies on Strategic Networks

High Links with > 20,000 vehicles per day (2031) within stormwater sensitive areas
Moderate Links with > 10,000 vehicles per day (2031) within stormwater sensitive areas

[85] Source: Future Connect Mapping Portal, Auckland Transport. Note that forecasting to 2031 is based on an Auckland Forecasting Centre ATAP2 scenario to 2028 adjusted for population/employment growth to 2031 (August 2019)

Summary of Problem 3 Evidence

Overall problems and opportunities for Problem 3 are summarised below. These exclude the effect of policy changes or RLTP 2021-2031 investments.

Problem	Key Evidence
PROBLEM 3: Emissions and other consequences of transport are harming the environment and contributing to the transport system becoming increasingly susceptible to the impacts of climate change	• Road transportation currently produces 38.5% of total GHG emissions in Auckland – 80% of that is by cars or light commercial vehicles • Increases in population and VKT forecast over the next decade will continue to drive increased CO_2 emissions without substantial interventions (despite improving vehicle fuel efficiency and PT use) • The predicted increase of low or zero emission vehicles in the fleet towards the end of the decade could substantially reduce average fleet CO_2 emissions – heavy vehicle fleet emissions are likely to reduce at a slower pace • The impacts of climate change (increased severe storms, landslides, coastal flooding and erosion, high winds) will result in more frequent disruption of transport operations and damage to infrastructure • Pollutants emitted by the transport system have a toxic effect on organisms that inhabit our waterbodies.

3.4.4 PROBLEM 4: Safety

SAFETY – The transport system has become increasingly harmful and does not support better health outcomes

Future problems and opportunities are assessed without the benefit of interventions whether through policy changes or RLTP 2021-2031 investments.

The transport system continues to cause harm to the people of Auckland both directly and indirectly. The most direct form this harm manifests is through death or serious injury because of a crash. However, there are a number of indirect ways in which the transport system impacts on human health. These include harm caused by air and noise pollution originating from the transport system, and chronic health issues which are exacerbated by a transport system that has historically been designed to prioritise car travel.

Auckland Transport and its partners have adopted a vision zero approach which concludes that no death or serious injury on our transport is acceptable. Much needs to be done to achieve this outcome.

Road Safety

Increasing Deaths and Serious Injuries on Auckland Roads

The number of deaths and serious injuries (DSIs) on Auckland roads has generally decreased since the 1980's. When considered alongside the significant population increase in Auckland over the past 40 years, the rate of DSIs per capita has decreased at an even greater rate. However, as shown in Figure 49, while there was a historic low number of deaths (421) around 2012, the number of DSIs on Auckland roads has climbed significantly from 2013 to a peak of 832 in 2017.

Figure 49 - Auckland Death and Serious Injuries 1993-2020[86]

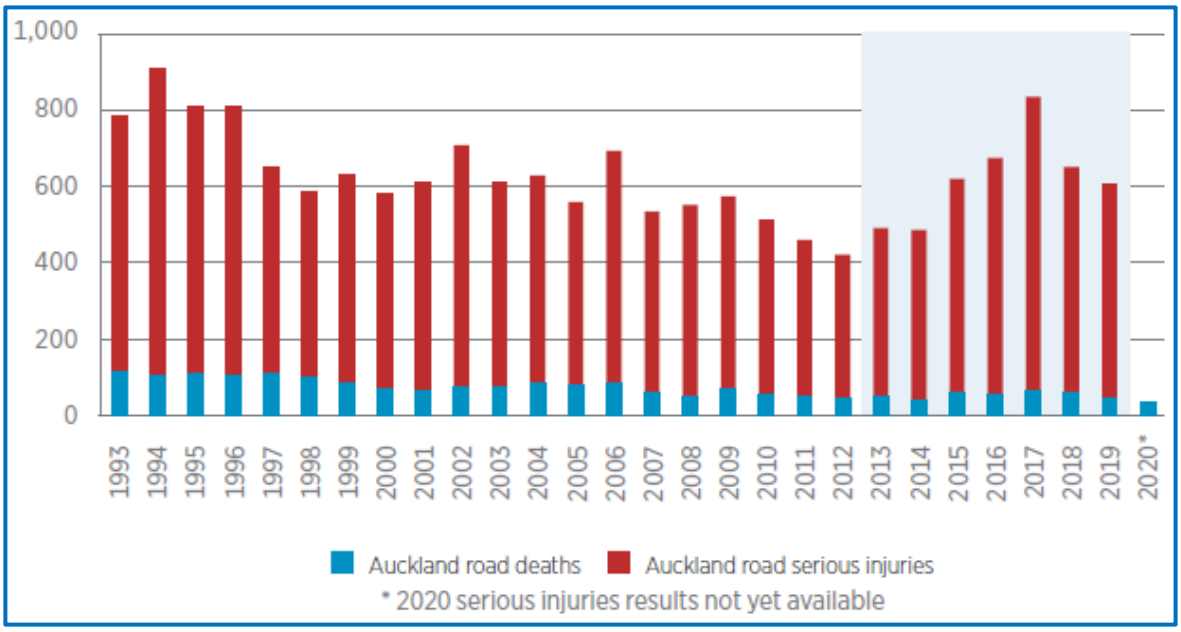
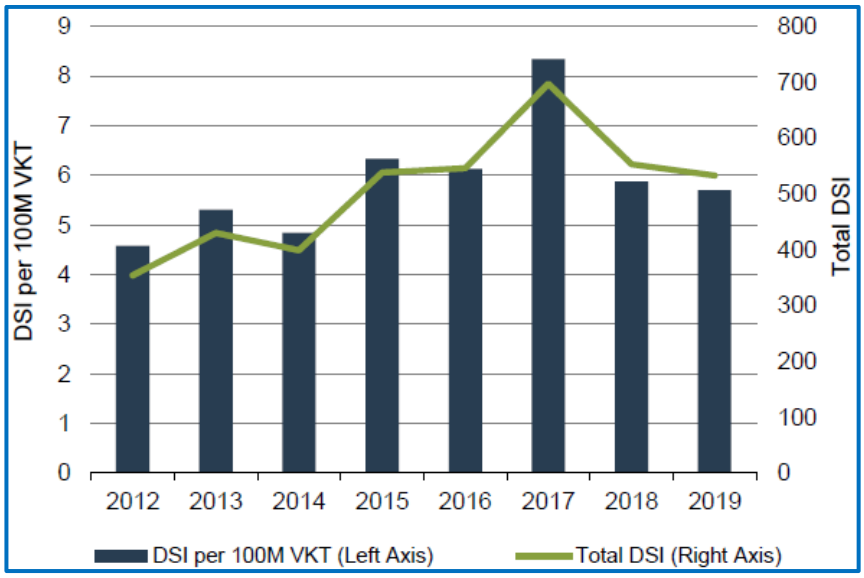


Figure 50 shows the rate of local road DSIs per million vehicle kilometres travelled (VKT) demonstrating a proxy for crash risk exposure over time. It is clear, however, that DSIs on Auckland roads are not simply a reflection of VKT or population increase, but that there are other factors influencing the rising number of DSIs.

Figure 50 - Local road DSI per VKT travelled[87]

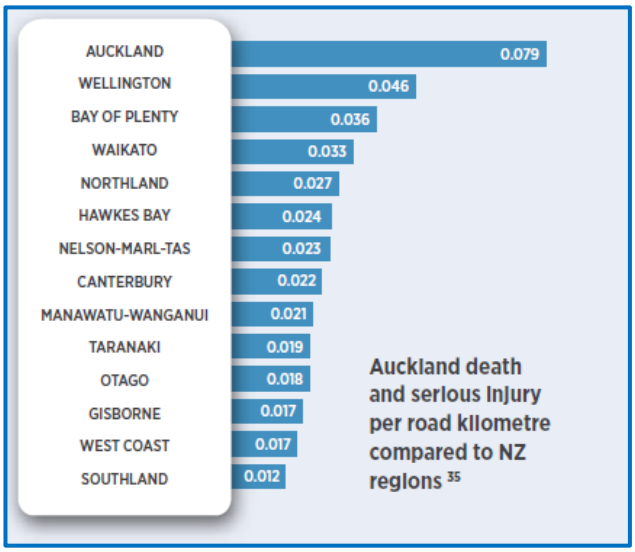


Auckland has a higher rate of DSIs than the rest of NZ

The substantial increase in DSIs since 2014 is also occurring at a faster rate than the national average, indicating that this is a greater issue in Auckland than in other New Zealand cities. This is reinforced by Auckland having the highest rate of DSIs per road kilometre, when compared with all other regions in New Zealand as shown in Figure 51 below.

