



U.S. Department of Transportation
Federal Highway Administration
Office of Infrastructure

FHWA Approaches for Addressing Extreme Weather Resilience in Asset Management

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FHWA



Undertaking Certification Review Using the Posted Guidelines

- Divisions are reviewing and certifying the State's processes using the FHWA Certification Guidelines.
- A question to ask is: Do the processes described in the Initial TAMP meet the requirements (Required Elements)?
- Examples: Does this describe the process sufficiently ... leadership has identified the top risks to the agency?

Ex: Risk Management Analysis

The TAMP must describe a methodology for:

- 1) **Identifying risks** that can affect condition of NHS pavements and bridges and the performance of the NHS,
- 2) **Assessing risks** in terms of the likelihood of their occurrence and their impact;
- 3) Evaluating risks to **prioritize** them;
- 4) Developing a **mitigation plan** for addressing the top priority risks;
- 5) **Monitoring** the top priority risks;
- 6) **Considering the results** of the 23 CFR 667 evaluation of facilities repeatedly damaged by emergency events

Asset Management, Risk, and Resilience

- ...Risk-based asset management can be used to manage a number of threats, including seismic risks and extreme weather events. By understanding the asset's vulnerability to these threats and of the economic impacts of damage, resources can be prioritized to address those with the highest likely impact per dollar expenditure. By spending up-front to increase resilience, DOTs can save over the long run by avoiding higher future costs. Additionally, there would be substantial benefits in terms of mobility and safety for the traveling public due to infrastructure closures that would be avoided. (Asset Management - Final Rule, Federal Register, pages 73259 and 73260)

Requirements to Address Extreme Weather Event Risks (23 CFR 515.7, 9)

Initial TAMPs (2018), States shall establish processes for developing

- **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 (2019)

- Risk management analysis
- Life cycle planning analysis

Is Resilience an Issue for my State? (Yes.)

Extreme weather leads to disruptions of transportation systems across the country...



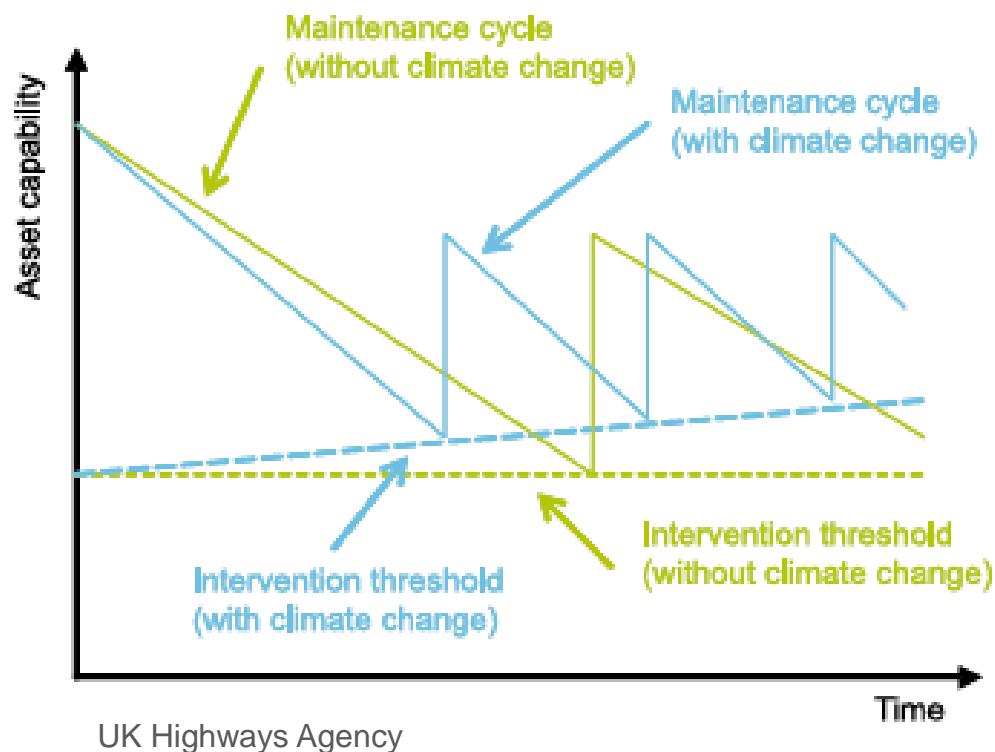
...and acceleration of deterioration rates.

- Impacts of extreme weather are being felt now, and will accelerate significantly in the future.

