



Summary of

AASHTO Resiliency Peer Exchange on Extreme Weather and Climate Impacts

November 6 - 7, 2017, Washington DC



RESILIENCY

*The ability to prepare and plan for, absorb, recover from,
or more successfully adapt to adverse events.*

EVENT SUMMARY

The American Association of State Highway and Transportation Officials (AASHTO) Resiliency Peer Exchange on Extreme Weather and Climate Impacts convened in Washington, DC on November 6 and 7, 2017. The goal of the exchange was to bring together transportation professionals from across the United States to discuss how resiliency is being addressed in state Departments of Transportation (DOTs). The definition of resiliency, in this context, follows the AASHTO definition: “the ability to prepare and plan for, absorb, recover from, or more successfully adapt to adverse events.”

State DOTs are threatened by extreme weather and climate impacts in completely different ways and may have varying resources or strategies to address these threats. This exchange was a gathering of a diverse array of DOT representatives who discussed the challenges and successes their states have faced in preparing for, managing and recovering from extreme weather events and, in some cases, anticipating the challenges expected from changes in climate. The meeting included participant breakout groups, speaker presentations, and panel discussions. Providing a variety of ways to exchange information led to multiple opportunities for participants to gain valuable perspectives and learn about best practices.

This document summarizes the outcomes of the peer exchange. Key lessons, challenges and recommendations include:

- Resiliency needs to be weaved into all DOT functions, including planning, design, operations, maintenance, and emergency response, as well as reflected in funding strategies.
- Disasters create opportunities for agencies to learn, improve and make their activities and systems more resilient.
- Agency leadership is critical for institutionalizing resiliency into an organization’s culture.
- Individuals at all levels of a DOT, including junior staff, can play roles in championing resilience approaches, methods, strategies and agency actions.
- Coordination and information sharing within the DOT and with external stakeholders is vital to foster effective resiliency strategies. This is even more important when attention to resiliency is siloed within different portions of a DOT, the way many peer exchange participants characterized their own agencies. DOTs should connect with partners before, during, and after crises.
- State DOTs are at various stages of integrating resiliency into agency actions. For some agencies, difficulties in creating a standalone resilience program has led to more efforts to incorporate resiliency concepts into existing activities.
- Conducting appropriate staff training is an important aspect of making DOTs more resilient.
- Many DOTs struggle to devote enough staff to resiliency activities.
- Framing resiliency in terms of risk, economic impacts, and return on investment can garner support, particularly in challenging political settings.
- Billions of dollars needed to make transportation systems more resilient, but funding remains limited.
- A substantial amount of helpful research on resiliency from recent years can help state DOTs enhance their resiliency efforts.
- Agencies often have trouble prioritizing high-importance but longer-term resiliency activities given competing shorter-term activities.
- Agency efforts at resilience should be proactive as well as responsive. Thus, state DOTs should plan for and anticipate likely needs during a weather-related disruption, as well as consider challenges to agency operations and program development posed by climate change.
- New or improved technologies provide potentially useful capabilities in planning for, responding to, and recovering from threats.
- As in most state DOT efforts, the availability of data will be an important challenge in assessing the vulnerability of transportation systems to weather-related disruptions.
- Agencies should be discussing and determining their risk tolerance for different types of events. Likewise, the concept of uncertainty needs to be better integrated into planning and decision making. This will be particularly relevant when considering potential climate change impacts in system planning and project design.
- Designers and engineers rely on manuals, AASHTO and Federal guidance, and other established procedures. Resilient design practices need to be incorporated into these resources.
- Asset management programs and efforts provide an opportunity to integrate resilience concepts into agency decision making.
- Emergency response approaches, responsibilities and coordination should be well thought out in a state DOT and response strategies should be practiced regularly.

BACKGROUND

PURPOSE AND INTENT

The AASHTO Resiliency Peer Exchange had two main purposes:

1. Share information and continue a national discussion: The AASHTO Resiliency Peer Exchange was funded and jointly hosted by the Federal Highway Administration (FHWA) and the AASHTO Center for Environmental Excellence, as a part of an overarching research plan. The event brought together a diverse set of transportation professionals from across the nation to discuss how extreme weather events and climate impacts affect their infrastructure, and began to identify strategies to reduce these impacts and increase system resiliency.
2. Compile a reference document: Practitioners shared experiences, saw presentations from leading agencies and discussed potential strategies for fostering resilient transportation systems. The lessons learned from these interactions are compiled into this document, which serves as a resource for attendees and other DOTs interested in creating a more resilient transportation agency. See the Event Summary above for a quick overview of these takeaways and lessons learned, and the Agenda Recap for more detailed summaries.

