

Exhibit D

Research Project Requirement Template

Empirical Investigation of Post-Disaster Travel Behavior to Points of Distribution of Relief Supplies

Recipient/Grant (Contract) Number: The University of Texas at Austin/Grant # 69A3552344815 and 69A3552348320

Center Name: Center for Understanding Future Travel Behavior and Demand (TBD)

Research Priority: Improving Mobility of People and Goods

Principal Investigator(s): Sofia Perez-Guzman

Project Partners: N/A

Research Project Funding: \$172,013 (Federal + non-Federal funding)

Project Start and End Date: 6/1/2024 - 5/31/2025

Project Description: The world has seen a surge in extreme weather events and increased challenges of disaster response. One overlooked factor complicating the distribution of relief supplies is the immediate decisions survivors make when seeking aid, which impacts the realized demand at various points of distribution (PODs) of relief supplies. This project aims to understand these critical decisions to improve the overall disaster response framework. Understanding relief supply-seeking behavioral patterns can significantly impact the success and efficiency of relief operations. Current relief distribution models follow normative frameworks where people are expected to visit their nearest PODs, often leading to misestimating demand at PODs and ineffective relief distribution processes. For instance, during Hurricane Maria in 2017, many survivors in Puerto Rico did not receive essential supplies, while thousands of unused water bottles were left to decay at a naval base due to ineffective relief distribution. Therefore, explaining relief supply-seeking travel behaviors, i.e., the decisions related to traveling to PODs and returning from them, in the aftermath of disasters is the first step in ensuring a more effective disaster relief distribution and improving the emergency response process.

Previous research on travel behavior in the context of disasters has focused on the behaviors occurring during the emergency stages of preparedness and recovery. Primarily, past research focused on evacuation and migration, e.g., leveraging high-resolution mobility data to map mobility patterns. There is a significant knowledge gap regarding travel behavior and human decisions made during the response stage, i.e., those related to post-disaster aid-seeking behaviors, including traveling to seek shelter until it is safe to return home and searching for disaster relief supplies to take home. While recent research has focused on shelter location selection decisions, relief supplies-seeking travel behavior, i.e., decisions surrounding traveling to and from PODs, has remained unexplored. Previous studies have only collected anecdotal evidence on why individuals might prefer to travel to a POD that is not the nearest to them, but no empirical research has been formally conducted on this topic. Therefore, there still remain questions regarding where people go to search for relief supplies after a natural disaster, how people get to the PODs, and what factors influence such decisions.

This project is an empirical investigation of relief supply-seeking travel behaviors after disasters. The focus will be on the decision-making of disaster-affected populations that seek relief supplies post-event. The decisions include selecting which POD to visit and choosing a transportation mode and route to and from the POD. These decisions are influenced by preferences, attitudes, perceptions, and disaster and individual-specific factors. The target population for this study includes adults who are familiar with natural disasters and have sought relief supplies after such events. This includes people living in communities that

are frequently affected by or have recently experienced a large sudden-onset natural disaster, such as hurricanes or flooding which would require the deployment of PODs during the disaster response stage. The project will leverage the PI's previous research on state-of-the-art disaster response logistics and ongoing community-building efforts. The latter will lead to identifying the communities for the data collection effort.

A mixed-method approach will be used for this research. Qualitative data will be collected from structured focus groups leveraging memory recall of past disasters to derive priorities, preferences, and perceptions around relief supply-seeking travel behaviors. Survey data will be collected for quantitative analyses on the related choices for past experiences and under hypothetical scenarios. The data analyses will use advanced statistical techniques. Additional dimensions of analysis will include the effect of various socio-economic characteristics, urbanistic levels, and multimodal transportation infrastructure, providing insights into vulnerability, accessibility, and equity-related implications. The travel behavior insights from this project will constitute the first step to developing a family of behavioral models to explain and predict relief supply-seeking travel behaviors in the aftermath of disasters. This research is a people-centric approach that will be a transformative step toward more effective and equitable disaster response logistics and more resilient communities.

US DOT Priorities: This project addresses research priorities: (1) For equity, “Equity and Accessibility Assessment: Develop data, tools, and research to evaluate and advance the equity and accessibility of transportation systems...”, with the objective “ensure traditionally underserved people are afforded equitable access to convenient transportation options”, and the desired outcome of “data and data analysis methodologies are available to assist transportation planners in assessing equity ... and accessibility issues when making decisions”; (2) for climate and sustainability, “Sustainable and Resilient Infrastructure,” i.e., “Climate resilience: Develop and deploy methods to assess and mitigate the risks to transportation system performance posed by climate change”; and (3) for transformation “Integrated System-of-Systems: Placing humans at the center of the transportation system with all outcomes oriented to supporting human needs”.

Outputs: The research outputs of this project aim to provide a detailed understanding of the behaviors of individuals seeking relief supplies after a natural disaster. This project serves as the initial step in creating a family of behavioral models that can predict and explain mobility choices, attitudes, and preferences related to accessing points of distribution for relief supplies during the disaster response phase. Additionally, this project utilizes a human-centered mixed-method research technique that proves the concept of a methodology not commonly used in the transportation field. The insights gained from the mixed-method approach, including data collection and analysis, behavioral and accessibility insights, and developed behavioral models, will be shared through peer-reviewed journal publications and conference presentations.

Outcomes/Impacts: The project's main outcome relates to the increased understanding of human behavior in the aftermath of disasters. The insights and models would be used to infuse disaster relief distribution models with more realistic mechanisms to predict the demand for relief items at points of distribution and, thus, to optimize their location and operation to meet the dynamic nature of demand for relief supplies. Additionally, the project's outputs will be a starting point for a human-centered design of transportation systems and emergency management protocols. Last, the proposed methodology will show the importance of human-centered research, tools, and processes within transportation. With the frequency and severity of extreme weather events on the rise, this project aims to develop analytical tools and decision-making support systems that improve the social efficiency of relief distribution processes and enhance community resilience to such events. Through this project, under the social efficiency target, the goal is to reduce the social costs of disasters by minimizing human suffering due to lack of access to relief supplies and the logistical costs associated with ineffective emergency response operations. Ultimately, this project seeks to advance both the theory of humanitarian logistics and the practice of emergency management.

Final Research Report: A URL link to the final report will be provided upon completion of the project.