- National Academy of Sciences and *National Climate Assessment*

Acceleration of Deterioration Rates

- Caused by extreme weather events & more gradual changes in environmental conditions
- More frequent interventions, \$



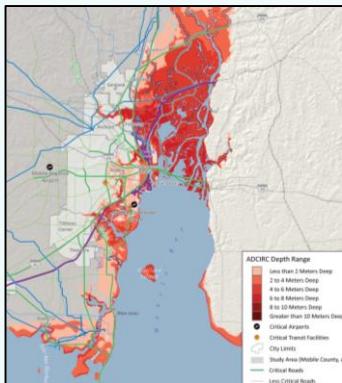
Information Sources for Current & Future Environmental Risk and Life Cycle Planning

- Studies of transportation resilience to future conditions
 - State DOTs
 - MPOs
 - FHWA
 - *Climate Science Special Report* (2017, part of the 4th National Climate Assessment).
 - Other Resilience studies

FHWA Resilience Resources

Research

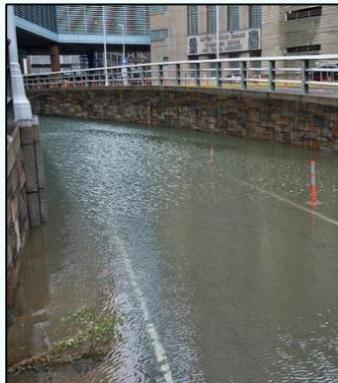
Gulf Coast 2 Study



Resilience Pilots with State DOTs & MPOs



Hurricane Sandy Project

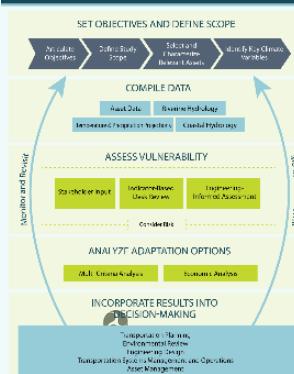


Engineering Assessments Study



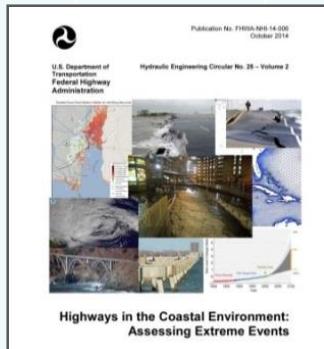
Vulnerability & Adaptation Framework

VULNERABILITY ASSESSMENT AND ADAPTATION FRAMEWORK

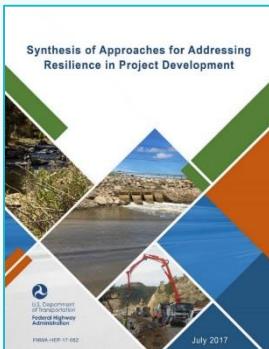


Resources

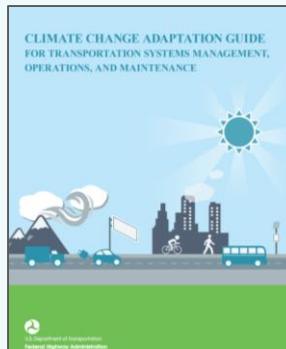
Engineering Guidance (HEC-25 & 17)