[86] Source: Crash Analysis System (CAS), Waka Kotahi
[87] Source: Monthly Indicators report 2020/21, Dec 2020, Auckland Transport

Figure 51 - Rates of DSI per road kilometre in NZ[88]



Several agencies have an ability to influence these negative trends by creating a safer system. Auckland Transport has adopted a Vision Zero approach[89] and has a mandate in certain areas (such as speed management, intersection design etc.) whilst Government can regulate (for example, safety standards of widely used imported second-hand vehicles). The police, community, and special interest groups can also play a role in reducing drunk and drug driving or other unsafe behaviour.

Transport safety does not impact all Aucklanders the same

Within Auckland, some communities and groups are at even greater risk on the transport network. People in lower income areas have a significantly higher risk of being seriously injured or killed on roads in Auckland, particularly children, young adults and the elderly.[90] People living in the urban south and west, and rural areas are over-represented in those that die or that are seriously injured on Auckland roads. Furthermore, children living in the most socio-economically deprived parts of Auckland are injured three times more than children living in the least deprived areas. Māori and Pasifika children have even higher rates of injury within these communities. Māori are at significantly higher risk of road traffic injury than any other ethnicity across all ages[91].

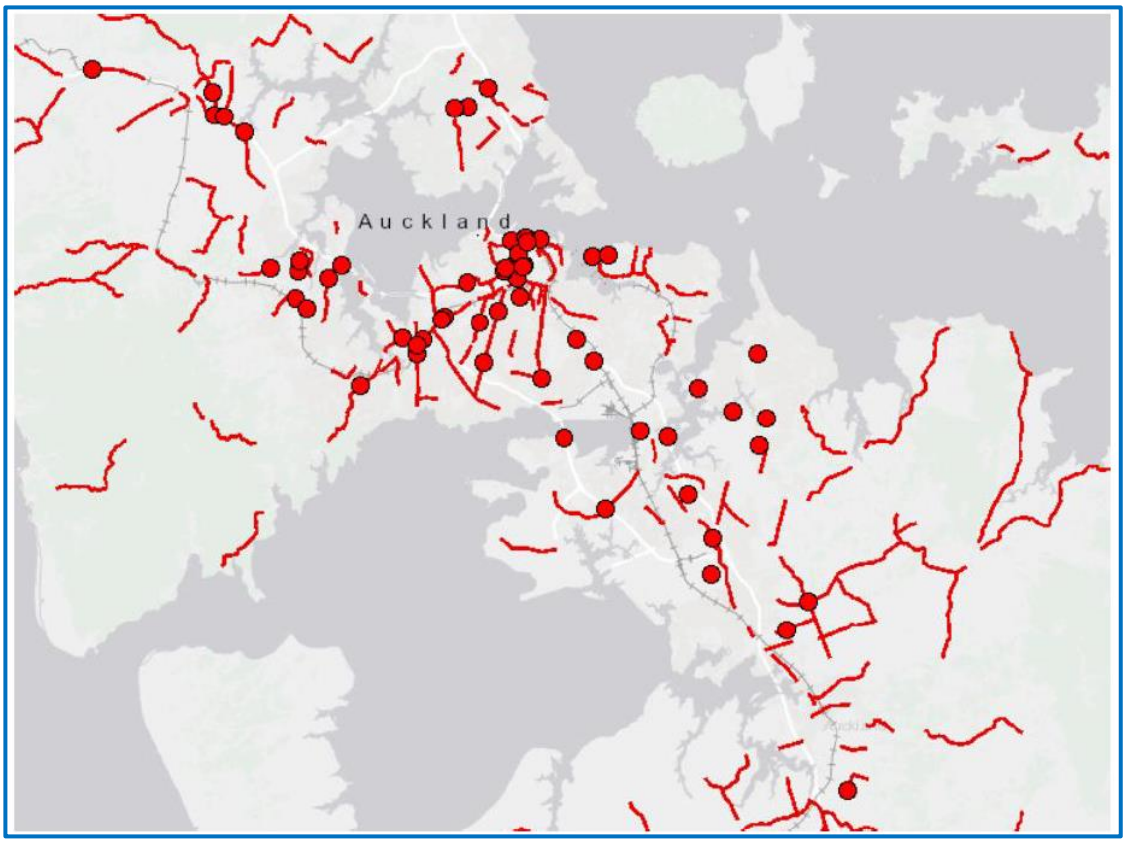
Vulnerable user groups especially cyclists, motorcyclists and pedestrians, suffer a disproportionate number of urban fatalities and are exposed to higher system risk. Emerging trends show an increasing risk for particular user groups, such as, the increasing numbers of motorcyclists (especially in bus lanes), and pedestrians without safe access to a growing public transport services network[92].

Unsafe road layouts increase speeds and the severity of crashes in Auckland

The Auckland Road Safety PBC identified that 13% of the road network (1,025km) in Auckland carries 51% of the total crash risk on the network. Similarly, 2% of intersections (300) on the network carry 25% of the crash risk. This indicates that a small proportion of the road network has a substantial impact on DSIs in Auckland and remains a significant risk for road safety into the future (Figure 52).

[88] Source: CAS and RAMM databases for 2014-2018 (June 2019) Annual average DSI on all roads (Vision Zero for Tāmaki Makarau, 2019, Auckland Transport)
[89] Vision Zero for Tāmaki Makaurau: A Transport Safety Strategy and Action Plan to 2030, 2019, Auckland Transport
[90] Source: Social and Geographical Differences in Road Traffic Injury in the Auckland Region, Hosking, Ameratunga, Exeter and Stewart, School of Population Health, University of Auckland (2013)
[91] Source: Social and Geographical Differences in Road Traffic Injury in the Auckland Region, Hosking, Ameratunga, Exeter and Stewart, School of Population Health, University of Auckland (2013)
[92] Source: Auckland Transport: Road Safety Business Improvement Review, 2018, Whiting Moyne P/L

Figure 52 - Location of High-Risk Intersections and Corridors in Auckland[93]



There are many factors that contribute to unsafe road layouts, including inappropriate road widths, sharp bends, mediocre intersection designs, lack of safe and convenient pedestrian crossings, cycle lanes and footpaths. A recent survey revealed that 84% of Aucklanders are concerned about red light running offences which are higher than the rest of the country[94]. An example of an area requiring a strong partnership approach between Waka Kotahi, Auckland Transport and the Police to achieve better enforcement outcomes[95].

Table 5 shows the significance of vehicle speed, drug / alcohol abuse and failure to use seatbelts as the main contributing causes of deaths and DSIs on Auckland's roads.

Table 5 - Key contributing behavioural causes to deaths and DSIs in Auckland (2015-2019)[96]

Importance of contributing cause	Deaths and Serious Injuries (DSIs)	Deaths
1st	Excess speed (22.2%)	Alcohol / other drugs (38.6%)
2nd	Alcohol / other drugs (18.5%)	Excess speed (36%)
3rd	Distraction (7.7%)	Non-restraint (seatbelt) use (23.3%)
4th	Non-restraint (seatbelt) use (6.1%)	Distraction (6%)

[93] Source: Mega Maps, Waka Kotahi (Auckland Road Safety Programme Business Case, Aug 2019, Auckland Transport)
[94] Source: Public Perceptions of NZ Road Safety: Penalties and Enforcement (including Auckland), July 2021, AT Marketing Insights
[95] Strengthening partnership relationships was an emphasis in the 2018 Auckland Transport: Road Safety Business Improvement Review to achieving better overall safety outcomes in key areas.
[96] Source: Waka Kotahi Crash Analysis System data: Five-year average 2015-2019

Pollution

Harmful emissions

The transport system is a significant contributor to harmful emissions that impact on human health. Air pollution is generated from exhaust fumes, as well as brake and tyre wear from vehicle usage. The negative impact varies, depending on vehicle operating conditions, with concentrations of emissions found in busy vehicle corridors.

Emissions from vehicles include pollutants which have been shown to contribute to cardiovascular and respiratory diseases, and lung cancer.[97] Diesel-powered, older, and poorly maintained vehicles generally produce more emissions. Two of the most significant emissions are Particulate Matter (PM) and Nitrogen Oxides such as Nitrogen Dioxide (NO_2). Exposure to PM is responsible for the greatest health impacts arising from air pollution. PM is typically categorised based on the diameter of particles, with PM2.5 (particles with less than 2.5 microns in diameter) having the greatest impact on health. PM10 is also recognised as having a significant impact on health. Long term exposure to PM, especially at higher concentrations, contributes to an increased risk of cardiovascular and respiratory diseases, and lung cancer. Research shows that where concentrations of PM reduce, related mortality also decreases.

