



The Effect of Extreme Climate Shifts to Pavement Infrastructure in Tennessee

Problem Description

While climate change manifestations such as extreme rains are considered a global phenomenon, its impacts tend to be regional and local as evident from recent hurricanes and tornadoes. Building transportation departments' institutional capacity is the key to the management of adverse climate change effects. Much of the capacity lies within planning and design through operation and maintenance of the infrastructure. To quantify needed capacity building, DOTs should establish the status of present infrastructure against the current climate and predict the status of a future infrastructure for projected climate change. The study will implement big-data analytics combined with machine learning approaches to quantify the current and future status of the TDOT infrastructure to provide short-term and long-term planning for the department capacity building with specific focus on pavement infrastructure.

PROJECT NUMBER:

RES2023-11

PRINCIPAL INVESTIGATOR:

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TDOT LEAD STAFF:

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PROJECT SCHEDULE:

August 2022 to January 2025

Research Objectives

The overarching objective of this study is to compile and assess the projected weather parameters of interest to pavement design and propose needed modification for pavement design inputs and maintenance strategies such that TDOT can consider climate changes in the long-term planning of pavement infrastructure projects. Specific objectives of this research include:

- Evaluate current pavement conditions on selected routes in Tennessee.
- Evaluate current and historical climatic conditions in Tennessee and develop new trends and investigate the correlation between the climatic condition with the pavement deterioration.
- Determine pavement design input parameters that account for the new trends and recommend design and material input improvement needed to resist extreme weather conditions in Tennessee.
- Recommend pavement maintenance strategies that may be helpful in resisting new adverse weather conditions.

Potential Implementation and Expected Benefits

The proposed research will assist in developing priorities for managing TDOT infrastructure in the wake of changing climate conditions and will also provide support to update design standards for future pavement infrastructure. TDOT will be provided with viable information on climate data forecasting and models that can be used to establish climate trends, evaluation of the correlation between climate data change and pavement performance, recommended pavement design and materials input parameters suitable for the changing climate, and recommended maintenance strategy and pavement materials that will provide good performance with changing climate. This will enable TDOT to design robust pavement structures that will withstand the adverse climatic challenges and last longer.