Climate Change Vulnerability Study and Resilience Plan Update

Public Service Law (PSL) § 66(29) – PSC Case 22-E-0222

O&R Climate Resilience Working Group
July 11, 2024

DRAFT for working group discussion purposes only

AGENDA

- New York State Climate Impacts Assessment (NYSERDA)
- Environmental Justice Policy Statement Update
- Meteorology Update for Orange and Rockland Region
- Resilience Plan Update: Next Steps & Key Dates

The New York State Climate Impacts Assessment: A Primer

Orange & Rockland Utilities

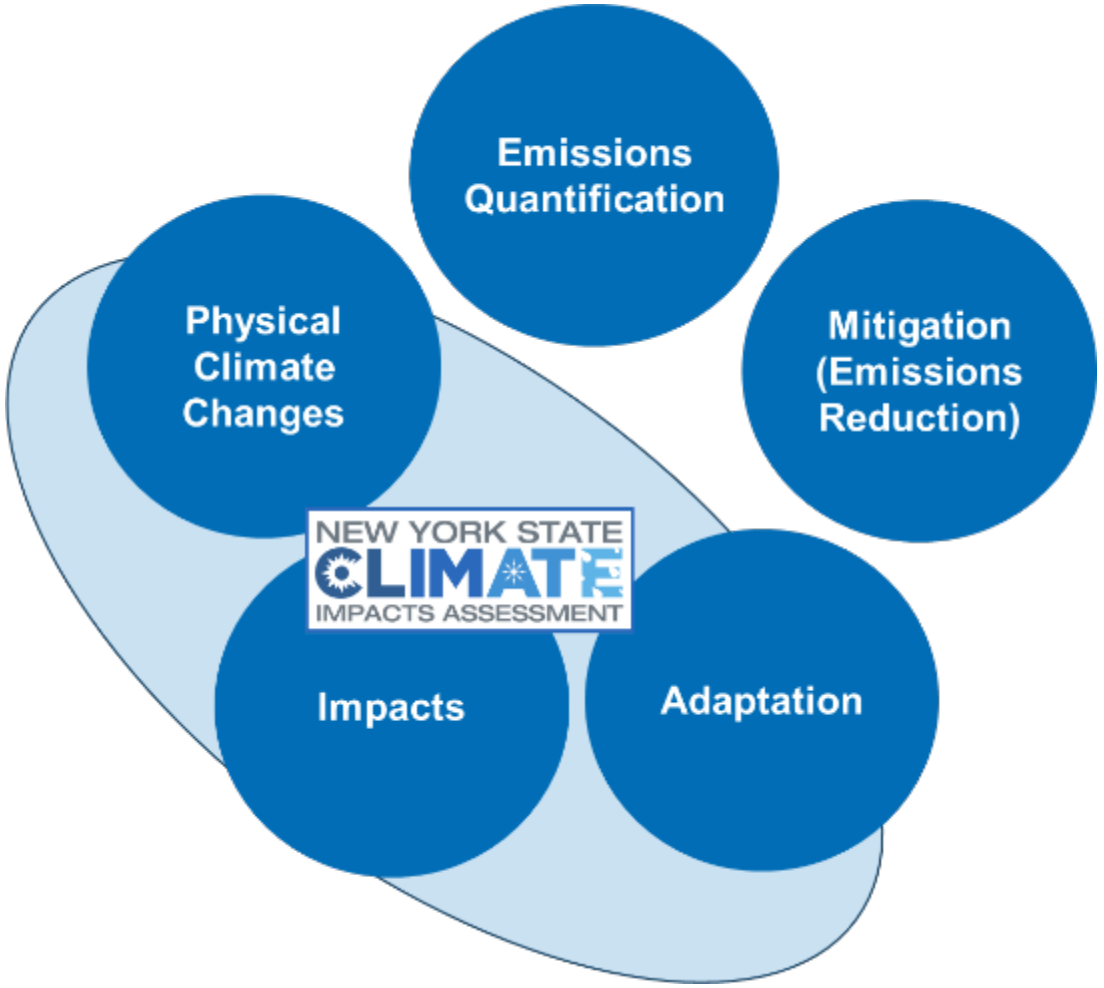
July 11, 2024

- What is it?
  - What information does it provide?
  - Who developed it?
  - Can I trust it?
- What is available on the website?
- Case study examples

What Is the Assessment?

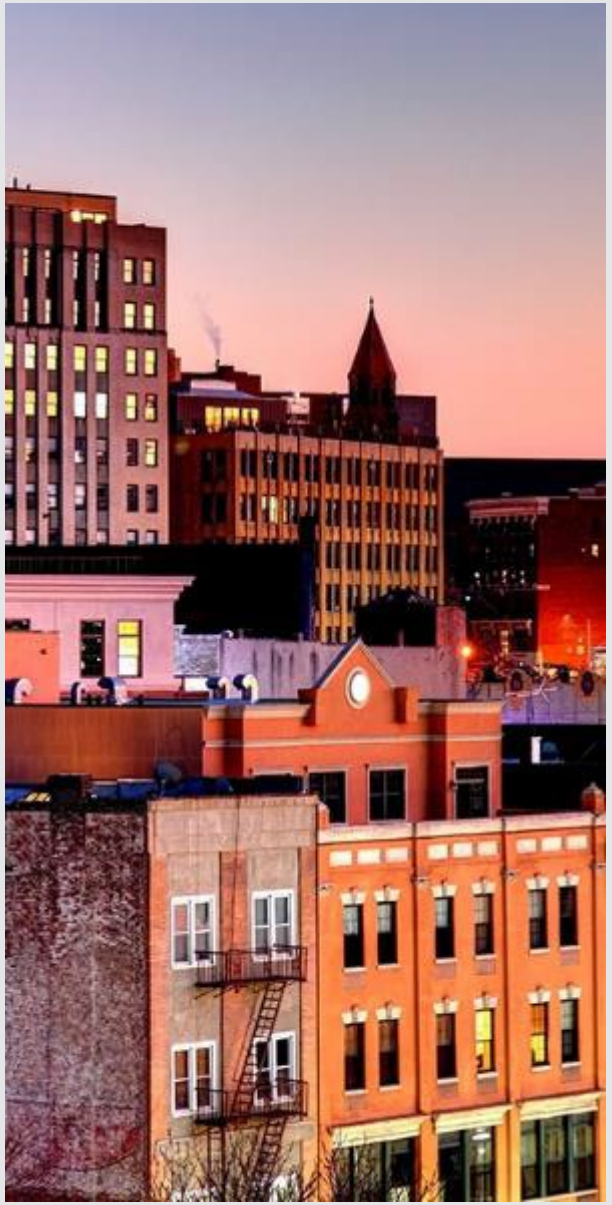
- A scientific investigation into how climate change is affecting New York State's communities, ecosystems, infrastructure, and industries

- Focused on how the climate will change, how those changes will impact the state, and how we can prepare for those impacts



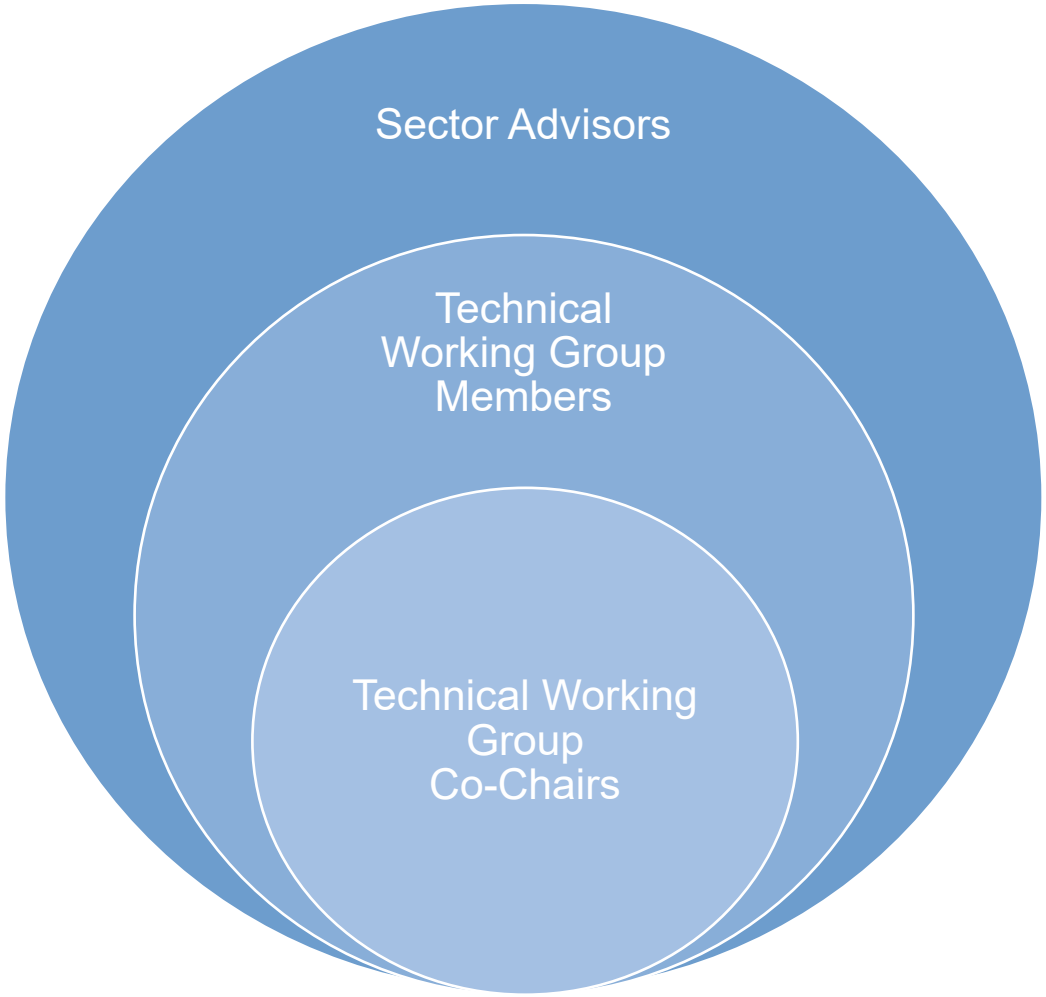
What Are the Assessment Goals?

- **Document** how our changing climate will affect New York State's many diverse communities, ecosystems, and industries.
- Help **foster informed decisions** around climate resiliency and preparedness.
- **Present data and information** to help New Yorkers understand, plan, and act.



Who Developed the Assessment?

- NYSERDA coordinated the assessment
- Academic institutions, science organizations, community leaders, industry representatives, and others have contributed
- Nearly **80 experts** from 60 organizations served as technical workgroup members
- More than **165 additional individuals** served as advisors
- Columbia University developed climate projections



Can I Trust It?

- The assessment was developed with credibility in mind by a team of national **climate science experts**, as well as **members of diverse communities** and constituencies from across New York State, other U.S. states, Indigenous communities, and Canada
- The technical report has been **peer reviewed** by experts in the field
- The assessment contains links and references to primary sources for **full transparency**

Website & Products

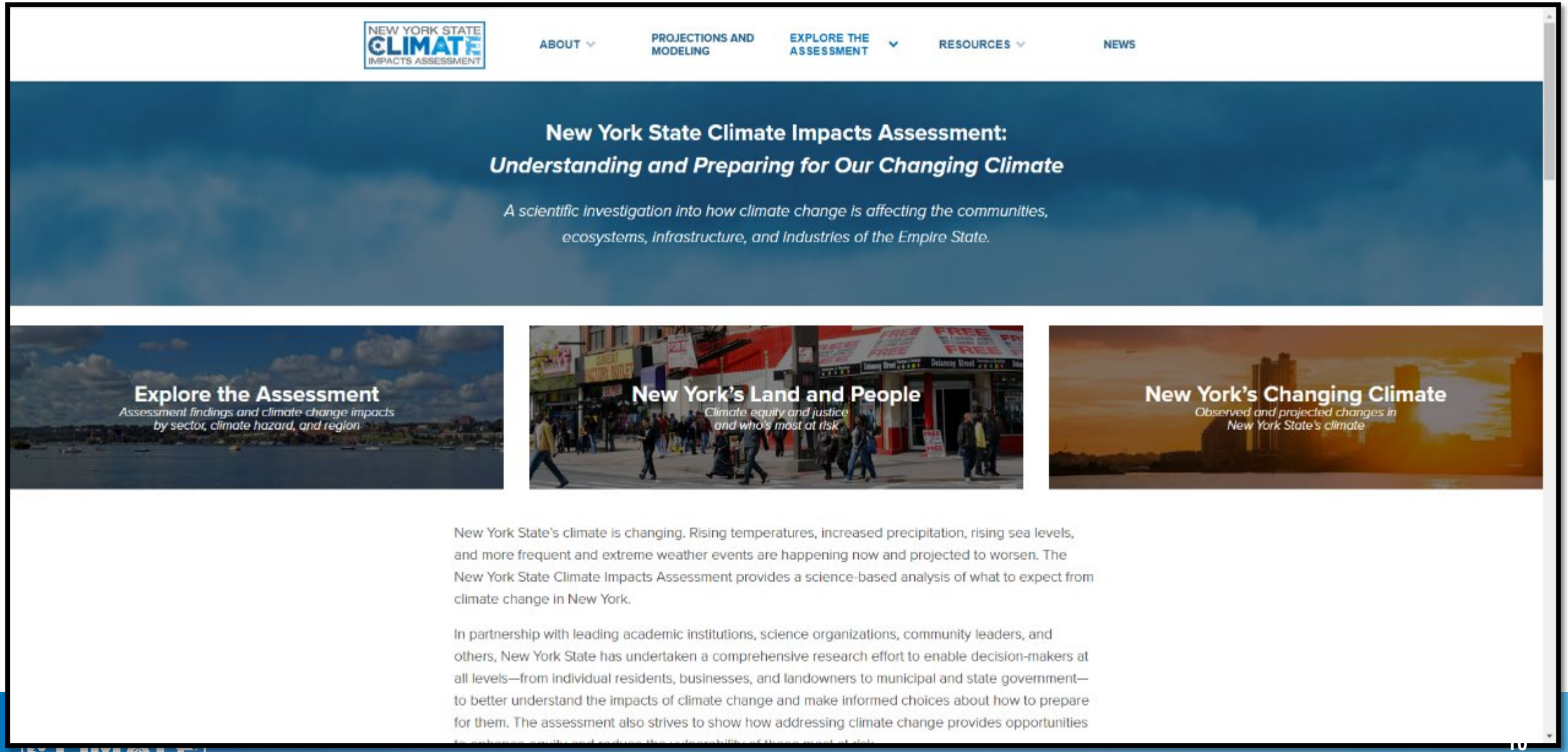
What Does the Assessment Include?

- Up-to-date **projections** of future climate conditions in New York State
- A peer-reviewed **technical report** on climate change impacts across eight sectors
- **Adaptation strategies** and **case studies**
- Accompanying **communication materials** designed for various audiences

Sectors

1. Agriculture
2. Buildings
3. Ecosystems
4. Energy
5. Human Health and Safety
6. Society and Economy
7. Transportation
8. Water resources

