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New Jersey Climate Change Resource Center

Understanding the Climate Vulnerability for Redevelopment of Brownfield Sites

Using NJ Adapt Suite of Tools

NJIT - June 12, 2024

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NJ Climate Change Resource Center, Rutgers
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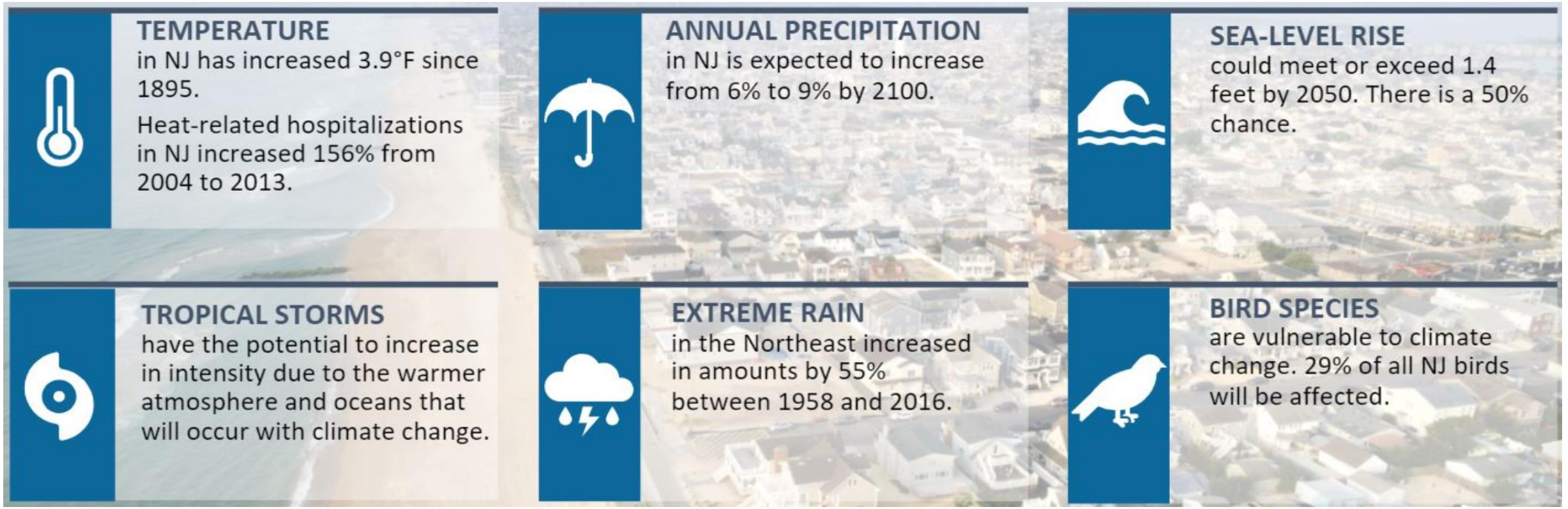
Climate Change Related Data

Resilience - The ability to prepare for and adapt to changing conditions; and withstand and recover timely from disruptions.



Source: NJDEP StoryMap- Climate Change in New Jersey, https://storymaps.arcgis.com/collections/311582f534fd485faccda6fd7f3a0519?item=3

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Climate Change Related Data

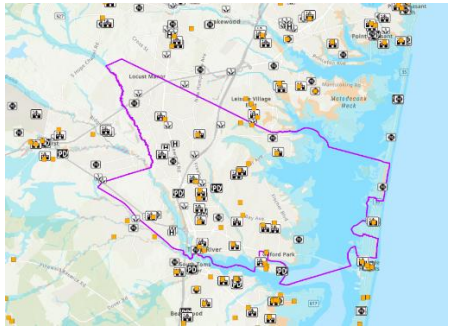
Rutgers University has developed a suite of data visualization and mapping decision support tools from various data sources that offer critical support to end users in

planning for future climate conditions

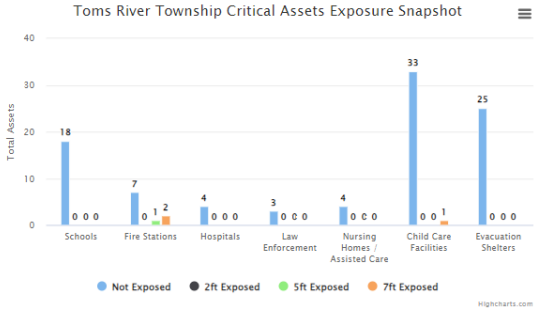
assessing climate change related hazards

communicating risks and hazards

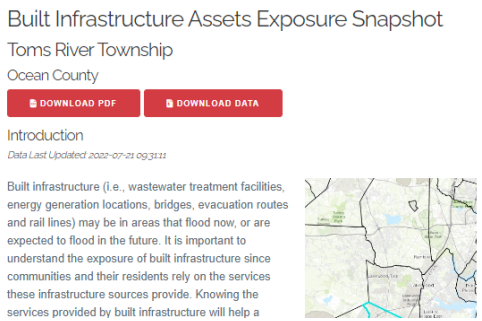
NJ ADAPT



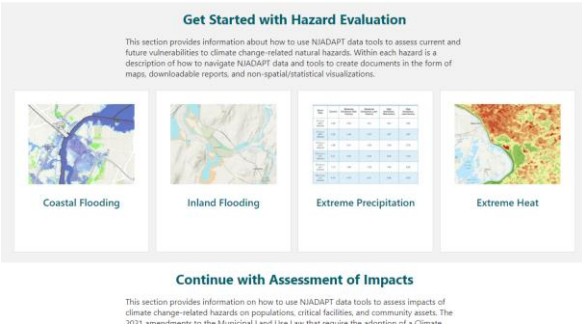
Maps



Graphs



Reports



Guides

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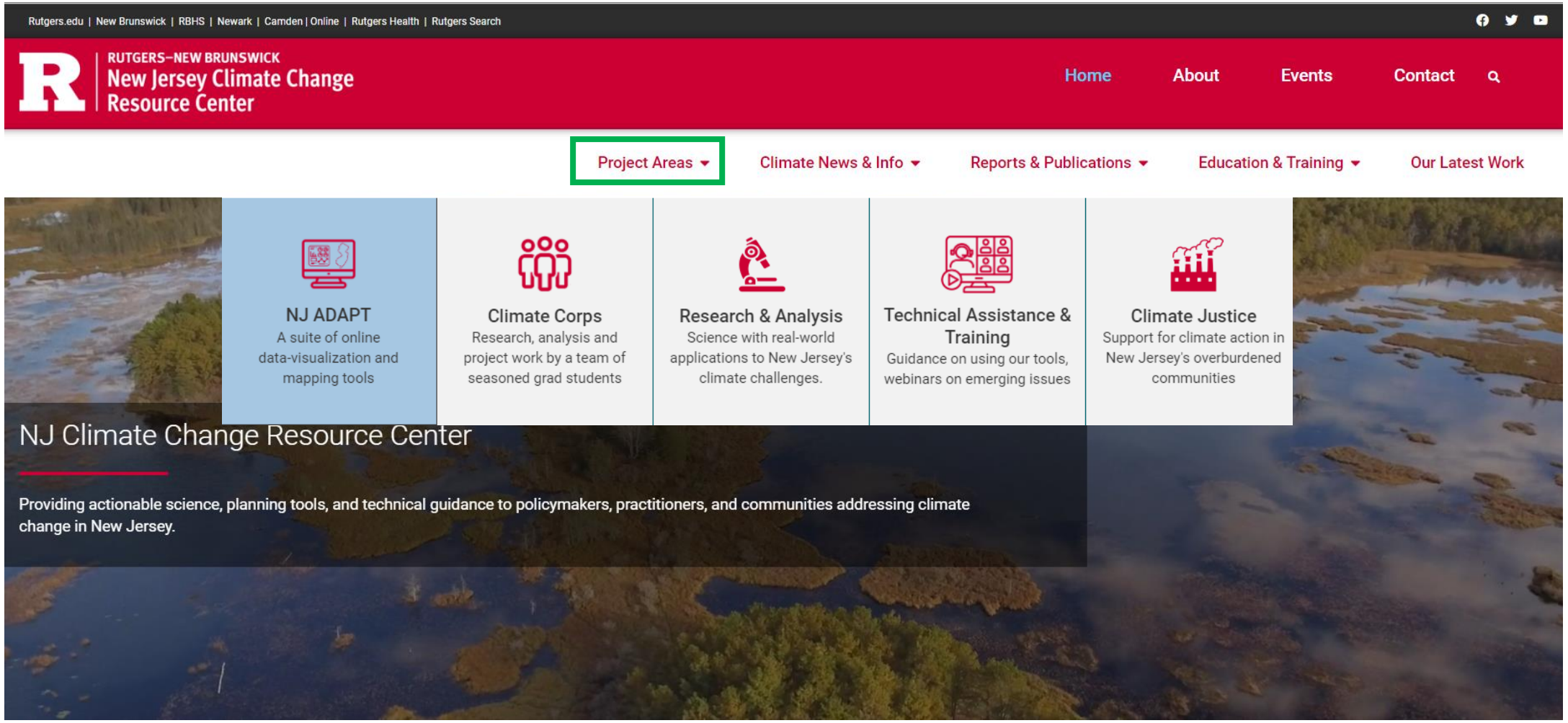
Locating NJ ADAPT



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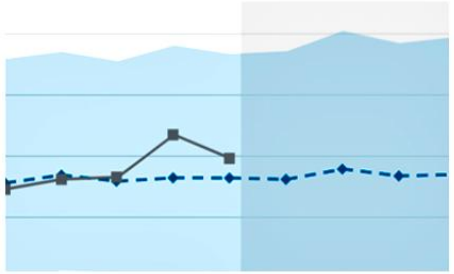
Overview of NJ Floodmapper



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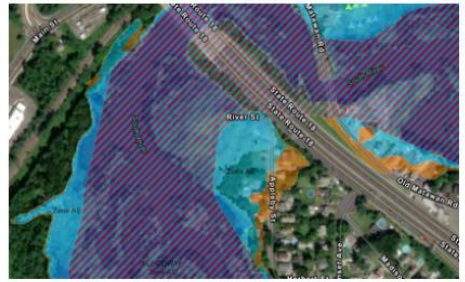

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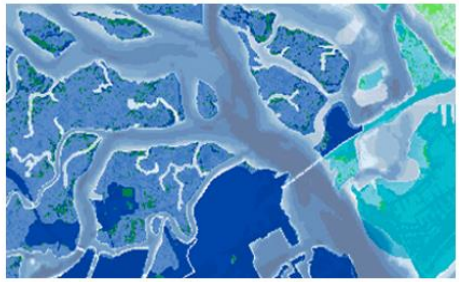

