Project Requirements Form USDOT
CREATE UTC Contract Number 69A3552348330
Center Lead: Texas State University; Oregon State University

Research Project Name: Improving Post-Disaster Access to Critical Facilities for Underserved Coastal Communities (OSU)
Improving the Durability and Extending the Life of Transportation Infrastructure
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Project Partners: Juyeong Choi, Associate Professor, Florida A&M University Swaroop Gowda, Director of Operations, Ceres New Zealand.
Research Project Funding: **Federal:** $100,000 **Match:** $100,000 (OSU)
Project Start Date: 6/15/2024 **Project End Date:** 6/14/2026
Project Description: The increased frequency of acute coastal hazards (tsunamis and hurricanes) in conjunction with climate-change induced chronic hazards (sea-level rise and coastal erosion) could result in the occurrence of unprecedented combinations of these hazards that can cause tremendous damage to the coastal transportation network. These disruptions combined with the prevailing lack of adequate redundancies in the transportation network can severely impact connectivity from coastal communities to critical facilities such as hospitals, fire stations, and other areas for post-disaster aid and exacerbate prevailing inequalities in resilience. Thus, this proposal will first quantify the impact of unprecedented combinations of coastal hazards on the connectivity of rural communities to critical hazards. Additionally, this project seeks to improve the equity of transportation network by identifying appropriate post-disaster response and recovery strategies to minimize differential impacts on vulnerable populations by improving their access to critical facilities after unprecedented disasters. These strategies include the identification of appropriate operations based on the region and the hazard for recovery, and creation of discrete event simulation models to enable quantification of their performance. These will also enable a large-scale optimization in the allocation of resources considering a region's vulnerability to hazards and the type of operations enabled.
US DOT Priorities: This project strongly aligns with the Equity goal from USDOT's strategic development plan due to its specific focus on ensuring vulnerable populations' access to critical facilities after a disaster. Numerous studies have noted that certain populations such as the elderly, immigrant, and tribal populations are at particular risk of being isolated after disasters due to numerous barriers including lack of knowledge of available resources, and an inability to respond to disaster onset in a timely manner. Disparities in resilience among populations can be expected to widen in the face of unprecedented disasters, and this research thus takes an interdisciplinary effort to integrate the perspectives of disaster impact, evacuation modeling, and recovery planning to mitigate impact on connectivity for vulnerable populations. The focus on disasters and resilience also aligns with USDOT strategic goals on Safety and Climate and Sustainability, by ensuring appropriate consideration of climate change in planning for disaster recovery of transportation infrastructure.

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This project engages in advanced research by integrating hitherto siloed aspects of disaster impacts including: impact on infrastructure; its cascading differential impact on vulnerable populations; and potential means of mitigating these impacts by focusing on resources needed for recovery.

Outputs: The primary research output is to be developed in this project consists of a framework to link GIS-based analysis with discrete event simulation for operations analysis. This framework will be applied to coastal communities in Oregon to enable linking hazard characteristics to regional connectivity and thus equity; and also, recovery operations to enable decision-makers to allocate resources. This output will be presented in the form of interactive geospatial connectivity maps that clearly identify vulnerable communities and vulnerable demographics within them. These connectivity maps will be updated based on local equipment availability and thus enable experimentation with various allocation strategies for recovery.

Partnerships have been established with debris contractors (Ceres Environmental) and researchers at Florida State University who focus on debris clearance after disasters to aid with validation of study.

Outcomes/Impacts: The anticipated outcome of this research is a method to equitably allocate resources that are needed for repairing roadways after disasters by considering both disaster characteristics, as well as population make-ups and their needs to access critical facilities. It is thus anticipated that the research proposed can improve both the resilience and equity of transportation networks in the face of unprecedented natural hazards.

Final Research Report: URL to final Report will be provided upon completion.