Generating Reliable Freight Disruption Measures with Freight Telematics Data – Project 3

Exhibit D

Recipient/Grant (Contract) Number: The University of Tennessee; Oregon State University, 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): Salvador Hernandez (OSU), Lee Han (UTK), Faisal Alkaabneh (NCAT)

Project Partners: Oregon, Idaho, and Washington DOTs, Robinsight, EROAD, Portland Metro, Tennessee DOT (TDOT), Oak Ridge National Laboratory (ORNL), North Carolina DOT (NCDOT)

We have welcomed several partners to the FERSC advisory board. We are committed to scheduling regular meetings with these partners, keeping them informed about our progress, and actively soliciting their feedback.

Research Project Funding: $260,000 Federal and $130,000 Non-Federal Funding

Project Start and End Date: 10/1/2023 – 9/30/2024

Project Description: Disasters on the transportation network raise awareness of the need to plan for quick mobility and recovery whether they are due to human error, human intent, or nature. Therefore, understanding how resilient a network is to such events provides opportunities for transportation agencies to better prepare. Resilience measures then become a useful tool to evaluate and predict impacts of disruptions and recovery to guide investment decisions to protect against these events. When it comes to freight network system measurements there are two major challenges the states and other agencies face: (1) the absence of data and (2) the lack of methods of analysis. There are robust data for the movement of people and passenger vehicles but understanding the way freight moves presents different types of challenges to decision-makers especially under disruptions scenarios. These movements are based upon supply chain decisions made by individual corporations, which quite often change over time due to various economic conditions. Freight often moves across numerous jurisdictions and by multiple modes of transport (e.g., air, rail, water/marine, and truck). Data that captures origins and destinations, as well as methodologies of collecting and utilizing data across multiple jurisdictions and modes, are extremely limited for freight. Currently, decision-makers are only able to use a few data sources that help in identifying freight movements among States and regions, commodities, tonnage, and value.

With this in mind, this research presents a framework based on telematics technology from EROAD, a regulatory telematics technology company from New Zealand who has provided telematics services to over 69,000 vehicles (and already collected data), to evaluate this data source for generating reliable freight network resiliency measures. EROAD is a company that develops and implements technology to modernize traditional paper-based systems within the trucking industry. As part of this modernization, EROAD collects the data used for generating reliable freight performance measures. Still, EROAD data has yet to be used for such an application. This research utilizes the Pacific Northwest as a case study which will allows to us evaluate freight movements over various jurisdictions (e.g., within state and state-to-state) and assess EROAD data in the development of reliable freight network resiliency measures. Given that EROAD data captures freight telematic data for truck movements, this study focuses on the trucking mode. The findings of this study have the potential to generate new and reliable freight network resiliency measures utilizing a new source of data for state transportation planners.

Project Statement:
While transportation networks are vital for ensuring swift mobility and recovery after disasters, there is a pronounced gap in our understanding of freight network resiliency. Specifically, transportation agencies face two critical challenges: a significant lack of data on freight movements and an absence of comprehensive analysis methods. Existing data primarily covers passenger vehicle movements, leaving freight – which operates across different domains and transport modes based on ever-changing supply chains underrepresented in the literature. This

research aims to bridge this gap by exploring the potential of EROAD telematics data supplied from robinsight (https://www.robinsight.com/) in generating reliable freight network resiliency measures, with a focus on the trucking sector within the Pacific Northwest as a case study. To achieve the aims of this research, the following objectives are envisaged:

- To generate reliable freight network resiliency measures using telematics technology, such as EROAD (Lead: OSU)
- To model freight network disruption scenarios and countermeasures (Lead: NCAT)
- To study actual freight disruption cases using infrastructural and crowdsourced data (Lead: UT)
- To chart the research paths forward for the subsequent phases and external funds (Lead: All)

US DOT Priorities: The research project aligns with several key priorities and strategic goals of the U.S. Department of Transportation (USDOT), as outlined in its strategic plan. Here's how the project supports these priorities and engages in advanced and transformative research:

1. Safety: The project directly supports the USDOT's priority of making the transportation system safer. By developing reliable freight network resiliency measures and modeling disruption scenarios, the research contributes to the goal of advancing a future without transportation-related serious injuries and fatalities. Improved understanding and preparedness for disruptions enhance safety.
2. Economic Strength and Global Competitiveness: The project aligns with the goal of growing an inclusive and sustainable economy. By optimizing freight network operations and reducing the economic impact of disruptions, the research supports job creation, fiscal health, and resilient supply chains, all of which are essential for economic competitiveness.
3. Climate and Sustainability: The project contributes to tackling the climate crisis by improving the resilience of the transportation system. By identifying vulnerabilities and developing strategies to mitigate disruptions, it aligns with the goals of infrastructure resilience and climate justice, reducing the environmental impact of transportation.
4. Transformation: The research engages in transformative and purpose-driven innovation. By utilizing advanced telematics technology and data analysis techniques for assessing freight network resiliency, the project aligns with the USDOT's emphasis on matching research and policy to advance breakthroughs. It represents an innovative and transformative approach to addressing critical transportation challenges.

Outputs: The primary output of this research project is the development of reliable freight network resiliency measures. These measures will be based on the analysis of EROAD telematics data, specifically focusing on the trucking sector within the Pacific Northwest. The project will likely produce methodologies for collecting, processing, and utilizing EROAD telematics data for evaluating freight network resiliency. As part of the study objectives, the project will model freight network disruption scenarios and develop countermeasures. This output will be valuable for transportation agencies and logistics companies in proactively planning for and mitigating disruptions in the freight network. The research findings, methodologies, and insights generated by the project can be disseminated through academic publications, conference presentations, and industry reports. The project will chart research paths forward for subsequent phases and external funding opportunities.

Outcomes/Impacts: The research outputs from the project have the potential to yield several significant outcomes and impacts on the transportation system, its regulatory and policy framework, and various aspects of the industry. The development of reliable freight network resiliency measures using EROAD telematics data will positively impact the transportation system's ability to withstand disruptions. Transportation agencies will have a more comprehensive understanding of vulnerabilities and will be better equipped to implement strategies to improve resilience. This could result in reduced disruptions, enhanced recovery, and ultimately, a more reliable freight network. The project's outcomes can contribute to the safety of the transportation system by allowing agencies to proactively identify and address potential safety risks in the freight network. The project's methodologies for utilizing telematics data can lead to a shift towards data-driven decision-making in the transportation sector. In conclusion, the research outputs have the potential to positively impact the transportation system by enhancing safety, and reliability.