STRUCTURE OF THE PEER EXCHANGE

The two-day event consisted of a mix of formal presentations, participant break-out sessions and plenary discussions. Break-out sessions were organized around the following themes:

- What is the current state-of-practice in considering resiliency at state DOTs?
- What are the real and perceived barriers to creating resilient state DOTs? and
- What strategies can be considered for enhancing resiliency-oriented efforts at state DOTs?

Presentations were designed to share helpful examples of resiliency efforts and lessons learned. A discussion panel of current and former DOT chief executive officers (CEOs) focused on incorporating resiliency into core agency functions.

ATTENDEES

The peer exchange attracted 60 participants, with representatives from 28 states. There were five CEOs (three current, two former), six assistant or deputy secretaries/chief engineers or chiefs (Chief Information Officers (CIOs) or Chief Operating Officers (COOs)), one chief engineer, 12 other division/office directors and chiefs, and other managers and specialists. Three federal agencies participated: FHWA, Federal Transit Administration (FTA), and the National Institute of Standards and Technology (NIST). AASHTO, the Association of Metropolitan Planning Organizations (AMPO), the Port Authority of New York and New Jersey (PANYNJ) and the Transportation Research Board (TRB) also participated. Appendix A lists the attendees.

AGENDA RECAP

DAY 1, NOVEMBER 6TH, 2017

Welcome from AASHTO (Melissa Savage (AASHTO), Bud Wright (AASHTO), and Butch Waidelich Jr. (FHWA))

The Peer Exchange began with a welcome from AASHTO Executive Director Bud Wright, as well as FHWA's Executive Director Butch Waidelich, Jr. Bud Wright noted that more DOTs are starting to take an enterprise-wide perspective on resiliency, where such an approach incorporates resiliency concepts into all planning, design and construction activities. Given the experiences with recent hurricane and extreme weather events, it is important for DOTs to be proactive about increasing infrastructure resiliency.

Butch Waidelich provided the example of the Florida DOT (FDOT), which came away from its Hurricane Andrew experience with a new perspective on how to build traffic signal mast arms. Since the hurricane, FDOT has begun to strengthen the mast arm design in coastal areas, where they are subject to high wind and storm events. This resiliency action proved to be successful, with most mast arms surviving Hurricane Irma winds this year.

Another recommendation from Waidelich was the need to consider risk tolerance. For example, DOTs may be particularly concerned with high impact events that have a high probability of occurring (in other words they have a low risk tolerance). They also need to consider incidents that have a low probability of occurring but potentially significant consequences. Adequately dealing with risk remains a challenge, especially given uncertainty in future events.

Melissa Savage wrapped up the introductions by providing some background on the Center for Environmental Excellence and its resiliency work completed in partnership with FHWA. The Peer Exchange itself was the outcome of this collaboration. Savage also mentioned the AASHTO Committee on Transportation System Security and Resilience (TSSR).

Introductions (Paula Hammond (WSP))

Paula Hammond, formerly the CEO of the Washington State Department of Transportation (WSDOT) and chair of the Climate Change Steering Committee at AASHTO, acknowledged that DOTs are at different places in their level of resiliency integration. Hammond also mentioned that NCHRP is planning a resiliency summit in Denver, Colorado on October 8-10, 2018.

The Case for Resiliency to Extreme Weather Events (David Fletcher (GPC))

David Fletcher underscored the role of the National Cooperative Highway Research Program (NCHRP) in conducting national research on resiliency for AASHTO and DOTs. Over 75 NCHRP research projects on resiliency have been conducted, including 50 guidebooks and research documents and 5 products that were officially adopted by AASHTO. Approximately \$20 million has been spent on this work. Fletcher also mentioned a series of resiliency discussion papers released by TRB.

The "Understanding Transportation Resilience" report documented AASHTO's understanding of resiliency and provided a research strategy for NCHRP on the topic. The report emphasized that resilience touches many aspects of a DOT and that it can be challenging for staff to see beyond how resiliency impacts their specific roles and functions.



Much coordination is needed for a complex topic like resiliency. Federal efforts like the National Incident Management System (NIMS) for coordinating emergency responses provides a good example of how to achieve this coordination.

