Tran-SET
Transportation Consortium of South-Central States

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Key Points

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Lead Institution:
Oklahoma State University

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$28,500

Funding Source(s):
Tran-SET
Oklahoma State University

Total Project Cost:
$57,000

Developing Implementable Climatic Input Data and Moisture Boundary Conditions for Pavement Analysis and Design

Brief Project Description

This study will mainly focus on improving our understanding of environmental interactions with pavement systems to better predict the changes in pavement material properties over time.

Problem Statement

Environmental conditions have a significant effect on the pavement performance. Of all the environmental factors, temperature and moisture have a direct impact on the pavement layer and subgrade properties. As a result, improving the understanding of environmental interactions with pavement systems can help predict the changes in pavement material properties over time. The current AASHTOWare Pavement ME software package utilizes the enhanced integrated climatic model (EICM) for applying the effects of climate on the pavement materials. The software uses historical climatic files that have been developed for each state in the US. However, these files are in most cases limited in number and region within each state, and therefore cannot represent the site-specific climate information. Therefore, there is a need to develop practical and implementable predictive models to study the moisture regime within the pavement subgrade in response to site-specific climate data. The Oklahoma Mesonet data can be utilized in developing the climate boundary conditions for the predictive model proposed in this study.

Objective

The main objective of this study is to develop implementable, realistic climatic input data, and to develop a practical and implementable numerical model for predicting the moisture regime within the pavement subgrade system.

Intended Implementation of Research

Workforce Development

One graduate student and one undergraduate student will be hired to conduct research with the PI. In addition, the technical results will be published in journals and presented at conferences attended by representatives of industry and academia. Project deliverables will be used to develop seminars for training and education of transportation professionals.

Education

The experience and knowledge accumulated during this project will be incorporated into courses offered by the School of Civil and Environmental Engineering at Oklahoma State University (OSU) for both undergraduate and graduate students. Findings of the proposed research will be published in technical journals such as the Transportation Research Board (TRB).

Outreach

The PI plans to participate in the OSU's Design Day Activities for high school students and upcoming College of Engineering, Architecture, and Technology (CEAT) freshmen, and demonstrate them the capabilities of the numerical model in predicting moisture variations in soils in response to the climatic boundary conditions. This event is a collaborative outreach effort in attracting high school students to civil engineering program as well as the current freshmen in CEAT who have not decided on a major yet.

Anticipated Impacts/Benefits of Implementation

The results of this study will help pavement engineers improve their understanding of the interaction between climate and subgrade soils underneath pavements. It is anticipated that the outcomes of this project will provide valuable guidelines and a practical and implementable numerical model for evaluating climate data to estimate the moisture boundary conditions above and below the subgrade and moisture variations in the subgrade soils. The numerical tool that will be developed from this research study could potentially be implemented in the AASHTOWare Pavement ME software in the near future.

Weblinks:

http://transet.lsu.edu/research/research-in-progress/

https://rip.trb.org/View/1505435