

# TRANSPORTATION RESILIENCE PLANNING IN THE NCR

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## Impacts, Solutions, and Transportation Resilience Planning Work Underway

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Region Forward Coalition  
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# Agenda

Natural Hazards + Climate Change

Key Terms, Definitions, Impacts

Resilience in Action – Examples of Impacts and Solutions

Federal Programs - PROTECT

What's Going on in the National Capital Region - TRIP

Q&A, Discussion, Mapping Tool Demo



# Natural Hazards to Transportation

- **Extreme heat causes**
  - Rails to overheat and expand, risking train derailments
  - Concrete roads to crack and asphalt to soften
  - Bridge joints to expand
- **Extreme winter conditions causes**
  - Freeze/thaw cycle that create roadway potholes and cracking
- **Extreme precipitation and flooding causes**
  - Erosion and collapse of roadways and supporting structures
  - Road closures during and immediately following a flood event

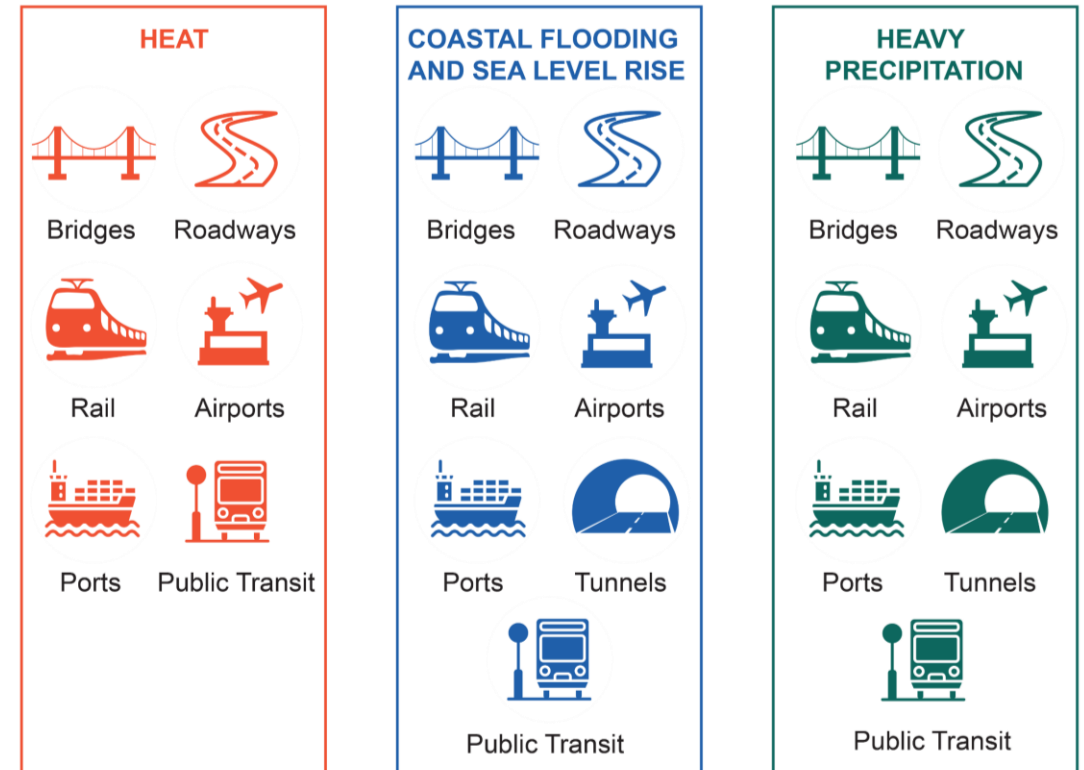


Figure: Fourth National Climate Assessment, Transportation Chapter



# Definitions

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- **Resilience** is the ability to **anticipate, prepare for, and adapt** to changing conditions and **withstand, respond to, and recover** rapidly from disruptions from natural hazards.
- **Proactive planning**
- **Climate Adaptation** is the process of **adjusting to the effects of climate change to build long-term resilience.** Adaptation may include changing behavior, adapting infrastructure, supporting natural systems, and more.



# Impacts - Examples



Fallen trees and broken power lines after the severe storm in 2023. Source: The Washington Post.



