RESEARCH
PROJECT CAPSULE [22-3SS]

June 2022

TECHNOLOGY TRANSFER PROGRAM

Testing the Hurricane Evacuation Modeling Package (HEMP)

JUST THE FACTS:

Start Date:
August 1, 2022

Duration:
18 months

End Date:
January 31, 2024

Funding:
TT-Fed/TT-Reg – 5

Principal Investigator:
Ruijie "Rebecca" Bian, Ph.D., P.E.
Research Assistant Professor
Louisiana Transportation Research Center

Administrative Contact:
Tyson Rupnow, Ph.D., P.E.
Associate Director, Research
225-767-9124

Technical Contact:
Elisabeta Mitran, Ph.D.
Research Assistant Professor
Louisiana Transportation Research Center
225-767-9129

Louisiana Transportation Research Center
4101 Gourrier Ave
Baton Rouge, LA 70808

Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used / Implementation Potential

WWW.LTRC.LSU.EDU

PROBLEM

All hurricane evacuation modeling components developed by LTRC between 2017 and 2020 have been assembled into one computer package named Hurricane Evacuation Modeling Package (HEMP). HEMP allows the estimation of hurricane evacuation traffic depending on storm characteristics and timing of decisions made by emergency managers.

HEMP was set up to operate in the New Orleans area and tested with data from Hurricane Katrina. A graphic user interface was created to make HEMP easily accessible for emergency managers who may not be familiar with traffic simulation tools. Emergency managers can enter decisions, such as phased evacuation orders, through the interface, and HEMP automatically generates outputs like average travel time to help assess impacts of those decisions.

OBJECTIVE

This project focuses on testing HEMP in different storm scenarios and improving its performance.

Objectives include:

- Improve and validate prediction accuracy of HEMP
- Improve HEMP's fitness to actual emergency operations in Louisiana
- Improve HEMP's computation speed
- Explore potential enhancement of HEMP's capabilities

METHODOLOGY

The first task of this project involves refinement of the current evacuation demand models in the demand simulation tool. These demand models include the evacuation/stay choice, travel mode/accommodation choice, and destination choice. The research team will check whether predicted evacuation demand matches actual observations from behavioral surveys. The road network in the traffic simulation tool will be checked and corrected where needed to improve traffic simulation accuracy.

Testing of the computer package is necessary to determine the accuracy and usefulness of the package before its release for practical use. Input data must be examined to ensure the models are applied in the same way they were estimated. Simulation outputs must be compared with observed data, such as traffic counts, to improve confidence in HEMP's prediction ability. Any changes needed to improve HEMP's ability to model actual emergency management operations in Louisiana will be made at this time.

Potential enhancements to HEMP's capabilities will also be considered. The research team will explore the feasibility of incorporating dynamic network changes to reflect

implementation of contraflow or lane closures. The research team will work with the Project Review Committee to develop a list of major decisions that typically need to be made during a storm, so that strategic scenarios may be evaluated based on their complexity and potential solutions.

HEMP's computation speed may also be improved. Faster computation speed will cut the time of each single simulation run. Taking average outputs from a batch of simulations is more reliable than relying on outputs from one simulation. Therefore, computation speed improvements will help generate more reliable outputs in a shorter time.

IMPLEMENTATION POTENTIAL

HEMP has a more advanced demand estimation core and generates more time-dependent outputs than other evacuation modeling packages, e.g., HURREVAC. This project will test HEMP and potentially improve its accuracy and computation speed.