FHWA Resilience Programs, Policies, & Projects

TRB 2019 Annual Meeting
Resource Conservation and Recovery Committee Meeting
Wednesday 8:00 AM - 12:00 PM
Marriott Marquis, Independence E (M4)

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Sixteen Billion-Dollar Disasters in 2017

This map denotes the approximate location for each of the 16 billion-dollar weather and climate disasters that impacted the United States during 2017.
What is Resilience?

Resilience: the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions.
1) Program and policies
2) Projects and resources
3) Q&A
Integrating Resilience

Goal: Integrate consideration of resilience in transportation decision making

- In support of 23 U.S.C. § 503(b)(3)(B)(viii), which directs the U.S. Department of Transportation “to carry out research and development activities … to study vulnerabilities of the transportation system to … extreme events and methods to reduce those vulnerabilities.”

Planning
- Long Range Transportation Plans
- Asset Management Plans

Project Level
- Environmental Processes
- Engineering
- Design

Operations and Maintenance
- Emergency Response
Extreme Weather Resilience Policy

- USDOT FY 2018-22 Strategic Plan: “DOT will increase its effectiveness in ensuring that infrastructure is resilient enough to withstand extreme weather”
- FHWA Order 5520 commits FHWA to integrating extreme weather risk consideration into programs
- Extreme weather resilience eligible for FHWA funds

Flooding from Harvey, Credit TTI
Risk-based **asset management** plans must address risks associated with current and future environmental conditions (23 CFR 515)

Assets requiring repeated repair require **evaluation of alternatives** (23 CFR 667)

State and metropolitan **transportation planning** should now include resilience as a planning factor (23 USC 134, 23 CFR 450)

**Metropolitan transportation plans** shall include an assessment of capital investment and other strategies to… reduce the vulnerability of the existing transportation infrastructure to natural disasters (23 CFR 450.324(f)(7))
Project: Integrating Resilience into the Transportation Planning Process

https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/planning/

- Workshops and Peer Exchanges
- White Paper
- Q&A Document (February 2019)
- Case Studies (February 2019)
- Handbook (March 2019)
Approaches to Incorporating Resilience in Planning

- Include resilience in transportation plan goals and objectives
- Identify, evaluate, and adopt strategies to address identified vulnerabilities
- Screen projects during planning to avoid making investments in particularly vulnerable areas
- Include resilience in the criteria for evaluating projects for funding
- Consider future environmental conditions in corridor planning studies
Integrating Resilience in Asset Management

Project: Asset Management and Resilience

• Pilot projects and associated reports (Early 2019)
  • Arizona
  • Texas
  • Kentucky
  • Maryland
  • New Jersey
  • Massachusetts

• Guidebook on addressing resilience in Asset Management (Summer 2019)
Include resilience focus in two sections of required State Transportation Asset Management Plans (TAMPs):

- **Risk management plan**…that identifies at a minimum risks associated with current and future environmental conditions, extreme weather events, etc. (23 CFR Part 515.7(c))

- **Life-cycle planning**, which should include a range of factors that could affect whole life cost of assets, including current and future environmental conditions, extreme weather events, etc. (23 CFR Part 515.7(b))

First complete TAMPs due June 2019
Integrating Resilience in Project Design

- **Transportation Engineering Approaches to Climate Resiliency (TEACR)**
  - Overall lessons learned for engineering
  - Coastal Hydraulics
  - Riverine Flooding
  - Pavements and Soils
  - Mechanical and Electrical Systems

- **HEC 25**: Highways in the Coastal Environment, V2
  - How to incorporate extreme events in coastal design
  - Sea level rise, storm surge, wave action
  - 3 approaches (low, medium, high level of effort)

- **HEC 17**: Highways in the River Environment
  - Strategies ranging from sensitivity analysis with higher discharges to integrating climate model rainfall projections into local hydrologic models
Approaches to Integrating Resilience in Project Design

Engineering-Focused Case Studies

- Gulf Coast 2 Study
- Adaptation Pilots
- Post-Sandy Resilience Study
- TEACR
Assessments:
- I-10 Bridge and wave action (AL)
- Living shoreline and sea level rise (NY)
- Pavement overwashing (FL)
- Pavement and drought (TX)
- Precipitation and slope stability (VA)
- Forest fire and debris loading (CO)
- Pavement and freeze-thaw (ME)
- Pavement, permafrost thaw (AK)
- Economic Analysis (ME)
FHWA Post-Hurricane Sandy Transportation Resilience Study

- Damage/disruption assessment based on recent storms
- System-level vulnerability and risk assessment
- Subarea vulnerability and risk assessment; one each in CT, NY, and NJ
- Facility-level engineering informed assessments

For more information see: https://www.fhwa.dot.gov/environment/sustainability/resilience/publications/hurricane_sandy/fhwahrep17097.pdf
Nature-based Resilience for Coastal Highways

Project: Research and technical assistance to help state DOTs and MPOs implement nature-based solutions to protect coastal highways from storm surge and sea level rise.