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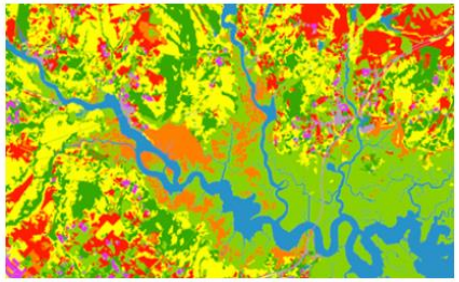

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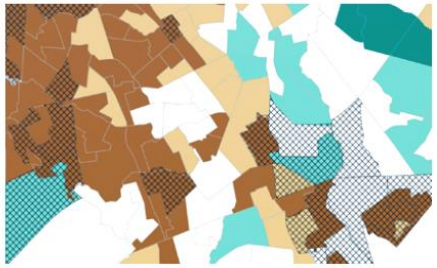

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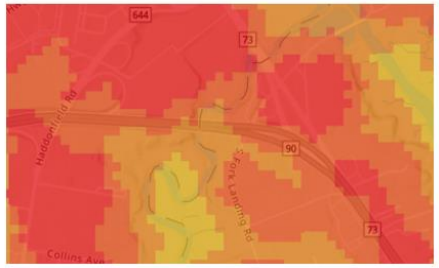

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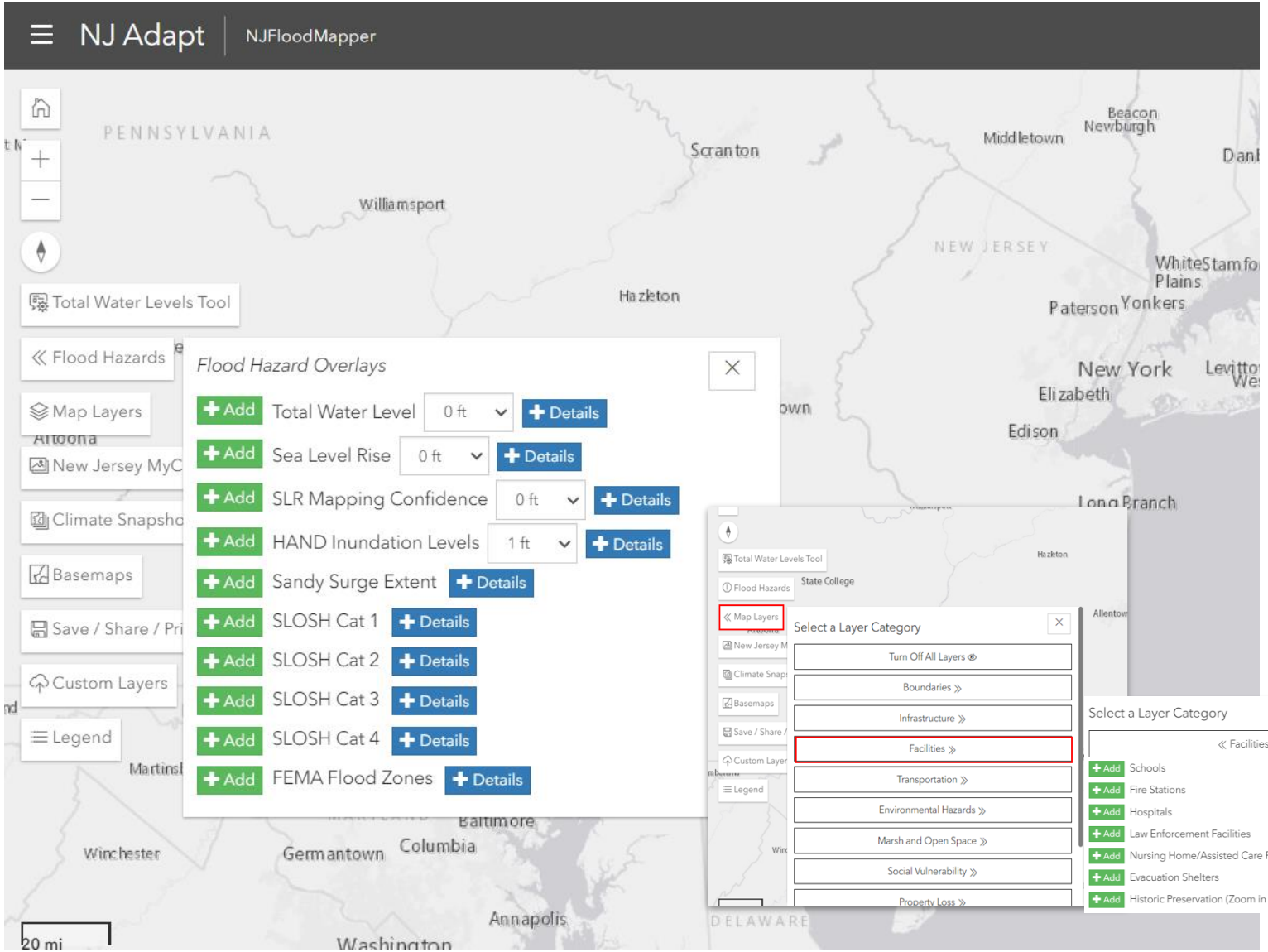

Social Vulnerability Data

- NJDEP EJ Overburdened Communities
- CDC Social Vulnerability Index
- Municipal Revitalization Index
- Asset Limited, Income Constrained, Employed
- Homeless – NJ Counts Point-in-Time
- Veterans Population
- Housing Stock Age
- Landscan

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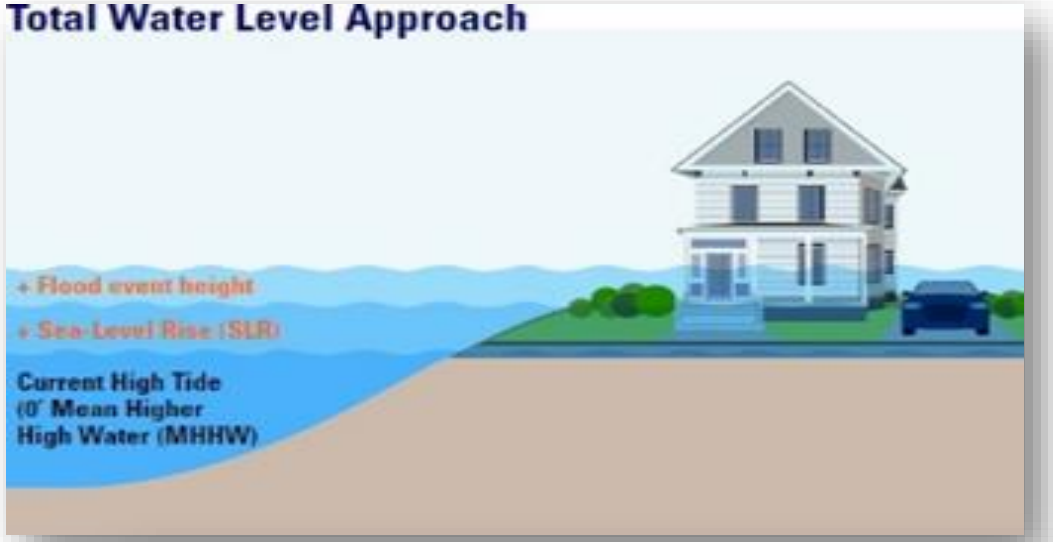

Total Water Levels Tool

Select a Flood Event or Choose Your Own Height:

3.3

4.8 ft. above MHHW
100-year-flood (1% AEP)

3.3 ft. above MHHW
10-year-flood (10% AEP)

2.4 ft. above MHHW
2-year-flood (50% AEP)

1.6 ft. above MHHW
Annual Flood (99% AEP)

0 ft. above MHHW
Permanent Inundation

Select a Flood Event

Historical Events

Select a Historical Flood Event

Step 5 - Choose between Flood Events Height using tide gauge specific data:

1. Historical Storm flood heights (e.g., Sandy)
2. Mean Higher High Water (MHHW)
3. NOAA's Annual Exceedance Probabilities (AEP), and

Flood event water levels are specific to each tide gauge and come from NOAA's Extreme Water Levels statistics program. Mean Higher High Water reflects permanent inundation, or where residents' feet will be wet on an almost daily basis. Selecting other water levels reflects recurring floods (i.e., the 99% AEP) or episodic flood events that could result from coastal storms (i.e., the 1% AEP). You can also choose historic flood events (like Sandy) to see how previous storms would look like in the future.

Step 5 of 5

Previous Next

Total Water Levels Tool

High emissions

7.2 ft.
Less than a 5% Chance of Exceeding

5.3 ft.
Less than a 17% Chance of Exceeding

3.4 ft.
Approximately a 50% Chance of Exceeding

2.1 ft.
At least an 83% Chance of Exceeding

1.4 ft.
At least a 95% Chance of Exceeding

Select a Sea Level Rise Estimate

Step 4 Analyzing at least two sea-level rise estimates is beneficial. Choosing one estimate in the 'likely' range, along with the 'high-end' estimate will allow you to see how a range of SLR scenarios change community level exposures to flooding.

You can choose between the following SLR estimates:

'High-End' Estimates:

There is less than a 5% chance of exceeding the SLR height value indicated. Using a high-end estimate is especially important for planning assets with long lifetimes (e.g., a bridge), or limited ability to move out of harm's way (e.g., a wastewater treatment plant).

Likely estimates:

- There is less than a 17% chance of exceeding the SLR height value indicated
- There is approximately a 50% chance of exceeding the SLR height value indicated
- There is at least an 83% chance of exceeding the SLR height value indicated

'Low-End' Estimate:

There is at least a 95% chance of exceeding the SLR height value indicated.

NJ Sea Level Rise Estimates Example

Step 4 of 5

Previous Next

Total Water Levels Tool

Total Water Level Summary

Total Water Level Summary

Tide Gauge: Atlantic City, NJ

Emission Scenario: High emissions

Timeframe: 2090 Planning Horizon

SLR Estimate: Less than a 17% Chance of Exceeding - 5.3 ft.

Flood Event: 10-year-flood (10% AEP) - 3.3 ft. above MHHW

Total Water Level Estimate: 8.6 ft.

Total Water Level Estimate Mapper: 9 ft.

Results - The resultant Total Water Level is rounded to the nearest whole foot. The TWL inundation map represents 'still water', which reflects the astronomical tide, the storm surge, and limited wave setup caused by breaking waves.

