**American Association of State Highway and Transportation Officials**

**Special Committee on Research and Innovation**

**FY2025 NCHRP PROBLEM STATEMENT TEMPLATE**

**(*see instructions for guidance on using this template)***

1. **PROBLEM STATEMENT TITLE**

Implementing Effective Community Resilience Performance Management

1. **KEYWORDS/TERMS** *– resilience, resiliency, community resilience, performance management, measures, KPIs*
2. **RESEARCH OBJECTIVE**This research seeks to clarify and refine what it means to have an effective, outcome-based, high-level performance management approach to resilience. Toward this end there are three essential parts:
3. Confirming definitions. For example, is resilience an inverse of vulnerability? Or does it imply an inverse of sensitivity and adaptive capacity (e.g., per the Vulnerability Assessment Scoring Tool [VAST])? If resilience is infinite, is exposure irrelevant? Consistent with the VAAF, is there consensus on the definitions for risk, criticality, consequence, and other essential terms? Through these definitions, resilience measures will be compared and contrasted with risk and related performance areas.
4. Community mobility, or mobility and destination access across a jurisdiction of any size, for all users and modes. This is distinct from infrastructure-focused resilience for a specific asset, e.g., a bridge. For a community subject to natural or human-caused disasters, how can they know whether they are more or less resilient? Is there a role for the broader 4R concept of Robustness – Redundancy – Resourcefulness – Rapidity?
5. Effective performance measures. Define performance measures for the resilience community.. Agency leaders need relevant, feasible, and quantifiable evidence of improved resilience that is outcome-based and trackable over time. These metrics should measure continuous data in the form of substantive change and performance in resilience as opposed to activity metrics already in play or project-specific evaluations. Performance measures should also reflect disparate impacts to mobile communities or disadvantaged areas and populations.

In addition to developed guidance, this project will pilot the implementation of a high-quality resilience performance measure into existing performance management frameworks for up to five agencies. Not only states, but MPOs, e.g. Los Angeles and San Diego have promising initiatives already developed.

1. **URGENCY AND POTENTIAL BENEFITS**

Transportation resilience continues to grow in importance and this gap in practice needs to be addressed. Beyond natural hazards, this work should address increasing system demand (e.g., growing or shifting populations), technology and mobility advancement risks (e.g., new or changing modes), and institutional issues such as risk appetites and scarce resources.

This is proposed as an implementation project for NCHRPs 23-26 Measuring Impacts and Performance of State DOT Resilience Efforts, planned to be completed by the end of 2024. It may also be done in parallel with the new 23-35 Developing New Performance Metrics for Risk Management.

1. **BACKGROUND INFORMATION AND NEED FOR RESEARCH**

The research question seeks to answer what is an effective performance measure for transportation resilience in a community, state, or other jurisdiction? Progress toward solving these questions has been underway for several years, though failing to reach the desired outcome. The need for this research was further reinforced during the December 2022 AASHTO conference in Providence and the January 2023 TRB annual meeting, which included a handful of workshops and sessions that broached this subject. From the perspective of high-quality performance management practice, effective measures of resilience have been elusive.

While the community has established measures of resilience for specific infrastructure, organizations, or supply chains, the metrics and definitions are lacking for community mobility. This research will focus on how best to measure it, from a state-of-the-art performance management perspective, not just the easy but low-value event or activity tallies. Consider an agency or community investing in preparedness work, infrastructure hardening, or implementing a policy shift – what is the most effective, objective, outcome-based evidence for whether the jurisdiction is now more resilient than it was a year ago? While there are seeds of ideas, questions linger and have been raised by multiple agencies, PIARC, AASHTO committees, TRB committees, and surely others.

1. **LITERATURE SEARCH SUMMARY**

While there are several published resources referring to resilience performance, there remains a gap in effective performance measurement that this proposed research seeks to close.

*Disaster Resilience Framework Workshop*, 2015, San Diego. The workshop notes (unpublished) includes a section about Community Resilience Metrics.

*Vulnerability Assessment and Adaptation Framework (VAAF)*, 2017, FHWA HOP ([link](https://www.fhwa.dot.gov/environment/sustainability/resilience/adaptation_framework/)). An important go-to guide for anybody working on transportation resilience.

*Integrating Resilience into the Transportation Planning Process*, White Paper on Literature Review Findings, 2018, FHWA HOP ([link](https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/planning/integrating_resilience.pdf)). A good resource for background and context, including a history of Federal rules on resilience. This document correctly places performance measure formulation after goals but *before* solutions.

*Investing in Transportation Resilience: A Framework for Informed Choices,* 2021, NAS/TRB ([link](https://doi.org/10.17226/26292)). This also included a Committee on Transportation Resilience Metrics. The document includes some relevant points but is generally of limited value for performance management given its focus on project-specific evaluations and benefit-cost analysis.

