Intermodal Solutions for Freight Flows in Southwest U.S. – Project 2

Deliverables and Reporting Requirements for UTC Grants Awarded in 2023 (June 2023)

Exhibit D

Recipient/Grant (Contract) Number: The University of Tennessee, Grant No. 69-A3552348338

Center Name: Center for Freight Transportation for Efficient and Resilient Supply Chain

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Mingzhou Jin (UTK) and Shailesh Chandra (CSULB)

Project Partners: Port of Long Beach, Southwest Supply Chain Coalition, California State Transportation Agency, Nevada Governor's Office of Economic Development, Union Pacific

We have included some partners in the FERSC advisory board and will schedule regular meetings with the partners, update them our progress, and seek feedbacks.

Research Project Funding: $132,041 Federal and $28,541 Non-Federal Funding

Project Start and End Date: 8/1/2023 – 7/31/2024

Project Description: This project is to develop an integrated intermodal transportation and logistics network in the Southwest to make the American supply chain resilient and sustainable. This project addresses the current supply chain disruptions at and around California ports and fundamentally improves environmental, economic, and social sustainability. This project will develop decision-making models and algorithms to design intermodal transportation networks and operations in Southwest U.S. that will implement the proposed intermodal solution to move containers directly from ports to inland warehouses or intermodal terminals. The benefits of the proposed intermodal solution to environmental, economic, and social sustainability will be quantified for all stakeholders and involved communities. Specially, models and analyses will show railroads that actually they can make money for short-haul businesses in this intermodal system due to the lower loading costs, no need of classification, simple management, large volume, and good work-life balance for conductors and rail engineers. Together, UT and CSULB will accomplish the following objectives to achieve this goal.

Obj. 1: Develop decision-making models and algorithms to design intermodal transportation networks and operations in Southwest U.S. that will implement the proposed intermodal solution to move containers directly from ports to inland warehouses or intermodal terminals.
Obj. 2: Quantify the benefits of the proposed intermodal solution to environmental, economic, and social sustainability for all stakeholders and involved communities.

These two objectives will help answer the two research questions: 1) What decision-making models are necessary to design and operate the proposed intermodal network? 2) What is the value of the proposed intermodal solutions to each major stakeholder group?

US DOT Priorities: The project will directly support the USDOT strategic goal of Economic Strength and Global Competitiveness by improving the freight movement in the Southwest U.S. In addition, this project will help the USDOT strategic goal of Climate and Sustainability by saving energy and reducing emissions through intermodal solutions. Specifically, the proposed intermodal solution responds to the RD&T priorities of "Resilient Supply Chains", "System Performance", and "Decarbonization" by improving the efficiency and resiliency of freight flows in the region and reducing carbon emissions because of lower emissions of railways than highways. This project helps achieve the following objectives of the research thrust of FERSC.

- Develop national network models and algorithms that integrate multiple modes and reflect commodity flow behavior,
- Study private-sector freight distribution modeling for public-sector planning, and
- Generate recommendations to improve supply chain efficiency and resiliency.

This project will focus on the intermodal freight network design and innovatively investigate the possibility and benefits of using multimodal solutions to alleviate the congestion in ports and highways around ports. The team includes people from both Industrial Engineering and Civil Engineering. Advanced optimization techniques, such as network flows, will be used to facilitate the design.

Outputs: This research project will result in 1) a database describing the intermodal network and freight demand in Southwest U.S. 2) an optimization model for the proposed intermodal solution, 3) estimated benefits of the proposed intermodal solution, 4) a summary of the stakeholder interaction and result dissemination. All four deliverables will be summarized in the final report. The optimization model will be original by considering a new business model to shipping containers directly from ports to inland warehouses or intermodal terminals by rails. The resulting data and benefit analysis results will be used to promote the solutions among new partners, including ports, railroads, state DOTs, and logistics companies.

Outcomes/Impacts: The resulting network and benefit analysis results a will be presented to railroads, logistics companies, port authorities, and state DOTs to promote the proposed intermodal transportation solutions. If the solutions are adopted, containers will be shipped directly from ports to inland warehouses or intermodal terminals by rails to improve the efficiency of port operations and overall freight network in the Southwest U.S., reduce congestions in California, improve reliability of the whole systems, and reduce energy consumption and carbon emissions via mode shift. Besides the final report and presentations to abovementioned stakeholders, the team will publish the optimization models, solutions, and benefit analysis results at academic journals and conferences.