The Effects of Climate Change on the Insurance Industry and Considerations for Underwriters

Originally presented on October 8th at the SEIP 2019 Conference in Boston, MA

Presentation Outline

- Introduction
- Chemical Releases Caused by Natural Hazards
- Climate Trends and Catastrophe Modeling
- Impacts on Underwriting
- Impacts on Coverages and Claims
- Takeaways

Who We Are

Molly Diggory
M.S. Civil & Environmental Engineering
B.S. Geology

Nick Palumbo
B.S. Chemical Engineering

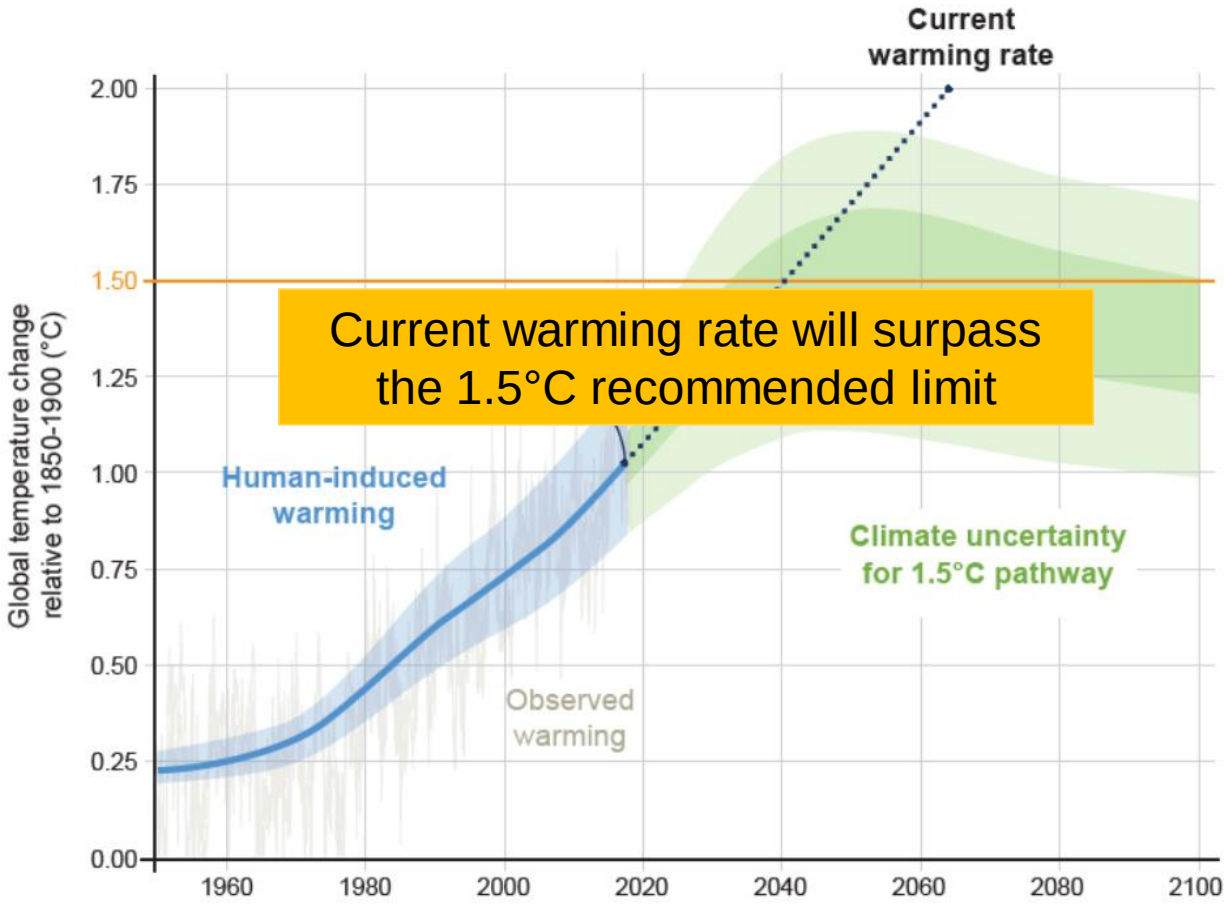
Crystal Stowell
A.B. Applied Mathematics: Environmental Science and Engineering

Rachel Miller
B.S. Biological Engineering

“Environment-related risks account for three of the top five risks by likelihood and four by impact.”

