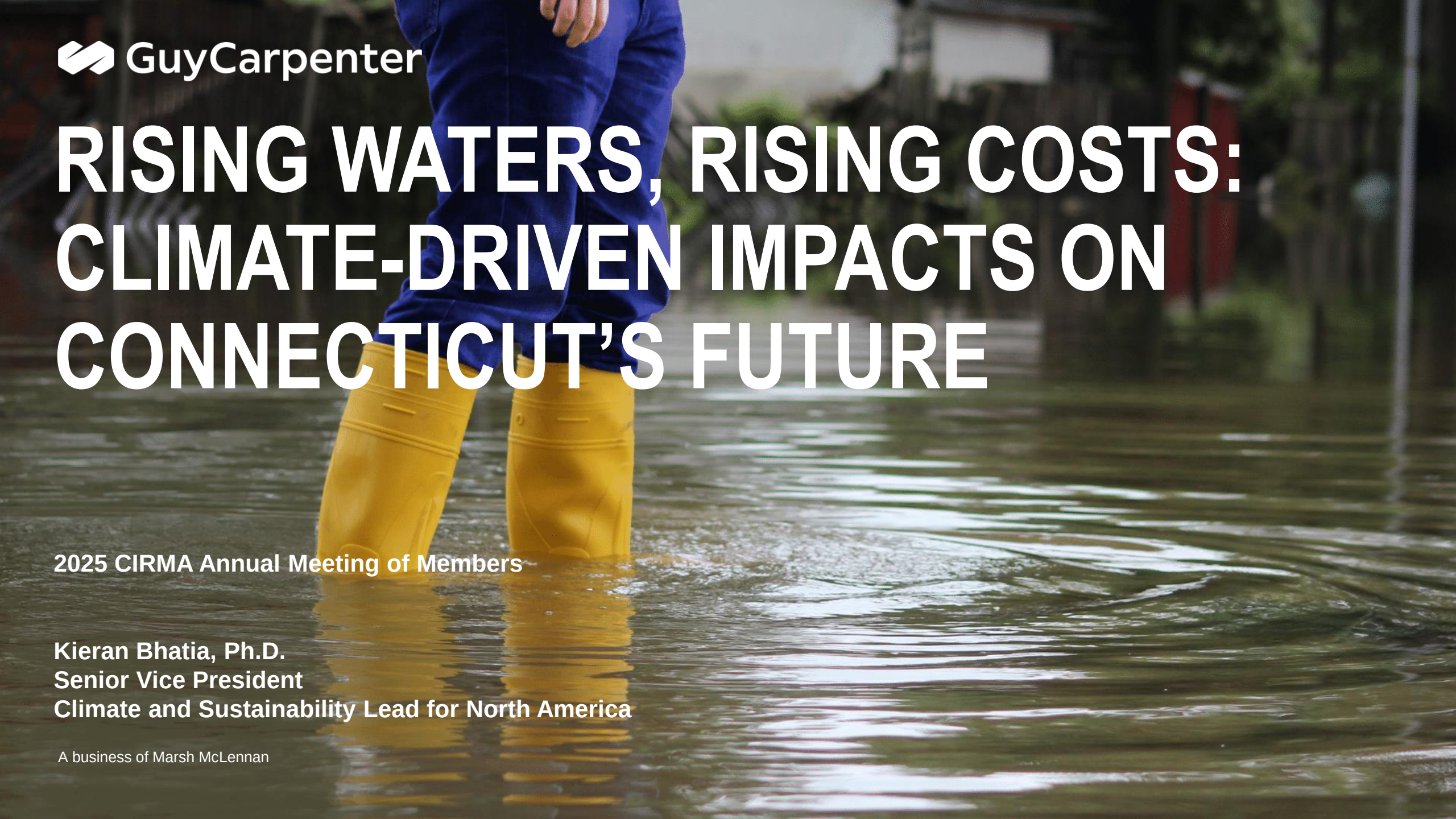


GuyCarpenter

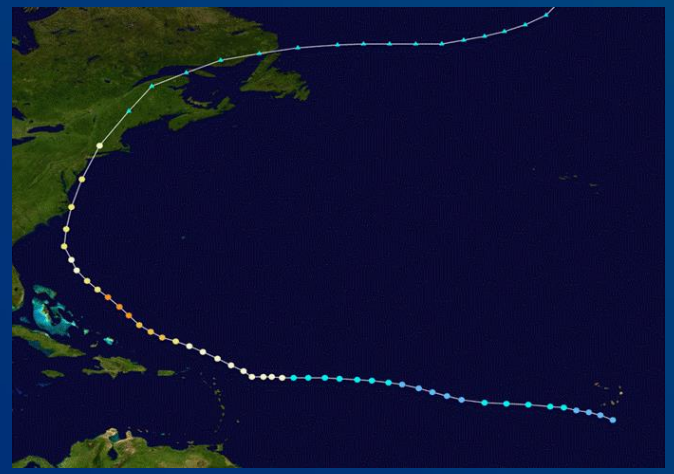
RISING WATERS, RISING COSTS: CLIMATE-DRIVEN IMPACTS ON CONNECTICUT'S FUTURE

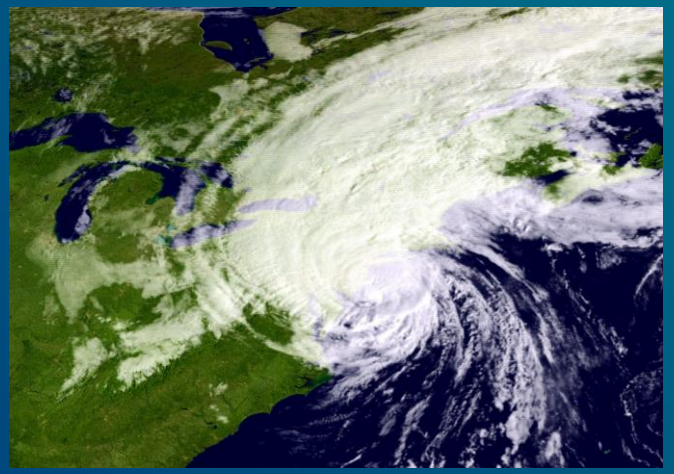
2025 CIRMA Annual Meeting of Members

Kieran Bhatia, Ph.D.
Senior Vice President
Climate and Sustainability Lead for North America

A business of Marsh McLennan

1. The Insurance Industry and Climate Change
2. The Evolving Physical Risk Landscape
3. Proactive Management of Climate Risks

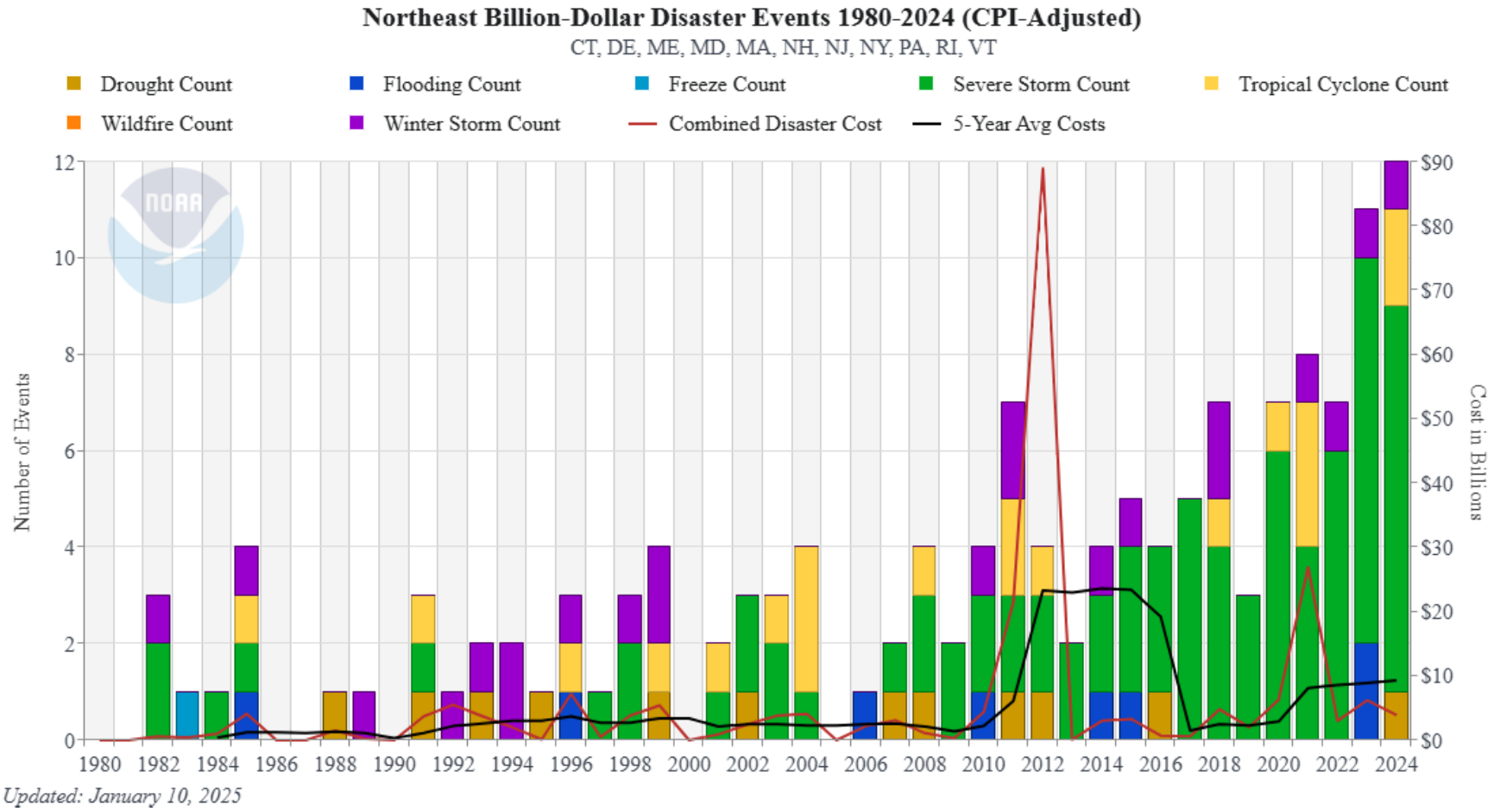




Agenda

The Insurance Industry and Climate Change

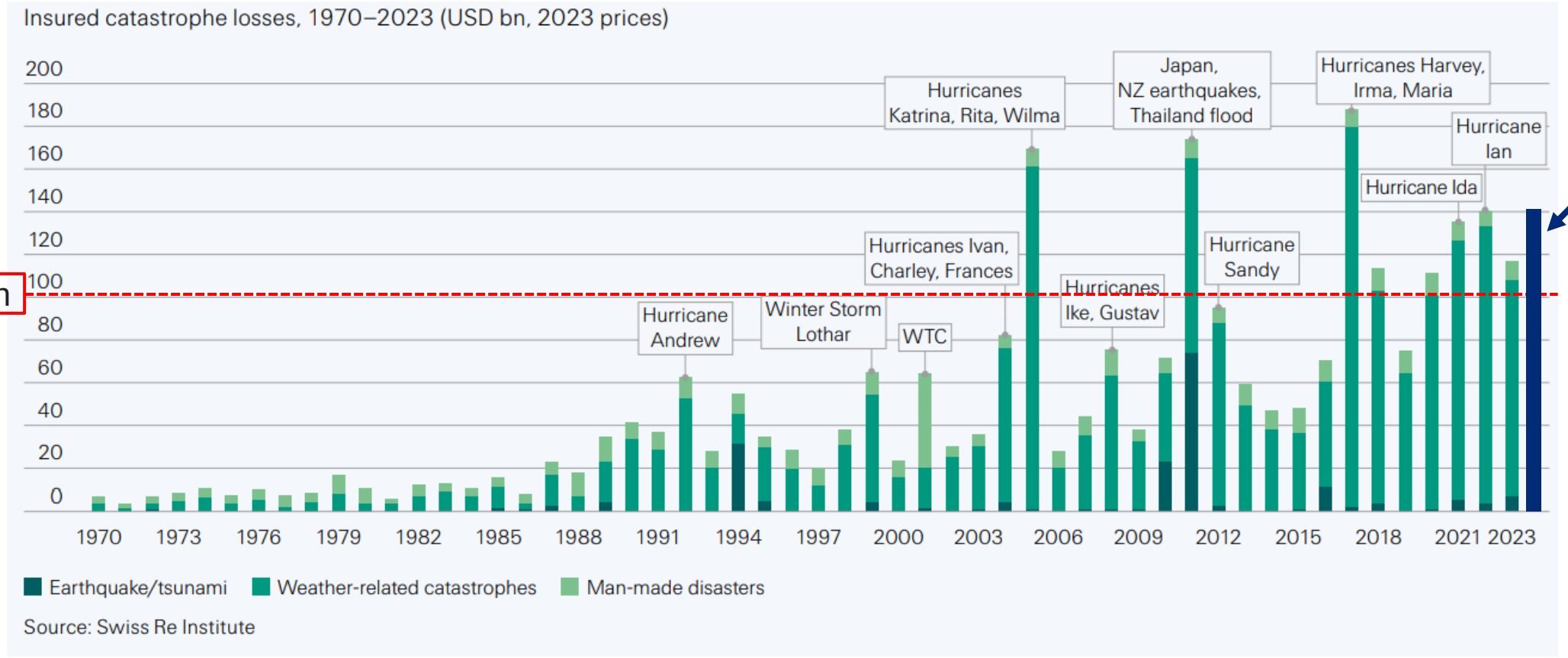
Increasing Frequency of US Billion Dollar Loss Events



27 billion-dollar loss events were logged in 2024 which was one shy of the previous year's record for most billion-dollar loss events in a year.

Global Insured Losses Show a Similar Trend

Secondary perils continue to be larger portion of global insured losses



5 years in a row and 7 of the last 8 years have exceeded $100 billion in insured losses globally.

