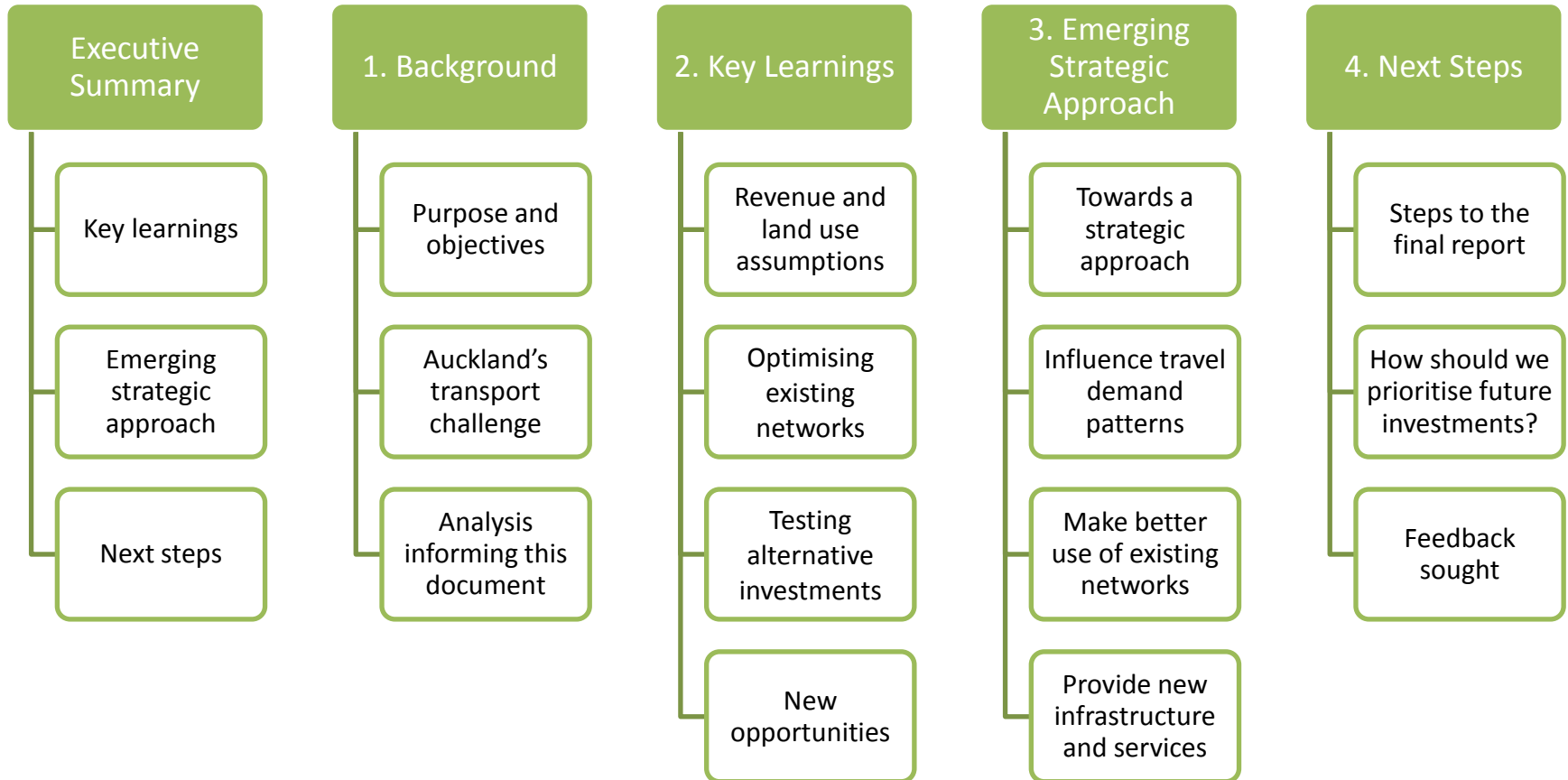


Auckland Transport Alignment Project

Interim Report: Findings and Conclusions – May 2016



Document Structure



Executive Summary

Key learnings

Emerging strategic approach

Next steps

Executive Summary



Key Learnings

This report is the second ATAP deliverable. It presents interim findings and conclusions from the work undertaken to date and sets out the emerging strategic approach for review and feedback from the project parties.

Short-term funding plans are mostly committed

There is limited forecast discretionary funding available for investment in the short term, as much of the Decade 1 programme is already committed to significant investments including the City Rail Link, East West Connection, Puhoi-Warkworth, and the Accelerated Motorway Package.

Even with these investments in place, there is a projected decline in network performance by 2026. This problem will be exacerbated if, as recent trends suggest, growth is faster than the medium population projection assumed in ATAP.

We have developed two alternative scenarios to estimate future revenue available for transport in Auckland: one based on maintaining current per capita investment, and another maintaining the current share of Auckland's GDP invested in transport. These provide an indication of likely future affordability, but are above currently forecast funding levels.

Changing the investment mix will not achieve a step-change

The vast majority of Auckland's future transport network already exists today. To help accommodate growth, the productivity of this existing network needs to improve. This requires a combination of better network optimisation, continued improvements to asset management, and a greater focus on Intelligent Transport Systems (ITS).

It is possible to deliver better results by changing the mix of investments within existing funding constraints, but this will not deliver a major improvement in regional outcomes over and above the current plan (the Auckland Plan Transport Network, or APTN).

However there are differences in impact at the sub-regional level, and specific interventions can help improve accessibility in the west and south, which were identified as problem areas in the Foundation Report.

A greater focus on influencing demand patterns has benefits

New initiatives, including variable network pricing (directly charging for road use and varying charges by location and time of day), shared mobility and connected vehicle technology, would have a potentially significant positive impact on system performance.

Pricing has major potential to influence travel demand patterns and improve network productivity but would require substantial further investigation. A work programme, which could start this year, would be needed to address a broad range of implementation challenges.

A variety of specific transport challenges need to be addressed

Continued growth in public transport ridership will put pressure on key corridors into the central area. Efficiency improvements can address these challenges in the short term, but beyond that substantial further capacity increases will be required.

The existing Auckland Harbour Bridge has limits on its ability to cater for heavy traffic growth, but a new crossing has very high opportunity costs. Route protection for a new crossing needs to progress. However, a clearer understanding of cost and benefits, and better integration between road and public transport, is needed.

Enabling growth in newly developing areas requires significant transport investment. Early investment in route protection and land acquisition is critical, and an early start is needed on key connections in the north-west, the south and to support Special Housing Areas. In the existing urban area, the location of growth and intensification will affect the timing and priority of transport investments.

Towards a strategic approach: embracing new opportunities

- Historically, our approach to dealing with Auckland’s transport issues has focused on investment in roading and public transport infrastructure and services, and optimising where possible to make better use of existing assets.
- Over time, this approach has become increasingly expensive and has struggled to keep pace with the demands that growth is placing on the system. Our analysis has shown that continuing on this path can deliver localised benefits, but will not provide the step change in transport system performance that Auckland needs.

To achieve this, a change in approach is needed. Where should we focus our efforts?

Should we build more?

One path is to focus on greater transport ‘supply-side’ provision by significantly accelerating the development of new infrastructure and services, to enable supply to get ahead of growth in demand.

Although this option has not been specifically tested to date, our analysis suggests that this would be a very expensive approach, with diminishing returns over time. As growing cities around the world are finding, adding new infrastructure in existing urban areas requires increasingly expensive solutions. Only building our way out of the problem does not offer a compelling future.

Or should we address demand?

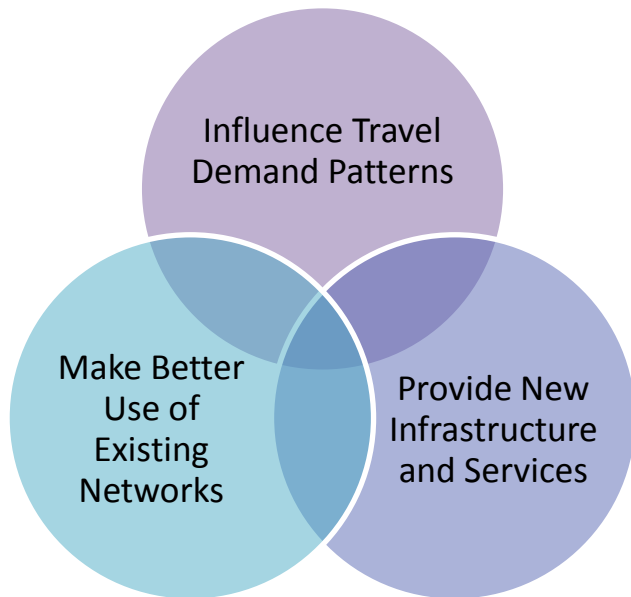
An alternative path is to take advantage of new demand-side opportunities that have previously not been available. Rapid advances in transport and communications technology provide opportunities to influence the demand for private vehicle travel, through variable road pricing and the emergence of “mobility as a service” technologies. In addition, advances in intelligent transport system (ITS) and vehicle connectivity provide the opportunity for significant gains in network productivity.

Our analysis has shown that, in combination, these initiatives have the potential to provide a step change in system performance.

- Auckland’s continued growth means there is a need to continue work on optimising the current network, and adding new infrastructure and services. However, these actions will not on their own be sufficient. To make a real difference, we need to also take advantage of new demand-side opportunities, and ensure these are integrated with our investments and optimisation plans.

Emerging strategic approach

The emerging strategic approach involves an integrated combination of three types of intervention



Influence Travel Demand Patterns

- Ensure land-use decisions support an efficient transport network
- Maximise opportunities from new technologies to increase vehicle occupancy and throughput
- Progressively introduce a variable network pricing system to encourage more efficient travel patterns and reduce the long-term need for investment

Provide New Infrastructure and Services

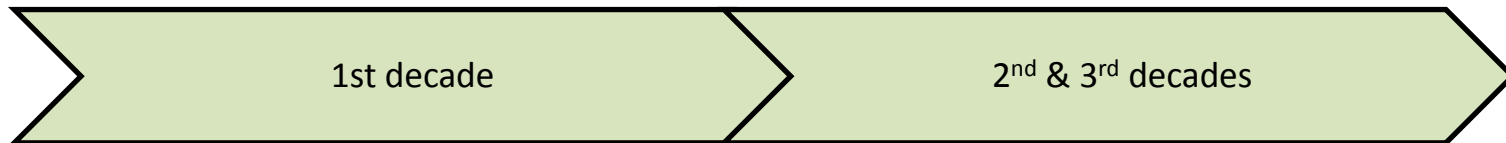
- Tailor solutions to suit different circumstances
- Ensure transport enables and supports growth to address Auckland's housing challenge
- Strengthen strategic road, rail and public transport networks to ensure sufficient capacity, resilience and efficiency

Make Better Use of Existing Networks

- Better prioritise existing networks to more effectively deliver their required tasks
- Continue to improve efficiencies in maintaining, operating and renewing existing networks
- Accelerate the use of intelligent transport systems to provide real-time information and enable the benefits of emerging technologies

Recommended pathway

- The recommended approach requires a strong commitment to influencing travel demand patterns. This brings some implementation challenges, but the potential gains mean that a proactive approach is justified.
- In the short term this means prioritising resources towards making the transport system “technology ready”, and laying the groundwork for variable network pricing, to enable a staged implementation.
- Because the benefits from these demand-side interventions may take some time to materialise, we need to ensure that progress is made on investments to improve our strategic networks and support Auckland’s growth. Priority should be given to investments that will be required regardless of pricing or technology changes and those that enable and support Auckland’s continued growth.



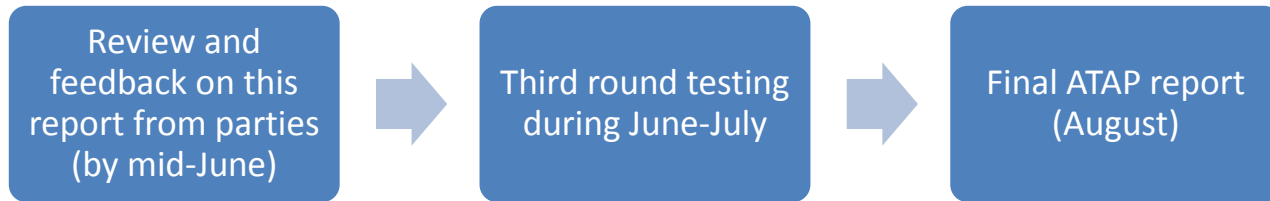
- Better optimise use of the existing transport network
- Remove barriers to new technology and provide incentives to encourage uptake
- Pave the way for the staged implementation of variable network pricing
- Prioritise investments that facilitate early implementation of tools to influence demand
- Prioritise route protection, land acquisition and commence delivery of infrastructure in growth areas

- Accelerate uptake and implementation of new tools
- Address public transport capacity constraints that may be exacerbated by pricing
- Continue base investment to enable and support growth

Implementing the recommended strategic approach will require the following issues to be addressed:

- How we accelerate a range of complementary interventions to influence future demand: including ride share services, connected vehicles, and pricing
- Whether to change level of investment in the first decade
- Where to focus early investment

Next steps will incorporate feedback with further analysis



The next stage of the project will include further modelling and evaluation to supplement the work to date, and provide sufficient evidence to support the recommended approach, and demonstrate its costs and benefits.

