

Draft strategic plan for development of the regional travel demand model

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Mark S. Moran, COG/TPB staff

National Capital Region Transportation Planning Board (TPB)
Metropolitan Washington Council of Governments (COG)



Overview

1. Definitions, motivation, and background
2. Strategic plan
3. Short-term implementation plan
4. Next steps & final thoughts

(Last presentation to Tech. Comm. on this topic was 4/3/15)



Section 1

Definitions, motivation, and background



Definitions

- **Strategic plan** for development of the regional travel demand model
 - ▣ Guides the development and improvement of the regional travel demand forecasting model
 - ▣ 7-year plan that includes updates to the existing trip-based, four-step travel model (FSM) and an eventual transition to an activity-based travel model (ABM)
 - ▣ Three reports: First two lay the ground work for the third.
- **Short-term implementation plan**
 - ▣ A memo focused on the first two years of the strategic plan, i.e., updates to the existing FSM



Definitions

- Four-step model (FSM)
 - ▣ **Trip**-based travel demand model
 - ▣ Mostly **aggregate** in nature
 - ▣ Current model: COG/TPB Version 2.3.57a Travel Model.
- Activity-based travel demand model (ABM)
 - ▣ **Tour**-based travel demand model
 - Tours are ordered sequences of trips
 - ▣ Demand for travel is derived by the need to participate in activities that are spatially separated
 - ▣ Mostly **disaggregate** in nature



Motivation: Why develop a strategic plan for models development?

- Has not been done for a long time
 - ▣ Though model is updated on a regular basis, last formal plan was in 1993
- To ensure that the TPB model is at least state of the practice and consistent with peer MPOs
- To ensure that the TPB model can address the policy questions being asked by the TPB and the local area modeling stakeholders



Strategic plan background

- Developed by Cambridge Systematics, Inc. (CS) and COG/TPB staff, under the guidance of the Travel Forecasting Subcommittee (TFS), in FY 15 & 16
- The plan includes three phases:
 1. Updates to the existing FSM (FY 16-17)
 2. Development of an ABM w/ existing data (FY 18-20)
 3. Development of an ABM w/ new data (FY 21-22)
(New household travel survey to be conducted in FY 17;
Ready for use in FY 20)



Strategic plan: FY 15 activities

- Input from stakeholders (users of the COG/TPB model)
 - ▣ Web-based stakeholder survey (Feb. – Mar. 2015)
 - ▣ Stakeholder meeting (Feb. 2015)
 - ▣ Other input, e.g., WMATA has been an assertive advocate for transit-related improvements (Oct. 2014 letter from WMATA & several subsequent meetings)
- Survey of peer MPOs (Mar. 2015)
 - ▣ Web-based survey
 - ▣ Top 20 MPOs by pop. (TPB is #9), plus 3 smaller MPOs known for innovation (SACOG, Portland Metro, MORPC).
- 4/3/15 pres. to Tech. Comm.



Key findings from the survey of peer MPOs

- Regarding ABMs, out of 23 MPOs:
 - ▣ 6 MPOs are using a FSM for production work (26%)
 - Includes COG/TPB
 - ▣ 6 MPOs are using an ABM for production work (26%)
 - ▣ 10 are working on developing an ABM (43%)
 - ▣ 1 is in pre-development of an ABM (4%)

Source: p. 11, CS. *Status of Activity-Based Models and Dynamic Traffic Assignment at Peer MPOs, Report 2 of 3*. October 15, 2015.

- More findings can be found in the consultant report referenced above



Strategic plan: FY 15 & 16 activities

- CS reports
 - ▣ Presented to the TFS in FY 15 (9/28/15)
 - ▣ Revised in FY 16
 - *Review of Consultant Recommendations from FY 2012-2014 of the COG/TPB Travel Demand Modeling Consultant-Assistance Project, Task Order 15.1.* Oct. 15, 2015.
 - *Review of Transit Modeling with Respect to FTA Guidance, Task Order 15.3.* Oct. 15, 2015.
 - ***Identifying Potential Opportunities for Model Improvement, Task Order 15.2, Report 1 of 3.*** Oct. 15, 2015.
 - ***Status of Activity-Based Models and Dynamic Traffic Assignment at Peer MPOs, Task Order 15.2, Report 2 of 3.*** Oct. 15, 2015.
 - ***Draft Strategic Plan for Model Development, Task Order 15.2, Report 3 of 3.*** Oct. 15, 2015.
- All reports are available on TFS webpage (search for MWCOG TFS)



Summary of current status

- Strategic plan
 - ▣ Presented to TFS on 9/28/15
 - ▣ Revised based on TFS review
 - ▣ Final reports dated 10/15/15
 - ▣ “Draft” has been left on strategic plan, since it had not yet been presented to the Tech. Comm. or TPB
- Short-term implementation plan
 - ▣ Presented to TFS on 11/20/15
 - ▣ Currently in a 30-day review (ends 12/20/15)



Section 2

Strategic plan



Areas identified in strategic plan for future improvement

- Non-motorized travel, including access to transit
- Transit modeling
- Road pricing and managed lanes
- Peak spreading and time-of-day behavior
- Travel time reliability



Three-phases of the strategic plan

	Description	Fiscal Years	Model Name
1	Updates to the existing FSM	2016-2017	Version 2.5
2	Development of an ABM w/ existing data	2018-2020	Version 3.0
3	Development of an ABM w/ new data *	2021-2022	Version 3.2

* New household travel survey to be conducted in FY 17; ready for use in FY 20



Advantages of ABMs

- ABMs are becoming more common, especially among larger MPOs
 - ▣ **70% of our peer MPOs are using or developing an ABM**
- ABMs offer a number of theoretical advantages
 - ▣ More accurate representation of travel behavior => more accurate results for policy/project testing;
 - ▣ Consideration of trip chaining, since trips are linked into tours;
 - ▣ Disaggregate application – reduces aggregation error;
 - ▣ Can be easier to understand for decision makers and public (who are not necessarily familiar with four-step models); and
 - ▣ Ability to perform certain types of analyses more readily, such as environmental justice, road pricing, and peak spreading.

