CTPP Status Report

April 2015

U.S. Department of Transportation
Federal Highway Administration (FHWA)
Bureau of Transportation Statistics (BTS)
Federal Transit Administration (FTA)

AASHTO Standing Committee on Planning
TRB Census Subcommittee

Census Transportation Planning Product (CTPP) Update

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Wow, we survived the winter, and spring is coming with new hope and software improvements! Look for some great added mapping capabilities on the CTPP Software such as the ability to map custom geography, labels for flow arrows, and bulk selection for downloads.

The CTPP Subcommittees are all humming away:

- The Table Specification subcommittee is meeting regularly to develop a tabulation request to the Census Bureau for the next CTPP special tabulation based on ACS 2012 to 2016 data. We are making some decisions about geography, variables, and variable collapsing. We are looking at results from the CTPP utility project to inform those decisions. Chair: Tom Faella, La Crosse Area Planning Committee, TFaella@LaCrosseCounty.org.
- The Training Subcommittee is working on the what and where of CTPP training and outreach; we are developing topics for more webinars and collaborating with the Census Subcommittee of TRB's Urban Data committee to bring those to you. Please le me know if you are interested in hands-on full-day training. We are currently scheduled for training in Arizona in March, and Arkansas in April. Chair: Jim Hubbell, Mid-America Regional Council, hubbell@marc.org.
- The Research subcommittee is gearing up to write problem statements for NCHRP 8-36, due by April 1. Chair: Phil Mescher, Iowa DOT, Phil.Mescher@dot.iowa.gov.

We are looking at some refinements to the mission statement, collaborations with likely and unlikely partners, and putting on a Data Conference in the next few years. As always, I am open to your comments and suggestions.

TRB Census for Transportation Planning Subcommittee Update

Mara Kaminowitz, Census Subcommittee Co-Chair, mkaminowitz@baltometro.org

The 2015 TRB annual meeting was a productive one for the Census for Transportation Planning Subcommittee, ABJ30(1). The subcommittee hosted a poster session on working with small-area American Community Survey (ACS) and CTPP data. We had eight posters which garnered many questions and positive feedback. The authors of the most innovative posters were invited to present at the subcommittee meeting. The topics included using neighborhood statistics to improve ACS data, incorporating the time of day into travel demand models, and identifying suitable communities for introducing low-speed electric vehicles. The subcommittee meeting also featured program updates from the Census Bureau and AASHTO's CTPP program.

Figure 1. Discussion at the 2015 TRB Poster Session

The Census Bureau update included the results of the ACS content review, new county-to-county worker flows, a new Census mapping tool, and a study of young adults. The AASHTO CTPP discussion focused on the CTPP Utility Project. The research objectives of the CTPP Utility Project are to assess common issues encountered in using CTPP data and suggest solutions to those issues, and to identify some case studies of applications. This project will inform the CTPP program work plan from 2015-2019. The meeting closed with a discussion on what future projects and activities that ABJ30(1) should participate in. Ideas included Longitudinal Employment and Household Dynamics (LEHD), commuter flows, webinars, poster sessions, and coordinating with the CTPP Oversight Board on trainings. More information on subcommittee activities can be found at http://www.trbcensus.com/.

Census for Transportation Planning Subcommittee Posters

Summaries for two posters presented in the Census for Transportation Planning Subcommittee poster session are below. All eight posters can be found at http://www.trbcensus.com/TRB2015/.

Poster 1: Urban Mobility Evaluation Using Small-Area Geography and High-Resolution Population Data

Wei Lu, Oak Ridge National Laboratory, luw4@ornl.gov

Population growth had led to unprecedented increases in travel demand and transportation infrastructure demand in some urban areas. Mobility is an important measure of the efficiency and livability in urban areas. The American Community Survey (ACS) five-year data and the Census Transportation Planning Products (CTPP) special tabulation provide home-to-work traffic flow at Traffic Analysis Zones (TAZ) level. We used the CTPP data in a microscopic traffic simulation in a case study in Knoxville, Tennessee.

To provide an open-source and easy-to-use tool for urban dynamics and transportation research communities, we developed the TUMS (Toolbox for Urban Mobility Simulation) system, which is a unique high-resolution population distribution and traffic microsimulation-based approach. There are three major components in TUMS: data processing module, traffic modeling and simulation module, and web-based visualization module. The major input data include LandScan USA high-resolution population distribution dataset, OpenStreetMap road network, TAZ polygons, and CTPP traffic flow at TAZ level.

