



Transportation Consortium of South Central States

Key Points

Project Number:
18HSTSA02

Start Date:
03/15/2018

End Date:
09/15/2019

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Funds Requested to UTC:
\$70,000

Funding Source(s):
Tran-SET
University of Texas at San Antonio
Texas A&M University
City of San Antonio

Total Project Cost:
\$140,000

Assessing the Impacts of Super Storm Flooding in the Transportation Infrastructure – Case Study: San Antonio, Texas

Brief Project Description

The main goal of this project is to develop and apply a computational framework capable of predicting the impacts of super storms in the transportation infrastructure and evaluating flood protection strategies that alleviate some of the impacts in highly populated urban areas. Deliverables include: (1) the development of state-of-the-art simulation models, (2) a website to raise awareness among the public about intense storm events and floods and to disseminate the findings of the project, and (3) one training workshop to engage different agencies impacted by floods, such as Texas DOT and city officials.

Problem Statement

Data from governmental agencies shows a clear exponential growth in fatalities, damages and recovery costs due to extreme weather events in the U.S. Most critical infrastructure built in urban areas, including that for transportation and flood protection, are designed to handle a design storm with a 1% probability of occurrence in one year or 100 years of return period. "Super storms" are defined as rainfall events with return periods greater than 100 years, which have recently occurred frequently in the U.S. Because super storms are likely to become more frequent and severe due to climate change, there is a pressing research need to (1) develop and test new modeling frameworks that can assess the impacts of flooding on the built environment and to (2) identify mitigation and adaptation strategies that protect critical infrastructure in urban areas against flooding. Recently, the use of two-dimensional models (2D) has become more accessible. However, the use of these models for floodplain mapping has not been sufficiently tested for storm events larger than the 100 year design storms and the suitability of the existing modeling capabilities to accurately represent super storms requires further investigation. Moreover, City and Watershed managers have been relying on old modeling software to plan and make design decisions on how to address flooding. Therefore, there is a critical education need to train the current and next generation of



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engineers on the proper use of new and more advanced hydrologic and hydraulic simulation tools.

Objectives

Specific objectives of the study are to:

- Assess the impacts of super storms flooding in the transportation infrastructure. A suite of hydrologic and hydraulic simulation models will be tested and used to evaluate flood impacts with a focus to the main transportation infrastructure, such as highways and bridges.
- Explore alternative flood protection structures that can minimize damages and maximize the resilience of transportation systems in large metropolitan areas: The models will be updated and flood control structures, such as levees, dams and alternative land cover will be tested.
- Train city and transportation officials and watershed managers to better delineate floodplain mapping of super storms and incorporate potential climate change impacts in future city planning.
- Enhance the public awareness of about the impacts of super storms in the built environment, with an emphasis in the main transportation infrastructure.

Intended Implementation of Research

This study aims to enhance the knowledge of officials, engineers and managers that interface with the problems generated by flooding in urban areas. The study will include a workshop with the goals of: (1) disseminating results and (2) providing training opportunities for members of the Texas DOT, City of San Antonio, and San Antonio River Authority. This study will also generate articles to be published in top peer-reviewed journals in the field of water resources such as *Journal of Hydrology*, *Journal of Hydrologic Engineering*, and *Water Resources Research*. Research and educational findings will be presented at the annual national meeting of the American Geophysical Union and the American Society of Civil Engineers World Environmental and Water Resources Congress

A website will be developed as part of this study. It will contain information about the impact of severe flooding and storm events. Data from past events that produced catastrophic damages in urban areas around the world will be compiled. The website will contain the data, the models, and the main findings of the project.

Anticipated Impacts/Benefits of Implementation

This study will have a positive impact for the communities of Region 6, in particular the City of San Antonio. The proposed analysis will investigate how recent hydrologic and hydraulic modeling developments impact the delineation of floodplain mapping. In particular, the model outputs will be used to identify how super storms impact transportation infrastructure. Furthermore, the project will have a strong educational component that will include workforce development and dissemination of results using the web.

Weblinks:

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

<https://rip.trb.org/View/1505470>