Improving the Model's Sensitivity to Land Use Policies and Nonmotorized Travel

presented to
MWCOG/NCRTPB Travel Forecasting Subcommittee

presented by
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July 17, 2009

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Author Acknowledgments

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Introduction

- **Among stated planning objectives of TPB is to seek improved coordination between land use and transportation planning**
- **Recent actions to further this objective**
  - **Identification of 58 Regional Activity Centers and Clusters (RACCs) along major transportation facilities where focused development exists or is planned**
  - **Completion of 2007/2008 household travel survey which was specially formulated to include representation of travel behavior associated with RACCs**

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Introduction

- **Recent actions to further this objective (continued)**
  - **Development of a new traffic analysis zone (TAZ) system to permit study of observed travel at a finer scale**
  - **Conflation of regional highway network to NAVTEQ centerline map to improve accuracy and allow enhanced coding detail**

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Introduction

This task was developed to provide thoughts on how best to improve the regional model's sensitivity to land use and transportation in a practical way

- **Reviewed and considered state of the practice, advanced practices, and the current TPB practice**
- **Explored key questions posed as part of the task**
- **Provided suggestions for possible short and longer term directions**

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Background Review

- **Incorporation of Land Use Factors in Travel Models**
  - **Almost half of MPOs forecast one or more of the following: household size, automobile ownership, and income**
  - **Neighborhood land use density variables and accessibility variables have been shown to improve performance of trip-based travel demand models**
  - **Accessibility and density measures can feed into many places in travel demand forecasting process**
    - **Automobile ownership models**
    - **Trip generation models**
    - **Mode choice models**

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Background Review

- **Nonmotorized Modeling**
  - **More than half of large MPOs include nonmotorized trips as part of their model in some way but treatment varies widely**
  - **Range of example treatments**
    - **Pedestrian three step model – special purpose studies (e.g., Central Artery/Tunnel model)**
    - **Pedestrian environment factor – e.g., included in auto ownership and mode choice models in Portland, OR**
    - **Binary mode choice model after trip generation – e.g., DVRPC and Triangle Regional Model (Raleigh, Durham, Chapel Hill)**

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Background Review
Nonmotorized Modeling – Triangle Regional Model

- **Existing Nonmotorized Model within Trip Generation**
  - **Set of binary choice models are applied as part of the trip generation step to split motorized and nonmotorized trips**
  - **Separate model for each trip purpose**
  - **Developed based on home interview survey data**
- **Developing Enhanced Nonmotorized Modeling**
  - **New activity-oriented household survey collected in 2006**
  - **Incorporating additional objective independent variables in existing model framework**
  - **Adding nonmotorized modeling through first three steps of model process (trip generation, trip distribution, mode choice)**

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Background Review

- **Land Use Modeling**
  - **Land use forecasts serve as fundamental inputs to travel model**
  - **Transportation infrastructure, services, and policy could influence land use forecasts**
  - **Some MPOs are moving towards integrating travel models with a formal land use model**
    - **Baltimore Metropolitan Council halted further development of its TRANUS model in 2003 and switched to PECAS development in 2005**

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Variables

- **RACC Indicator**
  - **Based on recent household travel survey analysis showing differences in household composition and travel behavior in *RACCs versus non-RACCs* it is attractive to look at this as possible dummy variable(s) for model estimation work**
  - **However, it would be *preferable* to first determine if alternative, fully objective measures of pedestrian and transit supportive land use could be used to achieve similar differentiation of household composition and travel behavior**
  - **This would avoid challenge of less-developed RACCs receiving similar treatment to more-developed RACCs and other potential unintended bias due to *subjective treatment***
  - **Likely that the selected *objective measure(s)* would be generally correlated with RACC designations**

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Variables

- **Potential Density Measures**
  - **Net Density**
    - **Ratio of activity measured to the land area devoted specifically to that activity (e.g., total households/residential acres)**
  - **Gross Density**
    - **Ratio of activity measured to the total land area (e.g., total households/total acres)**
  - **Composite Density**
    - **Looks at population and employment together (e.g., total population + total employment / total acres**

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Variables

- **Potential Accessibility Measures**
  - **Transit Accessibility**
    - **Number of jobs accessible in certain amounts of travel time**
  - **Composite Utility**
    - **Composite (highway and transit) travel time / cost impedance**
  - **Other**
    - **Amount of attractions accessible in certain amounts of walk travel time or highway travel time**

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Key Questions

- **How can the finer-level TAZ system be used?**
  - **Provides an opportunity to recognize and be responsive land use and transportation characteristics at a finer level**
  - **Align with the RACC boundaries and can thereby be tagged with a RACC indicator**
  - **TAZ system and network level of detail should be related (i.e., finer-level network coding follows)**
  - **Permits more accurate portrayal of density, accessibility, or other land use related variables**

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Key Questions

- **How would nonmotorized models be estimated?**
  - **New household survey provides rich dataset on which new models could be estimated**
  - **Develop binary choice models that split trip generation results into motorized versus nonmotorized trips**
  - **Density, block size, connectivity, or other objective measures could be included as variables**
  - **Sample holdout could be used to enable validation of models developed**
  - **Look to other regions for possible guidance on most promising variables to use**

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Key Questions

- **What changes to the model would be recommended?**
  - **Vehicle Availability Model**
    - **Current model uses household size, income level, area type, and employment accessibility**
    - **Possible improvements include taking into account a RACC indicator or an alternative, objective measure, such as density**
  - **Trip Generation Model**
    - **Current model uses trip rates stratified by household size, income level, and vehicle availability**
    - **Consideration to introducing additional market segments in the cross-classification framework such as RACC indicator, density, area type, and accessibility**
    - **Expand nonmotorized treatment to all trip purposes**

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Key Questions

- **How well can a regional travel model be expected to address these types of policies?**
  - **Nonmotorized Improvements**
    - **Less important to model for determining demand for nonmotorized facilities than for determining changes to motorized travel**
    - **Planned nonmotorized improvements generally follow from policy directives and a desire to support lower vehicle trip generation as well as higher transit use**

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Key Questions

- **How well can a regional travel model be expected to address these types of policies?**
  - **Land Use Policies**
    - **The travel behavior impacts of concentrated growth patterns should be discernable from regional travel model forecasts**
    - **Impact of TOD on transit demand should be discernable**
    - **Although not all underlying traveler response factors can be isolated, density and accessibility are solid indicators of travel behavior differences**

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Key Questions

- **What modeling components in the existing model might be modified to most effectively improve the sensitivity of the models to land use policies and nonmotorized travel?**
  - **Shorter-Term Improvements**
    - **RACC Indicator versus Alternative Variable(s) Exploration**
    - **Vehicle Availability Model**
    - **Trip Generation Model (add Nonmotorized Split)**

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Key Questions

- **What modeling components in the existing model might be modified to most effectively improve the sensitivity of the models to land use policies and nonmotorized travel?**
  - **Longer-Term Improvements**
    - **(Recommendations from Task 3 Regarding Framework Decisions)**
    - **Time of Day Model**
    - **Destination Choice Model**
    - **Expand Treatment of Nonmotorized Trips**
    - **Land Use Model**

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