– *The Global Risks Report, 2019*

The Effects of Climate Change



IPCC, 2018.

USD 225 billion

Economic cost of natural disasters in 2018

USD 90 billion

Insured cost of natural disasters in 2018 – 4th costliest year on record

USD 215 billion

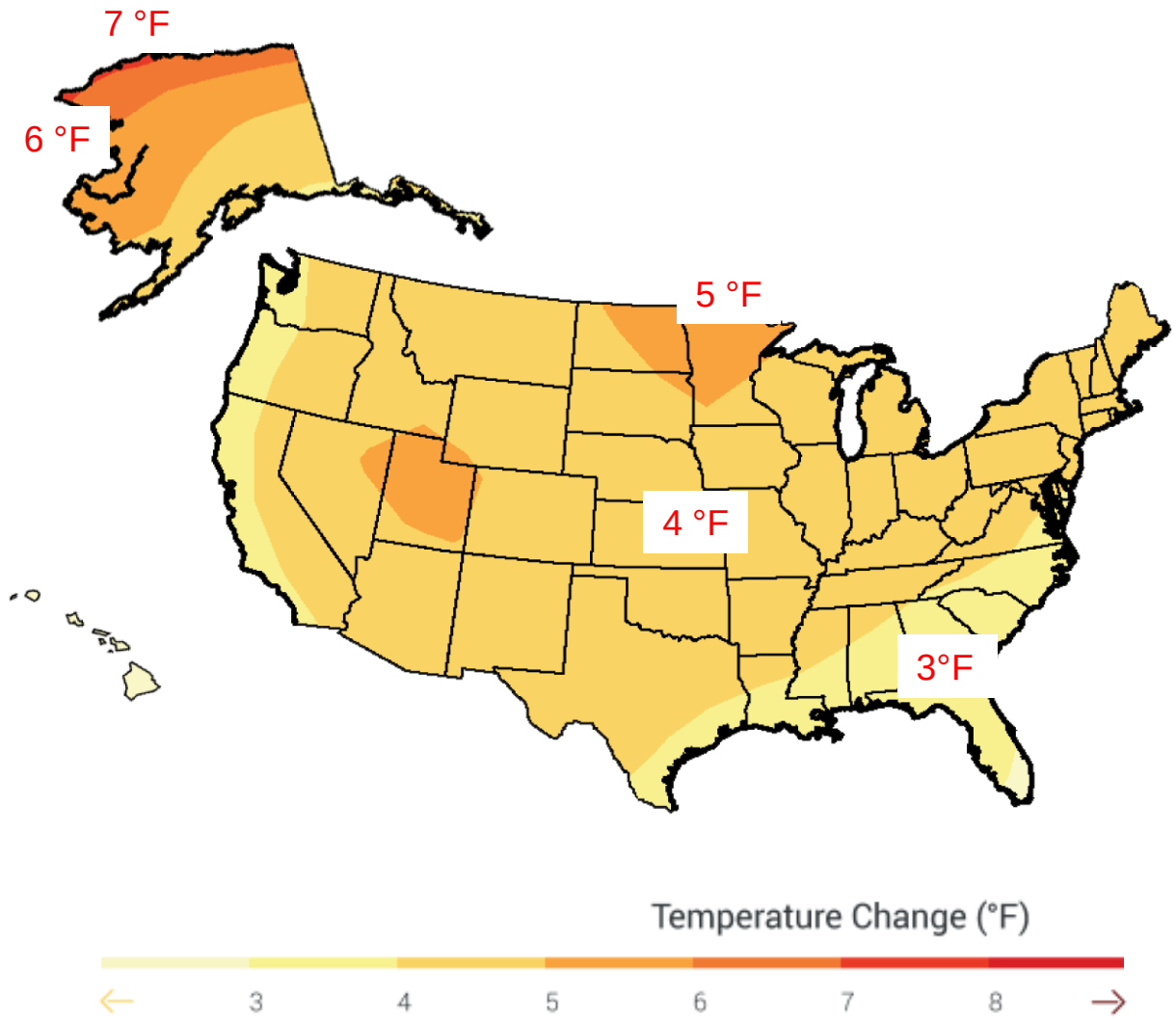
Economic cost of weather disasters in 2018

