Travel Modeling in Massachusetts

Joint Board Presentation

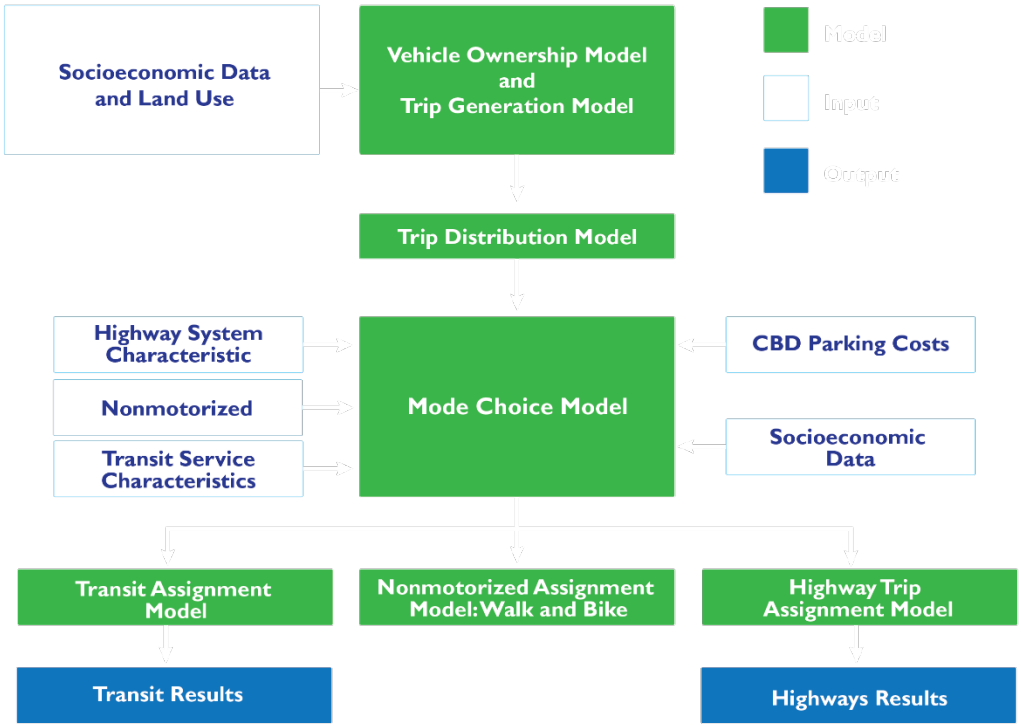
November 19, 2018

Agenda for Today

- Provide an overview of the travel demand modeling process
- Explain the process for developing state and regional demographic projections of population and employment
- Explain the uses, strengths and limitations of the statewide and regional travel models

Travel Modeling – A Primer

- The travel model is a spatially oriented planning tool used to estimate future travel behavior based upon a defined set of assumptions concerning land use and demographics, the transportation network, and socio-economic data.