A prioritisation framework consistent with the preferred strategic approach will be developed. In delivering value for money, recommended prioritisation criteria should include :

- Address most severe deficiencies against ATAP objectives
- Resilience to a range of different futures (pricing and technology)
- Unlock growth required for Auckland

Feedback on the following issues will be particularly useful to the project team:

- Is the emerging strategic approach supported?
- Do the parties support a move to embrace new technologies and demand management (variable pricing) as part of the preferred approach?
- Are there any differences in approach that should be considered?
- Are the recommended prioritisation criteria appropriate?
- Are there any additional issues that need to be addressed or options tested in the next phase of the project?

1. Background

1. Background

Purpose and objectives

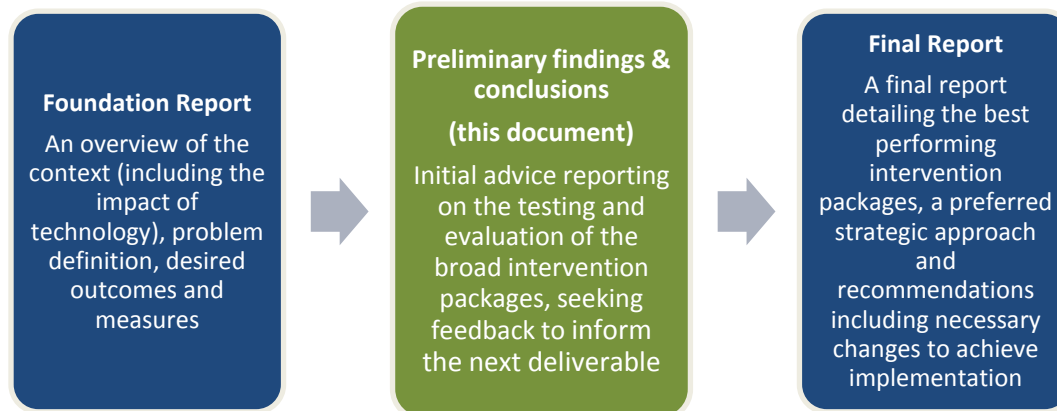
Auckland's transport challenge

Analysis informing this document



Purpose and objectives

ATAP Purpose and Objectives	Purpose of this Document
<p>The focus of the project is to test whether better returns from transport investment can be achieved in the medium and long-term, particularly in relation to the following objectives:</p> <ul style="list-style-type: none"> • To support economic growth and increased productivity by ensuring that access to employment/labour improves relative to current levels as Auckland's population grows • To improve congestion results, relative to predicted levels, in particular travel time and reliability, in the peak period and to ensure congestion does not become widespread during working hours • To improve public transport's mode share, relative to predicted results, where it will address congestion • To ensure any increases in the financial costs of using the transport system deliver net benefits to users of the system 	<ul style="list-style-type: none"> • This is the second Auckland Transport Alignment Project (ATAP) deliverable and presents initial findings and conclusions from analysis undertaken to date • The document sets out an emerging strategic approach, based on these findings. It also identifies further work that is planned to inform the Final Report • Feedback from the parties on this report will be used to help shape the Final Report, which is due for completion in August 2016



Auckland's transport challenge

The ATAP Foundation Report (released in February 2016) highlighted opportunities and challenges arising from Auckland's future growth.

Foundation Report Findings	Key Issues for ATAP
<ul style="list-style-type: none"> • While growth provides opportunities to capitalise on the benefits of a larger and more diverse labour force, driving productivity and prosperity gains, it also places pressure on transport networks leading to congestion, overcrowding and delays. • Some of most significant transport challenges appear to occur over the next 10 years, with projected congestion increasing to 2026 before flattening and eventually slightly decreasing. Growth in demand over this period means that, despite major investments either underway or committed, car accessibility and congestion results show a decline. • Auckland's fast growth since 2013, the base year for analysis, means that much of this early challenge may have already occurred. • Planned investments beyond the next decade appear to result in some improvements in network performance. • Of particular significance is how the opportunities and challenges from growth vary across different parts of Auckland. The Foundation Report indicated that under current plans there is a substantial and growing gap between areas in relation to their access to employment. Due to their distance from where projected employment growth occurs, the western and southern parts of Auckland appear to face the greatest future transport challenges. 	<p>The Foundation Report highlighted that subsequent stages of the project needed to focus on addressing the following key issues:</p> <p>Access to employment and labour</p> <ul style="list-style-type: none"> • an overall decline in access to employment by car between 2013 and 2036, particularly in the west and south • a low level of improvement in public transport access for people in the south and west, for accessing jobs in the south, and the slowing of public transport access improvements beyond 2026 • the extent to which transport interventions alone can improve access to employment <p>Congestion</p> <ul style="list-style-type: none"> • increased levels of congestion between 2013 and 2036, particularly on the motorway network • key bottlenecks on the motorways and local road network which impact on overall accessibility and trip reliability <p>Public transport mode share</p> <ul style="list-style-type: none"> • investigation of options to increase public transport mode share, particularly attracting longer trips off the motorway network to reduce congestion • the low level of public transport mode share growth in South Auckland, particularly in the first decade.

Analysis informing this document

The findings described in this report come from a range of technical analysis and assessment

Package development, modelling and evaluation	Specialist workstreams	Project team engagement
<ul style="list-style-type: none"> • Two rounds of package development, transport modelling and evaluation assessed different mixes of transport interventions • A variety of road pricing options were tested, informing a refined option that was modelled in combination with a supporting set of infrastructure projects • ‘What if’ technology scenarios looking at connected vehicles and shared mobility were developed and tested 	<ul style="list-style-type: none"> • Specialist reports have been prepared to provide information on the following key topics: • Arterial Roads • Emerging Transport Technologies • Rail Network Development • Freight • Revenue Assumptions 	<ul style="list-style-type: none"> • Ongoing engagement with teams that are undertaking more detailed analysis into major projects, including: • Additional Waitemata Harbour Crossing • Transport for Future Urban Growth • Central Access • North Shore Rapid Transit • Airport Rapid Transit

This work will be fully documented in the Final Report and supporting Working Papers, which are currently in draft

2. Key Learnings

2. Key Learnings

Revenue and
land use
assumptions

Optimising
existing networks

Testing
alternative
investments

New
opportunities



Revenue Assumptions

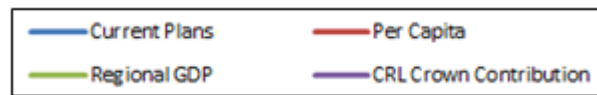
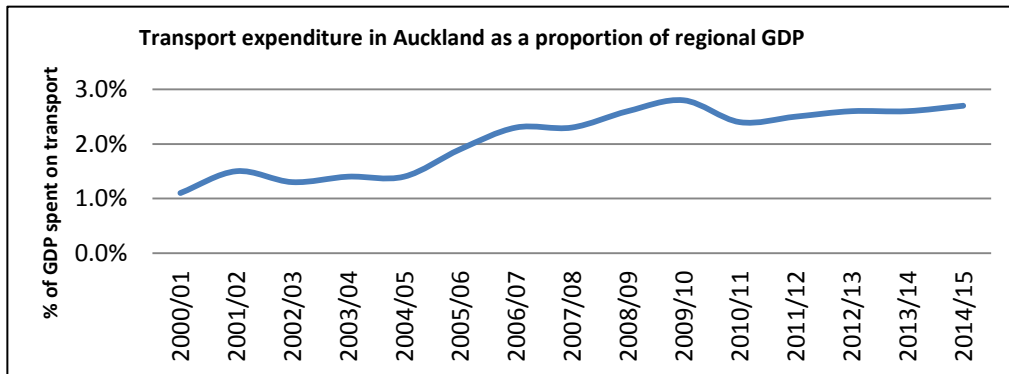
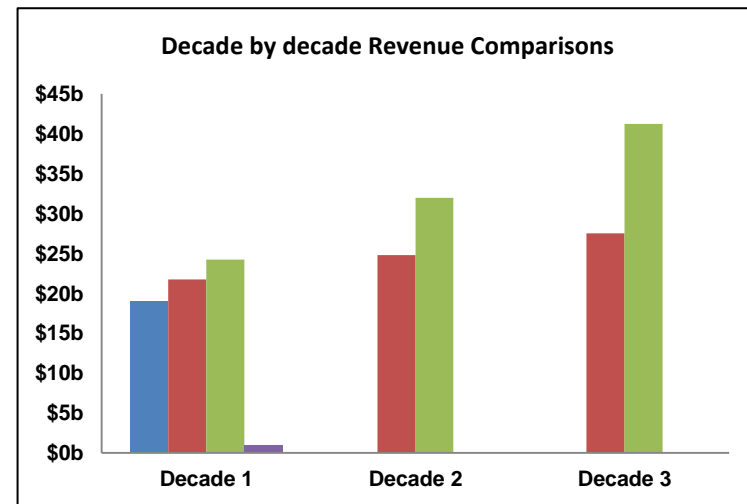
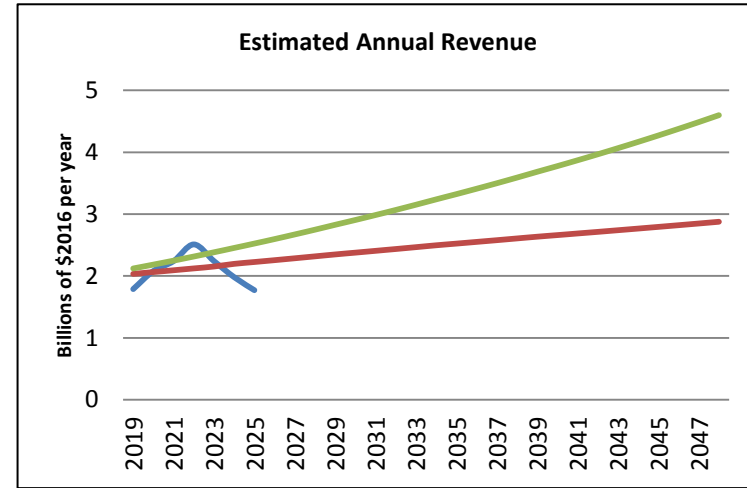
A key part of the project is to determine whether a funding gap exists. This requires an estimate of likely future revenues.

Recent & Planned Investment

- There has been a five-fold increase in transport investment in Auckland over the past 15 years (in nominal terms).
- This rate of growth has outpaced both population and economic growth, meaning that the share of Auckland’s economy being spent on transport has grown from around 1% to above 2.5% since 2000.
- Up to 2022, planned investment continues to grow quickly but subsequently sharply reduces once the City Rail Link is completed.
- Since current plans (Auckland’s Regional Land Transport Plan and the National Land Transport Programme) were published in 2015, there have been some new investment commitments (e.g. East West Connections and pending Crown contribution to City Rail Link).

Future Revenue Assumptions

- Current financial plans only extend out 3-10 years so broad revenue assumptions are required beyond these timeframes.
- Two alternative scenarios were developed to estimate future revenue available for transport in Auckland: one based on maintaining current per capita spending, and another maintaining the current share of Auckland’s GDP invested in transport. These provide an indication of likely future affordability, but are above currently forecast funding levels.
- Over the 30 year period, revenues would be approx. \$74b under the Per Capita scenario and \$97b under the Regional GDP scenario. Most of the difference occurs in the second and third decades
- Under both assumptions (and including an assumed Crown contribution to the City Rail Link) there would be a higher level of revenue than in current plans from 2024 onwards.



Land Use Assumptions

Where and when growth occurs has significant impacts on transport but is highly uncertain. Imbalances between the location of household and employment growth will increase pressure on the transport system.

