Evidence pack

Auckland region

June 2025

Version 1.0

NZ TRANSPORT AGENCY
WAKA KOTAHI

Te Kāwanatanga o Aotearoa
New Zealand Government

More information

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Introduction

This Auckland region section is part of the *Evidence pack*, which is intended to help in the preparation of the strategic front end of regional land transport plans (RLTPs).

It does this by providing a consistent set of data and information setting out the current and future state of New Zealand's transport system at a national and regional level, and what interventions are likely to be effective to address identified deficiencies.

This iteration (version 1, June 2025) is the first step in the collaborative development with the sector of consistent and comprehensive evidence and information. For future iterations we will be drawing on your feedback to iteratively improve it and close any data and analysis gaps.

For more background information about the evidence pack, see the Introduction and national summary.

What's in the evidence pack?

The complete evidence pack is available on the Transport Insights portal.

There you will find:

- evidence pack introduction and national summary, which gives you more background to the pack, its purpose and where the information and data are sourced from, and provides an overview for the whole country
- a section for each region, with data and information (calculated as strategic measures) specific to that region, and discussion of how it fits into the national network.

What's in this Auckland region section?

Each regional section follows the same structure:

- **Auckland overview** – a brief overview of the region.
- **Strategic measures** – which looks at how the region currently rates against the 14 strategic measures from the Land Transport Benefits Framework, and how it's expected to change over time.
- **Current and future challenges** – specific issues for the region to address.
- **Focusing effort** – identifies key areas to focus investment in the short and longer term, and includes targeted suggestions of potential interventions.
- **Appendices** – providing a deeper dive for background information, deficiencies, focusing effort, data sources for the strategic measures and more information on potential interventions.

Auckland overview

Auckland is considered a super-diverse city, with over 25 percent of the population born overseas, the largest Māori population in New Zealand and substantial Pacific peoples and Asian communities.[1] Ninety percent of Auckland's population lives in the 20 percent of the region that is classified urban.[2] Development is focused along a narrow axis stretching from Ōrewa in the north to Drury in the south, with areas of substantial growth in the south, west and northwest. The physical form influences the flow of goods and people, including to and from the port and airport, the 2 international gateways to Auckland.

Auckland has seen rapid expansion, with urban sprawl away from the central isthmus and the additions of satellite towns in areas such as Pukekohe and Warkworth. This continual growth has resulted in the growth of the transport network. In addition, the natural form of Auckland's geography presents constraints and complexities in developing and managing the transport network effectively, especially around the isthmus.

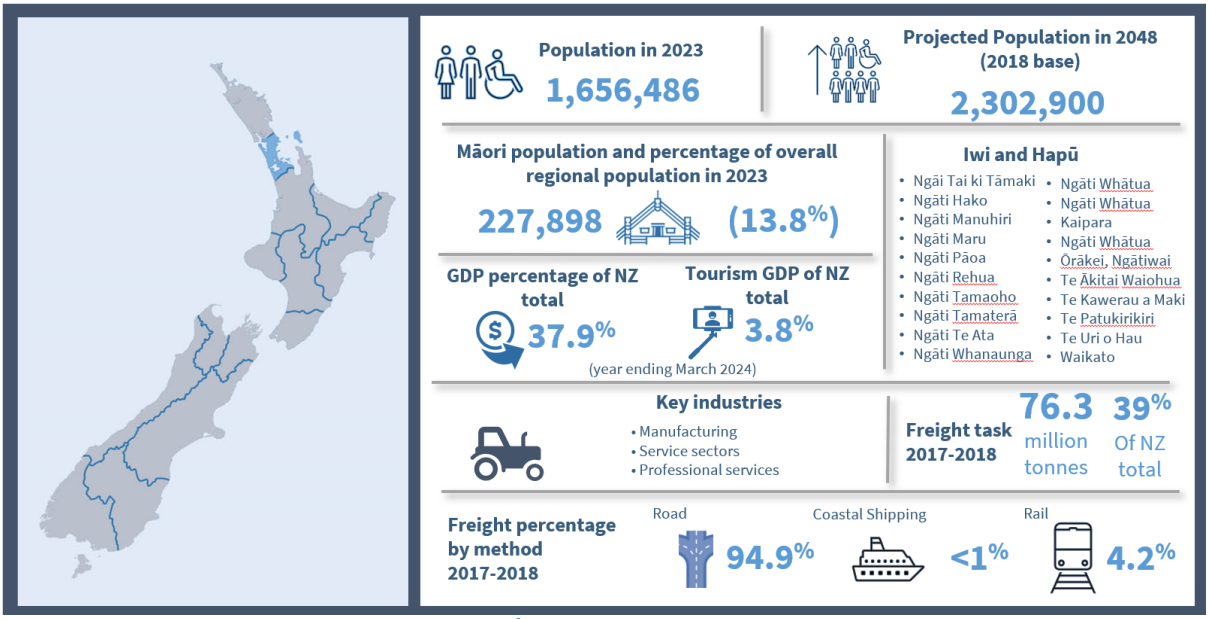

Figure 1: Auckland infographic from Arataki[3]

The region's transport network has seen major upgrades over the past 2 decades, including the completion of the motorway network and the ongoing development of a region-wide rapid transit network. Auckland's state highway network, which includes critical assets such as the Auckland Harbour Bridge and Waterview Tunnel, supports over a million trips daily.

Auckland's regional transport network includes about 8141km of arterial and local roads (of which around 800km are unsealed), 1150 bridges, 7770km of footpaths, 680km of shared paths, a growing fleet of electric trains and buses, rail and busway stations, bus shelters, ferry wharves, Auckland Airport and 2 airfields on the Gulf islands.[4] The total length of Auckland's motorway system is

[1] Committee for Auckland, Deloitte, & Tātaki Auckland Unlimited (2024). The state of the city: benchmarking Tāmaki Makaurau Auckland's international performance. Auckland, New Zealand. https://industry.aucklandnz.com/sites/build_auckland/files/media-library/documents/The_State_of_the_City_2024_report.pdf

[2] Ibid

[3] NZTA (2023). *Arataki regional direction Tāmaki Makarau – Auckland.* https://nzta.govt.nz/assets/planning-and-investment/arataki/arataki-30-year-plan/docs/arataki-regional-direction-auckland.pdf

[4] Auckland Transport (2024). Auckland Regional Land Transport Plan 2024−2034. https://at.govt.nz/media/pbyl211t/auckland-regional-land-transport-plan-2024-2034.pdf

approximately 220km and includes the Northern Motorway SH1, Southern Motorway SH1, Northwestern Motorway SH16, and Southwestern Motorway SH20.

Auckland's rail network forms a key part of the city's rapid transit and freight networks. Recent investments in rail have resulted in substantial growth in rail passenger boardings, which reached 21.9 million trips in 2019[5] (before COVID-19 started to impact public transport use). The region's much anticipated Central Rail Link (CRL) opens next year, enabling a doubling of the rail RTN capacity. The rail network in Auckland is part of the wider national rail network and plays an important role in the efficient movement of national and inter-regional freight across the country, especially to and from the Ports of Auckland and Port of Tauranga.

According to deficiency analysis of the cycle network by Future Connect, large parts of Auckland do not have safe and appropriate access to cycling routes.[6][7] Walking has the potential to play a much greater role in how Aucklanders move around the region, especially for shorter journeys. However, the time taken, and the quality of the pedestrian environment is a key barrier to increasing the numbers of walking trips.[8]

Every year, the people of Auckland travel around 15 billion kilometres by private vehicle (resulting in 13 billion vehicle kilometres) and 1 billion kilometres by public transport.[9] Public transport use, which had grown significantly before COVID-19 (100 million trips a year in 2019), is slowly recovering, with 89 million trips recorded in the 2023/24 year.[10]

Auckland's well-established transport plans, such as the Auckland Transport Alignment Project and the Auckland Plan 2050, require continued collaboration between central government, Auckland Council, and Auckland Transport to address the city's evolving transport needs and achieve national transport outcomes.

For additional background information, see Appendix A.

[5] Auckland Transport (2022). *Auckland Transport monthly indicators report 2021/22*. https://at.govt.nz/media/1987075/111_monthly-transport-indicators-report-2021-2022.pdf

6 Auckland Transport (2024). Regional Land Transport Plan 2024−2034. https://at.govt.nz/media/pbyl211t/auckland-regional-land-transport-plan-2024-2034.pdf

7 Auckland Transport (2023). Future Connect: Auckland Transport's Network Plan. https://at.govt.nz/media/c0vo5241/auckland-transport-future-connect-strategic-networks-report.pdf

[8] *Ibid*.

[9] Auckland Transport (2019). *Vision zero for Tāmaki Makaurau*. https://at.govt.nz/media/1980910/vision-zerofor-tamaki-makaurau-compressed.pdf https://at.govt.nz/media/1980910/vision-zero-for-tamaki-makaurau-compressed.pdf

[10] Auckland Transport (2024). Annual Report 2024. Auckland Transport. https://at.govt.nz/media/jzgn0uus/at-annual-report-2024.pdf

Strategic measures – current and future

This section provides tables summarising the 14 strategic measures in relation to the Auckland region. The data and evidence used to produce these results is included in Appendix B.

The 14 strategic measures are a subset of 60+ measures included in the Land Transport Benefits Framework. They have been selected to provide a coarse but practical overview of the 5 Transport Outcomes, as shown in the diagram.

The tables provide indicative current and future values for the 14 strategic measures (grouped by outcome), to understand how each measure (and therefore outcome) is likely to change if there is no significant investment (beyond that already committed).

More detail about the measures can be found in the Land Transport Benefits Framework measures manual.

Healthy and safe people

Benefit framework measure	Units	Current (2023/24)	Future (2048)	Change
1.1.1 Collective risk (crash density)	Average annual fatal and serious per kilometre of road section	0.073	0.115	0.042 (+58%)
1.1.3 Deaths and serious injuries (DSIs)	Number of DSIs (annual)	593	937	344 (+58%)
1.1.4 Personal risk (crash rate)	Average annual DSI per 100 million vehicle kilometres travelled	4.267	4.267	0 (0%)
1.2.1 Road assessment rating – roads	Infrastructure risk rating (applies to both current and future)	High: 14.92% Medium-high: 17.54% Medium: 48.12% Low-medium: 13.18% Low: 6.24%		N/A

Insights

- If there is no significant investment (beyond that already committed), crash density and the number of deaths and serious injuries (DSI) are projected to increase significantly by 2048. Projections are unavailable for other strategic measures for safety but indicate Auckland currently performs moderately for this outcome on those strategic measures.

- Collective risk (crash density) shows where the biggest difference can be made in terms of absolute numbers of DSIs and is affected by population size and transport mode chosen. The average annual fatal and serious crashes per kilometre of road section in Auckland are more than 2 times the national average and the highest average of all regions. If there is no significant investment (beyond that already committed), crash density is projected to increase by 58 percent by 2048.
- Auckland has the highest number of DSIs of all regions, with 22 percent of the national total and almost three-times the average number of DSI of all regions. If there is no significant investment (beyond that already committed), the number of DSIs is projected to increase by 58 percent by 2048.
- Personal risk (crash rate) highlights areas where a crash is more likely to occur based on use of the road network and is not affected by population size. The average annual DSI per 100 million vehicle kilometres travelled (VKT) in Auckland is currently higher than the national average and the second-lowest average of all regions..
- Infrastructure risk rating (IRR) describes the underlying level of risk a road presents to an individual road user based on key physical and operational attributes. The proportion of Auckland's roads rated as being at medium-high and high risk (that is, with DSI per 100 million VKT equal to or greater than 8) is 18 percent less than the country as a whole and the lowest proportion of all regions.

Resilience and security

Benefit framework measure	Units	Current (2023/24)	Future (2048)	Change
4.1.1 Availability of a viable alternative to high-risk and high-impact route	Percentage of high-risk, high-impact route with a viable alternative	Not included in this release		
4.1.2 Level of service and risk (note that for this evidence pack this data is from the National Resilience Assessment Tool (NRAT) and includes only state highways)	Number of identified sites in region by combined risk rating (future, geological and hydrological)	Low: 41 Med: 29 High: 13 Critical: 5 Not yet rated: 1	N/A	N/A

Insights

- If there is no significant investment (beyond that already committed), Auckland is projected to have the fifth-lowest number of future (emerging) risks. The low proportion of high and critical risks indicate Auckland currently performs moderately for this outcome.
- Hazard events at identified risk sites can lead to unplanned closures of the state highway network, impacting network resilience. Auckland is mostly at risk from geological events (rockfall, overslips, underslips), which make up 75 of the 89 resilience risk sites in the region.

- High and critical risks make up 20 percent of all risks in the region that have been rated to date. The proportion of high and critical risks is 11 percent lower than the national rate and in the middle of the range of all regions.
- The risks include 5 sites with future (emerging) risks, due to the impact of climate change for example. Auckland has the fifth-lowest number of future (emerging) risks of all regions, if there is no significant investment (beyond that already committed).

Economic prosperity

Benefit framework measure	Units	Current (2024)	Future (2048)	%Change
5.1.2 Travel time reliability – motor vehicles (note for this evidence pack, the data only relates to state highway traffic monitoring system (TMS) sites)	Calculated using coefficient of variation (CoV); standard deviation of travel time divided by average minutes travel time Rate: Low <0.3, Medium 0.3–0.6, High >0.6)	Low: AM 12% Day 1% Med: AM 9% Day 3% High: AM 79% Day 96%	Low: N/A% Med: N/A% High: N/A%	Low: N/A% Med: N/A% High: N/A%
5.1.3 Travel time delay (note, data is from the Auckland Forecasting Centre Macro Strategic Model (AFC MSM))	Difference between average travel time during AM peak and average travel time during the inter-peak in minutes per kilometre (by mode) as a percentage	Car: 29% PT: -4% Cycle: N/A	Car: 27% PT: 2% Cycle: N/A	Car: -2% PT: 6% Cycle: N/A:
5.2.2 Freight – mode share value	Percentage of value for each mode	Not included in this release		
5.2.3 Freight – mode share weight	Percentage of weight for each mode	Road: 96% Rail: 4%	Road: 97% Rail: 3%	Road: +1% Rail: -1%

Insights

- If there is no significant investment (beyond that already committed), Auckland's travel time delay in the morning peak is projected to reduce slightly for cars but increase for public transport by 2048. Also, the proportions of freight carried by road and rail in Auckland are projected to change slightly by 2048. A projection is unavailable for travel time reliability, but the poor travel time reliability in Auckland compared to the national rate and other regions indicate Auckland currently performs poorly for this strategic measure.
- Travel time reliability can impact the efficient movement of people and goods. 12 percent of Auckland's state highway network (limited to data based on where we have TMS sites) has poor travel time reliability (that is, a high CoV), compared to 6 percent for the country as a whole and the second-highest proportion of all regions. The volume of vehicle movements and congestion impacts travel time reliability in Auckland. The capability to estimate travel time reliability for future years is still being developed and is intended to be included in later iterations of the evidence pack.

- Travel time delay can impact the efficient movement of people and goods. Travel time delays for cars in the morning peak can be reduced by spreading peak demand and facilitating mode shift to public transport or active modes through investment in infrastructure, services or road pricing mechanisms. Public transport in Auckland currently has lower average travel times during the peak period than during inter-peak. However, if there is no significant investment (beyond that already committed), the difference is projected to reduce by 2048, resulting in slightly longer travel times during the peak than the inter-peak. The difference between peak and inter-peak travel times for cars is projected to reduce slightly in the future.
- While road freight is more efficient over short distances, rail freight is safer, lower emissions and more efficient over longer distances. 96 percent of freight in Auckland is carried by road, 7 percent higher than the national rate and the third-highest rate of all regions. 4 percent of freight in Auckland is carried by rail, 9 percent lower than the national rate and the second-lowest rate of all regions. If there is no significant investment (beyond that already committed), the share of freight carried by road is projected to increase by 2048, consistent with the trend for the country as a whole.
- The freight mode share appears to be consistent with forecast higher demand for imports and consumer goods, especially through the Port of Auckland, New Zealand's largest import port.

Environmental sustainability

Benefit framework measure	Units	Current (2023)	Future (2048)	Change
8.1.1 Greenhouse gas emissions (all vehicles)	Annual tonnes of CO_2 equivalents (CO_2-e) emitted	3.58 m	2.19 m	-1.38 m (-39%)
8.1.3 Light vehicle use impacts	Annual light vehicle kilometres travelled (light VKT)	13,137 m	20,504 m	+7,367 m (+56%)

Insights

- If there is no significant investment (beyond that already committed), Auckland's greenhouse gas (GHG) emissions from all vehicles are projected to reduce significantly (primarily due to a highly uncertain assumed level of vehicle fleet electrification) and light vehicle VKT is projected to increase significantly.
- Land transport is a major contributor to GHG emissions. Auckland accounts for 26 percent of transport GHG emissions in New Zealand. This proportion of the national total is the largest contribution of all regions. If there is no significant investment (beyond that already committed), both Auckland's volume of GHG emissions and the proportion of the national total are projected to decrease in 2048, primarily through electrification of the vehicle fleet (as forecast using the Ministry of Transport Vehicle Fleet Model (VFM)). However, this assumed level of electrification has high uncertainty, and is a major factor affecting GHG emissions; therefore the calculated 32% decrease needs to be considered in this light.
- Light vehicle VKT is currently the largest source of transport GHG emissions. Electrification could be complemented by mode shift to public transport and/or active modes to maximise a reduction of GHG emissions. Auckland accounts for 26 percent of light vehicle VKT in New Zealand. This proportion is

the largest of all regions. If there is no significant investment (beyond that already committed), both the volume of Auckland's light vehicle VKT and proportion of the national total are projected to increase in 2048.

Inclusive access

Benefit framework measure	Units	Current (2023)				Future (2048)				%Change			
10.2.1 People – mode share	Percentage by mode (Census (2023) journey to work and education)	Car: 77.8% PT: 11.3% Cycle: 1.3% Peds: 9.6%				Car: 66.7% PT: 22.8% Cycle: 1.3% Peds: 9.2%				Car: -11.1% PT: +11.5% Cycle: 0% Peds: -0.4%			
10.3.1 Access to key social destinations (all modes)	Number of jobs (x1000) accessible by mode in AM peak (car 40 min, PT 45 min, cycle 45 min) and distance from city centre (km)		0–5	5–10	10+km		0–5	5–10	10+km		0–5	5–10	10+km
		Car:	717	537	455	Car:	900	671	583	Car:	26%	25%	28%
		PT:	314	177	125	PT:	389	224	151	PT:	24%	27%	21%
		Cycle:	356	281	216	Cycle:	452	355	266	Cycle:	27%	27%	23%

Insights

- If there is no significant investment (beyond that already committed), the proportion of journeys to work and education by car are projected to decrease by 2048 and the proportion of jobs more than 5km from central Auckland accessible by public transport and cycling is projected to remain similar in 2048.
- The availability of public transport services and active mode infrastructure can reduce car dependence, which can be a barrier to access for those who are on low incomes or unable to drive. Journeys to work and education in Auckland by all modes are 34 percent of the national total and this proportion is the largest of all regions.
- Journeys by car in Auckland are 2 percent lower than the national rate and this proportion is the fourth-lowest in the country of all regions.
- Public transport use in Auckland is 4 percent higher than the national rate and this proportion is the second-highest in the country of all regions.
- The proportion of people cycling in Auckland is less than half the national rate and the second-lowest in the country of all regions.
- The proportion of people walking to work or education in Auckland is lower than the national rate and in the middle of the range of all regions.
- If there is no significant investment (beyond that already committed), journeys to work and education by car are projected to decrease in Auckland by 11 percent in 2048, with public transport journeys increasing by a similar proportion. This projected level of mode shift is higher than Canterbury and much higher than Greater Wellington.

