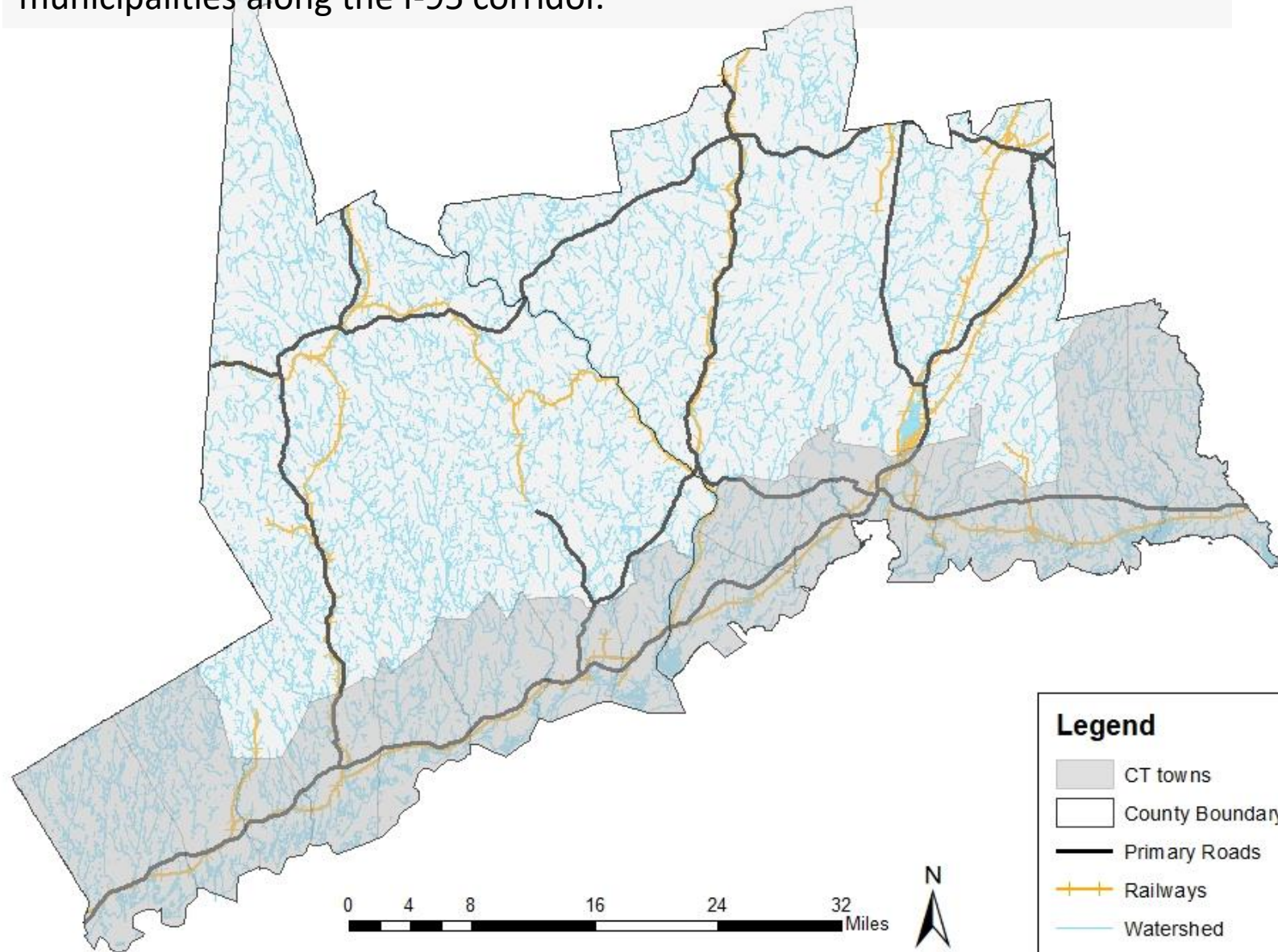


CIRCA Vulnerability Assessment Update

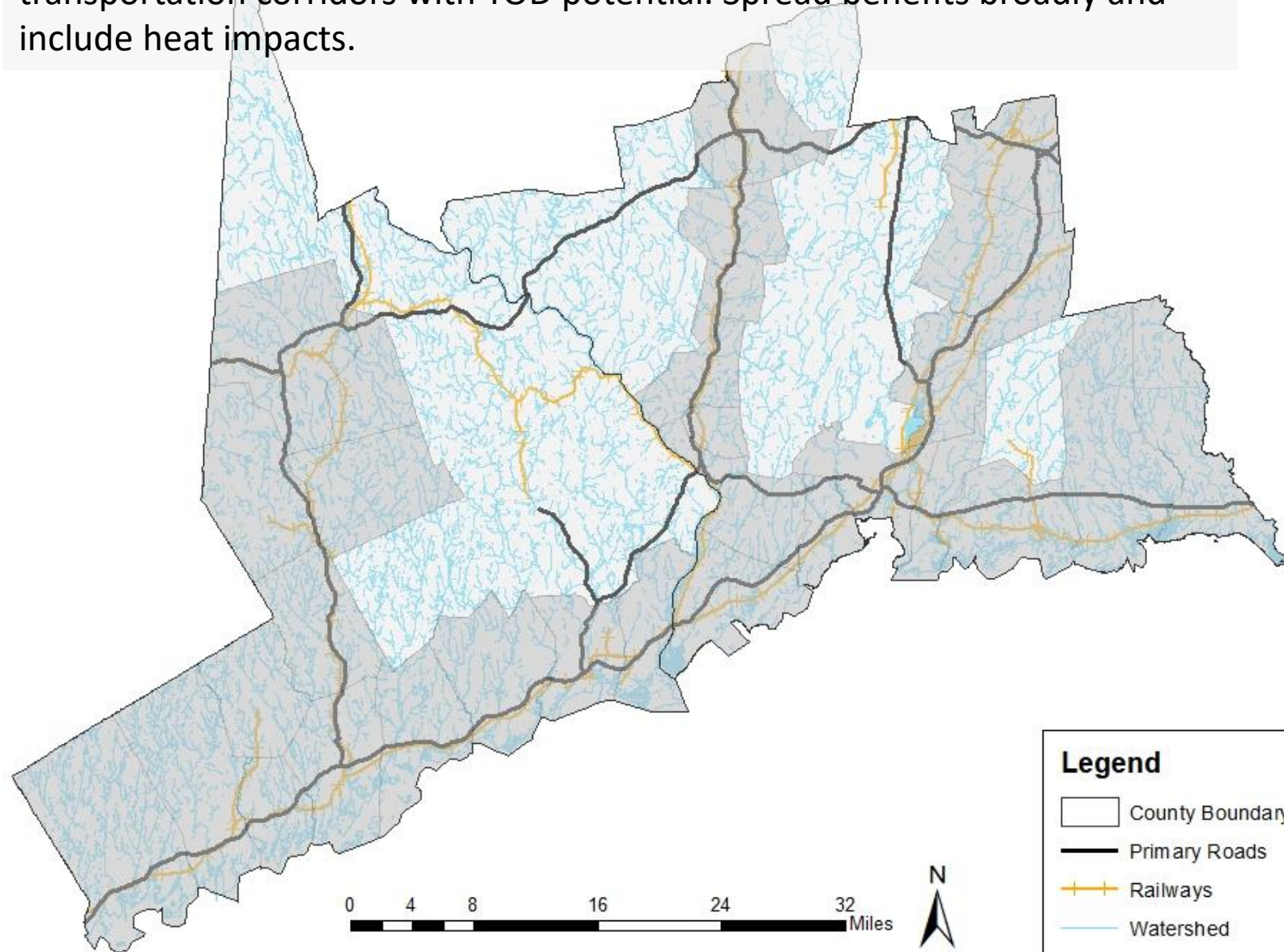
John Truscinski
Director of Resilience Planning
Connecticut Institute for Resilience and Climate Adaptation

