Transport implications of future options of the New Zealand economy: An opening discussion

November 2014
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Executive Summary

A core Government policy goal is that investments in the land transport system should support New Zealand’s economic development. While investment in transport cannot be an economic driver on its own, it can support economic growth by better connecting communities to markets and people to their place of work.

The Ministry of Transport partnered with The Agribusiness and Economics Research Unit (AERU) at Lincoln University to increase our understanding of the ways New Zealand’s economy may develop over time, better enabling us to be strategic about the type and scope of our transport investments.

AERU developed a Baseline projection and seven additional plausible Futures for the economy of New Zealand in 2042. These projections are shaped by two main factors: population growth and labour productivity growth. The Baseline projection reflects a New Zealand in 2042 that has been shaped by current patterns of growth.

The seven other Futures represent variations around the Baseline projection based on economic theory and different drivers for economic growth, which play out in changes to regional population and economic activity. For example, Future 1 describes the 2042 economy if there were a substantial increase in agricultural production in Canterbury, Hawke’s Bay and the Wairarapa and Future 7 describes an economy where increasing congestion in Auckland and improving broadband access sees people leaving Auckland in favour of living and working in smaller towns.

The following paper is meant to complement the AERU report by attempting to highlight the transport implications of each of these Futures. Consideration of the Baseline and each of the 7 Futures separately and collectively points to some key findings:

► **Significant growth and resulting transport pressure in the Auckland region.** The Baseline projection for New Zealand’s economy does not generate any great surprises for transport planning and investment. It highlights population and employment growth centred on Auckland. Under the Baseline projection, Auckland’s population will grow by nearly one million from 2007 to 2042. The region stands out as presenting the major challenges for passenger transport and transport in general with pressure on an already heavily-used network. Further, all but one of the Futures (Future 7) predict similar significant population and labour productivity growth in the Auckland region. For example, the Auckland region’s percentage of the New Zealand’s GDP increases from 34% in 2007 to over 40% and up to 43% in all of the Futures but one (Future 7).

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1 Refer to ‘Future Options for the New Zealand Economy: Model, Data, and Futures.’ AERU, September 2014.
Spare port, airport, road and (especially) rail capacity throughout the country and the network. With the exception of Auckland, parts of Canterbury, and various pinch points, most of New Zealand’s transport system can accommodate the Baseline and other Futures with only minimal or modest capacity enhancements over time. For example, while domestic air travel departures will more than double recent levels under many of the Future projections, the growth will be concentrated at the Auckland International Airport which is expected to have capacity through an ongoing programme of infrastructure improvements. Many of the land transport capacity enhancements needed to support expected growth are already planned or are currently underway.

Changes in pressure on the transport system will be gradual, but will be greatest on the land transport network, especially roads. Where the system is already heavily utilized, or will come under pressure from growth, a range of measures will be needed, depending on the situation. In many cases, investment should focus on responding to and mitigating localized congestion at peak times and choke points in the system.

NB This is a general comment based on an overview of the economic and population data generated by AERU. A detailed region by region analysis would be necessary to provide a more granular picture of the transport system, current and prospective pressures. Such an analysis was beyond the scope of this phase of the project.
Background

This is one of four reports from the Economic Development and Transport project commissioned by the Ministry of Transport. It is intended to complement the research contributed by the Agribusiness and Economics Research Unit (AERU) at Lincoln University, specifically the AERU report *Future Options for the New Zealand Economy (FONZE): Model, Data, and Futures*.

The AERU report establishes the economic and population profile in 2042 for the baseline projection and each of the seven Futures selected for examination. This report and the AERU report are in turn informed to varying degrees by two literature reviews which complete the package.

Briefly, the overall objectives of the Economic Development and Transport project are to:

► improve our understanding of how New Zealand’s economy may develop
► assess the relationships between economic development and transport
► assess the role of transport in facilitating various New Zealand Futures
► infer possible impacts on investment in transport infrastructure associated with each Future.

This project is intended to contribute to the Ministry’s strategic thinking on its longer-term policy agenda.

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3 The term ‘Future’ is a deliberate choice, intended to distinguish between these ‘snapshots’ in 2042, and forecasts or scenarios.
Introduction

This paper sets out the main transport implications that can be inferred from AERU's modelling of the New Zealand economy, including initial conditions in 2007 and projections for 2042.

AERU developed a Baseline projection for New Zealand in 2042 and seven other potential Futures using a framework termed the Future Options for New Zealand (FONZE) model. These projections are shaped by two main factors: population growth (by region) and labour productivity growth (by industry and region).

The Baseline projection provides expected population growth in 16 locations around the country and describes the regional and sectoral structure of the economy in 2042 given current patterns of growth. Consequently, we analyse the transport implications of the Baseline projection in more detail than most of the other Futures.

The Futures present alternative views of New Zealand’s economic development from 2007 to 2042, based mainly on variations around two core Baseline assumptions – population and labour productivity. The seven Futures can be grouped under three headings:

► *Primary sector expansion:* Future 1 is based on assumptions about irrigation and thence primary production, and Future 2 is based on an assumption about an oil and gas discovery off the Gisborne coast.

► *Catching up with Australia:* Futures 3 and 4 are based on various assumptions that allow New Zealand’s GDP per capita to catch up with Australia’s by 2042. Currently Australia’s GDP per capita is about 30% higher than New Zealand’s, so catch-up requires productivity growth in New Zealand well above the Baseline rate.

► *Location choices:* Futures 5, 6 and 7 are based on various assumptions about population growth rates in selected regions. Future 5 is focused on the Auckland region, Future 6 on three potential “golden triangles”, and Future 7 on selected “market towns.”

Note that this document does not purport to be a projection of transport volumes or transport patterns over the next 30 years. Its intention is to stimulate debate about the economic development issues raised by the AERU Futures and the possible transport implications of them. The Ministry welcomes feedback on transport challenges and opportunities not picked up in this assessment.

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4 The model is based on value added by sector in each region. These data are based on the national input-output tables produced by Statistics New Zealand for the year ending March 2007. These were the latest available at the time of this research.


6 More commonly referred to in New Zealand as ‘service towns.’
Approach: Inferring transport implications of these Futures

We have taken a high level approach to inferring transport implications of the Baseline and other Futures. We are looking for broad indications of likely trends in transport volumes and infrastructure pressures associated with each Future, and of cases where transport improvements would facilitate development. Detailed transport modelling has not been part of this project, but we have drawn on existing transport data and projections to inform the assessments in this report. Amongst these sources are:

- The National Freight Demand Study (March 2014)
- New Zealand Transport Agency (NZTA) information on road network volumes
- The Ministry of Transport’s aviation forecasts
- Information from Auckland Transport’s 2012-41 Integrated Transport Programme

At this stage, we haven’t undertaken any detailed review of transport strategies and plans for other regions.

Our focus in this paper has been shaped by three main factors:

- **Population and VKT**: around 90% of vehicle movements on New Zealand’s roads are by light passenger and light commercial vehicles, rather than heavy (freight or passenger) vehicles. This proportion is unlikely to change in the foreseeable future. We focus heavily on AERU’s population data because it has a strong correlation with the number of light passenger and light commercial vehicles on the road - crucial in considering impacts like congestion effects of the different Futures. It also has implications for passenger volumes on domestic and international flights.

- **Magnitude of population change**: we focus on the magnitude of the regional population changes in the Futures because they lead to the likely transport impacts. For example, regional population figures for the Auckland region in 2042 can vary by several hundreds of thousands according to the projection used.

