

Navigating Climate Impacts and Resilience – Rutgers’ NJ Climate Navigator Tool  
The Rutgers NJADAPT Program in New Jersey

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# Who We Are, What We Do

Our mission and leadership

## Our Mission

The New Jersey Climate Change Resource Center was established by statute in January 2020 to “create and support the use of impartial and actionable science to advance government, public, private, and nongovernmental sector efforts to adapt to, and mitigate, a changing climate.” To that end, our mission is to:



Conduct research with real-world applications to New Jersey’s most pressing climate-related challenges;



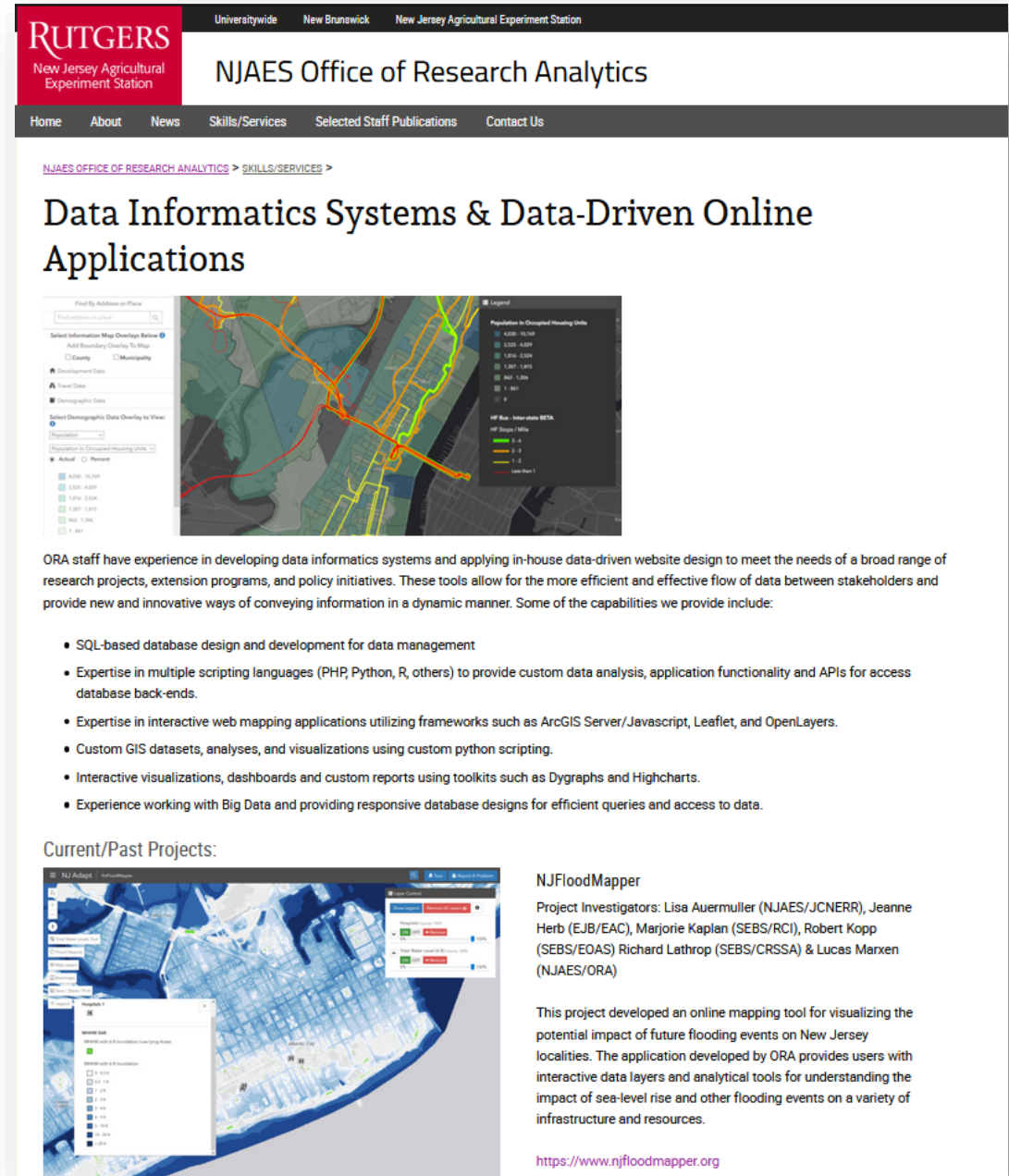
Create planning tools, develop technical guidance, undertake pilot projects, and provide practical support for addressing climate change in New Jersey;



Connect actionable research to policymakers, planners, practitioners, the media, communities, students, and other individuals through outreach, training, and education.

# Background

- SEBS/NJAES Office of Research Analytics
  - Provides advanced statistical, spatial, economic, and technological tools to projects and programs throughout the NJAES and broader University.
- Specialize in developing data informatics systems and data-driven online applications
- Expertise in GIS, interactive web-mapping, and data visualization technology
- Collaborate with experts and stakeholders to develop tools to meet research, extension and education mission of the Agricultural Experiment Station



The screenshot shows the NJAES Office of Research Analytics website. The header includes the Rutgers logo and navigation links for Universitywide, New Brunswick, and New Jersey Agricultural Experiment Station. The main navigation bar lists Home, About, News, Skills/Services, Selected Staff Publications, and Contact Us. The page title is "Data Informatics Systems & Data-Driven Online Applications". Below the title is a screenshot of a web mapping application interface. The interface includes a search bar, a legend, and a map showing various data layers. The legend includes categories like "Population in Occupied Housing Units" and "HF Base - Interpolate BETA".

ORA staff have experience in developing data informatics systems and applying in-house data-driven website design to meet the needs of a broad range of research projects, extension programs, and policy initiatives. These tools allow for the more efficient and effective flow of data between stakeholders and provide new and innovative ways of conveying information in a dynamic manner. Some of the capabilities we provide include:

- SQL-based database design and development for data management
- Expertise in multiple scripting languages (PHP, Python, R, others) to provide custom data analysis, application functionality and APIs for access database back-ends.
- Expertise in interactive web mapping applications utilizing frameworks such as ArcGIS Server/Javascript, Leaflet, and OpenLayers.
- Custom GIS datasets, analyses, and visualizations using custom python scripting.
- Interactive visualizations, dashboards and custom reports using toolkits such as Dygraphs and Highcharts.
- Experience working with Big Data and providing responsive database designs for efficient queries and access to data.

Current/Past Projects:

**NJFloodMapper**  
Project Investigators: Lisa Auermuller (NJAES/JCNERR), Jeanne Herb (EJB/EAC), Marjorie Kaplan (SEBS/RCI), Robert Kopp (SEBS/EOAS) Richard Lathrop (SEBS/CRSSA) & Lucas Marxen (NJAES/ORA)

This project developed an online mapping tool for visualizing the potential impact of future flooding events on New Jersey localities. The application developed by ORA provides users with interactive data layers and analytical tools for understanding the impact of sea-level rise and other flooding events on a variety of infrastructure and resources.

<https://www.njfloodmapper.org>

# The NJADAPT suite of tools were developed to address identified gaps in communicating climate science and data to policy makers, planners, and the broader public

**MHHW\_03ft**  
MHHW with 3 ft Inundation Low-lying Areas

- 0 - 0.5 ft
- 0.5 - 1 ft
- 1 - 2 ft
- 2 - 3 ft
- 3 - 4 ft
- 4 - 5 ft
- 5 - 10 ft
- 10 - 20 ft
- > 20 ft

**MHHW with 3 ft Inundation**

- 0 - 0.5 ft
- 0.5 - 1 ft
- 1 - 2 ft
- 2 - 3 ft
- 3 - 4 ft
- 4 - 5 ft
- 5 - 10 ft
- 10 - 20 ft
- > 20 ft

0 feet of water

Toggle "0 feet" on and off to see how the map represents coastal marsh areas as submerged lands.

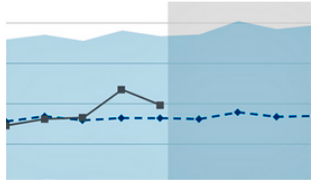
2 feet Total Water Level above MHHW

3 feet TWL above MHHW

5 feet...

7 feet...

You'll notice that some areas are marked as green; these areas are not connected to coastal waters at a given water level, and so would not be considered flooded according to a "bathtub" model of perfectly-calm water. Nonetheless, due to wave movement and overtopping, they are still at risk. (See Schmid, Hadley, Waters (2014); "Mass. Coast Flood Risk Model"; Anderson, Fletcher, et al (2018), Xie, Zou, et al 2019.)

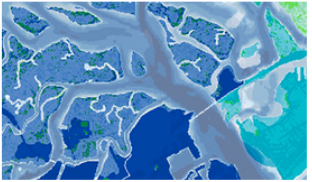


## Climate Dashboard

New Jersey climate trends in moderate and high emissions scenarios

The Climate Dashboard visualizes climate change trends and statistics for the whole of New Jersey. It compares today's conditions to future projections and can be displayed as maps or interactive charts. The projected changes are summarized in seasonal intervals (winter, spring, summer, fall) for six climate measurements in moderate (consistent with today's global policies) and high (continued growth of emissions by 2100) emissions scenarios.

[Go to Climate Dashboard](#)



## NJ FloodMapper

An interactive flood exposure mapping tool

NJ FloodMapper is an interactive mapping tool that allows users to conduct flood exposure analysis based on the best available science for sea-level rise and numerous other parameters, including total water levels, hurricane surge, FEMA flood zones, and Hurricane Sandy surge. Additional map layers depict infrastructure, environmental hazards, marsh and open space, social vulnerability, flood insurance payments for property loss, and land use.

[Go to NJ FloodMapper](#)

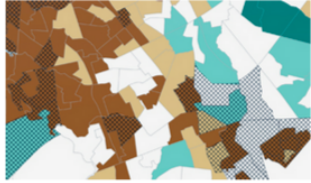


## Climate Snapshots

Climate risks summarized by municipality, county and statewide

Adapting to climate change requires an understanding of potential hazards and exposure. These Climate Snapshots provide easy access to information about the people, places, and assets at risk from climate impacts in each of New Jersey's municipalities, counties, and the state as a whole. Snapshots include reports on built infrastructure, critical assets, natural and working lands, public health, vulnerable populations, and forestry.

[Go to Climate Snapshots](#)



## NJ HazAdapt

Data for hazard planners

Developed with the NJ Office of Emergency Management, this tool provides municipal and county hazard planners with easy access to data and resources that will assist with development of hazard mitigation plans. State and local users can assess flooding impacts on key FEMA lifeline sectors, socially vulnerable populations, and individual land parcels. The tool includes heat hazard data to understand the impacts of heat waves and the urban heat island effect.

[Go to NJ HazAdapt](#)

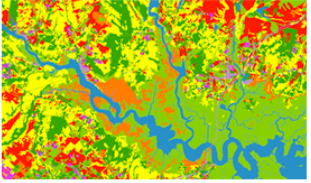


## Climate Planning Tool

A guide to using coastal flooding data

This tool assists state and local officials, communities, hazard planners, and others to understand the impacts of climate change on coastal flooding in New Jersey. Backed by data on sea level rise, hurricanes, and tidal floods, the tool explains how to use data to analyze different flooding scenarios. The tool is presented in two storymaps: the first is a primer on flooding; the second is a step-by-step outline of a coastal flood vulnerability analysis.

[Flooding Primer](#) [GIS Assessment Steps](#)



## NJ Forest Adapt

Forest management tool

This mapping tool enables users to visualize data over multiple timelines and climate change scenarios. Users can explore changes in plant hardiness and heat zones, species distribution, daily minimum and maximum temperatures, heating and cooling degree days, and precipitation. Additional map layers include forest carbon density, canopy cover, impervious surfaces, forest types, pest and disease, wildfire fuel hazard, and more.

[Go to NJ Forest Adapt](#)

# Climate Dashboards

How can we educate the public on the general science of climate change?

## Climate Change Impacts on Mean Daily Maximum Temperature in New Jersey

The mean seasonal daily maximum temperature is the average of the daily hottest temperature experienced in the winter, spring, summer, and fall seasons throughout the state. The average daily maximum temperatures have been generally increasing in New Jersey in recent decades and are projected to continue through 2100 across all seasons, with higher emissions causing a greater increase in temperatures.

[More about mean daily maximum temperature](#)

[About the Data](#)

### SELECT VISUALIZATION

- Map
- Chart

### SELECT TIME PERIOD

- 2001-2020
- 2021-2040
- 2041-2060
- 2061-2080
- 2081-2100

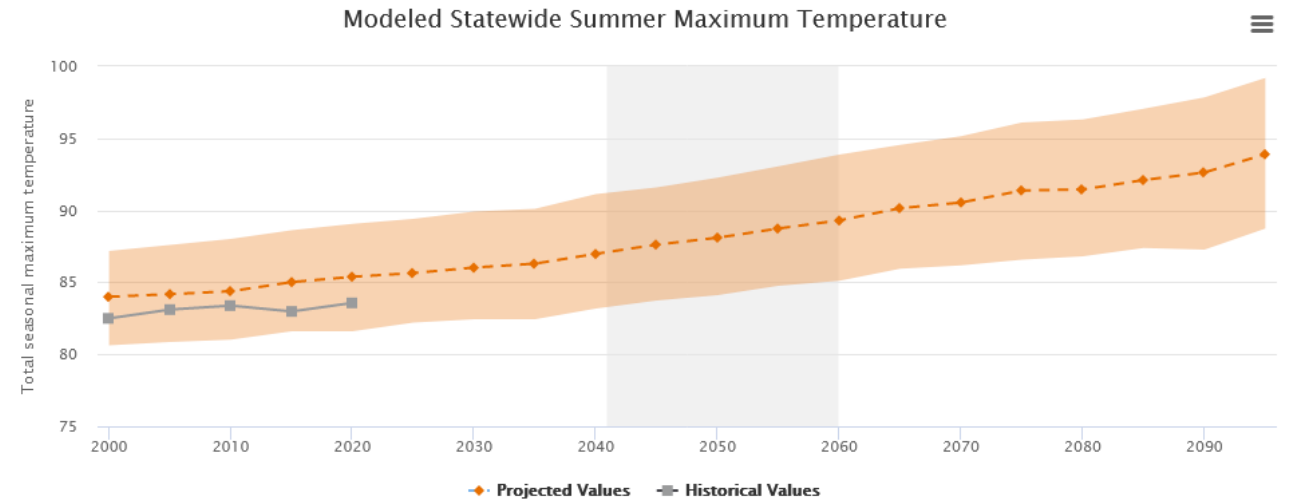
### SELECT EMISSIONS SCENARIO

- Moderate Emissions
  - High Emissions
- [Learn More](#)

### SELECT SEASON

- Winter
- Spring
- Summer
- Fall

Seasonal Maximum Temperature for 2041-2060 degrees		
Minimum	Average	Maximum
84.4	88.4	92.7



The above chart shows the projections of 32 climate models. The broad colored band shows the range of values that the models projected. The narrower the band, the more strongly models agree. The dashed line shows the average of those projections. The solid line shows the actual values that already occurred. They do not line up exactly with the average modeled values but do fall within the range, indicating the models are projecting realistic values.

This visualization is showing **high emissions**, corresponding to a future consistent with the strong, continued growth of fossil fuel consumption.

# NJFloodMapper

How can we help communities visualize the impacts of coastal and inland flood hazards on their infrastructure, people and resources?