April 7th, 2021

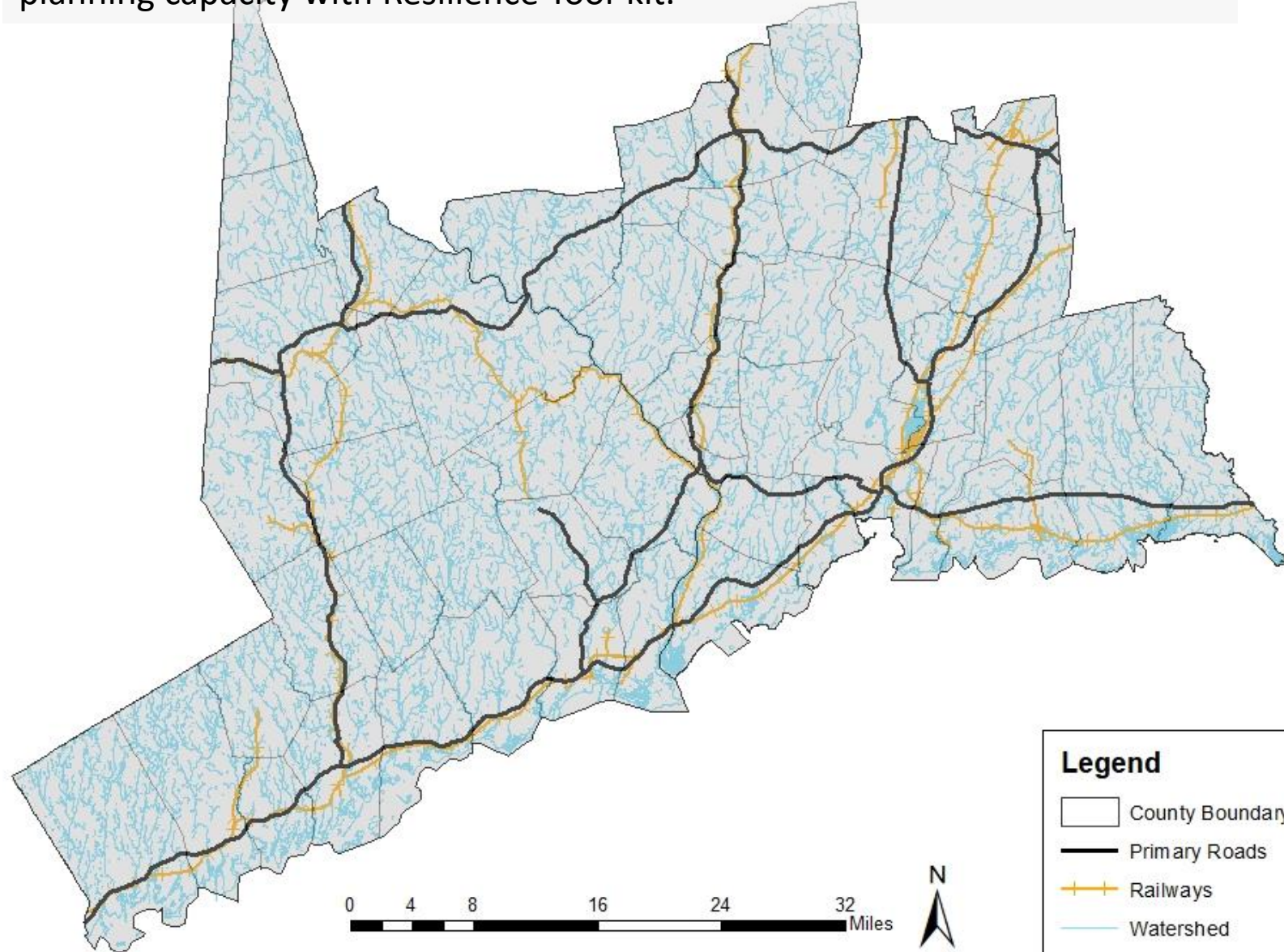
C3RP: “extend the NDRC planning process to the remaining coastal municipalities along the I-95 corridor.”



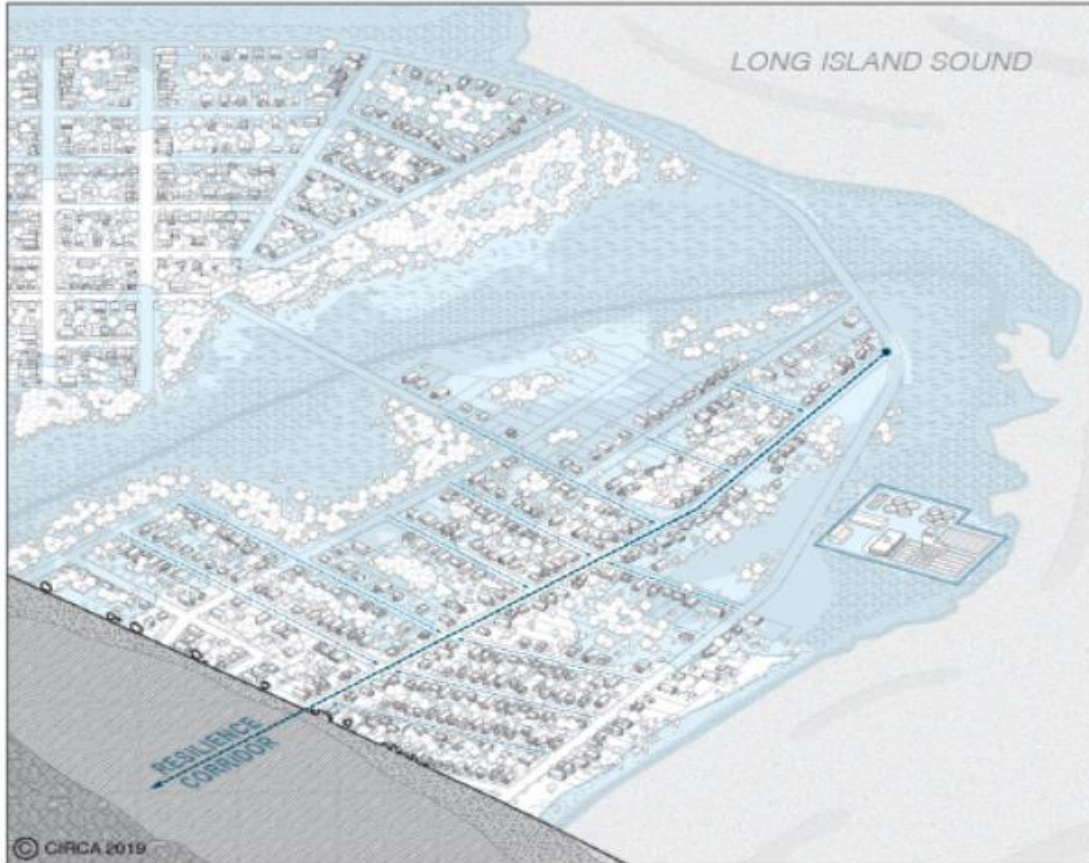
Updated Phase II Scope: Include additional inland communities along major transportation corridors with TOD potential. Spread benefits broadly and include heat impacts.



