Transport Model Peer Review Report

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To undertake a peer-review of the “Transport Modelling for North East Link - Transport Modelling Summary Report” and the modelling supporting it, in order to:

- Ensure that the Report adequately address the relevant requirements of the EES Scoping Requirements and the "public works" declaration; and,
- The Transport Model is suitable to represent the strategic transport effects of the North East Link project.
Qualifications

- Over 35 years of experience in transport planning, modelling and forecasting
- 15 years as lecturer and researcher at Leeds University and University College London
- 20 years as Director of Steer Davies Gleave (now Steer), an international consultancy
- Since 2010 an independent consultant
- Co-author of *Modelling Transport*
- Author of *Better Traffic and Revenue Forecasting*
- Lead over 50 toll road studies in more than 15 countries including Australia
- Expert Witness in the CLEM 7 toll road forecasting litigation case in Australia
Work undertaken

- Review background material on the project itself and the city
- Review the scope adopted for the strategic transport model and the standards applicable
- Undertook peer review of the Reports identifying assumptions, methodology and parameter values
- Review the data collection planned and delivered
- Visit the site to gain familiarity with conditions and expectations
- Hold meetings with modellers and forecasters that prepared the traffic projections
- Peer review the assumptions and methodologies in the model
- Suggest and review additional work that may be necessary to deliver projections that can provide the required confidence
- Write Peer Review Report and Statement.
The Transport Model 1

Scope

- Is a classic strategic multi-modal model implemented in the Zenith platform and refined over time
- The number of zones (~3500) is suitable for the project
- The number of links and their representation using flow-delay formulations is appropriate
- The time periods modelled capture the most important segments of demand and traffic
- The demand segmentation is appropriate to capture the differences in travel behaviour at the strategic level
- The outputs produced by the model are suitable to the task
- Unusually, the Report contains a good description of the main limitations of the model; these are also those of any other good strategic model.
The Transport Model 2

Sub-models

- The Trip Generation model follows conventional and suitable guidelines.
- The Destination Choice model is a local improvement on the classic gravity model.
- The Mode Choice model is a 3-level nested Logit model estimated using local and transferred data. It includes car, public transport, walking and cycling.
- The Route Choice and Assignment model incorporates a “toll choice” model and this combination is necessary for areas, such as Melbourne, where a toll cap is imposed.
- The treatment of freight is appropriate.
- Growth follows the classic approach based on projections of population, employment, students and economic activities.
Toll choice model

- Appropriate for the conditions in Melbourne
The Transport Model 3

Parameters

- The Zenith model for Melbourne has been supported by an extensive and sound data collection effort
- I reviewed the key parameters in the model for realism and benchmarking with international experience
- I asked and received additional details not provided in the Reports
- A few departed from my expectations but on discussion with VLC modellers I was satisfied that the model used reasonable values and the package was stable and consistent with best practice;
- The Validation gave good results:
  - Traffic counts on 6 screenlines at different times of the day
  - Travel time along key corridors (36 cumulative travel time tests)
  - Trip patterns on a 22 sector basis
- I am satisfied that VLC’s Transport Model is fit for the purpose of delivering the inputs for EES
Demand growth follows the expectations for Melbourne

Realism of the projections has been contrasted against known elasticities

Several sensitivity tests were undertaken including:
  • High and Low Population
  • A project specific land use scenario
  • +/- 20% change in the toll price
  • Reduction in the willingness to pay of Commercial Vehicles
  • Changes to some projects in the area of influence

The results were consistent with my expectation and experience
Transport Models cannot produce entirely accurate forecasts as some uncertainty that cannot be eliminated.

However, Transport Models are the best tool we have to support better decision making.

The next 30 years are likely to see radical changes to transport systems throughout the world.

Electric Vehicles, Mobility as a Service, Connected and Automated Vehicles and Micro-mobility are known and expected disrupters of future mobility.

I suggested some additional scenarios to explore the impact of these expected and plausible disruptions in 2036:

- Scenario 1: Connected Automated Vehicles (20% of traffic CAVs)
- Scenario 2: Mobility as a Service ride-sharing (MaaS)
- Scenario 3: CAVs + ride-sharing MaaS

The impact on NEL traffic were modest, between +7% (CAV only, induction + empty running) to -10% (ride-sharing MaaS) of traffic.

