Adaptation to Extreme Weather Events and Climate Change

STEICS, 2014 AASHTO Spring Meeting

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Planning for the Future…

• What we know:
  – Future will not be like the present
  – Present is not like the past
  – Transportation infrastructure is sensitive to extreme weather & climate change

• What we don’t know:
  – Exactly when or how much

• Climate change will affect maintenance/investment cycles, location decisions
  – Adds uncertainty
  – Expect higher maintenance & operations costs; potentially costlier designs
  – Adaptation can save funds over the long term

“U.S. average temperature has increased by 1.3°F to 1.9°F since 1895, and most of this increase has occurred since 1970.” – NCA

“Temperatures are projected to rise another 2°F to 4°F in most areas of the United States over [just] the next few decades.” – NCA

U.S. Department of Transportation
Federal Highway Administration
Resilience to Extreme Weather and Climate Change

- **FHWA Goal:** Transportation system that continues to provide safe mobility under current and future conditions
- **Objective:** Systematic consideration of risks at transportation *system* and *project* levels.
- **Approach:**
  - FHWA funds can be used for adaptation activities
  - Research and Technical Assistance: Develop and share information and tools that State DOTs and MPOs can use to assess risk and improve resilience
  - GROW AMERICA would add consideration of resilience, adaptation
Activities: System & Project Level focus

- Climate Change & Extreme Weather Vulnerability Assessment Framework (system, project levels)
- Climate Resilience Pilots – round 2 (s,p)
- Gulf Coast 2 (Mobile) (s,p)
- Hurricane Sandy Follow-up and Vulnerability Assessment & Adaptation Analysis (s,p)
- Central NM Climate Change Scenario Planning Project (s,p)

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- HEC 25 - Volume 2: Highways in the Coastal Environment: Assessing Extreme Events (p)
- Transportation Engineering Approaches to Climate Resiliency (p)
- Hydrology efforts w/NWS, climate engineering analyses in Gulf Coast 2 & Post Sandy project, pilots (p)
FHWA’s Climate Change & Extreme Weather Vulnerability Assessment Framework (2012)

1. Define Project Scope
   • Objectives
   • Relevant Assets
   • Climate Variables

2. Assess Vulnerability
   • Climate Inputs
   • Asset data, criticality, sensitivity
   • Vulnerabilities, risk

3. Integrate Vulnerability Into Decision Making
Climate Resilience Pilot & Other Project Locations

Hurricane Sandy Project
- GBRC
- SWRPC
- NYMTC
- NJTPA
- NJ DOT
- NY DOT
- CT DOT

Mid Region COG (Scenario Planning Project)
- Metropolitan Transportation Commission

North Central Texas COG
- South Alabama RPC (Gulf Coast 2 Project)

Capital Area MPO
- Hillsborough County MPO
- Broward MPO
Gulf Coast 2 Project (Mobile, AL)

- **Primary Phase 2 Tasks**
  1. Identify critical transportation assets in Mobile (complete)
  2. Identify climate effects, assess infrastructure sensitivity (complete)
  3. Assess vulnerability of critical assets (Summer 2014)
  4. Develop transferable risk management tools (Summer 2014)

- **Completed tasks:** FHWA website

Phase 2 performed by ICF International (prime), Parsons Brinckerhoff, South Coast Engineers, and Texas A&M, with support from USGS and Katharine Hayhoe (Texas Tech)
Sample of Storm Surge Analyses, etc.

- Scenarios based on historic hurricanes, with varying
  - Track
  - Intensity
  - Sea level rise

- Temperature, precipitation projections

Hurricane Katrina Natural Path Scenario

Hurricane Katrina Shifted Path Scenario with 0.75 meter Sea-Level Rise
Vulnerability Assessment: Planning & Project levels

Vulnerability Screen
- High-level analysis to find assets most likely to be vulnerable to future changes

Engineering Assessments
- Detailed assessments of specific assets in Mobile
- Eleven case studies
Tools Development and Deployment

Module 1

Module 2

Module 3

Module 4

Module 5

Module 6

Sensitivity Matrix

Criticality Guidance

CMIP Climate Data Processing Tool

Vulnerability Assessment Scoring Tool

Engineering Case Studies

http://www.fhwa.dot.gov/environment/climate_change/adaptation/
Technical guidance: HEC-25 Volume 2

• Highways in the Coastal Environment: Assessing Extreme Events
• Technical guidance, methods for incorporating extreme events and climate change into coastal highway designs
• Focus on sea level rise, storm surge, wave action
• Summer 2014
Asset Management

• All State DOTs will develop asset management plans that address risks. Examples of risks:
  – Financial, Under-investment in maintenance, etc.
  – Economic
  – Seismic
  – Extreme weather
  – Climate change (worse and/or more frequent EWE, etc.) - accelerated deterioration cycles

• Virtually all 50 States have used Emergency Relief funds for weather related damage over the last decade
Implications

• Environmental conditions will change
  – Local road; Interstate; Major bridge
• Climate change will affect maintenance cycles, investment decisions on when/where to invest, reconstruct
  – Added uncertainty (e.g., multiple scenarios)
  – Expect higher maintenance and operations costs; potentially costlier designs
• Adaptation can save funding over the long term
  – Emphasize proactive strategies vs. reacting to “disaster”
  – Focus on solutions
Thank you.

http://www.fhwa.dot.gov/environment/climate_change/adaptation/