



Florida MPO Resilience Peer Exchange:
Using the MPO Planning Process to Increase Transportation
System Resilience

Summary Report

Virtual

August 27-31, 2020

Notice

This document is disseminated under the sponsorship of the Department of Transportation in the interest of information exchange. The United States Government assumes no liability for its contents or use thereof.

The contents of this report reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official policy of the Department of Transportation. This report does not constitute a standard, specification, or regulation.

The U.S. Government does not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objective of the document.

Quality Assurance Statement

The Federal Highway Administration (FHWA) provides high-quality information to serve government, industry, and the public in a manner that promotes public understanding. Standards and policies are used to ensure and maximize the quality, objectivity, utility, and integrity of its information. FHWA periodically reviews quality issues and adjusts its programs and processes to ensure continuous quality improvement.

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Summary Report for Florida MPO Resilience Peer Exchange: Using the MPO Planning Process to Increase Transportation System Resilience		5. Report Date October 2020	
7. Author(s) Cassandra Bhat, Brenda Dix, Amanda Vargo, Maeve Givens (ICF), Heather Holsinger (FHWA)		6. Performing Organization Code	
		8. Performing Organization Report No.	
9. Performing Organization Name(s) and Address(es) ICF 1725 Eye Street NW, Suite 1000 Washington, DC 20006		10. Work Unit No. (TRAVIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name(s) and Address(es) Federal Highway Administration 1200 New Jersey Avenue, SE Washington, DC 20590		13. Type of Report and Period Covered Report	
		14. Sponsoring Agency Code	
15. Supplementary Notes			
16. Abstract <p>This report summarizes a Federal Highway Administration (FHWA) and Florida Department of Transportation (FDOT)-sponsored virtual peer exchange held across four sessions in August 2020. The peer exchange aimed to bring together representatives from metropolitan planning organizations (MPOs) across Florida and around the country to share approaches on how to use the MPO planning process to increase natural hazard resilience, including a focus on health, equity, and economic development. The peer exchange provided an opportunity for peer-to-peer collaboration and brainstorming on challenges and best practices for Florida MPOs to integrate resilience at their individual agencies.</p>			
17. Key Words Adaptation, asset management, natural hazards, coastal, extreme heat, flooding, planning, precipitation, sea level rise, transportation resilience, vulnerability assessments, stakeholder engagement, mitigation, transportation improvement program, health, and equity			18. Distribution Statement
19. Security Classif. (of this report) Unclassified	18. Security Classif. (of this page) Unclassified	20. No. of Pages 84	22. Price

Contents

Introduction	1
Key Takeaways	1
Session 1: State of the Practice in Florida	3
FDOT: Transportation Resilience Overview – Jennifer Carver, FDOT	3
Lightning Round: Resilience Planning at Florida MPOs	4
Session 2: Peer Exchange – Resilience Needs and Strategies	9
MTC: Making Plan Bay Area 2050 Resilient to Sea Level Rise – Dave Vautin	9
WILMAPCO: Resilience Planning – Bill Swiatek	10
RPC: Integrating Resiliency into the MPO Planning Process – Dave Walker	11
Session 3: Peer Exchange – Resilience Investments	13
H-GAC: Resiliency and Durability to Extreme Weather Pilot Study – Pramod Sambidi and Kathryn Vo	13
NJTPA: Using the MPO Planning Process to Increase Transportation System Resilience – Jennifer Fogliano	14
HRTPO: Integrating Resilience into Planning – Dale Stith	15
Volpe Center: Resilience and Disaster Recovery Metamodel Overview – Scott Smith	17
Session 4: Lessons Learned	18
Lessons Learned and Best Practices	18
Ongoing Challenges and Cutting-edge Topics	20
FHWA: Available Resources from FHWA – Heather Holsinger	23
Needs and Next Steps	25
Appendix A: Agenda	28
Appendix B: Poll Questions and Responses	30
Appendix C: MPO Resilience Peer Exchange – Resilience Resources and Examples	43
Appendix D: Participant List	57
Appendix E: Session 4 Mural Board	64

Introduction

This report summarizes a Federal Highway Administration (FHWA) and Florida Department of Transportation (FDOT)-sponsored virtual peer exchange that was held from August 27 to August 31, 2020. The peer exchange was split into four sessions:

- Session 1: State of the Practice in Florida
- Session 2: Identifying Resilience Needs and Strategies
- Session 3: Making Resilience Investments
- Session 4: Lessons Learned

The purpose of the peer exchange was to bring together representatives from metropolitan planning organizations (MPOs) across Florida and around the country to share approaches on how to use the MPO planning process to increase natural hazard resilience, including a focus on health, equity, and economic development. The peer exchange provided an opportunity for peer-to-peer collaboration and brainstorming on challenges and best practices for Florida MPOs to integrate resilience at their individual agencies.

Total attendance included 163 participants, representing at least 45 different agencies.¹ Individual session attendance ranged from about 90 to 130 participants.

Key Takeaways

The peer exchange provided opportunity for rich discussion and sharing of lessons learned and best practices related to resilience from MPOs across the country. Several lessons learned and best practices emerged. In addition, participants from agencies of varying levels of resilience integration activities were able to indicate relevant actions and next steps appropriate to their agency.

The primary takeaways from the peer exchange included:

- **There are a wide range of approaches being used across Florida to increase resilience through MPO planning activities.** MPOs of all sizes in Florida are using their planning activities to promote resilience to natural hazards in their communities. Some examples include conducting vulnerability assessments, establishing resilience goals, prioritizing funding for resilience projects, and developing resilience-focused investment programs (see Figure 1). **See the Lightning Round section for additional details.**

¹ Due to the virtual nature of the event, a handful of participants could not be identified (e.g., did not RSVP, identified as “unknown user” by Microsoft Teams, or called in over the phone).

What steps has your MPO taken to-date to address resilience through the planning process?



Figure 1. Poll question responses: What steps has your MPO taken to-date to address resilience through the planning process?

- Incremental approaches to integrating resilience into the planning process have been successful.** For example, Wilmington Area Planning Council (WILMAPCO) conducted a sea level rise vulnerability assessment in 2011, but it was not until 2015 that resilience was included in the long range transportation plan (LRTP) and 2019 when resilience performance measures were added. That said, it is also important to **maintain a sense of urgency** and continue to pursue resilience as a priority.
- Risks are not just coastal.** While sea level rise and hurricanes are major risks, Florida MPOs also face risks that include inland flooding, wildfires, and extreme heat. In some locations, green infrastructure projects (e.g., bioswales, enhanced wetlands, tree plantings) are being installed to absorb stormwater runoff and reduce inland roadway flooding.
- Collaboration is key.** Many Florida MPOs work closely with regional planning councils and other local and regional partners. These partnerships allow for resource sharing, joint projects, and a collective and coordinated vision for the region. In addition, smaller MPOs with less capacity can leverage resources and efforts from local and regional partners and other agencies, including larger MPOs. Several of the presenters highlighted the importance of interagency collaboration to the success of their resilience efforts.
- Funding continues to be a limiting factor for resilience efforts.** Many agencies have turned to external sources of funding to advance resilience integration efforts (e.g., National Oceanic and Atmospheric Administration (NOAA) grants, FHWA pilot projects, and collaborative projects with regional partners). Others benefit from having dedicated investment programs for resilience-related activities. For example, Hillsborough MPO has access to an investment program for stormwater mitigation efforts. Transportation agencies will continue to need to find new and creative ways to finance resilience efforts.

At the end of the peer exchange, participants were asked to brainstorm best practices they learned from the sessions and then vote on the top two practices they think could be implemented at their respective

agency. For the full list, see the Session 4: Lessons Learned section. Participants identified the top three best practices as:

- Connect land use and transportation planning efforts;
- Incorporate resilience as a project selection criteria; and
- Develop and track resilience performance measures.

Details on the discussions are provided by session below.

Session 1: State of the Practice in Florida

The purpose of the first session was to understand the state of practice in Florida, including available resources and MPO activities across the state.

FDOT: Transportation Resilience Overview – Jennifer Carver, FDOT

Jennifer Carver, FDOT Office Policy Planning, presented an overview of FDOT resilience activities:

- **Statewide Planning** – Statewide planning efforts include the Florida Transportation Plan (FTP) and the Freight Mobility and Trade Plan. The FTP planning process includes a resilience subcommittee that focuses on how to incorporate resilience into Florida’s transportation system.
- **Strategic Intermodal System (SIS) Vulnerability Assessment** – FDOT evaluated the vulnerability of SIS facilities to storm surge, flooding, sea level rise, wildfire, extreme heat, and sinkholes. They then developed adaptation strategies and a Resilience Action Plan.
- **Tools, Guidance, Standards** – FDOT has prepared guidance for MPOs on how to integrate resilience into planning, such as the LRTP Resilience Quick Guide. This resource identifies opportunities and examples to incorporate resilience into goals and objectives, defining performance measures and targets, assessing risks and vulnerabilities, creating a needs plan, and developing a cost feasible plan. MPOs also have access to the Sea Level Scenario Sketch Planning Tool² and several case studies.
- **Interagency and Regional Coordination and Collaboration** – FDOT collaborates with many groups focused on resiliency and sustainability including the Florida Department of Environmental Protection’s Coastal Resilience Forum, the Southeast Florida Regional Climate Change Compact, the Tampa Bay Regional Resiliency Coalition, the East Central Florida Regional Resilience Collaborative, and the Northeast Florida Regional Council.

The presentation also identified key challenges in MPO resilience planning for further discussion at the peer exchange, including:

- Technical capacity building (e.g., tools and resources, climate data and thresholds, complying with legislative requirements, and monitoring and evaluation);
- Coordination with partner agencies;

² The Sea Level Scenario Sketch Planning Tool is available at: <https://sls.geoplan.ufl.edu/>.

- Making a case for resilience improvements;
- Funding constraints;
- Operationalizing vulnerability assessment results; and
- Informing project development.

Lightning Round: Resilience Planning at Florida MPOs

FDOT invited 13 Florida MPOs to give a 5-minute snapshot of resilience efforts at each agency, capturing highlights of their efforts. These presentations are summarized below:

Sarasota/Manatee MPO – Ryan Brown and Dave Hutchinson

- Selected as one of six regions to receive training and participate in a pilot project aimed at helping MPOs develop emergency transportation recovery plans, funded by a Federal Transit Administration (FTA) research grant. Conducted a successful two-day training course designed to provide attendees with tools and skills on transportation recovery planning with a focus on transit, technology, management, and informational systems.
- Conducted a training with local jurisdictions on the Sea Level Scenario Sketch Planning Tool.
- Have begun developing performance measures and tools to incorporate resilience into project prioritization.
- Have a study funded in the LRTP and transportation improvement program (TIP) to conduct a more robust resilience study and identify resilience strategies.
- Planning to allocate \$75 million for resilience projects in the next LRTP.

Lee County MPO – Don Scott

- The 2045 LRTP includes resilience goals and objectives:
 - Goal: Transportation system that is sensitive to the changing environment.
 - Goal: Transportation system that improves resiliency and reliability of the system to keep people and goods moving.
 - Objective: To develop and implement multi-modal infrastructure improvements with the intent of improving resiliency and minimizing life cycle costs.
 - Objective: Improving the reliability of the transportation system by increasing awareness of and implementation of information technology systems (ITS), transportation demand management (TDM) programs and automated vehicles/connected vehicles (AV/CV).
- The 2045 LRTP also includes project priority evaluation criteria related to resilience:
 - One of the current scoring criteria is based on the five-year repetitive impacts of flooding – this analysis also includes the facility’s hurricane zone to account for the changing environment.

- Proposed improvements are focused on solutions to resolve or improve reoccurring impacts.
- Lee County MPO is tracking major road closures, including coverage area, time frames, and event details. They are mining media stories, comments, and studies from local partners over the last five years to build out this dataset (Figure 2). This data is resulting in detailed information of stormwater issues by County.
- Lee County MPO has observed that maintenance solutions are often effective at addressing flooding issues.
- Challenges include:
 - Building a reliable dataset of problem areas;
 - Funding; and
 - Quantifying the impacts of improvement projects to gain public and political acceptance.

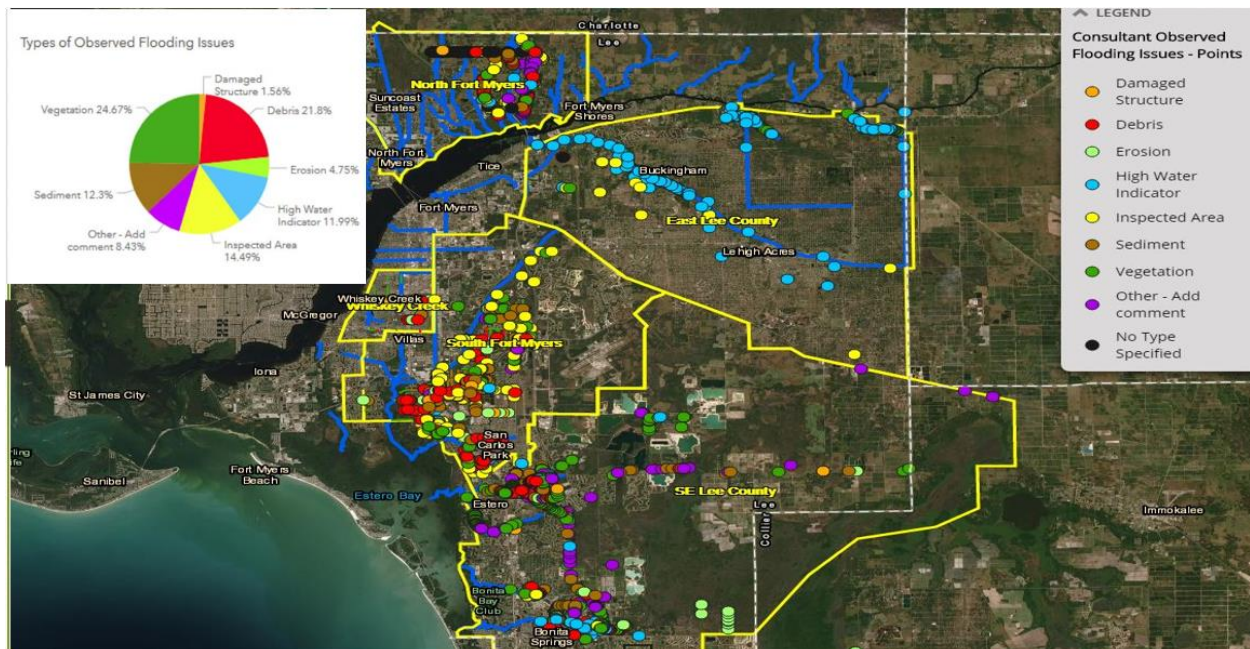


Figure 2. Observed flooding issues in Lee County.

Heartland Regional MPO – Pat Steed

- Heartland Regional MPO conducted a land suitability analysis for all counties in the region. This included economic modeling to identify where development is likely to occur in the future, environmental analysis, and scenario modeling of current and potential future trends. These types of analyses are helpful for corridor planning, land use planning, and the development of the LRTP.

Gainesville MTPO – Mike Escalante

- Gainesville MTPO is addressing transportation resilience through preventive maintenance. Maintenance activities include tree-trimming and stormwater maintenance and mitigation in response to wind and heavy rains, respectively.
- They are also incorporating resilience needs into the LRTP project list.

North Florida TPO – Denise Bunnewith

- Developed resilience goals for the LRTP.
- Conducted a vulnerability assessment for major state roads in the region.
- Recent and ongoing studies in the region will provide updated data for the next analysis (e.g., City of Jacksonville resilience study of St. John’s river, United States Army Corps of Engineers [USACE] work in the region, Northeast Florida Regional Council modeling data, and an upcoming study of State Road A1A).

Emerald Coast Regional Planning Commission (RPC) – Austin Mount

- Projects in the LRTP are awarded extra points for addressing resilience.
- Focused on economic and environmental resilience, specifically diversifying the economy and maintaining critical infrastructure.
- Partnership with the Regional Planning Council provides additional opportunities for implementing resilience projects and measures.
- Two recent resilience projects for SIS facilities included upgrading a Pensacola International Airport hangar to withstand 175 mph winds and building a hurricane resistant dome warehouse at Panama City Port.

Broward MPO – Greg Stuart

- Broward MPO conducted an initial analysis of sea level rise, storm surge, and flooding vulnerability focused on state and federal facilities. With more funding, it was expanded to cover local and private roads.
- The MPO is focused on all-hazards transportation recovery training and planning, recognizing the long-term impacts of major events are just as important to address as the immediate impacts.
- Broward MPO is also an active a partner to the Southeast Florida Regional Climate Change Compact, to participate in regional cooperation and collaboration around resilience issues.

St. Lucie TPO – Peter Buchwald

- As a small MPO, St. Lucie TPO has limited resources to address resilience. However, the TPO continues to build capacity and advance resilience planning efforts.
- Completed sea level rise mapping and an asset vulnerability assessment. Also held a training on two sea level rise mapping tools – NOAA’s [Coastal Flood Exposure Mapper](#) (Figure 3) and the Sea Level Scenario Sketch Planning Tool. The TPO found that sea level rise is expected to be a

problem in the area by 2080, but high tides and storm surge impacts could be problematic sooner.

- The latest LRTP reflects these findings by including climate impacts in the goals and objectives and limiting development near the coast. Development and growth are expected to occur in inland areas. The TPO can reinforce this growth away from the coast by prioritizing projects outside of climate vulnerable areas.