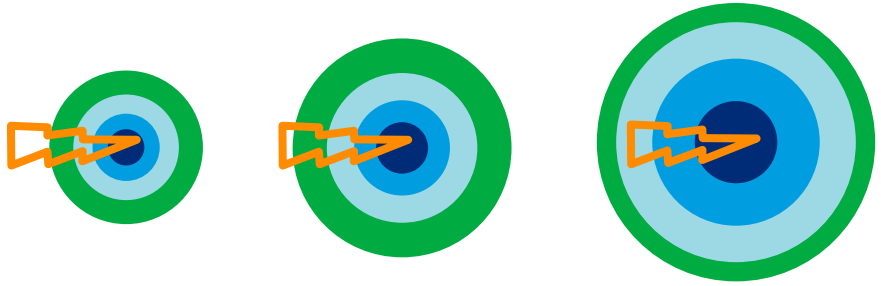
What Is Driving Loss Escalation?

Other factors besides hazard changing in the global insurance marketplace

Inflation, Social or Otherwise

- Supply Chain Disruption
- Monetary Policy
- Claims Litigation
- Widening Wealth Gap
- Cost of Goods

Population Growth



- Bullseye effect of population sprawl
- Footprint of severe thunderstorms, hurricanes, coastal flood, wildfire
- Expansion amplifies risk

Climate Change

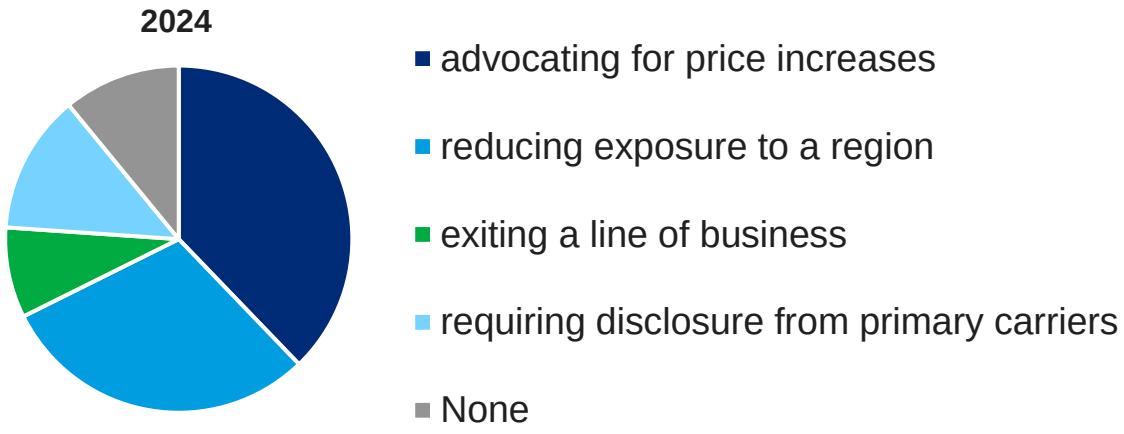
Physical Risk
Adverse losses Increased volatility

Transition Risk
Investments lose value due to abrupt industry transitions

Liability Risk
Could challenge law statutes, disclosures, compliance

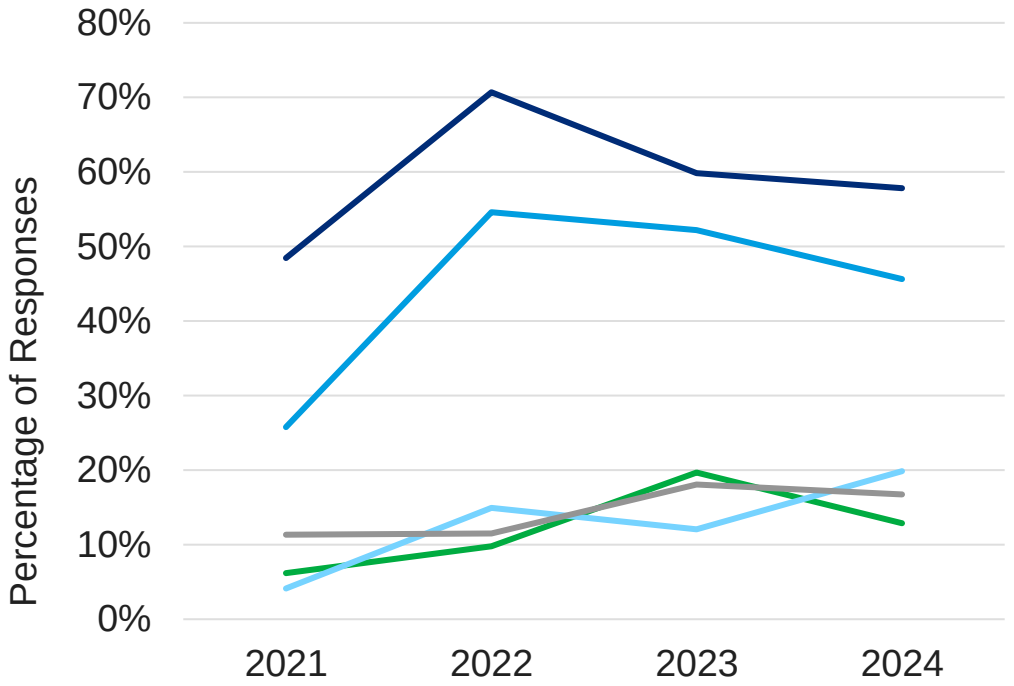
Climate Change Renewal Sentiment- GC Broker Survey

What actions do markets take when concerned about climate change?



Additional Individual Responses

- Higher attachment points
- Reducing hours in loss occurrence and limiting hours for aggregation
- Increased retentions
- Exclusions on fossil fuel intensive activities
- Adjusting models and view of risk



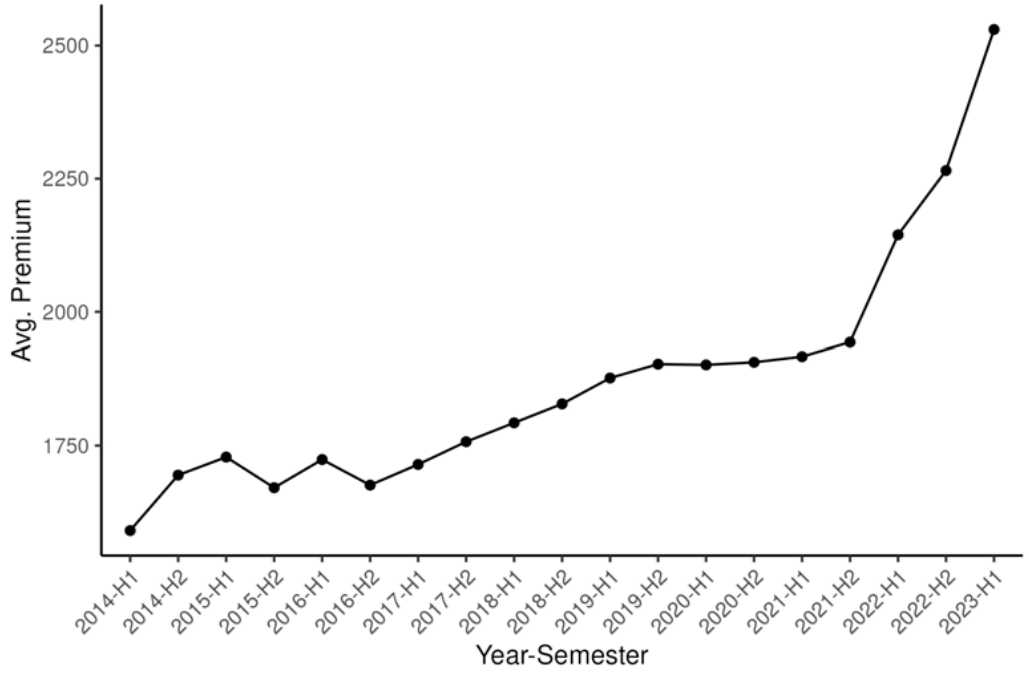
The percent of responses that answered "requiring disclosure from primary carriers" has quadrupled from 2021 to 2024.

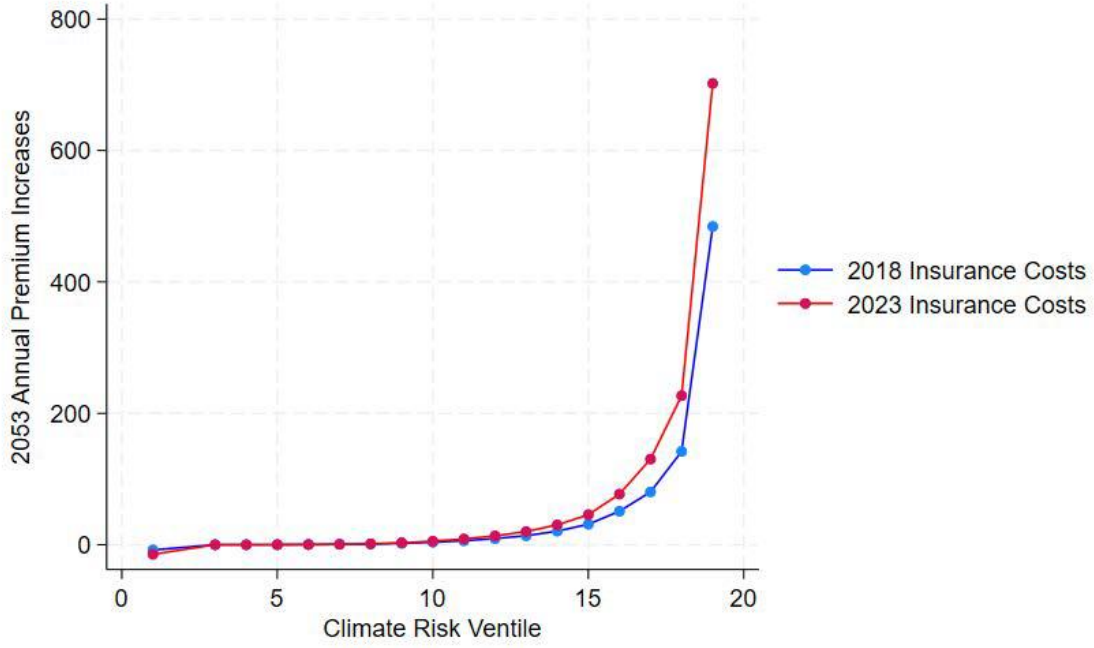
Insurance Premiums Are Responding

Study shows premiums have skyrocketed; forecasts premiums in higher risk locations to increase faster

Property Insurance and Disaster Risk: New Evidence from Mortgage Escrow Data

Benjamin J. Keys & Philip Mulder

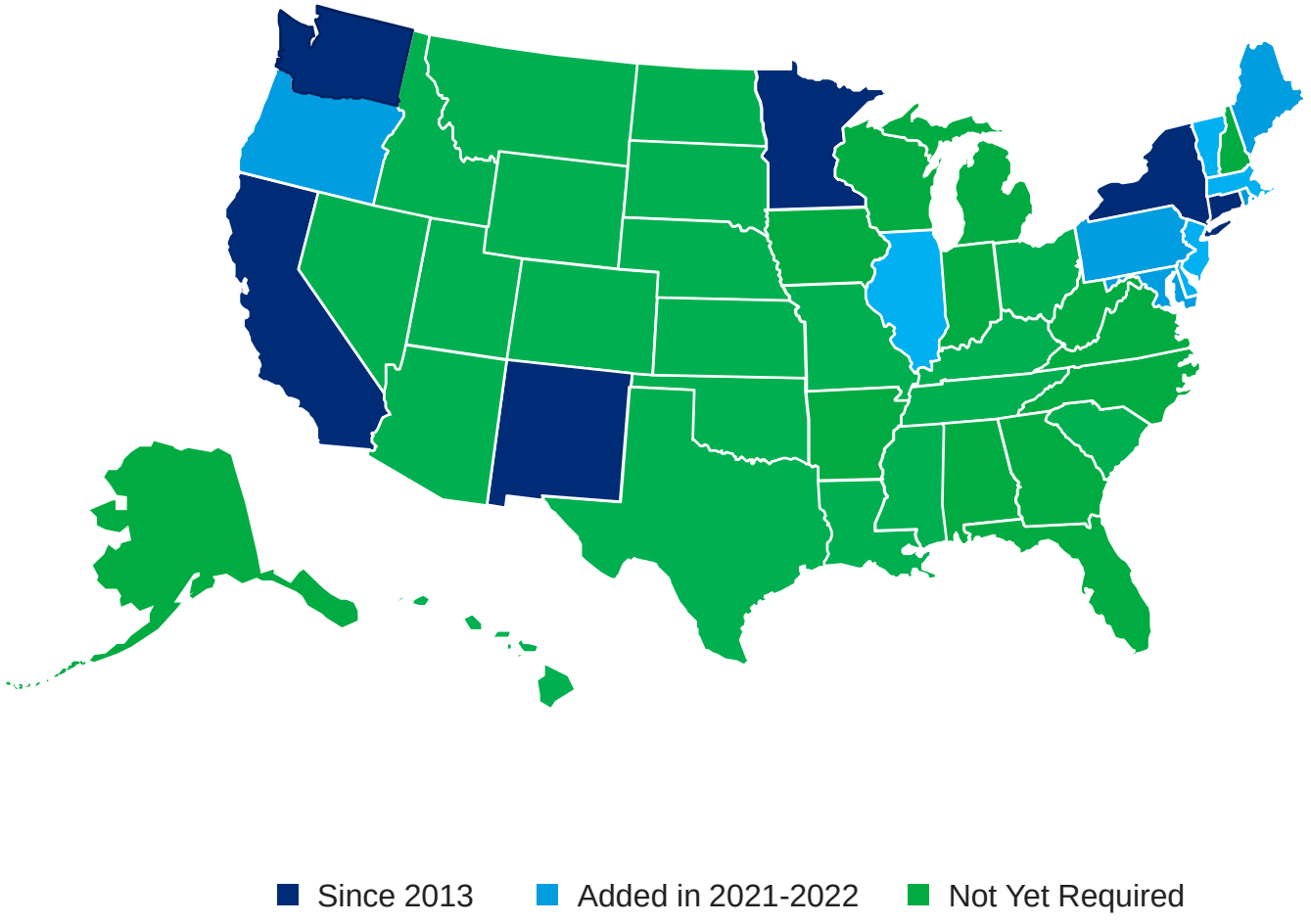




National Association of Insurance Commissioners Survey

NAIC aligned climate risk survey with TCFD standard

- In 2022, Illinois became the 16th state requiring NAIC survey participation for insurers with $100 million or more in premiums. The survey covers well over 80% of the entire US insurance market.
- NAIC Notice to Insurers is typically sent in July and survey responses are due at the end of August.
- Close-ended questions were mandatory for the first time in 2024.