Heat kink in MetroRail line near Crystal City stop, summer 2024. Source: X



Flooding at Greenbelt Metro Station, August 2022. Source: Washingtonian



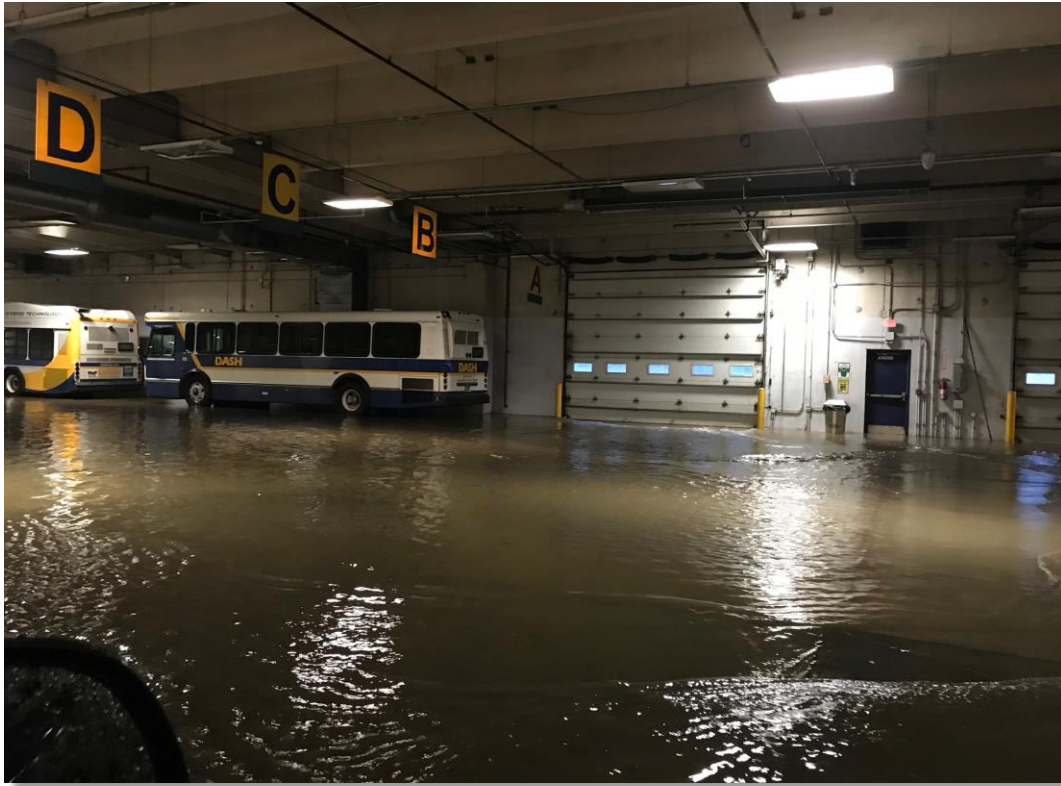
Route 50 in Prince George's County flooded after heavy rains in 2020. Source: WTOP News.



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# Impacts - Some Recent Examples

## Flooding



## Extreme Heat



### **RIDE ON TO PROVIDE FREE WATER TO RIDERS DURING HEAT WAVE**

In light of current extreme high temperatures, Ride On will be providing FREE bottles of water on our buses. Stay safe out there!

**RideOnBus.com**



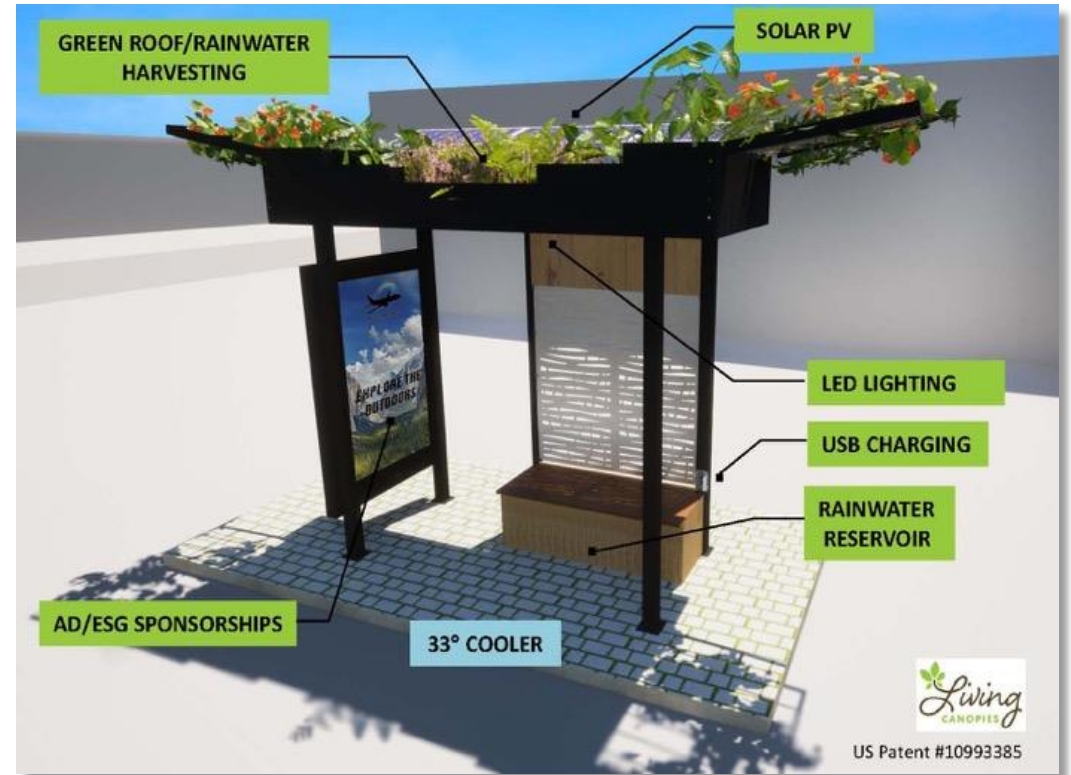
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# Solutions – Some Recent Examples

## Flooding



## Extreme Heat



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# 17<sup>th</sup> Street Levee – NW Washington DC

- Levee: structure that protects a specific area from flooding
- Can contain flood waters from 100-year storm



