OD Data Suite

Focus Group

Meeting Log

See presentation slide deck for reference / context

Inaugural Meeting

Friday, June 16, 2017 ◦ 10:00 AM to 2:00 PM ◦ CATT Conference Room (2227 TVB)

Meeting Attendees

CATT: Nikola Markovic

CATT Lab: Nikola Ivanov ◦ John Allen ◦ Jenny Lees ◦ Mark Franz

Agencies: Wenjing Pu (FHWA) ◦ Keith Miller (NJTPA) ◦ David Heller (SJTPO)

Others: Di Yang (National Transportation Center) ◦ Catherin Plaisant (Human-Computer Interaction Lab)

Topics / Discussion

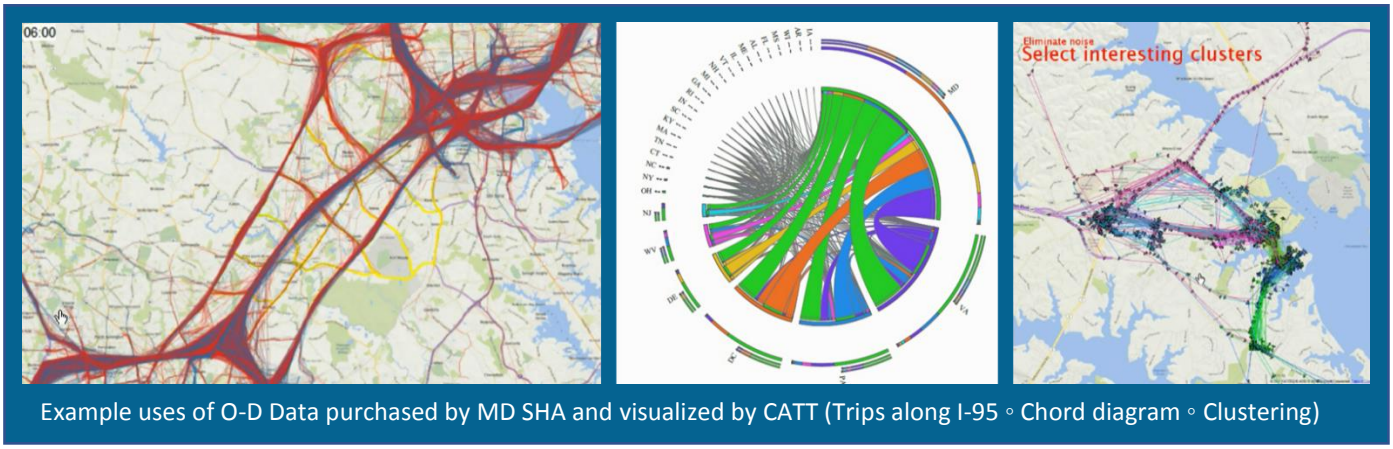
Following are summaries and highlights of each agenda topic from the meeting:

Welcome and self-intros – **John Allen (CATT Lab)** welcomed the group, thanked them for participating and asked each member to introduce themselves, including what area they work for in their organization, and what one thing they'd like to get out of the meeting. Some things mentioned were:

- Solid guidance on developing suite functions, visuals and reporting
- What the data can do for agencies
- How we can make the Suite user-friendly
- Building capabilities for evaluating long-distance (and multi-modal) travel
- Better understanding of using the data / tools for the planning process
- Ensure a person trip-based focus, not just on cars / roads

Meeting Objectives – John then went over meeting objectives; key takeaways for the Lab to better develop an OD Data Suite with maximum usability; features, functions, visuals and reporting capabilities that support and value-add agencies' planning, operations and project and program development and evaluation efforts.

Background / Context – To get the group oriented and grounded, **Nikola M. (CATT)** first presented "Visual Exploration of GPS Traces", demonstrating several ways GPS trajectory data can be visualized for a variety of purposes, such as trip patterns & duration, trip clustering and comparative analysis (e.g.; cars vs emissions.)



Example uses of O-D Data purchased by MD SHA and visualized by CATT (Trips along I-95 ◦ Chord diagram ◦ Clustering)