The Total Water Level does not portray wave runup, the movement of water up a slope. Therefore, the inundation mapping more closely corresponds to FEMA's Still Water Flood Elevations (SWEL), not the Base Flood Elevation (BFE). **Therefore, this analysis could under-represent the amount of inundation, as the calculations do not consider wave velocity and other dynamic effects from storms.**

Summary

Previous Next Close Wizard + Add To Map

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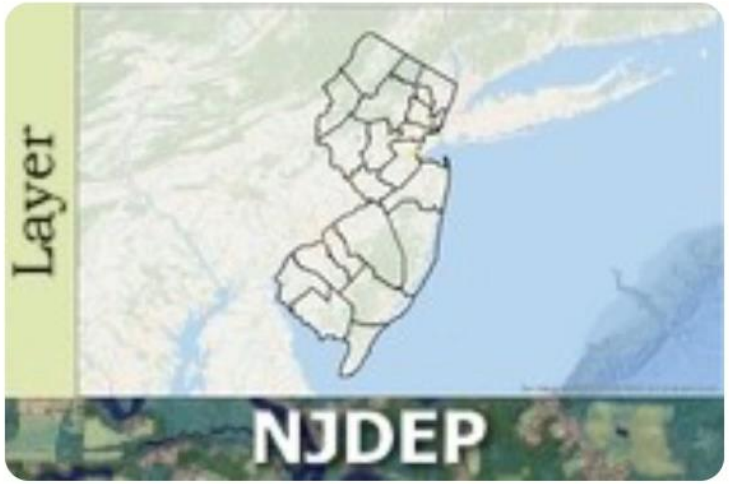
Adding Custom Layer

NJGIN Open Data



Brownfield Development Areas (Outline) of New Jersey

Authoritative

NJ Dept. of Environmental Protection Bureau of GIS
NJDEP Bureau of GIS

View Map | Download | More

Summary

The data enables the NJDEP to share BDA parcel data and other GIS spatial components with all the shareholders, in an easily accesible format via NJ GeoWeb. The shareholders can then use common data to research questions and make informed accurate decisions.

This is a graphical representation of the outline boundary for Brownfield Development Areas (BDA) in New Jersey.The data included in the layer enables GIS to map, as polygons, all current BDA's in New Jersey. A brownfield is any former or current commercial or industrial site that is currently vacant or underutilized and on which there has been, or there is suspected to have been, a discharge of contamination. Under the BDA approach, NJDEP works with selected communities affected by multiple brownfields to design and implement remediation and reuse plans for these properties simultaneously.

Details

Dataset
Feature Layer

November 3, 2022
Info Updated

As Needed
Data Updated: November 3, 2022

October 31, 2022
Published Date

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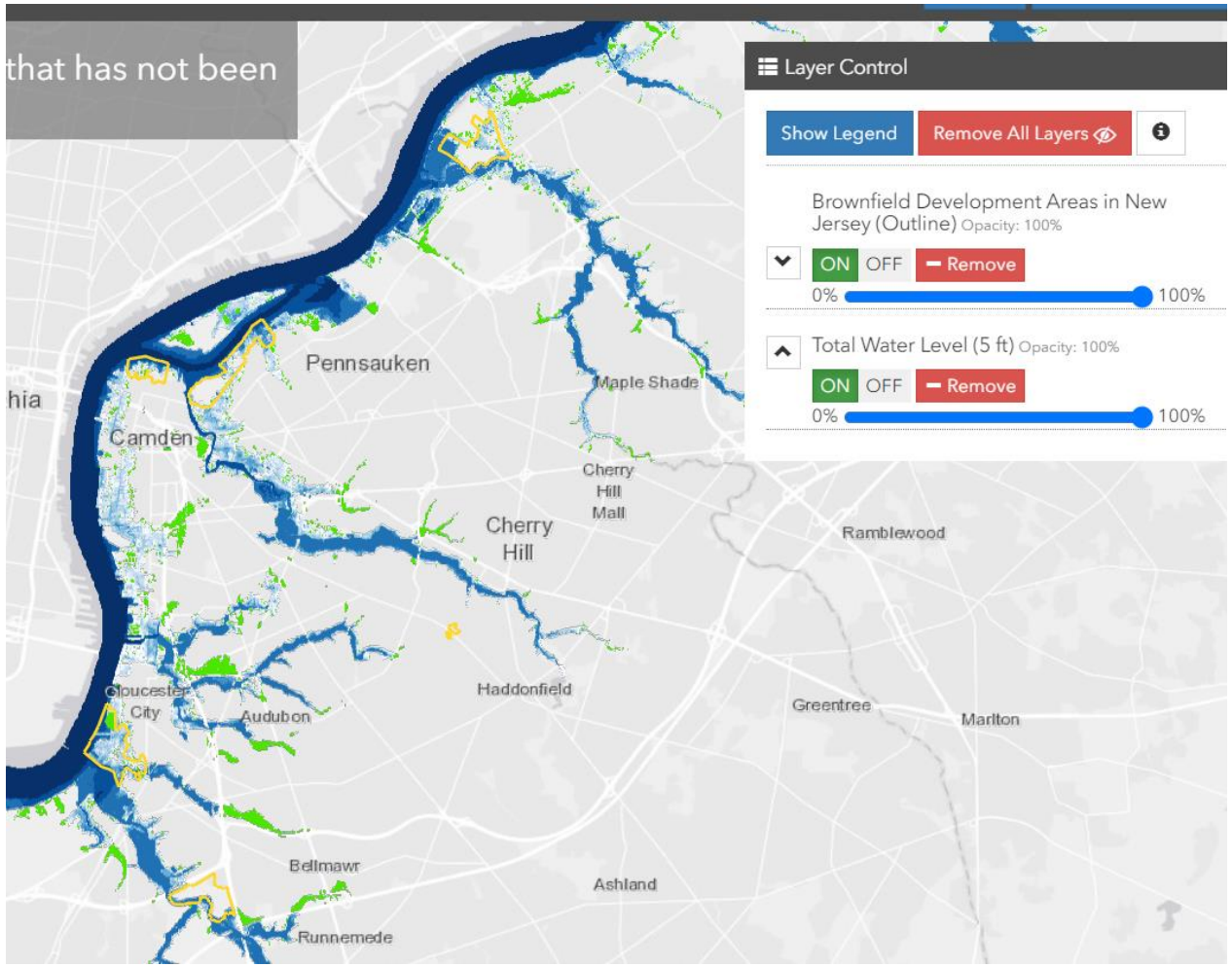
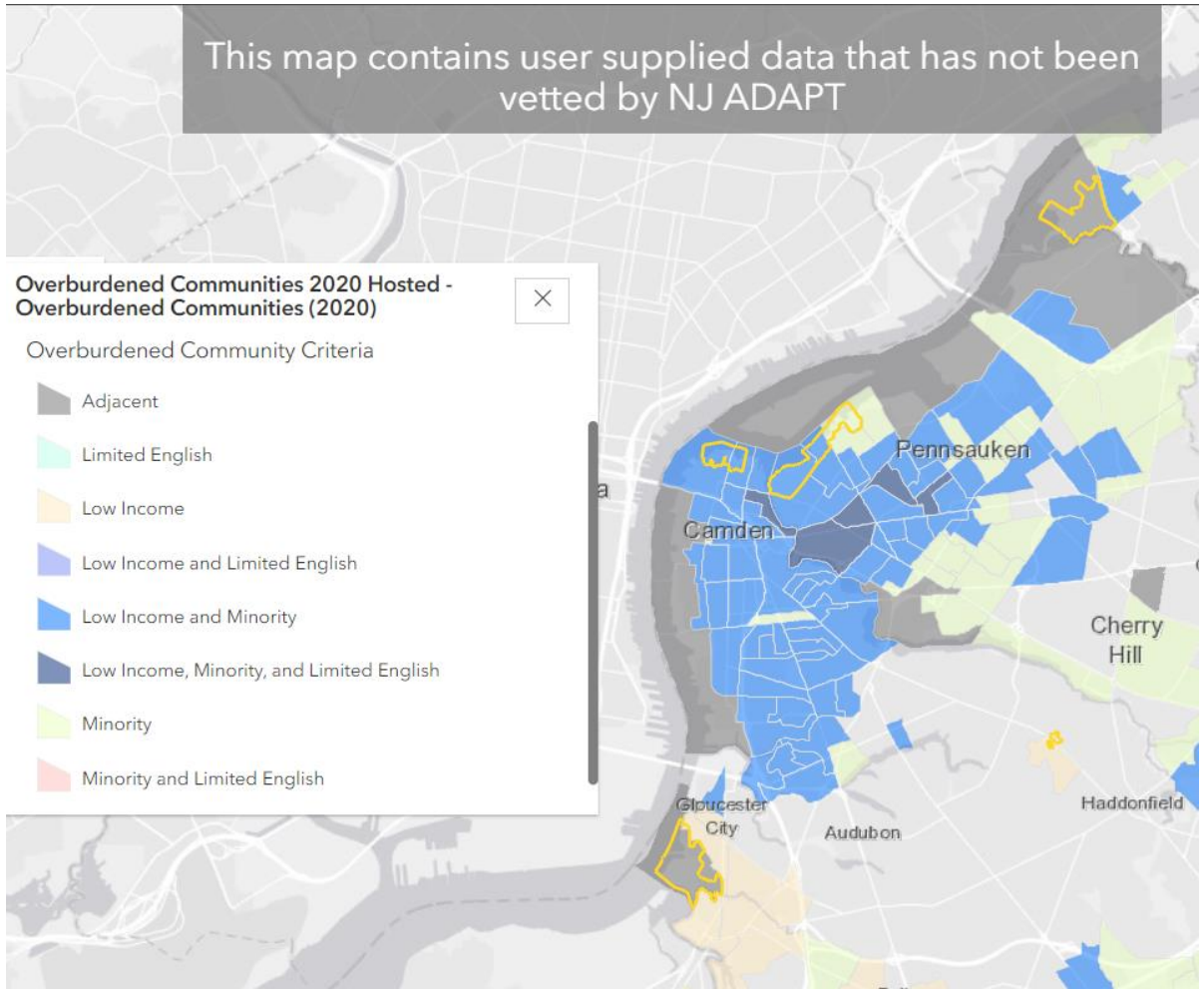
Brownfield Sites in Flood Zones and OBC





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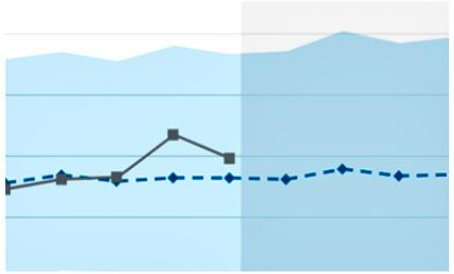
Overview of Climate Snapshots



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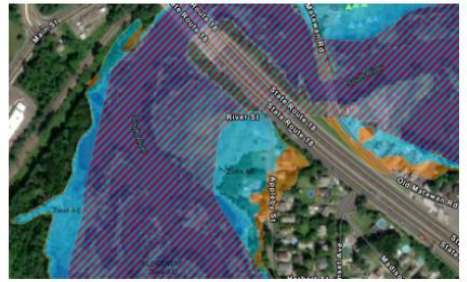

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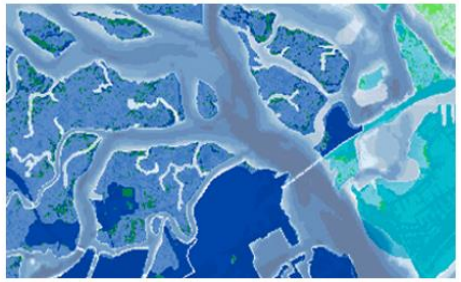

