A RESPONSE TO THE INSTITUTION OF ENGINEERS NATIONAL COMMITTEE ON TRANSPORT (NCTR) PAPER "QUALITY ISSUES IN STRATEGIC TRANSPORT PLANNING"

David J. Ashley
Sinclair Knight Merz

My Background

My perspective on this subject derives from over 20 years modelling research and applications in the UK and Europe. While this gives me the advantage of experience elsewhere, as yet I lack detailed knowledge of the Australian transport planning context.

General Observations

The terms "quality" and " fitness for the purpose" need to be interpreted and explained in the specific context of transport modelling if progress is to be made in addressing this topic.

Transport modelling has traditionally served public sector infrastructure investment planning, which is based on cost benefit analysis (CBA). Fundamentally, it has been a ranking tool whereby CBA is used to identify the most economically beneficial projects on which to expend a constrained budget. Where the investment is in a large portfolio of projects, the overall performance of the 'investment portfolio' is unlikely to be significantly undermined by random forecasting uncertainties in connection with individual projects, provided the projects are evaluated on consistent bases.

In common with many other activities, modelling quality is defined by process. That is to say, we cannot judge whether a forecast is good or bad simply by looking at the forecasts themselves. Instead we seek reassurance in the processes used to derive the forecasts: in the structure of the transport model and in the process by which the model has been calibrated to the local context. Thus we look for quality assurance through demonstration that the processes used to derive the forecasts are acceptable.

Clearly, this notion of quality being defined by process is compatible with the common public sector investment requirement that projects should be evaluated on consistent bases, and it has led to, for example, the UK Department of Transport imposing standardised forecasting methods and procedures for the appraisal of highway projects (in the Design Manual for Roads and Bridges).

The risk of an economically sub-optimal outcome from an investment 'portfolio' due to forecasting uncertainties is potentially significant when very major projects account for much of the infrastructure budget, and thus the risks of an individual project impact more significantly on the portfolio as a whole. This is a situation that occurs in the public sector, but which seems likely to be prevalent with the increasing involvement of the private sector. However, while this might suggest that private sector investors should be very much more concerned about forecasting quality because of the risks involved, experience does not universally support this contention, perhaps because they can pass on some of the risks to Government.

Pressures for Improved, Defensible Modelling Processes

As is suggested in the NCTR paper, I believe that, in the UK, the pressure has been from outside, principally from the Public Inquiry process, at which modellers must justify their forecasts if schemes are to be approved. I myself spent nearly 4 days giving evidence on mode share models at the Heathrow Terminal 5 Public Inquiry earlier this year. But Public Inquiries are not a feature of Australian planning.

A Quality Process

The use of modelling in infrastructure appraisal involves three broad processes: data collection, model specification and calibration, and model application to scheme appraisal and evaluation. In principle, each of these processes should either be demonstrably following guidelines or accord with good practice. The following is a suggested list of information which should provide a suitable basis for the evaluation of transportation models in the context of the named objectives of users.

1) A statement of the modelling objectives and the elements of the model specification which serve to meet them.

2) A specification of the base data:
   - description of travel surveys,
     - sample sizes,
     - bias assessments and validation, where available,
   - description of transport networks:
     - structure,
     - sources of network data (inventory surveys, timetables etc),
   - description of demographic and employment data (sources, summary statistics).

3) A document reporting on model specification and model estimation:
   - model structures, variables and coefficients,
   - outputs of statistical estimation procedures,
   - model fit to data.

4) Evidence of validation, where feasible:
   - fit to independent data,
   - comparison with other models,
   - sensitivity tests/elasticities.

5) Description of the forecast year inputs (networks, demographic data, economic assumptions):
   - sources of data,
   - statistics describing the main features of the data.

6) Documented validation of the forecasts, paying attention to the types of model runs and types of output most vulnerable to error (eg tests of small changes, economic benefit estimates):
   - comparison with other forecasts, where available,
   - comparison with historic trends, if relevant,
   - reasoned explanations of the forecasts (the sources of the diverted traffic, the reasons for diversion - size of time saving etc).

7) Record of model applications - ideally there would be evidence of a successful history of model application. For new models this is not possible, but there could alternatively be a documented history of model testing and of the issues of model behaviour that emerged in the process.

Professional Skills

Despite guidelines and such quality demonstrations, quality is only assured by having access to professional skills and, if such skills are not respected in practice and consequently not invested in, then customers of model systems will receive no more than they deserve.

Modelling Technology: **Innovation, Research and Development**

There exist a variety of well-understood modelling approaches used more-or-less worldwide for standard contexts. Providing these are properly applied, sensible results may be expected. These are often refined and developed further in different countries faced with non-standard contexts (for example, greater road congestion, stronger multimodal or environmental policies). In principle, all

such refinements should be established as reasonable through research before becoming part of standard practice.

In the UK, for example, a turn around in Government transport policy from a road-driven, capacity-provision emphasis to multimodal packages and an acceptance that new road construction will not keep pace with growing demand, especially in cities, has led to the development of new strategic modelling approaches. In the US, the Intermodal Surface Transportation Efficiency Act (ISTEA) is leading to the development of new modelling systems..

Of course, models do not address every issue that can be imagined, in most cases because the issues are minor in effect but sometimes because it is very difficult to establish their magnitude. Hitherto unimportant issues can become significant: in the UK the growing interest in congestion pricing as a means of controlling the inefficiencies of peak traffic delays has led to considerable interest and research into peak-spreading, and models able to predict such traffic responses.

Data

I have been surprised by the lack of Government interest in Australia in providing planning projections (of demographic and employment variables) for transport infrastructure appraisal, as a means of ensuring consistency between studies. I am also surprised by the lack of interest in roadside and public transport travel surveys, the staples of UK practice.

On the other hand, I have the impression that in some States there is a determined effort to keep travel data universally available (through all such data used by Consultants remaining the property of the public sector, and thus available to other studies).

Final Remarks

I am led to believe that it is the view of many in the Australian transport planning profession that the quality of modelling here is comparatively poor, because customers are not prepared to pay the higher costs of better approaches. It is also clear that some State governments have, at least until recently, allowed their centralised data and models, on which many studies are based, to become out-of-date.

While too ambitious notions of standardisation, pooling of data, centralised modelling and other schemes fail on the grounds of cost and impracticality, I believe that there are good arguments in favour of:

- centrally-developed city model systems providing consistent trip tables and other analyses to local studies and infrastructure projects,
- guidelines on good practice,
- centrally-imposed evaluation criteria and assumptions, and
- centrally-provided planning forecasts.

Training courses and conferences clearly have a major role to play in disseminating the skills, and advances in technology are likely to rely at least in part on Government recognition of the value of applied research.