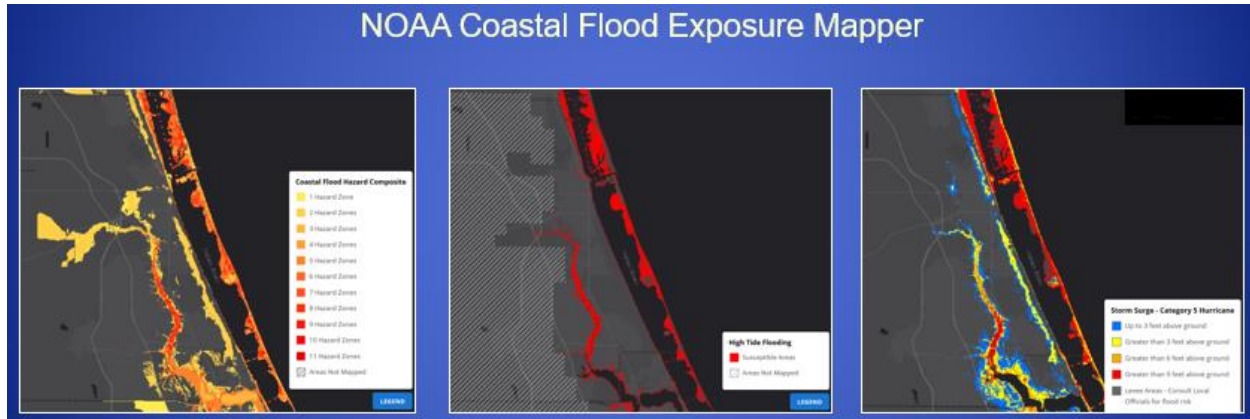


Figure 3. Example output from the NOAA Coastal Flood Exposure Mapper

Space Coast TPO – Sarah Kraum

- Completed a sea level rise vulnerability assessment in partnership with the East Central Florida Regional Planning Council. The study used the Sea Level Scenario Sketch Planning Tool and the USACE projected sea level rise curves³ to create a high level look at potential sea level rise impacts to the transportation system and essential facilities. It is just as important to protect access to essential facilities as the facility itself.
- Geo Plan conducted a local training on the Sea Level Scenario Sketch Planning Tool so stakeholders and committee members could better understand the tool, the results, and/or begin their own assessment.
- An assessment of potential environmental issues as part of the LRTP revealed that all projects on the needs list will need extra environmental support.
- Next steps are to include points for resilience in the project prioritization process.

River-to-Sea TPO – Lois Bollenback

- Working to address critical funding shortfalls for resilience projects. For example, the current taxing scheme is not sustainable for future needs.
- Working to integrate resilience into project prioritization. Previously, there was concern that integrating resilience into the prioritization process would weight projects in certain areas that would not necessarily support other priorities.

³ The USACE sea level rise curves are accessible via their Sea-Level Change Curve Calculator. http://corpsmapu.usace.army.mil/rccinfo/slc/slcc_calc.html

- Incorporating a review of equity and underserved populations in resilience efforts, especially as it relates to mobility.

Miami-Dade TPO – Lisa Colmenares

- The 2045 LRTP considers resiliency, environment, sustainability, livability, and climate change.
- Developed [Resilient 305](#), a local resilience strategy, with partners including the City of Miami, the City of Miami Beach, and Miami-Dade County. Three cross-cutting themes in this report include social equity, intergovernmental collaboration, and innovation/technology.
- Developed the [SMART Plan](#), a regional strategic vision focused on resilient land use and transportation planning. The vision supports multiple transportation options, integrating technology planning, supporting existing communities, increasing first-last mile connections, increasing transit ridership, improving connectivity and mobility, and supporting future population and employment growth anticipated in the region.

Hillsborough MPO – Allison Yeh

- Created three-dimensional flood scenario visualizations and used the Sea Level Scenario Sketch Planning Tool to visualize flooding impacts.
- A part of the [Resilient Tampa Bay Transportation Study](#), which identified roads with high criticality and high vulnerability (i.e., inundation greater than or equal to 11 feet) (Figure 4).
- Benefit from an investment program of \$46 million per year to mitigate stormwater impacts (e.g., hardening the pavement profile). The program has a regional focus, but MPOs are able to use this funding in their LRTPs.

Forward Pinellas – Rodney Chatman

- A part of the [Resilient Tampa Bay Transportation Study](#) (Figure 4). Based on the study findings, incorporated adaptation measures into two planned projects that were located on highly vulnerable and highly critical corridors.
- The Forward Pinellas Board recently adopted changes to the multimodal project prioritization criteria. Under this change, up to 10% of point total is awarded to projects that address various aspects of climate resilience.

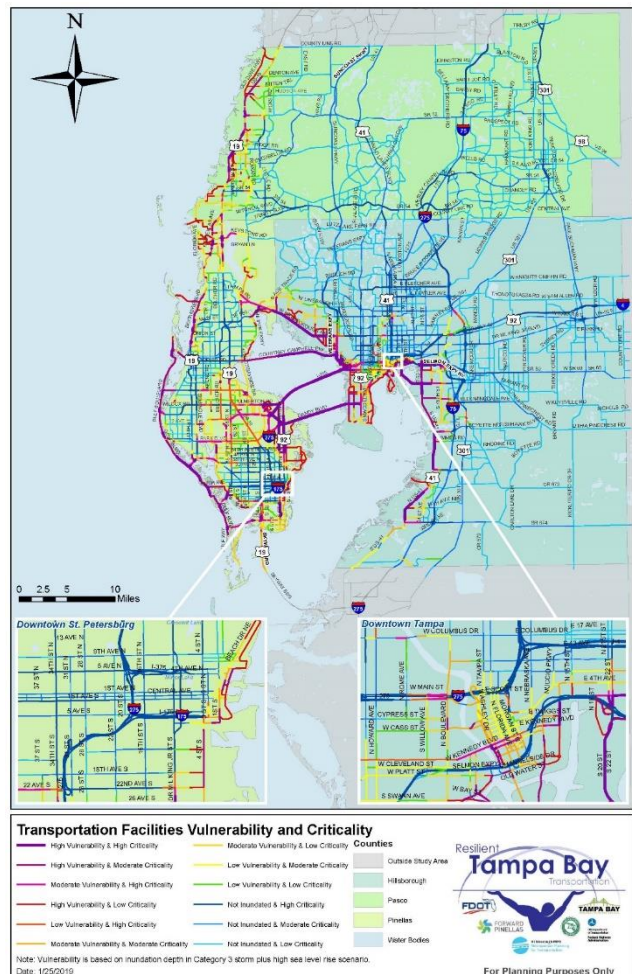


Figure 4. Example results from the Resilient Tampa Bay Transportation Study criticality and vulnerability analysis

- Developed the [Gateway/Mid-County Master Plan](#), which addressed resiliency through a triple bottom line analysis and adaptation toolkit.
- Convened a Coastal High Hazard Area Mitigation Strategy Working Group that included emergency management and several coastal communities. The working group explored actionable strategies to allow resilient development in vulnerable areas.

Session 2: Peer Exchange – Resilience Needs and Strategies

Session 2 featured presentations from the Metropolitan Transportation Commission (MTC), Wilmington Area Planning Council (WILMAPCO), and Rockingham Planning Commission (RPC) on integrating resilience into planning.

MTC: Making Plan Bay Area 2050 Resilient to Sea Level Rise – Dave Vautin

[Plan Bay Area 2050](#) is the San Francisco Bay Area’s (CA) regional LRTP plan. MTC is currently working on the 2021 update, which includes 25 strategies across transportation, housing, the economy, and the environment. MTC has explicitly integrated sea level rise impacts and strategies into the LRTP as part of this process (see Figure 5). The sea level rise exposure analysis assumed two feet of permanent inundation by 2050 and 3 feet of inundation under king tide events. Based on this exposure analysis, MTC flagged areas with significant inundation risks and identified strategies (e.g., nature-based solutions, hardened shorelines) to protect and reduce risks. MTC focused on identifying strategies located along the shoreline that would protect all inland assets, not just transportation facilities. MTC believes this approach will be more cost effective overall and hopes to contribute transportation funding to these types of broader-scale regional sea level rise protection strategies. This analysis allowed MTC to cost the need for sea level rise protection projects (\$17 billion) around the entire Bay Area for the first time.



Figure 5. Steps to integrating sea level rise into Plan Bay Area 2050

Prior to developing Plan Bay Area 2050, MTC completed a scenario analysis called [Horizon](#), which considered three different sea level rise scenarios to better understand uncertainty. The analysis included identifying vulnerable facilities and communities, including minority and low-income populations. The analysis found that unmitigated sea level rise impacts would cause significant damage to the region and affect tens of thousands of homes, but adaptation measures can reduce those impacts. Figure 6 illustrates how adaptation measures significantly reduce the impacts to sea level rise to residential units under all scenarios. This analysis has been a key input for the development of Plan Bay Area 2050.

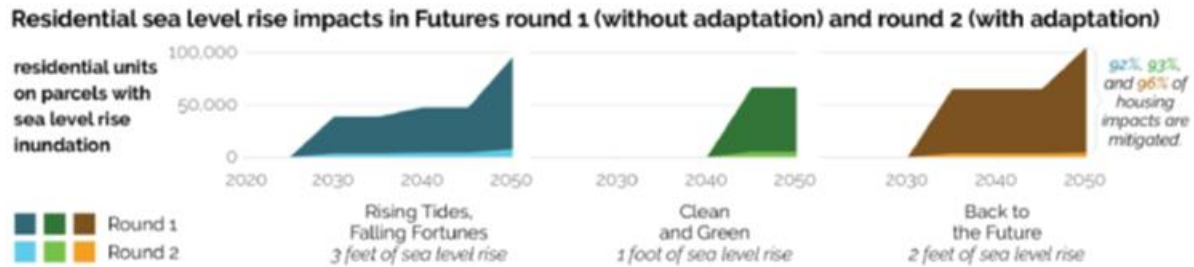


Figure 6. Example results from the Horizon sea level rise scenario analysis.

On the project level, MTC included resilience considerations in the cost-benefit analysis of major proposed LRTP projects. This allowed MTC to compare and rank sea level rise-related projects alongside all other projects. MTC notably found that projects focused on protecting transportation assets from sea level rise can be very cost effective, especially if protecting key corridors.

Lessons learned included the importance of bringing a diverse set of stakeholders together to discuss how to increase regional resilience in the Bay Area beyond just transportation.

Participant Poll: Which aspect of the MTC approach would be most beneficial to your organization?

- Collaboration and regional approach, going beyond silos
- Quantifying/measuring impacts
- Estimating costs
- Planning process priorities
- Economic analysis
- Information about how this financially benefits the community

WILMAPCO: Resilience Planning – Bill Swiatek

WILMAPCO first started looking at sea level rise impacts in a 2011 [sea level rise vulnerability assessment](#) for the region focused on transportation and housing impacts. This study helped make the case for integrating sea level rise into the LRTP. Although there was initial hesitation to adding resilience to the LRTP, it was included as an action in the [2015 plan](#) and in [2019](#) resilience performance measures were added.

As part of the LRTP, WILMAPCO identifies Transportation Investment Areas that consider sea level rise risks and prioritizes investments in the core investment areas and discourages growth in areas that are more vulnerable. WILMAPCO maps the exposure of proposed transportation projects to sea level rise and if exposed, flags the issue and recommends alterations to the design. For example, a bridge in Wilmington was built 2 feet higher than originally designed for to account for sea level rise risks.

WILMAPCO has also conducted a sea level rise social equity analysis by block group (Figure 7), recognizing that certain communities will be disproportionately affected by sea level rise. Projects in these regions should protect and benefit the disadvantaged communities. For example, restoring a degraded wetland to increase stormwater retention and treatment capacity, and be a community amenity with walking paths.

City of Wilmington, Delaware
2013-2017 ACS

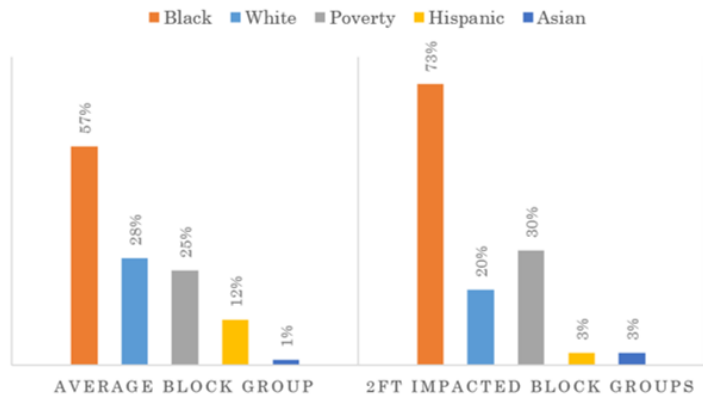


Figure 7. WILMAPCO sea level rise social equity analysis results

Lessons learned include:

- Seeking and recognizing the importance of incremental policy changes;
- Using scientific public opinion (e.g., representative survey data) to justify controversial policies and support for adaptation and resilience considerations; and
- Collaboration with local and state partners is key.

Participant Poll: Which aspect of the WILMAPCO approach would be most beneficial to your organization?

- Focus on equity
- Integrating a park (good community resource) into water treatment / drainage needs; innovative, dual-use stormwater solutions
- Collaboration/working with jurisdictions in other counties/states
- Connecting land use and transportation
- Incremental approach
- Using scientific evidence to encourage public and elected officials

RPC: Integrating Resiliency into the MPO Planning Process – Dave Walker

In 2015, RPC developed a [Regional Master Plan](#) as part of a sustainable communities grant from the US Department of Housing and Urban Development (HUD). The plan includes consideration of a variety of climate hazards in the vision, goals, and livability principles. In addition, there is a climate change chapter outlining current and future climate conditions and nine recommendations and implementation strategies. Existing research from regional partners, such as the New Hampshire Coastal Risks and Hazards Commission and the University of New Hampshire, were key resources for integrating climate change into the master plan.

The vision and goals of the master plan fed into the [2045 LRTP](#), which includes a resilience goal: “the region’s transportation system is adaptive and resilient to climate change and natural and other hazards.”

To identify vulnerable assets, RPC has conducted a number of sea level rise and climate change studies funded through NOAA grants and coastal zone programs, including New Hampshire DOT [Potential Impacts of Climate Change on Transportation Infrastructure](#) (2014), [Tides to Storms](#) (2015), and [Climate Risk in the Seacoast](#) (2017). These studies quantified the number of miles and acres of land types vulnerable to different sea level rise and storm surge scenarios. This information has been integrated into the assessment of current conditions, discussion of future conditions, and need for analyses in the LRTP. To date, there have not been any specific project recommendations, but certain areas have been flagged for additional analysis.

RPC has developed project selection criteria for natural hazard resilience, which considers:

- To what extent is the project vulnerable to damage from natural hazards?
- To what extent does the project mitigate or adapt to known natural hazards in the area?

RPC is now working on identifying project recommendations. A [Seacoast Transportation Corridors Vulnerability Assessment](#) (2021) study is underway to understand specific transportation infrastructure potentially impacted by sea level rise and groundwater elevation to assess and prioritize needed improvements. The outcome of this study will be a prioritized list of vulnerable locations. RPC then intends to conduct a more detailed analysis of the top priority locations to understand whether a transportation solution or a more comprehensive strategy is needed to address inundation risk.

Lessons learned include:

- Take incremental steps to implement resilience based on agency capacity;
- Collaborate with research and planning partners;
- Leverage outside funding from the Coastal Zone Program and NOAA; and
- Use “real world” flood examples to validate flood maps and focus the conversation.

Participant Poll: Which aspect of the RPC approach would be most beneficial to your organization?

- Process to identify transportation vs. non-transportation/broader project solutions
- Looking at co-benefits of protections
- Remember groundwater element (rising with sea level in Florida)
- Leveraging university talent
- Considering equity
- Stakeholder partnerships
- Applying vulnerability results to project prioritization
- Education - using real life scenarios in examples and high water signs
- Sea level rise scenarios
- Scenarios
- Public involvement and engagement

Session 3: Peer Exchange – Resilience Investments

Session 3 featured presentations from Houston-Galveston Area Council (H-GAC), North Jersey Transportation Planning Authority (NJTPA), Hampton Roads TPO (HRTPO), and Volpe Center on integrating resilience into planning.

H-GAC: Resiliency and Durability to Extreme Weather Pilot Study – Pramod Sambidi and Kathryn Vo

H-GAC is currently wrapping up an FHWA pilot study on resiliency and durability to extreme weather. The goals of the study are to measure criticality and vulnerability of regional transportation assets (i.e., freeways, major roads, and bridges) to inland and coastal flooding, develop an adaptation strategy decision tool to provide recommendations for resilient transportation infrastructure, and update H-GAC publications and future project selection criteria.

First, H-GAC conducted a criticality assessment to measure the importance of assets on a 0 to 1 scale based on weighted criteria: socio-economic importance (20%), operational and usage importance (40%), health and safety importance (30%), and emergency response importance (10%). See the left panel of Figure 8 for the criticality results.

To assess vulnerability, H-GAC applied the FHWA [Vulnerability Assessment Scoring Tool](#) (VAST) with the following weights and factors. See the middle panel of Figure 8 for the vulnerability results.

- Exposure assessment (70%)
 - Flooding (100-year, 500-year, Hurricane Harvey)
 - Storm surge (Hurricane categories 1-5 and Hurricane Ike)
 - Sea level rise (4 feet, 5 feet)
- Sensitivity assessment (20%)
 - Bridge age
 - Structural evaluation
 - Channel conditions
 - Scour ratings
 - Pavement condition
 - Past closure
- Adaptive capacity assessment (10%)
 - Detour length
 - Repair cost

H-GAC then applied a criticality-vulnerability matrix (right panel of Figure 8) to identify priority high criticality and high vulnerability assets. For eight of these assets, H-GAC then conducted economic impact analyses for a variety of sea level rise and storm surge scenarios.