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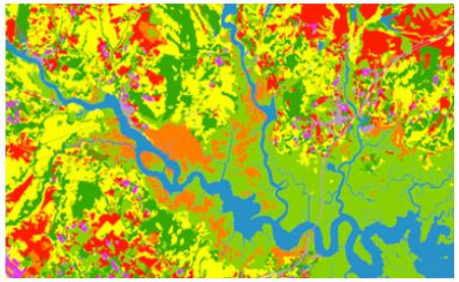

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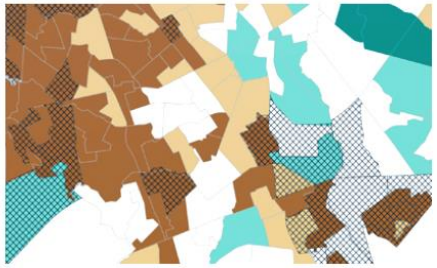

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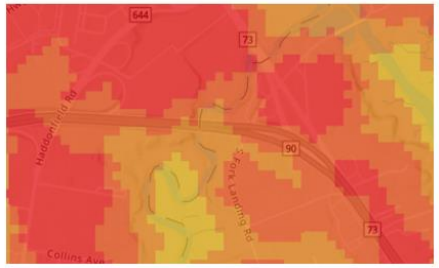

NJ Public Health Adapt

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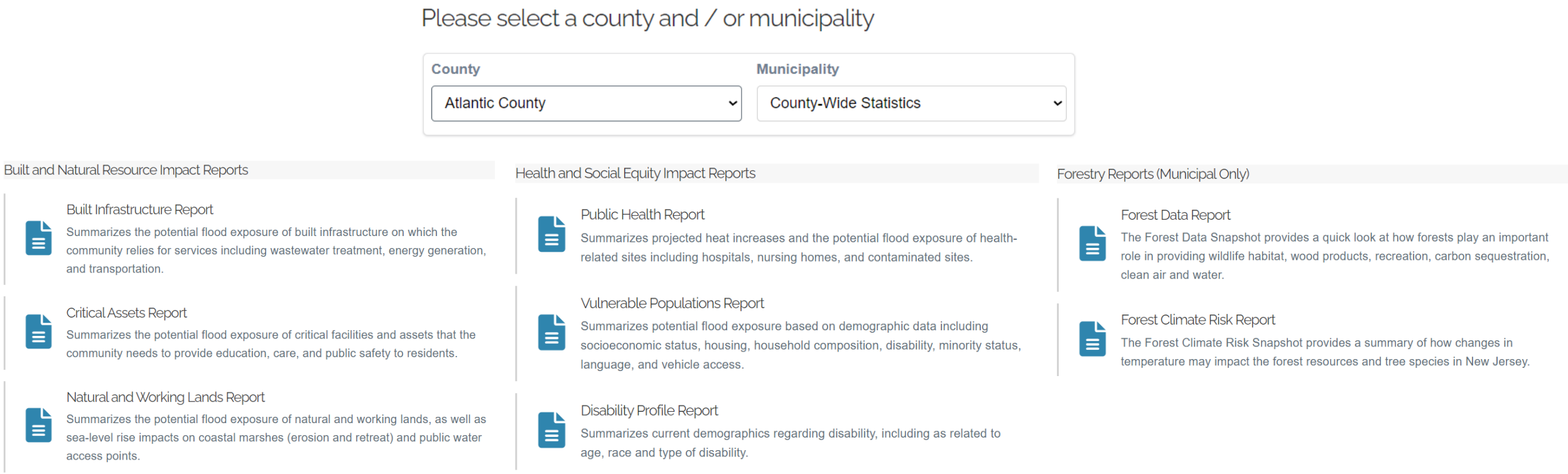
Climate Snapshots (https://climatesnapshots.rutgers.edu/) provide easy access to information about the people, places, and assets that are at risk from climate impacts in each of New Jersey's municipalities.



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Built Infrastructure Assets Exposure Snapshot

Gloucester City

Camden County

DOWNLOAD PDF | DOWNLOAD DATA

Introduction

Date Last Updated: [illegible]

Built infrastructure (i.e., wastewater treatment facilities, energy generation locations, bridges, evacuation routes and rail lines) may be in areas that flood now, or are expected to flood in the future. It is important to understand the exposure of built infrastructure since communities and their residents rely on the services these infrastructure sources provide. Knowing the services provided by built infrastructure will help a community plan for flooding.

There are 3 types of flood events:

1. Riverine (or "fluvial") flood events occur when intense rain events cause rivers and streams to overtop their banks.

2. Flash (or "pluvial") floods occur when intense rainfall causes a flood event that is not directly associated with a body of water. For example, flash flood events include floods in roadways from impaired stormwater management systems.

3. Coastal flood events occur when sea-level rise, high tides, and storm surge combine to create flood events that range from nuisance high-tide floods to destructive storm tides from seawater.

The Federal Emergency Management Agency (FEMA) models flood hazards, both riverine (1) and coastal (3), as part of the National Flood Insurance Program (NFIP) regulations and insurance requirements. FEMA does not model flash flood events (2) for their NFIP flood mapping.

In addition, coastal flood event exposures are assessed using a Total Water Level (TWL) approach for tidally influenced waters. The TWL approach combines sea-level rise and extreme water level information from NOAA to assess exposure to a variety of coastal flood events to complement FEMA flood mapping. The Appendix below provides additional background.

Built Infrastructure Assets in Exposed Areas

Assets	Total Assets	# Exposed at 2ft TWL	# Exposed at 5ft TWL	# Exposed at 7ft TWL
Wastewater	0	0	0	0
Energy Generation	1	0	N/A	1
Power Plants	0	0	0	0
NJ Bridges*	16	3	5	11
Gas Stations	2	0	0	0

* The National Bridge Inventory is a collection of information (database) describing the more than 600,000 of the Nation's bridges located on public roads as of December 31, 2018, including Interstate Highways, U.S. highways, State and county roads, as well as publicly-accessible bridges on Federal lands. It presents a State by State summary analysis of the number, location, and general condition of highway bridges within each State.

LINK TO INFRASTRUCTURE LIVE MAP

Built Infrastructure Assets in FEMA Flood Zone Areas

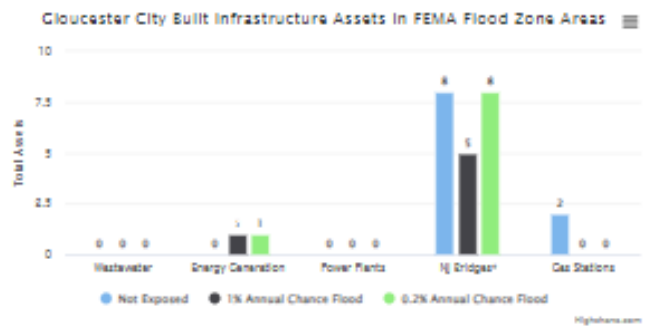
Assets	Total Assets	# Exposed In ... 1% Annual Chance Flood	0.2% Annual Chance Flood
Wastewater	0	0	0
Energy Generation	1	1	1
Power Plants	0	0	0
NJ Bridges*	16	5	8
Gas Stations	2	0	0

* The National Bridge Inventory is a collection of information (database) describing the more than 600,000 of the Nation's bridges located on public roads as of December 31, 2018, including Interstate Highways, U.S. highways, State and county roads, as well as publicly-accessible bridges on Federal lands. It presents a State by State summary analysis of the number, location, and general condition of highway bridges within each State.

The FEMA National Flood Hazard Layer (NFHL) dataset represents the current effective flood data across the United States. Areas in the National Flood Hazard Layer are:

- Floodway: The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood height.
- 1% Annual Chance Flood: The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- 0.2% Annual Chance Flood: The 0.2% annual flood (500-year flood) is the flood that has a 0.2% chance of being equaled or exceeded in any given year.
- Areas of Undetermined Flood Hazard are areas with possible but undetermined flood hazards.
- FEMA Flood Zone exposure analyses are inclusive of lesser FEMA flood designations. The number exposed to 1% Annual Chance Flood includes those exposed in the Regulatory Floodway area in its analysis and the 0.2% Annual Chance Flood includes those exposed in the 1% Annual Change Flood and in the Regulatory Floodway.

LINK TO INFRASTRUCTURE LIVE MAP



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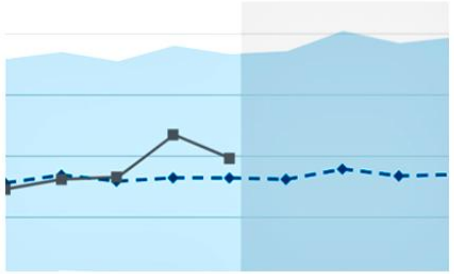
Overview of Local Planning Navigator



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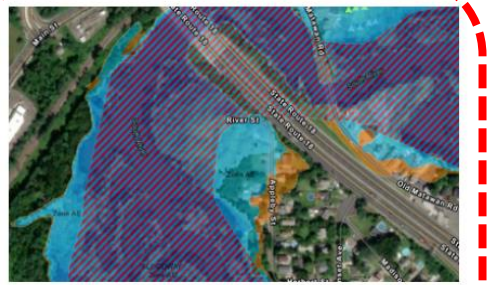

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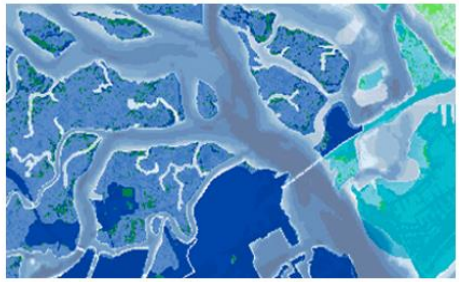

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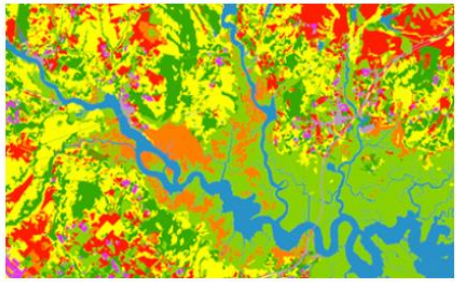

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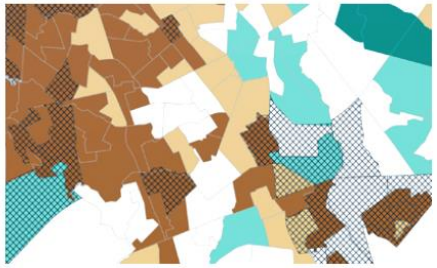

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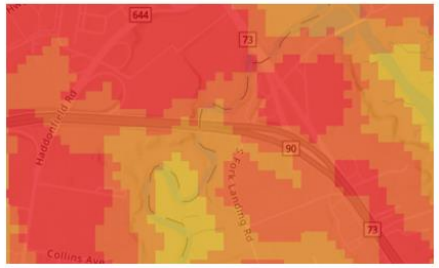

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Climate Change Related Hazard Vulnerability Assessment

2021 statutory amendments to the **New Jersey Municipal Land Use Law** require a *Climate Change Related Hazard Vulnerability Assessment* (CCRHVA) as part of the land use element of a municipal Master Plan

CCHRVA Requirements

Current and Future Threats Analysis	Analyze threats and vulnerabilities associated with climate change-related natural hazards.
Build-Out Analysis	Conduct a build-out analysis for future residential, commercial, industrial development and assess associated threats and vulnerabilities.
Critical Infrastructure Identification	Identify critical facilities, utilities, roadways, and infrastructure crucial for evacuation and maintaining quality of life during natural disasters.
Master Plan Impact Analysis	Analyze potential impacts of natural hazards on relevant components and elements of the master plan.
Risk Reduction Strategies	Provide strategies and design standards to reduce or avoid risks associated with natural hazards.
Policy Statement	Include a policy statement on the consistency, coordination, and integration of the climate change-related hazard vulnerability assessment with other relevant plans.
Scientific Basis	Rely on the most recent natural hazard projections and best available science provided by the New Jersey DEP.

