

Growing Catastrophe Losses & the Role of Climate Change

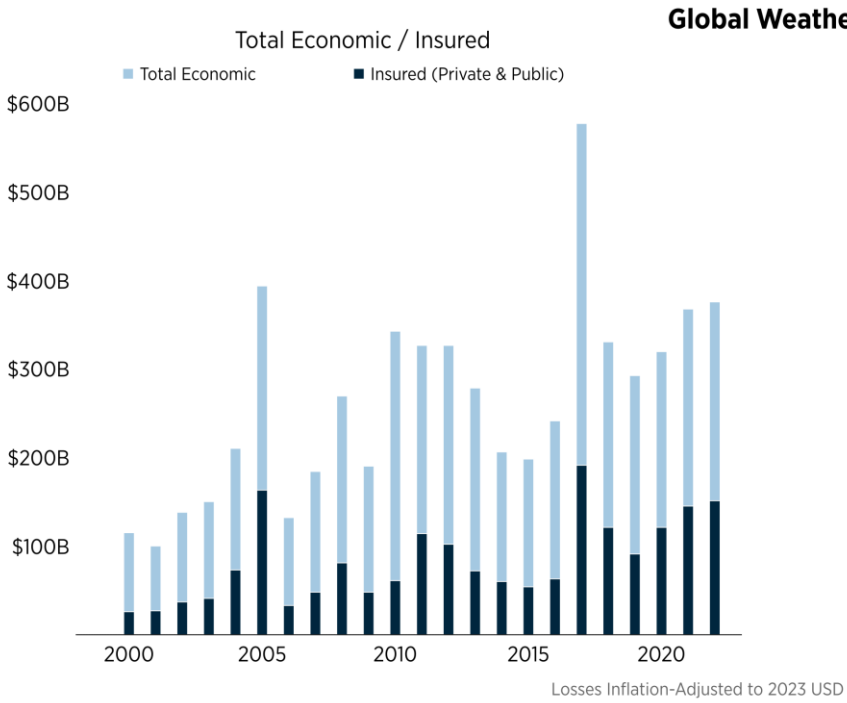
Steve Bowen | June 2023



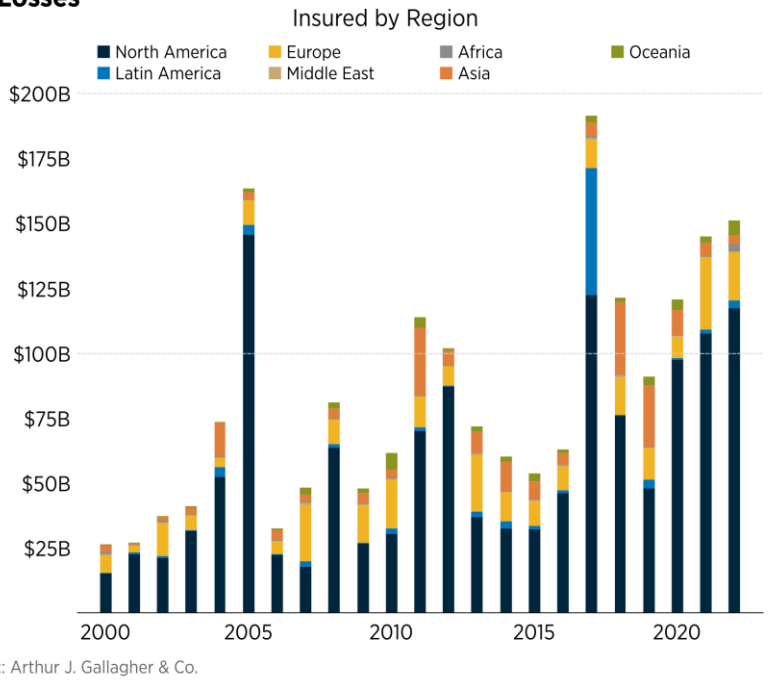
Gallagher Re

What's Happening?

State the Obvious: Losses Going Up

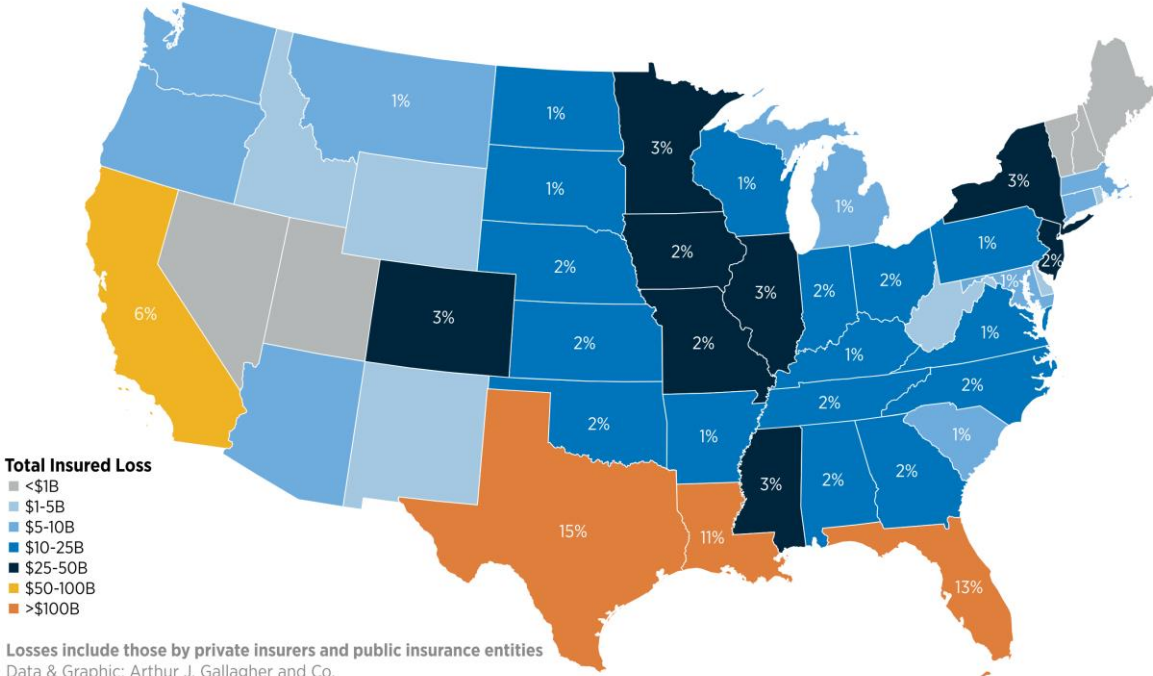


Global Weather & Climate Losses

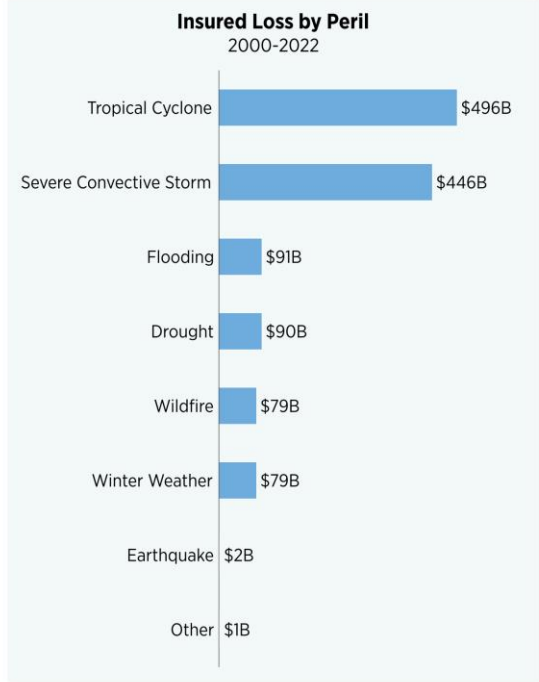


US Remains Nat Cat Epicenter

Since 2000: Private & public insurers have paid out USD1.3T



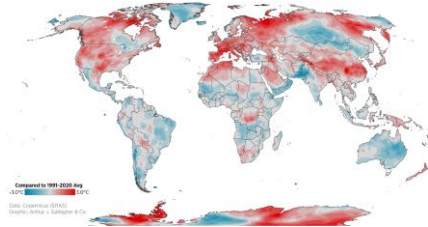
Losses include those by private insurers and public insurance entities
Data & Graphic: Arthur J. Gallagher and Co.