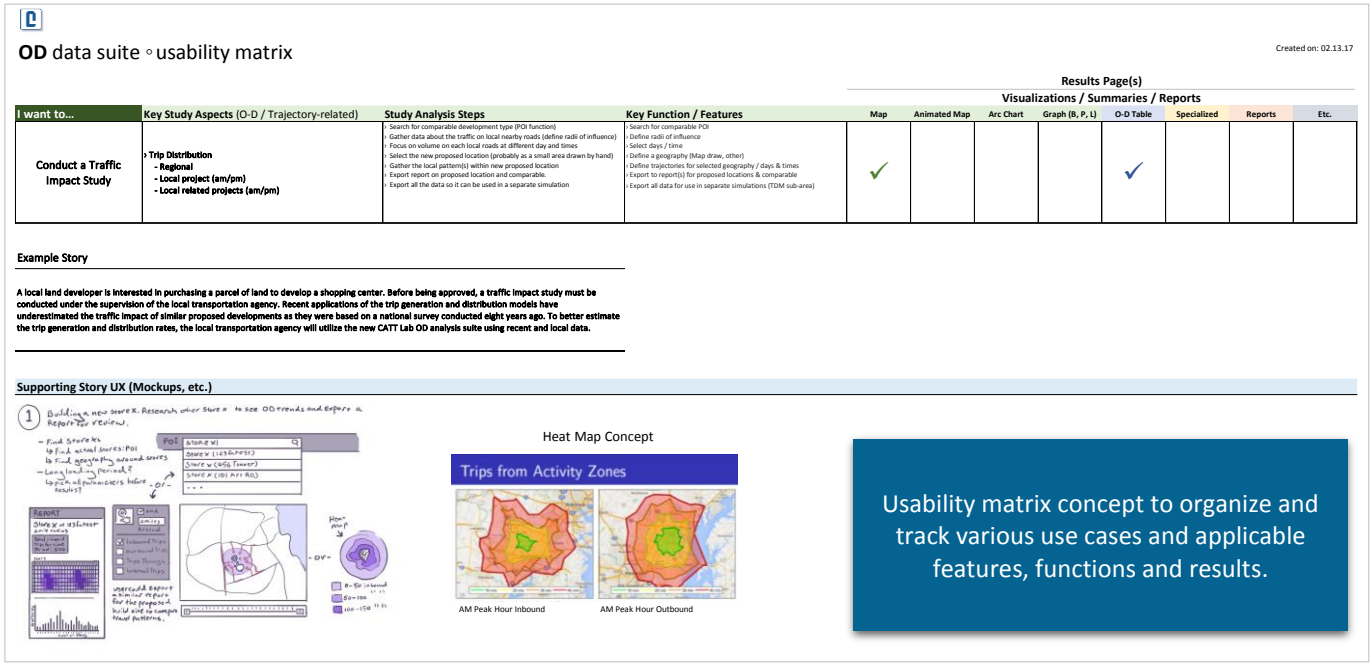
Afterwards, the Group had some questions related to the data:

- **Di Yang (National Transportation Center)** asked about where the OD comes from, to which Nikola replied it was derived as the first and last waypoint from each trip.
- **Keith Miller (North Jersey Transportation Planning Authority)** asked about whether data biases were an issue or concern, such as an over or underrepresentation of certain socio-demographic groups, to which Nikola explained that bias is a concern, especially considering that commercial vehicles are disproportionally over-represented with the data set. However, if traffic counters that differentiate between different vehicle classes are available, we can determine capture rates for different vehicle types and correct for any bias in data (MD automatic traffic recorder stations do not differentiate between different vehicle types – they only provide aggregate counts. As a result, we can only determine the aggregate capture rate of about 1.9%, and we cannot correct for any bias in data.) Nikola also mentioned that there are gaps in the data, from when

a GPS is turned off, then on, and that very long trips may not be captured accurately because INRIX resets the trip whenever a vehicle is idle for more than 10 minutes. For example, a trip from MD to CA would get reset when the driver stops for a lunch break in WV, and all the subsequent lags of the trip will get lost (i.e., they would not be included in the MD dataset purchased by SHA, so we would not have an accurate information about the trip's true destination.)

- **Catherine Plaisant (Human-Computer Interaction Lab)** asked whether there are missing trips, such as a local trip to a "Mom & Pop" store. Nikola replied that we would also need to get the ground-truth data to obtain an insight into any biases in trajectory data, and think that such a ground-truth data would be available.

The Case for Using Use Cases – **Mark Franz (CATT Lab)** built off Nikola's presentation by pointing to the need for defining desired tool functionality via associated use cases, to ensure the agencies' requirements are fully met. Mark then detailed four potential applications (tools), in terms of functionality and example use cases, used to develop UX / UI. Mark wrapped up by showing a "usability matrix" that may be used to help organize and track use cases and applicable features, functions and results throughout the OD Data Suite development process.



OD data suite ◦ usability matrix

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I want to...	Key Study Aspects (O-D / Trajectory-related)	Study Analysis Steps	Key Function / Features	Results Page(s): Visualizations / Summaries / Reports: Map	Animated Map	Arc Chart	Graph (B, P, L)	O-D Table	Specialized	Reports	Etc.
Conduct a Traffic Impact Study	› Trip Distribution - Regional - Local project (am/pm) - Local related projects (am/pm)	› Search for comparable development type (POI function) › Gather data about the traffic on local nearby roads (define radii of influence) › Focus on volume on each local roads at different day and times › Select the new proposed location (probably as a small area drawn by hand) › Gather the local pattern(s) within new proposed location › Export report on proposed location and comparable. › Export all the data so it can be used in a separate simulation	› Search for comparable POI › Define radii of influence › Select days / time › Define a geography (Map draw, other) › Define trajectories for selected geography / days & times › Export to report(s) for proposed locations & comparable › Export all data for use in separate simulations (TDM sub-area)	✓				✓			

Example Story

A local land developer is interested in purchasing a parcel of land to develop a shopping center. Before being approved, a traffic impact study must be conducted under the supervision of the local transportation agency. Recent applications of the trip generation and distribution models have underestimated the traffic impact of similar proposed developments as they were based on a national survey conducted eight years ago. To better estimate the trip generation and distribution rates, the local transportation agency will utilize the new CATT Lab OD analysis suite using recent and local data.