- The accessibility of jobs by modes other than car increases people's ability to work. There are significantly more jobs accessible by car than other modes in Auckland.
- Within 5km of the central city, accessibility by car is more than double that for both public transport and cycling. For locations further out, the difference is even greater. If there is no significant investment (beyond that already committed), the proportions of jobs accessible by each mode are projected to remain similar in 2048.
- A dispersed urban form increases the demand for travel to work, in terms of distance travelled and dependence on cars as there are few direct public transport options in locations distant from the city centre with more affordable housing. The lowest income households spend a greater proportion of their incomes on transport.[11] These factors combine to result in transport poverty (where people lack adequate access to affordable and reliable transport, hindering their ability to participate in essential activities like work).

Interdependencies between outcomes

- Auckland's largest proportion of the national total of DSI, GHG emissions and journeys to work mean that addressing the transport outcomes in this region will make the most significant contribution to the country as a whole. Addressing the current and future challenges for one transport outcome can have negative impacts on others. On the other hand, it is possible to take an approach to each outcome that makes a positive impact on the others.
- For example, encouraging a compact urban form and facilitating mode shift from light vehicles to public transport in the Auckland region could: reduce exposure to safety risk (see healthy and safe people), mitigate the long-term impacts of climate change (see resilience and security), improve the efficient movement of people and goods through urban areas and address congestion (see economic prosperity), reduce emissions (see environmental sustainability) and improve transport poverty (see inclusive access).
- Shifting to active modes, with safe infrastructure for walking and cycling to reduce conflict with light and heavy goods vehicles, could add to these with health benefits.

[11] Te Manatū Waka Ministry of Transport (2022). *The distributional impacts of transport-related carbon policy*. https://www.transport.govt.nz/assets/Uploads/The-Distributional-Impacts-of-Transport-final-report-005.pdf

Current and future challenges

National context

New Zealand's transport networks are extensive and vital for the country's connectivity and economic prosperity. The state highway network spans about 11,750km,[12] while the local road network covers about 83,368km.[13] Additionally, the rail network consists of around 4128km of rail lines.[14]

Maintaining existing networks

Maintaining such a vast network requires significant effort. Annually, 5−10 percent of the road network (4750km to 9500km) needs resurfacing or rebuilding.[15] The network includes nearly 4200 bridges[16] on state highways and about 15,000 on local roads.[17] Urban growth and higher traffic volumes, especially of heavy vehicles, increase maintenance needs, which strains budgets. Neglecting maintenance can lead to safety risks, higher long-term costs, and disrupted connectivity.[18]

Looking ahead, future challenges are expected to intensify. Climate change is likely to increase the frequency and severity of extreme weather events, such as flooding and heatwaves, which can damage infrastructure and accelerate wear and tear. Technological advancements, such as the rise of electric and autonomous vehicles, may require new types of infrastructure and maintenance protocols. Additionally, population growth and urban sprawl will create pressure to further expand the network, which will lead to increasing the scale and complexity of maintenance operations.

Access to opportunities and enabling the efficient movement of freight around the country

The transport system underpins economic and social wellbeing, ensuring access to jobs, education, healthcare, and efficient freight movement. Remote and rural areas face significant access challenges, especially during adverse weather. These challenges include a lack of alternatives to private vehicle trips as public transport services are not a viable alternative because of coverage and frequency. In addition, there is a lack of redundancy in parts of the land transport system – some places rely on one or 2 critical lifelines to stay connected.

Looking ahead, existing access challenges in remote and rural areas will be exacerbated by the impacts of climate change and demographic change. The population is expected to remain static or decline in smaller, rural, and remote districts. In some areas, people aged over 65 are expected to make up more than 35 percent of the population. The affordability of local government rates increases will be an issue in these areas. Network resilience will be further challenged as damage caused by climate change becomes more frequent, outages last longer and repair costs increase. Rural and coastal communities may become increasingly isolated and have difficulty accessing essential services – this may particularly impact Māori.

Freight is a key part of economic activity and is fundamental to making places great to live (liveability).[19] The efficient movement of freight is essential for economic productivity. Current freight

[12] NZTA (n.d.). State highway frequently asked questions. https://www.nzta.govt.nz/roads-and-rail/research-and-data/state-highway-frequently-asked-questions/

[13] Ministry of Transport (n.d.). Statistics and insights. https://www.transport.govt.nz/statistics-and-insights

[14] Stats NZ (n.d.). Transport. https://www.stats.govt.nz/topics/transport

[15] NZTA (n.d.). Road management and maintenance. https://nzta.govt.nz/roads-and-rail/management-and-maintenance/

[16] NZTA (n.d.). Bridges and structures. https://www.nzta.govt.nz/roads-and-rail/bridges-and-structures/

[17] Figure.NZ (n.d.). Number of bridges on local roads in New Zealand. https://figure.nz/chart/nHM7UwJuYIrWnLdT

[18] Government of New Zealand (n.d.). Government Policy Statement on land transport 2024–34. https://www.transport.govt.nz/assets/Uploads/Government-Policy-Statement-on-land-transport-2024-FINAL.pdf

[19] Auckland Transport (2020). Auckland freight plan. https://at.govt.nz/media/1983982/auckland-freight-plan.pdf

inefficiencies such as delays, detours and highly variable travel times can increase costs by up to 20 percent.[20]

Looking ahead, total freight volume is expected to increase by 39 percent by 2053.[21] The location of freight origin and destination may change. A growing population in the largest urban areas means more goods will need to be moved to these locations, and industry and population concentration is occurring in the upper North Island. Climate change is expected to change the nature and location of primary production and increase the frequency of extreme weather events, disrupting transport networks, isolating communities, and affecting freight reliability.[22] Technological shifts, including the rapid growth of e-commerce and the transition to low-emission freight vehicles, will require significant infrastructure upgrades and new logistics strategies to ensure efficiency and sustainability.[23]

Resilience to natural hazards and climate change

New Zealand faces significant natural hazard risks, including earthquakes, floods, and cyclones, worsened by climate change. The land transport system has always been exposed to natural hazard risks, with minor closures or delays through small scale events like slips and localised flooding common. However, the network is increasingly exposed to national and regional scale events such as Cyclones Hale and Gabrielle and the Kaikoura earthquakes that caused widespread and significant damage.[24] For instance, Cyclone Gabrielle alone caused damage estimated at $13.5 billion.[25]

Recovery from small events is quick, but larger events, such as Cyclone Gabrielle, cause extensive damage and long recovery times. The state highway network performs critical lifeline functions for communities, and repeated disruption to these functions impacts communities' access to the services they need.

Looking ahead, the land transport system will have to adapt to escalating impacts from natural hazards and climate change now and into the future. These impacts include sea-level rise and ongoing changes in the physical environment, as well as increasingly severe and frequent climate-related events such as storms, flooding, droughts, and wildfires.[26] The probability of an Alpine Fault earthquake occurring in the next 50 years is 75 percent, and there is a 4 out of 5 chance that it will be a magnitude 8+ event.[27] Such an event has the potential to cause severe damage and disruption across the entire South Island, with major consequences for the rest of the country.

These types of impacts will continue and will affect communities and the transport networks that connect them. As damage becomes more frequent, outages last longer and repair costs increase, rural and coastal communities may become increasingly isolated and have difficulty accessing

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[20] Ministry of Transport (2023). Aotearoa New Zealand Freight and Supply Chain Strategy. https://www.transport.govt.nz/assets/Uploads/MOT4806_Aotearoa-Freight-and-Supply-Chain-Strategy-p09-v03.pdf

[21] Ministry of Transport (2019). *New Zealand transport outlook – Freight model*. https://www.transport.govt.nz/assets/Uploads/Data/Transport-outlook-updated/Freight-Model-Version-2-Documentation-20190423.pdf

[22] KPMG & The Aotearoa Circle (2024). *Transport sector climate change scenarios: Report on big climate risks to New Zealand's transport sector*. https://kpmg.com/nz/en/home/media/press-releases/2024/06/report-on-big-climate-risks-to-new-zealand-s-transport-sector.html

[23] Ministry of Transport (n.d.). Climate change — emissions work programme. https://www.transport.govt.nz/area-of-interest/environment-and-climate-change/climate-change

[24] Byett, A, et al (2019). *Climate change adaptation within New Zealand's transport system*. Motu Economic and Public Policy Research. https://www.motu.nz/our-research/environment-and-resources/climate-change-impacts/climate-change-adaptation-within-new-zealands-transport-system

[25] NIWA (2024). Cyclone Gabrielle was intensified by human-induced global warming. https://niwa.co.nz/news/cyclone-gabrielle-was-intensified-human-induced-global-warming

[26] NZTA (2022). *Tiro Rangi: our climate adaptation plan 2022–2024*. https://www.nzta.govt.nz/assets/resources/tiro-rangi-our-climate-adaptation-plan-2022-2024/tiro-rangi-our-climate-adaptation-plan-20222024.pdf

[27] AF8 (2022). *AF8 Programme Strategy 2022–25*. https://af8.org.nz/media/fpxjy3uu/af8_programme-strategy-2022-25-jul22.pdf

essential services, and this may especially impact Māori. In urban areas, the impacts of climate change on multimodal networks can be complex, widespread and cascade across the land transport system. Interregional connections will also be disrupted.

Congestion and capacity constraints, especially in large and growing cities

New Zealand's road network is a vital part of the country's infrastructure, with significant portions now facing congestion and capacity constraints. This is particularly evident in Auckland, where congestion costs are estimated to range between $1.3 billion and $2.6 billion annually.[28]

The demand for transport in New Zealand has grown rapidly, meaning that in some places the demand exceeds the ability of the transport system to cater for it. This has resulted in frequent congestion across parts of the road and public transport networks, particularly on motorways in Auckland, Tauranga, Wellington, Queenstown and Christchurch. Previously confined to 'rush hour' periods, congestion has steadily lengthened and worsened over time.[29] Congestion on the local road network is a growing concern, especially in urban areas. Rail network capacity restraints currently affect both public transport services in Auckland and Wellington, and freight movements across the country. Population growth, dispersed land use patterns, and increasing vehicle ownership will continue to contribute to this issue into the future.

Looking ahead, a growing population in the largest urban areas means more people who need to get to work, education, business and entertainment. New Zealand's population is projected to reach over 6 million by the early 2030s, with much of this growth concentrated in urban areas.[30] This, combined with dispersed land use and rising vehicle ownership – currently at nearly 0.9 vehicles per person – will further strain transport corridors and worsen congestion.[31] Without significant investment, it is likely congestion will worsen, network productivity will fall, and emissions will rise. Future challenges include adapting for electric and autonomous vehicles, building resilience to climate impacts and reducing emissions through urban planning, mode shift and fleet carbonisation.

Reducing the level of harm to people and the environment

New Zealand's land transport system faces significant safety and environment challenges. In 2024, there were 292 road fatalities, placing New Zealand 7th highest in road deaths per capita among 35 OECD countries.[32] Contributing factors include adverse weather, unsafe driving behaviour, and poor road conditions. Rural road fatalities are disproportionately high, accounting for 60 percent of all road deaths, despite rural roads making up only 40 percent of the network.[33]

Air pollution from fossil fuels and particulate matter continues to impact public health, contributing to an estimated 2247 deaths in 2016.[34] While low-emission vehicles are essential for reducing transport-related emissions, they are not a complete solution. A broader systems approach – encompassing

[28] NZTA (2013). *The costs of congestion reappraised*. https://www.nzta.govt.nz/assets/resources/research/reports/489/docs/489.pdf

[29] NZTA (2024). *Significant land transport challenges facing New Zealand*. https://www.nzta.govt.nz/assets/planning-and-investment/nltp/2024/docs/significant-challenges-nltp-2024-27.pdf

[30] NZTA (n.d.). *Significant land transport challenges facing New Zealand*. https://www.nzta.govt.nz/assets/planning-and-investment/nltp/2024/docs/significant-challenges-nltp-2024-27.pdf

[31] NZTA (n.d.). *Significant land transport challenges facing New Zealand*. https://www.nzta.govt.nz/assets/planning-and-investment/nltp/2024/docs/significant-challenges-nltp-2024-27.pdf

[32] International Transport Forum (2024). Road safety country profile – New Zealand 2023. https://www.itf-oecd.org/sites/default/files/new-zealand-road-safety.pdf

[33] Stats NZ (n.d.). Transport. https://www.stats.govt.nz/topics/transport

[34] Emission: Impossible Ltd and the HAPINZ 3.0 team (2022) Key findings from HAPINZ. https://ehinz.ac.nz/projects/hapinz3/key-findings-from-hapinz/

clean energy, sustainable manufacturing, and urban planning – is needed to fully address environmental harm.[35]

The impact on the environment, including climate, on and from the transport network and its use is another pressing issue. The extensive road system crosses many sensitive ecosystems, habitats, and waterways, leading to habitat fragmentation, noise pollution, artificial light, and stormwater discharges.

Looking ahead, climate change is expected to intensify these impacts because of more frequent extreme weather events, increased infrastructure stress, and greater disruption to both human and natural systems. Future challenges will also include managing the environmental footprint of new transport technologies and ensuring that safety improvements keep pace with population growth and the needs of changing demographics (such as people with children), travel patterns (increased travel by older people) and vehicle types, while also taking advantage of new technologies (for example cooperative intelligent transport systems and alternatives to bitumen) to improve safety and environmental outcomes.

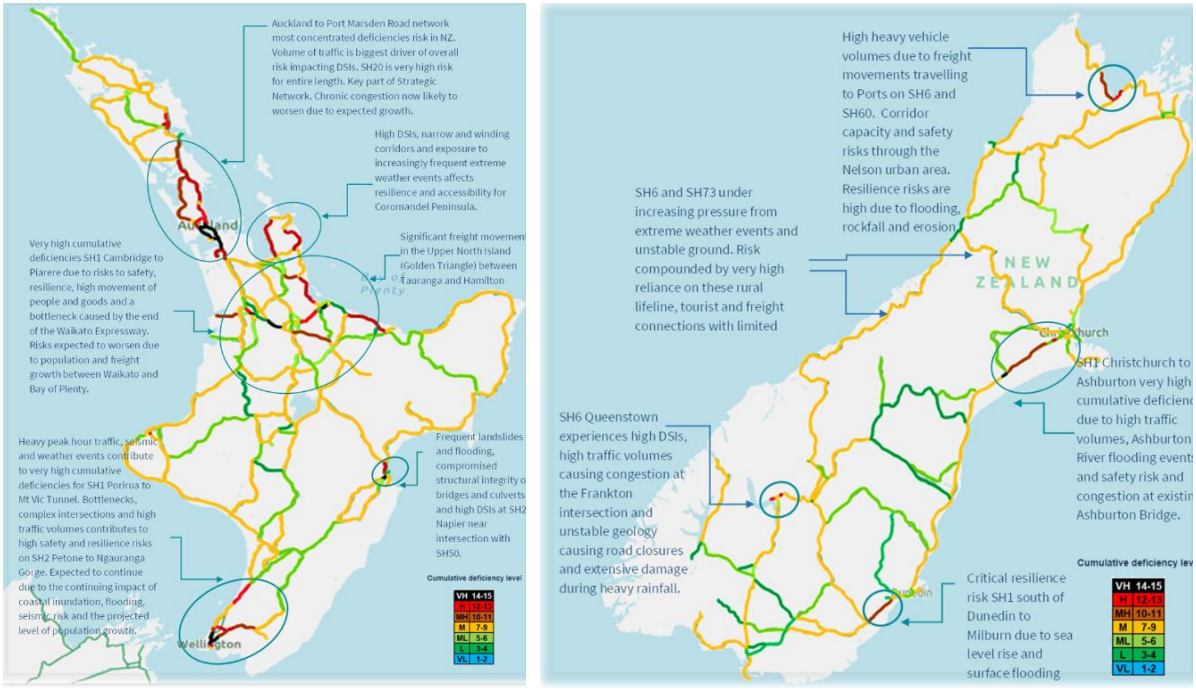


Figure 2: Cumulative (resilience, reliability and safety) deficiencies across the state highway network (source: NZTA data[36])

[35] Auckland Council (2022). *Transport emissions reduction pathway*. https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/Documents/transport-emissions-reduction-pathway.pdf

[36] Analysis of NZTA National Resilience Assessment Tool (NRAT), NZTA average annual daily traffic and NZTA cumulative risk using DSI data from 2019 to 2023.

Regional context

Auckland's transport network plays a major role in the upper North Island. This area is vital to New Zealand's social and economic success. It's home to over half of New Zealand's population and generates more than 50 percent of the national GDP. Nearly 75 percent of the country's population growth over the next 20 years is expected in the upper North Island.

Figure 3: Map of current strategic network in the upper North Island (source: *Arataki*)

The Auckland transport network connects to:

- south: SH1 Waikato Expressway and SH2 to Tauranga; North Island Main Trunk railway line (passenger and freight) to Hamilton and Wellington, with freight branches to Tauranga and Taranaki
- north: SH1 Northern Corridor to Port Marsden and Whangārei; North Auckland Line rail link (passenger south of Swanson and freight to Whangārei).

These connections provide critical links to growing metropolitan areas, freight hubs, ports, employment areas and satellite towns.

To achieve a land transport network that is safe, efficient and effective for Auckland, it's important to understand it in combination with the needs and lives of the region's people and the unique natural and built environment.

This section discusses the key current and future challenges of Auckland's transport network, using evidence and insights from NZTA's *Arataki* and Auckland Transport's planning tools and documents.

Key regional movement patterns with deficiencies across multiple outcomes

Key areas of deficiency include parts of the motorway network and key arterials across the metropolitan area that impact regional commuting flows and intra- and inter-regional freight flows. Movement deficiencies stem from high vehicle volumes causing congestion, which affects journey

reliability, causes significant safety risks, and flooding in locations that are low-lying and close to the coast. Non-separated and unconstructed sections of the public transport network across the urban area contribute to these deficient movement patterns.[37]

Current conflicts between passenger and freight services in the region limit capacity increases on the rail network and significant freight corridors and constrains access to key regional freight centres. Inter-regional rail connectivity needs to improve to ease heavy truck growth on SH1 on the Auckland to Hamilton corridor and to support Northport's growing role in the supply chain.

With minimal intervention, the effects of climate change and population growth will make these deficiencies worse and people's experience of the network will decline.

Complex transport and land-use interaction in urban hubs

Key hubs around the city where people work, study and live coincide with major transport interchanges where multiple modes and regional and local networks interact with each other. Safety deficiencies are highest in the city centre, where there is conflict between vehicles and people and connecting corridors have higher deaths and serious injuries (DSI) every year compared to other similar road types.[38] Multi-modal deficiencies are high on emerging rapid transit networks and many main roads across the isthmus, especially the historically developed corridors such as Great South Road and Mount Albert Road.[39]

With minimal intervention, safety deficiencies in the city centre and connecting corridors, where conflicts between vehicles and pedestrians are highest, will likely lead to an increase in accidents and injuries. Multi-modal deficiencies will increase, resulting in increased congestion and reduced accessibility, negatively impacting the quality of life for residents in and around these hubs and the overall economic productivity of the city.

Disconnection and safety challenges across the region's walking and cycling networks

The majority of the cycle network is characterised as deficient because of the universal lack of safe and appropriate cycle facilities. Disconnection and safety challenges for nonprotected cycleways and the walking network is preventing the significant shift to active modes required to support emissions and mode-shift goals.[40]

With minimal intervention, active mode use will continue to decline as the safety risk makes the mode choice unacceptable and unappealing.

Unmet need in areas of high levels of deprivation magnify transport inequities

Transport inequity contributes to the complexity of deprivation in South Auckland and West Auckland. People in these communities are disadvantaged because:

- they are not able to easily use active modes to local destinations because they are far away or there is poor infrastructure provision
- car reliance is high for day-to-day tasks, contributing to household costs
- there is poor access to regional opportunity across most modes
- they are impacted the most by the movement of others through their communities.

