Overview of Travel Demand Modeling
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What Is a Travel Demand Model?

Typical Definition:

A series of mathematical models that attempt to simulate human travel behavior, executed in a sequence of steps that answer a series of questions about traveler decisions.

Attempts are made to simulate choices travelers make in response to a given system of highways, transit and transportation policies.

The output is a measure of future travel demand that is expressed in terms of future traffic volumes.

Simply: A forecast of future travel

Where are people traveling to and from.

What routes are they choosing to get there.

Future year-forecasts are only as good as the assumptions that are made.
Why Are Models Important?

Travel demand models are fundamental to transportation planning and used to meet federal requirements in a number of areas.

Models:

- Are the major tool used to guide the development of Long-Range Transportation Plans (Metropolitan Planning Regulations “Title 23”)
- Support Transportation Studies at the Corridor Level
- Allow decision makers to make informed decisions with the best possible information about future needs
- Are used for determining where congestion may be in the future
- Are used for determining what projects will alleviate or minimize that congestion
- Are used for scenario analyses (What ifs?)
- Determine traffic impact due to land use changes (Chapter 527)
- Guide future investment strategies (PPTA)
- Are important to almost all transportation projects (EIS)
Building a Travel Demand Model

What do we need to start? DATA!!!
- Population (how many people do we have?)
- Households (where do they live)
- Employment (jobs, shopping, restaurants, recreation, etc.)
- Traffic Analysis Zones
- Roadway Network
- Travel Surveys (Travel Patterns, by trip purpose, by mode)
  - Basis for statistical travel models

The Four Steps - Fundamental to all Travel Demand Models:
1. Trip Generation - How many trips?
2. Trip Distribution - Where are they going?
3. Mode Choices – Auto, Transit, Carpool, Bus, Walk, Bike?
4. Trip Assignment - What path are they taking?
What's Next?

Calibration/ Validation - Does the Model work?

- **The Model is built with:**
  - Exiting Roadway
  - Existing Demographics, Land use and Economic data
- **Does model output statistically in line with survey results**
- **Is model statistically in line with observed traffic counts, speeds, etc.**
- **If so we move on, if not adjustments are made (calibration)**

Scenario Analysis (The What ifs)

- **Future Alternative Networks**
- **Future Alternative Population and Land use Scenarios**
  - Usually limited to MPO approved data and within VEC limits
Travel Demand Modeling Program

Applications of Model Outputs:
- Metropolitan Long-Range Plans
- Air Quality Data
- Traffic Studies (Corridor, EIS, PPTA, TIA)
- Highway Needs Assessment
- Rural Long Range Plans
- Surface Transportation Plan
- VTRANS
- Project Prioritization

Model Outputs:
- Performance Measures
- Traffic Forecasts
- Corridor Demand
- Trip Distributions
- Mode Distribution
- Alternative Feasibility
- Input into micro-analysis
14 Current Travel Demand Models

13 MPO
1 Statewide
VTM Modeling Program

Mission: To improve the state of the practice of travel demand modeling in Virginia to support both State and MPO travel demand modeling needs.

Supports the federally mandated (3-C) process

Partnership between VDOT and MPOs

Provides models that are consistent with Federal and State Modeling Requirements and Guidelines

Ensures that federal and state transportation dollars are spent effectively
  - Use same software standard: Citilabs CUBE VOYAGER
  - Statewide Training
  - Prevent Redundant Model Development and Data Collection
  - “Economies of Scale”

Supports numerous travel demand models:
  - 11 MPO models
  - Virginia Statewide Model
  - Tidewater “Super-Regional” Model (Covers 3 MPO areas)

Provides model development support for MPOs within Virginia
  - TMPD provides the modeling tools, software, and training needed by MPOs
  - MPOs are responsible for their own model usage or analysis
Current Major Projects Using Models

Hampton Roads / Richmond Super-Regional Model
   To support I-64 and US-460 Toll Analysis

Hampton Roads MPO Truck Model
   Commodity based port trucks plus non-port heavy trucks

Freight Enhancements to Virginia Statewide Model
   To support multi-modal freight study

HOT Lane Modeling
   Toll and HOV facilities
   For Hampton Roads, Richmond, and Fredericksburg

Transit Modeling
   Fredericksburg, Richmond, and Hampton Roads

Comprehensive research studies
   Speed/Flow for model calibration
   Area Type analysis (Urban / Suburban / Rural)
   Activity Based Model Usage in the US
Richmond/Tri-Cities Travel Forecasting Model

Setup
More Information

VTM Website

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