Website: https://nysclimateimpacts.org/



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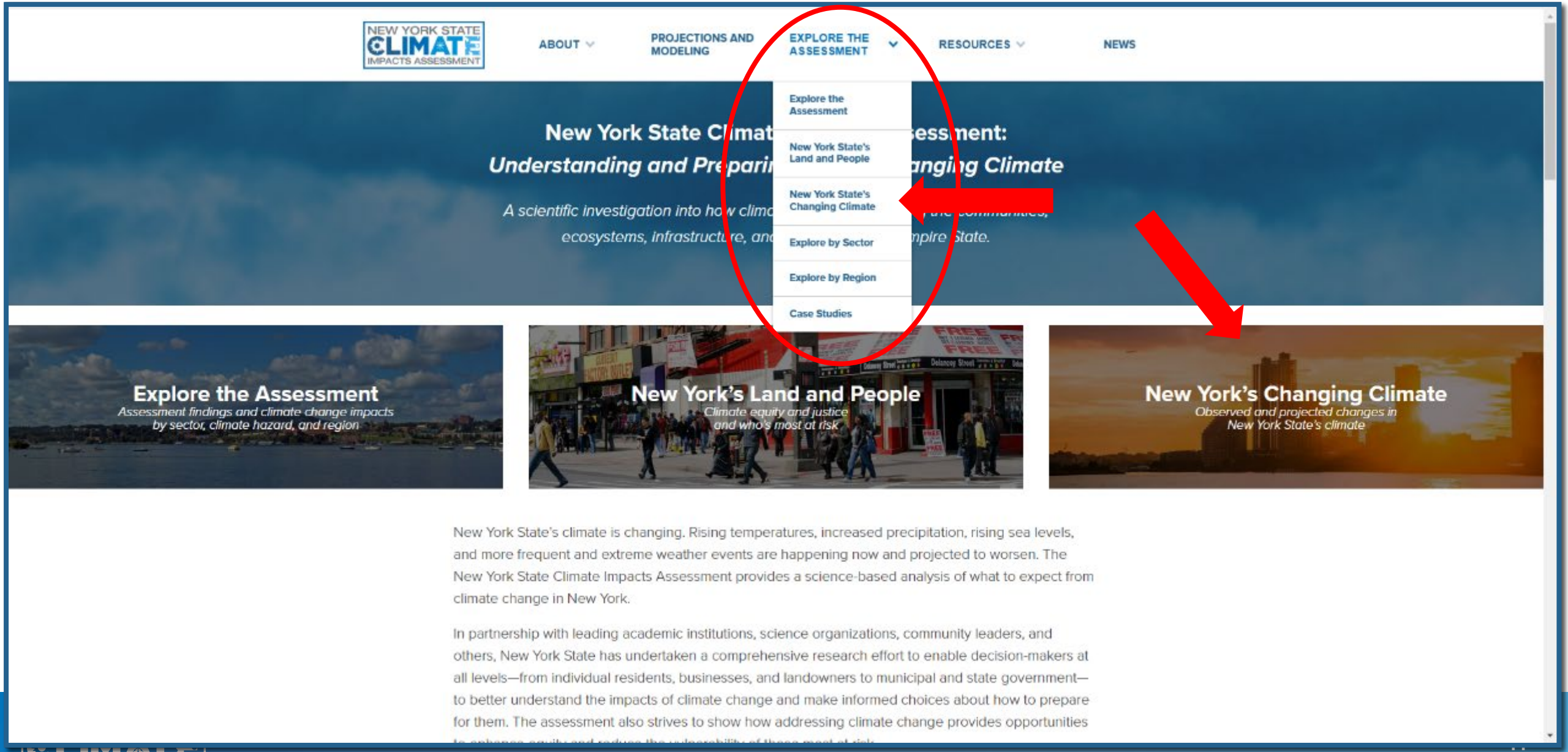
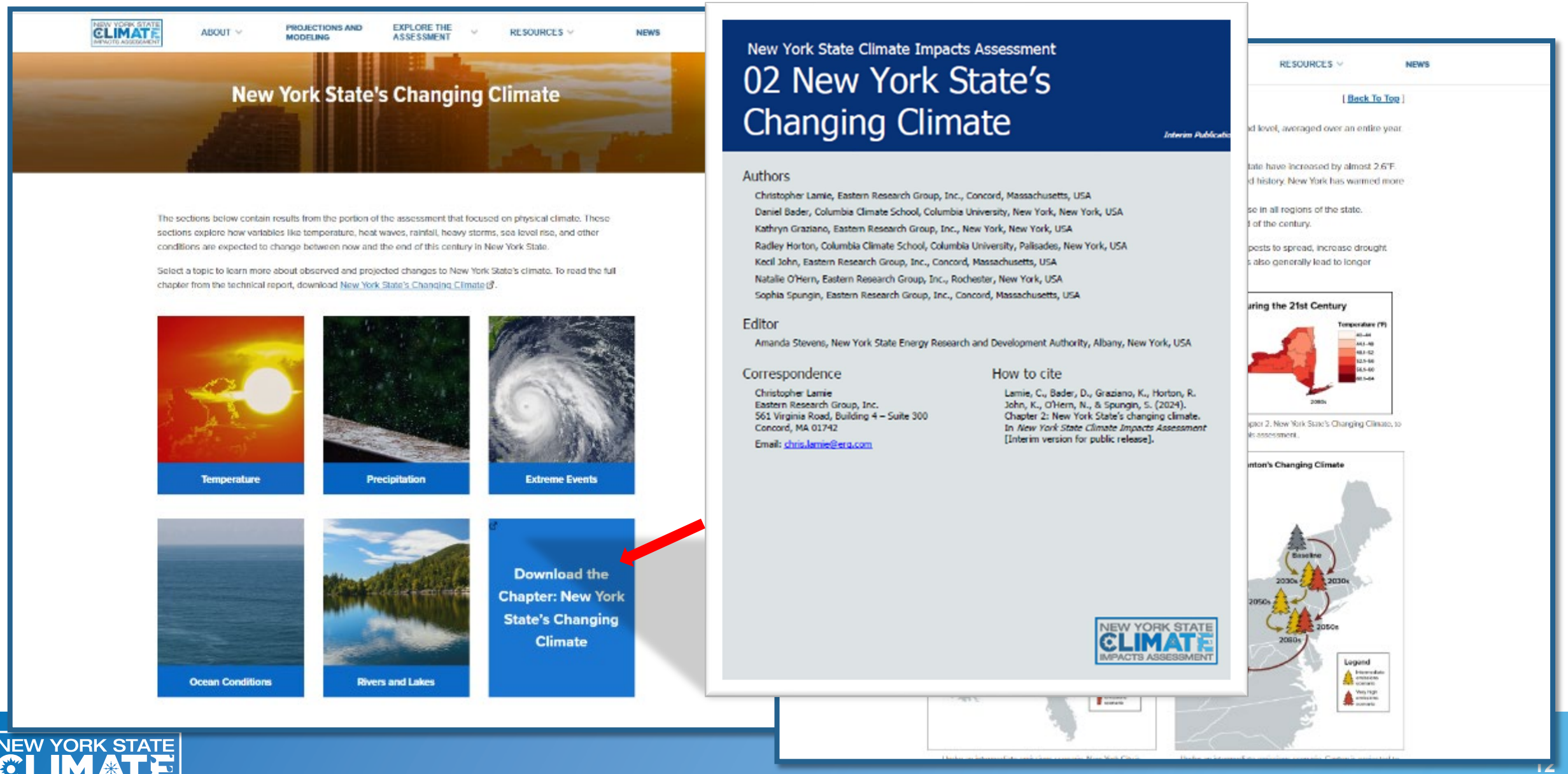
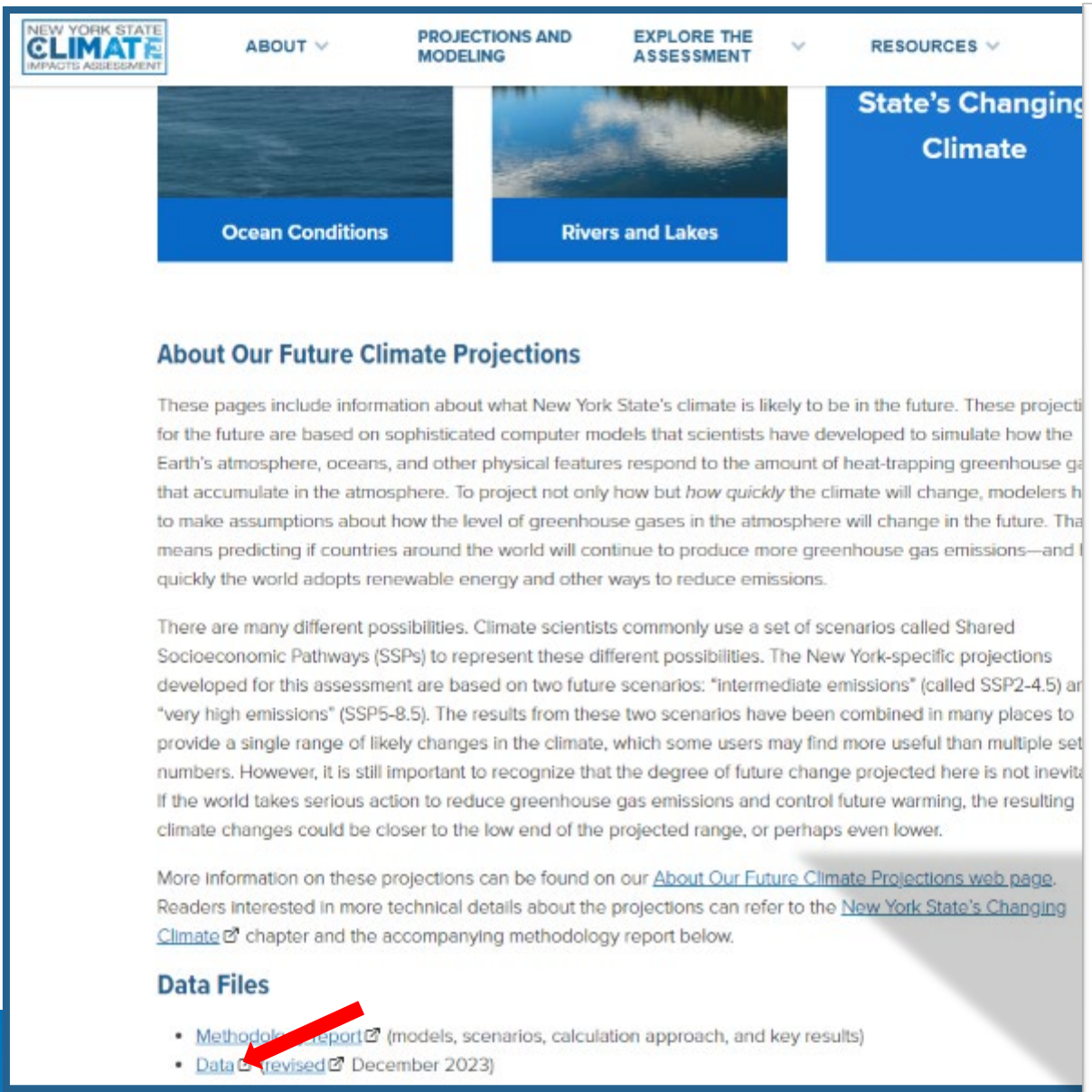
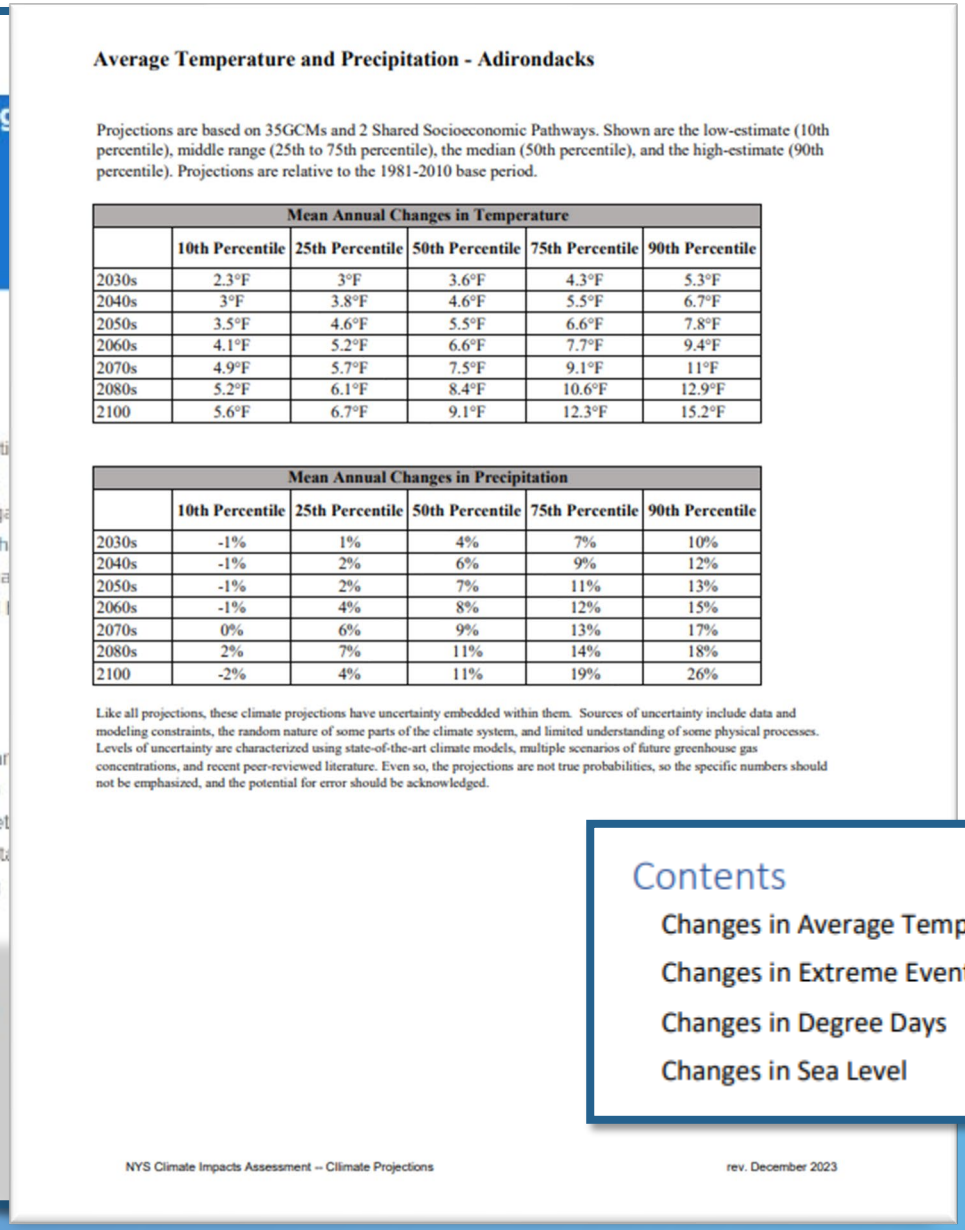


Climate Projections: Summary and Chapter



Climate Projections: Data Tables





Average Temperature and Precipitation - Adirondacks

Projections are based on 35GCMs and 2 Shared Socioeconomic Pathways. Shown are the low-estimate (10th percentile), middle range (25th to 75th percentile), the median (50th percentile), and the high-estimate (90th percentile). Projections are relative to the 1981-2010 base period.

Mean Annual Changes in Temperature

	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
2030s	2.3°F	3°F	3.6°F	4.3°F	5.3°F
2040s	3°F	3.8°F	4.6°F	5.5°F	6.7°F
2050s	3.5°F	4.6°F	5.5°F	6.6°F	7.8°F
2060s	4.1°F	5.2°F	6.6°F	7.7°F	9.4°F
2070s	4.9°F	5.7°F	7.5°F	9.1°F	11°F
2080s	5.2°F	6.1°F	8.4°F	10.6°F	12.9°F
2100	5.6°F	6.7°F	9.1°F	12.3°F	15.2°F

Mean Annual Changes in Precipitation

	10th Percentile	25th Percentile	50th Percentile	75th Percentile	90th Percentile
2030s	-1%	1%	4%	7%	10%
2040s	-1%	2%	6%	9%	12%
2050s	-1%	2%	7%	11%	13%
2060s	-1%	4%	8%	12%	15%
2070s	0%	6%	9%	13%	17%
2080s	2%	7%	11%	14%	18%
2100	-2%	4%	11%	19%	26%

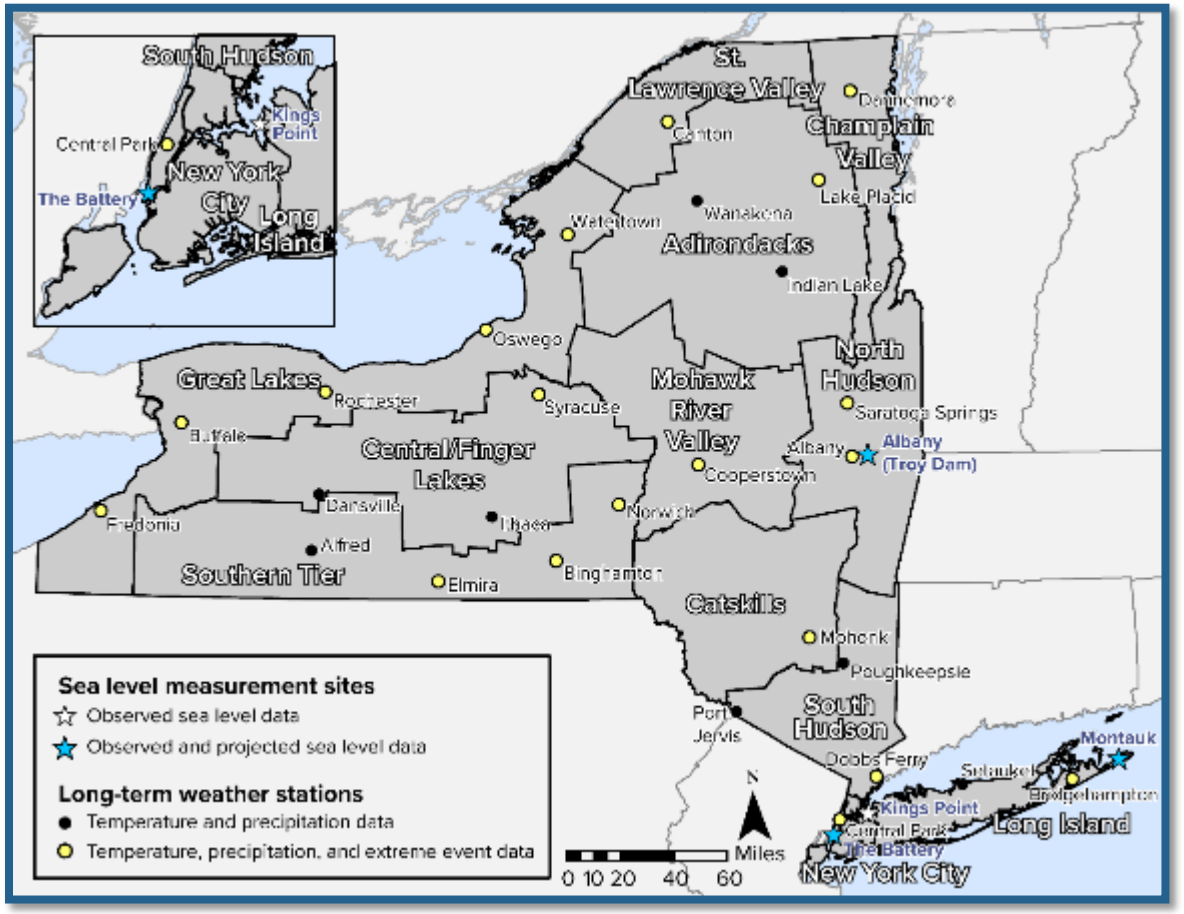
Like all projections, these climate projections have uncertainty embedded within them. Sources of uncertainty include data and modeling constraints, the random nature of some parts of the climate system, and limited understanding of some physical processes. Levels of uncertainty are characterized using state-of-the-art climate models, multiple scenarios of future greenhouse gas concentrations, and recent peer-reviewed literature. Even so, the projections are not true probabilities, so the specific numbers should not be emphasized, and the potential for error should be acknowledged.

NYS Climate Impacts Assessment -- Climate Projections rev. December 2023

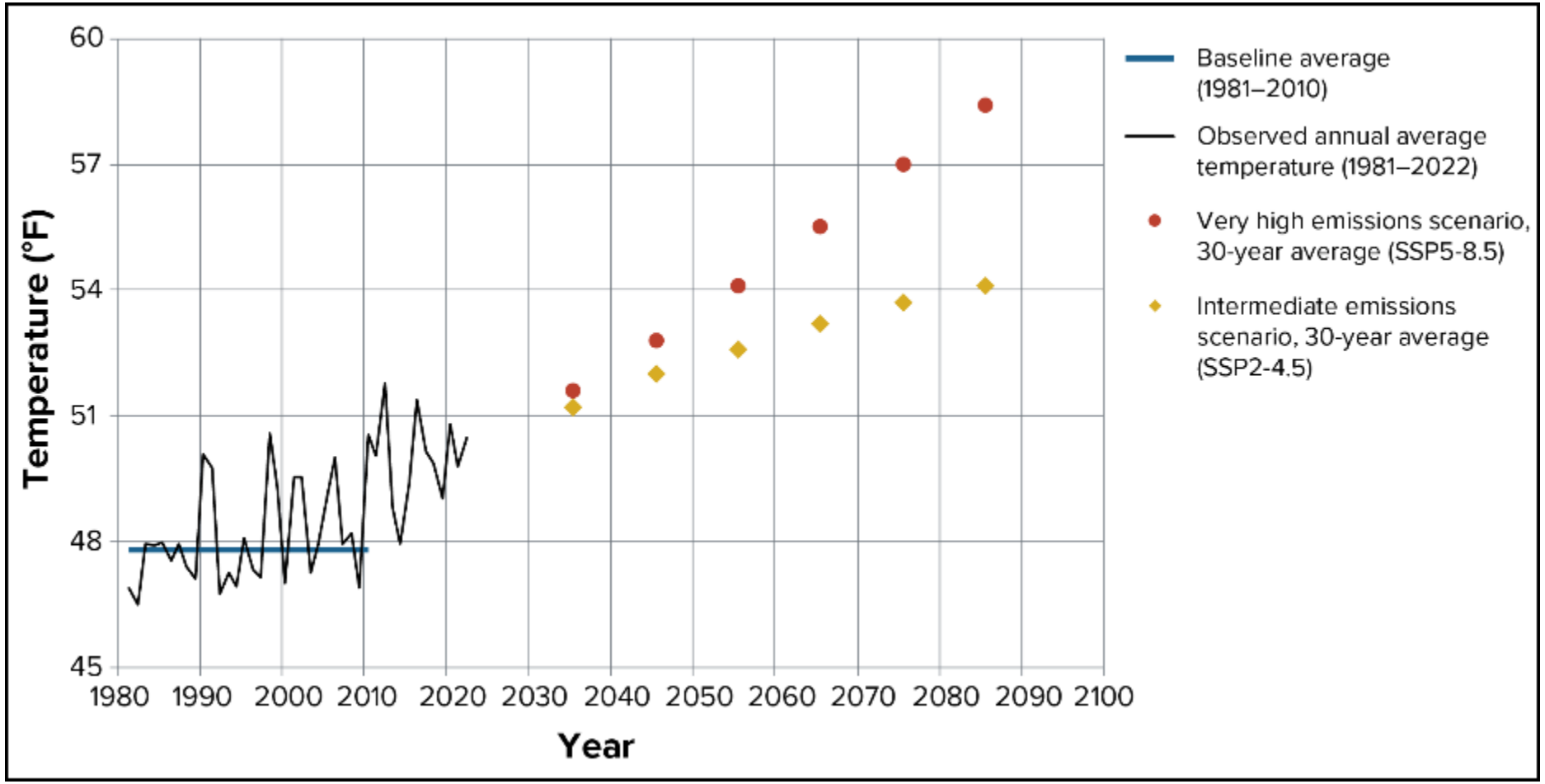
Contents

What Do the Projections Cover?