The screenshot shows the NJFloodMapper web application interface. At the top, there is a search bar and navigation icons for 'Tour' and 'Report A Problem'. The main map area displays a satellite view of a coastal area with blue overlays representing flood hazards and green overlays representing power plants. A 'Legends for Map' popup is open, showing the 'Utilities - Power Plants (NJ)' legend with categories: Biomass, Coal, Hydroelectric, Natural Gas, Nuclear, Petroleum, Pumped Storage, Wind, and Other Primary Source. Below the legend, the 'MHHW 07ft' layer is selected. A 'Layer Control' panel on the right shows the 'Power Plants (NJ)' layer is turned ON with 100% opacity, and the 'Total Water Level (7 ft)' layer is also turned ON with 100% opacity. A detailed data popup for 'Utilities - Power Plants (NJ)' is open, showing the following information:

Plant Name	PSEG Linden Generating Station
Primary Source	Natural Gas
Site ID	927
Source	EIA-860, EIA-860M and EIA-923
Source Description	Natural Gas = 1566.2 MW
State Name	New Jersey
Street Address	Wood Avenue South
Technical Description	Natural Gas Fired Combined Cycle; Natural Gas Fired Combustion Turbine;
Total MW	1,566

At the bottom of the map, there is a scale bar for 0.3 miles and the text 'New Jersey Climate Change Resource Center'. The footer includes attribution: 'NYC OpenData, State of New Jersey, Esri, HERE, Garmin, GeoTechnologies, Inc., USGS, EPA | NJDEP USEIA | State of New Jersey, Esri, HERE' and 'Powered by Esri'.





### 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](#)

### Total Water Levels Tool

## Select a Sea Level Rise Estimate

#### 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

**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](#)

[Previous](#) [Next](#)

Step 4 of 5

### Total Water Levels Tool

## Select a Flood Event or Choose Your Own Height:

3.3

## Select a Flood Event

### Historical Events

Select a Historical Flood Event

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

- Historical Storm flood heights (e.g., Sandy)
- Mean Higher High Water (MHHW)
- 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.

[Previous](#) [Next](#)

Step 5 of 5

# Climate Snapshots

## How can we make climate change impact analysis easily accessible?

### Climate Snapshots



Adapting to climate change requires an understanding of potential hazards and exposure. These Municipal Snapshots 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.

Please select a county and / or municipality

County:  Municipality:

Available Reports

Built and Natural Resource Impact Reports

**Built Infrastructure Report**  
Summarizes the potential flood exposure of built infrastructure on which the community relies for services including wastewater treatment, energy generation, and transportation.

**Critical Assets Report**  
Summarizes the potential flood exposure of critical facilities and assets that the community needs to provide education, care, and public safety to residents.

**Natural and Working Lands Report**  
Summarizes the potential flood exposure of natural and working lands, as well as sea-level rise impacts on coastal marshes (erosion and retreat) and public water access points.

### Critical Assets Exposure Snapshot

Hoboken City  
Hudson County

[DOWNLOAD PDF](#) [DOWNLOAD DATA](#)

#### Introduction

Data Last Updated: 2022-07-26 08:46:33

Critical assets are places a community needs to provide education, care, and public safety to residents. Some critical assets may be in areas that flood now or are expected to flood in the future. It is important to understand critical assets exposures to flood events along with exposures to roads leading to and from those facilities. Knowing the services provided by critical assets 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 overflow 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 storm water 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.](#)

#### Critical Assets in Exposed Areas

Assets	Total Assets	# Exposed at 2ft TWL	# Exposed at 7ft TWL
Schools	9	0	6
Fire Stations	4	0	3
Hospitals	1	0	1
Law Enforcement	2	0	0
Nursing Homes / Assisted Care	1	0	1
Child Care Facilities	43	0	30
Evacuation Shelters	4	0	1

[LINK TO CRITICAL ASSETS LIVE MAP](#)

### Critical Assets in FEMA Flood Zone Areas

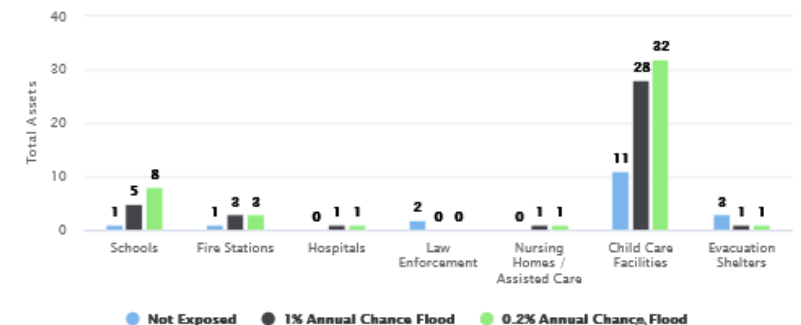
Assets	Total Assets	# Exposed in ...	
		1% Annual Chance Flood	0.2% Annual Chance Flood
Schools	9	5	8
Fire Stations	4	3	3
Hospitals	1	1	1
Law Enforcement	2	0	0
Nursing Homes / Assisted Care	1	1	1
Child Care Facilities	43	28	32
Evacuation Shelters	4	1	1

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:

- o **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.
- o **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 that water-surface elevation of the 1% annual chance flood.
- o **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.
- o **Areas of Undetermined Flood Hazard** are areas with possible but undetermined flood hazards.

[LINK TO CRITICAL ASSETS LIVE MAP](#)

#### Hoboken City Critical Assets Exposure Snapshot

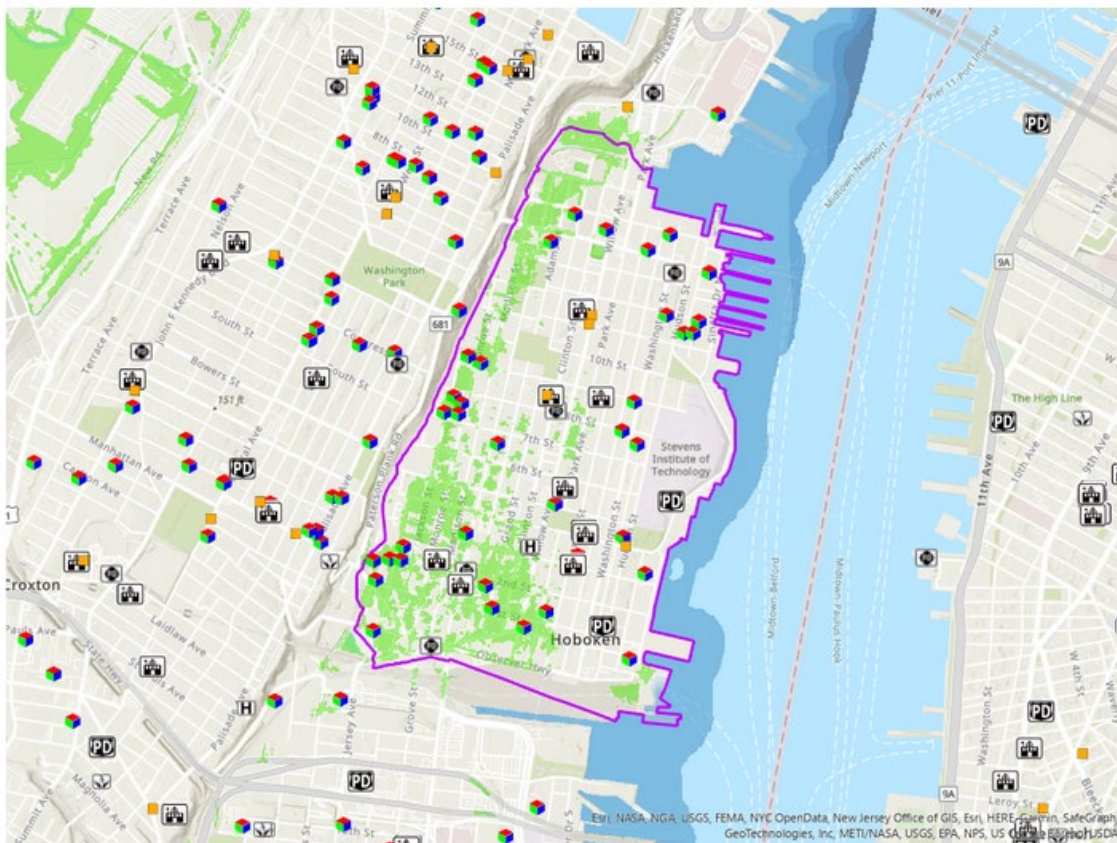




## 2 ft. Exposed

[LINK TO CRITICAL ASSETS LIVE MAP](#)

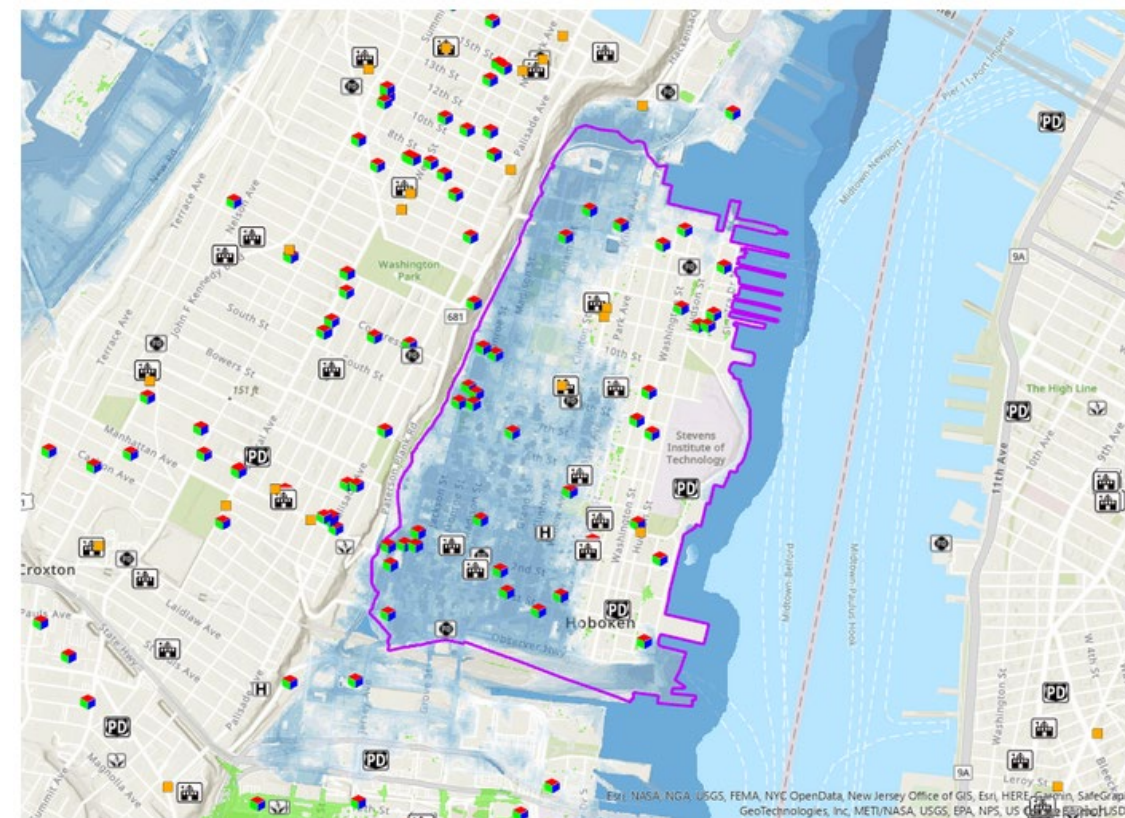
A 2-foot flood event along the New Jersey coast today can occur because of a coastal storm or especially high tide. By 2050, the same 2-foot flood event may happen during daily high tide alone because of sea-level rise. While daily high tides will result in flood inundation for parts of every day, coastal storm-induced flood events last only for the duration of a storm (although their impacts could be felt for far longer). Critical assets with exposures to a 2-foot flood event should consider short-term impacts from temporary inundation due to a storm, and longer-term impacts from permanent inundation when waters may not recede.



## 7 ft. Exposed

[LINK TO CRITICAL ASSETS LIVE MAP](#)

A 7-foot flood event along the New Jersey coast today can occur from a combination of coastal storm surge (hurricane or nor'easter) on top of a rising mean sea level. In the future, a 7-foot flood event along the New Jersey coast would become more likely to occur as the mean sea-level rises. For critical facilities it is important to be aware of and plan for currently "low probability, high consequence" flood events whose probability of occurring will become greater as sea-levels rise. Critical assets with exposures to a 7-foot flood event should consider short-term impacts from temporary inundation due to a storm, and longer-term impacts from the increasing probability that such an event could occur as sea-levels rise.



# NJ Public Health Adapt

How can we help communicate the potential impacts of climate change on the public health and populations that may be at higher risk?

**RUTGERS** NJ Public Health Adapt Socio-demographics

**Socio-demographic Factors at Greater Risk of Negative Health Outcomes from Climate Change**

Phillipsburg Town  
Warren County

While the health of all people living in the United States is affected by climate change, some communities and some populations are more vulnerable to changing climate conditions than others. Populations of concern include those with low income, communities of color, immigrant groups, indigenous peoples, children and pregnant women, older adults, outdoor laborers, persons with disabilities, and persons with preexisting or chronic medical conditions. Factors such as poverty, lack of access to transportation, limited English proficiency, and crowded or substandard housing may weaken an individual's ability to adapt to a changing climate. Existing societal inequities also impede the ability of an individual or community to respond to climate change. These inequities may include unequal access to social, community based, and economic opportunities that enhance health and well-being, disproportionate exposure to environmental hazards, and social isolation.

Ensure all maps are fully loaded before downloading information. [DOWNLOAD PDF](#)

**General Proportional Demographics 2021**

Demographic Factor	Percentage
Aged under 5	5%
Aged 65 and older	15%
Living alone, aged 65 and older	5%
Living alone, all ages	16%
At least one disability, aged 18 to 64	12%
Unemployed, aged 16 and older	4%
Foreign Born	9%
Below Poverty Line	17%
Speak English "Less than Well"	5%
Less than high school education	9%
Ambulatory difficulty	7%
Cognitive difficulty	6%
Works outdoors	25%
No health insurance	9%
In group quarters	0%

Total population: 15,146

Demographic Factor	Population Estimate	Population Prevalence
Aged under 5	723	5%
Aged 65 and older	2,264	15%
Living alone, aged 65 and older	740	5%
Living alone, all ages	2,445	16%
At least one disability, aged 18 to 64	1,142	12%
Unemployed, aged 16 and older	517	4%
Foreign Born	1,359	9%
Below Poverty Line	2,485	17%
Speak English "Less than Well"	787	5%
Less than high school education	983	9%
Ambulatory difficulty	1,072	7%
Cognitive difficulty	796	6%
Works outdoors	1,912	25%
No health insurance	1,416	9%
In group quarters	75	0%

**RUTGERS** NJ Public Health Adapt Climate Impacts

**Climate Conditions that Impact Health**

Camden City  
Camden County

**Land Surface Temperature**

Land Surface Temperature is the temperature of the ground. Impervious surfaces and structures such as buildings, roads, and other "built" infrastructure absorb a greater amount of solar radiation increasing land surface temperature and emit heat to a greater extent than most natural surfaces. Natural landscapes, such as trees, forests and water bodies can serve to reduce land surface temperature compared to urbanized landscapes.

