Municipal Vulnerability Index: Your Town's Vulnerabilities and Climate Change

ANR Municipal Day

October 20, 2023

VERMONT
AGENCY OF NATURAL RESOURCES

Goals

- Share progress to-date to develop a **Municipal Vulnerability Index (MVI)**.
- **Gather input** on key MVI challenges and questions.
- Share **other tools and resources** that indicate climate change vulnerabilities and opportunities.

Vermont Crop Damage Could Be Far Reaching after Mid-May Frost

May 23, 2023

June 9, 2023

DROUGHT STATUS UPDATE

Drought Early Warning Update for the Northeast

Air quality in Vermont reached 'very unhealthy' with latest smoke impacts

Vermont Public | By Abagael Giles
Published June 27, 2023 at 10:38 AM EDT

Vermont grapples with historic flooding as more rainstorms head for Northeast

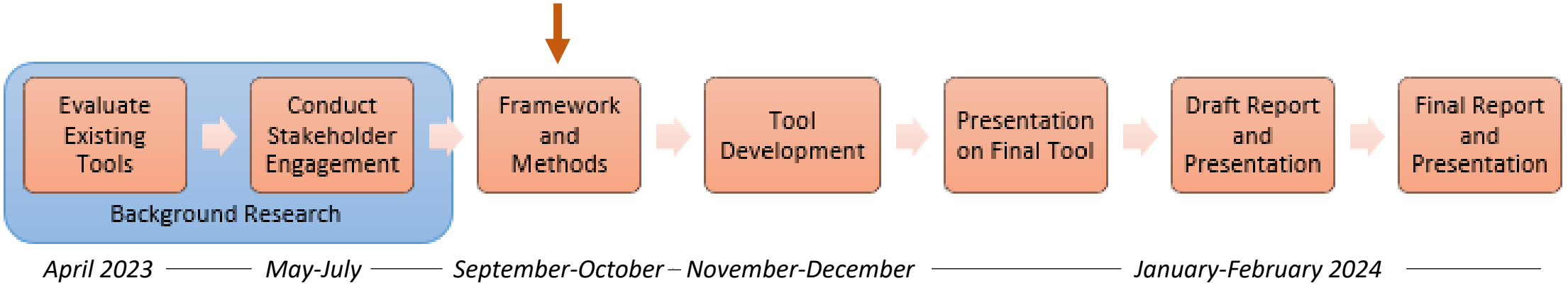
It's the worst flooding to hit Vermont since Tropical Storm Irene in 2011.

By Morgan Winsor and Emily Shapiro
July 12, 2023, 12:28 PM

1
Understand Exposure
2
Assess Vulnerability & Risk
3
Investigate Options
4
Prioritize & Plan
5
Take Action

MVI Project Background

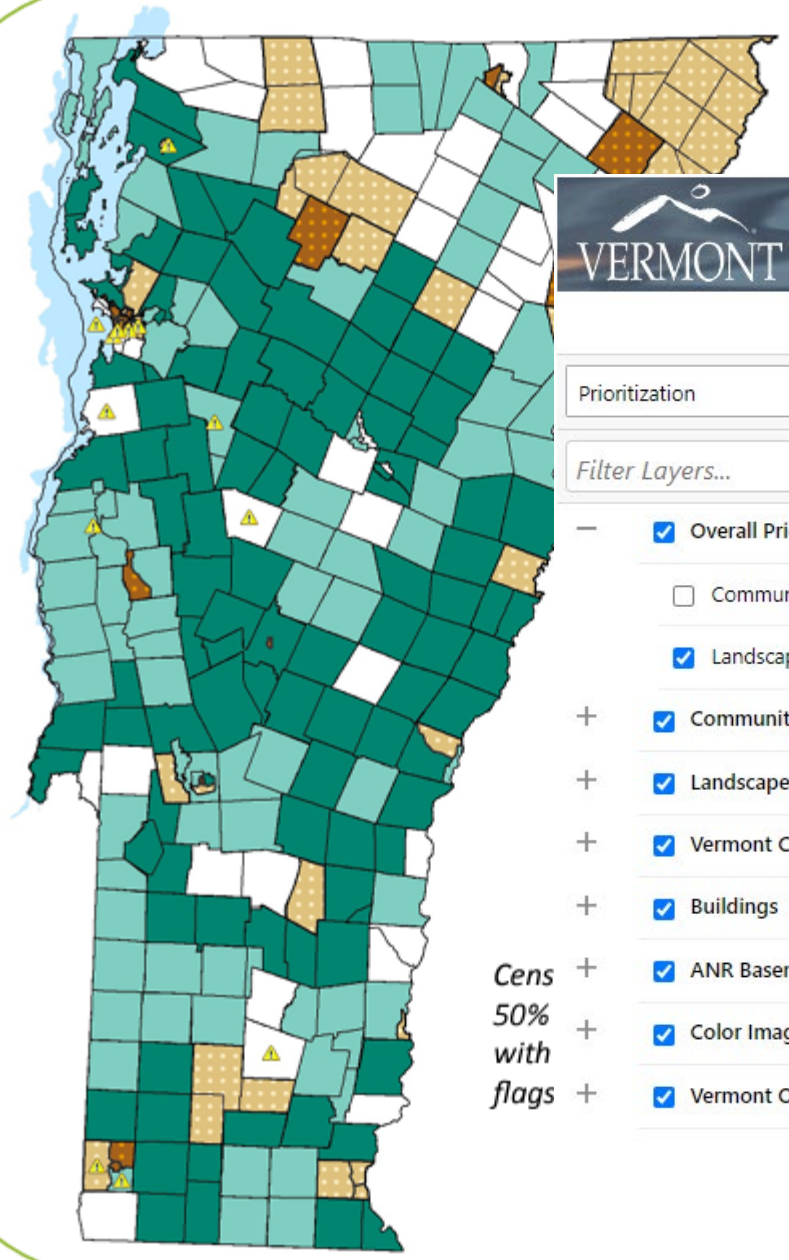
- Aim: Indicate municipalities' vulnerability to climate change based on a range of social, economic, and biophysical factors
- Information generated by the tool may be used to:
  - Develop local hazard mitigation, local and regional energy plans, or other climate-related plans and inform action.
  - Inform decisions about how to prioritize climate-related projects and funding within the state.



