

The Impact of Hurricane Harvey on Pavement Structures in the SE Texas and SW Louisiana

Evaluating damage caused by Hurricane Harvey by comparing the performance of pavement structures flooded during the hurricane to those not flooded

This study aims to evaluate the damage caused by Hurricane Harvey to road structures in the SE Texas and SW Louisiana by comparing the performance of pavement structures flooded during the hurricane, to those not flooded. The damage evaluation will indicate the pavement structural configurations and materials most affected by flooding.

The findings of the project will help the South-Central state DOTs and local agency officials make more informed decisions about the pavement structural configuration that are more resilient to the damaging action of hurricanes. It will allow a proper design of pavement structures, which will lead to longer life of road and street networks and of pavements used in General Aviation airports. Furthermore, it will provide solid evidence towards a risk-informed decision making process that will lead to more rational allocation of funding for the repair and maintenance of these pavements. This is urgent, given the climate changes recorded in recent years, that are expected to continue generate hurricanes in the Gulf region of the United States.

Background

Hurricane Harvey is considered the worst natural disaster in the history of Texas. Harvey brought one of the most intense rainfall recorded in the continental United States. In a four-day period, many areas received more than 40 inches (1,000 mm) of rain as the system meandered over eastern Texas and adjacent waters, causing catastrophic flooding. With peak accumulations of 51.88 in (1,318 mm), Harvey is the wettest tropical cyclone on record in the contiguous United States. The resulting floods inundated hundreds of thousands of homes, displaced more than 30,000 people, and prompted more than 17,000 rescues. Economic losses are preliminarily estimated at between \$70 to \$200 billion with a large portion of the losses being sustained by uninsured homeowners. The recovery from Harvey will take many years.

Harvey induced major damage to the built transportation infrastructure, including roadways, street and airfield pavements. The pavements were damaged by the flood, which weakened and softened the unbound foundation layers of the pavement structures, and by the increased heavy truck traffic brought by the recovery effort; the SE Texas and SW Louisiana regions are home to many oil refineries, gas and oil extraction sites, chemical plants and many other industrial units.

Project Summary

To evaluate the damage caused by Hurricane Harvey to road structures in the SE Texas and SW Louisiana by comparing the performance of pavement structures in flooded and unflooded areas. The performance comparison will reveal the pavement structural configurations and material most affected by flooding. It is envisioned that this study will be accomplished through search of available performance data for street pavement structures in the City of Houston, as well as roads in the surrounding area. For this, NOAA flood maps recorded during Hurricane Harvey will be used to determine not only the areas flooded, but the duration of the flooding as well for multiple locations in the area. The flooding maps will be matched with road maps and road and street sections will be selected. For these sections the pavements structures as well as historical performance data will be obtained from transportation agencies. Multiple linear regression analysis will be conducted to determine if the deterioration of the pavements after the hurricane was different for road and street sections having different pavement configuration but carrying similar truck traffic volumes.



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Status Update

The review of literature on the climate effects on pavement performance has been under way. The focus is on the effects of major climatic events (hurricane, flooding) which include the increase in water table level, moisture content in unbound layers but also the increased heavy traffic due to the relief effort.

The collection of pavement performance data relevant to the objective of the project is under way. A pavement performance dataset have been assembled. Additional data search is under way.

Impacts

The outcome of this study will help the South-Central state DOTs and local agency officials make more informed decisions about the pavement structural configuration that are more resilient to the damaging action of hurricanes. It will allow a proper design of pavement structures, which will lead to longer life of road and street networks and of pavements used in General Aviation airports. Furthermore, it will provide solid evidence towards a risk-informed decision making process that will lead to more rational allocation of funding for the repair and maintenance of these pavements. This is urgent, given the climate changes recorded in recent years, that are expected to continue generate hurricanes in the Gulf region of the Unites States.

Tran-SET

Tran-SET is Region 6's University Transportation Center. It is a collaborative partnership between 11 institutions (see below) across 5 states (AR, LA, NM, OK, and TX). Tran-SET is led by Louisiana State University. It was established in late November 2016 "to address the accelerated deterioration of transportation infrastructure through the development, evaluation, and implementation of cutting-edge technologies, novel materials, and innovative construction management processes".

Learn More

For more information about Tran-SET, please visit [our website](#), LinkedIn, Twitter, Facebook, and YouTube pages. Also, please feel free to contact Mr. Christopher Melson (Tran-SET Program Manager) directly at transet@lsu.edu.