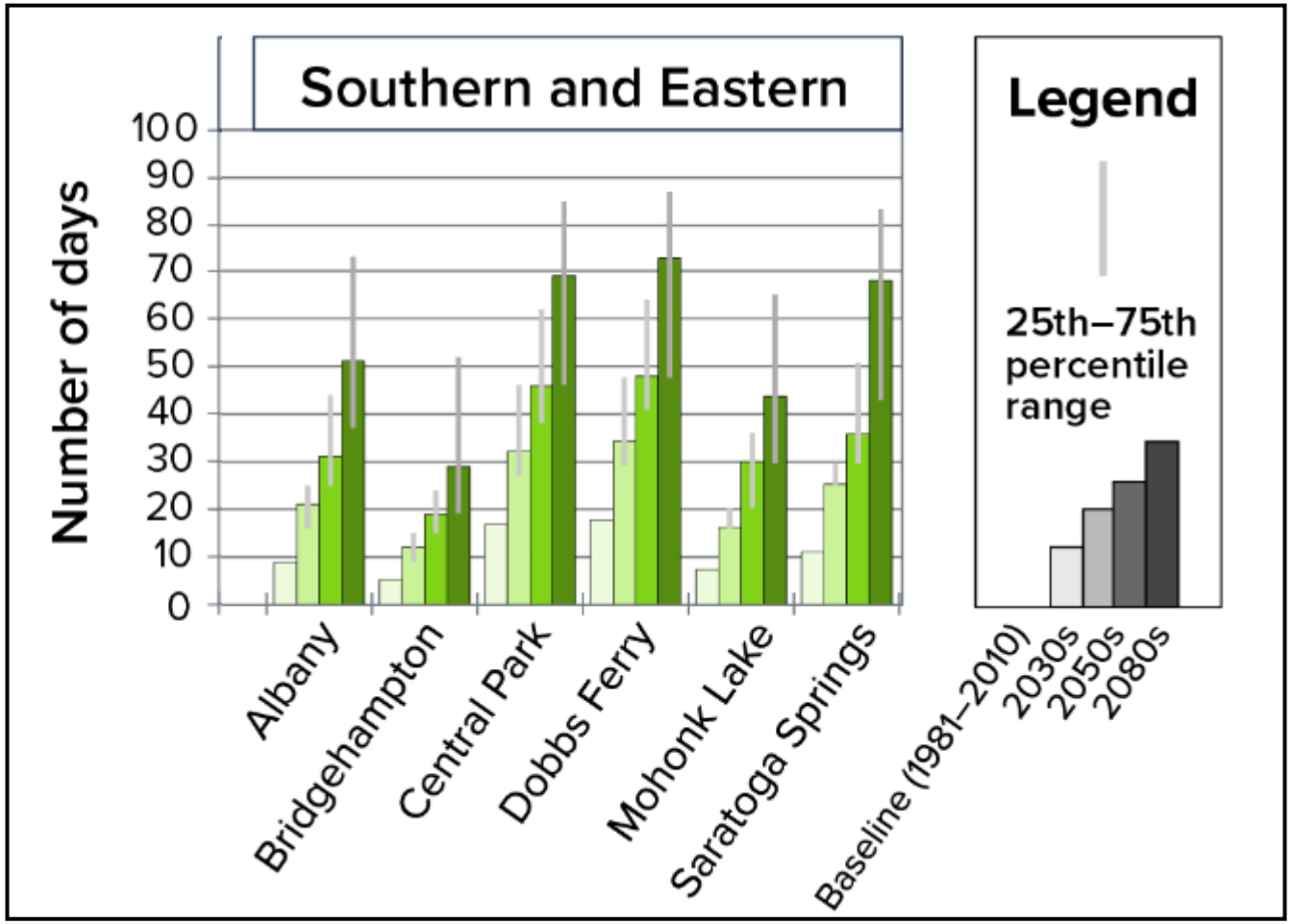
- Data are available for each region
  - Some data are available by station
- Average temperature and precipitation
  - Annual, seasonal, monthly
- Extreme events
  - E.g., Hot days, heat index, heat waves, cold days, heavy precipitation
- Degree days
  - i.e., heating and cooling degree days
- Sea level



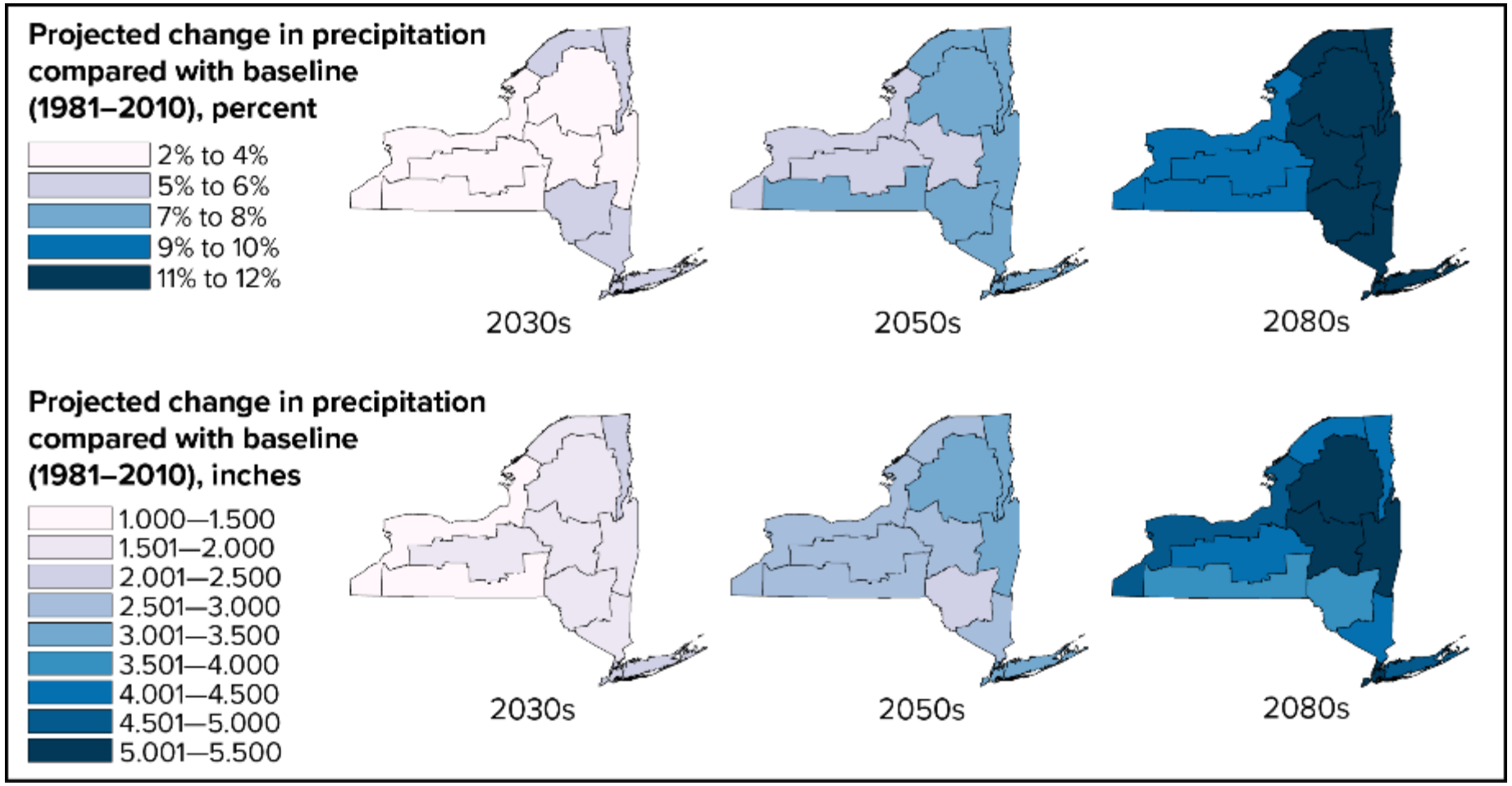
Projections – Annual Temperature



Projections – Days over 90

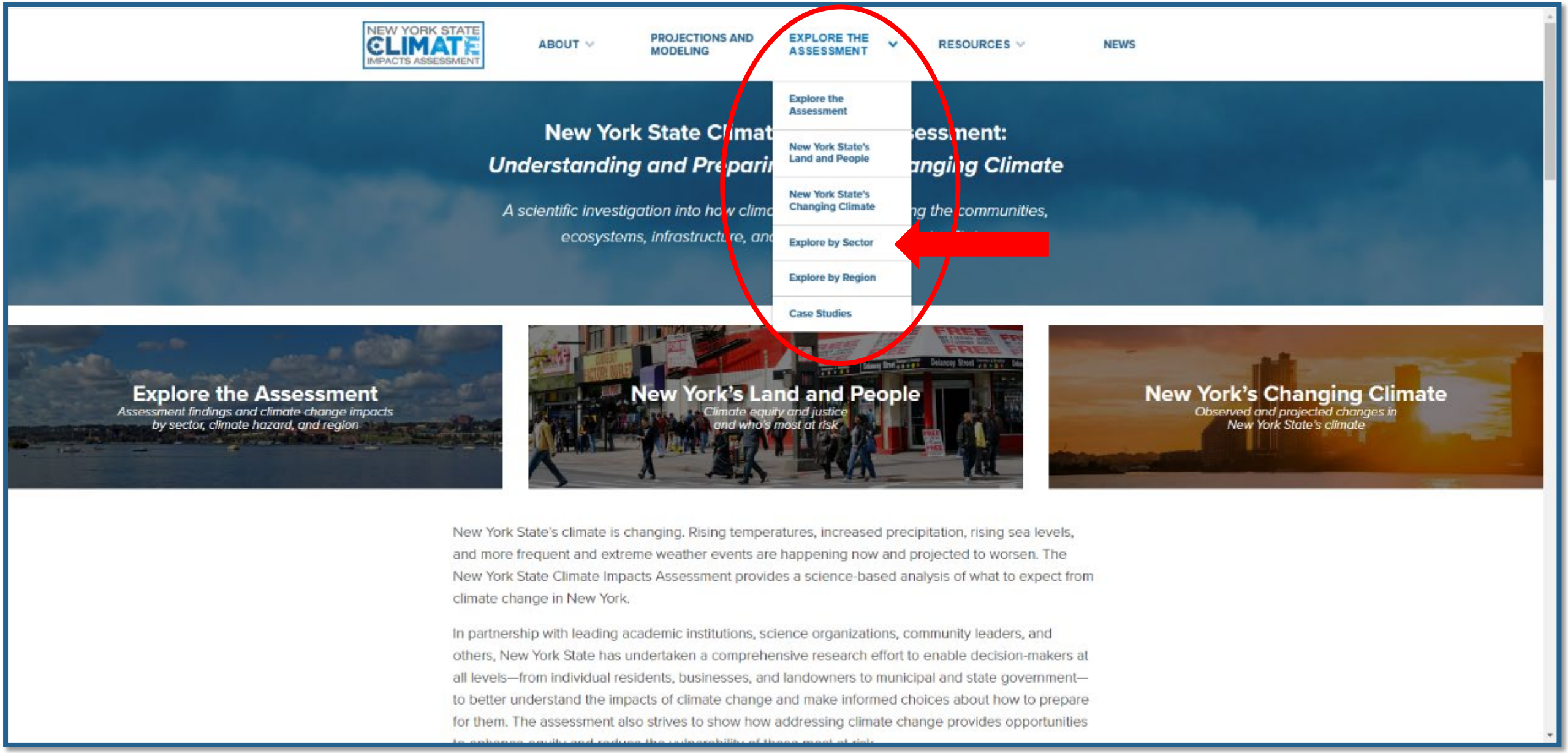


Projections – Annual Precipitation



Projections – Sea Level Rise

Station	2030s (inches)	2050s (inches)	2080s (inches)	2100 (inches)	2150 (inches)
Montauk	8–12	15–21	26–41	32–54	50–94
The Battery	7–11	14–19	25–39	30–50	47–89
Albany (Troy Dam)	7–10	12–17	21–35	25–46	41–82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Climate equity and justice and who's most at risk
New York's Changing Climate
Observed and projected changes in New York State's climate
New York State's climate is changing. Rising temperatures, increased precipitation, rising sea levels, and more frequent and extreme weather events are happening now and projected to worsen. The New York State Climate Impacts Assessment provides a science-based analysis of what to expect from climate change in New York.
In partnership with leading academic institutions, science organizations, community leaders, and others, New York State has undertaken a comprehensive research effort to enable decision-makers at all levels—from individual residents, businesses, and landowners to municipal and state government—to better understand the impacts of climate change and make informed choices about how to prepare for them. The assessment also strives to show how addressing climate change provides opportunities

Explore by Sector

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Explore by Sector

For the assessment, experts evaluated climate ch
sector below to learn more about current and pro
prepare for the impacts, community stories, and o

Agriculture

Human Health and Safety

Society an
Economy

Agriculture

New York State has a complex and diverse agricultural sector. Agricultural production statewide includes dairy and other livestock, field crops, vegetables, fruit, maple syrup, specialty crops, and aquaculture.

Agriculture is heavily exposed to and dependent on
eather and climate. Agricultural producers in New
k State already experience many challenges that
make it difficult to farm profitably and sustainably. As the climate changes, New York State's farmers face hazards such as too little or too much precipitation, rising temperatures, and increasing pressure from pests. These hazards can affect the quality and quantity of agricultural products, farm infrastructure, worker health, the supply chain, and more.

This chapter examines climate impacts on New York State's agriculture by commodity, identifies vulnerable populations and systems, explores adaptation strategies and opportunities for positive change, and summarizes emerging research needs.

Read the Chapter Summary

Read the Chapter

See the Contributors

Explore Case Studies

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Agriculture Chapter Summary

Agriculture is a vital industry in New York State. It provides food and other products to communities, creates jobs, and contributes more than $5.3 billion to the state's economy annually. At a national level, New York is a top producer of milk and dairy products, fruit, maple syrup, and more. Agriculture takes place in—and benefits—all regions of the state, including urban areas.

This summary provides an overview of climate change impacts on agriculture in New York State. It includes a synopsis of key climate change hazards, equity and justice considerations, impacts on Indigenous Peoples and Tribal Nations, key findings from the assessment's Agriculture chapter, and opportunities for the future.

Climate Change Hazards and Impacts

Climate Equity and Justice

Indigenous Peoples and Tribal Nations

Climate Change Hazards and Impa
New York State's Agriculture

Agricultural activities are heavily exposed to and dependent on
agriculture sector faces numerous challenges as the climate ch
influence agriculture, including:

- More extreme heat events.
- Changes in the amount and duration of precipitation, includ
- More frequent and intense storms.
- Sea levels rise, and saltwater intrusion into farmland and w

New York State Climate Impacts Assessment

03 Agriculture

Interim Publicati

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How to cite

Aller, D., Chatrchyan, A. M., Calixto, A., Cummings, J., Ortiz-Bobea, A., Peck, G., Schouten, J., Wolkert, B., & Wolters, E. (2024). Chapter 3: Agriculture. In A. Stevens (Ed.), *New York State Climate Impacts Assessment* [Interim version for public release].

NEW YORK STATE CLIMATE IMPACTS ASSESSMENT

Explore by Sector – Key Findings

Buildings

1 Technical Workgroup Key Findings

New York State has nearly 5.3 million buildings, and all of them are vulnerable in some way to the impacts of climate change. Understanding these impacts is critical, because risks to buildings not only threaten individual lives but also pose threats to community-level resilience. This chapter examines the impacts of climate change on buildings and, by extension, the people and communities they shelter and support. It also highlights building types and populations that are at particular risk and presents adaptation strategies to protect the state's existing and future building stock from climate impacts.

Key Finding 1: Buildings of all ages, functions, and locations across New York State are vulnerable to the impacts of climate change. Each of the state's 12 assessment regions will experience a range of impacts, including more severe storms, coastal and inland flooding, and increasing temperatures, all of which can affect building structures and systems, operations, and occupants. Local and regional factors, including geography, zoning, and socioeconomic disparities, also affect vulnerability and will shape site-specific adaptations.

Key Finding 2: Given the long lifespan of buildings, new construction and retrofits that consider long-term climate projections will better address future climate risk. New York State's new and existing buildings are expected to support many generations of use, while individual components of those buildings may be replaced more frequently. As climate change risks increase throughout this century, design decisions that align buildings' and building components' life cycles with future climate projections and expected hazards will lead to more cost-effective, sustainable, and future-ready buildings.

Key Finding 3: Climate impacts to buildings can ripple to many different parts of a community. Buildings are integrated and interdependent with other sectors, including agriculture, energy, transportation, and health services. Damage to buildings can disrupt these interdependent systems and compound the direct impacts of building loss and harm to individuals and communities. Addressing these cross-sector impacts will require not only resilient building design, but also a multidisciplinary approach and insight into interconnected sectors to improve community resilience.

Key Finding 4: Communities of color, Tribal communities, and low-income communities are more likely to congregate, live, and work in buildings that have greater exposure to climate hazards. In addition, people who are very young or very old, as well as those experiencing physical or developmental disabilities, are more vulnerable to building failures. Additional resources and policies will be required to respond to the disproportionate impacts of climate change in these communities.

Key Finding 5: Individual adaptation and resilience strategies can address multiple climate impacts. Buildings in New York State will face various climate hazards over their useful lives. Strategies such as green roofs, for example, can address both flooding and the urban heat island effect, while also providing co-benefits like reducing cooling load. Resilient design strategies can be implemented in many types of buildings and can increase community-level resilience to climate change.

Climate Change and New York State's Buildings Sector: Technical Workgroup Key Findings

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Technical workgroups for each of the assessment's eight sectors developed key findings focused on climate change impacts, responses, and solutions. More detail on the key findings for the buildings sector, and the evidence base for each finding, can be found in the full Buildings chapter.

Buildings of all ages, functions, and locations across New York State are vulnerable to the impacts of climate change.

Climate hazards—such as increased temperatures, heat waves, changes in precipitation, sea level rise, poor indoor air quality, pests, storms, and flooding—affect buildings in a variety of ways. These hazards can result in structural damage to roofs, framing, foundation, and walls; damage to indoor building materials; water damage and mold; damage to electrical, mechanical, and plumbing systems; and shorter lifespans of buildings and building systems (e.g., electrical systems; heating, ventilation, and air conditioning systems).

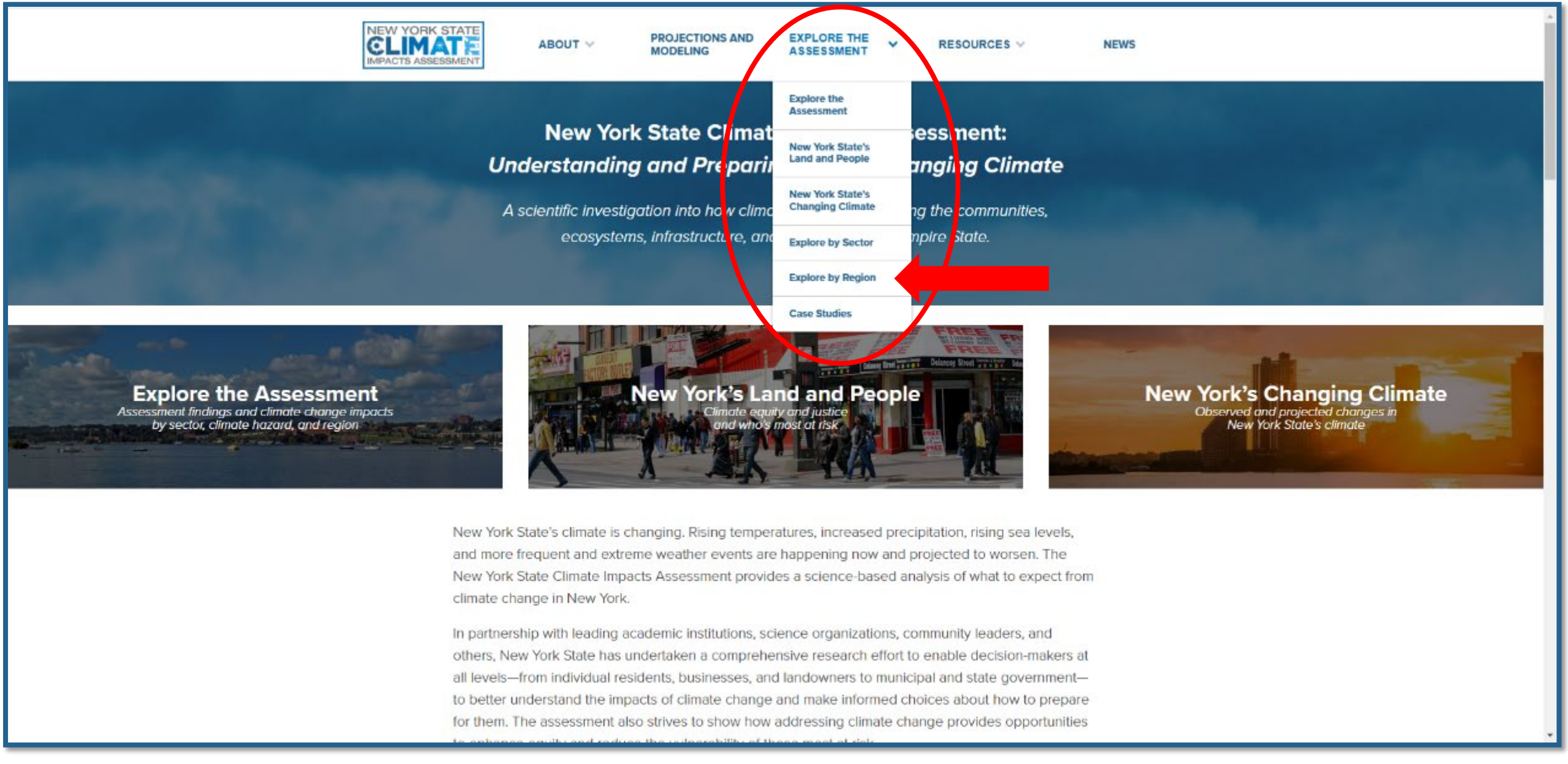
These buildings in Babylon Village, New York were damaged by Superstorm Sandy in 2012.

What Can We Do?

Property owners of both existing buildings and new construction can begin by identifying climate hazards that might affect their property and by implementing climate resilience strategies to address those current and future risks. For example, the University at Buffalo School of Architecture and Planning has developed information to help building owners and managers, architects, builders, and others understand the vulnerability of buildings in different regions of the state to various climate hazards.

Given the long lifespan of buildings, new construction and retrofits that consider long-term climate projections will better address future climate risk.