Supporting Story UX (Mockups, etc.)

Heat Map Concept

Trips from Activity Zones

AM Peak Hour Inbound

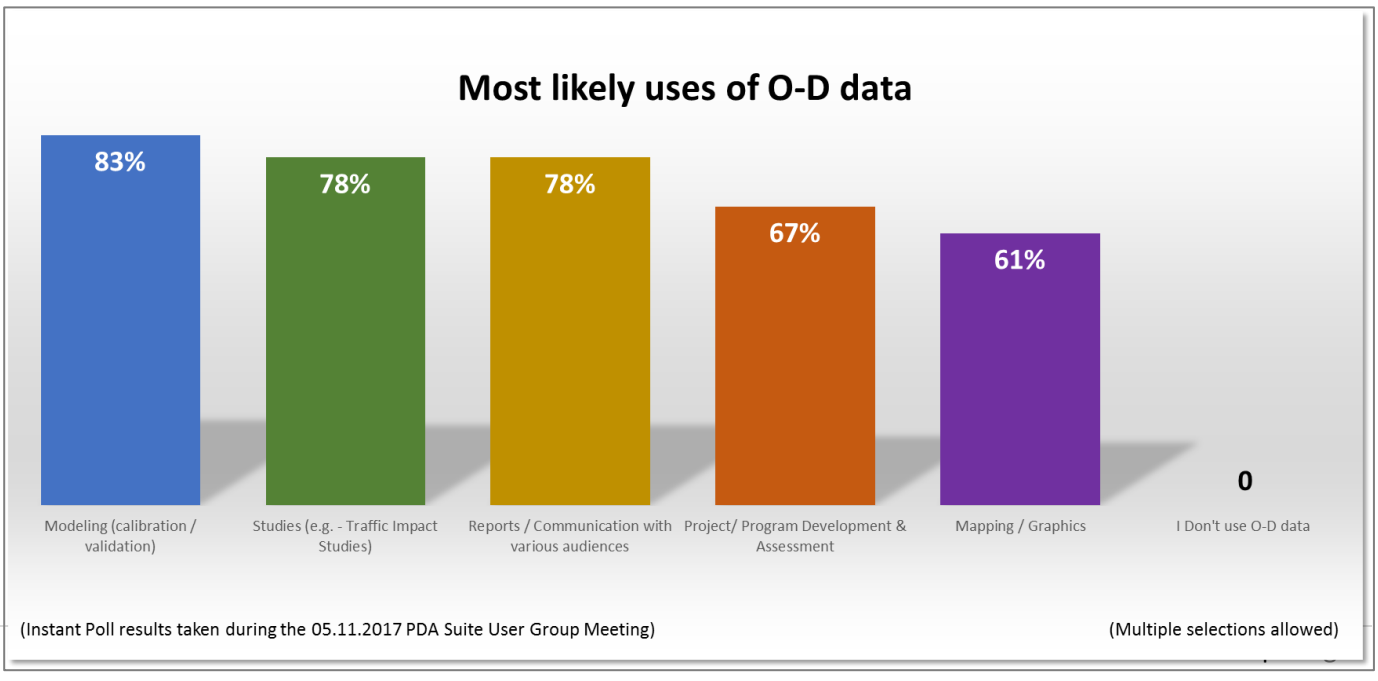
AM Peak Hour Outbound

Usability matrix concept to organize and track various use cases and applicable features, functions and results.

Questionnaire Results – John then shared some of the results from a questionnaire distributed to Group members prior to the meeting:

- Transportation Priorities – Transportation Demand Model validation & calibration, major event prep, large corridor studies, support of Federally-mandated processes (e.g.; Congestion Management Process);
- Current OD use – static and dynamic trip assignment, model calibration (trip purpose is key); supplement major corridor planning studies;
- Challenges – for activity-based TDM, developing tools that allow customized OD tables based on vehicle class, trip purpose, time of day, etc. For data compilation, having a way to easily manage the data and draw solid conclusions without spending inordinate amounts of time;
- Future (desired) uses – visually appealing, informative maps & charts for planning studies and reports, before/after analysis of major improvement projects, better understanding of travel patterns and trip purpose (e.g.; regional external vs internal traffic; commuter vs recreational travel) to meet various requirements, better leverage funding, etc.;
- Features, functions, visuals – customize/filter OD data based on different travel characteristics (vehicle class, trip purpose, etc.), show select link OD data to understand link-level travel patterns, need to "tell a story" and be visually appealing, without a lot of technical jargon.