*Mainstreaming System Resilience Concepts into Transportation Agencies: A Guide*, 2021, NAS/TRB ([link](https://doi.org/10.17226/26125)). Follows on a 2018 resilience summit in Denver. A wealth of information about resilience, but measurement appears limited to project-specific risk reduction.

*Developing Transportation System Climate Resilience Performance Measures*, 2022, Minnesota DOT ([link](https://rosap.ntl.bts.gov/view/dot/62737)). A survey showed most states do not have resilience performance measures. Those that do are not outcome-based.

*A Perspective on Quantifying Resilience: Combining Community and Infrastructure Capitals*, 2023, Gerges et al ([link](https://doi.org/10.1016/j.scitotenv.2022.160187)).

*Measuring Impacts and Performance of State DOT Resilience Efforts*, 2022-2024, NCHRP 23-26, underway ([link](https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5171)). Potentially valuable for this proposed research, but measures are not defined until after solutions and appear to focus only on monitoring project effects.

*Transportation Asset Risk and Resilience*, 2023-2026, NCHRP 23-32, pending/underway ([link](https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5361)). A relatively large effort to generate new guidance, which may or may not include performance.

There are many laws, rules, references, and guidance documents going back many years, and right up to the current PROTECT Program guidance. The Further Consolidated Appropriations Act (2020), H.R.1865, calls on the “Secretary of Transportation to enter into an agreement with the National Academies of Sciences, Engineering, and Medicine to conduct a study through the Transportation Research Board on effective ways to measure the resilience of transportation systems and services to natural disasters, natural hazards, and other potential disruptions.”

Be wary of two tangents in literature: those focused solely on infrastructure and others about operational/organizational resilience, which are mostly unhelpful and distracting. Apart from published guidance, this research project will include a scan of select agencies to gather more evidence and examples, including efforts to integrate transportation resilience with broader initiatives like communication and energy infrastructure.

1. **LINK TO 2021-2026 AASHTO STRATEGIC PLAN**

This project would advance goals identified in the AASHTO Strategic Plan, most specifically the goal of “Safety, Mobility and Access for Everyone” that includes “strengthen resiliency.” This project would also support several strategies in the Strategic Plan, including establishing frameworks and tools to enable impactful policy decisions, supporting implementation within member agencies, advocating to minimize the impacts of climate change, and applying scenario planning to better weigh options in decision-making.

1. **IMPLEMENTATION CONSIDERATIONS AND SUPPORTERS**

This research would primarily be used by transportation agencies and others responsible for implementing resilience performance measures and management systems and build on some of the research conducted on other projects. Recently completed NCHRP Project 23-09 established a framework and research roadmap for assessing risk to agency assets and the traveling public from extreme weather, climate change, and other threats and hazards. Follow-on NCHRP Project 23-32 Asset Risk & Resilience will develop the technical resource in three phases, including planning, execution, and final product development. As described above, this research should be conducted along a parallel and complementary timeline. Critical implementation elements include a communication plan to ensure awareness of the research products and TRB, FHWA, and AASHTO webinars to share the findings. As this work emphasizes resilience measures that are outcome-based and trackable over time, implementing organizations that are expected to monitor performance over time may benefit from collaboration.

A subsequent phase of this research funded through NCHRP 20-44 may be helpful to disseminate the research findings more broadly and develop case studies showing the use of the research guidance. There are several other AASHTO and TRB committees interested in resiliency that would likely support this project, including:

* AASHTO
  + Committee on Performance Based Management (CPBM) Task Force on Emerging Performance Measures - Deanna Belden, Minnesota DOT and Kelly Travelbee, Michigan DOT, Co-Chairs
  + CPBM Subcommittee on Risk Management
  + Committee on Transportation System Security and Resilience (CTSSR)
  + Committee on Planning
  + Highways and Streets Council
  + Subcommittee on Asset Management
* TRB
  + Strategic Management (AJE10) - Steve Woelfel, Massachusetts DOT, Chair
  + Performance Management (AJE20) - Michael Grant, Chair
  + Asset Management (AJE30)
  + Risk Management (ATO40)
  + Critical Infrastructure Protection (AMR10)
  + Extreme Weather and Climate Change Adaptation (AMR50)
  + Transportation Planning Policy and Process (AEP10)
  1. Communication and Implementation Funding:
  2. Communication and Implementation Period:

1. **RECOMMENDED RESEARCH FUNDING AND RESEARCH PERIOD**
   1. Research Funding: $300k
   2. Research Period: 24 months
2. **PROBLEM STATEMENT AUTHOR(s):** *For each author, provide their name, affiliation, email address and phone.*

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