[37] Auckland Transport (2023). Future Connect: Auckland Transport's Network Plan. https://at.govt.nz/media/c0vo5241/auckland-transport-future-connect-strategic-networks-report.pdf

[38] Auckland Transport (2023). *Future Connect* Methodology *Report*. https://at.govt.nz/media/vykldgu0/fc_methodology_report_2023.pdf

[39] Auckland Transport (2023). Future Connect: Auckland Transport's Network Plan. https://at.govt.nz/media/c0vo5241/auckland-transport-future-connect-strategic-networks-report.pdf

[40] Auckland Transport (2023). Future Connect: Auckland Transport's Network Plan. https://at.govt.nz/media/c0vo5241/auckland-transport-future-connect-strategic-networks-report.pdf

This challenge will worsen without significant investment focus due to high forecast growth and greenfield development in these areas (plus Silverdale in the northeast).[41]

Significant forecast growth requiring significant transport investment

With the region's population expected to increase by approximately 38 percent over the next 30 years,[42] the demand for efficient and reliable transport will surge. Ongoing housing development to the northwest, north and south of the region will put pressure on the transport network in these locations, with high demand on the motorway network and arterial routes in these areas. This growth necessitates significant investment in expanding and upgrading the existing transport infrastructure.

State highway hotspots

The following data sets have been overlaid to identify 'hotspots' on the state highway network:

- **Reliability:** Measured by average annual daily traffic (AADT), which calculates the total number of vehicles, including heavy vehicles, passing through traffic count sites. High to medium reliability issues are identified when highways frequently operate at or near their capacity of 20,000 vehicles per day (per lane).
- **Resilience:** Assessed by examining the risk of disruptions across the state highway network over the past 12 years.
- **Safety:** Derived from the NZTA Collective Risk Map, which uses historical crash data from 2019 to 2023 to identify areas with higher accident risks.

Cumulative deficiencies represent an overlay of 3 layers of service deficiencies, creating a comprehensive view of where multiple issues impact roads on the strategic road network. They're intended to support further conversations and more detailed analysis regarding the scale of issues and delivery of priority outcomes.

[41] Auckland Transport (2023). *Future Connect Methodology Report*. https://at.govt.nz/media/vykldgu0/fc_methodology_report_2023.pdf

[42] Statistics New Zealand (2021). Subnational population projections: 2018(base)–2048. https://www.stats.govt.nz/information-releases/subnational-population-projections-2018base2048/

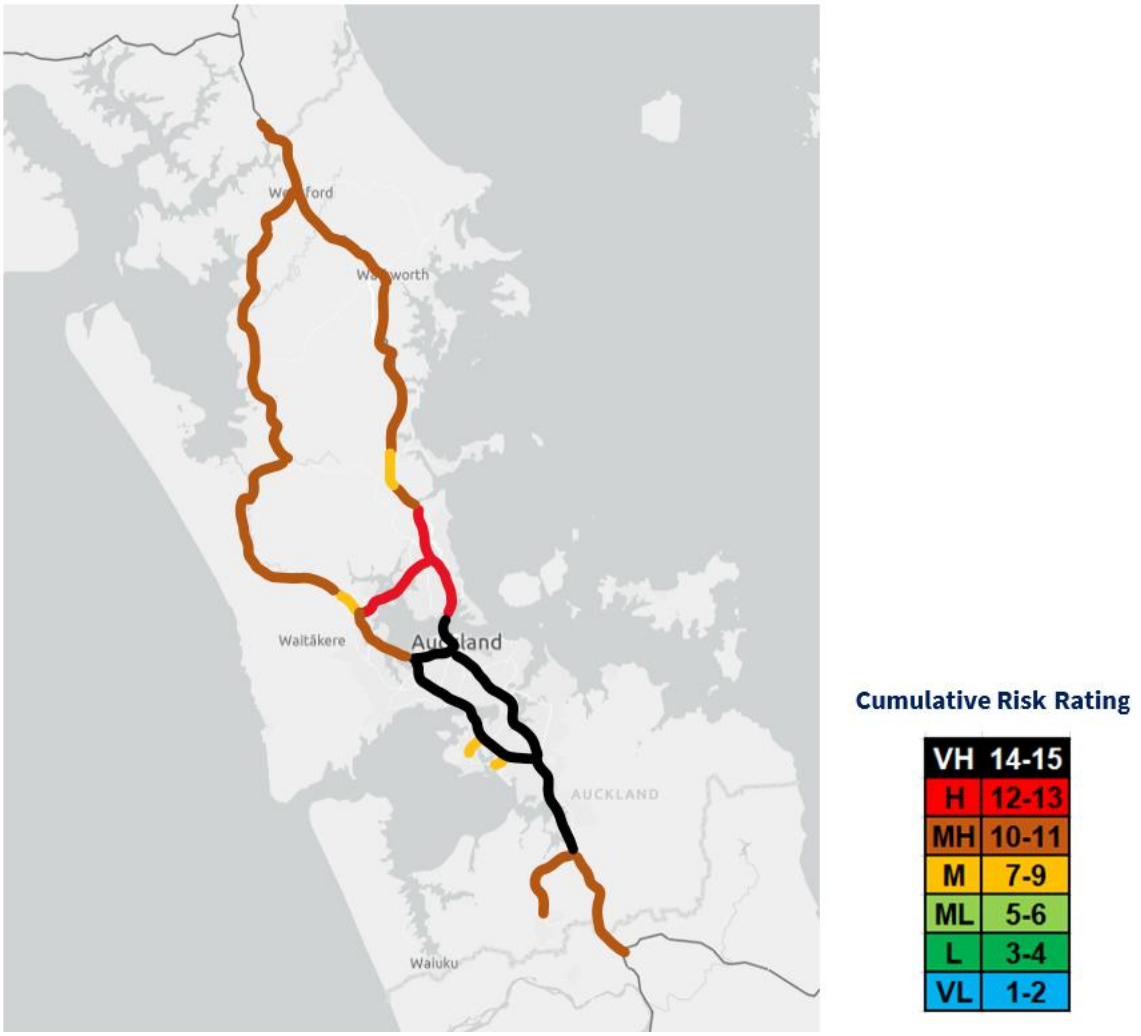


Figure 4 Cumulative deficiencies across the state highway network in the Auckland region (source: NZTA data[43])

The Auckland region currently has the highest concentration of medium- to very high-risk cumulative deficiencies compared to other regions. These deficiencies are primarily due to high vehicle volumes affecting journey reliability, significant collective safety risks, and flooding at key locations. Additionally, ongoing housing development to the north and south of the region, particularly along SH1, is expected to increase pressure on this nationally strategic route.

SH1 and SH20

- **Between Drury and Northcote Point (SH1)**: the busiest stretch of road in the country is on this part of the corridor from Northcote Point to Ellerslie, operating at or over capacity during key periods of the day, resulting in congestion and extended journey times. There are resilience challenges on parts of this network related to flooding. The safety risk is high along the whole motorway corridor driven by the volume of light and heavy vehicles.
- **Manukau to Waterview (SH20)**: capacity challenges on this critical element of the motorway network.
- **Drury to Bombay (SH1):** capacity challenges due to strong population growth and urban development

[43] Analysis of NZTA National Resilience Assessment Tool (NRAT), NZTA Average Annual Daily Traffic and NZTA Cumulative Risk using DSI data from 2019 to 2023.

- **North of Warkworth (SH1)**: a critical freight and passenger route with resilience issues, particularly Dome Valley, which is often at risk of slips and rockfalls.

SH16

There are resilience issues on the corridor north of Kumeū up to Wellsford, including rapid flooding on the SH16 extension, although it experiences a much lower volume of light and heavy vehicles than SH1. Congestion occurs from the SH18 intersection to the SH1 intersection driven by the volume of light and heavy vehicles using the network due to strong population growth in the northwest.

Strategic network

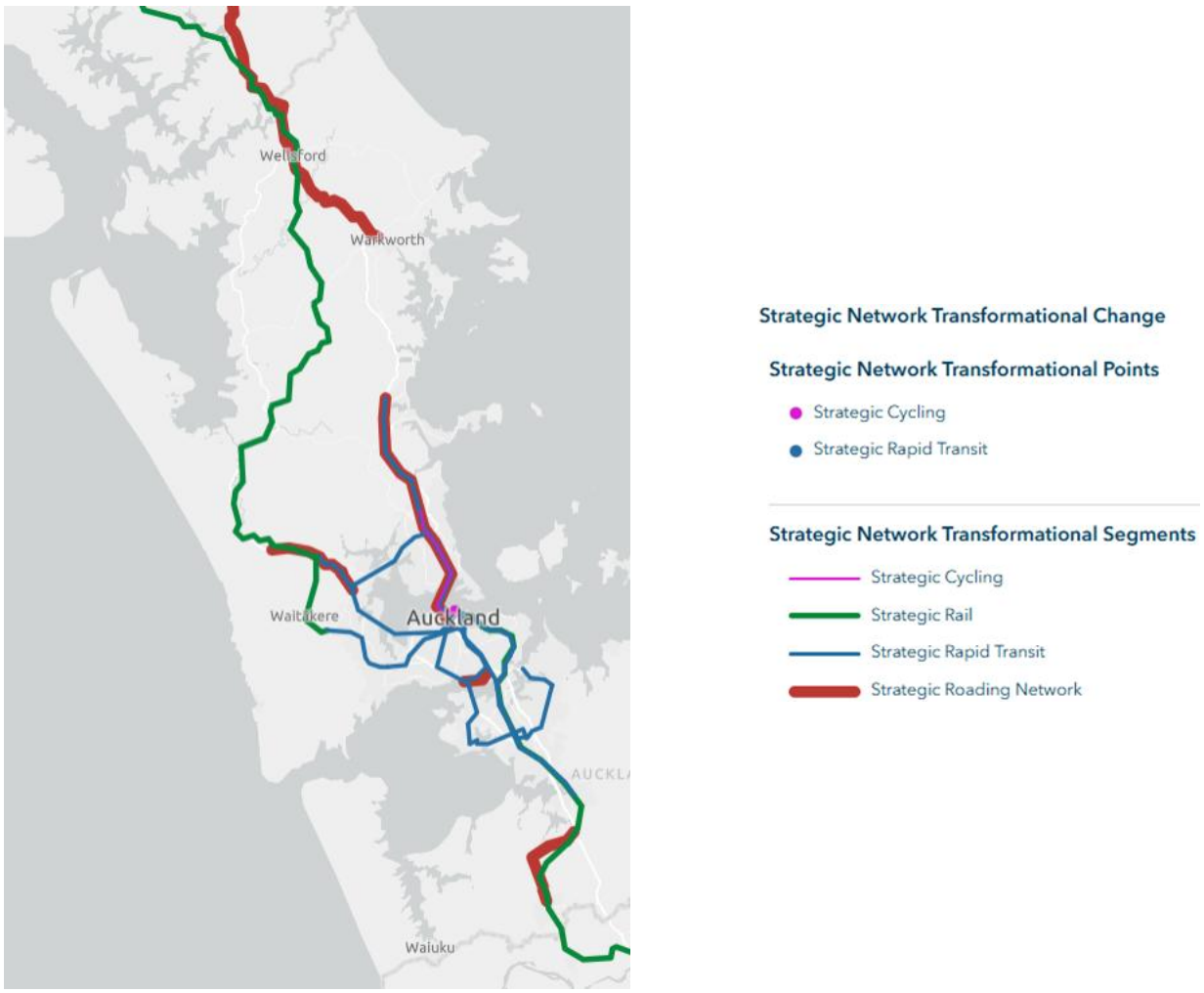


Figure 5: Strategic network and transformational change required (source: *Arataki*)

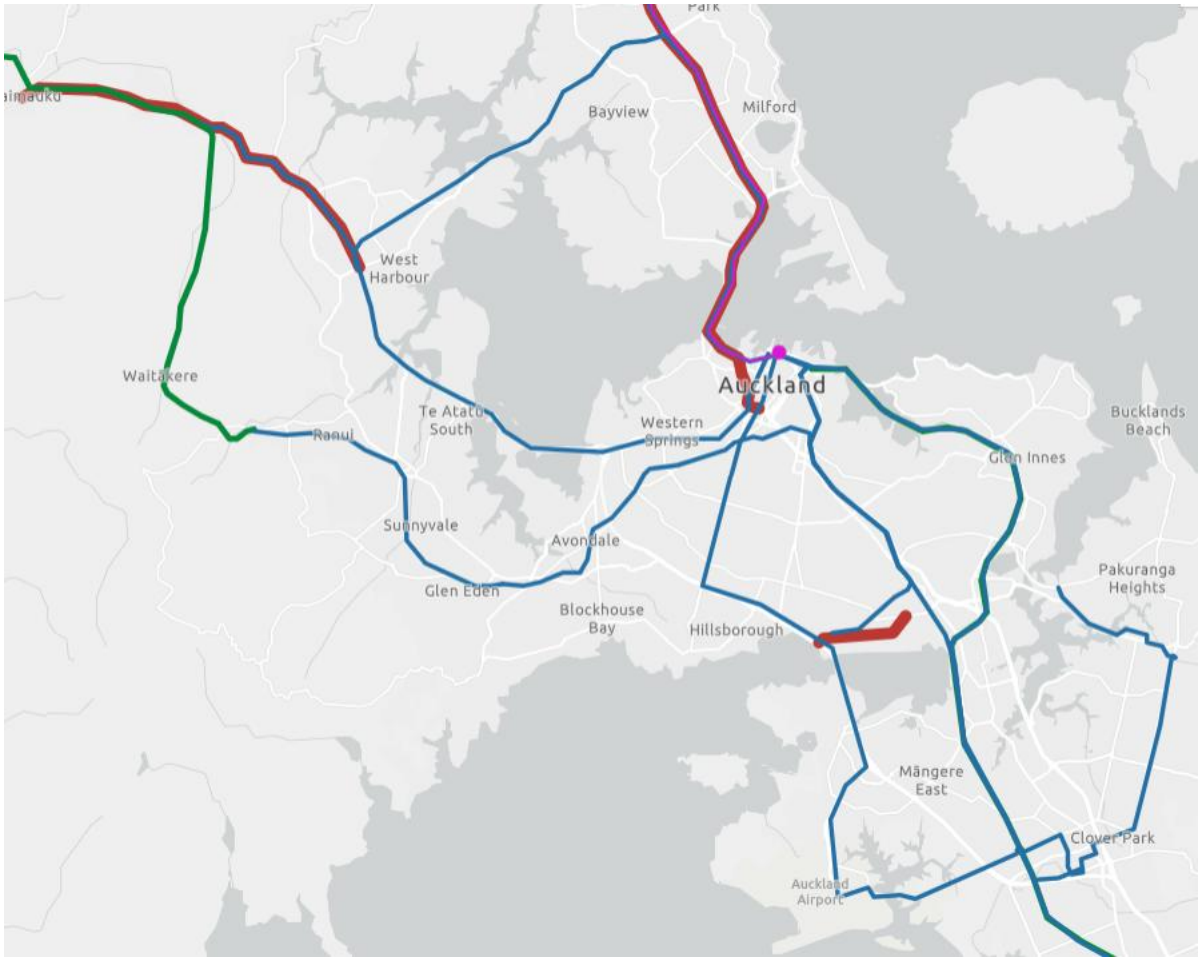


Figure 6: Strategic network and transformational change required – Auckland isthmus (source: *Arataki*)

The region includes a concentration of national strategic network, including SH1 Whangārei to lower North Island, and the Auckland motorway network: southwest SH20 including links to Auckland Airport, SH16 Ports of Auckland to Westgate and the northwestern SH18 Westgate to Albany. Additionally, SH16 Westgate to Kumeū/Huapai, SH22 Drury to Pukekohe and Neilson Street, Onehunga, are regional strategic.

In Auckland, the strategic rail network and rapid transit networks consist of North Island Main Trunk Line (NIMT), East Coast Main Line (ECML), Auckland Metro Rail Network, Northern and Eastern busways

Because of its size, scale and substantial forecasted future growth, Auckland has a significant role to play in achieving transformational change for New Zealand's land transport system and achieving national transport outcomes is highly dependent on what happens in the country's biggest city.

The key challenges across the strategic network include:

- Current conflicts between passenger and freight services limit capacity increases on the rail network and significant freight corridors such as Neilson Street. This corridor is part of the regionally strategic freight network and well used by heavy commercial vehicles (HCVs) and provides access to many industrial and commercial premises. Challenges include accessibility for local businesses, with conflict between through and local access traffic, high heavy vehicle flow, unreliable and inconsistent journey times and connectivity, severance and amenity issues for pedestrians and cyclists.
- High safety risks, low resilience and forecasted congestion to the north from the Auckland Harbour Bridge to the Brynderwyn Hills.

- Significant forecast growth and public transport demand requires increased capacity on Western, Northwestern and Southern motorways.
- Rapid transit is needed for SH18, SH16, and Auckland cross-isthmus to support growth and reduce car dependency. Eastern Busway and Airport to Botany rapid transit will improve travel choices and support growth.
- Safety risks along the corridor from Drury to Pukekohe due to significant growth, requiring urbanisation of the road to support the increased population and traffic flow.
- Improvement needed for inter-regional connectivity and to ease heavy truck growth on SH1, particularly on the Auckland to Hamilton rail corridor and Northport's growing role in the supply chain.
- A disconnected cycle and walking network and safety challenges for non-protected parts is preventing the significant shift to active modes required to support emissions and mode-shift goals.

Regional deficiencies

Auckland Transport's Future Connect has identified deficiencies across the regional transport network. The deficiencies highlight corridors where customers or the environment experiences outcomes that fall short of strategic objectives.

The analysis looks at each transport mode as well as 2 intermodal problems affecting all networks: safety and the environment. A third intermodal problem area, transport equity, looks at transport outcomes experienced by different communities.