Source: Office of Planning Advocacy Department of State, Business Action Center: Municipal Climate Resilience Planning Guide

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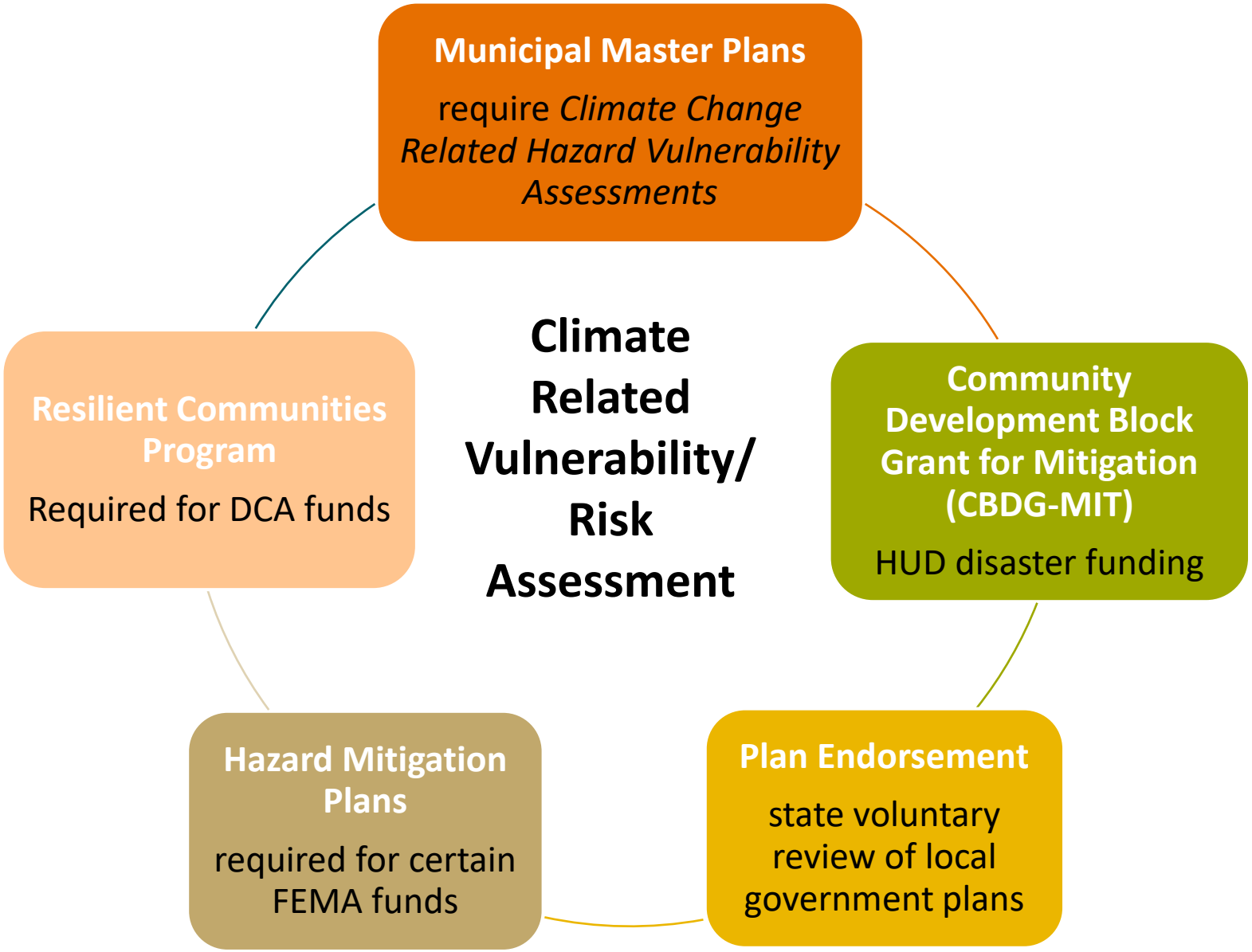
Overlap across Plans/Funding Mechanisms



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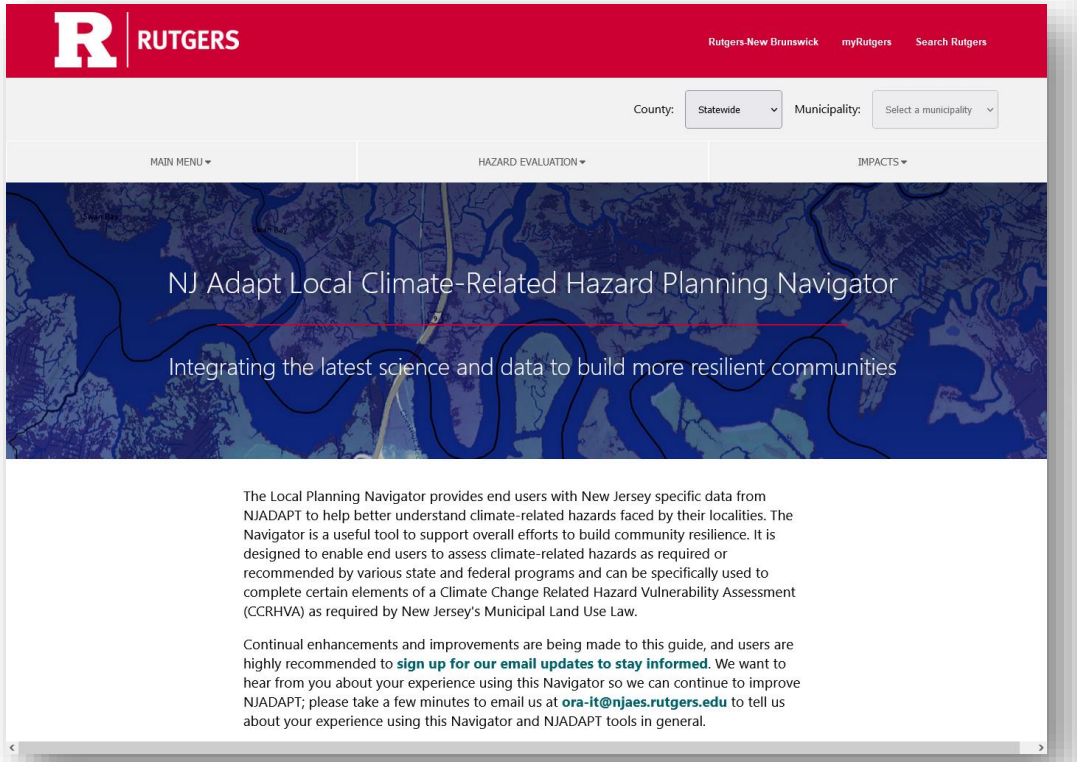


Get Started with Hazard Evaluation

This section provides information about how to use NJADAPT data tools to assess current and future vulnerabilities to climate change-related natural hazards. Within each hazard is a description of how to navigate NJADAPT data and tools to create documents in the form of maps, downloadable reports, and non-spatial/statistical visualizations.

Coastal Flooding

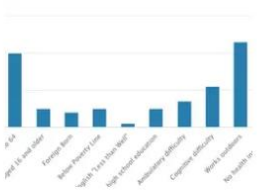
Inland Flooding

Extreme Precipitation

Extreme Heat

Continue with Assessment of Impacts

This section provides information on how to use NJADAPT data tools to assess impacts of climate change-related hazards on populations, critical facilities, and community assets. The 2021 amendments to the Municipal Land Use Law that require the adoption of a Climate Change-Related Hazard Vulnerability Assessment (CCRHVA) specifies that a CCRHVA must include an identification of "critical facilities, utilities, roadways, and other infrastructure that is necessary for evacuation purposes and sustaining quality of life during a natural disaster."



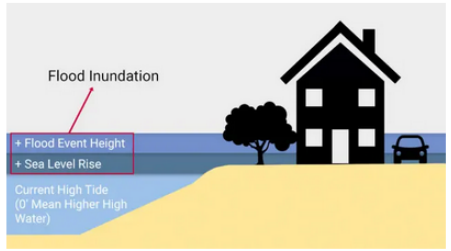
Demographics

Critical Facilities and Infrastructure

Community Assets

Coastal Flooding

Coastal flood inundation is affected by contributions from three factors:



- Tidal flooding - Flooding caused by twice-daily high-tides (also known as "sunny day" flooding or "nuisance" flooding). The term Mean Higher High Water (MHHW) is used to describe the average height of the highest tide over a recorded period;
- Sea-level rise - Sea-level rise increases the overall height of tidally-influenced waterbodies and, in doing so, increases the frequency and expanse of tidal flooding and worsens the impact of event-related flooding;
- Events - Flooding caused by events such as storms.

When planning for future coastal flooding, it is essential for end users to apply a future scenario(s) for sea-level rise to their hazard projections. The New Jersey Department of Environmental Protection (NJDEP) issued guidance for sea-level rise planning in 2021; further explanation of NJDEP guidance is in the box below.

Review NJDEP Guidance on Planning for Sea-Level Rise

In its **June 2021 sea-level rise guidance** for New Jersey, NJDEP outlines the following recommendations:

Planning Horizon - NJDEP encourages end users to consider both the design and reasonable life of activities for which hazards are being assessed when determining what planning horizon to apply. For example, NJDEP's guidance points out that planning for a 30-year typical mortgage may be useful when assessing impacts to residential structures. NJDEP recommends, in general, use of a 2100 planning horizon when planning for significant investments in infrastructure, such as coastal energy facilities.

Emissions scenarios - Projections for sea-level rise after 2050 are affected by the amount of greenhouse gas emissions in the global atmosphere. As outlined in the **2020 New Jersey Scientific Report on Climate Change**, a high GHG emissions scenario corresponds to a future in which there is continued growth of fossil fuel consumption; a moderate GHG emissions scenario corresponds to a future consistent with current global policies, and a low GHG emissions scenario corresponds to a future consistent with global accords such as the **2015 Paris Agreement**. NJDEP recommends, in general, use of a moderate emissions scenario.

