Surviving the Storm

Navigating Resilience in an Era of Climate Change

September 10, 2024

Learning Objectives

Outline Climate Projections: Be aware of both short- and long-term climate change projections and their implications for various business sectors.

Assess Business Implications: Identify and analyze the current and anticipated business risks and opportunities arising from the climate crisis.

Describe Adaptation and Mitigation Strategies: Learn effective strategies for adapting to and mitigating the risks posed by climate change to ensure business continuity and resilience.

Present Insurance and Resilience Planning: Explore the critical role of insurance in managing climate-related challenges, understand the rising costs of coverage, and develop strategies to enhance business resilience and insurability.

With You Today

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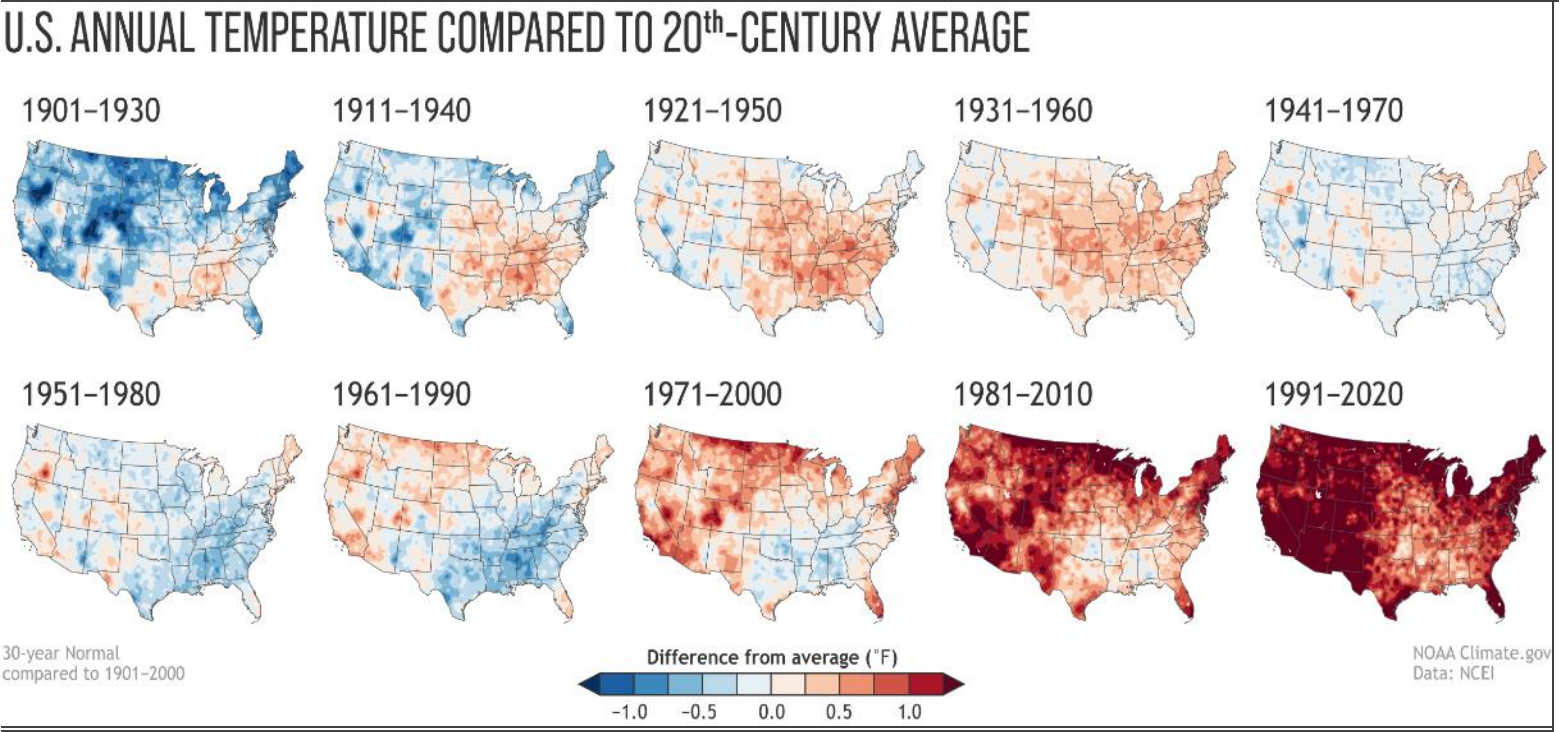
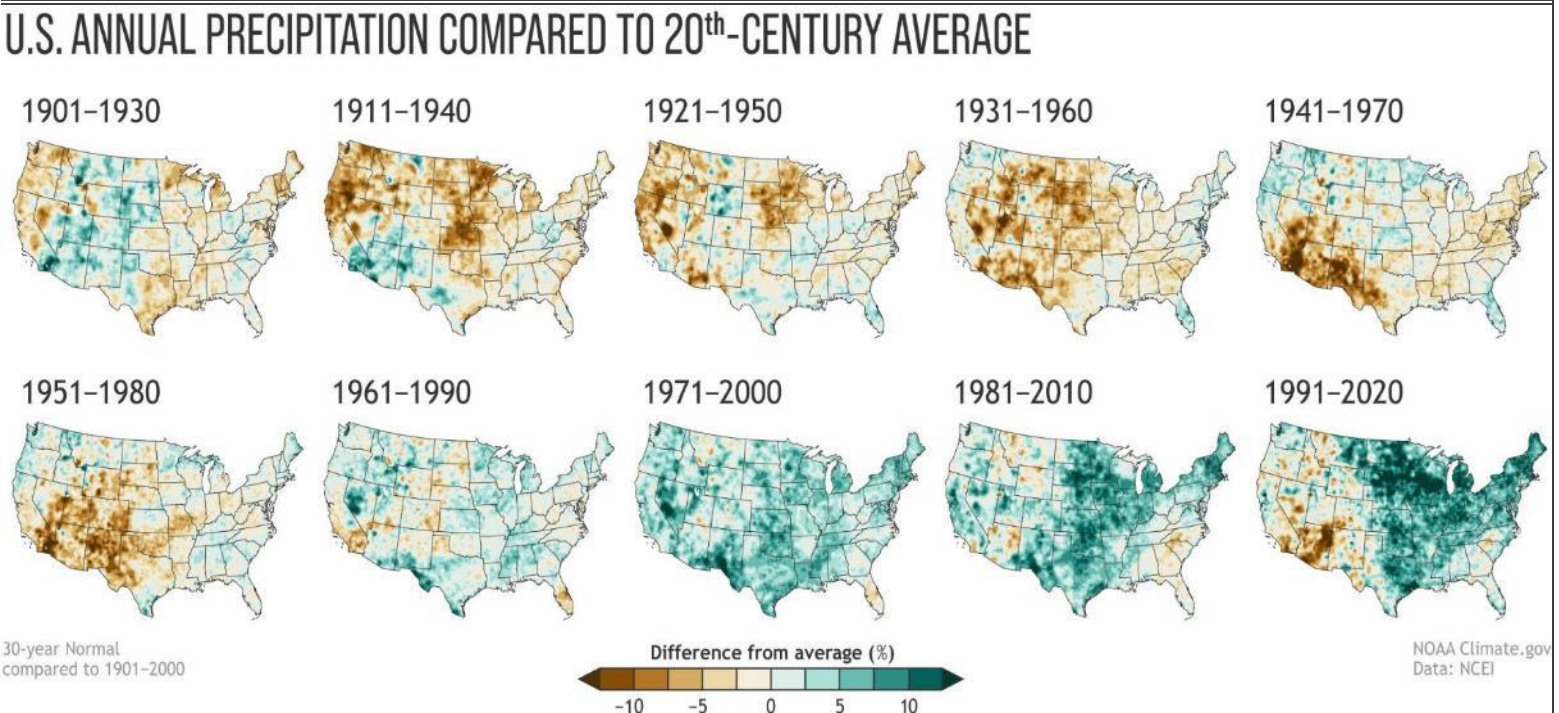
Agenda

1. Introductions
2. Today’s Trends and Impacts
3. Future Projections
4. How to Prepare
5. Q&A





By 2050, about 63% of the US population could be forced to endure temperatures over 100°F. For areas where triple-digit temperatures are seasonal already, the baseline temperature and the frequency of high heat events will increase.

