FHWA Climate Change Adaptation Activities and Lessons Learned

Transit and Climate Change Adaptation Webinar
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FHWA and Climate Change Adaptation

Goal: systematic consideration of climate change vulnerability and risk in transportation decision making

- Systems level (Metropolitan, Statewide planning) & individual projects, as appropriate

• Motivations
  - Internal: protect integrity of transportation investments, safety
  - External: CEQ guidance on addressing climate change in NEPA and Adaptation Planning

• Interdisciplinary cooperation is key to effort
  - Represents cooperative effort of multiple offices in FHWA, U.S. DOT, AASHTO, AMPO, and partnerships with science agencies such as USGS
FHWA Adaptation Initiatives

- FHWA is developing and sharing information on tools and methodologies that states and MPOs can use to assess risk and prioritize actions:
  - Climate projections
  - Critical asset identification
  - Vulnerability assessment methodologies

Source: City of New York
Regional Climate Change Effects (2010)

• Report synthesizes information on climate change projections for transportation decision makers
  ▪ Snapshot: Summarizes recent science

• Projected changes by region
  ▪ Annual, Seasonal Temperature (change in °F)
  ▪ Seasonal Precipitation (% change)
  ▪ Where information exists:
    • Sea level rise, Storm activity

• Also includes information at local, state scales

• Received assistance from climate experts at NOAA, USGS, DOE, etc.

http://www.fhwa.dot.gov/hep/climate/climate_effects/
How Can This Information Be Applied?

- Inform planning efforts with a consistent set of projections
- Inform consideration of vulnerability of key assets
- Not detailed/certain enough for definitive decisions on specific projects
Vulnerability/Risk Assessment Conceptual Model

- **Goal:** Help transportation decision makers identify vulnerable assets and adaptation strategies
  - most exposed to the threats from climate change; and/or
  - could result in the most serious consequences as a result of those threats
- Conceptual model completed
- Pilots - Use by State DOTs and MPOs (2010-2011)
- Update the conceptual model

Vulnerability/Risk Assessment Conceptual Model

- Develop inventory of infrastructure assets
- Gather climate data
- Assess vulnerability and risk of assets to projected climate change
- Analyze, prioritize adaptation options
- Monitor and revisit
Climate Change Vulnerability and Risk Assessment Pilot Locations

WASHINGTON

CALIFORNIA
San Francisco

HAWAII
Oahu

NEW JERSEY

HAMPTON ROADS

CENTRAL COASTAL

VIRGINIA

Hampton Roads

VIRGINIA
Pilot: New Jersey DOT

- **Study Areas:**
  - New Jersey Coastal
  - Central New Jersey

- **Partners:**
  - New Jersey DOT
  - North Jersey Transportation Planning Authority,
  - South Jersey Transportation Planning Organization,
  - Delaware Valley Regional Planning Commission,
  - New Jersey Department of Environmental Protection
Pilot: Metropolitan Transportation Commission

- Focus on San Francisco Bay
- Complements a NOAA funded sub-regional project
- Partners:
  - MTC,
  - CalTrans District 4,
  - San Francisco Bay Conservation and Development Commission,
  - NOAA,
  - Association of Bay Area Governments,
  - Bay Area Air Quality Management District
Gulf Coast Project Examines Issues at Metropolitan Scale

• **Phase 1**
  - Overview of climate change impacts on transportation infrastructure in central Gulf Coast (completed 2008)

• **Phase 2**
  - Focus on one metropolitan area – Mobile, AL
  - Development of adaptation tools and strategies that will be transferable to other areas
  - Timeframe: 2010-2013
Task 1: Identify Critical Transportation Systems

- Delineate important assets
- Develop scoring summary based on available data
- Apply engineering judgment to fill data gaps
- Consider redundancy

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<th>Facility List</th>
<th>Facility A</th>
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<tr>
<td>SocioEconomic</td>
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<td>Ops.</td>
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<td>Health and Safety</td>
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Component List:
- Component of National/International Commerce System
- Important Multi-Modal Linkage
- Functions as Community Connection
- No System Redundancy
- Serves Regional Economic Centers
- Functional Classification (Interstate, etc.)
- Usage
- Identified Evacuation Route
- Component of Disaster Relief and Recovery Plan
- Identified Hazardous Materials Route
- Component of National Defense System
- Provides Access to Health Facilities
Task 1: Identify Critical Transportation Systems (continued)

- What is “critical” will vary by community
- Important to consider community priorities as well as traditional measures
- Professional judgment is important:
  - Cannot always find data for the “boxes”
  - Not all critical criteria are quantifiable
Task 2: Projected Climate Data

- **USGS providing statistically downscaled projections for T and P**
  - 4 to 7 Climate models (PCM, Hadley, …)
  - 3 emission scenarios (A1fi, A2, B1); 3 time horizons out to 2100
  - Secondary variables calculated from daily T and P, e.g., 24-hr precip with 5%/yr prob

- **Sea level rise analysis**
  - Range of recent global SLR scenarios used
  - Accounts for local subsidence

- **Storm Surge Modeling – ADCIRC**
  - Range of storm intensities
  - Output includes surge distribution and dynamics

- **Wave Modeling – STWAVE**
  - Inputs from ADCIRC output and boundary conditions
  - Outputs include key aspects of wave energy

- **Exposure of transportation systems will be assessed using a GIS analysis**
Lessons Learned: Needed Data Can Be Difficult to Obtain

• Site specific climate projections are difficult to find
  ▪ Downscaling global models is a complex activity
  ▪ Universities are often important players in developing this data – have been partners in many assessments (Washington State and Oahu pilots, for instance)

• Transportation asset inventory data time consuming to assemble
  ▪ Many different sources even within one agency
  ▪ Many different formats
  ▪ LIDAR data does not capture all needed details
Lessons Learned (continued)

• Interdisciplinary cooperation is key
  - Need to include science information, engineering specifications, planning processes, etc.
  - Multi-disciplinary stakeholder communication is not easy
  - Understand existing decision-making processes and frameworks

• Impacts and concerns will vary by region – no one-size-fits-all answers
Lessons Learned: Embrace the Uncertainty

- Must be comfortable with range of climate projections
- Not all climate trends are clear
Thank You


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