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CALL FOR PAPERS

Convergence of the Sydney Strategic Traffic Model –
Implications for Economic Analysis of Urban Road Projects

Title of the paper

Matthew WILSON

Roads & Traffic Authority of NSW

Main Author

Organization

PO Box 558,
Address

(Level 2, 81 Flushcombe Rd)
Suite / floor

BLACKTOWN

NSW 2148 AUSTRALIA

City

Province/State – Country – Postal/Zip Code

61-2 8814.2024

61-2 8814.2155

Telephone

Fax

matthew_wilson@rta.nsw.gov.au

e-Mail

Xiaoping GUO & Marwan S DAIZLI

Roads & Traffic Authority of NSW

Names & Organization of co-author(s)

BIOGRAPHICAL SUMMARY FOR MAIN AUTHOR (100 words mini-CV)

Matthew Wilson is a civil engineer and transport planner now working as Transport Analysis Manager in the Sydney Region of the New South Wales Roads & Traffic Authority. He began his career in 1975, as a site engineer and project manager with the former NSW Department of Main Roads. He first became involved in transport planning as an analyst of the rural highway system for a national roads study which was published in 1984. He has been working with EMME/2 since it was adopted by the Roads & Traffic Authority in 1991.

Dr. Xiaoping Guo is a Network Analyst with Roads and Traffic Authority of New South Wales. He has a Bachelor of Engineering from Chongqing Institute of Communications, a Master of Engineering from Xi'an Highway Institute and a PhD (Transport Engineering) from the University of New South Wales. Prior to his present position he was a Transport and Traffic Engineer with the Sinclair Knight Merz, the Snowy Mountains Engineering Co. and China International Engineering Consulting Co. His research interests include transport and traffic modelling, land use/transport/environment interaction, evaluation methodologies, simulation and planning.

Marwan Daizli studied highway and traffic engineering at the University of Birmingham in the United Kingdom, receiving the degree of Master of Science in 1987. He has worked in transport modelling with the Roads and Traffic Authority since 1990, and in his role as Network Modelling Leader has been responsible for the development and maintenance of the Sydney strategic model for most of that time. He has introduced a number of innovations in the application of EMME/2 functions to the Sydney model, including methods for estimating intersection delay without explicit modelling of intersection operations.

AUDIOVISUAL SUPPORT NEEDED

(A PC with Office XP, a projector, and a microphone will be provided. Please mention any other needs.)

To be advised.

ABSTRACT (500 words)

The authors maintain and operate an EMME/2 model of Sydney, Australia, for the Roads and Traffic Authority of NSW. The network calculator is used to estimate the total economic cost of travel on the model network. The total cost is made up of three components. The value of personal travel time is calculated from the total vehicle hours. Vehicle operating cost is calculated based on the modelled traffic volume and speed on each link. The cost of traffic accidents is estimated using historical accident rates (crashes per million vehicle kilometres of travel) for each type of road in the network.

The benefit of a road project is then the difference between the total economic costs of travel on a 'base case' network (without the project) and an 'improved case' network (with the project). Since the networks cover the whole of Greater Sydney, the total economic cost of travel in the network is very high. The difference in travel costs between the base case and the improved case networks may be very small fraction of the total cost.

The EMME/2 traffic assignment module uses an iterative method to approach a true equilibrium assignment, in which no driver can find a better path through the network than the path they are assigned to. As successive iterations converge towards the equilibrium assignment, so the estimate of the total economic cost of travel converges. To obtain a stable estimate of the benefit of a road project, a high degree of convergence may be required. The smaller the project, the higher the level of convergence that will be needed.

This research examines the convergence of the equilibrium highway assignment, and tests the precision with which project benefits can be estimated. It is found that the overall convergence is well-behaved. However, there is a residual level of 'noise' which is evident as small oscillations in the value of total economic cost calculated from successive iterations. These oscillations continue long after the model has converged enough to give reliable values of traffic volume. This effectively limits the ability of the model to give precise estimates of project benefits.

It is concluded that if the model is allowed to converge to a relative gap of 0.1%, the outputs are sufficiently precise for evaluating projects with a capital cost of \$AU45M or greater. For smaller projects, the precision can be increased by taking the average of a sufficient number of successive model iterations.

These specific conclusions apply only to the model of the Sydney highway network. Models of other networks might be more or less stable. However, the method used for evaluating stability could be applied to any network assignment model. It would be a worthwhile test to apply to any model used for evaluating the economic benefits of any project.

Please send the completed form to the attention of:

Pierre Tremblay,

Fax: +1 (514) 864-1765

eMail: *pierre.tremblay@mtq.gouv.qc.ca*

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