Mid-South Regional Travel Survey & Model Update

MDOT Quarterly Meeting

October 3-4, 2013
Introduction & Overview

• Purpose of the project
  • Survey regional travel patterns
  • Update the MPO’s regional Travel Demand Model
  • Long-range transportation planning

• Key components of regional travel
  • Automobile
  • Transit
  • Bicycle & Pedestrian
  • Freight

• Changing dynamics in the region

• Changes in transportation policy
Project Overview – Key Components

**Project Management**
- Schedule and Budget
- Quality Assurance Plans
- Effective Communication
- Engage Regional Stakeholders
- Easy-to-Follow Documentation

**Model Assessment**
- Where are we?
- and
- Where do we need to be?
- Policies to be Tested; Integration with Air Quality, Land use
- Roadmap for Data Collection and Model Design

**Data Collection**
- Household Surveys
- Transit Surveys
- Freight Surveys
- Bike/Ped Surveys
- Optional Surveys
- GPS, Visitor, External
- Sample Sizes
- Targeting Methods
- Survey Dates
- Questionnaires
- Data Cleaning
- Data Expansion

**Model Update**
- Data-Driven Model Development
- Calibration and Validation
- Sensitivity Analysis
- Scripting and Documentation
- Staff Training and Reports

Memphis MPO
METROPOLITAN PLANNING ORGANIZATION
Study Area – The Memphis MPO
Study Area – New Travel Survey
The Project Team

- Cambridge Systematics - Primary consultant
  - Lead modeling & survey analysis
- Dikita Engineering – transit survey
- Abt SBRI – household survey
- Neel-Schaffer – freight and bike/ped surveys
Project Steering Committee

- Memphis MPO Staff
- State DOTs
- Memphis Area Transit Authority (MATA)
- Regional Partners

Roles of the Committee:
- Review study materials
- Ask questions of the project team
- Provide guidance, feedback, and agency perspectives
- Facilitate outreach
Project Schedule

1. Project Management
2. Travel Demand Model Consultation
3. Research Design, Pretest, and Refinement
4. Household Travel Survey Data Collection
5. Freight Survey
6. Transit Onboard Survey
7. Bicycle and Pedestrian Survey
8. Data Weighting and Expansion
9. Travel Surveys Final Report/Data Delivery
10. Travel Demand Model Update

Approximate Month

- Interim Findings
- Deliverable
- Project Oversight Committee Meetings
Modeling Needs – Multimodal Focus

- **Transit**
  - Rapid transit capabilities – BRT/LRT
- **Freight**
  - The Memphis Aerotropolis
  - Multimodal goods movement
- **Non-Motorized**
  - Bicycle & Pedestrian
- **Impacts of Modal Shifts**
  - Economic impacts
  - Congestion mitigation
  - Environmental impacts
Modeling Needs – Air Quality

- Integrating the MPO model with MOVES
- Streamlining the modeling process
- Ease of analysis and reporting
Modeling Needs - Performance

- Performance measures
- Performance-based planning
- Modeling transportation performance:
  - Locational factors
  - Travel patterns/times
  - Congestion
  - Transit usage
  - Modal shifts
- Assist in setting performance goals
Modeling Needs – Scenario Planning

- Integrate land use modeling and transportation modeling
- Alternative scenarios and investment strategies
- Model impacts of:
  - Economic factors
  - Development patterns
  - Changing demographics
Household Travel Survey

- Statistical sample of households in the region
  - 4,500 completed households
  - Stratified by county & household type
  - Address-based sampling
  - Use of GPS/GIS tools for quality control
- Survey issues
  - Maximizing response rates & addressing non-response
  - Oversampling of hard to reach households
  - Incentivizing participation

![Figure 2.4 Memphis HTS Study Area](image)