Combustion engines are one of the main sources of NO_2 in the environment. Short term exposure to NO_2 causes inflammation of the airways, while long term exposure to NO_2 is shown to exacerbate respiratory issues in children and reduce lung function. NO_2 is also the main source of nitrate aerosols (which are a significant component of PM2.5).[98]

The 2012 Health and Air Pollution in New Zealand report (HAPINZ) identifies that vehicle emissions are the largest contributor to poor air quality in Auckland. In 2016, human-made PM10 in Auckland is estimated to have contributed to approximately:

- 435 premature deaths
- 80 cardiac hospitalisations
- 1,805 respiratory hospitalisations
- 500,000+ restricted activity days.[99]

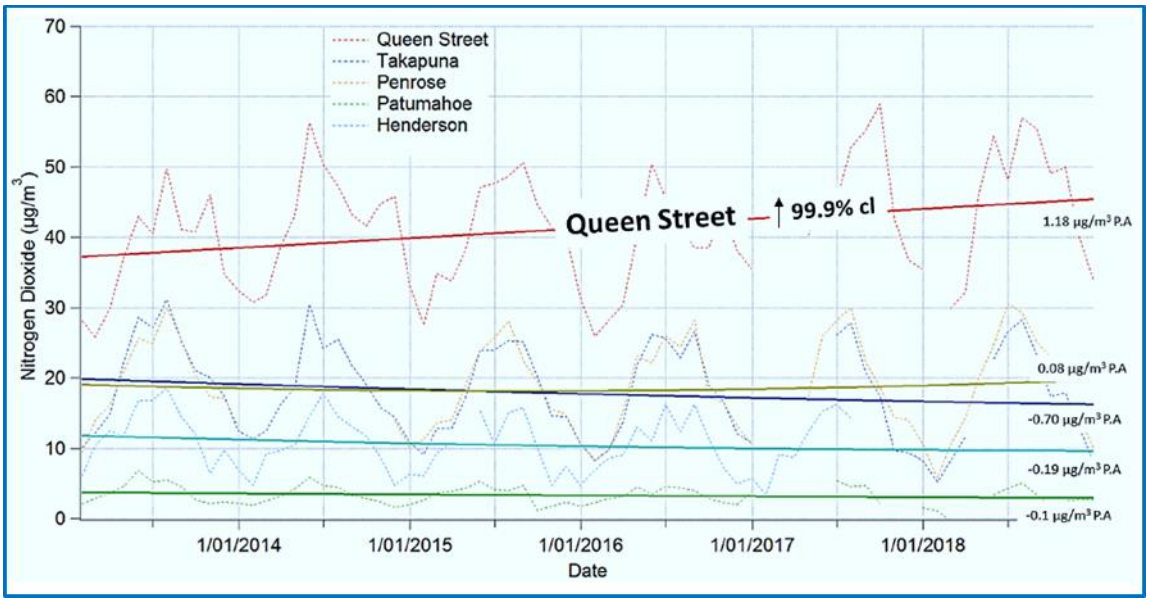
Figure 53 displays the distribution of PM10 emissions across Auckland. It is clear that areas with the highest concentrations of PM10 are located along highly trafficked corridors such as the State Highway network and arterial roads.

[97] Source: https://www.ehinz.ac.nz/indicators/air-quality/air-qual/
[98] Source: https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health
[99] Source: https://www.ehinz.ac.nz/indicators/air-quality/health-effects-of-air-pollution/#particulate-matter-exposure-affects-health

Figure 53 - PM10 Emissions across Auckland[100]

Trends at most Auckland sites monitored for PM10 and PM2.5 emission levels show a positive decline over time[101]. However, there is a long-term trend of increased PM10 and PM2.5 at the Queen Street site, and evidence of increasing NO_2 at Queen Street (refer to Figure 54) and concentrations at sites near major roads.

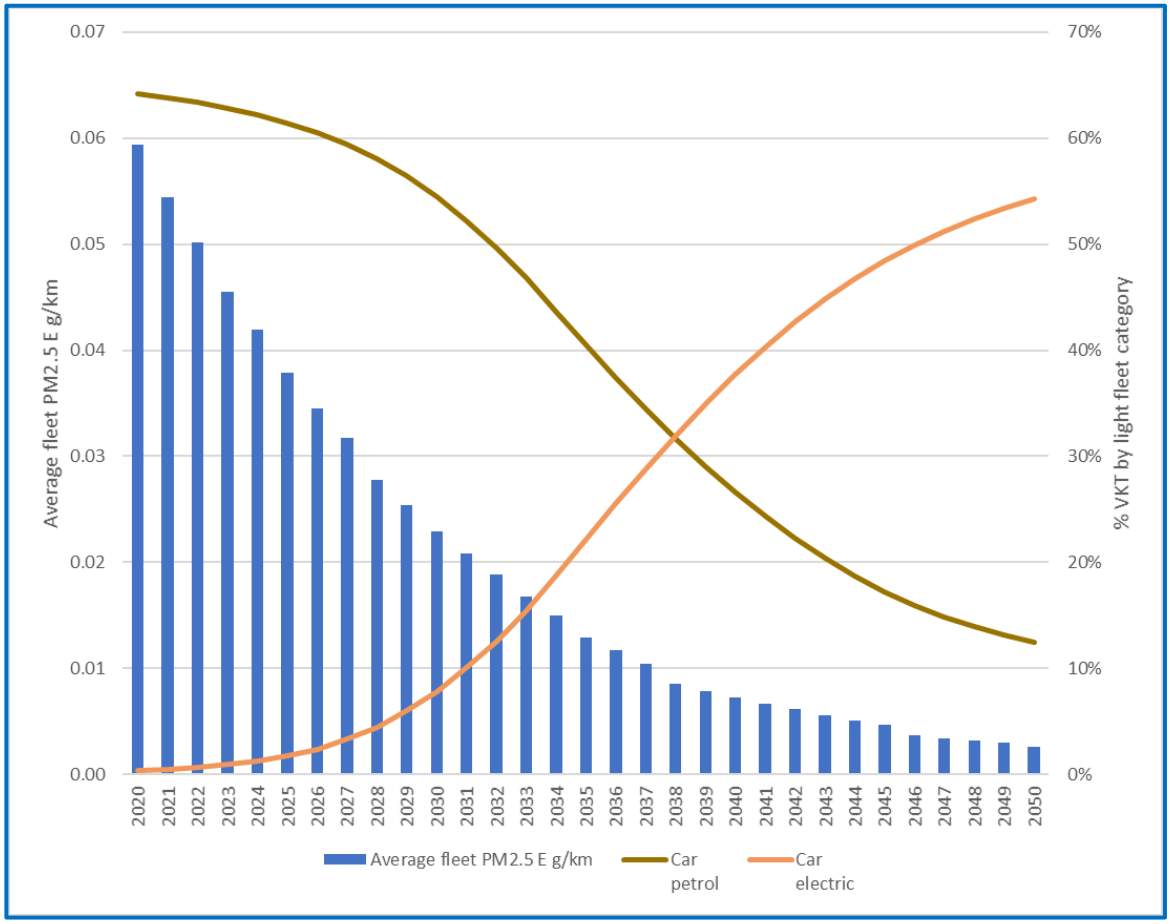
Figure 54 - NO_2 trends across Auckland monitored sites (2013-2018)[102]



[100] Source: https://storymaps.arcgis.com/collections/16be4050255c49489067a39bca090818?item=2
[101] Source: Talbot, N and P Crimmins (2020). Trends in Auckland's air quality 2006-2018. Auckland Council technical report, TR2020/004.
[102] Source: Talbot, N and P Crimmins (2020). Trends in Auckland's air quality 2006-2018. Auckland Council technical report, TR2020/004. 7 sites are monitored: Henderson, Takapuna, Penrose, Queen Street, Glen Eden, Pakuranga, Patumahoe

Although harmful emissions have historically been linked to VKT, technology improvements are helping to break this link for some types of emissions. In particular the shift to vehicles that meet higher emissions standards, such as Euro 6, plus the eventual move towards low emissions vehicles will see a reduction in many of the key harmful emission over time – refer to Figure 55. However particulates generated by brakes and tyres will continue to increase in line with VKT.