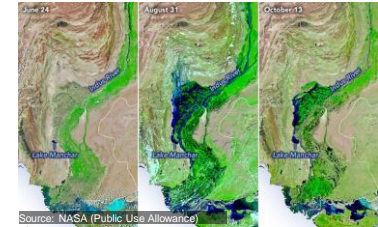
Climate Change & Extreme Weather



Hurricane Ian (2022)
USD112 billion



2022: Drought / Heatwaves
USD79 billion / 40,000+ dead



Pakistan Floods (2022)
USD15 billion

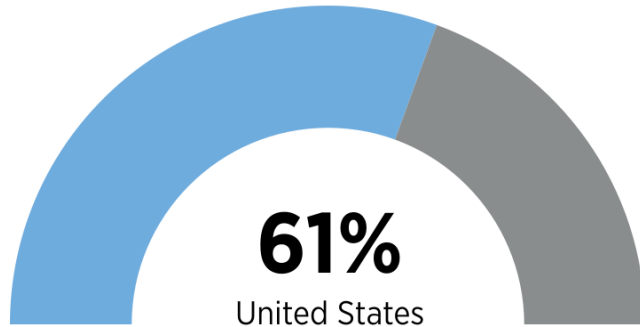
Common Theme

Events enhanced by climate change...

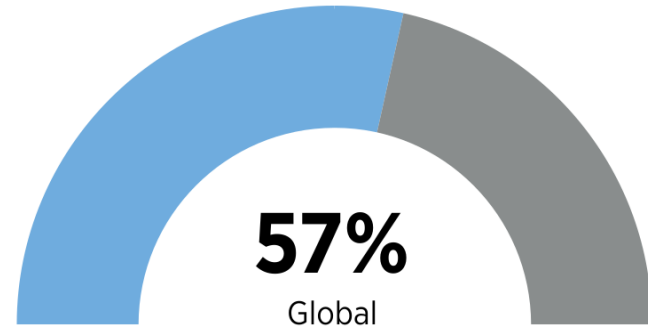
...and societal vulnerabilities in where / how we live.

“Primary” vs “Secondary”

Secondary perils play a primary role in annual insured losses



61%
United States



57%
Global

21st Century

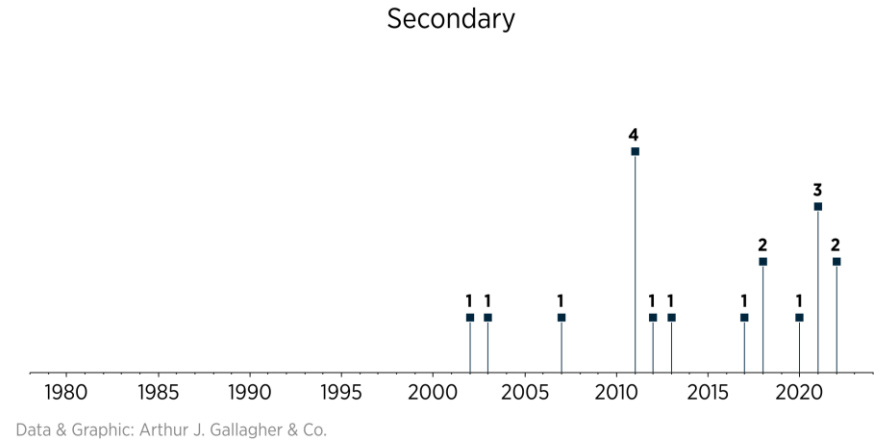
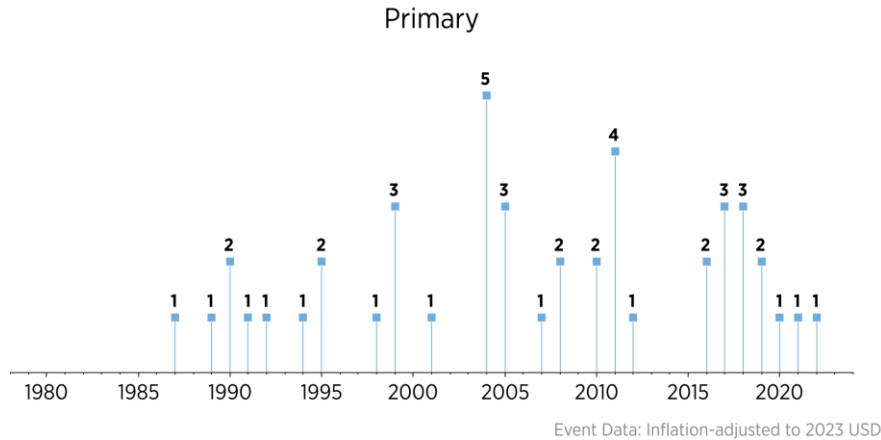
Data & Graphic: Arthur J. Gallagher & Co.

Primary: Tropical Cyclone / Earthquake / European Windstorm

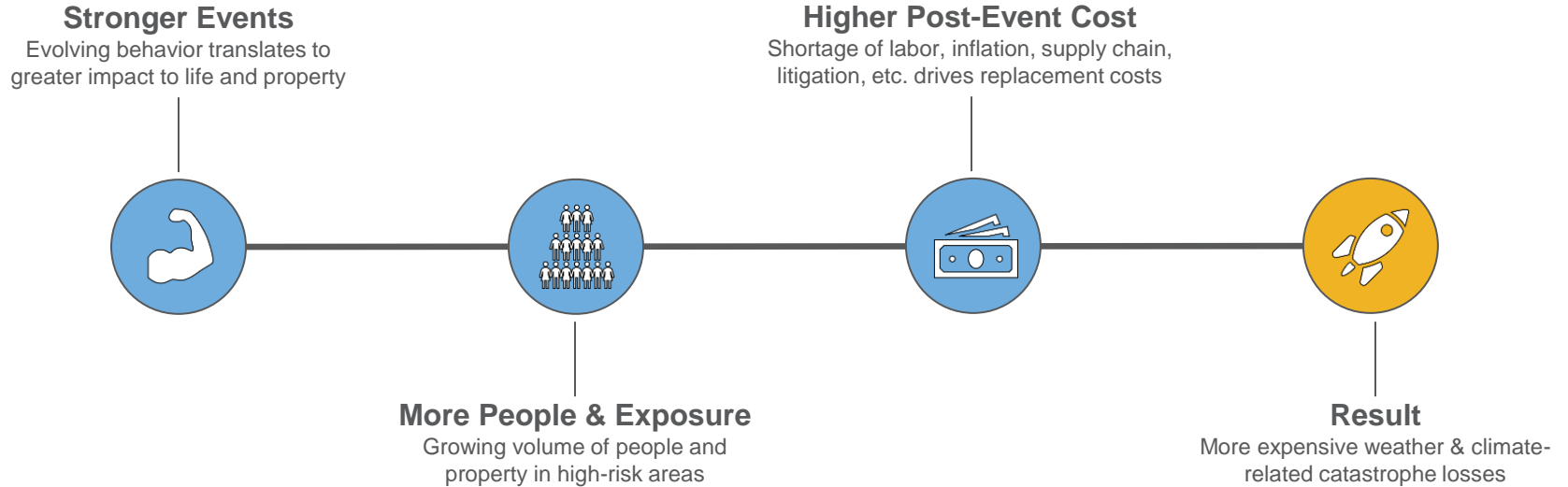
Secondary: Severe Convective Storm / Flooding / Wildfire / Winter Weather / Drought

