April 10, 2024: Public Meeting

Resilient Ways Forward

Transportation planning for our changing climate

dctc

Welcome

- **Q&A:** Use the Q&A to ask questions during the presentation. Speakers will respond following the presentation.

- **Polls:** We have questions for you to respond to during the meeting. You will receive a notification when a poll is open.

Agenda

- *Resilient Ways Forward* Overview
- Where are we vulnerable?
- *Resilient Ways Forward* Map Viewer
- What can we do?
- Next Steps
- Q & A

Introductions

- Dutchess County Transportation Council
  - Mark Debald, Transportation Program Administrator
  - Tara Grogan, Planner

- ICF Project Team
  - Amanda Vargo, Climate Resilience Expert
  - Amanda Rycerz, Climate Resilience Expert

Who is the DCTC?

- Metropolitan Planning Organization (MPO) for Dutchess County
- Required by federal law for Urbanized Areas of 50,000+ population
- Established in 1982 as the PDCTC
- Forum for establishing transportation policies & priorities
- Programs federal funds through a locally driven planning process

What do we do?

Core Products

- **Transportation Plan**: our Plan serves as the strategic guiding document for improving transportation in Dutchess County over the next 25 years.
  - **Capital Program**: our 5-year capital program assigns federal funding to highway, bridge, walking, bicycling, & transit projects.
    - **Planning Progam:** our annual work plan identifies upcoming planning studies and tasks.

Moving Dutchess Forward

Regional Planning

We work with Ulster and Orange Counties to address:

- Congestion, Freight, & Transit

Connect Mid-Hudson Transit Study

County-wide Planning

We work on studies to understand key issues:

- Walking and Biking
- Climate Vulnerability
- Speeding
- Traffic Trends
- Pavement Condition
- Human Services Transportation

Resilient Ways Forward

Transportation Planning for our Changing Climate

BEACON-HOPEWELL RAIL TRAIL STUDY

Local Planning

We work with communities on:

- Parking Studies
- Complete Streets
- Corridor Studies
- Pedestrian Plans
- Safety Assessments
- Data Collection & Analysis