- **Freight impacts**: Across the Futures there are considerable variations in implications for freight volumes, modes, and routes most affected. From a whole of network perspective in each region, freight impacts of the futures are generally smaller than the passenger impacts. However, there are particular parts of the road and rail networks where additional freight volumes make a big difference. This same rationale applies to a range of pinch points.

With respect to pressures on capacity and possible investment consequences, there is a two-way relationship between transport supply and economic activity. Increased transport supply may enable increased economic activity, or may be a response. The term ‘transport implications’ is intended to capture transport supply as both a driver and response to increased economic activity. Although timing can be an important factor in the effectiveness of transport investment, we make no attempt to assess or provide guidance on the appropriate timing of any investment that might be indicated by the projections.
Figure 1 provides a broad indication of transport patterns across New Zealand.

Source: Regional Economic Activity Report, New Zealand Government 2014

Figure 1: Major New Zealand transport network connections, 2013
The Baseline

Assumptions

In the neoclassical growth model a country’s longer-term economic growth rate depends on population growth and labour productivity growth. This model remains very important in conceptualising economic growth.

The following table is taken from Treasury’s forecasts prepared for the 2014 budget. In the short term, it is possible for growth in production to be greater than the sum of population growth and labour productivity growth, but in the long run this relationship must hold, as shown in the final row.

Table 1: Forecast Growth (Annual Average Percentage Change)

<table>
<thead>
<tr>
<th>Years Ending March</th>
<th>Forecast Growth (Annual Average Percentage Change)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Production (Real GDP)</td>
</tr>
<tr>
<td>2014</td>
<td>3.0</td>
</tr>
<tr>
<td>2015</td>
<td>4.0</td>
</tr>
<tr>
<td>2016</td>
<td>3.0</td>
</tr>
<tr>
<td>2017</td>
<td>2.1</td>
</tr>
<tr>
<td>2018</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Source: Treasury (2014, Table 4, p. 6).

The Baseline analysis for the FONZE model is based on that relationship, using Treasury’s projected labour productivity growth rate for 2018 applied to the whole projection period to 2042.

It also draws on projections by Statistics New Zealand for regional population growth rates. In October 2012 Statistics New Zealand (2012b) released sub-national population projections by regional council areas and by territorial authority areas.

The baseline analysis in the FONZE model uses the medium projection for population growth in each region.

Population growth

The Baseline projection is for a 37% increase in New Zealand’s population overall and a 68% increase in Auckland’s population between 2007 and 2042. Between 2007 and 2042 Auckland region’s population would grow by just under a million people. It would also grow at a substantially higher rate than any other parts of the country.

The overarching conclusion from examination of the Baseline projection is that the major population growth and economic activity effects are concentrated in the Auckland region, and pressures will be most marked on the transport network there, already the most congested. There will be periodic
pressures in some specific parts of New Zealand’s transport infrastructure, but most of the big investment decisions will remain centred on Auckland.

Figure 2: Population change under the Baseline projection (000), 2007-2042

**Economic growth**

The Baseline projection assumes that New Zealand’s real GDP growth averages a modest 1.8% per annum over the period to 2042.

In the Baseline, the sector structure of the economy remains largely unchanged, although a few sectors record significant changes in their GDP shares. For example, Agriculture, Forestry and Fishing falls from 5.5% to 4.8% of total GDP.

Moreover, under the Baseline projection growth largely occurs in the Auckland region. GDP for the region grows by 2.4% per annum over the period versus the national average of 1.8%. Auckland’s share of GDP grows from 33.6% to 41.3%, while every other region records a decline in GDP share.

The following table summarises different indicators of economic growth for New Zealand and Auckland under AERU’s Baseline projection.

**Table 2: Indicators of economic growth under the Baseline projection, 2007-2042**

<table>
<thead>
<tr>
<th>The Baseline (2042 compared with 2007)</th>
<th>Population</th>
<th>GDP</th>
<th>GDP/capita</th>
<th>Value of physical goods produced (*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Zealand</td>
<td>+37%</td>
<td>+87%</td>
<td>+37%</td>
<td>+84%</td>
</tr>
<tr>
<td>Auckland</td>
<td>+68%</td>
<td>+130%</td>
<td>+37%</td>
<td>+130%</td>
</tr>
</tbody>
</table>

(*) based on GDP contribution of Agriculture, Forestry and Fishing, Mining, Manufacturing, Construction, Wholesale Trade, Retail Trade
**Transport implications of the Baseline**

This table provides a qualitative summary of the transport implications of the Baseline projection. Implications are based on the effects of the population increases and economic growth described above. The arrows indicate the relative size of the transport impacts inferred from AERU’s Baseline projections to 2042.

**Table 3: Summary of the transport implications of the Baseline projection**

<table>
<thead>
<tr>
<th>The Baseline</th>
<th>Transport Pressure</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light vehicle travel (Auckland)</td>
<td>▲</td>
<td>Large population increase (68%) puts pressure on the network and services in Auckland.</td>
</tr>
<tr>
<td>Light vehicle travel (rest of NZ)</td>
<td>▲</td>
<td>The other most populous regions (Waikato, Wellington, and Canterbury) experience population growth of 23-28%. That will cause network pressure but not on the scale that Auckland will experience.</td>
</tr>
<tr>
<td>Freight</td>
<td>▲</td>
<td>Increased population and the production, export and import of physical goods imply growth in the freight task. The National Freight Demand Study forecasts a 48% increase in domestic tonne-kms by 2042, and 58% in tonnes at a national level. Regionally this is concentrated in Auckland where freight is forecast to grow by 75% over the same period.</td>
</tr>
<tr>
<td>Localised freight</td>
<td>▲</td>
<td>Pressures on infrastructure choke points. Population growth in Auckland, Auckland congestion and growth in sea imports (which largely come through Auckland) all contribute. The capacity of the Lyttelton road tunnel and port space at Lyttelton are already issues and they will become more pressing as Canterbury grows.</td>
</tr>
<tr>
<td>Public transport</td>
<td>▲</td>
<td>Pressure in Auckland in particular where there are major population and congestion increases.</td>
</tr>
<tr>
<td>Airports</td>
<td>▲</td>
<td>Large population and freight growth in Auckland airport catchment. Increased wealth will increase the activity levels in Auckland, Wellington and Christchurch airports in particular, though they have spare capacity and virtual communication may reduce the need for business travel. An additional runway is likely in Auckland, as well as expanded terminal facilities. Possible extension of Wellington runway has been reported in the media.</td>
</tr>
</tbody>
</table>

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7 For example, road access to the ports of Auckland, Tauranga and Lyttelton, and part of the rail line between the port of Auckland and Wiri.

8 See Shipping Gazette, September 2014, p.14, for comment on port and airport freight facilities.
The move to larger container ships and port hubbing will intensify container activity; particularly in Auckland and Tauranga (in this case some or all trade that currently comes into or goes out of Napier and Centreport may be transhipped via coastal services or moved by other modes to Auckland and Tauranga).

Road and rail congestion in Auckland will add to the pressure.

Coastal shipping

Coastal shipping will make a larger contribution to transport as larger container ships and port hubbing become dominant. This will add additional capacity pressure on the hub ports.

Rail (Auckland)

While competition for network paths between freight and commuter rail in Auckland will have been eased by 2042 by proposed construction of a third track between Southdown and Wiri, ongoing demand growth for both freight and passenger rail services will continue to generate pressures.