Assumed Growth Pattern

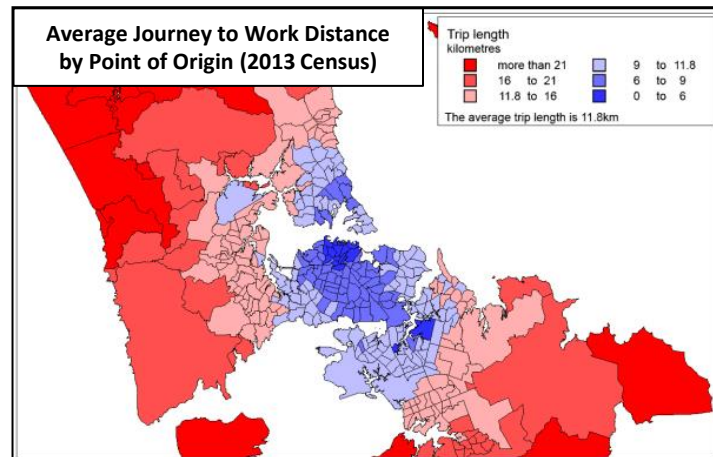
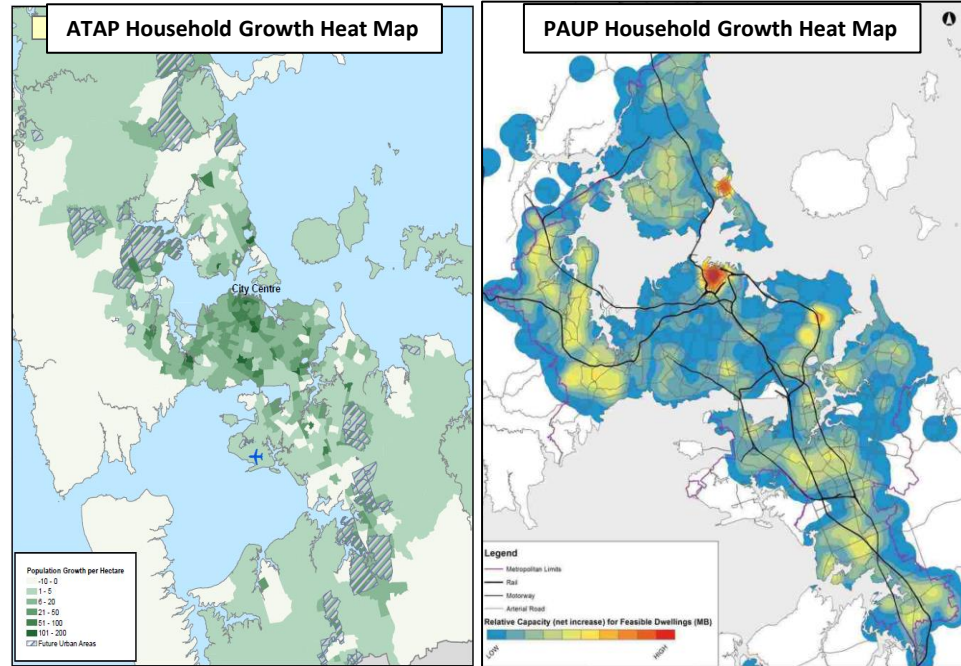
- The assumed pattern of household growth used for this project includes a substantial amount of growth throughout Auckland, including in inner parts of the urban area.
- The assumed pattern of employment growth (which has been peer reviewed) includes a very strong focus of growth in the Central Area and a limited number of other major centres such as the Airport and Westgate/Whenuapai.

Growth Uncertainty

- Where and when growth occurs is subject to a wide variety of factors including the extent to which it is enabled by planning documents, infrastructure provision and market attractiveness. This leads to unavoidable uncertainty about future growth assumptions.
- There are some substantial differences between the growth assumptions used in this project and what is enabled by the Proposed Auckland Unitary Plan (PAUP). This is particularly true in the balance between inner urban and outer urban household growth with the PAUP providing feasible capacity for approximately 50,000 fewer dwellings on the Auckland isthmus than the growth assumptions used in this project.
- Where and when growth occurs affects the timing and priority of transport investments as well as the overall size of the transport challenge faced by Auckland. Depending on the outcome of the Unitary Plan, a greater balance of growth towards outer areas will need to be reflected in the prioritisation of investment.

Effect of Different Growth Patterns

- Average journey distances tend to increase, while the use of public transport, walking and cycling tends to decline, with distance from central Auckland.
- Therefore, the balance between where household and employment growth occurs has important transport implications. Projected trends of widespread household growth and concentrated employment growth contributes to Auckland's growing transport challenge, especially for the West and South which are most distant from where projected employment growth is greatest.
- Increasing household growth in inner areas, or employment growth in outer areas, can help address this imbalance.



Optimising Existing Networks

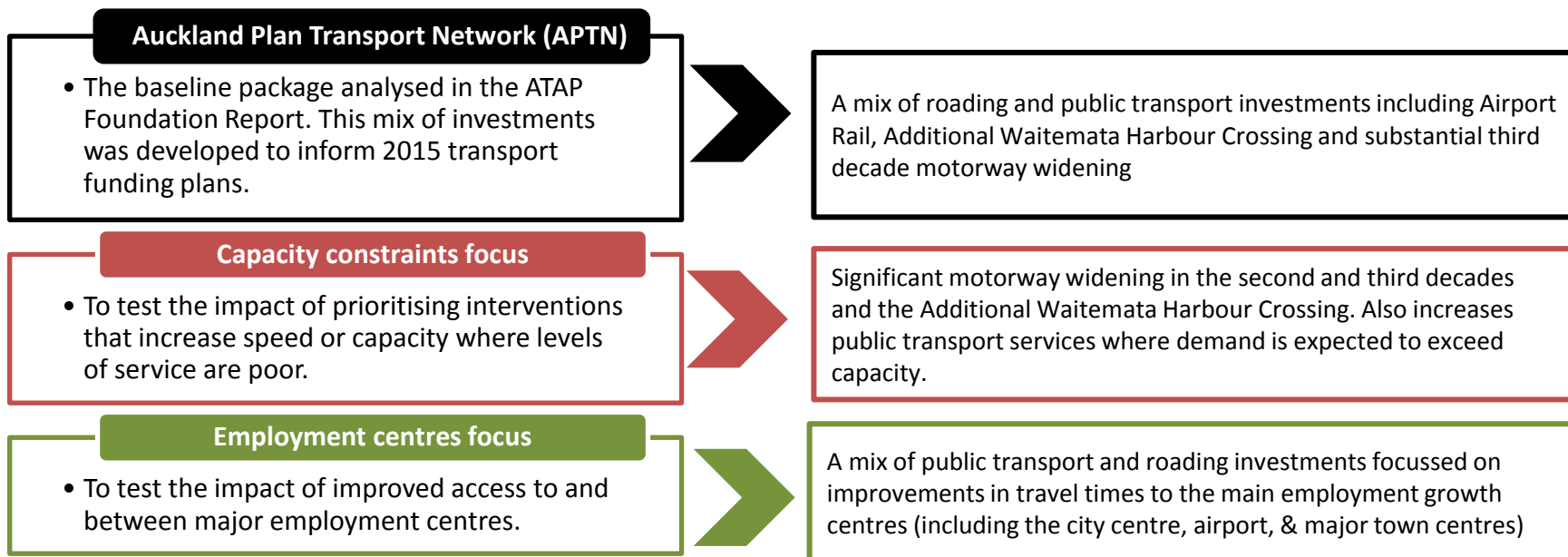
The vast majority of Auckland's future transport network already exists today. To achieve ATAP objectives, it is critical to get more out of the existing network.

We have looked at opportunities to improve in three key areas:

Network Prioritisation	Maintenance, Renewals and Operations	Intelligent Transport Systems												
<ul style="list-style-type: none"> Key challenge in providing for many competitive uses in the same corridors. Challenge is most acute on the arterial road network that have traffic, freight, public transport, walking & cycling, property access and place functions. No over-arching framework currently exists to guide trade-offs between competing uses for space on the arterial road network. To better optimise, greater specialisation of routes (e.g. general traffic, freight, public transport, place-making, cycling etc.) is required that balances network and place requirements. Major gains can be made in short-term by removing on-street parking, extending bus lane operating hours and improving pedestrian facilities in high volume areas. Often these changes can be difficult to implement, but they are very important and must be pursued. 	<ul style="list-style-type: none"> Looking after current assets is crucial but is becoming more expensive as the asset base grows. Current projections suggest that the share of transport expenditure going to maintenance, operations and renewals will grow over time. Key drivers of this projected growth are public transport service costs, increased heavy vehicle traffic, and maintaining/renewing new and more complex assets. (e.g. tunnels). There appears to be scope for further improving efficiencies in this area through increased use of technology for monitoring assets and new ways of delivering public transport services (e.g. ridesharing or driverless vehicles) <div data-bbox="707 1015 1251 1353" data-label="Figure"> <p>Projected Share of Available Funding: MO&R vs New Capex</p> <table border="1"> <thead> <tr> <th>Decade</th> <th>Maintenance, Operations & Renewals (%)</th> <th>New Capex (%)</th> </tr> </thead> <tbody> <tr> <td>First Decade</td> <td>59%</td> <td>41%</td> </tr> <tr> <td>Second Decade</td> <td>64%</td> <td>36%</td> </tr> <tr> <td>Third Decade</td> <td>71%</td> <td>29%</td> </tr> </tbody> </table> </div>	Decade	Maintenance, Operations & Renewals (%)	New Capex (%)	First Decade	59%	41%	Second Decade	64%	36%	Third Decade	71%	29%	<ul style="list-style-type: none"> Intelligent network management encompasses a wide variety of distinct interventions designed to enable a comprehensive real-time understanding of network use, the ability to intervene to manage dynamically travel demand, and the associated data processing capability to perform these functions. Better network management can improve the utilisation of existing infrastructure - for example by re-routing traffic in response to congestion or incidents. It can also inform where to target maintenance and renewals expenditure and allow better planning of new infrastructure investment. Increasing investment in this area would enable more comprehensive real time information and analytics and better traffic management tools. Early investment is also necessary to capture the full benefits of emerging technologies, particularly vehicle-to-infrastructure communication.
Decade	Maintenance, Operations & Renewals (%)	New Capex (%)												
First Decade	59%	41%												
Second Decade	64%	36%												
Third Decade	71%	29%												

Testing Alternative Investments

An important part of the work to date has been the testing of different intervention packages, to determine whether better results can be achieved by changing the mix of investment. Themed packages involving similar levels of investment were tested:



The next slides summarise the key findings from these package tests, and the extent to which different investments can address:

- Regional transport challenges: whether better results against ATAP objectives can be delivered at the region-wide level
- Access challenges in the South and West: whether better results can be achieved in areas where deficiencies have been identified

They also include a summary of findings from an assessment of key constraints and challenges that have been identified, including:

- Public transport capacity constraints
- Auckland Harbour Bridge constraints
- Auckland's housing challenge

Addressing Regional Transport Challenges

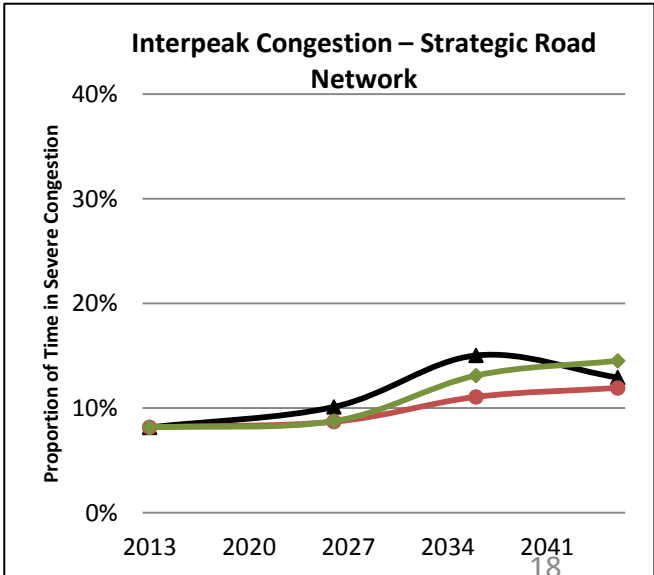
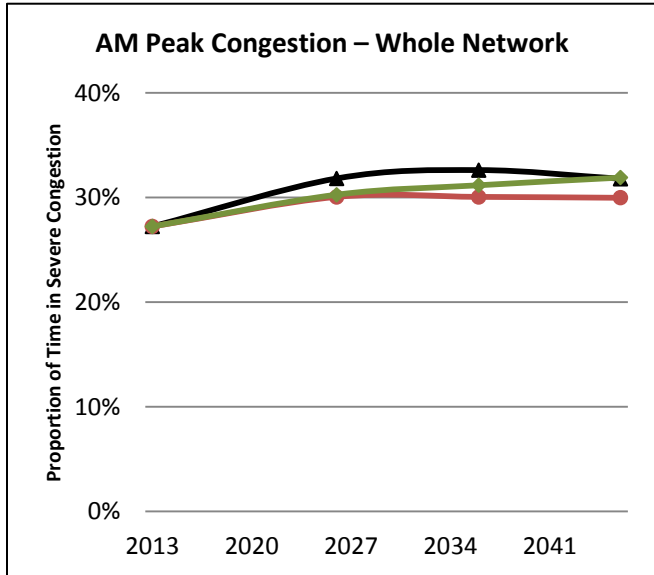
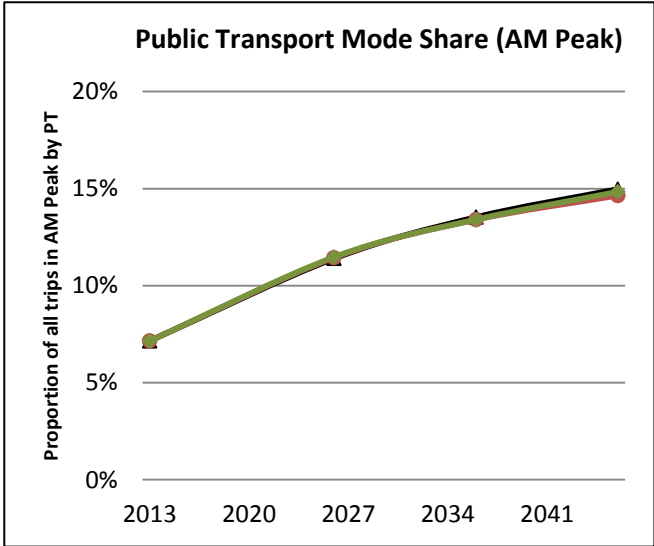
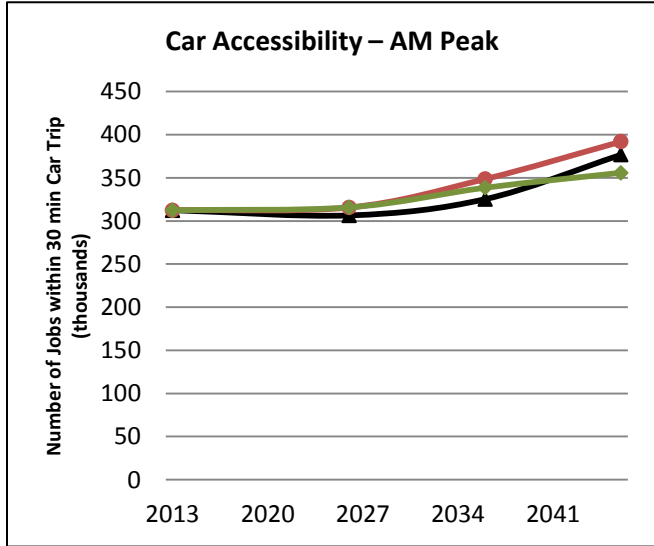
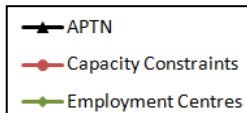
Modelling of different infrastructure programmes indicates broadly similar regional performance against key ATAP objectives, although some early gains can be made.