Poughkeepsie 9.44.55

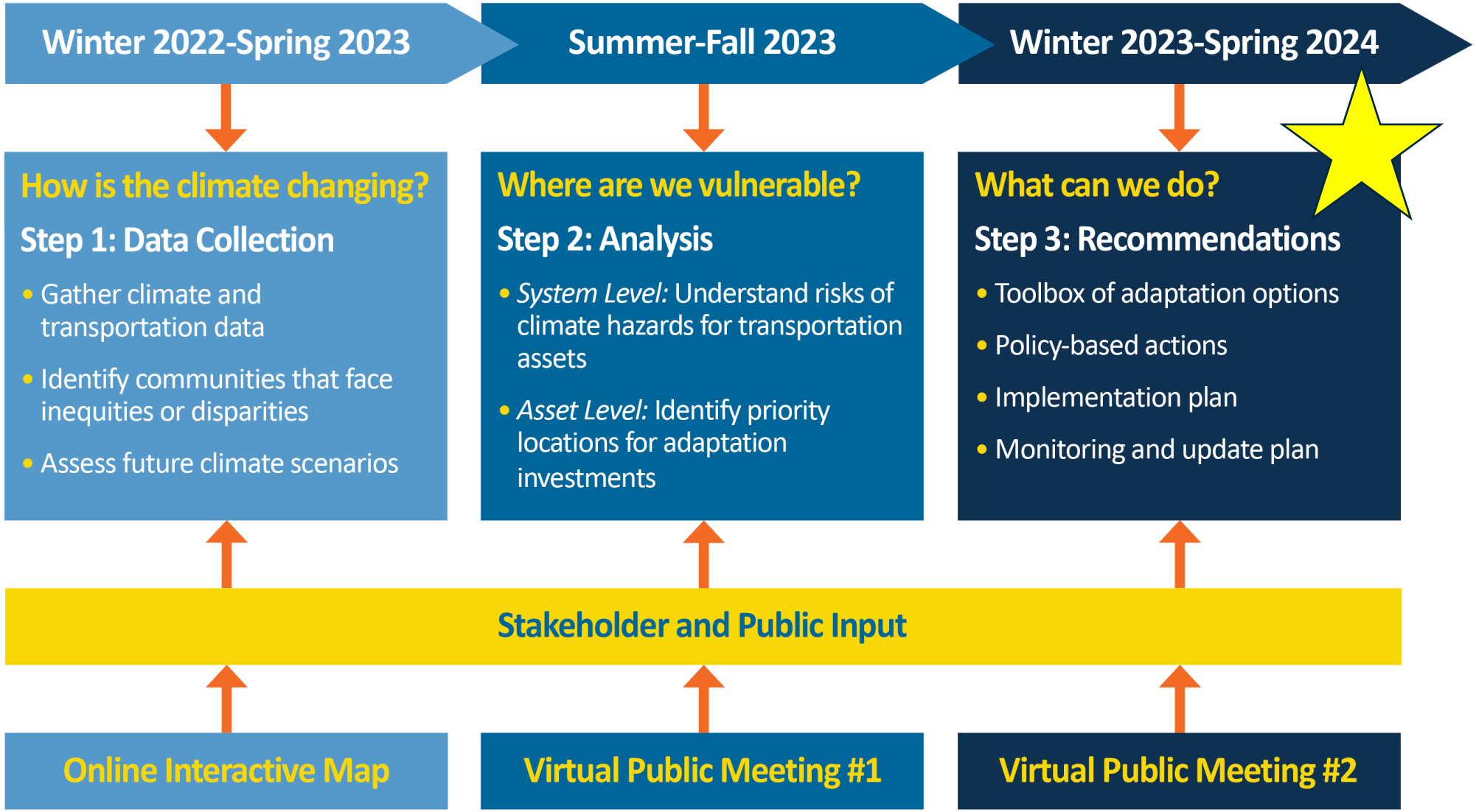
Rethinking the Arterials & Interchange

ARLINGTON MAIN STREET REDESIGN INITIATIVE

Study Goals

- What is *Resilient Ways Forward*?
  - **A climate vulnerability assessment** to identify where our transportation system is most vulnerable to heat, flooding, drought, wind, winter conditions, and landslides
  - **A suite of resources and an implementation plan** to better prepare our transportation system for climate change

Where are we in the process?



Where are we vulnerable?

Bridge over Wiccopee Creek, East Hook Road (Tropical Storm Ida)

What We Heard: Public Meeting #1

Which part of our transportation system do you think is the most vulnerable to extreme weather events?

- Roads
- Rail lines
- Bridges/culverts
- Bus routes

Which types of extreme weather events have most impacted your ability to get around?

- Winter storm
- Flood
- Wind

What would be most helpful to government agencies and elected officials to make the transportation system more resilient?

- Strategies to reduce the system's climate vulnerability
- An implementation plan
- Funding coordination between agencies