Rail (rest of NZ)

Outside the Auckland metro network, the rail network generally has spare capacity.

**Key transport implications**

- Auckland’s population will grow by nearly one million between 2007 and 2042 and continued investment will be needed to help the area function efficiently.
- There will be pressures on the land transport network, especially roads, in the Auckland-Hamilton - Tauranga region; elsewhere the challenges are less severe and are likely to be concentrated at specific pinch points.
- Air travel departures will more than double recent levels. Auckland International Airport will experience much of this growth but there will also be significant impacts on other airports.
- The Baseline projections would be associated with major growth in import and export volumes and commensurate growth in port activity.

**Domestic transport implications**

The Baseline (and all but one of the Futures), confirm the likelihood of Auckland continuing to grow faster than elsewhere. Constraints exist across Auckland’s port, airport and rail freight infrastructure but capacity alleviation is considered manageable with continued investment. Auckland’s road challenges are more severe and will require a range of mutually supporting measures if the network is to cope adequately with increased traffic and if it is not to restrict Auckland’s and New Zealand’s economic growth.

**Passenger:** Under the Baseline projection, the Auckland region stands out as presenting the major challenges for passenger transport and transport in general. This seems an inescapable conclusion based on population and real GDP growth rates which are well above national averages, together with an already heavily used network.
The most significant transport implications for Auckland in 2042 flow from population growth under the Baseline. Using AERU’s figures, Auckland’s population will grow by nearly one million between 2007 and 2042, increasing from 1,393,600 to 2,346,600. The scale of population increase projected is corroborated by other research which shows similar findings.

Auckland Transport’s modelling shows a medium population growth future, roughly equivalent to the Baseline, resulting in large increases in demand for travel across all modes by 2041. Even with additional investment in infrastructure and services, this growth in demand leads to significant increases in congestion on Auckland’s urban road network. By 2041, the road network is forecast by Auckland Transport to experience congested conditions, which will be worse than the current peak, throughout the working day.

Using the Baseline projections, domestic air travel departures in 2042 would be more than double recent levels and international departures would grow strongly. Auckland Airport’s major role as a domestic airport and as an entry and departure point for international travellers will see a large proportion of domestic and international travellers using Auckland region’s land transport network for travel to or from the Airport.

**Freight:** Significant features of the Baseline projections relating to freight are the impacts on ports and related landside links and the effects of congestion, particularly in Auckland.

The NFDS projects that freight as a whole, and in particular the more freight-intensive sectors (e.g. agriculture, forestry, fishing and mining) are projected by AERU to grow more slowly than GDP as a whole to 2042. Consequently, there are no major shocks to the transport system anticipated from freight growth other than inevitable pressures on capacity in specific parts of the network that are already heavily utilised. These pressures will be most evident in and around seaports which handle the major proportion of New Zealand’s exports and imports, particularly Auckland, Tauranga and Lyttelton. Investments in extra port capacity are under way and improved landside links are envisaged.

The Ministry of Transport through its Future Freight Scenarios Study has undertaken modelling of the effects of port specific growth on port capacity and landside links.

Under the Baseline Future, freight movements, particularly on parts of State Highway One into and out of the main centres, will be affected by congestion unless extra capacity (lanes etc) is installed or demand management initiatives (such as road pricing) are implemented. Most freight movement will continue to occur within Auckland and will need to move mainly by road. We can expect freight operators to seek to avoid congestion by increasingly operating at night, moving inter-regional freight by other modes where possible or, potentially, moving logistics centres out of the Auckland urban area.

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9 Applying to the Ministry’s aviation forecasting model, but using the GDP and population assumptions in AERU’s baseline projections.

10 Note however that there may be some major cycles in the freight volumes for individual commodities during the period to 2042. Port companies will consider these in their investment decisions. For example, according to the National Freight Demand Study export log volumes will peak in around 15 years, and fall back significantly after that.
**Transport infrastructure and other investment**

AERU’s baseline projections do not generate any great surprises. The implications we infer are broadly in line with other sources, i.e. that the major pressures will be on the land transport network, especially road and especially in the Auckland region. This will require attention to effective provision of additional capacity, demand management (e.g. through Intelligent Transport System applications and/or pricing), and measures to encourage switching from cars to public transport (e.g. Auckland’s plans for a rationalised PT network and faster more frequent services),
Overview of the seven Futures

The following section provides a brief comparative overview of the seven Futures. It provides an introduction into the transport implications of each of the Futures in the following sections.

Population and economic growth projections

The seven Futures are defined by projections of population, employment, and value added by region and sector, and exports and imports by sector at a national level.\(^\text{11}\) The overall results (relative to the Baseline data for 2042) are indicated in Figure 3.

\[\text{Figure 3: Population and GDP of New Zealand in the seven Futures relative to the Baseline projection, 2042}\]

This and the following figure show that the population assumptions for High productivity (Futures 3 & 4) are the same as for the Baseline projection.

\[\text{Figure 4: Percentage population increase of New Zealand in the Baseline and Futures, 2007 to 2042}\]

\(^{11}\) For detail on the assumptions underlying each set of projections see AERU (September, 2014)
Population growth specifically drives GDP in Primary expansion, Auckland agglomeration, Golden triangles and Market towns (Futures 1, 5, 6 & 7). Future 6, the Golden triangles, is based on growth in the main centres, which partially comes about by people being attracted from other areas. Future 7, Market Towns, is based on a lower growth rate in Auckland, as people elect to live elsewhere. This might be for lifestyle and/or lower housing prices, industry repositioning to avoid higher property prices, congestion, etc in Auckland, or might be "clusters" that develop a critical mass in a specialist activity and thus take pressure off Auckland.  

Table 4: Population projections by Future and region (000s), 2042

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>2,347</td>
<td>2,347</td>
<td>2,347</td>
<td>2,347</td>
<td>2,602 (high)</td>
<td>2,602 (high)</td>
<td>2,043 (lowest)</td>
<td></td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>341</td>
<td>341</td>
<td>341</td>
<td>341</td>
<td>341</td>
<td>406 (high)</td>
<td>406 (high)</td>
<td></td>
</tr>
<tr>
<td>Canterbury</td>
<td>694</td>
<td>774 (high)</td>
<td>694</td>
<td>694</td>
<td>694</td>
<td>826 (highest)</td>
<td>694</td>
<td></td>
</tr>
<tr>
<td>Gisborne</td>
<td>48</td>
<td>80 (highest)</td>
<td>48</td>
<td>48</td>
<td>48</td>
<td>39 (highest)</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Hawke’s Bay</td>
<td>163</td>
<td>167</td>
<td>163</td>
<td>163</td>
<td>163</td>
<td>142 (lowest)</td>
<td>195 (highest)</td>
<td></td>
</tr>
<tr>
<td>Manawatu-Wanganui</td>
<td>247</td>
<td>247</td>
<td>247</td>
<td>247</td>
<td>247</td>
<td>283 (highest)</td>
<td>247</td>
<td></td>
</tr>
<tr>
<td>Marlborough</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>44 (lowest)</td>
<td>62 (highest)</td>
<td></td>
</tr>
<tr>
<td>Nelson</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>55</td>
<td>46 (lowest)</td>
<td>63 (highest)</td>
<td></td>
</tr>
<tr>
<td>Northland</td>
<td>183</td>
<td>183</td>
<td>183</td>
<td>183</td>
<td>183</td>
<td>159 (lowest)</td>
<td>183</td>
<td></td>
</tr>
<tr>
<td>Otago</td>
<td>248</td>
<td>248</td>
<td>248</td>
<td>248</td>
<td>248</td>
<td>216 (lowest)</td>
<td>295 (highest)</td>
<td></td>
</tr>
<tr>
<td>Southland</td>
<td>97</td>
<td>97</td>
<td>97</td>
<td>97</td>
<td>97</td>
<td>81 (lowest)</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Taranaki</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>115</td>
<td>93 (lowest)</td>
<td>115</td>
<td></td>
</tr>
<tr>
<td>Tasman</td>
<td>59</td>
<td>59</td>
<td>59</td>
<td>59</td>
<td>59</td>
<td>49 (lowest)</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Waikato</td>
<td>505</td>
<td>505</td>
<td>505</td>
<td>505</td>
<td>505</td>
<td>581 (highest)</td>
<td>505</td>
<td></td>
</tr>
<tr>
<td>Wellington</td>
<td>578</td>
<td>578</td>
<td>578</td>
<td>578</td>
<td>578</td>
<td>665 (highest)</td>
<td>578</td>
<td></td>
</tr>
<tr>
<td>West Coast</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>34</td>
<td>28 (lowest)</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>NZ</td>
<td>5,766</td>
<td>5,851 (high)</td>
<td>5,798 (high)</td>
<td>5,766</td>
<td>5,766</td>
<td>6,022 (high)</td>
<td>6,259 (highest)</td>
<td>5,624</td>
</tr>
</tbody>
</table>