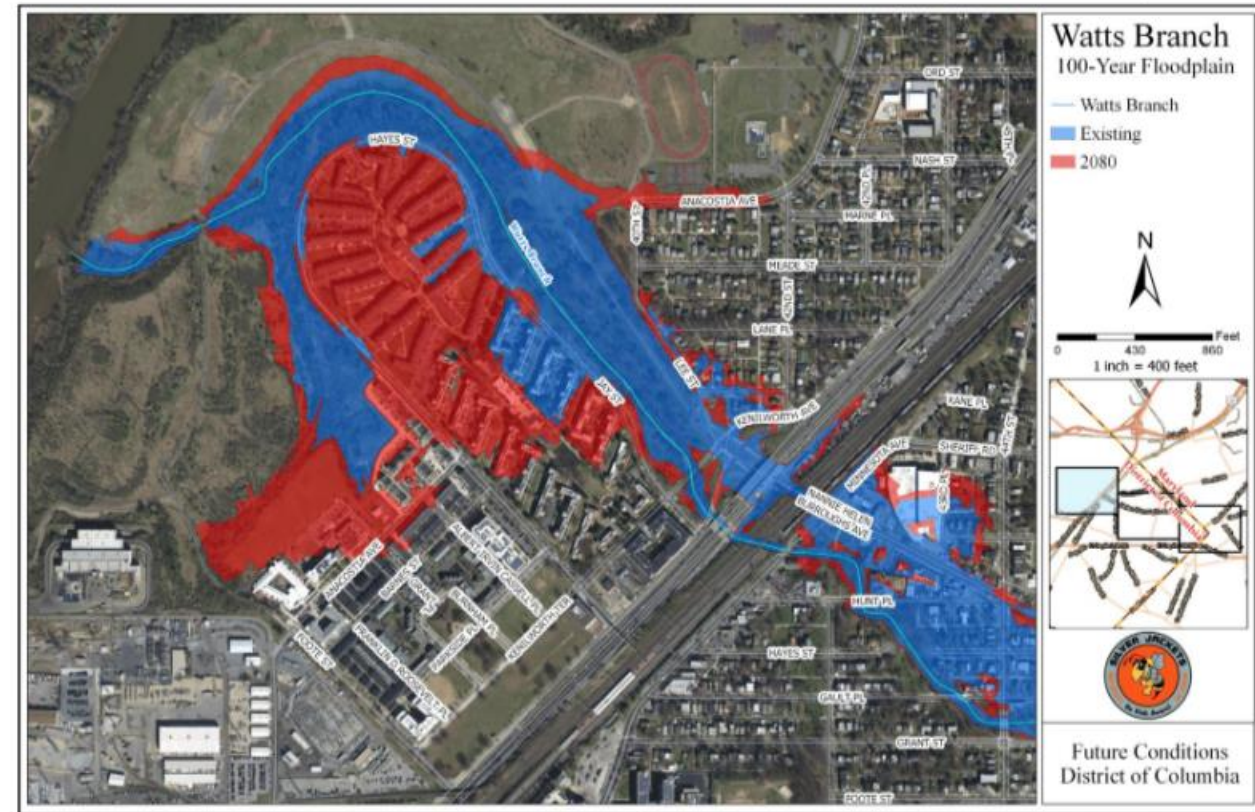
17<sup>th</sup> Street levee annual ACOE exercise. Source: The DCist



# Nannie Helen Burroughs DC-295 Underpass Flood Mitigation – Washington DC

- \$1 million to study and develop a plan to improve flood resilience of the Nannie Helen Burroughs Avenue NE underpass beneath DC-295.
- Critical access route for several surrounding historically disadvantaged neighborhoods

FIGURE 20: WATTS BRANCH 100-YEAR FUTURE CONDITIONS FLOODPLAIN MAPPING (NORTHWEST PANEL)



Watts Branch FRM Study

42

DC Silver Jackets  
April 2021



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FHWA Peer Exchange  
October 24, 2024

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# PROTECT Program

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The Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Grant Program

- Provides funding (**\$1.4 billion over 5 years**) to ensure **transportation resilience** to natural hazards including climate change and other natural disasters through four categories:

Planning  
activities

Resilience  
improvements

Community  
resilience and  
evacuation  
routes

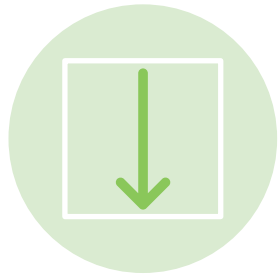
At-risk coastal  
infrastructure



# The Financial Benefits of PROTECT

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The PROTECT program provides a unique opportunity to access increased funding for transportation resilience



DOTs and MPOs that develop RIPs that meet program requirements reduce non-federal cost share by 7%