I accept that ride-sharing is generally not attractive to car users.
I participated in a two-day conclave with Tim Veitch, William McDougal, Peter Dunn, Knowles Tivendale.

During the conclave we discussed the key issues where there appeared to be differences of opinion regarding the model and forecasting results.

Several issues were clarified and explained in greater detail leading to agreements as reported in the Conclave report.

VLC managed to extract most of the results from model runs that help to settle some points.

A Conclave report was prepared identifying issues of general agreement and those where opinions differ.

I comment now on some of the most critical issues.
Specific issues with the model 1

- The model assumes car ownership will continue to grow and so will car trips. In recent years Australians have travelled by car less generating fewer car trips (and VKT) per capita (Dunn, McDougall).
  - Most world cities experienced a reduction in car trips per capita from around 2007 partly linked to the GFC
  - Car ownership continued to grow but car use declined
  - In the UK this trend was reversed around 2014 and car trips are now growing again
  - The reason for these remain elusive and are affected by growth in Van (LGV) and Uber-like traffic (some of it empty).
UK trend in vehicle miles

Light Commercial Vehicles and Public Hire Vehicles (Uber like) are growing faster than cars

Specific issues with the model 2

- **The model, and its most recent calibration, overestimates the number of trips in the study area (Dunn, McDougall, Tivendale)**
  - There was a change in coverage between the model used for the Business Case and that used for the EES.
  - The larger area (and population) of the version of the model used for the EES explains most of this difference.
  - A comparison with VISTA data has to consider that this type of survey **always** underestimates trips because of under-reporting. Individuals forget trips or simplify them to save time.
  - This under-reporting must be corrected in the model to be able to reproduce screenline counts and travel times.
  - Overall the Zenith model overestimates peak period traffic slightly (~10%) and underestimates off-peak traffic; the resulting daily traffic is about right.
The Distribution model, in particular when used in forecasting, does not follow recommended practice ATAP/VicRoads (McDougall)

- The Gravity Model is generally used to perform Destination Choice (Distribution) but it is the weakest link in the system. The choice of place to live, study, work and socialise is complex and the model is simple.
- The claim is that the model should feed back costs iteratively to Distribution and Mode Choice sub-models; this is the “Loop through Distribution” approach.
- The Zenith model does not do this, and uses a “Single Distribution” approach.
- VLC claims that the single distribution approach produces more stable results and that these are consistent with the observation that over time trips tend to get longer.
- Either approach should produce the same number of trips (as they are constrained by Trip Generation) but their average trip length and mode choice may be slightly different.
- The UK best practice recommends dampening the Distribution model during iterations; VLC’s approach has that effect; VLC calls their approach “dampened” Distribution.
Practical considerations

Loop through Distribution

- Trip Generation
- Distribution
- Mode Choice
- Assignment

VLC’s Single Loop

- Trip Generation
- Distribution
- Mode Choice
- Assignment

Travel Times + costs

Flows

Times
Distribution modelling

Practical considerations

- There is an issue of convergence of this looping process. Simple feed-back of costs to Distribution (and Mode Choice) may never converge to stable results; most practical applications stop arbitrarily at 3 to 5 loops.

- Looping through Distribution tends to produce shorter trips and it is debatable whether this is a natural trend.

- The costs and times chosen to produce the first trip distribution should reflect the changes in the network that year.

- VLC has done a good job of testing different approaches and contrasting with observations and the impact on forecasts.
  - VLC’s tests comparing both approaches show that the “Single Distribution” method produces some 7% more traffic on NEL and a small increase in VKT per capita.
  - I consider that these effects are within the range of realistic possibilities.

- The pragmatic choices made by VLC are defensible and produce reasonable results. They could be refined further but are likely to have little impact on outcomes.
Transport modelling and forecasting is not an exact science and differences of opinion between experts are a natural consequence of different experiences and particular skills; scenario and sensitivity tests can, and have been, used to explore the materiality of some of the uncertainties inherent to traffic forecasting.

Having undertaken a peer review of the model, assumptions, the calibration and validation tasks, its parameters, the sensitivity and reasonableness tests and convergence levels I conclude that the model is appropriate for use in the development of the Environment Effects Statement.

The treatment of uncertainty using different scenarios, sensitivity analysis, and disaggregation of contributors to traffic is sufficiently thorough and detailed to give confidence that these risks can be taken into account.
Thanks

Questions