As average temperatures at the Earth's surface rise, **more evaporation occurs**, which increases overall precipitation. For every 1.8°F of warming, the atmosphere can hold about 7% more moisture.

- Warmer air holds more water because the water vapor molecules it contains move faster than those in colder air making them less likely to condense back to liquid.
    - Sea surface temperatures have risen by 0.5–0.6 °C since the 1950s, and over the oceans this has led to 4% more atmospheric water vapor since the 1970s.
- Heat is released when water vapor condenses to form rain. When the rain falls, it brings the warm air down to the surface raising the temperature throughout the area.
- As temperatures increase at the surface, short-burst heavy rainfall events will increase.
    - The air is on average warmer and moister than it was prior to about 1970 and in turn has likely led to a 5-10% effect on precipitation and storms that is amplified in extreme downpour events.

Wet bulb conditions occur when heat and humidity are too high for sweat to evaporate. Such conditions can be fatal for humans if the temperature and humidity both exceed 95.

- Extreme heat and humidity are growing more common due to the growing distance between major low-pressure centers crossing the US, allowing for direct sunlight heating the surface and a larger presence of greenhouse gases trapping that heat for prolonged periods.

In cities, the air, surface and soil temperatures are on average warmer than in rural areas. This is known as the Urban Heat Island Effect and can contribute to localized downpours.

The Role of Heat in Storm Growth

Severe thunderstorms are defined as having sustained winds above 93 kilometers (58 miles) per hour or unusually large hail, and there are two key factors that fuel their formation: convective available potential energy (CAPE) and strong wind shear.

- Scientists have evidence that global warming should increase CAPE by warming the surface and putting more moisture in the air through evaporation.
- Research by Climate Central has shown an increase of 10 to 15 high-CAPE-value days annually between 1979 and 2021 across much of the eastern US.
- According to NASA, disproportionate warming in the Arctic should lead to less wind shear in mid-latitude areas prone to severe thunderstorms. So, one factor makes severe storms more likely, while the other makes them less so.
- Cities such as Atlanta and New York could see a doubling of the number of days that severe thunderstorms could occur.

Lightning: Each 1 degree Celsius of warming could spur a 12% increase in lightning frequency, boosting the flash rate to about four times per second by 2090, up from nearly three times per second in 2011. Many datacenters take this into consideration and implement lightning protection systems.

- Flashes that touch down amid minimal or no rainfall, known as dry lightning, are especially effective fire starters.
- Currently about 20 million lightning bolts touch down each year within the continental United States.
- Climate change may boost updraft within thunderstorms, causing hot lightning flashes to increase in frequency to about 4 strikes per second globally — about a 40% increase from 2011.
- The rate of all cloud-to-ground strikes might increase to nearly 8 flashes per second (+28%).

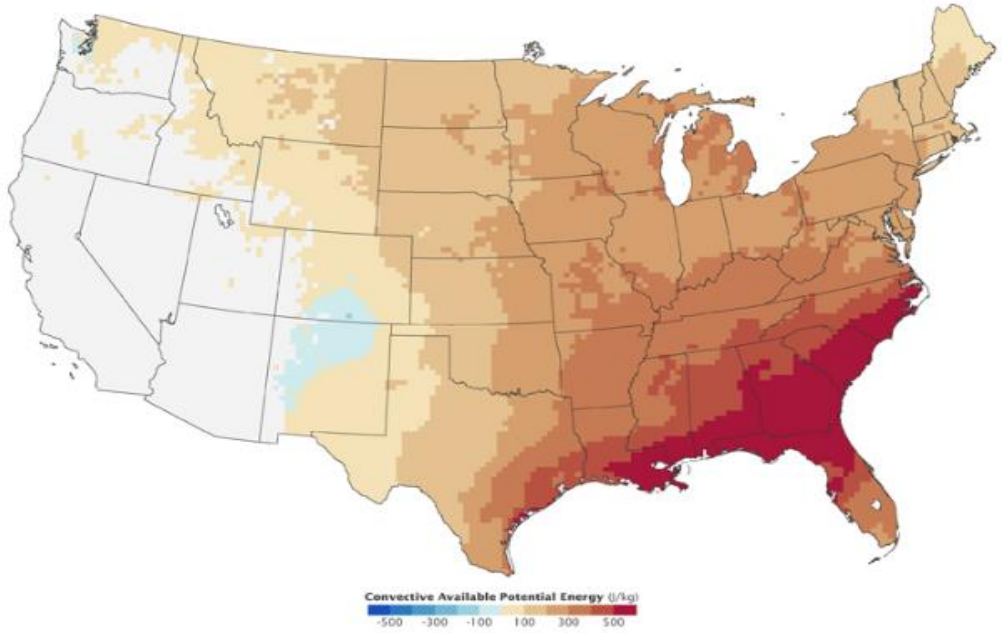
Hail: increasing temperatures and humidity could fuel larger hail and could mean smaller pellets are more likely to melt before hitting the ground.

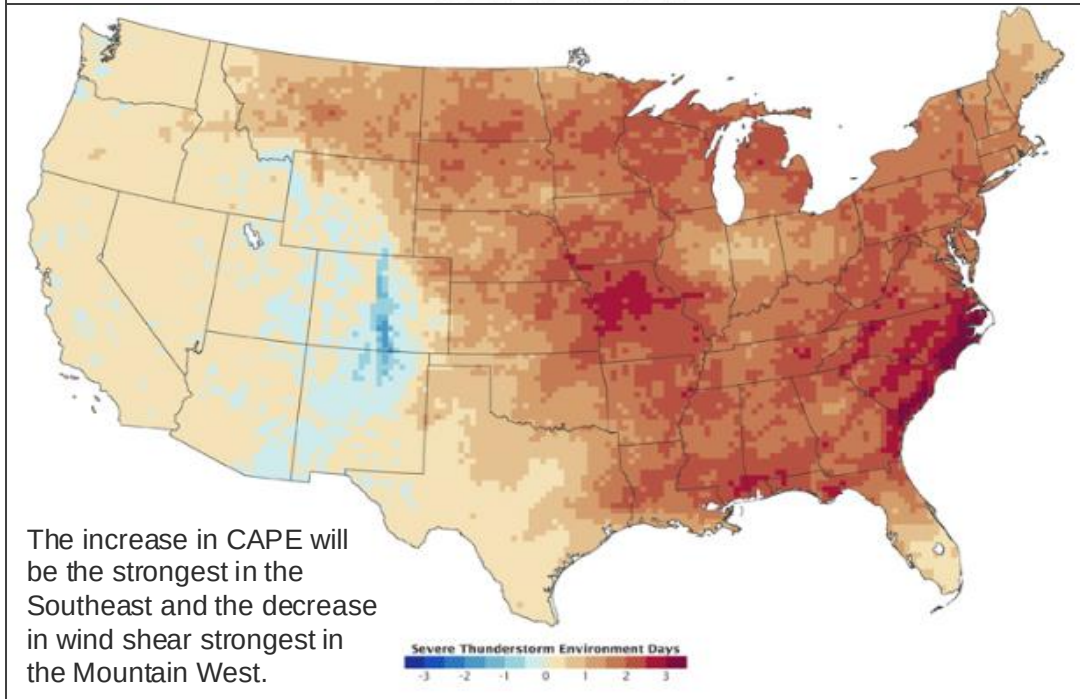
- Damage from severe thunderstorms has been inching up by about 7% annually for 30 years.
- Worldwide, thunderstorm losses were almost 90% higher than the previous five-year average of $32 billion, and more than double the previous 10-year average of $27 billion.

Derechos, Heat Bursts, Outflow Boundaries, Microbursts, and Macrobursts could all increase.