Stakeholder Engagement

- **MVI tool users:** Primary end users of the MVI tool (e.g., municipalities, regional planning commissions (RPCs), utilities).
- **Affected Populations:** Populations that may experience disproportionate impacts from climate change based on characteristics such as race, ethnicity, age, income, education, and geographic location. Engagement included representatives of organizations serving or working with these populations.
- **MVI Tool partners:** Entities whose work is parallel to, or overlaps with, the MVI tool where there is a need to align efforts.

Vermont Social Vulnerability Index



VERMONT **BioFinder**
Vermont Agency of Natural Resources

Layers

Prioritization

Filter Layers...

Filter

- Overall Priorities: Vermont Conservation Design
  - Community & Species Scale
  - Landscape Scale
- Community & Species Components
- Landscape Components
- Vermont Conservation Design - Targets
- Buildings
- ANR Basemap Data
- Color Imagery by Year
- Vermont Orthophotos

Cens
50%
with
flags

Quick Tools...

Search...

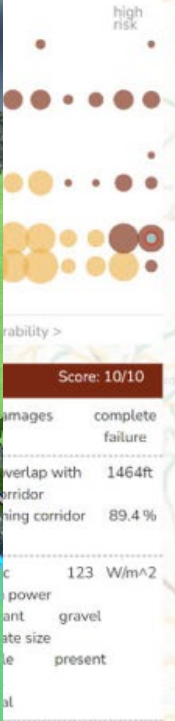
Overall Priorities: Vermont Conservation Design

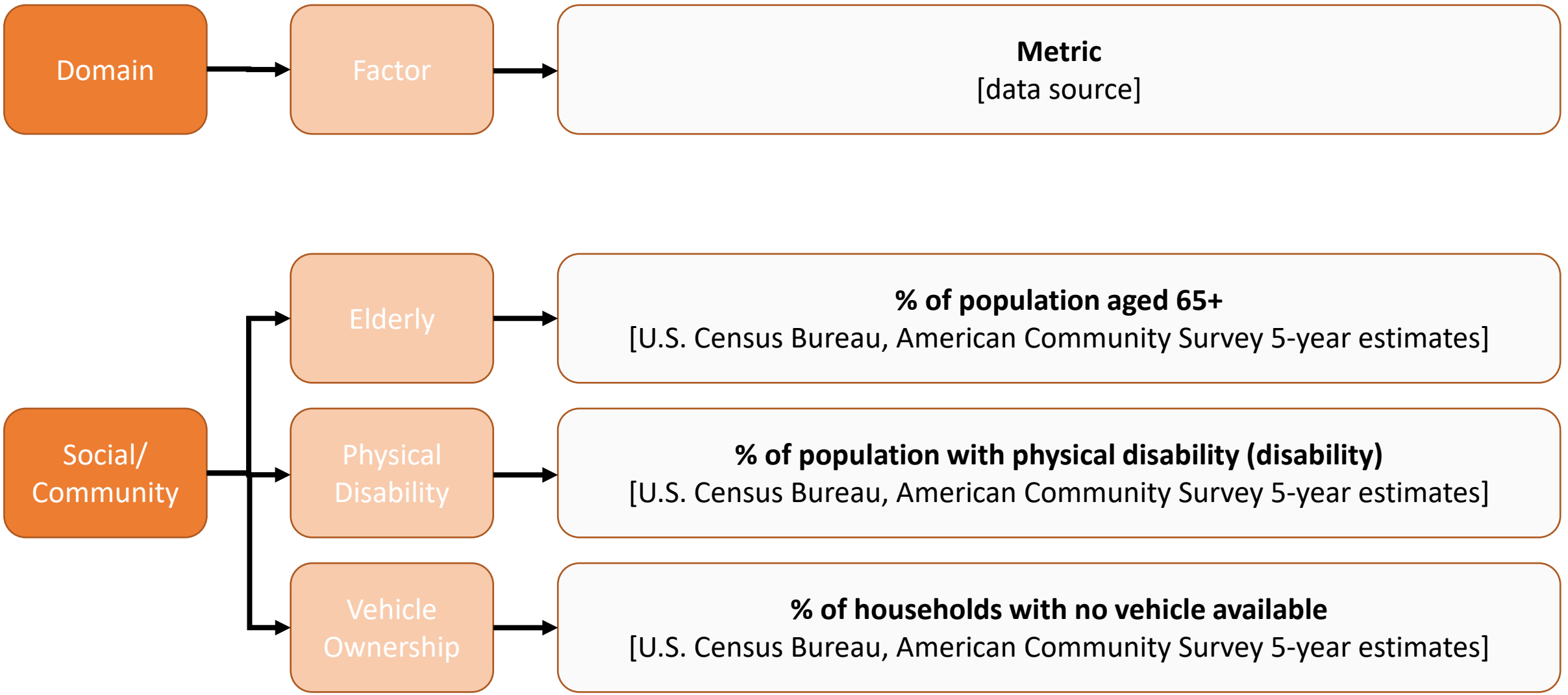
Landscape Scale

Highest Priority	Priority
Interior Forest Blocks	Interior Forest Blocks
Connectivity Blocks	Connectivity Blocks
Surface Water and Riparian Areas	Surface Water and Riparian Areas
Riparian and Wildlife Connectivity	
Physical Landscape Diversity	
Physical Landscape Blocks	

For more information: Learn more about scales and priorities.

