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A Statewide Freight Flow Model and its Applications in Oklahoma

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The paper presents a novel multi-stage freight flow movement (FMM) model in the United States by commodity and by mode for a base-year (i.e., 1997) and any forecast year (i.e., 2030). The 43 commodities based on 2-digit SCTG code are classified into 5 broad categories, including Food, Chemical, Mining, Manufactured, and Other. The modes considered include highway, water, rail, and air. The FMM model, based on a modification of the classic 4-step urban travel demand model, examines freight flows "from", "to", "within" and "through" a state or metropolitan area in tonnage.

Extensive data mining and analysis were done in this study using publicly available databases, such as population and economic census, commodity flow survey (CFS), including code mapping, which links SIC to NAICS, STCC to SCTG, and NAICS to SCTG to identify factors influencing freight flow production through multiple linear regression. Similarly, economic and demographic data were used to link freight flow attraction through multiple linear regression. Mode splits by state O-D and by commodity were generated from historical data from CFS. Freight flow distribution was assigned to real networks of highway, water, and rail.

The study was implemented in TransCAD 4.7 and applied to Oklahoma City and Tulsa Transportation Management Area. Results were validated with some known data sources. The freight flow estimates for the base-year and freight flow forecasts for the future years provide a good foundation for the Oklahoma Department Transportation and Oklahoma MPOs in making plans and decisions regarding transportation infrastructure planning and investment.