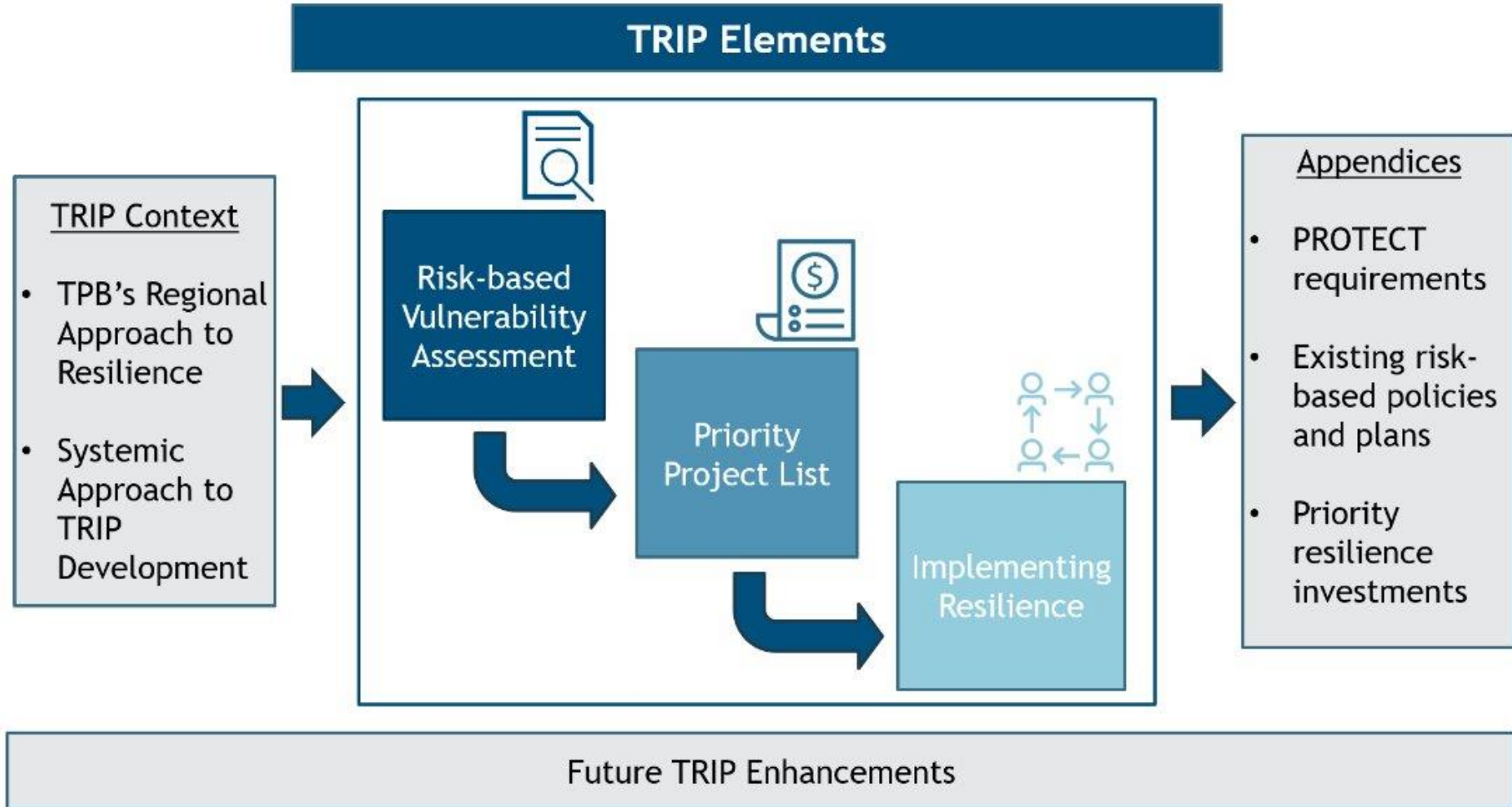
Additional 3% if the RIP is incorporated into state or regional long-range transportation plan (LRTP)



Projects included in a RIP do not require Benefit Cost Analysis (BCA)



# What's TPB Doing Now? TRIP



# Stakeholder Engagement and Collaboration



# Phase 1: System-Level Analysis



Figure 2. System-level analysis results (Infrastructure impacts on left; service and customer impacts on right).



# Phase 2: Asset-Level Analysis (GIS Analysis)

- For pairs with available data: Completing an asset-level GIS analysis using asset-specific data, exposure indicators, and criticality indicators

## GIS Pairs

- Extreme heat:
  - Public transit
- Inland flooding:
  - Roads and highways
  - Bridges
  - Public transit
- Coastal flooding:
  - Roads and highways
  - Bridges
  - Public transit

## Key Climate Datasets

Hazard	Dataset
Temperature	Land Surface Temperature
Inland Flooding	FEMA 100/500 Year Floodplain Maps
Sea Level Rise	NOAA Digital Coast 2 Ft Sea Level Rise

## Key Criticality Elements

Criticality Element
MWCOG Equity Emphasis Areas (for all pairs)
Functional Class (for roads and bridges)
Detour Length (for bridges)