“Primary” vs “Secondary”

Number of >\$5B Insured Events Since 2010: Primary (20) / Secondary (15)



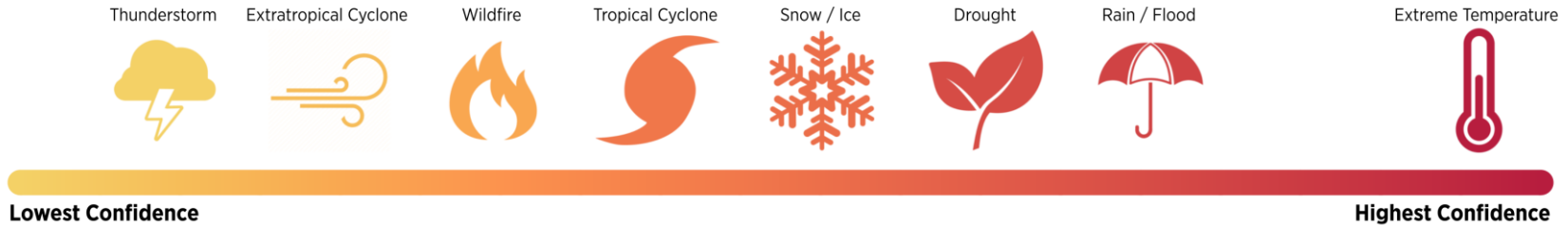
What's Driving the Loss?



Climate Change & Individual Peril Risk

Current Science

Current confidence level of climate change influence varies per peril & region

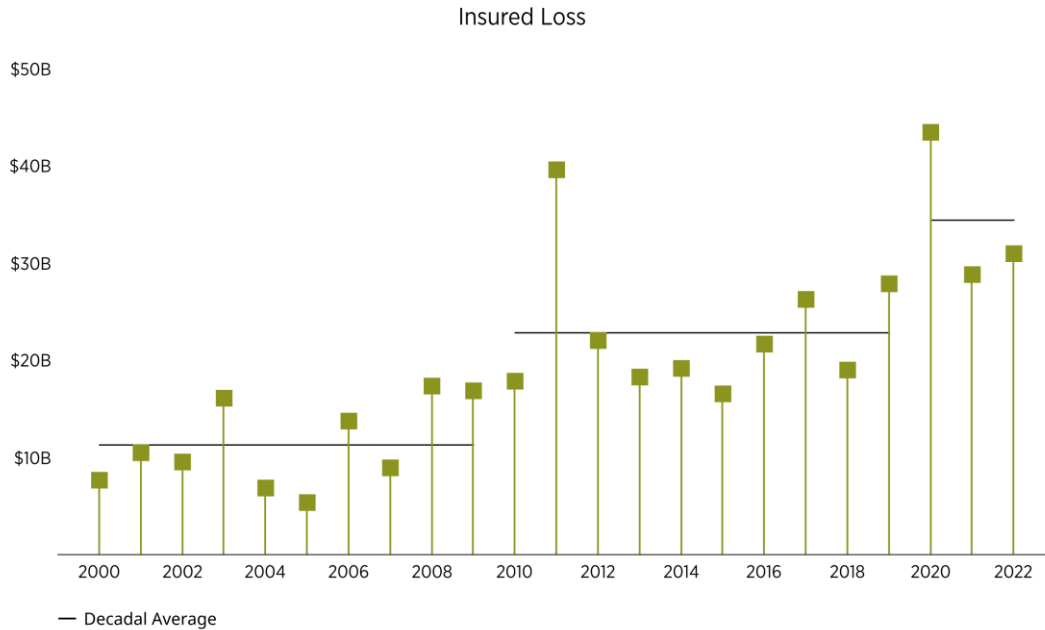


Adapted from <https://www.nap.edu/catalog/21852/attribution-of-extreme-weather-events-in-the-context-of-climate-change>

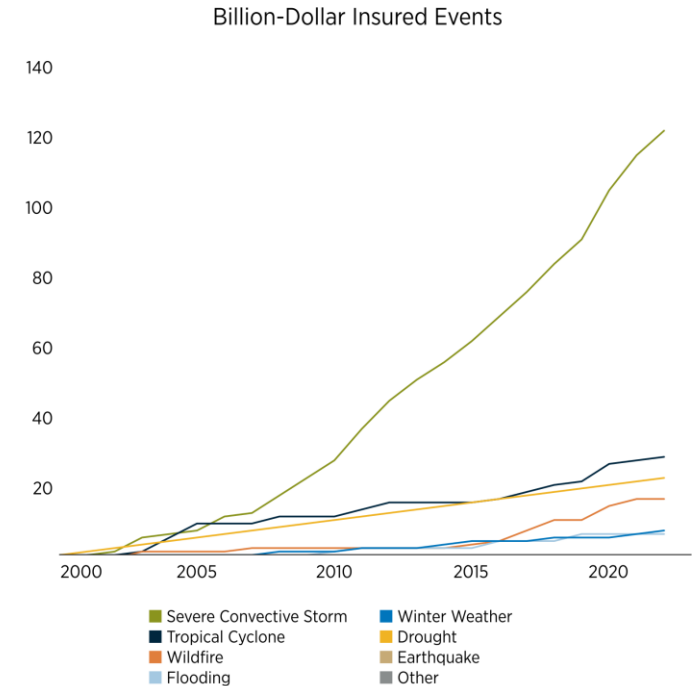
Graphic: Arthur J. Gallagher & Co.