Engage the remaining communities to assess priorities and provide climate planning capacity with Resilience Tool-kit.



Resilient Connecticut



Planning Framework

Connecticut Institute for Resilience and Climate Adaptation



1. Set the Stage – Establish Project Partnerships, Goals and Regional Scope Informing Locations and Scales
 - D. Collect, organize and evaluate available planning documents and data sources, identify critical assets, and areas of planned conservation and development. Identify existing planning processes within and between towns, regional councils of government, and state agencies, building on previous climate adaptation efforts where possible and avoiding duplicative efforts. Identify barriers and opportunities in the planning process to achieving local and regional resilience.

[Resilient Connecticut Planning Framework](#)

Inventory of Local & Regional Planning Documents for Fairfield and New Haven Counties

as of February 25, 2021

Fairfield County	Coastal Resilience Plan	Plan of Conservation & Development	Municipal Natural Hazard Mitigation Plan	COG Natural Hazard Mitigation Plan	Regional Framework for Coastal Resilience	TNC Community Resilience Building Workshop
Bethel		Yes - 2020	Yes - 2015			
Bridgeport	Yes - 2014	Yes - 2019		Metro COG - 2019	Yes - 2017	Yes - 2012
Brookfield		Yes - 2016	Yes - 2014			
Danbury		Yes - 2013	Yes - 2017			
Darien		Yes - 2016		WestCOG - 2016		
Easton		Yes - 2018		Metro COG - 2019		
Fairfield		Yes - 2016		Metro COG - 2019	Yes - 2017	Yes - 2013
Greenwich	Resilience Planning Study - 2013	Yes - 2019		WestCOG - 2016		
Monroe		Yes - 2010		Metro COG - 2019		
New Canaan		Yes - 2014		WestCOG - 2016		
New Fairfield		Yes - 2014	Yes - 2016			
Newtown		Yes - 2014	Yes - 2015			
Norwalk	Proposed Coastal Vision - 2018	Yes - 2020		WestCOG - 2016		
Redding		Yes - 2018	Yes - 2015			
Ridgefield		Yes - 2020	Yes - 2015			
Shelton		Yes - 2017		ValleyCOG - 2012		
Sherman		Yes - 2013	Yes - 2017			
Stamford	Resilience Opportunity Assessment - 2018	Yes - 2015		WestCOG - 2016		Yes - 2015
Stratford	Yes - 2016	Yes - 2014		Metro COG - 2019	Yes - 2017	Yes - 2012
Trumbull		Yes - 2014		Metro COG - 2019		
Weston		Yes - 2020		WestCOG - 2016		
Westport		Yes - 2017		WestCOG - 2016		
Wilton		Yes - 2019		WestCOG - 2016		

<https://resilientconnecticut.uconn.edu/wp-content/uploads/sites/2761/2021/02/Web-Friendly-Planning-Inventory-Charts-2.25.21.pdf>



	Municipality	Plan	Action/Project	Location
20	Stratford	Community Resilience Building (CRB)	Railroad viaducts: complete West Broad Street, assess Bruce Avenue, King Street, East Main, a...	Various
21	Stratford	Community Resilience Building (CRB)	WWTP: Investigate flood risk scenarios and identify resonses (raise berm), also work to reduce...	Wastewater Treatment Plant
22	Stratford	Community Resilience Building (CRB)	Explore hardening of 16 pump stations, and test the system to to assess impacts due to temp...	Various
23	Stratford	Community Resilience Building (CRB)	Ensure Durham Bus Co. has updated contingency plan and notificatoin process to ensure bus...	Durham Bus Company Dep...
<input type="checkbox"/>	<input checked="" type="checkbox"/> Stratford	Community Resilience Building (CRB)	Assess vulnerability of high pressure gas main in Pecks Mill Pond Area.	Pecks Mill Pond
25	Stratford	Community Resilience Building (CRB)	Update evacuation plans depicting loss of access/egress during peak events.	Various
26	Stratford	Community Resilience Building (CRB)	Work with UI to harden utilities by hardening.	Various
27	Stratford	Community Resilience Building (CRB)	Stratford Housing Authority should conduct feasibility study of power supply needs via gener...	Various
28	Stratford	Community Resilience Building (CRB)	Coordinate floodproofing effots for buildings south of Stratford Avenue	Various
29	Stratford	Community Resilience Building (CRB)	For the South End, reassess existing and future risl to employment growth areas identified in t...	Various
30	Stratford	Community Resilience Building (CRB)	Secure generator for Bunnell High School and Baldwin Senior Center shelters facilities	Bunnel High School Shelter
31	Stratford	Community Resilience Building (CRB)	Secure generator for Bunnell High School and Baldwin Senior Center shelters facilities	Senior Center Shelter
32	Stratford	Community Resilience Building (CRB)	Support and identify funding to provide generators to priorty gas stations.	Various
33	Stratford	Community Resilience Building (CRB)	Ensure private contractor equipment is relocated to secure, floodproof locations. Particularly S...	Various
34	Stratford	Community Resilience Building (CRB)	Encourage private entities such as restaurants throughout town to acquire backup power to i...	Various
169 records				

Resilient Connecticut – Regional Climate Planning

A collaborative project to build resilience of communities, with assessments and pilot projects in New Haven and Fairfield Counties