Project Development



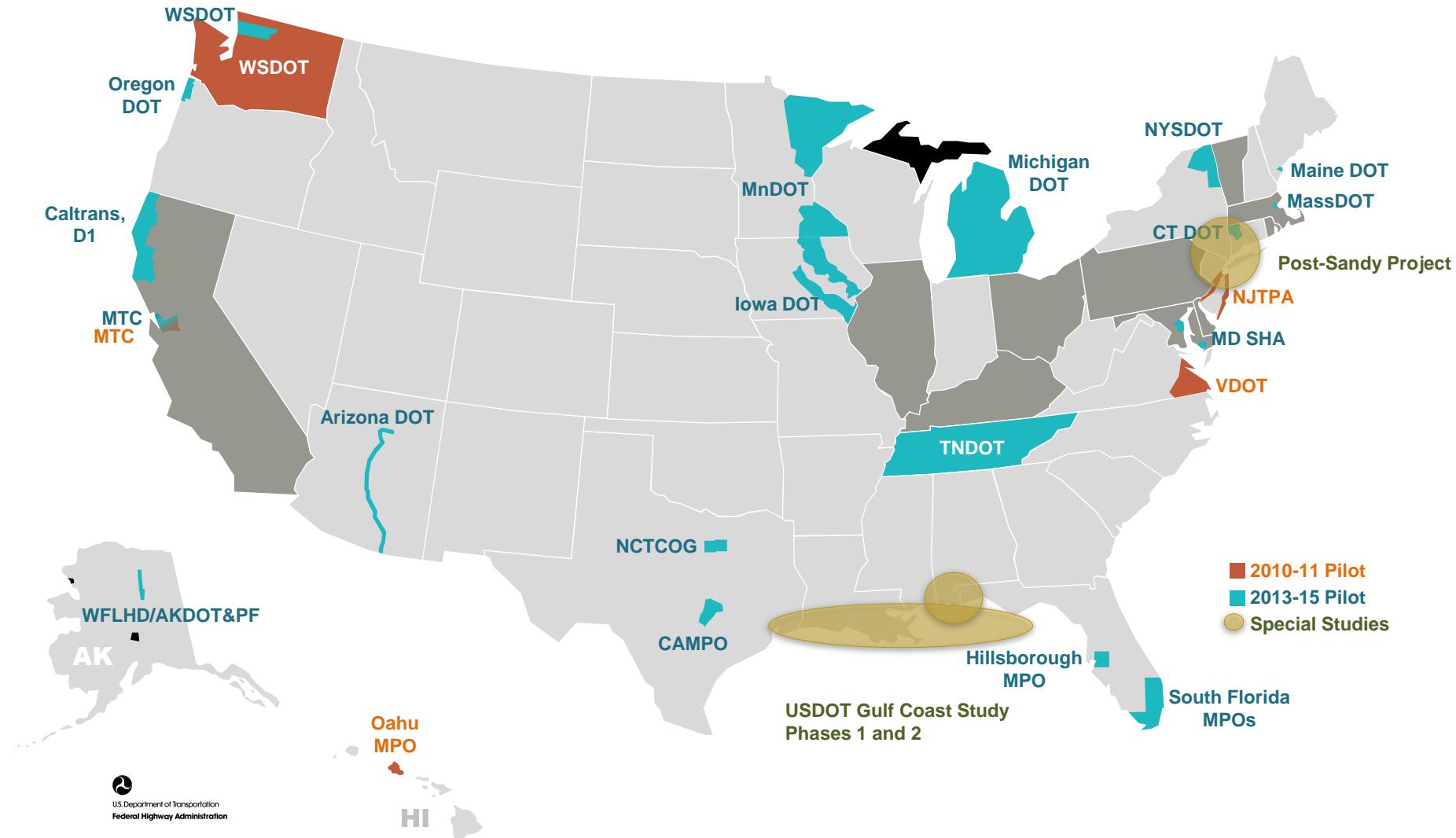
Operations & Maintenance



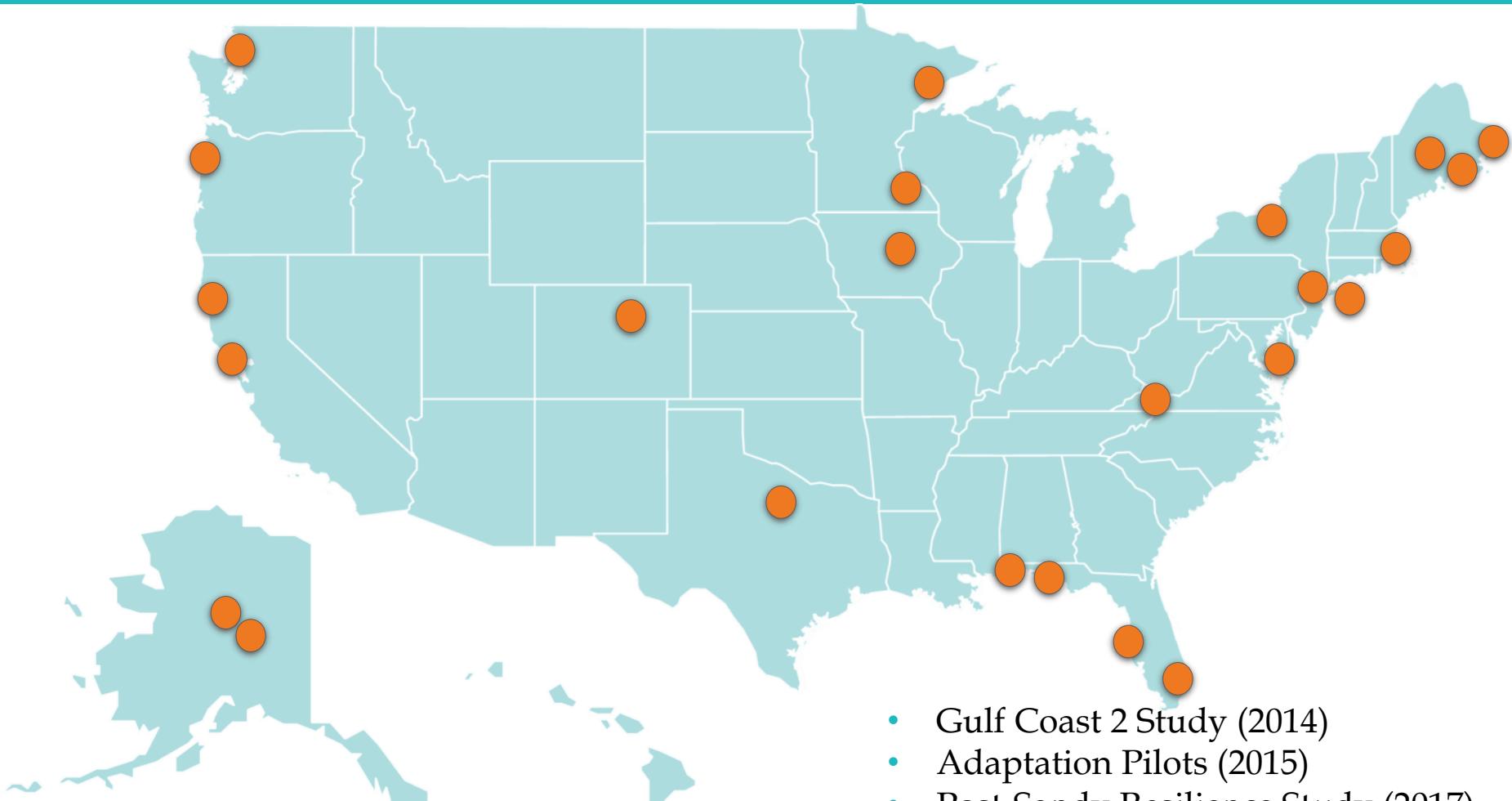
Guidebooks under development on integrating resilience in:

- Asset Management
- Transportation Planning
- Nature-based solutions

Vulnerability Assessment Studies



Engineering-Focused Case Studies



- Gulf Coast 2 Study (2014)
- Adaptation Pilots (2015)
- Post-Sandy Resilience Study (2017)
- TEACR (2017)

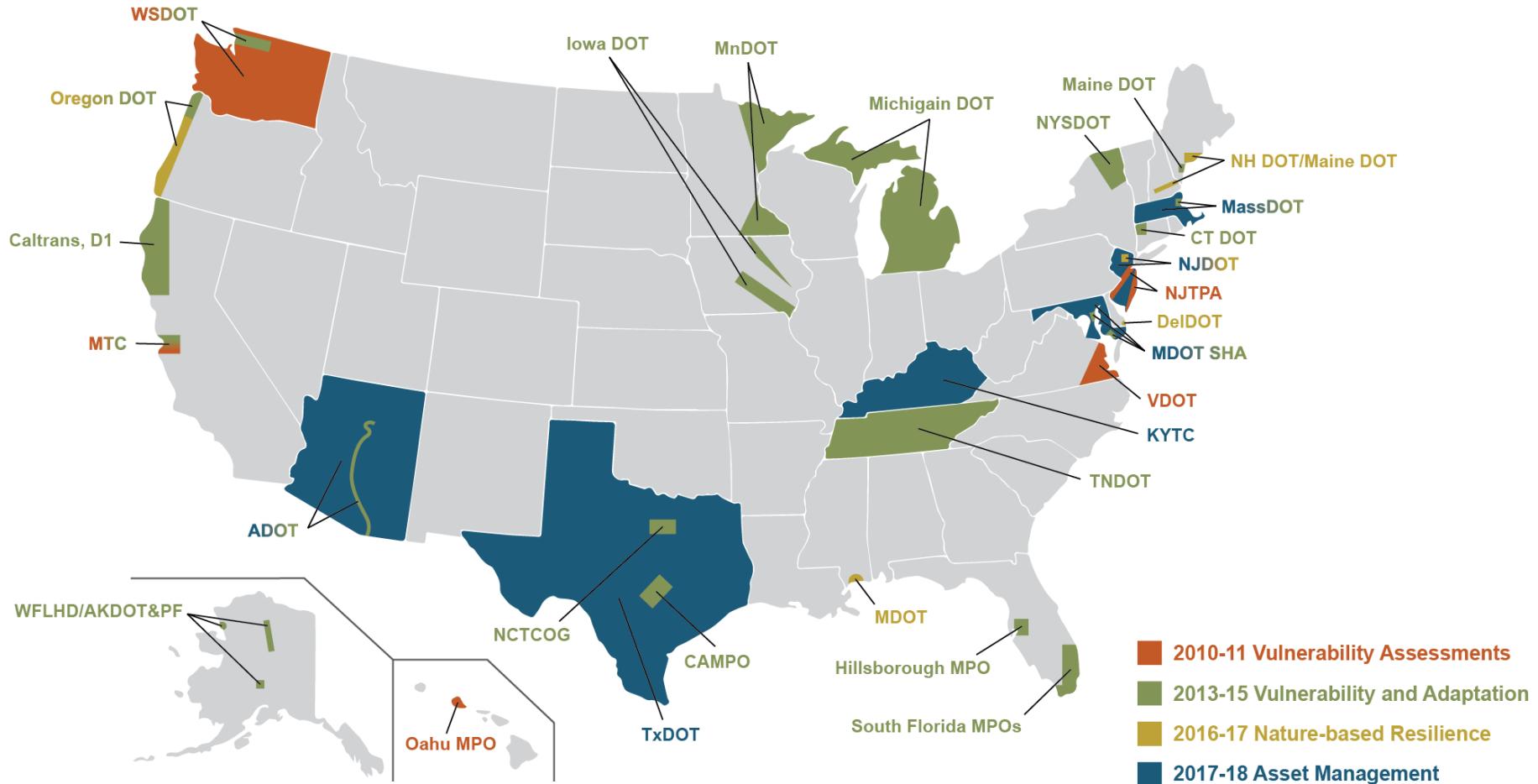
Six Asset Management and Resilience Pilot Projects, Guidebook