Severe Convective Storm

Higher frequency peril with increasingly consequential impacts

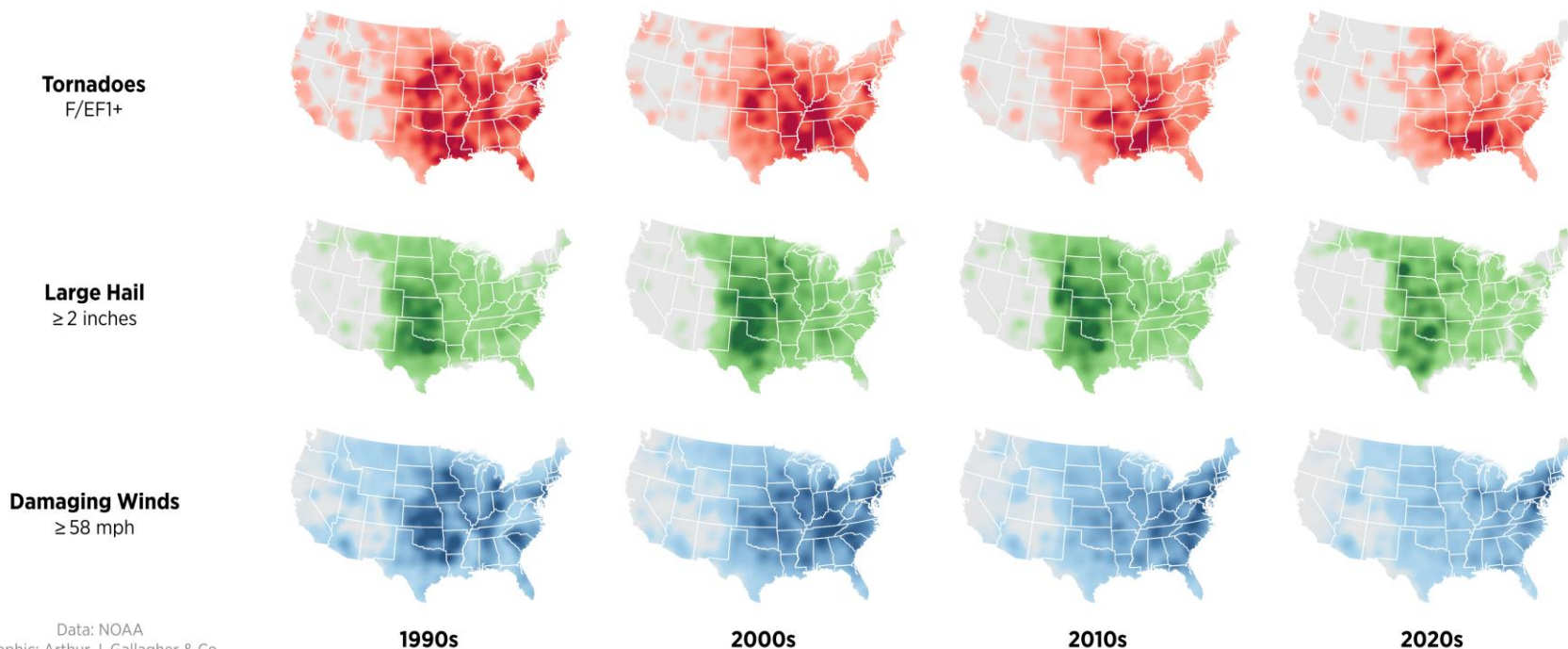


Data & Graphic: Arthur J. Gallagher & Co.



Severe Convective Storm

Takeaway: Most notable shift seen in tornado genesis location (east & south)



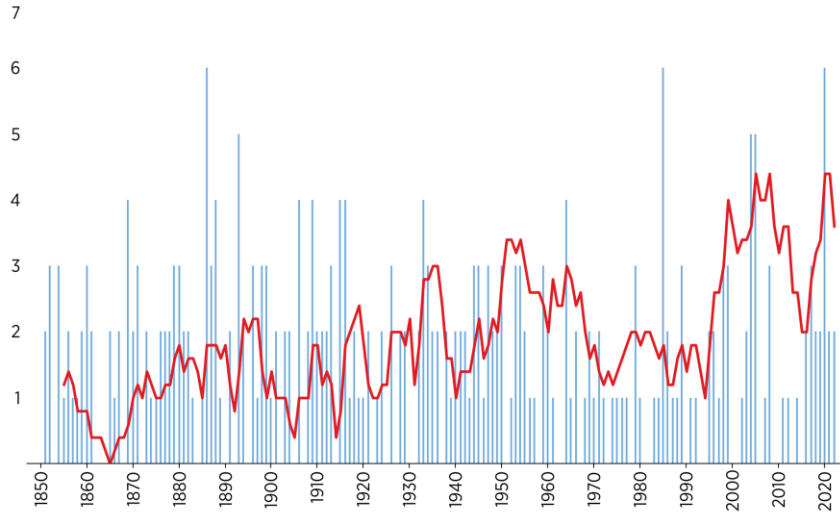
Data: NOAA
Graphic: Arthur J. Gallagher & Co.

Tropical Cyclone

Limited climate change signal in TC frequency change or landfalls

U.S. Hurricane Landfalls

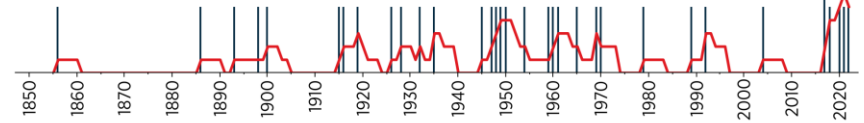
All Hurricanes (Category 1+)



No Obvious Trend. Yet.

— 5-Year Rolling Avg.

Category 4/5



Since 2017: Historical Highs

Data: NOAA Graphic: Arthur J. Gallagher & Co.

Tropical Cyclone

Increased frequency of rapid intensification & higher portion of high-end TCs

Atlantic TC Rapid Intensification Points

Rapid Intensification: 30+ knots (35+ mph) in a 24-hour period

Explosive Rapid Intensification: 50+ knots (58+ mph) in a 24-hour period

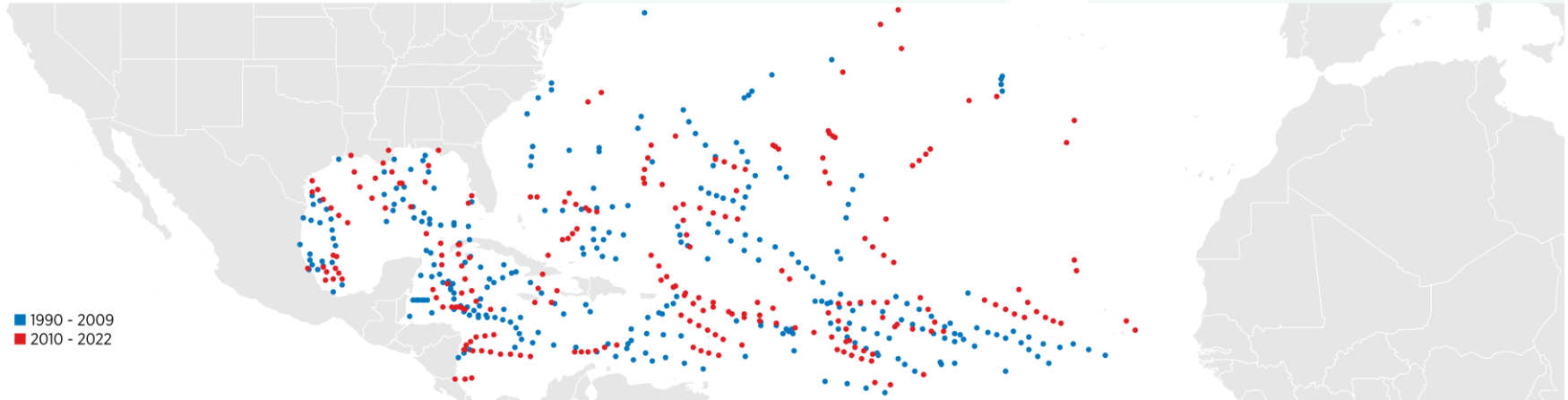
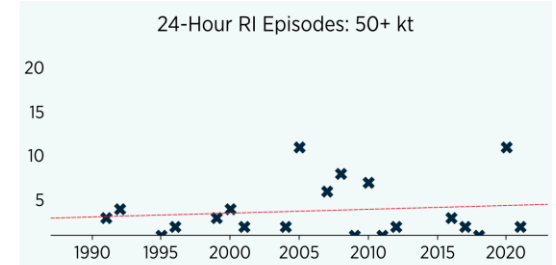
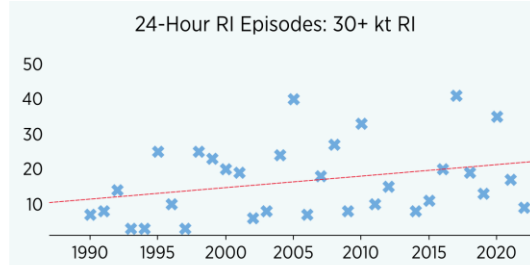
Research Paper

