Research Project Name: Data-driven assessment of rigid pavement vulnerability in Texas coastal regions (TXST)

Improving the Durability and Extending the Life of Transportation Infrastructure

Principal Investigator:
Jung Heum Yeon, PhD; jung.yeon@txstate.edu; 0000-0003-1147-0588; Texas State University
Chul-Ho Lee, PhD; chulho.lee@txstate.edu, 0000-0002-4778-8996; Texas State University

Project Partners: Texas Department of Transportation (TxDOT)

Research Project Funding:
Federal: $88,450 Match: $50,408 (TxDOT/TXST)

Project Start Date: 01/01/2026 **Project End Date:** 06/30/2027

Project Description: This research aims to evaluate the vulnerability of rigid pavements in two major coastal districts of Texas (i.e., Beaumont and Houston) spanning about 900 miles using data-driven approaches. Particularly, the study will (1) identify the key factors contributing to rigid pavement distress under dynamic coastal weather conditions, and (2) develop data-driven strategies to enhance the durability and performance of these pavement networks. Multi-source datasets, such as weather, geotechnical, traffic, coastal proximity, and pavement conditions, will be collected and integrated to support this analysis. Weather data, including temperature and precipitation, will be obtained from national and global databases such as NOAA's National Centers for Environmental Information (NCEI) and NASA Earthdata/GES DISC. Soil classification and geotechnical attributes will be sourced from the NRCS SSURGO (Soil Survey Geographic Database), while coastal proximity data will be derived from Google Earth. Traffic volumes and loading data will be gathered from TxDOT's Statewide Traffic Analysis and Reporting System (STARS II). Pavement condition metrics, including distress quantity, distress score, condition score, and ride quality, will be extracted from TxDOT's Pavement Management Information System (PMIS) and supplemented with satellite imagery. By integrating these datasets, the project will perform statistical and spatial analyses to establish correlations between weather variables, geotechnical conditions, traffic patterns, and pavement performance indicators.

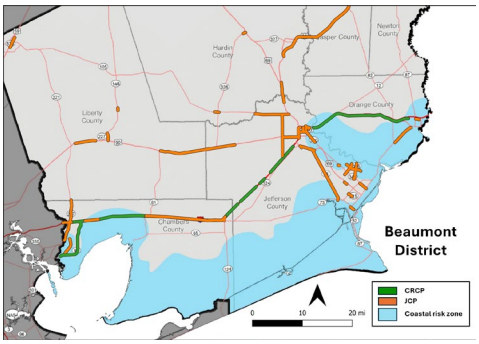

Fig. 1. Rigid pavement networks in Beaumont, Texas

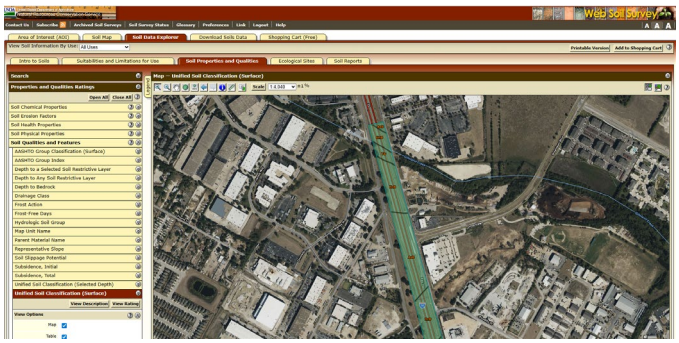

Fig. 2. Soil classification data from NRCS SSURGO

US DOT Priorities: *Section left blank until USDOT's new priorities and RD&T strategic goals are available in Spring 2026.*

Outputs: The project will deliver a comprehensive data-driven framework for assessing rigid pavement vulnerability in extreme coastal environments, focusing on the Beaumont and

Houston districts. Key outputs include predictive models that integrate diverse datasets to quantify how factors such as temperature variation, precipitation, soil conditions, and coastal proximity affect long-term pavement performance. The project will also produce geospatial maps and visualization tools that identify high-risk pavement segments, enabling TxDOT and stakeholders to prioritize maintenance and rehabilitation proactively and cost-effectively. Additionally, resilience-focused design and maintenance recommendations targeting coastal districts will be developed, with potential applicability to other regions facing similar challenges.

Outcomes/Impacts: This research will advance rigid pavement design and maintenance strategies tailored to the weather and geotechnical conditions of Texas coastal regions. By identifying key factors driving pavement distress, the findings will help agencies construct more resilient pavements that withstand harsh coastal conditions, thereby improving rigid pavement durability and reliability. The findings will provide transportation agencies with actionable tools to design more resilient rigid pavement systems, optimize maintenance planning, prioritize repairs, and extend the operational life of critical infrastructure in coastal regions. Enhanced pavement performance will reduce failures and disruptions, benefiting users and supporting more efficient use of transportation budgets through lower maintenance and repair costs. Ultimately, the project will contribute to more cost-effective transportation systems in coastal districts by informing engineering practices and policy decisions focused on infrastructure durability.

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