About Resilient Connecticut

Understanding Vulnerability

Zones of Shared Risk

The Pathway to Resilience

Provide Input

- [Hazard Mitigation Plans](#)
- [South Central Regional Framework for Coastal Resilience](#)
- [Community Resilience Building \(CRB\) workshops](#)
- [Drinking Water Vulnerability and Resilience Plan \(DWVARP\)](#)
- [Resilient Historic Resources: Best Practices for Planners](#)
- [CT-DOH CDBG-DR Funded Projects Map](#)

Zoom to ◀ 1 of 4 ▶

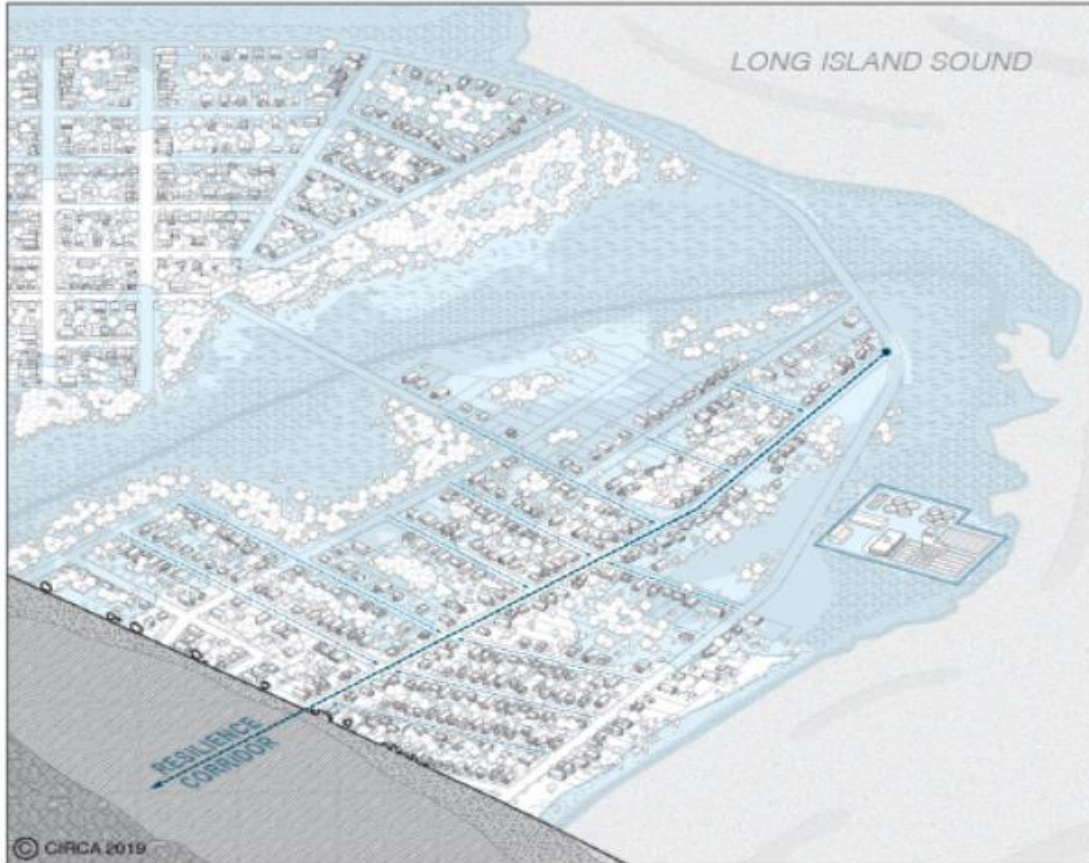
Mill River Shoreline Projects □ ×

Project Name	Mill River Shoreline Projects
Primary Category	Revetment
Secondary Category	
Tertiary Category	
Action	Enhance
Address	Various roads
Town	New Haven

[Planning Actions and Projects Inventory](#)



Resilient Connecticut



2. Apply Robust Science and Technical Analysis Planning
 - A. Utilize projected climate change scenarios using CIRCA's vulnerability assessment and other tools to establish a shared baseline understanding of climate change risks and their regional impacts in Connecticut.

Planning Framework

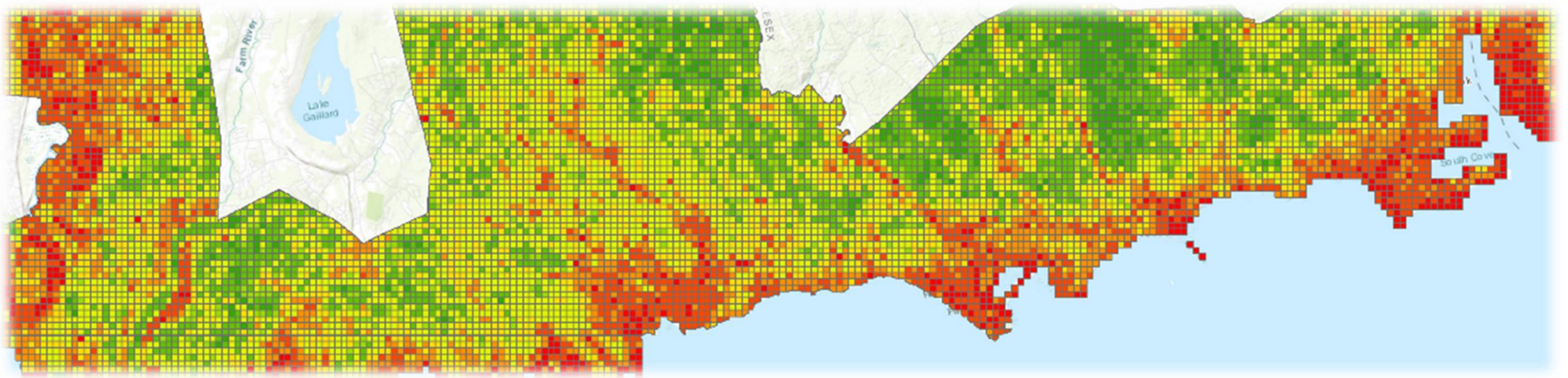
Connecticut Institute for Resilience and Climate Adaptation



[Resilient Connecticut Planning Framework](#)

Climate Change Vulnerability Index (CCVI)

- ✓ A **tool** developed for New Haven and Fairfield Counties that can be used, in conjunction with other resources, for **planning and developing projects**
- ✓ An **index** that aggregates **sensitivity, exposure, and adaptive capacity**
 - Brings together lots of different data that contributes to vulnerability
 - Helps us visualize patterns of vulnerability across a wide area
- ✓ **Vulnerability scores are relative** to the region as a whole



Climate Change Vulnerability Index (CCVI)

Assets with higher adaptive capacity and low sensitivity can tolerate impacts to a greater degree and therefore have an overall lower vulnerability.