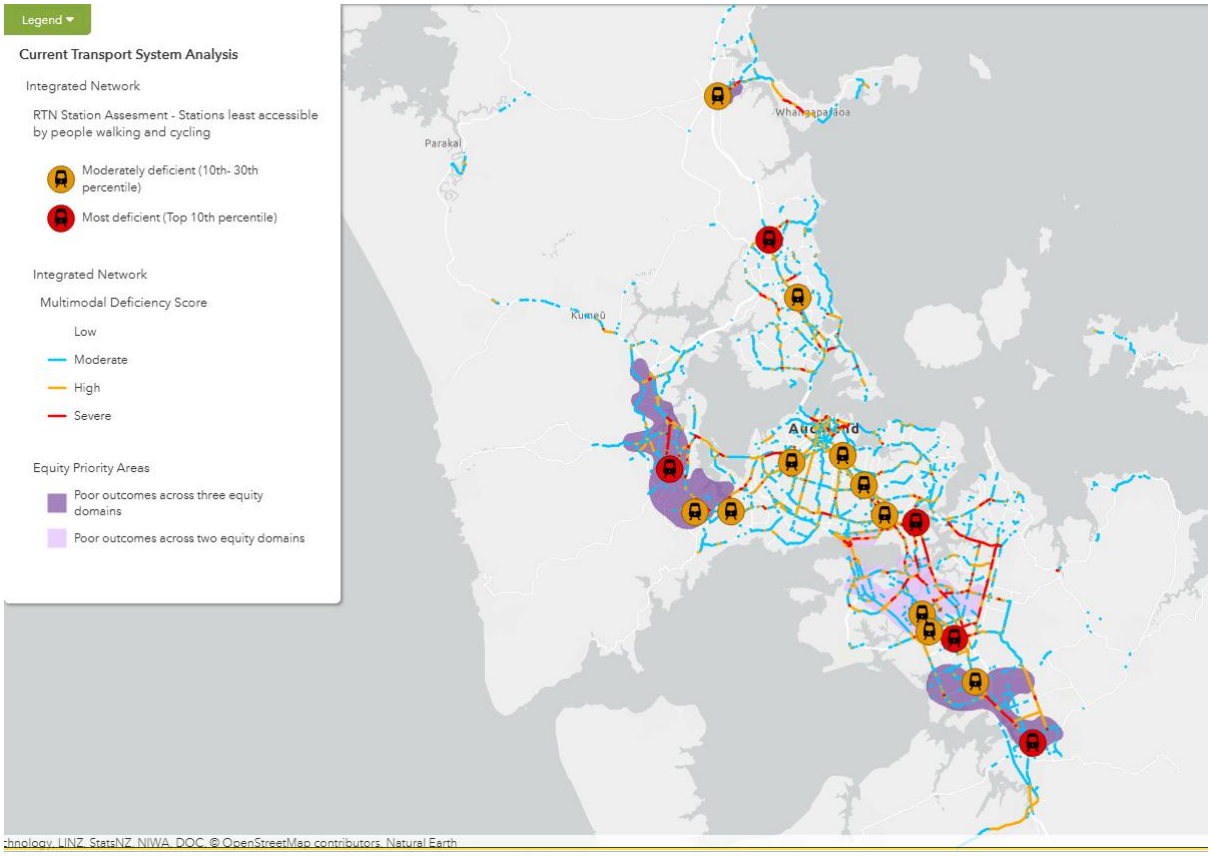


Figure 7 Auckland regional network deficiencies (source: Future Connect)

Key regional transport deficiencies:

- Public transport deficiencies include sections of the Northern Busway that are not physically separated from general traffic, the Eastern Line rail line and unconstructed sections of the Eastern Busway and Auckland Airport to Botany.
- Deficiency across the majority of the cycle network because of the universal lack of safe and appropriate cycle facilities.
- High to moderate walking deficiencies scattered across the wider Auckland region.
- Constrained access to key freight centres such as the Port of Auckland, Auckland Airport, North Harbour, and the intermodal freight hubs at Southdown and Wiri.
- Highest traffic deficiencies are on the motorway network, and key arterials across the metro area.
- Safety deficiencies are highest in the city centre, where there is conflict between vehicles and people. Connecting corridors have higher DSI per annum compared to other similar road types.
- Environmental deficiencies impact parts of the network close to the coast, such as the city centre waterfront, Tamaki Drive and around the Mangere Inlet, on motorways to the north and south and roads that intersect with floodplains.
- Emerging rapid transit networks have high multi-modal deficiencies. Main roads in the city with multi-modal deficiencies include Dominion Road, Great North Road, New North Road, Manukau Road, Mill Road and Mount Albert Road.
- Transport inequity: South and West Auckland face significant deprivation, with poor infrastructure limiting active transport options and high car reliance for daily tasks.

Addressing these challenges requires better infrastructure utilisation, targeted investments, and strategic planning to ensure these corridors remain safe and resilient.

Some of the planned and committed initiatives include:

- **Waitematā Harbour Connections:** an additional crossing to ease pressure and resilience risks on the current Auckland Harbour Bridge.[44]
- **Te Ara Hauāuru – Northwest Busway**: a dedicated busway alongside SH16 between Brigham Creek and the city centre, with 7 new bus stations and a park and ride at Brigham Creek. The project aims to improve access for the growing population in the northwest, increasing transport choice, freeing up space on the motorway and boosting economic growth.[45]
- **Auckland Network Optimisation Programme**: a 10-year programme of around 215 individual projects and activities, which together as a package will improve the network's productivity, sustainability, agility and reliability. It's made up of both physical and technological projects such as converting existing lanes to bus or transit lanes, closing cycle and walkway gaps, trialling improvements to intersection operations and additional bus priority at traffic signals.[46]
- **Roads of National Significance**: including SH1 Warkworth to Wellsford, Mill Road, East-West Link, North-West Alternative Highway.

[44] NZTA (2025).Waitematā Harbour Connections. https://nzta.govt.nz/projects/waitemata-harbour-connections/

[45] NZTA (2025). Te Ara Hauāuru – Northwest Busway. https://www.nzta.govt.nz/projects/northwest-busway/

[46] NZTA (2025). Auckland Network Optimisation Programme. https://www.nzta.govt.nz/projects/auckland-network-optimisation-programme/

Focusing effort

Note: this section has a high-level strategic focus; we'll develop more specificity in future iterations of the evidence pack.

Based on the preceding sections, and consideration of regional investment priorities identified in the RLTP, Auckland Transport Future Connect and Auckland Council Strategic Plan, we've identified the following areas where it would be beneficial to focus investment. This section provides an overview, and further detail can be found in Appendix D.

Longer-term investment focus

The appropriate level of performance according to Future Connect's assessment of Auckland's regional network means focusing effort in the long-term on the following:

Resilience

- Investigate options for critical transport corridors away from high-risk areas in the face of natural hazards such as relocation and extension of routes − this includes working with communities to identify plans for when to defend, accommodate, or retreat.
- Investigate the diversification of transportation networks by developing alternative modes.

Transport connectivity

- Continue to improve regional movement patterns between urban centres/key employment centres and rural areas/areas of poor access.
- Create connected walking and cycling networks in urban areas – this includes the completion of cycling networks in urban areas, and improved active-mode facilities in smaller towns.
- Continue to make changes to the allocation of space on existing roads and streets to enable and encourage mode shift to public transport, walking, and cycling.
- Deliver an integrated public transport network.

Economic and urban development

- Continue to align transport investments with urban development plans − supporting, enabling, and encouraging growth and development in areas that have good travel choices and shorter trip lengths.
- Explore opportunities to move to a more multi-modal freight system with greater use of rail and coastal shipping.
- Better understand the impact of future socio-economic transformation on travel patterns and freight volumes.
- Focus on improving travel in and around key destinations with complex transport interconnections, especially interregional connections, town centres and key freight and industrial hubs.

Safety and environment

- Continue to invest in safety infrastructure, education, enforcement, and that significantly reduce harm caused by the region's transport system.
- Focus improvement on local corridors that have safety deficiencies across multiple modes.
- Deliver interventions, activities, and investments needed to achieve vehicle kilometres travelled (VKT) and emissions reduction across the region.
- Continue to reduce the environmental impact of the maintenance, operations and improvement across the transport network including waste minimisation and resource efficiency.

Community and accessibility

- Work with iwi/hapū partners to improve or maintain, as appropriate, physical access to marae, papakāinga, wāhi tapu, and wāhi taonga.
- Continue to improve the design and provision of transport infrastructure and services to meet the needs of people of all ages and abilities, focusing on communities with unmet needs.
- Continue to improve access to social and economic opportunities, especially by public transport, walking, and cycling, so these low-cost, sustainable, and healthy travel options are safely used for more journeys.
- Explore opportunities to support the mobile or digital delivery of essential services.

Short-term investment focus

Projects in the shorter term typically will involve low-cost, low-risk, high-effectiveness improvements and projects that 'set the scene' to incrementally enable (or transition to) longer-term outcomes.

Steps to make progress towards transport outcomes in a more efficient and cost-effective way include:

- renewing the focus on small-scale projects
- getting more from existing infrastructure, by making the most of existing networks, services, and demand management
- reallocating existing road space, particularly for public transport and active modes
- seeking continuous improvement in network resilience through maintenance, renewals, and low-cost, low-risk investments
- influencing travel behaviour and growth patterns.

Resilience

- Investigate motorway sections with very high cumulative risk in more detail to understand the degree with which these deficiencies can be managed through targeted maintenance and renewals, incremental change, or whether a targeted intervention is required, focusing on SH1 Northcote Point to Drury, SH16 section from intersection SH20 to intersection SH1, SH20 whole corridor.

Transport connectivity

- Progress planning for rapid transit on SH18 corridor.
- Secure the rapid transit route between Auckland Airport to Botany for future implementation.
- Confirm long-term transport network for Drury to Pukekohe.
- Begin progressive implementation of service improvements and minor upgrades between Auckland Airport and Botany.
- Confirm extent of corridor, alignment and mode for cross-isthmus rapid transit.
- SH16 Northwest Busway − confirm timing for and how investments should integrate with development and the wider transport network.

Economic and urban development

- Rail programme business case (PBC) provides a view of how the rail network needs to evolve over time to meet future requirements, including maximising full benefit of the City Rail Link (CRL).
- Confirm a progressive programme of improvements for Neilson Street.
- Investigate freight-focused rail corridor Avondale to Southdown and the potential for passenger services.

Safety and environment

- Complete current tranche of rail network improvements including level crossing removals over time.

Community and accessibility

- Complete route protection work between Albany and Ōrewa and confirm programme of improvements over time
- Provide additional cycling and walking connections across the city, focusing on priority routes and locations already identified.
- Work with iwi partners to improve access to opportunities for iwi Māori, including papakāinga development and access to sites of cultural significance.
- Improve travel choice and access to social and economic opportunities, focusing on low income/low access areas.

Potential interventions

As part of the PIE programme, NZTA is developing the Intervention Catalogue (IC) tool, which compiles a wide range of empirical data relating to the implementation of transport projects and how effective they have been in achieving the intended outcomes. We'll continue to add to this over, using data from benefit realisation associated with the investment logic mapping (ILM) process.

An AI interface for supporting queries and providing relevant evidence is currently being investigated.

An example of how exploratory use of this tool might be used to match potential interventions to deficiencies to understand and compare the likely relative effectiveness is included in Appendix E.

The process seeks to avoid potential pitfalls that might occur during option formulation:

- an over-reliance on preconceived ideas
- a focus on the more obvious supply-side measures, such as infrastructure and management rather than demand-side measures such as regulation and pricing
- a general lack of awareness of the wider range of policy measures available
- lack of evidence of the performance of those measures in other contexts
- lack of a formalised or consistent approach for option generation.

The example tables included in Appendix E take the focus areas and related transport issues from the previous section of this report and maps them to some relevant interventions from the KonSULT knowledgebase.

Insights

Using IC is only intended to inform the option formulation process. It does not replace the need for judgement, but rather provides a set of empirical evidence that supports decisions (along with additional information sources).

The tables in Appendix E indicate the following:

- Most interventions related to addressing the identified Auckland deficiencies are likely to be effective in relation to cost.
- Most interventions have mostly a positive (or neutral) effect across all outcomes, much more so than negative.
- Road pricing (or time of use pricing) is extremely effective, positively affecting most outcomes while also creating net revenue.

Short-list of most effective interventions

It is intended that the information and tools provided above will assist consideration and development of projects to be included in the next RLTP and NLTP.

It provides a starting point for us to understand regional issues and investment opportunities, which can then be expanded upon through further engagement between approved organisations and NZTA to increase the likelihood of suitable projects being submitted for funding via the NLTP.

Appendix A: Auckland background

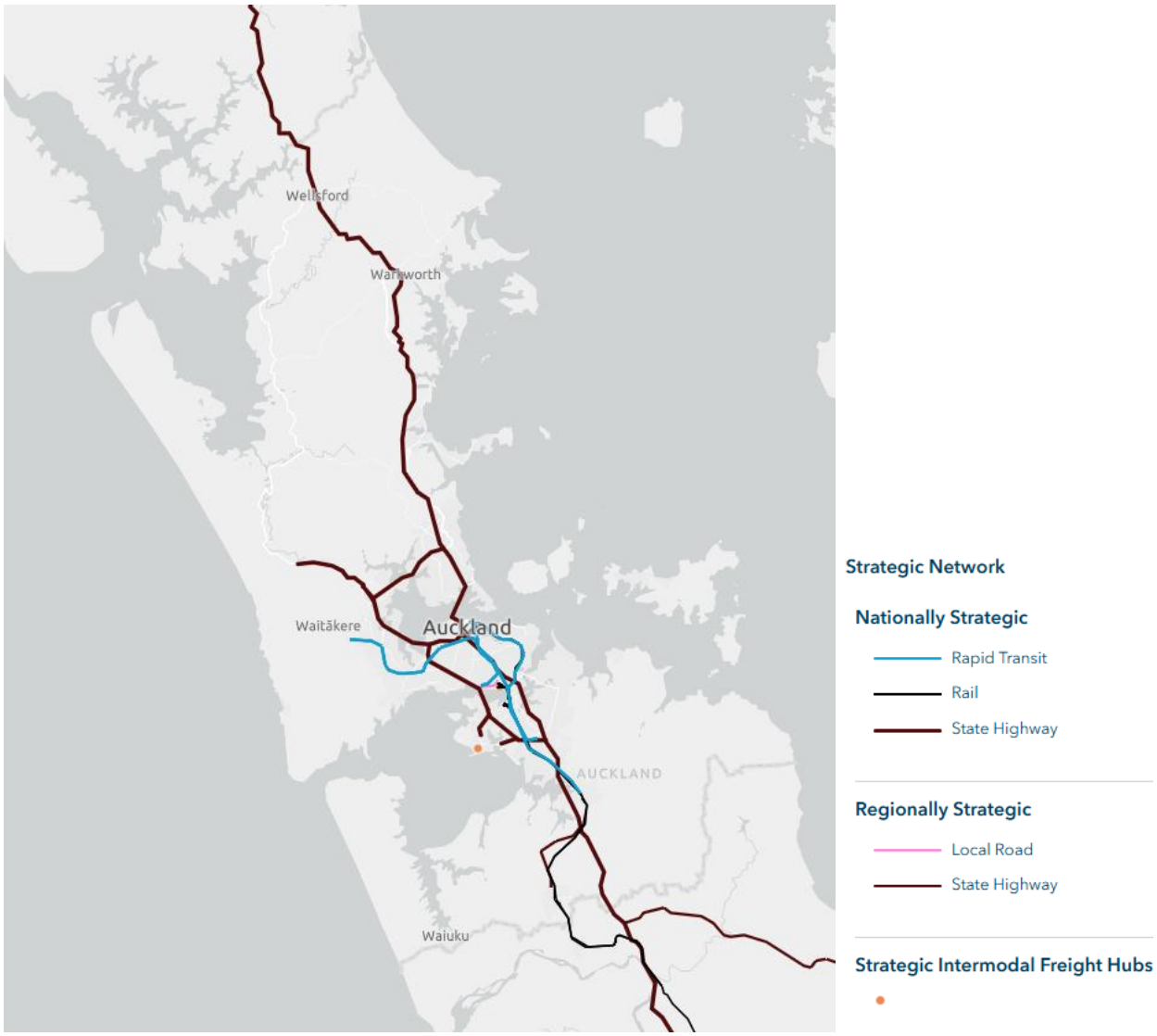
This appendix pulls together useful background information sourced from various documents, including *Arataki*, strategic plans and RLTPs.

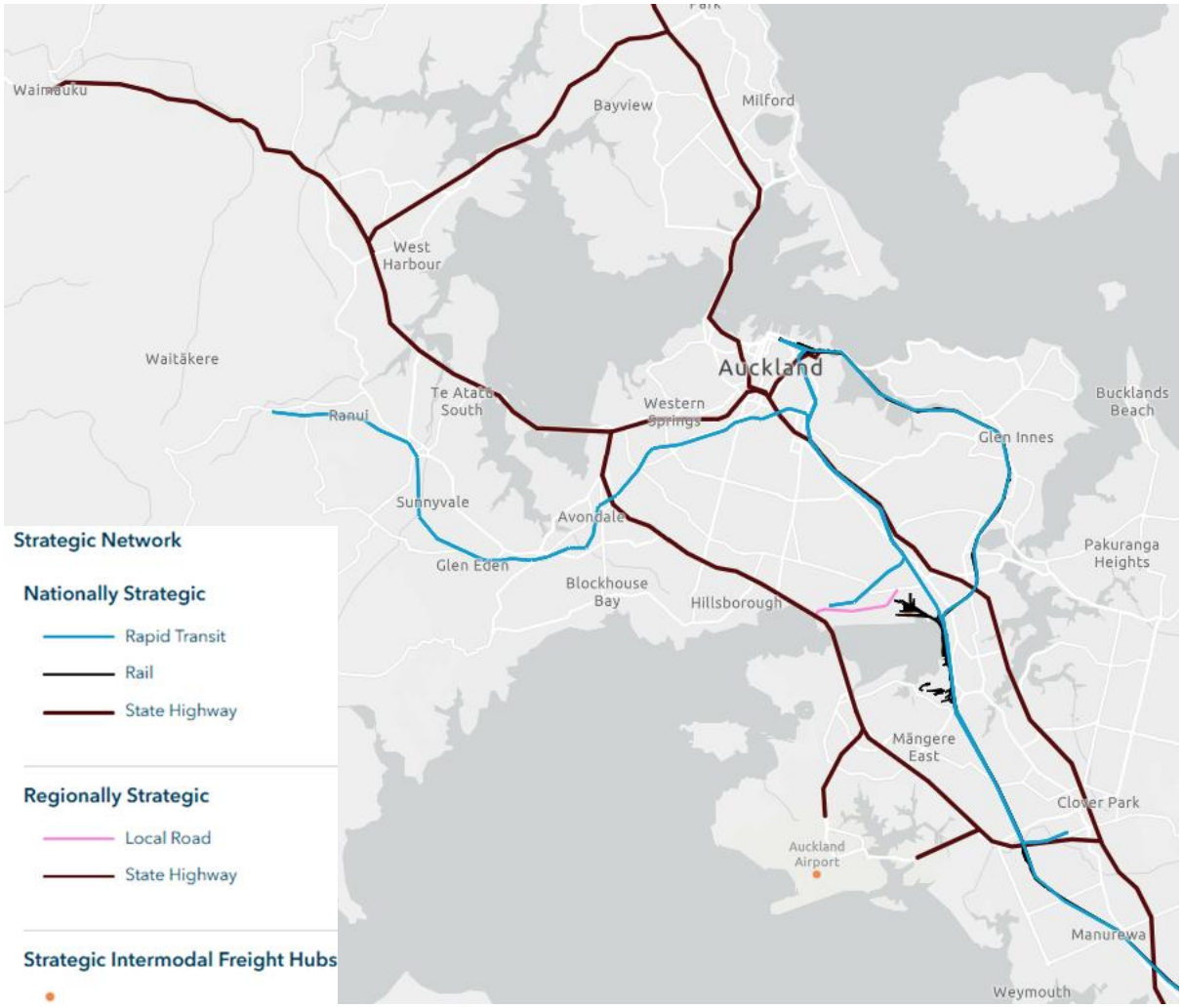
Strategic networks

1. Arataki

In *Arataki,* strategic networks are high-performing parts of the land transport network. They make a significant contribution to achieving transport outcomes at a national level. Nationally strategic networks play an important national function by connecting cities, towns, and regions. Regionally strategic networks serve important regional functions, such as connecting areas, acting as lifelines, and offering alternate routes.

The strategic road network in the Auckland region includes:





Nationally strategic:

- Whangārei to lower North Island
- SH20 Manukau to Waterview
- SH20 to SH20A and SH20B to Auckland Airport
- SH16 Ports of Auckland to Westgate
- SH18 Westgate to Albany.

Regionally strategic:

- SH16 Westgate to Kumeū/Huapai
- SH22 Drury to Pukekohe
- Neilson Street, Onehunga.

In Auckland, the strategic rail network and rapid transit networks consist of:

- North Island Main Trunk Line (NIMT)
- East Coast Main Line (ECML)
- Auckland Metro Rail Network
- Northern Busway
- Eastern Busway.

Because of its size, scale and substantial forecasted future growth, Auckland has a significant role to play in achieving transformational change for New Zealand's land transport system and achieving national transport outcomes is highly dependent on what happens in the country's biggest city.

2. Auckland Transport

Auckland Transport's planning tool Future Connect has developed an Auckland Regional Strategic Network across all modes, combining information from different plans and strategies.