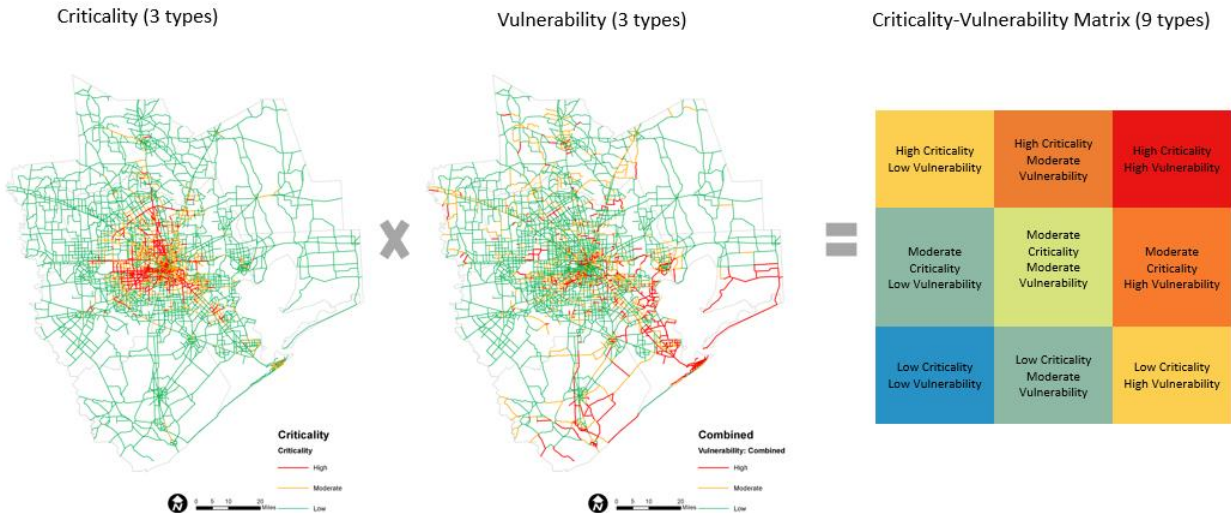


Figure 8. Criticality and vulnerability assessment results and criticality-vulnerability matrix

Based on these analyses, H-GAC has developed 25 resilience adaptation strategies and built a [regional resilience tool](#) to map the results of the pilot. H-GAC's next steps are to integrate the pilots results into the LRTP and TIP and prioritize projects for high criticality and high vulnerability assets.

Participant Poll: Which aspect of the H-GAC approach would be most beneficial to your organization?

- Criticality/vulnerability matrix excellent
- Using criticality to prioritize
- Recognition of compound effects (e.g., sea level rise + surge)
- The approach/methodology of obtaining data and processing to final report
- Technical analysis for criticality evaluation
- Economic impact analysis
- Mitigation measures "cheat-sheet"
- Truck AADT

NJTPA: Using the MPO Planning Process to Increase Transportation System Resilience – Jennifer Fogliano

NJTPA's LRTP, [Plan 2045](#), includes a new investment principle to increase regional resiliency. This principle states that investments should be made to mitigate risks associated with climate change, extreme weather, homeland security and other threats. Investments should consider criticality, infrastructure vulnerability, and level of risk. The investment guidelines for increasing regional resiliency include:

- Prioritize transportation investments that offer additional benefits for resiliency, for system preservation projects as well as upgrades and expansions.
- Incorporate vulnerability and risk assessments into project development.

- Scrutinize investments that are in places highly vulnerable to potential flooding/sea level rise.
- Invest in alternative fuel infrastructure in support of energy independence.
- Coordinate investments within and across modes to strengthen routes, enhance regional connectivity, increase mode options, and increase network redundancy.
- Make investments that support the targets of the Global Warming Response Act of 2007, addressing New Jersey’s greenhouse gas reduction goals and New Jersey State Plan recommendations.

NJTPA uses performance measures to track the progress of investment principles and as criteria to prioritize projects for funding. NJTPA would like to develop a regional resilience measure in the future but has determined it is difficult to develop a quantitative measure that reflects desired outcomes (avoided impacts) and is relevant across the region.

Plan 2045 builds on the efforts of [Together North Jersey](#) (TNJ), a comprehensive plan for sustainable development in the region developed with a wide array of partners. Plan 2045 operationalizes the themes and strategies of the TNJ initiative such as adapting infrastructure, identifying regional vulnerabilities, and improving management of stormwater runoff. These plans share common themes to make the region more resilient.

NJTPA is currently working towards [Plan 2050](#) and conducting background research on climate change to directly inform the updated plan.

Participant Poll: Which aspect of the NJTPA approach would be most beneficial to your organization?

- Prioritizing investments that offer additional benefits for resiliency
- Investment strategy approach - add resilience as a goal
- Add resiliency goal to plan
- Benefit-cost estimation
- Project dashboard
- Local stakeholder engagement
- Volkswagen grant to improve electric vehicle (EV) infrastructure coverage
- Integrating transportation planning and water resources planning/stormwater management
- Mitigation strategies
- RCIS
- Performance measures
- Collaboration and strategies
- Clear connection to regional vision

HRTPO: Integrating Resilience into Planning – Dale Stith

HRTPO has a strong partnership with the Hampton Roads Planning District Commission (HRPDC), which has increased collaborative environmental and transportation planning efforts. HRPDC has completed a number of resilience studies and planning efforts utilized by HRTPO including the [Regional Sea Level Rise](#)

[Policy](#) which includes sea level rise scenarios for near, medium, and long-term planning as well as recommendations for integrating sea level rise into project design.

In 2013, HRTPO conducted its [first vulnerability assessment](#) for roadways serving the military. In 2016, HRTPO partnered with HRPDC to conduct a vulnerability assessment of all major roads in the area to two feet of sea level rise, two feet of sea level rise with a 25-year storm, and two feet of sea level rise with a 50-year storm. These findings and recommendations have directly fed into the [LRTP](#) and project prioritization. Two local projects have modified their designs based on the findings of the vulnerability assessment by raising the profile of the asset.

HRTPO is currently developing its [2045 LRTP](#), which will include updating the project prioritization tool to better identify projects that improve flood resilience and incorporating scenario planning to assess multiple potential futures. The two flood resilience vulnerability measures in the project prioritization tool are shown in Figure 9. Although the measures are not as data driven or robust as others, their inclusion is an important first step for consideration of resilience in project prioritization.

Candidate project is in a vulnerable area for sea level rise/storm surge/recurrent flooding (Yes/No)

- Vulnerable Area – Developed planned improvements or adaptation strategies to address future sea level rise/storm surge/recurrent flooding and the project includes design features that make it resilient to flooding
 - Yes – points awarded
 - No – no points awarded
- Not in Vulnerable Area – points awarded (due to no vulnerability)

Level of access provided by the candidate project to critical areas or facilities* that are projected to be disrupted by flooding or related effects of climate change

- High, Medium Low (sliding scale of points)

*(e.g. hospitals, Fire-EMS, emergency shelters, dense employment area, and single entry/exit point for flood prone areas or neighborhoods)

Figure 9. HRTPO's flood resilience vulnerability measures

For scenario planning, HRTPO developed a [regional scenario planning framework](#), which consists of a baseline scenario and three greater growth scenarios. These scenarios are inclusive of a 3 feet sea level rise assumption across all scenarios. HRTPO plans to evaluate projects against all four scenarios to identify the most robust projects for the region.

U.S. DOT Volpe Center is developing a resilience and disaster recovery metamodel (RDRM), which is being piloted with HRTPO (see the summary of Volpe's presentation for more details). The tool will also help them efficiently model the transportation impacts of multiple flood scenarios. HRTPO is planning to use the RDRM results to support the development of objective, data-driven resiliency measures for use in the project prioritization tool. Using RDRM, HRTPO hopes to be able to identify the extent of flooding events, quantify congestion as a result of flooding, quantify avoided congestion of mitigating flooding, and develop a cost-benefit ratio of resiliency improvements. For the LRTP, RDRM will help identify vulnerable projects, improve the project prioritization process, help with fiscal constraint, and

help prioritize the build order of projects. RDRM outputs can also help with project design and cost refinement and other regional studies (e.g., joint land use studies).

Participant Poll: Which aspect of the HRTPO approach would be most beneficial to your organization?

- Resilience [project dashboard](#)
- Consideration for variability in growth patterns
- Coordination with diverse multiple agencies (Department of Defense, Volpe, etc.)
- Project prioritization tool
- Resilience and Disaster Recovery Metamodel
- Using vulnerability as a project evaluation measure
- Effective/productive partnerships
- Scenario planning
- Identify vulnerabilities and develop adaptation strategies

Volpe Center: Resilience and Disaster Recovery Metamodel Overview – Scott Smith

The resilience and disaster recovery (RDR) project aims to help transportation agencies make informed infrastructure investments. The objective is to develop a nationally available tool to address a variety of hazard conditions affecting transportation. The tool will also enable transportation agencies to compare various hazard scenarios and incorporate the costs and benefits of resilience into the project prioritization process.

The RDRM process, which is being piloted with HRTPO, is shown in Figure 10. This process builds on an MPO’s existing travel demand model and creates a much faster routing model to explore a range of disruption scenarios. This process also includes consideration of external factors and policies such as land use change, resilience investments, sea level rise, frequency and severity of inundation events, and disruptive events. Relationship models can then be developed to transition from external factors and policies to output metrics. Relationship models

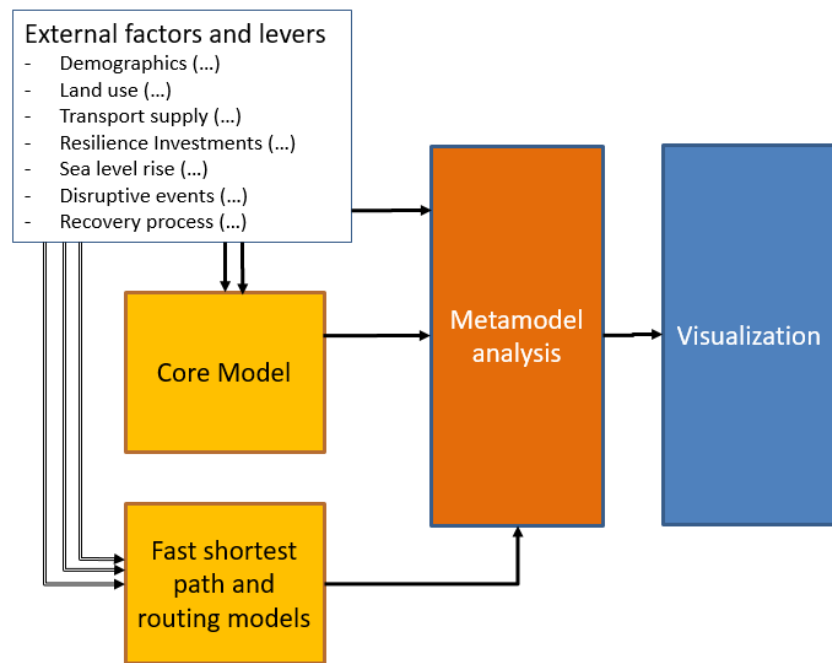


Figure 10. Resilience and disaster recovery metamodel overview

can include baseline trips and network flows, travel demand model, inundation recovery models, recovery cost and lost trips, etc. The output performance metrics can include trips, person house traveled, person and vehicle miles traveled, monetized value of the scenario, etc.

To aid with project prioritization, the model can illustrate performance over time for different resilience investments and project alternatives. The model also produces an output visualization dashboard, which summarizes the results of the analysis at the asset, asset-project, or all asset scale.

The Volpe Center is currently finalizing the RDRM and is expects to release the tool in early 2021.

Participant Poll: Which aspect of the Volpe approach would be most beneficial to your organization?

- Consistent approach that can be replicated
- Ability to test wide range of scenarios and options quickly
- Simplified routing model
- Benefit-Cost Estimation
- In the preparation of our LRTP, TIP, and UPWP
- Another tool, expand ways to present/visualize data
- All hazards approach
- Robust data

Session 4: Lessons Learned

The final session provided an opportunity for participants to reflect on lessons learned and best practices from the previous sessions and identify remaining needs and next steps using a virtual and interactive Mural board. Mural is a digital workspace that helps facilitate virtual engagement. The findings are summarized below. To view the full Mural board, please visit:

<https://app.mural.co/t/icfee4168/m/icfee4168/1598631899055/577e8fda04173d90bf90b27111ff5e6224a66731>. Screenshots of the Mural Board are included in Appendix E.

Lessons Learned and Best Practices

The primary **lessons learned** from the peer exchange included:

- **There are a wide range of approaches being used across Florida to increase resilience through MPO planning activities.** MPOs of all sizes in Florida are using their planning activities to promote resilience to natural hazards in their communities. Some examples include conducting vulnerability assessments, establishing resilience goals, prioritizing funding for resilience projects, and developing resilience-focused investment programs (see Figure 1). **See the Lightning Round section for additional details.**
- **Incremental approaches to integrating resilience into the planning process have been successful.** For example, Wilmington Area Planning Council (WILMAPCO) conducted a sea level rise vulnerability assessment in 2011, but it was not until 2015 that resilience was included in the long range transportation plan (LRTP) and 2019 when resilience performance measures

were added. That said, it is also important to **maintain a sense of urgency** and continue to pursue resilience as a priority.

- **Risks are not just coastal.** While sea level rise and hurricanes are major risks, Florida MPOs also face risks from include inland flooding, wildfires, and extreme heat. In some locations, green infrastructure projects (e.g., bioswales, enhanced wetlands, tree plantings) are being installed to absorb stormwater runoff and reduce inland roadway flooding.
- **Collaboration is key.** Many Florida MPOs work closely with regional planning councils and other local and regional partners. These partnerships allow for resource sharing, joint projects, and a collective and coordinated vision for the region. In addition, smaller MPOs with less capacity can leverage resources and efforts from local and regional partners and other agencies, including larger MPOs. Several of the presenters highlighted the importance of interagency collaboration to the success of their resilience efforts.
- **Funding continues to be a limiting factor for resilience efforts.** Many agencies have turned to external sources of funding to advance resilience integration efforts (e.g., National Oceanic and Atmospheric Administration (NOAA) grants, FHWA pilots, and collaborative projects with regional partners). Others benefit from having dedicated investment programs for resilience-related activities. For example, Hillsborough MPO has access to an investment program for stormwater mitigation efforts. Transportation agencies will continue to need to find new and creative ways to finance resilience efforts.

Participants also brainstormed **best practices** they learned from the sessions and “voted” on the two practices they are more excited about and think they could implement at their agency. The best practices from this brainstorming session, in rough order of most to least votes included:

- **Integrate land use and transportation planning efforts.** Land use development and transportation should not operate in silos and should be considered collectively. For example, an agency could overlay sea level rise risk areas with future land use plans and discourage development in vulnerable areas. MPOs that have considered resilience across both land use and transportation planning are better able to coordinate planning efforts and collaborate with partners to implement a regional vision for resilience. MPOs that do not have land use planning responsibilities should coordinate with the regional planning council or other local and regional partners to develop a shared regional vision.
- **Include resilience as a specific project selection criteria** to help prioritize resilience projects. Many of the peer presenters (e.g., HRTPO, NJTPA, RPC) as well as Florida MPOs (e.g., Lee County MPO, Forward Pinellas) have begun to integrate resilience criteria into project prioritization.
- **Develop and track resilience performance measures.** While resilience performance measures tend to be more qualitative than other types of performance measures, they are a useful tool to track progress towards resilience goals and objectives.
- **Collaboration is key for information sharing and coordinated planning efforts.** Specific examples of communication and collaboration best practices, include:
 - Collaborate and coordinate with land use planners, local governments, State DOTs, regional planning councils, local universities, and other partners.

- Share data and agree on common datasets to use for region, such as sea level rise projections (such as the Southeast Florida Climate Change Compact [Unified Sea Level Rise Projections](#)).
- Educate partners and the public about climate risks and resilience solutions.
- Identify a resilience champion to lead the resilience effort at an agency or regional scale.
- Engage in the political process to inform elected officials early and often about the importance of integrating resilience considerations into planning and decision-making.
- **Consider the equity impacts of environmental hazards and adaptation solutions.** Sea level rise and other hazards can have disproportionate impacts on certain populations and communities. It is important that adaptation solutions address these disparate impacts.
- **Identify resilience strategies.** Specific examples, include:
 - Establish a process to identify and promote cross-cutting strategies. Strategies that can address multiple challenges at once may be more cost-effective and beneficial to implement.
 - Recognize that not all transportation system risks have transportation project solutions. For example, watershed restoration strategies or land use development changes may be a more permanent and effective solution to flood risk than a project-level solution.
 - Develop archetype adaptation strategies to analyze high-level cost/benefit assumptions and inform decision-making, similar to the MTC and H-GAC approaches.
 - Encourage nature-based solutions, where feasible and effective.
- **Consider an expanded role of the Efficient Transportation Decision-Making (ETDM) process** and MPO use for a planning screen. For example, add storm surge and sea level rise to ETDM reviews.
- **Conduct a vulnerability assessment** to better understand what areas are most vulnerable to sea level rise or other hazards. Vulnerability assessment findings can then inform the LRTP by emphasizing the need for resilience planning, identifying potential future conditions, and highlighting potential focus areas for resilience investments and solutions. The findings can also be used to flag at-risk projects that may need to consider design alternatives to manage risk.
- **Train MPO staff on available resilience resources and tools** to increase knowledge capacity.
- **Develop creative funding techniques** to pursue resilience planning efforts and projects. Examples include applying for federal grants or working with local governments to champion processes to leverage developer funding for projects.
- **Maintain a sense of urgency.** Although integrating resilience into planning and decision-making can be slow and incremental at times, it is important to celebrate those victories and carry the momentum forward.