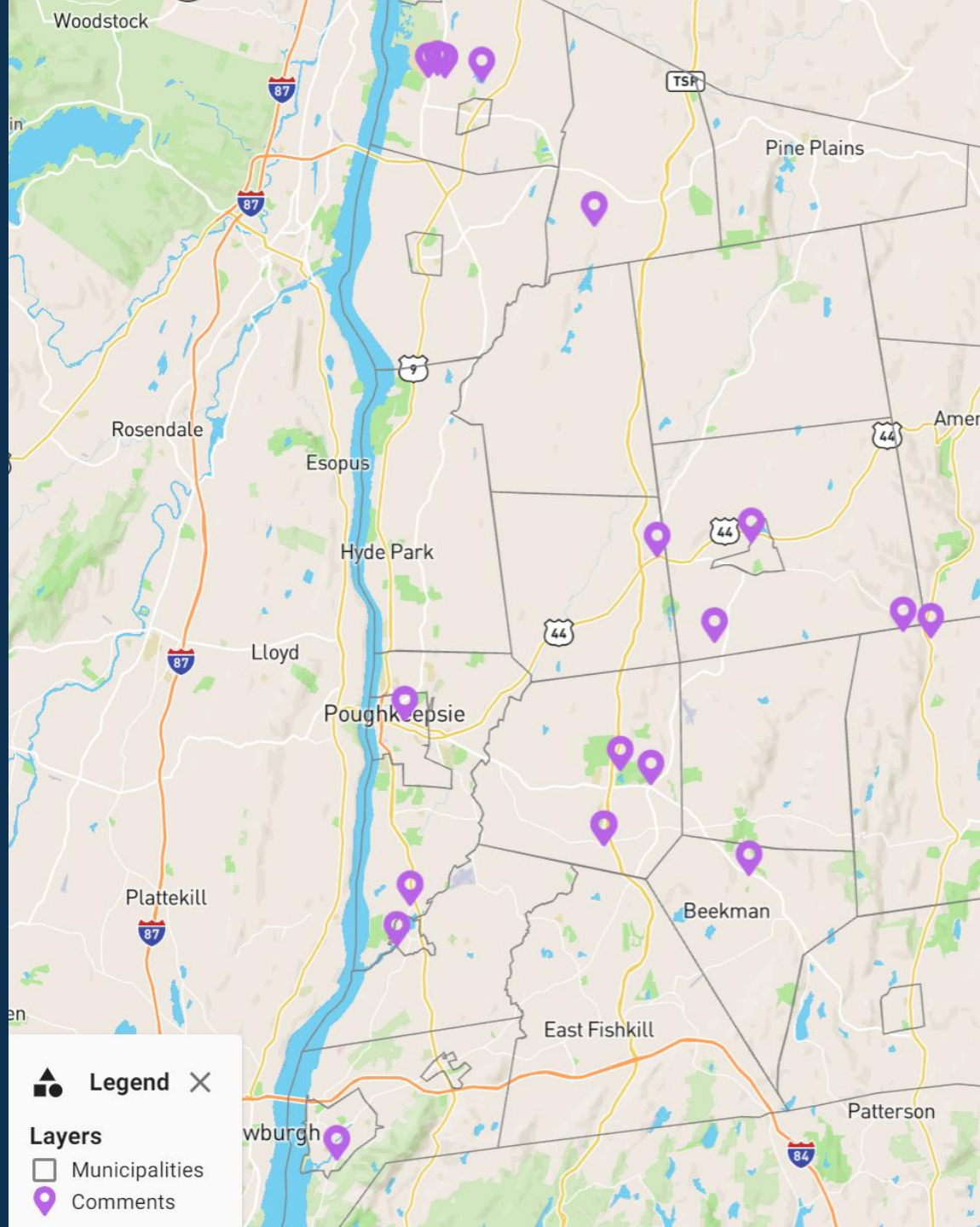
dctc

What We Heard

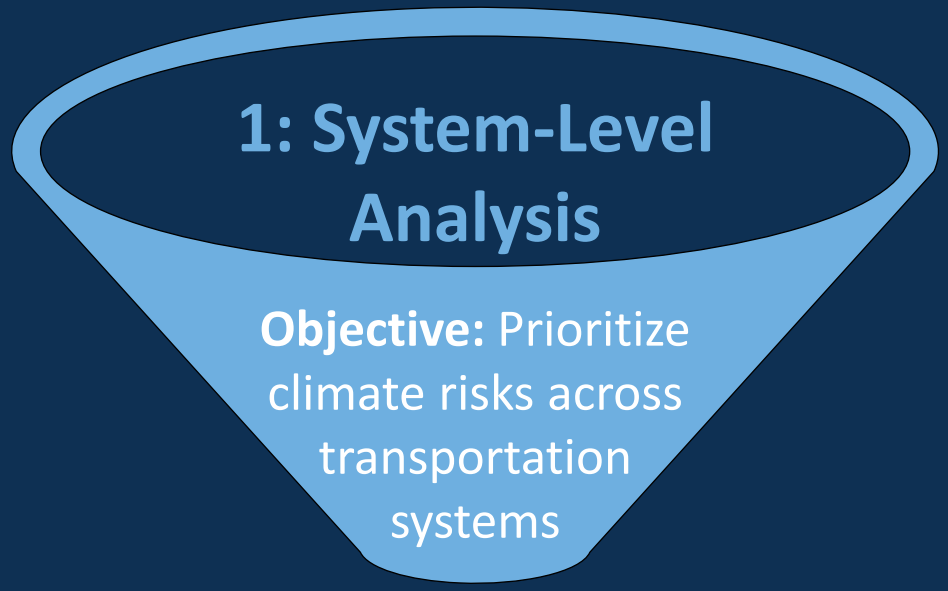
Mapping Survey

- Public submitted 20 points where travel was affected by extreme weather
- Reported issues were given extra weight in the vulnerability assessment

Resilient Ways Forward
Share Your Story: Map Survey
Public comments submitted



Two-Phase Vulnerability Assessment



2: Asset-Level Vulnerability Assessment

Objective: Identify priority assets and locations for resilience investments

Phase 1: System-Level Analysis

Sensitivity of Transportation System to 6 Climate Hazards:

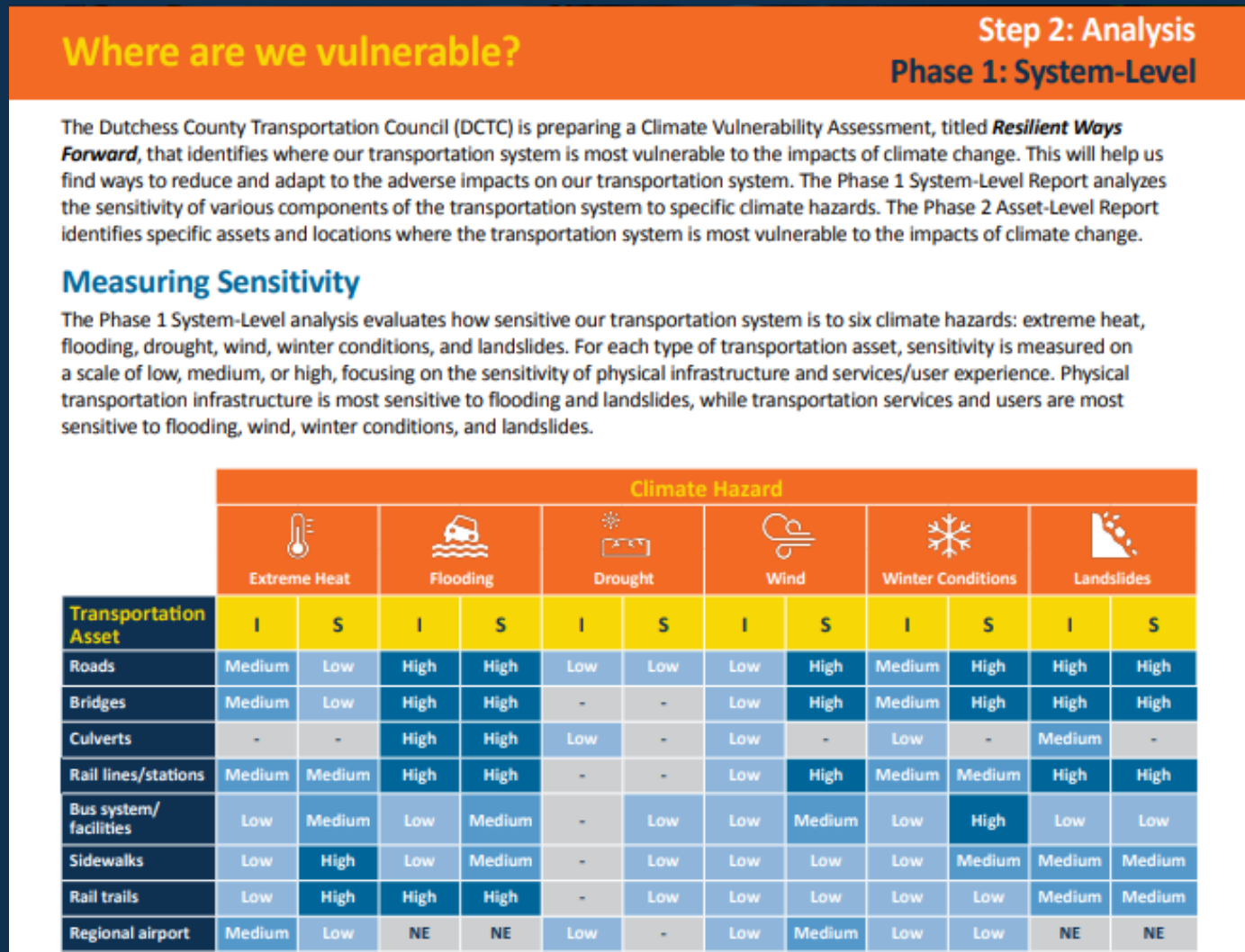
- Extreme Heat
- Flooding
- Drought
- Wind
- Winter Conditions
- Landslides

Where are we vulnerable?

Findings from Phase 1: System-Level Analysis

- **Physical transportation infrastructure:** most sensitive to flooding and landslides

- **Transportation services and users:** most sensitive to flooding, wind, winter conditions, landslides



Where are we vulnerable?