Risk Tolerance - NJDEP recommends that end users consider the extent to which certain activities have the capacity to adapt to and/or tolerate hazards and risks. For those activities that have less risk tolerance, NJDEP recommends planning for high end projections of sea-level rise; for those activities that have high risk tolerance, NJDEP recommends that end users consider the extent to which those activities may have limited impacts and plan accordingly.

Geographic area of flooding - NJDEP recommends that end users add 5.1 feet to the geographic extent of the one-percent (100 year) storm base flood elevation to accommodate sea-level rise in coastal areas.

Building height - To allow for a margin of safety, NJDEP recommends that end users add a minimum of one foot of freeboard to the projected SLR for buildings and structures.

Get Started

Using NJADAPT Tools to Assess Coastal Flooding Hazards

Please select your desired geography in the menu at the top of this page to get customized analysis and outputs from this and the other tools in this navigator.

Please note some areas in New Jersey are not threatened by coastal flooding.

Maps

- **Explore an interactive map of current high-tide flooding** (2 feet of coastal flooding). This is the amount of nuisance flooding some parts of New Jersey are currently experiencing at highest high-tide. This data is sourced from the National Oceanic and Atmospheric Administration (NOAA).
- **Explore an interactive map of sea-level rise by the year 2100** (5 feet of coastal flooding). This map shows where the NJDEP advises the shoreline will potentially be in 2100. This data is sourced from NOAA.
- **Explore an interactive map of high-tide flooding by the year 2100** (7 feet of coastal flooding). This map shows the amount of nuisance flooding some parts of New Jersey are expected to experience at highest high-tide in the year 2100. This data is sourced from NOAA.

Reports - Climate Snapshots

- NJADAPT provides a numerous reports that detail flood impacts from 2ft (current) and 7ft (future) high-tide events, and 5ft of sea-level rise expected for 2100 (NJDEP recommendation), including effects to power plants, evacuation shelters, farmland, evacuation routes, as well as to people, including populations disproportionately affected by climate change. **Explore flood impact reports here** and **explore flood impacts on public health sites and vulnerable populations here**.

Statistical Data - NJHazAdapt

- **Download MOD IV property tax parcel data** showing percentage of flooding by following the link to NJHazAdapt, selecting your location at the top of the page, and then scrolling down to the MOD-IV Parcel Flood Analysis section at the bottom of the page. This data can be joined in GIS software to the NJ Geographic Information Network's **Parcels Composite of NJ** for mapping purposes.
- Review step-by-step guidance on creating a MOD IV property tax parcel data analysis for flooding using these **GIS Assessment Steps**.

Important information about NJADAPT data

The NJADAPT data tools incorporate provisions that ensure that the NJADAPT data are consistent with NJDEP's sea-level rise 2021 guidance. MOD IV data are property tax parcel data for the State of New Jersey that NJADAPT has included to allow exploration of how individual parcels of property are affected by flooding.

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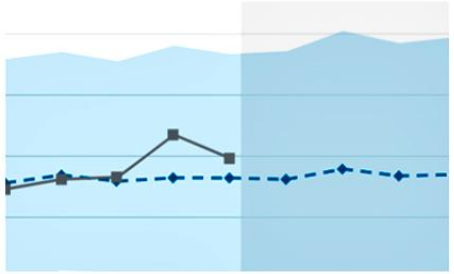
Overview of NJ HazAdapt



Climate Dashboard

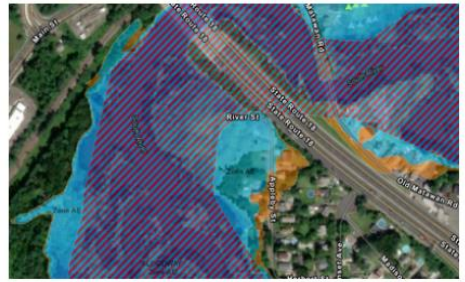
New Jersey climate trends in moderate and high emissions scenarios

Climate Planning Tool

A guide to using coastal flooding data in climate change planning

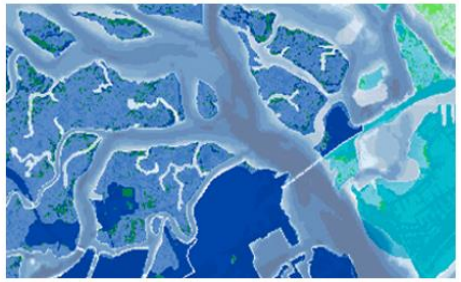
Climate Snapshots

Climate risks summarized by municipality, county and statewide



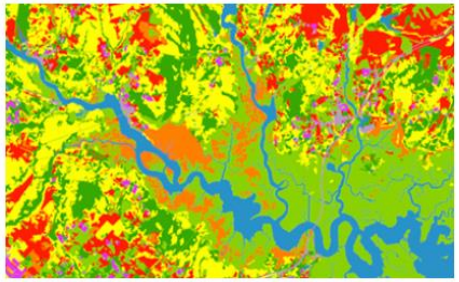
Local Planning Navigator

A decision-support tool for building community resilience



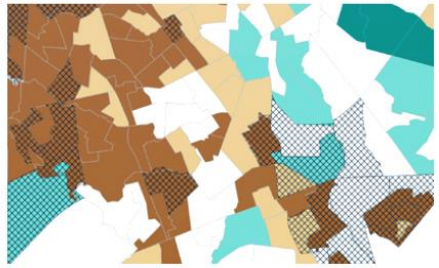
NJ FloodMapper

An interactive flood exposure data mapping tool



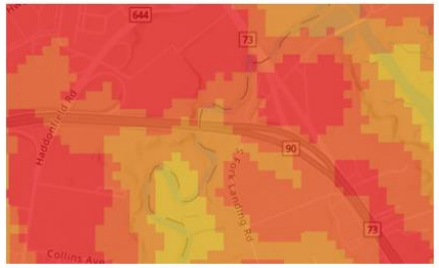
NJ Forest Adapt

A data mapping tool for forest management



NJ HazAdapt

Data and resources for hazard mitigation planning



NJ Public Health Adapt

Climate planning for improved health outcomes

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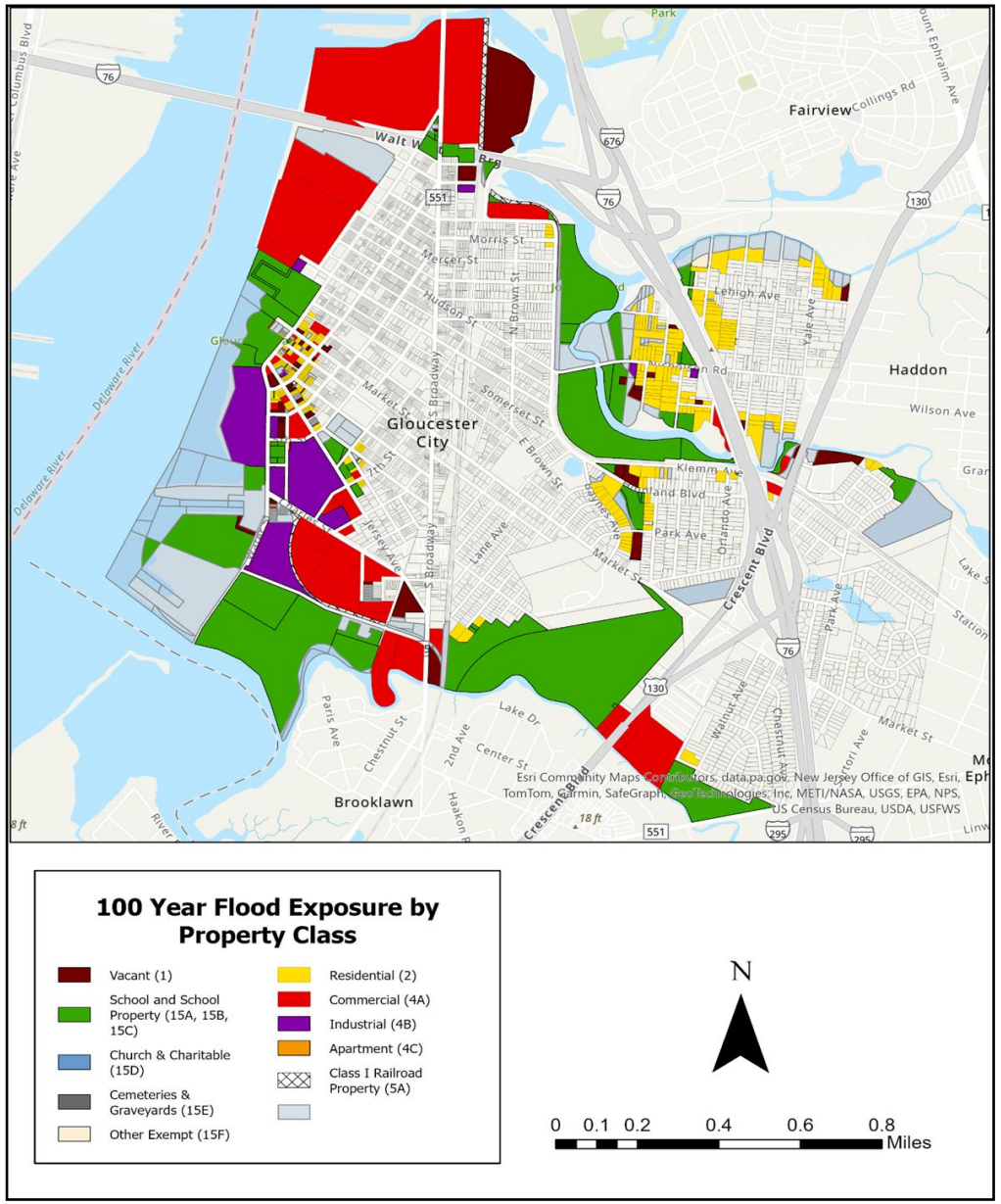
MOD IV Parcel Flood Analysis – Gloucester City



100-Year Flood Event
(1% Chance Annual Flood)

Property Class	Value of Flooded Land Parcels	Value of Flooded Improvement	# Parcels Flooded	Total Area flooded (in Acres)
Vacant (1)	$ 2,921,500	$ -	46	4.4082
Residential (2)	$ 8,508,300	$ 25,295,950	307	36.3338
Public and School Property (15A)	$ 4,110,300	$ 20,030,800	2	0
Public and School Property (15C)	$ 11,604,500	$ 24,912,700	66	6.5392
Other Exempt (15F)	$ 165,000	$ 274,200	4	0.2289
Commercial (4A)	$ 12,844,500	$ 38,992,400	46	7.5464
Industrial (4B)	$ 3,146,600	$ 10,256,500	11	2.7694
Apartment (4C)	$ 14,000	$ 89,600	1	0.0344
Railroad Class I (5A)	$ 487,500	$ -	3	0
Total	**$ 43,802,200**	**$ 119,852,150**	**486**	**58**