Ongoing Challenges and Cutting-edge Topics

The session also included discussion of four key ongoing challenges and cutting-edge topics:

- Incorporating equity in the resilience planning process;
- Operationalizing vulnerability assessments and implementing adaptation projects;
- Approaching economic development in the resilience planning process; and
- Developing resilience performance measures.

Participants reflected on best practices, approaches, and questions for peers for each of these topic areas, summarized below.

Incorporating Equity into the Resilience Planning Process

Best practices to incorporate equity into the resilience planning process include:

- Purposefully and regularly engage underserved communities in planning efforts to get community input and buy in (e.g., focus groups). Outreach to both underserved communities and existing advocacy groups is key. It is also important to provide educational materials in multiple languages.
- Ensure that land use planners are at the table for resilience planning decisions.
- Use available data sources to analyze equity and impacts to underserved communities. For example, agencies could develop and apply vulnerability assessment criteria for underserved communities based on available data and consider specific solutions to avoid impacts.
- Develop equity-related performance measures.
- Conduct a triple bottom line review of all projects.

Attendees are approaching equity by:

- Incorporating equity into project development and prioritization.
- Constructing complete streets projects.
- Conducting an environmental justice review for all projects, in which resilience is one of the criteria (e.g., using census data to analyze projects in the LRTP and bike/pedestrian mobility plan).
- Including a set of equity criteria in the project prioritization process.
- Coordinating with transit agencies using demographic data.
- Including an environmental justice section in transportation resilience master plans.

Key remaining questions for peers include:

- How is outreach being conducted in underserved communities?
- How do you define progress with regard to incorporating equity considerations into resilience planning?
- How is equity used in project prioritization?

- How do you overcome concerns that addressing resiliency will take away from other funding needs?
- Where can agencies access resources from peer agencies on equity?

Operationalizing Vulnerability Assessments and Implementing Adaptation Projects

Best practices to operationalize vulnerability assessments and implement adaptation projects include:

- Using vulnerability assessment results to inform LRTP projection prioritization;
- Applying the [Regional Unified Sea Level Curve](#);
- Collaborating with local jurisdictions;
- Conducting flood assessments during or after storm events;
- Mapping with LIDAR and GIS; and
- Referencing vulnerability assessments whenever applicable in project scoping.

Attendees are utilizing approaches such as:

- Using vulnerability assessments to identify corridors in need of mitigation projects;
- Applying a project prioritization methodology that uses a scoring matrix that distributes points to resiliency projects; and
- Allocating LRTP funds for eligible projects to be selected following resilience studies.

Key remaining questions for peers include:

- How to identify the best options for adaptation?
- How to get buy-in for decisions?

Approaching Economic Development in the Resilience Planning Process

Best practices to incorporate economic development in the resilience planning process include:

- Partnering with local planning and economic development agencies; and
- Developing links between land use and transportation planning.

Attendees are incorporating economic development by:

- Facilitating economic development focus groups for input on the LRTP; and
- Including economic development performance measures in the LRTP.

Key remaining questions for peers include:

- What have been successful partnerships for incorporating economic development?
- How do you approach economic development without creating concerns over property values?

Developing Resilience Performance Measures

Examples of performance measures include:

- Estimating lost trips after a disruptive event; and
- Calculating the percentage of critical transportation facilities that are resilient to sea level rise and storm surges.

Attendees are approaching resilience performance measures by:

- Developing and incorporating performance measures pertaining to resilience in the system performance report; and
- Utilizing a scenario planning framework for determining climate change vulnerabilities in a LRTP.

Key remaining questions for peers include:

- How can we track resiliency efforts at a regional scale?
- What is the best way to collaborate with local agencies on resiliency?

FHWA: Available Resources from FHWA – Heather Holsinger

To help MPOs implement lessons learned and best practices and address challenges and next steps, Heather Holsinger shared a number of available and upcoming FHWA resources.

FHWA requires resilience to be considered in asset management plans (23 CFR 515), transportation plans (23 USC 134, 23 CFR 450), emergency relief (23 CFR 667), and FHWA programs and policies (Order 5520). There are a number of adaptation activities eligible for FHWA funding and an extensive set of resilience resources and tools available on the FHWA resilience website

(<https://www.fhwa.dot.gov/environment/sustainability/resilience/>). Some of these key resources include:

- [FHWA resilience pilots](#) – FHWA has been conducting resilience pilots across the country with DOTs and MPOs since 2010. The results from the latest round of pilots will be online in early 2021.
- [FHWA's Vulnerability Assessment and Adaptation Framework \(VAST\), 3rd edition](#) – VAST provides an in-depth structured process for conducting a vulnerability assessment and features examples from assessments completed around the country. It also incorporates information from FHWA and other federal partners as well as links to related resources and tools.

Ongoing FHWA resilience efforts span planning, project level studies and resources, and operations and maintenance. New and upcoming key resources include:

- [Synthesis of Approaches for Addressing Resilience in Project Development](#) – Provides information on why, where, and how to integrate resilience into the project development process. This report covers lessons learned, FHWA guidance, adaptation options, and knowledge gaps for coastal hydraulics, riverine flooding, pavement and soils, and mechanical and electrical systems.

- [Nature-based Solutions for Coastal Highway Resilience: An Implementation Guide](#) – Provides transportation practitioners with information on how and where nature-based solutions can be used to improve the resilience of coastal roads and bridges. The report covers benefits and co-benefits of strategies as well as guidance on the project delivery process, such as how to consider nature-based solutions in the planning process.
- Integrating Resilience in Asset Management – A handbook on how to integrate resilience into the asset management process is expected to be released in 2020. The handbook covers steps such as developing an asset inventory informed by vulnerability assessments, identifying and managing risks, conducting life cycle planning, and creating resilient investment strategies and financial plans.
- Integrating Resilience in Transportation Planning – A handbook on how to integrate resilience into each step of the transportation planning process is expected to be released in 2020. An example of the planning steps and potential integration actions is shown in Figure 11. A white paper, fact sheets, and workshop and peer exchange summaries on this topic can be found on the [project website](#).

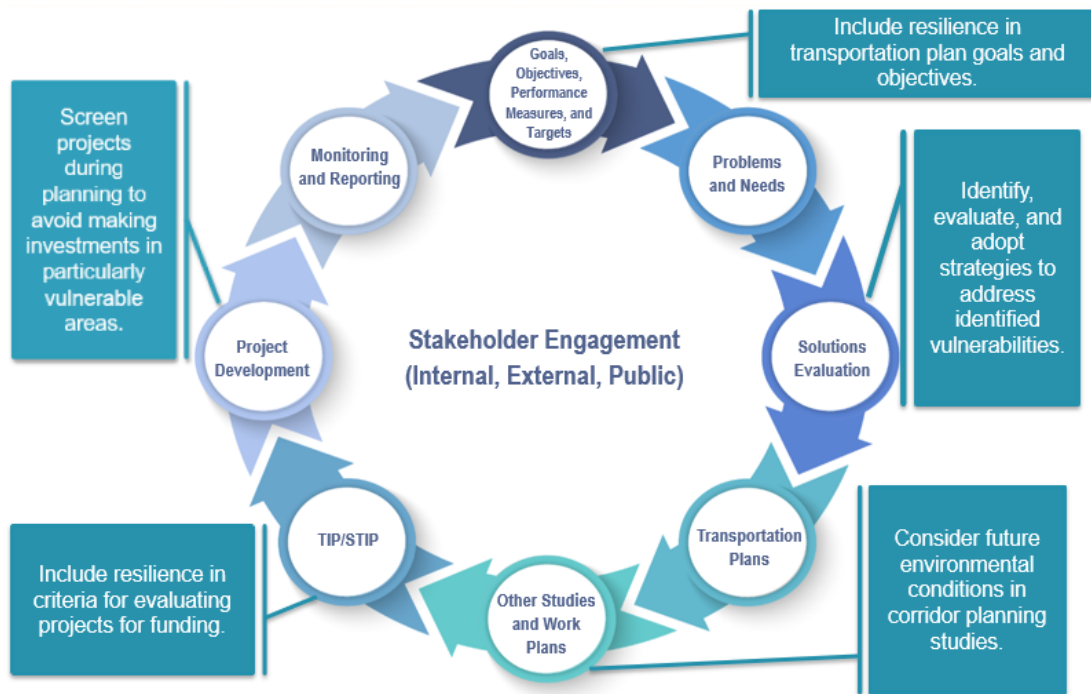


Figure 11. Example planning steps and resilience integration actions from the draft *Integrating Resilience in Transportation Planning* handbook

FHWA is also collaborating with NOAA on [Effects of Sea Level Rise research grant program](#) (2021), which could be a potential funding opportunity for coastal transportation agencies. The program will include a focus on how nature-based solutions can improve transportation resilience.

Needs and Next Steps

The final topic of the peer exchange was remaining needs and next steps. This section summarizes the responses to a series of prompts and sets the stage for additional resilience work and support across individual agencies, FDOT, and FHWA.

Attendees identified the following **key action items** from the peer exchange to apply at their respective agencies:

- Identify a resiliency champion;
- Clarify how the agency has historically addressed resiliency, and identify areas for improvement;
- Increase communication and coordination with internal and external partners. Specific examples include:
 - Improve coordination and communication with local partners;
 - Increase education, engagement, and empowerment efforts with communities including elected officials, municipal partners, and citizens;
 - Network and learn from peer organizations;
 - Develop partnerships across the board;
 - Coordinate with staff to determine next steps;
- Refine economic models for resiliency;
- Adopt a continuous learning approach on the topic of resiliency;
- Develop policies that guide future actions; and
- Request resources from Volpe.

Attendees identified the following **remaining needs** to incorporate resilience into the planning process and promote project implementation at their respective agencies:

- Increase collaboration with new and existing partners, including coordinating with planning partners on how to address resilience at the regional level;
- Identify additional funding sources for resilience efforts and project development;
- Educate and get buy-in from leadership and the general public;
- Obtain and analyze data on additional climate shocks and stressors beyond sea level rise;
- Conduct additional research on resiliency factors;
- Expand staff resources to address resilience;
- Clarify the role of MPOs as a planning agency to provide for resilience without authority;
- Prioritize resilience among other pressing needs; and

- Increase incentives for implementing agencies to include mitigation measures in transportation projects.

In response to **funding challenges**, attendees indicated two potential approaches: transitioning away from a fuel tax to a more sustainable funding solution and incorporating resilience improvements into system preservation projects.

Finally, attendees provided suggestions for how **FDOT and FHWA can support and partner with MPOs**. Suggestions for FDOT included:

- Help address funding challenges, specifically:
 - Allow state funding to be used for regional resilience projects
 - Fund and participate in MPO studies and projects
 - Partner with MPOs on federal grants
 - Develop a new grant program similar to the Transportation Regional Incentive Program (TRIP) for resilience projects that allow Surface Transportation Block Grant (STBG) funds to be used as a match for state funds
 - Develop a district-wide resilience grant program
 - Help quantify impacts to funding to deal with storm related damage throughout the state
 - Support the relaxing of State Transportation Trust Fund (STTF) dollars to allow some to be used for improving parallel facilities that support the State Road (SR) system
- Provide guidance and leadership on resilience efforts, specifically:
 - Being a strong proactive leader in operationalizing resilience
 - Ensuring consistency between districts in implementing the FDOT resiliency policy
 - Including resilience as a planning emphasis area
 - Incorporating resilience into context classification
 - Incorporating vulnerability assessment results into the project development and evaluation process
- Provide tools, resources, and trainings, specifically:
 - Develop a GIS screening of state roads and facilities at risk of flooding
 - Provide a tool or information on conducting a resilience screening from a design perspective
 - Hold more peer exchanges, trainings, and discussions on integrating resilience
 - Give a presentation on the threat to the state system and actions being taken

- Engage with local governments that have land development codes that are encouraging development in vulnerable areas.
- Mirror the District 1 planning studio across other districts
- Provide comments early on MPO processes so feedback can be addressed

Suggestions for FHWA to support both FDOT and MPOs included:

- Provide requirements or expectations for incorporating resiliency into long-range planning, including expectations for resilience performance measures
- Require states to establish long-range resilience plans, including costs and needs
- Provide support and advocacy related to addressing funding shortfalls, specifically:
 - Advocate for unique funding sources
 - Support updating funding formulas
 - Redistribute resources to small and mid-sized MPOs
 - Encourage dedicating a portion of federal funds to resiliency planning and implementation
 - Tie funding for project development to resiliency strategies
- Allow for more flexibility in cost feasible plans
- Share best practices on the value of stormwater capture and its potential for flood mitigation
- Continue to provide best practices and resources from nationwide efforts
- Provide training and education targeted at elected officials and citizens

Appendix A: Agenda

SESSION 1: State of the Practice in Florida Thu August 27, 10am-12pm ET	
10:00	Welcome and Peer Exchange Objectives (Alison Stettner, FDOT; Heather Holsinger and Michael Sherman, FHWA)
10:15	Overview of efforts to use the MPO planning process to increase resilience in Florida (Jennifer Carver, FDOT)
10:30	Lightning Round: Resilience Planning at Florida MPOs <i>5 min presentations from MPOs around the state on their experiences with resilience</i> Sarasota/Manatee MPO, Lee County MPO, Heartland Regional MPO, Gainesville MTPO, North Florida TPO, Emerald Coast RPC, Broward MPO, St. Lucie TPO, Space Coast TPO, River-to-Sea TPO, Miami-Dade TPO, Hillsborough MPO, Forward Pinellas
11:55	Wrap up and preview of upcoming sessions

SESSION 2: Peer Exchange – Resilience Needs and Strategies Thu August 27, 2-4pm ET	
2:00	Welcome
2:10	Peer presentations: Experience integrating resilience into planning <ul style="list-style-type: none"> • Metropolitan Transportation Council (MTC), Dave Vautin • Wilmington Area Planning Council (WILMAPCO), Bill Swiatek • Rockingham Planning Commission (RPC), David Walker
2:55	Discussion of challenges and opportunities
3:55	Wrap up

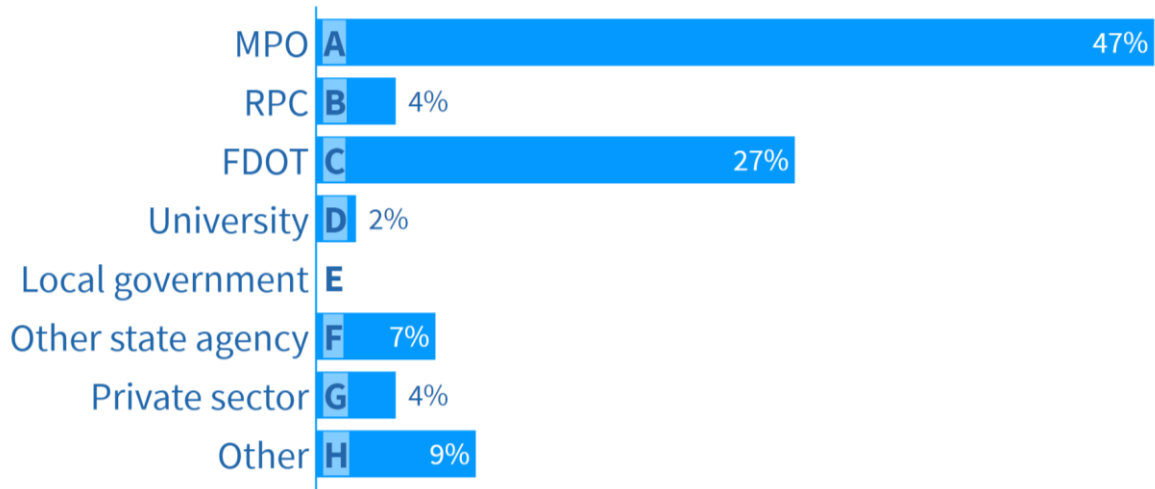
SESSION 3: Peer Exchange – Resilience Investments Fri August 28, 10am-12pm ET	
10:00	Welcome
10:10	Peer presentations: Experience integrating resilience into planning <ul style="list-style-type: none"> • Houston-Galveston Area Council (H-GAC), Pramod Sambidi and Kathryn Vo • North Jersey Transportation Planning Authority (NJTPA), Jennifer Fogliano • Volpe Center, Scott Smith • Hampton Roads TPO, Dale Stith
11:05	Discussion of challenges and opportunities
11:55	Wrap up

SESSION 4: Lessons Learned

Mon August 31, 10am-12pm ET

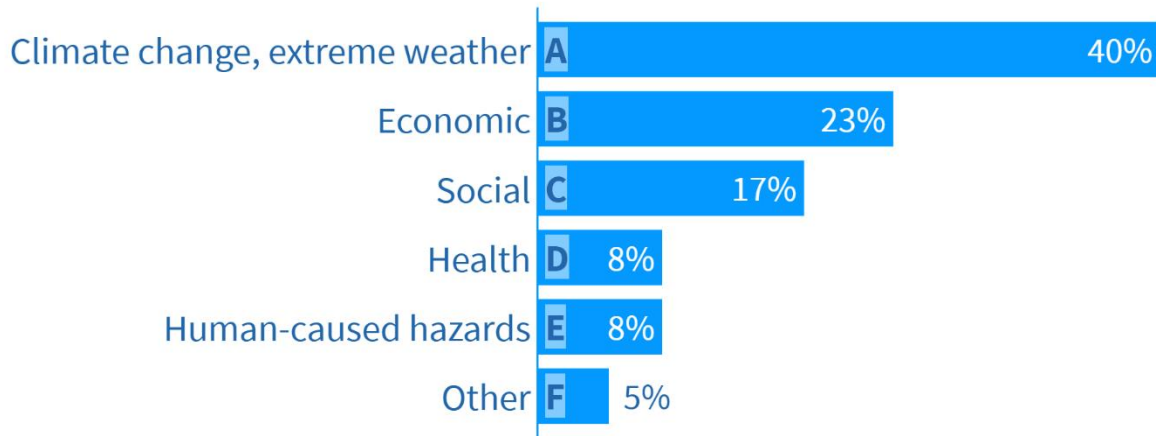
10:00	Welcome
10:15	Discussion of lessons learned: <ul style="list-style-type: none">• Discussion on role of MPOs in state-wide resilience planning• Discussion on operationalizing the vulnerability assessment results• Discussion on equity and economic development• Discussion on funding sources
11:45	Available resources (Heather Holsinger, FHWA)
11:55	Wrap up

What type of agency do you represent?



