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| **Research Project Name**: Transportation Assets Risk and Resilience Analysis to Reduce Societal Risks to Vulnerable Populations |
| Improving the Durability and Extending the Life of Transportation Infrastructure |
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| **Project Partners**: n/a |
| **Research Project Funding**: <br> Federal: $75,000          Match: $37,500 (TAMU) |
| **Project Start Date**: 09/01/2023      **Project End Date**: 05/31/25 |

**Project Description**:

The growing threats associated with various natural, man-made, and technological hazards coupled with the aging transportation infrastructure have made transportation assets highly vulnerable, with significant societal and economic impacts. The Federal Highway Administration (FHWA) regulations require state departments of transportation (DOTs) and metropolitan planning organizations (MPOs) to consider resilience in the transportation planning process and include resilience considerations in asset management plans. Adherence to these federal mandates and the ability to take full advantage of the PROTECT program requires transportation agencies to have quantitative tools, methods, and measures to identify and prioritize highly critical transportation assets. In risk and resilience assessment of transportation assets, a particular attention should be made to societal risks to vulnerable populations. However, currently, there is a lack of quantitative methods and metrics for such assessment. Recognizing this important gap, the objective of this study is to reduce societal risks to vulnerable populations due to disruptions in transportation infrastructure during coastal extreme weather events. The research approach focuses on identifying and developing methods and procedures for transportation assets risk and resilience assessment that enables identification, analysis, and evaluation of risks. The methods and procedure we will create in this task will enable DOTs to: (1) Identify and screen assets according to their relative vulnerability to identify sources of risk and relative criticality. (2) Assess identified risks based on event probability and likelihood of asset failure given predicted exposure and sensitivity to hazards. (3) Identify and evaluate the consequences associated with events in terms of costs and performance impacts (using performance metrics that capture societal impacts and costs). By considering social equity in the identification of critical assets, it is possible to prioritize efforts and resources in a way that benefits all members of the community. For example, some transportation assets are critical for evacuation or are on the path between communities and critical facilities. The proposed approach will capture and integrate social risks and equity considerations and dependence of socially vulnerable populations on assets in determining network-level asset vulnerability and asset-level criticality. The methods created in this project will be tested in two study areas.

**US DOT Priorities**:

Improving the resilience of transportation assets is a national imperative with multiple federal level programs mandating integrating resilience and societal equity in transportation planning and asset management. This project will create and test new quantitative methods and models that enable transportation organizations to effectively integrate resilience and societal risks consideration into their transportation planning, asset management, and project selection procedures. Hence, the project outcomes address the priority area related to "Equitable

Response to Unprecedented Hazards" and is closely aligned with the US DOT Strategic Goal of improving resilience and equity in the nation's transportation infrastructure.

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**Outputs:**

The proposed Transportation Risk and Resilience method will be documented in the final report in an intuitive manner to ensure that it is well utilized and referenced when DOTs develop and implement their own resilience plans and actions. The team will present and disseminate the research outcomes extensively to facilitate its implementation. To this end, the research outcomes will be shared during the TRB annual conference. The team will also participate and present the manual at the TRB Asset Management and Transportation Resilience Conferences. We will also present a webinar as part of the UTC webinar series. Also, as part of our research report, we would suggest pilot projects with interested agencies in the UTC (as a possible next phase to this project).

**Outcomes/Impacts**:

The project will yield new quantitative methods and measures for integrating resilience in transportation planning and asset management. Based on the knowledge and experience of the research team, we are confident that the research results will yield explicit and directly applicable results for DOTs and other local transportation agencies across the nation. The results will center on quantitative, effective, and easy to implement methods and procedures to integrate R&R assessments into various transportation planning, infrastructure prioritization, project selection and screening, and project scoping processes. The quantitative R&R assessment procedures for transportation assets will assist DOTs in proactively specifying highly critical assets within their transportation networks during transportation planning, evaluating the extent of risks and impacts in highly critical assets during prioritization and project selection, evaluating various hazard mitigation alternatives during project development, and monitoring the status of the system R&R during strategic performance assessment.

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