Severe thunderstorms and climate change

Models compare the summer climate from 1962–1989 to future climate projections for CAPE indices in 2072–2099.





The increase in CAPE will be the strongest in the Southeast and the decrease in wind shear strongest in the Mountain West.

Knowledge Check #1

How concerned are you about the impact of climate change on the real estate market?

A Very Concerned

B Somewhat Concerned

C Neutral

D Not Concerned

Severe Weather on the Rise

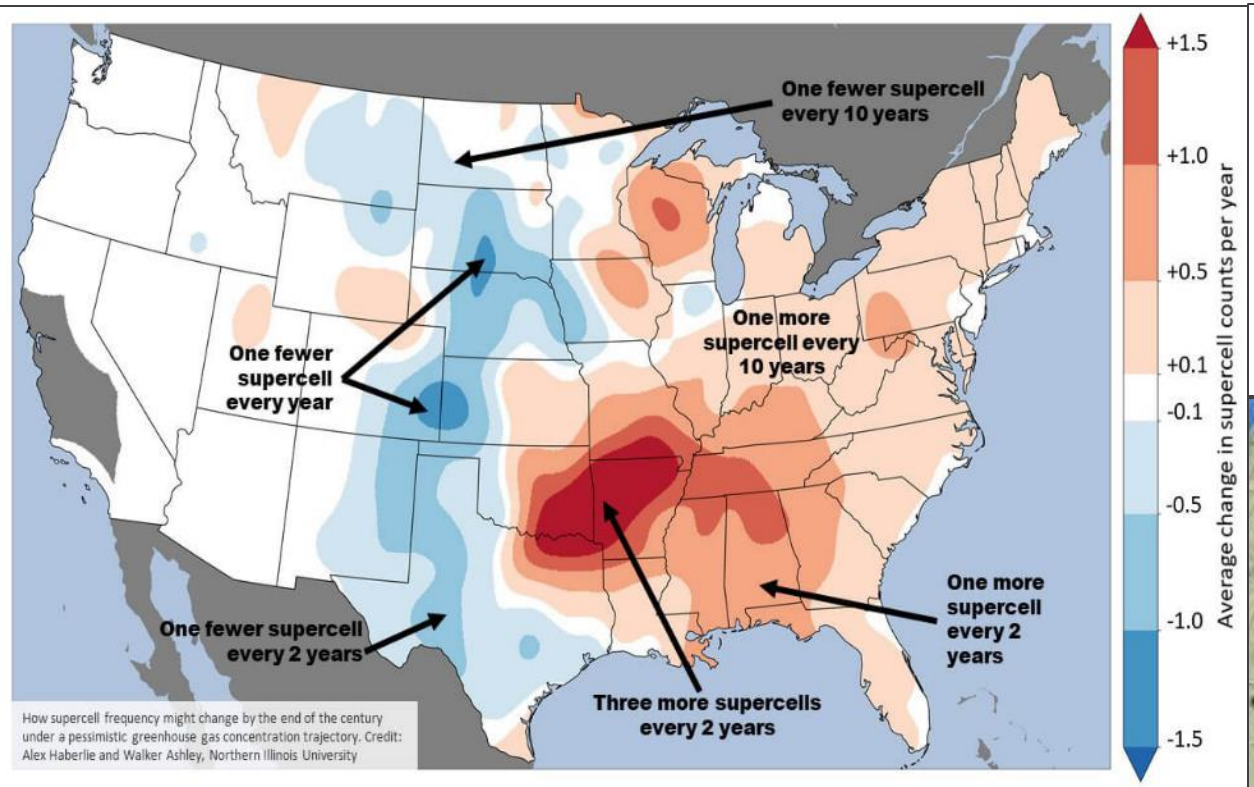
Hail events throughout the US are forecasted to intensify regarding size of the hailstones as warmer climates enable stronger updrafts for supercell storms responsible for large hail.

In Texas, Colorado, and Alabama the records for largest hailstone have been broken in the last three years, reaching sizes of up to 6.2 inches in diameter. Insured U.S. hail losses average $8 billion - $14 billion per year, or $80-140 billion per decade.

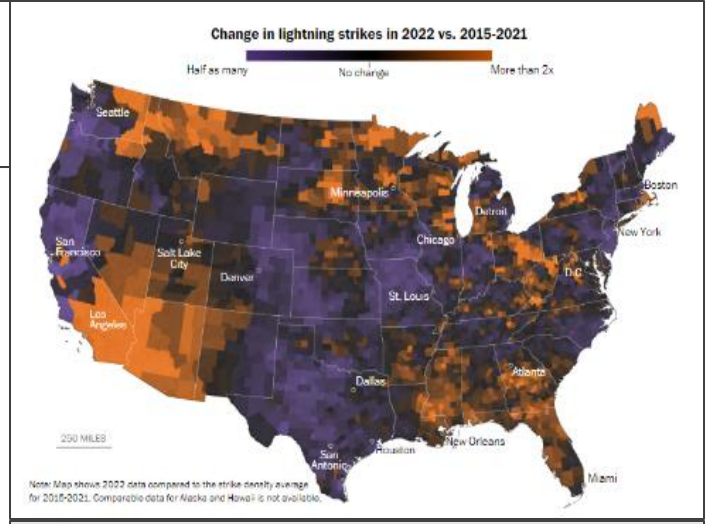
A new study published by the National Center for Atmospheric Research finds there has been "a fivefold increase in the area affected by straight-line winds since the early 1980s" in the central U.S. Straight-line winds are often produced by thunderstorms and can impacts like that of a tornado. These winds have increased at a rate of 13% per degree of warming.

Tornado activity from 2008-2021 in comparison with 1991-2010 indicates the seasonal frequency has remained the same but the location and intensity of tornadic supercells has expanded from "Tornado Alley" to "Dixie Alley" producing larger, longer supercells. Dixie Alley includes Eastern TX, AR, LA, TN, KY, MS, AL, GA, South MO, Southeast OK, and the FL panhandle.

A recent study predicts a nationwide 6.6% increase in supercells and a 25.8% expansion in the area and time supercells remain over land by the year 2100. This may result in areas which do not often see tornadic activity reporting an increase in events too.



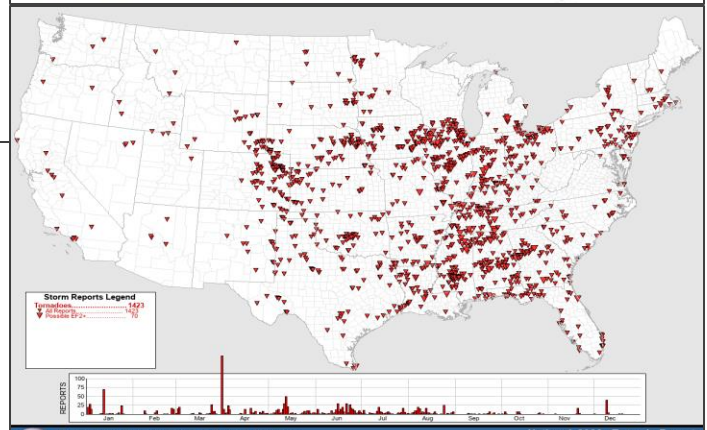
How supercell frequency might change by the end of the century under a pessimistic greenhouse gas concentration trajectory. Credit: Alex Haberlie and Walker Ashley, Northern Illinois University

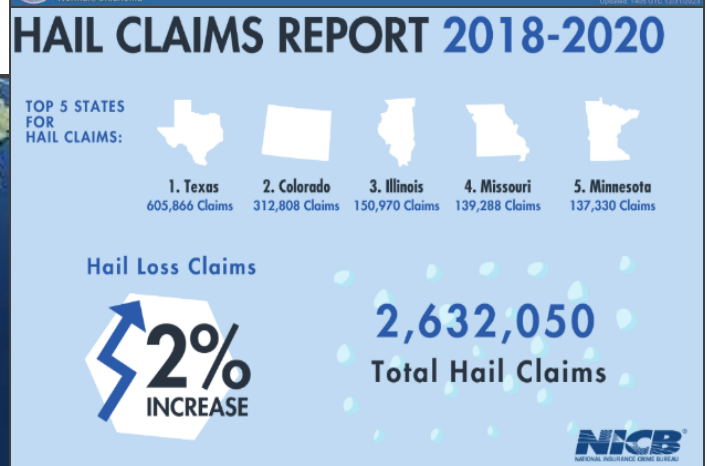


Note: Map shows 2022 data compared to the strike density average for 2015-2021. Comparable data for Alaska and Hawaii is not available.

