Request for Research Funding for FY 2023-2024

Project Number (Research Center Use Only): FRO-24-03

Requesting Office	Freight and Rail Office	Priority	3 of 3 (projects may not have the same ranking – no ties)
Proposed Title	Assessing the Effects of Emergency Events on Last-Mile Delivery to Support Emergency Planning and Safety		
Justification	E-commerce has grown rapidly in the past decade, and its share of total retail sales is projected to increase to 25% by 2026, if not sooner. E-commerce driven last-mile logistics have become more complex and challenging and have great implications on society. Last mile refers to the final leg of the transportation process that moves goods from a business (typically a retail store, warehouse, or distribution center) to the end consumer. Last mile is the most time-consuming and expensive leg of the supply chain, often accounting for 53% of the overall shipping costs. Fast, reliable, and efficient last-mile delivery is essential to consumers, businesses, and the entire community (considering the externalities costs to the society, such as congestion, safety risks, and emissions). Managing last mile logistics becomes even more challenging when facing emergency events, which might compromise the capacity and connectivity of the transportation network. Being highly susceptible to nature disasters (such as hurricanes, severe storms, floods, etc.), the state of Florida needs an effective approach to address last-mile issues during emergency events. The proposed research aims to develop a resilience assessment framework that focuses on vulnerability analysis of last-mile logistics in case of disruptions or emergency closures on the transportation network. The framework will consist of a novel geospatial analysis algorithm that quantifies last-mile movements and identifies critical last-mile infrastructure. The geospatial analysis should consider warehouse establishment allocation, residential distribution with key demographic characteristics (household size, age group, etc.), and their spatial interactions. Delivery movements between the facilities and residential areas will be determined through spatial weights proportional to facility floorspace and size of employment. The developed framework with the geospatial algorithm will support the emergency planning and safety of last-mile logistics.		
Impact	Efficient and cost-effective last-mile logistics have great benefits to society. This proposed framework provides a systematic and innovative method to facilitate emergency planning for last-mile logistics. Successful completion of this research project and its implementation will assist the FDOT with accomplishing the following objectives: (1) estimate last-mile demand and identify critical last-mile infrastructure; (2) improve emergency management and safety of last-mile logistics; (3) a systematic framework to facilitate last-mile logistics in emergency events; (4) vulnerability assessment of the transportation network in case of emergency disruptions or closures; (5) evaluate investment and policy alternatives addressing last-mile logistics.		
Affected Offices	The proposed project will be of interest to a wide range of the FDOT Offices and stakeholders, including: • FDOT Safety Office • FDOT Traffic Engineering and Operations Office • FDOT Freight, Logistics and Passengers Office • FDOT Transportation Data & Analytics Office • FDOT District Freight Coordinators Metropolitan Planning Organizations		
Existing Work	The current state-of-the-practice in freight analysis and infrastructure planning does not specifically address last-mile distribution due to the emerging and evolving nature of e-commerce and lack of data on last-mile deliveries. Previous efforts conducted by the Forecasting and Trends Office (BDV29-977-59) provided a method to estimate home delivery rate based on demographic attributes, this project can utilize the method and estimate delivery demand using Census population data.		
Keywords Used In Existing Work Search **(Cannot leave blank)**	e-commerce, last-mile delivery, emergency planning		
Related Contracts (Give contract numbers)			

Funding Request	$250,000	Anticipated Duration	18 Months
Project Manager	Eugene Jules	Contracting Method	Direct Contract with FIU
Equipment	Estimated equipment cost (or N/A)	N/A	
Urgency	Score 1-5 1= highest, most immediate need	E-commerce has grown rapidly in the past decade; this trend has been accelerated by the recent pandemic and is likely to continue to grow. This means increasing delivery-vehicle traffic on highway network around distribution centers and residential areas that are previously not accounted for in freight planning analysis. There is a pressing need to develop a framework to address the last-mile component, especially for emergency planning and safety.	
Implementability	Score 1-5 1=greatest likelihood of and proximity to implementing results	This project provides a framework and innovative algorithm to estimate last-mile delivery movements to support emergency planning and safety for last-mile logistics. The proposed framework and methodology will be directly implementable.	

Project Benefits (Succinct, complete explanation)

The rising e-commerce demand and delivery traffic have great impacts on the transportation infrastructure and society. This project proposes a framework and methodology to capture last-mile delivery movements and identify critical last-mile infrastructure, with a focus on vulnerability analysis of last-mile logistics in case of emergency disruptions or closures on the transportation network. This will assist the FODT to assess the impacts of emergency events on last-mile logistics. It also provides an approach for FDOT to evaluate various technologies, infrastructure projects and policy alternatives to manage last-mile logistics facing emergency events.

Project Benefits (Select all that apply and explain)	Quantifiable Benefits (units, dollars, etc…if applicable)	Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits
o Materials Enhancement		
o Materials Savings		
o Time Savings		
o Lives Saved/Injuries Prevented		The proposed framework will assist the FDOT to better manage last-mile logistics during emergency events, which will help avoid potential hazards and enhance safety involving last-mile deliveries.
o Other (Explain)		The proposed framework and algorithm will assist the FDOT to analyze last-mile movements and identify critical infrastructure to support planning and decision-making. It will also help the FDOT address last-mile delivery in the planning process, and better estimate of the potential implications on the transportation system and society.

*Comments should explain and support urgency, financial benefit, and implementability scores