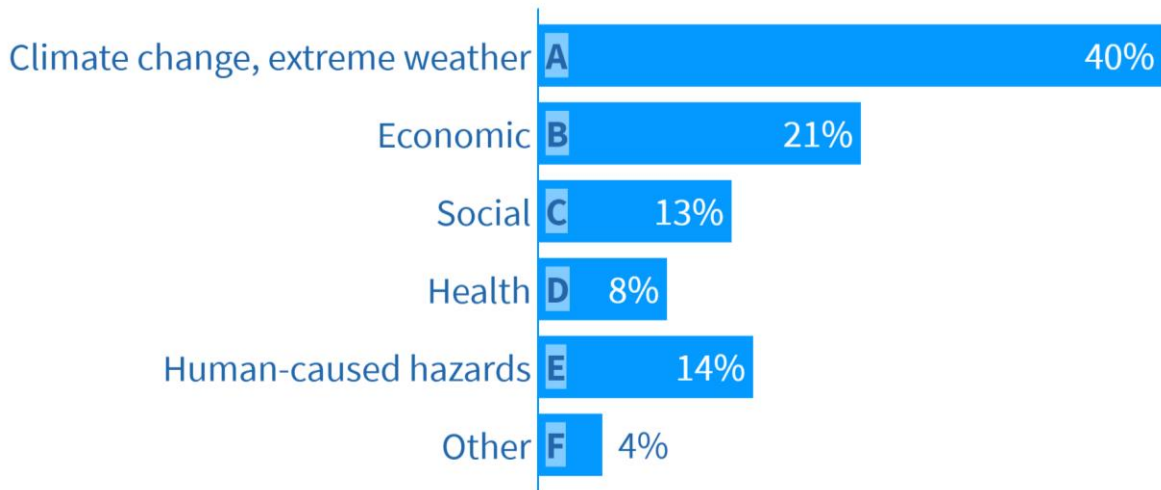
Response options	Count	Percentage
MPO	21	47%
RPC	2	4%
FDOT	12	27%
University	1	2%
Local government	0	0%
Other state agency	3	7%
Private sector	2	4%
Other	4	9%

What resilience challenges (risks) are your MPO facing?



Response options	Count	Percentage
Climate change, extreme weather	35	40%
Economic	20	23%
Social	15	17%
Health	7	8%
Human-caused hazards	7	8%
Other	4	5%


What risks is your MPO actively planning for? (select all that apply)



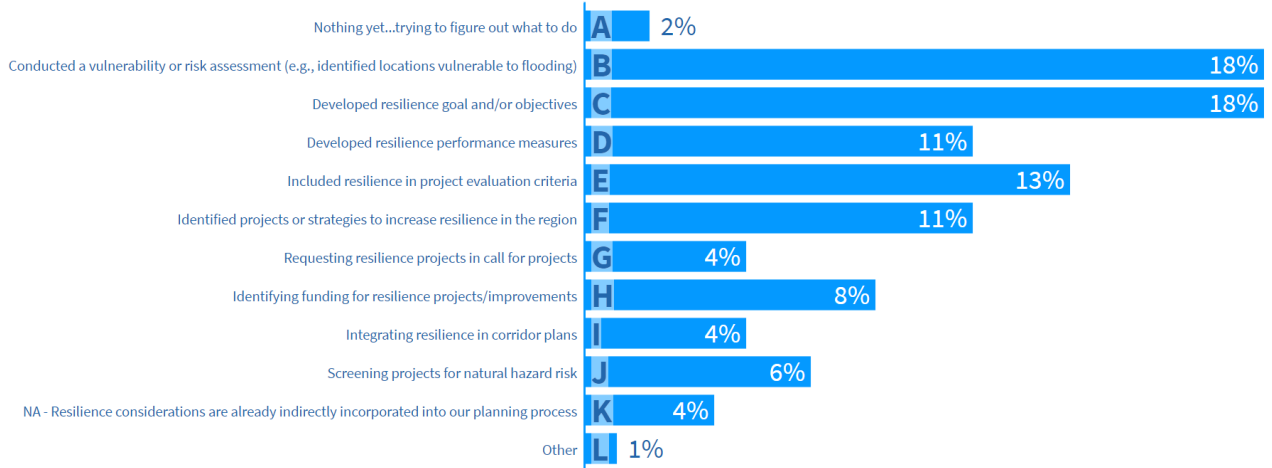
Response options	Count	Percentage
Climate change, extreme weather	29	40%
Economic	15	21%
Social	9	13%
Health	6	8%
Human-caused hazards	10	14%
Other	3	4%

What performance measures is your MPO using to track resilience progress?

Responses

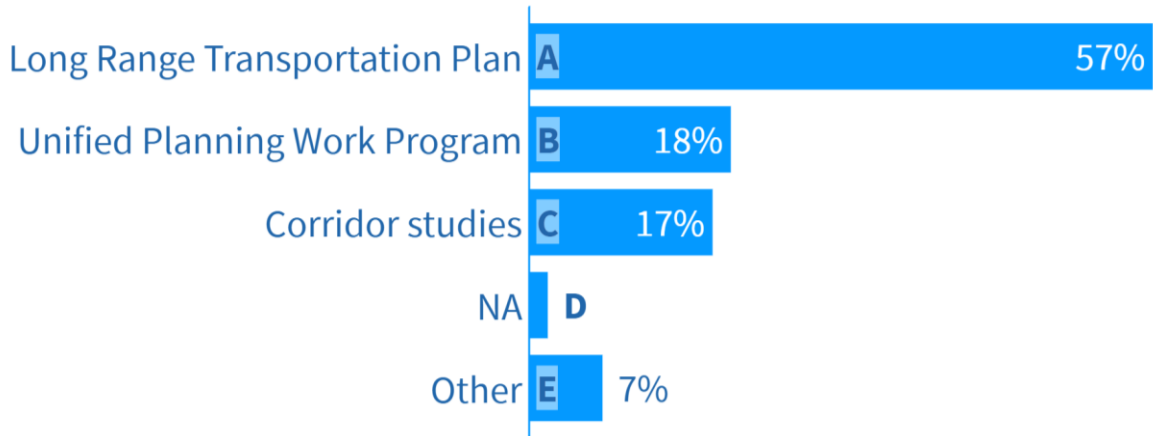
- No performance measures as yet. Maintenance of highways/bridges.
- Recovery time Disruption unknown unknown ??
- evacuation routes enhancements Network disruption
- None at this time None Potential Disruption to network
- By project completion None safety and security; system maintenance
- None at this time  None at this time collaboration

What steps has your MPO taken to-date to address resilience through the planning process? (select all that apply)



Response options	Count	Percentage
Nothing yet...trying to figure out what to do	2	2%
Conducted a vulnerability or risk assessment (e.g., identified locations vulnerable to flooding)	21	18%
Developed resilience goal and/or objectives	21	18%
Developed resilience performance measures	12	11%
Included resilience in project evaluation criteria	15	13%
Identified projects or strategies to increase resilience in the region	12	11%
Requesting resilience projects in call for projects	5	4%
Identifying funding for resilience projects/improvements	9	8%
Integrating resilience in corridor plans	5	4%
Screening projects for natural hazard risk	7	6%
NA - Resilience considerations are already indirectly incorporated into our planning process	4	4%
Other	1	1%

Which planning documents include these resilience performance measures? (select all that apply)



Response options	Count	Percentage
Long Range Transportation Plan	34	57%
Unified Planning Work Program	11	18%
Corridor studies	10	17%
NA	1	2%
Other	4	7%

What was your key takeaway from Session 1?

Responses

Not just coastal issues

There is a lot of exciting and amazing work in resiliency happening!

Not consistent

Common issues across the state: good role for FDOT

Not one single best practice, varied by location

varying levels of progress

A lot of MPOs / TPOs are doing a lot of great things

Great to see what others are doing.

The multiple plans that are already in place.

Storm Surge

coordination_is_paramount

varied progress being made by different MPO's

Various approaches

Larger MPOs/TPOs have resources and support that small MPOs do not.

Sea level rise

Lots of low lying areas

Variability

Wide range of strategies

There is a lot happening in FL!

storm surge

Varied

alot of interest in resiliency - but focus varies depending on location (climate, env, economy, tech)

FDOTPLANNING

In 1-3 key words, what are your MPO's challenges to using the planning process to increase transportation system resilience?



Responses

- integrated planning - transportation+ land use/housing, etc.
- Not enough staff Mitigation
- few stakeholder with both transportation and environmental planning skillsets
- housing MPO Competing-demands
- Funding, Coordination, Approval priorities resources
- Low cost solutions staff time Public outreach competing
- Money that the localities are willing to commit Funding public
- FDOT_Support denial Partnerships Tools Politics
- Champions politics Understanding Funding olitics Funding
- FHWASupport politics funding Elected Officials \$\$\$\$
- Funding hard to pinpoint mitigation cost different-stakeholders
- measurement Money \$\$\$ funding different priorities
- Education Politics \$\$\$ Competing needs and demands
- jurisdiction politics Staff capacity Funding funding

Which aspect of the MTC approach would be most beneficial to your organization?

Responses

- measuring impacts
- Quantifying impacts
- Collaboration and regional approach
- Costs
- Estimating costs
- Planning process priorities
- Quantifying impacts
- economic analysis
- Information about how this financially benefits the community
- Collaboration
- going beyond silos
- Collaboration
- collaboration
- collaboration with stakeholders

Which aspect of the WILMAPCO approach would be most beneficial to your organization?

Responses

- Land use - transportation link
- Wetland Park Example sounds good
- Working with jurisdictions in other counties/states
- collaboration
- Connecting land use and transportation
- innovative storm water solutions - dual use
- Equity
- Using Equity in Resilience Planning
- integrating a park (good community resource) into water treatment / drainage needs
- Incremental
- * on
- Using scientific evidence to encourage public and elected officials
- collaboration with FDOT
- an incremental approach
- equity
- Focus o equity

Which aspect of the RPC approach would be most beneficial to your organization?

Responses

Transportation solutions or broader solutions.

Looking at co-benefits of protections

remember groundwater element (rising with sea level in Florida)

Leveraging university talent

Considering equity

Stakeholder partnerships

applying vulnerability results to project prioritization

working with University

using real life scenarios in examples & high water signs

Education-High water signs

Process to ID transportation vs. non-transportation project solutions

university partnership

High water signs

SLR Scenarios

Public involvement and engagement

What was your key takeaway from Session 2?

Responses

Taking an incremental approach was mentioned a number of times, evolving situations/impacts do not allow for that 'luxury' in all cases

funding challenges

innovative approaches

Need for avoiding silos, and finding projects that can protect transportation infrastructure AND communities

Funding is a challenge!

rely on each others strengths

Go green where green is possible

Engagement is the KEY!

education partners

Coordination

Multiple approaches to tackling the issue

funding

Utilizing peer resources

COLLABORATION!

coordination

Lots of plans, not so many project specifics

communication

We need to up our education and engagement

Coordination

incremental progress is still progress

Which aspect of the H-GAC approach would be most beneficial to your organization?

Responses

The approach/methodology of obtaining data and processing to final report

Technical Analysis for critical evaluation

economic impact analysis

criticality/vulnerability matrix excellent

matrix for vulnerability

mitigation measures "cheat-sheet"

truck AADT

Great explanation do criticality and vulnerability

recognition of compound effects (e.g., SLR + surge)

Using Criticality to prioritize

Which aspect of the NJTPA approach would be most beneficial to your organization?

Responses

- Benefit-Cost Estimation project dashboard
- local stakeholder engagement
- VW grant to improve EV infrastructure coverage
- integrating transportation planning and water resources planning/stormwater management
- Mitigation strategies RCIS performance measures
- Add Resiliency Goal to Plan Collaboration and Strategies
- Prioritizing tsp investments that offer additional benefits for resiliency.
- Investment strategy approach - add resilience as a goal
- clear connection to regional vision CMAQ to promote electric vehicles

Which aspect of the HRTPO approach would be most beneficial to your organization?

Responses

- Consideration for variability in growth patterns
- Coordination with diverse multiple agencies (DoD, Volpe, etc)
- Project prioritization tool
- looking forward to learning more on the Resilience and Disaster Recovery Metamodel
- Wow! Can't wait to dig into the resources you have provided
- project prioritization model Dashboard!!!
- Using vulnerability as a proj evaluation measure project dashboard
- The project dashboard love dashboard Prioritization of projects
- effective/productive partnerships great resources
- SCENARIO PLANNING resilience project dashboard
- Identify vulnerabilities and develop adaptation strategies
- I wish we were you!

Which aspect of the Volpe Center approach would be most beneficial to your organization?

Responses

- able to run scenarios
- Consistent approach that can be replicated
- Benefit-Cost Estimation
- simplified routing model
- ability to test scenarios quickly
- My head is exploding over thousands of scenarios
- In the preparation of our LRTP, TIP, and UPWP
- Another tool, expand ways to present/visualize data
- multiple scenarios
- All Hazards approach
- robust data
- ability to test wide range of scenarios and options

What was your key takeaway from Session 3?

Responses

- resilience dashboard
- Resilience planning is fun!
- Cost/Benefit useful for making the case for resiliency
- There are process to factor resilience into project prioritization
- Resiliency needs to be integrated fully
- Dashboards/GIS platforms can be very helpful in communicating to partners and the public
- funding is always an issue
- working with locals to incorporate other amenities into required infrastructure/transportation improvement projects
- Benefit-Cost Analysis
- Vulnerability Assessment
- There's a lot left to do.
- Can't wait for Volpe's output
- Some MPOs in Florida are well positioned.

Appendix C: MPO Resilience Peer Exchange – Resilience Resources and Examples

Florida Metropolitan Planning Organizations

The following table highlights resilience efforts conducted by Florida Metropolitan Planning Organizations.

M/TPO	Resource	Objective
<u>Bay County TPO</u>	<u>Bay County TPO 2045 Long Range Transportation Plan</u>	Comprehensive economic development strategy “Environmental Quality, Protection and Resilience”
<u>Broward MPO</u>	<u>Commitment 2045 Metropolitan Transportation Plan</u> <u>South Florida Climate Change Vulnerability Assessment and Adaptation Pilot Project</u> <u>Extreme Weather and Climate Change Risk to the Transportation System in Broward County, Florida All Hazards Recovery Training</u>	<p>Resiliency objective and performance measures with targets under Strengthen Communities goal.</p> <p>Determine resiliency improvements for various state and non-state roads.</p> <p>Determine the impacts of exposure to sea level rise and flooding for the regional transportation network for the four-county (Palm Beach, Broward, Miami-Dade, Monroe) South Florida region.</p> <p>Focus on resiliency for Broward County arterials and major collectors.</p> <p>Resiliency covered in the “Next Steps and Actions” chapter.</p> <p>The purpose of this training was to equip the region to develop a comprehensive emergency recovery plan that maximizes the use of transit, social media, TDM strategies, and ITS technologies.</p>
<u>Capital Region Transportation Planning Agency (CRTPA)</u>	<u>CRTPA Connections 2040 Regional Mobility Plan Chapter 7</u>	CRTPA continues to monitor emerging trends and programs
<u>Charlotte County-Punta Gorda MPO</u>	<u>Charlotte County-Punta Gorda 2040 Long Range Transportation Plan</u>	<p>The goals of the Charlotte County-Punta Gorda 2040 LRTP are as follows:</p> <ul style="list-style-type: none"> • Ensure efficient travel for all modes of transportation • Expand transportation choices for everywhere • Preserve natural spaces while promoting a health community

M/TPO	Resource	Objective
	Route to 2045 Charlotte County-Punta Gorda MPO L RTP	<ul style="list-style-type: none"> Promote vibrant centers and the local economy Enhance safety and security for everyone
Collier MPO	Collier MPO 2045 L RTP	Consider Climate Change Vulnerability and Risk in Transportation Decision Making
Forward Pinellas	Advantage Pinellas 2045 L RTP Criteria used to select priority projects for funding Countywide land use planning	<p>The components of the Advantage Pinellas 2045 L RTP related to resilience primarily include Resilient Tampa Bay: Transportation project, completed in partnership with other MPOs and partners in the region.</p> <p>For additional information please see the Resilient Tampa Bay: Transportation Pilot Program Technical Memorandum and the Resilient Tampa Bay: Transportation Study Receives Excellence in Regional Transportation Award blog post.</p> <p>Forward Pinellas has also built resilience into the criteria used to select priority projects for funding (item 5D). Resilience is reflected in the Countywide Plan and Countywide Strategies through the Coastal High Hazard Area.</p>
Gainesville MTPO	The Gainesville Metropolitan TPO List of Priority Projects Fiscal Years 2021/22 – 2024/25	The metropolitan transportation planning process shall provide for consideration of projects and strategies that will improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation
Hernando/Citrus MPO Hillsborough	Hernando/Citrus MPO L RTP It's TIME Hillsborough 2045 L RTP	<p>The Hernando/Citrus MPO will work with the coalition and other partners such as FDOT, local public works departments, and emergency planning agencies, to assist in strengthening the transportation system's resiliency to man-made and natural disasters.</p> <p>Establish an investment program to improve the resilience and reliability of the transportation system and reduce or mitigate the stormwater impacts of surface transportation.</p>