Fletcher highlighted three principles of resiliency: (1) one strategy is not sufficient; (2) one size does not fit all; and (3) one agency is not in charge (i.e., it must be collaborative). He also mentioned five myths of resiliency: (1) resilience is a system-wide problem; (2) you can engineer your way to resilience; (3) DOTs have not invested in transportation resilience; (4) resilience is just operations on steroids; and (5) “extreme weather resilience” is the new politically correct term for “climate change”.

Roundtable Discussions – The Current State of Resiliency at My DOT

When asked how resiliency is viewed at DOTs, participants responded that resiliency is regarded differently by different groups, with some efforts being more advanced in resiliency than others. Most or all state DOTs practice resilience in some form, though it is often organizationally siloed. States that experience more extreme weather events are often more involved with resiliency; there are often opportunities for institutions to change and incorporate resilience into their activities after extreme events. Operations, maintenance and emergency response divisions may also be more advanced in resiliency-related work. Many DOTs are working on, or have worked on, vulnerability assessments, but some states expressed the need for integrating resiliency agency-wide, including capital planning and project design.

DOT leadership is often supportive of resiliency efforts, and is a necessary element of institutionalizing resiliency into agency practice. Policy and staff directives have helped catalyze resiliency in different states; including creating committees on risk and resiliency, conducting pilot programs, and legislating resiliency measures and funding. Using weather or climate metrics to measure resiliency can build a case for more funding. Channels for gathering public input on extreme weather, such as mobile apps, can also be helpful.

Several states acknowledged that project prioritization is an important tool for allocating scarce resources, though it is a complex and imperfect process. Resilience should be incorporated into project prioritization.

While participants acknowledged that Federal efforts at resiliency have been reduced, such as changing the process for determining flood protection measures, the Fixing America’s Surface Transportation (FAST) Act resiliency requirements remain.

Participants recommended that the term resiliency should be paired with risk. Making the economic case for resilience, including discussing how disruptions to transportation facilities impact business and individuals, will help garner more widespread attention.

CEO Discussion Panel – Perspectives of Resiliency Across the Entire DOT Enterprise

Paula Hammond hosted a discussion panel with the following DOT CEOs (or former CEOs): Joan McDonald (former New York State DOT Secretary), Christy Hall (South Carolina DOT Secretary), Shawn Wilson (Secretary of the Louisiana DOTD), and Tom Church (Secretary of the New Mexico DOT). They answered and discussed questions posed by Hammond and the audience.

Key items discussed by the panel include:

- Some agencies have not formally defined resiliency, but instead integrate it into existing work. Others have been more explicit, including measures like adding emergency response responsibilities for staff from across an agency.
- Limited funding is a concern. State gas tax increases can be a helpful source of funding. Making an economic case for how resiliency funding benefits communities is an important step.
- Adaptation is often responsive rather than proactive, though agencies can leverage a post-emergency environment for increased funding and looser restrictions on permitting and procurement.

- Having an entire DOT leadership team, aside from just a CEO, on board with resiliency is critical. Getting staff throughout the agency to support resiliency is also important. Disaster response provides a good opportunity to show what a DOT can do during a critical time.
- After disasters, DOTs often have after-action reviews both internally and externally with multiple agencies. Discussion is often more pointed during internal meetings, though the latter are important for coordination. After-action meetings are often closed to the public, but there are usually ways that the public can provide input.
- Different DOT strategies for coordinating with the federal government included: 1) maintaining a good relationship with respective FHWA representatives; 2) taking a centralized approach to coordination by making the DOT's top administrator responsible for it; 3) involving FHWA in every step of the process, including embedding them in the damage assessment teams; 4) coordinating with FEMA; and 5) coordinating with the US Army Corps of Engineers (USACE) ahead of disasters.
- CEOs' five-year goals for resiliency included instilling a culture of resiliency; developing resiliency corridors; better funding of resiliency and increased spending on flood controls outside the right-of-way; and incorporating risk into asset management systems.

Changing Perspectives on Resiliency and Climate Impacts

Carol Lee Roalkvam (Washington State DOT)

Carol Lee Roalkvam identified sources of useful information on resiliency, including FHWA technical reports, AASHTO's materials, and local research organizations' information (e.g., WSDOT uses the University of Washington Climate Impacts Group for their climate projections).

Washington has done three FHWA climate adaptation pilot projects, with each using the FHWA Vulnerability Assessment Framework. WSDOT conducted a statewide vulnerability assessment focused on all hazards. The agency is beginning to incorporate climate projections into corridor plans, individual projects, and emergency management activities. WSDOT is also working climate change into its asset management planning and intends to update its hydraulics manual to include climate projections.