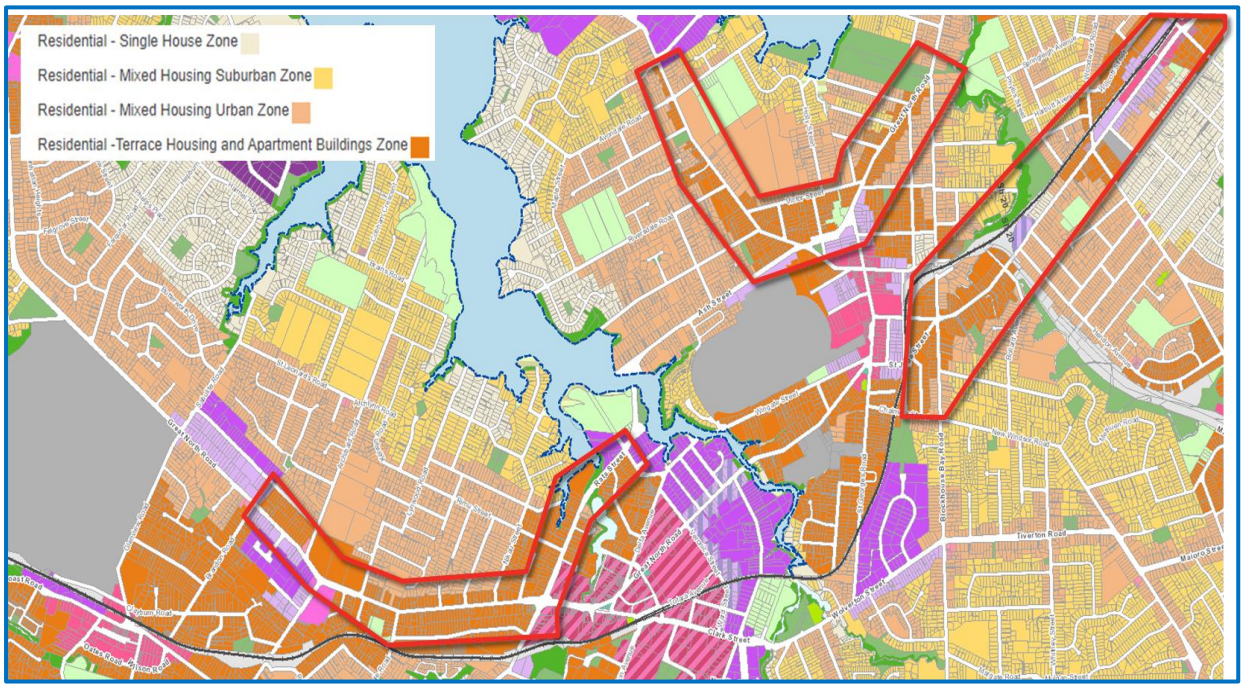
Figure 55 - Particulate emissions (PM2.5) and % VKT light fleet categories over time[103]



The Auckland Unitary Plan has identified land adjacent to arterial roads for higher density residential development. Figure 56 shows how the arterial roads adjacent to New Lynn generally have higher density land use zoning than other road classes. Arterial roads typically carry some of the highest traffic volumes across Auckland. Consequently, the number of people living on heavily trafficked corridors will increase over time, increasing the number of people potentially exposed to harmful emissions.

[103] Source: Analysis based on VEPM 6.1 data https://www.nzta.govt.nz/roads-and-rail/highways-information-portal/technical-disciplines/air-quality-climate/planning-and-assessment/vehicle-emissions-prediction-model/

Figure 56 - Land Use Zoning on Arterial Roads[104]



Noise Pollution

Noise pollution is a significant environmental hazard to mental and physical health. Noise generated from transport (such as rail, road traffic and aircraft) has a great impact on human health with the World Health Organisation rating it second only to air pollution as greatest environmental threat to human health[105].

The impacts of noise pollution on human health include[106]:

- **Sleep disturbance** – interrupted or insufficient sleep is associated with negative physiological and mental function, increased fatigue, depressed mood and decreased performance
- **Physiological effects** – exposure to noise can have temporary and permanent impacts on physiological functions in humans. Temporal changes can include increased blood pressure and heart rate. Prolonged exposure can result in permanent effects such as hypertension and ischaemic heart disease
- **Mental Health effects** – exposure to noise is believed to accelerate and intensify the development of latent mental health disorders. These can include anxiety, emotional stress, nausea, headaches, neurosis, and psychosis
- **Performance effects** – exposure to noise adversely impacts performance on cognitive tasks and memory.

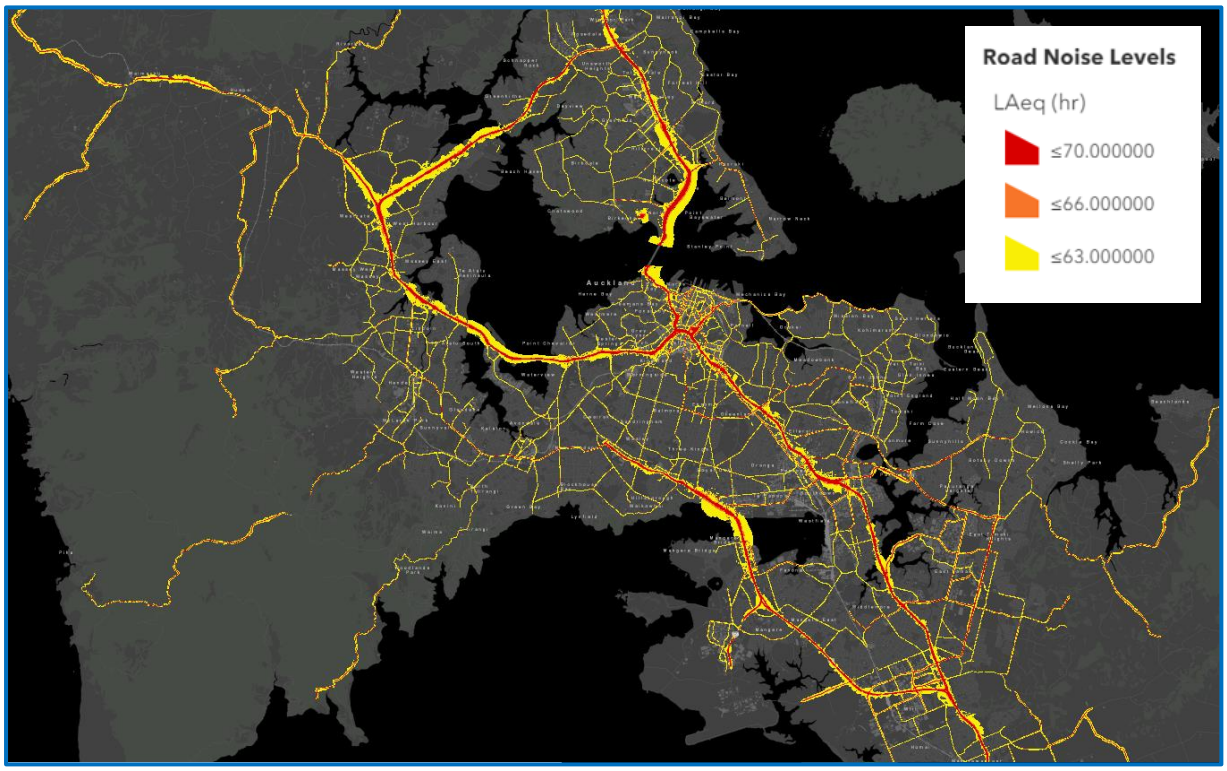
Noise is generated by the road transport system through a combination of sources:

- Vehicle speed
- Vehicle type
- Vehicle volumes
- Road surface.

[104] Source: Auckland Unitary Plan, Auckland Council
[105] Source: Burden of disease from environmental noise: Quantification of healthy life years lost in Europe, World Health Organisation
[106] Source: Guidelines for Community Noise; Berglund, Lindvall and Schwela, World Health Organisation

Figure 57 shows the existing noise levels along roads in Auckland, with the greatest noise levels being experienced on the state highway and arterial road networks. As discussed above, VKT in Auckland is increasing and, consequently, the levels of noise pollution in Auckland will increase over time (although not necessarily proportionally). Increasing residential density along heavily trafficked roads will also increase the number of people exposed to high levels of noise pollution. Consequently, the adverse health impacts associated with noise pollution will increase over time.