View Additional Details | Add to Results

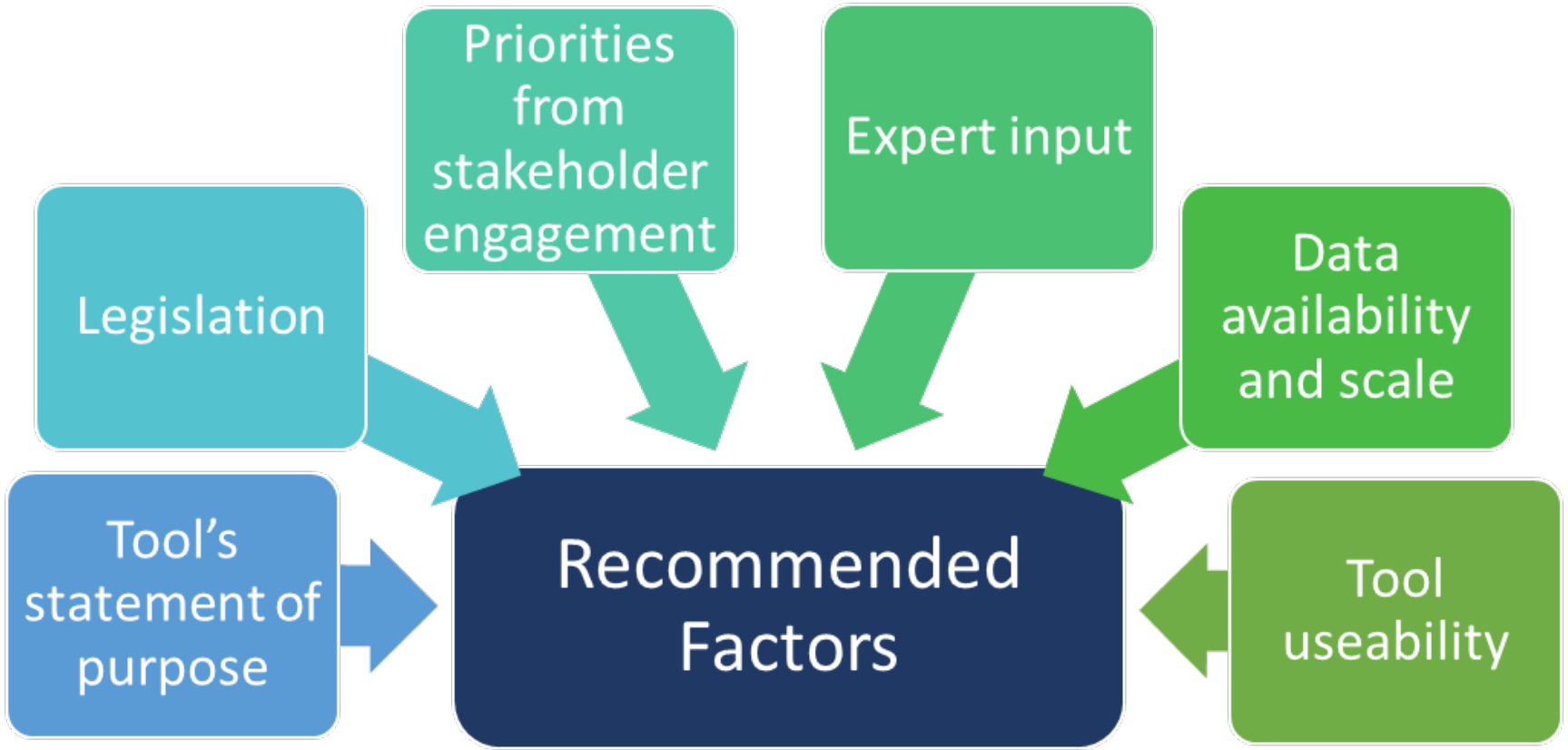



Domain
Factor
Metric
[data source]
Social/ Community
Elderly
% of population aged 65+
[U.S. Census Bureau, American Community Survey 5-year estimates]
Physical Disability
% of population with physical disability (disability)
[U.S. Census Bureau, American Community Survey 5-year estimates]
Vehicle Ownership
% of households with no vehicle available
[U.S. Census Bureau, American Community Survey 5-year estimates]

MVI Domains

- **Social/Community** (e.g., demographic factors, municipal staff capacity, distance from emergency services and shelters)
- **Economic/Jobs** (e.g., unemployment rate, income, key economic sectors)
- **Built/Physical Environment** (e.g., transportation, utilities, mobile homes, impervious surfaces)
- **Natural Environment** (e.g., stream protection, critical habitat, air quality)
- **Natural Hazards** (e.g., flooding, extreme temperatures, drought)