John then showed the "Instant Poll" results from a recent PDA Suite User Group meeting, that revealed a consensus between the Focus Group and User Group re important OD data uses.



Afterwards, the Group had some questions related to OD challenges and uses:

- John asked **David Heller (South Jersey Transportation Planning Organization)** to elaborate on his questionnaire response of enhancing tourism (a FAST Act planning factor – see appendix.) as a *future* use case. David replied that his region is heavily oriented towards recreational travel (Atlantic City, Jersey shore) and that better understanding the impact of tourism (notably regional vs local trips) may help leverage federal funding, and address the local population's voiced concerns about regional travel impact to their local roadway system. David also mentioned as an aside, that visualization is a "big part" of their organization's mission – the ability to communicate complex information and/or analyses, especially to non-technical audiences, is critical. David also mentioned as an aside, that visualization is a "big part" of their organization's mission – the ability to communicate complex information and/or analyses, especially to non-technical audiences, is critical.
- Mark asked agencies if trip purpose is tracked in their planning models, to which David replied it is, but a way of validating these trips is needed. Catherine followed up by asking about SJTPO's current validation process to which David replied it's mostly anecdotal, but he felt the OD data set may help with validation.
- Keith mentioned the importance of demonstrating benefit (as well as burden) in developing projects and programs along the lines of Environmental Justice, Urban vs Rural and so on. This is especially important to NJTPA, as their 13-county region covers great diversity from a land use and socio-economic perspective. In terms of use cases, Keith felt that event analysis – such as major incidents with detouring – was important, and thus linking OD data to travel time or speed data would be beneficial and desired. It was also pointed out that currently there is no good trip purpose data (except for the work trip) and that agencies generally rely on surveys to fill the need.

CATT Lab OD Data Suite Concepts – **Jenny Lees (CATT Lab)** then walked the Group through three refined mock-ups of the OD Data Suite and select tools. For each individual mock-up, Jenny went through the slides from beginning to end, so the Group can understand how each tool would work. Afterwards, she went back to the beginning and opened the floor for discussion, one slide at a time (refer to slides 24 to 51):

- Choosing an OD data set – this mock-up included the login screen, and how to select a data set, with a table layout of the information detail provided (data

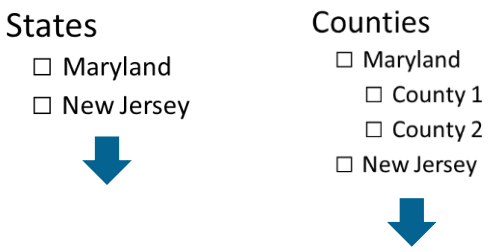
provider, date range and other details, like temporal and spatial granularity and trip types, etc.)

There was no design feedback for this mock-up.

- Building and Origin-Destination Matrix – this mock-up laid out the tool for a query page and results page, detailing several features and functions envisioned to be included:
  - Standard or custom axes
  - Geography selection (state, county, TAZ, etc.)
  - Custom geographies (via a map selection feature)
  - Matrix results, with detailed depictions of controls such as a Legend Color Bar for highlighting cell entries (low to high % of trips); Date Range Selection (time-of-day, day of week, month & ability to include / exclude certain dates); Matrix Controls (vehicle type, trip disposition, trip results display) and; Display Options for sorting and grouping OD's and geographies

The Group members offered this design feedback:

1. **Geography Grouping** – consider other groupings, such as:



2. **Geography Granularity** – in addition to what's already included, census tracks, municipalities and cities would be desirable.
3. **Trip Purpose** – having trip type info is highly desirable, but the data doesn't include that aspect. However, using a comparative analysis may be useful, such as looking at shore trips for two time periods - February-April and June-August - then look at the differential as a rough estimate of recreational traffic and ODs. This approach could also be useful for looking at school vs non-school traffic, before and after studies, etc.
4. **"Show trips that were…"** – it was agreed that this makes sense as a user-defined component, but some eventual use may help refine this function.

5. **Output table** – it was suggested that the diagonal (internal trips) be highlighted (e.g.; bold borders) for symmetrical matrices, as this is typically shown in some fashion. Also, having some summary information to value-add an exported table (and perhaps on the results page) is recommended, along with highlighting the highest/lowest trip exchanges (e.g.; bold the text.)
6. **Other results functions** – there was discussion and general agreement that it would be useful to have the ability two easily switch from a matrix to a map view. It would also be good to add an "internal trips" map.