- Build off USACE and NOAA work
- 5 pilot projects completed
  - OR DOT
  - ME & NH DOTs jointly
  - MS DOT
  - DE DOT
  - US Army Corps of Engineers in NJ
- White paper, Winter 2018
- Regional peer exchanges, Spring 2018: AL, CA, DE, NC
- Implementation guide, 2019

For more information see: https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/green_infrastructure/index.cfm
Why talk about nature-based solutions (also called green infrastructure)?

- May be cheaper; effective; more adaptable; co-benefits for habitat, fisheries, recreation

**Integrated Approach:**
- **Structural** (e.g. armoring, raise road, widen culvert, pavement materials)
- **Natural features**: (e.g. wetlands, dunes)
- **Nature-based features**: built in coastal areas by acting in concert with natural processes (e.g. wetland restoration, artificial reefs, beach nourishment)
- **Non-structural** (e.g. land use policies, infrastructure siting, insurance policies)
Integrating Resilience into Emergency Response

FHWA Resources:

- FHWA ER Manual
- ER and Resilience FAQ
- FHWA ER Order
- 23 CFR 667

Two ways ER funds can be used to improve resilience when repairing/rebuilding damaged highway:
1. Bring up to current standards
2. Cost-effective betterment (would save FHWA ER program money over time)

“The FHWA supports planning, designing and constructing highways to adapt to current and future climate change and extreme weather events under the Federal-aid program. Features that will improve the resilience of repaired federal aid highways should be considered and evaluated consistent with risk, cost effectiveness and regulatory conditions. The evaluation should apply the best available scientific and economic information to forecast and assess future risk factors.” FHWA ER Manual, p60.
1. Prior to disasters, ensure transportation plans and asset management plans include resilience.

2. Ensure State has completed evaluation of facilities repeatedly requiring repair, as required by 23 CFR 667.

3. When developing Detailed Damage Inspection Reports (DDIR), discuss the cause of the asset failure and likelihood of recurrence. Discuss potential for resilience improvements.

4. Develop and review cost effectiveness analyses for betterments.

5. After the emergency event, ensure the DOT updates the 667 evaluation.

6. Share best practices with other States through FHWA’s ongoing technical assistance and information sharing webinars, case studies, and trainings.
Vulnerability Assessment and Adaptation Framework, 3rd Edition

- Provides an in-depth and structured process for conducting a vulnerability assessment.
- Features examples from assessments conducted nationwide.
- Includes links and references to related resources and tools.
Vulnerability Assessment Studies

Map showing various transportation agencies and regions across the United States involved in vulnerability assessment studies. Agencies include WSDOT, Oregon DOT, Caltrans, MnDOT, Iowa DOT, Michigan DOT, NYSDOT, MassDOT, Maine DOT, CT DOT, and more.

Regions and projects mentioned include:
- 2010-11 Pilot
- 2013-15 Pilot
- Special Studies
- Post-Sandy Project
- USDOT Gulf Coast Study Phases 1 and 2
- Vulnerability Assessment Studies

Agencies and regions highlighted include:
- WSDOT
- Oregon DOT
- Caltrans, D1
- MTC
- Arizona DOT
- NCTCOG
- USDOT Gulf Coast Study Phases 1 and 2
- Hillsborough MPO
- South Florida MPOs
2018 Resilience and Durability Pilots

Lead Agency:
- = MPO
- = DOT
= Federal

Type of Project:
- Integrating resilience and durability into agency practices.
- Using available tools and resources to assess the vulnerability and risk of transportation projects or systems.
- Deploying a resilience solution and monitoring performance.
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WASHINGTON, DC
TRANSPORTATION RESILIENCE 2019
An international conference on natural hazards & extreme weather events

CONTRIBUTE
Submit your ideas for conference topics and tracks online now at www.TR2019.org

PRESENT
Solicitation for Abstracts will commence in March 2019. More information will be forthcoming from TRB and will be posted on the TR2019 website.
THANK YOU!

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