New York State's buildings are expected to support many generations of use, while individual components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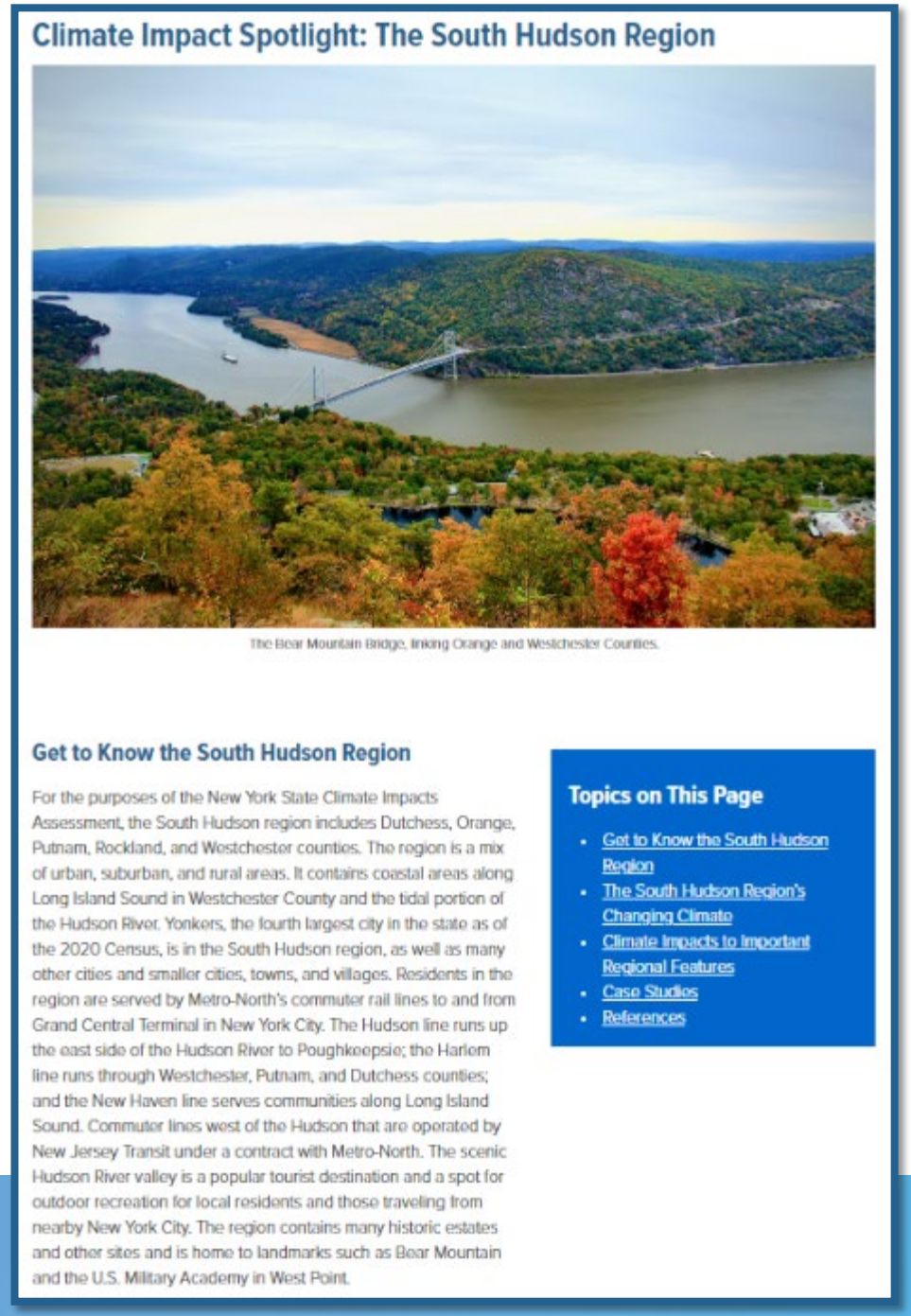
Explore by Region



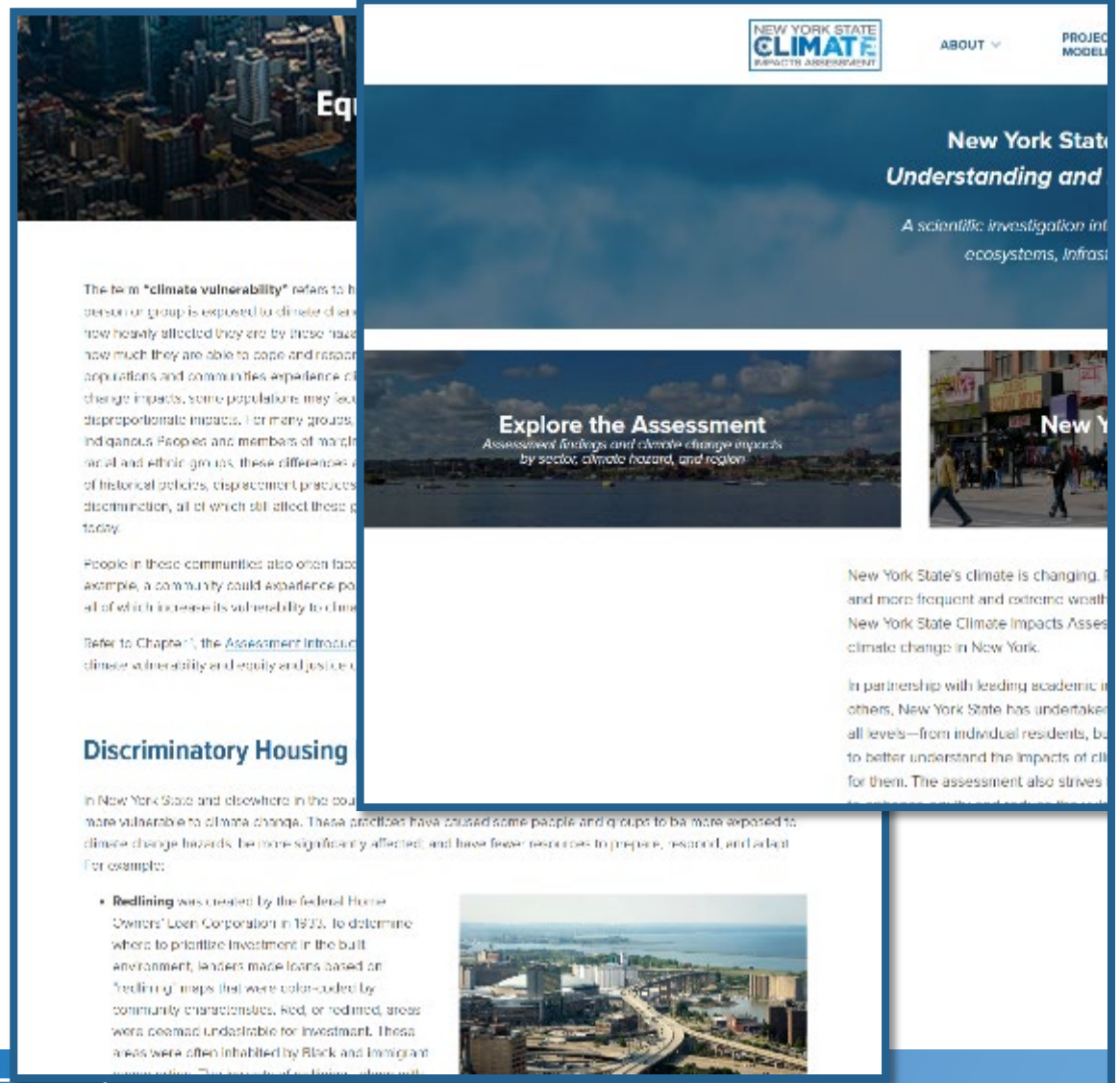
South Hudson Highlights

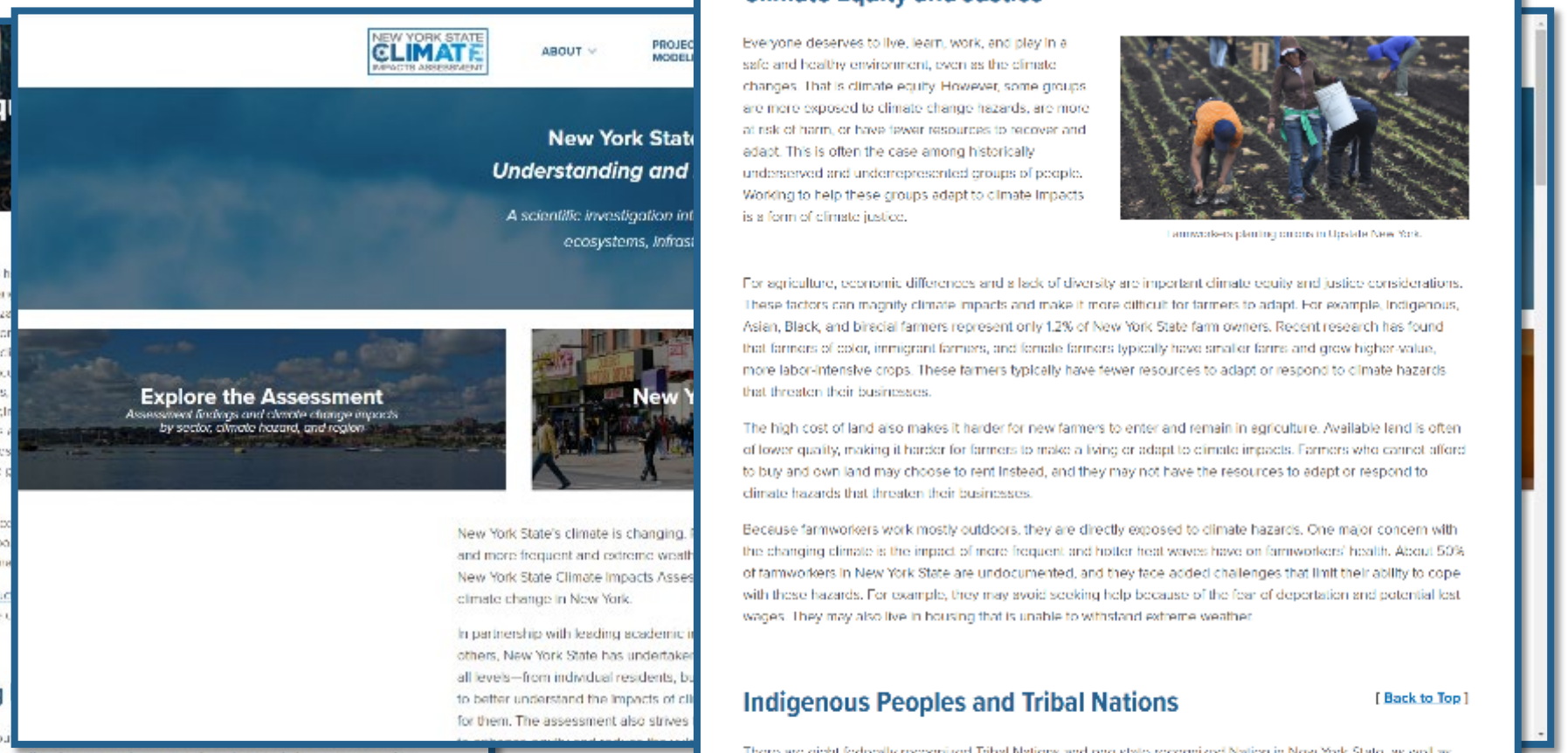
- Sea level rise in the Hudson River estuary

- Flooding impacts to commuter transportation

- Extreme heat and urban heat islands

Equity and Justice





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- Glossary

New York State Climate Impacts Ass

Understanding and Preparing for Our Cl e

A scientific investigation into how climate change is affecting the communities, ecosystems, infrastructure, and industries of the Empire State.

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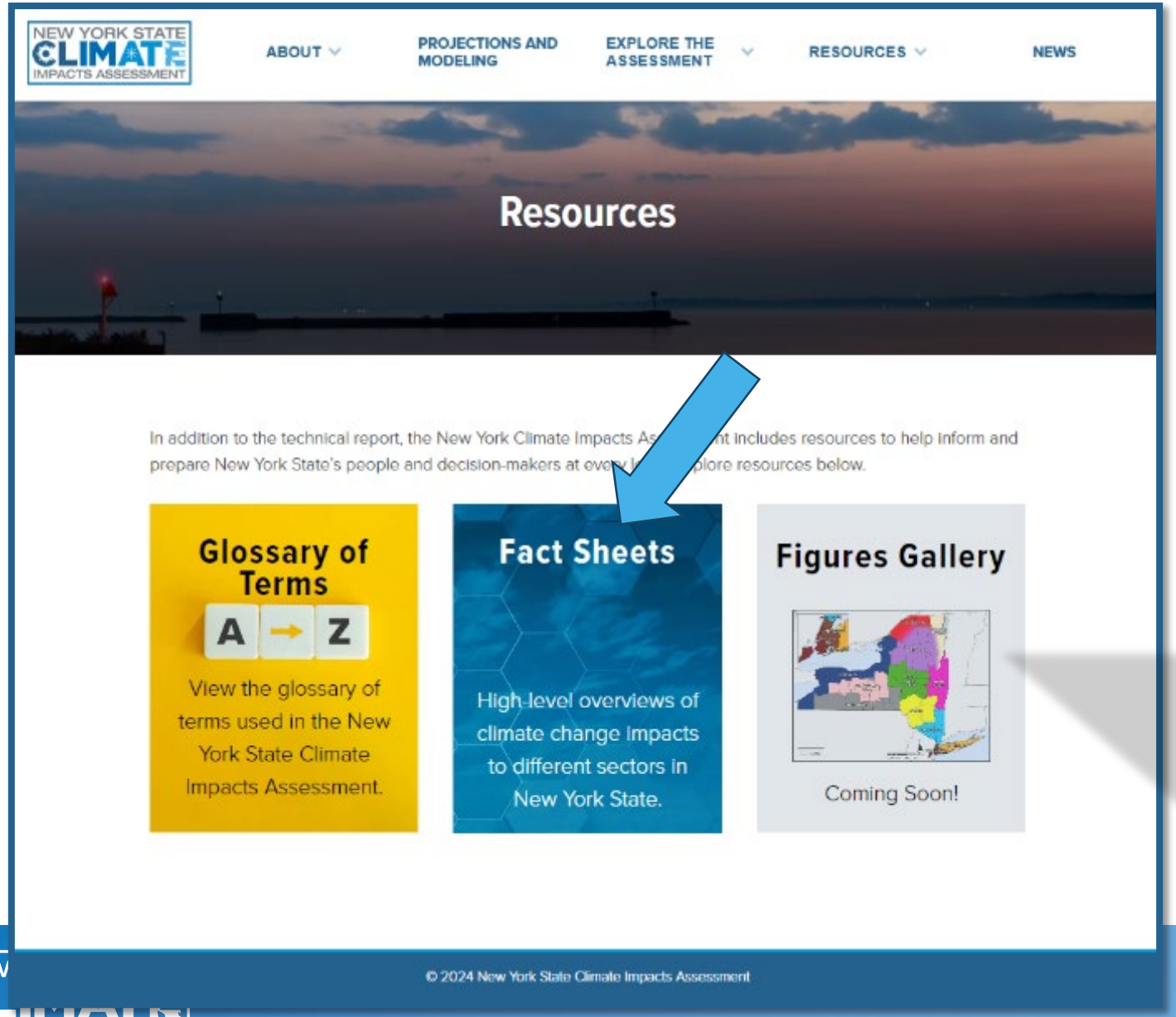
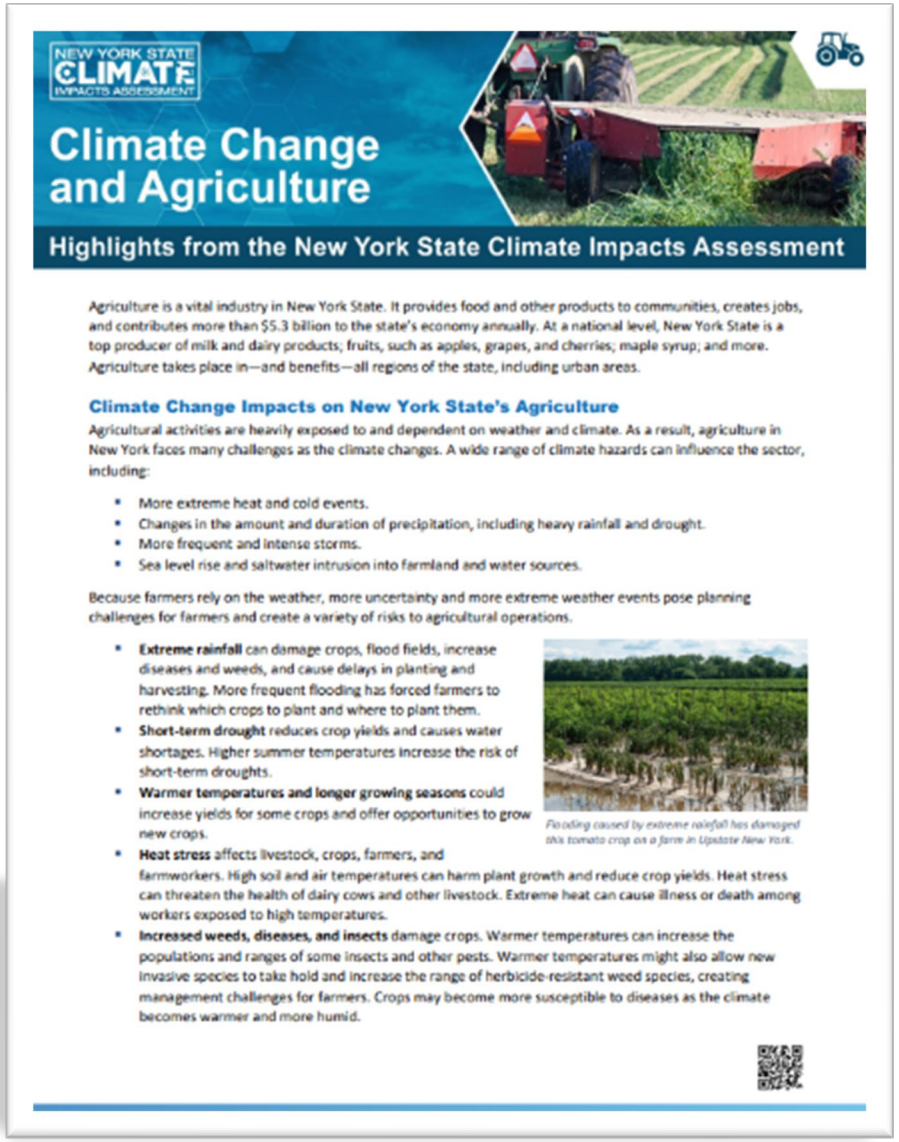
Additional Resources





Case Studies

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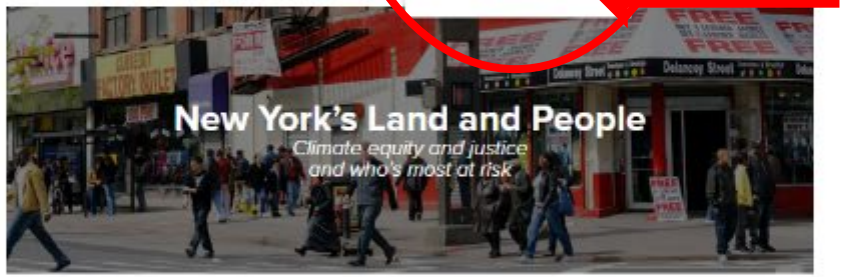
New York State Climat ...sessment:
Understanding and Prepari ...anging Climate

A scientific investigation into how clima ...g the communities, ecosystems, infrastructure, an ...mpire State.