Tool Factors: Selection Process



MVI Example Factors

Social/Community

- Single parent household
- Linguistic Isolation
- No internet
- Energy & transportation burden
- Housing cost burden
- Access to healthy foods
- ERAF Rate
- Public and civic organizations
- ACCD Designated Areas

Economic/Jobs

- Vulnerable employment
- Agriculture
- Tourism

Built/Physical

- Location of manufactured home communities in flood hazard area
- Critical assets (libraries, schools, hospitals)

Natural Environment

- Tree Canopy
- Conserved and protected lands
- River and stream protection
- Impervious surfaces

Infrastructure

- Roads, bridges, and culverts
- Power lines & utility poles
- Water and wastewater infrastructure

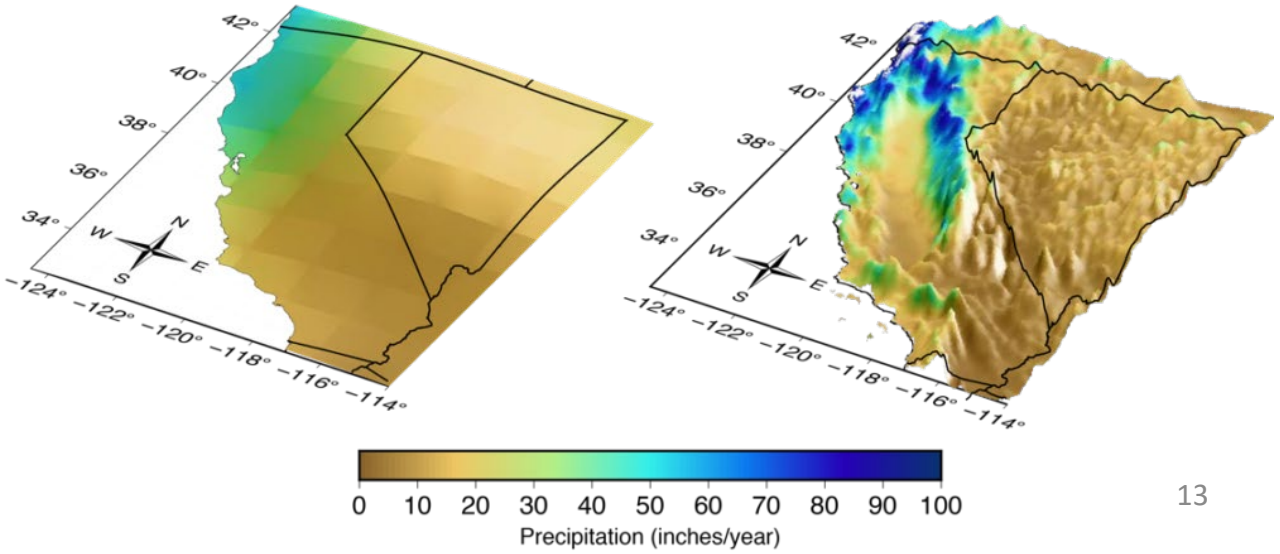
Selected Factors: Hazards

Factor	Data Source
Flood	1. FEMA National Flood Hazard Layer 2. VT Center for Geographic Information (Lake Champlain Basin) 3. VT ANR River Corridors
Wildfire	U.S. Forest Service
Drought	U.S. Drought Monitor
High heat	LOCA Statistical Downscaling[a]
Extreme precipitation	LOCA Statistical Downscaling[a]
Wind	First Street Foundation[b]
Cold	LOCA Statistical Downscaling[a]
Hail	NOAA NCEI Storm Events Database[c]
Blizzard	NOAA NCEI Storm Events Database[c]

[a] LOCA data includes projections through 2100.
[b] First Street Foundation's data includes climate projections.
[c] The NOAA Storm Events Database provides the number of events, or the number of days with event, in a county.

Climate Projections – LOCA Data

- LOCA (*Localized Constructed Analogs*) is a technique for downscaling climate model projections of the future climate. Instead of getting very rough global climate model outputs, we can have data for the entire U.S. at a 6 km resolution.
- Used in the Fourth National Climate Assessment
- We are using this data to create metrics for projected high heat, cold, and extreme precipitation in VT for 2050.
- We plan to do this for SSP5-8.5 (very high emissions) and SSP2-4.5 (intermediate emissions)