USD 89 billion

Insured cost of weather disasters in 2018 – 4th costliest year on record

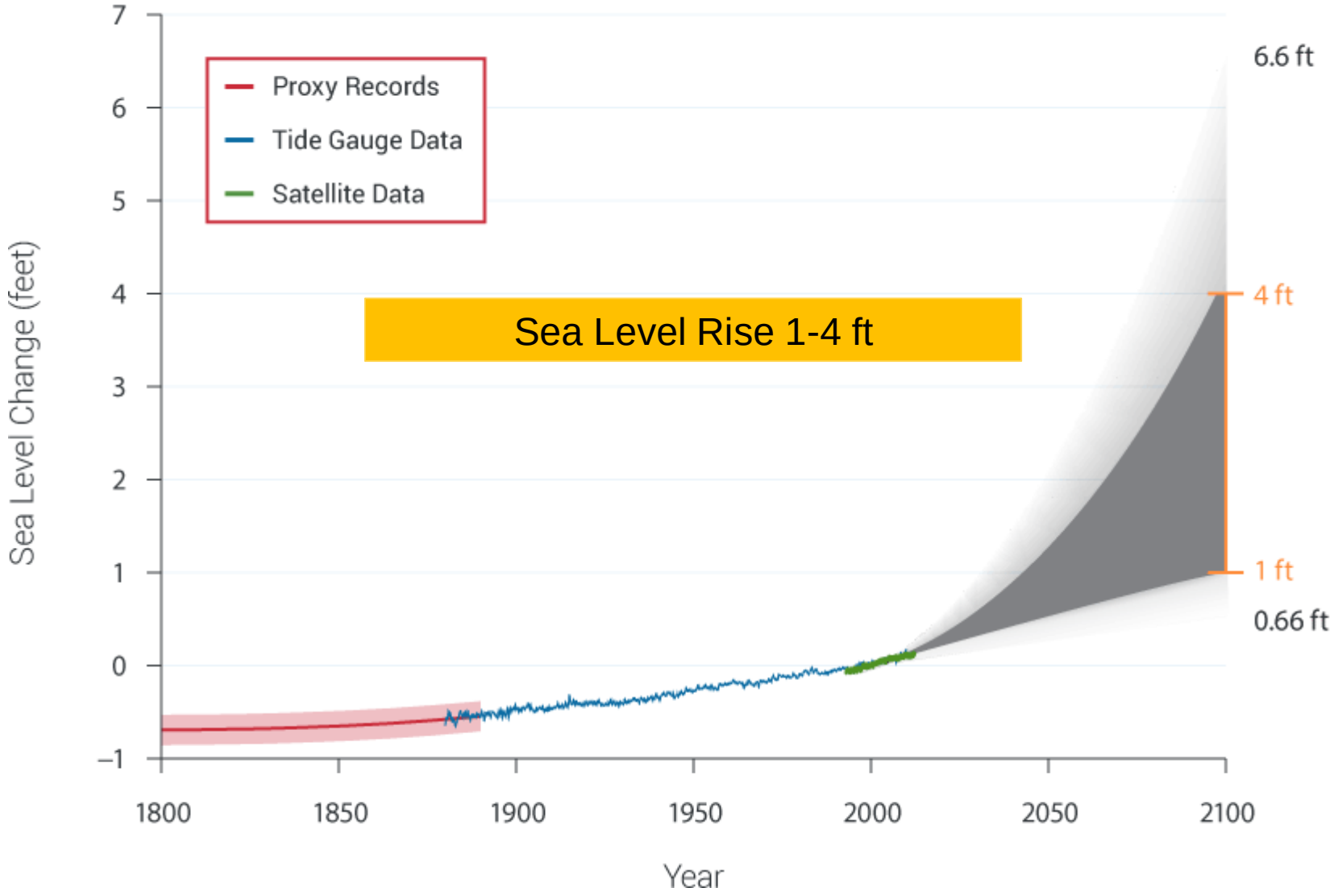
Aon, 2018.