Figure 57 - Road Noise Levels in Auckland[107]



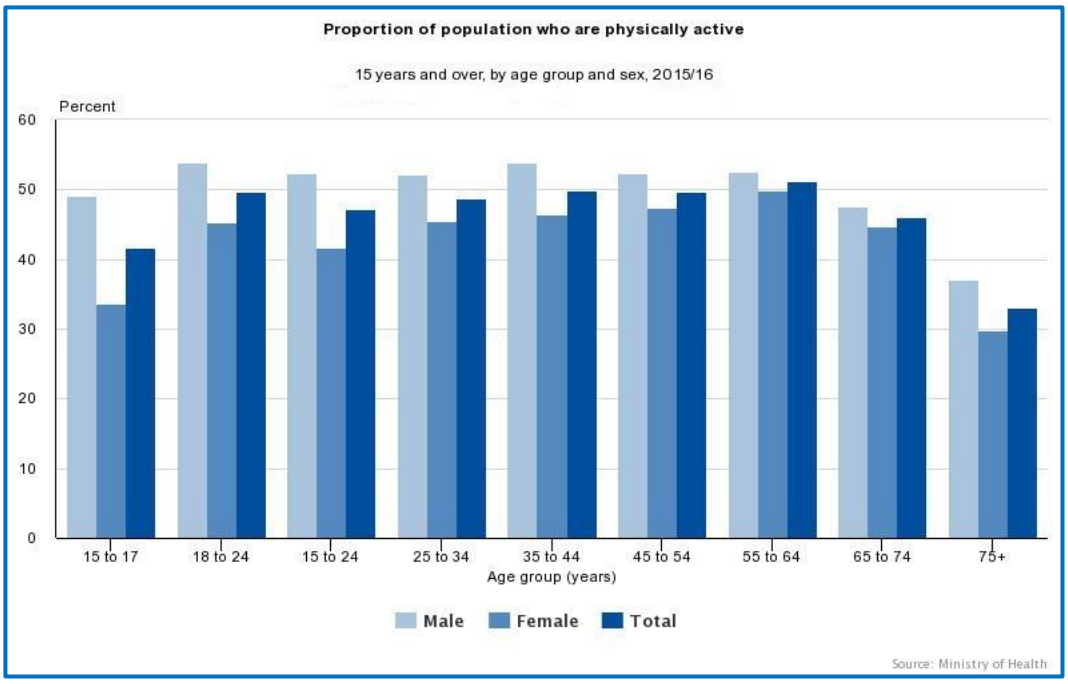
The ability to influence factors that will reduce air or noise pollution requires multiple organisations and initiatives, such as Auckland Council's land use planning and zoning requirements, Auckland Transport's improvements to the public realm which reduces exposure to pollution, and the Government's vehicle emission standards.

Physical Activity

Insufficient physical activity is a key risk factor for diseases such as cardiovascular disease, cancer and diabetes. Consequently, insufficient physical activity is one of the leading risk factors for premature death across the world. In New Zealand, approximately half of all adults are physically active for at least 30 minutes on 5 or more days per week, with 1 in 7 adults active for less than 30 minutes per week[108]. Figure 58 displays the proportion of adults in New Zealand who are physically active by age group.

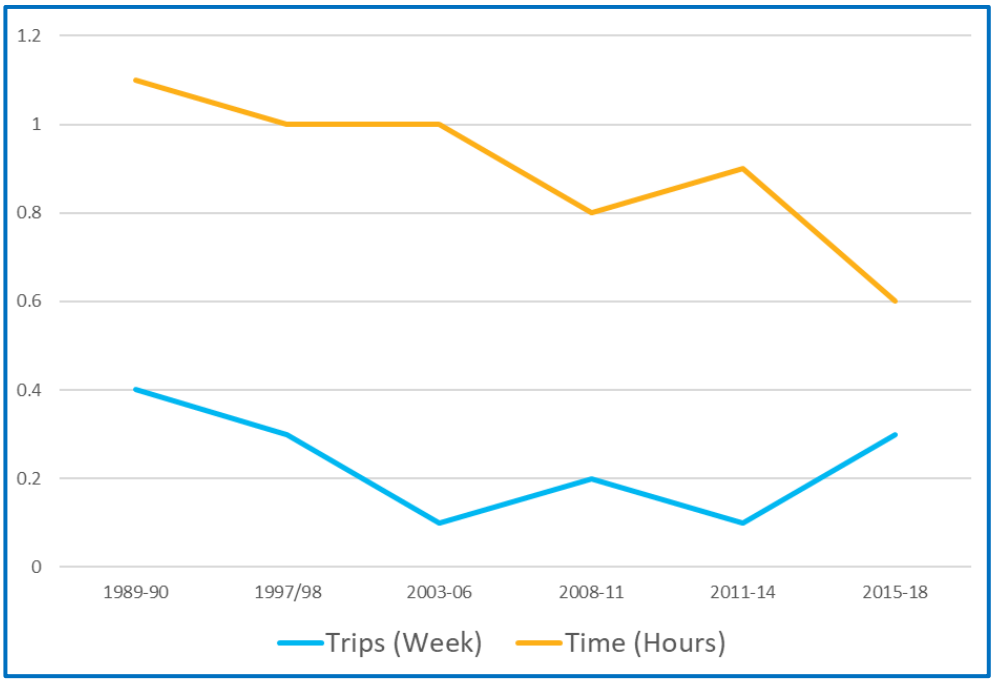
[107] Source: https://storymaps.arcgis.com/collections/16be4050255c49489067a39bca090818?item=2
[108] Source: https://www.health.govt.nz/your-health/healthy-living/food-activity-and-sleep/physical-activity/activity-levels-new-zealand

Figure 58 - Physical Activity in Adults[109]



People in Auckland are becoming less active in meeting their transport needs, with the number of walking trips and walking time decreasing over the past few decades. The time spent travelling by foot has decreased by about 45%, indicating that on an average, people are walking fewer times per week, for shorter periods of time (Figure 59). This trend could be related to Problem 2 i.e., a lack of competitive travel options and high car dependency.

Figure 59 - Change in Walking 1989-2018 (per week)[110]

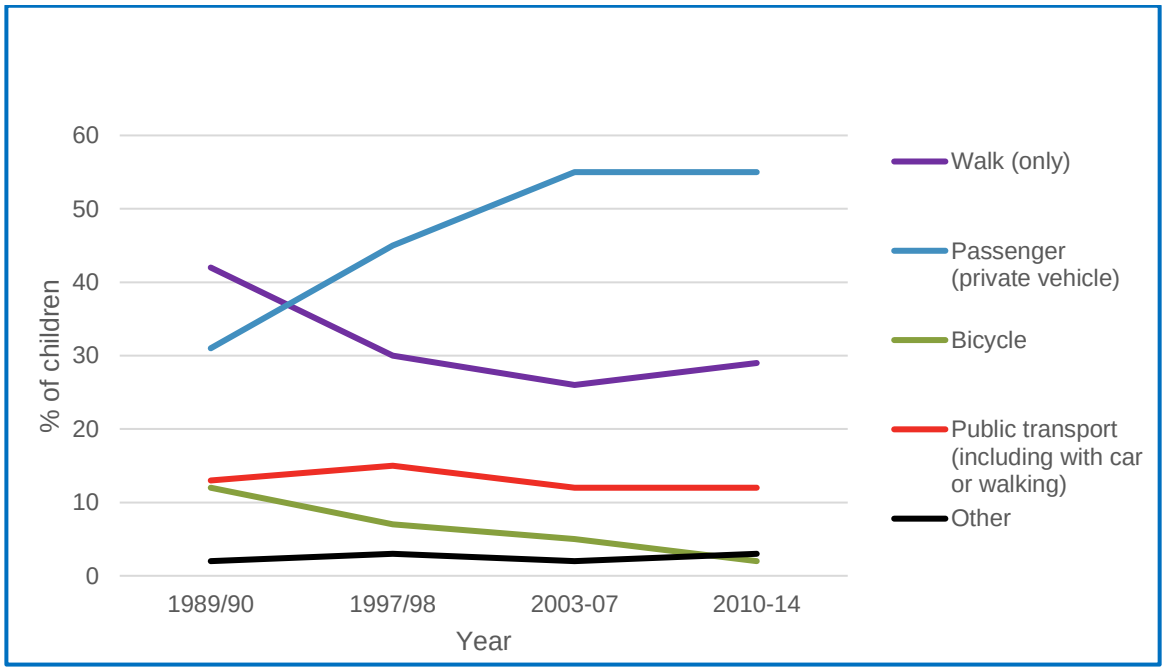


[109] Source: NZ Health Survey, Ministry of Health

[110] Source: compiled from 30 years of the Household Travel Survey - Auckland Trends presentation, Greg Mossong, Oct 2020, Ministry of Transport. Note that the method of data collection changed between the 2011-14 and 2015-18 periods; as a result comparison need to be treated with caution.