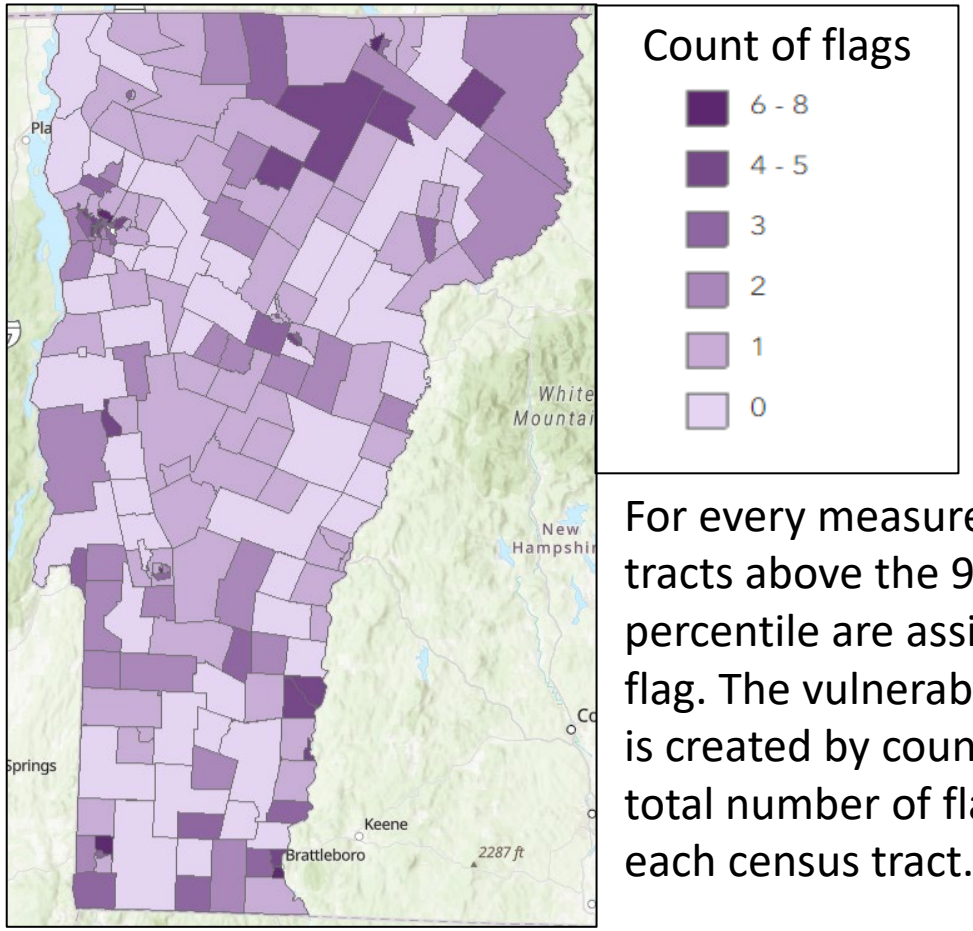


Factor	Metric
High heat	Number of days with maximum temperature > 90 °F
Cold	Number of days with minimum temperature < 32 °F
Extreme precipitation	Number of days with > 1 inch of precipitation

Conceptual framework

- Flexible, user-guided approach to understanding and exploring vulnerability.
- No single vulnerability score, but a range of flags to help identify the presence and scale of vulnerability

- Example of tool that “flags” vulnerability measures: VT Social Vulnerability Index



For every measure, census tracts above the 90th percentile are assigned a flag. The vulnerability index is created by counting the total number of flags in each census tract.

Questions

- What tool outputs would be helpful for your municipality to have to be better prepared for the next flood or heatwave?
- How would a tool like this be used in your climate-related planning processes?
- As your community reflects on the July flooding, what questions do you have about climate vulnerability and resilience?

Challenges and Opportunities

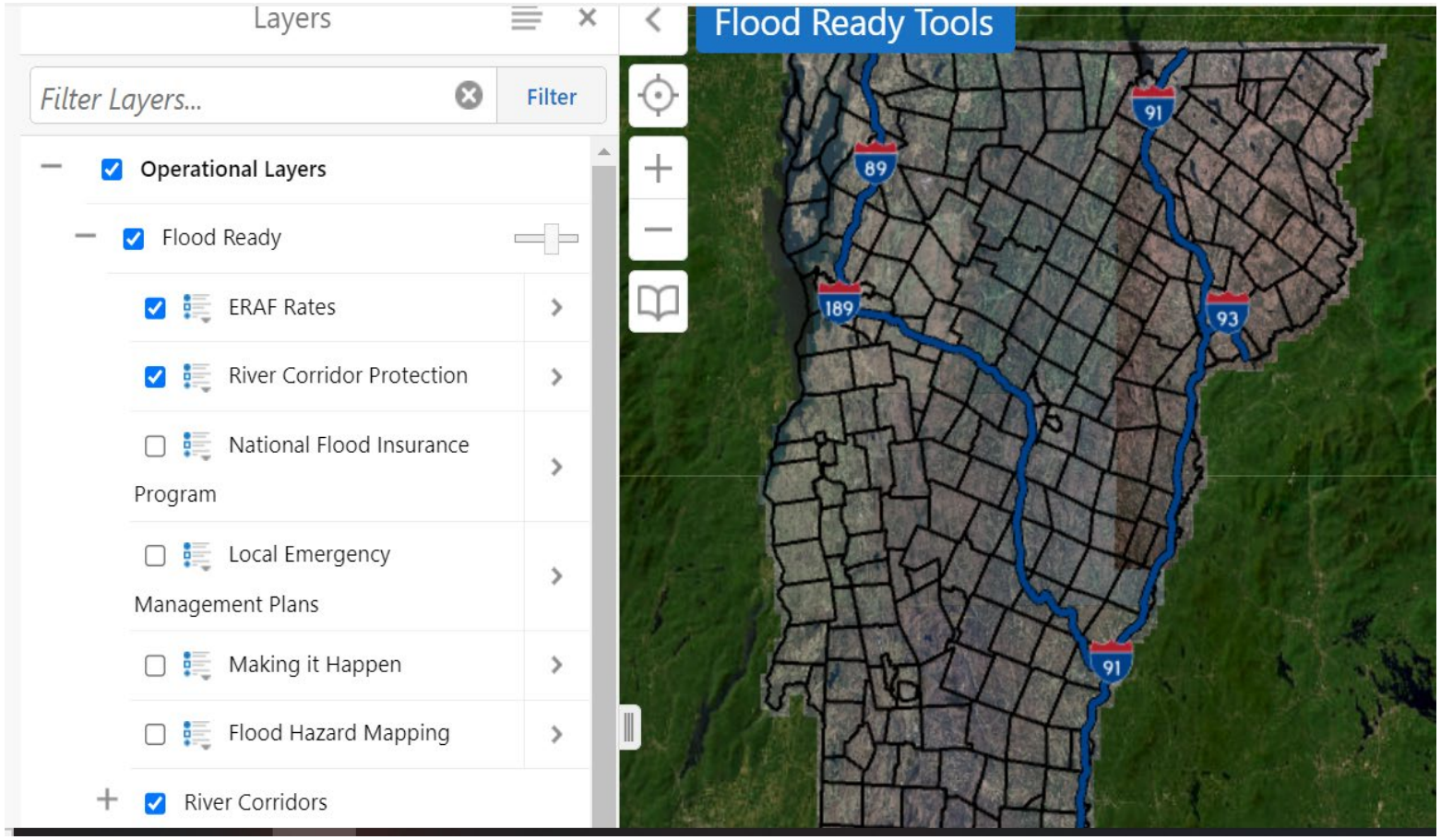
- Capacity and training
- Scale of data
- Vulnerability vs. opportunity
- Shifting awareness to action
- Metrics for community resilience
- Historical data and climate projections

