

RESEARCH RESULTS DIGEST

SPR-736: LONG-DISTANCE TRAVEL MODELING: PROOF OF CONCEPT

The Arizona Statewide Travel Demand Model (AZTDM) is one of ADOT's key technical analysis tools for long-range transportation planning. It is also used in the assessment of alternative mobility investments such as intercity transit and engineering design studies and traffic operations analysis.

One purpose of the AZTDM is to estimate long-distance intercity trips between Arizona's small and large urban areas. To achieve reliable estimates, the model must reflect actual travel behavior. These trips, longer than 50 miles, are estimated using data from the 2002 National Household Travel Survey. However, this survey is aging and may not capture recent trends in travel behavior, and its sample of long-distance travel in the Southwest is small. For example, two of Arizona's nearest neighbors, Nevada and New Mexico, have no NHTS long-distance travel records. The current model bases travel behavior between Arizona and these states on travel survey records synthesized from other neighboring states.

Another element of long-distance personal travel is the extreme commute, defined as more than 50 miles in distance or more than one hour of travel. Extreme commutes between cities like Phoenix and Tucson cross regional boundaries. While census journey-to-work data shows that thousands commute between Phoenix and Tucson, the AZTDM home-based work model does not adequately predict this travel behavior.

RESEARCH OBJECTIVES AND SCOPE

This research project was established to provide ADOT with direction on the best sources of data and best practices for updating its long-distance personal travel models to better reflect observed travel behavior. Its original intent was to recommend approaches for combining these data sources

PRINCIPAL INVESTIGATOR

Lee Engineering
3610 N. 44 Street, Suite 100
Phoenix, Arizona 85018

to improve the model and ensure that long-distance trips are reflected in forecasts.

The research scope comprised the following tasks:

- Identify advances in long-distance personal travel modeling and feasible new sources of long-distance travel data by reviewing published literature; identifying private data sources, such as AirSage and INRIX; and interviewing industry leaders.
- Establish evaluation criteria, and assess the suitability and feasibility of the identified data sources for ADOT's use in estimating long-distance travel. Identify the 2-3 highest-ranking data sources. The first phase of research concluded after this task, and a decision was made to not proceed to the proof-of-concept tasks, as described below:

Using a purchased sample from each of the recommended data sources, conduct a proof-of-concept test to determine the potential of each source to improve ADOT's ability to estimate long-distance travel.

Based on the results of the proof-of-concept testing, develop recommendations regarding the best data sources and statistical techniques for estimating long-distance travel in Arizona.

Table 1. Traditional Data Sources

Data Source	Features	Potential	Purpose	Evaluations
ACS data	Demographic, socio-economic, and land-use data	Reliable population data for both four-step and activity based modeling	Generation of base population	Currently using
CHTS data (long distance trip component)	Demographic, socio-economic, and trip data	Has potential to transfer modeling parameters	Model development	Highly recommended for transferability study
NHTS 2016	Demographic, socio-economic, and trip data	Reliable, most recent and comprehensive data for both four-step and activity based modeling	Model development, calibration and validation	Highly recommended
BTS data	Traffic volume data	Air passengers and border crossing traffic volume	Model validation	Currently using
HPMS data	Traffic volume data	Traffic volume for screen line validation	Model validation	Currently using
CCS data	Traffic volume data	Traffic volume for screen line validation	Model validation	Currently using
FMS data	Traffic volume data	Traffic volume for screen line validation	Model validation	Currently using
DPS data	Traffic volume data	Traffic volume for screen line validation	Model validation	Currently using
Intercity Passenger travel data	Origin-destination and traffic volume data	Intercity transit passenger flow	Model calibration and validation	Highly recommended
Airport Ground Survey data	Demographic, socio-economic, and trip data	Ingress and egress models, and information on non-residents	Model development, calibration and validation for air passengers	Highly recommended (if disaggregate level modeling technique is adopted)
Tourism Industry data	Origin-destination and traffic volume data	Traffic volume for screen line validation	Model validation	Currently using
Roadside intercept survey data	Demographic, socio-economic, and trip data	Supplement information on long distance personal travel	Model development, calibration and validation	Recommended for pilot study
FHWA traveler analysis framework data	Trip matrix	Comprehensive trip matrix for the entire country	Model calibration and validation	Recommended for further study
American time use data	Trip information (to some extent)	Activity duration	Not applicable	Not recommended

Table 2. Emerging Data Sources

Data Source	Features	Potential	Purpose	Evaluations
AirSage data	Trip information, and demographic and socio-economic data	Model calibration and validation	Model calibration and validation	Recommended for proof-of-concept study
INRIX and StreetLights data	Trip information, network configuration, and demographic and socio-economic data	Network GIS file, and model calibration and validation	Model calibration, validation, and GIS network file	Recommended for proof-of-concept study
FDOT Smartphone Apps for ADOT	Demographic, socio-economic, and trip with exact location information	Easy customization since it's an open source program	Model development, calibration and validation	Recommended for ADOT's adoption
NHTS 2016 Survey with GPS sampling	Demographic, socio-economic, and trip with exact location information	Model calibration and validation	Model development, calibration and validation	Costly option and has been excluded from the plan
Bluetooth/Wi-Fi data	Origin-destination, and traffic volume and speed	Traffic volume for screen line and condor line validation	Model calibration and validation	Recommended for Pilot test bed
ALPR data	Origin-destination, and traffic volume and speed	Traffic volume for screen line and condor line validation	Model calibration and validation	Recommended for Pilot test bed
HERE data	Traffic volume and speed, and transportation network configuration file	Transportation network configuration	Improvement of network configuration	Recommended for network GIS file
LBSN data	Origin-destination, and traffic volume	Not significant at this point	Not applicable	Not recommended
Travel website data	Origin-destination, and trip information	Not significant at this point	Not applicable	Not recommended
Delcan Technologies data	Origin-destination, and traffic volume and speed	Not significant at this point	Not applicable	Not recommended
Cellint data	Origin-destination, and traffic volume and speed	Not significant at this point	Not applicable	Not recommended
TomTom PND data	Origin-destination, and traffic volume and speed	Not significant at this point	Not applicable	Not recommended
RFID data	Origin-destination, and traffic volume and speed	Not significant at this point	Not applicable	Not recommended

RESEARCH RESULTS

Tables 1 and 2 summarize the results of the research team's investigation into potential data sources for long-distance travel estimation, which were acquired through a literature search and interviews with industry leaders. The tables also contain the team's recommendations based on its evaluation of the suitability of the data for ADOT's use.

ACRONYMS USED IN TABLES 1 AND 2

ACS	American Community Survey
ALPR	automated license plate recognition
BTS	Bureau of Transportation Statistics
CCS	continuous counting stations
CHTS	California Household Travel Survey
DPS	Department of Public Safety (Arizona)
FDOT	Florida Department of Transportation
FHWA	Federal Highway Administration
FMS	freeway management system
HERE	product name; not an acronym
HPMS	Highway Performance Monitoring System
INRIX	product name; not an acronym
LBSN	location-based social networking
NHTS	National Household Travel Survey
PND	personal navigation device
RFID	radio frequency identification

PROOF OF CONCEPT

The research team recommended the testing of data purchased from AirSage and INRIX if the study were to proceed to the proof-of-concept stage. The plan for the proof-of-concept was intended to determine whether using these data:

- Eliminates the current limitations of AZTDM
- Changes the results of modeling using AZTDM
- Increases the accuracy of the model and, if so, the significance of the impact
- Is cost-effective for ADOT

ADOT decided not to proceed with the proof-of-concept study using AirSage and INRIX data initially contemplated in the work plan developed for this study.