Texas A&M Transportation Institute

Texas Department of Transportation

PROJECT SUMMARY REPORT

0-7037: Develop Models for Freight Flows and Commercial Travel Patterns within Texas Urban Regions

Background

This project was initiated in order to develop a model/tool that could help the Texas Department of Transportation (TxDOT) and other transportation planners estimate and assess changes in freight traffic flow impacts on the Texas Highway Freight Network (THFN) much more quickly than conducting a Statewide Analysis Model run. The goal was to produce a tool that could assess proposed change scenarios in a timely manner to answer queries by elected officials, members of the Texas Transportation Commission, TxDOT administration, and other transportation system stakeholders regarding the introduction of new freight generators or shifting of existing freight facilities/employees to new locations. The key means of doing so was to leverage the availability of new freight-based, economic databases and the use of advanced data analysis methods that were just becoming available at the outset of the project.

What the Researchers Did

Early in the project, researchers performed a targeted literature review and investigation of the availability of innovative freight analysis methodologies. Researchers also investigated the cost of various public and private/commercial freight-related databases used in similar tools by states and regions to determine which should be purchased for tool development in Texas. From the outset, efforts were scoped in accordance with the minimum viable product (MVP) concept widely used in software development to seek initial model functionality to which more advanced features—and potentially other freight modes—could be added in later stages.

After identification of existing freight datasets made available by TxDOT and purchase of additional required commercial datasets, the research team worked with the project oversight panel to scope types of tools that might be achievable in the project. Ultimately, it was determined that the development of a statewide county-to-county, commodity-specific freight flow model was needed. The research team began preparing the data and implementing methods to create the initial (MVP) Texas Freight Flow Model (TFFM), which could be accessed through a web-based application based on user inputs.

What They Found

Project researchers used economic data to determine dollars to tons to estimated number of truck trips for the top 50 industries in terms of dollar value in Texas. Researchers examined truck flows on a county-to-county basis statewide based on production and consumption locations. Four analysis modules were created as part of the TFFM (Figure 1):

- **New Firm:** Assesses the addition of a new firm producing a commodity in a specific county.
- **Relocate Firm**: Assesses the relocation of a percentage of an existing firm's/commodity's production to a new county location elsewhere on the THFN in Texas.
- **Warehouse Flow:** Assesses the addition of up to four new intermediate warehousing locations to new counties and the impacts on commodity flows.
- **Network Closure:** Assesses the impacts of roadway closures by direction in user-selected locations on freight commodity flows.

Only the New Firm module requires offline analysis time, while the other modules can run online and in real time within the app. Users of the TFFM enter desired

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Project Completed:
8-31-2024

parameters and commodities of interest for analysis within the web-based TFFM app to generate desired scenario outcomes, producing data tables, graphic reports, and charts for review. A user guide is included in the final report. The research team also identified several potential advancements that could be implemented to improve the TFFM beyond the MVP stage.

What This Means

The TFFM has been developed to the MVP concept level as a modular functional tool representing county-to-county flows within Texas, which could incorporate national commodity flows and develop sub-county clusters as part of future implementation. The TFFM at the MVP level allows TxDOT planners to create, estimate, and quickly test many freight-based scenarios to assess the impacts of changes in freight generation locations by commodity to the THFN. Distinct modules allow impacts to be examined progressively or individually. The TFFM app allows planners to estimate freight commodity flow changes between counties resulting from economic development, business growth, or the introduction of new warehousing locations on the THFN. Several potential additional features for the TFFM that would advance it beyond MVP status were identified during the project. Pursuing these in an implementation project could further expand the TFFM's functionality and applicability for statewide planning.

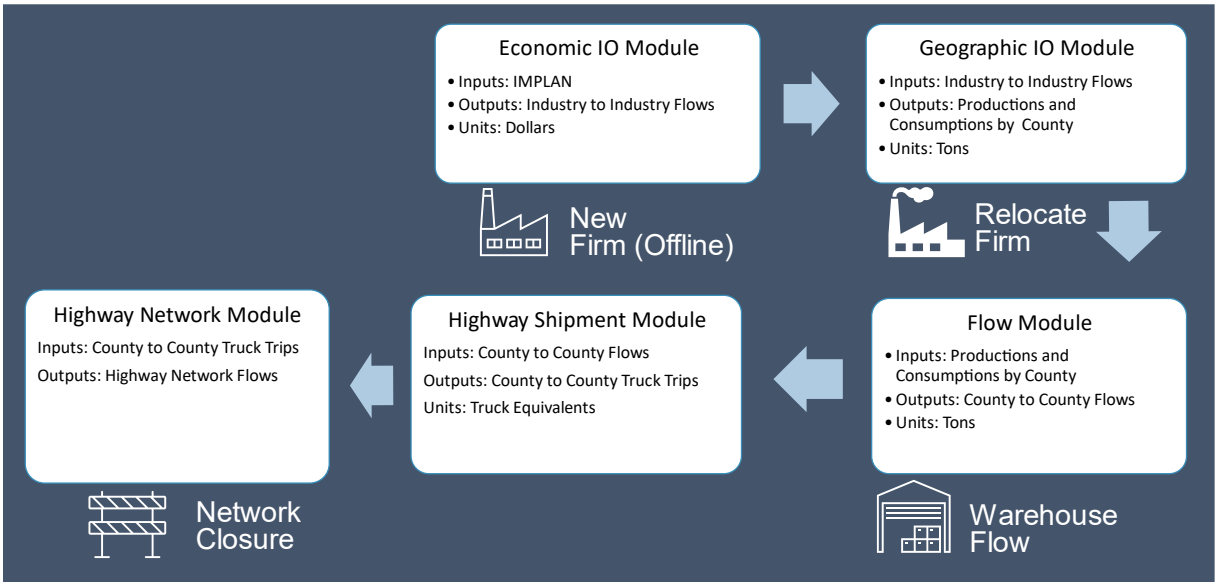

Figure 1. TFFM Analysis Modules.

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Keyword: Research

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