New Zealand Transport Outlook

Household Travel Model Postprocessor

April 2019

Short name

Household Travel Model Postprocessor

Purpose of the model

The Transport Outlook Household Travel Model Postprocessor projects New Zealand household (non-commercial) travel by region for ten modes of transport for the years 2012/13 to 2057/58 in five-year increments. Projections are provided for the number of trips, distance travelled in kilometres, and duration of travel in hours.

Software used

Excel

For questions and comments:

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Transport Outlook Household Travel Model Postprocessor Documentation

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

The Transport Outlook Household Travel Model Postprocessor projects New Zealand household (non-commercial) travel by region for ten modes of transport for the years 2012/13 to 2057/58 in five-year increments. Projections are provided for the number of trips, distance travelled in kilometres, and duration of travel in hours.

The Household Travel has two main components. First, the separately documented Transport Outlook Household Travel Model SAS Programmes provide the base year 2012/13 results for each region, as well as starting values for the projections of total travel by mode nationwide to 2042/43. The Transport Outlook Household Travel Model Postprocessor provides the final projections of travel by mode by region to 2057/58. There are 14 regions in the model, with the Tasman, Nelson and Marlborough regions treated as a single region, labelled 'TNM'.

The Household Travel Model is heavily based on data from the New Zealand Household Travel Survey, as well as population projections from Stats NZ and GDP projections from the Treasury. The focus of the model is on projecting local travel, which accounts for the overwhelming majority of travel by the ten land transport modes considered. While the Household Travel Survey data does pick up an occasional inter-city trip, the sample size for inter-city travel is too small to be meaningful.

2. Where do I find the model results?

The model consists of a single Excel workbook for each scenario to be modelled. In the workbook, the first three sheets, labelled 'Total Trip Tables', 'Total Distance Tables' and 'Total Duration Tables', provide the final model results.

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

An initial set of projections of travel demand by region and mode to 2042/43 comes from the Household Travel Model SAS Programmes but, except for the base year 2012/13, only the national summation of these numbers is actually used. It was originally intended that the SAS Programmes would produce the final Household Travel Model travel demand projections by region and mode, and, indeed, the SAS Programmes still produce a complete set of demand projections by region and mode. These projections are shown in the 'Total Trip Tables Original', 'Total Distance Tables Original' and 'Total Duration Tables Original' sheets. However, our analysis of the regional projections produced by the SAS Programmes suggested that the Household Travel Survey sample size in some regions was too small to support reliable projections at the regional level, especially in the smaller regions. Hence, the Postprocessor uses only projections of travel demand at a national level from the SAS Programmes. It then uses a relatively simple approach to break these out by region and make further adjustments, so as to produce the final regional projections. It also extends these projections to 2057/58.

An exception to this approach is the projections for local train and local bus in Auckland and Wellington, and for local bus in Christchurch (where there is no local train service). Here, no simple

breakdown of national bus and train demands would be meaningful, so the regional projections from the SAS Programmes are still used as a starting point for the final regional projections.

Projections of regional populations are shown in the 'Updated Population' sheet. They come from the separately documented Transport Outlook Population and GDP Model file. The population projections used by the original SAS Programmes are shown in the "Original Population' sheet.

There is also a series of user-provided assumptions, entered in the last three sheets, which can be used to model various alternative scenarios.

In the 'Active Mode Assumptions' sheet, the user can enter assumptions about the growth of active modes (walking and cycling) compared with business as usual (BAU). Here, 'BAU' refers to the initial results from the SAS Programmes, whatever they may be. In the event that these modes grow beyond BAU, the user can specify what fraction of this growth is shifted away from the light vehicle driver and light vehicle passenger modes. The percentages do not need to sum to 100. In the event that the percentages sum to less than 100, the model will treat the remaining percentage of walking or cycling trips as newly generated.

In the 'PT Assumptions' sheet, the user can similarly enter assumptions about the growth of public transport (local train, local bus, and local ferry) in Auckland and Wellington only. The reason this feature was added is that we wanted to ensure that the impacts of the City Rail Link, now under construction in Auckland, as well as other planned public transport improvements in Auckland and Wellington, were fully reflected in our projections. Our models are not detailed enough to project the impact of specific local projects, so we have used this sheet to replace our own projections for Auckland and Wellington for public transport with projections provided by Auckland Transport and the Greater Wellington Regional Council.