Klotzbach; Wood; Schreck III; Bowen; Patricola; Bell (2022)

<https://doi.org/10.1029/2021GL095774>

Data: IBTrACS

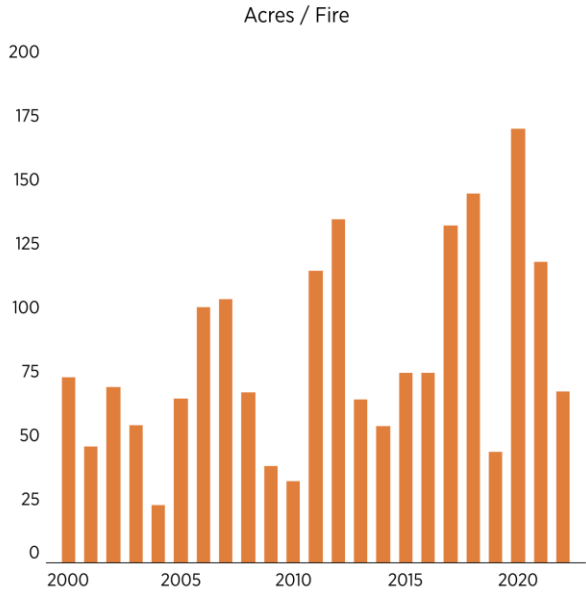
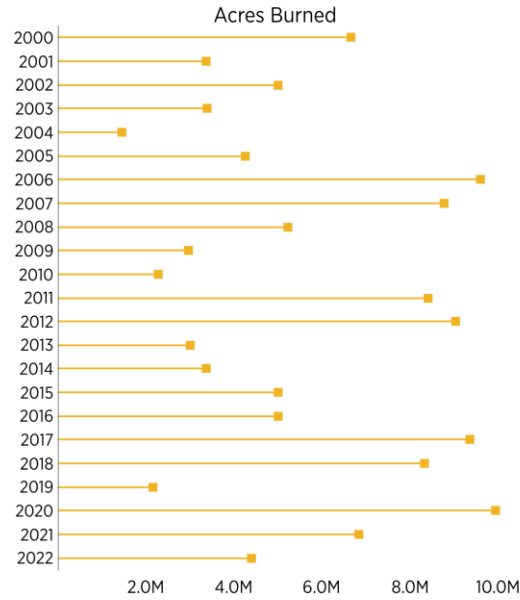
Graphic: Steve Bowen (Co-Author)



Wildfire

Bigger fires. Hotter fires. Longer fire seasons. Increased loss costs.

Wildfire Statistics: CONUS (Lower 48)



Fire Data: NIFC Loss Data & Graphic: Arthur J. Gallagher & Co.

U.S. Wildfire Seasons Since 2015

\$100B
Economic Loss (2023 USD)

\$66B
Insured Loss (2023 USD)

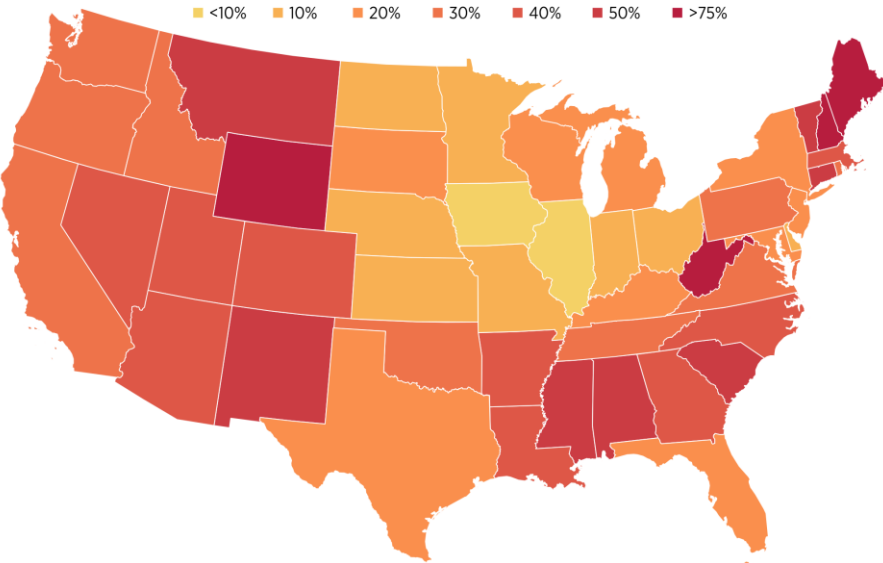
Fact
The United States has recorded 18 individual billion-dollar insured wildfire events on record. Fourteen (14) have occurred since 2015.

CA: 11 OR: 1 CO: 1 TN: 1

Wildfire

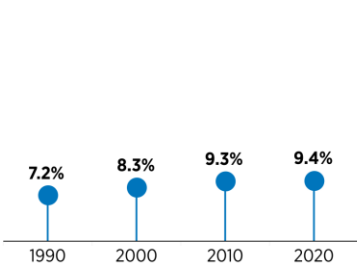
Most risk focus is on the Western US, but wildfire potential is everywhere

Wildland Urban Interface & Intermix
Percentage of Homes: 2020

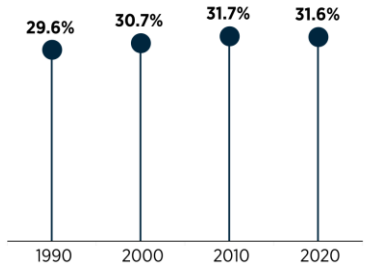


Data: Univ. of Wisconsin (SILVIS) & U.S. Census Bureau
Graphic: Arthur J. Gallagher & Co.