- [NJDEP provides more information about the data provided in this map at this link](#)
- [Click here to go to an interactive version of this map](#)

**Land Surface Temperatures in New Jersey (Summer 2022)**

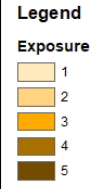
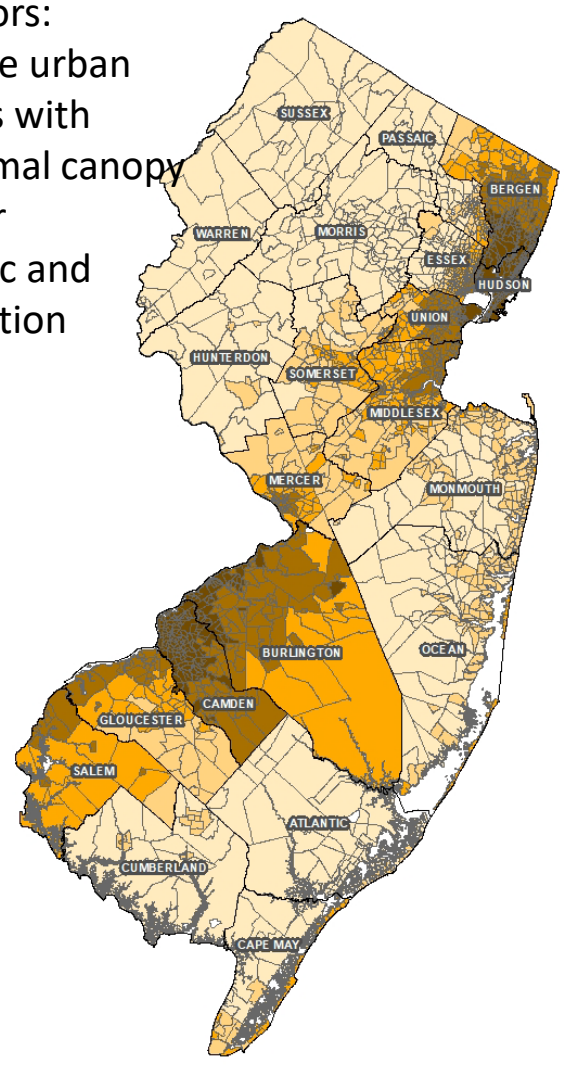
Over 110 | 100 - 110 | 90 - 100 | 80 - 90 | Below 80

# NJ Public Health Adapt – Heat Vulnerability Index

## Exposure

Key factors:

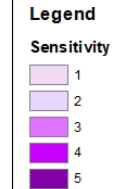
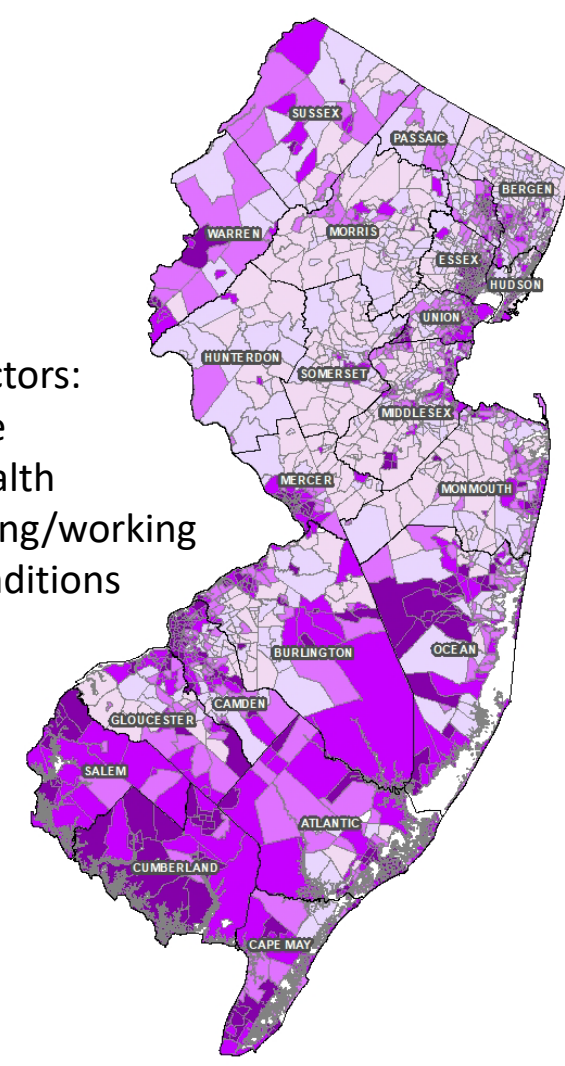
- Dense urban areas with minimal canopy cover
- Traffic and pollution



## Sensitivity

Key factors:

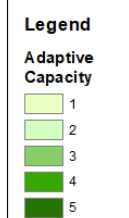
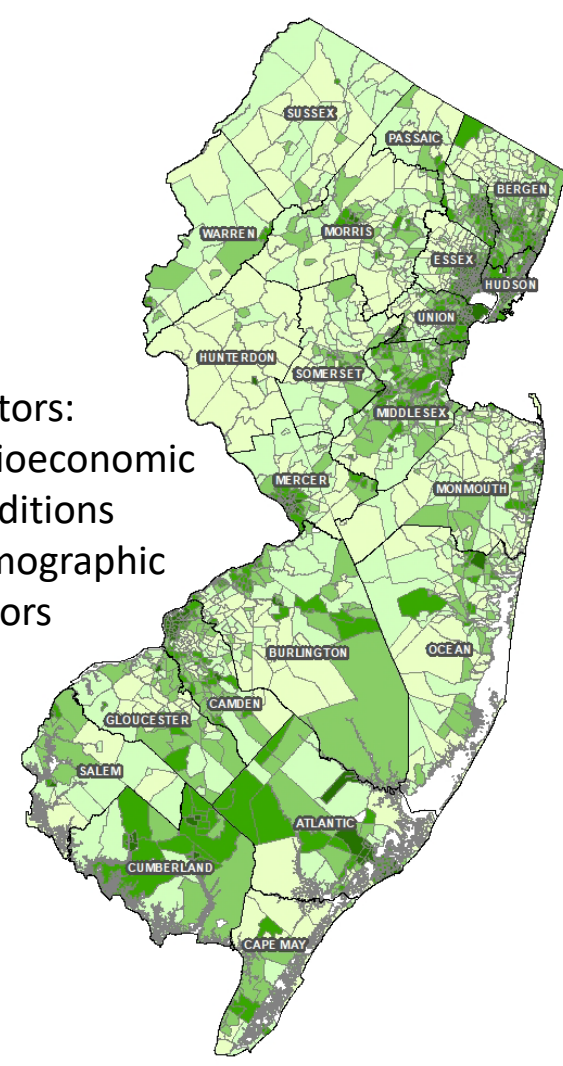
- Age
- Health
- Living/working conditions



## Adaptive Capacity

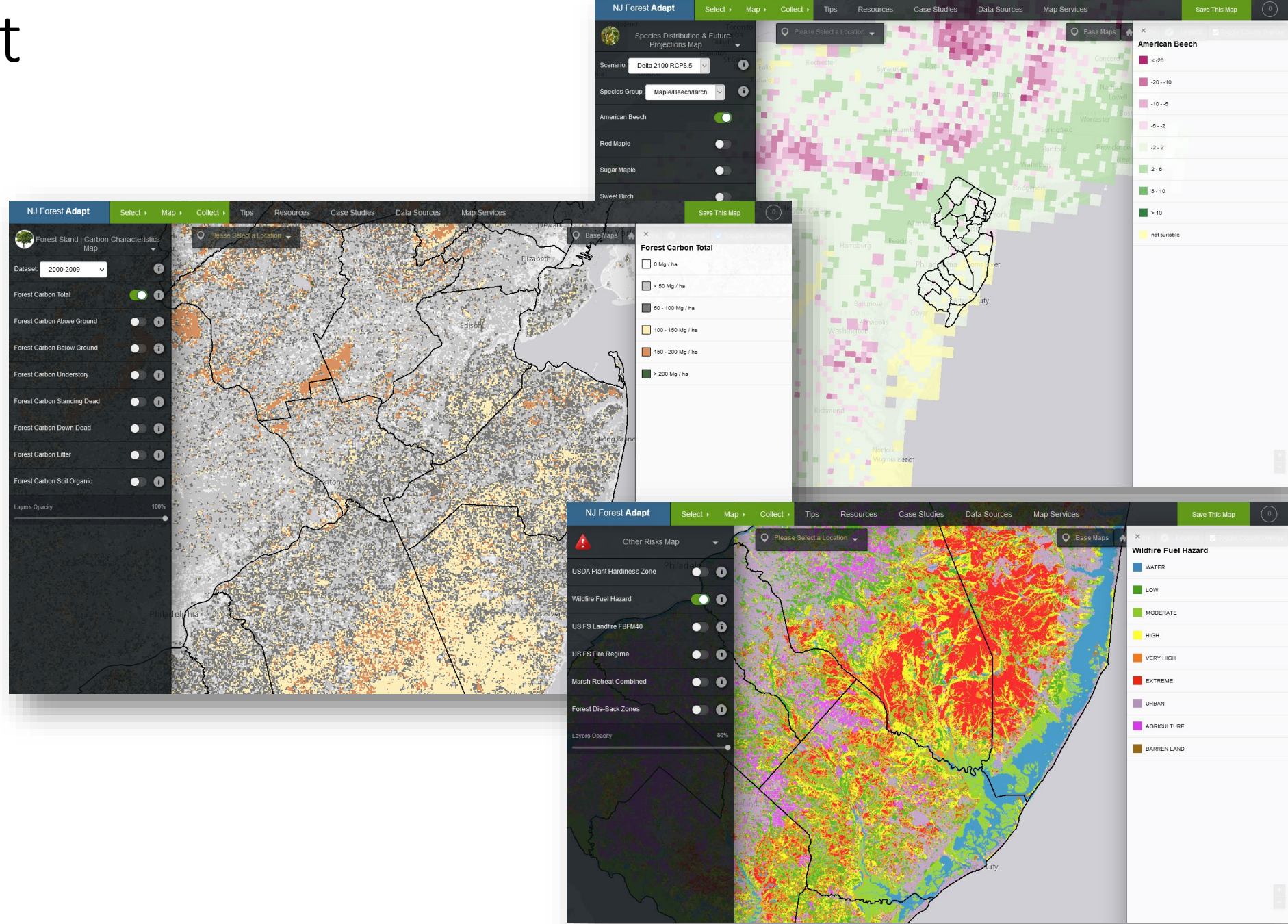
Key factors:

- Socioeconomic conditions
- Demographic factors

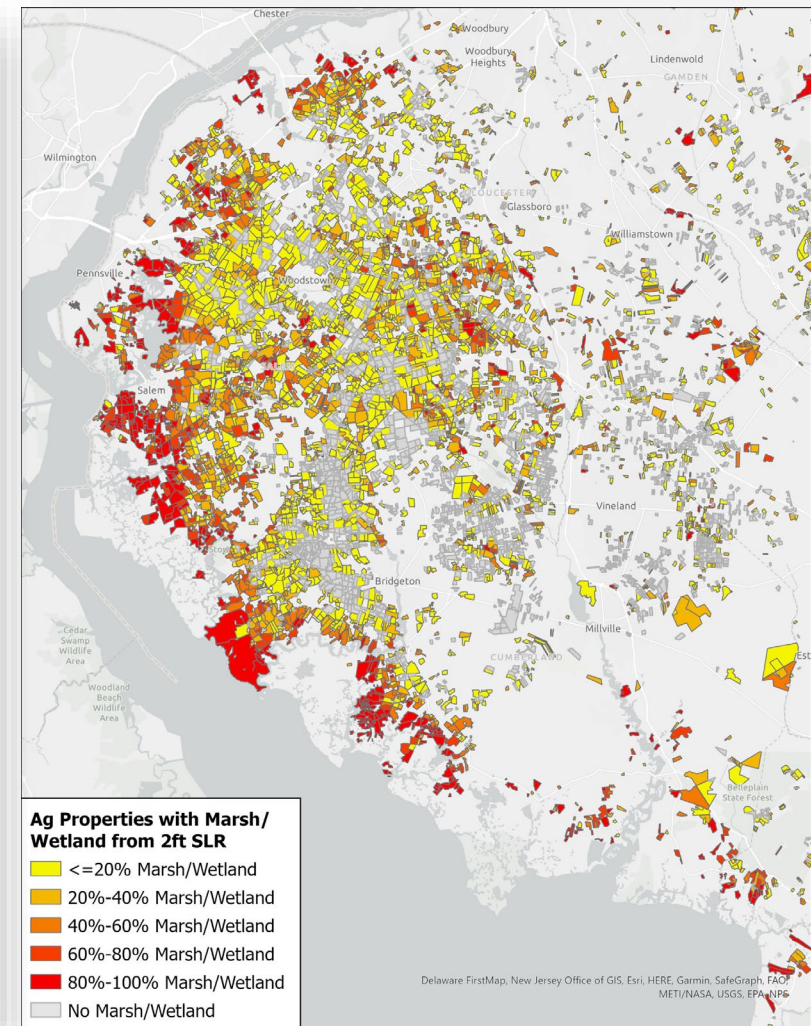
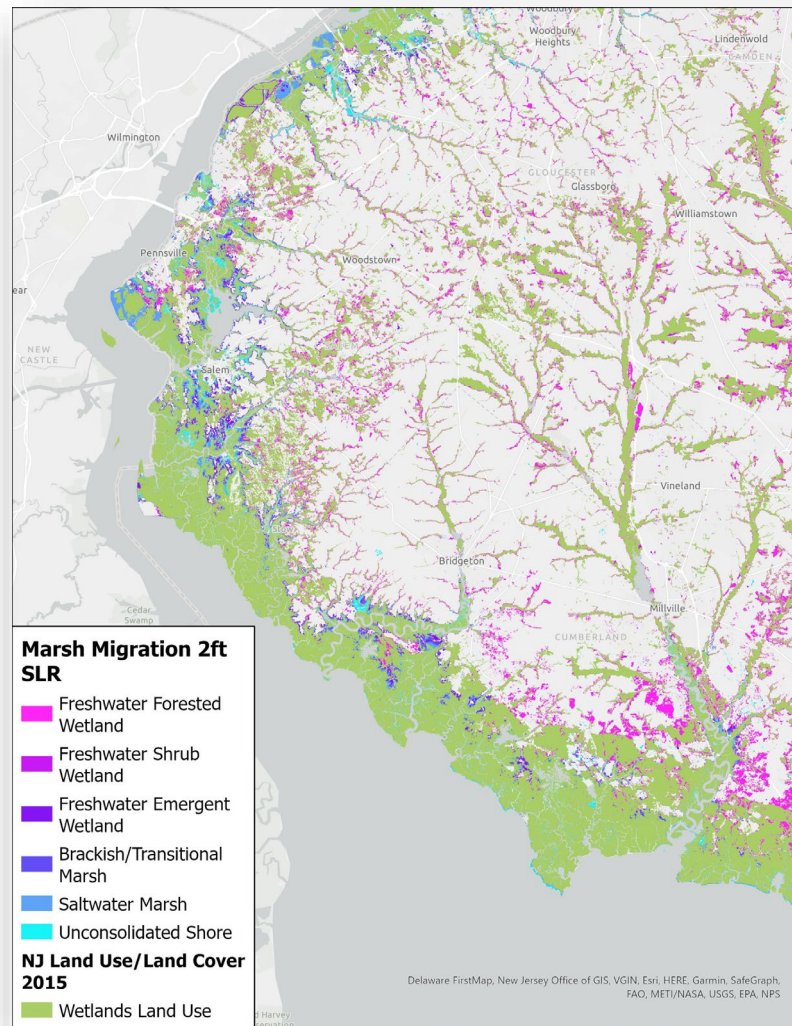
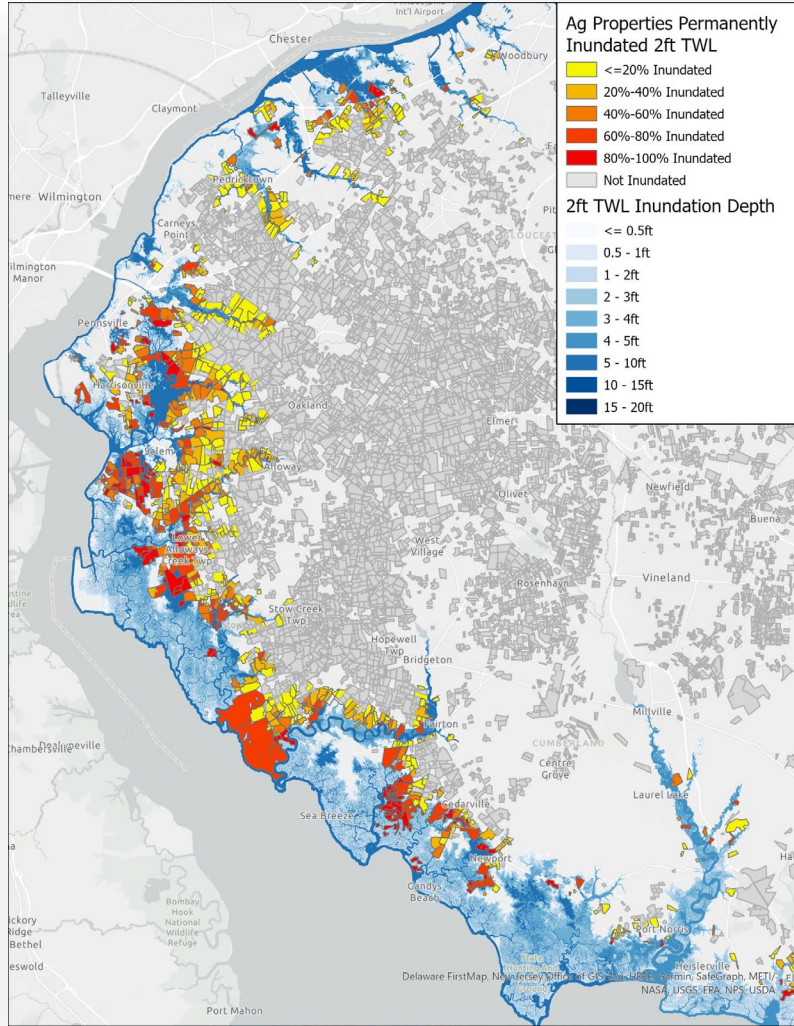