WSDOT has found that there are often direct co-benefits to adaptation projects. For example, expanding culverts to meet fish passage requirements helps with handling higher stream flows.

WSDOT is also working collaboratively with The Netherlands and FHWA on a green infrastructure assessment project using each country's adaptation framework.

Elizabeth Habic (Maryland State Highway Administration)

Elizabeth Habic spoke about resilience activities at the Maryland State Highway Administration (SHA) and across the state. Maryland has a working group on climate change and a Coast Smart Council, which requires that all structures be built at least two feet above the base flood elevation. There is also a Maryland Resiliency Partnership of state agencies collectively working to develop adaptation strategies. The University of Maryland is also required by state law to create climate projection reports every five years. State agencies must report annually on what they are doing about climate change. SHA also coordinates with the USACE Silver Jackets program on flood risk management.

Maryland was involved in an FHWA pilot study focusing on sea level rise, storm surge and precipitation. It used the FHWA's VAST tool to assess vulnerability and to develop a hazard vulnerability index for rating road vulnerability. They also modified the capacity or availability of highly vulnerable segments in their travel demand model to assess network impacts.

SHA is now starting to look in more detail at riverine flooding with a pilot study. The agency is also working on a pilot study with FHWA on asset management and climate change. Adaptation is not yet integrated into Maryland's Transportation Asset Management Plan (TAMP).

Roundtable Discussions – Challenges to Implementing Proactive Resiliency at my DOT

Participants mentioned that using the term "climate change" can be a barrier in some states, where elected officials can be hostile toward resiliency initiatives. Focusing the discussion on risk and on economic impacts is more likely to be effective in many settings.

It can also be difficult to create a standalone resiliency program, so some agencies have instead tried to incorporate resiliency efforts into existing activities. Similarly, defining staff roles on resiliency, making enough staff available, conducting training, and learning the language of different departments are key challenges.

Given that system resiliency regarding climate change is a long-term issue, agencies are trying to figure out how to deal with the short-term tradeoffs when paying for resiliency work. Agencies can have trouble navigating competing priorities and goals. Practical design and P3s may have perverse incentives working against resiliency.

Data limitations and challenges were also discussed. Planning for uncertainty is difficult. Engineers are accustomed to designing infrastructure to specific values. Also, climate science is also an area where DOTs do not traditionally have expertise. Climate-related datasets are often large and numerous, but they can be difficult to sort through and apply appropriately.



DAY 2, NOVEMBER 7TH, 2017

Moving Toward a Resilience-Oriented Agency (Josh DeFlorio (Port Authority of New York and New Jersey))

Josh DeFlorio reviewed the PANYNJ assets and scope, which includes a \$32 billion, 10-year capital plan. PANYNJ was impacted heavily by Superstorm Sandy with flooding at airports, ports, tunnels and the World Trade Center site. The agency developed short-term priority protective measures (PPMs) after Superstorm Sandy that were in place before the next hurricane season. Long-term permanent fixes were to be studied and implemented later. The PPMs include temporary and permanent flood walls, HESCO bastions (essentially large engineered sandbags), and coverings on floors to stop water from going down stairwells and other subterranean pathways at PATH train stations.

The PANYNJ Environmental Sustainability Policy from 2008 provides the internal legal basis for climate resilience. The agency created a report called *Design Guidelines Climate Resilience* in 2015. The report provides guidance on how to incorporate sea level rise projections into design. It superseded earlier (2009) guidance that specified simply adding an additional 18 inches of freeboard to everything. New edits to the guidance are coming soon. The guidelines are layered on top of building code requirements. Thus, to receive a recommended flood elevation, one takes the FEMA Base Flood Elevation value then adds the freeboard requirement from the building code (one to three feet, depending on asset criticality) and, in addition, the sea level rise amount.

Benefit-cost analyses are performed for high-value projects (over \$50 million), with PANYNJ's economic group conducting these analyses. The agency developed a manual for dealing with climate change risks in economic analyses.

In the 2019 work plan, PANYNJ intends to make the sea level rise and surge guidance more robust and incorporate additional climate stressors. Resiliency needs to be incorporated into its planning and asset management. PANYNJ has not yet conducted a vulnerability assessment of all its assets.

DeFlorio commented that it is a daily effort to convince people that resiliency is important. Considerable education and outreach efforts are directed at the project design teams. The agency looks to mentor more junior engineers to help foster a resiliency perspective in their professional career.