The Auckland Regional strategic network and its routes are defined as:

- The most critical links for movement of people, goods and services to be managed as part of an integrated multi-modal network.
- Key connections with important regional activity and a high volume of users linking sub regions and key centres with other parts of New Zealand.
- The backbone of the transport system providing safe, efficient and reliable movement of people, goods and services across the region.
- Providing easy whole-of-trip journeys for customers.

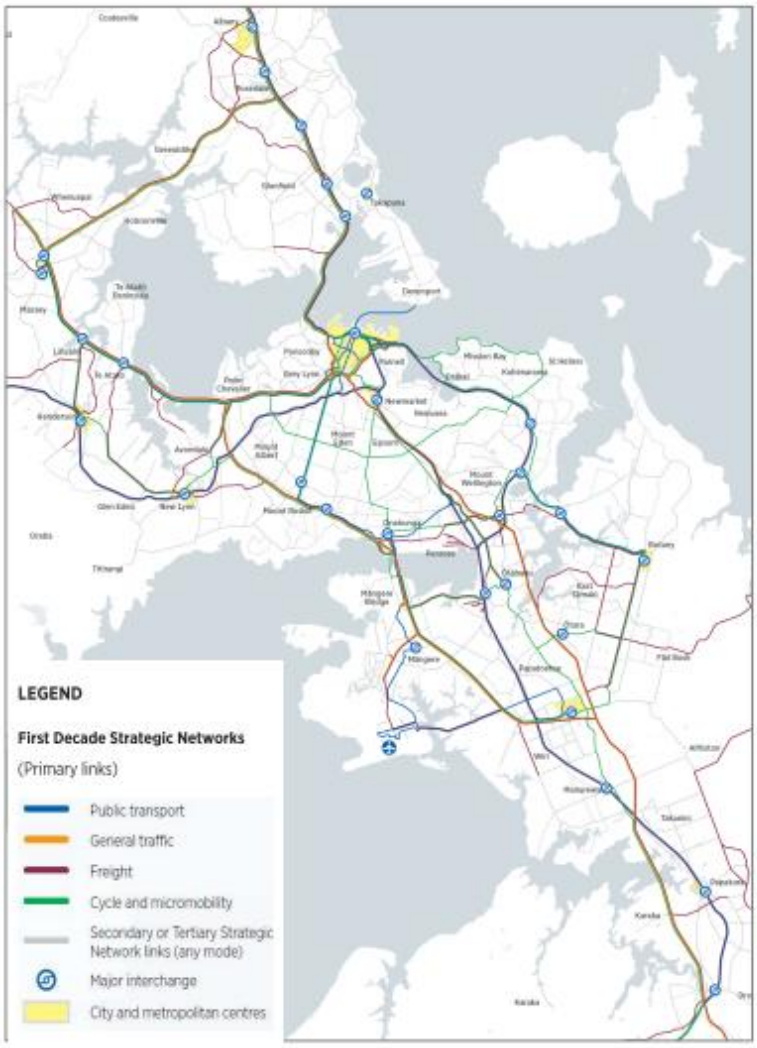


Figure 17: First decade integrated Strategic Networks (excluding walking)

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Key points:

- Multiple strategic networks on the same corridor.
- Correlation between the location of centres and density of strategic networks.
- Cycle and micromobility strategic networks indicate where to prioritise investment.
- The walking network will expand significantly due to new urban development.

Appendix B: Data sources for the strategic measures

This appendix references all relevant data sources and assumptions for the 14 strategic measures reported within each regional chapter.

Because this is the first attempt at providing the evidence pack, and the development of the associated tools and processes under the Planning and Investment Evidence base (PIE) programme is still ongoing, we do not yet have the full capability to report outputs for all measures, particularly for future years. In these instances, we have noted that the data is 'not available' by using the 'N/A' abbreviation as a placeholder until such time this can be addressed by a subsequent version of the evidence pack.

Similarly, the process has identified the need for better understanding and reporting of data quality ratings, version control and internal consistency (that is, a single source of truth). These are all things we intend to improve in subsequent releases.

Bearing the above in mind, we have adopted the following general convention for this version in how we report numbers:

- For large numbers, only report 3–4 significant figures (and using rounding units of thousands or millions).
- For small numbers (including percentages), report to one decimal place by default, but make exceptions where appropriate (for example where more or less detail is required to make meaningful comparisons).

The focus is on convenience and the useability of the data. As such, it doesn't necessarily imply a particular level of accuracy (especially for future year forecasts, which have a great deal of uncertainty associated with them).

Each section below (grouped by outcome) provides data for all regions to allow comparison in terms of how each region contributes to the national total. It also provides any important caveats and limitations associated with each of the measures for that outcome.

Healthy and safe people

To understand the current and future safety risk both at the regional and national level, we calculated deaths and series injuries, personal risk and collective risk as shown in the following table. More details can be found in the Land Transport Benefits Framework.

Benefit framework measure	Units
1.1.1 Collective risk (crash density)	Average annual fatal and serious per kilometre of road section
1.1.3 Deaths and serious injuries (DSIs)	Number of DSIs (annual)
1.1.4 Personal risk (crash rate)	Average annual DSI per 100 million vehicle kilometres

Notes, caveats and data limitations:

- Data for the number of deaths and series injuries (DSIs) is sourced from the Crash Analysis System (CAS) database managed by NZTA.
- Regional VKTs and network length in kilometres is sourced from the NZTA official data published for financial year 2023/24.[47]

[47] https://www.nzta.govt.nz/planning-and-investment/learning-and-resources/transport-data/data-and-tools/

- Generally, DSI measures are calculated as multi-year rolling average. However, because of time and resource constraints the following data is for the financial year 2023/24 only.
- Future year growth factor is based on regional VKT change. This method to calculate this change is discussed in more detail for the 'E.4 Environmental sustainability' section later in this appendix.
- It is assumed that crash rates remain constant over time. This is consistent with safety expert advice that application of crash trend adjustment factors for long term future predictions may no longer be supported by evidence.
- Future year DSIs were estimated based on the regional change on VKT (all vehicles) between 2023 and 2048 adopted for the GHG emissions measure (8.1.1). This assumes the crash rate (per VKT) remains constant (that is, no crash trend reduction factors applied).

Region	Current 2023/24			Future 2048		
	DSIs #	Per km	Per 100 million VKT	DSIs #	Per km	Per 100 million VKT
01 – Northland	181	0.027	7.783	176	0.026	7.554
02 – Auckland	593	0.073	4.267	924	0.114	6.651
03 – Waikato	416	0.035	6.372	501	0.042	7.678
04 – Bay of Plenty	184	0.038	5.321	210	0.044	6.059
05 – Gisborne	33	0.015	7.779	37	0.016	8.737
06 – Hawke's Bay	125	0.027	7.005	145	0.031	8.135
07 – Taranaki	82	0.021	6.293	97	0.024	7.429
08 – Manawatū-Whanganui	234	0.026	7.718	231	0.026	7.619
09 – Wellington	171	0.039	4.671	230	0.052	6.289
10 – Top of the South	117	0.027	6.868	151	0.035	8.848
11 – Canterbury	346	0.021	5.007	480	0.030	6.942
12 – West Coast	43	0.014	7.548	43	0.014	7.545
13 – Otago	137	0.013	4.799	142	0.013	4.968
14 – Southland	51	0.007	3.877	53	0.007	4.024
15 – Chatham Islands	0	0.000	0.000	0	0.000	0
National	**2713**	**0.025**	**5.451**	**3419**	**0.035**	**5.055**

Infrastructure risk rating (safety)

We calculate strategic measure 1.2.1 Road assessment rating to understand the current situation of infrastructure risk both at regional and national level. This measure can be used for any safety-related investment benefits, particularly those that target road infrastructure to improve safety. It is a comprehensive measure that considers land use, road type, alignment, average annual daily traffic (AADT), intersection density, land and shoulder width, roadside hazards and access density. More details can be found in the Land Transport Benefits Framework.

Benefit framework measure	Units
1.2.1 Road assessment rating – roads	Average infrastructure risk rating

Notes, caveats and data limitations:

- Data to calculate the regional infrastructure risk rating (IRR) measure in the following table is sourced from Megamaps, which is a geospatial platform managed by NZTA.[48]
- IRR data used to calculate regional and national measure values in the following table was calculated in Megamaps in 2024. The raw data used is for the period 2019–23.
- The data in Megamaps is for each road segment, intersection or corridor. We have aggregated it to calculate regional percentages under each risk band.

Region	High	Medium-high	Medium	Low-medium	Low
01 – Northland	45.77%	26.44%	18.74%	8.34%	0.71%
02 – Auckland	14.92%	17.54%	48.12%	13.18%	6.24%
03 – Waikato	21.40%	25.42%	34.39%	15.15%	3.64%
04 – Bay of Plenty	17.10%	20.74%	37.82%	19.35%	4.99%
05 – Gisborne	50.43%	19.93%	21.93%	7.50%	0.21%
06 – Hawke's Bay	33.47%	25.30%	29.79%	9.16%	2.28%
07 – Taranaki	28.83%	24.08%	33.13%	13.13%	0.83%
08 – Manawatū-Whanganui	41.81%	19.13%	25.67%	12.43%	0.96%
09 – Wellington	17.98%	19.51%	41.67%	13.62%	7.22%
10 – Top of the South	33.70%	23.83%	28.06%	12.94%	1.47%
11 – Canterbury	10.87%	29.16%	42.29%	16.36%	1.32%
12 – West Coast	17.75%	29.97%	38.04%	13.61%	0.63%
13 – Otago	21.83%	37.95%	26.55%	12.63%	1.04%
14 – Southland	6.99%	41.27%	37.99%	13.34%	0.42%
National%	**23.21%**	**2.29%**	**13.50%**	**34.25%**	**26.75%**

[48] https://spatial.nzta.govt.nz/apps/megamaps/

Resilience and security

This transport outcome is about minimising and managing the risks from natural and human-made hazards, anticipating and adapting to emerging threats, and recovering effectively from disruptive events. We intended to use strategic measure 4.1.1 and 4.1.2 from the Land Transport Benefits Framework to understand the resilience and security situation at national and regional level. However, we don't currently have data to calculate measure 4.1.1, so this time around we have only calculated measure 4.1.2. The intent of the measure 4.1.2 is to allow for description and measurement of the risk to level of service by unplanned disruption (including earthquakes, storms, volcanos and tsunamis). This measure is generally used for any investment that focuses on maintaining or increasing the resilience of the transport network.

Benefit framework measure	Units
4.1.1 Availability of a viable alternative to high-risk and high-impact route	Percentage of high-risk, high-impact route with a viable alternative
4.1.2 Level of service and risk	Number of identified sites in region by combined risk rating (future, geological and hydrological)

Notes, caveats and data limitations:

- The data for the following measure is sourced from the National Resilience Assessment Tool (NRAT) managed by NZTA.[49]
- The following table shows the regional number of resilience risks on state highways under each risk band. This includes hydrological, geological and future risks.
- 'No rating' is for considered risk sites that have not yet been rated.
- There is no easy way to currently calculate future projections for this measure, but we are working on the capability to do so.

Regions	Critical	High	Moderate	Low	No rating
01 – Northland	29	84	276	171	169
02 – Auckland	5	13	29	41	1
03 – Waikato	20	175	212	174	149
04 – Bay of Plenty	16	64	153	121	67
05 – Gisborne	1	7	35	49	74
06 – Hawke's Bay	18	123	72	30	143
07 – Taranaki	0	11	9	0	98
08 – Manawatū-Whanganui	1	11	9	8	8
09 – Wellington	39	37	25	118	1
10 – Top of the South	9	51	59	177	91
11 – Canterbury	32	88	57	195	46
12 – West Coast	34	49	21	34	37
13 – Otago	26	84	86	247	172
14 – Southland	27	23	18	28	14
National	**257**	**820**	**1061**	**1393**	**1070**

[49] https://national-resilience-assessment-tool-nzta.hub.arcgis.com/

Economic prosperity

This transport outcome is about supporting economic activity via local, regional, and international connections, with efficient movements of people and products. We calculated the following strategic measures from the Land Transport Benefits Framework to measure the economic prosperity outcomes at both regional and national level.

Benefit framework measure	Units
5.1.2 Travel time reliability – motor vehicles (note for this evidence pack, the data only relates to state highway traffic monitoring system (TMS) sites)	Calculated using coefficient of variation (CoV); standard deviation of travel time divided by average minutes travel time Rate: Low <0.3, Medium 0.3–0.6, High >0.6)
5.1.3 Travel time delay	Difference between average travel time during AM peak and average travel time during the Inter Peak in minutes per kilometre (by mode) as a percentage
5.2.2 Freight – mode share value	Percentage of value for each mode
5.2.3 Freight – mode share weight	Percentage of weight for each mode

Notes, caveats and limitations:

- Data for travel time reliability and delay measures is sourced from the National Network Performance (NNP) platform managed by NZTA.
- The sources used to calculate following measures is limited to the TMS sites only – that is, for state highways. In future, as more data is available in NNP for local roads, we intend to calculate using extensive local and state highway roads. Additionally, NNP will be able to assess both travel time delay and travel time reliability.
- The data for 5.1.2 Travel time reliability and 5.1.3 Travel time delay is for a typical day.
- Where we have gained access to regional model origin–destination data (for Auckland, Waikato, Wellington and Christchurch), we have used this to estimate current and future values of travel time for all available modes.
- Measure 5.2.2 Freight – mode share value has been selected as one of the 14 strategic measures but currently, there is insufficient data to reliably calculate this. Therefore, the data table for this measure remains unpopulated as a placeholder.
- Measure 5.2.3 Freight – mode share weight would ideally include coastal shipping but currently only includes road and rail modes.
- Future road freight is based on the same data used to forecast heavy commercial vehicle (HCV) VKT (also used for other measures) combined with average cargo weight from weigh-in-motion (WiM) sites (collected for the North Island only, but also applied to the South Island due to lack of data from the South Island). This data covers seven years and shows a trend of average load sizes decreasing over time. This trend line was used to estimate the 2048 average cargo weight (4615kg). Compared to the 2024 value (4822kg), this implies the average load size is projected to decrease by 7%. In contrast, national HCV VKT is projected to increase by 39% (2024 to 2048).
- The last seven years of rail freight net tonne-kilometres (NTK) by line segment has been provided by KiwiRail. This indicates that the amount of freight is reasonably steady over this period (with a small decline over the last few years). Based on the overall trend, we have assumed future year (2048) NTK will remain the same as current day (2024)
- A discrepancy in the rail data has been noted, where a 27km section of the network is missing from the calculations. This is possibly the section between Palmerston North and Woodville, which has been noted for further follow up.

5.1.2 Travel time reliability – motor vehicles

Region	Daily (CoV)			Peak time (CoV)		
	Low	Medium	High	Low	Medium	High
01 – Northland	96.43%	3.57%	0.00%	88.24%	0.00%	11.76%
02 – Auckland	96.67%	2.50%	0.83%	78.57%	9.18%	12.24%
03 – Waikato	94.59%	1.35%	4.05%	95.00%	0.00%	5.00%
04 – Bay of Plenty	100.00%	0.00%	0.00%	80.56%	19.44%	0.00%
05 – Gisborne	96.30%	3.70%	0.00%	100.00%	0.00%	0.00%
06 – Hawke's Bay	98.95%	1.05%	0.00%	65.38%	34.62%	0.00%
07 – Taranaki	94.74%	5.26%	0.00%	69.44%	16.67%	13.89%
08 – Manawatū-Whanganui	92.11%	7.89%	0.00%	82.56%	8.14%	9.30%
09 – Wellington	92.37%	6.78%	0.85%	67.90%	30.86%	1.23%
10 – Top of the South	100.00%	0.00%	0.00%	86.49%	10.81%	2.70%
11 – Canterbury	94.39%	3.96%	1.65%	73.98%	16.84%	9.18%
12 – West Coast	96.30%	1.23%	2.47%	98.08%	0.00%	1.92%
13 – Otago	92.59%	6.79%	0.62%	75.56%	17.78%	6.67%
14 – Southland	93.27%	5.77%	0.96%	71.43%	21.43%	7.14%
National	**95.30%**	**3.84%**	**0.86%**	**77.34%**	**15.54%**	**7.12%**

5.1.3 Travel time delay

Region	Peak (mins/km)	Inter-peak (mins/km)	Difference (mins/km)	%Change
01 – Northland	0.78	0.85	0.7	8.40%
02 – Auckland	0.77	0.86	0.8	10.23%
03 – Waikato	0.79	0.87	0.8	9.17%
04 – Bay of Plenty	0.69	0.76	0.6	8.18%
05 – Gisborne	0.75	0.77	0.2	3.30%
06 – Hawke's Bay	0.79	0.87	0.7	9.15%
07 – Taranaki	0.80	0.88	0.7	8.46%
08 – Manawatū-Whanganui	0.73	0.78	0.4	5.72%
09 – Wellington	0.83	1.00	0.2	16.94%
10 – Top of the South	0.82	0.84	0.1	1.98%
11 – Canterbury	0.75	0.77	0.2	3.46%
12 – West Coast	0.74	0.77	0.2	3.13%
13 – Otago	0.74	0.78	0.3	4.69%
14 – Southland	0.73	0.76	0.2	3.23%
National	**0.76**	**0.83**	**0.6**	**8.17%**

5.2.3 Freight – mode share weight – base year 2024

Region	Road (m NKT/yr)	Rail (m NKT/yr)	Total (m NKT/yr)	Road (%)	Rail (%)
01 – Northland	912	17	929	98%	2%
02 – Auckland	2904	132	3036	96%	4%
03 – Waikato	5016	751	5767	87%	13%
04 – Bay of Plenty	2208	534	2742	81%	19%
05 – Gisborne	301	0	301	100%	0%
06 – Hawke's Bay	1120	31	1152	97%	3%
07 – Taranaki	603	59	661	91%	9%
08 – Manawatū-Whanganui	1824	646	2470	74%	26%
09 – Wellington	1004	102	1106	91%	9%
10 – Top of the South	1193	60	1253	95%	5%
11 – Canterbury	4045	563	4608	88%	12%
12 – West Coast	409	313	722	57%	43%
13 – Otago	1396	220	1616	86%	14%
14 – Southland	776	73	849	91%	9%
15 – Chatham Islands	0	0	0	100%	0%
Grand total	**23,712**	**3,500**	**27,212**	**87%**	**13%**

5.2.3 Freight – mode share weight – future year 2048

Region	Road (m NKT/yr)	Rail (m NKT/yr)	Total (m NKT/yr)	Road (%)	Rail (%)
01 – Northland	912	17	929	98%	2%
02 – Auckland	2,904	132	3,036	96%	4%
03 – Waikato	5,016	751	5,767	87%	13%
04 – Bay of Plenty	2,208	534	2,742	81%	19%
05 – Gisborne	301	0	301	100%	0%
06 – Hawke's Bay	1,120	31	1,152	97%	3%
07 – Taranaki	603	59	661	91%	9%
08 – Manawatū-Whanganui	1,824	646	2,470	74%	26%
09 – Wellington	1,004	102	1,106	91%	9%
10 – Top of the South	1,193	60	1,253	95%	5%
11 – Canterbury	4,045	563	4,608	88%	12%
12 – West Coast	409	313	722	57%	43%
13 – Otago	1,396	220	1,616	86%	14%
14 – Southland	776	73	849	91%	9%
15 – Chatham Islands	0	0	0	100%	0%
Grand total	**23,712**	**3,500**	**27,212**	**87%**	**13%**

Environmental sustainability

This transport outcome is about transitioning to net zero carbon emissions, and maintaining or improving biodiversity, water quality and air quality. We calculated following strategic measures from the Land Transport Benefits Framework to the measure the economic prosperity outcomes at both regional and national level.