M/TPO	Resource	Objective
	<p>The Resilient Tampa Bay Transportation Pilot Also described at: FHWA Resilience & Durability to Extreme Weather Pilot Program</p> <p>Hillsborough MPO Transportation Vulnerability Assessment Pilot Project</p> <p>FHWA Scenario Planning Peer Exchange</p>	<p>One of eleven FHWA Resilience and Durability to Extreme Weather Pilot Program projects to improve transportation infrastructure by identifying vulnerable roads in the tri-county Tampa Bay TMA and estimating the per-mile costs of appropriate mitigation and hardening treatments. The study also forecast the economic impact, in a post-disaster scenario, of not making the improvements.</p> <p>The predecessor of the Resilient Tampa Bay study, five years earlier, this study was a similar analysis for Hillsborough County alone, and informed the 2040 L RTP. Presented on integrating vulnerability assessment into scenario planning, in a 2016 peer exchange with the Hampton Roads, Virginia TPO.</p>
<p>Indian River County MPO</p>	<p>2040 Indian River County MPO L RTP</p>	<p>Increase resiliency of infrastructure for extreme weather and climate trends</p>
<p>Lake-Sumter MPO</p> <p>Martin MPO</p>	<p>Lake Sumter MPO Transportation Improvement Program Martin MPO’s 2045 Cost Feasible Plan Resiliency Projects Map</p> <p>Moving Martin Forward 2040 L RTP</p>	<p>Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation. The roads identified on the Resiliency Projects Map have a Federal Functional Classification and are identified on the County’s preliminary vulnerability map as having the potential to become inundated with more than a foot of water in the future due to sea level rise:</p> <ul style="list-style-type: none"> • N Sewalls Point Road from SR-A1A (NE Ocean Boulevard) to SE Palmer Street • SE MacArthur Boulevard from SE South Marina Way to approximately 1,500 feet north <p>Create goals that were focused on outcomes further supplemented by measurable performance measures</p>
<p>MetroPlan Orlando</p>	<p>MetroPlan 2045 Long Range Transportation Plan</p>	<p>Resiliency is built in throughout the 2045 planning process starting with the goals and objectives and continuing through the project prioritization. Programmatic resiliency strategies and implementation</p>

M/TPO	Resource	Objective
		<p>responsibilities will be established to guide the development of new transportation infrastructure.</p> <p>MetroPlan Orlando has chosen to integrate resiliency throughout the Safety & Security, Reliability & Performance, Access & Connectivity, Health & Environment and Investment & Economy goals and objectives.</p> <p>Planning for resiliency begins with understanding potential disruptions to the transportation network and the 2045 MTP is using scenario planning to identify potential risks and how they can impact the region. MetroPlan has chosen six key drivers of change for the focus of the plan: Population, Economy, Visitation, Development & Land Use, Technology, and Climate.</p> <p>The 2045 MTP will be evaluating needs and opportunities based on a comprehensive set of performance measures to identify mobility needs resulting in a multimodal approach. Projects identified in the needs plan will be prioritized based on the full range of goals and objectives. Several tools will be used to obtain qualitative data in order to compare projects with the established performance indicators.</p>
<u>Miami-Dade</u>	<u>South Florida Climate Change Vulnerability Assessment and Adaptation Pilot Project</u> <u>Miami-Dade 2045 LRTP</u>	<p>The study used exposure, sensitivity, and adaptive capacity as the three indicators. The tool was used to determine the impacts of exposure to sea level rise and flooding for each highway segment.</p> <p>Improve and Preserve the Existing Transportation System</p>
<u>North Florida TPO</u>	<u>North Florida TPO 2045 PathForward LRTP</u>	Create reliable and resilient multimodal infrastructure
<u>Okaloosa-Walton TPO</u>	<u>2040 Long Range Transportation Plan</u>	

M/TPO	Resource	Objective
<u>Palm Beach TPA</u>	<u>South Florida Climate Change Vulnerability Assessment and Adaptation Pilot Project</u> <u>Palm Beach TPA 2045 LRTP</u>	<p>The study used exposure, sensitivity, and adaptive capacity as the three indicators. The tool was used to determine the impacts of exposure to sea level rise and flooding for each highway segment.</p> <p>Identify the percentage of federal aid eligible mileage susceptible to inundation by 1.2-foot sea level rise and historic storm surge. Record the 1% chance of annual flooding.</p>
<u>Pasco County MPO</u>	<u>Resilient PASCO Vulnerability Assessment and Sustainability & Resiliency Plan</u> <u>Mobility 2040 Long Range Transportation Plan</u>	<p>The proposed scope of work has two major phases that address community lifelines from a vulnerability, sustainability and resiliency perspective.</p>
<u>River to Sea</u>	<u>Sea Level Rise Vulnerability Assessment</u> <u>Connect 2045 LRTP</u> <u>Resilient Volusia County</u> <u>Resilient Flagler County</u>	<p>Increase the ability of local and regional stakeholders to implement resiliency and climate adaptation strategies.</p> <p>Used the data from the Sea Level Rise Vulnerability Assessment, to evaluate a “Resiliency Scenario”.</p> <p>To build resiliency against flooding and sea level rise, the Volusia County Office of Emergency Management partnered with East Central Florida Regional Planning Council (ECFRPC), Florida Department of Transportation, the River to Sea Transportation Planning Organization, and UF Geoplan Center to assess impacts.</p> <p>The study also looked at the different approaches Volusia can use to build resiliency including retreat, accommodate, and protect. Resources, along with recommendations for implementing new data and strategies, policies and information into existing plans throughout the county were discussed. Emphasis was placed on Emergency Preparedness, Land-Use, and Transportation.</p> <p>To build resiliency against flooding and sea level rise, the Flagler County Office of Emergency Management partnered with North East Florida Regional Council (NEFRC),</p>

M/TPO	Resource	Objective
	<p>East Central Florida Regional Resiliency Action Plan</p>	<p>the River to Sea Transportation Planning Organization, and UF Geoplan Center to assess impacts. Using the FDOT Sea Level Scenario Sketch Planning Tool along with FEMA’s Hazus-MH software, impacts of sea level rise, combined with a 100-year-storm were modeled.</p> <p>Using these models and Flagler County data, critical assets and facilities were assessed to determine potential impacts during such a 100-year storm event with increased coastal flooding. Assessments also included significant evacuation routes and impacts to County facilities. After analyzing the data Flagler can now begin to prepare for the future impacts of a 100- year storm as sea levels rise. The study also looked at the different approaches Flagler can use to build resiliency including retreat, accommodate, and protect.</p> <p>The Resiliency Action Plan seeks to increase capacity of regional stakeholders resiliency and climate adaptation capacity, engage stakeholders and obtain support for adaptation of the plan.</p>
<p>Space Coast TPO</p>	<p>Space Coast TPO 2045 LRTP</p>	
<p>St. Lucie TPO</p>	<p>St. Lucie TPO TIP 2019/20 – 2023/24</p> <p>Sea Level Rise Mapping Study</p> <p>2040 LRTP Performance Measures and Resiliency Performance Measures</p> <p>Coordination with St. Lucie County Environmental Resources Department on climate resiliency</p>	<p>Improve the transportation system’s stability/resiliency in the event of climate change, emergencies or disasters.</p> <p>Identify transportation infrastructure exposed to current and future flooding due to sea level rise and reduce economic impact of major storms.</p> <p>Integrate Resiliency into long range transportation plan (LRTP) and develop performance measures to monitor resiliency effort through long range transportation planning.</p> <p>Coordinate with local agencies to address climate change and to improve the climate adaptation/resiliency and reduce natural disaster risk.</p>

Regional Resilience Organizations/Collaboratives

The following table highlights regional resilience organizations and collaboratives.

Agency	Objective
<u>Southeast Florida Regional Climate Compact</u>	The Regional Climate Action Plan (RCAP) provides a set of recommendations, guidelines for implementation, and shared best practices for local entities to act in-line with the regional agenda.
<u>Tampa Bay Regional Resiliency Coalition</u>	The Tampa Bay Regional Resiliency Coalition provides information and recommendations to ensure the region’s transportation system meets the near and long term functional, economic, and quality of life goals of Tampa Bay’s residents, businesses, and visitors in the face of weather and climate changes.
<u>East Central Florida Regional Resilience Collaborative</u>	The East Central Florida Regional Resilience Collaborative is a group of stakeholders across the region to develop a structure and framework for a regional resilience collaborative.
<u>Northeast Florida Regional Council</u>	The Northeast Florida Regional Council seeks to continue to push regional conversations about resilience forward.

Peer Organizations Outside Florida

The following table highlights resilience efforts conducted by peer organizations outside Florida.

Organization	Document	Objective
<u>Hampton Roads TPO</u>	<u>Hampton Roads 2045 LRTP</u>	The plan is incorporating scenario planning to consider how changing factors such as sea level rise could affect connectivity and resiliency across the region. Recently updated Project Prioritization Tool used to evaluate and prioritize candidate projects includes some resiliency measures.
	<u>Project Prioritization</u>	
	<u>Sea Level Rise Planning Efforts</u>	Efficiency, Resiliency, & Innovation: Improve the resiliency and reliability of the transportation system and reduce or mitigate stormwater impacts of surface transportation
	<u>Interactive Map</u>	Potential Submergence of Roadways by 2045
	<u>HRPDC Coastal Resilience Planning Efforts</u>	The Hampton Roads Planning District Commission (sister agency to the HRTPO) Coastal Resiliency Program activities addresses regional challenges related to flooding and sea level rise.

Organization	Document	Objective
<p><u>San Francisco Bay Area MTC</u></p>	<p><u>Hampton Roads Resilience Project Dashboard</u></p> <p><u>Plan Bay Area 2040</u></p> <p><u>Plan Bay Area 2050</u></p> <p><u>SR 37 Transportation and Sea Level Rise Corridor Improvement Plan</u></p> <p><u>Futures Final Report: Resilient and Equitable Strategies for the Bay Area's Future</u></p>	<p>The Environmental Impact Report (EIR) for Plan Bay Area 2040 discloses potential environmental impacts and recommended mitigation measures of implementing the plan.</p> <p>MTC prepared a corridor plan for State Route 37, which includes an assessment of sea level rise in addition to congestion. The roadway currently experiences periodic closures because of flooding and may experience permanent flooding towards the end of the century. The corridor study resulted in a phased adaptation approach with short-term (protect), medium-term (protect/accommodate), and long-term (accommodate) approaches</p> <p>The goal of Futures Planning was not to pick a preferred Future but rather to use three distinct Futures with a variety of different conditions as backdrops to test the resilience of different strategies. The key question in the Futures Planning process was, “which strategies that could be advanced by local jurisdictions, regional agencies or the state in the coming decades are effective under a variety of uncertain conditions?”</p>
<p><u>Dover/Kent County MPO / DeIDOT</u></p>	<p><u>DeIDOT Project Prioritization Criteria</u></p>	<p>DeIDOT created a prioritization system in which each resilience strategy is assigned a score of 1-3 across four categories: Enabler (of another strategy), Impact, Cost, and Ease. Based on the outcome of the prioritization, DeIDOT developed three tiers of priority, which eventually contributed to their development of an implementation timeline.</p>
<p><u>North Jersey Transportation Planning Authority (NJTPA)</u></p>	<p><u>Plan 2045 Connecting North Jersey</u></p>	<p>The plan includes the resilient strategy which strives to adapt infrastructure to be resilient to extreme weather events and to the impacts of climate change.</p>

Organization	Document	Objective
<u>Fayette Raleigh MPO</u>	<u>Extreme Weather At-Risk Roadways System</u>	Developed an Extreme Weather At-Risk Roadways System report, in which they assessed threats to their system from extreme weather events with the intent of informing the scope of projects and programs in the region’s long-range transportation plan, 2040 Regional Transportation Plan. Within this assessment, FRMPO identified and mapped areas of concern, such as roadway segments that are vulnerable to flooding during potential future extreme weather events.
<u>Houston-Galveston Area Council</u>	<u>Resiliency and Durability Pilot</u> <u>Regional Resilience Tool</u>	The Houston-Galveston Area Council is currently conducting a Resilience and Durability to Extreme Weather pilot. H-GAC is partnering with TxDOT, Harris County, and other local governments to reduce flood risk on critical regional and local highways by developing detailed recommendations to improve resiliency of transportation infrastructure.
<u>Southern California Association of Governments</u>	<u>2012-2035 Regional Transportation Plan (RTP)</u>	RTP identifies \$68B to address preservation, operation, and resilience needs of the state highway system, and also embeds \$6B to implement and accelerate strategies that will support transportation system resilience.
<u>Boston Region MPO</u>	<u>Destination 2040 LRTP of the Boston Region Metropolitan Planning Organization</u> <u>All Hazards Planning</u>	Project evaluation criteria include ratings for how well project design improves the region’s LRTP in areas that are flood-prone or at risk to storm surge and sea level rise. Uses an All-Hazards Planning Application tool that maps the transportation network and TIP projects in relation to natural hazard zones to determine if proposed projects are at risk of flooding, hurricane storm surges, earthquake liquefaction, or sea level rise.

Organization	Document	Objective
<u>Washington DOT</u>	<u>US Army Corps of Engineers: Levees and Flood Risk Management</u>	WSDOT actively engaged the U.S. Army Corps of Engineers when they learned the Corps was undertaking a major flood study to determine how and where to invest in levees and other flood risk reduction projects. Transportation assets were likely to be affected by the outcomes of the study, but they were not the focus of the study.
<u>LA Metro</u>	<u>Metro Climate Action and Adaptation Plan 2019</u>	Developed climate risk assessment and adaptation plan; incorporating into long range planning process and other systems; emphasis on ensuring equity through resilience planning
<u>NC Capital Area MPO</u>	<u>Connect 2045 The Research Triangle Region's Metropolitan Transportation Plan</u>	Conducted an extreme weather risk assessment, and incorporated extreme weather resilience into the LRTP.
<u>Atlanta Regional Commission</u>	<u>Vulnerability and Resiliency Framework For the Atlanta Region</u>	Developed Vulnerability and Resiliency Framework for the Atlanta region and are currently assessing vulnerabilities and incorporating into the decision-making processes, focusing on vulnerabilities to inland flooding and extreme heat.
<u>Rockingham Planning Commission (RPC)</u>	<u>Regional Master Plan - Climate Change Chapter</u> <u>Seacoast Transportation Corridor Vulnerability Assessment & Plan</u>	<p>A major impetus for considering resilience in transportation planning at the Rockingham Planning Commission has been the increased frequency of natural hazards.</p> <p>RPC has focused on the Goals and Problems and Needs steps of the process, having included resilience as one of their long-range goals and completed a number of vulnerability assessments to inform their planning. RPC is currently developing metrics for considering resilience in project selection and for monitoring performance.</p> <p>This vulnerability assessment and plan will enhance regional coordination in New Hampshire for transportation networks vulnerable to sea-level rise and other coastal hazards in order to maximize information sharing, identify opportunities to fill data gaps, and develop shared understanding of options for future transportation planning.</p>

Organization	Document	Objective
	Tides to Storms: Assessing Risks and Vulnerability to Sea-level rise and Storm Surge: A Vulnerability Assessment of Coastal New Hampshire Climate risk in the Seacoast (C-RiSe): Assessing Vulnerability of Municipal Assets and Resources to Climate Change Rockingham Planning Commission 2045 LRTP	<p>The Tides to Storms project assessed the vulnerability of coastal municipalities and public infrastructure to flooding from expected increases in storm surge and rates of sea-level rise. The project’s purpose was to develop a regional scale understanding of what and where impacts from sea-level rise and storm surge will occur on New Hampshire’s coast.</p> <p>C-RiSe will provide Great Bay municipalities with maps and assessment of flood impacts to road and transportation assets, critical facilities and infrastructure and natural resources associated with projected increase in storm surge, sea level and precipitation. The 2045 LRTP includes resiliency related goals and objectives as well as an assessment of current and future conditions.</p>
Northeast Ohio Areawide Coordinating Agency (NOACA)	Transportation Improvement Program 2021 - 2024	<p>NOACA has integrated resilience into the goals and objectives, problems and needs, solutions evaluation, transportation plan, and TIP steps of their transportation planning process. The agency is just beginning to fund and implement resilience projects and intends to develop a monitoring process. NOACA is in the process of updating and expanding its project application process to encourage project sponsors to demonstrate how the project will control and mitigate stormwater during the design, construction, and long-term performance of the project before it is eligible for funding.</p>

State of Florida and Federal Efforts

The following table highlights resilience efforts conducted by the state of Florida and at the federal level.