Step 2: Analysis
Phase 1: System-Level

The Dutchess County Transportation Council (DCTC) is preparing a Climate Vulnerability Assessment, titled ***Resilient Ways Forward***, that identifies where our transportation system is most vulnerable to the impacts of climate change. This will help us find ways to reduce and adapt to the adverse impacts on our transportation system. The Phase 1 System-Level Report analyzes the sensitivity of various components of the transportation system to specific climate hazards. The Phase 2 Asset-Level Report identifies specific assets and locations where the transportation system is most vulnerable to the impacts of climate change.

Measuring Sensitivity

The Phase 1 System-Level analysis evaluates how sensitive our transportation system is to six climate hazards: extreme heat, flooding, drought, wind, winter conditions, and landslides. For each type of transportation asset, sensitivity is measured on a scale of low, medium, or high, focusing on the sensitivity of physical infrastructure and services/user experience. Physical transportation infrastructure is most sensitive to flooding and landslides, while transportation services and users are most sensitive to flooding, wind, winter conditions, and landslides.

	Climate Hazard											
	Extreme Heat		Flooding		Drought		Wind		Winter Conditions		Landslides	
Transportation Asset	I	S	I	S	I	S	I	S	I	S	I	S
Roads	Medium	Low	High	High	Low	Low	Low	High	Medium	High	High	High
Bridges	Medium	Low	High	High	-	-	Low	High	Medium	High	High	High
Culverts	-	-	High	High	Low	-	Low	-	Low	-	Medium	-
Rail lines/stations	Medium	Medium	High	High	-	-	Low	High	Medium	Medium	High	High
Bus system/ facilities	Low	Medium	Low	Medium	-	Low	Low	Medium	Low	High	Low	Low
Sidewalks	Low	High	Low	Medium	-	Low	Low	Low	Low	Medium	Medium	Medium
Rail trails	Low	High	High	High	-	Low	Low	Low	Low	Low	Medium	Medium
Regional airport	Medium	Low	NE	NE	Low	-	Low	Medium	Low	Low	NE	NE

Phase 2: Asset-Level Analysis

Vulnerability of Specific Transportation Assets

- Deeper dive into flooding and landslide vulnerability for specific transportation assets

- Vulnerability is considered along two dimensions:
  - Is the asset in an area affected by a climate hazard? (e.g., in the floodplain)
  - Is the asset critical to the transportation system? (e.g., traffic volume, key destinations, equity area)

Where are we vulnerable?

Findings from Phase 2: Asset-Level Analysis

Prioritize high vulnerability scores for future adaptation investments by agencies

Example:

- 180 = miles of roads with high vulnerability to flooding
- 6% = percentage of roads analyzed with high vulnerability to flooding

	Climate Hazard							
	Flooding				Landslides			
Transportation Asset	High	Medium	Low	Not Vulnerable	High	Medium	Low	Not Vulnerable
Roads (miles)	180 (6%)	337 (11%)	47 (2%)	2,490 (82%)	37 (1%)	77 (3%)	263 (9%)	2,678 (88%)
Bridges	9 (3%)	20 (6%)	78 (21%)	259 (71%)	4 (1%)	7 (2%)	21 (6%)	234 (91%)
Culverts	4 (1%)	19 (4%)	264 (57%)	177 (38%)	Not assessed			
Rail Lines (miles)	14 (11%)	78 (62%)	6 (5%)	28 (22%)	1 (1%)	11 (9%)	2 (2%)	122 (89%)
Rail Stations	0 (0%)	3 (27%)	1 (9%)	7 (64%)	0 (0%)	3 (27%)	0 (0%)	8 (73%)
Rail Trails (miles)	3 (7%)	23 (47%)	2 (3%)	20 (42%)	Not assessed			

Poll Question # 1

Thinking about transportation, which climate hazard concerns you the most?

Resilient Ways Forward

Map Viewer

Review Results

Poughkeepsie Waterfront (Hurricane Sandy)

Welcome to Resilient Ways Forward

An assessment of climate change and its impacts on transportation in Dutchess County

What can we do?