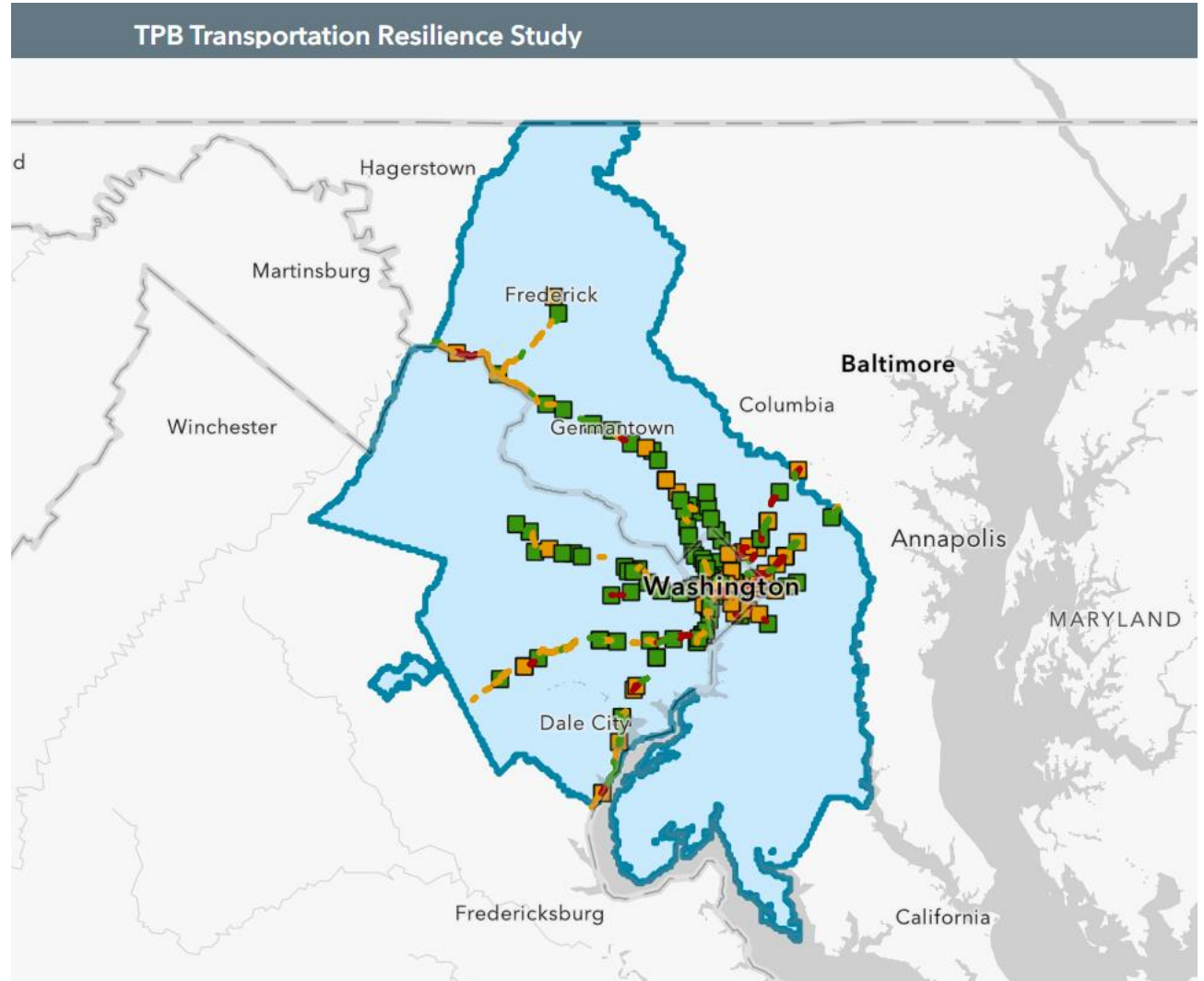


# Interactive Mapping Tool

- The results of the Vulnerability Assessment have been integrated into an [Interactive Mapping Tool](#) on the TPB ArcGIS website
- The Mapping Tool layers transportation asset, climate, and equity spatial data to identify highly vulnerable assets
- Agencies can use the Mapping Tool to evaluate their assets and services






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Example of interactive mapping tool, layers turned on are: TPB Boundaries, Temperature - Rail Stops, Inland Flooding - Rail Routes