NAIC Climate Risk Disclosure Survey

2025 NAIC RBC Climate Requirement

New disclosure of climate impact on catastrophe exposure for all RBC Filers due March 1, 2025

1

NAIC Scenarios

‘Frequency-based’ approach:

- **Hurricane**: 10% and 50% frequency increases to Category 3+ hurricanes
- **Wildfire**: 10% and 50% frequency increases to all wildfires

Value:

Box-checking exercise allows companies to quickly and easily understand how stress-test scenario affects their portfolio. However, low utility for company strategy and actionable insights.

2

Vendor Adjustment

Vendor climate catalog approach:

- ‘Time-based’ approach (NAIC term), forecast of climate risk in 2040 and 2050, under RCP4.5 or SSP2-4.5

Value:

Vendor climate-conditioned results provide a more realistic view of future risk but come at a much higher cost to companies.

3

Own View

‘Time-based’ approach:

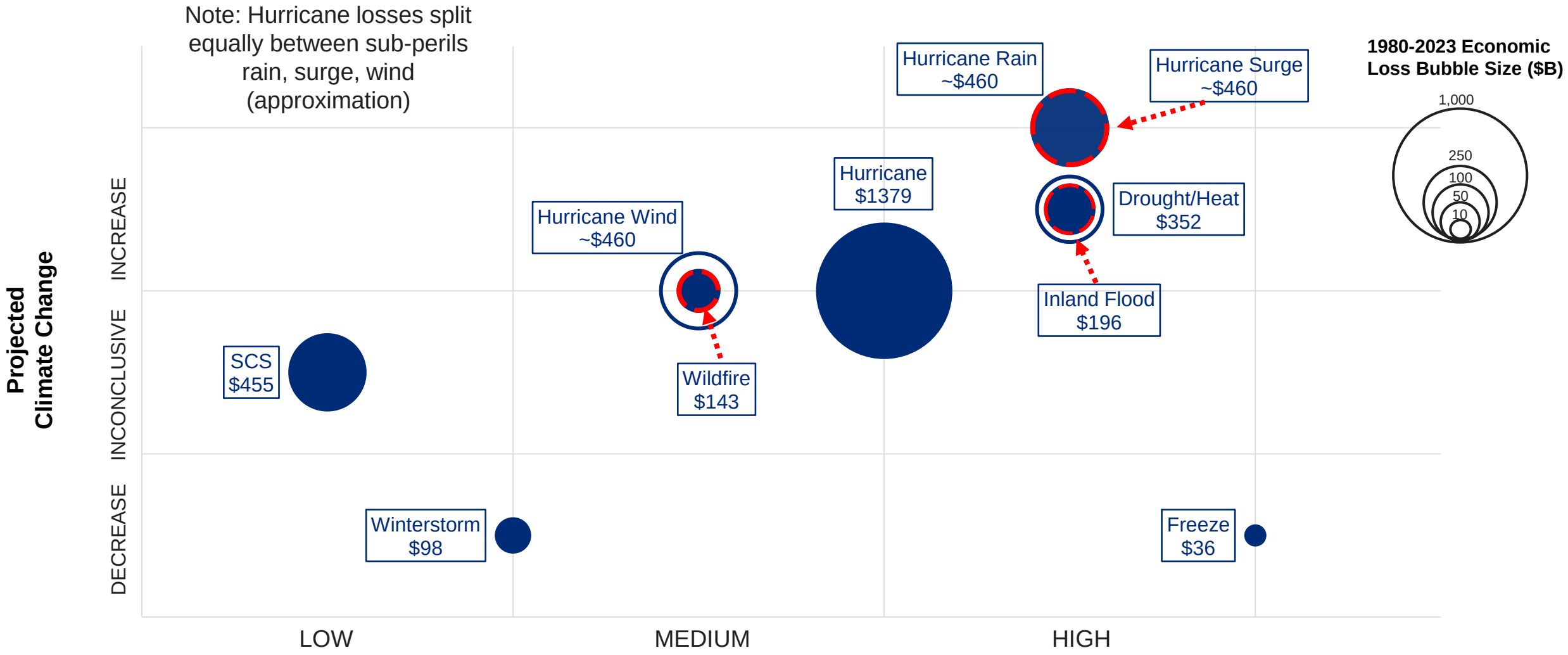
- Science-based forecast of climate risk for hurricane and wildfire in 2040 and 2050, under RCP4.5

Value:

Developing an internal view or relying on a third-party approach allows for flexibility in methodology and better understanding of uncertainty. This approach is helpful for company strategy.

The Evolving Physical Risk Landscape

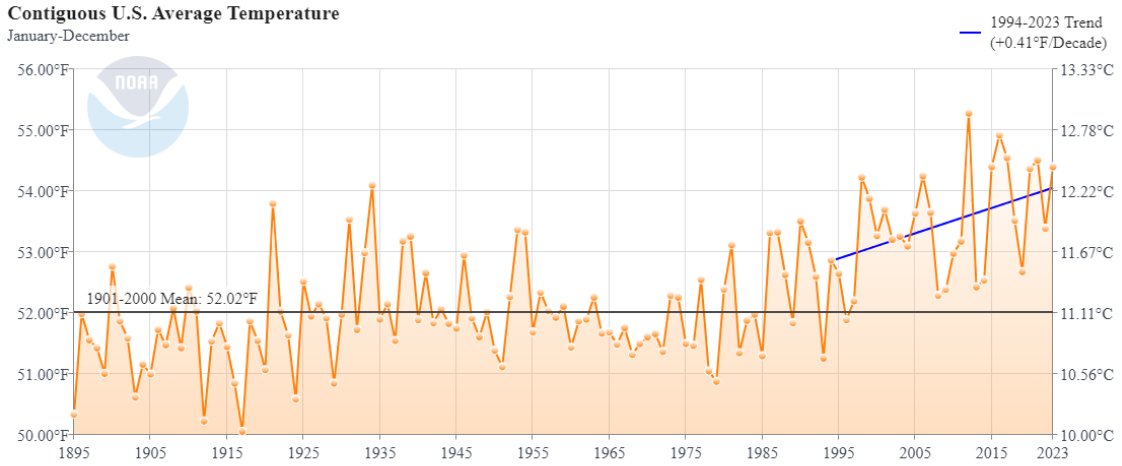
US 2024 Peril Assessment of Climate Change Impact
1980-2023 Economic Loss Bubble Size ($B)

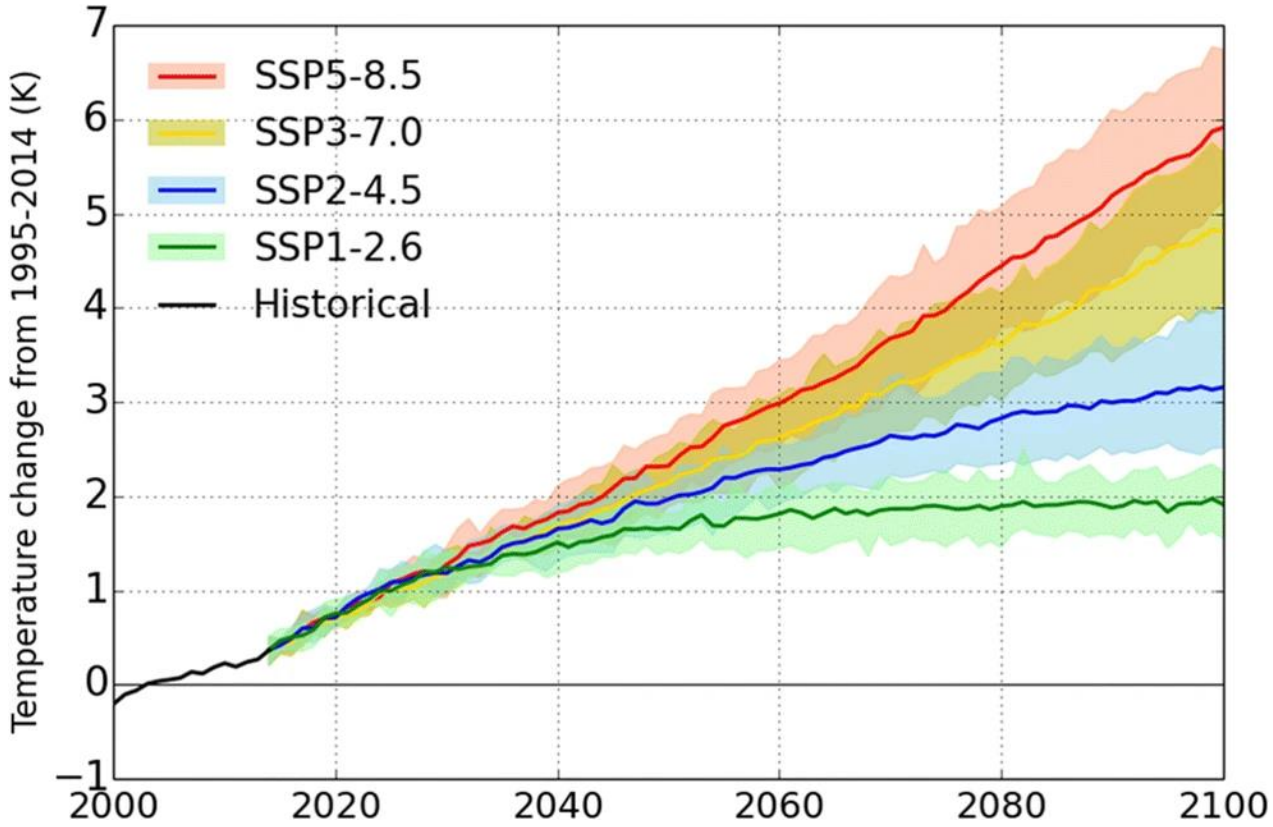


Source: NOAA Billion Dollar Database

Temperature Extremes

Projections for additional warming throughout the 21st century suggests more daily extremes

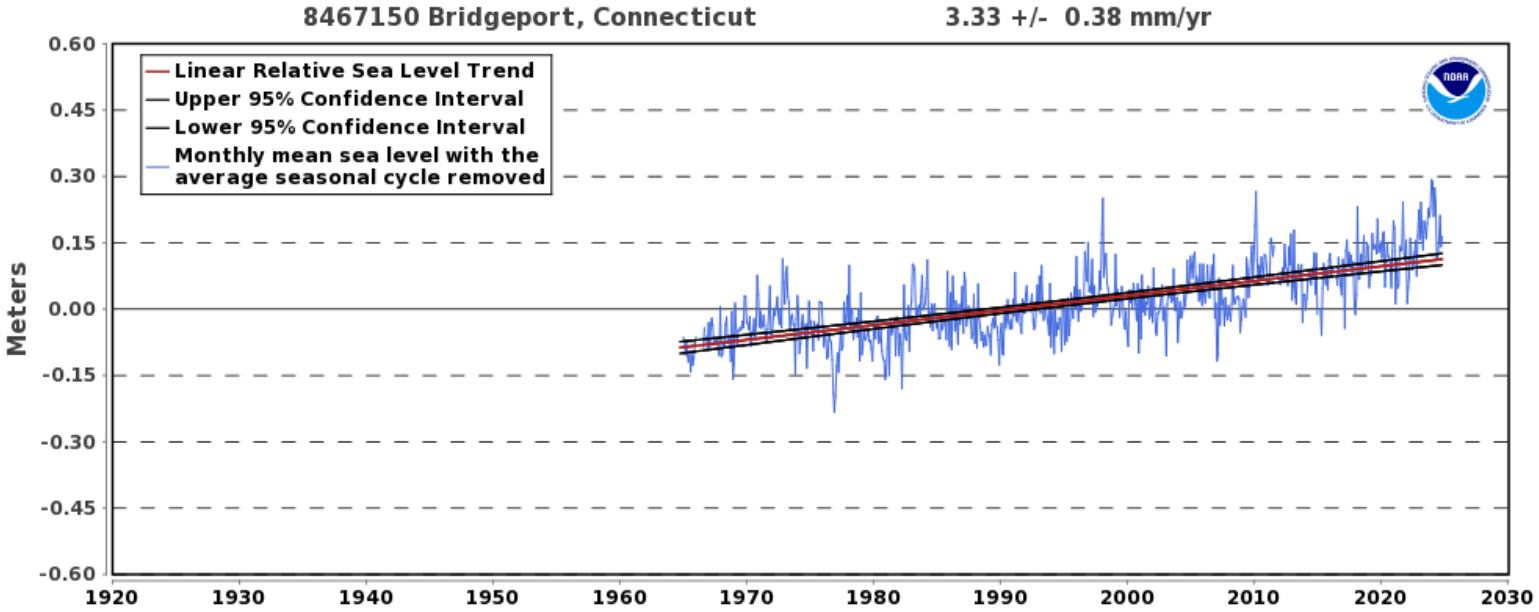


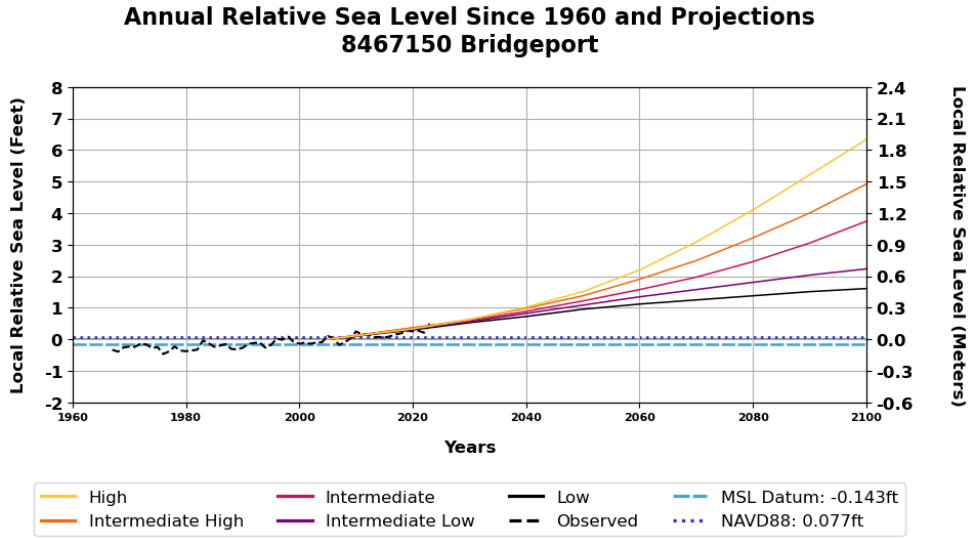


The average annual temperature in the US has warmed by ~2 degrees Fahrenheit over the last 125 years. An increase of ~2 more degrees Fahrenheit is projected in the next 40 years.