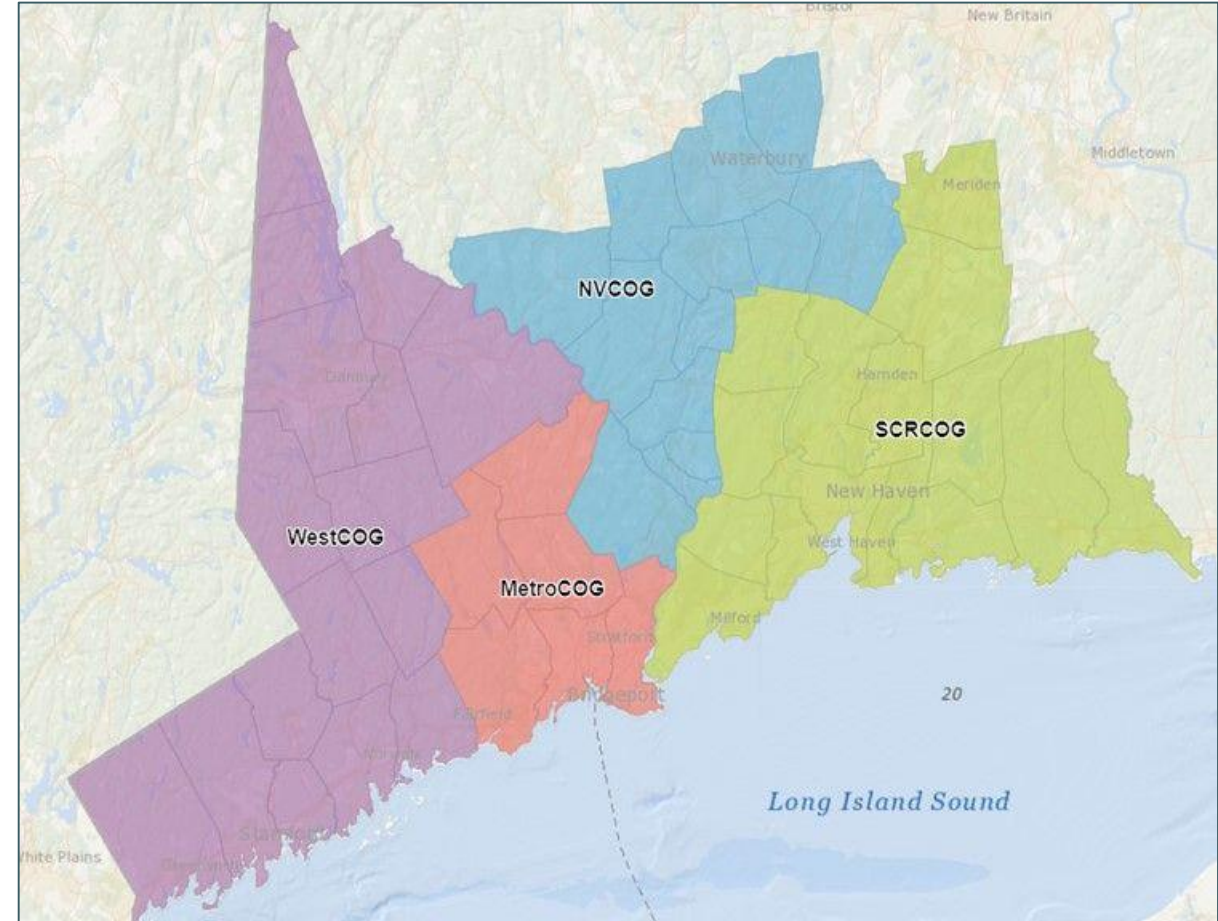
Assets with higher sensitivity and low adaptive capacity are more susceptible to impacts, and therefore have an overall higher vulnerability.



Adapted from: Adapting Urban Water Systems to Climate Change,
A handbook for decision makers at the local level. SWITCH Training Kit, 2011.

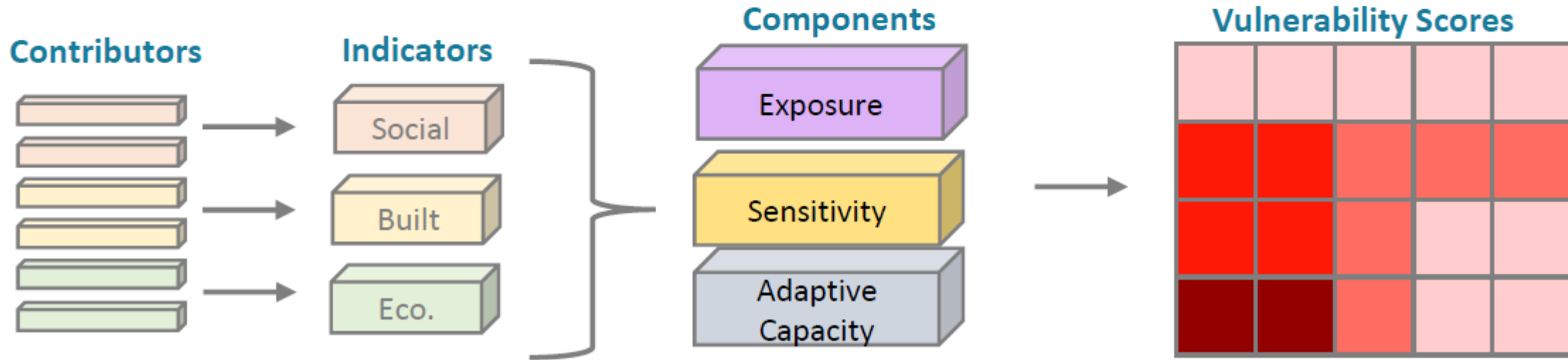
Climate Change Vulnerability Index (CCVI)

Indicator	Factor	Source	
Climate	Riverine flood zones	FEMA	
Climate	Sea Level Rise	CIRCA	
Climate	Storm Surge	opmgis	
Climate	Tidal Range	Connecticut Institute for Resilience and Climate Ada	
Physical	Elevation	CT ECO 2016 LIDAR	https://
Physical	Erosion susceptibility	CT DEEP	https://
Physical	Impervious surfaces	Microsoft US Building Footprints	
Physical	Shoreline change rate	National Oceanic and Atmospheric Administra	http://
Physical	Soil drainage	SSURGO Soil Drainage Class	https://
Built	Critical infrastructure (facilities)	Natural Hazard Mitigation Plans	
Built	Railways	CT DEEP	https://
Built	Septic System Areas	SLR - Sewer service area erased from project bounda	
Built	Streets	CT DESPP	
Built	Brownfields	CT DEEP	https://
Built	Bus Terminals	Bureau of Transportation Statistics	
Built	Railroad Stations	CT Open Data	
Built	Septic Areas (outside of sewer service a	SLR - Sewer service area erased from project bounda	
Ecological	Critical habitat	CT DEEP	https://