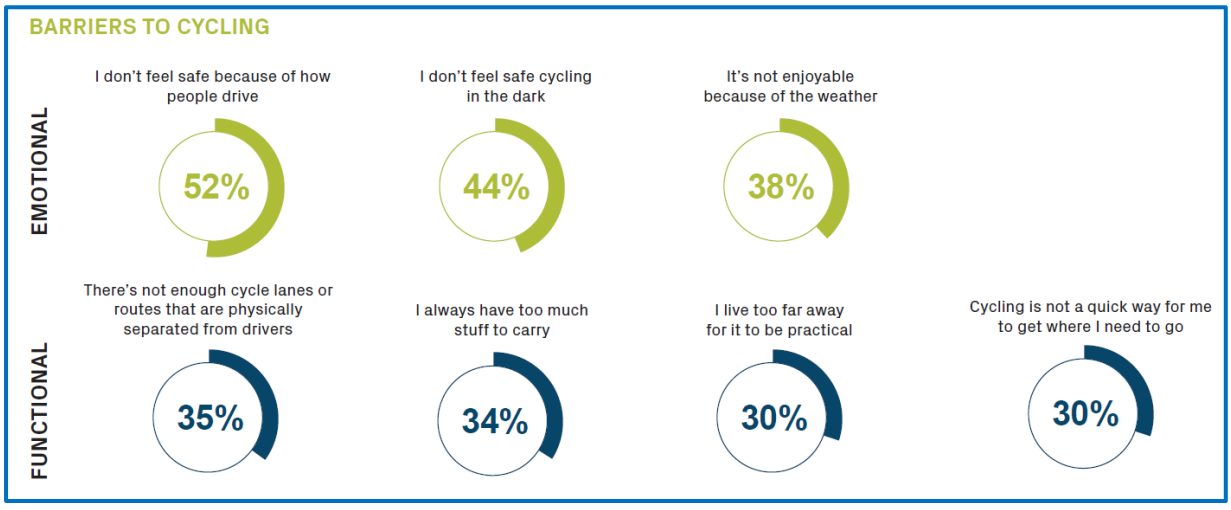
Figure 60 shows how the proportion of children travelling by bike or foot to primary school has also reduced significantly over the past 30 years.

Figure 60 - Mode of Travel to School (children 5-12 years)(Ministry of Transport)[111]



The transport system currently creates barriers that prevent greater uptake of active travel. In New Zealand, safety and the lack of appropriate facilities are two of the greatest factors preventing people from cycling more often to access destinations. As shown in Figure 61, safety is cited as the greatest barrier to cycling, and less than 50% of people feel that cycling in Auckland is safe.

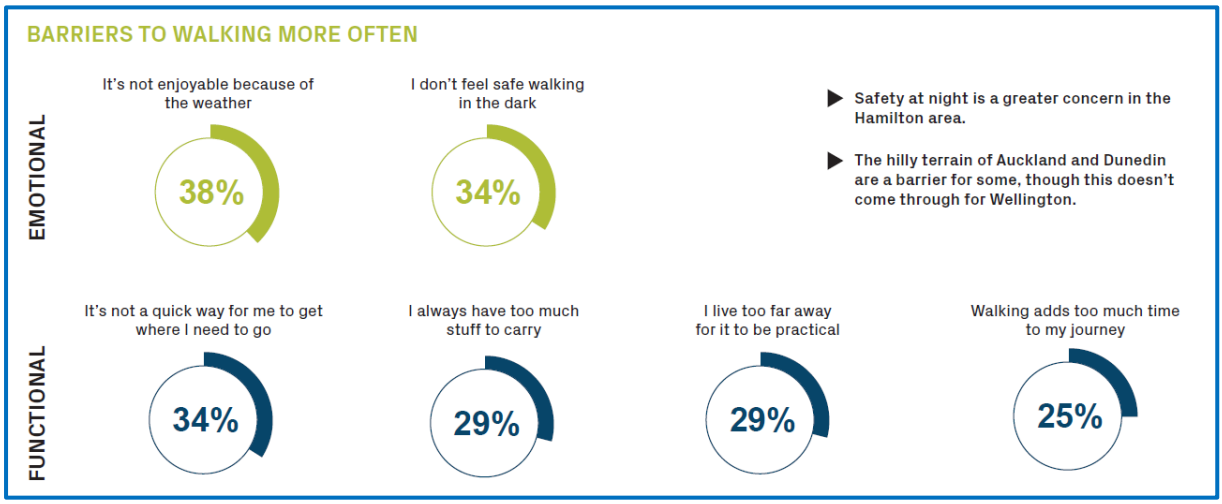
Figure 61 – Barriers to Cycling[112]



The barriers to walking are slightly different to those for cycling. However, as shown below in Figure 62, safety is again cited as a key reason that people walk less often, particularly at night.

[111] Source: https://www.ehinz.ac.nz/indicators/transport/active-transport-to-and-from-school/
[112] Source: Attitudes to Walking and Cycling, 2018, Waka Kotahi

Figure 62 - Barriers to Walking[113]



Walking is perceived to be a slow, and time-consuming form of transport, with distance also identified as an important barrier to walking. As a result, people's propensity to walk is heavily influenced by having an efficient street network that minimises deviation from the most direct path. However, the pattern of development in Auckland, particularly through the latter part of the 20th century, has resulted in spread out destinations which increases walking distances (and times) and limits the attractiveness of walking.

Summary of Problem 4 Evidence

Overall problems and opportunities for Problem 4 are summarised below. These exclude the effect of policy changes or RLTP 2021-2031 investments.

Problem	Key Evidence
PROBLEM 4: The transport system has become increasingly harmful and does not support better health outcomes	• DSIs in Auckland almost doubled between 2012 and 2017 to a peak of 832 (local roads and state highways) • The most significant contributing causes of DSIs on Auckland roads are excessive vehicle speed, drug / alcohol abuse and failure to use seatbelts • Vulnerable community members are more likely to be harmed on Auckland's roads • Unsafe road layouts contribute to DSIs in Auckland • Air pollution from the transport system is harming the health of Aucklanders, especially sources of particulate matter (e.g. vehicle emissions and brake / tyre wear) and Nitrogen Oxides (e.g. NO_2 from combustion engines) • Both air and noise pollution are linked to VKT and increasing VKT alongside intensification on major transport corridors will increase the number of people exposed to air and noise pollution. Multiple organisations and initiatives would be required to address these challenges (e.g. land use planning, street design, vehicle emission standards) • Low levels of physical activity contribute to cardiovascular disease and other health issues. The design of infrastructure and the transport system creates barriers which reduces people's willingness to walk or cycle (e.g. safety concerns).

[113] Source: Attitudes to Walking and Cycling, Waka Kotahi, 2018

3.5 Benefits of Investment

The potential benefits and measures of success for addressing the problems have been identified as part of the ILM process. The agreed benefits were initiated from the six key outcomes outlined in ATAP 2018. Recent changes to the programme landscape were also considered, particularly (but not limited to) Auckland Council's declaration of a climate emergency and the adoption of the Vision Zero safe system approach.

The benefits were subsequently refined to formulate the objectives that will guide the 2020 ATAP Update and 2021-2031 RLTP.