MVI Next Steps

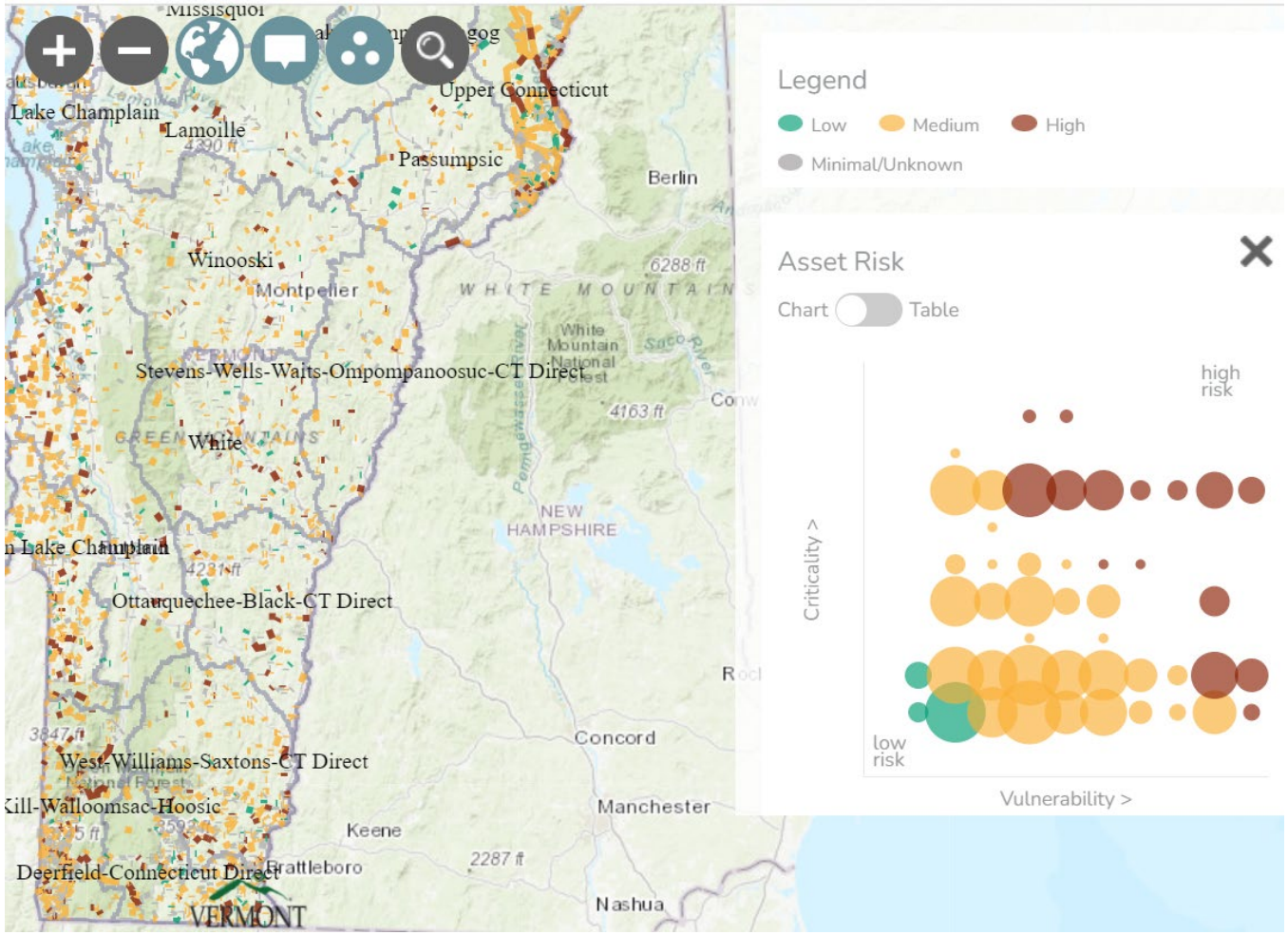
- Finalize MVI framework and methods
- Re-engagement with stakeholders
- Tool development
- Beta testing
- Resources and capacity to use tool

Other tools!

