



Research Project Statement 24-089 FY 2024 Annual Program

Title:	Develop Systematic and Quantitative Approach to Assess the Probability of Extreme Weather and Resilience Risks for TxDOT Highways and Bridges
The Problem:	<p>Extreme weather and climate hazard pose a significant threat to transportation infrastructure assets. Recognizing this, FHWA requires state departments of transportation to consider extreme weather and resilience as part of the life cycle planning and risk management analyses within a state transportation asset management plan (TAMP), resulting from Section 11105 of the Bipartisan Infrastructure Law (BIL) changes to Title 23, United States Code (U.S.C.), Section 119(e)(4), which took effect on October 1, 2021. In addition to compliance with the FHWA requirements, integrating resilience measures and practices with asset management improves the prioritization of the maintenance of roads and bridges to reduce their vulnerability during climate hazards. Past research on transportation resilience by TxDOT and the ongoing statewide resiliency study primarily focus on planning and do not address measures and practices to integrate resilience in asset management. Resilience-based asset management is a critical component of resilient infrastructure which requires specific research beyond transportation planning.</p> <p>The TxDOT 2022 TAMP identified risk categories that could impact TxDOT's infrastructure, specifically its highways and bridges. Extreme weather and resilience were discussed extensively, but the 2022 TAMP is lack of a systematic and quantitative approach to assess and manage extreme weather and resilience related risks in risk management and life cycle planning analysis.</p>
Technical Objectives:	<p>This research will focus on the impact on pavements and bridges following the statewide resilience plan. Research findings will not only be used to meet federal requirements, but more importantly, the recommendations and analysis will be used to guide TxDOT's future project selection and development process in term of addressing extreme weather and resilience impacts. To achieve the project objectives, the research team shall:</p> <ul style="list-style-type: none"> • Perform literature review of available state and national research projects, legislative requirements, and best practices from state DOTs and local agencies. • Identify and characterize risk factors to TxDOT's highway and bridge infrastructure both temporally and spatially, and estimate their potential intensity. • Assess the risk or likelihood of the identified factors occurring based on a thorough quantitative statistical analysis of available data. • Calculate the potential impact occurring based on the characteristics of the TxDOT managed highway/bridge network system using available relevant databases based on current condition, age, traffic, and environmental conditions. • Create an analytical decision-making framework for probabilistic scenario simulations to prioritize assets for maintenance and retrofit based on climate hazards and asset's criticality and vulnerability. • Quantify the mitigation strategies and their benefits and associated costs for the life cycle planning analysis. • Conduct scenario analysis and scenario planning to evaluate and prioritize the identified risks. • Identify proxy indicators that TxDOT can track to monitor high priority risks. • Implement probabilistic resilience economic analysis for adaptation strategies vulnerable and critical assets. <p>The expected technology readiness level (TRL) for this project is 8.</p>
Anticipated Deliverables:	<ol style="list-style-type: none"> 1. Technical memorandum for each task completed. 2. Monthly progress reports. 3. Value of Research (VoR) that includes both qualitative and economic benefits, to be included in the final research report. This is not a stand-alone deliverable. 4. Product P1: Quantitative risk framework that can be implemented in updated Texas TAMPs. 5. Research report documenting the findings of the research, including a set of resilience-related measures and practices for asset management plans. 6. Project Summary Report

Proposal Requirements:	<ol style="list-style-type: none">1. Project duration shall not exceed 36 months.2. Proposal Deadline: 12:00 p.m. Central Time, Monday, March 6, 2023.3. RFP#1 Q&A Deadline: 12:00 p.m. Central Time, Wednesday, February 1, 2023.4. Use the current “ProjAgre” and “PA Forms” templates located at the RTI Forms webpage.5. Proposals will be considered non-responsive and will not be accepted for technical evaluation if they are not received by the deadline or do not meet the requirements stated in RTI's University Handbook.6. Proposals should be submitted in PDF format; (1) PDF file per proposal. File name should include project name and university abbreviation.7. This project will be tracked during the life of the project using the Technology Readiness Level (TRL) scale.8. The 2021 Texas Legislative Session requires that universities be in compliance with Senate Bill 475 by submitting a completed and signed TxDOT Security Questionnaire (TSQ) to RTIMAIN@txdot.gov in advance of a proposal submission. Universities found to not submit a completed and signed TSQ in advance of proposal submitting will be held in non-compliance and unable to participate in the Program.
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