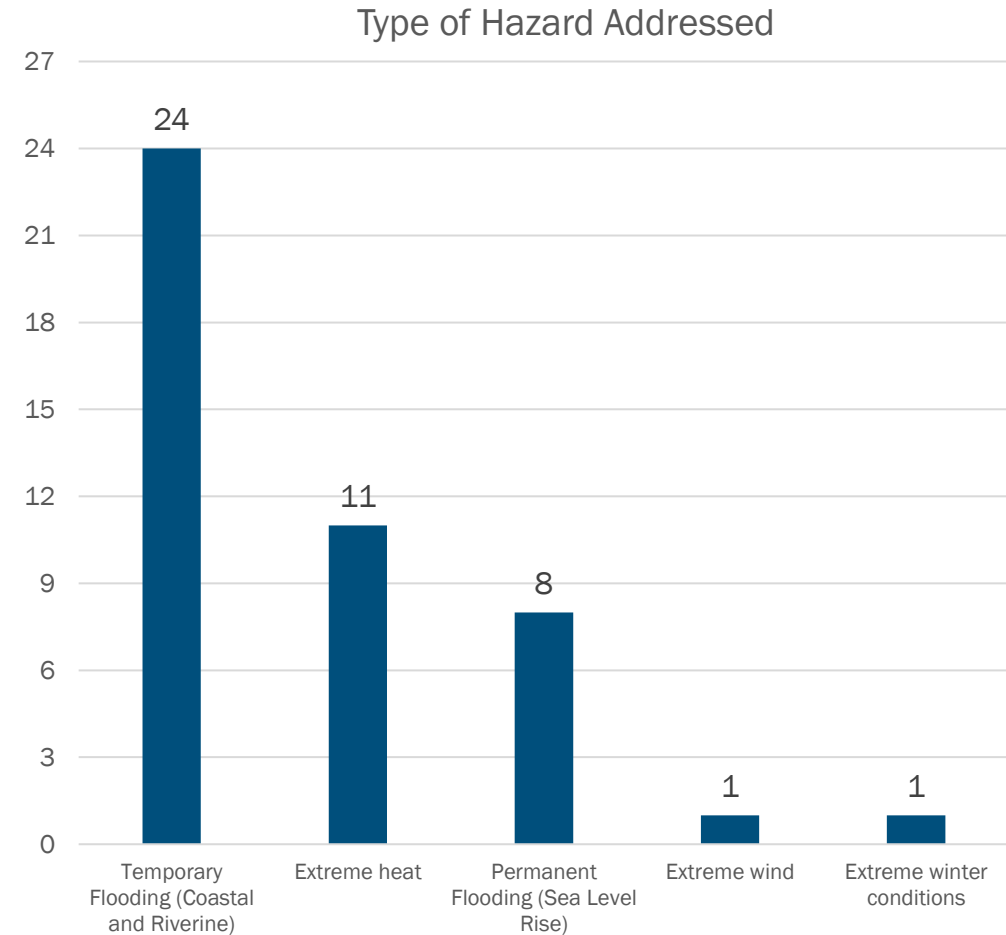
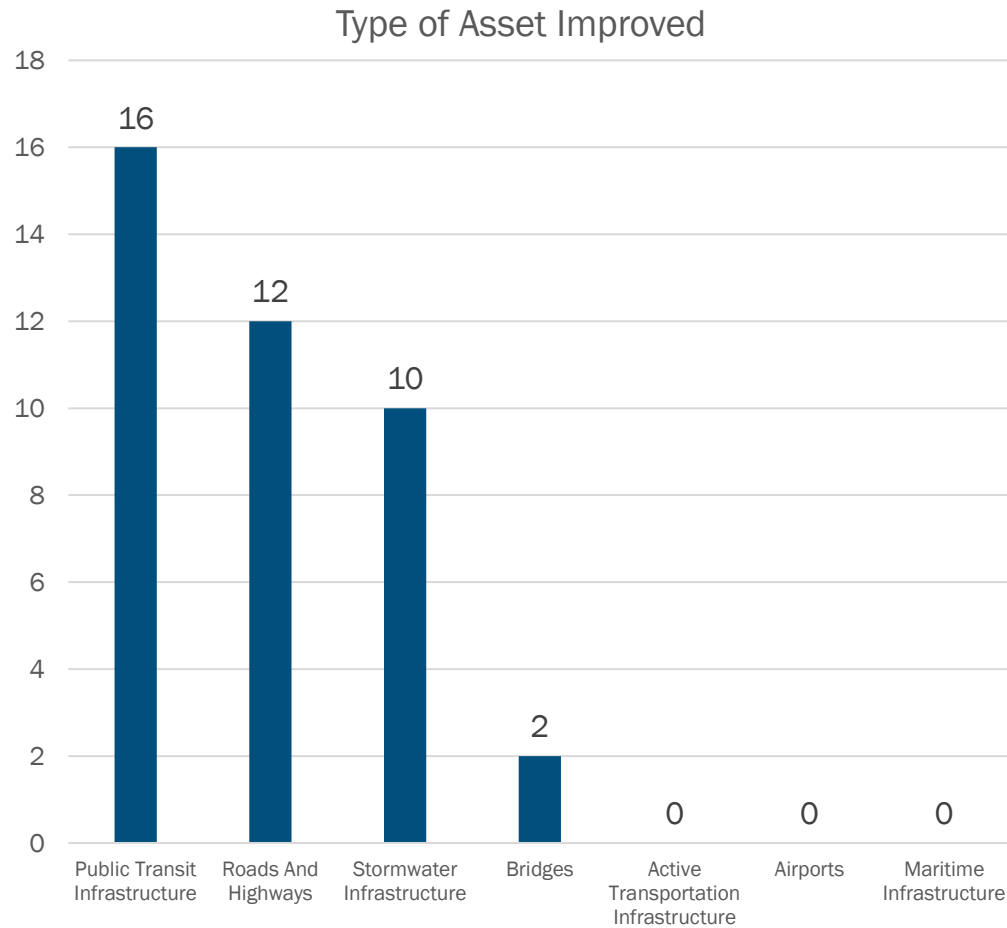


# Transportation Assets At Risk – TPB Region




Asset Type	 Extreme Heat				 Temporary Flooding (Coastal and Riverine)				 Permanent Flooding (Sea Level Rise)			
	High	Medium	Low	Not Exposed	High	Medium	Low	Not Exposed	High	Medium	Low	Not Exposed
Roads/Highways (miles)	Not Assessed				1,097 (4.8%)	1318 (5.8%)	733 (3.2%)	19,754 (86.3%)	50 (0.2%)	17 (0.1%)	14 (0.1%)	22,820 (99.6%)
Bridge	Not Assessed				1 (0.0%)	39 (3.0%)	1,281 (97.0%)	0 (0.0%)	* Bridges were evaluated for flood vulnerability generally based on condition data rather than coastal and riverine vs. sea level rise			
Bus Stops	196 (0.9%)	6,467 (29.1%)	15,560 (70.0%)	0 (0.0%)	173 (0.8%)	336 (1.5%)	377 (1.7%)	21,337 (96.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	22,223 (100.0%)
Rail Stops	0 (0%)	53 (33.1%)	107 (66.9%)	0 (0%)	1 (0.6%)	6 (3.8%)	4 (2.5%)	149 (93.1%)	0 (0%)	0 (0%)	0 (0%)	160 (100.0%)
Rail Line (miles)	18 (1.8%)	352 (34.6%)	646 (63.6%)	0 (0.0%)	115 (11.3%)	154 (15.2%)	128 (12.6%)	619 (60.9%)	19 (1.8%)	42 (4.1%)	2 (0.2%)	954 (93.9%)



