Assessing the Vulnerability of Tennessee Transportation Assets to Extreme Weather

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8th Annual Intermodal Conference
Memphis TN
October 7, 2014
Requires states to

• Evaluate performance of roads, traffic congestion and freight

• Develop a risk-based asset management plan for the National Highway System

Assessing transportation asset vulnerability to extreme weather a key step in this process
The Problem

• Significant transportation impacts
  • Access to jobs
  • Business continuity
  • Social lifeline
  • Regional and national mobility

The Need

• Statewide vulnerability assessment of transportation assets to identify *critical* assets *vulnerable* to extreme weather
  • Vulnerability includes
    • Asset damage
    • Loss of use
    • Resilience

Tennessee selected as FHWA Extreme Weather Pilot Project
Stakeholder Involvement

• Tennessee Department of Transportation (TDOT)
  • Division Directors appoint senior staff as project liaisons
  • Divisions (headquarters and regions) provide information

• TEWTAP (Tennessee Extreme Weather and Transportation Adaptation Partnership)
  • Comprised of endorsing organizations, other state and federal agencies, MPOs and transportation providers
  • Guide and advise project and review project results

• Regional Focus Groups
  • Public invited to four regional meetings
  • Obtain local/regional feedback
  • Obtain access to data
Project Overview

Critical Assets

Extreme Weather Events

Damage potential and resilience

Vulnerability

Project will make extensive use of color-coded GIS maps to visually display critical assets, extreme weather exposure, impacts and overall vulnerability.
Asset Inventory

- Roads (interstate, state and U.S. highways)
- Rail (passenger and freight)
- Navigable waterways (rivers and locks)
- Intermodal freight terminals
- Airports
- Pipelines (oil and natural gas)
- Mass transit systems
- Support systems (traffic control centers, maintenance facilities)
Criteria for Determining Asset Criticality

• Volume of activity
• Strategic importance
• Use as emergency response resource
• Redundant capability
• Network connectivity
• Local knowledge and experience
Tennessee Critical Assets: Roads, Rail, and Tunnels
Tennessee Critical Assets: Airports and Pipelines
Types of Extreme Weather Events

- Extreme temperatures (high and low)
- Heavy rain
- Drought
- Wind
- Tornado
- Ice
- Fog
- Snow

High temperatures

Ice

Heavy rains

Wind
Characterization of Extreme Weather Events

• Define extreme weather events based on thresholds that cause serious damage

• Determine portfolio of plausible extreme weather scenarios during study period (2015-2040)

• Historical weather data source
  • National Weather Service (NWS)

• Climate forecast model sources
  • World Climate Research Programme
  • University of Georgia
  • Federal Highway Administration
Overall Historic Extreme Weather Events
Water Events

Wind Events
Future Precipitation and Temperature by Tennessee County

Projected Precipitation Data By County

Projected High Temperature Data By County
Damage Potential and Resilience

- Asset damage caused by the extreme weather event in terms of repair/replacement cost
- Economic impact of loss of use due to delays/disruption
- Utilize maintenance records, anecdotal information and damage/loss models
<table>
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<th>F2/F3</th>
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Asset Type: Highways

Extreme Weather Event: Tornado
Ongoing Activities

• Complete development of extreme weather scenarios
• Assess damage/loss of critical assets to extreme weather scenarios
• Produce vulnerability “hot spot” maps
• Explore opportunities to assimilate project results into TDOT policies & procedures
• Prepare final report

Expected completion date: January, 2015
Dissemination of Results

• Project is first step in determining what can be done to reduce transportation asset vulnerability to extreme weather events

• Will provide essential information for risk-based transportation asset management planning by TDOT, MPO’s and others.

• Will create an important tool to:
  • Inform decision-makers
  • Promote “no regrets” planning

REGRETS
Thank You!

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