# NJ Forest Adapt

How can we inform different stakeholder groups on the impacts of climate change to their sectors?



# Agricultural Properties (Property Class 3A & 3B) Impacted by 2ft Sea-Level Rise



# NJ HazAdapt

## How do we provide detailed climate hazard analysis for planners to meet state and federal requirements?

### NJ HazAdapt: A Hazard Mitigation Planning Tool

This tool was developed in collaboration with the New Jersey State Office of Emergency Management (OEM). It is intended to provide municipal and county hazard planners with easy access to data and other resources that can assist with development of Hazard Mitigation Plans consistent with guidance issued by the Federal Emergency Management Agency (FEMA). Additionally, this tool is designed to help state and local end users assess impacts of flooding on key lifeline sectors, socially vulnerable populations, and individual land parcels. It also includes data on heat hazards to assist end users with understanding impacts of heatwaves and urban heat island. Currently, this tool includes datasets on the following topics:

- Flooding and heat hazards;
- Social vulnerability to hazards to assist hazard planners in preparing communities for natural hazards; and
- Potential flood analysis for each tax parcel in New Jersey using the Parcels and MOD-IV Composite of New Jersey.

Spatial Datasets Available Here: <https://arcgis/1zLm40>

Please select a county or municipality

County	Municipality
All Counties - Statewide	Select Municipality

Available Datasets



#### Flood Hazard Analysis

Use this data to analyze the potential impacts of flooding events on Lifeline Sectors identified by the US Department of Homeland Security. Datasets include latitude and longitude coordinates to support mapping.

Downloads

Download All

Communications	Metadata	Hazardous Materials	Metadata
Energy	Metadata	Health	Metadata
Financial	Metadata	Safety and Security	Metadata
Food, Water & Shelter	Metadata	Transportation	Metadata

Maps

Communications	Hazardous Materials
Energy	Health
Financial	Safety and Security
Food, Water & Shelter	Transportation



#### Heat Hazard Analysis

Use the Heatwave Analysis to view annual statistics of historical (1981–2010) and projected future (2036–2065, 2070–2099) incidences of heatwaves by county.

Use the Heat Island/Overburdened Communities Analysis to assess intersections of potential heat islands and vulnerable populations by Census Block Group. The dataset provides impervious cover and canopy cover prevalence that could indicate potential heat island effects joined with the NJDEP's Environmental Justice - Overburdened Community data. Includes Census Block Group identifiers for joining with associated spatial datasets.

Downloads

Download All

Heatwave Analysis (County-Level Data)	Metadata
Heat Island/Overburdened Communities Analysis	Metadata

Maps

Heat Island/Overburdened Communities Analysis	
NJ Heat Vulnerability Index	Metadata



#### Social Vulnerability

The Social vulnerability Index provides specific socially and spatially relevant information to help public health officials and local planners better prepare communities to respond to emergency events such as severe weather, floods, disease outbreaks, or chemical exposure.

Downloads

Social Vulnerability Data	Metadata
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Maps

Overall Social Vulnerability Analysis
Socio-Economic Vulnerability Analysis
Minority Status / Language Analysis
Household Composition / Disability Analysis
Housing Type / Transportation Analysis

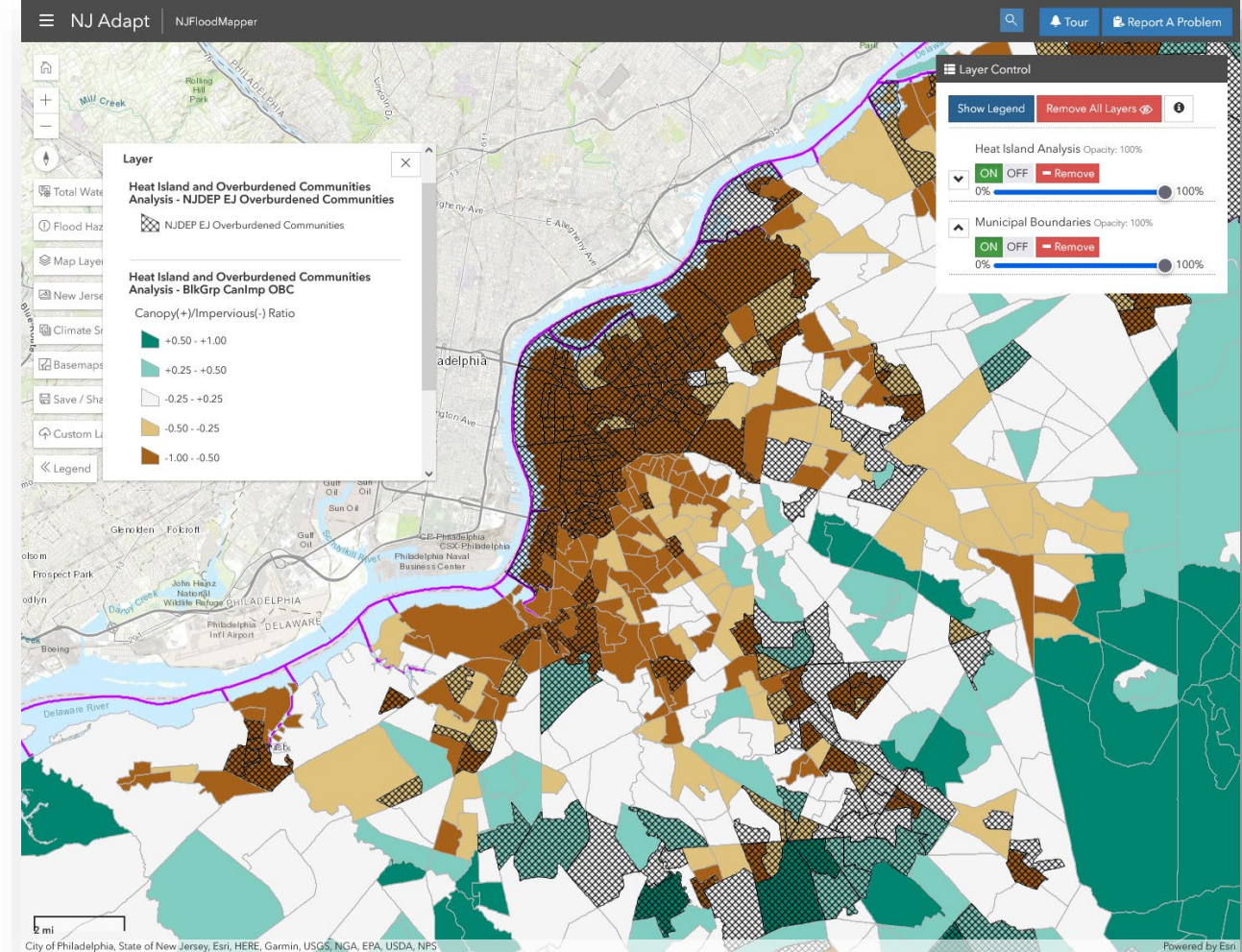
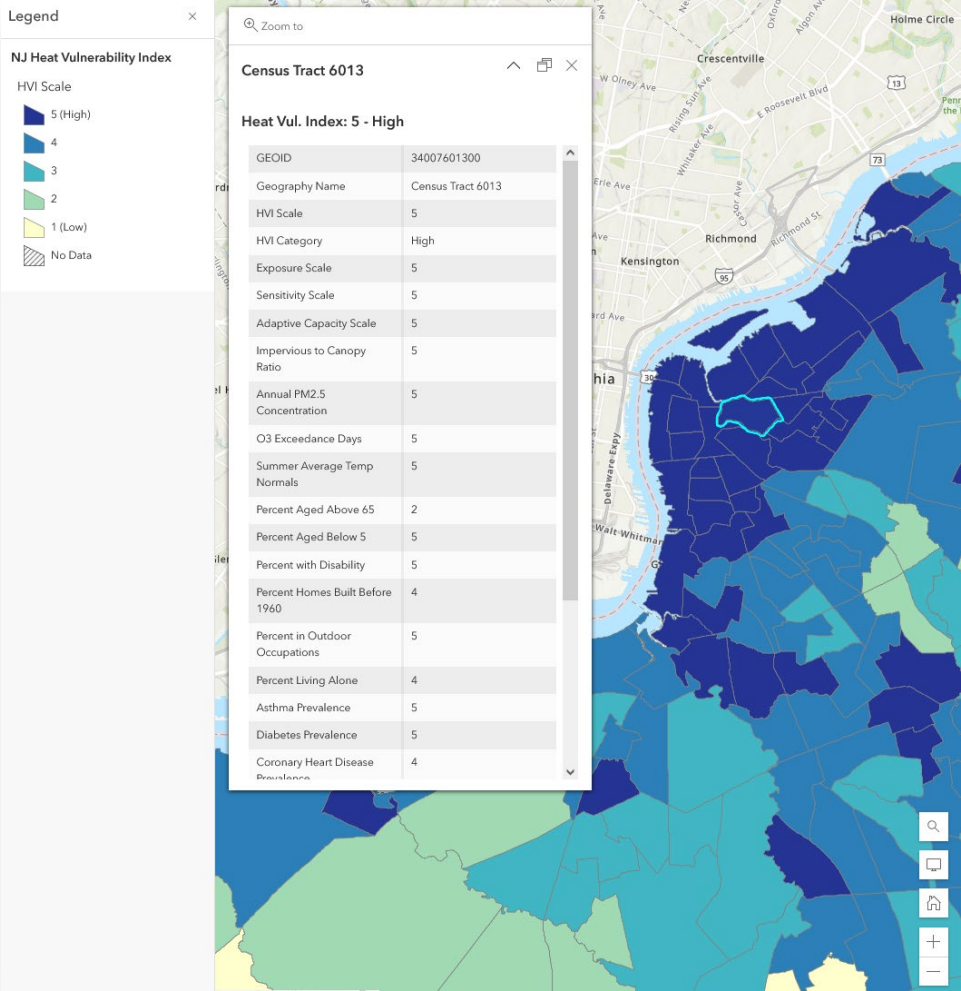


#### MOD-IV Parcel Flood Analysis

This dataset provides potential flood analysis for each tax parcel in New Jersey. The analysis was performed using the Parcels and MOD-IV Composite of NJ (Link) and intersecting it with 1-20ft of Total Water Levels (see the Total Water Levels Tool on [NJFloodmapper](#) for more information) and the FEMA Flood Zones for the 1% Flood Event, 0.5% Flood Event, Regulatory Floodway, and Areas of Undetermined Flood Hazard.

Downloads

MOD-IV Parcel Flood Analysis Data	Metadata
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CountyID	County	Dataset	Threshold (F)	Annual Mean Heatwave Number	10% Annual Heatwave Number	90% Annual Heatwave Number	Annual Mean Heatwave Duration (Days)	10% Annual Heatwave Duration (Days)	90% Annual Heatwave Duration (Days)	Annual Max Heatwave Duration (Days)	10% Annual Max Heatwave Duration (Days)	90% Annual Max Heatwave Duration (Days)
1	Atlantic	Historical (1981-2010)	81.3	1.1	N/A	N/A	3.4	N/A	N/A	6.4	N/A	N/A
1	Atlantic	RCP4.5 (2036-2065)	81.3	3.8	2.8	7.3	8	6.3	12.7	13.2	9.4	21.2
1	Atlantic	RCP8.5 (2036-2065)	81.3	5.1	3.3	9.5	10.2	7.6	18	15.6	10.5	27.2
1	Atlantic	RCP4.5 (2070-2099)	81.3	5	3	10.1	10.2	7.1	15.8	14.8	10.3	25.1
1	Atlantic	RCP8.5 (2070-2099)	81.3	7.6	4.8	14.3	22.7	14.8	42.1	32.9	19.1	52.9

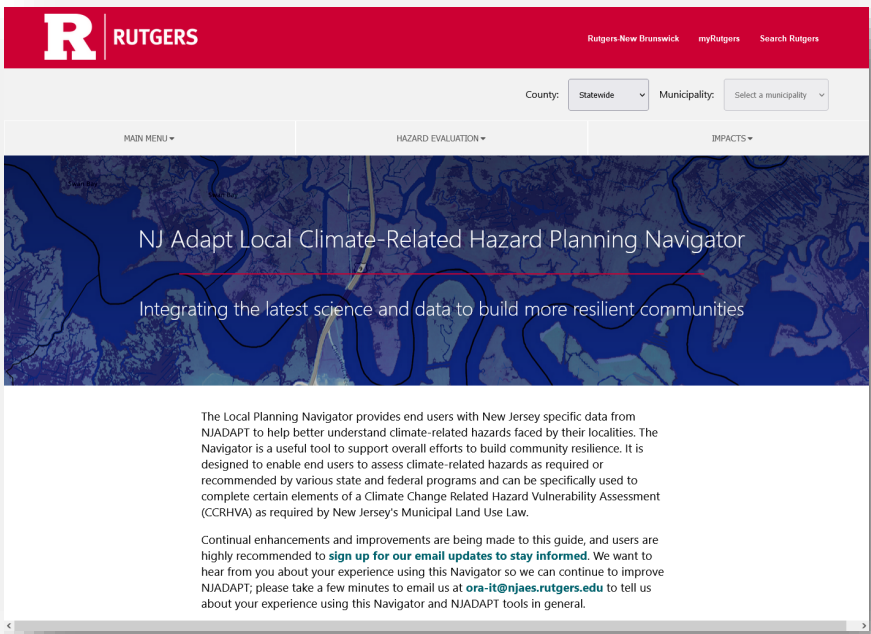
# Warren County Parcel Analysis

Property Class	Properties in Regulatory Floodway	Properties in 1% Annual Chance Flood Zone	Properties in 0.2% Annual Chance Flood Zone	Acres in Flood Zones
<b>1: Vacant Land</b>	252	363	411	9,989
<b>2: Residential (4 families or less)</b>	928	1,795	2,181	81,992
<b>3A: Farm (Regular)</b>	2	6	6	167
<b>3B: Farm Qualified</b>	282	702	723	100,312
<b>4A: Commercial</b>	169	279	356	4,483
<b>4B: Industrial</b>	14	29	45	2,036
<b>4C: Apartment</b>	8	19	25	472
<b>5A: Class I Railroad Property</b>	30	45	51	395
<b>5B: Class II Railroad Property</b>	13	17	30	90
<b>15A: Public School Property</b>	10	15	16	901
<b>15B: Other School Property</b>	4	6	6	277
<b>15C: Public Property</b>	336	523	560	48,166
<b>15D: Church and Charitable Property</b>	6	12	15	621
<b>15E: Cemeteries and Graveyards</b>	3	7	7	264
<b>15F: Other Exempt Properties</b>	23	69	77	5,748
<b>Total Properties</b>	<b>2,080</b>	<b>3,887</b>	<b>4,509</b>	<b>255,913</b>




# NJADAPT Local Climate-Related Hazard Planning Navigator

- How can we provide a guided approach to accessing the various tools and datasets available in NJADAPT for specific planning purposes/needs?