We used CTPP traffic flow data as our major input for daily traffic demand modeling. The high margin of error in TAZ-based traffic flow lowered the modeling and simulation accuracy. In the case study of Knoxville, Tennessee traffic modeling process, we used the mean values from CTPP to build origin-destination tables. We ran the whole microscopic traffic simulation and summarized road network performance at link level. For the very first time, the CTPP data provide an approach to improve model accuracy and details for microscopic traffic simulation.

This poster is available at http://www.trbcensus.com/TRB2015/poster/Lu_Mobility_poster_TRB2015.pdf.

Poster 2: Visualization of Origin-Destination Commuter Flow Using CTPP Data and GIS Applications

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Which county had the highest increase in bike share between the Year 2000 and 2010-2012 for the journey to work?

The answer is Multnomah County, Oregon, home to the City of Portland. Bike share in Multnomah County, increased 3.7 percent from 2000 and 2010-2012.

To learn more about the top 30 counties with the highest increases in transit, walk and bike commute share between the Year of 2000 and 2010-2012, visit: CTPP Website.

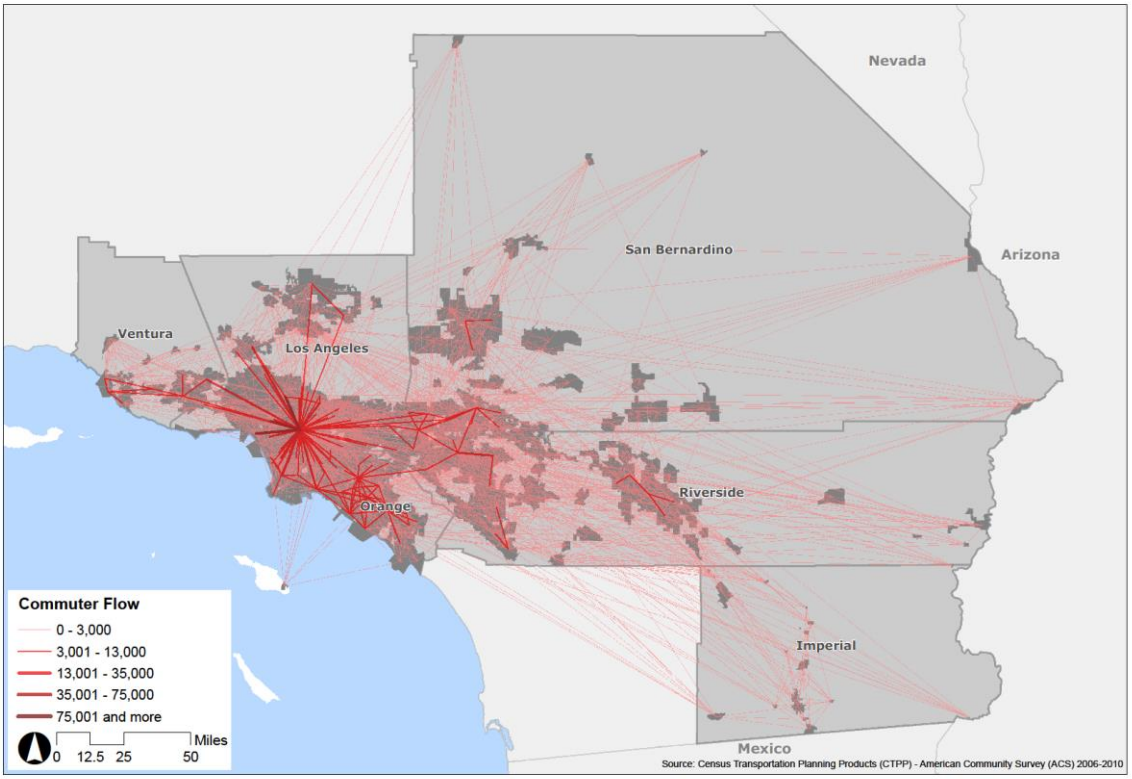

Figure 2. Commuter Flow Map of Entire SCAG Region

Analyzing the origin-destination commuter flow at the local jurisdictions level is important for understanding workers' commuting patterns among local jurisdictions. Southern California Association of Governments (SCAG), the nation's largest metropolitan planning organization representing six counties and 191 cities, has conducted an origin-destination commuter flow analysis for 197 jurisdictions in the region. Understanding this relationship has the potential to improve our transportation model which may lead to better travel demand projections. Therefore, one goal is to visualize the work trip distribution in an intuitive way where all parties – state, regional, and local governments, researchers, stakeholders, and residents can benefit.