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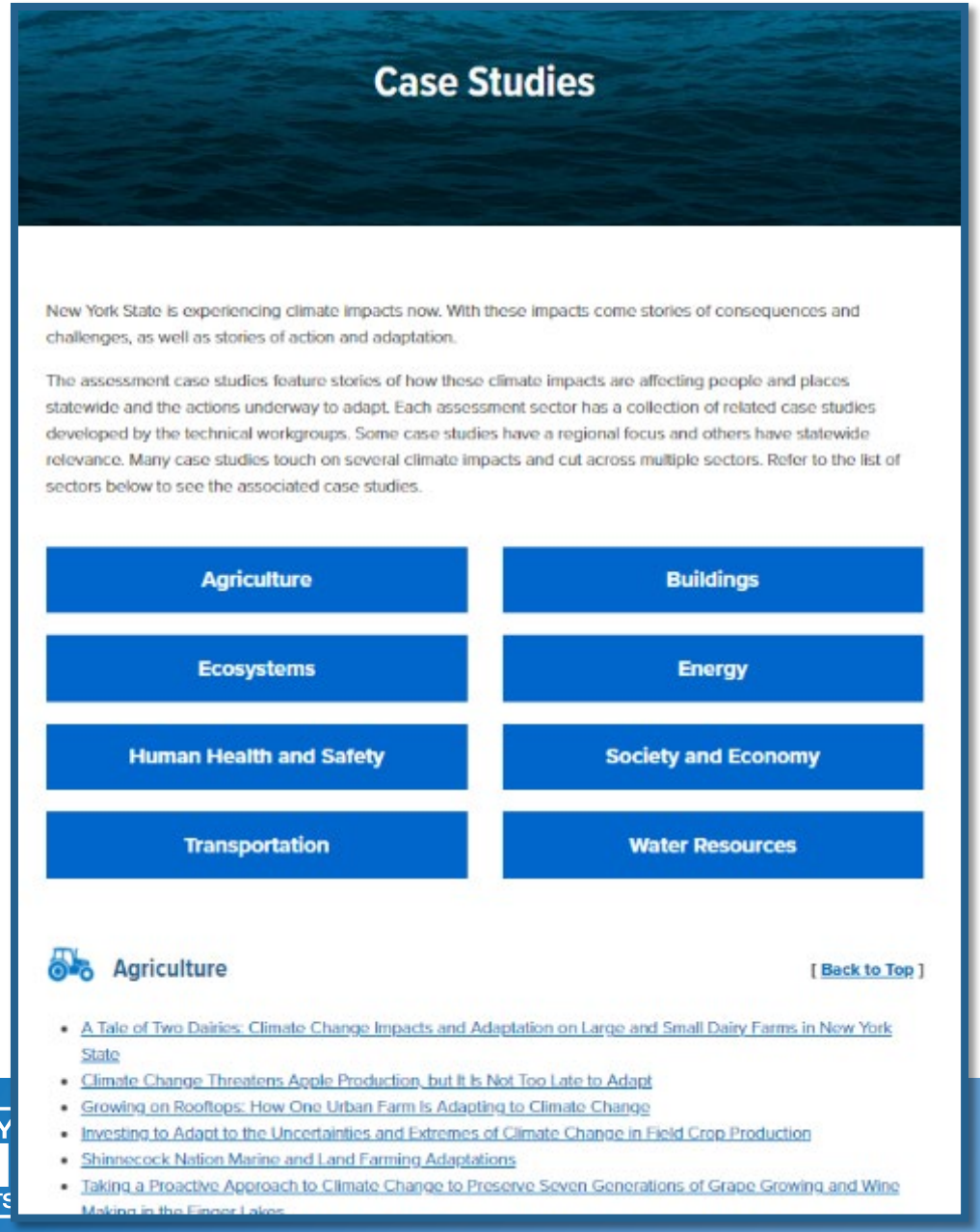
Case Studies



Case Studies

New York State is experiencing climate impacts now. With these impacts come stories of consequences and challenges, as well as stories of action and adaptation.

The assessment case studies feature stories of how these climate impacts are affecting people and places statewide and the actions underway to adapt. Each assessment sector has a collection of related case studies developed by the technical workgroups. Some case studies have a regional focus and others have statewide relevance. Many case studies touch on several climate impacts and cut across multiple sectors. Refer to the list of sectors below to see the associated case studies.

Agriculture | Buildings
Ecosystems | Energy
Human Health and Safety | Society and Economy
Transportation | Water Resources

Agriculture

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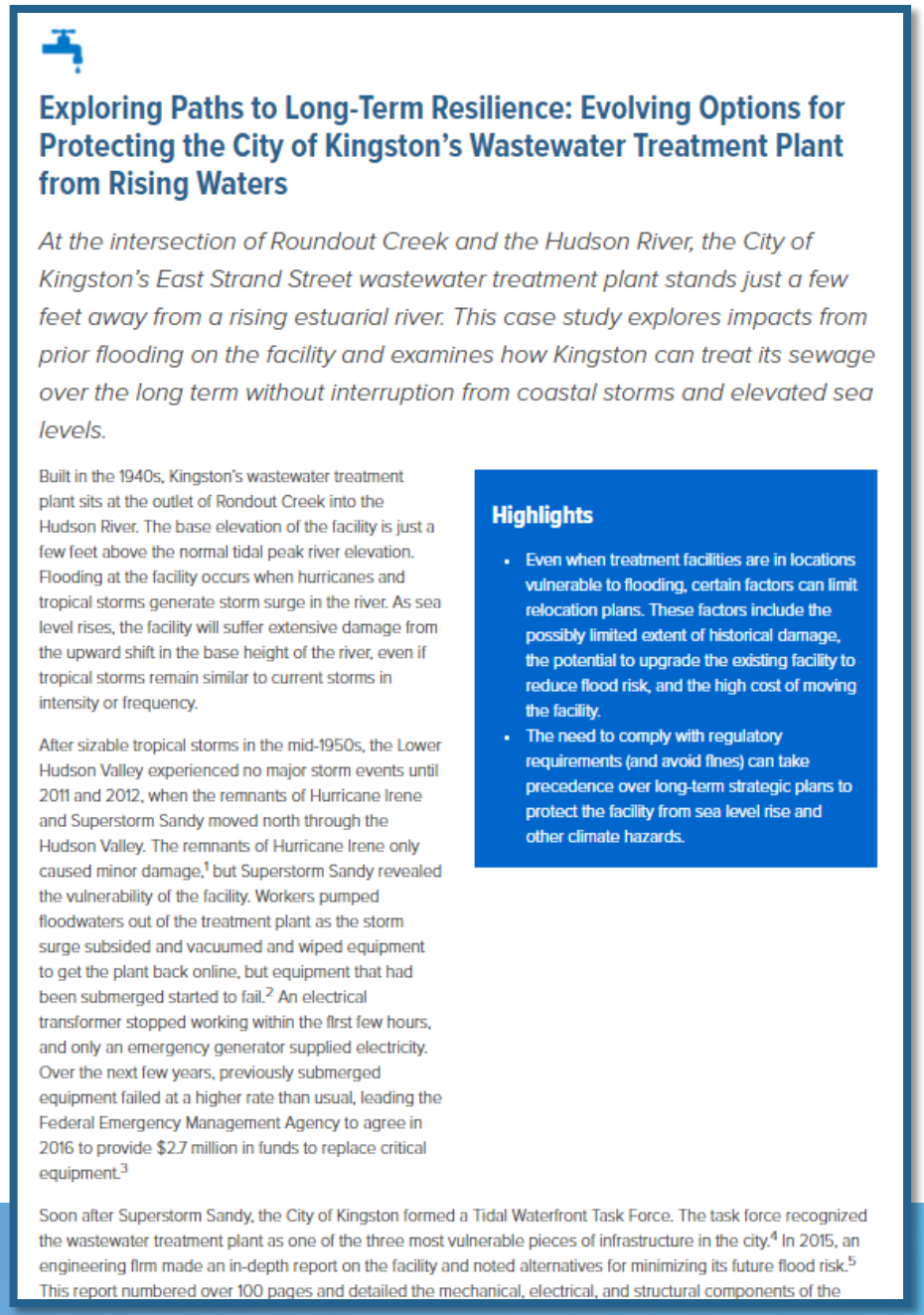
- A Tale of Two Dairies: Climate Change Impacts and Adaptation on Large and Small Dairy Farms in New York State
- Climate Change Threatens Apple Production, but It Is Not Too Late to Adapt
- Growing on Rooftops: How One Urban Farm Is Adapting to Climate Change
- Investing to Adapt to the Uncertainties and Extremes of Climate Change in Field Crop Production
- Shinnecock Nation Marine and Land Farming Adaptations
- Taking a Proactive Approach to Climate Change to Preserve Seven Generations of Grape Growing and Wine Making in the Finger Lakes



Exploring Paths to Long-Term Resilience: Evolving Options for Protecting the City of Kingston's Wastewater Treatment Plant from Rising Waters

At the intersection of Roundout Creek and the Hudson River, the City of Kingston's East Strand Street wastewater treatment plant stands just a few feet away from a rising estuarial river. This case study explores impacts from prior flooding on the facility and examines how Kingston can treat its sewage over the long term without interruption from coastal storms and elevated sea levels.

Built in the 1940s, Kingston's wastewater treatment plant sits at the outlet of Rondout Creek into the Hudson River. The base elevation of the facility is just a few feet above the normal tidal peak river elevation. Flooding at the facility occurs when hurricanes and tropical storms generate storm surge in the river. As sea level rises, the facility will suffer extensive damage from the upward shift in the base height of the river, even if tropical storms remain similar to current storms in intensity or frequency.

After sizable tropical storms in the mid-1950s, the Lower Hudson Valley experienced no major storm events until 2011 and 2012, when the remnants of Hurricane Irene and Superstorm Sandy moved north through the Hudson Valley. The remnants of Hurricane Irene only caused minor damage,[1] but Superstorm Sandy revealed the vulnerability of the facility. Workers pumped floodwaters out of the treatment plant as the storm surge subsided and vacuumed and wiped equipment to get the plant back online, but equipment that had been submerged started to fail.[2] An electrical transformer stopped working within the first few hours, and only an emergency generator supplied electricity. Over the next few years, previously submerged equipment failed at a higher rate than usual, leading the Federal Emergency Management Agency to agree in 2016 to provide $2.7 million in funds to replace critical equipment.[3]

Highlights

- Even when treatment facilities are in locations vulnerable to flooding, certain factors can limit relocation plans. These factors include the possibly limited extent of historical damage, the potential to upgrade the existing facility to reduce flood risk, and the high cost of moving the facility.
- The need to comply with regulatory requirements (and avoid fines) can take precedence over long-term strategic plans to protect the facility from sea level rise and other climate hazards.

Soon after Superstorm Sandy, the City of Kingston formed a Tidal Waterfront Task Force. The task force recognized the wastewater treatment plant as one of the three most vulnerable pieces of infrastructure in the city.[4] In 2015, an engineering firm made an in-depth report on the facility and noted alternatives for minimizing its future flood risk.[5] This report numbered over 100 pages and detailed the mechanical, electrical, and structural components of the

Case Study

Collaborative Approaches to Water Management in a Changing Climate in the Delaware River Basin

- This case study highlights the role of the Delaware River Basin Commission (DRBC) in establishing dialogue and building consensus across states and municipalities, including New York City and Philadelphia, that rely on the Delaware River for water.
- In particular, the case study investigates how a climate change advisory committee is guiding the development of new technical knowledge while grappling with potential regional changes in water availability and quality.

Case Study

From Disastrous Delays in Extreme Weather to Resilient Energy-Efficient Emergency Operations: Rebuilding the New Paltz Firehouse Through Community-Driven Commitment

After flooding and power outages from back-to-back storms hampered emergency response in New Paltz, local and state leaders collaborated to create a model, climate-resilient firehouse that will remain operational even during power outages caused by extreme weather events.

Photo by Chris Kendall

Case Study
Of Infrastructure and Inundation: A Tale of Adaptation Along Sauquoit Creek

How one New York State community raised awareness of local transportation infrastructure problems and flooding—and persuaded stakeholders to work together to find solutions.

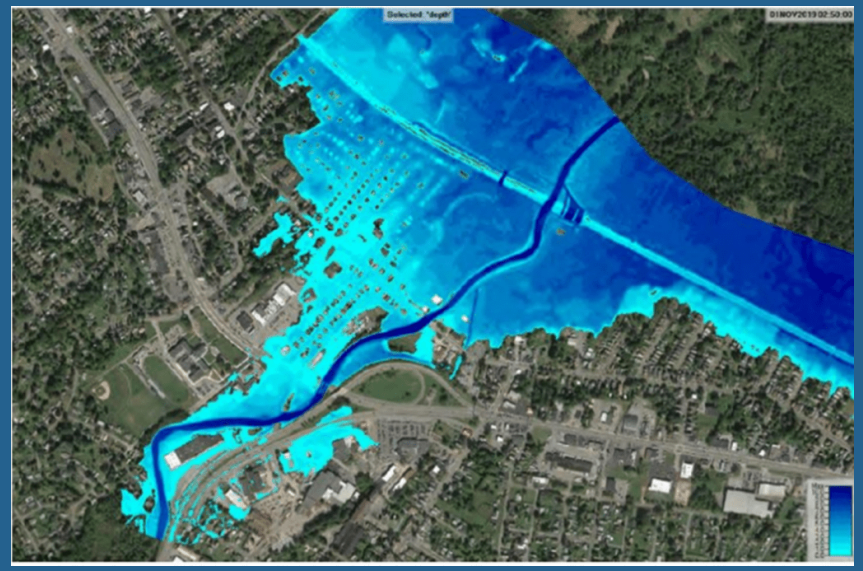


Figure from Kandamby (2020).

Case Study
Urban Heat Islands and Energy Inequality in Syracuse, New York

- Urban heat islands cause disproportionate energy burdens for people living in neighborhoods that are low-income and that have higher populations of people of color.
- To help combat the urban heat island effect, Syracuse adopted an Urban Forestry Master Plan to provide cooling where it is needed most.

Photo by Lemir Teron

Case Study

Innovative Housing Microgrid for Community Resilience at Marcus Garvey Village

The first-of-its-kind low- and middle-income housing microgrid project at Marcus Garvey Village in Brooklyn reduces local electricity demand on the power grid and provides the community with power resources after a power loss event, facilitating both community and grid resilience.

Photo by Bright Power

Case Study

It Takes a Village: How the Village of Sodus Point Is Adapting to Variable Water Levels

Partnerships and local knowledge can help municipalities—especially smaller ones, such as the Village of Sodus Point—find new ways to build climate resilience.

Photo by Mary Austerman, Great Lakes Coastal Community Specialist, New York Sea Grant

Case Study

Climate Change Threatens Apple Production, but It's Not Too Late to Adapt

Fruit producers are experiencing disruptions and losses due to climate change, requiring adaptation solutions. Financial incentives may provide opportunities to encourage adaptation.

Photo by Deborah Aller

Case Study

Growing on Rooftops: How One Urban Farm Is Adapting to Climate Change

As climate change affects urban farms, adaptation practices provide solutions for crops, farm operations, and workers, as seen in the example of Brooklyn Grange.

Photo by Deborah Aller

Case Study

Municipalities Across New York Respond as Extreme Heat Threatens Lives Statewide

- Reducing exposure to heat and increasing access to cool indoor spaces is an important health intervention.
- However, many New Yorkers lack choice in their personal exposure, and many also lack access to cooling.

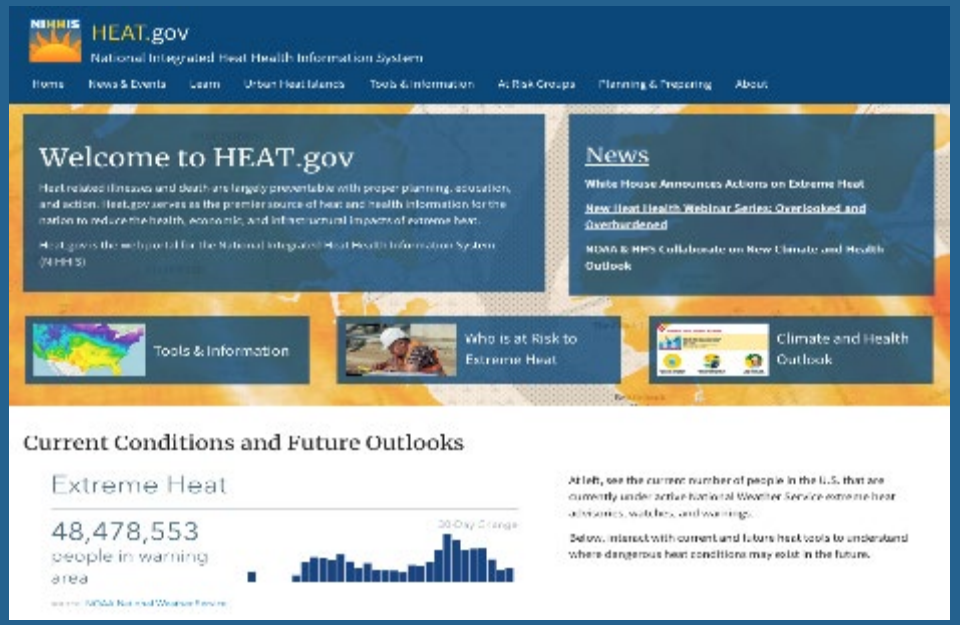


Figure from NOAA's heat.gov (2022)

Case Study
Housing Policy, Climate Change, and Health

Community investments, housing codes, and lending practices all affect the built environment in ways that create health risks and protections for individuals as the climate changes.

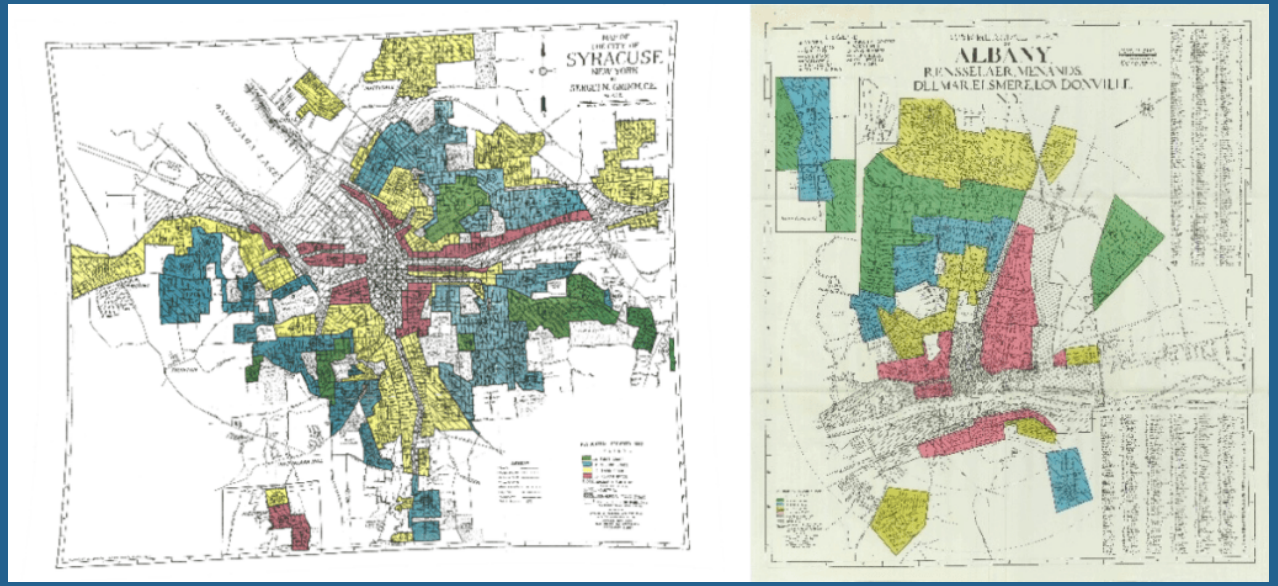


Figure from Mapping Inequality: Redlining in New Deal America

Visit www.nysclimateimpacts.org to access the assessment and supporting materials

Environmental Justice

O&R Climate Resilience Working Group

July 11, 2024

Laurie J. Sands

Agenda

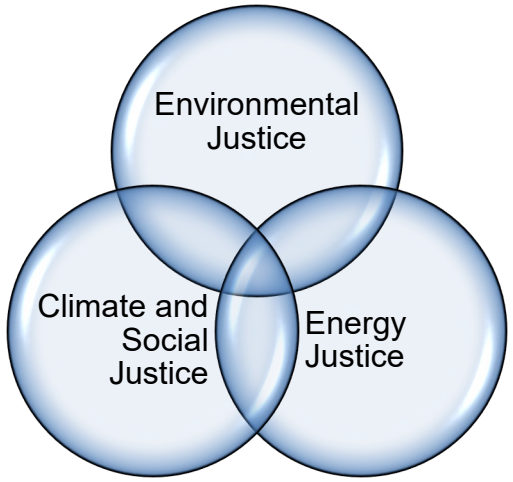
- Defining Environmental Justice
- Environmental Justice Working Group
- Environmental Justice Policy
- Questions

Defining Environmental Justice

What is Environmental Justice (EJ)?

*The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies

- Developed out of the Civil Rights Movement
- Addressed by federal, state and local policies and laws
- Evolving into Climate Justice aligned with larger Social Justice Movement



*Source: US Environmental Protection Agency; New York State (DEC Commissioner's Policy 29) employs same definition.