## 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

Hazard Type	Current	Medium-Emissions, High-Century	Medium-Emissions, Low-Century	High-Emissions, Mid-Century	High-Emissions, Late-Century
10 to 25 ft coastal flooding	0.00	0.50	0.01	0.01	0.00
10 to 25 ft inland flooding	0.20	4.40	4.07	4.07	4.07
25 to 50 ft coastal flooding	0.00	0.21	0.26	0.26	0.26
25 to 50 ft inland flooding	0.11	0.54	0.58	0.60	1.00
50 to 75 ft coastal flooding	0.00	0.00	0.00	0.00	0.00
50 to 75 ft inland flooding	0.10	0.70	0.51	0.68	0.40

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

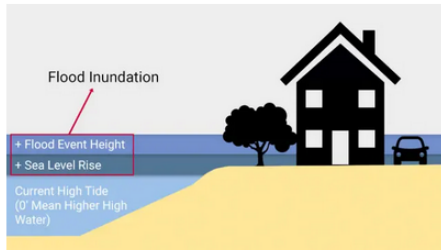


Community Assets

## 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.

# NJ Climate Navigator

- How can we provide a unified platform to provide guided and flexible access to all the data and tools available in NJADAPT and support more advanced features, functionality, and built-in analysis?



I'M LOOKING FOR INFORMATION ABOUT

### Hazards

Drought   Extreme Weather   Flood   Heat Wave   Sea Level Rise   Wildfire

I WANT INFORMATION ABOUT SPECIFIC

### Places

County:    Municipality:

I NEED ASSISTANCE WITH THE FOLLOWING

### Process

Coastal Resilience Plan   Hazard Mitigation Plan   Land Use Plan   Plan Endorsement

I WANT TO EXPLORE THE FOLLOWING

### Sectors

Agriculture   Coastal Resilience   Energy   Environmental Justice   Built Infrastructure   Natural Resources   Public Health   Water Resources

I WANT TO USE ONE OF THESE

### Tools

NJ FloodMapper   NJ Forest Adapt   Municipal Snapshot

I WANT INFORMATION FOR THE FOLLOWING TYPES OF

### Users

City Planner   Emergency Manager   Public Health Professional   Natural Resource Manager

# NJ Climate Navigator

- **Modular Platform** – Ability to access all datasets and tools across current platforms through single unified interface
- **Decision Tree Framework** – Guide users towards most helpful data and tools
- **Integrated Guidance** – Provide users with guided applications to assist in completing plan requirements (CCRHVA, HMPs, BCBG, etc.)
- **New Dashboard Snapshot Framework** – Interactive UI for climate snapshot data
- **User Account Framework** – Allow users to save preferences, map views, analyses
- **Advanced Analysis Framework** – Custom analyses of datasets (e.g. – custom flood analysis of user provided data)
- **ArcGIS Hub** – Provide open access and standardization to all datasets

# NJ Climate Navigator

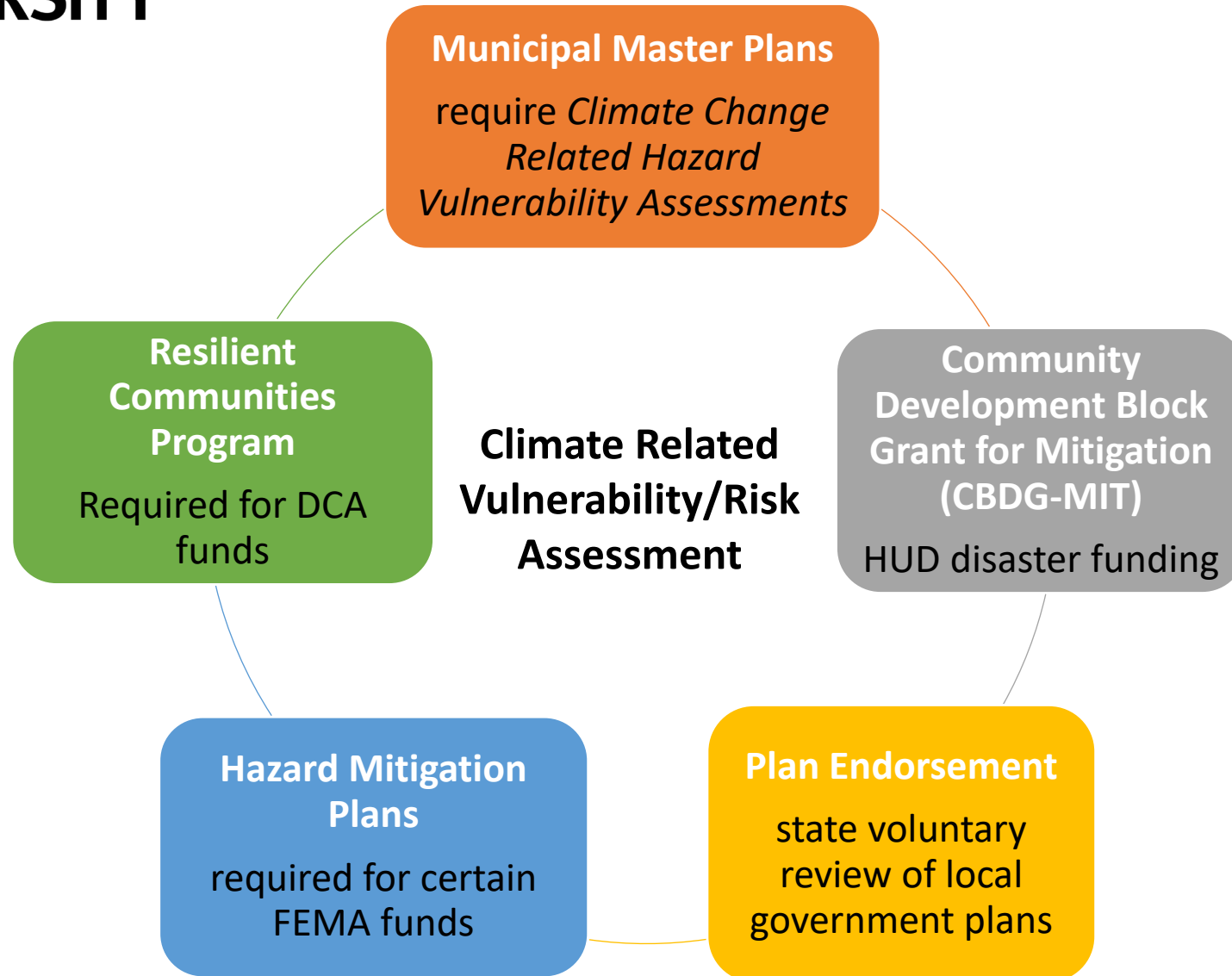
- Timeframe

- Port existing platforms over to new modular/unified framework (Spring 2024)
  - NJFloodmapper
  - NJ Forest Adapt
- Data upgrades and development into data modules (Spring/Summer 2024)
- Re-develop existing platforms over to new frameworks and UIs (Summer/Fall 2024)
  - Climate Dashboards
  - Climate Snapshots
  - NJ Haz Adapt
  - NJ Public Health Adapt
  - Individual Tools
- Develop guided interface for exploring and selecting data/tools for custom workspace (Winter 2024)
- Develop user account system (Winter 2024/2025)
- Stakeholder engagement and feedback (Throughout Project)

# Navigating Climate Related Vulnerability Assessment Across Programs and Case Example

Pritpal Bamhrah, AICP | Senior Research Specialist, NJ  
Climate Change Resource Center, Rutgers

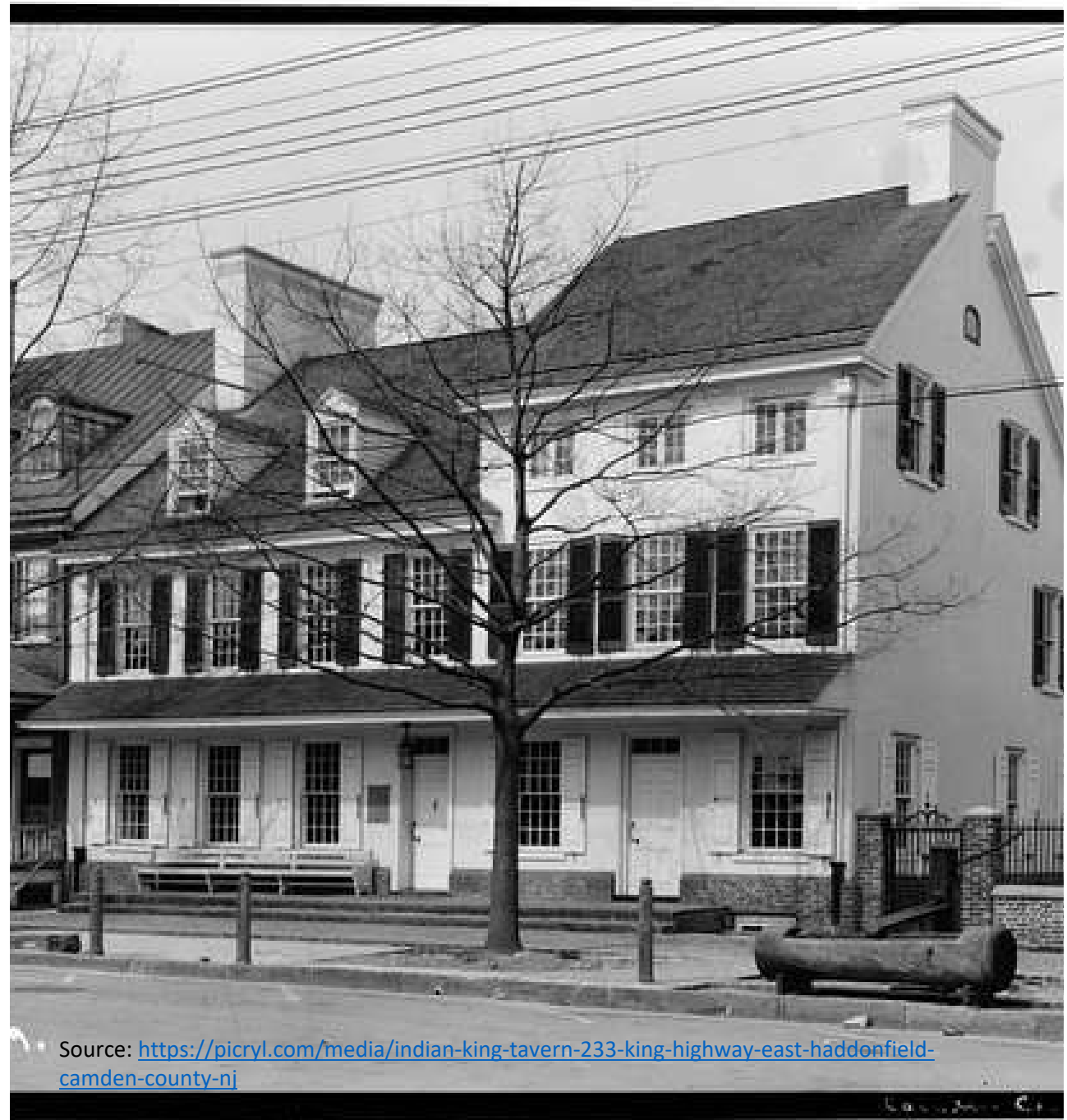
March 12, 2024



- The climate related vulnerability or risk assessments don't line up 100% but there is a clear overlap across plans/programs.
- Various departments should align the requirements to make it simple for communities.
- The tools/guidance should enable the communities to perform these assessment and analysis in a way that can inform and serve various requirements.



# Case Example - Planning for a Resilient Haddonfield





Source: <https://picryl.com/media/indian-king-tavern-233-king-highway-east-haddonfield-camden-county-nj>

# Background: Hazard Vulnerability Assessment in the Haddonfield Master Plan

In 2021, Governor Murphy mandated a **Climate Change-Related Hazard Vulnerability Assessment (CCRVHA)** in Municipal Land-Use Law.