To analyze and visualize the origin-destination commuter flows, SCAG staff has developed the automated Geographic Information System (GIS) using CTPP Origin-Destination data, ArcGIS, Statistical Analysis Software (SAS) and Python scripting. With the development of the automated GIS system, SCAG staff effectively visualized the origin-destination commuter flow for 191 cities and 6 counties in the region in a time and labor efficient manner. The maps depict the commuter flows and patterns between home and work place throughout the region. The maps help jurisdictions, business community and residents to visually understand where workers are employed and where workers live in the region.

Visualizing the origin-destination commuter flow has generated several noteworthy lessons. The visualization of the major work flows helps stakeholders (the public and decision-makers) to easily understand the spatial interaction of small areas through commuting. Automated GIS allows analysts to efficiently produce the visualized GIS maps of work flows between many small areas. The visualization of the major work flows can increase public interest and can promote public participation in the planning process. In addition, future works may focus on comparing commuter flow datasets of CTPP and Origin-Destination Employment Statistics (LODES), narrowing the geographical boundaries to Census blocks or block groups, and developing an interactive web-based map application.

This poster is available at: http://www.trbcensus.com/TRB2015/poster/Vo_Flow_poster_TRB2015.pdf.

State Agency Congestion Footprint: Using ACS Data to Estimate the Impact of State Employees on Austin Congestion

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As the capital of Texas, Austin is known for its music, its technology, its top-notch universities, and … its traffic. The Austin metropolitan statistical area (MSA) has seen continuous population and job growth over the last several decades, burgeoned by its strong and growing economy. This growth, combined with constrained transportation funds, has led to an increased focus on how to better manage travel demand.

Researchers at the Texas A&M Transportation Institute (TTI) used the CTPP to examine ACS employment and journey to work data to analyze the travel patterns associated with one specific worker group: State of Texas employees who work in the central Austin area. The research sought to isolate commuter travel associated with state agencies located in the highly congested central corridor area of Austin.

The CTPP web application was used to retrieve home and work locations by worker class based on the ACS 2006-2010 five-year estimates. The following CTPP tables were downloaded for all census tracts of the five counties that make up the Austin MSA:

- Residence: A102103 – Class of Worker (Workers 16 years and over); and
- Workplace: A202102 – Class of Worker (Workers 16 years and over).

Downloaded in tabular form, the data were joined to the Census Bureau's TIGER/Line tract boundary layer shapefiles. The data were mapped in ArcGIS, visualizing the employment density in the Austin MSA and the home and work locations for state government workers in the Austin MSA. Based on the study area defined in Figure 3 (red outline), the ACS data revealed that nearly one in five workers (19 percent) in central Austin are state employees. In addition, the CTPP data showed that 26 percent of all workers (across all classes) commute to the central Austin study area. In comparison, CTPP data showed that 60 percent of state employees (state government worker class) commute to the central Austin study area. This data helped quantify the potential influence of state workers on overall congestion levels in the region.

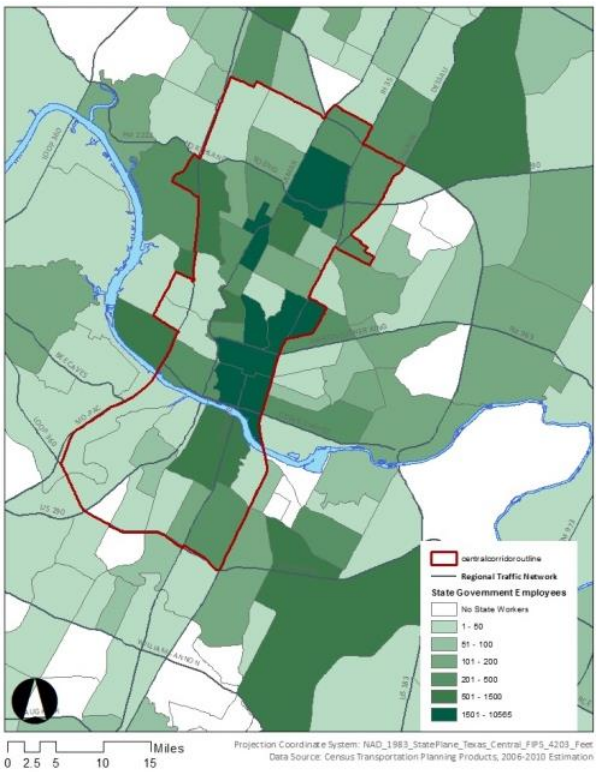

Figure 3. State Employee Density in Central Austin

Several data sources were used to further investigate the state worker impact on congestion levels in Austin. ACS 2008-2012 five-year estimates provided data on employment, worker class and commute mode distributions for state employees and the total workforce in Austin and selected peer cities. ACS data was complemented by state facility data and INRIX congestion data to review the influence of state employees in the context of daily, monthly and annual congestion levels.

