

TMIP Connection

The Travel Model Improvement Program Newsletter

TMIP Goes to School: Moving Next Generation Models into Practice.

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- Portland Metro (Len Usvyat)
- Atlanta Regional Commission
(Colin Foley)
- Metropolitan Transportation
Commission – San Francisco Bay
Area (Michael Smart)
- North Central Texas Council of
Governments – Dallas-Fort Worth
(Robert Kogan)
- Houston-Galveston Area Council
(Christopher Jurek)
- Puget Sound Regional Council
(Carmen Bendixen)
- El-Paso Metropolitan Planning
Organization (Elizabeth
McQueen)

It started with a simple post to the TMIP email list. Ken Cervenka posted a call for participation in a workgroup for MPOs who were thinking about, or in the process of, improving their models. The main focus of the group was to discuss transferability issues. The idea was to start moving next generation models into practice or to move practice into the next generation. The day before that posting I had assigned my *Introduction to Transportation Methods* class the task of doing MPO model system case studies as a way to learn about travel demand forecasting. I sent an email to Ken asking if our case studies might serve as resource documents for his group and then limited the list of candidate MPOs to

those who had indicated an interest in joining discussion he initiated. Having a ‘client’ helped focus the project and provided the students a networking opportunity as well.

The class produced case studies for the following eleven MPOs (MPO contacts in parentheses):

- Metropolitan Washington Council of Governments (Thomas Hastings)
- Mid-Ohio Regional Planning Commission – Columbus (Alex Karman)
- New York Metropolitan Transportation Council (Andrew Dobshinsky)
- Denver Regional Council of Governments (Molly Kotlen)

The assignment:

Each case study was to include some contextual information describing the region in which the model is used, some ‘facts’ about the model and the processes used such as: how many zones, links, area types, trip purposes and so forth and a section describing how the model is employed. The students were given a starter list of some issues to cover including:

- Number of traffic analysis zones (TAZs)
- What are the trip purposes?
- What modes are modeled?
- How many nodes, links, and external stations make up the network?



Elasticity of VMT and Fuel Prices

By Mark Brucker, *Transportation Consultant*



Right after Katrina hit, generating the spike in fuel prices and interruptions to supply, I posed two questions on the TMIP email list. First, whether those who prepare travel forecasts ever disclose the uncertainties in those forecasts and, second, how they address fuel prices, which have risen so dramatically in the last few years.

Dozens of emails were generated by these questions, with many valuable ideas and insights (thanks!). Here are some of the comments:

1. It's impossible to predict ranges of VMT reliably. Assume gas prices will remain the same for the next 25 years, they have stayed about the same over the last 25 years.
2. We provided ranges of rail ridership numbers, but people tend to just take the average anyway.
3. It would be good to perform rigorous sensitivity tests on land use, fuel cost, etc. and see what happens to VMT and compare the elasticities to the literature.
4. A risk analysis would be prudent; extrapolating off current paradigms is like fighting the last war.
5. Running the Albuquerque MPO model showed "elasticity of VMT to fuel cost came out to -0.25 using the midpoint elasticity method (the model crashed when first trying to raise the fuel price 25 percent). The simple result is that a 25 percent price increase resulted in a 5.4 percent drop in VMT...85 percent of the VMT reduction was due to trip distribution shifting to shorter trips; land use changes were not reflected since there's no feedback in the model.
6. "I will certainly recommend...that we perform runs with alternative fuel prices when testing scenarios for our Metropolitan Transportation Plan."
7. "The mode choice equilibrium solution that maximizes utility for higher operating cost conditions will not be the same as the maximum for lower cost conditions."

Some of my comments in response to questions and other comments:

1. The possible range of fuel prices seems much higher than for other factors; economists for French investment bank Ixis-CIB said they "don't think a price level of \$380 per barrel is out of the question" (<http://english.aljazeera.net/NR/exeres/73CE8286-740C-482B-8150-DA57696BC02F.htm>).
2. Some analysts have argued that it's better to analyze outcomes on a range of possible forecasts and try to choose alternatives that work well across a range, rather than the current practice of using one forecast alone to evaluate outcomes. (<http://listserv.tamu.edu/cgi/wa?A2=ind0504&L=tmip-l&P=R9324>).
3. Three reports indicate long-run elasticities of VMT to fuel price of about -0.3 (short run about half that) (http://www.vtpi.org/tdm/tdm11.htm#_Toc68662039).

