

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

Research Project Name: Identification of Unprecedented Coastal Flooding Hotspots for Highway Network Durability and Social Justice (TXST)

Improving the Durability and Extending the Life of Transportation Infrastructure

Principal Investigators:

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Project Partners: N/A

Research Project Funding:

Federal: \$99,965 Match: \$51,089 (TXST)

Project Start Date: 9/1/2024 Project End Date: 12/31/2025

Project Description: The proposed work outlines an innovative approach aimed at constructing a comprehensive framework and toolsets for evaluating unprecedented coastal flood risks while considering the highway network's durability. This approach involves integrating detailed highway network information with an artificial intelligence (AI) based flood model. The intellectual merit of this project resides in leveraging AI algorithms, hydrodynamic numerical simulations, road risk scoring, and remote sensing techniques to (1) develop a super-resolution, physically informed AI algorithm to improve flood hazard mapping on a road network scale, (2) implement a data fusion approach to uncover social vulnerability in transportation systems, and (3) transfer research outputs to operations for public benefits.

US DOT Priorities: This research efforts will address the US DOT statutory research priority "D: Improving the Durability and Extending the Life of Transportation Infrastructure." Under this statutory priority, the proposed activities will address the two USDOT strategic goals (1) "Climate and Sustainability: Tackle the climate crisis by ensuring that transportation plays a central role in the solution. build more resilient and sustainable transportation systems to benefit and protect communities" as primary and (2) "Equity: Reduce inequities across our transportation systems and the communities they affect. Support and engage people and communities to promote safe, affordable, accessible, and multimodal access to opportunities and services while reducing transportation-related disparities, adverse community impacts, and health effects." as a complementary, secondary strategic goal.

Outputs: The major output of the project will be an interactive web-based highway network-level durability and flood risk assessment map. This innovative tool will allow for analysis and visualization of flood risks and infrastructure durability across low-volume and highway networks, enhancing decision-making capabilities for local transportation planners and emergency response teams. The project is expected to foster new partnerships outside the UTC, facilitating collaboration and knowledge exchange with external regional stakeholders such as Houston-Galveston Area Council, and the City of Galveston as well as academic institutions such as the University of Texas at Austin.



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Outcomes/Impacts: This tool will provide broader impacts on regional and local societies by empowering decision-makers with the information needed to formulate equitable responses to potential flooding scenarios and enabling them to identify the critical links, spots, or zones in coastal areas, especially in underserved communities. By providing detailed, location-specific data, this map will enable proactive maintenance and timely interventions, thereby improving the safety, reliability, and durability of transportation systems. Additionally, the tool can contribute to cost savings by identifying vulnerable areas before major damages occur, allowing for more efficient allocation of resources. While this research will focus on Galveston, TX, as a testbed, the research framework is expected to apply to other coastal regions in the U.S. and worldwide.

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