Resilient Connecticut 2.0 Synthesis Report
Appendix D

Climate Change Vulnerability Index (CCVI) Resources

CIRCA
Connecticut Institute for Resilience and Climate Adaptation

Climate Change Vulnerability Index (CCVI)

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The Climate Change Vulnerability Index (CCVI) is a statewide mapping tool for flood and heat vulnerability that can be used, in conjunction with other resources, for planning and developing purposes. The CCVI combines built, social, and ecological factors to identify areas that are vulnerable to flooding and heat related impacts of climate change. Vulnerability is the propensity or predisposition to be adversely affected. Areas that are more vulnerable to climate change are ones where people, infrastructure, and/or ecological assets are more likely to experience harm as temperatures rise, floods worsen, and high winds increase. Vulnerability is a complex concept and encompasses a variety of elements including physical exposure, sensitivity or susceptibility to harm, and lack of capacity to cope and adapt. Understanding vulnerability helps us to make decisions about resource allocation, policy development, and project prioritization, siting, and design.

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) developed a Climate Change Vulnerability Index (CCVI), an index-based spatial model that identifies community vulnerability to flood and heat-related impacts of climate change. 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.

The CCVI can be used to view vulnerability at both a regional scale and at specific sites to see how factors are contributing. For more information, and to access the interactive map viewers for the CCVI, please see the viewer links below. A fact sheet can be found below in this document and webinars can also be found at https://resilientconnecticut.uconn.edu/ccvi/.

Climate Change Vulnerability Index: Flood
Link to Online CCVI Flood Viewer:
https://experience.arcgis.com/experience/44ddea38aac34779a6a115ed6eae1db1/

Climate Change Vulnerability Index: Extreme Heat
Link to Online CCVI Heat Viewer:
https://experience.arcgis.com/experience/b1d7b11d8d3d45e5b6d9b753d716f4fc/

Climate Change Vulnerability Index (CCVI)

Information for a More Resilient Connecticut

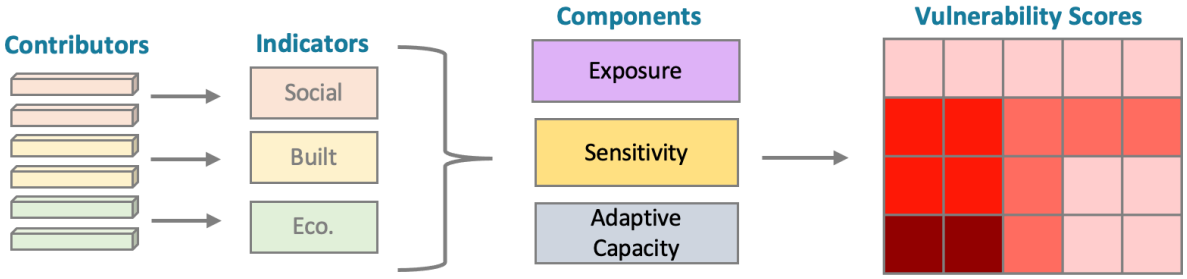
What is the CCVI?

An index-based spatial model that identifies community vulnerability to flood, and heat-related impacts of climate change. The CCVI characterizes areas based on an equation using sensitivity times exposure, divided by adaptive capacity. The equation can be defined as:

Vulnerability = **Exposure** (The degree of the stress that a certain asset is going through with climate variability. This includes changes such as the magnitude and frequency of extreme events.) × **Sensitivity** (The degree to which a built, natural, or human system will be impacted by changes in climate conditions.) ÷ **Adaptive Capacity** (The ability of a system to adjust to changes, manage damages, take advantage of opportunities, or cope with consequences.)

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 two different indicators – social and built. Each indicator has its own final "score" based on the average of the contributors. The average of the 2 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.



What might this tool mean for municipalities?

In addition to other resilience data and planning tools, municipal staff, consultants, and the general public can access new vulnerability map viewers to assist with their community's resilience planning, to make educated decisions about future development and infrastructure investments, and to use as information for grant applications. The new state-wide CCVI Story Maps guide users through the steps needed to use flood and heat vulnerability viewers. Visit the CCVI website to access these viewers and to give CIRCA feedback on the approach and products: resilientconnecticut.uconn.edu/ccvi.

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Flood Contributors

Sensitivity

Social

Household Median Income
Over 5 with a Disability
Percent Living Below 185% Federal Poverty Level
Percent Over 25 without a high school diploma
Percent Over 65
Percent population under 5
Percent population unemployed
Population density
Non-White Population
Speaks English less than well/not at all
Over 65 Living Alone (households)
Single Parent households

Community Assets

Brownfields
Proximity to Bus Hubs (Plus transit, bus stations)
Critical Facilities
Railroad Stations
Roadways
Railways
Private Wells in SFHA
Building Density
Historic Buildings (SHPO)
Critical Habitat
Public Water Supply Watersheds
Septic Areas (outside of sewer service area)

Exposure

Physical

Elevation Pooling
Erosion Susceptibility
Shoreline Change Rate
Impervious Surfaces
Soil Drainage

Climate

CIRCA-Modified Flood Zone (Q3, DFIRM, Preliminary)
CIRCA Sea Level Rise
Storm Surge

Adaptive Capacity

Social

Percent of Owner-Occupied Housing Units
2022 Average Disposable Income (Esri)
Percent Housing Units with No Vehicle Present

Community Assets

Proximity to Healthcare Facility
Proximity to Shelter
Proximity o Major Roadways
Public Water Service Area
Regulatory Standards
Sewer Service Areas
Percent Open Space in SFHA
Resilient Landscapes
Water Company Land

Heat Contributors

Sensitivity

Social

Average number of emergency visits for asthma over 10 years, per population
Heat Stress
Percent Housing Units with No Vehicle Present
Household Median Income
Over 5 with a Disability
Percent living below 185% federal poverty level
Percent over 25 without a high school diploma
Percent Over 65
Percent population under 5
Percent population unemployed
Population density
Non-White Population
Speaks English less than well/not at all
Outside Employment
Over 65 Living Alone (households)
Single Parent households

Built

Private Well Coverage
Median Structure Age
Public Housing Units

Exposure

Physical

Emissivity
Roadway Usage Classification (Traffic Emissions)
Impervious surfaces
Building Density

Climate

Maximum Land Surface Temperature

Adaptive Capacity

Social

Proximity to Bus Hubs (Plus transit, bus stations)
Percent population with (no) health insurance
Percent of Owner-Occupied Housing Units
Proximity to Swimming Areas
Proximity to Healthcare Facility
Proximity to Shelter
Proximity to Cooling Center

Ecological

Percent Tree Cover
Normalized Difference Vegetation Index (NDVI)