Model results show that it is possible to deliver some improvement in performance against the ATAP objectives, compared to APTN.

The most significant difference is for congestion levels on the strategic network (largely motorways) due to earlier and different levels of investment in motorway widening.

At the regional level, however, there is relatively little difference between the packages for key measures by the end of the third decade. This is because the infrastructure programmes tested only change a small part of the overall transport network

This suggests that changing the mix of investment within current expenditure levels will not achieve a 'step-change' in regionwide performance.



Addressing Access Challenges in the West and South

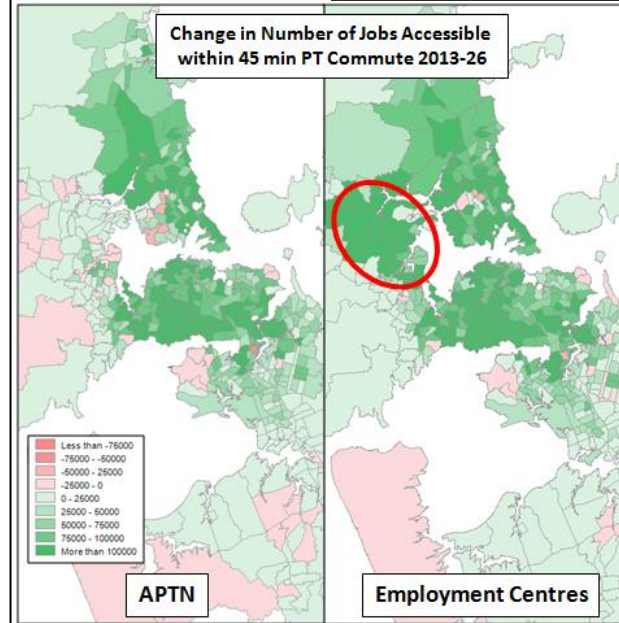
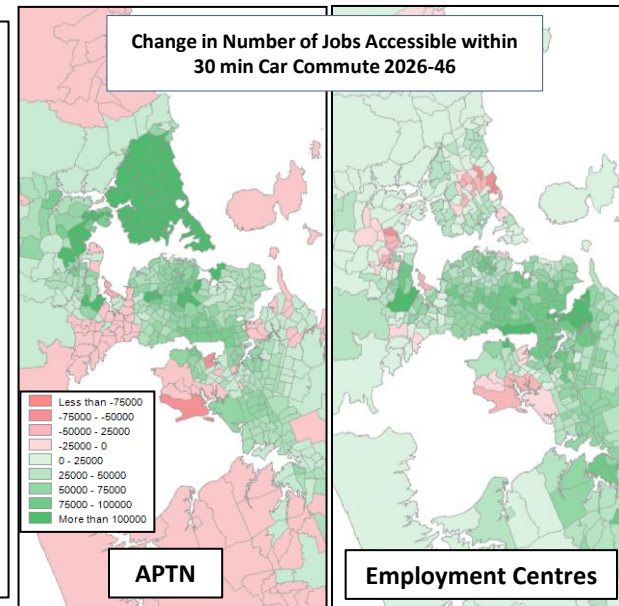
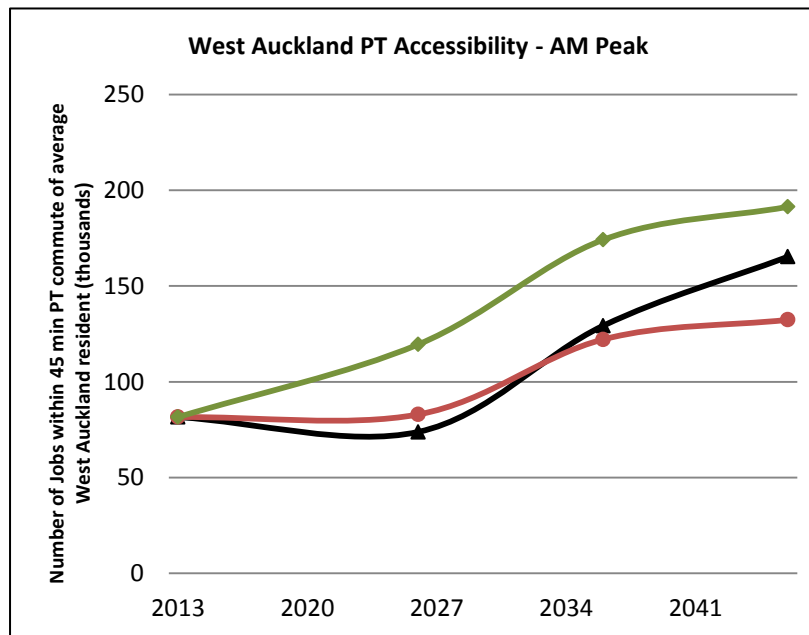
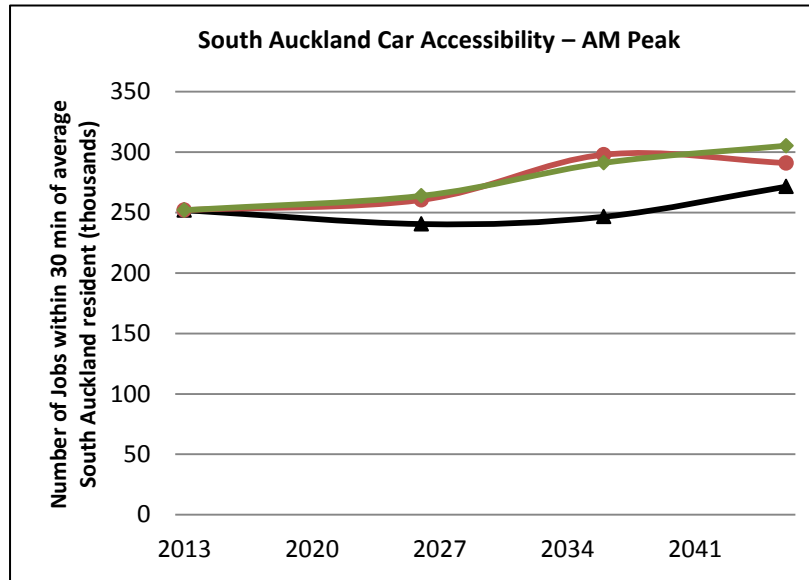
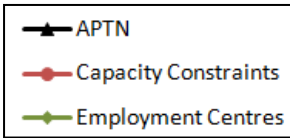
Specific interventions can help address identified deficiencies in the west and south

Access challenges in west and south Auckland

- The Foundation Report highlighted significant accessibility challenges in west and south Auckland.
- These findings were particularly concerning given substantial projected growth and higher levels of deprivation in these parts of Auckland.

Different investment mixes do have sub-regional impacts

- Reconfigured motorway widening contributes to increasing 2046 South Auckland car accessibility by around 12% (34,000 more jobs within a 30 minute car commute)
- Advancing Northwest Busway contributes to increasing 2026 West Auckland public transport accessibility by around 60% (45,000 more jobs within a 45 min PT commute)



Addressing Public Transport Capacity Constraints

Continued growth in public transport ridership will put pressure on key bus corridors into the central area

Strong Projected Public Transport Growth

- Public transport ridership is expected to triple by 2046.
- Public transport expected to carry the majority of growth in AM peak trips to work over the next 30 years.

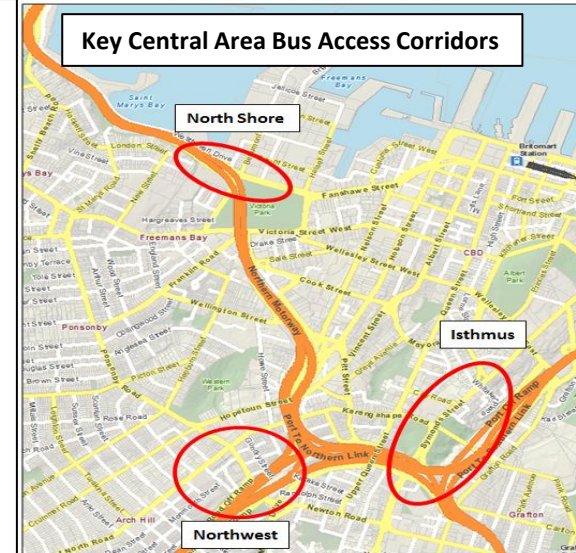
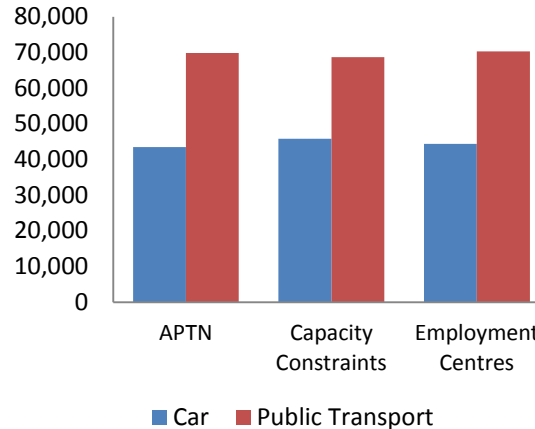
Concentration of Trips in Central Area

- The greatest concentration of PT trips is related to accessing Auckland's largest and fastest growing employment centre, the central area (city centre & fringe, Newmarket)
- Rail network serves the west, south and eastern parts of Auckland. However, access to central area from much of the isthmus, the North Shore and the northwest currently relies upon buses.

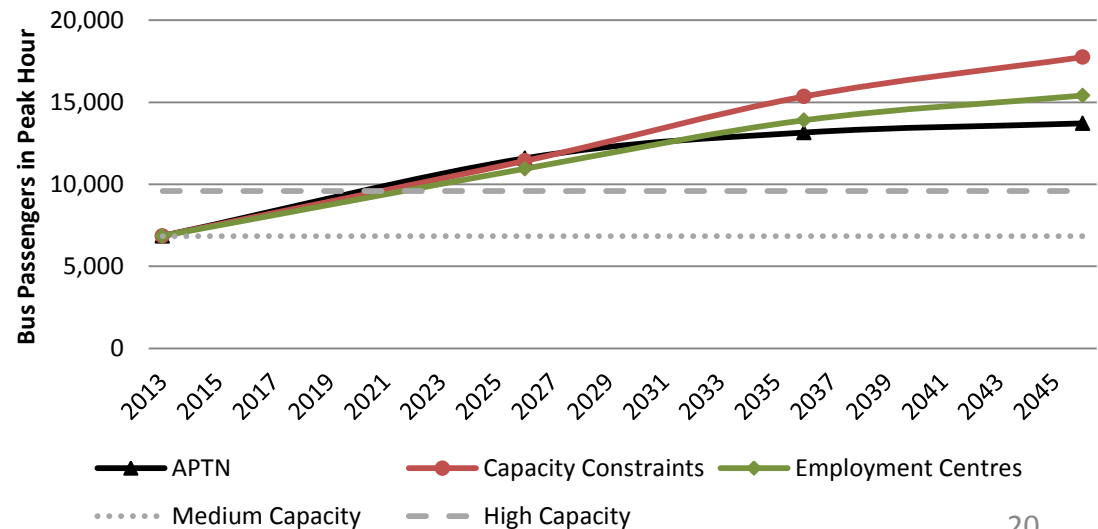
Bus Capacity Constraints

- There is substantial projected growth in bus passenger numbers accessing the central area from the isthmus, North Shore and the northwest.
- The number of buses required to meet this demand is channelled into a few key corridors and is reliant upon limited space within the city centre for passengers to board and alight.
- These constraints will have a widespread impact on the effectiveness of the bus system to meet demand, with widespread overcrowding projected on a variety of routes serving the isthmus, North Shore and the northwest. This will increase delays and decrease reliability.
- In the short term, efficiency improvements to the bus network (completing currently planned bus infrastructure improvements, rerouting services and fully utilising benefits of the City Rail Link project) will help to address these challenges.
- Beyond this, however, it appears that substantial further capacity increases are required to avoid severe overcrowding.