Over the past two years more severe weather has been reported in the way of large, damaging hail and more tornadic activity in the Spring and late Winter months reaching further north than usual.

This is amplified in the higher tornado count in 2023 as 2024 reports 2-3x the average tornado count, placing 2024 in line with the annual average for tornado reports within the first six months.



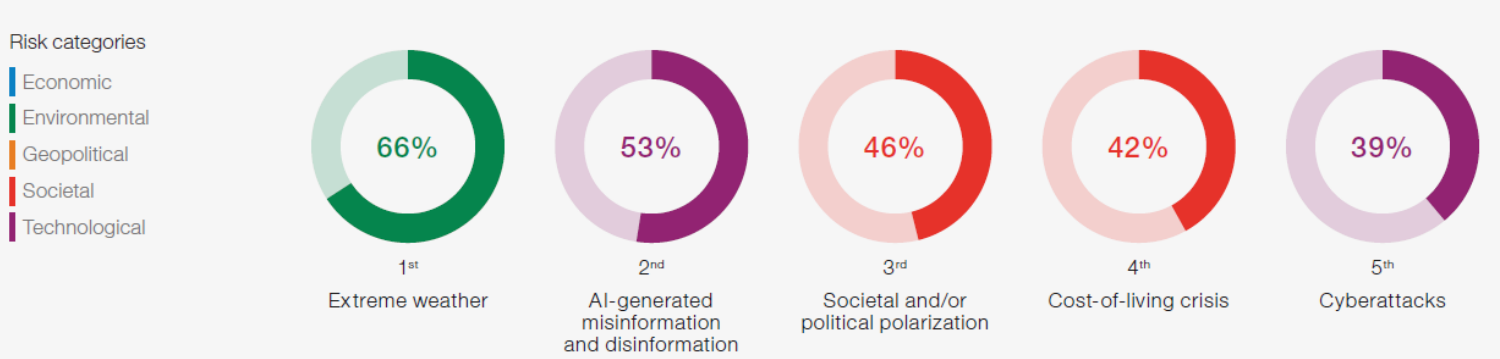


Global Risk Update

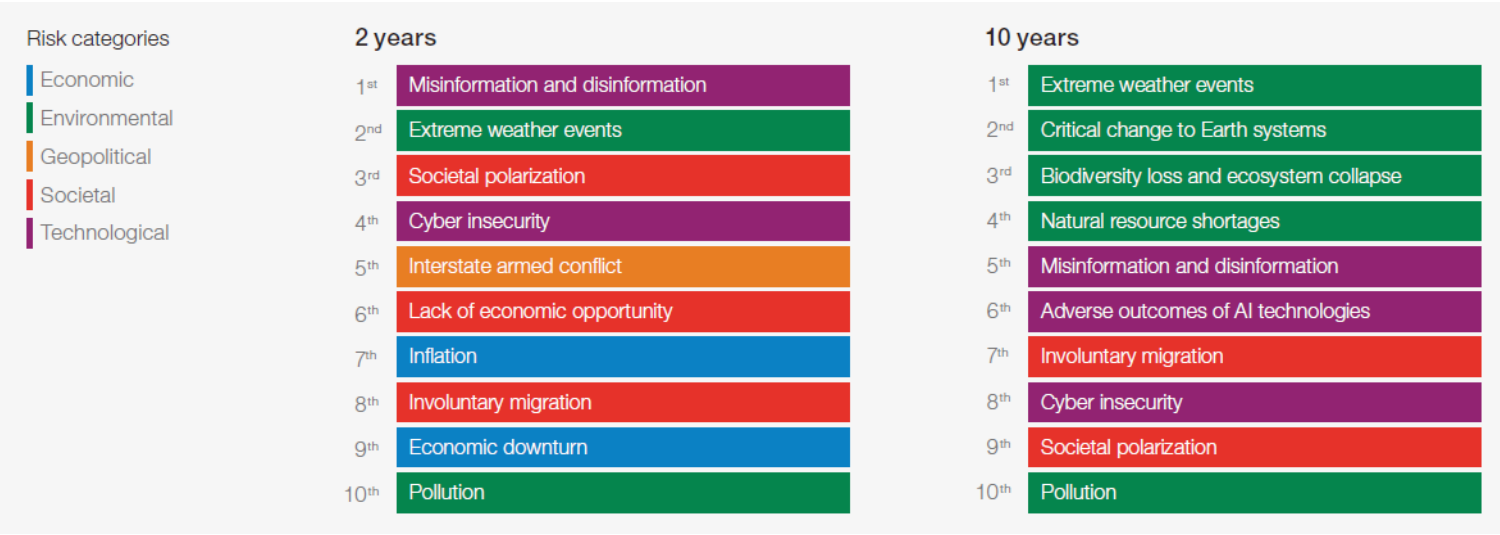
World Economic Forum
Global Risks Report 2024

- Respondents assessed the likely impact (severity) of global risks over a:
  - Two-year horizon
  - 10-year horizon
- Illustrates the potential development of individual global risks over time and identify areas of key concern
- Key risks for 2024 include extreme weather as the #1 concern
- Over a 10-year horizon, environmental risks dominate concerns

