Session 12: Innovations in Freight Planning for Small and Medium-sized Communities

USING A FEDERAL DATABASE AND LOCAL INDUSTRY SECTOR KNOWLEDGE TO DEVELOP FUTURE FREIGHT FORECASTS

Michael D. Anderson
Civil Engineering
University of Alabama in Huntsville
Huntsville, AL 35899
256-824-5028
256-824-6724
mikea@cee.uah.edu

Gregory A. Harris
Office of Freight Logistics and Transportation
University of Alabama in Huntsville
Huntsville, AL 35899
256-824-6060
256-824-6974
harrisg@uah.edu

Lauren Jennings
Office of Freight Logistics and Transportation
University of Alabama in Huntsville
Huntsville, AL 35899
256-824-6652
256-824-6974
jenningl@uah.edu

Lisa Blanchard
Office of Freight Logistics and Transportation
University of Alabama in Huntsville
Huntsville, AL 35899
256-824-6275
256-824-6974
lisa.blanchard@uah.edu

In smaller urban areas, freight transportation is often not explicitly modeled, but is included implicitly as a percentage of non-home-based trips, which has nothing to do with the actual behavior of freight. This incorporation has the potential to develop future traffic forecasts that are unreasonable and potentially will lead to poor roadway infrastructure investment decisions. The federal freight flow data contained in the Freight Analysis Framework Version 2.2 (FAF2) Database has the potential to improve the forecast year accuracy, however, use of the database itself is often suspect and the large aggregation level of the database usually makes it impractical. This paper examines a process to systematically improve the forecasted volumes from the FAF2 using local industry sector knowledge to a potential level that is acceptable for urban transportation modeling. A case study is shown using the state of Alabama to demonstrate the process of adjusting the FAF2 data to account for industries located in the community. The paper concludes that with appropriate adjustment and application, the FAF2 database can be used for in forecasting future travel demand in a smaller urban area.

INTRODUCTION

Modeling statewide transportation is an important part of understanding and predicting the transportation infrastructure needs in a region. These models typically focus on passenger transportation to evaluate current and future network congestion and test alternatives. Freight transportation is often not explicitly modeled, but is included implicitly as a percentage of non-home-based trips, which has little to do with the actual behavior of freight. The limited integration of freight movements into traffic models results in models that are questionable for use in infrastructure decisions and policy-making. The need to incorporate freight traffic in the transportation modeling process becomes apparent considering the magnitude of the decisions that these models support. Unfortunately, impediments exist in obtaining sufficient, accurate and representative data to use in freight modeling efforts. Local freight data is often considered proprietary and companies are generally reluctant to divulge this information fearing it may compromise their competitive position. An alternative is to utilize readily available national freight databases. However, the high level of aggregation of the data presents challenges for determining freight movement at the sub-state level. Therefore the publicly available data has to be supplemented by local data to provide reliable transportation demand forecasts at a level of accuracy suitable for transportation planning purposes.

FAF2 DATABASE

The Federal Highway Administration's Freight Analysis Framework, version 2.2 (FAF2) provides estimates of commodity flows between states/regions. The origin-destination database contains tonnage and value of commodity shipments between geographic regions by mode of transportation and commodity type. The commodity flows are provided for the base year, 2002 as well as forecasts for 2010 to 2035, in 5-year increments. The FAF2 database contains 114 domestic regions, shown in Figure 1. The regions are defined to include one or more major Metropolitan Statistical Areas (MSA) or Consolidated Statistical Areas (CSA), shown in green, or those that lie outside of these MSAs and CSAs (white). It also includes 17 ports/gateways that are major freight entry/exit points in the US (blue), and 7 international regions. The state of Alabama is divided into 2 zones (Zone 1 and 2) and has one international gateway at the Port of Mobile (Zone 123).