The budget envelope for projects does not consider resiliency, but PANYNJ has usually been able to fit it in without going over the initial estimates. There is no standard cost increment to incorporate resiliency on projects. Most increments are small, but some are large. In the large cases, the risk appetite must be evaluated by leadership and a decision must be made on whether to forego other capital projects to do resiliency. Leadership is often sympathetic to resiliency.

Roundtable Discussions – Strategies for Creating a Resilient DOT

Participants suggested strategies that spanned the breadth of DOT activities. Most agreed that defining a risk and resiliency policy and how this influences decision making is an important first step. Resiliency should be incorporated early in the planning and project development processes. Agencies can position themselves well by collecting better resiliency-related data and assessing risk to the system, corridor and asset levels. Climate change should be considered in this process.

Risk should be incorporated into asset management plans. Project design should account for potential damage and disruption costs. DOTs can leverage available technology and data to conduct predictive modeling of these costs. Resiliency can be thought of as an insurance policy. For some cases, controlled failure may be a sensible option. Resiliency can be folded into land use policy (a prerogative of local governments) in addition to asset-level plans.

DOTs can prepare themselves to respond to and take advantage of disasters. Agencies that plan ahead for disasters are often better positioned for funding options.

For operations and emergency response, practitioners can consider response time, prepare debris removal and other contracts, and pre-stage equipment and resources. Contract flexibility can be helpful in managing event responses. Technology such as crowdsourcing can also help manage responses. After events, agencies need to conduct debriefings and cover lessons learned. Data collected from events can feed back into the planning and operations teams.

Institutionally, educating and training DOT management and other staff helps to build and establish a culture of resiliency. A dedicated resiliency person or team can work toward achieving this. DOTs should groom internal champions for resiliency; these can often be more junior staff.

Outside the agency, coordination with other agencies and the public is an essential strategy.

Ongoing Resiliency Efforts and Lessons Learned

Meg Pirkle (Georgia DOT)

Georgia faces a range of climate and weather hazards including tornadoes, hurricanes, floods, ice storms, and wildfires. During emergencies, Georgia DOT (GDOT) has district staff work across district lines to help other areas.

Atlanta experienced an ice storm in 2014 that resulted in over 100,000 abandoned cars, stranded school buses with children inside, and salt trucks stuck in traffic. The event became national news and a politically volatile issue. Impactful winter storms are rare enough that Georgia does not have lots of experience handling them.

After the storm, Georgia's Governor Nathan Deal created a task force, which established a number of resiliency measures. Information-related measures included hiring a state meteorologist, installing road weather sensors for temperature and dampness, and creating data tools, including WEB EOC for monitoring incidents, Bridge Watch for monitoring bridge conditions, and Find My Plow for snowplow tracking.

On the operations side, lessons learned included, multi-agency strike teams should pre-contract with towing companies, and a manager of emergency operations position was created. As a low-cost, no regrets strategy, brine can now be placed on the interstates prior to storms. Salt and brine crews are to be given police escorts and dedicated radio communication channels. More salt barns were installed. During storms, GDOT can work off the state highway network without the Governor's approval. Operational procedures and responses are practiced regularly.

Meg Pirkle also discussed an incident in which materials stored under an I-85 bridge near Atlanta caught fire, resulting in the bridge deck collapsing. The event response was speedy and collaborative. A joint press conference with other state and local agencies was held the evening of the collapse showing a unified response. GDOT quickly redesigned part of the bridge and worked around the clock to rebuild the bridge in a matter of months. The FHWA Division office was helpful and approved suspending certain procurement restrictions to allow for rapid contractor selection. Other bridges around Georgia were checked for materials to prevent similar incidents.

Lessons learned from the I-85 incidents include presenting a unified front; having the emergency management agency take the lead in response; employing continuous communication and education before, during, and after; and partnering with other agencies and stakeholders.

Therese McAllister (NIST)

Therese McAllister presented NIST's planning approach to community resilience. The process emphasizes the need to understand, 1) the context, or role that infrastructure plays in a given community; 2) the functionality, including the time it takes infrastructure to recover; and 3) the dependencies of the infrastructure.

The NIST community resilience approach can be employed for both short- and long-term considerations. It is intended to be a proactive and flexible method applicable to all types of assets, including transportation assets. It underscores the major resiliency strategies of maintaining, strengthening, enhancing redundancy, and retreating.



The NIST approach is a six-step process. The first step entails forming a collaborative planning team with diverse stakeholders. The second step involves understanding the situation, including its social dimensions and the relevant built environment. Next, goals and objectives are determined. After determining these goals, a resilience plan can be developed. The fifth step involves preparing, revising, and approving the plan. The final step is implementing and maintaining the plan.