Benefit framework measure	Units
8.1.1 Greenhouse gas emissions (all vehicles)	Annual tonnes of CO_2 equivalents (CO_2-e) emitted
8.1.3 Light vehicle use impacts	Annual light vehicle kilometres travelled (light VKT)

Notes, caveats and limitations:

- Current year data for VKT is sourced from NZTA's open data portal.
- Future light national VKT projections have been sourced from the NZTA 2024 Light VKT projection models. These are based on Stats NZ population growth and forecasts for GDP and fuel prices (mid-range assumptions have been adopted for this evidence pack).
- Future regional light vehicle VKT distribution is based on research work done by Beca (VKT and GHG emissions baseline report – NZTA research note 008 September 2022). This assumes the base year light VKT per capita remains unchanged and uses population projection to estimate light VKT within each territorial local authority (TLA). The results are aggregated to spatial areas and adjusted to reconcile with the Ministry of Transport (MoT) observed and projected national totals. It uses base and projected light vehicle fleet GHG emissions factors from the Vehicle Fleet Emission Model (VFEM) to calculate GHG emissions for the baseline spatial areas. The report year 2035 (future) VKT values (by region) have been adjusted (scaled) to 2048 national light vehicle (LV) totals.
- Future year regional heavy vehicle VKT distribution has been calculated using growth factors comprising trend data, Stats NZ medium population forecast and Ministry of Business, Innovation and Employment (MBIE) GDP forecast data. This is a placeholder calculation pending further work on HCV demand forecasting currently being developed (using this general approach) as part of the PIE programme.
- GHG emissions have been estimated by applying light and heavy VKT to Vehicle Emissions Prediction Model (VEPM) (v7.0) emission rates (for current and future years) using the default MoT Vehicle Fleet Model (VFM) assumptions within VEPM (for each year) and average vehicle speeds from NNP or regional transport models (Auckland, Waikato, Wellington and Christchurch).
- Estimates of VKT are key inputs to multiple measures (such as vehicle emissions (affecting both health and environmental measures), DSIs, freight etc. Care has been taken to ensure consistency at the national, regional and local levels.

8.1.1 Greenhouse gas emissions (all vehicles)

Region	Current 2024	Future 2048	Change	% Change	Contribution
01 – Northland	0.61	0.27	-0.35	-57%	4%
02 – Auckland	3.58	2.19	-1.38	-39%	26%
03 – Waikato	2.00	1.36	-0.64	-32%	14%
04 – Bay of Plenty	1.01	0.63	-0.38	-38%	7%
05 – Gisborne	0.13	0.07	-0.06	-48%	1%
06 – Hawke's Bay	0.52	0.30	-0.22	-42%	4%
07 – Taranaki	0.35	0.19	-0.16	-46%	3%
08 – Manawatū-Whanganui	0.87	0.49	-0.38	-44%	6%
09 – Wellington	0.93	0.45	-0.48	-52%	7%
10 – Top of the South	0.51	0.36	-0.15	-30%	4%
11 – Canterbury	1.98	1.26	-0.71	-36%	14%
12 – West Coast	0.17	0.10	-0.08	-44%	1%
13 – Otago	0.78	0.40	-0.38	-48%	6%
14 – Southland	0.38	0.21	-0.17	-46%	3%
15 – Chatham Islands	0.002	0.001	-0.001	-39%	0.02%
National	**13.83**	**8.29**	**-5.54**	**-40%**	**100%**

8.1.3 Light vehicle use impacts

Region	Current 2024	Future 2048	Change	% Change	Contribution
01 – Northland	2172	2075	-97	-4%	5%
02 – Auckland	13137	20504	7367	56%	29%
03 – Waikato	5597	6514	918	16%	12%
04 – Bay of Plenty	3056	3349	293	10%	7%
05 – Gisborne	369	420	52	14%	1%
06 – Hawke's Bay	1581	1810	229	14%	3%
07 – Taranaki	1199	1397	198	17%	3%
08 – Manawatū-Whanganui	2702	2523	-179	-7%	6%
09 – Wellington	3488	4746	1258	36%	8%
10 – Top of the South	1484	1854	370	25%	3%
11 – Canterbury	6182	8583	2402	39%	14%
12 – West Coast	494	476	-18	-4%	1%
13 – Otago	2610	2624	14	1%	6%
14 – Southland	1175	1182	7	1%	3%
15 – Chatham Islands	5	4	-0.4	-7.9%	0%
National	**45250**	**58062**	**12812**	**28%**	**100%**

Inclusive access

This transport outcome is about enabling all people to participate in society through access to social and economic opportunities, such as work, education and health care. We calculated the 10.2.1 and 10.3.1 strategic measures from the Land Transport Benefits Framework to measure the inclusive access outcome both at the national and regional level.

Benefit framework measure	Units
10.2.1 People – mode share	Percentage by mode (Census (2023) journey to work and education)
10.3.1 Access to key social destinations (all modes)	Number of jobs (x1000) accessible by mode in AM peak (car 40 min, PT 45 min, cycle 45 min) and distance from city centre (km)

Notes, caveats and limitations:

- There is a limited information about measure 10.2.1 in the Land Transport Benefits Framework measures manual – that is, its intent, scope, forecasting methods etc are not defined yet.
- Mode share data, that is main means of travel to work and education, is sourced from census 2023 outputs produced by Stats NZ.[50]
- The data for all public transport (PT) modes (buses, trains and ferries) is aggregated together.
- Where we have gained access to regional model origin–destination data (for Auckland, Waikato, Wellington and Christchurch), we've used this to estimate current and future values of 10.2.1 People – mode share based on modelled relative changes applied to the base year census values.

10.2.1 People – mode share

Region	%Car	%PT	%Cycle	%Peds
01 – Northland	91.00%	1.33%	0.99%	6.67%
02 – Auckland	77.81%	11.29%	1.32%	9.58%
03 – Waikato	86.34%	2.69%	2.49%	8.48%
04 – Bay of Plenty	87.36%	2.06%	3.37%	7.22%
05 – Gisborne	89.78%	0.43%	2.54%	7.25%
06 – Hawke's Bay	88.12%	0.99%	2.96%	7.93%
07 – Taranaki	87.18%	1.25%	2.91%	8.66%
08 – Manawatū-Whanganui	86.33%	1.77%	2.60%	9.30%
09 – Wellington	63.97%	18.40%	2.98%	14.64%
10 – Top of the South	80.14%	1.09%	7.53%	11.24%
11 – Canterbury	85.26%	0.17%	3.27%	11.30%
12 – West Coast	79.75%	4.44%	6.27%	9.54%
13 – Otago	73.35%	4.38%	3.77%	18.50%
14 – Southland	87.70%	0.70%	3.40%	8.21%
Auckland city	77.78%	11.30%	1.32%	9.59%

50 https://explore.data.stats.govt.nz/?fs[0]=2023%20Census%2C0%7CTransport%23CAT_TRANSPORT%23&pg=0&fc=2023%20Census&bp=true&snb=9

Region	%Car	%PT	%Cycle	%Peds
Hamilton city	82.96%	4.96%	3.08%	9.01%
Tauranga city	85.33%	2.92%	4.65%	7.10%
Wellington city	48.62%	28.51%	3.59%	19.29%
Christchurch city	77.74%	5.84%	7.20%	9.22%
Queenstown-Lakes District	79.27%	4.13%	5.77%	10.83%
National total	**79.45%**	**7.46%**	**2.91%**	**10.19%**

Accessibility to employment

Notes, caveats and limitations:

- Data is sourced from the Accessibility Toolkit (ATK).
- It uses network-based travel times (by mode) between household locations and employment locations. This uses recorded travel times for general traffic, bus timetables for PT and road network distance with a constant average speed applied for cycles (the default used in OpenTripPlanner, which is 5m/s = 18km/h).
- Measure 10.3.1 currently estimates accessibility to employment rather than social destinations. Further work is progressing using ATK to also include access to social destinations, which will be included in subsequent versions of this evidence pack.
- ATK has been used to estimate future accessibility in a very limited way by only looking at changes associated with land-use growth based on population and employment sub-regional projections (while keeping base year travel times by mode). It may be possible to improve this in future releases, where other tools (currently being developed) can provide suitable inputs to ATK regarding future network performance (including travel times).

10.3.1 Access to key social destinations (all modes)

Region	Mode	Current year (2023)			Future year (2048)		
		0–5km	5–10km	10+km	0–5km	5–10km	10+km
01 – Northland	Car	31,292	30,536	35,034	36,807	35,913	40,486
	PT	16,850	5,845	869	19,200	7,465	1,311
	Cycle	29,138	19,854	2,377	34,068	24,541	3,369
02 – Auckland	Car	716,503	536,916	455,088	899,714	670,758	582,690
	PT	313,788	177,213	124,557	388,878	224,214	151,103
	Cycle	355,847	280,586	216,239	451,914	355,494	265,792
03 – Waikato	Car	133,357	133,999	213,804	176,632	177,837	276,406
	PT	69,881	25,929	9,321	95,049	33,744	12,351
	Cycle	104,923	82,607	16,567	140,886	112,340	21,034
04 – Bay of Plenty	Car	79,040	77,841	93,611	103,455	101,584	107,430
	PT	35,631	23,794	18,017	47,915	32,656	20,225
	Cycle	58,707	40,240	26,289	77,374	54,337	29,099
05 – Gisborne	Car	17,327	17,265	25,979	18,308	18,254	27,378
	PT	9,241	144	147	9,421	137	150
	Cycle	15,211	10,255	517	15,898	9,799	849
06 – Hawke's Bay	Car	72,436	71,160	165,625	82,291	81,101	186,660
	PT	18,570	12,495	21,930	20,305	13,607	26,451
	Cycle	27,802	26,148	59,881	30,745	29,448	70,751
07 – Taranaki	Car	36,869	36,779	81,917	41,180	40,985	91,527

	PT	17,946	6,379	3,989	19,839	7,537	4,939
	Cycle	27,594	21,814	5,315	30,784	26,806	6,171
08 – Manawatū-Whanganui	Car	63,400	60,858	116,324	70,215	68,118	129,915
	PT	42,455	8,809	12,769	47,710	12,863	14,373
	Cycle	49,725	27,467	15,275	55,486	31,480	16,815
09 – Wellington	Car	226,937	203,306	257,735	254,242	227,977	286,594
	PT	149,015	87,351	100,318	169,490	97,902	112,643
	Cycle	160,012	138,296	82,987	178,699	153,837	93,008
10 – Top of the South	Car	59,509	39,238	43,526	65,205	43,653	48,604
	PT	33,554	20,850	2,236	36,531	23,406	2,550
	Cycle	48,104	34,767	5,135	52,973	39,147	5,744
11 – Canterbury	Car	246,820	237,377	350,704	298,103	286,139	440,946
	PT	135,521	83,670	25,420	164,523	99,853	33,350
	Cycle	197,173	163,672	46,480	238,400	196,568	59,540
12 – West Coast	Car	6,225	6,455	14,589	5,843	6,196	13,893
	PT	3,757	183	1,862	3,445	210	2,326
	Cycle	5,537	4,664	3,015	5,099	4,604	3,432
13 – Otago	Car	59,213	58,364	112,598	62,075	61,521	128,941
	PT	45,898	27,674	13,916	48,301	33,897	16,699
	Cycle	53,343	41,614	12,458	55,959	47,303	15,473
14 – Southland	Car	32,733	33,106	69,145	34,463	34,638	71,342
	PT	20,598	10,281	2,169	21,320	13,138	2,138
	Cycle	27,027	22,387	4,685	28,399	26,232	4,374
National	Car	1,781,661	1,543,200	2,035,679	2,148,533	1,854,674	2,432,812
	PT	912,705	490,617	337,520	1,091,927	600,629	400,609
	Cycle	1,160,143	914,371	497,220	1,396,684	1,111,936	595,451

Appendix C: Deficiencies

This appendix provides further details on the region's transport deficiencies discussed in the Current and future challenges section.

List of key transport system deficiencies

- Deficient movement patterns:
  - major regional commuting flows impacted
  - congested and worsening general traffic
  - high safety and environmental risks and limited competitive alternatives
  - likely to require significant central government investment.
- Multi-modal streets with space and safety constraints:
  - local roads that users of many modes rely on, with high deficiencies for most of those modes
  - historically developed corridors with complex land-use interactions.
- Major destinations with complex transport interconnections:
  - key hubs around the city where people work, study and live
  - hubs coincide with major transport interchanges where multiple modes and regional and local networks interact with each other
  - complex web of transport and land-use interaction.
- Transport deprivation priority areas:
  - areas with high social deprivation experiencing poor outcomes across at least 2 of the 3 equity domains.

In addition to the transport system deficiencies above, various outcome-based deficiencies have been identified from *Arataki*, Future Connect and the current RLTP and Auckland Council's preparatory work. Each of these sources are generally aligned so we've grouped deficiencies into common themes below:

- Healthy and safe people:
  - dangerous behaviour (road users)
  - safer infrastructure (including speed limits) required to reduce DSIs
  - perceived safety (including crime) for active modes and PT
  - particulate matter and harmful gases from vehicle emissions
  - burden on the health system due to perceived lack of safety and convenience for active modes.
- Resilience and security:
  - risk of landslips, flooding and erosion
  - maintenance of existing networks and services.
- Environmental sustainability:
  - vehicle GHG emissions
  - discharges to ground and surface water.
- Economic prosperity:
  - integration of future land use and infrastructure
  - travel time and travel time reliability (all modes)
  - uncertainty and rapid change.
- Inclusive access:
  - integration of future land use and infrastructure.
  - active modes – improved infrastructure quality needed to bring about mode change

- public transport – improve service and infrastructure quality needed to bring about mode change
- age and mobility constraints.

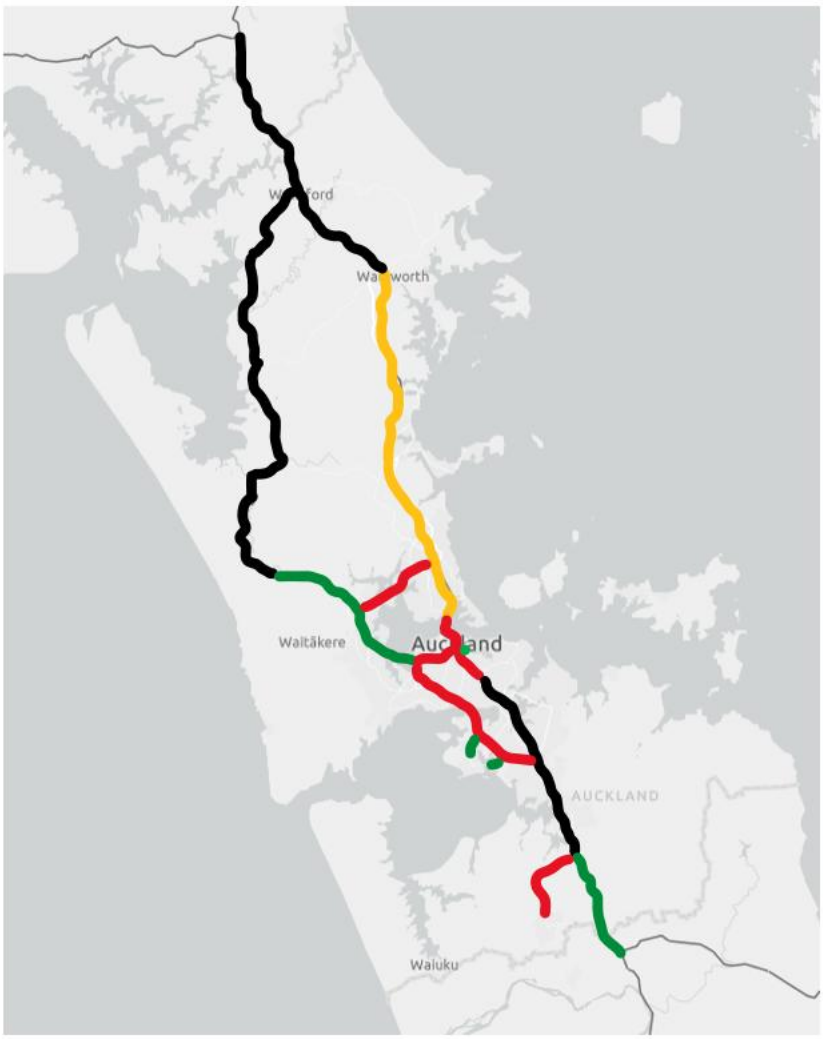
State highway deficiencies

The following maps from *Arataki* highlight the areas of the state highway and rail network in the Auckland region that currently suffer from significant service deficiencies, particularly in terms of safety, resilience, and travel time reliability.

Some of these deficiencies may have been addressed by recently implemented improvements, such as the Pūhoi to Warkworth motorway, or will be addressed by currently planned improvements.

Resilience risk

Resilience risk indicates parts of the network that are at particular risk of closure and disruption because of unplanned events, either natural or human. The ratings reflect the risk and impact of disruption and emphasise connections with high-potential impacts on customers and/or corridors with no viable alternate routes. Risk ratings have been derived from the National Resilience Assessment Tool (NRAT).



Resilience Risk Rating

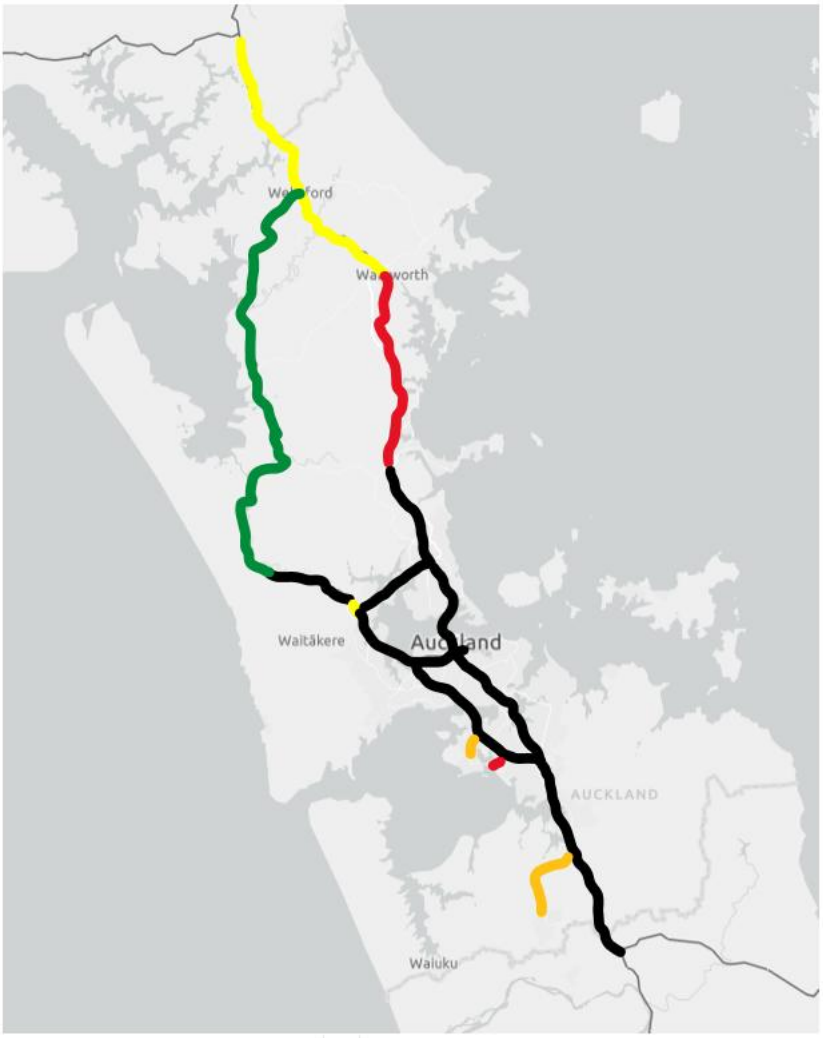
Critical	5
High	4
Medium	3
Low	1, 2

The main north–south freight artery, SH1, faces critical resilience issues north of Warkworth, including the Dome Valley, and between the central city and Drury, particularly with flooding at the Ellerslie–Panmure interchange. Similarly, SH16 north of Kumeū has resilience issues up to Wellsford, including

rapid flooding on the SH16 extension, though it experiences a much lower volume of light and heavy vehicles.