12 Overseas examples are Hartford, Connecticut and Le Mans, France (insurance); Boston, Pittsburgh and Lille (medical centres and medical research); and Rheims, France (IT).
Future 1: Primary sector expansion - Agriculture growth

Assumptions

Future 1 explores the possible impacts of an increase in agricultural production as a result of an increase in irrigable land. There are currently proposals for large scale increases in irrigation in Canterbury, the Hawke’s Bay and the Wairarapa. \(^ {14}\)

Future 1 is based on the consequent increases in dairy production and dairy processing in those regions. It is assumed that these increases would take place in 2017. The regional input-output tables were used to estimate regional multiplier impacts (indirect and induced) throughout the region, but not in the rest of the country. These calculations took care not to double-count the impact of the manufacturing change on the agricultural sector.

Summary results in comparison to the Baseline

The expansion of irrigated land in Canterbury, Hawke’s Bay and Wellington (Wairarapa) means that these three regions increase their share of the national economy. Notably, the Canterbury economy increases from 12.3 per cent of New Zealand’s GDP under the Baseline to 13.5 per cent under Future 1.

By 2042, total population and employment in Canterbury would be 12% higher than in the Baseline, but effects on population in Hawke’s Bay and Wellington are minor. There are no population effects in other regions.

Figure 5: Population by region under Future 1 (000), 2007-2042

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\(^{13}\) For further detail refer AERU, September, 2014

\(^{14}\) Government agency Crown Irrigation Investment Ltd estimates potential new irrigable land areas of 260,000 hectares in Canterbury, 40,000 ha in Hawke’s Bay and 30,000 ha in the Wairarapa over the next few years.
Transport implications

**Domestic transport implications**

**Passenger:** Under Future 1, population and employment in the Canterbury region will be 12% higher in 2042 than in the Baseline. In absolute terms, Canterbury's population would be 80,000 higher than in the Baseline, and employment about 37,000 higher. There would be significant additions to commuting flows and general passenger vehicle movements within the region. Christchurch already has urban transport problems, and mitigation measures (as above for Auckland) will need to be considered so that transport can help the region thrive. Air traffic would increase but, as with most scenarios, there is enough spare airport capacity.

**Freight:** The most significant factor in domestic freight is likely to be the 12% addition to the Baseline population in Canterbury. Additional demands will be placed on local roads servicing the production areas within Canterbury, Hawkes Bay and the Wairarapa, but apart from Christchurch and highways leading to it, there is adequate capacity. The NFDS notes the projected lift in production from specific irrigation schemes and quotes Napier Port predictions that the Ruataniwha Water Storage Scheme has the potential to lift agricultural exports through the port by 15-20,000 TEU per annum, an 8-10% increase.

The following chart illustrates the complex supply chains for horticulture crops such as apples and the corresponding freight movements that occur on local roads prior to final export.

![Figure 6: Example of Supply Chain Diagram for Apples](source: National Freight Demand Study (2014, p.90))
Any increase in production as a result of irrigation will increase such freight movements, placing pressure on localised parts of the system. While there is generally adequate capacity requiring relatively minor infrastructure changes to respond to this Future, there is a risk that, without appropriate planning, responses will be incremental and ad hoc, resulting in sub-optimal system outcomes.

**International transport implications**

**Freight:** There would be some impact on maritime freight and port activity at Lyttelton and Napier. As noted earlier, the Lyttelton tunnel and feeder roads are already pinch points for this Future. There is limited land available in proximity to the port for staging and consolidation of exports and the storage of empty containers. This is likely to see port related freight activity pushed to cluster areas outside Christchurch, requiring new transport links, with potential for increased use of rail, to connect these areas to the port.

There are capacity pinch points in handling increased agricultural production on the feeder roads to the Napier port which will need to be addressed but will not require major investment.
Future 2: Primary sector expansion – Mineral exploitation

Assumptions
Mineral discoveries might be made in several places in New Zealand. Future 2 illustrates potential impacts by considering the possible consequence of a discovery of significant oil and gas reserves off the coast of Gisborne, using estimates from the East Coast Oil and Gas Development Study published by MBIE (2013). The large-scale production scenario was used, in which the Gisborne mining sector produces annual revenue of $5.1 billion, which implies value added in the sector of $2.2 billion.

It was assumed that this change occurs from 2017 and multiplier impacts were permitted in the region but not in the remainder of the country. The mining sector in Gisborne is currently negligible and so it was assumed that labour productivity in the expanded sector would equal that being achieved in Taranaki’s mining sector under the assumptions of the model. This resulted in an employment jump in the Gisborne mining sector from 77 people to 2,099 people.

There were increases in the other sectors as the higher production was not assumed to increase labour productivity beyond the annual growth of 0.9 per cent. This implies an increase in Gisborne’s population to keep the employment–population ratio unchanged; again, it was assumed that the expansion was made possible by more migrants.

Under Future 2, AERU has assumed that an offshore petroleum development will be geographically centred on Gisborne and that most of the support services (including transport) and immediate economic benefits will be located there. This would broadly mirror experience from the major Taranaki oil and gas field developments since the 1970s.

Summary results in comparison to the Baseline
A lift in Gisborne’s projected (2042) population and employment from 48,000 and 20,000 in the Baseline, to 80,000 and 32,000 respectively.

Other impacts would be major jumps in mining sector GDP and average mining productivity nationally, increases in mining sector exports and imports, and a major increase in GDP for the Gisborne region. Under Future 2, GDP for the Gisborne region would be approximately 200% higher than under the Baseline projection.

An alternative analysis of the regional effects of the oil/gas discovery
The characteristics of offshore petroleum development have changed since the development of the Taranaki petroleum field. Local onshore processing facilities are no longer a pre-condition for proceeding to exploit an offshore find.

Rather, an offshore development could well involve importation of a drilling exploration platform with a production facility also sourced from another country and towed into position. Such facilities are, from
a CAPEX perspective, acquired ‘off the shelf’ rather than relying on New Zealand-sourced manufacture and assembly.