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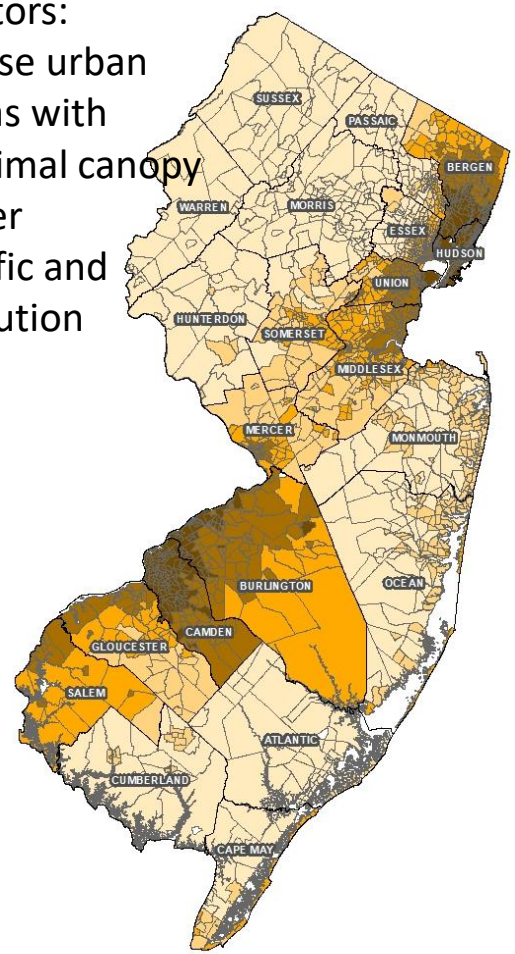
Heat Vulnerability Index

Exposure

Key factors:

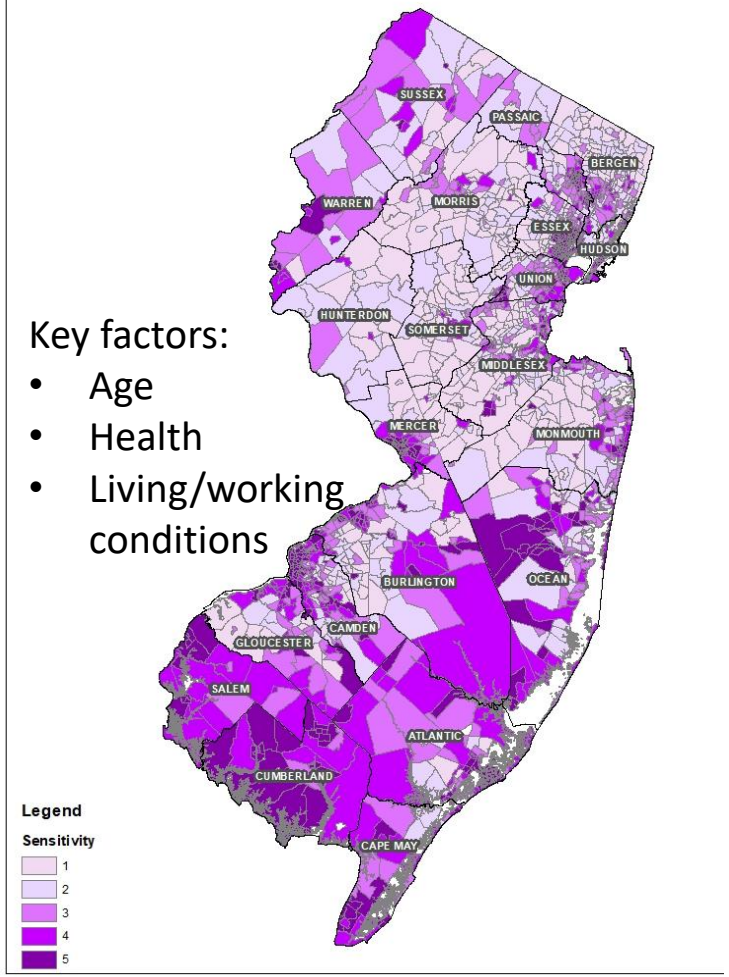
- Dense urban areas with minimal canopy cover
- Traffic and pollution



Sensitivity

Key factors:

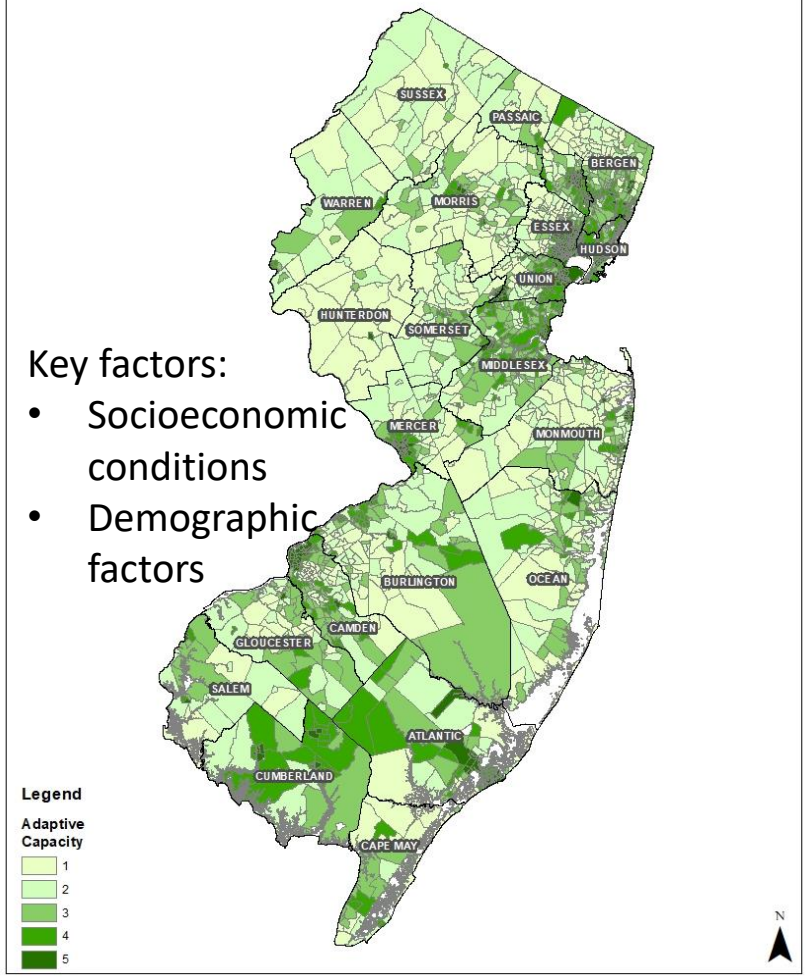
- Age
- Health
- Living/working conditions



Adaptive Capacity

Key factors:

- Socioeconomic conditions
- Demographic factors



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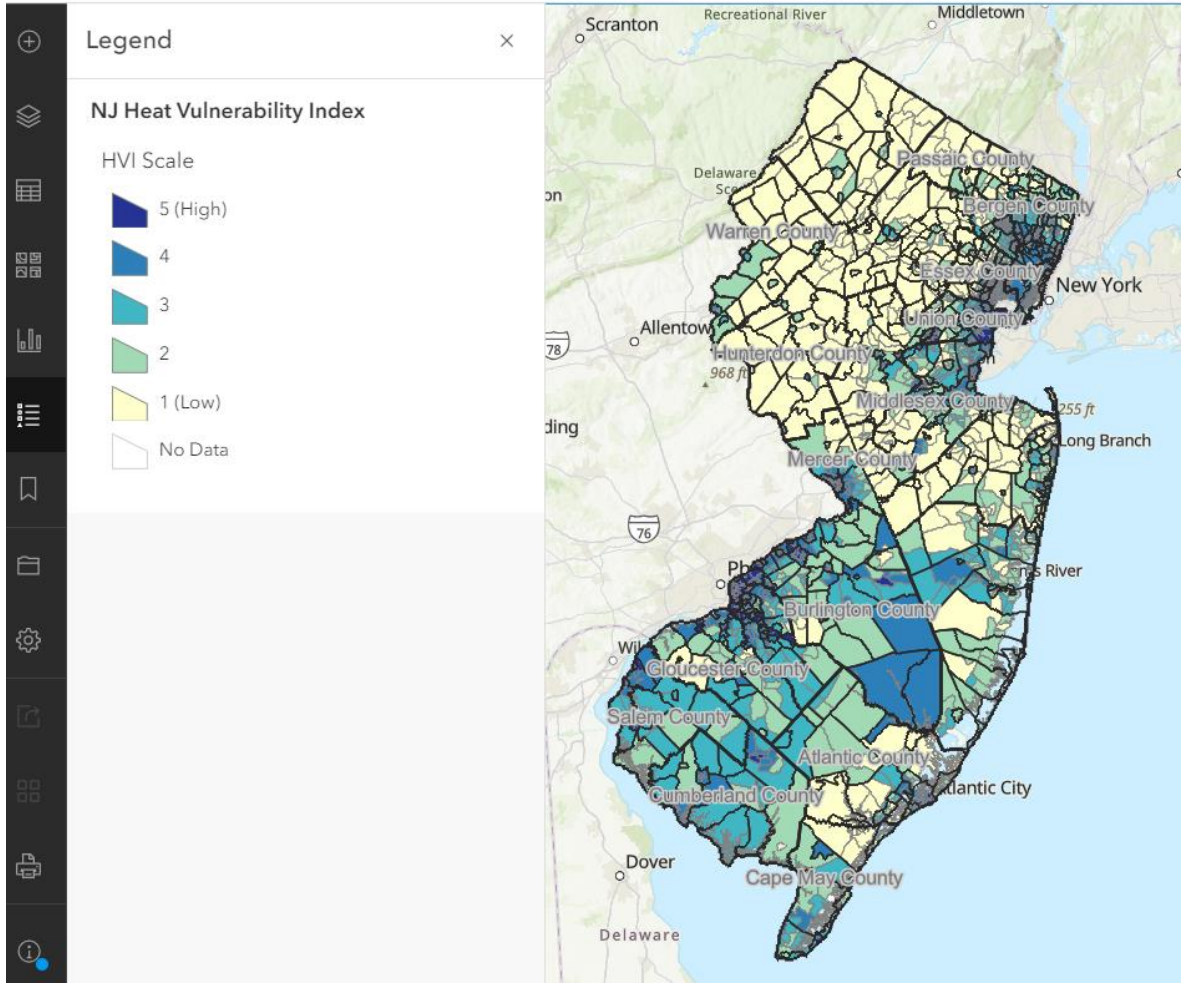
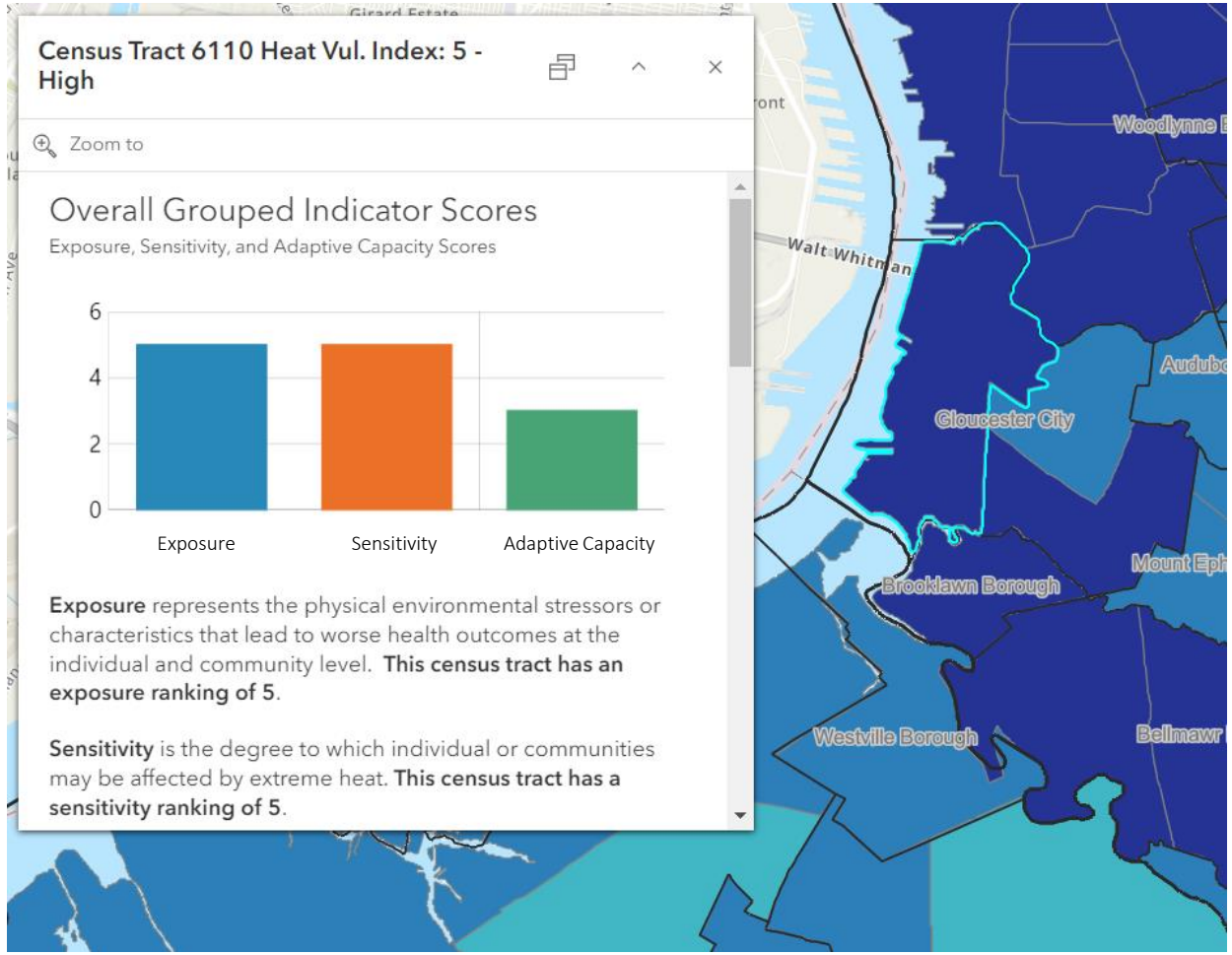
NJ Heat Vulnerability Index