The CCRVHA process involves several steps, including the '**Current and Future Threats Analysis.**'

## Steps involved in the CCRVHA

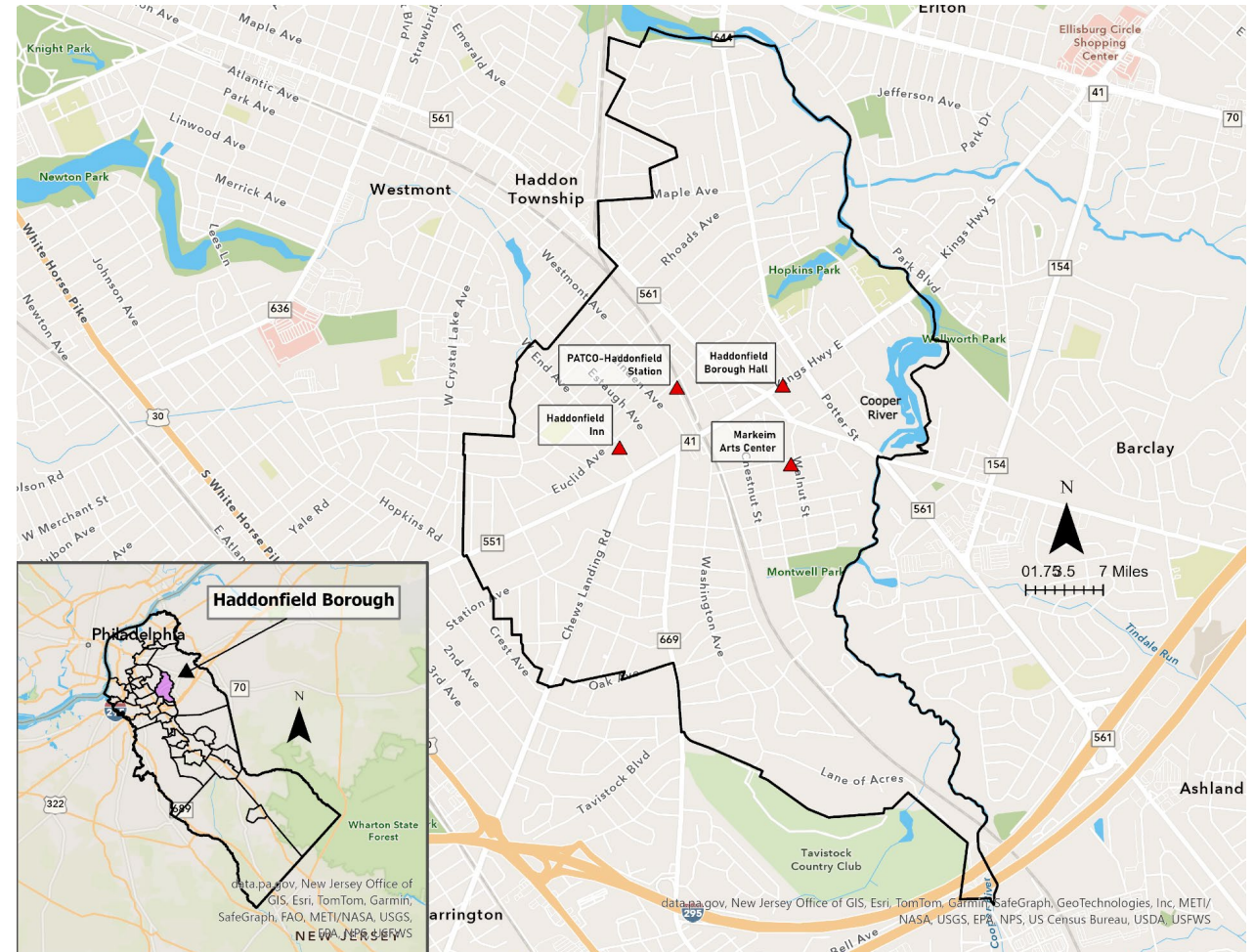
 <b>Current and Future Threats Analysis</b>	Analyze threats and vulnerabilities associated with climate change-related natural hazards.
 <b>Build-Out Analysis</b>	Conduct a build-out analysis for future residential, commercial, industrial development and assess associated threats and vulnerabilities.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

### About this project

- Pennoni Associates is collaborating with Haddonfield Borough to prepare their 2024 Master Plan, which includes the CCRVHA.
- The New Jersey Climate Change Resource Center at Rutgers University, via the Climate Corps program, supports Pennoni Associates in analyzing public data for Step I of the CCRVHA.
- Data analysis is conducted using the NJ Adapt Suite of Tools provided by the NJRCC.
- A StoryMap is developed to communicate key environmental hazards to the Haddonfield community effectively.

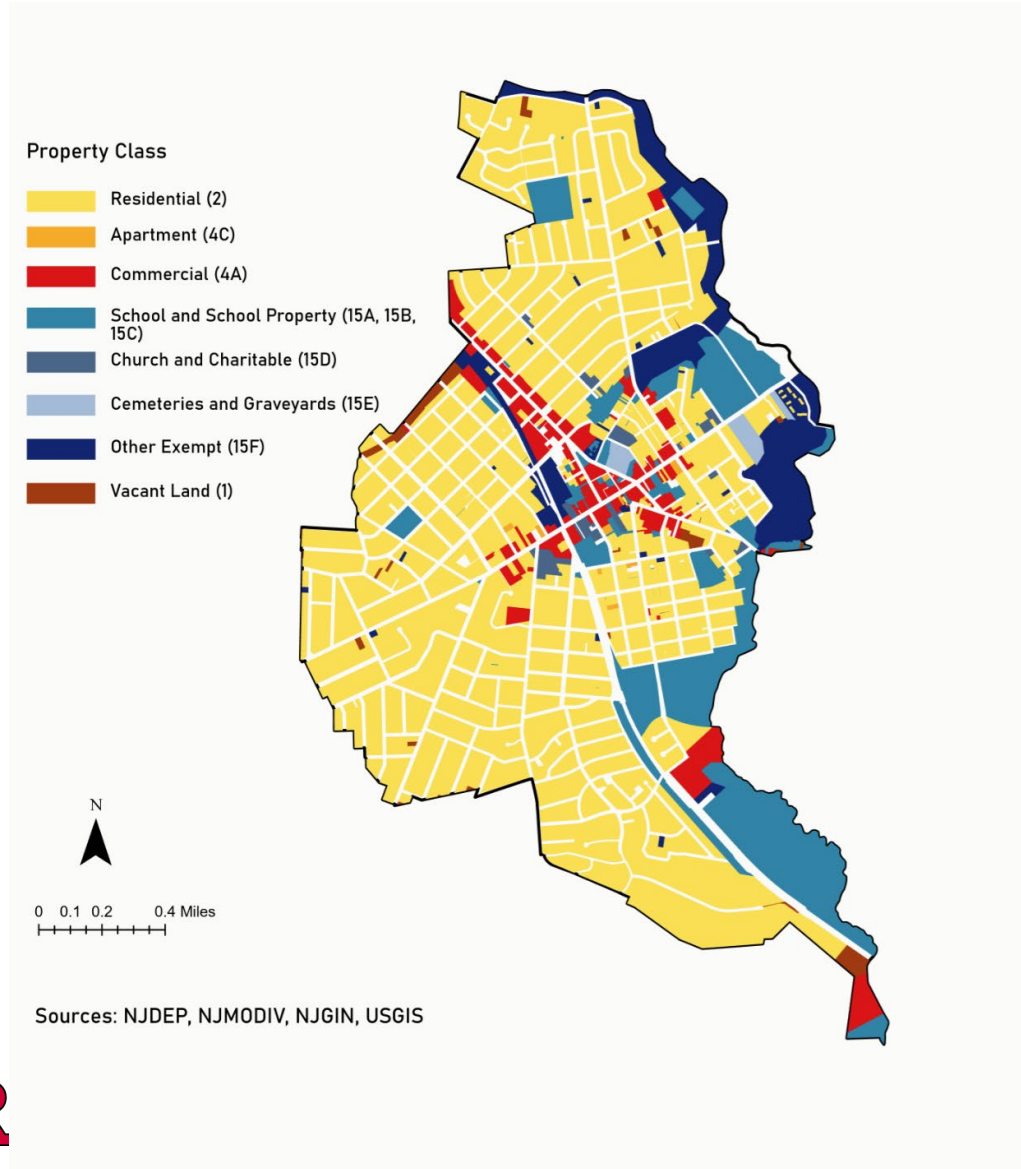
# About Haddonfield

- Located in Camden County, approximately 5 miles from Philadelphia.
- Spans across three square miles, with its 17 drainage areas discharging into the Cooper River and its tributaries.
- Relatively low poverty rate of 2%.
- Median income is \$159,323.
- Over 79% of residents hold at least a Bachelor's degree.
- Median Rental Cost per month is \$1,084.
- Median House Value is \$558,300.



Source: NJGIN Portal

# Land-Use



Around 90% of Haddonfield consists of developed land, primarily used for single-family residential housing.

Land-Use	# of parcels
Residential (2)	4,112
Apartment (4C)	12
Commercial (4A)	279
School and School Property (15A, 15B, 15C)	103
Church and Charitable (15D)	28
Cemeteries and Graveyard (15E)	3
Other Exempt (15F)	40
Vacant (1)	34

Source: NJ [MOD-IV property tax data](#)



# Climate Change and Natural Hazards in New Jersey

The New Jersey Department of Environmental Protection has released the following data concerning climate change within the state:



## TEMPERATURE

in NJ has increased 3.9°F since 1895.

Heat-related hospitalizations in NJ increased 156% from 2004 to 2013.



## ANNUAL PRECIPITATION

in NJ is expected to increase from 6% to 9% by 2100.



## SEA-LEVEL RISE

could meet or exceed 1.4 feet by 2050. There is a 50% chance.



## TROPICAL STORMS

have the potential to increase in intensity due to the warmer atmosphere and oceans that will occur with climate change.



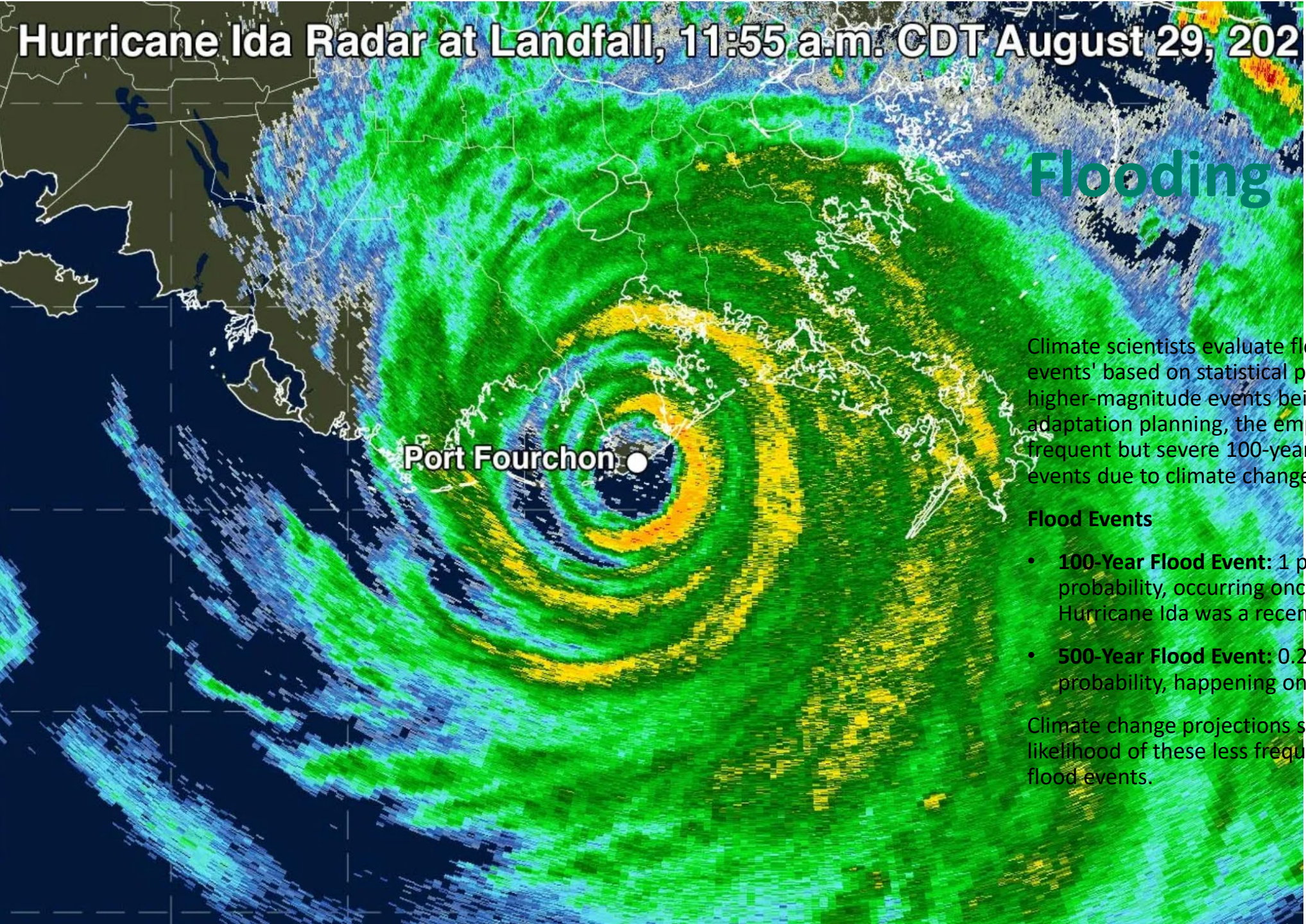
## EXTREME RAIN

in the Northeast increased in amounts by 55% between 1958 and 2016.



## BIRD SPECIES

are vulnerable to climate change. 29% of all NJ birds will be affected.



# Hurricane Ida Radar at Landfall, 11:55 a.m. CDT August 29, 2021

## Flooding

Climate scientists evaluate floods through 'flood events' based on statistical probability, with higher-magnitude events being less likely. In adaptation planning, the emphasis is on less frequent but severe 100-year and 500-year flood events due to climate change.

### Flood Events

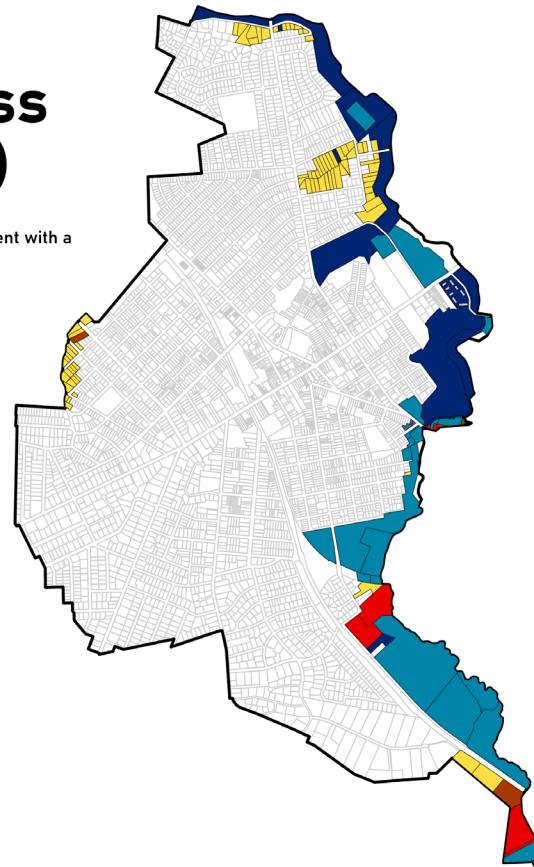
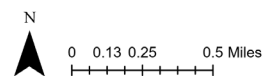
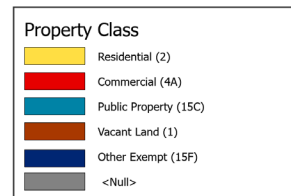
- **100-Year Flood Event:** 1 percent annual probability, occurring once every 100 years. Hurricane Ida was a recent example.
- **500-Year Flood Event:** 0.2 percent annual probability, happening once every 500 years.

Climate change projections show increased likelihood of these less frequent, high-magnitude flood events.

# Tax Parcel-Wise Flood Risk: 100-Year Flood Event

## Flood Exposure by Property Class (100-Year Event)

Under a moderate emissions scenario, when a flood event with a 1 percent annual probability of occurring transpires, the highlighted tax lots are at risk of flooding.



Sources: NJDEP, NJMODIV, NJGIN, USGIS

For each property class, the table below presents the total area of flooded parcels for each land-use, along with the total value of improvements and land. Improvement values represent the worth of physical structures on the property, while land values signify the value of the land itself.

Estimating the total damage value in dollars is helpful in projecting the potential **fiscal impact** on the municipality.