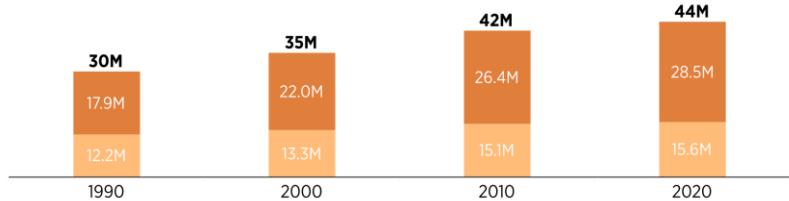
US: Land % in WUI



US: % Homes in WUI



US: Total Housing Units in WUI

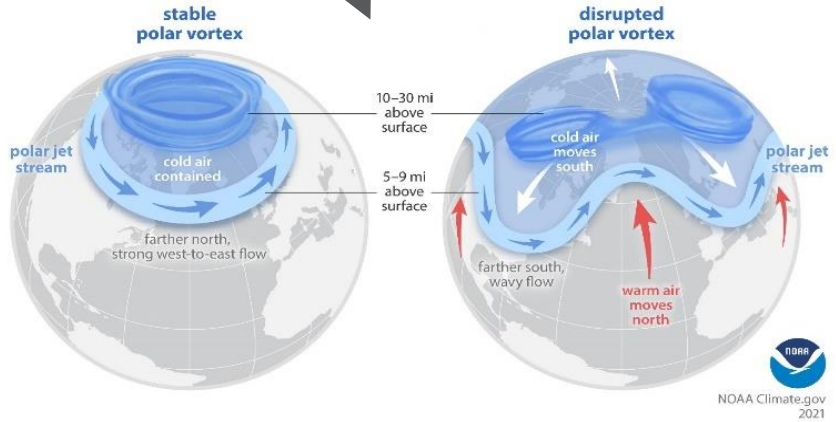
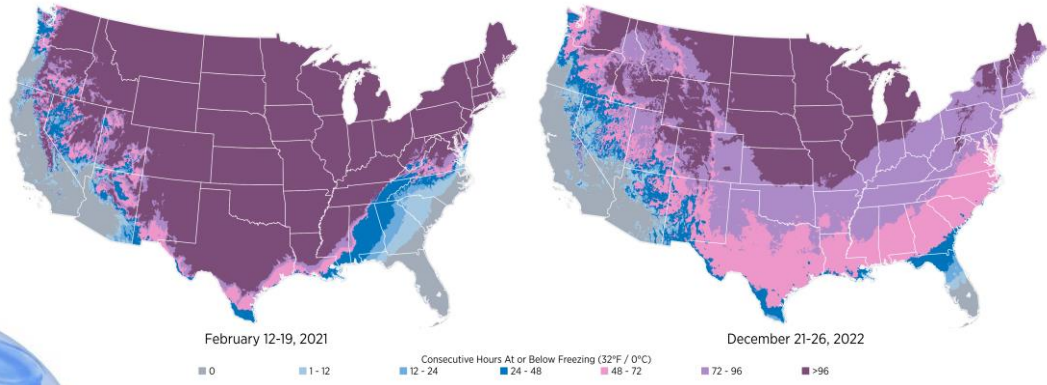


Interface: Zone marked by the transition between wildland vegetation and urbanized areas
Intermix: Development built within wildland vegetation

Winter Weather

Polar Vortex: No significant increase in North American occurrences (yet)

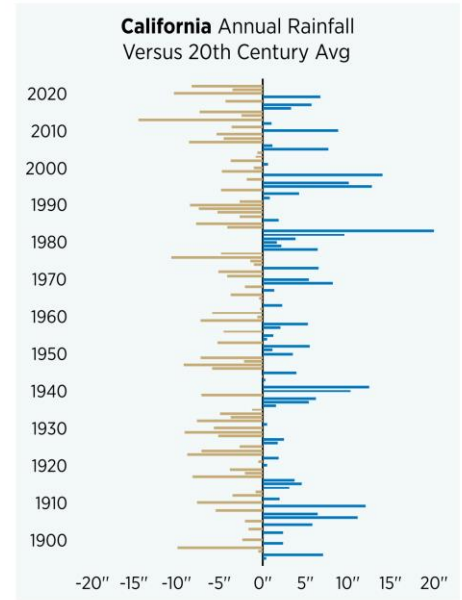
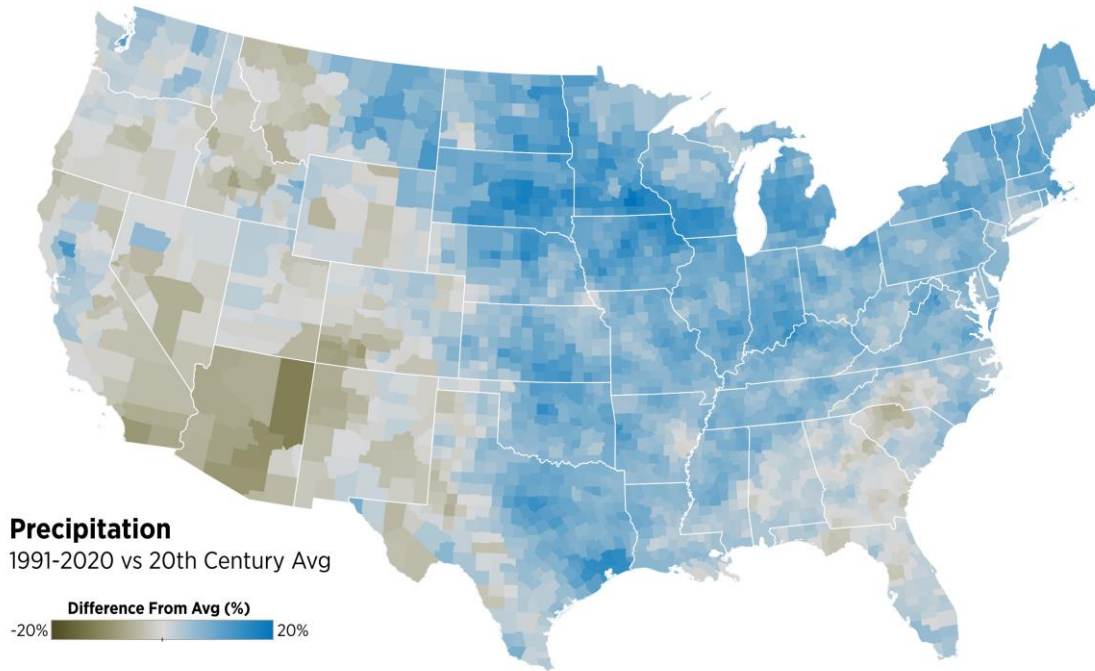
More of this...



...could lead to more of that.

Rainfall / Flooding

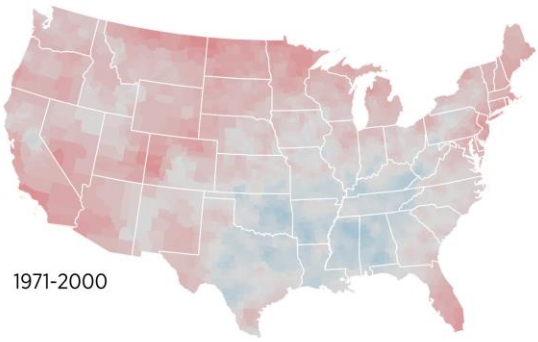
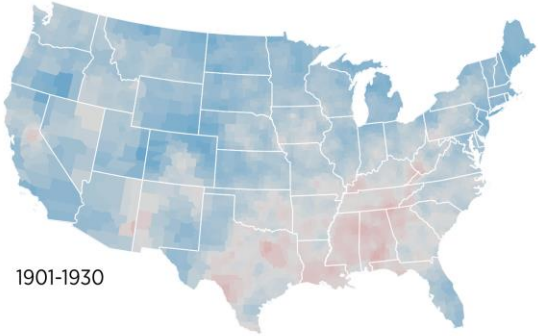
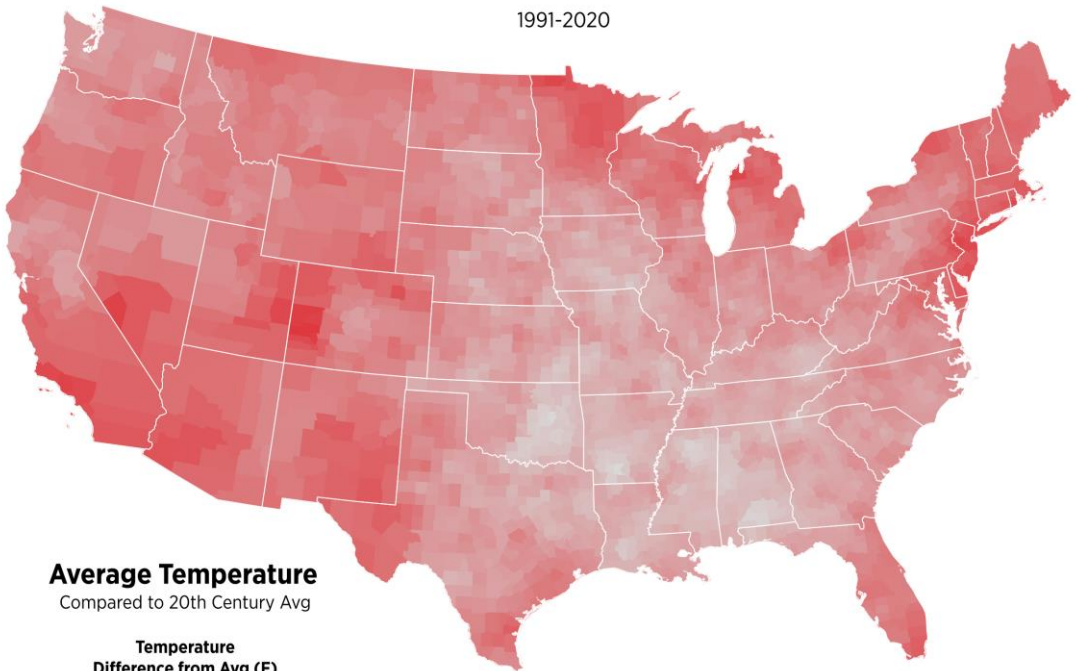
Heavier individual rain events occurring; long-term data can be noisy