Planners should consider chronic versus acute risk and be mindful of potential maladaptations.

The NIST process has been tested in Colorado and further testing may occur in Utah and Florida.

Chris Schmidt (California Department of Transportation)

The California Department of Transportation (Caltrans) has experienced 110 weather-related impacts costing approximately \$250 million in the San Francisco Bay Area (Caltrans District 4) alone thus far in 2017. There have been approximately \$1 billion in impacts statewide. Key hazards include wildfire, landslides, tidal flooding, and riverine flooding.

Caltrans has a good understanding of what short and long-term fixes might be needed for climate-driven impacts, but does not yet consider climate change in many of its project designs. The California legislature passed legislation requiring and providing funding for adaptation and the Governor is very supportive of climate change mitigation and resiliency.

Caltrans regularly coordinates resiliency efforts with regulatory agencies, local and regional governments, non-governmental groups, research universities, and the public. Caltrans has created guidance on how to consider sea level rise on projects. Many Caltrans staff, particularly junior staff, are passionate about resiliency.

Caltrans is developing a series of vulnerability assessments that focus on temperature, wildfire, precipitation, sea level rise and storm surge. GIS data will be available for all Caltrans staff to use.

Caltrans' approach to resiliency involves assessing exposure, determining potential consequences, and prioritizing actions. The options for response include defense, adaptation, planned retreat, and if other options fail, forced retreat from events. Caltrans is considering how to employ green infrastructure options.

Roundtable Discussions – The One Thing – The Key Elements of Resiliency

Small group discussions focused on four functions in the DOT: budgetary and policy, planning and environment, engineering design, and operations/emergency response/maintenance.

The budgetary and policy group highlighted the importance of determining a return on investment for resiliency efforts, seeking political support, and fostering strong leadership with executive buy-in.

The planning and environment group identified training and coordination as important strategies for enhancing the capacity of state DOT staff in addressing resiliency. Establishing a consistent framework for considering hazards, assessing system and asset vulnerability, programming resiliency projects, and incorporating resilience into asset management planning were also highlighted. Considering environmental impacts and reducing greenhouse gas emissions were other key elements.

The engineering design group underscored design manual updates, AASHTO and FHWA guidance, and National Highway Institute (NHI) training. Overcoming risk aversion, incorporating acceptable risk into project designs, and assessing lifecycle costs were other important factors identified by the engineering design group.

The operations, emergency response, and maintenance group mentioned training, standard operating procedures, emergency response plans, and prioritizing maintenance based on risk as being critical considerations. Documenting and applying lessons learned, coordinating and information sharing, and incorporating resiliency into operations were also highlighted.

NEXT STEPS

Based on the facilitated discussions held during the peer exchange, the Center for Environmental Excellence at AASHTO plans to continue providing resiliency-related resources and information for state DOTs and other practitioner's through the Center website (environment.transportation.org). The Center will also support the efforts of AASHTO's Transportation System Security and Resilience Committee (TSSR) and will look for opportunities to share these resources with other AASHTO committees like the Committee on Environment and Sustainability.

TSSR will also take an active role in 2018, incorporating the important outcomes of this peer exchange into a series of activities, providing guidance on the upcoming summit (see below) and leading the development of outreach/training opportunities for state DOT participants.

NCHRP 2018 TRANSPORTATION RESILIENCE INNOVATIONS SUMMIT AND EXCHANGE

NCHRP will host the Transportation Resilience Innovations Summit and Exchange (Transportation RISE) in Denver, Colorado on October 8-10, 2018.

Transportation RISE will build on the work of previous conferences and peer exchanges, like this one, and bring together transportation policy makers, practitioners, researchers, and consultants to share research results and experiences on transportation resilience. It will include state agency CEOs; senior TRB, AASHTO, and FHWA officials; and other industry leaders. Members of the TSSR Committee will have an active role in the development and delivery of this important conference.



Image is the result of participant input on the definition of a resilient DOT during the "One Thing" session

APPENDIX A. | LIST OF PEER EXCHANGE ATTENDEES

STATE TRANSPORTATION REPRESENTATIVES

Brent Cain	Arizona DOT (Director, Transportation Systems Management & Operations Division), bcain@azdot.gov
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Josh DeFlorio	Port Authority of New York/New Jersey (Chief, Resilience & Sustainability), jdeflorio@panynj.gov
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