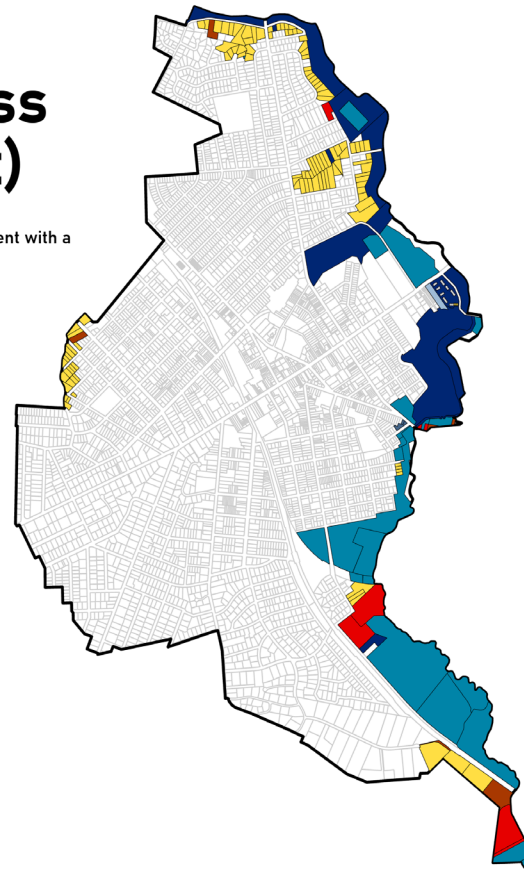
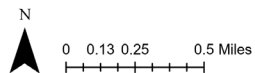
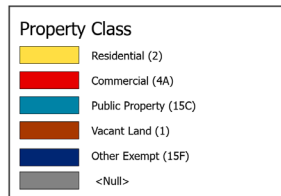
Property Class	# Parcels Flooded (% within property class)	Area Flooded per Property Class (in acres)	Value of Flooded Land Parcels	Value of Flooded Improvement
Residential (2)	74 (1.7%)	43	\$24,250,500	\$23,439,000
Commercial (4A)	6 (2%)	19	\$1,004,700	\$997,700
School and School Property (15A, 15B, 15C)	21 (23%)	136	\$34,935,200	\$5,872,500
Church and Charitable (15D)	2 (7%)	0.5	\$334,300	-
Other Exempt (15F)	14 (35%)	103	\$9,681,500	\$1,193,600
Vacant Land (1)	4 (12%)	5	\$506,200	-
<b>Total</b>	<b>121 (2.6% out of the total # parcels in each land-use)</b>	306.5 acres at flood-risk	<b>\$70,712,400</b>	<b>\$31,502,800</b>

Source: NJ [MOD-IV property tax data](#)

# Tax Parcel-Wise Flood Risk: 500-Year Flood Event

## Flood Exposure by Property Class (500-Year Event)

Under a moderate emissions scenario, when a flood event with a 0.2 percent annual probability of occurring transpires, the highlighted tax lots are at risk of flooding.



Sources: NJDEP, NJMODIV, NJGIN, USGIS

Property Class	# Parcels Flooded (% within property class)	Area Flooded per Property Class (in acres)	Value of Flooded Land Parcels	Value of Flooded Improvement
Residential (2)	106 (2.5%)	60	\$33,652,900	\$30,526,200
Commercial (4A)	8 (3%)	20	\$1,445,000	\$1,006,800
School and School Property (15A, 15B, 15C)	19 (21%)	136	\$35,014,500	\$5,872,500
Church and Charitable (15D)	1 (3.5%)	0.5	\$334,300	-
Cemeteries and Graveyards (15E)	1 (33%)	1.5	\$625,500	-
Other Exempt (15F)	11 (27.5%)	103	\$9,681,500	\$1,193,600
Vacant (1)	7 (20.5%)	6.5	\$880,900	-
<b>Total</b>	<b>153 (3.3 % out of the total # parcels in each land-use)</b>	<b>327.5 acres at flood-risk</b>	<b>\$81,634,600</b>	<b>\$38,599,100</b>

Source : NJ [MOD-IV property tax data](#)



# Extreme Precipitation

The table below illustrates projected rainfall amounts in Haddonfield for different storm events over a 12-hour period under a historical baseline and **two emissions scenarios**: moderate (RCP 4.5) and high (RCP 8.5).

Both scenarios anticipate increased rainfall compared to the baseline across storms of different likelihoods.

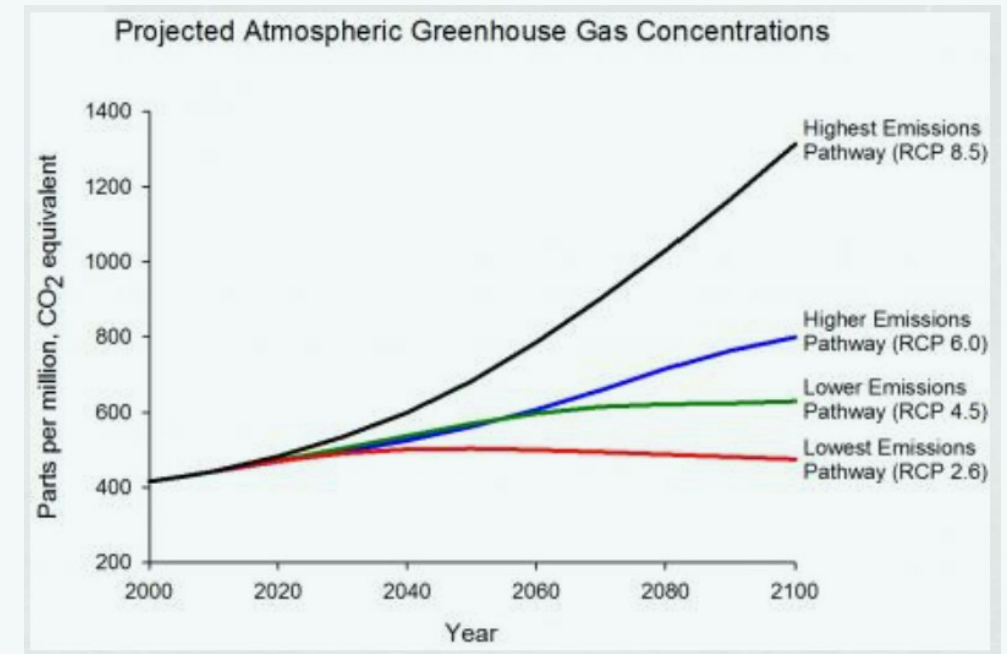
Storm Type	Baseline	Moderate Emissions, Mid-Century	Moderate Emissions, Late-Century	High Emissions, Mid-century	High Emissions, Late-Century
50% chance	3.30	3.50	3.60	3.63	3.83
20% chance	4.21	4.51	4.63	4.63	4.93
10% chance	4.99	5.39	5.54	5.49	5.89
4% chance	6.14	6.69	6.88	6.82	7.37
2% chance	7.13	7.85	8.06	7.92	8.63
1% chance	8.23	9.13	9.38	9.22	10.04

Rainfall is measured in inches.

## What are emissions scenarios?

Emission scenarios, represented by Representative Concentration Pathways (RCPs), depict potential trajectories for greenhouse gas concentrations.

Developed by the IPCC, RCPs forecast greenhouse gas and air pollutant concentrations until 2100. These trajectories consider various socio-economic, technological advancements, and climate policies aimed at reducing emissions. The four RCP scenarios are summarized below:

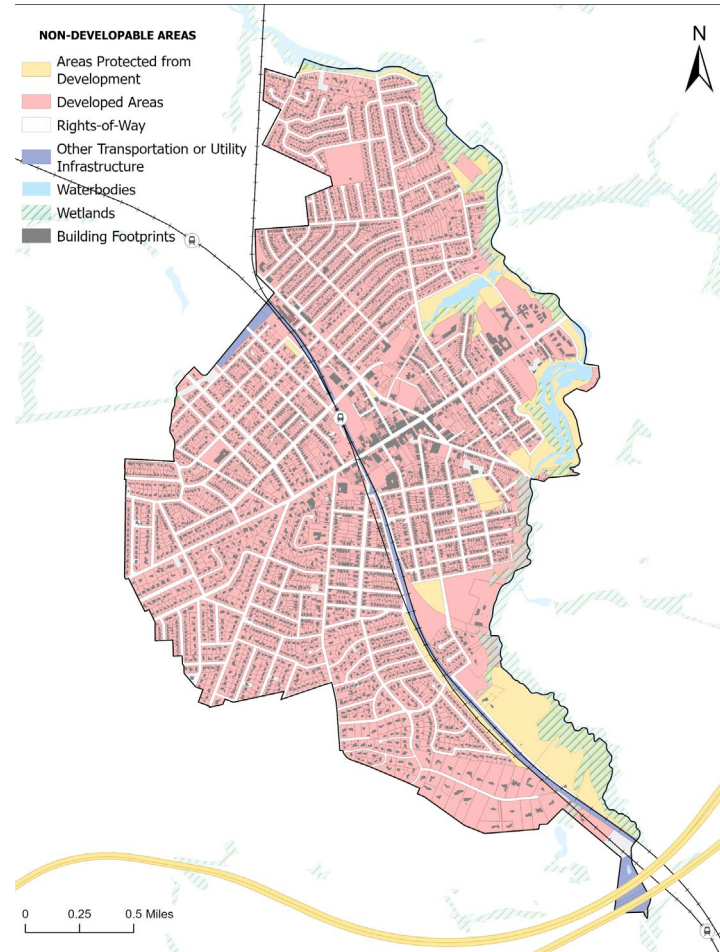


The image displays four distinct RCP trajectories. The highest, RCP 8.5, projects uncontrolled growth in greenhouse gas emissions throughout the century. In contrast, the lowest, RCP 2.6, anticipates emissions peaking between 2010 and 2020, followed by a decline. RCP 4.5 and RCP 6.0 represent moderate emissions pathways.

# Flash Flooding



*This map, prepared by Pennoni Associates, displays developed and impervious surfaces. It also highlights areas excluded from development under current zoning regulations in muted yellow.*



*The map illustrates developed and redevelopable regions in Haddonfield susceptible to flooding. This encompasses areas (i) intersecting 100-year Floodplains (violet-highlighted polygons with dark violet boundaries and diagonal lines), (ii) within 500 feet of Flash Flooding Areas of Concern (red-highlighted polygons with dark red boundaries and diagonal lines), and (iii) Flash Flooding Areas of Concern (red-highlighted ovals).*

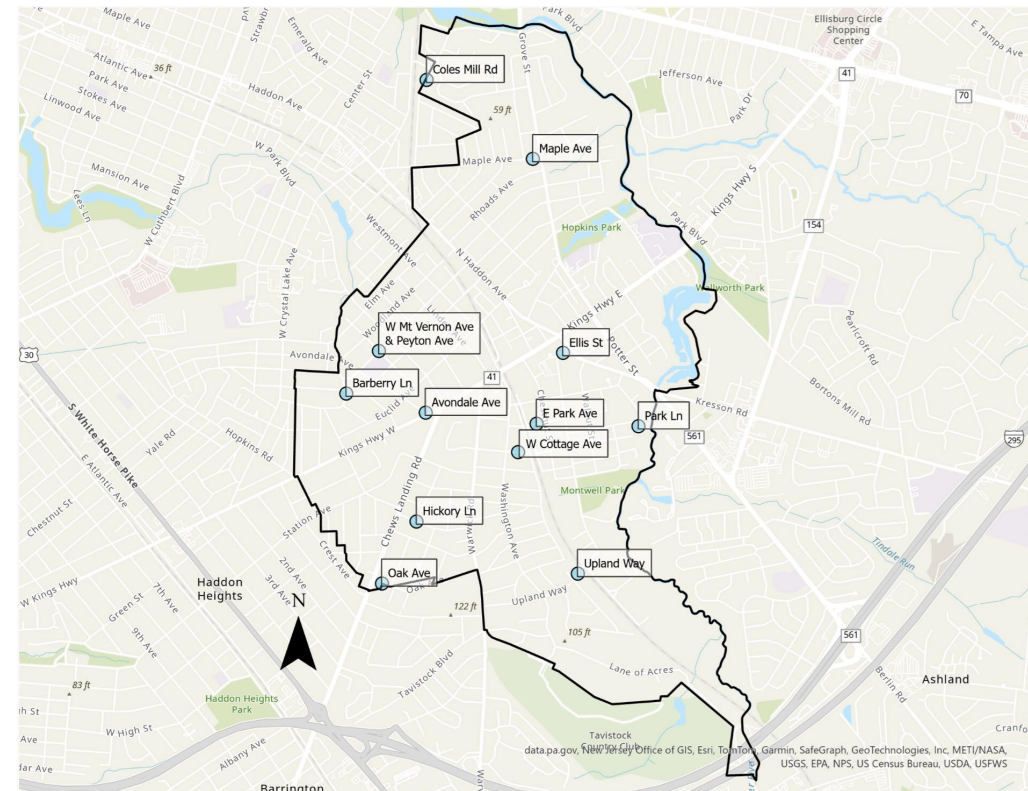
Flash flooding, often triggered by intense thunderstorms, occurs suddenly and catches people off guard due to its rapid onset. The probability of flash flooding rises with extreme precipitation events. Haddonfield faces vulnerability to flash floods in various developed and developable, and redevelopable areas.

# Flash Flooding Areas of Concern

The areas shown in the map to the right are prone to flooding due to factors or a combination of factors like high volumes of runoff or tailwater surcharging from nearby water bodies or lack of adequate drainage infrastructure.

*Pennoni Associates* proposes the following infrastructure improvements and Green Infrastructure solutions for the Areas of Concern and estimates the costs for implementing them:

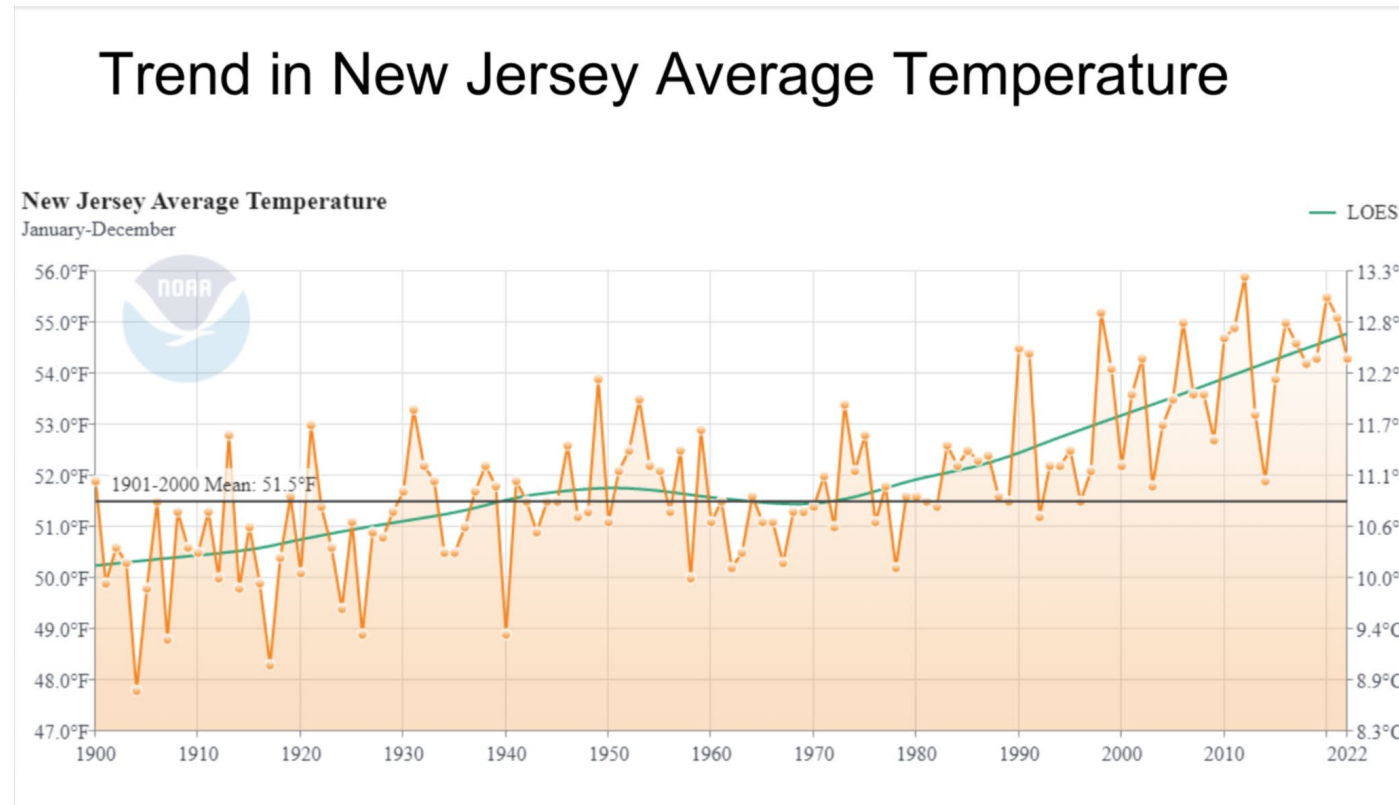
Problem Area	Estimated Cost	Type of Improvement (Green/ Drainage/Other)
Oak Avenue	\$50,000	Paving/regrading
W Cottage Avenue	\$100,000	Paving/regrading
East Park Avenue	\$363,000	Dainage
Park Lane	\$58,300	Green/regrading
Upland Way	\$673,750	Drainage
Coles Mill at Grove Street	\$100,100	Green



Source: *Pennoni Associates (2022), Stormwater Drainage Study and Green Infrastructure Plan for Haddonfield Borough*

# Extreme Heat

New Jersey is experiencing accelerated warming, surpassing the global average of 2.0°F (1.1°C) and the Northeast regional average of 2.7°F (1.5°C). Heatwaves are expected to increase in frequency and duration by 2050 (NJDEP, 'Climate Change and its Impacts'). The bar chart depicts the upward trend in New Jersey's average summer temperatures from 1900 to 2022, measured in °C, indicating a rise over the past century.