Growth in AM Peak Trips to Work 2013-46



Bus Demand – Symonds Street (Isthmus Access Corridor)



Addressing Auckland Harbour Bridge Constraints

The existing bridge has limits on its ability to cater for growth in heavy vehicles, but any new crossing will require very substantial investment

Preserving the Auckland Harbour Bridge's Lifespan

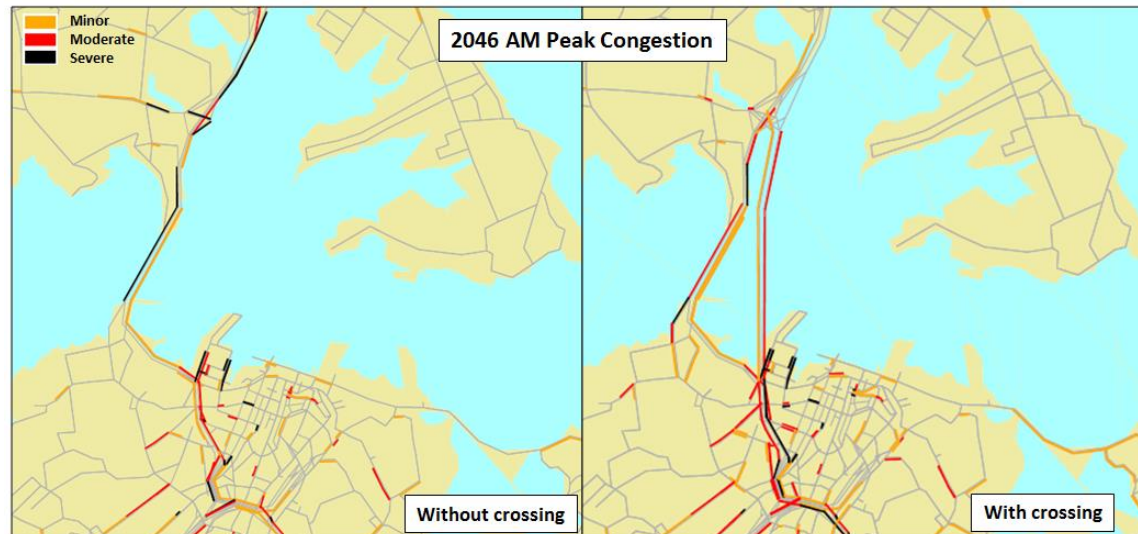
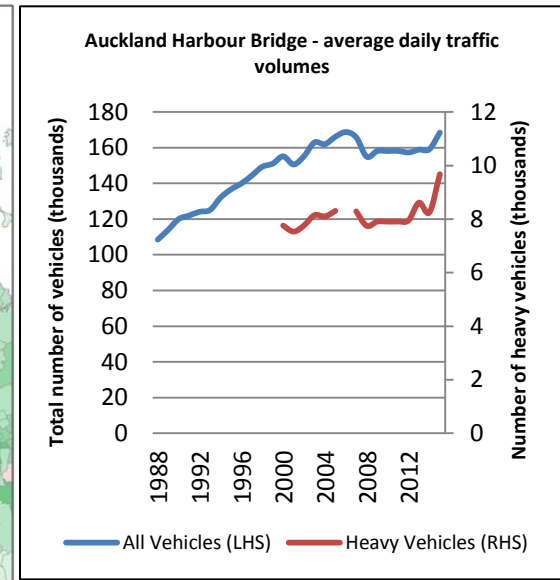
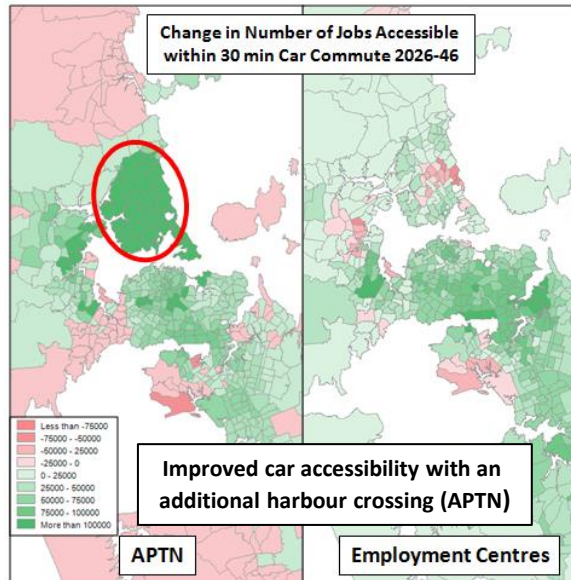
- The Auckland Harbour Bridge is one of the most important pieces of transport infrastructure in New Zealand, being both State Highway 1 and the main connection between the North Shore and the rest of Auckland. Preserving the bridge's lifespan is critical.
- Although strengthened in the past decade, the bridge has limitations in its ability to cater for growth in heavy vehicle traffic. Some level of heavy vehicle management will be necessary in the future to preserve its lifespan.
- Depending on the timing and nature of any restrictions on heavy vehicle traffic, there could be substantial economic costs for Auckland and New Zealand.

Improving access to and from the North Shore

- The bridge and its approaches are a pinch-point on the transport network, particularly during the evening peak in both directions.
- An additional crossing significantly improves accessibility to/from the North Shore but does not appear to substantially improve congestion results.
- Projected growth in public transport demand appears likely to trigger the need for a new crossing within the next 30 years. There is potential for a shared road/PT crossing but the costs and benefits of different options require further analysis.

High cost of potential solutions

- Because any new crossing will be tunnelled, there is a significant opportunity cost arising from this investment. Fully understanding key drivers, alternatives, cost and benefits will be crucial before any investment decisions are made.
- It makes sense to protect the route for a new harbour crossing in a way that integrates potential future roading and public transport requirements.



Addressing Auckland's Housing Challenge

Enabling growth in newly developing areas will require significant transport investment.

Early investment in route protection, land acquisition and investments to support Special Housing Areas is critical

Transport enables growth

- Enabling and supporting a faster rate of housing development in Auckland is a critical element of improving housing affordability.
- Transport investment is a key enabler of growth, particularly in greenfield areas where transport shapes growth patterns and investment is required before growth can occur.

Substantial and ongoing investment to support greenfield growth

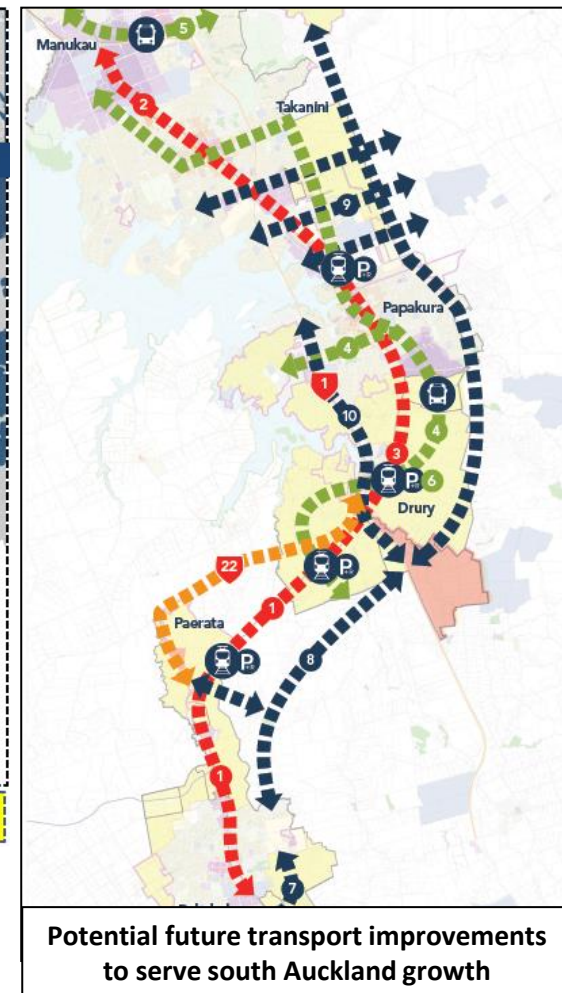
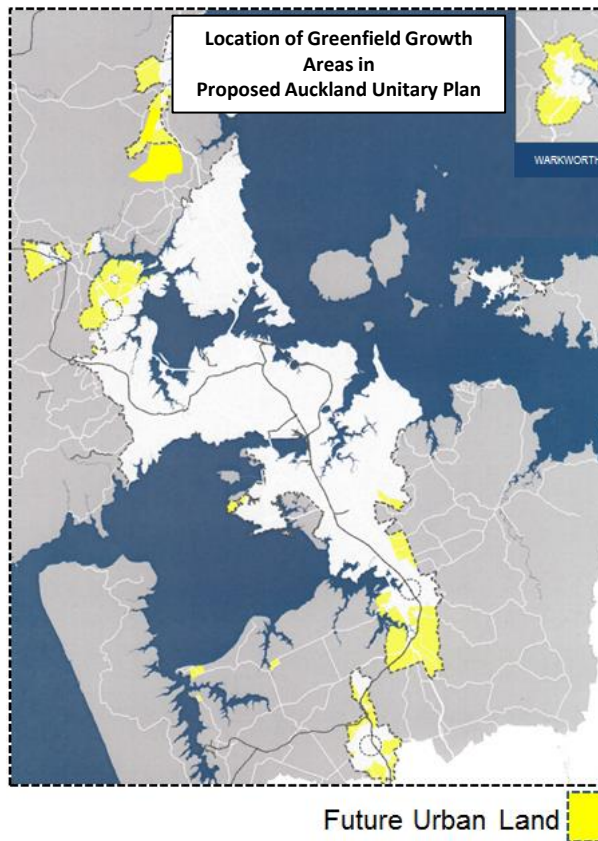
- Over 11,000 hectares of "Future Urban" land is identified in the Proposed Auckland Unitary Plan. New transport (and other) infrastructure is required to make this land ready for development.
- Travel demands generated by growth in these areas will also place pressure on existing networks, particularly as more peripheral areas tend to have longer average trip lengths and a lower use of public transport, walking and cycling.
- There are also substantial ongoing operational costs arising from this growth.

Early Focus

- Substantial early investment in route protection and land acquisition for future transport infrastructure will be required to minimise future costs and protect alignments.
- Early investment is also required to support Special Housing Areas, address current deficiencies and enable a faster rate of development, particularly in the northwest and parts of the south.

Urban redevelopment

- Major new infrastructure to enable greenfield growth will take a number of years to be constructed.
- Ensuring planning rules enable growth in locations with existing transport capacity and good access will have significant transport benefits and reduce investment requirements.



New opportunities: Variable Network Pricing

ATAP has explored the potential to use variable road network pricing as a demand management tool to achieve better network performance against ATAP objectives.

- The goal of demand management pricing is to achieve better performance by pricing users to face a greater proportion of the true costs of their travel, including impacts on other users. Over time this can reduce the extent of investment required in the transport system.
- Road pricing can improve transport network performance by changing travel patterns through shifting the mode, route or time of travel in a way that improves the efficiency of the transport system.
- Developing technologies enable more sophisticated pricing systems to be examined than was envisaged by earlier work – including whole of network dynamic pricing schemes.
- Early analysis looked at different options (CBD cordon, motorway access charge & whole of network system). Whole of network system had biggest impact and was merged with the motorway access charge (by applying slightly higher rates on the motorway network) in subsequent analysis.

