



New Jersey Department of Transportation 22nd Annual NJDOT Research Showcase

Preparing Today for a Resilient Tomorrow





COMING SOON:

NJDOT Flood Risk Visualization Tool

22nd Annual NJDOT Research Showcase October 29, 2020 | 9:45 to 10:30 AM

Last Revised: 06/08/2020

Presentation Outline

- Background & Context
 - Why resilience is important
 - NJDOT Resilience Efforts
- Project Overview
 - Purpose and phasing
- Results and outcomes to date
 - Version 1.0 prototype
 - Internal workflows findings
 - Recommendations for incorporating resilience in problem screening
 - Proposed Technical Advisory Panel
- Next steps





NJDOT Flood Risk Visualization Tool

BACKGROUND

Why Resilience is Important



National Emphasis on Resilience



Vulnerability Assessment and Adaptation Framework

FEDERAL HIGHWAY ADMINISTRATION OFFICE OF PLANNING, ENVIRONMENT, & REALTY

C. Department of Transportation Federal Highway Administration

NJDOT Resilience Program Organization





Timeline of On-going Efforts

Dewberry

Tasks	April 2020	June 2020	September 2020	November 2020		June 2021	
Develop a Resilience Policy Statement (Dewberry)	Draft policy statement	Final rev	view				
Develop a Vulnerability Framework (Dewberry)	Gather data and develop framewor	k	Use in scalable pilot project				
Develop a Criticality Framework (Dewberry)	Gather data and develop framewor	k	Use in scalable pilot project			ARESILIENT	
Incorporate Resilience into the Concept Development Phase of the PD Process (Dewberry)	Develop resilience criteria		Use in scalable pilot project			NJDOT	
Develop Flood Risk Visualization Tool (Rutgers)	Develop flood risk visualization tool						
Engage with RWG	RWG Meeting			Gather input	Continue working with RWG and subcommittees		
Engage with SASG	SASG Meeting			Gather input	Continue working with Senior Advisory Stakeholders		
Engage with Third Party Stakeholders	Third Party Stakeholder Meeting			Gather input	Continue working with Third Party Stakeholders		



NJDOT Flood Risk Visualization Tool

PROJECT OVERVIEW

Project Purpose

- Create an GIS-based visualization tool
 - Map potential exposure to weather and climate hazards based on latest science
 - Inland and coastal flooding from rain events, storm surge and sea level rise
 - Heavy precipitation
 - Extreme temperature
 - "Zoom to" location widget to find specific infrastructure/assets
- Make recommendations for how NJDOT can incorporate the data and mapping from the tool in transportation planning, project development, operations and maintenance decisions

Phase 1 – Tool Development

- Understand work flows and data needs
 - Manager-level input
- Design user interface and functionality
 - End-user input
- Provide near-term capacity to "flag" projects potentially impacted by flood inundation
 - Coastal NJFloodMapper data
 - Inland FEMA Flood Hazard maps
- Version 1.0 tool available by December 2020

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Phase 2 – Enhanced Inland Flood Mapping Capability

- <u>New Layer 1:</u> Specific Storm-Event Flooding Scenarios
 - Resilient NJ flood modeling applied statewide (HEC-RAS Two-Dimensional

Flooding Condition	Туре	
Current	1.	MHHW + 2% annual chance, 2-hour storm event
	2.	MHHW + 1% annual chance, 24-hour storm event
Future	3.	MHHW + SLR 2070 (2.4 ft.)
	4.	MHHW + SLR 2070 (2.4 ft.) + (2% annual chance, 2-hour storm event + 10% increase in rainfall)
	5.	MHHW + SLR 2070 (2.4 ft.) + (1% annual chance, 24-hour storm event + 10% increase in rainfall)
	6.	MHHW + SLR 2070 (2.4 ft.) + Superstorm Sandy in 2070 (High Water Mark = 8.3 ft.)

- <u>New Layer 2</u>: Flexible Screening-level Mapping Protocol
 - Informed by "Technical Advisory Panel" input
 - Visualization of future flood inundation (coastal, riverine and combined riverine/storm surge in tidal river basins) based on user selected parameters
- Version 2.0 tool available by June 2021

Rain on Grid)



NJDOT Flood Risk Visualization Tool

RESULTS & OUTCOMES TO DATE

- Boundaries
 - County
 - Municipality
- NJDOT Tool Panel
 - Roadway network (SLD database)
 - Zoom to mile marker selection
 - Bridge location (Work in progress)
- Flood Hazards
 - Coastal total water level, SLR, Sandy surge extent, SLOSH Cat 1-4
 - Inland FEMA Flood Zones
- Climate Hazards (precipitation, temperature)









Internal Workflows Meeting (Aug 7)

- 24 participants from various parts of the department
- Key questions:
 - Where in the project development process should flood risk be considered and how?
 - What asset/infrastructure should be incorporated in the tool in addition to roads and bridges (e.g., signals, ITS, other)?
 - What data and information about flood risk would be beneficial to have?



Internal Workflows Meeting (Aug 7)

Outcomes:

- Flood Risk Visualization Tool designed to **identify/flag potential** <u>exposure</u> to flooding
 - Data on asset criticality is also needed to determine the degree to which flood risk should be addressed in project design
- **Problem Screening** is the most appropriate step to include potential flood exposure data
 - Flood risk should also be considered in more detail as part of concept development
- It may be appropriate to include additional asset/infrastructure data including signals, ITS, and perhaps others
 - Follow up needed with TOS&S
- There is a need to coordinate flood exposure data with data and outputs from the Drainage Management System (DMS)
 - Follow up needed with DMS

Incorporating Resilience into Problem Screening

- Collect and Analyze Data (1.2)
 - New Resilience data collection activity (1.2.1.X)
 - Flood Risk Visualization Tool data and mapping
 - Criticality Tool output
 - Others as available
 - Coordinate with SMEs from the Bureau of Environmental Resources
- New Resilience section of the Problem Screening Report (1.4)
- Changes to Risk Register?



Proposed Technical Advisory Panel

- Up to four meetings
- Members to include:
 - Academic researchers (Rutgers, Stevens, Monmouth, Cornell, University of Bristol, UC-Davis, others?)
 - Federal agencies (FEMA, USGS, Army Corps)
 - State agencies (NJDOT, NJDEP)
- Topics to be addressed:
 - Flood modeling methods and techniques
 - Future precipitation and other assumptions and values needed for accurate flood depictions
 - Short- and long-term approaches to address predictive inland flood hazard and combined storm surge and river flow flooding in tidal river basins



Next Steps – Fall 2020

- Get input from DOT subject matter experts
 - TOS&S workflows follow up
 - DMS workflows follow up
 - End-user tool design input meeting(s)
- Convene Technical Advisory Panel Meeting #1
- Continue to advance tool development process
 - Database integration
 - User interface design and testing





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