For local train travel, the user may also specify what fraction of this growth is shifted away from the pedestrian, cyclist, light vehicle driver, light vehicle passenger, and bus modes. For local bus travel, the user may specify what fraction of this growth is shifted away from the pedestrian, cyclist, light vehicle driver, and light vehicle passenger modes. Again, the percentages do not need to sum to 100, with any remaining percentage of trips treated as newly generated. As the total distance walked or cycled is typically small, even a small diversion of pedestrian and cyclist flows to public transport can result in a large percentage reduction in distance and duration walked or cycled.

The 'Other Assumptions' sheet contains four further tables, all of which are linked to identical tables in the Population and GDP Model, where these assumptions should be entered by the user. The reason is that these assumptions may be used by other Transport Outlook models, including the separately documented Transport Outlook VKT/Vehicle Numbers Model. Entering them in the Population and GDP Model assures that all models are using consistent assumptions.

In the first two tables of the 'Other Assumptions' sheet, the user can enter an assumed share of household light vehicle driver and light vehicle passenger travel diverted to vehicle sharing and an assumed share of commercial light vehicle driver and light vehicle passenger travel diverted to vehicle sharing. In the third, the user can enter an assumed percentage change in average trip length, where 0% indicates no change from BAU.

The fourth table shows congestion charging, also known as demand management road pricing, assumptions for the Auckland, Wellington, and Canterbury regions. These include the desired reduction in household light vehicle and vehicle share VKT and the desired reduction in commercial light vehicle and vehicle-share VKT. The latter figures are not used by the Postprocessor, which deals only with household travel, but are shown here to keep the format consistent with the same table in the Population and GDP Model. Any reduction in household light vehicle VKT is assumed to be equivalent to a reduction in travel by household light vehicle and vehicle share drivers (or first occupants, in the case of self-driving vehicles).

The fourth table also shows the percentage diversion to other modes when the household light vehicle and vehicle-share VKT is reduced by congestion charging. The other modes to which this travel may be diverted include household light vehicle and vehicle share passengers (resulting in higher vehicle occupancy), bus, rail, cycling, and walking. As always, the percentages do not need to sum to 100. Any deficiency will be assumed to represent a reduction in total travel demand.

4. How does this model derive its results?

The projections from the SAS Programmes enter the Postprocessor through the 'Unformatted Trip Summary' sheet, which is linked directly to a .csv file generated by the SAS Programmes. This data appears in more readable format in the 'Formatted Trip Summary' sheet, which, in turn, feeds into the 'Total Trip Tables Original' 'Total Distance Tables Original' and 'Total Duration Tables Original' sheets. For the periods 2047/48, 2052/53, and 2057/58, for which the SAS Programmes did not generate results, 2042/43 results for each mode are grown in line with the regional population.

The 'Total Trip Tables Sup #1', 'Total Distance Tables Sup #1' and 'Total Duration Tables Sup #1' sheets then do the first-cut projections of travel by mode and region. These are estimated by growing the base year flows (trips, distances or durations, respectively) by the growth in the regional population and the growth in national per capita demand for that mode from the SAS Programme projections. The exception is for local train and local bus in Auckland, Wellington, and Canterbury, although the growth in train service in Canterbury is irrelevant, since the base year flows are zero.

The 'Total Trip Tables Sup #2', 'Total Distance Tables Sup #2' and 'Total Duration Tables Sup #2' sheets then make four possible adjustments to the first-cut projections.

- Walking and cycling are increased as specified by the user in the 'Active Mode Assumptions' sheet; some of these flows may be drawn from light vehicle drivers and light vehicle passengers.
- In Auckland and Wellington only, local train, local bus, and local ferry may be increased as specified by the user in the 'PT Assumptions' sheet; for local train and local bus, some of these flows may be drawn from light vehicle drivers, light vehicle passengers, pedestrians, cyclists and (for local train only) local bus.
- Distances and durations may be changed according to the changes in average trip length specified in the 'Other Assumptions' sheet.
- All figures are multiplied by a small 'adjustment constant' for each mode, shown on rows 159-168. This adjustment ensures that the sum of the flows across all regions for the mode, before taking into account the two adjustments above, equals the original national total projections from the SAS Programmes.

The ‘Total Trips Tables’, ‘Total Distance Tables’ and ‘Total Duration Tables’ sheets then do two final adjustments.

- Flows of light vehicle drivers in Auckland, Wellington, and Christchurch may be reduced according to the congestion charging assumptions shown in the ‘Other Assumptions’ sheet; some of these flows may be diverted to light vehicle passengers (higher vehicle occupancy), local train, local bus, cyclist and pedestrian.
- Some light vehicle driver and light vehicle passenger flows may be diverted to taxi/vehicle share according to the assumptions shown in the ‘Other Assumptions’ sheet.