Agency	Document Title	Objective
Florida Department of Transportation (FDOT)	FDOT Resilience Quick Guide	<p>FDOT Office of Policy Planning (OPP) developed the Resilience Quick Guide which outlines the steps for an MPO to consider throughout the development of the LRTP</p>

Agency	Document Title	Objective
U.S Department of Transportation Federal Highway Administration	Resiliency Subject Brief	The Resiliency Subject Brief highlights the importance of planning for resiliency, FDOT’s role in resiliency, the ways in which FDOT is advancing resiliency, the requirements for resiliency, and additional resiliency resources.
	Florida Transportation Plan	The Florida Transportation Plan (FTP) is the single overarching statewide plan guiding Florida's transportation future. It is a plan for all of Florida created by, and providing direction to, the Florida Department of Transportation (FDOT) and all organizations that are involved in planning and managing Florida's transportation system, including statewide, regional, and local partners. The FTP includes seven goals to guide transportation planning decisions.
	Emergency Relief Program and Resilience	Integrating Resilience into the Transportation Planning Process
	Federal-Aid Program Administration	
National Centers for Coastal Ocean Science U.S Army Corps of Engineers	Integrating Resilience into the Transportation Planning Process	
	Special Federal-Aid Funding	
	The Effects of Sea Level Rise Grant Program Silver Jackets Teams South Atlantic Coastal Study	The vision of the South Atlantic Coastal Study is to provide a common understanding of risk from coastal storms and sea level rise to support resilient communities and habitats.

Transportation Resource Board Cooperative Research Program Projects

The following table highlights the Transportation Resource Board Cooperative research program projects.

Project Number	Project Title	Stage	Comments
ACRP 02-78	Climate Resilience and Benefit Cost Analysis-- A Handbook for Airports	Completed	
ACRP Synthesis 11-03/Topic S02-06	Airport Climate Adaptation and Resilience	Final (Synthesis)	

Project Number	Project Title	Stage	Comments
<u>NCFRP 50</u>	Improving Freight Transportation Resilience in Response to Supply Chain Disruptions	Final	Published as NCFRP Research Report 39.
<u>NCHRP 08-129</u>	Incorporating Resilience Concepts and Strategies in Transportation Planning	Pending	
<u>NCHRP 08-146</u>	Integrating Resiliency into Transportation System Operations	Anticipated	
<u>NCHRP 08-36/Task 146</u>	Economic Resilience and Long-Term Highway/Transportation Infrastructure Investment	Completed	
<u>NCHRP 08-36/Task 73</u>	Adding Resilience to the Freight System in Statewide and Metropolitan Transportation Plans: Developing a Conceptual Approach	Completed	Completed - Final Report sent to AASHTO
<u>NCHRP 15-80</u>	Design Guidance and Standards for Resilience	Anticipated	
<u>NCHRP 20-117</u>	Deploying Transportation Resilience Practices in State DOTs	Active	
<u>NCHRP 20-125</u>	Strategies for Incorporating Resilience into Transportation Networks	Pending	
<u>NCHRP 20-127</u>	Business Case and Communications Strategies for State DOT Resilience Efforts	RFP	
<u>NCHRP 20-24(125)</u>	Scoping Study to Develop the Basis for a Highway Standard to Conduct an All-Hazards Risk and Resilience Analysis	Completed	
<u>NCHRP 20-59</u>	Surface Transportation Security and Resilience Research	Active	
<u>NCHRP 20-59(53)</u>	FloodCast: A Framework for Enhanced Flood Event Decision Making for Transportation Resilience	Active	
<u>NCHRP 20-59(54)</u>	Transportation System Resilience: Research Roadmap and White Papers	Completed	
<u>NCHRP 20-59(55)</u>	Transportation System Resilience: CEO Primer & Engagement	Active	
<u>NCHRP 20-59(56)</u>	Support for State DOT Transportation Systems Resilience and All-Hazards Programs	Completed	

Project Number	Project Title	Stage	Comments
<u>NCHRP 23-09</u>	Scoping Study to Develop the Basis for a Highway Standard to Conduct an All-Hazards Risk and Resilience Analysis	RFP	
<u>NCHRP Synthesis 20-05/Topic 48-13</u>	Resilience in Transportation Planning, Engineering, Management, Policy, and Administration	Final (Synthesis)	
<u>TCRP A-41</u>	Improving the Resiliency of Transit Systems Threatened by Natural Disasters	Completed	

Appendix D: Participant List

	Last Name	First Name	Email	Organization	Session 1	Session 2	Session 3	Session 4
1	Abraham	Jesten	Jesten.Abraham@dot.state.fl.us	FDOT	X	X	X	X
2	Arbeau	Donnie	Darbeau@cfrpc.org	Heartland Regional TPO			X	X
3	Austin	Jared	jaustin@co.pinellas.fl.us	Forward Pinellas	X			
4	Austin	Mitchell	maustin@cityofpuntafordafl.com	City of Punta Gorda	X			
5	Barber	Joshua	barberj@plancom.org	Hillsborough MPO		X		
6	Bartolotta	Al	abartolotta@co.pinellas.fl.us	Forward Pinellas	X			
7	Bauer	Joseph	Joseph.Bauer@FloridaDEP.gov	Florida Department of Environmental Protection	X			X
8	Beckom	Adam	adam.beckom@h-gac.com	Houston-Galveston Area Council (TX)	X			
9	Belfield	Sam	sbelfield@hrtpo.org	Hampton Roads TPO (VA)	X	X	X	X
10	Bermudez	Josenie	Josenie.Bermudez@dot.state.fl.us	FDOT	X	X	X	X
11	Bhat	Cassandra	Cassandra.Bhat@icf.com	ICF	X	X	X	X
12	Blackshear	Ronnie	rblackshear@pascocountyfl.net	Pasco County MPO		X	X	X
13	Blais	Jasmine	jblais@metroplanorlando.org	MetroPlan Orlando	X	X		X
14	Blanton	Whit	wblanton@co.pinellas.fl.us	Forward Pinellas	X	X		
15	Blizzard	Stacie	Stacie.Blizzard@dot.gov	FHWA		X		X
16	Bock	Megan	Megan.Bock@dot.state.fl.us	FDOT	X		X	
17	Bollenback	Lois	Lbollenback@r2ctpo.org	River to Sea TPO	X	X		X
18	Bouck	Lara	Lbouck@metroplanorlando.org	MetroPlan Orlando	X	X		X
19	Brown	Millie	Millie.Brown@dot.state.fl.us	FDOT	X			
20	Brown	Ryan	Ryan@mympo.org	Sarasota/Manatee TPO	X	X	X	X
21	Buchwald	Peter	BuchwaldP@stlucieco.org	St. Lucie TPO	X	X	X	X
22	Bunnewith	Denise	dbunnewith@northfloridatpo.com	North Florida TPO				X
23	Burke	Charlene	burkec@browardmpo.org	Broward MPO	X			
24	Burke	Greg	Greg.Burke@talgov.com	Capital Region TPA	X			X
25	Bush	Lois	lois.bush@dot.state.fl.us	FDOT	X	X	X	X
26	Cabral	Irene	Irene.Cabral@dot.state.fl.us	FDOT	X			X

	Last Name	First Name	Email	Organization	Session 1	Session 2	Session 3	Session 4
27	Carter	Laura	Laura.Carter@brevardfl.gov	Space Coast TPO	X	X	X	X
28	Carver	Jennifer	Jennifer.Carver@dot.state.fl.us	FDOT	X	X	X	X
29	Cassidy	Mark	mcassidy@sfrpc.com	South Florida Regional Planning Council	X			
30	Chatman	Rodney S	rschatman@co.pinellas.fl.us	Forward Pinellas	X	X	X	X
31	Clarendon	Rich	clarendonr@plancom.org	Hillsborough MPO	X	X	X	
32	Colmenares	Maria Elisa	MariaElisa.Colmenares@miamidad e.gov	Miami-Dade TPO	X		X	X
33	Conte	Tony	tony.conte@yourcharlotteschools. net	Charlotte County Schools	X		X	
34	Corales- Cuadrado	Alvimarie	alvimarie@mympo.org	Sarasota/Manatee MPO	X	X		
35	Corbett	Melissa	Melissa.Corbett@deo.myflorida.co m	Florida Department of Economic Opportunity	X	X	X	X
36	Culp	Michael	Michael.Culp@dot.gov	FHWA	X	X	X	
37	Dagenhart	Cayce	Cdagenhart@co.hernando.fl.us	Hernando/Citrus MPO	X	X	X	
38	Davis	Julia	JuliaDavis@polk-county.net	Polk TPO	X	X		
39	Davis-Walcott	Arlene	adavis-walcott@sfrpc.com	South Florida Regional Planning Council	X	X	X	X
40	Dill	Romero	romero.dill@dot.state.fl.us	FDOT	X	X		
41	Ding	Yi	DingY@stlucieco.org	St. Lucie TPO	X	X		X
42	Dix	Brenda	Brenda.Dix@icf.com	ICF	X	X	X	X
43	D'Onofrio	David	david.d'onofrio@dot.gov	FHWA			X	
44	Edara	Sai	Sai@CCMPO.com	Charlotte County-Punta Gorda MPO	X	X	X	X
45	Elmore	Amy	aelmore@forwardpinellas.org	Forward Pinellas	X	X	X	
46	Engala	Todd	todd.engala@dot.state.fl.us	FDOT	X		X	X
47	Escalante	Michael	escalante@ncfrpc.org	Gainesville MTPO	X	X	X	X
48	Favero	Chelsea	cfavero@co.pinellas.fl.us	Forward Pinellas	X	X	X	X

	Last Name	First Name	Email	Organization	Session 1	Session 2	Session 3	Session 4
49	Fisher	Linda A	lfisher@forwardpinellas.org	Forward Pinellas				X
50	Flannery	Aimee	aimee.flannery@dot.gov	U.S. DOT	X	X		X
51	Flavien	Paul	flavienp@browardmpo.org	Broward MPO	X			
52	Fogliano	Jennifer	jfogliano@njtpa.org	North Jersey Transportation Planning Authority (NJ)			X	X
53	Frederick	Chandra	ChandraFrederick@polk-county.net	Polk TPO	X	X		X
54	Fulcher	Virginia	Elizabeth.Fulcher@dot.state.fl.us	FDOT	X	X	X	X
55	Gabriel	Greg	GGabriel@PalmBeachTPA.org	Palm Beach TPA	X			
56	Gardner-Young	Caryn	Caryn.Gardner-Young@dot.state.fl.us	FDOT	X	X	X	X
57	Gies	Peter	giesp@browardmpo.org	Broward MPO	X			
58	Gillette	Georganna	Georganna.Gillette@brevardfl.gov	Space Coast TPO	X	X	X	X
59	Gogoi	Ron	rgogoi@leempo.com	Lee County MPO	X	X	X	X
60	Goodison	Crystal	goody@geoplan.ufl.edu	University of Florida	X	X	X	X
61	Gorman	Tania	tgorman@pascocountyfl.net	Pasco County MPO	X			
62	Gray	Whitney	Whitney.Gray@FloridaDEP.gov	Florida Department of Environmental Protection	X			X
63	Green	David	David.Green@TBARTA.com	Tampa Bay Area Regional Transit Authority	X			
64	Green	Donna	Donna.Green@dot.state.fl.us	FDOT		X		X
65	Gurram	Lakshmi N	Gurram@ccmpo.com	Charlotte County-Punta Gorda MPO		X	X	
66	Habic	Elizabeth	elizabeth.habic@dot.gov	FHWA	X	X	X	X
67	Hall	Justin	Justin.Hall@dot.state.fl.us	FDOT	X		X	
68	Harrell	Gary	Harrell@ccmpo.com	Charlotte County-Punta Gorda MPO	X	X	X	X
69	Hartofelis	Rachael	rhartofelis@bayareametro.gov	Metropolitan Transportation Commission (CA)		X	X	

	Last Name	First Name	Email	Organization	Session 1	Session 2	Session 3	Session 4
70	Hicks	Michael	MichaelP.Hicks@dot.state.fl.us	FDOT	X	X		X
71	Hill	Eric	Ehill@metroplanorlando.org	MetroPlan Orlando	X			
72	Hodges	Tina	tina.hodges@dot.gov	FHWA	X			
73	Holsinger	Heather	Heather.Holsinger@dot.gov	FHWA	X	X	X	X
74	Huddle	Ben	ben.huddle@dot.gov	U.S. DOT	X			X
75	Hudson	Joshua	Joshua.Hudson@charlottecountyfl.gov	Charlotte County		X		
76	Hutchinson	Dave	Dave@mympo.org	Sarasota/Manatee TPO	X		X	X
77	Huttmann	Gary	Ghuttmann@metroplanorlando.org	MetroPlan Orlando	X			
78	Hymowitz	Larry	Larry.Hymowitz@dot.state.fl.us	FDOT				X
79	Indrakanti	Suseel	Sindrakanti@camsys.com	Cambridge Systematics	X	X	X	X
80	James	Steven C.	Steven.James@dot.state.fl.us	FDOT	X	X		X
81	Jeffries	Ken	Ken.Jeffries@dot.state.fl.us	FDOT			X	
82	Johnson	Christy	Christy.Johnson@dot.state.fl.us	FDOT			X	X
83	July	David	David.July@dot.state.fl.us	FDOT	X	X	X	
84	Kafalenos	Robert	Robert.Kafalenos@dot.gov	FHWA	X		X	X
85	Kamarajugadda	Ravi Shankar	Ravi.Kamarajugadda@charlottecountyfl.gov	Charlotte County	X		X	
86	Kelleny	Bishoy	Bkelleny@hrtpo.org	Hampton Roads TPO (VA)			X	
87	Kersey	Jamie	jamie.kersey@dot.state.fl.us	FDOT		X		
88	King	Jenn	jenn.king@aecom.com	AECOM	X	X	X	X
89	Kiselewski	Karen	kkiselewski@camsys.com	Cambridge Systematics	X	X		
90	Klara	Eugene	klara@ccmpo.com	Charlotte County Punta Gorda TPO	X		X	
91	Knoebel	Sandra	sknoebel@co.pinellas.fl.us	Forward Pinellas		X		X
92	Koons	Scott	koons@ncfrpc.org	Gainesville MTPO			X	X
93	Kraum	Sarah	Sarah.Kraum@brevardfl.gov	Space Coast TPO	X	X	X	X
94	Larsen	Sarah	Slarsen@metroplanorlando.org	MetroPlan Orlando		X		X

	Last Name	First Name	Email	Organization	Session 1	Session 2	Session 3	Session 4
95	Lathou	Marceia	lathoum@stlucieco.org	St. Lucie TPO	X	X	X	X
96	Lee	Sungmin	cegis@h-gac.com	Houston-Galveston Area Council (TX)	X	X	X	
97	Lex	Suzanne	Suzanne.Lex@talgov.com	Capital Region TPA		X		X
98	Lupes	Rebecca	Rebecca.Lupes@dot.gov	FHWA	X		X	X
99	Macon	Tameka	Tameka.Macon@dot.gov	FHWA	X	X	X	
100	Marsey	Rebecca	rebecca.marsey@dot.state.fl.us	FDOT			X	
101	Martin	Jim	jim.martin@dot.gov	FHWA		X		
102	Martinage	Autumn	autumn.martinage@dot.state.fl.us	FDOT	X	X		X
103	Mathie	Roger	mathier@plancom.org	Hillsborough MPO	X	X	X	
104	McFarlane	Ben	bmfcarlane@hrtpo.org	Hampton Roads TPO (VA)				X
105	McKinney	Edward	edward.mckinney@dot.state.fl.us	FDOT	X		X	
106	Mendoza	Christina	cmendoza@forwardpinellas.org	Forward Pinellas	X			
107	Mikyska	Carl	Carl.Mikyska@dot.state.fl.us	FDOT				X
108	Miller	Keith	Kmiller@njtpa.org	North Jersey Transportation Planning Authority (NJ)	X	X	X	X
109	Mills	Nicole	Nicole.Mills@dot.state.fl.us	FDOT	X			
110	Miskis	Christina	Cmiskis@sfrpc.com	South Florida Regional Planning Council		X		X
111	Mount	Austin	Austin.Mount@ECRC.org	Emerald Coast Regional Council	X	X	X	
112	Otero	Brandy	Brandy.Otero@colliercountyfl.gov	Collier MPO	X	X	X	
113	Paulk	Bryant	bryant.paulk@dot.state.fl.us	FDOT		X	X	
114	Peters	Victoria	Victoria.Peters@dot.state.fl.us	FDOT		X		
115	Philips	Scott	Scott.Philips@dot.state.fl.us	FDOT	X	X	X	X
116	Podczerwinsky	John	john.podczerwinsky@dot.state.fl.us	FDOT	X	X	X	
117	Rahman	Nousheen	Nrahman@co.pinellas.fl.us	Forward Pinellas	X		X	
118	Reichert	Mark	Mark.Reichert@dot.state.fl.us	FDOT	X	X	X	X