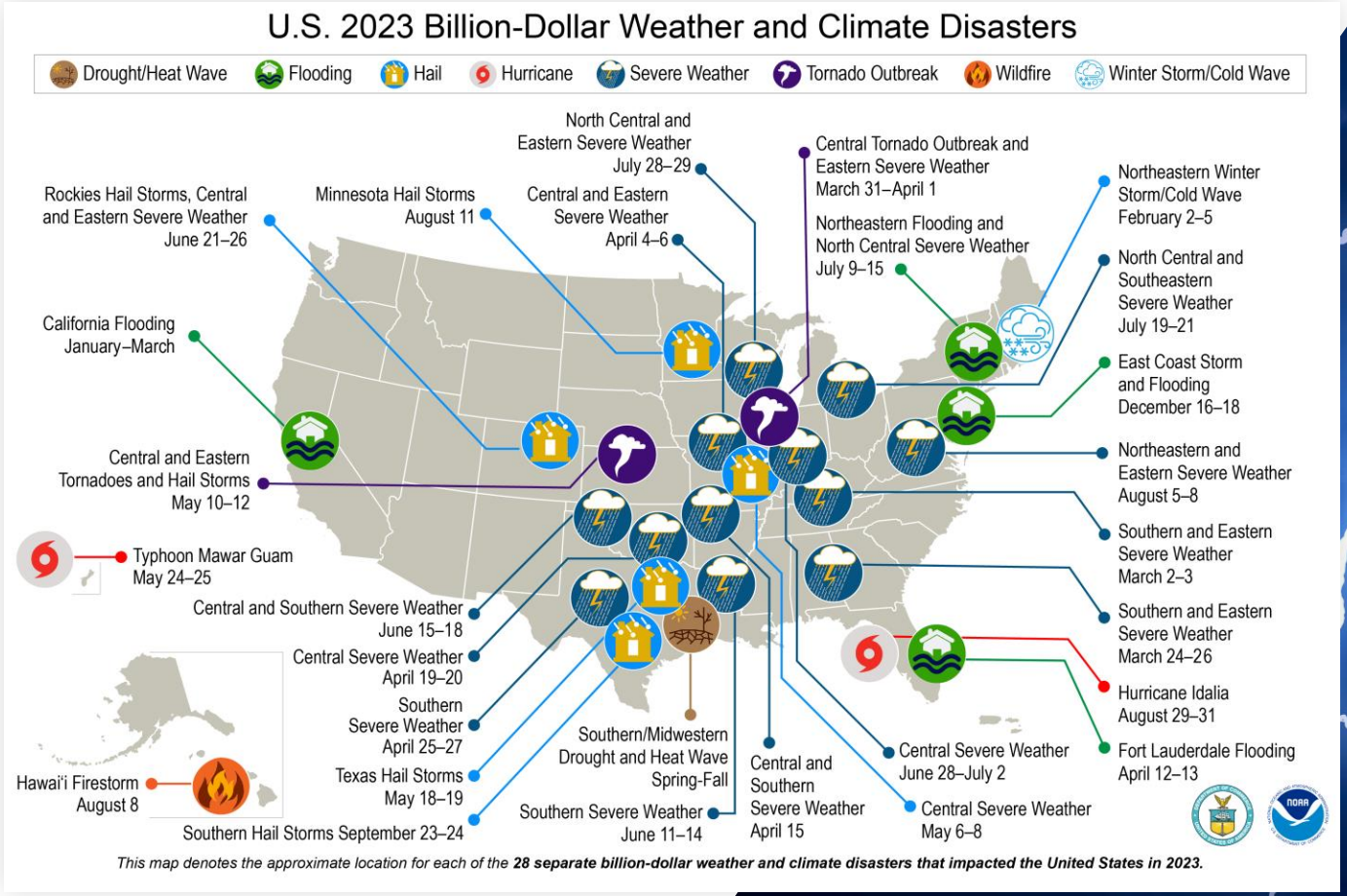
CURRENT RISK LANDSCAPE



GLOBAL RISKS RANKED BY SEVERITY OVER SHORT & LONG TERM



Domestic Impact to Insurance Market



$2.7T Cost of 376 weather and climate disasters since 1980 where overall damages were in excess of $1B

28 Confirmed weather/climate disaster events with losses exceeding $1B each in 2023

$22B Average cost of damage for tropical cyclone

$5.7B Cost of Central Tornado Outbreak and Eastern Severe Weather in March 2023

55K Fires burned more than 2.6M acres in 2023

SOURCE
A historic year of U.S. billion-dollar weather and climate disasters

Knowledge Check #2

What are your biggest concerns about the risk of climate change?

A Insurance Premiums

B Property Damage

C Construction Costs

D Supply Chain Stability

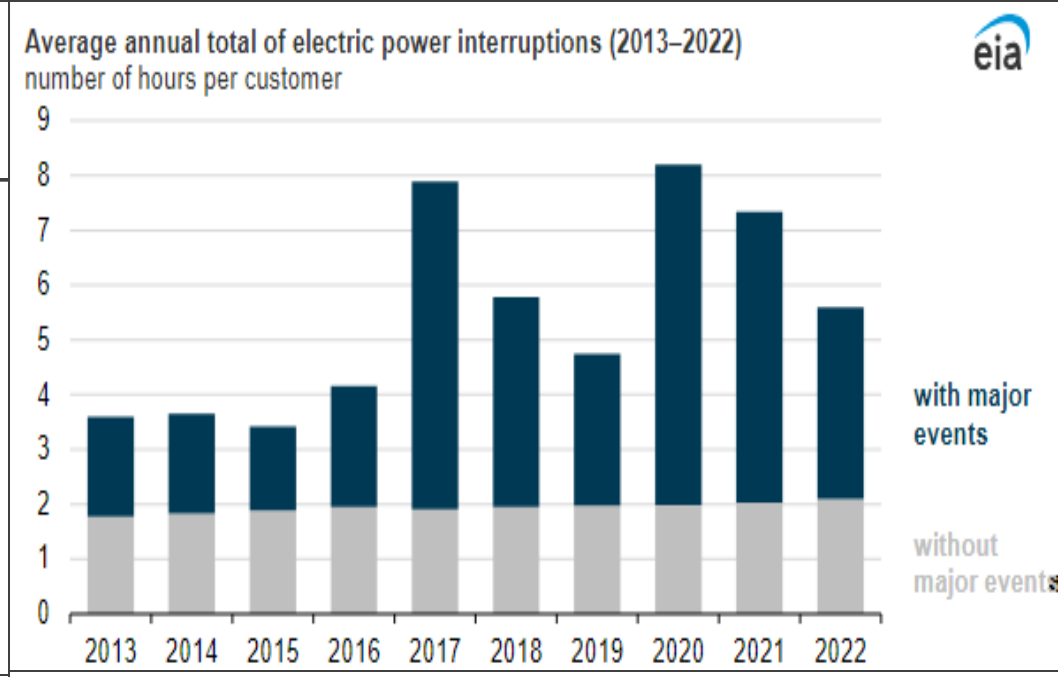
E Impacts to Utilities (water, power, etc.)

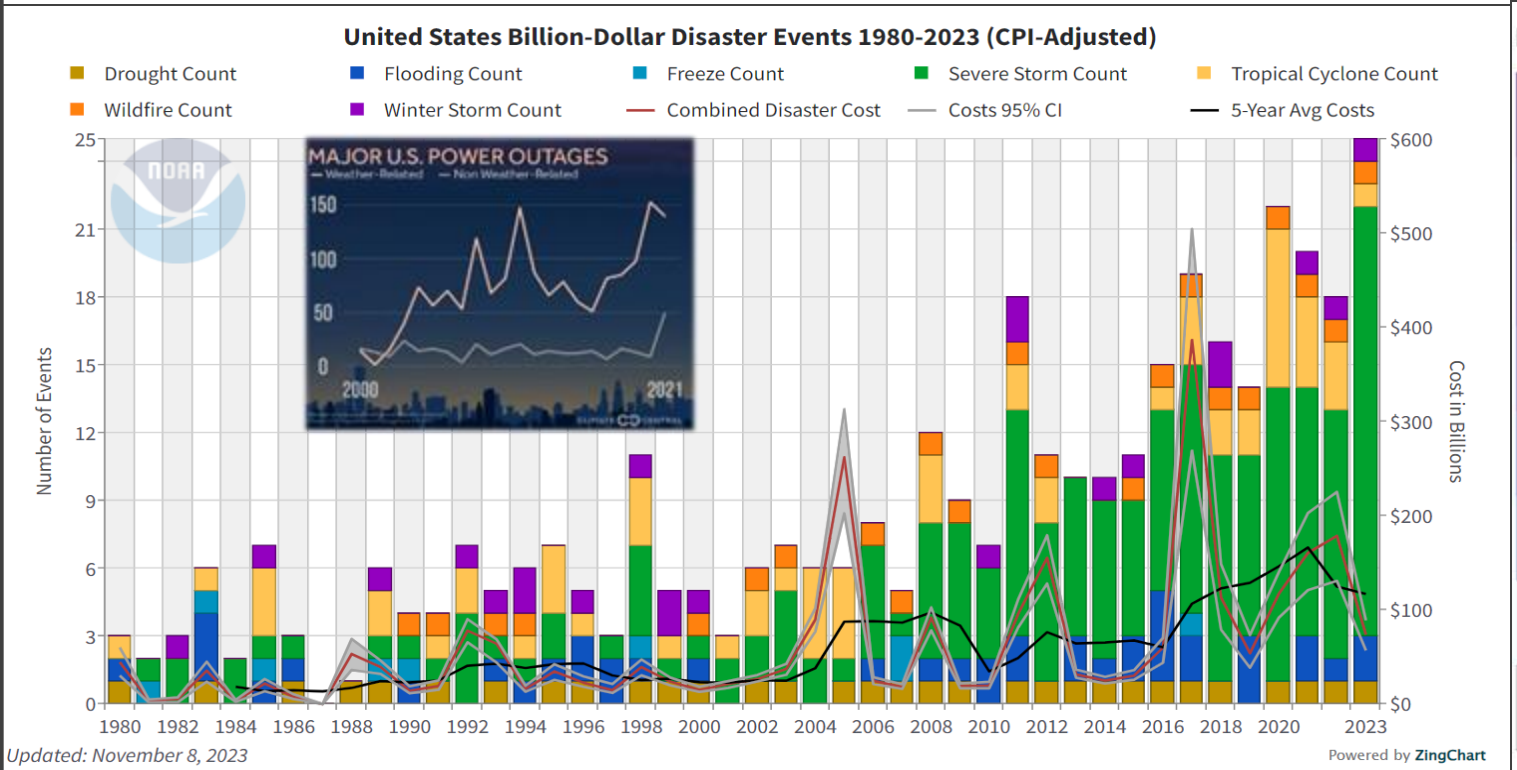
F People Issues (OSHA proposing new regs, working in heat)