<table>
<thead>
<tr>
<th>County</th>
<th>HH Size (Source: 2010 Census)</th>
<th>Number of Vehicles (Source: ACS five-year estimates)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
<td>3+</td>
</tr>
<tr>
<td>Fayette, Tennessee</td>
<td>3,013</td>
<td>5,480</td>
<td>6,012</td>
</tr>
<tr>
<td>Shelby, Tennessee</td>
<td>99,405</td>
<td>104,218</td>
<td>147,238</td>
</tr>
<tr>
<td>Tipton, Tennessee</td>
<td>4,264</td>
<td>6,929</td>
<td>10,424</td>
</tr>
<tr>
<td>DeSoto, Mississippi</td>
<td>11,496</td>
<td>18,110</td>
<td>23,412</td>
</tr>
<tr>
<td>Marshall, Mississippi</td>
<td>3,257</td>
<td>4,389</td>
<td>5,723</td>
</tr>
<tr>
<td>Tipton, Mississippi</td>
<td>3,206</td>
<td>3,220</td>
<td>4,600</td>
</tr>
<tr>
<td>Tunica, Mississippi</td>
<td>1,159</td>
<td>1,041</td>
<td>1,727</td>
</tr>
<tr>
<td>Total</td>
<td>124,830</td>
<td>145,947</td>
<td>205,875</td>
</tr>
</tbody>
</table>
Household Travel Survey

- **Travel Diaries**
  - Detailed account of a full day of trips
  - Every household member
  - All trips by all modes (car, bike, bus, walk, carpool)

- **Demographic questions**
  - Details on income, employment, school enrollment, auto availability, etc.

- **Methods of participation**

- **GPS pilot survey**

---

**Travel: How did you get to Location 12?**

1. **What type(s) of transportation did you use to go to Location 12?**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car, van, truck</td>
<td>1</td>
</tr>
<tr>
<td>Bike</td>
<td>2</td>
</tr>
<tr>
<td>Public Bus</td>
<td>3</td>
</tr>
<tr>
<td>Walk</td>
<td>4</td>
</tr>
<tr>
<td>Light Rail (commuter)</td>
<td>5</td>
</tr>
<tr>
<td>School Bus</td>
<td>6</td>
</tr>
<tr>
<td>Commuter Rail (transit)</td>
<td>7</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>8</td>
</tr>
<tr>
<td>Bicycle</td>
<td>9</td>
</tr>
<tr>
<td>Motorcycle/ Humped</td>
<td>10</td>
</tr>
<tr>
<td>Carpool</td>
<td>11</td>
</tr>
<tr>
<td>Taxi/Shuttle</td>
<td>12</td>
</tr>
</tbody>
</table>

2. **If you used a bus/train for this trip, did you use a pass?**
   - Yes
   - No
   - How much did you pay? ____________

3. **If you used a **car/truck** or motorcycle/moped** for this trip . . .
   - **Driver**
   - **Passenger**
   - **Including yourself, how many people were in the vehicle?** 1 2 3 4+
   - **Including yourself, how many are household members?** 1 2 3 4+
   - Which household members were with you? ____________

4. **Was this vehicle from your household?**
   - Yes
   - No

5. **Did you pay a toll?**
   - Yes
   - No

6. **How much, in total, did you personally pay for parking?**
   - **Nothing**
   - $_________ ________
   - Was the rate...?
     - **Hourly**
     - **Daily**
     - **Monthly**
     - **Other**

---

**Location 12**

4. **When did you arrive at Location 12?**
   - ______ : ______ AM PM

5. **Where is this?**
   - Name of Location 12

6. **What was your primary activity at Location 12?**
   - **Home — Paid Work**
   - **Other School Activities**
   - **Recreation—Watch**
   - **Home — Unpaid Work**
   - **Quick Stops**
   - **Eating Out**
   - **Other**
   - **Personal Business**
   - **Major Shopping**
   - **Accompany Another Person**
   - **Pick-Up Passenger**
   - **Everyday Shopping**
   - **Drop-Off Passenger**
   - **Recreation—Participate**
   - **Turn Around**

7. **When did you leave Location 12?**
   - ______ : ______ AM PM

---

Memphis MPO
METROPOLITAN PLANNING ORGANIZATION
Transit On-Board Survey

- Calibrate & validate travel demand model
- Meet FTA reporting requirements
- Use of latest technology
  - Web-based management tools
- Survey all existing routes
  - Incorporate existing ridership data
  - AM Peak, Mid-day, PM Peak, Evening

**Program and Design**
- Sampling Plans
- Instruments
- Download schedules
- Methodology

**Coordinate**
- Agency requirements
- Survey activity
- Recruit, hire, and train local team

**Collect Data**
- Organize field activity
- Supervise with experienced field personnel
- Improve response rates
Transit On-Board Survey

1. Where are you COMING FROM? (Choose best answer for THIS ONE-WAY TRIP)
   - Home
   - Work
   - Work-Related Business
   - University/College (student only)
   - Middle School / High School (student only)
   - Hospital
   - Mental Hospital
   - Shopping
   - Social/Recreational/Restaurant
   - Personal Errands
   - Other