	Last Name	First Name	Email	Organization	Session 1	Session 2	Session 3	Session 4
119	Reiding	Dana	Dana.Reiding@dot.state.fl.us	FDOT	X		X	
120	Reina	Bessie	Bessie.Reina@dot.state.fl.us	FDOT	X	X	X	X
121	Rockwell	Elizabeth	Elizabeth.Rockwell@mdtpo.org	Miami-Dade TPO	X			
122	Ryan	Angela	aryan@co.pinellas.fl.us	Forward Pinellas	X	X		
123	Sambidi	Pramod	psambidi@h-gac.com	Houston Galveston Area Council (TX)	X	X	X	X
124	Sanders	Buffy	sandersb@browardmpo.org	Broward MPO	X			
125	Schwabacher	Mari	mari.schwabacher@dot.state.fl.us	FDOT	X			
126	Scott	Don	dscott@Leempo.com	Lee County MPO	X	X	X	X
127	Sheffield	Jeff	jsheffield@northfloridatpo.com	North Florida TPO	X			
128	Simpson	Nancy	nancy@mympo.org	Sarasota/Manatee TPO	X	X	X	X
129	Sherman	Michael	michael.sherman@dot.gov	FHWA	X		X	X
130	Smith	Scott B	Scott.Smith@dot.gov	U.S. DOT Volpe Center	X	X	X	X
131	Smith	Kellie	Kellie.Smith@dot.state.fl.us	FDOT				
132	Smith	Mark-Anthony	msmith@sfrpc.com	South Florida Regional Planning Council	X	X	X	X
133	Soderstrom	Marybeth	msoderstrom@cfRPC.org	Heartland Regional TPO	X			
134	Stannard	Keith	Keith.Stannard@aecom.com	AECOM	X	X	X	X
135	Steed	Pat	psteed@cfRPC.org	Heartland Regional TPO	X	X	X	
136	Stettner	Alison	Alison.Stettner@dot.state.fl.us	FDOT	X	X	X	X
137	Stith	Dale	dstith@hrtpo.org	Hampton Roads TPO (VA)			X	
138	Stuart	Greg	stuartg@browardmpo.org	Broward MPO	X			
139	Suguri	Vitor	Vitor.Suguri@dot.state.fl.us	FDOT	X			X
140	Swiatek	Bill	bswiatek@wilmapco.org	Wilmington Area Planning Council (DE)	X	X		
141	Tabatabaee	Frank	Frank.Tabatabaee@dot.state.fl.us	FDOT	X	X	X	
142	Taulbee	Karen	Karen.Taulbee@dot.state.fl.us	FDOT	X			
143	Taylor	Maya	MTaylor@Camsys.com	Cambridge Systematics	X	X	X	X
144	Taylor	Marsha	marsha.taylor@dot.state.fl.us	FDOT	X	X	X	X

	Last Name	First Name	Email	Organization	Session 1	Session 2	Session 3	Session 4
145	Thomas	Curlene P.	Curlene.Thomas@dot.state.fl.us	FDOT	X	X		X
146	Thompson	Erika	Erika.Thompson@dot.state.fl.us	FDOT	X	X	X	X
147	Thorne	Jim	Jim.Thorne@dot.gov	FHWA	X	X		X
148	Tisch	Michael	Michael.Tisch@dot.state.fl.us	FDOT	X	X	X	X
149	Trauger	Alex	atrauger@metroplanorlando.org	MetroPlan Orlando	X			
150	Tucker	Corinne	corinne@mympto.org	Sarasota/Manatee TPO	X	X		
151	Uhlir	Andrew	Auhlir@palmbeachtpa.org	Palm Beach TPA	X	X	X	X
152	Uhren	Nick	Uhren@palmbeachtpa.org	Palm Beach TPA	X			
153	Vargo	Amanda	Amanda.Vargo@icf.com	ICF	X	X	X	X
154	Vautin	Dave	Dvautin@bayareametro.gov	Metropolitan Transportation Commission (CA)		X		
155	Vo	Kathryn	Kathryn.Vo@h-gac.com	Houston-Galveston Area Council (TX)	X	X	X	
156	Walford	Kevin C.	Kevin.Walford@miamidade.gov	Miami-Dade TPO		X	X	X
157	Walker	David	dwalker@therpc.org	Rockingham Planning Commission (NH)		X	X	X
158	Williams	Victoria	Victoria.Williams@dot.state.fl.us	FDOT	X	X		X
159	Williamson	Tina	Tina.Williamson@dot.state.fl.us	FDOT	X			
160	Wyche	Vickie	Vickie.Wyche@dot.state.fl.us	FDOT	X			
161	Yee Fong	Shereen	Shereen.yeefong@dot.state.fl.us	FDOT	X			
162	Yeh	Allison	yeha@plancom.org	Hillsborough MPO	X	X	X	X
163	Zhang	Kevin	Unknown	Unknown			X	

Appendix E: Session 4 Mural Board

Full board available at: <https://app.mural.co/t/icfeei4168/m/icfeei4168/1598631899055/577e8fda04173d90bf90b27111ff5e6224a66731>



Resilience Peer Exchange: Synthesis of Best Practices and Lessons Learned

1

SET THE STAGE



5 Minutes

1A

LOGISTICS & TIPS

Try your best to participate. Adapt and work hard to be open with your peers and this tool. Remote workshops require a different set up and mindset than in-person workshops.

Tech stuff



A Chrome browser is key.

Avatar



You may have entered the board as an animal, with initials, or with an image

The Basics



Move & Zoom, orient to numbers and letters. Follow me.

Speak up!



Ask for help. Use Teams chat to get tech assistance.

Cursors Off



I'll leave mine on so I can point things out.

1B

GROUP COMMITMENTS:

Stay focused (one screen please!)

Write it down!

Make space for others, help keep the board tidy

Share your thoughts!

Engage in lively conversation, even if it feels awkward

1C

AGENDA

Today!



Session 4:
Lessons
Learned

Today we will.....

Get acquainted with Mural



Reflect on lessons learned and best practices



Reflect on needs and next steps

1C

AGENDA

Today!



Session 4:
Lessons
Learned

Today we will.....

Get acquainted with Mural



Reflect on lessons learned and best practices



Reflect on needs and next steps

1D INTRODUCTION (AND PRACTICE)

Let's get going! Try and get a handle on your sticky notes with this quick introduction.



New user tip

Double-click in the middle of a sticky note to activate the typing function. When you're done, click on any white space around your sticky to close it out.

Christina Miskis, SFRPC	Jennifer Carver, FDOT	Cassie Bhat, ICF	Heather Holsinger, FHWA	[Name, Agency]		[Name, Agency]	Becky Lupes, FHWA
Allison Yeh, HMPO	Whitney Gray, DEP	Joe Bauer, DEP	Curlene Thomas FDOT	[Name, Agency]	Mr. Turtle	[Name, Agency]	[Name, Agency]
Donnie Arbeau - HRTPO	[Name, Agency]	Keith Miller, NJTPA	[Name, Agency]	[Name, Agency]	Sarah Kraum, SCTPO	[Name, Agency]	Dave Walker, RPC
[Name, Agency]	[Name, Agency]	Sarah Larsen, MetroPlan Orlando	Crystal Goodison, UF GeoPlan	Lara Bouck, MetroPlan Orlando	<u>Todd Engala</u>	Don Scott	[Name, Agency]
[Name, Agency]	Lois Bollenback, R2CTPO	Stacie Blizzard, FHWA	Brenda Dix, ICF	[Name, Agency]	[Name, Agency]	Laura Carter, SCTPO	[Name, Agency]

Rodney Chatman Forward Pinellas	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	Scott, Volpe	[Name, Agency]	Erika Thompson
[Name, Agency]	Amanda Vargo, ICF	[Name, Agency]	[Name, Agency]	Kevin Walford [TPO]	Melissa Corbett, DEO	[Name, Agency]	[Name, Agency]
Michael Tisch	Suseel Indrakanti, Cambridge Systematics	Maya Taylor, Cambridge Systematics	[Name, Agency]	[Name, Agency]	[Name, Agency]		[Name, Agency]
[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	Andrew Uhlir, Palm Beach TPA	[Name, Agency]	[Name, Agency]
[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]
[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]	[Name, Agency]

2

OVERALL BEST PRACTICES



10 Minutes

2A

Key Lessons Learned and Best Practices from the Peer Exchange



Instructions:

1. Review the best practices below
2. Are there any missing best practices? Raise your hand or type in the Teams chat to add to the list

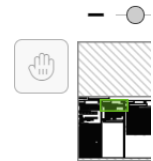
Lessons Learned

There are a wide range of approaches being used across Florida

Incremental approaches have been successful

Risks are not just coastal

Larger MPOs can support smaller MPOs (e.g., sharing resources, examples)



Best Practices for Integrating Resilience into MPO Planning

Flag at-risk projects	Incorporate resilience as a project selection criteria (e.g., HRTPO, NJTPA, RPC)	Collaborate with land use planners, local governments, state DOT, and other partners	Partner with local universities	Educate partners and public about risks and solutions	Work with local governments to champion processes to leverage developer funding for projects	Identify long term funding impacts (cost/benefit)
Connect land use and transportation planning	Establish process to identify and promote cross-cutting adaptation solutions	Recognize not all transportation system risks have transportation project solutions	Overlay risk areas with future land use plans	Develop archetype adaptation strategies for high-level cost/benefit assumptions (e.g., MTC, H-GAC)	Maintain a sense of urgency!	Help me to help you. By asking the local governments for input
Encourage nature-based solutions, where feasible and effective	Consider equity impacts of hazards and adaptation solutions	Develop and track resilience performance measures	Transportation Infrastructure vulnerability Assessment and Mitigation Identification	Think of creative funding techniques	Agree on common datasets for SLR	engage in the political process to inform officials early and often.
Triple Bottom Line review and Prioritization	Resilience champion on the board	Continue the sense of urgency!	Partner with Regional Planning Councils and other MPOs	Coordinate with regional DEP staff, especially aquatic preserves	Adding Storm Surge, SLR to ETDM reviews	
Expanded role of ETDM and MPO use for Planning Screen	Show me the money!					

2B Vote on Best Practices



Instructions:

1. Vote for two best practices that you are most excited about and think you can implement at your organization
2. To vote, click on a sticky when the voting session is "live"

3

ONGOING CHALLENGES / CUTTING EDGE TOPICS



25 Minutes



Instructions:

1. If your first name starts with A-L, go to sections 3A and 3B
 2. If your first name starts with M-Z, go to sections 3C and 3D
 3. Respond to the prompts using the blank stickies
 4. Review and discuss responses as a full group
-

3A Incorporating Equity in the Resilience Planning Process

Best Practices

Go to your undeserved communities vs expecting them to come to you	Community input and buy in	Outreach is key - to the communities as well as existing advocacy groups
Use data sources available to analyze equity and impacts to underprivileged communities	Complete vulnerability assessments and consider specific solutions to avoid impacts	Tripple Bottom Line review
Target density close to transit	resilience dashboards	regular community engagement and outreach
Ensure that land use planners are at the table	work with local government engineers to consider potential risks	Provide educational material in multiple languages.
Use focus groups and specific outreach to people who don't normally participate	Develop vulnerability assessment criteria	Develop performance measures related to equity - what is measured matters

How Are You Approaching Equity?

Incorporate into project development and prioritization	EJ review is done for all projects - resiliency is just one of several crieria	complete streets
We have a set of equity criteria in our project prioritization process	Using census data to analyze projects in LRTP and Bike/Ped MP	Coordinating with transit agencies using demographic data
establish ej-related factors in the evaluation of potential projects	Will have a specific EJ section in upcoming Transportation Resiliency Master Plan - will include focus groups with identified vulnerable communities	

Questions for Peers?

How is outreach currently being done to underserved communities?

what successes have you had in finding program champions on boards?

How are you defining progress wrt incorporating equity considerations into resiliency planning

Where can we go to access resources from peer agencies

How is equity used in prioritization?

How have you overcome concerns that addressing resiliency will take away from other funding needs?

3B

Operationalizing Vulnerability Assessments and Implementating Adaptation Projects

Best Practices

Use vulnerability assessment results to inform LRTP project prioritization	Referencing VA whenever applicable in project scoping	LIDAR mapping/GIS Mapping
Regional Unified Sea Level Curve		Flood assessments during or after storm events
Lots of work with local jurisdictions		

How Are You Approaching Adaptation Project Implementation?

Allocation of LRTP funds for eligible projects to be selected following study	vulnerability assessment identified corridors that need mitigation projects	
Project Prioritization Methodology - scoring matrix distributes points to resiliency projects		

Questions for Peers?

How to identify best options for adaptation?	How to get buy-in for decisions?	

Best Practices

Partner with local planning and economic development agencies	Linking land use and transportation	

How Are You Approaching Economic Development?

By facilitating Econ Dev Focus Group for input on LRTP		Including econdev performance measures in LRTP

Questions for Peers?

Who has been your best partner?	How do you approach this without creating concerns over property values	

3D

Approach to Resilience Performance Measures

Best Practices / Example Performance Measures

lost trips (after an event)

% of critical transportation facilities 'resilient' to sea level rise/storm surge

How Are You Approaching Performance Measures?

By developing and incorporating performance measures pertaining to resilience in the System Performance Report

Scenario planning for climate consequences in L RTP

We aren't yet but would prefer some uniform strategies for the state

Questions for Peers?

How to track resiliency at a regional scale

What is the best way to collaborate with local agencies on resiliency?

How can FHWA provide more funding to the MPOs for resilience planning?

How does Vople select MPOs to partner with and determine how to allocate funding?

4 NEEDS AND NEXT STEPS

 35 Minutes




Instructions:

1. Answer the following questions by selecting and typing into a blank sticky note

4A Action Items

What is the number one “action item” you are taking home from this peer exchange?

Find a resiliency champion	Need to work on educating and empowering our elected officials, municipal partners, and citizens	Learning about the resiliency plans of local agencies	More collaboration between entities needs to occur.				Figure out how to obtain resources from Volpe		
get a better understanding of how my org has historically addressed resiliency and identify areas of opportunity	Refine economic models for resiliency	continue to watch and learn as the topic continues to evolve		Opportunity to develop policies that guide future actions		peer networking is valuable			
Get better informed about what resiliency planning is already in place within our planning area			Developing partnerships across the board						
		Coordinate with staff on peer exchange and determine next steps			Collaboration				
Better coordination with Local Partners									

Find a resiliency champion	Need to work on educating and empowering our elected officials, municipal partners, and citizens	Learning about the resiliency plans of local agencies	More collaboration between entities needs to occur.	
get a better understanding of how my org has historically addressed resiliency and identify areas of opportunity	Refine economic models for resiliency	continue to watch and learn as the topic continues to evolve		Opportunity to develop policies that guide future actions
Get better informed about what resiliency planning is already in place within our planning area			Developing partnerships across the board	
		Coordinate with staff on peer exchange and determine next steps		
Better coordination with Local Partners				

		Figure out how to obtain resources from Volpe		
	peer networking is valuable			
Collaboration				

4B Remaining Needs and Next Steps

What is still needed to incorporate resilience into your planning process and promote project implementation?

More collaboration between entities needs to occur.	Need money to cover the resilience component.	metrics	Leadership	Data resources on other shocks/stressors other than SLR
	Coordination and agreement between planning partners on how we will address resiliency as a region	Funding for project development		Funding and staff resources
better coordination with those who have already identified potential risks	Data - SLR as well as other impacts around the state			
prioritizing resiliency when there are so many other needs		More research into resiliency factors		Determining the impacts of resiliency on inland region
More incentives for implementing agencies to include mitigation measures in transportation projects				

Leadership	Data resources on other shocks/stressors other than SLR	Dedicated new funding source	Buy-in from the general public	Knowledge transfer
	Funding and staff resources			Education of elected officials
		Identification of the role of MPOs as a planning agency to provide for resiliency without authority		
	Determining the impacts of resiliency on inland region			

How can FDOT support and partner with MPOs?

Allow State funding to be used off the State system for regional resilience projects	Tools such as GIS Screening of State Roads impacted by the design of high water - for facilities being at risk	Develop a new grant program similar to TRIP for resilience projects that allow STBG funds to be used as a match for the State funds		Consistency between districts in implementing the FDOT Resiliency Policy	How can FDOT incorporate resiliency into Context Classification?
Partner with MPOs on Federal grants	Incorporate VA assessments into PD&E process		coordinate needs and desires, ensure formalized in MPO documents	Be a strong and proactive leader in operationalizing resiliency	provide guidance and training
Mirror the D1 Planning Studio across other Districts	Fund and participate in studies then projects	Early comments in MPO processes, versus criticism after a plan is adopted	more opportunities like this (e.g. training, discussions)		Resilience screening from a design perspective
How can FDOT incorporate resiliency into Context Classification?	Including resiliency as a planning emphasis area	Giving presentations re: the threat to the state system and actions being taken	Help quantify impacts to funding to deal with storm related damage throughout the state		
provide guidance and training	partner with MPOs on resiliency planning initiatives	Support the relaxing of STTF dollars to allow some to be used for improving parallel facilities that support the SR system			
Resilience screening from a design perspective	FDOT needs to "partner" with local governments which have land development codes that provide for development within vulnerable areas, they build and maintain the transportation infrastructure. Whether MPOs are called champions or cheerleaders, they are only planning agencies	create a district-wide resilience grant program			

What are ideas for how MPOs can address the funding challenge – creative approaches that agencies are taking?

Identify new funding sources		Address the basic need to switch away from a fuel tax to a more sustainable solution	incorporate resiliency improvements into system preservation (resurfacing) projects

How can FHWA support and partner with FDOT and MPOs?

	Require states to establish long range resilience plans (cost & needs)		Providing clear expectations for performance measures	Redistribute resources to small and mid-sized MPOs
advocate for unique funding sources	Provide expectations for incorporating resiliency into long range planning	Allow for more flexibility in cost feasible plans	Flexibility and partnerships	Encourage dedicating a portion of federal funds to resiliency planning and implementation
		Support updating funding formulas, help identify funding shortfalls		
Share the vision that FHWA has with using limited resources				

<p>Training and education targeted at elected officials and citizens</p>	<p>Support FDOT in their efforts by providing best practices from nationwide efforts</p>	<p>Tie funding for project development to resiliency strategies</p>	<p>Previous directives have been helpful in supporting planning efforts - keep leading in this way.</p>	
<p>More best practices on value capture potential of mitigation</p>				
<p>Direct resilience requirements to appropriate entities - FDOT and local governments that build and maintain transportation infrastructure</p>				