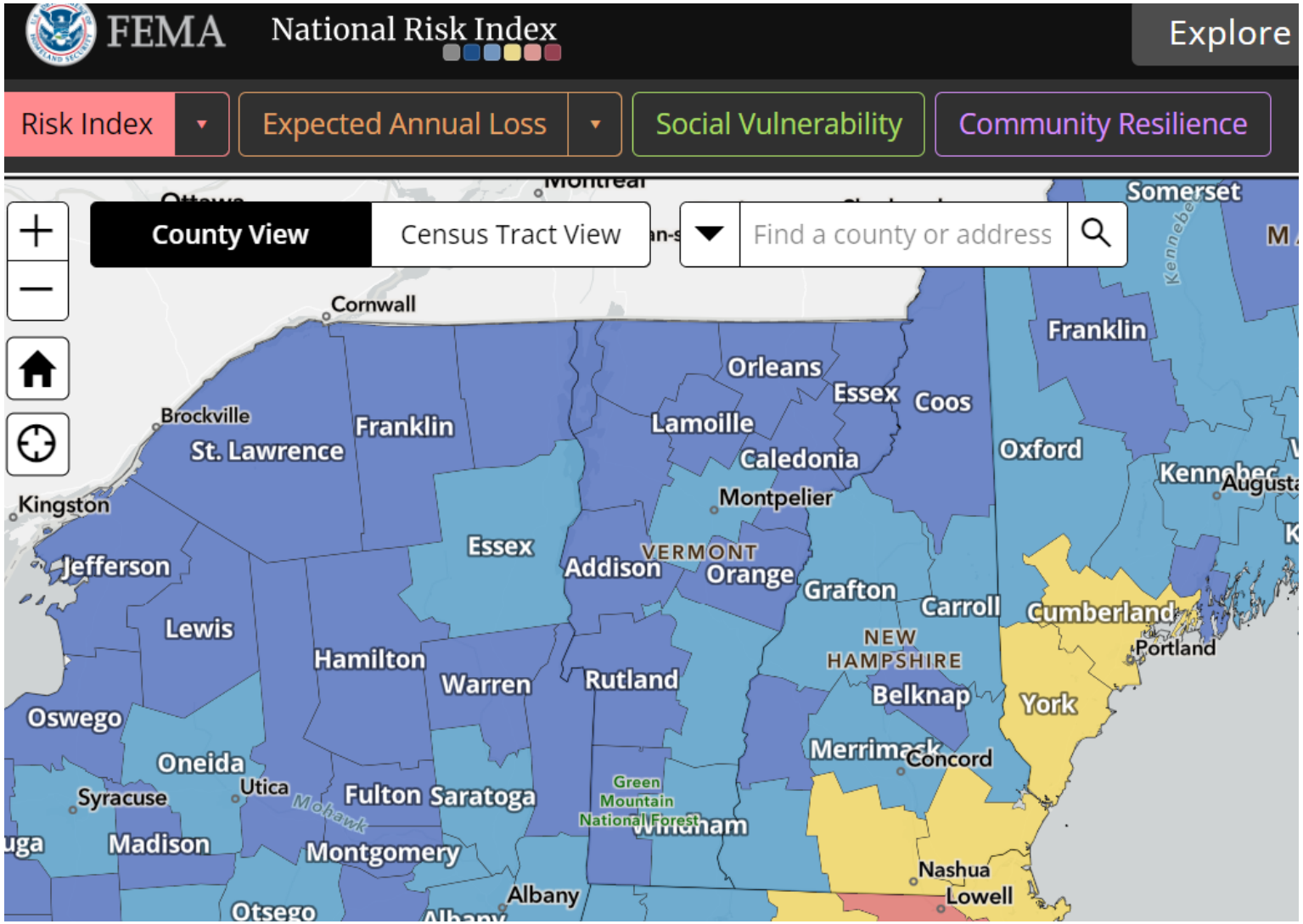
[Vermont Flood Ready Atlas]