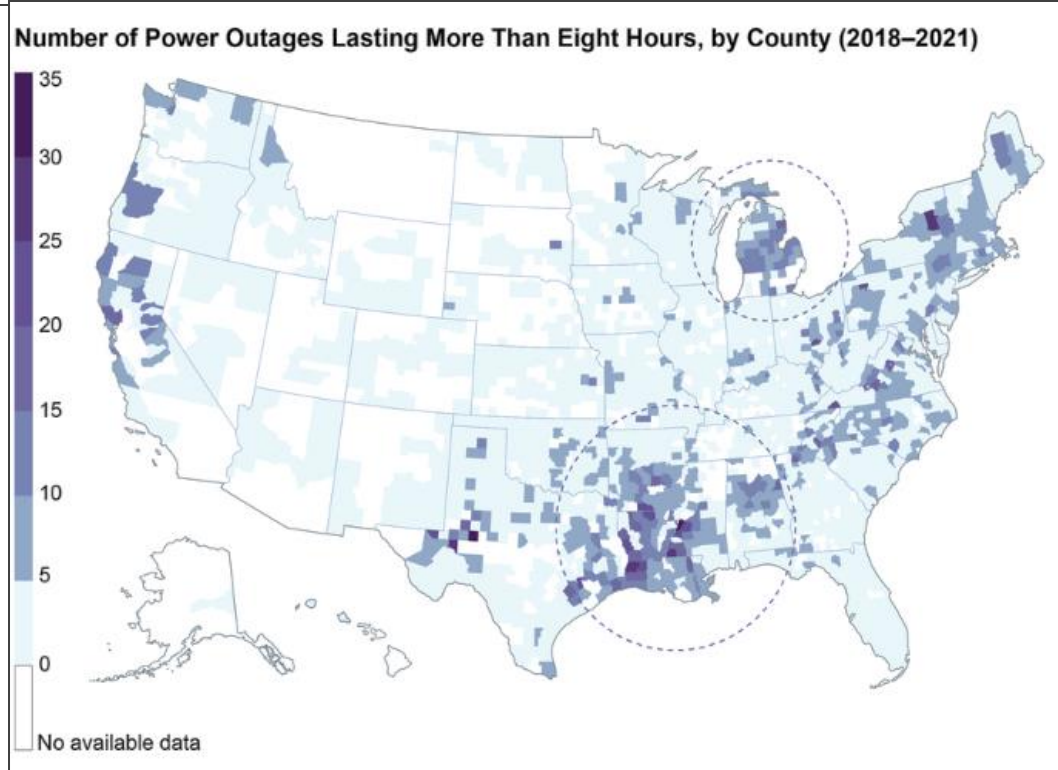
Energy Sector Loss - Weather

Between 2000 and 2021, about 83% of reported major outages in the U.S. were attributed to weather-related events. Severe hailstorms can damage other renewables like wind turbines and solar power.

- The average annual number of weather-related power outages increased by roughly 78% during 2011-2021, compared to 2000-2010.
- The decade from 2011-2021 experienced 64% more major power outages than that from 2000-2010.
    - From 2000-2021, there were 1,542 weather-related power outages nationally.
- Most outages were caused by severe weather (58%), winter weather (22%), and tropical cyclones (15%). These events are all likely to increase in damages caused and duration of outages to rise.
- Wind turbines/solar panels exposed to freeze events or extreme icing may see significant output loss.
- Drought: In 2021-2022 the Upper Missouri River saw numerous hydroelectric plants shutdown earlier than normal due to low water levels. The Colorado River saw a 33% drop in hydroelectric output.







International Climate Impacts to CI Sectors

2021 China Heat Wave: Sichuan is rich in mineral resources like lithium and polysilicon, key raw materials in the solar photovoltaic and electronics industry.

- Many international semiconductor companies have plants in Sichuan, including Texas Instruments, Intel, Onsemi, and Foxconn. Chinese lithium battery giant CATL, which supplies batteries to Tesla, also has a factory in the region.
- Officials from the manufacturing hub of Chongqing notified factories August of 2022 that mandated power cuts in the municipality were extended for weeks, affecting both PC and Apple suppliers. Relocation was widely communicated.

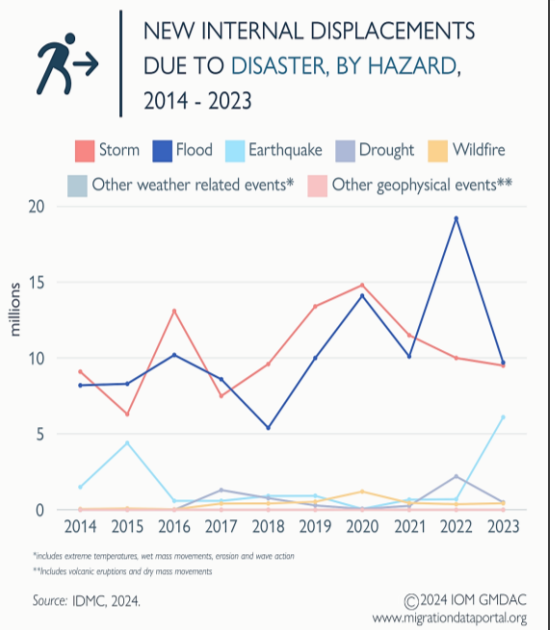
2022-2023 India Toxic Air: The Energy Policy Institute at the University of Chicago (EPIC), states that bad air could reduce the life expectancy of Delhi residents by as much as nine years. Shutdowns due to air quality impacted more than 75 million people.

- School and business closures as well as roadway use bans were put in place with construction halts and crop burning pauses.

2023 Global Drought: Critical rivers in South America, Europe, US, China, and across Africa reported record lows impacting water for manufacturing, energy sector cooling, agriculture, cargo shipments, and built infrastructure through soil stability.

2024 Global Floods: Brazil, Texas, China, France, Germany, Russia, and the Middle East all reported record rains, snowmelts, and floods impacted major transportation networks, manufacturing hubs, supply chain capabilities, and overall functionality.

- More than 600,000 people globally were displaced along with hundreds of millions in direct economic losses and damages.



Hong Kong (CNN Business) — China's Sichuan province has ordered all factories to shut down for six days to ease a power shortage in the region as a scorching heat wave sweeps across the country.

Sichuan is a key manufacturing location for the semiconductor and solar panel industries and the power rationing will hit factories belonging to some of the world's biggest electronics companies, including Apple (AAPL) supplier Foxconn and Intel (INTC).

The province is also China's lithium mining hub — a key component of electric car batteries — and the shutdown may push up the cost of the raw material, analysts said.

China is facing its fiercest heat wave in six decades, with temperatures crossing 40 degrees Celsius (104 degrees Fahrenheit) in dozens of cities. The extreme heat has caused a spike in demand for air conditioning in offices and homes, putting pressure on the power grid. The drought has also depleted river water levels, reducing the amount of electricity produced at hydropower plants.

Sichuan, one of China's largest provinces with 84 million people, told 19 out of 21 cities in the region to suspend production at all factories from Monday to Saturday, according to an "urgent notice" issued on Sunday by the provincial government and the state grid.

For the third day this week, air quality in the city passed the "severe" threshold, reaching 445 on Friday, India's Ministry of Earth Sciences said. The figure is 10 times the target level established in the World Health Organization's 2021 air quality guidelines, which advises a 24-hour mean of 45.