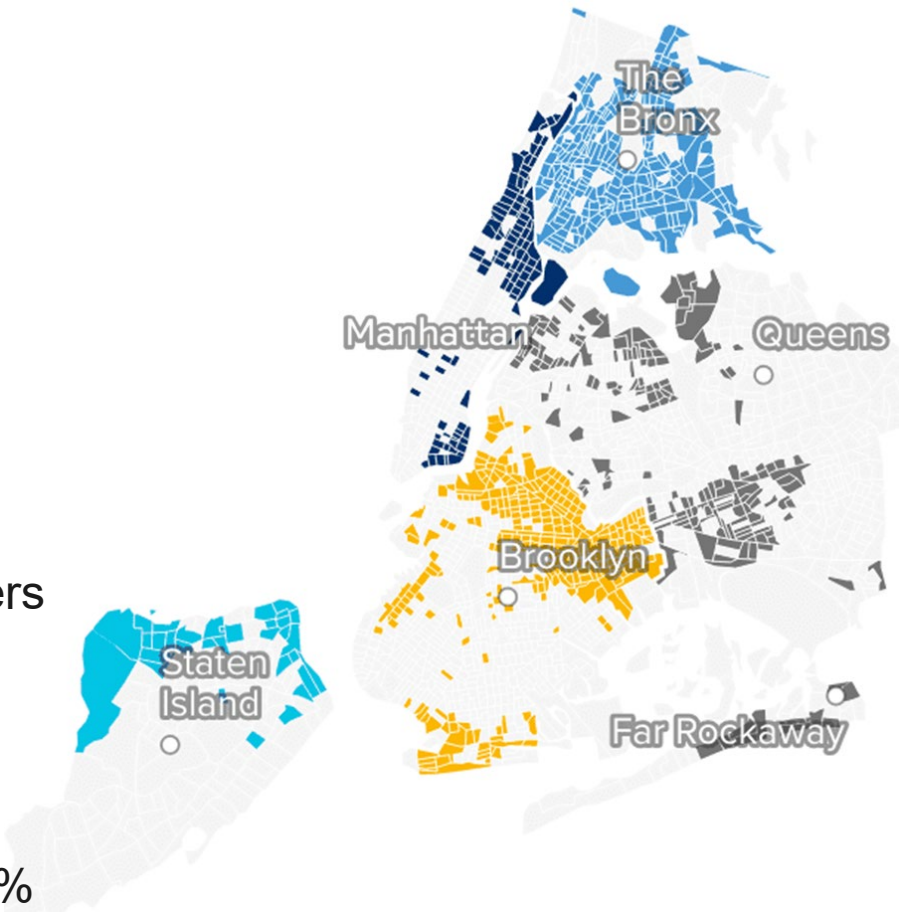
EJ Context

General Context:

- Environmental Justice (EJ) is dynamic, rapidly evolving into a Climate Justice movement with bold aspirations
- Climate Justice brings together EJ advocates with labor
- EJ is a “lens” not a metric

Con Edison Context:

- NYS Climate Leadership and Community Protection Act (CLCPA) covers State agencies
- Five boroughs contain **60%** of State DACs with large pockets in Westchester and Orange counties
- **45%** of Con Edison customers live in DACs (46% for CECONY and 33% for Orange and Rockland)



Disadvantaged Community census tracts in the five boroughs of New York City

Environmental Justice Stakeholder Landscape

EJ groups have an increasingly powerful voice politically, locally, and nationally

Objectives:

- Ending fossil fuel use
- Closing “peaker” plants
- Focusing on energy affordability, bill impacts
- Developing community ownership
- Increasing Green Jobs, DAC workforce development, and “just transition”

WE ACT FOR ENVIRONMENTAL JUSTICE

UPROSE

PEAK Coalition

NEW YORK CITY ENVIRONMENTAL JUSTICE ALLIANCE

On the ground – and at the table

Environmental Justice Working Group

Working Group Priorities

- Equitable and Inclusive Planning
- Engaging with Radical Listening
- Championing Needs/Investments in DACs
- Educating

CON EDISON'S ENVIRONMENTAL JUSTICE POLICY

THE DRAFT POLICY

Con Edison is privileged to serve some of the most diverse communities in the world. As a company, we understand the need to consider potential environmental impacts of our activities and investments on all customers regardless of their race, color, religion, national origin or income. We can only do this by listening to, learning from and understanding the concerns of our customers in disadvantaged communities and working with them to make certain that they are treated fairly.

Con Edison, through its commitment to environmental justice, aims to ensure that:

- Disadvantaged communities are not disproportionally burdened by our operations, while at the same time continuing to maintain reliable, resilient energy service for all our customers;
- We engage with environmental justice advocates and other community stakeholders so that we may understand the concerns of disadvantaged communities with respect to the design and implementation of Con Edison projects and programs;
- Disadvantaged communities benefit from our clean energy investments in terms of improved quality of life and climate-resilient energy infrastructure;
- We provide opportunities for employment in our clean energy future, focusing on education and skills development in the communities we serve;
- We continue to support disadvantaged communities through volunteerism and contributions to local non-profit groups, particularly those with a focus on education and environmental stewardship;
- In collaboration with our government partners, we work to remediate former utility sites where there is a history of environmental damage;
- There is support for our commercial customers, government and other strategic partners to transition car, bus, and truck fleets to zero-emission vehicles, as we continue to take steps to improve air quality and support livable streetscapes, particularly in disadvantaged communities; and
- Our operations benefit all the communities in which our employees and our customers live, work and study.

Breaking it Down

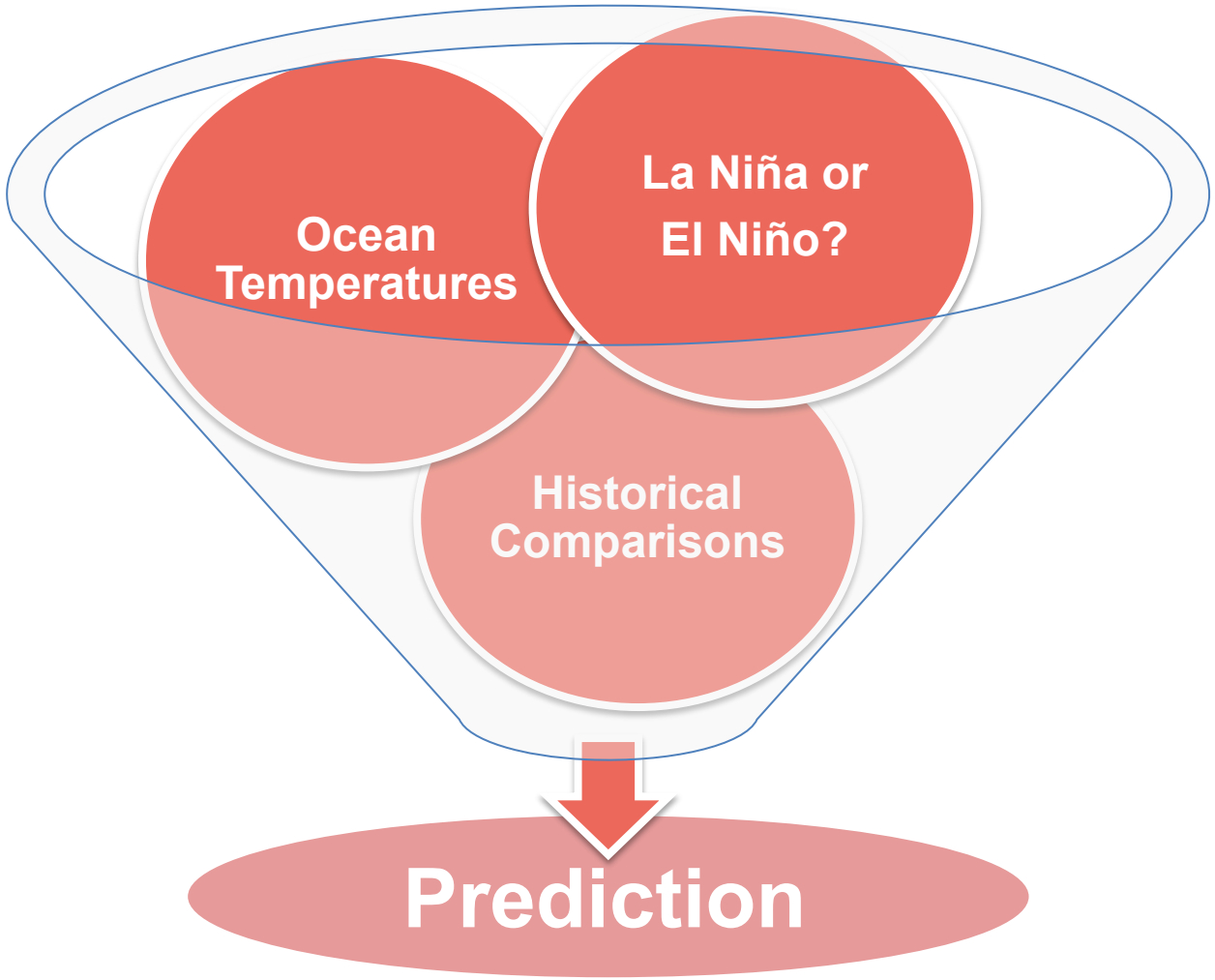
- Serve Diverse Communities
  - Environmental Justice is very real for the Company
- Understanding
  - Active listening
- Balance – Impacts, Reliability and Resiliency
- Share Benefits from Clean Energy Investments
- Clean Energy Employment Opportunities
- Support Disadvantage Communities
- Remediate Contaminated Sites
- Transition to Zero-Emission Vehicles
- Benefits for all Communities the Company Serves

Questions?

Weather Update

Matt Leszak
Project Specialist / Meteorologist - Emergency Preparedness

Summer Outlook Process



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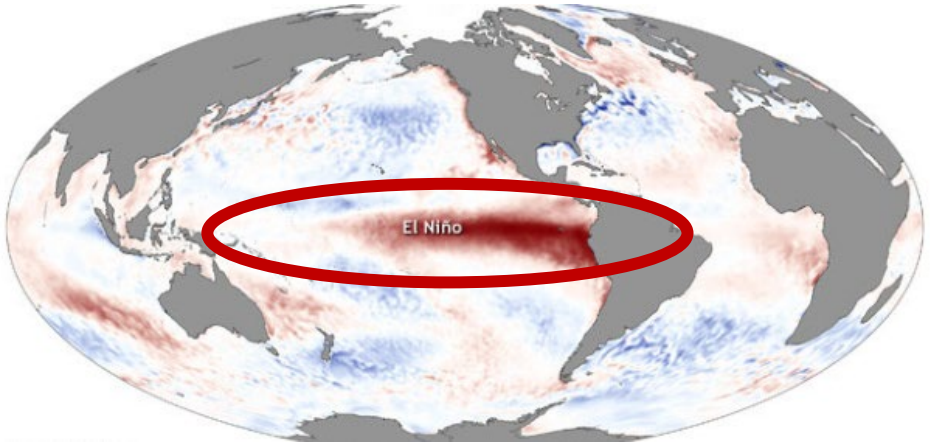
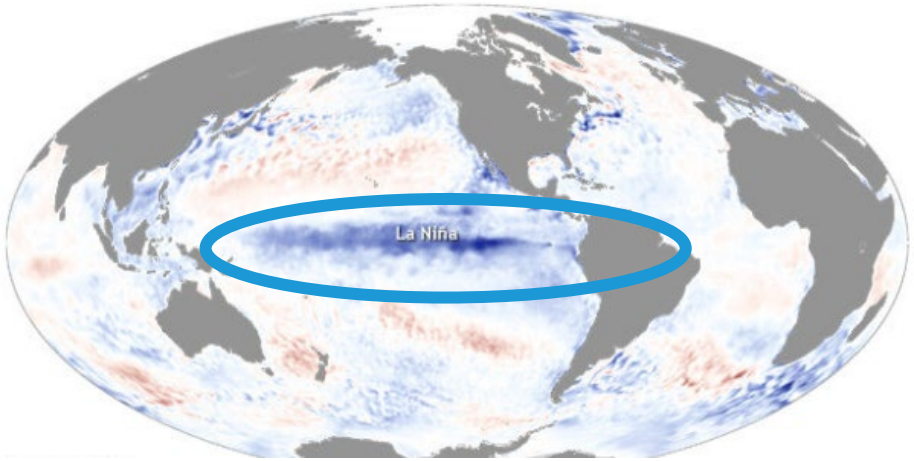
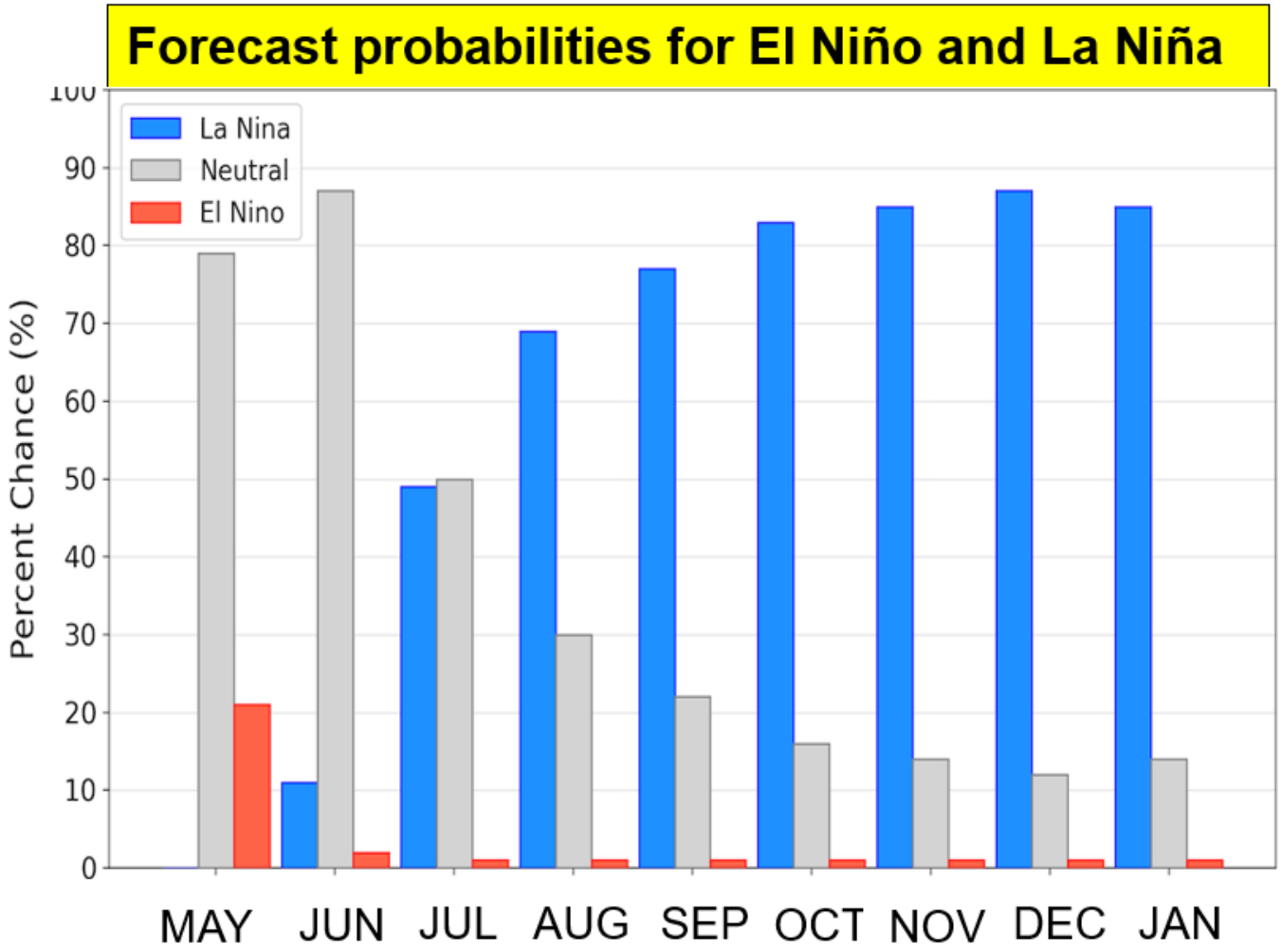
Transitioning to La Niña by Late Summer



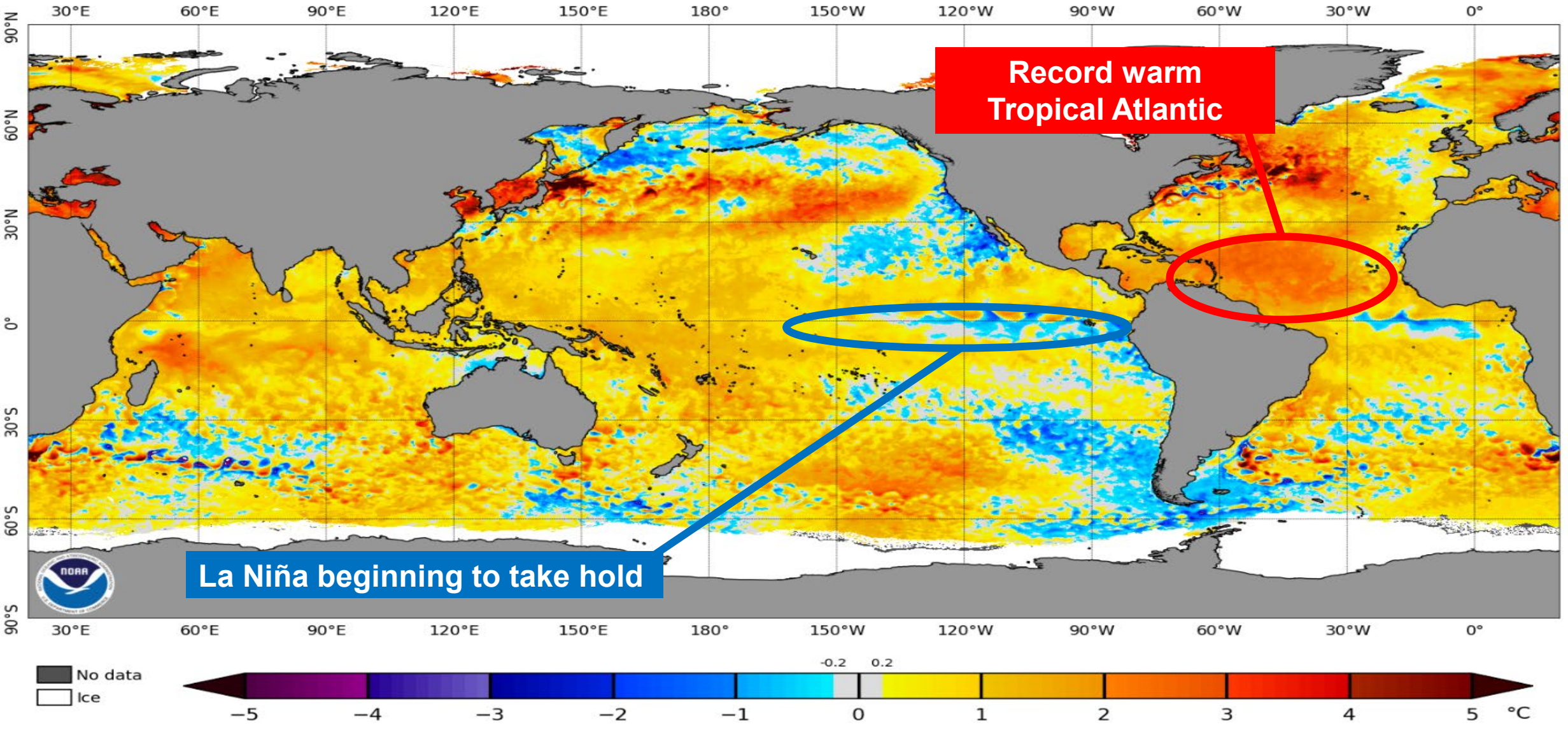
El Niño → Warm water in Equatorial Pacific



