Forecasting Freight Logistic Needs and INDOT Plans

Introduction

Indiana is known as the Crossroads of America since it is the fifth busiest state for commercial freight traffic serving regional, national, and international markets. Indiana forecasts a 60% growth in freight flow by 2040. While the current freight infrastructure in Indiana is adequate for its current needs, the state may run out of capacity to support the growth in freight traffic and incur heavy costs to maintain its current status. To continue supporting economic growth and industry competitiveness, INDOT aims to provide a robust freight transportation and logistics system to ensure the efficient, reliable, safe movement of freight throughout the state. This project aims to understand the growing freight logistics needs in Indiana and to provide INDOT with recommendations to plan for these needs.

By developing industry-specific case studies, this project focuses on major industries situated in various counties in Indiana. By considering the freight traffic for the industries specific to these counties, a scenario-based optimization model was developed to help identify the major highway ramps where increased capacity is needed to reduce congestion and ensure minimum cost.

Findings

- For each commodity, production industry GDP and attraction industry GDP were used to disaggregate FAF zone-level flows into county-level flows to obtain inbound, outbound, and within flow. The data on the interactive dashboard provides a spatial and historic spread of commodity-based economic activities. SSP-RCP industry-level GDP was used to forecast the future flow of commodities until 2045.
- All the states considered for benchmarking around Indiana have a state freight plan that details the strategy for near-future needs based on the national FAST Act Goals. Based on these goals, the state will develop plans to improve its infrastructure and allocate specific funding according to FHWA guidelines.
- An industry survey was developed and distributed for specific companies in Indiana to help identify the main type and volume of freight that is moved by these companies, the type of projects INDOT

Different truck vehicles on road.

AVA Bitter. (n.d.) *Truck icon set* [Vector illustration]. Shutterstock. https://www.shutterstock.com/image-vector/truck-icon-set-freight-delivery-symbol-1503583958

should undertake for improving the freight infrastructure, and industry perception of Indiana's goals.

- We prepared three different county case studies based on the significant presence of recreational vehicles in Elkhart County, a furniture supply chain in Dubois County, and a Honda Plant in Decatur County. These case studies helped identify the flow of commodities and the major highways used, which prepared the optimization model to minimize congestion.
- A scenario-based optimization model was developed to minimize the overall cost from ramp congestion in the counties identified in the case studies. The model provided results for INDOT to address the issue of freight traffic congestion for future scenarios.
- We prepared case studies for additional counties based on industry clusters. Case studies were prepared for Allen County, Bartholomew County, Gibson County, Howard County, Vigo County for the automotive industry, and Marion County for the e-commerce industry. Based on the model parameters, an increase in traffic congestion and a need for ramps was identified for these counties.

Implementation

Future freight flow, consisting of inbound, outbound, and within flow of commodities, is forecasted based on the production and attraction industries for five probable scenarios. Industry-based case studies were developed where high volume of freight traffic was observed. Using a scenario-based optimization model, a tool was built to identify the ramps where INDOT needs to reduce congestion by increasing capacity. Based on the forecasted future freight flows and the capacity of highway ramps, this tool is able to devise the total capital cost that is needed to reduce congestion, while also considering the trade-off of cost associated with congestion. The tool allows a user to consider different scenario-based growth and modify inputs to set the desired congestion-level and competitiveness parameters. It also helps INDOT understand the need for infrastructure improvement and proactively plan to maintain competitiveness in the state. Further insight is provided about INDOT's future plans using surveys from target audience companies. The analysis can be further expanded to include other industries in other counties that would impact the freight traffic in Indiana, and can be used to study, in detail, the model parameters and the input data with personnel from the counties considered in this study.

Recommended Citation for Report