In this Future, the provision of offshore consumables would be managed through a Platform Support Vessel from a suitable port facility with the rotation of foreign personnel managed through helicopter transfers from offshore to Gisborne and onward via additional scheduled flights (or charter) to Auckland.

**Transport implications**

**Domestic transport implications**

The projected uplift in GDP would be the consequence of increased value in the economic activity arising from the on-shore servicing of the offshore platform (increased spend on consumables, materials, accommodation, air transport (helicopter and transit journeys from Gisborne to Auckland and return) engineering and port activity.

Because of logistical issues at Eastland Port (single pier, no land-based crane facilities, not an all-weather port, two berth with one berth dedicated fulltime to log exports) it is possible that much of the imported equipment would transit through Tauranga. The provision of other consumables and services could be managed through Gisborne.

The Taranaki experience demonstrated that a commercial find can lead to a flurry of locally-based support effort (engineering, equipment servicing, seismic analysis and interpretation etc). But in this Future, it is likely the major portion of that support would be sourced from Tauranga and Hawke’s Bay where there is more immediate access (than in Gisborne) to a workforce with the relevant skills.

It should be noted that all of the production from the offshore well could be exported without landing in New Zealand. This is because the specification of the extracted material is expected to be of a higher grade than required as feedstock to the Marsden Point refinery. Greater value capture would be achieved through the export market. Even if it went to Marsden Point, transport would be by ship direct from the oil/gas field.

**Transport infrastructure and other investment**

The level of transport activity for crew rotation and platform support is not large, and unlikely to cause significant additional pressure on transport capacity, relative to Baseline. The incremental growth of support services in Tauranga, Gisborne and Hawkes Bay would somewhat increase demands on local transport networks and possibly bring forward the need for incremental capacity increases such as passing lanes. However, with the impact spread across three regions and with the oil or gas being directly shipped away, the impacts would be minor, nor would transport problems restrict the new economic activity.
Future 3: Catching up with Australia – sector selection model

Assumptions
In recent years, per capita gross domestic product in Australia has been around 27 per cent higher than in New Zealand on a purchasing power parity basis.

Policy makers in New Zealand have from time to time adopted a target of catching up with Australia, meaning that per capita gross domestic product in New Zealand would equal that in Australia

Consequently Future 3 and Future 4 explore the impact if labour productivity in New Zealand grows faster than the 0.9 percent per annum assumed in the baseline scenario in order to increase per capita value added by a further 25 percent above the baseline figure in 2042.

AERU suggests that it would be easier to improve productivity growth in sectors that are growing faster in the international market. Their sector selection model finds the business services sector growing much faster than the primary sector.

Summary results in comparison to the Baseline
Wealth effects are important in Future 3 and Future 4. Increased productivity would increase real incomes/purchasing power and increase the demand for high value luxury goods, and enhance both domestic and international tourism.

Figure 7: GDP by region in Future 3 relative to the Baseline projection, 2042
Transport Implications

The key assumption in this Future is that projected population in 2042 is the same as Baseline, which limits any additional transport pressure. But this Future implies considerable additional income and wealth relative to baseline, with some implications for passenger movements and general freight. Both domestic and international air travel would be significantly higher than under the Baseline.

The additional productivity growth in the selected sectors would be achieved over time. The network capacity at any time should indicate the scope of any bottleneck developing. Necessary remedies should then be taken to ensure the continuation of the trend in productivity growth.

Domestic transport implications

Passenger: In this Future faster economic growth is expected from labour productivity rather than additional employment. Consequently there would be almost no additional requirement for passenger movement by road and public transport during peak hours. The income/wealth effects in this Future could have profound effects on discretionary travel including road passenger vehicle movements and domestic air travel. In general, with the exception of Auckland, there is spare road and airport capacity to service these demands.

Freight: Additional retail and wholesale trade would add to pressure on urban road networks. Higher demand for luxury goods would have an impact on imports of such goods as well as their production within the country and their exports. This is likely to increase transportation of high value goods by air. Goods movement to and from sea ports would also be a little higher than under the Baseline driven by increased imports.

International transport implications

Passenger: Under this Future, export and import of goods and professional services would be above baseline levels. This would in turn add to international movement of both freight and passengers. Both domestic and international air travel would be significantly higher than under the Baseline.

Freight: Higher exports and imports would also increase international transport by sea. The ports generally have sufficient capacity or are currently expanding, however some pressure will also be added to road and rail links to the port.
Future 4: Catching up with Australia – the knowledge economy

Assumptions

This section explores transport implications of Future 4, which considers achievement of higher productivity growth necessary to catch up with Australia’s real per capita GDP by 2042, by developing better expertise (intellectual capital) over time. The better knowledge of technology can be through higher academic qualifications in general or better understanding through special training and work experience that would be required to apply improved technological changes in the production process.

Availability of better expertise is expected to increase productivity in all sectors with some variation depending on current concentration of expertise in these sectors. AERU estimates that the growth rates for ‘value added’ would be relatively high in ‘agriculture, forestry and fishing’, mining, manufacturing, construction and ‘wholesale and retail trade’. This is because they are assumed to benefit more than other sectors from a lift in skills/knowledge.

Summary results in comparison to the Baseline

Increased productivity and incomes would have similar wealth effects to those in Future 3 e.g. higher demand (than in the baseline) for high value luxury goods, domestic and international tourism, and recreational activities. The percentage lift in GDP (relative to baseline) would be broadly the same across regions.

Figure 8: GDP by region in Future 4 relative to the Baseline projection, 2042
Transport Implications

Transport pressures are limited by the key assumption of no population growth relative to baseline. The major additional production of goods and services, consequent on the lift in productivity, would probably have some implications for both domestic and international transportation of freight and passengers.

**Domestic transport implications**

**Passenger:** Because the economic growth is expected from productivity improvement and not additional employment, as in Future 3, there would be almost no additional requirement of passenger movement by road and public transport during peak hours. And, as for Future 3, potentially the income/wealth effects in this Future could have profound effects on discretionary travel including road passenger vehicle movements and domestic air travel. This could bring forward the optimal date for road enhancements (e.g. passing lanes, improvements of pinch points) in some areas, and the optimal timing for a second Auckland airport runway.

**Freight:** Higher output from the mining, manufacturing, and construction sectors, as well as from the service sector, will increase freight demand. According to AERU estimates, exports and imports in all sectors under this Future would be significantly higher than under the Baseline.

The total impact on the road network will depend on the proportion of freight carried by road versus rail. The former is expected to continue to be the dominant mode. Most of New Zealand outside Auckland has ample road capacity, except for pinch points that can be fixed. The rail network has substantial spare capacity apart from pinch points in Auckland. Substantial additional retail and wholesale trade would increase pressure on the urban road network.
Future 5: Location choices – “Auckland agglomeration”

Assumptions
Under Future 5, AERU has assumed that Auckland will grow at the high rate of population growth projected by Statistics NZ (1.8 percent per annum, rather than 1.5 percent per annum under the medium projection). Note that, in this Future, Auckland’s population growth is not assumed to come at the expense of other regions, so the higher growth results in a corresponding increase in New Zealand’s total population, and Baseline growth rates for other regions.

Summary results in comparison to the Baseline
The key transport effects under the Future would be an increase in travel demand concentrated in Auckland resulting from increased population and employment as value added per employee is assumed to remain constant between Futures.