Travel time reliability

The following deficiencies are parts of the rural and inter-regional state highway networks that experience poor travel time reliability on a regular basis. This is derived from analysis of the average annual daily traffic volumes measured at telemetry sites and applying internationally recognised traffic volume benchmarks.

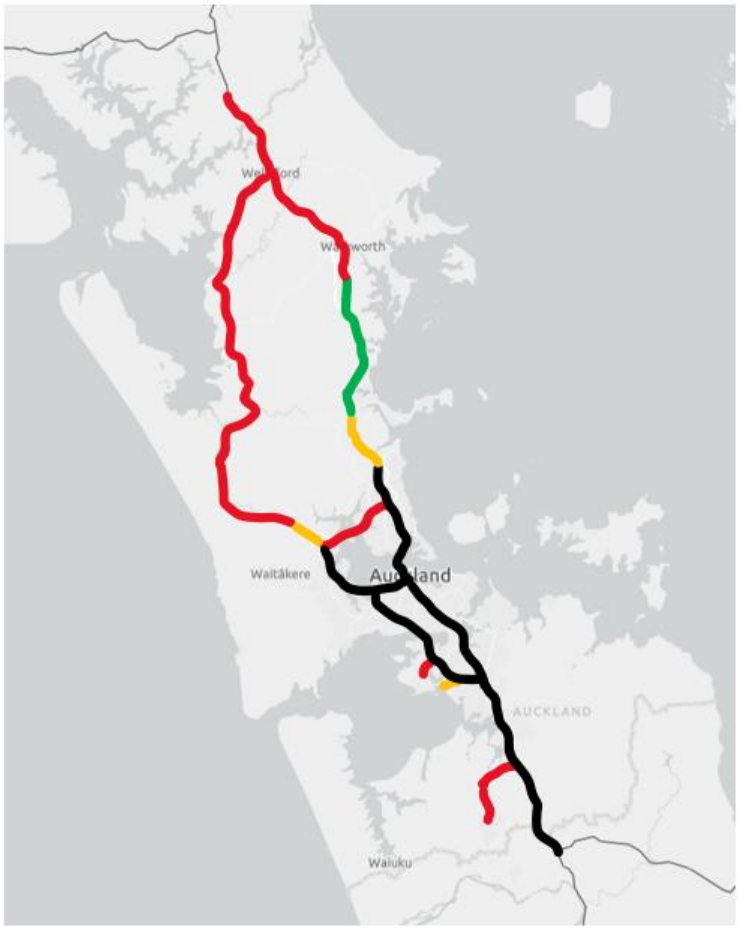


Reliability Risk Rating	
	Frequently operating at, or over, capacity
	Operating at capacity for key periods
	Operating close to capacity for key periods
	Operating below capacity for majority of day
	Operating below capacity

The Auckland region has the busiest roads in New Zealand, with the busiest stretch being SH1 from Northcote Point to Ellerslie. Sections of SH1 from Pokeno to Warkworth are operating at or over capacity during key periods of the day, resulting in congestion and extended journey times. Most of the corridors facing current capacity challenges are in areas experiencing strong population growth, such as Westgate, Drury, and Silverdale.

Safety

The following deficiencies are state highway corridors showing collective risk levels using DSIs over 5 years from 2019 to 2023.



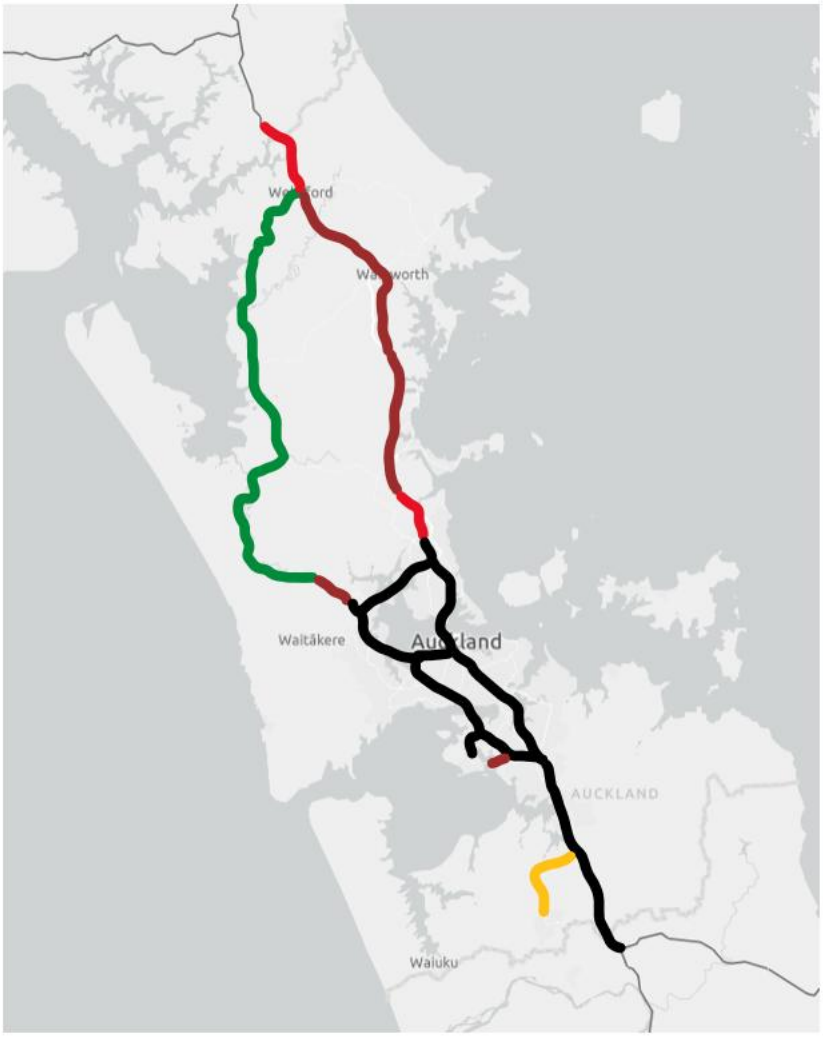
Safety Collective Risk (2019-2023)

High	5
Medium High	4
Medium	3
Medium Low	2
Low	1

The majority of the state highway network in the Auckland region has a high or medium-high collective safety risk rating, driven by the volume of light and heavy vehicles using the network. High-risk sections include SH1 from Pokeno through to Albany, SH20, and SH16 from the SH18 intersection to the SH1 intersection.

Heavy vehicle flows

Heavy vehicle flows are derived from the average annual daily traffic figures and the percentage of heavy vehicles measured at each telemetry site. As a comparison, the majority of the state highway network corridors across New Zealand see less than 500 heavy vehicles per day.



Heavy Vehicles Per Day

>2000	7
1501-2000	6
1001-1500	5
751-1000	4
501-750	3
251-500	2
1-250	1

The principal freight routes through Auckland are SH1, SH16, SH18, and SH20, including SH20A to the airport. The large amount of freight on the corridors on the isthmus contributes to capacity and safety challenges. Freight connectivity for the golden triangle (the area between Auckland, Tauranga, and Hamilton) relies heavily on SH1. In comparison to the rest of the region's state highway network, SH16 carries a very low volume of freight traffic.

Detour route availability

The ratings for the strategic network corridors are derived from the NZTA Detour Routes Tool, which shows alternative routes, where available, for the entire state highway network, along with restrictions for vehicles. Analysis of the quantity and quality of detour routes for a corridor produced a measure of the detour route availability which has been applied initially to the strategic network.

	No practical detour available due to no suitable roads, or an excessive journey time (>4 hours for HPMVs) due to length of detour (>300Kms)
	Many detours are lengthy, often with multiple restrictions, particularly impacting HPMVs.
	Some detours are lengthy and have restrictions for light and heavy vehicles
	Detours available for all vehicle types, mostly short in length and adding little to overall journey times

The golden triangle has reasonable detour routes for the strategic network, allowing freight and people to move even if key sections are out of service. Ports in Auckland, Tauranga, and Hamilton can still handle imports and exports.

Detour routes are mainly on local roads, causing tension with local communities due to increased traffic, pollution, road wear, and safety risks.

The Wellsford to Ruakākā corridor is crucial for freight between Northland and Auckland but has detours with restrictions for light and heavy vehicles, including hairpin corners, height restrictions, and one-lane bridges. Some detours in Wellsford have unknown restrictions.

SH20A and SH20B routes to Auckland Airport have lengthy detours with heavy vehicle restrictions, affecting freight and passenger movement, leading to congestion and longer travel times.

Strategic network deficiencies

Auckland's current strategic transport networks are among New Zealand's most important and valuable assets. They require constant care. *Arataki*'s strategic network plan has identified the key challenges that require transformational change.

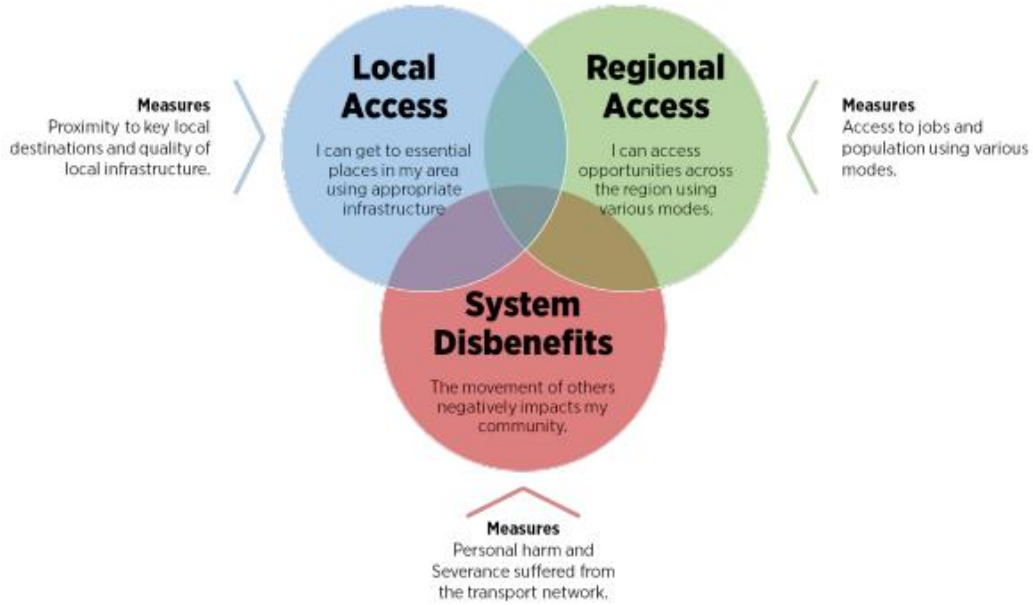
Ongoing programmes of maintenance, operations and renewal, safety, optimisation and resilience are the best way to make progress for most of the strategic network. However, transformational change may be required when current networks are under-developed and require the introduction or expansion of new solutions (for example, rapid transit and strategic active mode networks in major cities), or the scale of change required is beyond what can be achieved through ongoing programmes (for example, the scale of existing or forecasted deficiency, how challenging the desired outcome is, where circumstances change, or where new approaches are required).

The most significant drivers of change for strategic networks in Auckland over the next 30 years are:

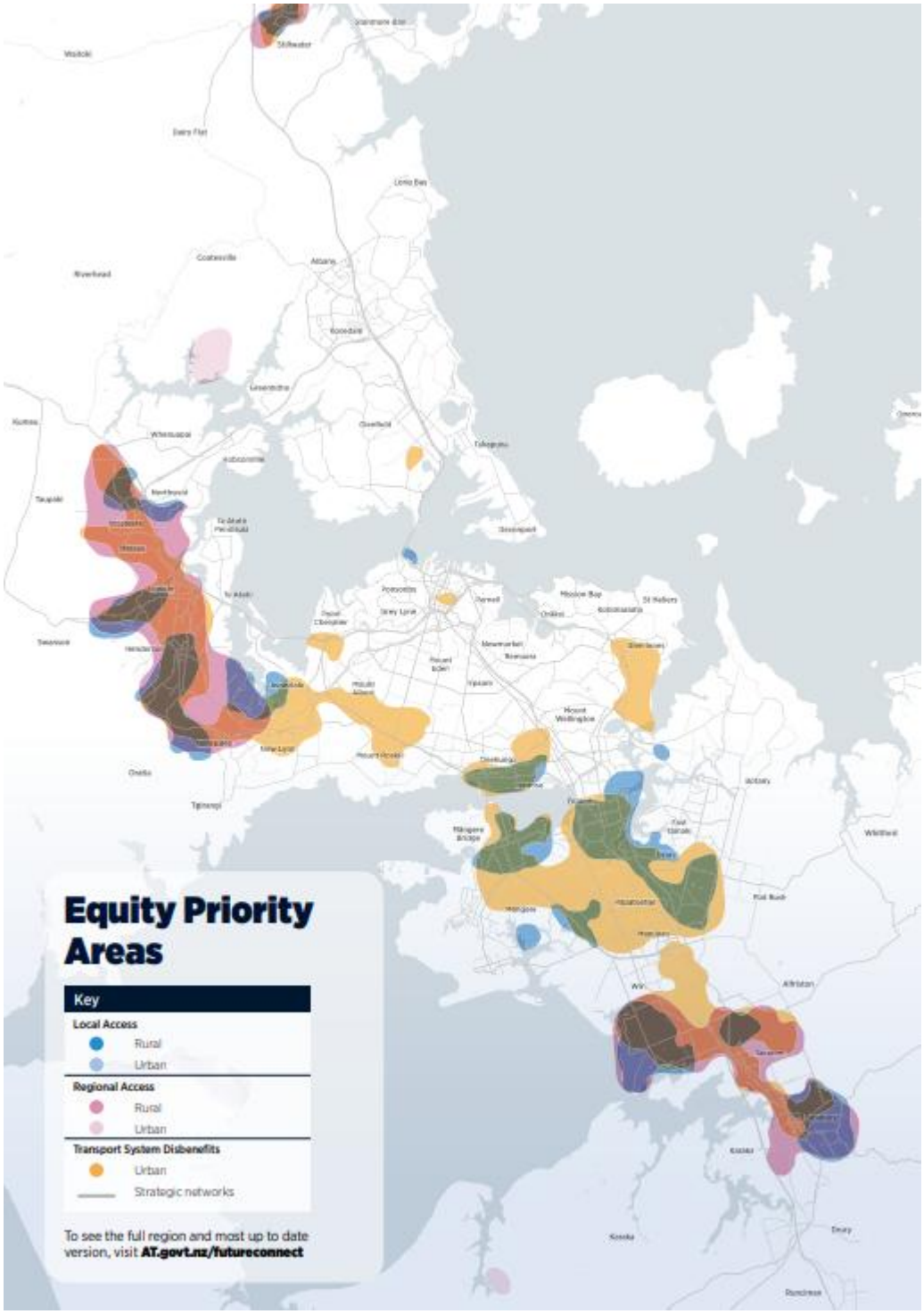
- increasing travel demand from population and economic growth
- urgently and dramatically reducing transport emissions
- improving resilience to the impacts of climate change
- addressing unacceptable safety, health, and resilience deficiencies
- addressing unacceptable impacts of network conflicts, including those between movement and place outcomes
- potentially changing national supply chains, particularly the long-term location of the Ports of Auckland.

Regional transport equity analysis

Future Connect has investigated equity across 3 domains using multiple measures such as distance to nearest essential services, percentage of unsealed roads, jobs accessible by public transport, and community severance. There are slight differences in some measures for urban and rural areas.



This is then overlaid with the NZDep index of social deprivation, which gives an indication of people's ability to overcome transport barriers such as cost. This produces a general view of locational transport inequity.



South and West Auckland face significant deprivation, with poor infrastructure limiting active transport options and high car reliance for daily tasks. These areas have the highest concentration of deprived households and suffer from poor access to regional opportunities. They are also most affected by the movement of others through their communities. Areas with the poorest outcomes, including West Auckland, South Auckland, and Silverdale, align with high growth and greenfield development. Rural satellite areas like Warkworth, Wellsford, Pukekohe, and Waiuku also face multiple issues, though urban areas with moderate deficiencies impact more people.

Appendix D: Focusing effort

This section highlights the key sections and aspects of the Auckland region transport network where effort should be focused to provide the required future level of performance 30 years from today. It provides more detail to the Focusing effort section.

Looking at the national picture across the New Zealand transport network, a fit-for-purpose land transport network in 30 years will need to:

- provide affordable, convenient, safe, and sustainable access for everyone to social, cultural, health, and economic opportunities
- unlink the problem from the corridor and focus on movement patterns instead (a deficiency is not necessarily resolved through improving that particular corridor; this could also be done by improving travel options elsewhere)
- support efficient, resilient, and reliable connections that support economic activity and move goods to market
- deliver safe, healthy and low-emissions travel that avoids harm to people and the environment
- be multi-modal (providing many ways of transportation)
- promote shared modes (such as buses and trains) and active modes (such as walking and cycling)
- plan, design, build, maintain, and operate to minimise waste and use resources efficiently
- respond and adapt to disruption and the impacts of climate change
- consider land use and the regional context
- contribute to the creation of great places
- respect and uphold the mana, taonga, and tikanga of tangata whenua
- minimise environmental impact, protect and enhance biodiversity, and ensure water quality
- provide options for communities with unmet needs
- ensure communities remain socially, economically, and digitally connected through periods of unplanned disruption.

Auckland's transport network will need to change substantially over the next 30 years to address the challenges that exist today, as well as support the region's ongoing success.

The region's transport network has been significantly upgraded during the past 2 decades, with completion of the long-planned motorway network and the beginning of a region-wide rapid transit network. However, public transport and cycle networks remain relatively undeveloped, and most people are dependent on private vehicle use. This is because of a long history of outwards urban growth and imbalanced transport investment to expand the road network.

Addressing the transport challenges in Auckland is especially difficult. This is because of rapid growth and the need to fund the maintenance, operation, and renewal of a growing, dispersed, and heavily used transport network.

Auckland is anticipated to grow and change significantly over the next 30 years. The population is expected to grow by around 520,800 people to a total of 2,230,800. The make-up of that population will change too – the population will be older and more multi-cultural, and households will be smaller.[51]

[51] Auckland Council (2023). Future Development Strategy. https://www.aucklandcouncil.govt.nz/plans-projects-policies-reports-bylaws/our-plans-strategies/auckland-plan/development-strategy/Pages/default.aspx

In light of increased extreme weather events, the next 30 years will present long-term resilience challenges as the likelihood of damaged roads and rail networks grows. It will be necessary to work with communities to:

- understand climate adaptation
- identify and prioritise responses in high-risk areas
- identify sections of the network prone to closure
- plan to avoid infrastructure and development in high-risk areas.

It's becoming more expensive to operate, maintain, and renew existing assets and services, because of greater use and past under-investment. Delivering new infrastructure is also becoming more expensive as land prices soar and more sophisticated solutions, such as tunnelling, are required.