# Priority Resilience Projects - TPB Region

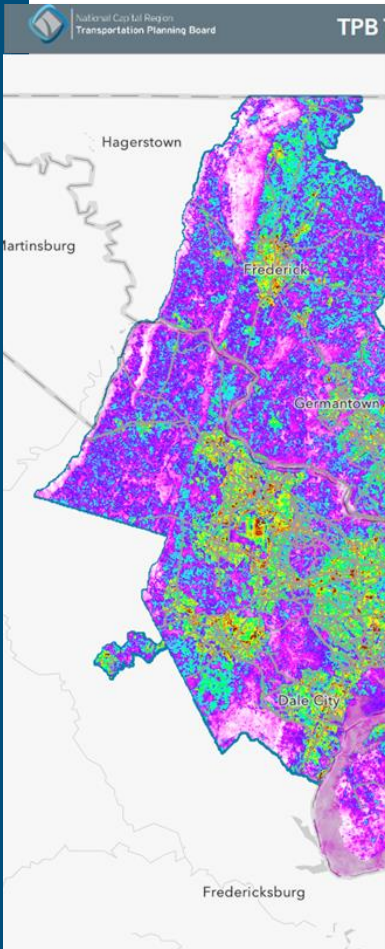


# Priority Resilience Improvement Projects - Examples

Lead Agency	Project Title	Location	Description	Hazards
Virginia Railway Express	VRE Stations Heat Vulnerability and Mitigation Strategies Analysis	Station assets located on VRE's Manassas and Fredericksburg Lines, as well as on the joint line between Alexandria and Union Station.	Increasing temperatures have the potential to cause significant passenger discomfort to VRE riders. This project will identify the appropriate mitigation strategies to address the adverse effects of heat in five VRE station facilities. The project will detail potential effects on passengers and facilities, and will propose, at a planning level, conceptual projects that could mitigate or eliminate the adverse condition(s) through the horizon planning year.	
Virginia Railway Express	VRE Assets Flooding Vulnerability and Mitigation Strategies Analysis	L'Enfant and Quantico stations; Broad Run Maintenance and Storage Facility (excluding the passenger station platform, including the parking facilities).	The TPB vulnerability assessment has identified this area as having high vulnerability to inland flood. The study will analyze the proposed effects to this infrastructure from adverse future inland flooding events, and will propose, at a planning level, conceptual projects that could mitigate or eliminate the adverse condition(s) through the horizon planning year.	
WMATA	Systemwide Flood Resiliency Infrastructure Upgrades Implementation	Cleveland Park, Federal Triangle, Smithsonian, Archives/Navy Memorial, Rhode Island Ave/Brentwood, Capitol South, and Waterfront Stations (DC); Greenbelt Rail Yard (Greenbelt, MD).	All stations included in this project are either within the FEMA 100 year flood zone or are regularly impacted by interior flooding. The proposed upgrades address flood vulnerability in the MetroRail system and include measures such as new grading at station entrances, temporary flood barriers, raising vent shaft openings, and improving drainage capacity around stations. Improvements will lower the risk of adverse impacts to passenger service and system operations.	



# Resources



## Transportation Resilience Project Request

### I. Purpose

The National Capital Region Transportation Planning Board (TPB) includes in the TPB Transportation Resilience Improvement Plan (TRIP) Operations for Transformative, Efficient, and Cost-Effective Guidance from the Federal Highway Administration. The TRIP will receive extra evaluation points as a share of project costs for the PROTECT Discretionary Grant Program offers an additional 3% reduction if incorporated into the PROTECT Discretionary Grant Program offers...

- Resilience planning
- Resilience improvements
- Community resilience and evacuation
- At-risk coastal infrastructure

This guidance document outlines resilience criteria for projects to submit for consideration to include in the TRIP.

For agencies that are also interested in submitting for federal programs like FEMA BRIC, Appendix A of the TRIP provides information on developing resilience project proposals.

### II. What is a Resilience Project?

The COG 2030 Climate and Energy Action Plan states that a Climate Resilient Region is achieved when the region has the "ability to a current and future, acute and chronic climate functions." FHWA defines a resilient project as having the ability to adapt to conditions or withstand, respond to, or recover rapidly from disruptions, including...

- Resist hazards or withstand impacts from weather events and natural disasters.
- Reduce the magnitude or duration of impacts of a disruptive weather event.
- Have absorptive capacity, adaptive capacity, and recoverability to decrease the magnitude or duration of impacts of a disruptive weather event or other natural disasters.
- The consideration of incorporating natural infrastructure.