Sea Level Rise – Accelerating Threat

Bridgeport, Connecticut

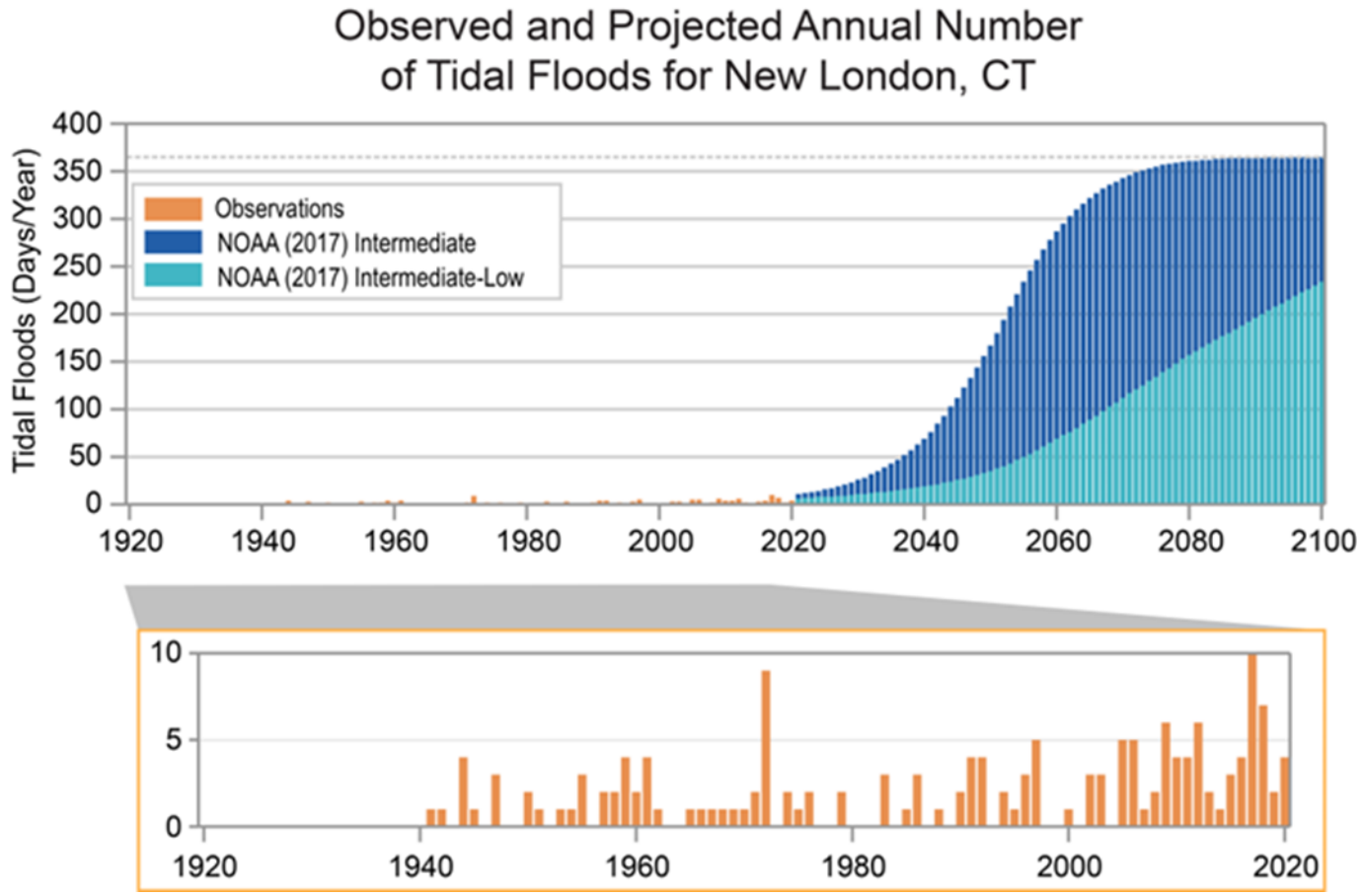




~8 inches of sea level rise during the last 60 years, ~8 inches of sea level rise projected in the next 25 years.