› Visualizing roadway segment trip ODs – this mock-up included several variations of a results page to visualize trip ODs for a roadway segment, or multiple segments in a map and table view, that included these functions:

- **Map Controls** – Geographic resolution controls that show origins, destinations or net totals traveling through the selected roadway segment; what routes were used in traveling to or from the selected roadway segment; Data appearance controls that show map geography or simplified shapes (e.g.; grid); values on the map, with the ability to select which groupings to display (low to high)
- **Time Range** – full set of controls to select time of day, include / exclude certain dates, days of week and months of year, for multiple years (as available)
- **Map Display** – zoom in / out, OD geography color coded to number of trips of on roadway segment; segment highlighted in contrasting color for easy reference

The Group members offered this design feedback:

1. **Map Controls** – group members liked the idea of a grid display to normalize the areas/densities (add "view as grid" to the geographic resolution dropdown – may need to then revise the Data appearance section); when showing routes on a map, consider allowing the user to filter by roadway type (interstate, non-interstate, etc.)
2. **Map Display** – for the number of trip pop outs, show percentages rather than totals by default; if all the trip values are selected the map can get very busy, consider defaulting to having them turned off (and revisit the selection bar / checkboxes to ensure they are intuitive.)

3. **File Saves** – Exportable report(s) should include: OD matrix for all trips that passed through segment; only origins, and; only destinations.

Mark then walked the Group through some other potential visuals that could be incorporated into the Suite, such as having the route map display different degrees of line thickness to correspond to route use frequency, average trip departure stats and OD pair trip duration histograms.

The one comment here was the visualizations should be capable of focusing on specific OD pairs.

Brainstorming Session – Jenny then presented several sketch plan-level concepts of other features and functions being considered for possible development. These concepts were built from specific use cases proposed by CATT Lab staff (see slides 54 to 60.)

Group members offered the following comments:

1. **Slide 55, National Level** – include the ability to do non-contiguous periods (6A-9A and 4P to 7P) and multiple time ranges; option to show just inbound or just outbound trips; add map zoom function; noted that this would be useful for viewing out-of-state travel.
2. **Slide 56, Site-specific traffic impact studies –** agency members felt this concept wasn't applicable to them, as they rarely do any site-specific analysis. One noted exception was **American Dream** in the Meadowlands, NJ http://americandream.com/ – 2.9M sq. ft. of retail, 1M sq. ft. entertainment/dining, 33,000 parking spaces in a highly congested part of the state. But comparable examples may be hard to find for these types of mega-developments. This concept would be more applicable to municipalities, or counties.
3. **Slide 57, Telecommute impacts on peak hour travel** – this concept would be good for all Travel Demand Management strategy assessment and community connectivity analysis. Agency members felt it would be useful to include or integrate congestion maps and / or travel time reliability to better tell a story.
4. **Slides 57 & 58, Develop commuter rail (other transit) options between 3 cities** – automated weighted arrows indicating travel intensities is very desirable; was previously done "by hand" (see examples in the appendix.) Another option to consider for the arrows is how NJ's State Data Center depicts Worker Inflow /

5. Outflow, labeled specific geographies as opposed to a map (See appendix/click this link: http://lwd.state.nj.us/labor/lpa/content/maps/io2014/mercercountyio.pdf)
6. **Slide 60, Work zone or Dynamic Message Sign impact on the primary and secondary (detour) routes** – this use case was like a situation in South Jersey for scenario planning of a major storm taking out bridge crossings and the effect on the overall system. Thus, this concept is seen to be very useful in exploring evacuation routes, verifying FITM plans, in addition to work zone impact evaluation, planning and management.

Wrap-up / Next Steps – John wrapped up the discussion with these next steps:

- **For the group**
  - Summarize the meeting discussion
  - Send minutes out to group members for review, comment and approval
  - Share highlights with the PDA User Group at the next meeting
- **For the Lab**
  - Consider any suggestions to help refine features, functions and results (visuals, tables, etc.)
  - Use additional insight to help define and prioritize future tool development and deploy

In addition, Catherine asked agencies to provide at least one common use case that they typically address within their organization.

End of Meeting

Appendix

U.S. Department of Transportation
Federal Highway Administration

METROPOLITAN PLANNING

Fiscal year	2016	2017	2018	2019	2020
Estimated funding*	$329 M	$336 M	$343 M	$350 M	$359 M

*Calculated (sum of estimated individual State Metropolitan Planning apportionments)

Program purpose

The FAST Act continues the Metropolitan Planning program. The Program establishes a cooperative, continuous, and comprehensive framework for making transportation investment decisions in metropolitan areas. Program oversight is a joint Federal Highway Administration/Federal Transit Administration responsibility.

Statutory citation: FAST Act § 1201; 23 U.S.C. 134

Funding features

Type of budget authority
Funded by contract authority from the Highway Account of the Highway Trust Fund. Funds are subject to the overall Federal-aid obligation limitation.

Apportionment of funds
The FAST Act continues the MAP-21 approach to formula program funding, authorizing a lump sum total instead of individual authorizations for each program. Once each State's combined total apportionment is calculated, funding is set aside for the State's Metropolitan Planning program from:

- the State's base apportionment [23 U.S.C. 104(b)(6)]; and
- the State's apportionment for the National Highway Freight Program [23 U.S.C. 104(b)(5)(D)].