Under Future 5, Auckland’s 2042 population is 255,400 higher than the Baseline, with an additional 113,000 employees.

Table 5: Population and Employment: Future 5 and in the Baseline, 2042

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Future 5</th>
<th>Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>2042 Population</strong></td>
<td>2,346,600</td>
<td>2,602,000</td>
<td>255,400</td>
</tr>
<tr>
<td><strong>2042 Employment</strong></td>
<td>1,040,500</td>
<td>1,153,700</td>
<td>113,200</td>
</tr>
</tbody>
</table>

Figure 9 contrasts Auckland population projection under Future 5 with the other regions.
Because of the assumptions in the FONZE model this is mirrored in projected GDP shares.

Figure 10: Auckland region share of GDP under each of the Futures, 2042

These can be compared with an Auckland region’s share of 41.3% (of GDP in 2042) under the Baseline.

Transport implications

Domestic and international transport implications

Passenger: In Future 5, private vehicle and PT travel within Auckland is predicted to increase significantly compared to the baseline. The relative increase in private vehicle travel will, however, be slightly lower than the relative increase in population growth due to diversion to other modes and potentially some trip suppression from congestion. As discussed in the Ministry’s Future Demand strategy project, there is an increased level of uncertainty about demand. For example, a combination of factors has resulted in a decline in vehicle kilometres travelled per capita and young people are less inclined to get drivers licences. However, as population growth underlies Auckland’s challenges, we still expect total demand for travel to increase in Auckland, particularly for journey’s to work, even if per capita travel declines.

Auckland Transport’s modelling of the Auckland Plan illustrates the impacts of the increase in trips from additional population growth. By way of background, the Auckland Plan sets out Auckland
Council’s strategy for responding to forecast population growth, which the Plan assumes will occur at
the high rather than medium rate, until 2041. The Plan seeks to achieve a transformational shift to
public transport and proposes investment in a range of public transport roading and active mode
projects as well as ITS technologies and non-pricing demand management measures. To deliver this
programme, the Plan assumes a further $10-$15 billion of funding will be available in addition to
funding forecast to be available under current settings. As noted in the Baseline discussion, the
Auckland Unitary Plan requires urban growth to be primarily focused within the metropolitan area
2010.

Auckland Transport has modelled Future network performance, assuming delivery of the full Auckland
Plan programme, for both medium and high population growth Futures. The modelling indicates that
the increase in demand for travel in a high growth Future, similar to Future 5, will result in increased
congestion across Auckland’s road network15.

► Under a medium Future, 15 to 16 percent of all vehicle kilometres travelled across the region
(VKT) during the morning peak and inter-peak are forecast by Auckland Transport to be in
severely congested conditions16 in 2041. This proportion increases to around 20 percent of VKT in
a high growth Future.
► On the strategic freight network17, around 20 percent of VKT in the morning peak and inter-peak
will be affected by severe congestion under a medium growth Future, rising to around 25 percent
in a high growth Future (similar to Future 5).

Despite the higher congestion, the modelling results suggest that increases in access to employment,
assuming full funding of the Auckland Plan programme, will keep pace with the additional increase in
employment in a high growth Future18. This is a positive result.

The Ministry’s view is that, in this time period, it will be possible to implement measures that mitigate
some of these pressures such as demand management through ITS measures and potentially wider
network pricing that offsets current fuel taxes. Private vehicle travel to destinations outside of the
Auckland Region is also likely to increase in Future 5, putting greater pressure on the State Highway
network in the Waikato and, to a lesser degree, Northland.

Public transport and active mode travel: Public transport and active mode travel will increase in
Future 5. Auckland Transport’s modelling suggests that, under a high growth Future, the share of
public transport and active mode travel during the morning peak would increase, from around 27
percent of trips in a medium growth Future to around 31 percent under this high growth Future19.
Increases in services would likely be needed to accommodate the additional growth.

15 These figures are taken from Auckland Transport’s 2012-14 Integrated Transport Programme pg 95.
16 Severely congested conditions are defined as Level of Service E or F, which, on a motorway, equates to flow breakdown and
stop – start travel.
17 Basically the motorway network, plus the following arterials – Church and Neilson streets, South Eastern Arterial, Pakuranga
Highway, Ti Rakau Drive and Te Irirangi Drive.
18 See figure 5.9 of Auckland Transport’s 2012-14 Integrated Transport Programme pg 97.
19 This is based on comparing the results for the Fully Funded Future’s 2 and 3 in Figure 5.5 of Auckland Transport’s 2012-14
Integrated Transport Programme pg 93.
**Freight:** The increase in freight task in Future 5 is expected to be roughly proportionate to the overall increase in population. The increase in freight volumes is largely expected to be made up of the distribution of manufactured goods (including imports) and aggregates (for construction), with the bulk of movements remaining internal to Auckland.

No large shifts in freight movement trends are expected between the baseline and Future 5. However, the higher congestion occurring throughout the day is likely to increase emphasis on initiatives to avoid congestion, such as night time movements and some shift to rail and coastal shipping for inter-regional movements.

Upper North Island port capacity is expected to be able to accommodate the expected increase in freight movements through progressive increases in the capacity of their facilities. The road and rail links feeding the ports will also need to be considered.

The pressure on land and increased congestion may well see some shift of industry, e.g. distribution centres, to regions outside Auckland. An example is the proposed Ruakura development in Hamilton which is seeking to attract distribution centres from South Auckland and provide an aggregation point for import and export cargoes by acting as an inland port.

**Air travel:** Domestic and international air passenger and freight travel can be expected to increase in Future 5 at rates above those in the Baseline. Auckland airport is expected to have capacity for this additional travel through an ongoing programme of infrastructure improvements, potentially including a second runway. Improvements in road and public transport access to the airport are assumed to have been delivered under the Baseline.
Future 6: Location choices – Three golden triangles

Assumptions
This Future assumes that the country follows a path in which some regions experience high population growth (the ‘three golden triangles’) while the remainder of the country experiences low population growth. The three golden triangles are defined as follows:

► Northern Triangle: Auckland, Waikato, Bay of Plenty
► Central Triangle: Wellington, Manawatu–Wanganui
► Southern Triangle: Canterbury

Summary results in comparison to the Baseline
The populations of these six regions were assumed to grow at the high projected rate and the remaining regions were assumed to grow at the low projected rate.

Figure 11: Future 6 population relative to the Baseline projection, 2007-2042

GDP in the three golden triangles is higher than for the Baseline, whereas GDP in other regions is lower than under the Baseline.
Figure 12: Future 6 GDP by region relative to the Baseline projection, 2042

**Transport implications**

**Domestic transport implications**

Population is a key driver of transport demand. The Golden Triangles Future has population growth in Auckland just as high as Future 5, but transport demand in Auckland will be further increased by the higher growth in the regions south of Auckland – the Waikato and Bay of Plenty. This Future is the most extreme for transport pressure in Auckland.

**Passenger:** In Future 6, the combined population of the Auckland, Bay of Plenty, and Waikato regions would be 400,000 above the Baseline figure. Canterbury’s population would be 131,000 higher than the Baseline figure and the equivalent figure for Wellington and Manawatu-Wanganui combined would be 123,000.

So the scale of the additional population effects would be much larger in the northernmost triangles than in the other two. However Future 6 would still mean considerable more pressure (than in the Baseline) on the road and public transport networks in Wellington and Christchurch.