The five benefits of investment are:

1. **Better connecting people, places, goods and services**

   Ensuring the bulk of growth in demand for travel is absorbed by sustainable modes or is addressed by targeted improvements in roading capacity, which will:

   - *increase overall network capacity and person throughput*
   - *minimise the spread and severity of congestion (relative to a 'do minimum'), thereby limiting the negative impacts on freight throughput, travel time reliability for motor vehicles and overall vehicle travel time*
   - *improve total access to opportunities, particularly potential jobs / labour force and key economic destinations. Ideally improvements in access to employment will keep pace with the scale of growth in total labour force, ensuring Auckland receives full economic and social benefits from its growth*
   - *support more equitable access to and from key destinations.*

2. **Providing and accelerating better travel choices for Aucklanders**

   Dramatically improve the competitiveness and attractiveness of public transport in comparison to private vehicle travel - particularly in terms of speed, frequency, reliability and span of coverage - which will in turn:

   - *support mode shift to public transport, both in terms of trips and distance travelled*
   - *increase overall network throughput and reduce congestion impacts for private vehicles (relative to a 'do minimum')*
   - *increase access to employment and other key economic destinations by public transport*
   - *increase the availability of the public transport network*
   - *support more equitable access to public transport*
   - *support reductions in greenhouse gas emissions, along with other harmful emissions*
   - *encourage more intensive housing typologies.*

   Dramatically improve the scale, safety and attractiveness of Auckland's cycling, walking and micro-mobility networks, which will in turn:

   - *support mode-shift away from private vehicle travel*
   - *increase access to employment and other key economic destinations by active modes and micromobility*
   - *support reductions in greenhouse gas emissions, along with other harmful emissions*
   - *reduce deaths and serious injuries and improve health and fitness.*

3. **Enabling and supporting Auckland's growth, focusing on intensification in brownfield areas and with some managed expansion into emerging greenfield areas**

   Ensure priority growth areas are provided with appropriate infrastructure and services to:

   - *unlock overall housing capacity*
   - *encourage growth to locate in the most suitable areas in Auckland, including areas with higher public transport accessibility*
   - *support higher take up of sustainable modes and minimise emissions along with congestion, and other negative impacts on the transport network, that may otherwise arise from growth.*

4. **Improving the resilience and sustainability of the transport system, and significantly reducing the greenhouse gas emissions it generates**

   Encourage a significant shift to travel by more sustainable modes and greater take up of low emissions vehicles, while also investing in measures to reduce harm to the environment and improving the adaptability of the transport system to climate change, which will in turn:

   - *significantly reduce greenhouse gas emissions relative to the 'do minimum' and on a per capita basis*
   - *reduce harmful particulate emissions from the transport system*
   - *mitigate the effect of the transport system on the natural environment, particularly on water quality and biodiversity*
   - *improve the resilience of the transport system to the likely impacts of climate change.*

5. **Make the transport system safe by eliminating harm to people**

   Improve the safety of the transport system through infrastructure, speed management and relevant enforcement activities to reduce the overall risks associated with the system – in line with Vision Zero principles – and thereby leading to a rapid reduction in the number of deaths and serious injuries on the network.

The final key outcome for the RLTP 2021-31 is "Sound asset management", which is not a direct benefit of addressing the problems identified through the ILM. However, as it is not inconsistent or in conflict with the benefits of investment it will be considered as a supplementary component of the ILM.

6. **Sound management of transport assets**

   Transport networks and assets remain in an acceptable condition over the next decade to ensure that assets provide an appropriate level of services – including road network condition – and are renewed and maintained in a way that is optimal from a value for money perspective. In addition:

   - *provide for coordination with relevant improvement projects to support the preceding benefits*
   - *embed resiliency to climate change as assets are renewed.*

3.6 Performance Measures

Performance measures have been developed to evaluate the success of investment in achieving the potential benefits. The Waka Kotahi Land Transport Benefits Framework and Management Approach have been used to identify broad categories of investment benefits, and the tangible way in which these will be assessed. The Investment Benefits provide the linkage between the Benefit and Measure. Some of the measures have been taken directly from the benefits framework, while others have been identified to reflect the available data. The measures were chosen to be specific, measurable and attributable to investments in Auckland's transport system (i.e. ATAP/RLTP).

Table 6 displays the benefits of investing in resolving the ILM problems, and how these will be assessed.

Table 6 - Investment Benefits and Measures

RLTP Process		Waka Kotahi Benefits Framework
Benefits	**Performance Measures**	**Investment Benefits and Measures**[114]
Better connecting people, places, goods and services	Number of jobs Aucklanders can connect to within an acceptable time (30min by car, 45min by public transport)* *proxy for connections to other activities	Impact on network productivity and utilisation: • Access to key economic destinations (all modes)
	Proportion of Auckland freight network operating at LOS C or better (inter-peak)	Impact on network productivity and utilisation: • Freight - throughput value
	Proportion of time spent in congested conditions (LOS F) (morning / inter-peak)	Impact on system reliability: • Travel time reliability – motor vehicles
	Average travel speeds on Auckland FTN (morning peak)	Impact on system reliability: • Punctuality – public transport
Providing and accelerating better travel choices for Aucklanders	Total Auckland public transport boardings	Impact on user experience of the transport system: • People – throughput of pedestrians, cyclists and public transport boardings
	Number of Auckland cycle movements past selected count sites	
	Share of Auckland growth in trips absorbed by public and active modes (morning peak)	Impact on mode choice: • People – mode share
	Overall Vehicle Kilometres Travelled (VKT) for Auckland	Impact on mode choice: • Traffic – mode share (distance)
Enabling and supporting Auckland's growth, focusing on intensification in brownfield areas and with some managed expansion into emerging greenfield areas	Proportion of Auckland population within 500m of Rapid and/or Frequent network stops	Impact on mode choice: • Spatial coverage – cycle lanes & paths • Spatial coverage – cycling facilities • Spatial coverage – public transport – employees
	Auckland Spatial Priority Areas are provided with adequate	

[114] Source: Land Transport Benefits Framework and Management Approach, Appendix 1: Overview of Land Transport Benefits Framework with Measures, July 2021, Waka Kotahi. There is general alignment between the themes of outcomes sought with the RLTP.

RLTP Process		Waka Kotahi Benefits Framework
Benefits	**Performance Measures**	**Investment Benefits and Measures**[114]
	infrastructure to support the development of land** ** To support form and function whilst encouraging sustainable travel behaviour and minimising potential negative impacts on wider transport system	• Spatial coverage – public transport – resident population • Spatial coverage – public transport – new residential dwellings
Improving the resilience and sustainability of the transport system, and significantly reducing the greenhouse gas emissions it generates	Auckland greenhouse gas emissions (for land transport purposes)	Impact on greenhouse gas emissions: • CO_2 emissions
	Greenhouse gas emissions from AT's corporate activities, facilities and trains	
	Proportion of AT buses that are electric	
	Runoff from the busiest local roads impacting high quality receiving environments	Impact on water: • Water quality Impact on land and biodiversity: • Biodiversity
Make the transport system safe by eliminating harm to people	Deaths and serious injuries (DSI) on the Auckland transport network	Impact on social cost of deaths and serious injuries: • Deaths and serious injuries
	Deaths and serious injuries of people walking, riding a bike or motorcycle on the Auckland Transport Network	
Sound management of transport assets	Proportion of overall road assets in acceptable condition	Impact on user experience of the transport system: • Network condition – road
	Road maintenance standards (ride quality) as measured by smooth travel exposure for urban and rural roads	
	Average age of road pavement base rehabilitated	
	Average age of road pavement surface resealed	
	Proportion of footpaths in acceptable condition	

4 SUMMARY

This Auckland Region Transport Strategic Case outlines the problems and opportunities facing Auckland's transport system to align with ATAP 2021-31 and RLTP 2021-31 investment programmes, and subsequent business cases that emanate from it.

The Strategic Case was initially developed to inform and support the development of ATAP and in particular the 2021-31 RLTP. This was achieved through updated problem definitions which aligns to Auckland Transport and partner strategic objectives and priorities via an Investment Logic Map (ILM), and a strategic assessment of the problems facing Auckland's transport system. As it is focused on identifying problems, the Strategic Case does not include the impact of 2021-31 RLTP investment on the problems assessed.

The Strategic Case was developed in partnership with Auckland Council and Waka Kotahi. The initial ILM was subsequently updated to bring investment objectives in line with the ATAP 2020 and RLTP processes. The ILM has resulted in four key problem statements that have been reviewed and agreed with stakeholders:

- **ACCESS** – Existing deficiencies in the transport system and an inability to keep pace with increasing travel demand is limiting improved and equitable access to employment and social opportunities
- **TRAVEL OPTIONS** – A lack of competitive travel options and high car dependency as the city grows, is limiting the ability to achieve the quality compact urban approach for Auckland
- **ENVIRONMENT** – Emissions and other consequences of transport are harming the environment and contributing to the transport system becoming increasingly susceptible to the impacts of climate change
- **SAFETY** – The transport system has become increasingly harmful and does not support better health outcomes

This Strategic Case summarises this process, provides evidence and contributes towards the business case pathway for studies and investigations for projects included in the ATAP and RLTP programmes.