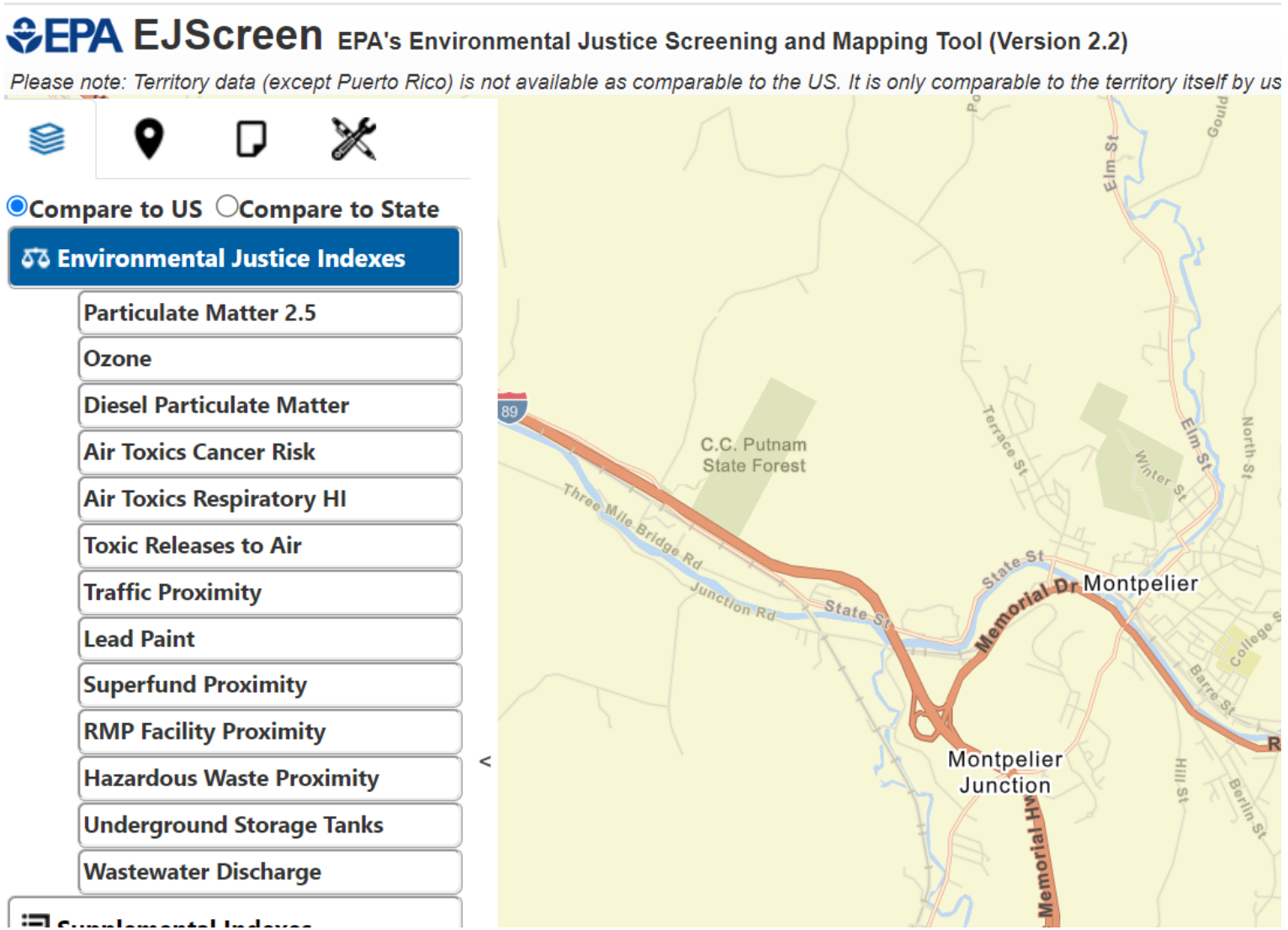
Transportation Resilience Planning Tool



FEMA National Risk Index



EPA EJScreen



First Street Foundation Risk Factor

RISK FACTOR

Vermont

Products & Pricing | The Science | Resources

Flood Factor | Fire Factor | Wind Factor | Heat Factor

Does Vermont have Flood Risk?

- Flood Risk Overview
- Current Protections
- Where to Start
- Current & Future Risk
- Historic Floods
- Environmental Changes
- Community Solutions

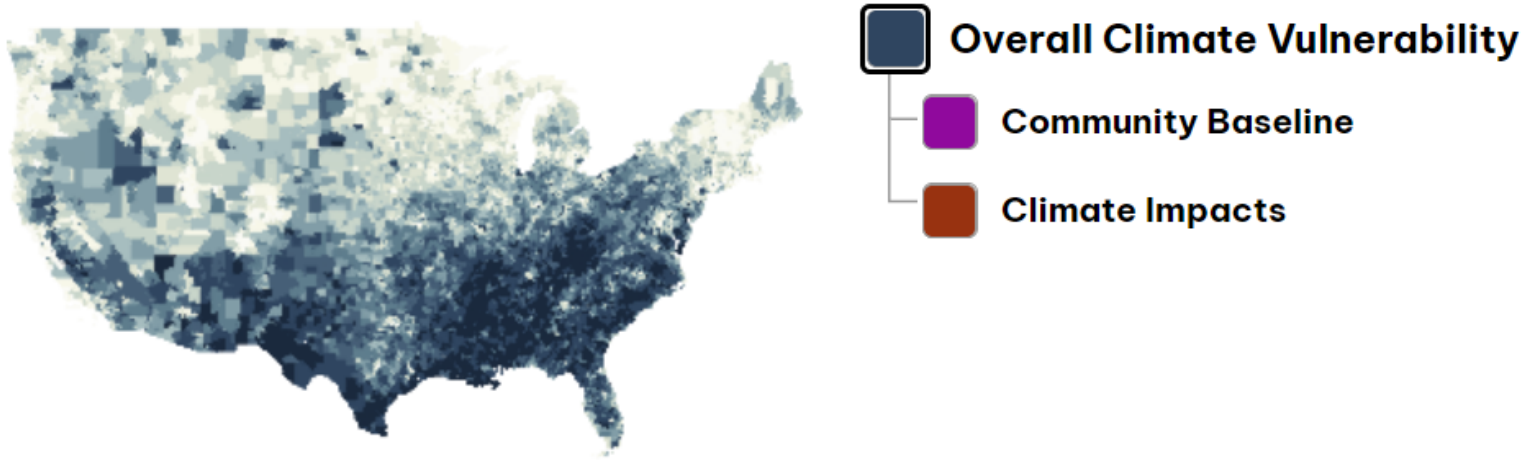
FLOOD FACTOR™

There are **37,614** properties in **Vermont** that have greater than a **26%** chance of being severely affected by flooding over the next 30 years. This represents **15%** of all properties in Vermont.

In addition to damage on properties, flooding can also cut off access to utilities, emergency services, transportation, and may impact the overall economic well-being of an area.

Climate Vulnerability Index

Pulling in 184 sets of data to rank more than 70,000 U.S. Census tracts, the U.S. Climate Vulnerability Index helps you see which communities face the greatest challenges from the impacts of a changing climate. This tool shows what is driving the challenges, so policymakers and communities themselves can take action to build climate resilience where it is needed most.



Stay in Touch!

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