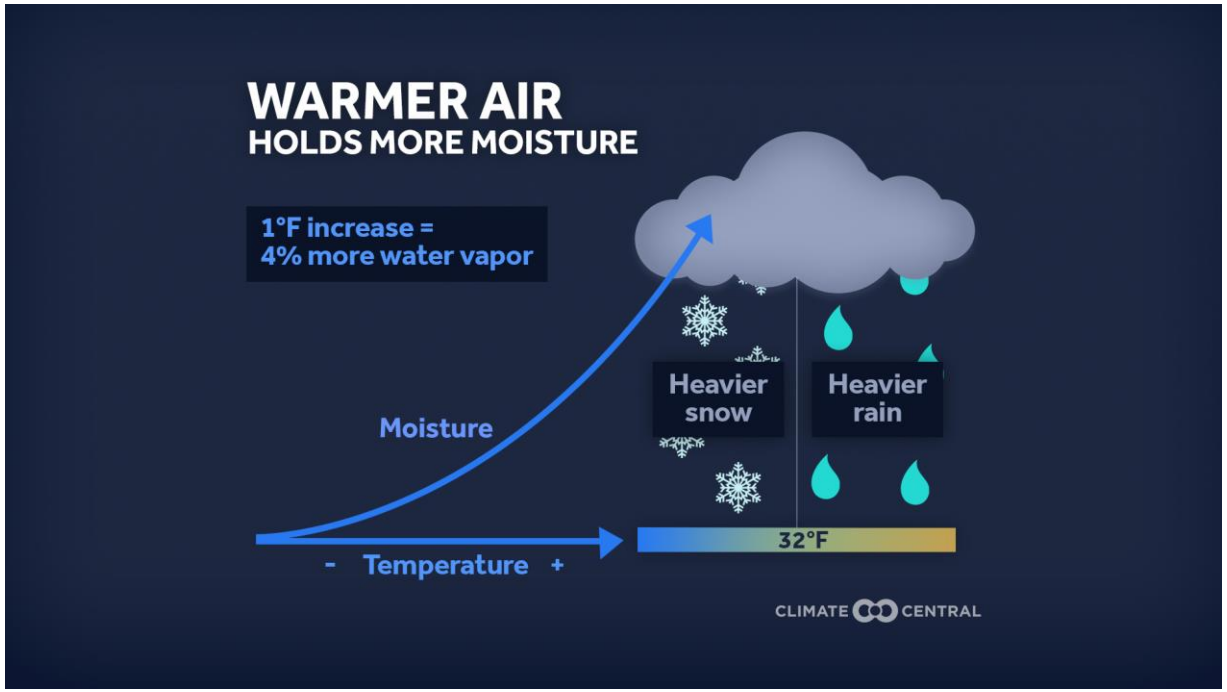
Sea Level Rise – Accelerating Threat

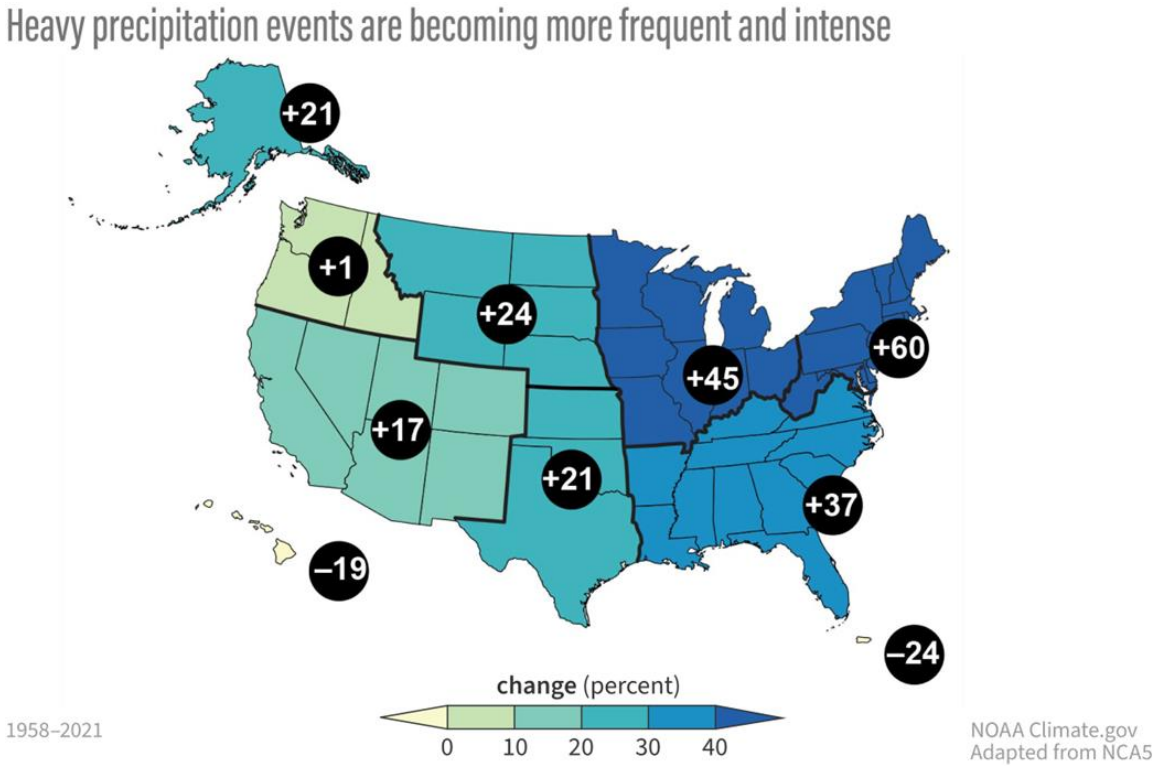
New London, Connecticut



Precipitation Extremes Have Increased

Heaviest precipitation events increased by 60% in the Northeast from 1958-2021

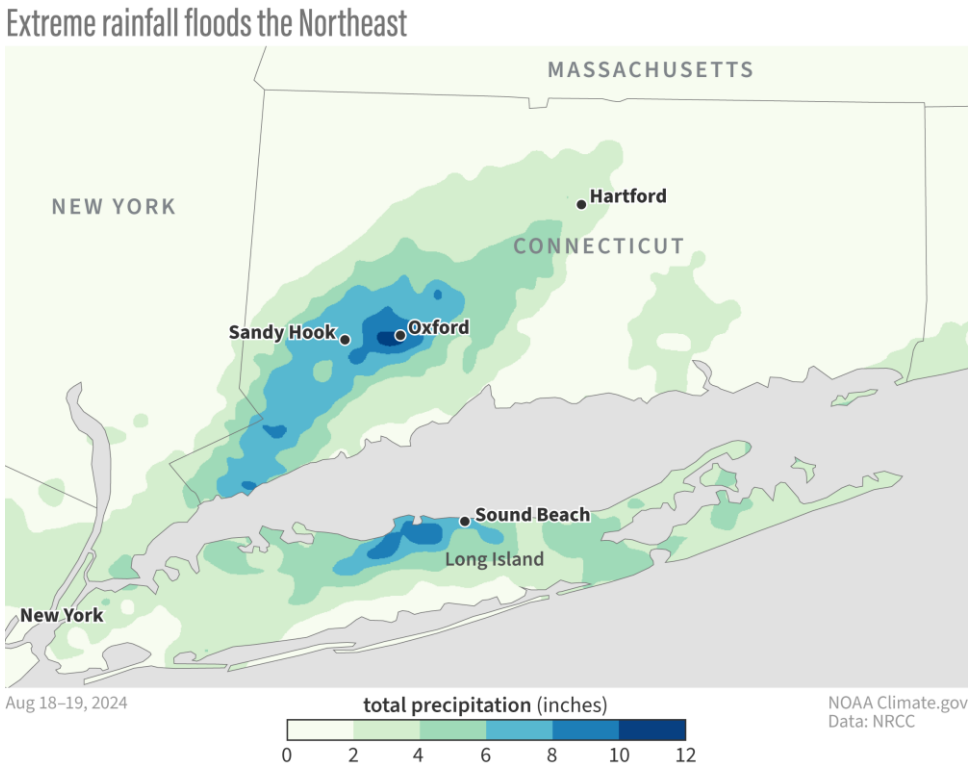


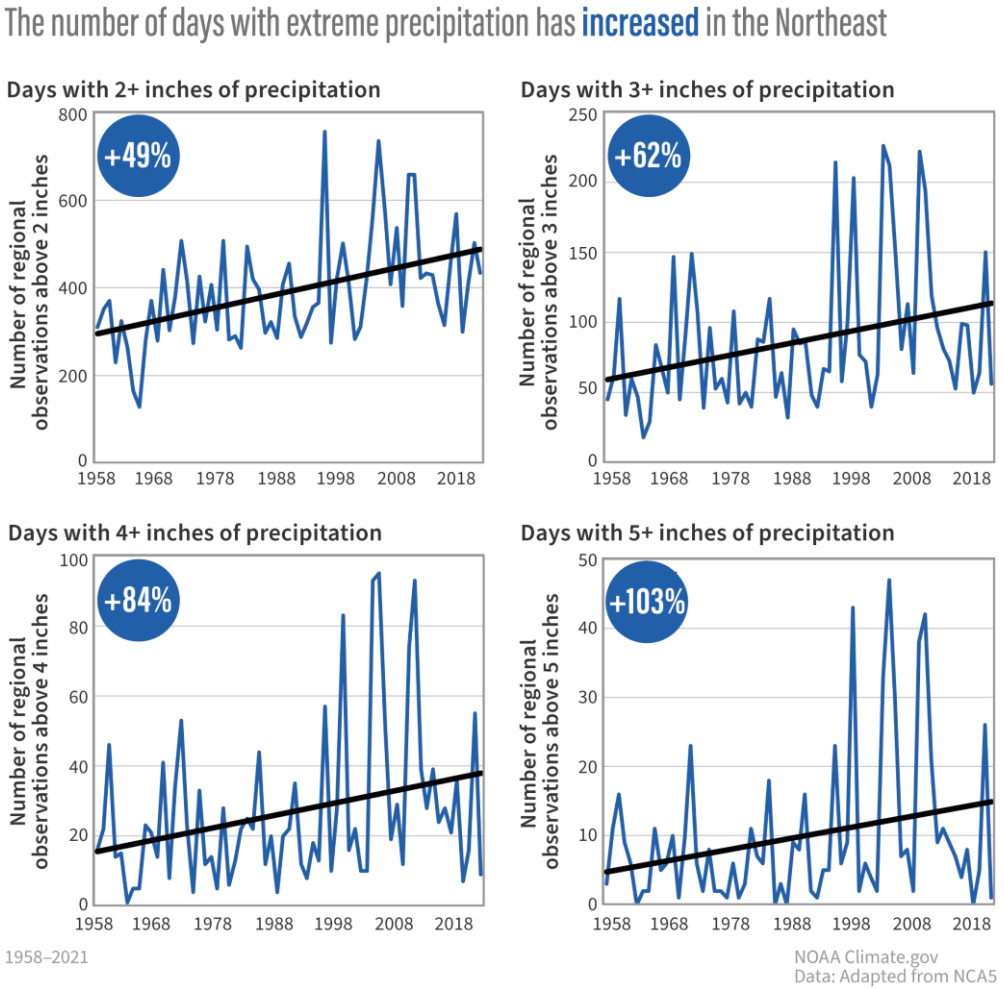


The relationship between the "water-holding ability" of the atmosphere, temperature, and pressure is defined by the Clausius-Clapeyron equation. This relationship means the atmosphere can hold approximately 7% more water per degree temperature rise.

August 2024 Connecticut Rain Event

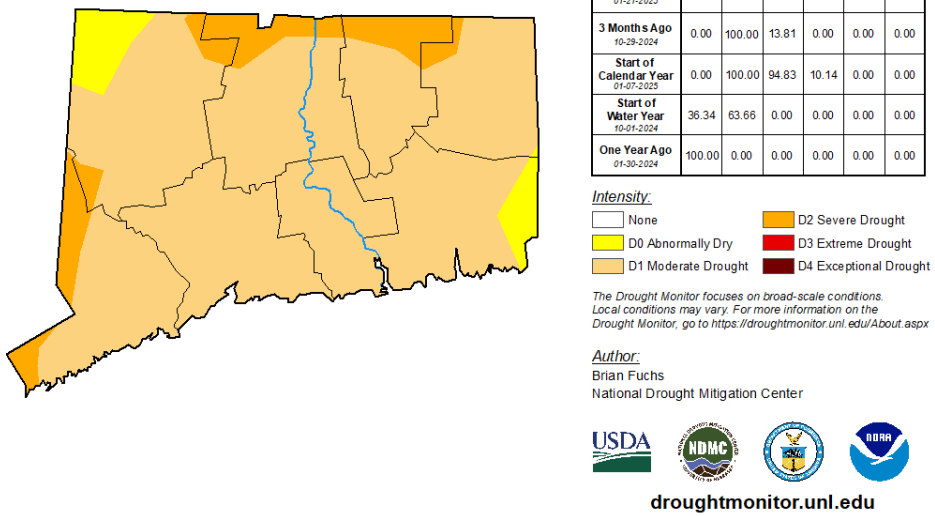
Over 200 million dollars in losses for CT from the 2024 event and still counting…

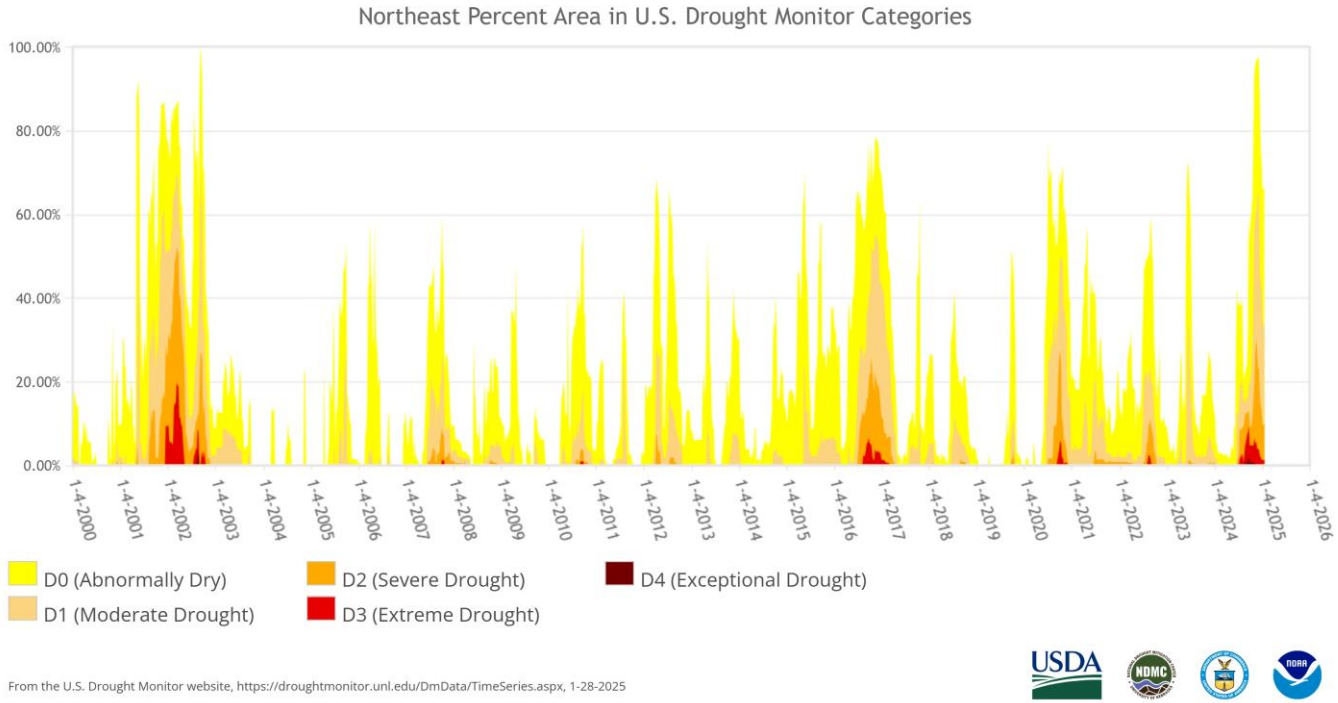




Drought Risks Increasing With Warmer Temperatures

Winter 2024-2025 Northeast drought is the worst one since 2002

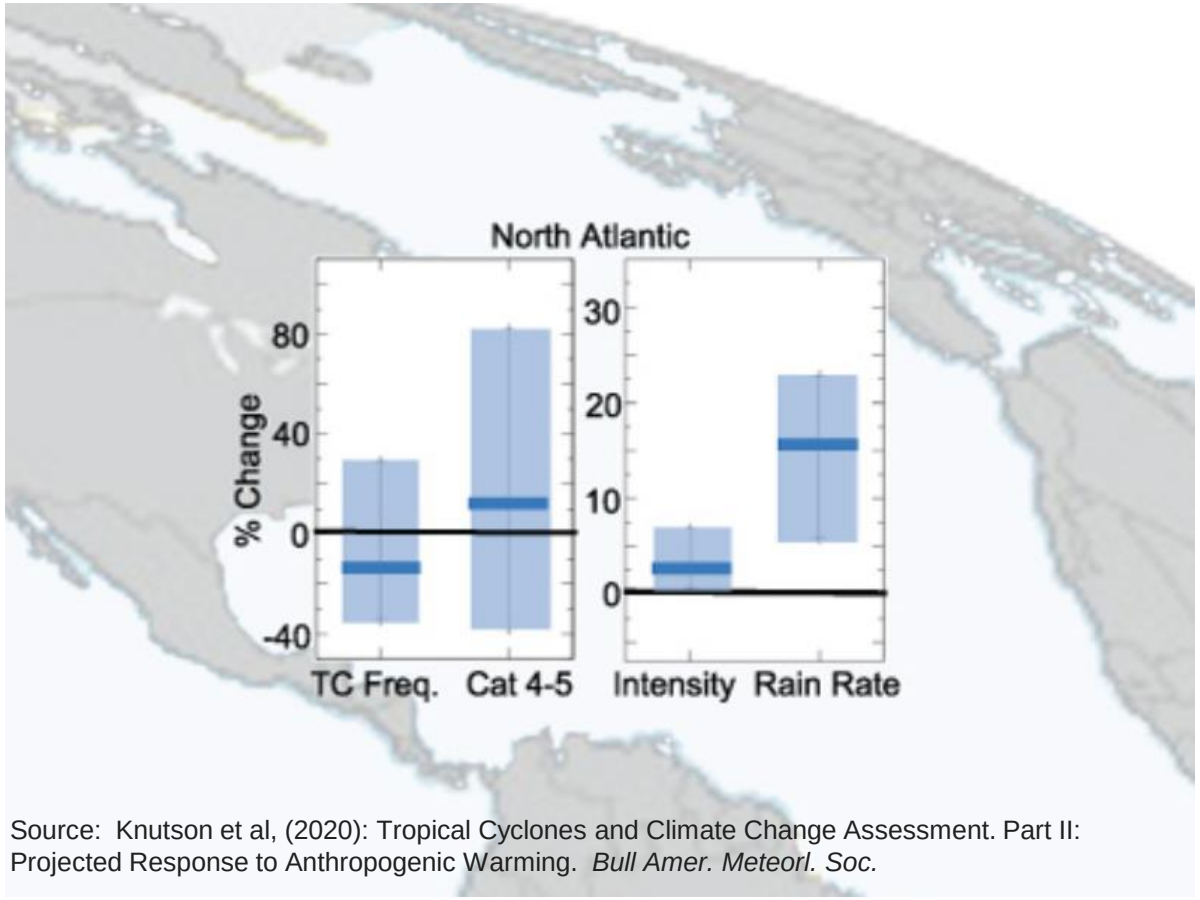




From the U.S. Drought Monitor website, https://droughtmonitor.unl.edu/DmData/TimeSeries.aspx, 1-28-2025

Climate Change and Hurricanes

2°C warming of planet, roughly 2050



Source: Knutson et al, (2020): Tropical Cyclones and Climate Change Assessment. Part II: Projected Response to Anthropogenic Warming. *Bull Amer. Meteorl. Soc.*

Hurricane Climate Change Impacts

Descending Order of Confidence

Higher Storm Surge

- Sea level rise, most prominently low lying islands and coastal cities

Heavier Rainfall

- Warmer atmosphere holds more moisture
- Warmer sea surface temperatures increase evaporation off ocean
- Slower moving storms

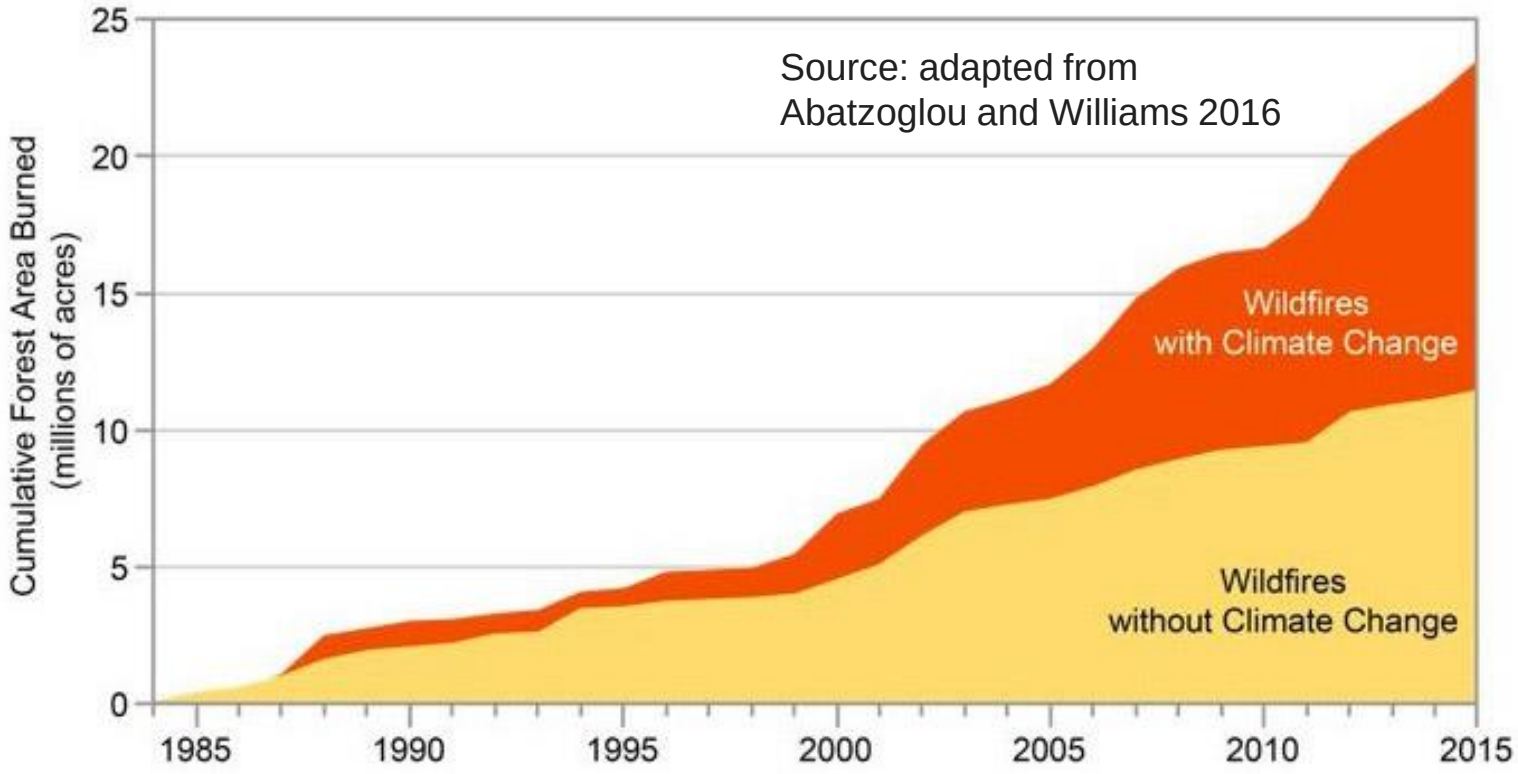
Higher Ceiling of Intensity

- Strongest storms expected to be stronger (warmer oceans)
- Rapid intensification (RI) potentially more likely