Source: p. 6, CS. *Status of Activity-Based Models and Dynamic Traffic Assignment at Peer MPOs, Report 2 of 3*. October 15, 2015.



Disadvantages of ABMs

- There are also potential disadvantages to ABMs
 - ▣ More complexity: more components, and more complex formulations than conventional models;
 - ▣ Greater expense to develop;
 - ▣ Longer run times;
 - ▣ Need to manage simulation error;
 - ▣ Potentially greater hardware requirements; and
 - ▣ The need for custom software (though there are now a few common platforms).

Source: p. 6, CS. *Status of Activity-Based Models and Dynamic Traffic Assignment at Peer MPOs, Report 2 of 3*. October 15, 2015.



Decision to begin developing an ABM

- Not developing an ABM puts TPB outside of the state of the practice, when measured against our peers
- Ultimately, it was decided to move ahead with an ABM
- Baltimore Metropolitan Council is currently developing an ABM
 - ▣ Currently in year 3 of a 3-year development process
 - ▣ Phasing of our strategic plan should allow us to learn from their experience



Section 3

Short-term implementation plan



Short-term implementation plan

- Focused on updates to the trip-based travel model
- Memo dated 11/11/15
- CS has organized into four proposed task orders
 - ▣ 16.2: Advice and Testing
 - ▣ 16.3: Managed Lanes
 - ▣ 16.4: Non-motorized Model Enhancements
 - ▣ 16.5: Mode Choice Model Enhancements
- Work would be divided between CS and TPB staff
- Proposed task orders are currently being reviewed by TPB staff
- Next slides discuss proposed updates



Short-term plan:

Proposal for non-motorized modes

- FY 16
 - CS will work to advise staff on best way to improve existing process
 - Proposed activities:
 - Improving existing non-motorized trip generation
 - Adopting a separate accessibility-based tool
 - Improving supply-side data (e.g., database of bike/pedestrian facilities)
- FY 17: Complete trip-based model enhancements



Short-term plan:

Proposal for mode choice model

- Develop model specs for a new MC model & begin implementation in FY 16. Proposed activities:
 - ▣ Use of **parcel-level database** and **new path-building capabilities**
 - ▣ Improved representation of **non-motorized access** to transit and **reduced reliance on geographic constants** (such as via inclusion of land-use and built-environment variables)
 - ▣ Potentially less specificity of transit sub-modes in the mode choice step (“**flattened mode choice model**”), but more specificity in transit path-building and assignment
 - ▣ Differential weights on in-vehicle travel time could be used in path-building to reflect the amenities associated with modes
 - ▣ New mode codes and network coding instructions
- Plan to coordinate with WMATA



Short-term plan:

Proposal for managed lanes

- COG/TPB staff plans to continue to review and test the revised modeling scripts that AECOM delivered to COG at the end of FY 14 to enhance toll and HOT modeling
- Further automation of current COG/TPB process for toll setting for HOT lane facilities
- CS will explore options, offer design decisions that can be acted on, and begin to implement methods that improve HOT/HOV/managed lane modeling
- TPB staff will confirm the availability of supporting data
- Application experience in other regions will be used to inform CS recommendations
- Implementation will be completed in FY 17



Short-term plan: Other activities

- Transit
 - ▣ Migration of the path-building software (Primarily TPB staff)
 - ▣ Perform transit network coding enhancements (Significant CS role)
 - ▣ Include transit drive access trips into highway assignment (Significant CS role)
 - ▣ Add external-to-internal transit trips (Primarily TPB staff)
 - ▣ Revise bus speed linkage to highway speeds (Significant CS role)
 - ▣ Migration of mode choice application software (Primarily TPB staff)



Short-term plan: Other activities

- Update non-resident trips: Visitors/tourists, airport passengers, special generators
- Update screenlines/cutlines
- Adjust freeway volume-delay functions
- Investigate version control and bug tracking software to improve maintenance of model code
- Data preparation, e.g.,
 - ▣ Develop parcel-level development database
 - ▣ Prepare non-motorized GIS database



Section 4: Next steps

- Finish 30-day review period for short-term plan and adjust as necessary
- TPB staff: Review proposed task orders and adjust as necessary
- Begin work on short-term plan



Section 4: Final thoughts

- As we move into the ABM phase
 - ▣ There will be a transitional period when both the FSM and the ABM will be operational
 - ▣ Goal: Not to leave stakeholders behind.
 - Some are likely to continue to use a FSM for a period of time.
 - ▣ Managing expectations: ABM, as with any model, cannot be all things to all people.



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Questions? Comments?

- Mark Moran
 - mmoran@mwkog.org