**Freight:** There will be pressure on the ports in the regions to handle increased activity. Growth in Auckland/BoP/Waikato triangle will be dis-proportionate to other two golden triangles. This will require efforts to increase port handling, port access and extra storage facilities. At the major ports there may be added pressure due to transhipment and to larger ships.
In this Future, industrial production, retail and wholesale trade are higher than Baseline. This is due to the increase in GDP and population in the three golden triangles. The impact would be mainly on road freight resulting from increased population and higher demand for transport of consumer goods.

**Roads:** There will be extra pressure on road infrastructure in the three golden triangles, and a need for additional investment, or other measures, to accommodate this additional pressure. The pressure will be at its most extreme in Auckland. Some of the current large motorway projects will help but upgrades of the state highway networks linking the three regions is likely to be required. The rail network outside Auckland has ample capacity. The busiest rail line, Auckland-Hamilton-Tauranga, would be important to facilitate further growth of the Auckland/Waikato/BOP golden triangle.
Futures 7: Location choices – thriving market towns

Assumptions
An alternative possibility is that congestion in Auckland reduces its population growth while changes in technology such as the roll-out of ultrafast broadband will make smaller market towns more attractive in which to live and do business.

The analysis in the FONZE model is at the regional level, which is probably too coarse for exploring this possibility in any depth, but the market towns regions adopted for Future 7 are: Bay of Plenty; Hawke’s Bay; Marlborough; Nelson; and Otago. The populations of these regions were assumed to grow at the high projected rate, Auckland was assumed to grow at its low projected rate, and the remaining regions were assumed to grow at the medium projected rate (see Table 15 above).

► The Market Towns Future has additional population growth in the market towns in the Bay of Plenty, Hawke’s Bay, Nelson, Marlborough and Otago
► Their populations are SNZ’s ‘high’ projections in contrast with the medium projections used in the baseline
► Their growth is partly fuelled by slower growth in Auckland, which is on a low growth track in this Future. Auckland transport pressure and other cost structures could underlie this, or the market towns could have lifestyle or cluster attractions as discussed above

Summary results in comparison to the Baseline
The actual population changes are shown below. Auckland drops from the baseline population of 2.35 million to 2.04 million in Future 7. While the Bay of Plenty, Hawke’s Bay, Marlborough, Nelson and Otago all experience growth compared to the Baseline projection. Overall population is slightly down on the baseline.

Differences between the population numbers under Future 7 and the Baseline are shown in Table 6.
Table 6: Population by region in 2007, Baseline and Future 7 in 2042 (000)

<table>
<thead>
<tr>
<th>Region</th>
<th>2007</th>
<th>Baseline</th>
<th>Future 7: Market towns</th>
<th>Difference between the baseline and Future 7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auckland</td>
<td>1,394</td>
<td>2,347</td>
<td>2,043 (lowest)</td>
<td>-304</td>
</tr>
<tr>
<td>Bay of Plenty</td>
<td>267</td>
<td>341</td>
<td>406 (high)</td>
<td>+65</td>
</tr>
<tr>
<td>Canterbury</td>
<td>544</td>
<td>694</td>
<td>694</td>
<td>0</td>
</tr>
<tr>
<td>Gisborne</td>
<td>46</td>
<td>48</td>
<td>48</td>
<td>0</td>
</tr>
<tr>
<td>Hawke’s Bay</td>
<td>152</td>
<td>163</td>
<td>195 (highest)</td>
<td>+31</td>
</tr>
<tr>
<td>Manawatu-Wanganui</td>
<td>230</td>
<td>247</td>
<td>247</td>
<td>0</td>
</tr>
<tr>
<td>Marlborough</td>
<td>44</td>
<td>52</td>
<td>62 (highest)</td>
<td>+10</td>
</tr>
<tr>
<td>Nelson</td>
<td>45</td>
<td>55</td>
<td>63 (highest)</td>
<td>+8</td>
</tr>
<tr>
<td>Northland</td>
<td>153</td>
<td>183</td>
<td>183</td>
<td>0</td>
</tr>
<tr>
<td>Otago</td>
<td>201</td>
<td>248</td>
<td>295 (highest)</td>
<td>+47</td>
</tr>
<tr>
<td>Southland</td>
<td>93</td>
<td>97</td>
<td>97</td>
<td>0</td>
</tr>
<tr>
<td>Taranaki</td>
<td>108</td>
<td>115</td>
<td>115</td>
<td>0</td>
</tr>
<tr>
<td>Tasman</td>
<td>46</td>
<td>59</td>
<td>59</td>
<td>0</td>
</tr>
<tr>
<td>Waikato</td>
<td>396</td>
<td>505</td>
<td>505</td>
<td>0</td>
</tr>
<tr>
<td>Wellington</td>
<td>469</td>
<td>578</td>
<td>578</td>
<td>0</td>
</tr>
<tr>
<td>West Coast</td>
<td>32</td>
<td>34</td>
<td>34</td>
<td>0</td>
</tr>
<tr>
<td>NZ</td>
<td>4220</td>
<td>5,766</td>
<td>5,624</td>
<td>-144</td>
</tr>
</tbody>
</table>
GDP growth is lower than the Baseline by 2.7% as population is slightly down, and value added per employee is lower in the market towns than in Auckland. However, as shown in Figure 13, population figures for each of selected region are nearly 20% higher than in the Baseline.

![Figure 13: Future 7 population relative to the Baseline projection, 2042](image)

These may be the source of significant additional transport pressures in the relevant localities for example on local roads, state highways, and public transport. But without much more detailed analyses of the locations affected, and their transport networks, we cannot add much more.

## Summary and conclusions

The following table indicates, for each of the seven Futures, the scale and mix of transport effects (relative to the Baseline) that can be inferred from the AERU numbers. The table also indicates, for each type of pressure (i.e. population growth, light vehicle travel, etc.), the relative magnitude and locality of effects across the seven futures using small or large triangles.

Futures 5 & 6 imply even faster population growth in the Auckland region than in the Baseline, so we have highlighted the additional pressure that this implies. For Futures 3 & 4, which are based on high productivity (but no additional population growth relative to Baseline), we give more emphasis to air travel and international freight.
Table 6: Summary of transport implications by Future

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<tbody>
<tr>
<td>Population growth (Auckland)</td>
<td>🔴</td>
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<td>🔴</td>
<td>🔴</td>
<td>🔴</td>
<td>🔴</td>
<td>🔱</td>
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<tr>
<td>Population growth (rest of NZ)</td>
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<tr>
<td>Light vehicle travel (Auckland)</td>
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<td>🔴</td>
<td>🔴</td>
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<tr>
<td>Light vehicle travel (rest of NZ)</td>
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<tr>
<td>Freight</td>
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<tr>
<td>Localised freight</td>
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<td></td>
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<tr>
<td>Public transport</td>
<td>🔴</td>
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<tr>
<td>Rail freight</td>
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</tbody>
</table>

Legend:
- 🔴: Large increase in transport pressure relative to the baseline projection
- 🔱: Small decrease in transport pressure relative to the baseline projection
- Light vehicle travel (rest of NZ) is marked for Canterbury.

Transport pressure relative to Baseline:
- Population growth (Auckland)
- Population growth (rest of NZ)
- Light vehicle travel (Auckland)
- Light vehicle travel (rest of NZ)
- Freight
- Localised freight
- Public transport
- Rail freight
- Airports
- Ports
The main conclusion from this work is that although there are numerous possible futures for New Zealand, the most likely of those are ‘more of the same’ in terms of ongoing concentration of population and economic activity in and around Auckland. Based on New Zealand’s experience and that of other developed countries there is an almost inevitable long-term path towards increased concentration of economic activity in service industries and urbanisation. Other factors are overlaid on this creating a gravitational pull towards the Auckland region.