Recommendations

Adaptation Measures

- Focus on actions to help advance resilience efforts in Dutchess County
- Potential measures address concerns for high priority asset/hazard pairs and are for local, county, and state agencies to consider

Flooding	Landslides	Heat	Wind	Winter Conditions
• Roads • Bridges • Culverts • Rail lines/ stations • Rail trails	• Roads • Bridges • Rail lines/ stations	• Sidewalks • Rail trails	• Roads • Bridges • Rail lines/ stations	• Roads • Bridges • Bus systems/ facilities

Adaptation Toolbox

Provides **infrastructure owners and managers** with **40** potential adaptation measures to consider

Adaptation Measures

Select hazard(s) and asset(s) of interest and press the 'Filter by hazard' and 'Filter by asset' buttons to update the table below. To select multiple hazards, use the hazard drop down at right to select each hazard of interest. To select multiple assets, use the asset drop down at right to select

Select hazard(s):

Select asset(s):

Filter by hazard

Filter by asset

Reset all filters for the table below:

Reset filters

Climate Hazard, Relevant Asset(s), and Adaptation Measures

Climate Hazard	Category of Measure	Relevant Asset(s)	Gray Engineering vs. N	Adaptation Measure	Description
Flood (I&S)	Plan and Prepare	Roads, Bridges	N/A	Prohibit overweight/oversized vehicles	Prohibit heavy loads on weakened pavements in the immediate aftermath of a flooding event to prevent sudden failure or severe damage. Identify appropriate re-route plan (next measure).
Flood (I&S)	Plan and Prepare	Roads, Bridges	N/A	Identify evacuation routes for highly vulnerable assets and critical transportation routes	Identify select transportation routes that can remain reliably traversable in the event of severe flood events.
Flood (I&S), Landslide (I&S)	Maintain and Manage	Culverts	N/A	Increase maintenance schedule to clear vegetation and debris from culverts, where debris accumulation is problematic	Clear vegetation and debris from drainage systems and clear drains more frequently to prevent clogging and flooding, especially before major storms. Determine appropriate maintenance schedule based on site-specific considerations.
Flood (I&S)	Strengthen and Protect	Bridges	Gray Engineering	Structurally elevate low-lying bridges	Elevate bridges to prevent inundation and reduce service disruptions.

Flooding

There are 21 potential measures to reduce flood risk to roads, bridges, culverts, rail lines/stations, and rail trails. These measures can help reduce flood risks to both physical infrastructure and services/operations. Certain measures in this section also help reduce risks associated with landslides and winter conditions (these are indicated with a * under the table).

Plan and Prepare

Source: Stock photo

1. Prohibit overweight/oversized vehicles

Prohibit heavy loads on weakened pavements in the immediate aftermath of a flood event to prevent sudden failure or severe damage. Identify an appropriate re-route plan (next measure).

Source: iStock

2. Identify evacuation routes for highly vulnerable assets and critical transportation routes

Identify select transportation routes that can remain reliably traversable in the event of severe flood events.

Maintain and Manage

Source: Cloud9Service

3. Increase maintenance schedule to clear vegetation and debris from culverts, where accumulation is problematic

Clear vegetation and debris from drainage systems and clear drains more frequently to prevent clogging and flooding, especially before major storms. Determine appropriate maintenance schedule based on site-specific considerations.

This measure can also help reduce **landslide risk by reducing surface runoff.*

Factors for Consideration

Capital Costs

What are the initial costs to implement the measure?

Operations & Maintenance

What is required to maintain the measure over its useful lifespan?

Effectiveness

How effective is the measure to mitigate vulnerability?

Flexibility

Does the measure allow for modifications to scale up or down?

Barriers to Implementation

What obstacles prevent the measure from being effectively implemented?

Equity Considerations

What should be considered to ensure that the measure is equitable?

dctc

Policy Actions

- Local agencies can also consider policy actions to improve resilience

- Sample policy actions include:
  - Reliable and consistent emergency alert systems for extreme weather events
  - Real-time sensor technologies and monitoring programs
  - Updated emergency plans with recovery actions/plans for extreme events

Poll Questions

- 6 questions related to adaptation measures
- Your feedback will help us finalize the adaptation toolbox

Poll Question #2

One adaptation measure is to implement reliable and consistent emergency alert systems for extreme weather events.

How would you prefer to get emergency alerts about extreme weather events?

Poll Question #3

Which **heat** adaptation measure would you be most excited to see implemented?

Poll Question #4

Which **winter conditions** adaptation measure would you be most excited to see implemented?

Poll Question #5

Which **flooding** adaptation measure would you be most excited to see implemented?

Poll Question #6

Which **landslide** adaptation measure would you be most excited to see implemented?