## Transportation Resilience Project Guidance

The Transportation Resilience Project Guidance document aims to support regional projects that will enhance the resilience of the region's transportation system and qualify for federal and other resilience investment funding. This Guidance document:



• **Overviews the Transportation Planning Board's (TPB) process for regional resilience coordination, including the development of the National Capital Region Transportation Resilience Improvement Plan.**



• **Helps to define a resilience project and provides examples for practitioners.**



• **Describes the annual project submission process for inclusion in the Priority Project List.**



• **Provides guidance on developing strong project submission proposals and funding programs related to resilience.**

For questions regarding this document or for more information about TPB's transportation planning program, please contact Katherine Rainone at [krainone@mwco.org](mailto:krainone@mwco.org).

## Understanding Resilience

### What is transportation resilience?

The COG 2030 Climate and Energy Action Plan states that a Climate Resilient Region has the "ability to adapt and absorb against disturbances caused by and chronic climate impacts and successfully maintain essential functions." The Federal Highway Administration (FHWA) defines a resilient project as having the ability to anticipate conditions or withstand, respond to, or recover rapidly from disruptions, including...

- Resist hazards or withstand impacts from weather events and natural disasters.
- Reduce the magnitude or duration of impacts of a disruptive weather event.
- Have absorptive capacity, adaptive capacity, and recoverability to decrease the magnitude or duration of impacts of a disruptive weather event or other natural disasters.
- The consideration of incorporating natural infrastructure.<sup>1</sup>

### What are some examples of transportation resilience projects?

## Building a Resilient Transportation System for the National Capital Region

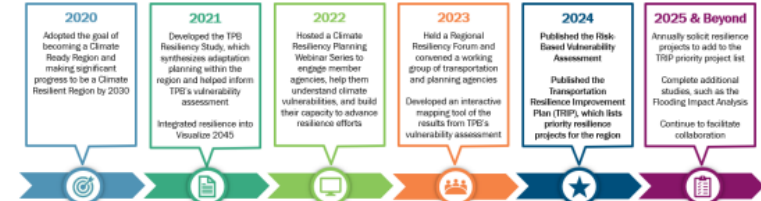


### TPB's Regional Approach to Transportation Resilience

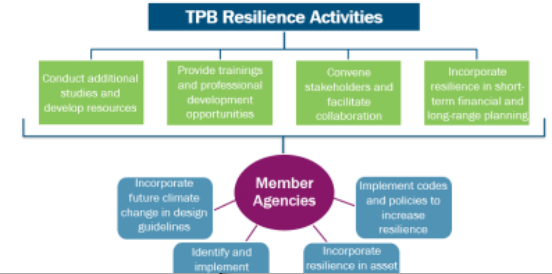
Metropolitan Washington is already adversely affected by extreme weather events, from heat waves to blizzards to severe coastal storms and flooding, and the frequency and severity of significant weather events will increase in the future due to climate change. The Transportation Planning Board (TPB) continues to address this reality by developing a 2024 Transportation Resilience Improvement Plan (TRIP) in coordination with member agencies to help improve the preparedness and resilience of the region's transportation system to the impacts of climate change.

TPB defines resilience as the ability to anticipate, prepare for, and adapt to changing conditions and withstand, respond to, and recover rapidly from disruptions. The TRIP builds on the strong foundation of transportation resilience work in the region by further assessing transportation system vulnerabilities and identifying priority resilience investments.

### TPB's Road to Resilience



The TPB and its member agencies serve essential roles in advancing resilience across the National Capital Region. Continued collaboration and coordination between the TPB and its member agencies will be vital for achieving the goal of making significant progress to be a Climate Resilient Region by 2030.



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## Putting it all together: TRIP in Practice

- Cross reference proposed new projects in resilience mapping tool
- Use risk scores to show need for potential adaptation solutions in grant applications
- Redundancy can be good
- Eligibility for reduced match requirements
- Working group/subcommittee for regional collaboration
- MPO resources can serve as educational tools for planners
- Better prepared for upcoming Federal requirements



## National Capital Region Transportation Resilience Improvement Plan

June 2024



# Questions & Discussion

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- How can elected officials and local planners use the Transportation Resilience Improvement Plan resources, the mapping tool in particular, to help prioritize planned resilience improvement/adaptation projects in the region? In addition to this tool, how else could this be undertaken?



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# Future TRIP Enhancements

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Potential future improvements to the TRIP include:

- **Additional flooding impact analysis**  
Consider urban flooding, pluvial flooding, floodplain change due to climate change, combined effects of sea level rise and coastal and riverine flooding; ground-truth flooding results.
- **Increased consideration of equity and potential impacts to critical services**  
Conduct user-based analysis, critical service access analysis.
- **Economic impacts and system-level analysis**  
Identify monetary risk associated with hazard; consider how alternative transportation options or a lack thereof impact vulnerability.
- **Mapping regional closures due to natural hazards**  
Analyze Regional Integrated Transportation Information System data alongside hazard data.





# Regional Inland Flooding Analysis

- TRIP Working Group identified the need for enhanced understanding of potential flooding impacts to the region's transportation system
  - FEMA floodplain data is only historical
  - Three potential data sources
  - Updating TRIP risk scores for inland flooding
  - Target completion date end of June 2025



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# Economic Impact Analysis + Case Studies

- New effort to conduct economic analysis to demonstrate the cost of inaction and provide support for the benefits of proactive resilience investment.
  - Five transportation assets analyzed for no/medium/high-cost adaptation interventions
  - Generalized best practices/flow chart framework for benefit-cost assessment
  - Completion date targeted for end of June 2025