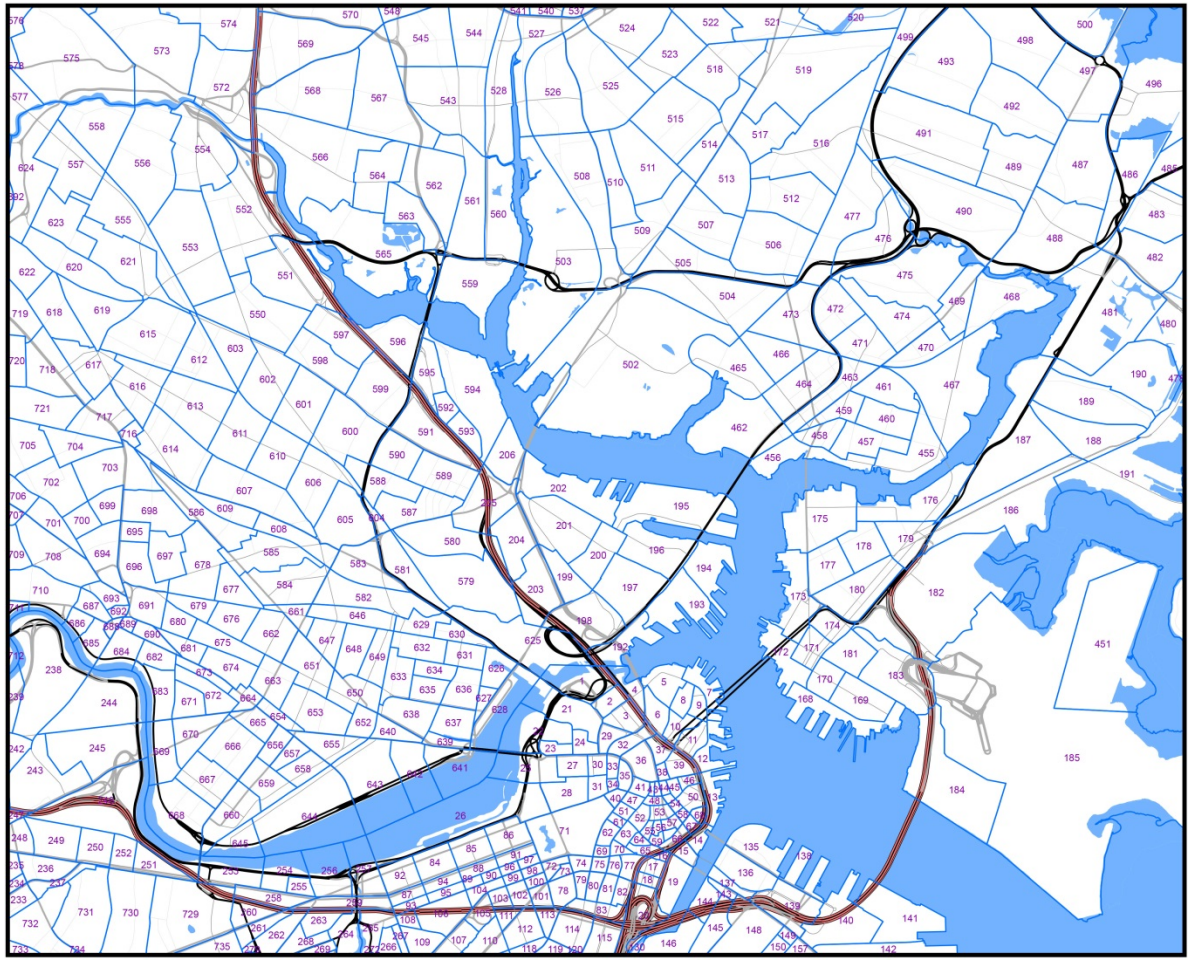
Travel Modeling – Geography

- The statewide travel model covers the entire Commonwealth, all of Rhode Island, and Southern New Hampshire (within the commuting shed for the Boston Region).

- In order to provide the appropriate level of granularity, the model is divided into transportation analysis zones.

- The model has 5,839 transportation analysis zones (TAZs) - 4,497 in Massachusetts, 1,241 covering southern New Hampshire and all of Rhode Island, and 100 “external stations” along the edges of the model network.
  - Outside of Eastern Massachusetts, TAZs are largely based on U.S. Census block group geography.
  - In Eastern Mass. (metro Boston area), approximately 2,700 TAZs have been more closely delineated to areas of employment and other travel-attracting activities (rather than using just the residential-based census geography).

Travel Modeling – Transportation Analysis Zones



Travel Modeling – Major Inputs (Future State)

- Demographic projections are developed by the Regional Planning Agencies every fours years in consultation with MassDOT and the UMASS Donahue Institute. We have just completed an update and later in the presentation, the Metropolitan Area Planning Council will discuss this process in more detail.
  - Population (by age cohort)
  - Households (by size, number of workers and income)
  - Automobile ownership
  - Employment (by sector)

- User costs are reflected in the model along with travel times to create a generalized cost for travel by mode.
  - Transit fares and highway tolls
  - Parking costs
  - Automobile operating costs

Travel Modeling – Control Totals

- The demographic projections developed by the Regional Planning Agencies in consultation with MassDOT and the UMASS Donahue Institute constitute control totals for planning purposes.

- The control totals are the projected demographics (population, households and employment) for the state and each RPA region for the horizon year(s). These totals are further divided between municipalities and, for modeling purposes, assigned to transportation analysis zones.

- For individual project analyses different growth totals may be assumed for a specific location, but increases in growth in that location need to be offset by decreases in growth in other locations within the same municipality or RPA region.
  - We sometimes make exceptions to this general rule for large scale projects when necessity requires.

Travel Modeling – Horizon Year

- The selection of a horizon year(s) for the model analysis is based upon the needs of the particular project being reviewed.

- For long range planning purposes, federal regulations require the Metropolitan Planning Organizations to use a minimum planning horizon of twenty years. Recently concluded demographic projections, therefore provide estimates to 2040 (with interim estimates provided for 2020 and 2030).

- Project specific analyses often use more than one horizon year - one that reflects the date of opening for the project and one that reflects usage at a later date (often the 20-year planning horizon used for the MPO long range plans).

Travel Modeling - Basics

- The “Base Case” analysis is a model run of the current (or a recent) year with existing socio-economic, land use and demographic data and the existing transportation network.

- The “No Build” analysis is a model run of future conditions for a defined horizon year(s) that reflects predicted changes to socio-economic, land use and demographic data, but limits changes to the transportation network to projects that are currently underway or funded.

- The “Build” analysis is a model run of future conditions for a defined horizon year(s) using the same socio-economic, land use and demographic data as the No Build, but changing the No Build transportation network to reflect the project(s) under consideration.

Travel Modeling – the No Build Future

- A No Build analysis is run for each horizon year.
- The land use and demographic inputs are those developed by the Regional Planning Agencies interpolated if necessary to the particular horizon year(s).
- The transportation network is the existing network modified to include projects for which funding is committed and that will be open by the particular horizon year(s).
- The same No Build outputs are produced for each horizon year, showing the changes to transportation behavior based upon a steady state transportation future without the construction of the project(s) under consideration.

Travel Modeling – the Build Future

- A Build analysis is run for each horizon year.
- The land use and demographic inputs are the same as the No Build for the particular horizon year(s).
- The transportation network is the No Build network modified to include the project(s) under consideration.
- The outputs are the same as the No Build outputs produced for each horizon year, showing the changes to transportation behavior based upon the implementation of the project(s) under consideration.

Travel Modeling – Typical outputs

- Model outputs can vary based upon the type of analysis being done. Typically, the outputs include projections of roadway usage and transit usage, but may also include other impacts (revenue, GHG, EJ, etc.).

- Roadway usage is typically measured in vehicle volumes and time. Examples include:
  - Vehicle miles of travel
  - Vehicle hours of travel
  - Levels of congestion or delay

- Transit usage is typically measured in person volumes and time. Examples include:
  - Ridership by line and station
  - Passenger miles of travel
  - Passenger hours of travel