Lower confidence:
total number of tropical cyclones globally and ratio that make landfall

Climate Change and Wildfire

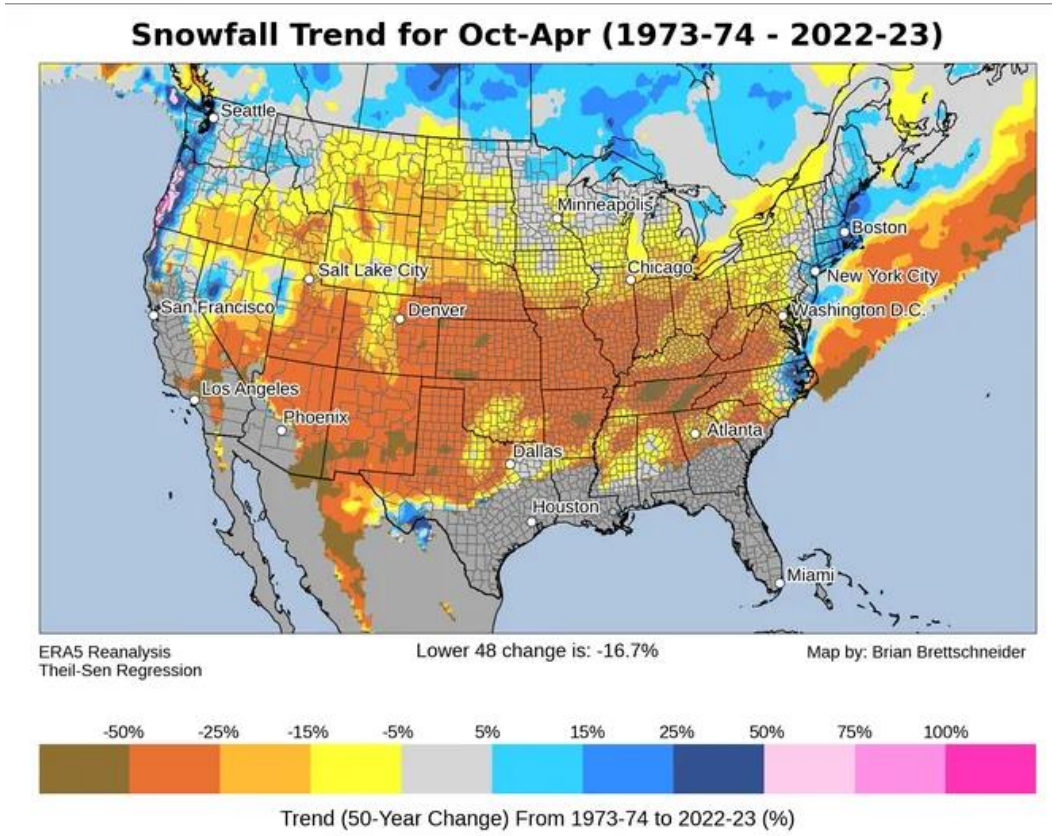
Recent IPCC Report (2021) notes growing confidence in climate change impact on fire weather

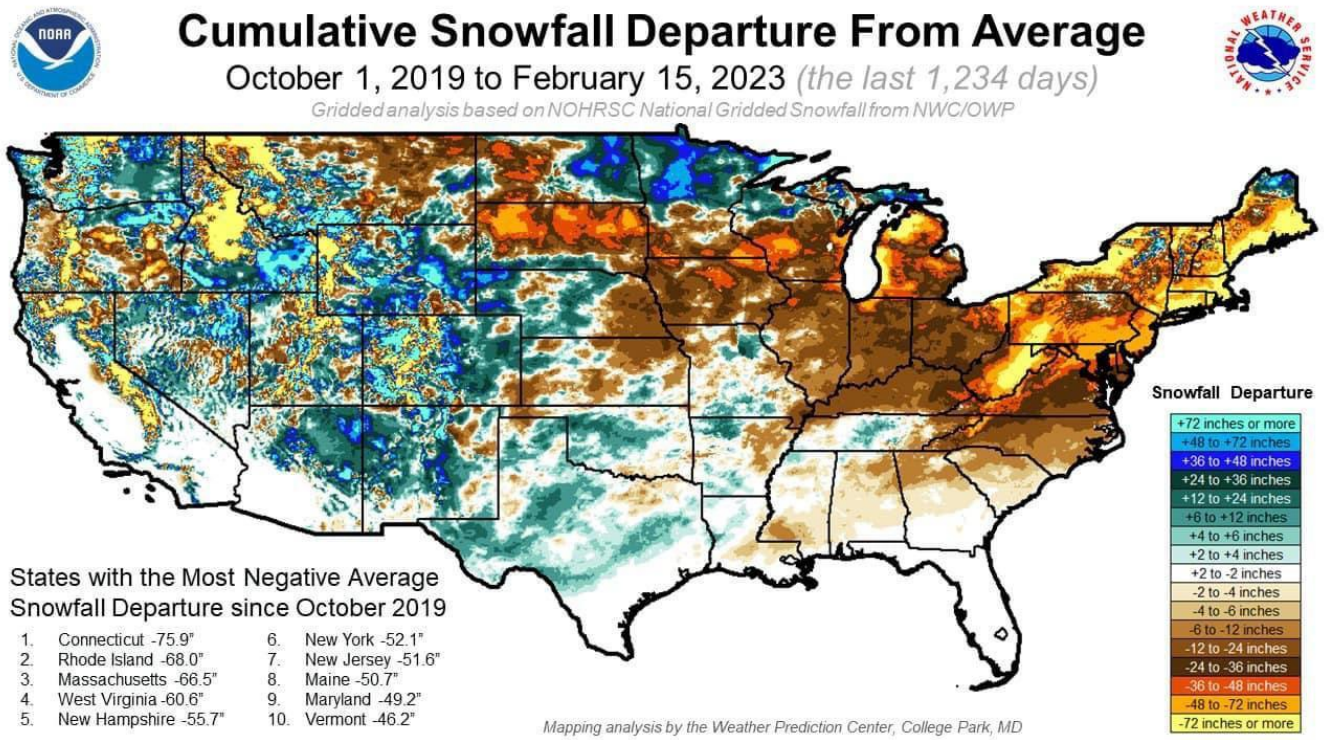


The cumulative forest area burned by wildfires has greatly increased between 1984 and 2015, with analyses estimating that the area burned by wildfire across the western United States over that period was twice what would have burned had climate change not occurred.

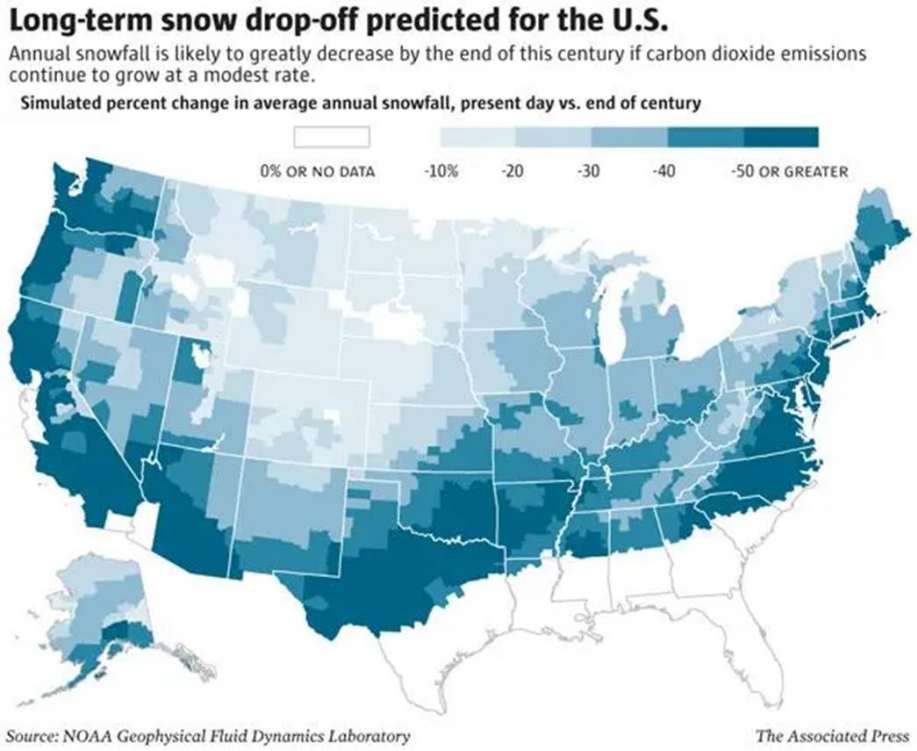
Observed Northeast Snowfall Trends Expected to Flip

Last 50 years show an increase in CT snow which differs from recent behavior and projections



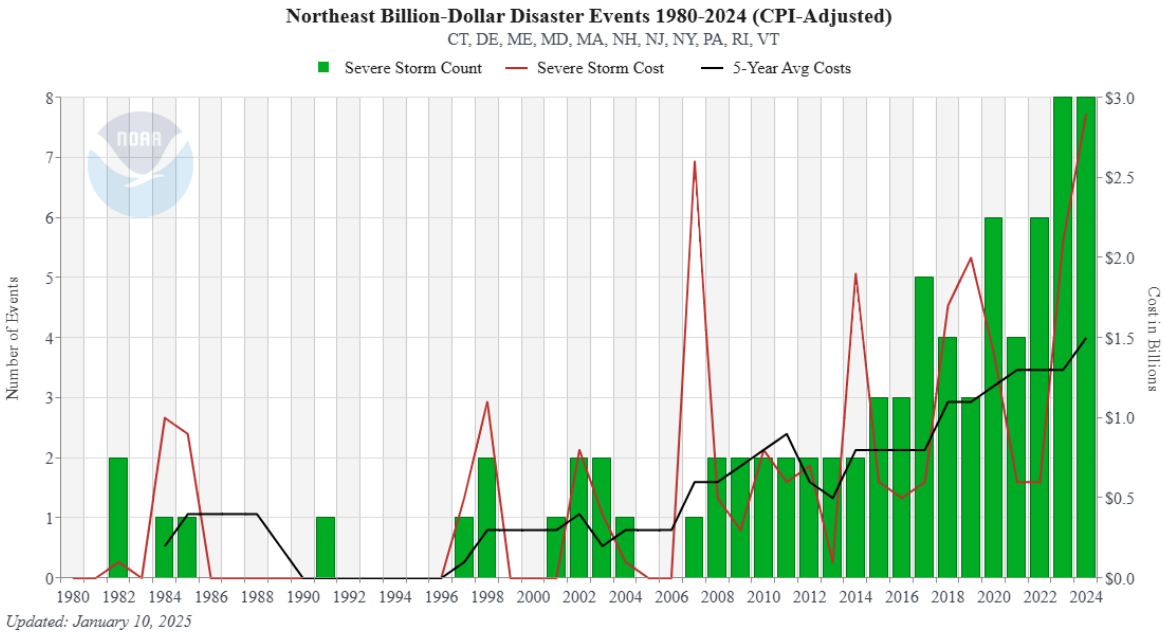


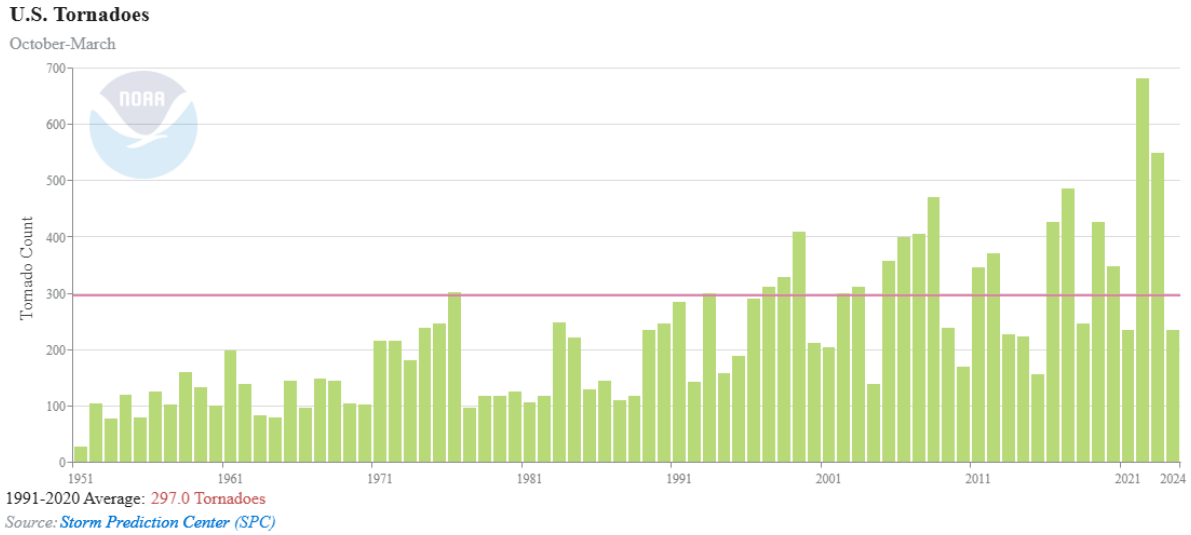
Observed Northeast Snowfall Trends Expected to Flip



Climate Change and Severe Convective Storms

Potential expansion of severe convective season and geographies



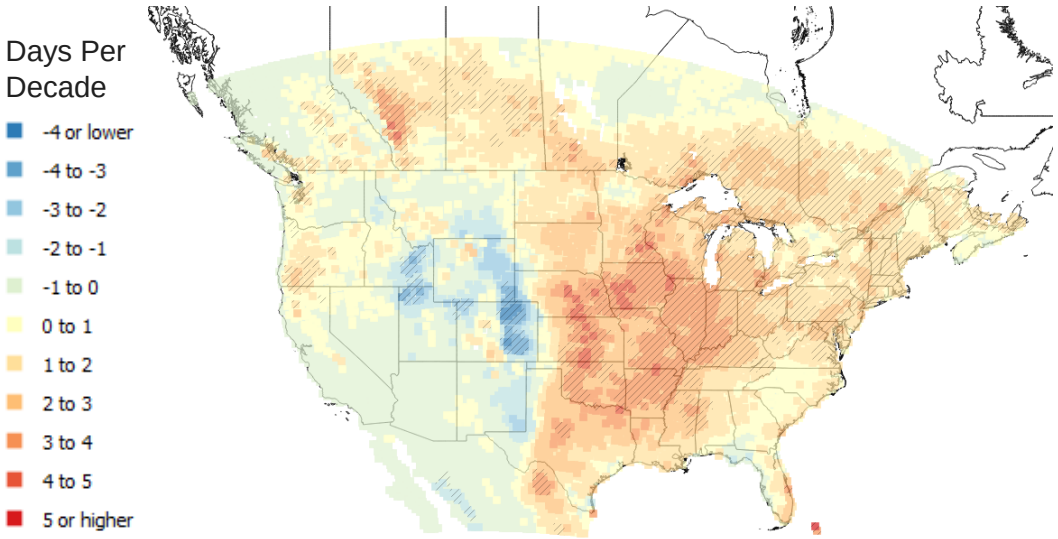


Competing factors make projections inconclusive. Some consensus developing for a longer severe thunderstorm season, eastward migration of conducive severe convective conditions, and busier fringe seasons (winter/fall).