Hypothetical network-wide pricing system

- Modelling was undertaken to investigate the impact of a hypothetical network-wide pricing system, with varying charges (between 3c and 40c per kilometre) depending on time of day, location and type of network travel occurs within (see table).
- Highest prices targeted to areas with most congestion and where travel alternatives are most available (e.g. the “inner urban” Auckland isthmus).
- Pricing tested with accompanying infrastructure investments focused on providing sufficient public transport capacity was available where possible to meet changing travel patterns. Reported as the “Managing Demand” package

		Peak	Inter-Peak	Off-Peak (night)
Inner Urban	Motorways	Highest Increase	Medium/High Increase	Decrease
	Other Roads	Medium/High Increase	Medium Increase	Decrease
Outer Urban	Motorways	Medium/High Increase	Medium Increase	Decrease
	Other Roads	Medium Increase	Smallest Increase	Decrease
Rural	All Roads	Decrease	Decrease	Decrease

New opportunities: Variable Network Pricing

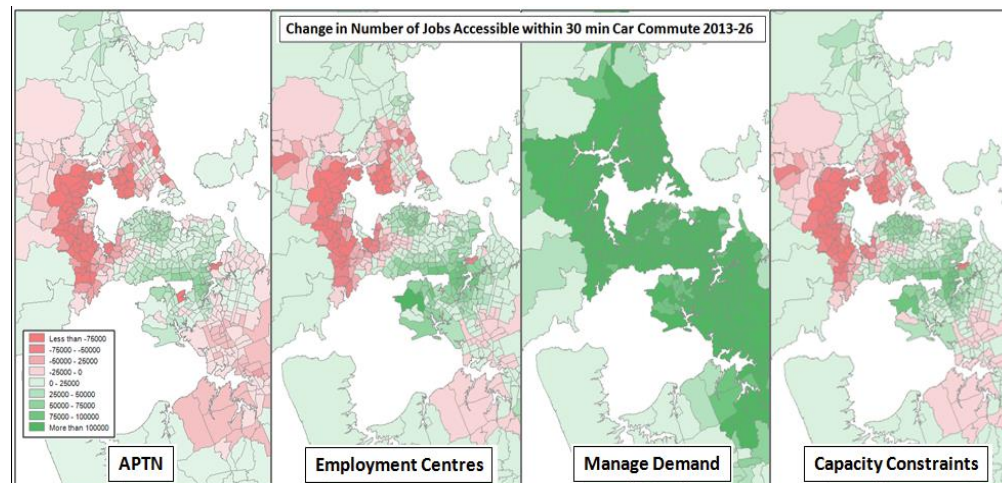
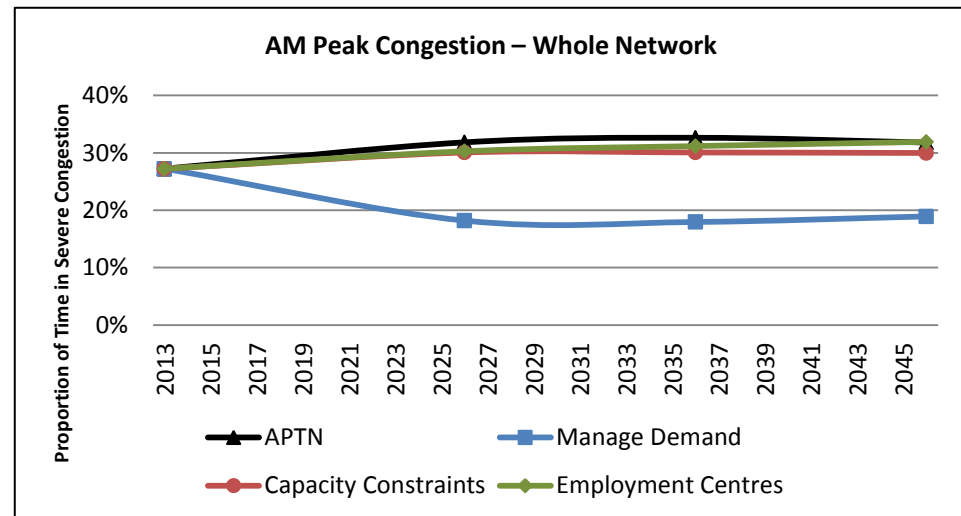
Model results show encouraging impacts on ATAP performance objectives, but further work is needed to assess user impacts

Encouraging impacts on ATAP performance objectives...

- Pricing has a substantial regional impact on congestion, leading to a significant reduction from current levels and well below the other packages tested.
- Pricing also leads to major accessibility improvements (in terms of how many jobs can be reached within certain commute times) due to reduced congestion.
- A substantial growth in public transport mode share was also evident with the introduction of pricing.
- As its impacts are far greater than different mixes of investment, pricing can help to avoid or defer significant infrastructure investment
- Pricing is adaptable, can be phased in over time, and changed to meet changing circumstances or demands. Unlike infrastructure investment, it is also reversible if it fails to meet its objectives.

...but further analysis is required to properly understand net user impacts and overall value for money

- Price levels tested so far indicate a net financial cost to users, based on the analytical tools available. Further refinement of pricing levels is underway to inform the final report.
- The improved congestion performance is a result of some trips being “priced off” the network. Overall value for money assessments need to consider wider benefits to society but also the potential for deferred/reduced transport expenditure that could be very substantial.



New opportunities: Transport Technologies

Emerging transport technologies have the potential to enable much more efficient use of existing transport infrastructure and to achieve better transport outcomes. The timing and impact of new technologies, which will be driven by private sector innovation, remains uncertain, but appear likely to have profound effects within the next 30 years.

Two different scenarios tested:

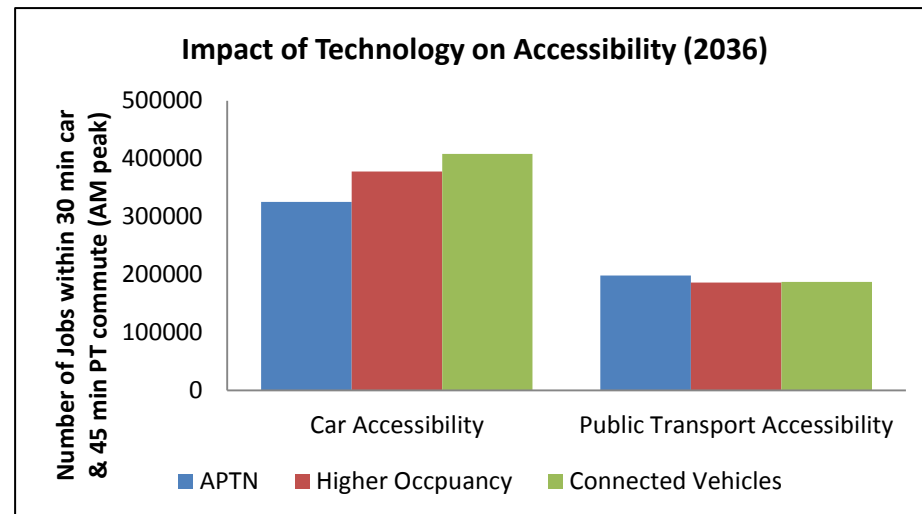
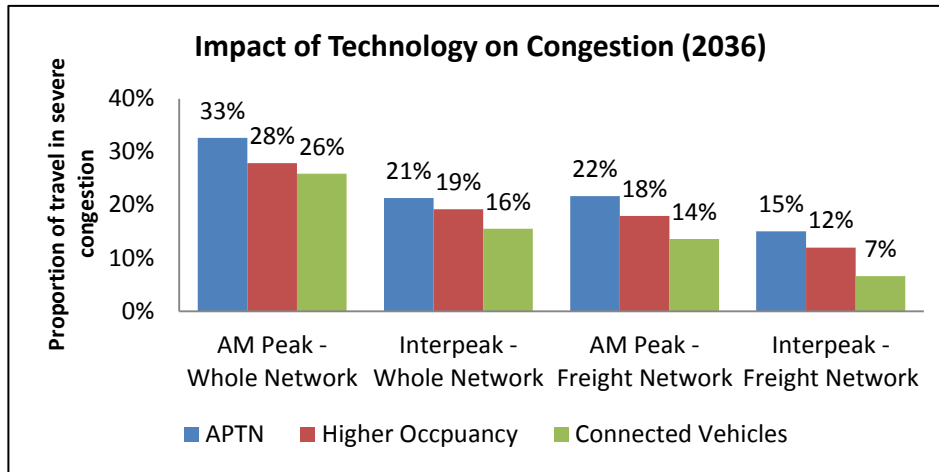
- “What-if” technology scenarios testing the impact of aggressive increases in vehicle occupancy (from more ridesharing enabled by ongoing IT advances) and connected vehicle uptake from current and future improvements in vehicle technology.
- All options were tested with a low-level investment programme to understand the impact of technology alone.

Initial results are encouraging...

- Increased vehicle occupancy delivers positive car accessibility and congestion outcomes.
- Improved vehicle connectivity delivers very positive outcomes – and is potentially easier to implement as it relies on technology rather than human behaviour change.
- The effect of these changes are cumulative, so both shared mobility and connected vehicles appear worth pursuing.
- Timing is important: the scenarios were developed for 2036: need to determine whether this is plausible, and what might occur in the meantime.

... but probably reflect a “best case”, and some caution is needed...

- Scenarios assume a reasonably aggressive uptake of shared mobility and connected vehicles: further work needed to identify a level of uptake which is both sufficiently ambitious and plausible.
- Uptake of shared mobility will rely on behavioural change as well as technology – this has proven to be very challenging in the past.
- The results show a strong switch from PT to shared cars: however, this needs further analysis as it may simply reflect the way it is modelled.
- No attempt was made to estimate the impact of new technology on the overall demand for travel.



3. Emerging strategic approach

3. Emerging Strategic Approach

Towards a strategic approach

Influence travel demand patterns

Make better use of existing networks

Provide new infrastructure and services



Towards a strategic approach: embracing new opportunities

- Historically, our approach to dealing with Auckland’s transport issues has focussed on investment in roading and public transport infrastructure and services, and optimising where possible to make better use of existing assets.
- Over time, this approach has become increasingly expensive and has struggled to keep pace with the demands that growth is placing on the system. Our analysis has shown that continuing on this path can deliver localised benefits, but will not provide the step change in transport system performance that Auckland needs.

To achieve this, a change in approach is needed. What are our options?

Should we build more?

One path is to focus on greater transport ‘supply-side’ provision by significantly accelerating the development of new infrastructure and services, to enable supply to get ahead of growth in demand.

Although this option has not been specifically tested to date, our analysis suggests that this would be a very expensive approach, with diminishing returns over time. As growing cities around the world are finding, adding new infrastructure in existing urban areas requires increasingly expensive solutions. Only building our way out of the problem does not offer a compelling future.

Or should we address demand?

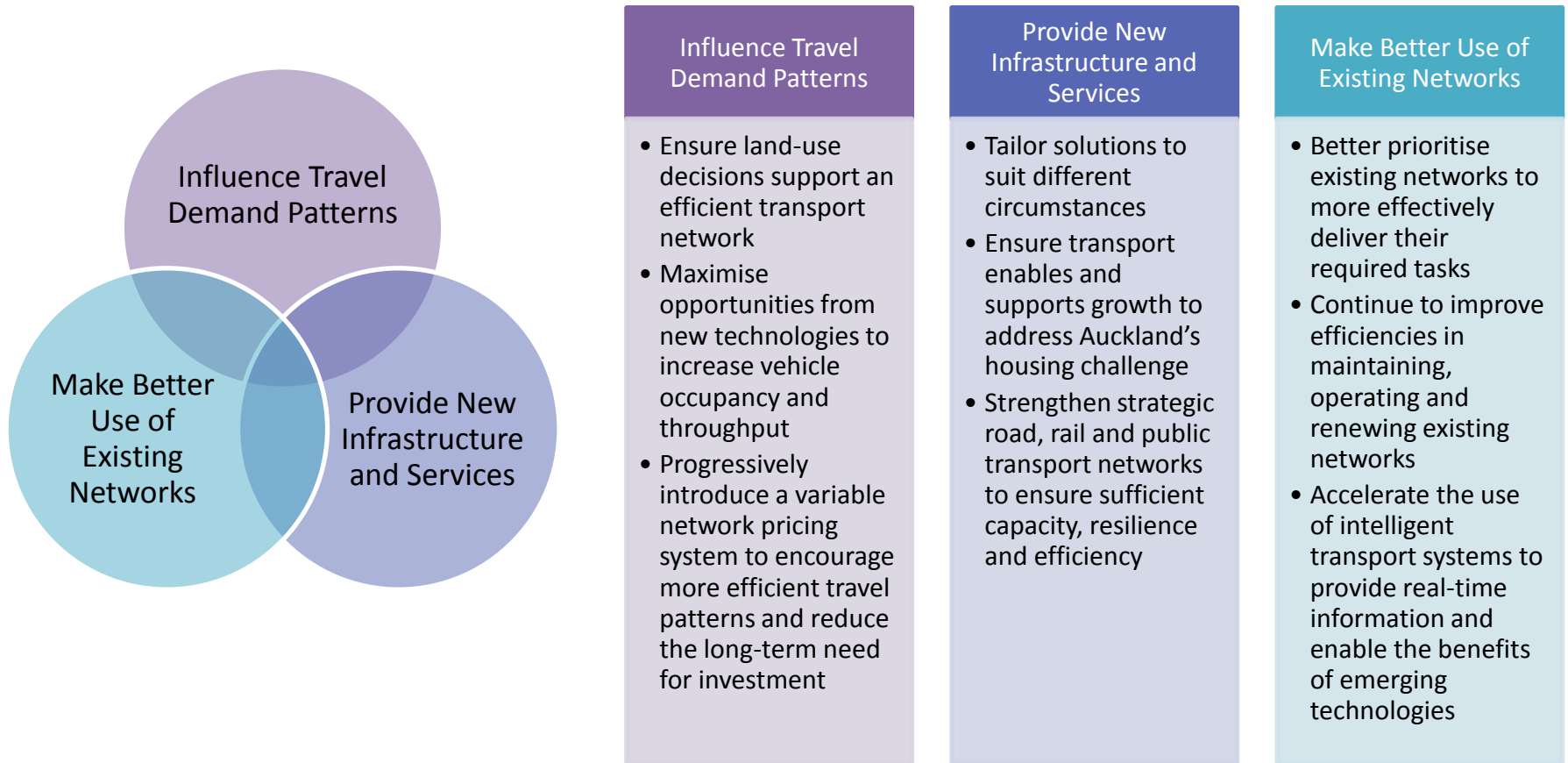
An alternative path is to take advantage of new demand-side opportunities that have previously not been available. Rapid advances in transport and communications technology provide opportunities to influence the demand for private vehicle travel, through variable road pricing and the emergence of “mobility as a service” technologies. In addition, advances in intelligent transport system (ITS) and vehicle connectivity provide the opportunity for significant gains in network productivity.