2. What is the ADDRESS of the place you CAME FROM? (in question 1). Please give as much information as possible
   - Street Number
   - Street Name

3. How did you GET FROM THAT PLACE (in question 1) to the FIRST bus/trolley you used for THIS TRIP? (Mark best answer / choose one)
   - I drove & parked my car at:
   - I was picked up by someone
   - I rode my bicycle
   - I walked (if minutes)
   - I rode with someone (carpool)
   - Other

4. Where did you GET ON THIS BUS/TROLLEY you are riding now? (Please give location of bus stop or Transit Center)
   - Nearest Intersection / Cross Street 1
   - Cross Street 2

5. Where are you GOING TO NOW? (Mark best answer / choose one)
   - Home
   - Work
   - Work-Related Business
   - University/College (student only)
   - Middle School / High School (student only)
   - Hospital
   - Mental Hospital
   - Shopping
   - Social/Recreational/Restaurant
   - Personal Errands
   - Other

6. What is the ADDRESS of the place you ARE GOING TO NOW? (in question 5). Please give as much information as possible
   - Street Number
   - Street Name

7. Where will you GET OFF THIS BUS/TROLLEY you are riding now? (Please give location of bus stop or Transit Center)
   - Nearest Intersection / Cross Street 1
   - Cross Street 2

8. How will you get TO THAT PLACE (in question 5) from the LAST bus/trolley you will use for THIS TRIP? (Mark best answer / choose one)
   - I will drive my car
   - I will be picked up by someone
   - I will ride my bicycle
   - I will walk (if minutes)
   - I will ride with someone (carpool)
   - Other

9. Did you transfer FROM another bus/trolley TO GET TO THIS one you are on NOW? (Mark best answer / choose one)
   - No, this is my first bus/trolley on this trip
   - Yes, I transferred from Bus Route
   - Yes, I transferred from Trolley

10. Will you transfer to another bus/trolley to get to your FINAL DESTINATION? (Mark best answer / choose one)
    - No, this is my last bus/trolley on this trip.
    - Yes, I will transfer to Route
    - Yes, I will transfer to Trolley

11. For this ONE-WAY Trip, how many TOTAL buses/trolleys did you OR will you take from the place you are GOING NOW?

12. How did you pay for your fare when you boarded THIS vehicle? (Mark best answer / choose one)
    - Adult fare
    - Child fare
    - Daily Pass
    - Zone fare
    - Express service base fare
    - Student Base Fare
    - 7-Day Pass
    - Student 7-Day Pass
    - Student Daily Pass
    - Student 31-Day Pass
    - Senior Person with disability Daily Pass
    - Senior Person with disability 7-Day Pass
    - Senior Person with disability 31-Day Pass
    - Trolley Base Fare
    - Trolley Base Fare
    - Trolley Reduced Fare
    - Daily Pass

13. What was the AMOUNT PAID for the fare marked above? $
Transit On-Board Survey

14. If bus/metro service was not available, how would you MAKE THIS TRIP? (Mark best answer / choose one)
   - Drive
   - Get a ride
   - Bicycle
   - Walk
   - Taxi
   - Would not make trip

15. Was a CAR (or other personal motor vehicle) AVAILABLE to make this trip?
   - Yes
   - No

16. Was a bicycle available to make this trip?
   - Yes
   - No

17. How many working motor vehicles (autos, vans, trucks, motorcycles) are AVAILABLE in your household?
   - None
   - One
   - Two
   - Three
   - Four or more

18. Are you...?
   - Male
   - Female

19. How OLD are you?
   - Under 18
   - 18-19
   - 20-24
   - 25-34
   - 35-49
   - 50-64
   - 65 or older

20. Are you a LICENSED DRIVER AND ABLE to drive?
   - Yes
   - No

22. Including yourself, how many people in your household are employed?
   - 1
   - 2
   - 3
   - 4 or more

23. Are you...? (Mark all that apply)
   - Employed full-time
   - Unemployed/Looking for job
   - Self-employed
   - Government
   - Retired
   - Homemaker
   - Student
   - Other

24. Are you of Hispanic, Latino, or Spanish Origin?
   - No
   - Yes, Mexican, Mexican American, Chicano
   - Yes, another Hispanic, Latino or Spanish Origin
   - Cuban
   - Puerto Rican