As the smog descended on Delhi and the surrounding areas, officials on Friday ordered schools, factories and construction sites closed and banned diesel trucks from bringing nonessential goods to the capital. About half of the city's government employees were urged to work from home.

(CNN) — Lahore has become the latest megacity to shut down as pollution chokes swathes of South Asia, where nearly 50 million people have been breathing toxic air for nearly a week.

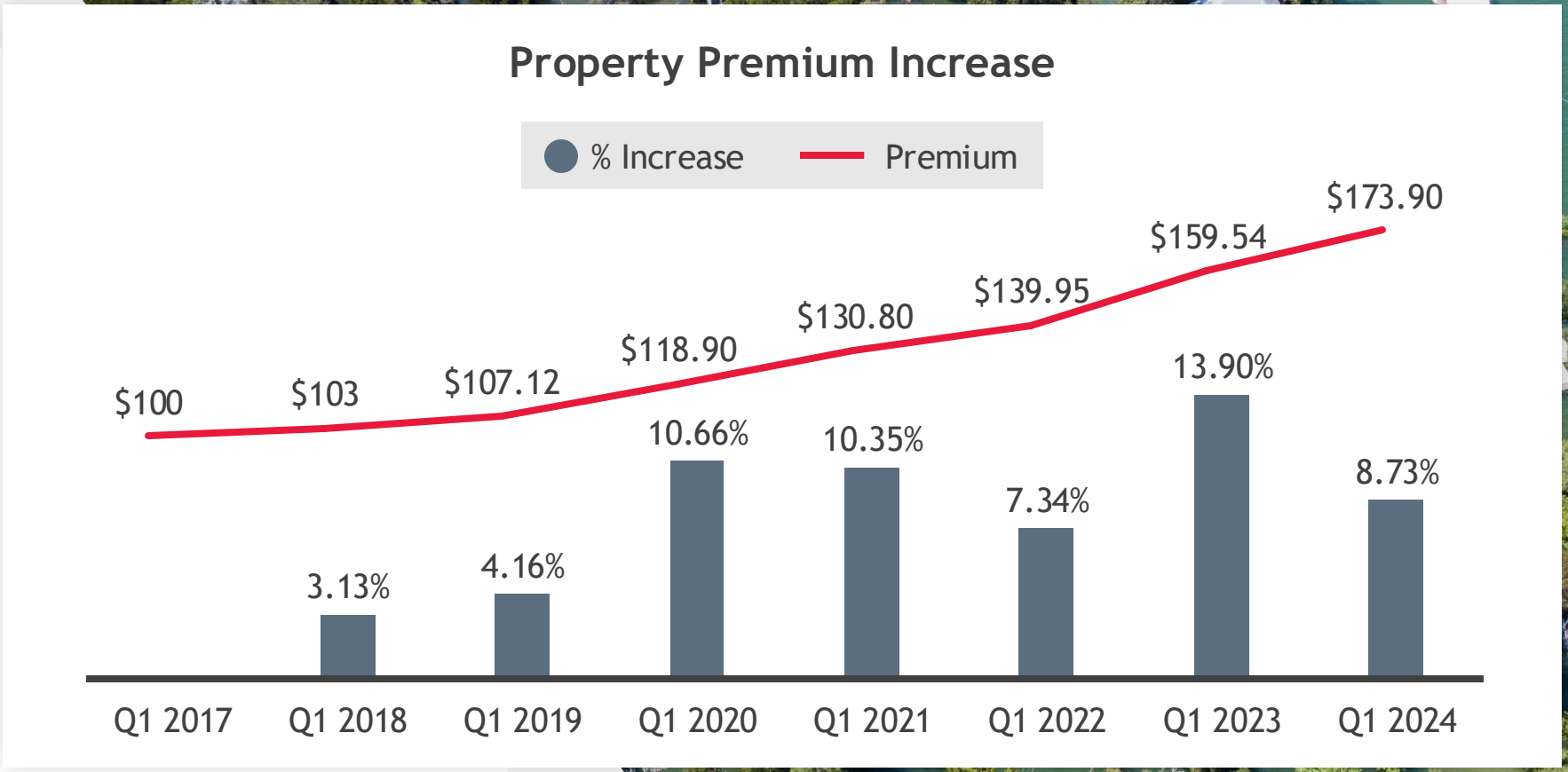
Pakistan's second most populous city – of more than 13 million people – has shut schools and closed public parks, malls and offices after the air quality index (AQI) this week spiked to more than 400, according to IQAir. That number is considered "hazardous" by the Swiss air tracking company.

Authorities in Pakistan's Punjab province have imposed an "environmental and health emergency" in three cities – Gujranwala and Hafizabad in addition to Lahore – until the situation improves, its chief minister Mohsin Naqvi said this week. The three cities combined account for more than 15 million people.

"There shall be a limited movement of people to and from these areas by public and private transport," a statement from Naqvi's office said Tuesday.

State of the Market

DOMESTIC PROPERTY INSURANCE PREMIUM INCREASE



Source: Business Insurance

Knowledge Check #3

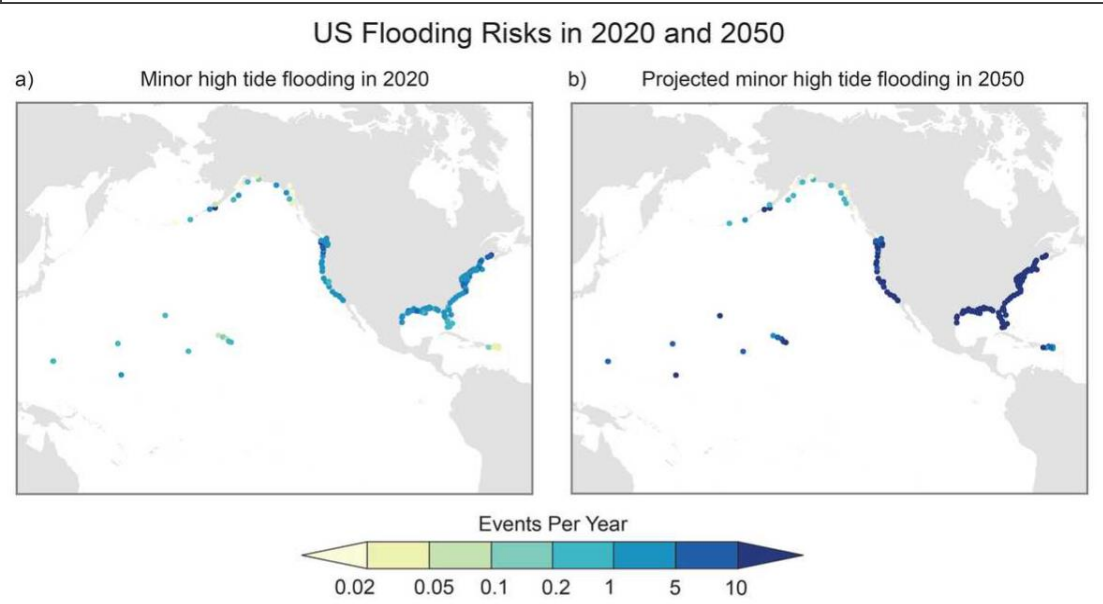
Do you believe that the insurance industry is adequately prepared to handle the increasing frequency and severity of climate-related events?