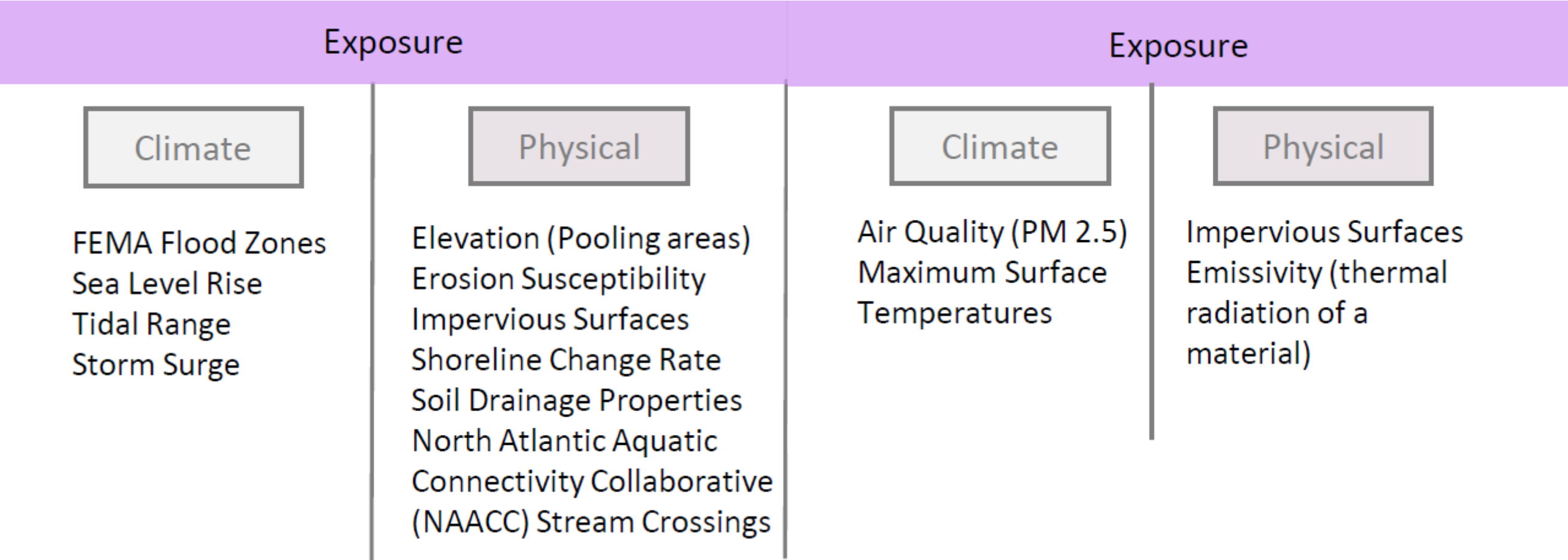
2 How does it work?

The CCVI process is based on combinations of exposure, sensitivity, and adaptive capacity applied to thousands of grid cells. For example, the sensitivity component includes many different contributors that fall under three different indicators – social, built, and ecological. Each indicator has its own final “score” based on the average of the contributors. The average of the 3 indicators represents a score of sensitivity for one grid cell. This sensitivity score, along with final exposure and adaptive capacity scores, is used to calculate the vulnerability score, leading to many different gridded scores throughout a community. A list of flood and heat contributors can be found on the back.



Flood Contributors

Heat Contributors



Flood Contributors

Sensitivity

Social

Median Income
Older than 5 with a Disability
Percent below Poverty Level
Average no. Per Household
Lack of Vehicle
Percent Population over 65
Percent Population under 5

Speaks English less than well/not at all
Population Density
Race and Ethnicity
Percent Population
Unemployed
Percent Population over 25 without a HS Diploma

Built

Building Density
Median Structure
Age
Critical Facilities
Railways in SFHA
Streets in SFHA
Private Wells

Historic Resources
Brownfields
Septic Areas
Bus Terminals
Railroad Stations

Eco.

Critical Habitat
Land Cover
Natural Diversity Data Base (NDDB)

Heat Contributors

Sensitivity

Social

Asthma Related Emergency Visits
Median Income
Older than 5 with a Disability
Percent below Poverty Level
Average no. Per Household

Lack of Vehicle
Percent Population over 65
Percent Population under 5
Speaks English less than well/not at all
Percent Population

Unemployed
Population Density
Race and Ethnicity
Percent Population over 25 without a HS Diploma