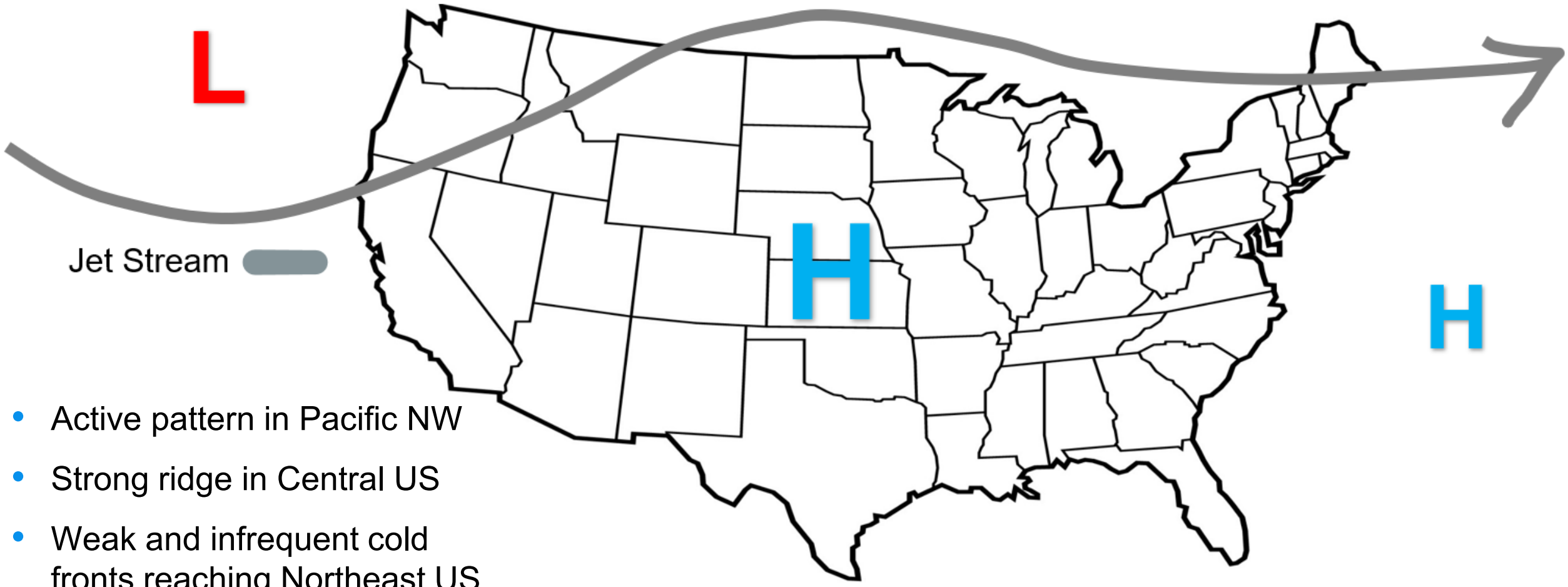
La Niña → Cool water in Equatorial Pacific



Global Sea Surface Temperature Anomalies



Forecasted Summer Weather Pattern



- Active pattern in Pacific NW
- Strong ridge in Central US
- Weak and infrequent cold fronts reaching Northeast US

2024 Summer Outlook

Temperatures	Rainfall
Above normal	**Near or below normal**

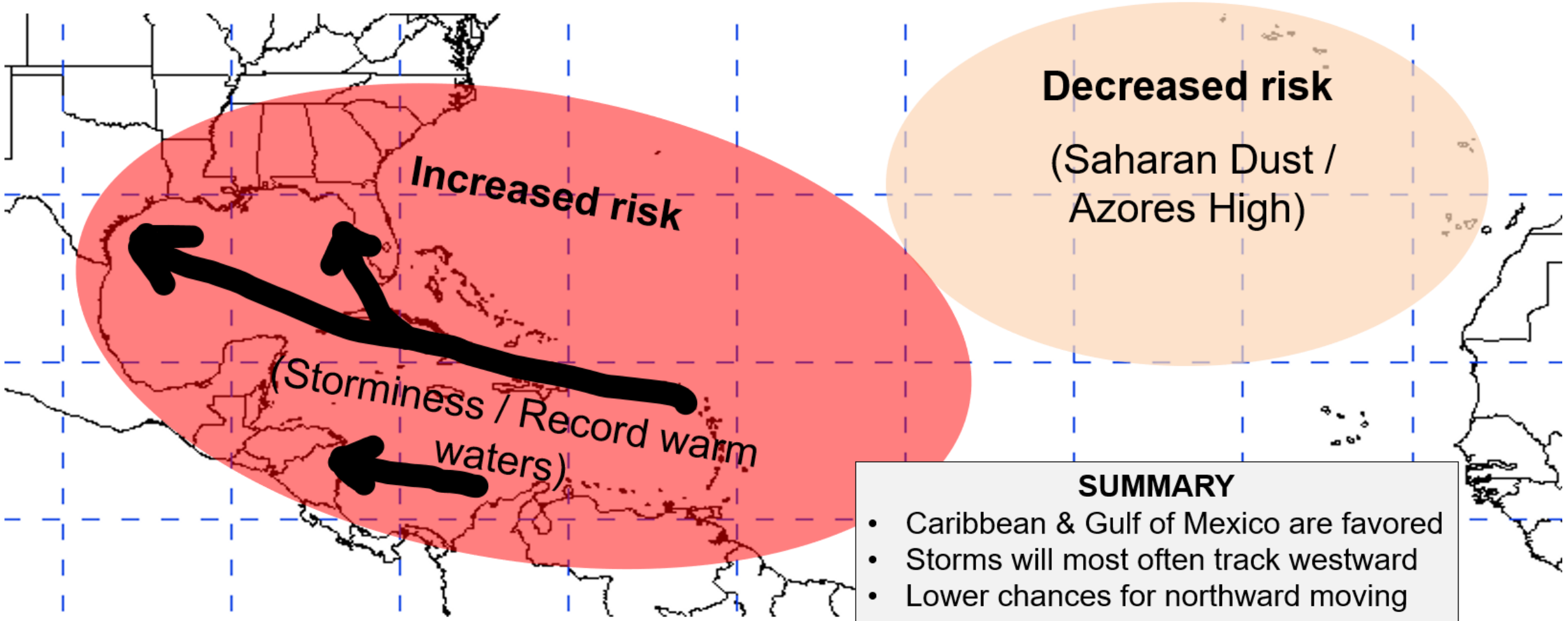
- Confidence is **moderate** in this outlook
- Reasons:
  - Variability in recent similar summer seasons
  - Onset of La Niña and how quickly it takes effect

Active Hurricane Season Lies Ahead

- La Niña favors ***above normal*** tropical activity
- Favoring factors:
  - Record warm Tropical Atlantic
  - Lower wind shear
  - Increased storminess in Caribbean and Gulf of Mexico

Storm Class	Normal	Forecast
Tropical Storms	14.4	↑
Hurricanes	7.2	↑
Major Hurricanes	3.2	↑

Hurricane Season Outlook



SUMMARY

- Caribbean & Gulf of Mexico are favored
- Storms will most often track westward
- Lower chances for northward moving storms (recurving)

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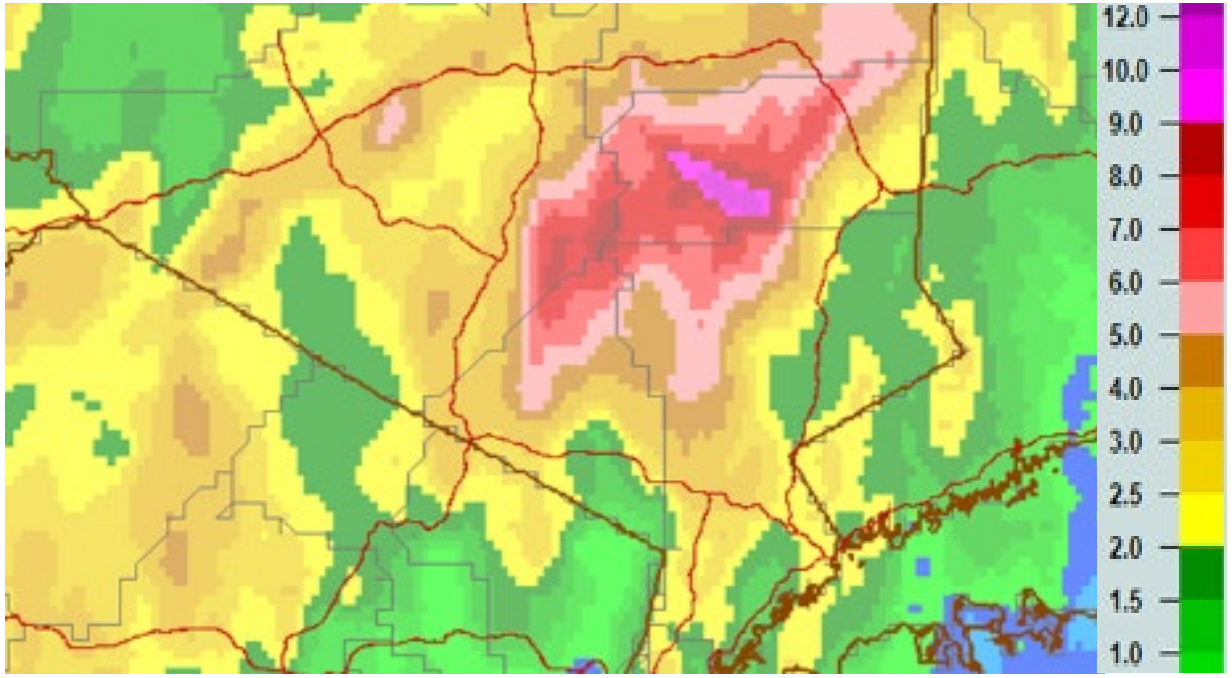
Recent Weather Events

- July 9, 2023 Deluge Rainfall
  - ~ 8 inches of rain in 3-4 hours
  - 1000-year return interval
  - Hyperlocal event



Radar Estimated Total Precipitation

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Recent Weather Events

- May 23, 2024 Microburst
  - West Milford, NJ
  - Greenwood Lake, NY
  - Exact max wind gusts unknown
  - Estimates of 80-100 mph based on damage

Next Steps & Key Dates

Dates	Climate Change Resilience Plan (CCRP) Activities
Summer 2024	O&R Rate Case settlement discussions that cover Climate Change Resilience Plan investments for 2025-2027
July 30, 2024	Public Hearing on O&R's Climate Change Resilience Plan and Cost Recovery Surcharge
Q4 2024	Next O&R Climate Resilience Working Group Meeting (TBD)
By October 21, 2024	**Commission Action on 2023 O&R Climate Change Resilience Plan filing**

Dates	Other Climate Resilience Activities
July 2024	Nonprofits notified of selection decision for Climate Justice RFP
Ongoing	Supplementary flood modeling and deluge rainfall study with CECONY

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Orange & Rockland

Continued Stakeholder Engagement and Discussions on Climate Resilience

Public Service Law (PSL) § 66(29) – PSC Case 22-E-0222

For the Climate Resilience Working Group

November 18, 2024

AGENDA

- Climate resilience investments in the current O&R electric rate case
- Deluge rain and flood modeling study
- Next steps

Climate resilience investments in the current O&R electric rate case

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Joint Proposal summary of projects and programs in O&R's CCRP

Projects / Programs	Rate Case Years (2025 – 2027) Total ($ in millions)
Selective Undergrounding	$103.2
Enhanced Overhead Program	$17.5
Overhead Structure Replacement	$6.9
Distribution Automation / Smart Grid	$25.8
Emergency Response Ops & Control	$14.6
Storm Material Management	$20.1
Micronet Weather Station Expansion (3 stations)	$0.2
Substation Flooding Mitigation (3 sites)	$13.8
Shoreline Erosion Protection	$3.5
Total	**$205.6**

Wind & Ice

Wind & Ice

Selective Undergrounding Program

Program Scope & Resiliency Benefits

Program Scope:

- 2025-2027: 20 specific projects for undergrounding with ~15 miles of overhead distribution lines and ~5 miles of underground transmission lines
- 9 of the projects are planned in disadvantaged communities (DAC) and will benefit a total of 44 circuits

Resiliency Benefits:

- Enhance durability and reliability of distribution and transmission systems
- Mitigate exposure to external hazards such as weather events, wildlife contact, and car accidents
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:

Wind / Ice

- The service area is likely to experience higher wind speeds and gusts during tropical cyclones, extratropical cyclones, and thunderstorms.
- The potential remains for increased freezing rain frequency and ice accumulation.
- North Atlantic hurricanes could become more intense (~5% increase) relative to historical hurricanes.

Program Funding in O&R Rate Case:

- Joint Proposal funding: $103.2 million (capital)

*RY denotes rate year in rate case period (3-years)

	2025 (RY1)*	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$38.9	$47.9	$16.4
Joint Proposal ($M)	$38.9	$47.9	$16.4

Wind & Ice

Enhanced Overhead (Hendrix System)

Program Scope & Resiliency Benefits

Program Scope:

- 2025-2027: Reinforce ~16 miles of overhead distribution lines with Hendrix spacer cable

Resiliency Benefits:

- Enhance durability and reliability of distribution system
- Mitigate exposure to external hazards such as weather events and tree contact
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:

Wind / Ice

- The service area is likely to experience higher wind speeds and gusts during tropical cyclones, extratropical cyclones, and thunderstorms.
- The potential remains for increased freezing rain frequency and ice accumulation.
- North Atlantic hurricanes could become more intense relative to historical hurricanes.

Program Funding in O&R Rate Case:

- Joint Proposal funding: $17.5 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$15.6	$11.4	$15.3
Joint Proposal ($M)	$7.5	$3.2	$6.8

Overhead Structure Replacement Program

Program Scope & Resiliency Benefits

Program Scope:

- Supplement inspection-based pole replacement with a proactive approach that gives a weighted consideration of pole age

Resiliency Benefits:

- Increased ability to withstand more frequent and intense storm events
- Reduces maintenance costs and minimizes unplanned repair expenditures
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:

Wind / Ice

- O&R is likely to experience higher wind speeds and gust during tropical cyclones, extratropical cyclones, and thunderstorms in the future.
- Projections show that maximum wind gusts could reach 110 mph in the future.
- The potential exists for increased radial icing intensity during ice storms.

Program Funding in O&R Rate Case:

- Joint Proposal funding: $6.9 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$2.3	$3.1	$4.0
Joint Proposal ($M)	$1.4	$2.3	$3.2

Multiple Hazards

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Multiple Hazards

Distribution Automation/Smart Grid

Program Scope & Resiliency Benefits

Program Scope:

- Continue current pace of installation and commissioning of SCADA controlled devices (reclosers, smart capacitors, remotely operated switches, and power quality sensors) per year on a feeder-by-feeder basis
- Install and upgrade field devices with command-and-control schemes
- Three-tiered approach: (1) Feeder Optimization, (2) Field Automation, (3) Centralized Automation Control

Resiliency Benefits:

- Reduce potential customer outages during storms by automatically isolating faults
- Expedite storm response by remotely activating devices

Climate Drivers

Climate Change Vulnerabilities:

Extreme Events

- Projections show that maximum wind gusts could reach 110 mph in the future.
- The frequency of strong storms could increase in the future, with higher rainfall amounts and stronger winds.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Program Funding in O&R Rate Case:

- Joint Proposal funding: $25.8 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$12.0	$12.1	$12.1
Joint Proposal ($M)	$8.4	$8.6	$8.8

Multiple Hazards

Emergency Response Operation and Control Facility

Program Scope & Resiliency Benefits

Program Scope:

- Install a dedicated emergency response operation and control facility on land owned by O&R, across from the existing Blooming Grove Operating Center, to be placed into service in 2028.
- This location is centrally located within the O&R service territory and has easy highway access for emergency storm response events.
- This building will be co-located with the new storm material warehouse.

Resiliency Benefits:

- Having a dedicated facility that will be configured as an emergency response control facility will save time when mobilizing for storm coordination and response.

Climate Drivers

Climate Change Vulnerabilities:

Extreme Events

- The service area is likely to experience more frequent and intense events such as high winds, icing, and high heat.
- North Atlantic hurricanes could become more intense and have higher rainfall amounts (~10% to 15% increase) relative to historical hurricanes.
- The probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future.

Project Funding in O&R Rate Case:

- Joint Proposal funding: $14.6 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$2.1	$5.0	$7.4
Joint Proposal ($M)	$1.3	$5.5	$7.8

Multiple Hazards

Storm Material Management

Program Scope & Resiliency Benefits

Program Scope:

- This program will install a dedicated storm material warehouse on land owned by O&R, across from the existing Blooming Grove Operating Center, to be placed into service in 2028.
- This location is centrally located within the O&R service territory and has easy highway access for emergency storm response events
- Facility will house 20 days' worth of critical spare equipment inventory for catastrophic storm response (O&R currently maintains 5 days' worth)

Resiliency Benefits:

- Reduces event recovery time by making spare parts available more quickly
- Mitigates elongated lead times from existing supply chain issues

Climate Drivers

Climate Change Vulnerabilities:

Extreme Events

- The service area is likely to experience more frequent and intense events such as high winds, icing, and high heat.
- North Atlantic hurricanes could become more intense relative to historical hurricanes.
- The probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future.

Project Funding in O&R Rate Case:

- Joint Proposal funding: $20.1 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$3.7	$8.5	$13.8
Joint Proposal ($M)	$0.7	$7.8	$11.6

Multiple Hazards

Micronet Weather Station Expansion

Program Scope & Resiliency Benefits

Program Scope:

- Install three (3) Micronet weather stations and instrumentation across O&R service territory
- These instruments can measure temperature, wind, precipitation, humidity, and barometric pressure to capture hyperlocal weather conditions

Resiliency Benefits:

- Better understanding of the hyperlocal impacts of climate change
- Reduce restoration times and outage costs by providing a more granular view of weather progression and impacts

Climate Drivers

Climate Change Vulnerabilities:

Extreme Events

- The service area is likely to experience more frequent and intense events such as high winds, icing, and high heat.
- The probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future.

Program Funding in O&R Rate Case:

- Joint Proposal funding: $0.16 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($000)	$380	-	-
Joint Proposal ($000)	$160	-	-

Flood Mitigation

Summitville Substation Flooding Mitigation

Program Scope & Resiliency Benefits

Program Scope:

- Install a paved 30” perimeter berm to prevent or control flow of water until substation retirement in 2032
- Summitville substation set to be retired and replaced with the Wurtsboro station

Resiliency Benefits:

- Reduced substation equipment vulnerability to damage failure from flooding due to extreme rain events, and location within FEMA 100-year floodplain
- Avoid restoration and replacement costs
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:

Precipitation

- FEMA 100-year flood map projection of an inundation depth of up to ~2 feet
- Maximum 5-day precipitation could increase 13% by 2050 at Dobbs Ferry.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Project Funding in O&R Rate Case:

- Joint Proposal funding: $0.14 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($000)	$140	-	-
Joint Proposal ($000)	$140	-	-

Hillburn Substation Flooding Mitigation

Program Scope & Resiliency Benefits

Program Scope:

- In the near-term Install 48” perimeter berm to prevent or control water
- In the longer term, two possible paths to enhance resilience to flooding:
  - Relocate substation to area less susceptible to flooding
  - Elevate the entire facility on raised site grade elevation

Resiliency Benefits:

- Reduce substation equipment damage failure from extreme rain events
- Increased reliability and life expectancy of assets
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:

Precipitation

- FEMA 100-year flood map projection of an inundation depth of between 1-4 feet within the substation site.
- Maximum 5-day precipitation could increase 13% by 2050 at Dobbs Ferry.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Project Funding in O&R Rate Case:

- Joint Proposal funding: $0.5 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($000)	$500	-	-
Joint Proposal ($000)	$500	-	-

Lovett 138kV Substation Flooding Mitigation

Program Scope & Resiliency Benefits

Program Scope:

- In the near-term construct two primary flood protection measures: raising the control house and installing waterproof cabinets
- In the longer term, two possible paths to enhance resilience to flooding:
  - Relocate substation to area less susceptible to flooding
  - Elevate the entire facility and fortify with a retaining wall

Resiliency Benefits:

- Increased ability to withstand climate-driven flood risks
- Avoid restoration and replacement costs
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:

Precipitation / Sea Level Rise

- FEMA 100-year flood map projection combined sea level rise resulting in an inundation of 4 feet by 2050
- Projections show sea levels could rise 16 inches by the 2050s.
- Maximum 5-day precipitation could increase 13% by 2050 at Dobbs Ferry.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Project Funding in O&R Rate Case:

- Joint Proposal funding: $13.2 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$2.6	$5.2	$5.4
Joint Proposal ($M)	$2.6	$5.2	$5.4

Shoreline Erosion Protection Program

Program Scope & Resiliency Benefits

Program Scope:

- Expand the existing inspection program with a more proactive mitigation approach
- Armoring additional structures along rivers per year
- Implement mitigation measures such as riprap or retaining walls to prevent erosion and potential failure of overhead structure

Resiliency Benefits:

- Provide long-term solution for shoreline erosion damage due to sea level rise and flooding from severe coastal storms
- Reduce flood risk to O&R's shoreline infrastructure
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:

Precipitation / Sea Level Rise

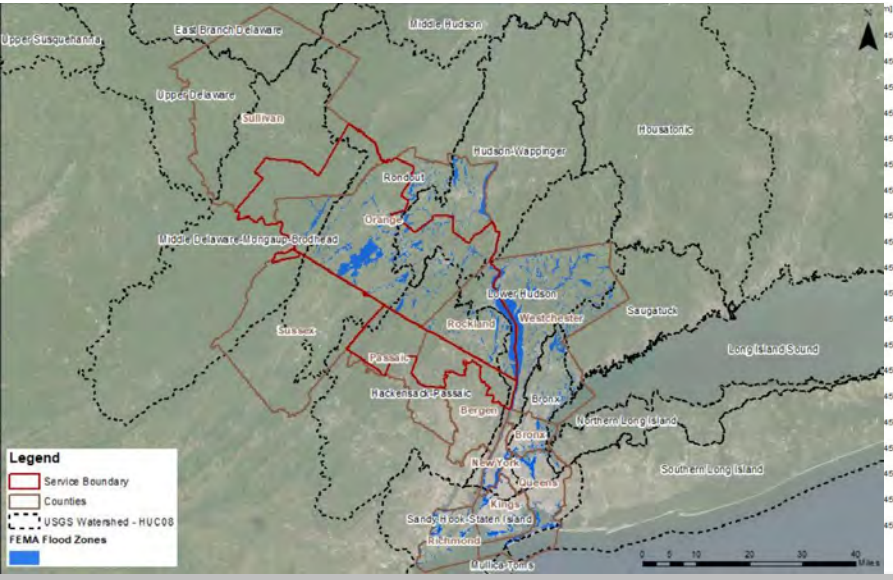
- Projections show sea levels could rise 16 inches by the 2050s for assets near the Hudson River
- North Atlantic hurricanes could become more intense with rainfall amounts increasing approximately 10% to 15% relative to historical hurricanes.