(See "Apportionment" fact sheet for a description of this calculation.)

Transferability to other Federal-aid apportioned programs
The Fast Act continues to prohibit transfer of Metropolitan Planning Program funds to other apportioned programs. [23 U.S.C. 126(b)(1)]

Federal share: In accordance with 23 U.S.C. 120. (See the "Federal Share" fact sheet for additional detail.)

Program Features

Except as specified above or below, the FAST Act continues all of the metropolitan planning requirements that were in effect under MAP-21.

Support for intercity bus and commuter vanpools
The FAST Act continues to require metropolitan transportation plans and transportation improvement programs (TIPs) to provide for facilities that enable an intermodal transportation system, including pedestrian and bicycle facilities. It adds to this list other facilities that support intercity transportation (including intercity buses, intercity bus facilities, and commuter vanpool providers). The FAST Act also requires that the metropolitan long-range plan include identification of public transportation facilities and intercity bus facilities. [23 U.S.C. 134(c)(2) & (i)(2)]

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Selection of MPO officials
The FAST Act clarifies that metropolitan planning organization (MPO) representation is selected by an MPO according to its bylaws/enabling statute. It also changes the selection criteria for MPO officials to—

- grant a representative of a transit provider authority equal to that of other MPO officials; and
- allow a representative of a transit provider to also represent a local community.

[23 U.S.C. 134(d)(3)]

Consultation with other planning officials
The FAST Act continues to encourage MPOs to consult with officials responsible for other types of planning activities. It adds to the list of such activities tourism and the reduction of risk of natural disasters. [23 U.S.C. 134(g)(3)(A)]

Scope of planning process
The FAST Act expands the scope of consideration of the metropolitan planning process to include—

- improving transportation system resiliency and reliability;
- reducing (or mitigating) the stormwater impacts of surface transportation; and
- enhancing travel and tourism. [23 U.S.C. 134(h)(1)(I) & (J)]

Capital investment and other strategies
The FAST Act continues to require a metropolitan transportation plan to include strategies to meet current and projected transportation infrastructure needs. [23 U.S.C. 134(i)(2)(G)]

Resilience and environmental mitigation activities
The FAST Act expands the focus on the resiliency of the transportation system as well as activities to reduce stormwater runoff from transportation infrastructure. In addition, it newly requires strategies to reduce the vulnerability of existing transportation infrastructure to natural disasters.
[23 U.S.C. 134(d)(3) & (i)(2)(G)]

Transportation and transit enhancement activities
The FAST Act continues to require a metropolitan transportation plan to include transportation and transit enhancement activities. When proposing these activities, the plan must now include—

- consideration of the role that intercity buses may play in reducing congestion, pollution, and energy consumption in a cost-effective manner; and
- strategies and investments that preserve and enhance intercity bus systems (including those that are privately owned and operated. [23 U.S.C. 134(i)(2)(H)]

Participation by interested parties in the planning process
The FAST Act explicitly adds public ports and certain private providers of transportation, including intercity bus operators and employer-based commuting programs to the list of interested parties that an MPO must provide with reasonable opportunity to comment on the transportation plan.
[23 U.S.C. 134(i)(6)(A)]

Congestion management
The FAST Act adds examples of travel demand reduction strategies for congestion management in a transportation management area (TMA). While retaining the requirement for a congestion management process for MPOs that serve a TMA, the law also allows an MPO that serves a TMA to develop a congestion management plan (distinct from the congestion management process) that will be considered in the MPO's transportation improvement program. Any such plan must include regional goals for reducing peak hour vehicle miles traveled and improving transportation connections must identify existing services and programs that support access to jobs in the region, and must identify proposed projects and programs to reduce congestion and increase job access opportunities. The FAST Act specifies certain consultation requirements MPOs must use in developing the plan. [23 U.S.C. 134(k)(3)]

Treatment of Lake Tahoe region
For the purpose of 23 U.S.C., the FAST Act treats the Lake Tahoe Region of California and Nevada as—

- a metropolitan planning organization;
- a TMA; and
- an urbanized area comprised of a population of 145,000 in California and 65,000 in Nevada.