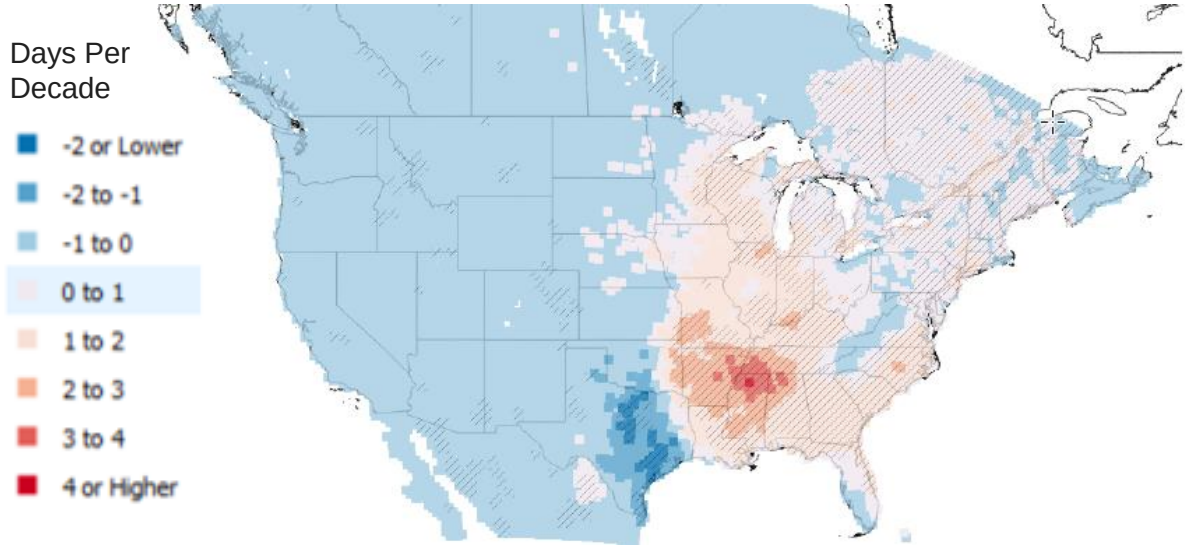
Shifts in Weather Conditions for Larger Hail / Strong Tornadoes

Recent lift in weather loss contribution likely due to upward trend in higher populated areas

Trend in Significant Hail (2”+)

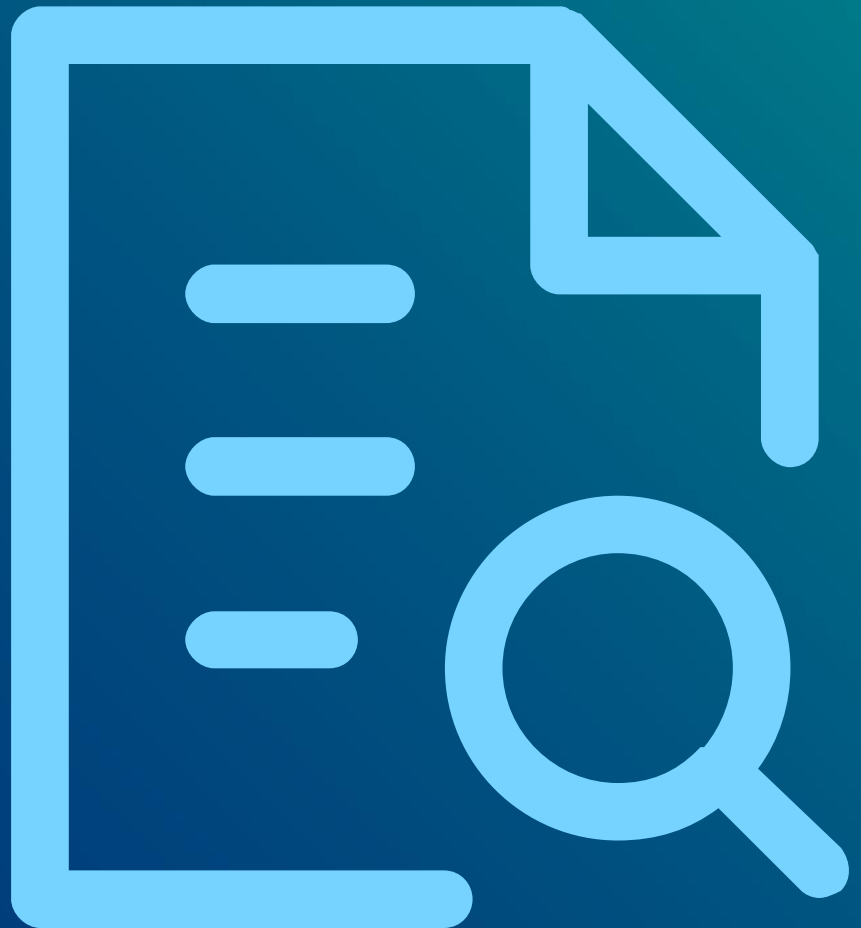


Significant Tornado Trend (EF2+)



While climate projections of Severe Convective Storm risk are extremely uncertain, trends in the atmosphere since 1980 suggest the hail and tornado belt is moving into more heavily populated regions of the country.

Proactive Management of Climate Risks



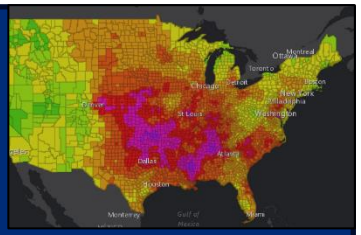
What Can We Do About It?

The tools below can enhance clarity in view of risk…

Claims Experience

Valuable context for shorter return periods to better understand model bias

Hazard Layers



Accumulation analysis by risk classification for decision making

Deterministic Scenarios

Assess peak concentrations with known events or ring analysis

Catastrophe Models

Physically plausible & unobserved events for tails, loss estimates

Climate Change Analysis Toolkit

Overview of Guy Carpenter offering

Perils

	Climate Risk Score	Cat Model Adjustment
Wildfire	✓	ETA: Q1 2025
Convective Storm	✓	TBD
Tropical Cyclone	✓	✓
Sea Level Rise/ Storm Surge	✓	TBD
Heat/Flood	ETA: ~2025	TBD

Scenarios

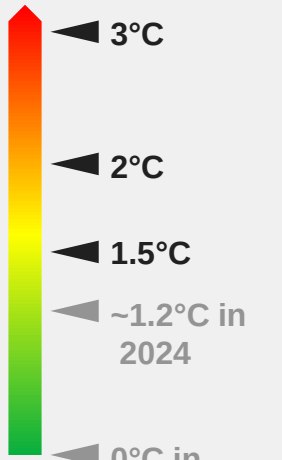
Emission scenarios

High-emission pathway SSP5-8.5 or RCP8.5

Mid-emission pathway SSP2-4.5 or RCP4.5

Low-emission pathway SSP1-2.6 or RCP2.6

Warming level scenarios



Tools

Education
Briefings, Executive Trainings, White Papers

Climate Change Risk Scores
Portfolio-Specific Insights

Catastrophe Model Adjustments
AAL and PML Projected Changes

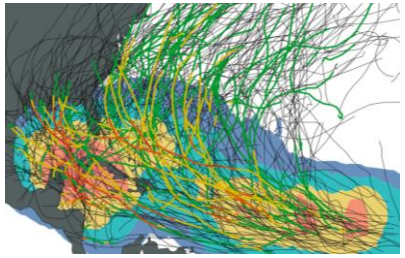
Model Suitability Analysis
Climate Adjustments for Present-Day View of Risk

GC climate change offering has four pillars. Today, we will dive into our risk scores for hurricane.

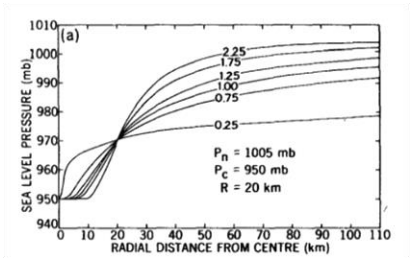
GC Hurricane Risk Score Methodology

Models and data

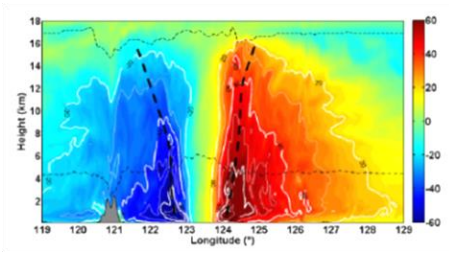
Tim Hall NASHM Stochastic Track Set



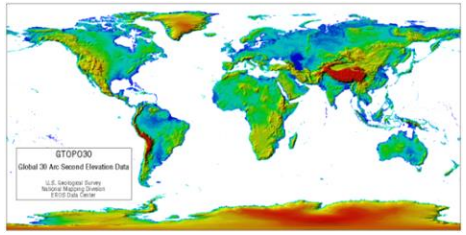
Holland and Powell Tangential Wind Profile



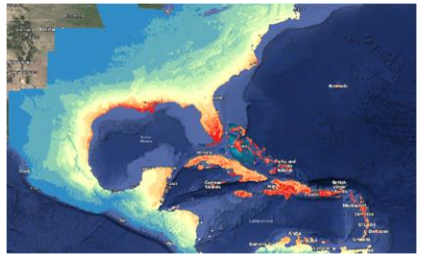
Kepert and Wang Surface Wind Model

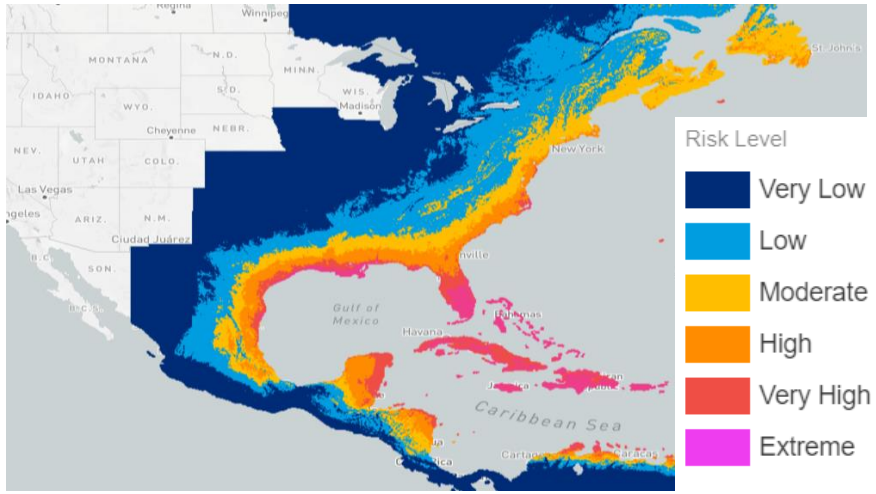


Land Cover and Elevation Model



Risk Score Binning

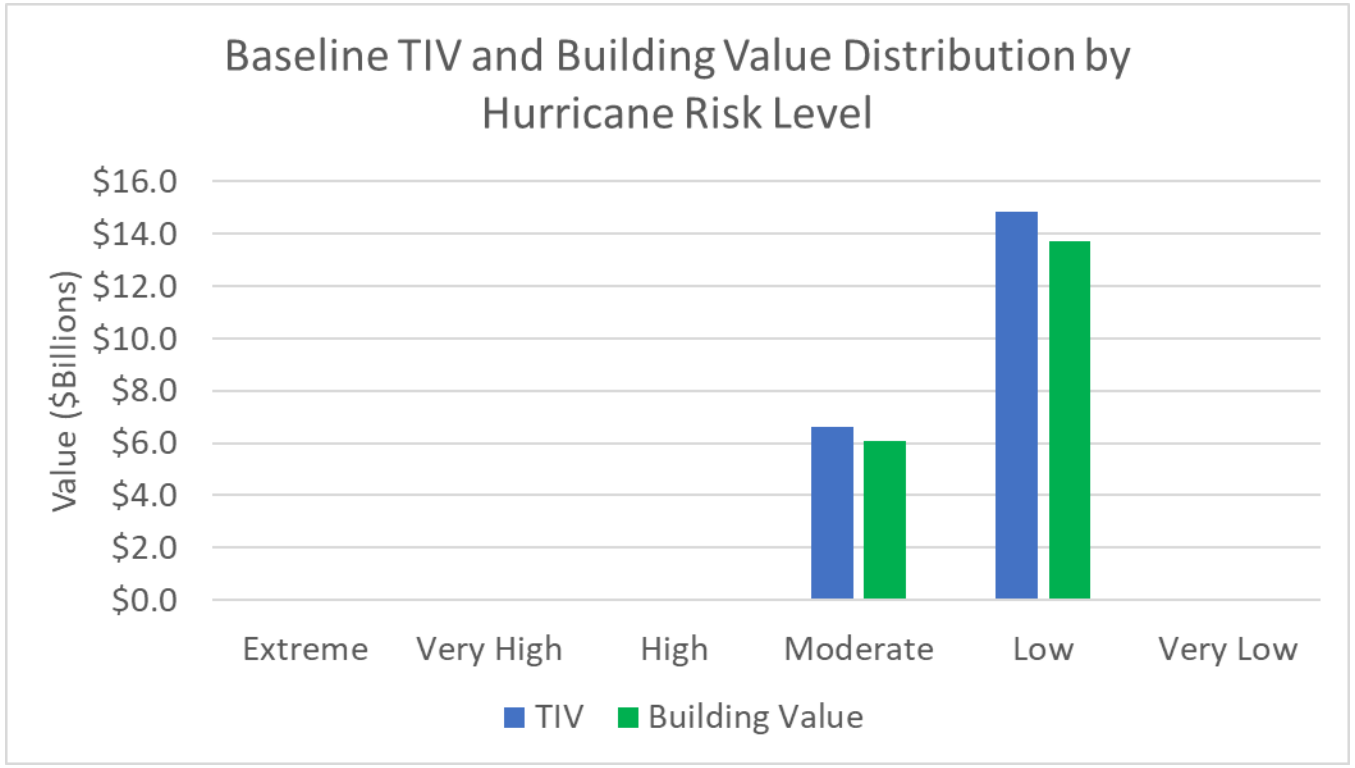




At Guy Carpenter, we create our own view of hurricane risk by using all the ingredients of a catastrophe model.