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Hazardous Facilities and Flooding Analysis

Toxic Catastrophe Prevention Act Sites

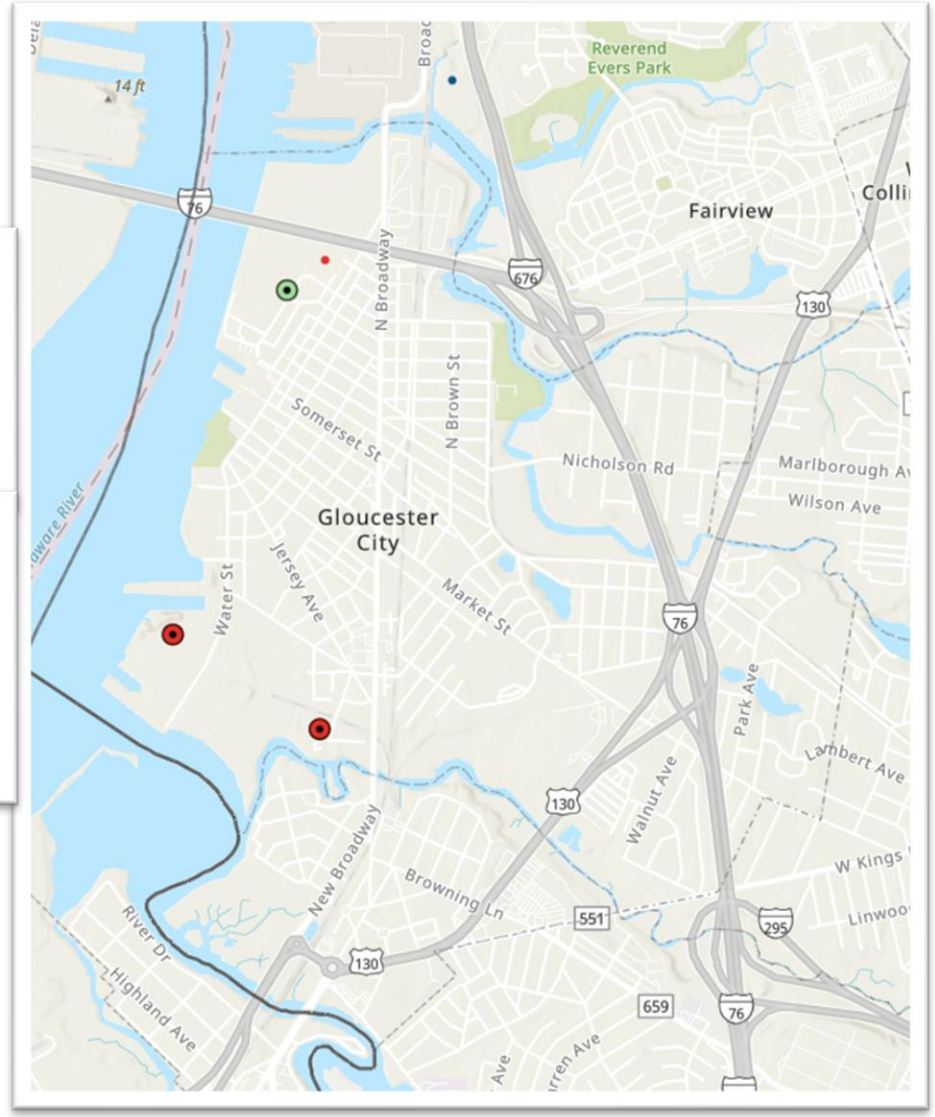
TCPA Sites

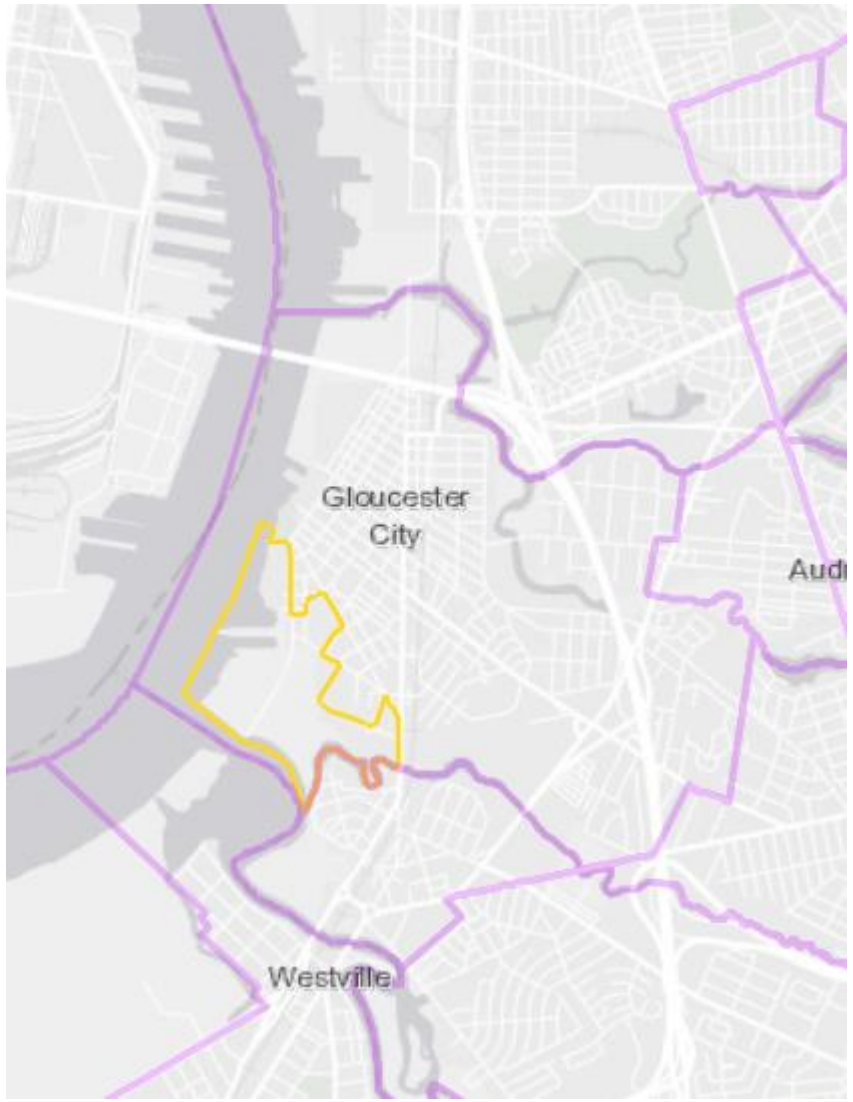
- Current Flood Risk In OBC
- Current Flood Risk
- Future Flood Risk
- Sites with Limited Flood Risk

Known Contaminated Sites List

KCSL Sites

- Current Flood Risk In OBC
- Current Flood Risk
- Future Flood Risk In OBC
- Sites with Limited Flood Risk





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Key Takeaways

Climate change is posing continued risk to human health, infrastructure, natural resources, social and economic systems

Climate change-related data and tools are essential drivers for decisions about zoning, redevelopment, housing, open space, and other investments by local and regional governments

Rutgers' NJ Adapt is a powerful public resource available for high-level planning and learning about the impacts of climate change on people, assets, and communities in New Jersey