The ACS data reveal that Texas state employees show higher levels of carpool and transit use than other worker classes in downtown Austin (see Figure 4). In contrast, Texas State employees report the lowest levels of teleworking among

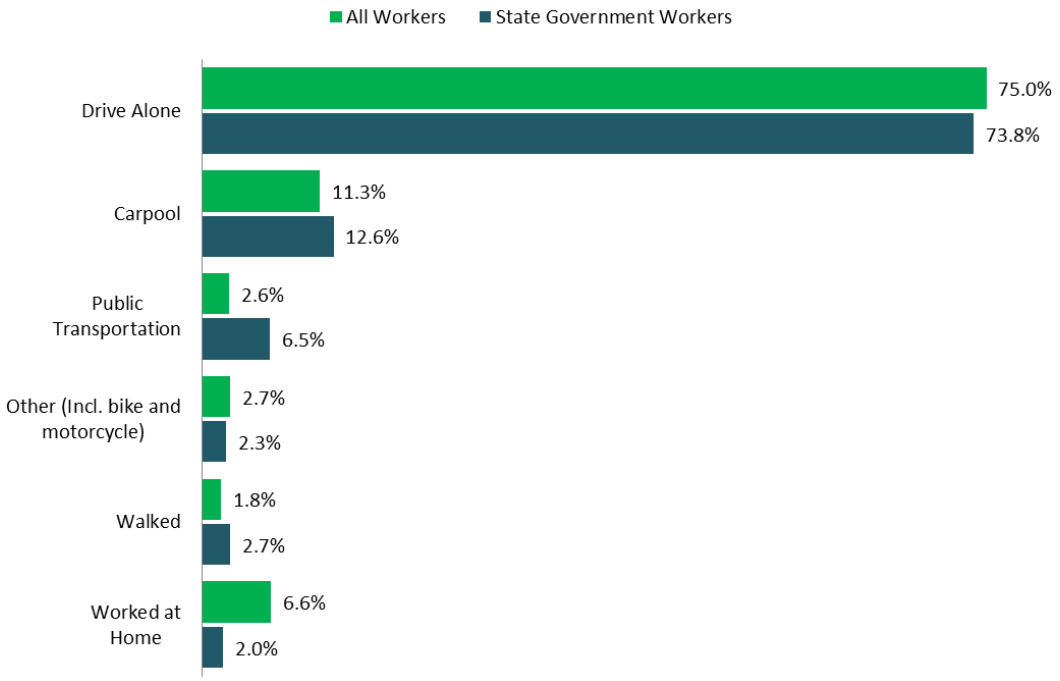

Figure 4. Workforce and State Employee Commuting Mode in Austin MSA

Data source: ACS 2012 five-year estimates.

Austin worker classes (attributed to a combination of statutory requirements and IT firewall issues, among other contributors).

The ACS and CTPP data analyzed in this research painted a picture of state employee commuting patterns in Austin, enabling a better understanding of the impact of state employees on Austin area congestion. This data informed the design of the INRIX-based congestion analysis and suggests that Texas State agencies could benefit from policies that support public transit subsidies for state workers, intra-agency ride matching, and consideration for increased telework opportunities.

Application of CTPP Data for Validation of Regional Transportation Forecasting Models: MAG Experience

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Validation of travel forecasting models ideally requires data sets that have not been used in model development, including model estimations and calibrations. Observed traffic data (traffic counts and speeds) are often used for the validation purposes whereas travel surveys data (origin-destination, socioeconomic and demographic information) are a common source for model development. Due to relatively small size of survey sample, survey data are often utilized in their entirety for development purposes which make proper model validation with travel data problematic. CTPP can provide a unique source of relatively independent travel data that can be considered for model validation purposes.

The input data for the current analysis include TAZ-level journey-to-work tables from CTPP, TAZ-level peak and off-peak home-based work trips from the Maricopa Association of Governments (MAG) model. Freeways, major roads, jurisdictional and generalized land use boundaries served as a reference point for district delineations. A web-based mapping service for median household income distributions was also utilized.