Many of the transport pressures described under the Baseline projection and seven futures (as at 2042) are variations of what we see now. It is possible that these longer term trends in the spatial pattern of economic development may change.

Finally, this is high level review. At a smaller scale relatively small changes in agglomeration or dispersion factors and population and economic trends within regions and within urban areas could have marked effects in areas of concentration, and hence in the location of transport pressures. Much more detailed analysis would be required to draw any firm conclusions at that level of granularity.
Capacity of New Zealand’s Transport Infrastructure

The scenarios in this paper all imply increased freight and/or passenger traffic in particular parts of New Zealand. This box presents a broader, high level view of the capacity in New Zealand’s transport infrastructure to accommodate additional freight and passenger traffic. Growth constraints relate to infrastructure but not to trucks, trains, aeroplane and ships (as additional capacity is readily obtained from competitive overseas suppliers).

The Ministry welcomes feedback on transport capacity challenges not picked up in this assessment.

Roads

The road capacity issues arising from the scenarios especially relate to Auckland and the Golden Triangle. There is a concentration of significant transport impacts in the upper North island, including severe congestion in Auckland (which imposes significant costs on the economy), and some high journey time, safety and resilience issues across key strategic routes. In the lower North Island and around greater Christchurch there is a moderate level of severe congestion in the urban areas, with safety and resilience risks on key strategic routes.

That said, most of the national state highway network appears to have sufficient capacity to handle substantially increased freight. There would be instances where some projects would be required (additional passing lanes) or more substantive projects moved forward (bridge replacements, four laning).

Four-laning to relieve route congestion and address safety issues is typically undertaken once traffic levels reach a threshold level. All routes likely to exceed the threshold have adequate planned four-laning projects, largely in the form of Roads of National Significance projects and the Auckland accelerated projects over the next 10 years, but also including passing lanes. In the longer term more projects could be required on strategic routes where there is growing demand.

There are significant pinch-points on the network where additional truck movements would create adverse effects, notably additional congestion. This is mainly within major urban areas:

- Auckland (to and from Ports of Auckland)
- Hamilton (Hamilton bypass and southern links)
- Tauranga (over SH29, and to and from Port of Tauranga)
- within Christchurch (to and from Port of Lyttelton) and to a lesser degree through Dunedin (SH88 and access to Port of Otago)

The mitigation cost for these is likely to be significant due to the additional road capacity required in an urban environment.
The following significant pinch points have proposed mitigations although they are not necessarily programmed yet:

- Auckland’s Central Motorway Junction (western ring route complete within the next few years).
- Wellington’s Ngauranga Gorge and SH1/2 interchange (New Petone - Grenada route, and Cross Valley Link)
- Rimutakas (realignments).

Pinch points with the highest technical and cost challenge include:

- Brynderwyn Hills, between Auckland and Whangarei
- Kaikoura Coast.

Other potential problems, notably access across the Kaimais to Tauranga, are being avoided through increasing use of rail freight.

Passenger traffic is a problem for large metropolitan areas. A decline in vehicles travelled per capita has offset population increases and helped avoid increased congestion (this is discussed in a companion strategic study on future demand). Metropolitan traffic growth is also being addressed with a combination of:

- better bus networks (e.g. route rationalisation, increased frequency, improved interchanges and more bus lanes being implemented in Auckland and planned in Wellington)
- recent urban rail upgrades in Auckland and Wellington
- demand management. For example, Auckland has ramp access control on the main motorway and is discussing congestion pricing
- plans to increase density in some areas combined with public transport improvements.

**Rail**

KiwiRail has spare capacity on almost all its network, and would benefit financially from increased freight. The KiwiRail turnaround plan has seen substantial investment in its infrastructure, improving capacity, reliability of journey times. Further upgrades and replacements are planned. Other capacity related projects, subject to funding, include:

- improvements to some freight yards
- installation of a third line between Westfield and Wiri
- other improvements in Auckland where there is congestion from the mix of passenger and freight services.
Airports

All New Zealand airports with scheduled flights have spare capacity. The airport most affected under all the scenarios in this study is Auckland. Rapid or accelerated growth in Auckland may bring forward the date when a second runway is needed; the airport company already has the land and planning permission for that option and some preliminary construction work has already been undertaken.

Jets and turboprops operate domestic flights between Auckland, Wellington, Christchurch, Queenstown and Dunedin. Services to other airports are by turboprops though some have had jet service in the past (e.g. Hamilton, Palmerston North, Invercargill). The main implications of the studied scenarios, besides increased activity at Auckland, are for increased demand at Christchurch and some provincial airports, all of which have ample spare capacity.

Some provincial airports would not be able to accommodate regular jet services without runway lengthening and/or strengthening, but increased turboprop frequency would be the best response to increased demand – their smaller capacity allows higher frequencies and their journey times are similar to jet journey times on shorter flights. Turboprops also have a significant advantage with respect to fuel consumption. If scheduled services to particular provincial airports ceased, the impact on economic activity would depend on whether there was another scheduled-service airport within reasonable driving distance.

Trans-Tasman services are provided to the three main airports, Queenstown and, less frequently, to Dunedin, with seasonal flights elsewhere (although those to Rotorua are about to be dropped). Long-haul international services are all through Auckland except for a daily Christchurch-Singapore flight; there is debate about whether a proposed lengthening of Wellington’s runway would lead to long-haul services there. Most of New Zealand's major international air routes are open to competition (those to Australia, North America, Japan, Singapore and the UK) and the Ministry is negotiating with overseas governments to liberalise restrictions on other routes.

If a natural disaster or extreme weather closed particular airports, there is in most cases another one within a one or two hour drive that could be used, although not always by larger aircraft.

Most freight goes in the belly holds of passenger aircraft, adding to the importance of capacity liberalisation. There is effectively no restriction on freight-only aircraft to or from the major markets including China.

Ports

Some of New Zealand's major ports are increasing their capacity, e.g. Auckland, Tauranga, Lyttelton. Others either have spare capacity or the potential to add capacity. Some have constraints that would be expensive to overcome, e.g. Gisborne, Wanganui. Capacity constraints at any one port are mitigated by competition between ports, e.g. between Tauranga and Auckland, Timaru and Lyttleton, Napier and Wellington. Broader competitive potential is shown by the recent Kotahi deal involving the Ports of Tauranga and Timaru.
Potential future demand at particular ports will be affected not only by the scenarios in this study but also the advent of larger container ships. With lower costs per container, they are expected to make fewer port calls and hence require greater use of road and rail links to connect to some of the freight origins and destinations. However those links cost more per net tonne kilometres than ships. There will be a competitive dynamic between larger ships making fewer port calls, smaller ships making more calls, and coastal shipping.

The broad picture is that New Zealand’s ports will be able to cope with the increased freight implied by the scenarios, but the pattern between ports will be dynamic.

**Conclusion**

Increased transport demands implied by the scenarios in this study will not give rise to major capacity problems in most of the transport network, but may bring forward the dates for routine capacity enhancements such as additional road lanes and rail passing loops. Increased demands will however add to existing difficulties with certain pinch points in the road network; the most notable cases under all scenarios are in Auckland. There are potential investments to address the main freight related problems, while broader policies will be needed for general urban traffic.