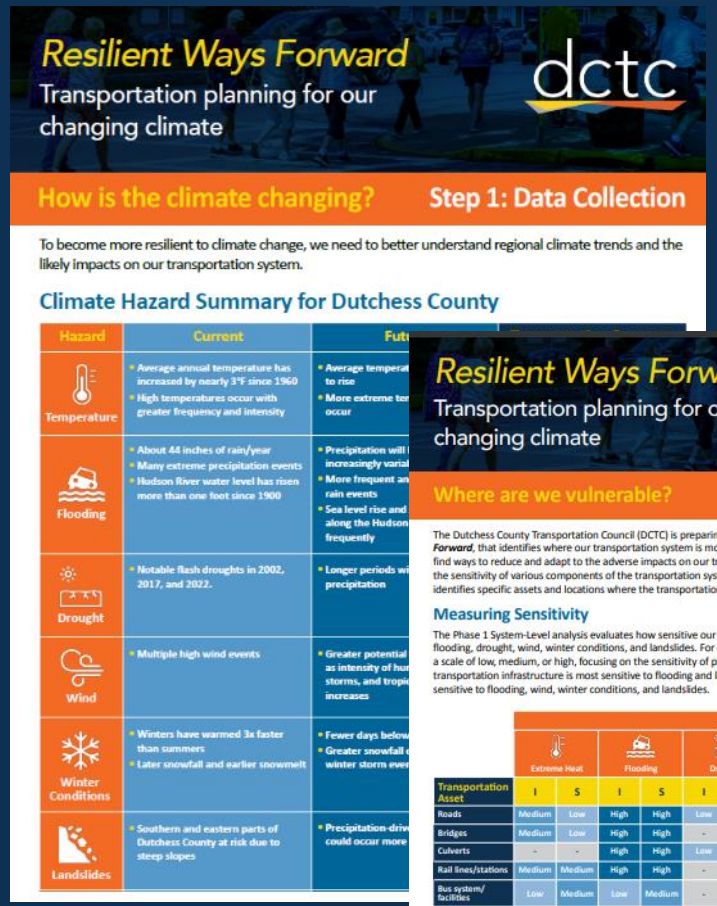
Poll Question #7

Which **policy** measure would you be most excited to see implemented?

Resilient Ways Forward

www.ResilientWaysForward.com

- Climate Change Fact Sheet
  bit.ly/RWF_FactSheet1
- Vulnerability Assessment Fact Sheet
  bit.ly/RWF_FactSheet2
- Online Map Viewer
  gis.dutchessny.gov/resilient-ways-forward
- Today's presentation will be posted to the website



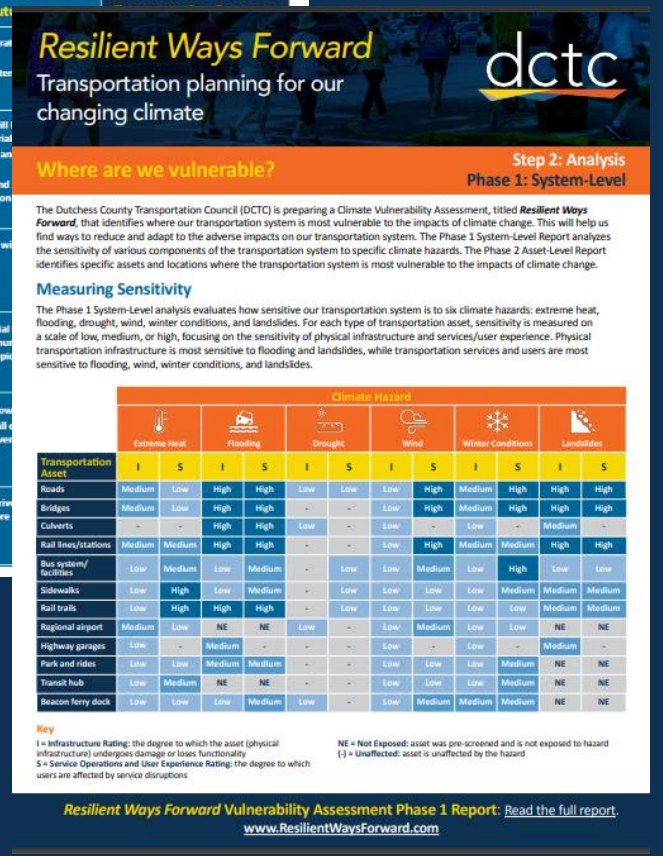
Resilient Ways Forward
Transportation planning for our changing climate
dctc

How is the climate changing? Step 1: Data Collection

To become more resilient to climate change, we need to better understand regional climate trends and the likely impacts on our transportation system.