A Yes

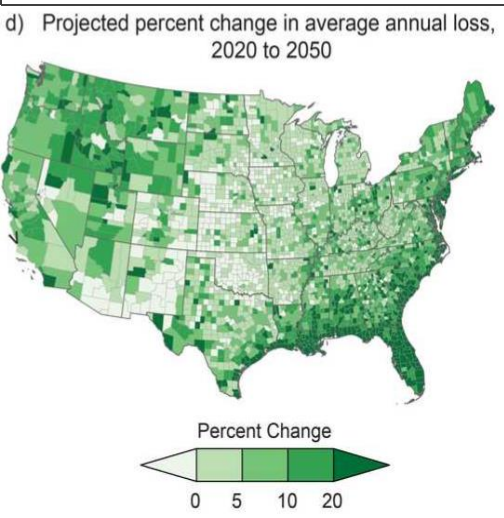
B No

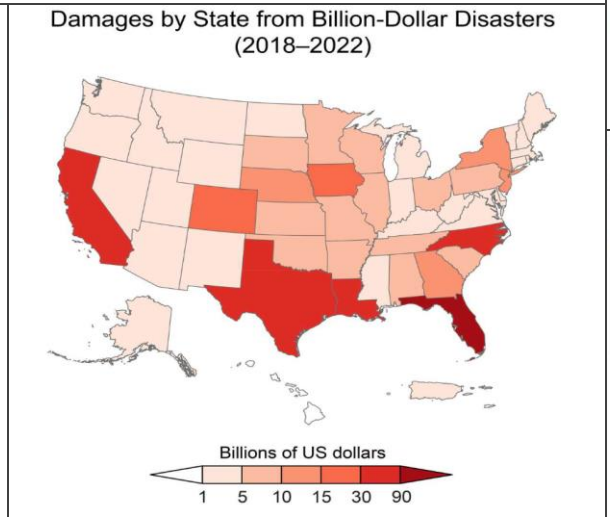
C Unsure

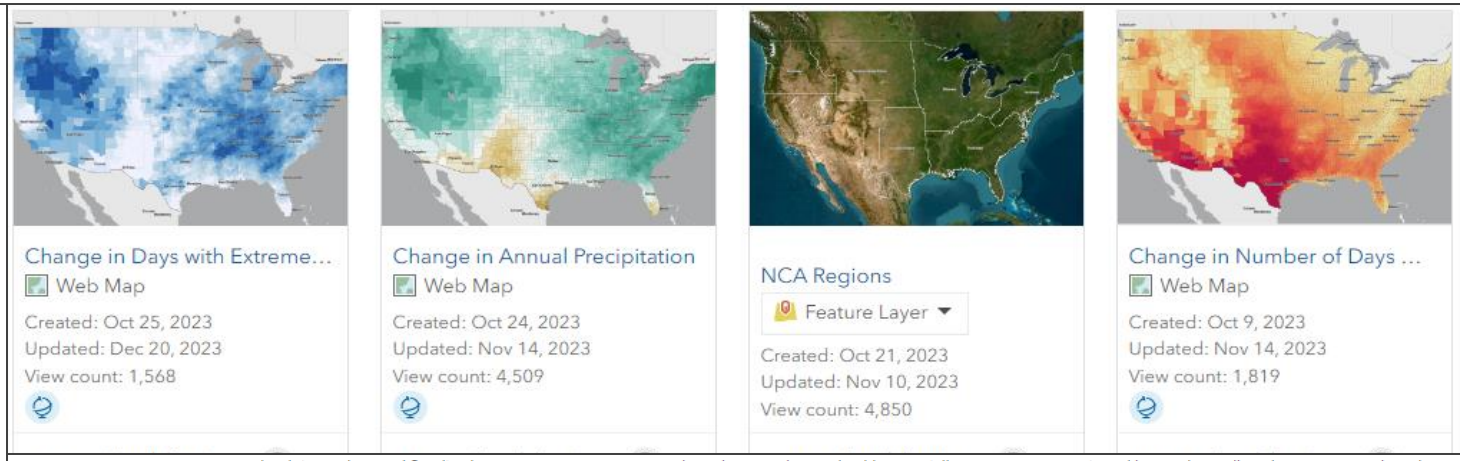
Modeling and Application of NCA 5 Data Sets Available

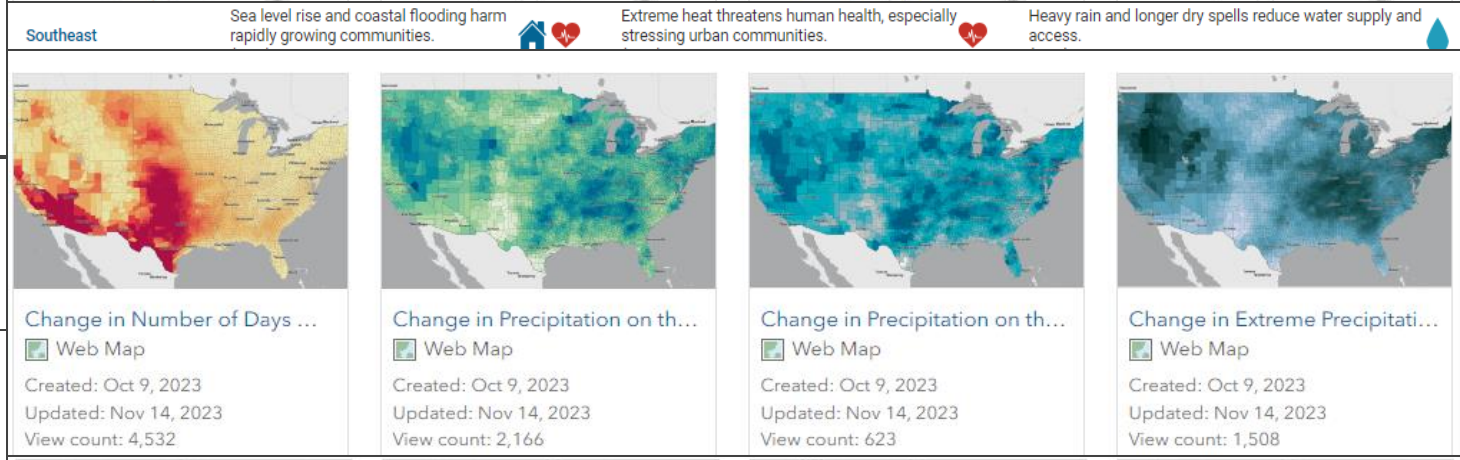


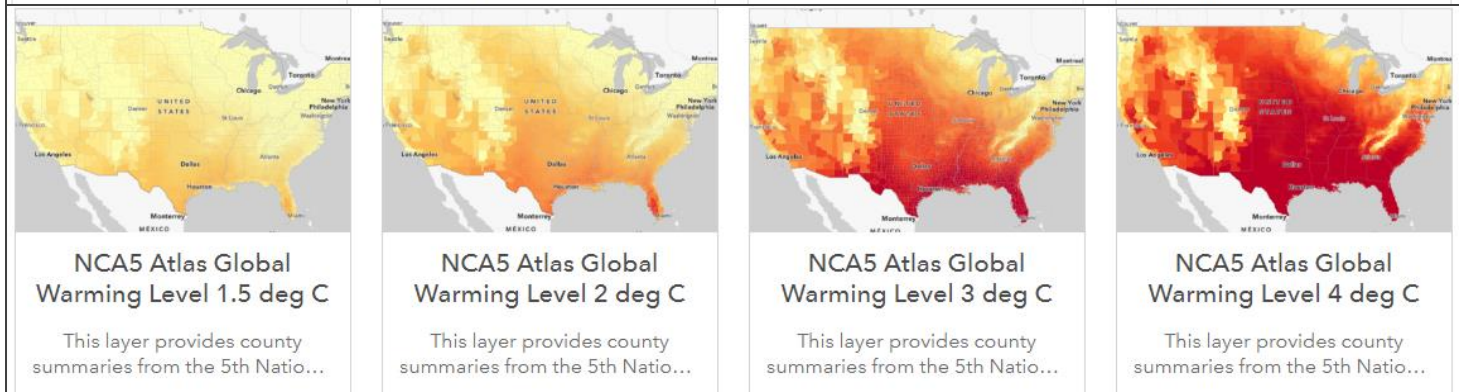
The impacts of climate change increase with warming, and warming is virtually certain to continue if emissions of carbon dioxide do not reach net zero. Hurricanes have been intensifying more rapidly since the 1980s and causing heavier rainfall and higher storm surges.











Knowledge Check #4

What measures do you think are most effective in mitigating climate related risks for real estate properties?

A Improved building codes & standards

B Enhanced flood defenses

C Better land-use planning

D Investment in resilient infrastructure

E Adoption of green building practices

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