APPENDIX A: INVESTMENT LOGIC MAP (ILM)

ORIGINAL ILM (FEBRUARY 2020)

Future Connect/RLTP Investment Logic Map

Outlining problems and opportunities facing Auckland's transport system in order to guide integrated land transport planning and investment; and key objectives for the Regional Land Transport Programme (RLTP)

Problem Statement	Problem Indicators	Objectives	Outcome Indicators
Problem 1 – Existing deficiency in the transport system and an inability to keep pace with increasing travel demand is limiting improved and equitable access to employment and social* opportunities	1. Vulnerability to, and high levels of closures, on strategic networks due to unplanned incidents 2. Comparative trip growth on the network for each mode 3. Ability of strategic network to cope with large scale developments 4. Extent of delays and travel time variability on strategic networks, including interpeak on the freight network 5. Road space allocation not consistent with desired strategic networks 6. High travel times to employment and social opportunities from high deprivation areas 7. Low numbers of pedestrians, cyclists and PT boardings given infrastructure, services availability and affordability in areas of high deprivation	**Objective 1 –** Enabling & supporting Auckland's growth and the quality compact urban approach	1. Transport infrastructure and services deployed in right places to support Council's Priority Areas 2. Increased intensification of dwellings around Rapid and Frequent Transit Network (FTN) stations and interchanges 3. Reduced average VKT trip length
Problem 2 - A lack of competitive travel options and high car dependency as the city grows is limiting the ability to achieve the quality compact urban approach for Auckland	8. Low availability of safe, attractive and connected infrastructure and services in an area by mode 9. Low numbers of pedestrians, cyclists and PT boardings given availability of infrastructure and services in an area 10. Uncompetitive PT travel times compared to the private vehicle on key routes 11. Level of crowding on PT services reducing attractiveness 12. Significant residential/economic activity areas, and Council's Priority Areas, are not sufficiently complemented by modal infrastructure and services	**Objective 2 –** Accelerating better travel choices for Aucklanders	4. Increase in number of occasional and new PT users and active modes** 5. Reduction in SOV mode share 6. Increase in PT and active mode share on key corridors and in town centres 7. Increase in length of connected segregated cycle infrastructure 8. Improved PT service reliability and customer travel time relative to general traffic; especially in peak periods
		Objective 3 – Better connecting people, places, goods and services	9. Increased number of jobs accessible within: • 30 minutes by private vehicle • 45 minutes by PT 10. Proportion of FTN corridor with PT priority where needed 11. Improved throughput of people (peaks), and freight (interpeak) on strategic networks 12. Improved customer satisfaction on connectedness of journeys 13. Reduced average time to recover from incidents
Problem 3 – Emissions and other consequences of transport are harming the environment and contributing to the transport system becoming increasingly susceptible to the impacts of climate change	13. High quantity of poor-quality storm water run-off from the road network 14. High levels of greenhouse gas emissions 15. Vulnerability to closures on the strategic network due to climate change impacts	**Objective 4 –** Improving resilience and sustainability of the transport system	14. Reduction in transport related fuel use and associated carbon emissions 15. Increased proportion of low emission vehicles 16. Reduced kilometres of road and rail infrastructure susceptible to climate change impacts 17. Increased proportion of stormwater from transport system is treated
Problem 4 - The transport system has become increasingly harmful and does not support better health outcomes	16. Portions of the strategic network operating at higher than Safe and Appropriate Speeds 17. High levels of harmful emissions in key town centres 18. High risk corridors and intersections on the network 19. Areas where vulnerable users are at risk 20. High numbers of deaths and serious injuries on the strategic networks 21. Level of personal perception of safety for PT users discourages use 22. Safety risk rating (KiwiRAP) on strategic networks	**Objective 5 –** Making Auckland's transport system safe by eliminating harm to people	18. Reduction in deaths and serious injuries on the transport network, especially for vulnerable road users (total/per capita/per VKT) 19. Reduction in particulate and NOx and volatile organic compound emissions in key town centres 20. Increased movement (and health) of users through increased active mode usage

* Includes education, retail, recreation and community

** Includes walking, cycling and micromobility

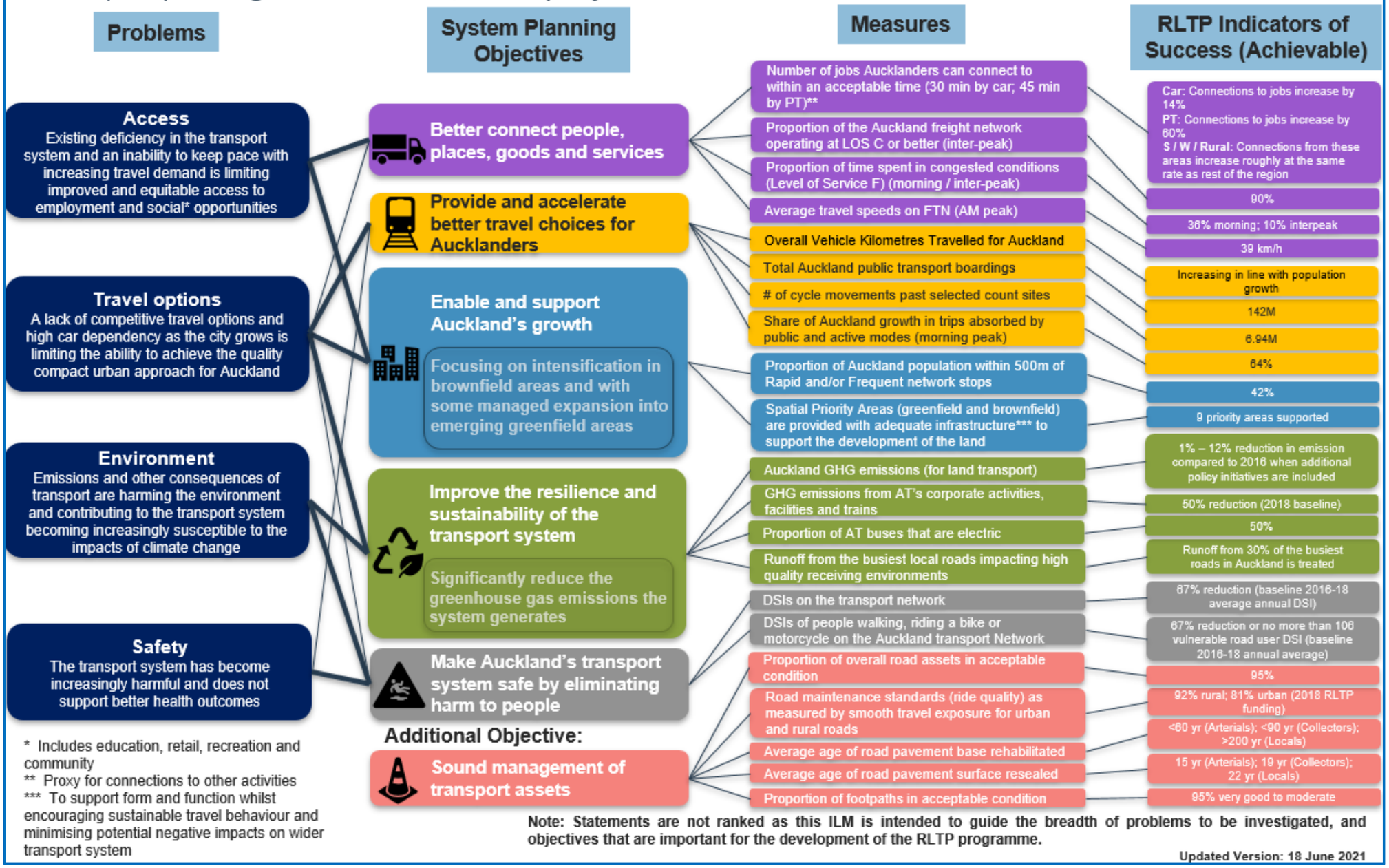
NB. Statements are not ranked as this ILM is intended to guide the breadth of problems to be investigated for Future Connect, and objectives that are important for the development of the RLTP programme.

Final Version

UPDATED ILM (JUNE 2021)

Investment Logic Map

Outlining problems and opportunities facing Auckland's transport system in order to guide integrated land transport planning and investment; and key objectives for the 2021-31 RLTP.



* Includes education, retail, recreation and community
** Proxy for connections to other activities
*** To support form and function whilst encouraging sustainable travel behaviour and minimising potential negative impacts on wider transport system

Note: Statements are not ranked as this ILM is intended to guide the breadth of problems to be investigated, and objectives that are important for the development of the RLTP programme.

Updated Version: 18 June 2021