Climate Hazard Summary for Dutchess County

Hazard	Current	Future
Temperature	• Average annual temperature has increased by nearly 3°F since 1960 • High temperatures occur with greater frequency and intensity	• Average temperat to rise • More extreme te occur
Flooding	• About 44 inches of rain/year • Many extreme precipitation events • Hudson River water level has risen more than one foot since 1900	• Precipitation will increasingly varia • More frequent an rain events • Sea level rise and along the Hudson frequently
Drought	• Notable flash droughts in 2002, 2017, and 2022.	• Longer periods wi precipitation
Wind	• Multiple high wind events	• Greater potential as intensity of hu storms, and tropi increases
Winter Conditions	• Winters have warmed 3x faster than summers • Later snowfall and earlier snowmelt	• Fewer days below • Greater snowfall winter storm eve
Landslides	• Southern and eastern parts of Dutchess County at risk due to steep slopes	• Precipitation-driv could occur more



Resilient Ways Forward
Transportation planning for our changing climate
dctc

Where are we vulnerable? Step 2: Analysis Phase 1: System-Level

The Dutchess County Transportation Council (DCTC) is preparing a Climate Vulnerability Assessment, titled ***Resilient Ways Forward***, that identifies where our transportation system is most vulnerable to the impacts of climate change. This will help us find ways to reduce and adapt to the adverse impacts on our transportation system. The Phase 1 System-Level Report analyzes the sensitivity of various components of the transportation system to specific climate hazards. The Phase 2 Asset-Level Report identifies specific assets and locations where the transportation system is most vulnerable to the impacts of climate change.

Measuring Sensitivity

The Phase 1 System-Level analysis evaluates how sensitive our transportation system is to six climate hazards: extreme heat, flooding, drought, wind, winter conditions, and landslides. For each type of transportation asset, sensitivity is measured on a scale of low, medium, or high, focusing on the sensitivity of physical infrastructure and services/user experience. Physical transportation infrastructure is most sensitive to flooding and landslides, while transportation services and users are most sensitive to flooding, wind, winter conditions, and landslides.

	Climate Hazard											
	Extreme Heat		Flooding		Drought		Wind		Winter Conditions		Landslides	
Transportation Asset	I	S	I	S	I	S	I	S	I	S	I	S
Roads	Medium	Low	High	High	Low	Low	Low	High	Medium	High	High	High
Bridges	Medium	Low	High	High	-	-	Low	High	Medium	High	High	High
Culverts	-	-	High	High	Low	-	Low	-	Low	-	Medium	-
Rail lines/stations	Medium	Medium	High	High	-	-	Low	High	Medium	Medium	High	High
Bus system/ facilities	Low	Medium	Low	Medium	-	Low	Low	Medium	Low	High	Low	Low
Sidewalks	Low	High	Low	Medium	-	Low	Low	Low	Low	Medium	Medium	Medium
Rail trails	Low	High	High	High	-	Low	Low	Low	Low	Low	Medium	Medium
Regional airport	Medium	Low	NE	NE	Low	-	Low	Medium	Low	Low	NE	NE
Highway garages	Low	-	Medium	-	-	-	Low	-	Low	-	Medium	-
Park and rides	Low	Low	Medium	Medium	-	-	Low	Low	Low	Medium	NE	NE
Transit hub	Low	Medium	NE	NE	-	-	Low	Low	Low	Medium	NE	NE
Beacon ferry dock	Low	Low	Low	Medium	Low	-	Low	Medium	Medium	Medium	NE	NE

Key

I = Infrastructure Rating: the degree to which the asset (physical infrastructure) undergoes damage or loses functionality
S = Service Operations and User Experience Rating: the degree to which users are affected by service disruptions

NE = Not Exposed: asset was pre-screened and is not exposed to hazard
(-) = Unaffected: asset is unaffected by the hazard

Resilient Ways Forward Vulnerability Assessment Phase 1 Report: Read the full report.
www.ResilientWaysForward.com

dctc

Q & A


Join the Conversation!
Use the Q&A function to ask questions.
Invite
Participants
41
Share Screen
Q&A
Record
Reactions

Stay Engaged

- Send a comment or question
- Sign up for email updates
  bit.ly/DCTC_EmailUpdates

www.ResilientWaysForward.com
dctc@dutchessny.gov
(845) 486-3600

Dutchess County Transportation Council
85 Civic Center Plaza, Suite 107
Poughkeepsie, NY 12601


Thank you!
Resilient Ways Forward
Transportation planning for our changing climate
dctc