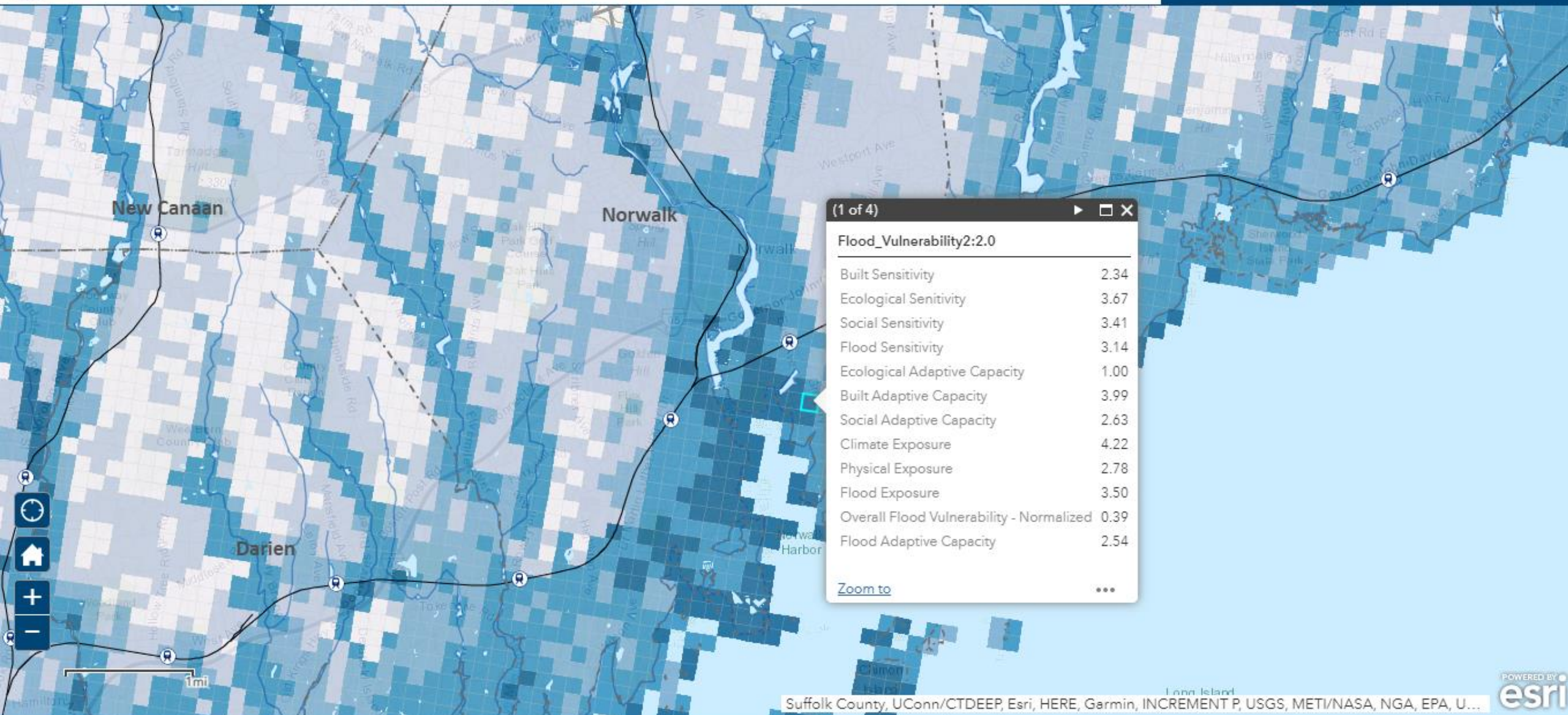
Built

Building Density
Median Structure Age
Private Wells

Flood Contributors

Heat Contributors

Adaptive Capacity			Adaptive Capacity		
<div data-bbox="168 496 359 576" data-label="Text"> <p>Social</p> </div>	<div data-bbox="563 496 754 576" data-label="Text"> <p>Built</p> </div>	<div data-bbox="958 496 1149 576" data-label="Text"> <p>Eco.</p> </div>	<div data-bbox="1319 496 1531 576" data-label="Text"> <p>Social</p> </div>	<div data-bbox="1735 496 1946 576" data-label="Text"> <p>Built</p> </div>	<div data-bbox="2142 496 2354 576" data-label="Text"> <p>Eco.</p> </div>
<div data-bbox="122 615 435 848" data-label="Text"> <p>High Owner-Occupied Housing Disposable Income NFIPs in Force Compared to # of Structures in SFHA</p> </div>	<div data-bbox="499 615 901 1048" data-label="Text"> <p>Distance to Hospitals Distance to Shelters Coastal Structures and Flood Protection Riverine Flood Protection Systems Water and Sewer Service Areas Open Space in SFHA Proximity to Highway Access Regulatory Standards</p> </div>	<div data-bbox="945 615 1182 762" data-label="Text"> <p>Marsh Migration Resilient Landscapes (Eco Regions)</p> </div>	<div data-bbox="1238 615 1577 791" data-label="Text"> <p>Percent population with Health Insurance High Owner-Occupied Housing</p> </div>	<div data-bbox="1658 615 1972 791" data-label="Text"> <p>Distance to Hospitals Distance to Shelters Distance to Cooling Centers</p> </div>	<div data-bbox="2099 615 2463 833" data-label="Text"> <p>Normalized Difference Vegetation Index (NDVI) Percent Mixed Forest Cover Albedo</p> </div>



(1 of 4)

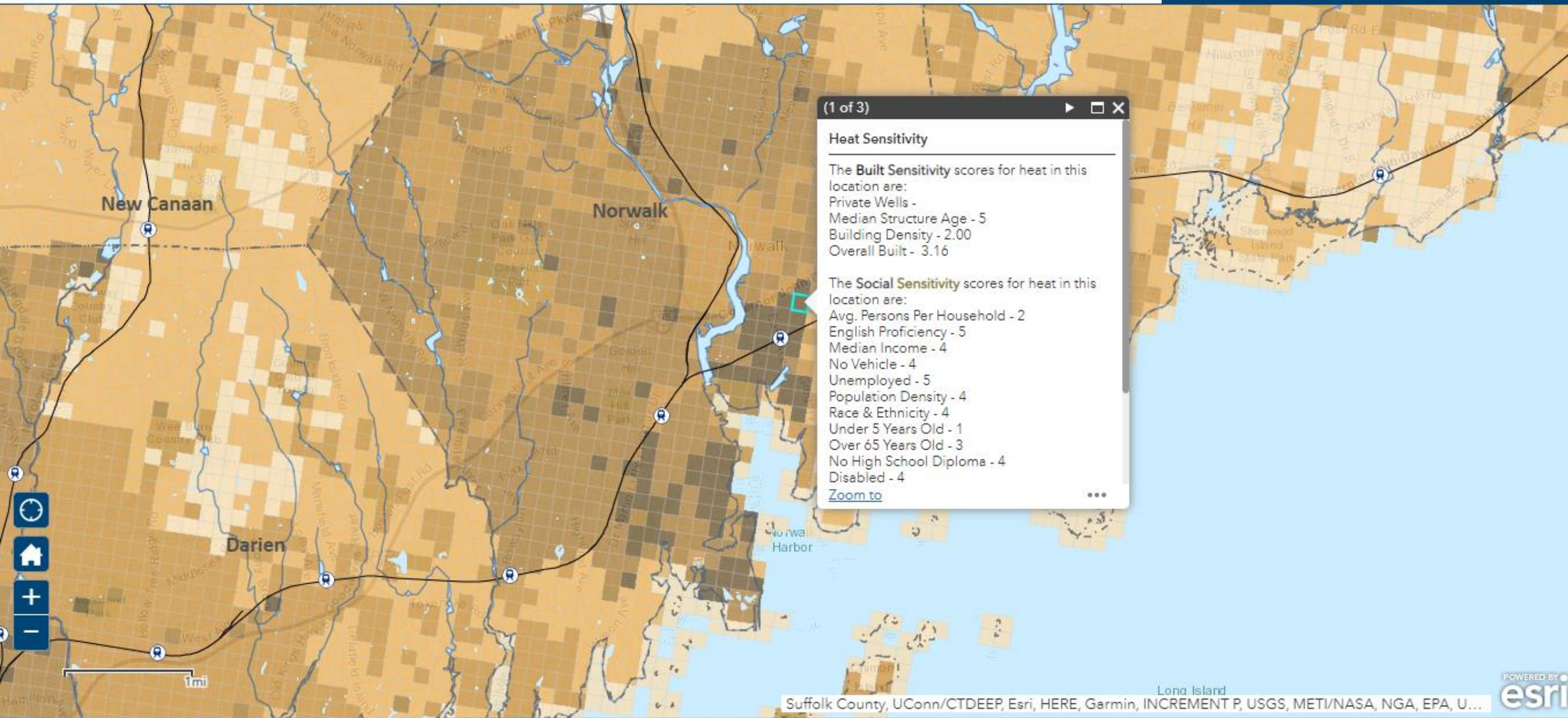
Flood_Vulnerability2:2.0

Built Sensitivity	2.34
Ecological Sensitivity	3.67
Social Sensitivity	3.41
Flood Sensitivity	3.14
Ecological Adaptive Capacity	1.00
Built Adaptive Capacity	3.99
Social Adaptive Capacity	2.63
Climate Exposure	4.22
Physical Exposure	2.78
Flood Exposure	3.50
Overall Flood Vulnerability - Normalized	0.39
Flood Adaptive Capacity	2.54