Our analysis has shown that, in combination, these initiatives have the potential to provide a step change in system performance.

- Auckland’s continued growth means there is a need to continue work on optimising the current network, and adding new infrastructure and services. However, these actions will not on their own be sufficient. To make a real difference, we need to also take advantage of new demand-side opportunities, which will offer Auckland-wide benefits, and ensure these are integrated with our investments and optimisation plans.

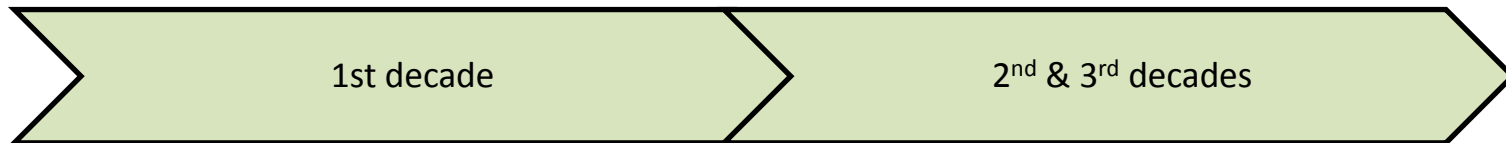
Emerging strategic approach

The emerging strategic approach involves an integrated combination of three types of intervention



Recommended pathway

- The recommended approach requires a strong commitment to influencing travel demand patterns. This brings some implementation challenges, but the potential gains mean that a proactive approach is justified.
- In the short term this means prioritising resources towards making the transport system “technology ready”, and laying the groundwork for variable network pricing, to enable a staged implementation.
- Because the benefits from these demand-side interventions may take some time to materialise, we need to ensure that progress is made on investments to improve our strategic networks and support Auckland’s growth. Priority should be given to investments that will be required regardless of pricing or technology changes and investment that enable and support Auckland’s continued growth



- Better optimise use of the existing transport network
- Remove barriers to new technology and provide incentives to encourage uptake
- Pave the way for the staged implementation of variable network pricing
- Prioritise investments that facilitate early implementation of tools to influence demand
- Prioritise route protection, land acquisition and commence delivery of infrastructure in growth areas

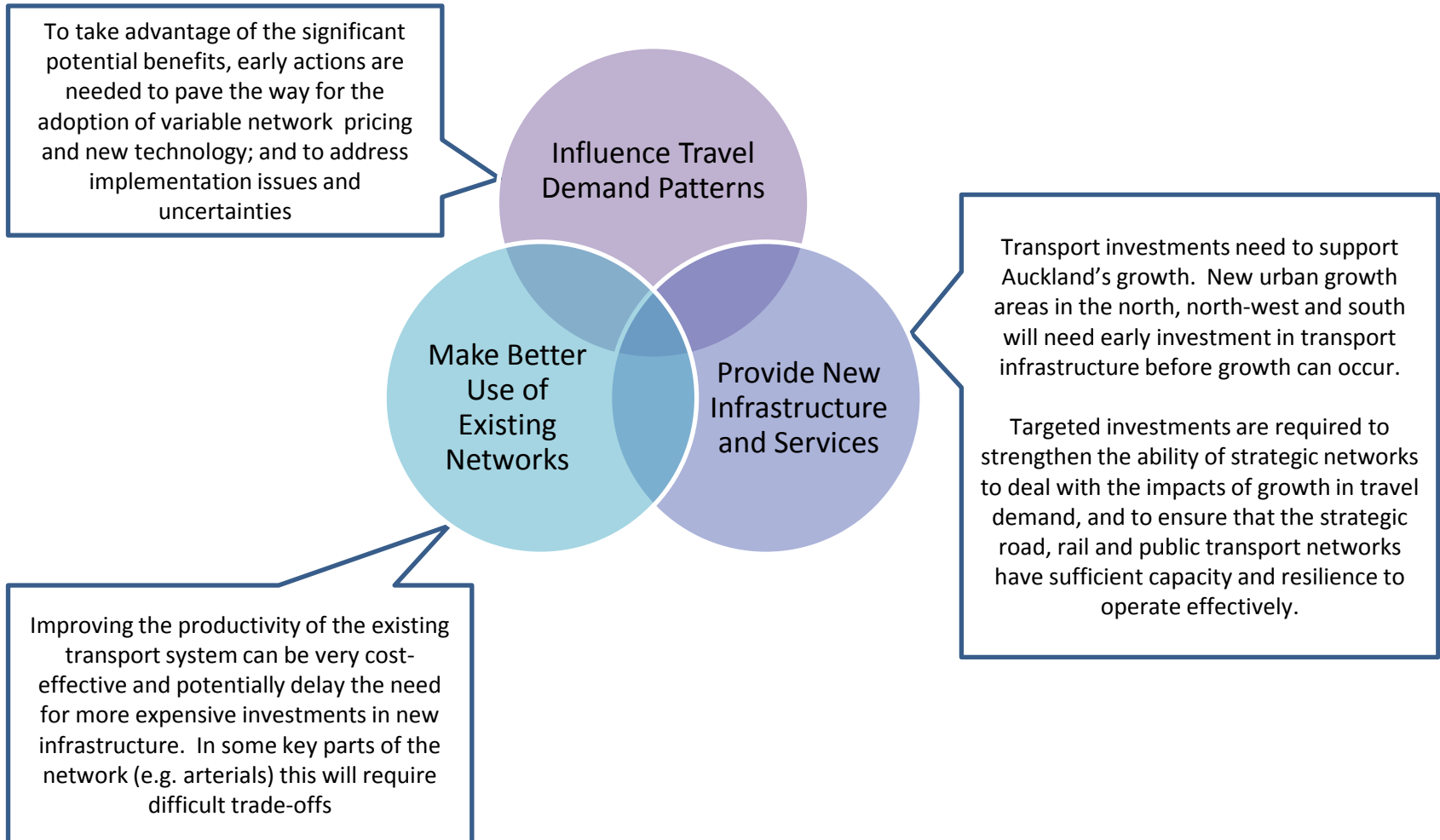
- Accelerate uptake and implementation of new tools
- Address public transport capacity constraints that may be exacerbated by pricing
- Continue base investment to enable and support growth

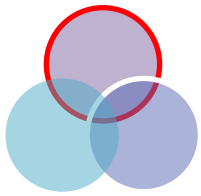
Implementing the recommended strategic approach will require the following issues to be addressed:

- How we accelerate a range of complementary interventions to influence future demand: including ride share services, connected vehicles, and pricing
- Whether to change level of investment in the first decade
- Where to focus early investment

Key elements of the emerging strategic approach

The following slides provide detail on the key elements of the emerging strategic approach





Influence travel demand patterns

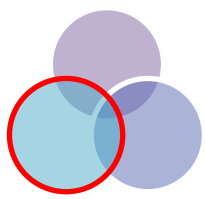
- There is potential for significant benefits from a shift to variable network pricing, and mobility as a service technologies, which can influence travel behaviour, especially for single occupant vehicles. The benefits from these tools appear to be much stronger than traditional supply-side interventions.
- To maximise the opportunities that pricing and technology present, we need to take early actions to facilitate their adoption; and to address the issues and uncertainties that have been identified. Actions in the first decade will have a big influence on our ability to capture the potential benefits of technology in later decades.

Implementation Path - Pricing

- Progress further work to understand how and when a network-wide pricing system could be introduced in Auckland through a staged implementation pathway (including how national implications of such a system would be addressed).
- Undertake work to identify social and economic impacts, and how these should be mitigated
- Examine merits of an interim pricing scheme as a step towards implementation of a network-wide approach. Partial schemes may achieve some level of performance improvement but also generate unintended outcomes (e.g. discouraging growth in some areas, shifting traffic flows) that need to be fully considered.
- Identify how variable network pricing might be phased in over time, in a manner that is compatible with any future development of the national charging system. The most likely implementation path for pricing would be a 'phasing in' approach, potentially over a fairly long time period. This could include some vehicle-types (e.g. heavy vehicles) being phased in first. Other ways of phasing in pricing could be to shift to a GPS-based system but initially charge at current levels, with prices moving to variable rates over time
- Identify any necessary investments that may be required ahead of implementing a pricing scheme to deal with shifts in travel behaviour.
- Refine analytical tools to better understand the detailed effects of pricing. Current tools used to assess impacts of pricing have significant limitations.

Implementation Path - Technology

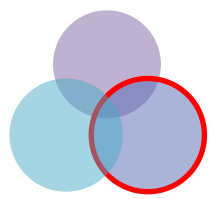
- In the short term, adopt a proactive approach to making the transport system "technology-ready", by:
 - making maximum use of current ITS technologies, e.g. better synchronising traffic lights
 - investing in ITS improvements that will enable benefits of connected vehicle to be realised at an early stage
 - ensuring that regulatory settings don't act as a barrier to technology uptake, and enable the private sector to respond and innovate;
 - providing incentives to increase vehicle occupancy. (e.g. road pricing)
 - ensuring that technology helps facilitate a move to variable network pricing
 - gaining a better understanding of behavioural aspects related to ridesharing, and identifying actions that are most likely to increase uptake
- Not able to conclude at this stage which infrastructure investments should be delayed or discarded due to technology changes. It would be risky to do this in the short term, given levels of uncertainty and high growth.



Make better use of existing networks

- Investments in new major transport infrastructure can be expensive and disruptive. Therefore, improving the productivity of existing transport networks can be very cost-effective and potentially delay the need for more expensive investments in new infrastructure.
- There appears to be significant potential to increase road network productivity in Auckland, particularly the arterial network. This requires:
 - a stronger focus on network-level strategic planning of arterial roads to provide an effective basis for prioritisation, and addressing the trade-offs between competing activities on the network
 - taking advantage of new ITS technologies to assist with network optimisation
 - a stronger commitment to addressing incompatible activities, such as removal of parking on arterial roads
- The recommended strategic approach identifies opportunities to significantly increase future road productivity through technology improvements, particularly connected vehicles. ITS investments that enable these opportunities to be realised earlier should be prioritised.
- There are also opportunities to improve the productivity of the public transport system. For example, improvements to bus operations on high volume corridors can help to delay the need for large-scale investments in new mass-transit infrastructure.
- International evidence suggests improved asset management processes can also deliver significant benefits, improving efficiencies and informing the optimal timing of intervention. In the long-term this could lead to substantial savings in maintenance and renewals.

Further work required for final report: providing direction about how the existing network can be further optimised.



Provide new infrastructure and services: Ensure that transport enables and supports growth

- New urban growth areas in the north, north-west and south will need investment in transport infrastructure before significant growth can occur.
- Without investment, a lack of transport infrastructure will constrain development in these areas. Early growth areas in the north-west and south require new internal and external connections within the next decade to enable their development.
- An early investment focus on route protection and land acquisition is required to ensure investment is able to proceed when required and in a cost-effective way. Route protection helps avoid incompatible development and reduces the cost of land purchase for key projects.
- Early investment will also be needed to support Special Housing Areas, address current deficiencies and enable a faster rate of development, particularly in the north-west and parts of the south.
- Transport investment within the existing urban area can also unlock growth by providing improved accessibility and making redevelopment more market attractive. Projects like AMETI, which improves access and connections in east Auckland, are important catalysts for growth, especially in the town centres they serve. Similarly, ensuring that planning documents enable growth in areas with good accessibility and spare capacity is an important way to minimise future investment requirements.
- The extent to which a transport investment enables growth should be an important consideration in its prioritisation for funding.

Further work required for final report: understand which potential investments enable the greatest level of growth, particularly in the next decade.

Provide new infrastructure and services:

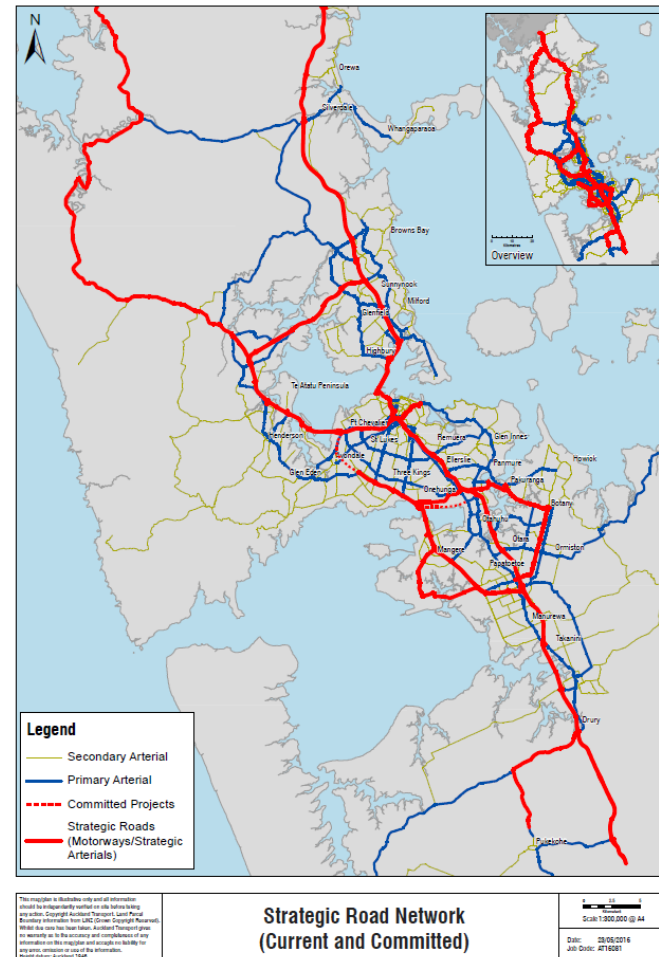
Targeted investment to strengthen strategic networks

- The strategic road, public transport and rail networks carry a significant proportion of the daily transport task in Auckland.
- They are essential economic arteries, enabling access between different parts of the region, and connections to other parts of the country.
- As Auckland grows, demand pressures on these strategic routes will increase. Maintaining strong and resilient strategic networks that can cope with these increased demands is essential.
- Although there are some opportunities to add new corridors to these networks, this is often expensive and disruptive, especially in existing urban areas.
- This means that a targeted investment approach will be required to deal with the impacts of growth, and to ensure that the core parts of the network have sufficient capacity to operate effectively. The different investment drivers and emphases across each network are described in the following slides.
- A key focus for the next phase of the project is determining the relative priorities for improvements to the strategic networks and the extent to which some of them could be brought forward to deliver benefits at an earlier stage.