SEE FUEL PRICES ON PAGE 5 ►

- Is there a separate bike/pedestrian network?
- What are the inputs to the model?
 - Was there a recent household survey?
 - Is another agency responsible for the economic and land use forecasts?
 - How are those forecasts done?
- What software is the basis for the model?
 - Are there stand alone components?
- Is there an airport model?
- Is there an independent mode choice model?
- How is trip generation performed?
- How is trip distribution performed?
- How is mode choice done?
- What is the assignment algorithm?
- Is there a separate freight model?
- How are truck trips modeled?
- Were the model parameters estimated from local data? Were they adopted (transferred) from a model for a similar area?
- How is calibration accomplished?
 - Has the modeled been recalibrated?
 - What are the calibration statistics?
- Has the model been used to back-cast?

The process:

Each student learned what they could about their respective MPO from available documentation and then by interviewing a modeler at the MPO. After a review of their drafts they followed up with the MPO to correct any mistakes and fill in gaps. All of the students had a good first contact with their MPO and about half were able to complete a follow-up interview and get feedback on their case. With the exception of the Mid-Ohio Regional Planning Commission (MORPC), which has moved to an activity based model, and NYMTC, all the MPOs are currently using some version of a conventional four-step model.

Two of the eleven cases are northeastern MPOs, three are west coast MPOs,

three are in Texas and the remainder represent one city in the South, one in the Rockies and one in the Midwest. Because the case studies were selected primarily due to a particular affinity on the part of the student for a place, and from a small self-selected group of MPOs, they cannot be construed in any way as a representative sample. Specific generalizations to models would be inappropriate. Furthermore, not all of the same information was gathered for each model. That said, it is interesting to note some of the following things:

Software:

Each of the three well-known model software packages (Cube, Emme/2 and TransCAD), were each used in at least three MPOs.

Network size:

Regardless of the region size the networks were very similar. After the removal of two outliers, the NYMTC model region, which includes about 11 million people and is represented by a network that includes 53,000 links, and the El Paso, Texas MPO which represents 700,000 people and has a network of only 4,600 links, all the regions had a network size in the range of 20k to 30k links (1.5 times the size), even while population size ranged from 1.3 million to 6 million (4.6 times larger). Variation in number of zones was greater. The number of TAZs, not surprisingly, was more consistent with population size.

Household Travel Survey:

Most of the MPO models are based on a household travel survey completed in the mid-nineties or earlier.

Four Steps:

Cross-classification is by far the dominant approach to trip generation.

Most of the MPOs are using gravity models for trip distribution. A couple employ destination choice models and

one is using a combined mode and destination choice model. Mode choice and assignment are almost all done by using some form of logit and user equilibrium respectively.

Lessons learned:

The students benefited in several ways from the assignment. In the first place they learned quite a bit about the model process. Second, some also developed a professional contact. Finally, they were able to learn some of the modeling resources that will be available to them should they pursue careers in travel demand forecasting.

Lessons for the modeling community, however, are probably both more important and more profound. First, there is a very powerful community, stitched together in some ways by the travel model improvement program, of generous, knowledgeable professionals who seek to improve their professional efforts and who are willing to give their time to help educate the next generation of modelers. The second thing of note is that there is variety in the models estimated. While there are obvious structural commonalities, the details are highly varied. Each model is very specific to its place and this bodes ill for transferring model components or parameter estimates from one place to another. The uniqueness of each model strongly suggested that travel behavior is highly contextual. It would be very interesting to run some tests using one MPO's model on another MPO's input data set to see if the results differ substantially. An evaluation would consider whether losses in accuracy are offset by the benefit of transferability.