[23 U.S.C. 134(r)]

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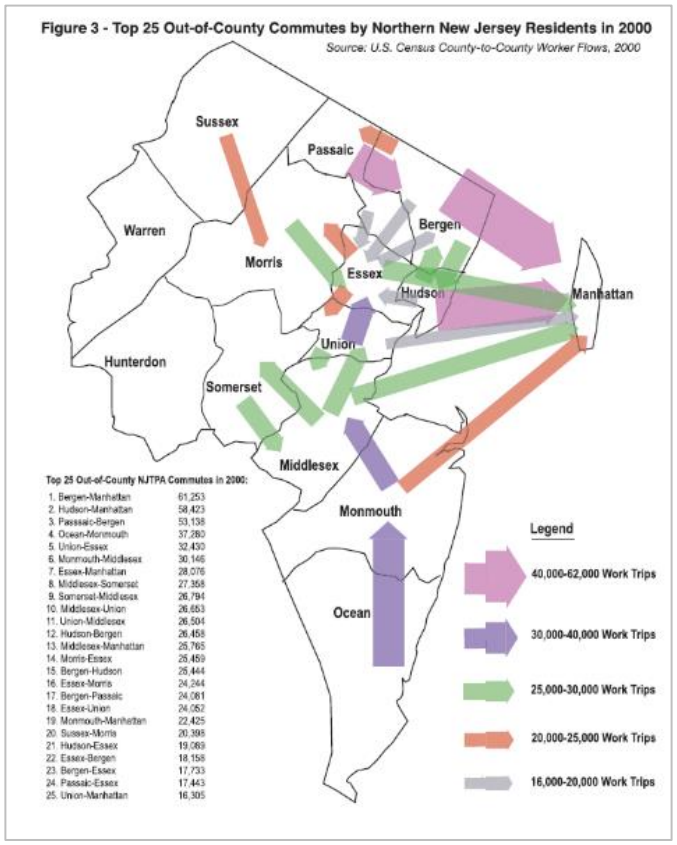
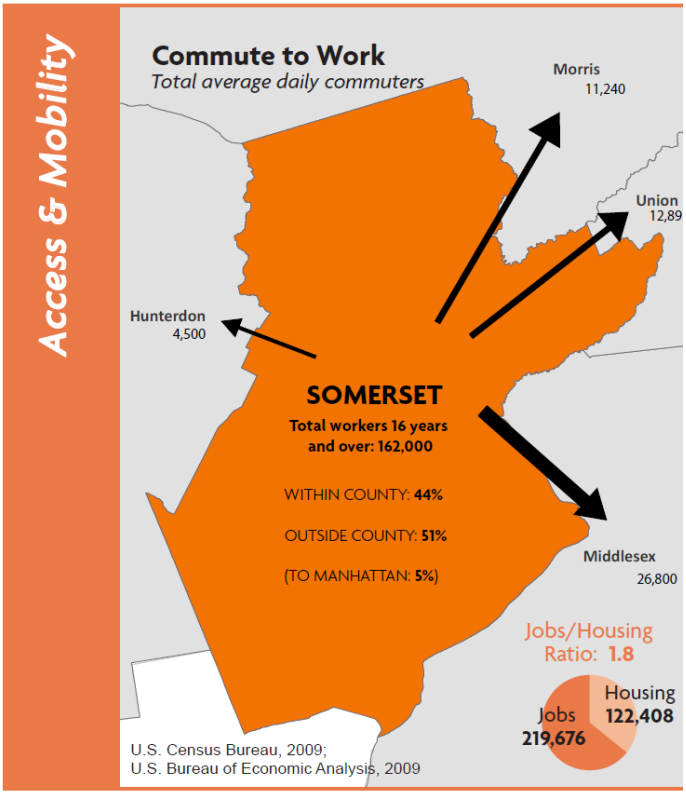
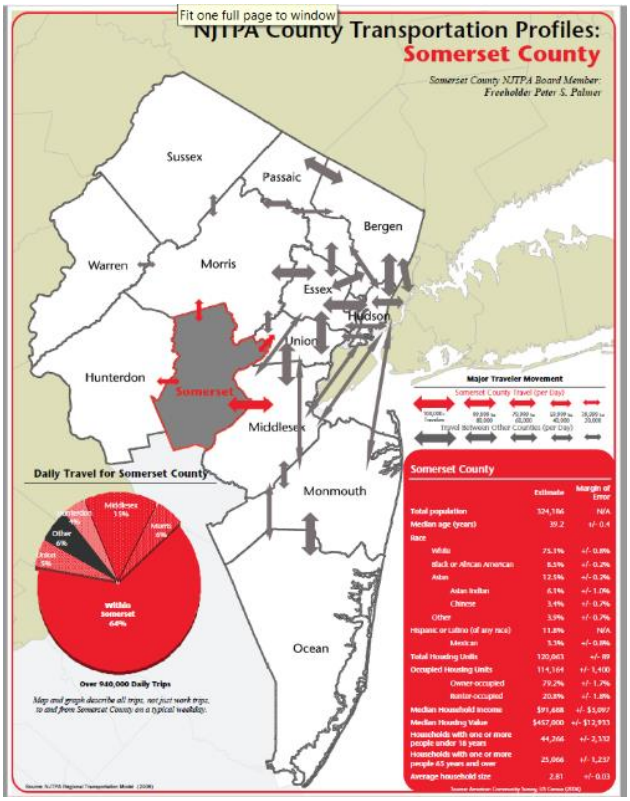
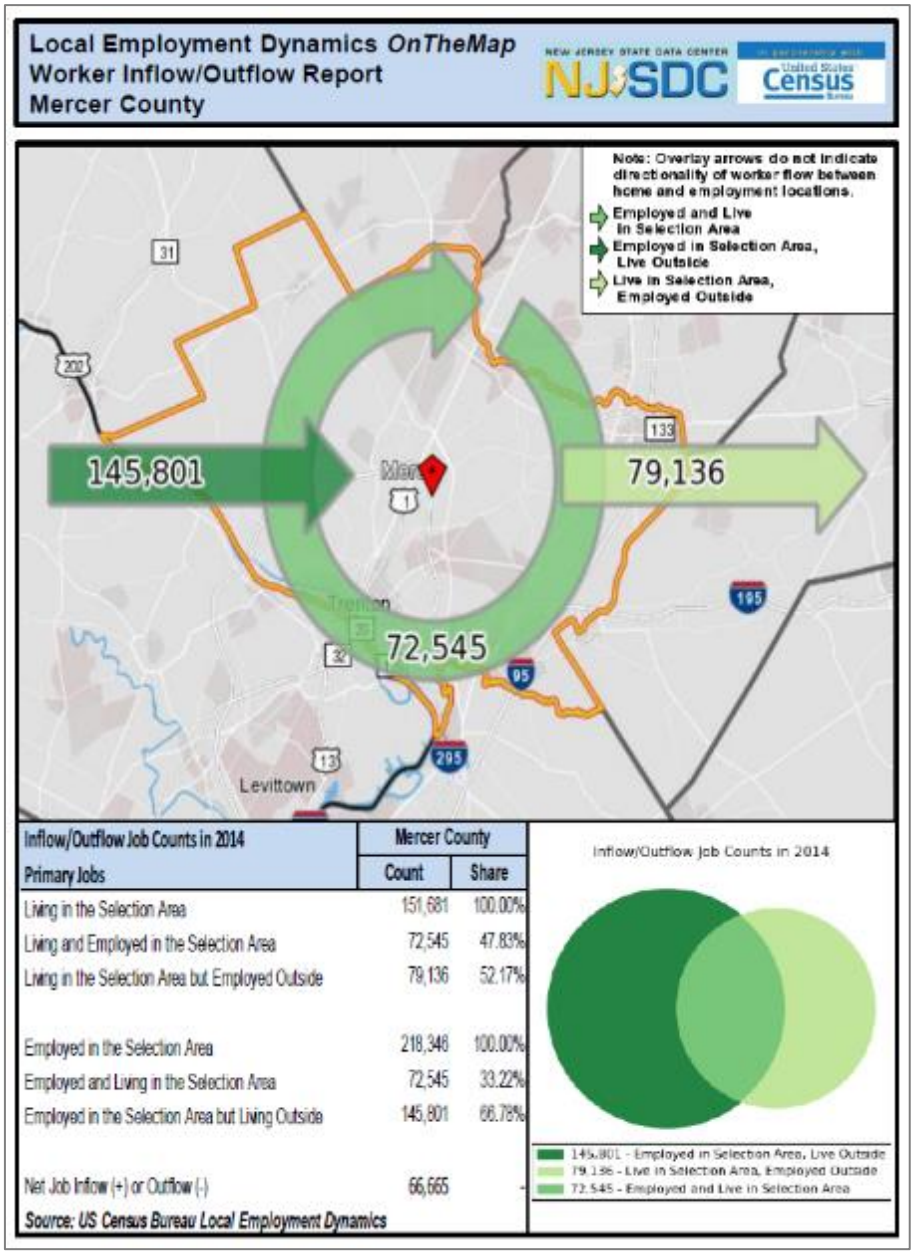




Census Transportation Planning Package, 2006-0




Local Employment Dynamics OnTheMap
Worker Inflow/Outflow Report
Mercer County
NJSDC
Census
Note: Overlay arrows do not indicate directionality of worker flow between home and employment locations.
Employed and Live in Selection Area
Employed in Selection Area, Live Outside
Live in Selection Area, Employed Outside
145,801
79,136
72,545
Levittown
Inflow/Outflow Job Counts in 2014
Primary Jobs
Mercer County
Count
Share
Living in the Selection Area 151,681 100.00%
Living and Employed in the Selection Area 72,545 47.83%
Living in the Selection Area but Employed Outside 79,136 52.17%
Employed in the Selection Area 218,346 100.00%
Employed and Living in the Selection Area 72,545 33.22%
Employed in the Selection Area but Living Outside 145,801 66.78%
Net Job Inflow (+) or Outflow (-) 66,665
Source: US Census Bureau Local Employment Dynamics
Inflow/Outflow Job Counts in 2014
145,801 - Employed in Selection Area, Live Outside
79,136 - Live in Selection Area, Employed Outside
72,545 - Employed and Live in Selection Area