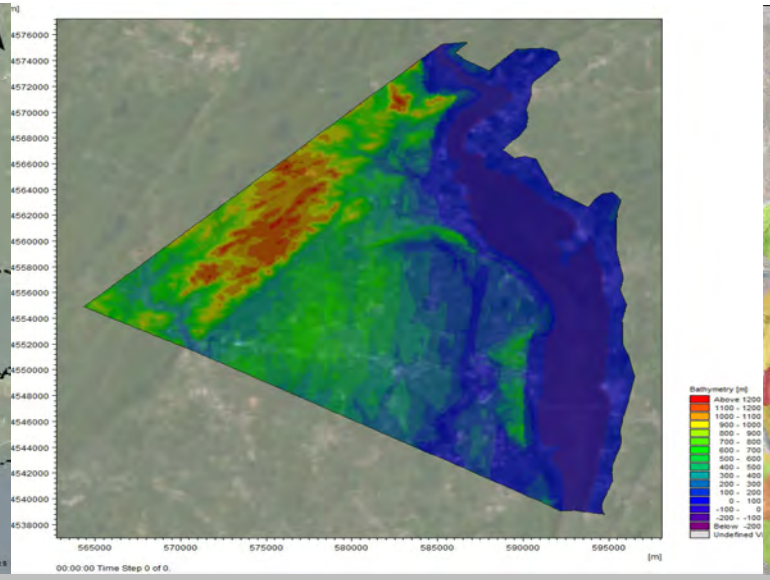
Program Funding in O&R Rate Case:

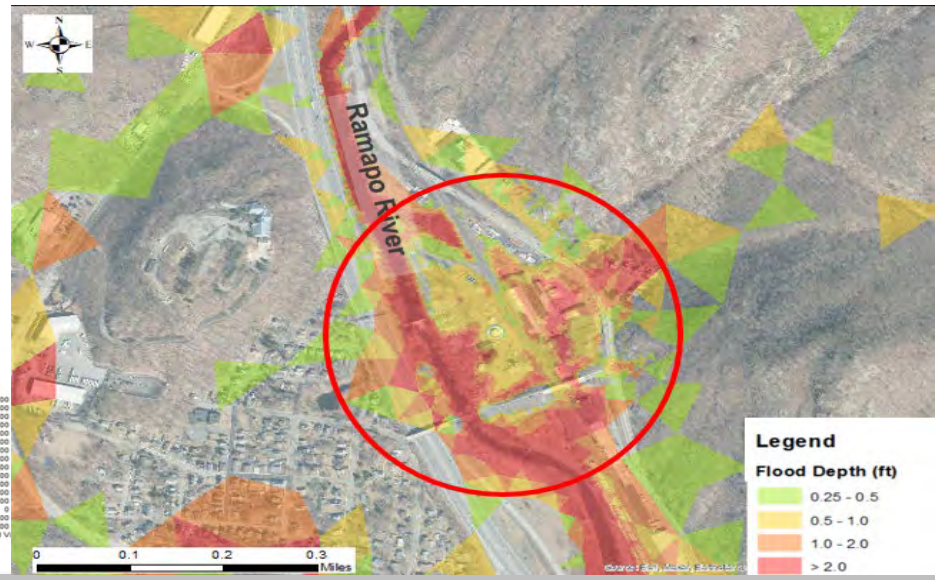
- Joint Proposal funding: $3.1 million (capital)

	2025 (RY1)	2026 (RY2)	2027 (RY3)
CCRP Request ($M)	$1.0	$1.0	$1.1
Joint Proposal ($M)	$1.0	$1.0	$1.1

Deluge rain and flood modeling study







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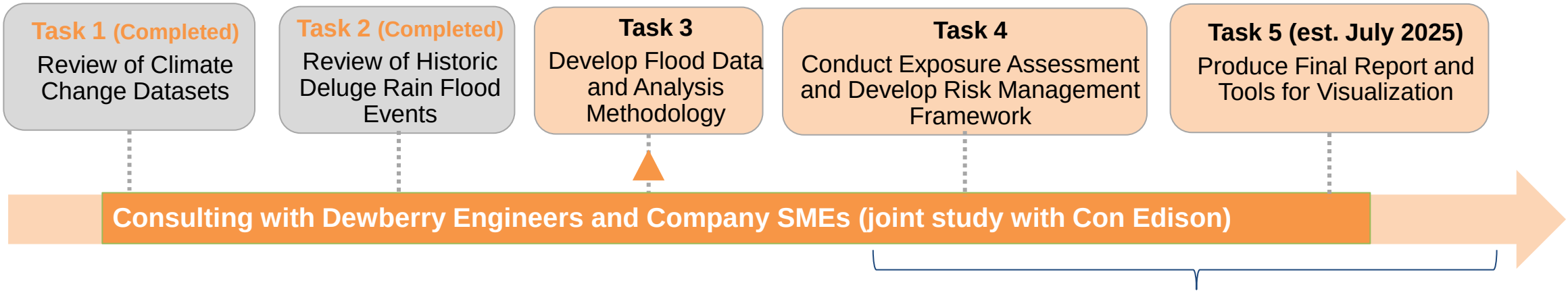
Deluge rain and flood modeling study

The study aims to evaluate regional inland and riverine flooding using hydraulic & hydrologic (H&H) modeling to develop new GIS Layers and guidance documents for five plausible future rainfall scenarios

- Goal is to assess data gaps and vulnerabilities not yet quantified or outdated
- Objective is to use study outputs to identify whether O&R needs to update or revise long term planning and engineering decisions and/or justify funding for future resilience investments



Current Status

- Reviewing 2023 climate vulnerability study and existing datasets (e.g., LIDAR, GIS data, FEMA data)
- Identifying deluge rain flood scenarios
- Identifying flood modeling and analysis methodology

Study Outputs

- Flooding insights (i.e., future trends)
- Exposure assessment and risk management framework
- Tools to visualize flood exposure for O&R facilities (i.e., GIS layers, maps)

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Deluge rain and flood modeling study

The Study Team will utilize the latest climate models and flood/intense rain projections to model plausible future events and identify the impact throughout the service territories.

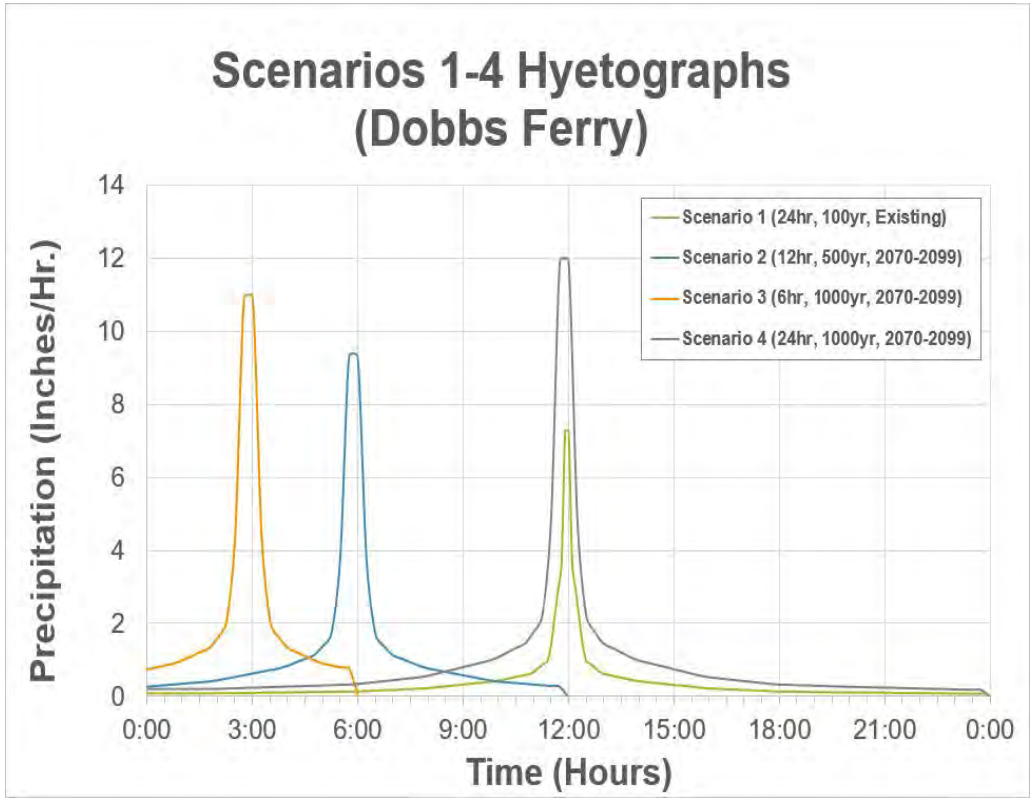


Fig. 1: Scenario hyetographs* for Dobbs Ferry, NY

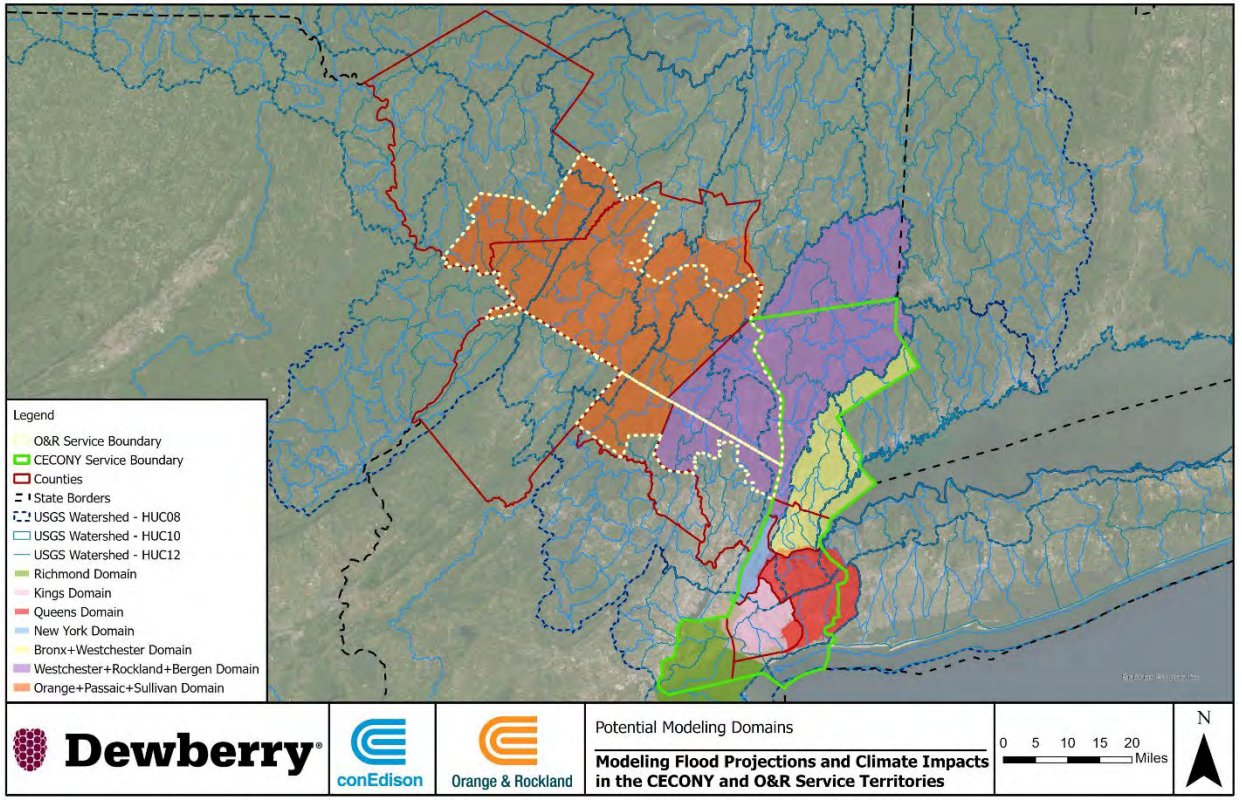


Fig. 2: O&R and Con Edison service area with USGS watershed boundaries and FEMA floodplain datasets shown

*A hyetograph is a graph that shows how rainfall intensity changes over time

Deluge rain and flood modeling study

The Study Team selected five rainfall scenarios for this study to model flood projections and climate impacts in the O&R service territory.

~8.6”

Total Rainfall Depth from a 100-year rain event over 24 hours at Dobbs Ferry

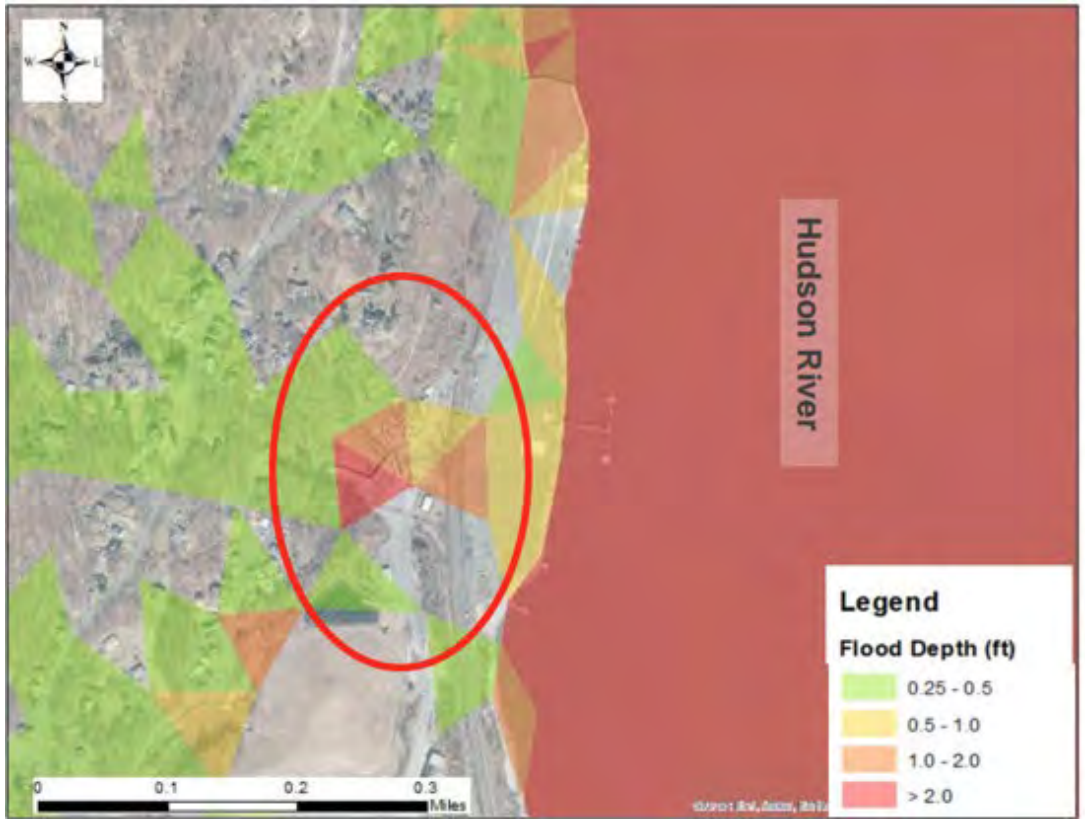
~13.5”

Total Rainfall Depth from a 1000-year rain event over 6 hours at Dobbs Ferry

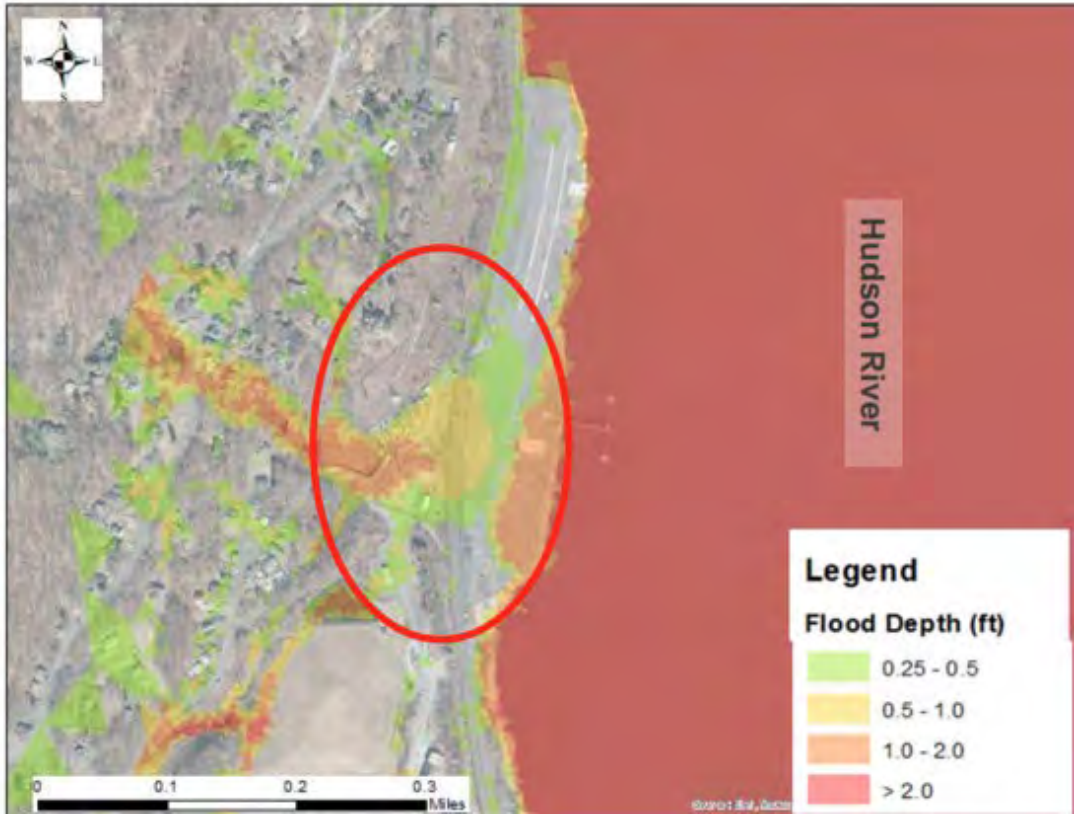
Scenario	Return Period	Rainfall Duration (Hours)	Climate Condition	Goal
1	100-year	24	Existing	Create baseline; reflect recent rainfall events
2	500-year	12	Future (late century)	Simulate overnight storm with high rainfall totals
3	1,000-year	6	Future (late century)	Simulate cloudbursts (flash flooding)
4	1,000-year	24	Future (late century)	Simulate stalled tropical storm
5	Probable Maximum Precipitation (PMP)	96	Existing PMP	Simulate dual-band or compound event over multiple days

Deluge rain and flood modeling study

The GIS layers are two-dimensional ("coarse mesh") for all scenarios. We will also conduct a “hotspot analysis” using a “fine mesh” refinement for individual locations that are yet to be determined.



Coarse mesh (100x100m resolution)



Fine mesh (10x10m resolution)

Next Steps

- We will continue to share relevant updates with the Working Group
  - Next Working Group meeting will be scheduled for Q1/Q2 2025
- Continuation of the deluge rain and flood modeling study
  - Estimated completion in July 2025

Orange & Rockland