Strategic Road Network

Strategic Public Transport Network

Rail Network



Investments to strengthen the strategic road network

Context

- In the existing urban area there are very few opportunities to add new strategic road corridors beyond projects already underway (e.g. Waterview Connection) or committed (e.g. East-West Connections).
- Corridors protected many decades ago have now been largely utilised. Therefore, additional major new roading corridors will either have significant social/environmental/property impacts or will need to be expensively tunnelled, which makes achieving value for money challenging.
- Preliminary analysis suggests major new corridors in existing urban areas (e.g. a new Eastern highway corridor combined with an eastern harbour crossing) would be unlikely to deliver sufficient access improvements or congestion relief to the existing strategic network to offer value for money.

Broad Approach to Strategic Road Network

- Focus on improving existing strategic corridors, widening where needed, with some new connections e.g. East –West Connections, greenfield sites.
- In the long term, there is potential for greater productivity of the strategic network through ITS and vehicle technology improvements which will enable greater throughput.
- Variable network pricing will also enable improved management of the strategic road network to prioritise high value trips.
- In the short to medium term, growth in demand appears likely to drive the need for further improvements to the strategic road network.
- The drivers for these improvements will differ across Auckland, as outlined below:

Central Isthmus	North	West	South
<ul style="list-style-type: none"> • Inner parts of the motorway network are particularly constrained. In these areas, investment beyond highly targeted choke point treatments appears to deliver limited gains compared to the cost. • Improvements to SH20 (Southwestern Motorway) should focus on optimising available capacity in the Waterview Connection, the Mangere Bridge and the proposed East West Connections. • Ensure port connections are consistent with future port operations. 	<ul style="list-style-type: none"> • Northern Motorway: future enhancements will be strongly tied to timing of Additional Waitemata Harbour Crossing (AWHC) and greenfield growth in the longer term, leading to demand growth north of Albany. • AWHC: protect route for a new crossing, but further analysis of drivers and timing, and better integration with public transport options is needed before investment decisions are made. 	<ul style="list-style-type: none"> • SH16 (Northwestern Motorway): growth in the northwest will place this corridor under increasing strain: improvements should focus on optimising corridor, alongside proposed busway. • SH18 (Upper Harbour Motorway) upgrades are strongly related to enabling projected growth and providing access between the west and the North Shore. 	<ul style="list-style-type: none"> • Southern motorway: once current improvements complete, shift focus to improving airport access from the east and optimising capacity between Manukau and the isthmus. • Upgrades to SH22 (connecting Pukekohe and Drury) and southern part of the southern motorway will be strongly driven by when growth occurs in the southern greenfield area • Investments in AMET1 and the Mill Road corridor (the main arterial roading connection for new growth areas in the south) should seek to optimise the southern strategic roading network, improve freight reliability and enhance resilience.

Investments to strengthen the strategic public transport network

Context

- Public transport demand is projected to increase strongly under all future options, partly in response to investments that are already committed (e.g. City Rail Link).
- As Auckland grows, the strategic public transport network (current and future rapid transit and mass transit corridors) will need to carry an increasing proportion of this demand to provide fast, high-capacity attractive services that are reliable and free from road congestion.

Two Key Investment Drivers

- Future investment in public transport is expected to be focussed in two key areas: responding to capacity constraints on the current system; and expanding the strategic network to provide an alternative to car travel, especially in growth areas.

Respond to Capacity Constraints

- Demand projections for public transport have highlighted an emerging need for a step-change in capacity along some key corridors in the future. The timing and sequencing of this needs to be addressed as a system-wide wide strategic issue.
- The future volume of buses needed to meet projected demand will create capacity constraints at key 'pinch-points' entering the city centre. Unless addressed, bus speeds and service levels will reduce, and overcrowding will limit the ability for public transport to meet its required share of the transport task in a critical part of the network.
- Short term efficiency improvements to existing bus operations will address some of these problems, as will the City Rail Link. At some stage, however, substantial further capacity increases will be required.
- The most pressing challenge is to relieve corridors serving the isthmus; followed by those serving the North Shore.
- The specific investment response and proposed timing and are the subject to further analysis and will need to be considered alongside other regional priorities. At this stage it appears that an investment that enables many more people to be carried on substantially fewer vehicles will be needed.

Expand the strategic public transport network to improve overall network efficiency

- Public transport has an important role to play in enhancing the efficiency of the transport network by enabling greater person-throughput on main corridors.
- This role is particularly important in serving new growth areas, which are likely to have longer average trip lengths and place considerable pressure on the transport network. Growth areas to the North and South can be connected to the rapid transit system through extensions to the Northern Busway and rail electrification from Papakura to Pukekohe.
- There is no existing rapid transit connection to the new development areas in the North-west, where growth is expected to take place at an early stage. The most cost-effective rapid transit connection is the proposed Northwestern busway. The analysis shows that this would significantly improve accessibility to the West.
- A future rapid transit connection would improve accessibility and provide a congestion-free alternative for travel to the Airport, where employment and visitor travel demands are growing rapidly. At this stage, the focus should be on route protection. Heavy rail is not favoured because it is more substantially more expensive and disruptive and would require a significant up-front investment to secure a suitable route within the airport precinct.
- Further busway connections between Botany, Flat Bush, Manukau and the Airport should be timed to align with growth and addressing congestion levels along these corridors

4. Next steps

4. Next Steps

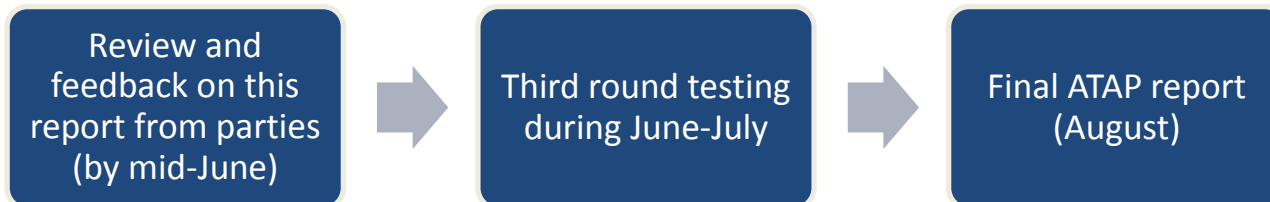
Steps to the final report

How should we prioritise future investments?

Feedback sought

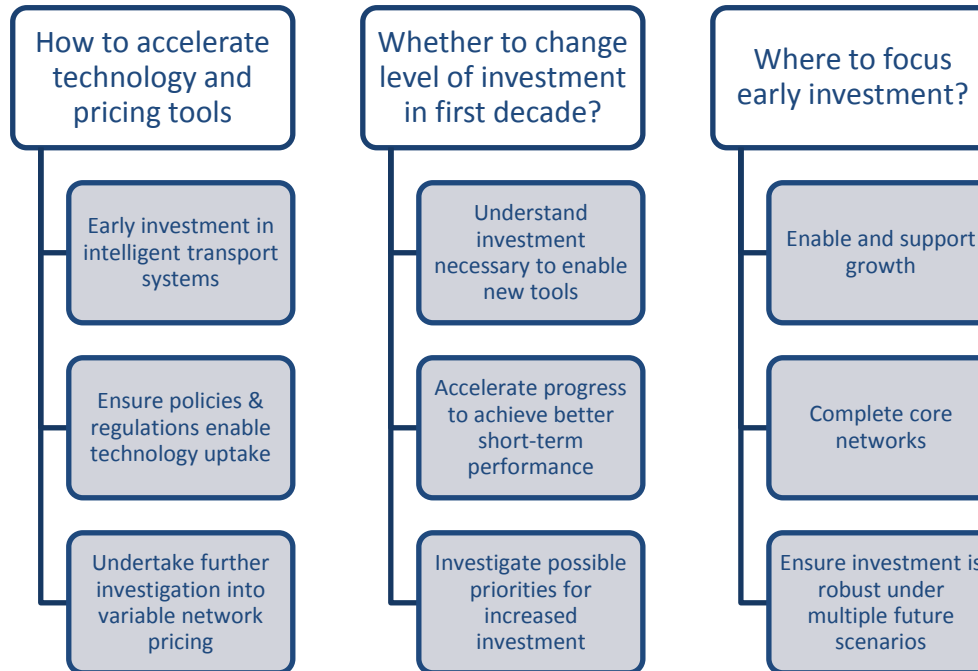


Steps to the final report



Current Evidence Gaps	Final ATAP Report
<p>The next stage of the project will include:</p> <ul style="list-style-type: none"> • Further modelling and evaluation to supplement the work to date, and provide sufficient evidence to support the recommended approach, and demonstrate its costs and benefits • Development and application of a prioritisation framework consistent with the preferred strategic approach <p>Evidence gaps:</p> <ul style="list-style-type: none"> • The extent to which a refined programme could improve outcomes (with no additional funding) • Whether additional or advanced funding is value for money (we have not tested a higher level of investment) • Whether we can ensure net benefits to users from introducing pricing • The combined impact of pricing and technology • Priority/triggers for the big investments • Value for money and contribution to the wider economy • The impact of a faster than projected rate of population growth 	<p>The final ATAP report will recommend an aligned strategic approach for the development of Auckland’s transport system that delivers the best possible outcomes for Auckland and New Zealand.</p> <p>To meet the ATAP Terms of Reference, this will:</p> <ul style="list-style-type: none"> • Include an assessment of whether better returns from transport investment can be achieved • Include preferred indicative package(s), for the long-term development of Auckland’s land transport system • Indicate the costs, benefits and other implications of implementing the aligned strategic approach and its main alternatives • Include recommendations on how to implement the aligned strategic approach (including consideration of further work and any changes to statutory documents)

Issues to address in developing and implementing the recommended approach



- The final deliverable will identify the steps needed to ensure the next round of statutory documents relating to transport planning and funding in Auckland (including the Government Policy Statement, Regional Land Transport Plan, National Land Transport Programme, and Auckland Plan) are aligned with the strategic approach
- It will highlight the need to invest in improved modelling tools to enable the more detailed investigations needed to give effect to the preferred strategic approach (e.g. models that enable the impacts of pricing and technology to be better understood)
- The final deliverable will also identify where the current planning and funding system may need to change to give effect to the preferred strategic approach. The details of resolving these issues will need to occur beyond ATAP.

Proposed approach to Round 3 testing and what it will tell us

Recommended Approach

- Show what our recommended approach will achieve & how it meets project objectives
- Show the impacts of variable network pricing, timing and phasing implications
- Show what investments in the current approach are/are not needed if pricing is introduced
- Identify any specific investments needed to enable pricing (especially in first decade)

Alternative Investment Approaches

- Show how far you can get without a stronger focus on managing demand
- Show what outcomes can be achieved from additional funding in the first decade
- Better understand value for money from different levels of transport investment

Scenario testing

- Test a higher rate of population growth to show requirements if recent growth levels continue

How should we prioritise future investments?

As part of the strategic approach there will be a need to prioritise key investments:

- Existing committed expenditure means there is high competition for available funds, particularly in the short-medium term
- Clear prioritisation can enable us to decide which investments should be in each decade.

A prioritisation framework will be developed and refined as part of the next stage of ATAP.

In delivering value for money, recommended prioritisation criteria should include :

- Address most severe deficiencies against ATAP objectives
- Resilience to a range of different futures (pricing and technology)
- Unlock growth required for Auckland

Feedback sought

To enable project timeframes to be met, feedback on this report from the parties is needed by mid-June.

Feedback on the following issues will be particularly useful to the project team:

- Is the emerging strategic approach supported?
- Do the parties support a move to embrace new technologies and demand management (variable pricing) as part of the preferred approach?
- Are there any differences in approach that should be considered?
- Are the recommended prioritisation criteria appropriate?
- Are there any additional issues that need to be addressed or options tested in the next phase of the project?