Source: NJCCRC using NOAA/National Centers for Environmental Information data

# Impervious Coverage

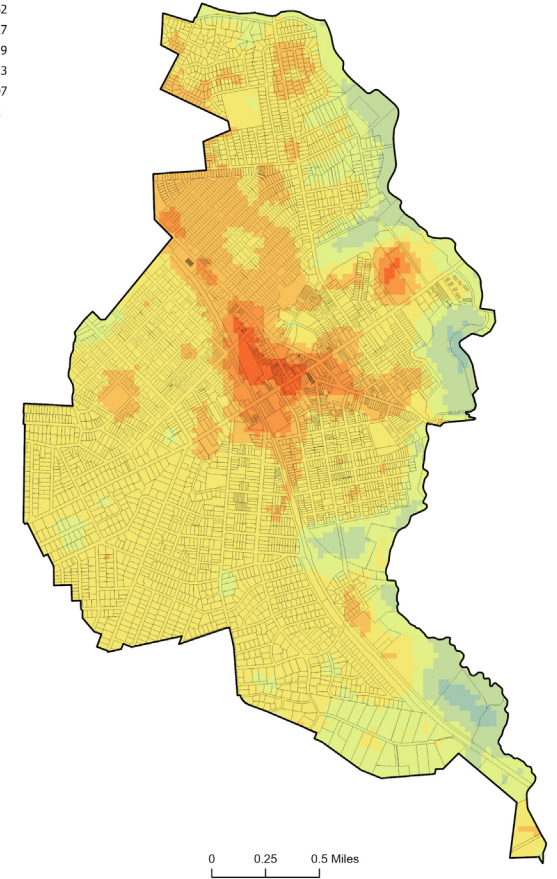
Building Coverage  
 Impervious Coverage  
 Parcel Boundaries



Much of Haddonfield is developed, having a high proportion of impervious surface coverage, making it vulnerable to heat waves. The building coverage and impervious coverage within Haddonfield can be seen in the map on the left, prepared by Pennoni Associates as part of the Build-Out Analysis for the CCRHVA.

Land Surface Temperature (Fahrenheit)

127 - 162  
 119 - 127  
 113 - 119  
 107 - 113  
 102 - 107  
 97 - 102  
 92 - 97  
 87 - 92  
 81 - 87  
 48 - 81



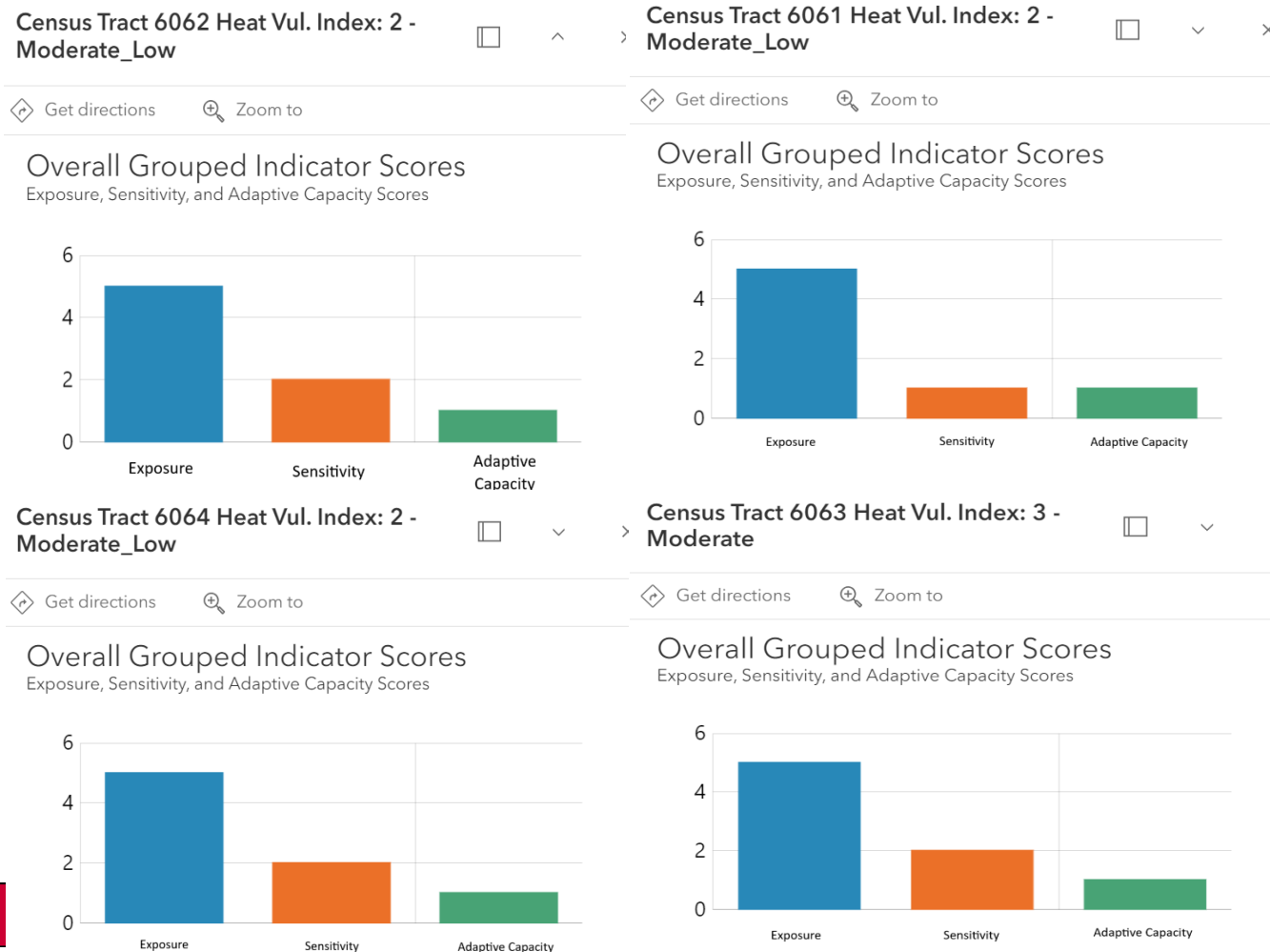
The central part of Haddonfield, consisting of the PATCO Haddonfield Station with its rapid transit lines and a concentration of commercial establishments, has a high proportion of impervious surface, along with a heightened transportation activity. Consequently, as the map below shows, the Land Surface Temperature in the borough for the year 2022, is higher in the central part compared to the rest of Haddonfield.

# Haddonfield's Heat Vulnerability Index

Haddonfield's four census tracts rank highest in Exposure due to prevalent environmental stressors. Following Exposure, Sensitivity and then Adaptive Capacity are prioritized. Despite high Exposure, positive socio-economic factors mitigate impact, resulting in a lower Heat Vulnerability Index (HVI) than Camden County.

## Heat Vulnerability Index Indicators

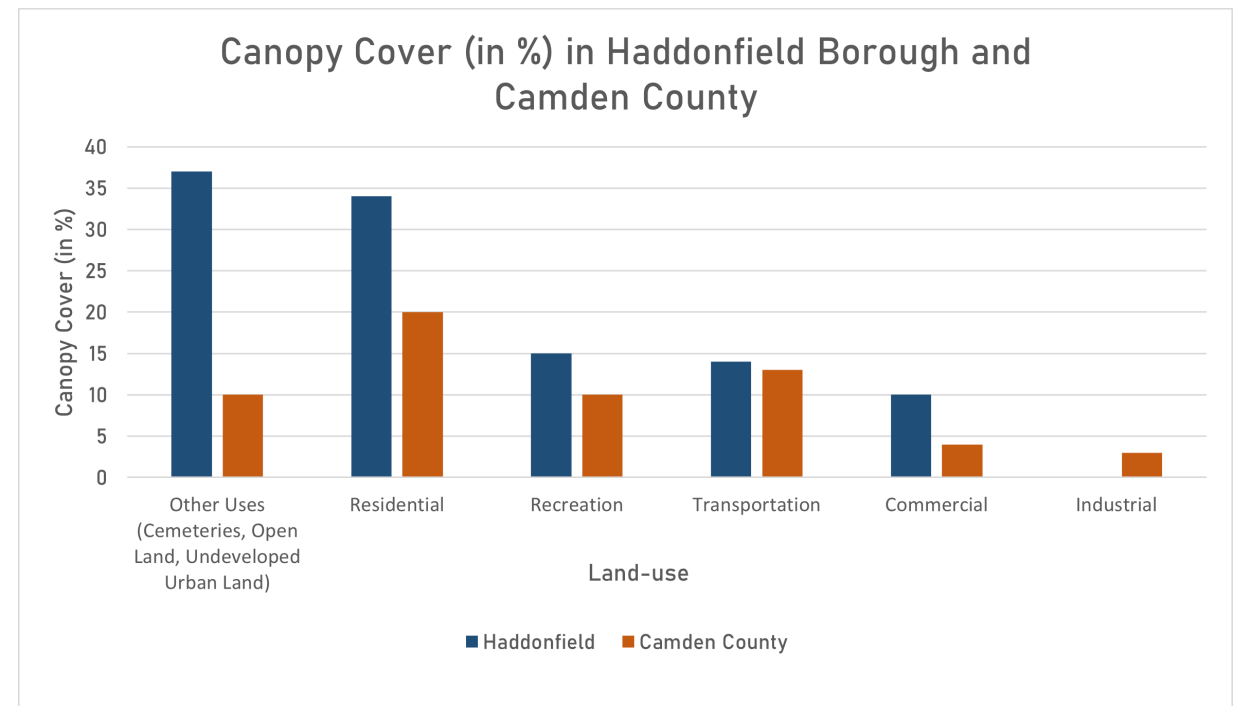
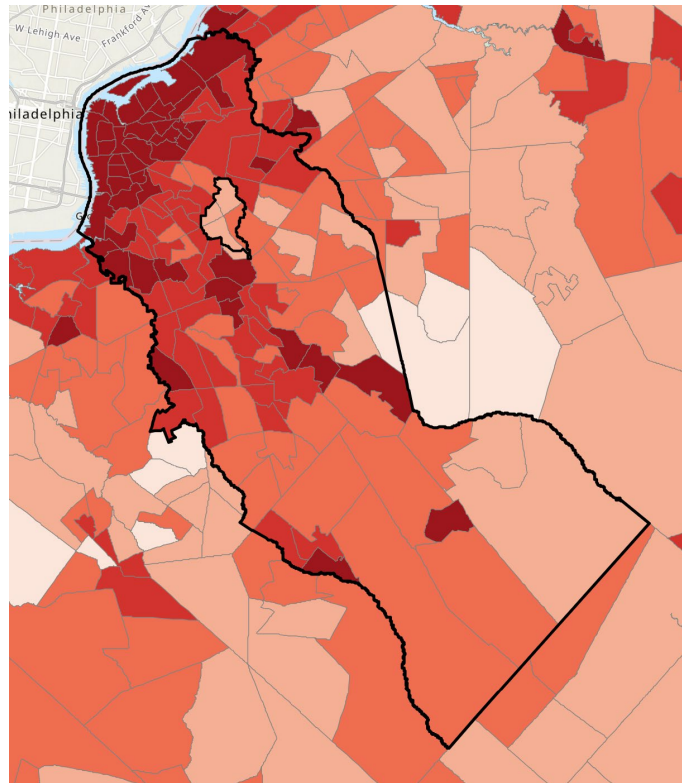
- **Exposure:** Represents environmental stressors contributing to adverse health outcomes. Sub-indicators include Impervious Cover Ratio, PM2.5 Concentration, Ozone Exceedance Days, and Summer Average Temperature Normals.
- **Sensitivity:** Reflects individuals' and communities' susceptibility to extreme heat. Sub-indicators include Population Below 5 Years, Disability Rate, Homes Built Before 1960, Outdoor Occupation, Living Alone, Asthma, Diabetes, and Heart Disease Prevalence.
- **Adaptive capacity:** Signifies the ability to respond to extreme heat. Sub-indicators include Poverty Rate, Unemployment Rate, Linguistic Isolation, Education Level, Non-White Population, and Health Insurance Coverage.



# Haddonfield's HVI Compared to the Rest of Camden County

Overall, Haddonfield's HVI remains relatively lower compared to Camden County.

This can be partly attributed to Haddonfield having a higher canopy cover in each land use, compared to the rest of the county, contributing to reducing the community's vulnerability to extreme heat. **The canopy cover of Haddonfield compared to Camden County within each type of land-use category can be seen below.**



*Climate Snapshots, New Jersey Climate Change Resource Center*

# Conclusion

- Haddonfield exhibits lower susceptibility to natural hazards compared to other parts of New Jersey and the Northeastern region, **yet the impacts of recent flash floods has been alarming.**
- It is imperative for the borough to **enhance its stormwater system** to address flooding during extreme storm and precipitation events.
- **Installing green infrastructure** is essential to bolster the community's flood mitigation capabilities.
- **Increasing pervious coverage**, particularly by expanding canopy cover, can mitigate both flood impacts and the effects of extreme heat.



# THANK YOU!

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<https://njclimateresourcecenter.rutgers.edu>

# Websites

- NJ ADAPT
  - <https://njclimateresourcecenter.rutgers.edu/nj-adapt/>
- NJ Climate Dashboards
  - <https://climatedashboards.rutgers.edu/>
- NJFloodMapper
  - <https://njfloodmapper.org>
- Municipal Snapshots
  - <https://climatesnapshots.rutgers.edu>
- NJ HazAdapt
  - <https://njhazardapt.rutgers.edu>
- NJ Forest Adapt
  - <https://njforestadapt.rutgers.edu>
- NJ Public Health Adapt
  - <https://njhealthadapt.rutgers.edu>
- NJ Adapt Local Climate-Related Hazard Planning Navigator
  - <https://njclimatenavigator.rutgers.edu/localplanning>