Data: NOAA
Graphic: Arthur J. Gallagher & Co.

Heat / Drought

Average temperatures getting warmer; minimum temperatures rising fastest



Data: NOAA Graphic: Arthur J. Gallagher & Co.

Takeaways & Things to Consider

Climate Change

Essential to identify the totality of climate change risk



Exposure

Where and how we (re)build is critical to minimize physical risk



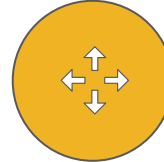
Hazard

Changes in the behavior and frequency of high intensity events



Attribution

Quantify the “fingerprints” of climate change on individual events



Non-Physical / Transition

Companies looking to transition away from carbon focused portfolios



People

Population trends moving into well-known high-risk areas



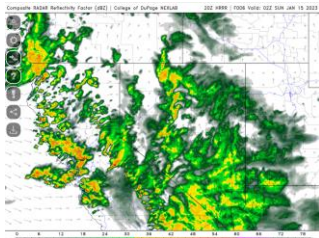
Uncertainty

Account for unknowns found within current state of climate science

Modelling Climate Change Risk

The term “model” can mean different things to different people. Understanding the unique and distinct differences are critical when assessing various types of risk.

Numerical Weather Prediction (NWP)

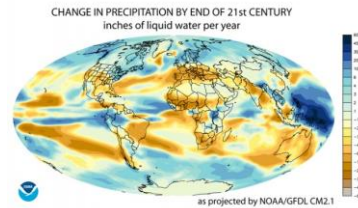


Time Scale
Current or Short-Term

Base Data
Current surface, satellite, and atmospheric observation data

Usage
Simulate future weather at a downscaled level

Global Climate Model (GCM)

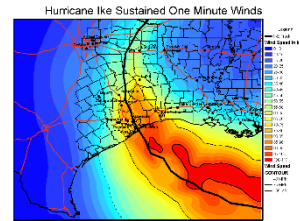


Time Scale
Long-Term (Decadal / Centurial)

Base Data
Atmospheric, land surface, ocean, sea ice, tree rings, etc.

Usage
Simulate future larger-scale global climate conditions

Catastrophe Model



Time Scale
Historical / Current / Future

Base Data
Physical hazard exposure, historical weather events, financial info, etc.

Usage
Simulate historical events or stochastic (hypothetical) events

Climate Risk Model (CRM)

MOODY'S | **ESG**

S&P Global

Time Scale
Short, Medium, Long-Term

Base Data
Climate data, socioeconomic metrics, current exposure, policy details, etc.

