Research Project Name: Agent-based modeling for assessment of coastal transportation network resiliency	
Improving the Durability and Extending the Life of Transportation Infrastructure	
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Project Start Date: 09/01/2024 **Project End Date:** 08/31/2025	

Project Description: This research examines how coastal regions face greater challenges during extreme weather events due to limited access to resources and infrastructure support. It investigates how current infrastructure planning strategies, especially those related to transportation, can unintentionally increase existing gaps in access to transportation. The goal is to develop an agent-based modeling (ABM) framework that captures the interaction between public agency decisions, infrastructure functionality, populations, and environmental stressors. This tool will enhance understanding of how various systems interact under stress and provide guidance for engineering and planning strategies. Ultimately, the project aims to support effective infrastructure solutions for the Houston area.

US DOT Priorities: This research proposal supports the U.S. Department of Transportation's strategic objectives related to long-term infrastructure planning, system modernization, and service accessibility by examining how coastal infrastructure planning can better serve coastal communities. The project focuses on differences in how weather-related events affect coastal populations, with the aim of developing transportation strategies that are both practical and broadly beneficial. It also contributes to U.S. DOT's efforts to prepare transportation networks for future challenges through improved modeling and planning tools. The proposed ABM framework will enable advanced scenario testing and decision support to strengthen the functionality and reliability of coastal transportation systems, aligning with CREATE goals for advancing safety, performance, and inclusivity in areas subject to environmental stress.

Outputs: This project is expected to generate several key outcomes that will contribute to the advancement of coastal systems planning and management. Central to this effort is the development of a novel ABM framework designed to evaluate coastal system performance under stress, incorporating interacting components such as populations, environmental conditions, infrastructure networks, and institutional actions. This framework will offer an integrated view of coastal system behavior and support more informed decision-making. The project will also foster collaboration with experts in coastal engineering and geospatial analysis, including Dr. Joseph Louis and Dr. Haizhong Wang from Oregon State University, promoting technical exchange and strengthening ties beyond the UTC consortium.

Outcomes/Impacts: The outcomes of this project are expected to significantly inform improvements in transportation systems, particularly regarding safety, reliability, and cost-efficiency. Through the development of a comprehensive ABM framework, the project will support better planning and design of coastal transportation infrastructure under conditions of environmental stress. This will contribute to stronger system performance and more effective emergency response capabilities in affected regions. Furthermore, the project emphasizes access to transportation benefits across coastal populations, helping ensure that all communities receive adequate consideration in planning and protection efforts related to major disruptions.

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