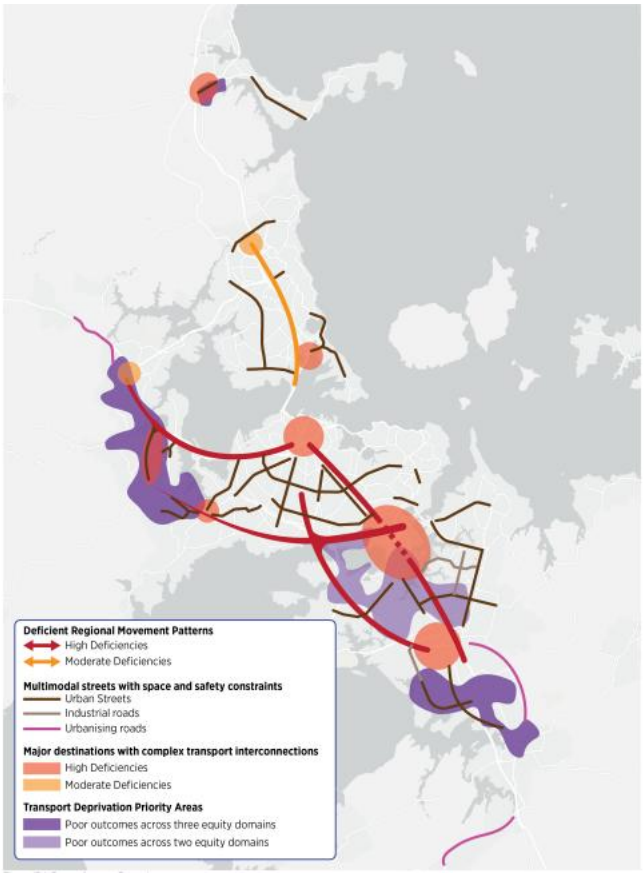
Steps to make sure transport outcomes are delivered in a more efficient and effective way include:

- increasing the focus on small-scale projects across more locations in response to the uncertainty about where growth will occur – this includes getting more from existing infrastructure and services
- increasing use of active modes and public transport by reallocating existing road space and making temporary or low-cost improvements
- influencing travel behaviour through pricing tools.

The appropriate level of performance according to Future Connect's assessment of Auckland's regional network means focusing effort on the following:

1. **Improving regional movement patterns between key employment destinations and areas of poor access in the south and west**.
   People moving between these areas often lack travel choices, and predominantly rely on motorways that are heavily congested and carry high risk of harm.
2. **Clusters of deficiencies in and around key destinations with complex transport interconnections.**
   Key destinations such as town and metropolitan centres and major industrial areas, where the regional and local transport networks interchange with one another. In these areas, various modes are interfacing and interchanging with one another.
3. **Multi-modal streets with space and safety constraints.**
   Key local corridors that have multi-modal demand, with deficiencies for multiple modes and often safety. These include older urban streets that traverse diverse and well-established land uses, industrial roads with a significant role in the freight network and urbanising (former rural) roads that connect growth areas to the city.
4. **Areas of transport deprivation**.
   The Future Connect transport equity analysis highlighted areas in South and West Auckland where communities experience poor outcomes across all domains (local and regional access, transport disbenefits). People in these areas face some of the most significant disadvantage in the region.

The map below highlights the main areas of future focus within Auckland city.



Focusing effort on the Auckland state highway network

The cumulative risk table below shows the road corridors where the safety, resilience and journey reliability risks overlap and indicates the road sections where effort should be focused in the first instance.

Cumulative risk

Very high risk	
SH1	Northcote Point to Drury
SH16	I/S SH20 to I/S SH1
SH20	Whole corridor

High risk	
SH1	Albany to Northcote Point
SH16	Whole corridor

Road segments with medium-high to critical deficiencies (below) should be investigated further and in more detail to understand the degree with which these deficiencies can be managed through targeted maintenance and renewals, incremental change, or whether a targeted intervention is required

Resilience risk

Critical risk	
SH1	Warkworth To Brynderwyn
SH1	Ellerslie to Drury
SH16	Kumeū to Wellsford

High risk	
SH1	Northcote Point to Ellerslie
SH16	I/S SH20 to I/S SH1
SH18	Whole corridor
SH20	Whole corridor
SH22	Whole corridor

Travel time reliability risk

Frequently operating at over capacity	
SH1	Silverdale to Pokeno
SH16	Kumeū to Tamaki Drive
SH18	Whole corridor
SH20	Whole corridor

Operating at capacity for key periods	
SH1	Warkworth to Silverdale
SH20B	Whole corridor

Safety risk

High risk	
SH1	Albany to Pokeno
SH16	I/S SH18 to I/S SH1
SH20	Whole corridor

Medium-high risk	
SH1	Brynderwyn to Warkworth
SH16	Wellsford to Kumeū
SH18	Whole corridor
SH20A	Whole corridor
SH22	Whole corridor

Focusing effort on the Auckland strategic network

Arataki has identified the strategic network components, reviewed their current performance, and identified where transformational change is potentially required for the strategic network to perform as it should between now and over the next 30 years. This is where parts of the network are either underdeveloped, or the scale of change is beyond what can be achieved through ongoing programmes.

The table below identifies the Auckland strategic network sections potentially requiring transformational change and gives the strategic directions to move towards closing the network's performance gaps.

Location	Type	Key drivers of need for transformational change	What has previous work confirmed?	Strategic direction/Next steps
Brynderwyns to Warkworth	Road	• Very high safety risk, especially through Dome Valley and around the Brynderwyns. • Hilly and low-standard corridor for such a critical link. • Little resilience as the only main road connection between Tāmaki Makaurau and Northland. • Incremental programmes are in progress and should continue, but need to be developed with a long-term plan in mind.	• Warkworth to Wellsford route protection work has confirmed this as the preferred long-term route for this section. • A combination of online and offline improvements to progress over 30 years. • Current focus on addressing critical safety issues and resilience.	• Confirm plan from current programmes of improvement through to preferred long-term corridor form. • Complete route protection process for Warkworth to Wellsford project.
Orewa to Auckland City Centre	Road, rapid transit, walking, and cycling	• Resilience issues on the Auckland Harbour Bridge and its approaches. • Forecast growth and capacity constraints on Northern Busway and Northern Motorway that can't be fully addressed through small-scale improvements. • All-day congestion is forecasted, despite significant improvements to public transport and active modes. • Gaps in the active mode and rapid transit networks. • Extremely high forecast demand for public transport which, if not provided for, will undermine mode shift and urban form outcomes.	• Business case work for additional Waitematā Harbour connections confirmed need for a programme of work that includes busway enhancements, an additional rapid transit connection, and improvements to road connectivity. • Growth-planning work confirmed the need for strategic roading corridor upgrades between Orewa and Albany. • New and upgraded interchanges with enhanced capacity and public transport priority. • No walking and cycling structure can be attached to the existing Harbour Bridge – a connection alongside SH1 is preferred (Harbour Bridge to Albany).	• Confirm the preferred additional Waitematā Harbour connections option with partners. • Complete route-protection work between Albany and Orewa. • Confirm programme of improvements over time.
Tāmaki Makaurau: Upper Harbour	Rapid transit	• Significant forecast growth in corridors and limited capacity on SH18 corridor mean there's a need to increase capacity by introducing rapid transit. • A connection between critical-growth nodes of Westgate and Albany is necessary to realise the potential of these locations. • Provides network-level benefits by connecting Northwest and North Shore rapid transit.	• Some work on corridor protection as part of SH18 development. • High-level work confirmed bus rapid transit as most likely mode, and potential station locations.	• Need to confirm design and plan to implementation, potentially through a series of interventions over time.

Location	Type	Key drivers of need for transformational change	What has previous work confirmed?	Strategic direction/Next steps
Tāmaki Makaurau: Westgate to Kumeū/ Huapai	Road and rapid transit	• Very significant future growth planned in Northwest Auckland – this will create fundamental place and movement conflicts, especially through Whenuapai and Kumeū/Huapai. • Northwest Auckland has relatively poor access to employment and travel choice – this results in high car dependency and significant congestion.	• Supporting Growth Alliance work and SH16/18 work identified preferred future solutions – the focus on removing traffic from key value locations by motorway-to-motorway links, enhancing interchanges, and a bypass of Kumeū /Huapai. • Rapid transit between Westgate and Kumeū /Huapai confirmed necessary, as part of wider Northwest Rapid Transit corridor.	• Focus on timing, when different investments are needed, and how investments should integrate with development and the wider transport network to achieve key outcomes.
Tāmaki Makaurau: City Centre to Westgate	Rapid transit	• Significant forecast growth and major reliance on the single-lane SH16 corridor – need to dramatically increase the corridor's capacity by introducing rapid transit. • Northwest part of Auckland has relatively poor access to employment and travel choice. • High levels of car dependency and relatively high deprivation in many areas.	• Planning and business-case work confirmed the need for rapid transit, alignment, and the preferred mode as either bus rapid transit or light-rail. • Regional-planning work confirmed corridor as a high priority. • Interim bus improvements are in progress.	• Confirm mode and design. • Confirm timeframe for implementation, including progression from short-term bus improvements to a more permanent solution.
Tāmaki Makaurau: City Centre to Māngere	Rapid transit	• Growing public transport demand can't be met through incremental improvements to bus system because of capacity constraints in city centre and on key approaches. • Encourage more of Auckland's future growth into this corridor for regional-level benefits. • Access and travel choice deficiencies in parts of the corridor contribute to deprivation.	• Several previous business cases, most recently culminating in an indicative business case, confirmed light-rail with tunnelled sections.	• Confirm project design and implementation pathway. • Integrate with wider rapid transit network, especially Northwest and North Shore corridors.
Tāmaki Makaurau: Cross-Isthmus	Rapid transit	• Links up several rapid transit corridors, providing faster journeys across Tāmaki Makaurau. • Enables, supports, and shapes significant potential growth across a part of Tāmaki Makaurau well suited to transformational change.	• Little planning work to date. • Rail planning work has suggested the potential need for a freight-focused rail corridor using the long-designated Avondale-Southdown route – this could also be used by passenger services.	• Need to confirm extent of corridor, alignment, and mode. • Develop a pathway to implementation.
Neilson Street, Tāmaki Makaurau	Road	• Nationally-significant freight corridor and location faces highly complex challenges and conflicting movements. • Indirect strategic connections result in heavy freight movements on local roads and reduced efficiency.	• Designation for full East West Link acquired. • Some incremental improvements done, particularly at the eastern end and near Great South Road.	• Confirm a progressive programme of improvements that align with policy direction and priorities. • Identify smaller-scale improvements to be made in the short term.

Location	Type	Key drivers of need for transformational change	What has previous work confirmed?	Strategic direction/Next steps
Tāmaki Makaurau: Eastern Busway	Rapid transit	• Improve travel choice for a large part of Tāmaki Makaurau that's very car dependent. • Increase people capacity along a corridor that's constrained and under pressure.	• Extensive work confirmed project design.	• Construction to start shortly.
Tāmaki Makaurau: Airport to Botany	Rapid transit	• Transformational access improvements to South Auckland's two major future employment nodes – Manukau and Auckland Airport. • Improve travel options for southeast Auckland, which is highly dependent on cars. • Support major growth opportunities, especially at Botany, Flat Bush, Manukau, Puhinui, and Auckland Airport.	• Business case confirmed route and mode (bus rapid transit). • Previous business case identified a progressive implementation pathway, starting with service improvements and minor infrastructure upgrades.	• Secure the route through a designation process. • Begin progressive implementation of corridor.
Auckland Rail Network	Rail and rapid transit	• Enable the heavy rail network to play a larger role in moving people and freight, and an emerging role in inter-city passenger movement – this will help reduce private-vehicle reliance and improve access to opportunities. • Realise the full benefits of City Rail Link. • Reduce resilience, safety, and capacity constraints on the rail network.	• Rail network not likely to grow substantially over time in Tāmaki Makaurau – other modes are more suitable for new rapid transit corridors. • Additional tracks required to reduce conflicts between different services (metro rail, freight, intercity rail), especially between Westfield and Pukekohe – tracks will enable express- and limited-stop services to growing South Auckland areas. • Level crossings to be removed from the network over time. • Further tranches of trains, and supporting infrastructure, required to increase capacity over time.	• Rail programme business case will provide a view of how the rail network needs to evolve over time to meet future requirements, including maximising full benefit of the City Rail Link. • Complete current tranche of rail network improvements.
Tāmaki Makaurau Auckland Cycling Network	Walking and cycling	• Need to rapidly provide additional connections across the city. • Safety challenges for non-protected parts of the network. • Significant shift to cycling (7%) required to support emissions and mode shift goals.	• Active modes and micromobility business case identified priority routes and locations.	• Identify additional funding sources to support progress towards full implementation. • Support policy changes to enable progress.
Drury to Pukekohe	Road	• Very significant growth in the Drury, Paerata, and Pukekohe areas will create fundamental place and movement conflicts – will require urbanisation of the existing road. • Significant safety risks along the corridor.	• Supporting Growth Alliance work to confirm the form and function of the current corridor, and will consider if alternative corridors are needed.	• Confirm long-term transport network. • Integrate short-term upgrades to align across programmes and outcomes.

Appendix E: Intervention Catalogue

As part of the PIE programme, NZTA is developing the Intervention Catalogue (IC) tool, which compiles a wide range of empirical data relating to the implementation of transport projects and how effective they have been in achieving the intended outcomes. We'll continue to add to this over time, using data from benefit realisation associated with the investment logic mapping (ILM) process.

An AI interface for supporting queries and providing relevant evidence is currently being investigated.

For this evidence pack, a limited subset of data (related to 80 interventions) based on the KonSULT knowledgebase maintained by the University of Leeds in the UK, on sustainable urban land use and transport has been made available to demonstrate how IC might be applied to explore and identify the effectiveness of various interventions as part of the option formulation process.

Effectiveness is reported using a simple qualitative 1–5 scale that is indicative rather than absolute, and results may vary based on context.

The screenshot in Figure shows the interventions we extracted from the KonSULT knowledgebase. This data is available in the summary spreadsheet: Extract-of-IC-KonSULT-data-(interventions-typology).xlsx.

Figure 8: Extract of IC KonSULT data

We've used the data shown in Figure to create a draft interactive tool (Spreadsheet-deficiency-to-intervention-example.xlsx) that allows users to explore the effectiveness and trade-offs associated with a range of interventions that are associated with a user-specified list of issues or deficiencies.

The tables shown in the screenshots below are examples of how the tool can be used (and is not necessarily recommending any of the interventions currently selected).

User Inputs	Intervention Catalogue	Intervention Catalogue		4) Select Area Type	5) Review likely effectiveness of se	
Issue/Deficiency	Intervention Group	IC Interventions	IC Lever		Effectiveness	Cost
1) User to provide list of issues/deficencies below	2) User drop down menus to explore availble Groups	3) User drop down menus to explore Interventions in Group		Area	(1-5)	Min. Max.
Consolidate growth, shorten trip lengths, co locating transport hubs with community services	Regulation (pricing and incentives)	Public transport fare reductions	Pricing	Tier 1	3	0 0
Design and Planning - adaptable 'scenarios-based' (defend, accommodate, retreat), identify critical routes, improve operational responses to events	Spatial and place-based planning	Design and Planning	Resiliance	Tier 1	0	0 0
perceived safety (incl. crime)	Deliver new or upgraded infrastructure and services	Safe system approach	Safe System	Tier 1	4	0 0
prioritise low risk low cost maintenance projects	Maintain and optimise existing networks and services	Maintaining the existing road network level of service	Infrastructure	Tier 1	3	0 1
Implement high quality improvements that bring about mode change	Maintain and optimise existing networks and services	Conversion of road capacity to shared and active modes	Optimisation	Tier 1	2	0 2
perceived safety (incl. crime)	Deliver new or upgraded infrastructure and services	Safe system approach	Safe System	Tier 1	4	0 0
rapid transport network	Spatial and place-based planning	Spatially integrated land use and transport networks	Multi-modal planning	Tier 1	4	0 1
Improved services	Deliver new or upgraded infrastructure and services	Fixed line mass public transport	Public transport	Tier 1	3	0 5
Road pricing	Regulation (pricing and incentives)	Time and distance based charges	Pricing	Tier 1	2	-4 0
PT Fares	Regulation (pricing and incentives)	Public transport fare reductions	Pricing	Tier 1	3	0 0
Road safety plans, safe speed limits, reduce dangerous behavior	Deliver new or upgraded infrastructure and services	Safe system approach	Safe System	Tier 1	4	0 0
Encourage Evs (low emission zones)	Maintain and optimise existing networks and services	Banning polluting vehicles from a defined area	Management	Tier 1	2	0 1
Encourage active modes	Deliver new or upgraded infrastructure and services	Networks for small, low powered, low speed transport devices	MAAS	Tier 1	4	0 1
Encourage active modes	Education and awareness	School based travel behaviour change	Travel reduction	Tier 1	4	0 1
Accessible infrastructure	Deliver new or upgraded infrastructure and services	On call shared transport	Public transport	Tier 1	2	0 1
Adaptable approach to road space management (e-scooters)	Deliver new or upgraded infrastructure and services	Networks for small, low powered, low speed transport devices	MAAS	Tier 1	4	0 1
More Freq Rail &PT Services	Deliver new or upgraded infrastructure and services	New rail services on existing lines	Public transport	Tier 1	1	0 3
Bus Priority	Maintain and optimise existing networks and services	Reduce journey times and improve reliability of bus services	Public transport	Tier 1	3	0 1

Figure 9: Example of using tool to explore overall effectiveness and cost of potential interventions based on a list of user specified deficiencies or issues (entered in the first column)

User Inputs	Intervention Catalogue	MoT Outcome(s)											
Issue/Deficiency	IC Interventions	Economic prosperity		Environment		Health		Inclusive access		Safety		Resilience	
1) User to provide list of issues/deficencies below	3) User drop down menus to explore Interventions in Group	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
Consolidate growth, shorten trip lengths, co locating transport hubs with community services	Public transport fare reductions	0	0	0	2	0	2	0	4	0	1	0	0
Design and Planning - adaptable 'scenarios-based' (defend, accommodate, retreat), identify critical routes, improve operational responses to events	Design and Planning	0	0	0	0	0	0	0	0	0	0	0	0
perceived safety (incl. crime)	Safe system approach	-2	2	-1	3	0	0	0	3	0	5	0	0
prioritise low risk low cost maintenance projects	Maintaining the existing road network level of service	0	1	0	2	0	1	0	3	0	3	0	2
Implement high quality improvements that bring about mode change	Conversion of road capacity to shared and active modes	-1	2	-1	3	-1	4	0	3	0	3	0	0
perceived safety (incl. crime)	Safe system approach	-2	2	-1	3	0	0	0	3	0	5	0	0
rapid transport network	Spatially integrated land use and transport networks	0	3	0	2	0	3	0	4	0	3	0	0
Improved services	Fixed line mass public transport	-1	3	0	2	0	0	0	2	0	3	0	0
Road pricing	Time and distance based charges	0	3	0	4	0	3	-3	3	0	3	0	0
PT Fares	Public transport fare reductions	0	0	0	2	0	2	0	4	0	1	0	0
Road safety plans, safe speed limits, reduce dangerous behavior	Safe system approach	-2	2	-1	3	0	0	0	3	0	5	0	0
Encourage Evs (low emission zones)	Banning polluting vehicles from a defined area	-2	0	0	1	0	4	-2	0	0	1	0	0
Encourage active modes	Networks for small, low powered, low speed transport devices	0	0	-1	1	0	0	0	2	-1	0	0	0
Encourage active modes	School based travel behaviour change	0	1	0	3	0	3	0	1	0	4	0	0
Accessible infrastructure	On call shared transport	0	0	0	1	0	1	0	3	0	1	0	0
Adaptable approach to road space management (e-scooters)	Networks for small, low powered, low speed transport devices	0	0	-1	1	0	0	0	2	-1	0	0	0
More Freq Rail &PT Services	New rail services on existing lines	0	0	0	2	0	2	0	3	0	2	0	0
Bus Priority	Reduce journey times and improve reliability of bus services	0	2	0	2	-1	2	0	3	0	2	0	0

Figure 10: Example of using tool to explore overall trade-offs between outcomes associated with potential interventions