Present Day View of Hurricane Risk Using GC TC Risk Score

Moderate and low risk TIV for all counties in CT

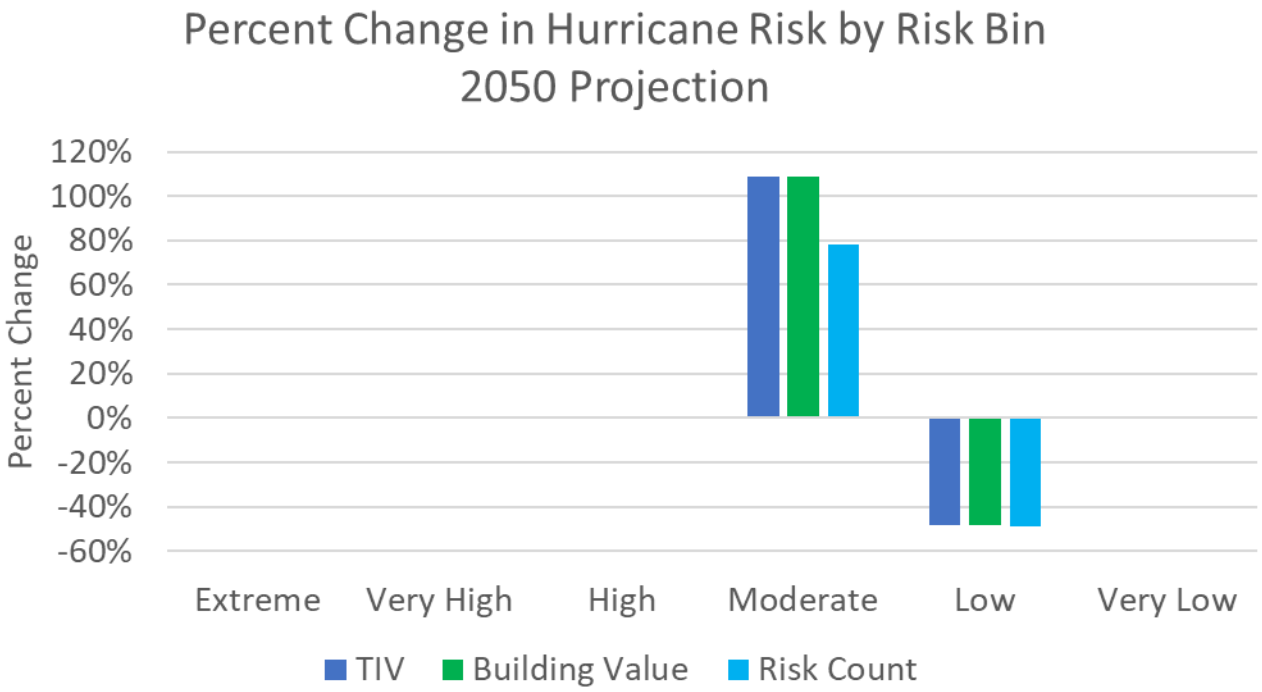


Total Insured Value (million dollars)

County	High	Moderate	Low	Very Low
Fairfield County	0.0	1,231.2	5,546.1	0.0
Hartford County	0.0	168.3	5,053.3	0.0
New Haven County	0.0	1,048.9	1,709.2	0.0
New London County	0.0	1,750.2	83.8	0.0
Tolland County	0.0	1,237.0	275.2	0.0
Middlesex County	0.0	640.9	743.8	0.0

Future View of Hurricane Risk Using GC TC Risk Score

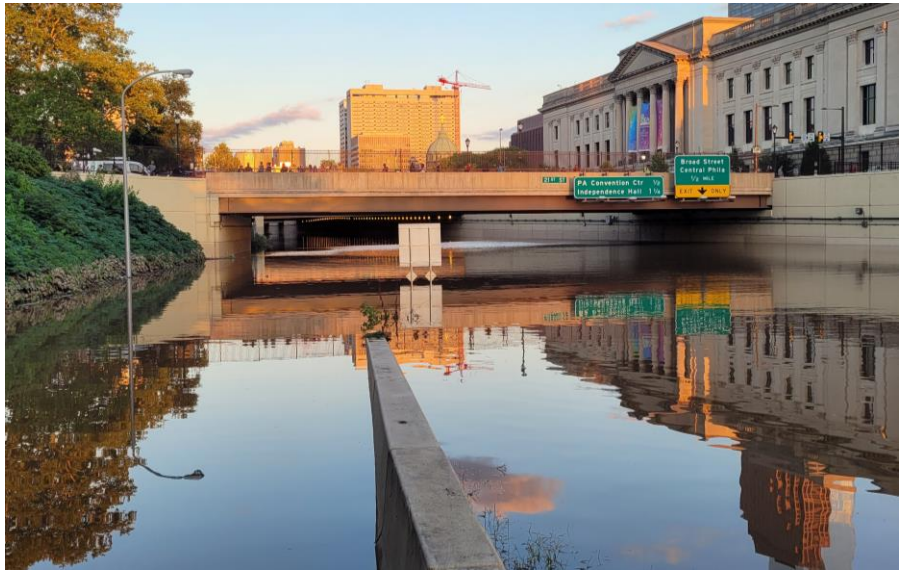
RCP 4.5, 2050 view shows a large uptick in moderate bin TIV (>3x, $3.5 billion in Fairfield County)



Total Insured Value (million dollars)

County	High	Moderate	Low	Very Low
Fairfield County	0.0	4,805.4	1,971.9	0.0
Hartford County	0.0	796.5	4,425.1	0.0
New Haven County	0.0	2,227.7	530.4	0.0
New London County	0.0	1,834.0	0.0	0.0
Tolland County	0.0	1,420.8	91.4	0.0
Middlesex County	0.0	1,078.8	306.0	0.0

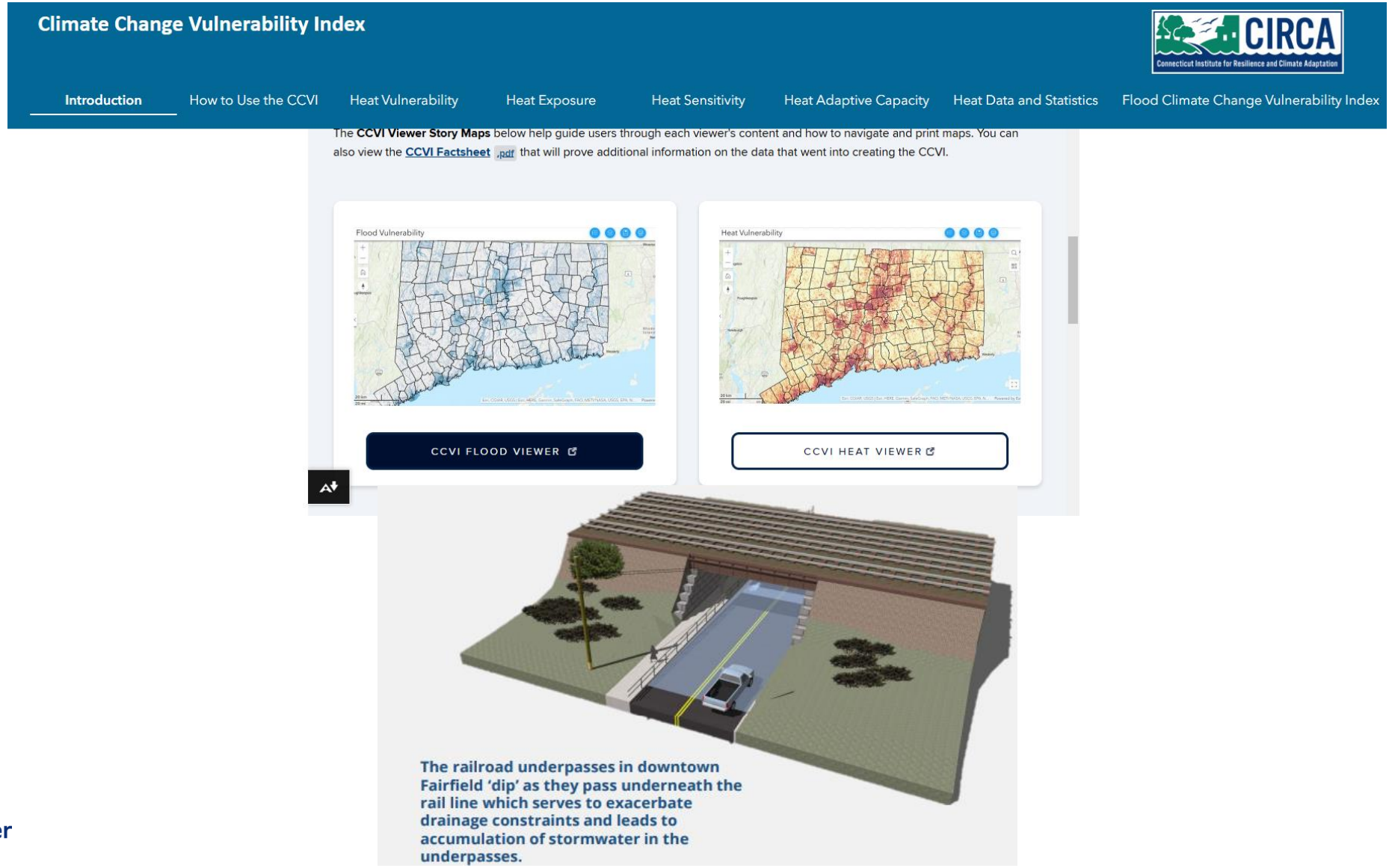
Resilience Measures – What Else Can We Do About It?



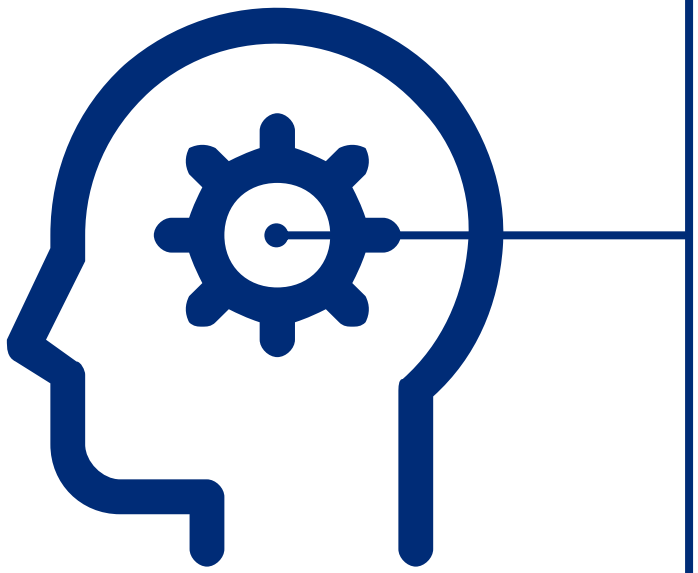
	Wind – structural resilience measures, roof properly attached and sealed, continuous load path from roof through walls to foundation, secure garage doors, ICC codes, IBHS Fortified standard (IBHS)
	Winter Weather – check insulation and “heat leaks” around pipes, cable entry (IBHS)
	Coastal Flood – elevated foundations, coastal flood defenses, wetlands (FEMA)
	Inland Flood – stormwater management and retention systems, land use, strategic placement of valuables, backflow valves, sump pumps (FEMA, Municipal)
	Wildfire – defensible space, use non-combustible building materials, screens on air intake vents (IBHS)

Connecticut Institute for Resilience and Climate

CIRCA has initiated several projects to improve Connecticut's climate change resilience



Conclusions: Climate Change and Severe Weather



Simultaneous changes in climate, exposure growth, and inflation have resulted in a sharp increase in industry losses over the last decade. The increase in catastrophe losses has put the impact of climate change on the insurance industry under a microscope, and companies/regulators are responding.

The acceleration of climate change coupled with the already observed warming suggests a continued increase in insured losses over the next decades. Specific regions and perils (e.g. Northeast flooding) are projected to affected more than others.

Catastrophe modelling developed purely on historical records is no longer sufficient for providing an expectation of hazard behavior over the next decade. Incentivizing resilience measures and greenhouse gas mitigation will be crucial for managing the accelerating impacts of climate change.