

TO: Plano Comprehensive Plan Review Committee (CPRC)

CC: Mike Bell, AICP; Daniel Harrison, AICP; Dan Sefko, FAICP; Eddie Haas, AICP

FROM: Brian Crooks

SUBJECT: Travel Demand Model Processes, Inputs, and Assumptions

DATE: May 5th, 2020

PROJECT: Plano Comprehensive Plan Update

This memo was created in a response to a request by the City of Plano for an overview of travel demand model processes and inputs in support of the Plano Comprehensive Plan Update. Information included in this memo is sourced from the 2009 NCTCOG Regional Travel Demand Model Description report.

Key Data Sources:

To develop the regional model, NCTCOG collects data from numerous sources. For roadway network data, NCTCOG staff collaborates with the following agencies:

- NCTCOG member cities
- TxDOT
- FHWA
- FTA
- DART
- DCTA
- Trinity Metro

NCTCOG uses the collected network data to create a GIS database of roadway, transit, and rail networks for the AM and PM peak periods and the off-peak periods. Transit networks are developed for the AM period and the mid-day off-peak.

For population and other demographic information, NCTCOG collects and refines data from the following sources:

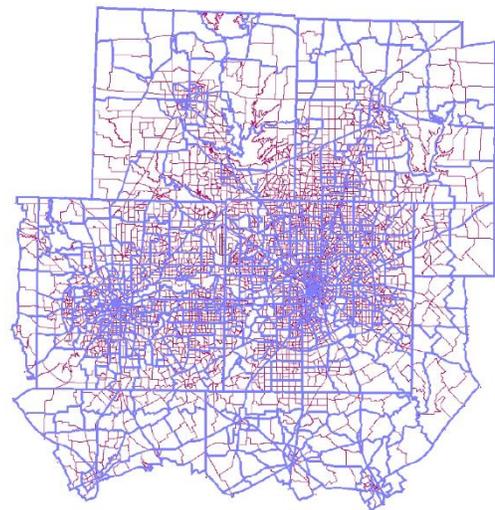
- US Census
- Texas State Data Center (migration patterns and population projections)
- NCTCOG Regional Data Center (refines Census data in collaboration with the model group)

Information from other studies and organizations help NCTCOG staff determine mode share preferences, transit usage, and act as a baseline to determine the accuracy of the model outputs. These sources include:

- Dallas-Fort Worth household surveys
- Automatic Traffic Count Stations
- TxDOT Traffic Saturation Counts
- DFW Airport Survey
- DART onboard transit survey
- Trinity Metro onboard transit survey
- Workplace Surveys
- External Stations Survey

Trip Generation

The first step in the modeling process, trip generation, uses demographic inputs to generate person trip tables by trip purpose for each traffic survey zone. There are a total of 4,874 travel survey zones in the regional model, including 61 external zones that represent “gateways” to and from the modeling area. Demographic inputs include employment, population, number of households, household size, household income distribution, and household size distribution. Trip generation produces person trips for four trip purposes: Home-Based Work, Home-Based non-Work, Non-Home Based, and internal truck trips. Home-Based Work trips are then separated into four income groups defined by the model.



Trip Distribution

The second stage of the modeling process determines how trips will be distributed by the model through the study area. This process is designed to find the shortest paths between traffic survey zones for auto modes and generates a set of matrices (often referred to as “skims” or skim matrices) to represent distribution between travel survey zones. The number and types of travel time matrices/skims needed are determined by the number trip purposes, the number of peak periods, and traffic assignment vehicle classes, which are determined by the mode choice model.

There are four roadway skim matrices produced for time periods (AM Peak, AM-PM Off-Peak, PM Peak, PM-AM Off-Peak). Additional matrices are created for HOV travel. They are Peak-HOV, Peak No HOV, Off-Peak HOV, and Off-Peak No HOV. Matrices include travel distance along the shortest travel time path determined by various mathematical algorithms. Separate skim matrices are developed for transit and include peak period with park and ride, peak period with no park and ride, and off-peak period with no park and ride. Each matrix has tables describing costs and times for travel. These skims, along with other inputs, are used in the mode choice module to calculate mode share.

Mode Choice

The mode choice component of the travel demand model determines what portion of trips use different modes. Modes considered are drive alone, shared ride with 2 occupants, shared ride with 3 or more occupants, transit with walk access, transit with auto access.

Trip Assignment

Roadway assignment is the final stage of the travel demand modeling process. Trips are “assigned” or “loaded” onto the electronic roadway networks for three time of day periods – AM Peak, PM Peak, and Off Peak. Four vehicle classes are considered during the assignment: drive alone vehicles, shared ride with HOV access, shared ride with no HOV access, and trucks. These vehicle classes have different sets of roadway networks to access and different parameters for value of time.

Transit assignment is run separately from roadway assignment and has four assignments. Home-Based Work walk and drive access to the peak transit network with and without park and ride and Home Non-Work walk and drive access to the off-peak transit network with and without park and ride.

These trips are loaded incrementally onto the regional roadway networks until they achieve equilibrium, where origins and destinations to and from each traffic survey zone are almost, if not exactly, equal. These volumes are then used as a decision support tool for transportation experts and officials to determine strategies for optimal transportation network development.

Further Information

Any additional questions regarding the NCTCOG regional travel demand model can be sent to Hua Yang, Principal Transportation System Modeler at hyang@nctcog.org.

End of Memo.