Finally, the issue of greatest frustration for this project is that there is little uniformity or consistency in documentation. It would seem that by moving to some documentation standards we might go a long way toward understanding some of the transferability issues! ■

What's Happening with TRANSIMS?



With the passage of SAFETEA-LU, the TRANSIMS program will focus on developing case studies for planning and preparedness applications and supporting the deployment of agent-based microsimulation techniques into practice. Pending reports from the re-started Portland case study will focus on data preparation, routing and traffic simulation with techniques for incorporating tour and activity models to follow. For more information on the TRANSIMS program, visit <http://tmip.fhwa.dot.gov/transims> or contact Fred Ducca at Fred.Ducca@fhwa.dot.gov.

Recent developments

- Source code released under the NASA Open Source Agreement
- Version 3.1.1 of the source code posted on the TMIP website
- TRANSIMS email listserv created: TRANSIMS-L@LISTSERV.TAMU.EDU
- Additional documentation posted on the TMIP website ■

TMIP Goes to School – Part II

Kansas City, MO – Part of the TMIP strategic plan is to promote planning technical analysis as a profession. One approach to implement that goal is to develop relationships with schools of planning and provide support and materials for teaching planning technical analysis at university. In conversations with professors of planning, it has come to our attention that there is a gap in teaching planning technical analysis. One theory is that schools of planning leave the responsibility of teaching planning technical analysis to engineering schools, while the engineers feel it is the responsibility of the planners. To begin to discuss and address this issue, TMIP sponsored a roundtable at the Association of Collegiate Schools of Planning (ACSP) annual conference in Kansas City in October 2005.

The panel included Michael Meyer of the Georgia Institute of Technology; Rachel Weinberger of the University of Pennsylvania; and Kelly Clifton

of the University of Maryland. For a Saturday, 7:30 AM session, it was a well-attended, well rounded discussion with great participant contributions. Some of the topics broached included:

- Is there a canon of travel model knowledge/literature etc. that should be taught?
- When we aim for the middle who do we reach?
- How can we teach effectively in the timeframe allowed?
- What is the “market” looking for (engineers/planners)?

While we could not resolve these issues in an hour, the conversation began and continues on a new email list called Ed-TMIP. Interested parties are welcome to join. “The list address is: ED-TMIP@LISTSERV.TAMU.EDU. To join, send an email to listserv@listserv.tamu.edu and write in the BODY SUBSCRIBE ed-tmip firstname lastname.” Leave the subject line blank. ■

Culp Departs TMIP



Michael Culp

After nearly seven years of labor, love and leadership, Michael Culp is leaving the TMIP program. Mike was a key drafter of the TMIP strategic plan and has been responsible for TMIP outreach and education. Mike oversaw the development of NHI modeling courses and championed the TMIP Peer Review Program. He also put the plan in place for support services such as the TMIP email list, website and clearinghouse. Mike has moved on to the FHWA Office of Project Development and Environmental Review. Mike, we'll miss you and thanks for everything! ■

4. A new report says that Americans report they would begin to significantly change behavior at \$2.50 a gallon (26 percent say they would drive their most efficient vehicle) and at \$4 a gallon half say they would do so, 56 percent would reduce overall driving and 54 percent would buy a more efficient vehicle.
5. In a California Poll and AARP polls people said they were significantly changing their behavior. Over 50 percent in the former said in August that they were reducing driving and using their more efficient vehicle. 47 percent of those 50+ in age in the AARP poll said they have cut down on travel and vacations (early September).

I've done some new research on fuel prices. They are, as of January, 2006, about 58 percent higher than 4 years before and 48 percent in real dollars. Even the U.S. Energy Information Administration, which seems to generally predict much lower future prices than many others, predicts petroleum prices will be 63 percent higher in 2025 than in 2005 (<http://www.eia.doe.gov/oiaf/aeo/growth.html#prices>). That implies an increase in gas prices of a little over 30 percent in real terms or to about \$3 in current terms. Projections of 2010 prices based on a synthesis of experts gave a value \$3.45 in current dollars (<http://www.vtpi.org/fuelprice.pdf>, Page 5). Using the elasticity of -0.3 from above, the \$3.45 projection would translate into a 14 percent reduction in VMT in the U.S. in 2010 compared with how much would otherwise occur. Such a reduction would have major benefits in reducing pollution, crashes, congestion, etc. That also suggests a major adjustment in the economy and the transportation system, however.

