

New Zealand Transport Outlook: Future State

Population and GDP Assumptions

April 2019

Short name

Population and GDP Assumptions

Purpose

These assumptions are used for a single Transport Outlook scenario, including population, GDP, regional GDP, tourism, utilisation of vehicle-sharing services, change in average trip length, and impacts of hypothesised congestion charging in Auckland, Wellington, and Christchurch.

Software used

Excel

For questions and comments:

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Population and GDP Assumptions

1. At a high level, what does this model do?

The Transport Outlook Population and GDP Assumptions provide a set of key assumptions used by other Transport Outlook models, including assumptions about population, GDP, regional GDP, tourism, diversion of private vehicle travel to vehicle-sharing, and impacts of hypothesised congestion charging in Auckland, Wellington, and Christchurch. By keeping all these assumptions together in one file and linking other models to this file, we ensure that all models are using consistent assumptions, and make updating these assumptions easy.

2. Where do I find the model results?

The model consists of a single Excel workbook for each scenario to be modelled. There are six sheets in the workbook.

Provincance – Just tells the file this file was originally adapted from.

Population – This sheet shows assumptions about the New Zealand population in five historical years (2012/13 - 2016/17) and projected in five-year increments to 2057/58. There are two results tables at the top of the sheet. One shows only the 2012/13 historical data and projections to 2057/58 in five-year increments, while the other shows all five historical years. The two tables are provided for convenient linking to models that require data in a certain layout; the numbers are the same.

GDP – This sheet shows assumptions about New Zealand's GDP between 1996/97 and 2059/60. There are three sets of results at the top of the sheet. Rows 3-8 shows results for every year; rows 10-14 show results in five-year increments from 2012/13-2057/58; rows 16-20 show results for five historical years (2012/13 – 2016/17) and projections in five-year increments to 2057-58. In the medium growth scenarios, the numbers in all three sets of results are the same. In the high-growth scenarios (@home and Golden), the annual results in rows 3-8 remain the medium-growth projections, while the results in rows 10-14 and 16-20 have an additional percentage annual growth increment (currently 1%/year) added to make them high-growth projections.

Regional GDP – This sheet shows assumptions about GDP by region. The results are shown in rows 4-21. Results are shown for five historical years (2012/13 – 2016/17) and projections in five-year increments to 2057/58.

Tourism – This sheet shows assumptions about the growth of tourism at a national level. Rows 3-10 show the assumptions on an annual basis. Three measures of tourism are shown: visitor arrivals, visitor days, and visitor spend. Rows 17-20 show the visitor arrivals and visitor days for the historical year 2012/13, as well as projections in five-year increments to 2057/58. Rows 30-33 show the visitor arrivals and visitor days for the historical years 2012/13 - 2016/17, as well as projections in five-year increments to 2057/58. The numbers in all three sets of data are the same.

Other Assumptions – This sheet shows additional transport assumptions. Rows 3-19 show the assumed fraction of household light vehicle travel (light vehicle drivers and light vehicle passengers) diverted to vehicle sharing services. Assumptions are given for the historical years 2012/13 –

2016/17 (all assumed to be zero), as well as projections in five-year increments to 2057/58. Rows 22-38 show the assumptions for diversion of light commercial vehicle travel to vehicle-sharing services in a similar format. Rows 41-57 show an assumed change in average trip length in percentages in a similar format. Rows 60-95 show the assumed impacts of congestion pricing in the Auckland, Wellington, and Canterbury regions. For each region, two rows show the reduction in household light vehicle and commercial light vehicle VKT, respectively, compared with unconstrained levels. Five additional rows for each region show how the assumed percentage of the reduction in light vehicle drivers, light vehicle passengers, and vehicle share passengers are diverted to other modes: additional light vehicle passengers and vehicle share passengers in the remaining light vehicle trips (resulting in increased vehicle occupancy), bus, rail, cycling, and walking. The diversions do not need to sum to 100%; if they sum to less than 100%, the residual reduction is assumed to be a reduction in travel.

3. What are the inputs to this model and where do they come from?

Population – Historical population estimates (through 2016/17) are from ‘Subnational population estimates (RC, AU), by age and sex, at 30 June’ by Stats NZ (<http://nzdotstat.stats.govt.nz/wbos/Index.aspx>).

Population projections through 2042/43 are based on the ‘Subnational population projections by age and sex, 2013(base)-2043’ from Stats NZ (<http://nzdotstat.stats.govt.nz/wbos/Index.aspx>). In the Base Case and the Staying Close to the Action scenario, these come directly from the ‘medium’ projection. The Metro-Connected scenario is also based on the ‘medium’ projection, but with some additional adjustments discussed in Section 4. The @Home in Town and Country and Golden Triangle scenarios are based on the ‘high’ projection, but with some additional adjustments discussed in Section 4.

Beyond 2042/43, Stats NZ does not provide population projections at a regional level, so we created our own, as discussed in Section 4 below; the regional projections were designed to sum to national population projections 2016(base)–2068 available from Stats NZ at http://archive.stats.govt.nz/browse_for_stats/population/estimates_and_projections/NationalPopulationProjections_HOTP2016.aspx. The Base Case, Staying Close to the Action scenario, and Metro-Connected scenario are based on the 50th percentile projection. The @Home in Town and Country and Golden Triangle scenarios are based on the 97.5 percentile projections.

