



RESEARCH PROJECT CAPSULE [11-6GT]

February 2012

TECHNOLOGY TRANSFER PROGRAM

Quantifying the Key Factors that Create Road Flooding

JUST THE FACTS:

Start Date:
August 1, 2011

Duration:
11 months

End Date:
June 30, 2012

Funding:
Operations

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Department of Transportation and
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POINTS OF INTEREST:

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

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PROBLEM

Road flooding is a serious operational hazard for low-lying areas of south Louisiana. This is especially true for emergency evacuation routes, which must be accessible for coastal residents evacuating ahead of an approaching hurricane or tropical storm.

Numerous factors contribute to the hazards of road flooding, which include vulnerability and risk relative to vehicle type, road elevations, tidal ranges, wave action, and storm surge. In order to mitigate hazards associated with flooded evacuation routes, the Center for Geoinformatics (C4G) at Louisiana State University (LSU) proposes to develop a decision support tool for determining the hazard characteristics of specific road segments vulnerable to hurricane flooding.

OBJECTIVE

The fundamental objective for this proposal is to develop a near real-time, data-driven decision support model and operational instrument that will synthesize the flood hazards for emergency evacuation road segments in south Louisiana.

METHODOLOGY

This study is organized into six phases of development, each comprised of the following:

Task 1: Collect and Measure Data on Commonly Flooded Road Segments

The Louisiana Department of Transportation and Development (DOTD) will identify commonly flooded road segments on state-maintained highways and provide relevant data regarding characteristics (geographic location, elevation, type, construction, etc.) of select segments to LSU C4G. LSU C4G will then measure elevations of selected road segments on an as-needed basis.

Task 2: Develop a Deterministic, Scenario-Based Flood Inundation Model

LSU C4G will develop a deterministic, scenario-based flood inundation model for DOTD to utilize. It will consist of data from several sources:

- Storm surge and flood data published by the National Hurricane Center (NHC) to account for flooding due to storm surges. Datasets will include the Maximum Envelop of Water (MEOW) data published by the NHC via the Sea, Lakes, and Overland Surges from Hurricanes (SLOSH) modeling software.
- Tidal data will be integrated from Internet-based data feeds from select riverine/lacustrine water and coastal tide gauge data services. Sources for this near real-time data will include: Geological Survey, U.S. Army Corps of Engineers, and the National Weather Service.
- Vertical wave height data will be integrated from published data relating to water depth and flow rates for estimating local wave heights.

Task 3: Vehicle Vulnerability and Risk Analysis

LSU C4G will examine vehicle vulnerability and risk analysis including: a literature review of flood vulnerabilities by vehicle class, the research factors associating flood vulnerability and risk relative with vehicle class, and research factors attributing to the vulnerability and risk relative to road inundation depth, wind, and flow conditions.

Task 4: Map Interface and Reporting Tool

Researchers will design decision-support map products illustrating flood hazards attributable to all of the combined storm surge scenarios published by the National Hurricane Center (NHC).

Task 5: Metadata & Operational Instruction

Researchers will document and generate metadata for each dataset submitted and develop brief instruction for deployment.

Task 6: Contract Review & Delivery

Researchers will document the efforts in a final report and deliver the tool to DOTD.

IMPLEMENTATION POTENTIAL

The outcome of this research will result in the development of a decision support mapping tool that will reveal the flooding hazards resulting from hurricane storm surge on evacuation routes across south Louisiana. The research will be used to attribute flood-vulnerable road segments. The deliverables will include a map of these road segments attributed with estimated inundation heights, road surface elevations, storm surge estimates, links to tidal and wave action data sources, and vehicle vulnerability assessments. The map and supporting data will provide decision makers with a simple device for identifying road segments at risk from flooding.