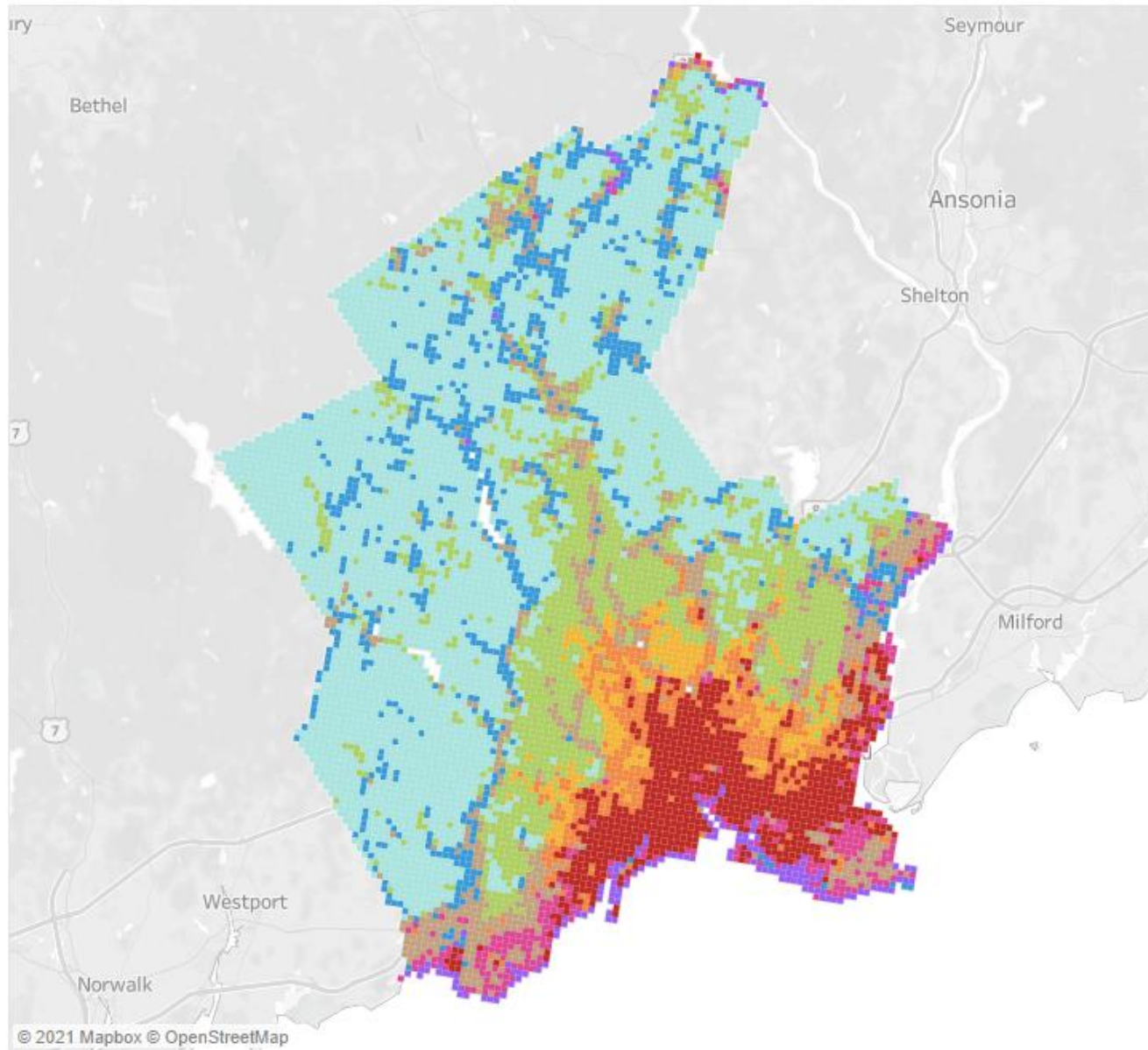
Zoom to ...

Suffolk County, UConn/CTDEEP, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, U...

POWERED BY



Long Island
Suffolk County, UConn/CTDEEP, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, U...



Combined Vulnerability

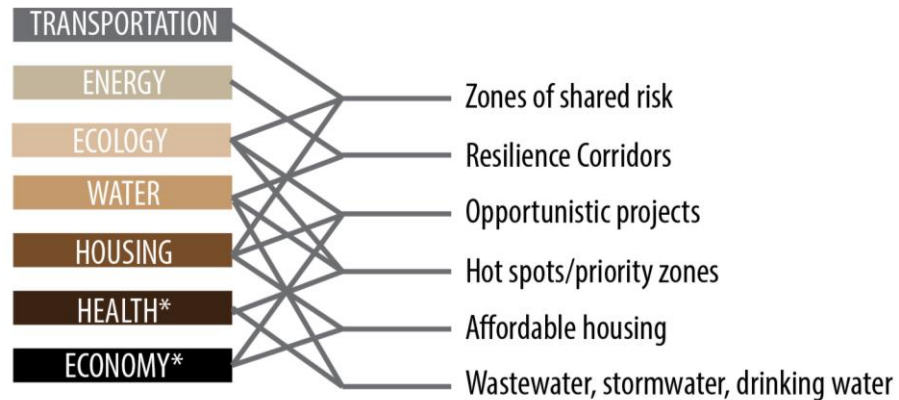


$\text{Exposure} \times \text{Sensitivity} \div \text{Adaptive Capacity} = \text{Vulnerability}$

- Areas of concern for socially vulnerable populations and environmental justice communities
- planned conservation and development areas identified in local and/or regional POCDs
- Critical infrastructure (with “critical” defined by statute [such as the state flood management statutes] or as designated in local hazard mitigation plans)
- Rail and bus service assets and infrastructure
- Transit Oriented Development areas (designated or future proposed)
- Affordable housing assets as identified by COGs and the municipalities
- Egress and evacuation routes as identified by COGs and the municipalities
- Septic fields (areas of sewer avoidance or areas of known existing septic systems) and potential wastewater issues resulting from salt water intrusion and increased tidal flooding
- Sanitary sewer systems
- Drinking water systems
- Regional employment centers and economic assets as identified by COGs and the municipalities
- Critical ecological assets identified by CT DEEP

Phase II: January 2020 – Summer 2021

- Regional Analysis
- Regional Engagement
- Resilience Opportunities



*UConn lead team

Phase III: Fall 2021 – Fall 2022

- Develop Pilot Projects
- Implementation Planning
- Resilience Tool-kit



Thank You!

[Resilientconnecticut.uconn.edu](https://resilientconnecticut.uconn.edu)

John.truscinski@uconn.edu

UConn