GDP - Total real GDP history and projections for 2014/15 to 2031/32 are from The Treasury’s 2018 Budget and Fiscal Update (BEFU) (www.treasury.govt.nz/government/fiscalstrategy/model). Historical data for 2007/2008 to 2013/14 was not in the BEFU 2018 spreadsheet, so data from the BEFU 2016 spreadsheet was used. For 2032/33 and beyond, real GDP is based on nominal GDP projections by the Treasury’s New Zealand Superannuation Fund Model (<https://treasury.govt.nz/publications/information-release/new-zealand-superannuation-fund-contribution-rate-model>), with an assumed inflation adjustment of 2% per year, as suggested by the Treasury.

Regional GDP - Historical data on regional GDP in current prices for 2012/13-2016/17 is from Statistics New Zealand: <https://www.stats.govt.nz/information-releases/regional-gross-domestic-product-year-ended-march-2017>. Since the Regional GDP figures are for years ending 30 March,

while we need data for 30 June years, adjustments are made to the figures to attempt to convert them to 30 June years. The regional figures are then scaled to force their sum match the national GDP figures in the GDP sheet.

Tourism – historical and projected data on tourism to 2024 comes from MBIE (<https://www.mbie.govt.nz/immigration-and-tourism/tourism-research-and-data/international-tourism-forecasts/2018-2024-international-tourism-forecasts/>).

Other Assumptions – All data in this sheet are simply assumptions supplied by the modeller. However, there is an additional spreadsheet behind the congestion pricing assumptions in the Staying Close to the Action scenario, which has been peer-reviewed by officials at Auckland Transport and the Greater Wellington Regional Council.

4. How does this model derive its results?

Population – For the Base Case and Staying Close to the Action scenarios, the population projections through 2042/43 are taken directly from the Stats NZ ‘medium’ projections. Beyond 2042/43, the regional populations are first estimated by extrapolating based on 2037/38-2042/43 growth rates in each region. These initial regional estimates are then scaled to match the Stats NZ 50 percentile national population projections 2016(base)–2068.

For the Metro-Connected scenario, the goal is to have each of the 11 largest cities/districts all grow at the same rate as each other, corresponding to the growth of their total population according the Stats NZ 'medium' projection. This is no problem through 2042/43, however, after 2042/43 there are no Stats NZ regional projections. Therefore, after 2042/43, populations of each region and city are first extrapolated based on their 2037/38-2042/43 growth rates. The 11 largest cities/districts are then adjusted to all grow at the same rate as each other, corresponding to the growth of their total population according the extrapolations. These initial regional estimates are then scaled to match the Stats NZ 50 percentile national population projections 2016(base)–2068.

In the Golden Triangle scenario, the goal is to have the difference in population growth between the Stats NZ 'high' and 'medium' projections assigned to the three Golden Triangle regions (Auckland, Waikato, Bay of Plenty) only, with population in other regions following the 'medium' projection. Again, this is no problem through 2042/43, however, after 2042/43 there are no Stats NZ regional projections. Therefore, after 2042/43, the Stats NZ ‘medium’ regional populations are extrapolated based on 2037/38-2042/43 growth rates in each region. The difference between the Stats NZ 97.5 percentile and 50 percentile national population projections 2016(base)-2068 is then assigned to the three Golden Triangle Regions. These initial regional estimates are then scaled to match the Stats NZ 97.5 percentile national population projections 2016(base)–2068.

In the @Home in Town and Country scenario, the goal is to have the population grow at the same rate in every region, with overall growth following the Stats NZ ‘high’ projection. Again, this is no problem through 2042/43, however, after 2042/43 there are no Stats NZ ‘high’ projections, as the ‘high’ projection was a projection by region. Therefore, after 2042/43, the population in every region grows at the same rate, with overall growth following the Stats NZ 97.5 percentile national projections 2016(base)-2068. It is worth noting that in earlier years, the national sum of the regional

'high' projections is almost identical to the 97.5 percentile national projection, so there is no loss of continuity in shifting between projections.

GDP – For the medium-growth scenarios (Base Case, Staying Close to the Action and Metro-Connected), all figures are taken directly from Treasury projections. The only adjustment is the conversion of nominal GDP projections to real GDP projections for 2030/31 and beyond, which are based on an assumed 2% per annum inflation rate. For the high-growth scenarios (Golden Triangle and @Home in Town and Country), an additional percentage increment is added to the assumed growth in real GDP per capita, as shown in cell H1.

Regional GDP – A simple model, contained entirely in this sheet, is used to project regional real GDP. The process works in two stages. First, the real GDP in each region is grown in line with the projected population of the region, a process that implicitly assumes that real GDP/person remains constant over time. Second, this initial projection of GDP in each region for a given year is multiplied by whatever constant forces the sum of all the regional real GDPs to match the projected total New Zealand real GDP in that year. An implication of this modelling approach is that regions that have relatively low or relatively high GDP/person compared with the New Zealand average tend to stay that way.

Tourism – The projections to 2024 come directly from MBIE. However, MBIE does not provide projections beyond 2024. Therefore, we have assumed in the medium-growth scenarios that tourism grows by 3.5% per year in 2025 and 3% per year thereafter. The 3% assumption is the same as the one used by Tim Hazledine in the domestic aviation model that he developed for the Ministry of Transport (refer his paper "Projections of regional air passenger flows in New Zealand 2018-2043", 18 March 2016, footnote 16, which he argues is very close to actual 2009-2015 growth in visitor arrivals). For the high-growth scenarios, we assume that tourism grows by 4% per year to 2043.

Other Assumptions – These projections are entirely created by the modeller to reflect the assumptions of the scenario.