- Arizona DOT
 - Integration of extreme weather risks into Asset mgt practice
 - Assessment of costs as part of life cycle planning
 - Consideration of proxy indicators for identifying resilience concerns
- Kentucky Transportation Cabinet
 - Use of vulnerability assessment in development of risk register
 - Consideration of the effect of extreme weather events on asset deterioration rates and LCP
- Massachusetts DOT
 - Assessment of resilience of bridges, culverts and roads to inland flooding risks, inclusion in asset management systems.
 - Culvert inspection protocols and test out proxies for vulnerability
- Maryland SHA
 - Development of methods to pull coastal vulnerabilities and hazards into bridge and pavement management systems
 - Update of life cycle management plans to reflect future environmental risk

Six Asset Management and Resilience Pilot Projects, & Guidebook

- New Jersey DOT
 - Reduce system risk by linking management of culverts and drainage systems to extreme weather and climate resilience
- Texas DOT
 - Assessment of vulnerability of critical assets to extreme weather events in Houston district, inform asset management practices including LCP, deterioration curves
- Final Pilot Reports (late 2018)
- Guidebook on addressing Resilience in Asset Management (2019)

Asset Management and other Resilience Pilots



Resilience & Asset Management Resources

- Asset Management, Extreme Weather, and Proxy Indicators Pilot Program (2017-2019)
- Guidance on Incorporating Risk Management into Transportation Asset Management Plans (2017)
- Guidance on Using a Life Cycle Planning Process to Support Asset Management (2017)
- Risk-Based Transportation Asset Management Reports: Building Resilience into Transportation Assets (2013)
- [AASHTO](#):NCHRP 25-25 (94) Integrating Extreme Weather into TAMPs (2015)

Resilience Resources (FHWA)

www.fhwa.dot.gov/environment/sustainability/resilience/

- Adaptation Framework, 3rd editions (2017)
- Pilot reports (four sets of reports, since 2011)
- Post-Hurricane Sandy Transportation Resilience Study of NY, NJ, and CT (2017)
- Gulf Coast 2 study (2014)
- Synthesis of Approaches for Addressing Resilience in Project Development & related engineering studies (2017 and earlier)
- Highways in the River Environment - Floodplains, Extreme Events, Risk, and Resilience, 2nd Edition (2017)
- Highways in the Coastal Environment: Assessing Extreme Events: Volume 2 (2014)
- Nature-based Resilience for Coastal Highways (2018, etc.)

Asset Management Resources

- Guidance and Informational Materials
 - FHWA Office of Asset Management Website
www.fhwa.dot.gov/asset/index.cfm
 - Certification Guidelines found at:
www.fhwa.dot.gov/asset/guidance/certification.cfm
 - Formal Training
 - NHI Transportation Asset Management Training Courses
 - FHWA TAMP Implementation Workshop
 - Technical Assistance
 - On Demand, Tailored Technical Assistance from the Resource Center (e.g.—support to Divisions on initial TAMP reviews)



Source: Microsoft PowerPoint

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