



Project Summary

Texas Department of Transportation

0-4430: A Comprehensive Commodity/Freight Movement Model for Texas

Background

The movement of commodities and freight is changing to meet the demand of an ever-increasing competitive market with rapid advancements in technology and communications. These movements and flows have a significant impact on traffic and the mix of traffic on urban and intercity roadways. As part of this project researchers developed a statewide passenger and commodity freight flow model. The model provides a means for forecasting intercity passenger and freight trips and is based on the traditional four-step travel demand modeling process, i.e., generation, distribution, mode split, and assignment.

Travel demand modeling efforts within urban areas have concentrated on the estimation of the movement of people and not commodities or freight. The commodity and freight estimates developed from the Texas Statewide Analysis Model (SAM) are at a level that is not directly compatible with the independent travel demand modeling accomplished within urban areas with populations greater than 50,000. A need was identified to link and integrate the commodity/freight movements from the SAM into the urban travel demand modeling efforts, improve the estimation of commodity/freight movements within urban areas, and establish consistency between the SAM and urban area estimates of commodity/freight movements.

What the Researchers Did

The research team:

- Reviewed literature on trucks, commodities, goods movement, freight, travel demand models, etc., to ascertain the current state-of-the-practice on commodity/freight movement modeling and available data sources for these efforts.
- Evaluated and compared the SAM with the statewide modeling efforts in 11 other states.
- Developed an urban commodity/freight conceptual model structure that: recognized the specific needs within Texas to model these movements for up to 25 urban areas, utilized existing data and software, and integrated the statewide estimates from the SAM into the urban travel demand modeling process.
- Applied the conceptual model in the Houston-Galveston urban area to demonstrate the model structure.
- Developed rates for empty vehicle movements and movements of vehicles that did not involve the transfer of cargo.
- Conducted a “critical link” analysis with output from the SAM to estimate the external-local and external-through commodity movements for external stations in urban areas.
- Evaluated the results of the model application and identified a number of recommendations to provide for improvements in the model and assist in the assessment of the model results.

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What They Found

Statewide commodity/freight models in the U.S. tend to be sequential four-step models estimating commodity flows. Urban area models also tend to be sequential, but typically estimate vehicle flows and not commodities. Some models are hybrid in that they have parts that are vehicle-based and parts that are commodity-based.

The proposed model, applied to the Houston-Galveston area for the base year 1998, included the full integration of the Texas SAM results and the urban model estimation based on the results from 1995 Houston travel surveys. The daily estimates of commodity movements in the eight-county Houston-Galveston study area were: Texas SAM internal, 76,962 tons; urban model internal, 318,974 tons; Texas SAM external-local, 808,738 tons; and Texas SAM external-external, 71,999 tons.

These estimates were developed from the Texas SAM and include only cargo transport trucks. Total estimate of daily vehicle trips (including empties and non-transfer movements) was 273,484. The estimate of vehicle miles of travel (VMT) from the model was 5.5 million. The estimated truck VMT in the Houston-Galveston area was 5.73 million. Only 57 vehicle classification counts were identified in the Houston-Galveston study area that would provide an estimate of truck volumes to compare with the assigned volumes from the model. These comparisons were inconclusive. The overall results from the model appeared reasonable.

What This Means

Researchers recommend a number of modifications and improvements to current travel surveys. These recommendations are specifically targeted to address data elements that would provide improvements in the commodity flow model as developed and presented in this research. These recommendations are:

- Commercial vehicle surveys in urban areas should collect data on the amount of cargo being delivered and/or picked up as well as the type of cargo.
- Commercial vehicle surveys should distinguish between vehicles that carry cargo and those that are primarily used in commercial service functions.
- Workplace surveys should identify and count the number of commercial cargo transport vehicles and commercial service vehicles traveling to and from the workplace establishment on the day of the survey.
- In the pre-survey of workplace establishments, the data collected should include the number of commercial cargo transport and service vehicles available to the establishments for business purposes.
- The saturation count program for urban areas should collect vehicle classification data at all locations being counted. If this is not feasible, commercial vehicle corridors should be identified, screen lines established, and vehicle classification counts done at those locations to provide data for calibration and validation of urban commodity/freight models.
- Commercial vehicle surveys at external stations should collect data on the cargo weight and type being transported.
- Commercial vehicle surveys at external stations should collect vehicle classification data to provide the means to estimate the number of commercial cargo transport and service vehicles.
- A macro program should be developed for use with the Texas SAM to provide the necessary critical link data for use in the urban commodity/freight model.
- The analysis of commercial vehicle and workplace surveys in urban areas should include the development and documentation of commodity shipping and receiving rates by employment type and households.

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