Usage
Simulate hazard scenarios to quantify portfolio risks to businesses

Complementary Risks

Complexity of climate change rising as ancillary issues add further costs



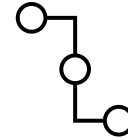
**Litigation /
Liability**



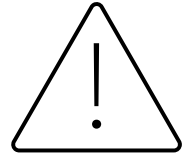
**Claims
Fraud**



Inflation



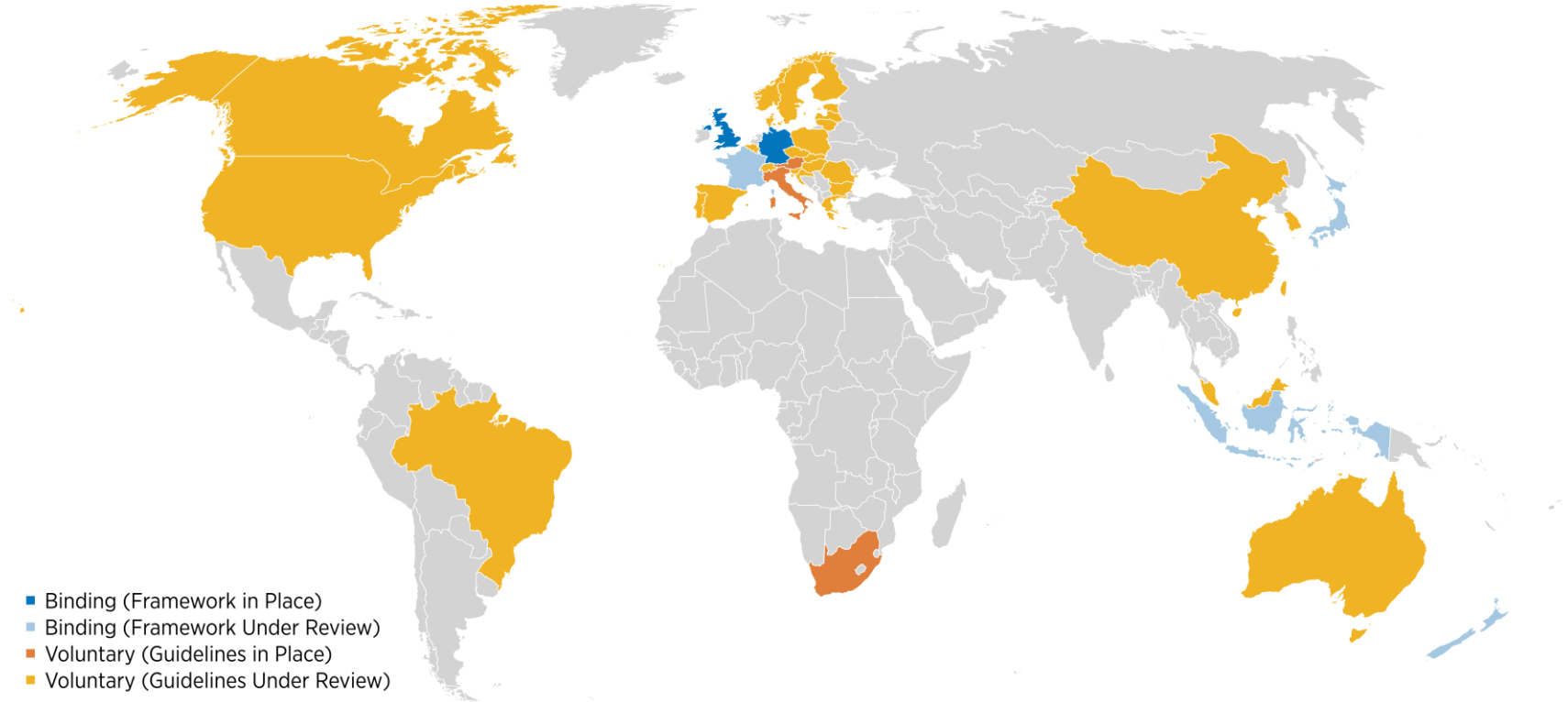
**Supply
Chain**



**Contingent
Business
Interruption**

Climate & ESG: Global Regulation

Europe leads on regulatory frameworks with mandatory standards and reporting



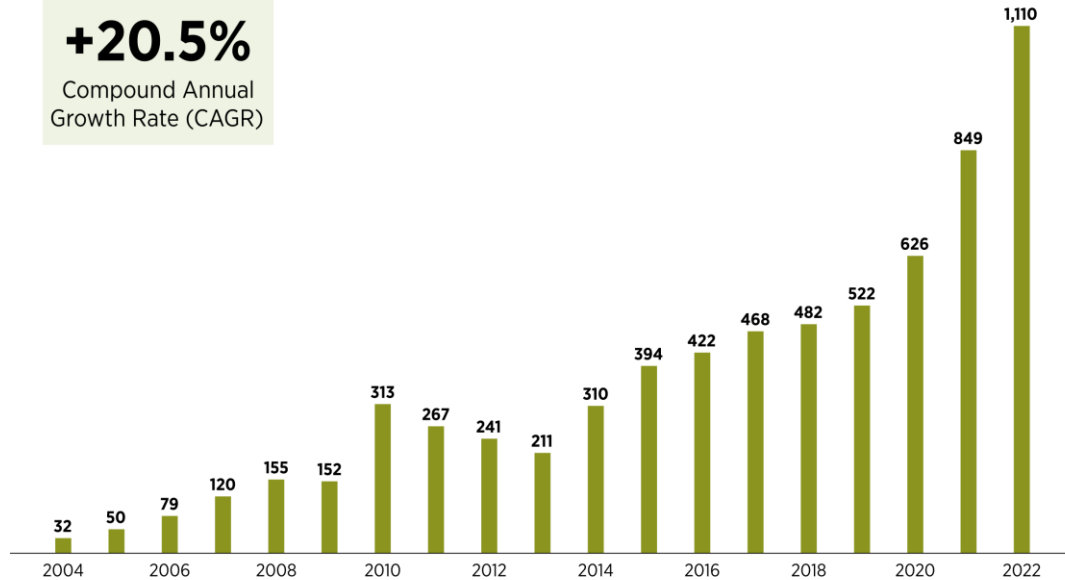
Climate Finance

Rapid acceleration in global investment to clean energy solutions

Global Annual Energy Transition Investment

+20.5%

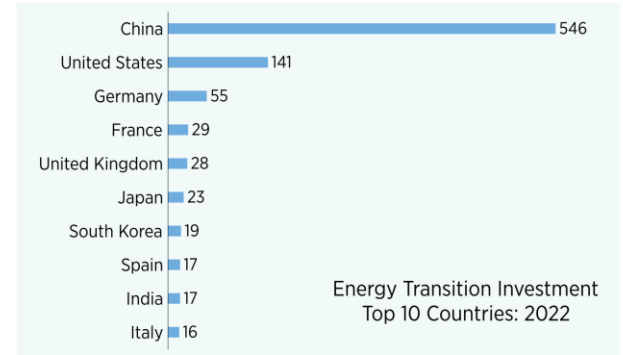
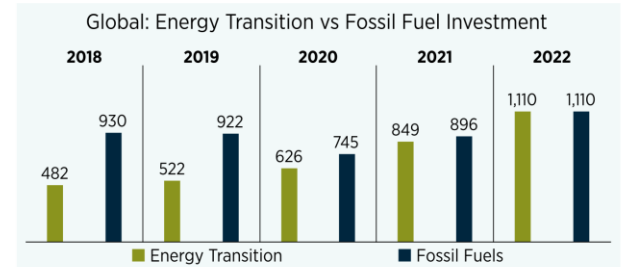
Compound Annual Growth Rate (CAGR)



Data in USD Billions

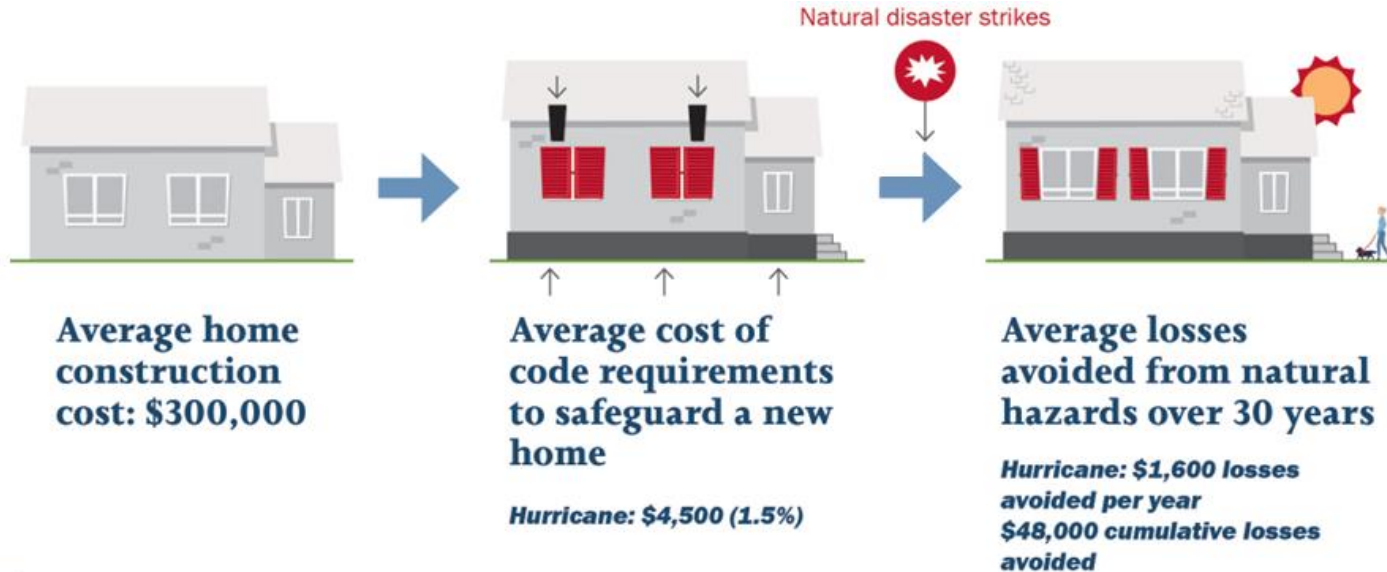
Data: BloombergNEF

Graphic: Arthur J. Gallagher & Co.



Effective Investment Will Save Money

Build Better. Build Smarter. Codes Work.



Sources:

FEMA, "Building Codes Save: A Nationwide Study," 2020; (source of cost data).

NIBS, "Natural Hazard Mitigation Saves: 2019 Report," 2019; (source of dollar spent on mitigation).

The climate of tomorrow is here today.

Thank You!

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