25. What is your race? (Mark best answer / choose one)
   - Black or African American
   - White
   - American Indian or Alaska Native
   - Native Hawaiian or other Pacific Islander
   - Asian
   - Other

26. What was your estimated HOUSEHOLD INCOME in 2012 before taxes (EVERYONE AT HOME)?
   - Less than $5,000
   - $5,001 - $9,999
   - $10,001 - $15,000
   - $15,001 - $20,000
   - $20,001 - $30,000
   - $30,001 - $40,000
   - $40,001 - $50,000
   - $50,001 - $60,000
   - $60,001 - $90,000
   - More than $90,000

27. How much do you AGREE or DISAGREE with the following?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>No Opinion</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit services mostly operate on time.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Service Staff are helpful and friendly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drivers are helpful and friendly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Buses are clean and well-maintained.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Website providers detailed up-to-date information</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Informational materials are easy to understand</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use MATA's trip planner or MATA's mobile app to plan my trip</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

101 OFF CONTINUE
Non-Motorized Survey

- Purposes of the bike/ped surveys
  - Provide baseline data & model inputs
  - Evaluate impacts of investments & policies
- Mining of household and transit surveys
  - Trips made by biking and walking
  - Availability of bicycles for transportation
- Choice-based sample survey
  - 2011 Regional Bicycle & Pedestrian Plan
  - Over 2,100 responses
- Counts at key locations
  - National Bike & Ped Documentation Project
  - Existing & planned facilities; problem areas
Freight Survey – Existing Data

- Reliance on existing data sets/tools:
  - Federal Freight Analysis Framework
  - American Transportation Research Institute (ATRI)
  - TRANSEARCH
  - National Performance Management Research Data Set (NPMRDS)
- Previous studies
  - I-40 Origin-Destination Truck Survey
  - US-78 (Lamar Ave) Truck Field Survey
Freight Survey – GPS Data

- Next generation truck activity data
  - Significant improvement relative to establishment surveys
- Millions of truck activity events
  - Speeds
  - Precise origins and destinations
  - Routing information
  - Multiple stop trips
  - Time-of-day stamp

<table>
<thead>
<tr>
<th>All Trucks</th>
<th>April 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total GPS Events</td>
<td>3,429,603</td>
</tr>
<tr>
<td>Total Trucks</td>
<td>22,657</td>
</tr>
<tr>
<td>Weekday Truck Tours</td>
<td>19,813</td>
</tr>
<tr>
<td>Weekday Truck Trip Ends</td>
<td>57,032</td>
</tr>
</tbody>
</table>
Freight Survey – Gate Surveys

- Gate surveys will be used for key freight generators in the Memphis region
  - Port gates
  - Intermodal rail yards
- Key information to include
  - Percent local v. through truck trips
  - Commodities and industries served
  - Origins / Destinations
  - Routes used
Freight Survey – Data Analysis

- Adds significant depth and breadth to existing data sets
- Supports regional travel demand model
- Enables project-level analysis of major freight investments
  - Traffic impacts
  - Economic impacts
- Informs broader freight planning efforts
  - Regional freight studies, TN Freight Plan, MAP-21
Travel Demand Model Update

How Do All the Pieces Fit into the Model?

Model Consultation
- Drives survey effort
- Informs model framework

Transit On-board Survey
- Enriched sample
- Transit calibration
- Model validation
- Transit operations

Household Survey
- Travel repository
- Model estimation
- Model calibration

Freight Data
- GPS data
- FAF analysis
- Integrate with passenger model

Bike/Ped Data
- Route preferences
- Counts
- Nonmotorized model validation
Travel Demand Model Update

- Updated demographic data and base year
- Increased focus on freight and bike/ped
  - Access and mobility
  - Mode shift
- Additional functionality
  - Scenario analysis
  - Rapid transit capabilities
  - Performance measures
  - Air quality post-processor

Model Documentation

Ongoing Documentation
- Task-Specific Tech Memos
- FTP site for quick exchange of model results, files and software scripts.

Final Project Report
- Comprehensive MS Word Document for Memphis MPO reference
- Comprehensive PowerPoint synopsis of project findings and results
- CD-ROM with all final project documentation files

Model User's Guide
- Input-output file description
- Software and hardware requirements information
Questions & Discussion

John Paul Shaffer
Transportation Planner

john.shaffer@memphistn.gov
www.memphismpo.org