Between 1970 and 1981 gas prices in the U.S. increased just over 50 percent. A \$3.45 price in 2010 would represent just about a 50 percent increase in price, one

occurring in a much shorter time period and on top of substantial increases in the last several years.

In the Summer 2005 TMIP Newsletter, Berry Ives of the Albuquerque MPO wrote: "What will fuel prices be in 2030?" I don't know. It seems very likely they will be much higher than they are now. It troubles me greatly if we're predicting travel in the future without acknowledging the uncertainty of forecasts, especially when fuel prices are predicted to increase and may increase a great deal. Fuel prices are currently about 70 percent higher than 10 years ago and 60 percent higher than 5 years ago in real terms. Data that was used to develop current models therefore seems quite likely to be unreliable in estimating even current elasticities. Who knows how well our models are likely to predict behavior with likely fuel prices. The Albuquerque model showed elasticity consistent with literature reports. It seems likely that some models would not.

I think the uncertainty in forecasts should be disclosed. I also think that particularly with respect to fuel prices it's important to discuss possible ranges of prices and potential effects on VMT, mode share, etc. Fuel prices may change very substantially and appear to have a significant effect on travel. Continuing transportation policies that do not account for the substantial potential for dramatic price changes could mean that far more harm will occur if prices do increase. If we continue to develop a system for a future with low prices, it will be far less effective and could be disastrously expensive to change and to try to maintain if that is not the future we experience.

To see other interesting topics vetted on the TMIP email list go to: http://tmip.fhwa.dot.gov/email_list/ ■

Determination of the State of the Practice in Travel Forecasting

The FHWA, FTA and Office of the Secretary of Transportation have funded the National Academy of Sciences (NAS) to conduct a "Determination of the State of the Practice in Travel Forecasting." This project will gather information and determine the state of the practice of metropolitan travel demand modeling by metropolitan planning organizations and state departments of transportation. The practice of interest includes such features of travel modeling as:

- the size and scope of the transportation network and how it is represented;
- population, employment, and land use forecasts and travel surveys and how they are generated and input into the modeling process;
- how key model details, such as trip purposes, are represented, including how light-duty and heavy-duty commercial vehicle travel are modeled;
- the nature, extent and justification of model adjustments to fit unique local circumstances;
- how congestion on networks is represented and how it is used as an input to mode choice models;
- techniques and measures used in model estimation, calibration and validation;
- post-processing of travel demand modeling outputs to become inputs to emissions factor modeling;
- feedback and model iterations;
- induced travel demand;
- staff capability and resources; and
- unique conditions in individual areas.

The NAS expects to produce a report on this in the summer of 2006. As part of the project a survey of MPO modeling practice was conducted. The results of the survey can be found at <http://www.trb.org/publications/reports/BMI-SG-Sept2005-Draft.pdf>. ■

UPCOMING EVENTS

Conferences

Innovations in Travel Modeling 2006 TRB Conference

May 21-23, 2006 – Austin, TX

NARC Annual Conference

June 17 - 20, 2006 – San Antonio, TX

Courses

Introduction to Urban Travel Demand Forecasting

May 8-12, 2006 – Houston, TX

Multimodal Travel Forecasting

May 9-11, 2006 – San Diego, CA

June 6-8, 2006 – Atlanta, GA

Model Citizens Sought

TMIPConnection is seeking subjects for the Model Citizen column. If you are a modeler employed in the public sector working on an interesting problem and you would like to talk about it in the *TMIPConnection*, please send an email describing the work to penelope.weinberger@fhwa.dot.gov.

Additional offerings may become available; consult the TMIP website <http://tmip.fhwa.dot.gov/> for the latest training information.

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