The analysis of the input datasets started with the understanding that TAZ-level geography CTPP

data represents five-year period estimates while the model results are annual point estimates. Adding to this challenge, most of the travel purposes are not represented in the CTPP data, which includes only commute trips. A number of populations normally included in socioeconomic regional forecast are excluded from CTPP (such as seasonal and transient populations in the MAG region). Employment data statistics cannot be directly compared either since the census products, unlike MAG's own projections, exclude employment in census blocks with zero population. In light of the apparent differences in the census and MAG data products an attempt was made to compare proportional distributions rather than absolute values.

The process of district delineations started with review of district datasets produced for other purposes. The review of those files led to the conclusion that a set of about 8 to 12 districts would best capture statistically meaningful regional-level commuter trends given the discrepancies between the CTPP data and MAG model socioeconomic input data on small geography level (see Figure 5).

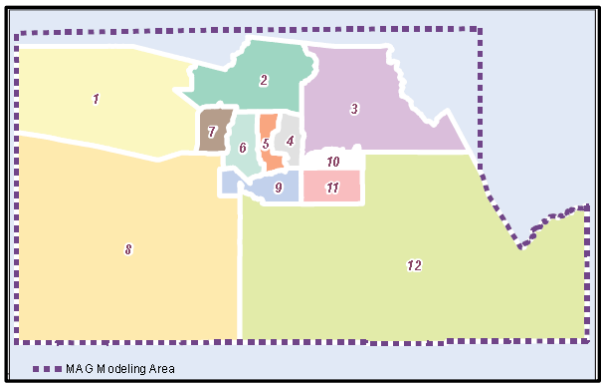

Figure 5. Final Comparison Districts Delineation

The current districts were outlined by regrouping a set of 25 areas (polygons) which were created based on the spatial distribution of median household income. Since income is a strong predictor of travel behavior, this particular dataset was considered a good starting point. A few intermediate files were created with two alternative approaches in mind: either insulate the regional-level differences in employment and population into the minimum possible number of polygons or distribute them evenly in space. For instance, as the overall population in the MAG model is 10 percent higher than the ACS five-year estimate, each of the new districts will have ideally 10 percent higher population when using MAG data versus census data. Those targets were being pursued following certain guidelines of district delineation: consideration of network topology, jurisdictional boundaries, aggregate land use sectors and regional commuter patterns. The final boundaries include a set of 12 polygons. Based on the 12 districts the tables for comparison were created as follows (Figure 6):

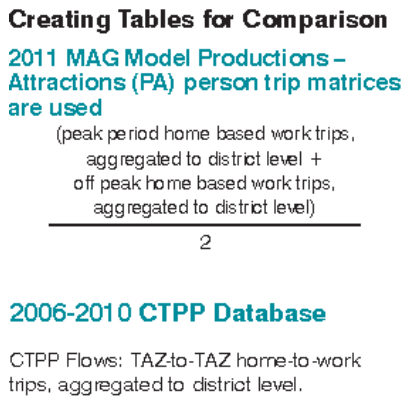

Figure 6. Calculations for Comparison between MAG Model and CTPP Trip Distributions

Comparisons between proportional distributions of district-level commuter trips in 2006-2010 CTPP data and 2011 MAG model were done for MAG model versus CTTP total commuter flows.

The conducted validation exercise clearly demonstrated that a comparison between CTPP datasets and results of regional travel forecasting models is possible, despite some apparent differences in population and employment statistics and the way data are produced. Aggregating district-level comparison with CTPP data provides valuable insight and can be used as a validation tool for trip distribution purposes. In the absence of independent data sets, such validation provides a unique additional source for checking trip distributions on regional level. MAG experience demonstrated that in large regions, properly developed regional travel forecasting models and comparisons should ensure a relatively close match with aggregated CTPP flows with root-mean-square error (RMSE) below 30 percent and R^2 exceeding 0.9. Similar analyses on more disaggregate levels both in terms of geography and travel demand warrant further investigation.

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CTPP web site: http://www.fhwa.dot.gov/planning/census_issues/ctpp/
FHWA web site for Census issues: http://www.fhwa.dot.gov/planning/census_issues
AASHTO web site for CTPP: http://ctpp.transportation.org
1990 and 2000 CTPP data downloadable via Transtats: http://transtats.bts.gov/
TRB Subcommittee on census data: http://www.trbcensus.com

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CTPP Listserv

The CTPP Listserv serves as a web-forum for posting questions, and sharing information on Census and ACS. Currently, more than 700 users are subscribed to the listserv. To subscribe, please register by completing a form posted at: http://www.chrispy.net/mailman/listinfo/ctpp-news.

On the form, you can indicate if you want emails to be batched in a daily digest. The web site also includes an archive of past emails posted to the listserv.