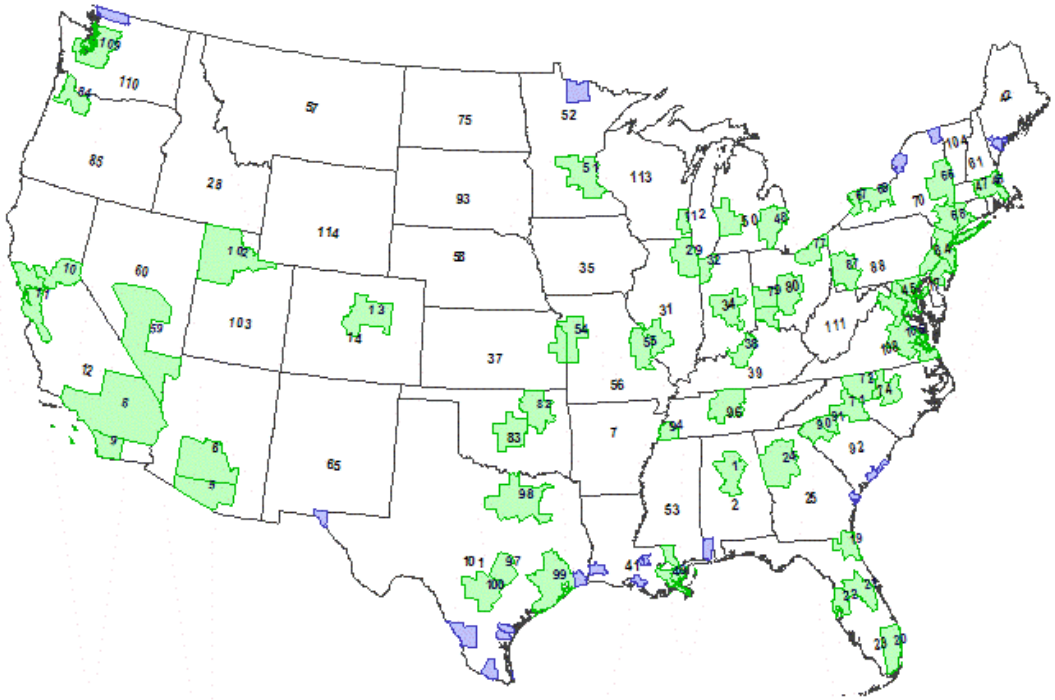

Figure 1 - FAF Zones

DEVELOPING AN ECONOMIC DATABASE FOR ALABAMA

The economic base of Alabama includes major manufacturing industries, agriculture, logging and mining. Each of these industries along with retailing, wholesaling and warehousing can potentially generate both incoming and outgoing freight traffic. These industries were examined, and data gathered to form the economic database. The data is developed from several publicly available sources including the economic census, mining reports, forestry reports, etc. The base year for the economic database is 2002, the year corresponding to the FAF2 O-D matrices.

The economic database also includes industry and county specific growth factors of these data to the year 2035. The county-level base year and growth factor data were collated into the *Value of Sales* spreadsheet. This spreadsheet contains value of sales and employment data for the 2002 base year for the industries found in each of Alabama's 67 counties. It also projects these values to the future year using the growth factors.

The commodity-level economic data was then collated by FAF zone (zone 1 and zone 2) to determine the zone totals. A table was then constructed to determine the fraction of the zone totals that were contributed by each county within that zone, for every commodity. This was done twice, once using employment only and once using only value of sales. These percentages became the disaggregation factors for the next step.

DETERMINING FREIGHT FLOWS FOR ALABAMA

The industries within the economic database are classified by 3- or 4-digit North American Industry Classification System (NAICS) codes. However, the commodities in the FAF database are classified by 2-digit Standard Classification of Transported Goods (SCTG) codes. To prepare to merge the data in the two databases, first a crosswalk for NAICS and SCTG codes had to be developed.

The first step in obtaining the Alabama-related flows is to query the FAF2 Access database tables for all Alabama-originating flows and Alabama-destined flows. This includes Zone 1 and Zone 2 flows as well as Port of Mobile flows.

The Zone 1 and Zone 2 freight flows were then apportioned to the 67 counties based on the value of sales. For example, 20% of the FAF flows of live animals/fish to zone 1 would be allotted to Blount County based on it having 20% of sales of live animals in Zone 2. The Port of Mobile flows were kept separate.

REFINING AND ADJUSTING COUNTY FREIGHT MOVEMENTS

Some information was available for the Port of Mobile, which allowed some adjustments to the data. Some origin-destination pairs seemed unlikely to use Mobile's port when there are other more convenient gateways available. Filters were used to remove unlikely origin-destination pairs from the dataset based on geography and access to other gateways and highway corridors.

Discussions with Port personnel also revealed that some of the Port of Mobile commodity flows estimated from FAF2 database seemed unlikely, particularly based on the mode choices known to be preferred at the Port. For example, the FAF2 data overestimated the amount of coal moved by truck. The vast majority of imported coal is moved from the port by barge up the river system and the majority of exported coal is moved to the port by rail. For exports, a split among rail, truck and water was determined for each SCTG commodity based on researcher expertise and information supplied by Port management. The same was done for imports. These mode split factors were applied to the filtered freight flows from FAF2 to generate more reasonable commodity flows in and out of the Port of Mobile.

Also, according to the FAF2 database considerable tonnage of SCTG 41, *waste and scrap*, is imported through the Port of Mobile. Waste and scrap includes iron/steel and precious metal scrap, glass scrap, paper and other recyclables. This commodity description can be misleading—it does not refer to

garbage. Flows for waste and scrap were added to flows for mixed freight to avoid ambiguity. This adjusted data was added to the Mobile County freight flows from previous steps to ensure that Port of Mobile traffic was represented in Mobile County freight movements.

This series of adjustments made to the FAF2 freight flows resulted in a set of matrices showing annual kilotons of freight originating from and destined to the 67 Alabama counties for 2007 and 2035, by truck, rail and water. Truck tonnage was converted to daily vehicles using the Federal Highway Administration's truckload conversion factors. Rail tonnage was converted to daily railcars using railcar weights provided by Port of Mobile. Waterway tonnage was converted to daily barges in a similar manner.

The adjusted freight data was then used as input into the modeling of freight and the integration of that freight into the transportation planning process.

CONCLUSIONS

This research has shown that local economic data from diverse sources can be employed to allocate freight flows to smaller, sub-state regions from the commodity volumes provided by highly-aggregated national databases, such as FAF2. The validation of the model demonstrates that, with proper calibration, the modified freight data can be used as input to the modeling of freight, and the integration of that freight into existing transportation planning and modeling activities at the state and local level. This has been accomplished in Alabama at the county organization level, resulting in transportation models that integrate freight into the planning activity.