Projected Temperature Increase Over 100 Years



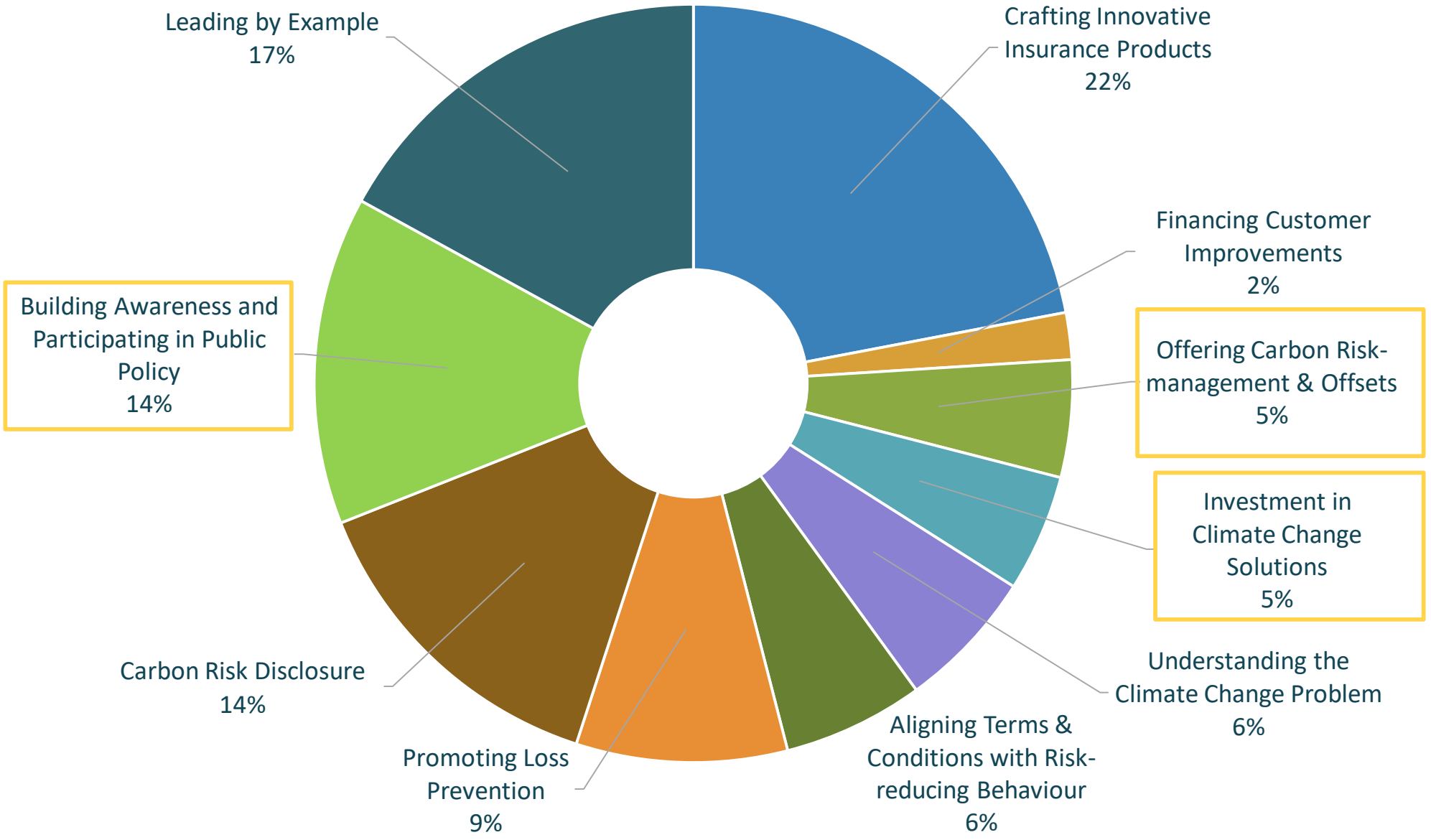
U.S. Global Change Research Program.

Past and Projected Changes in Global Sea Level



U.S. Global Change Research Program.

Insurance Industry Response to Climate Change



Adapted from: Evan Mills, 2009.

Chemical Releases Caused by Natural Hazards

Nick Palumbo

What is a Natech?

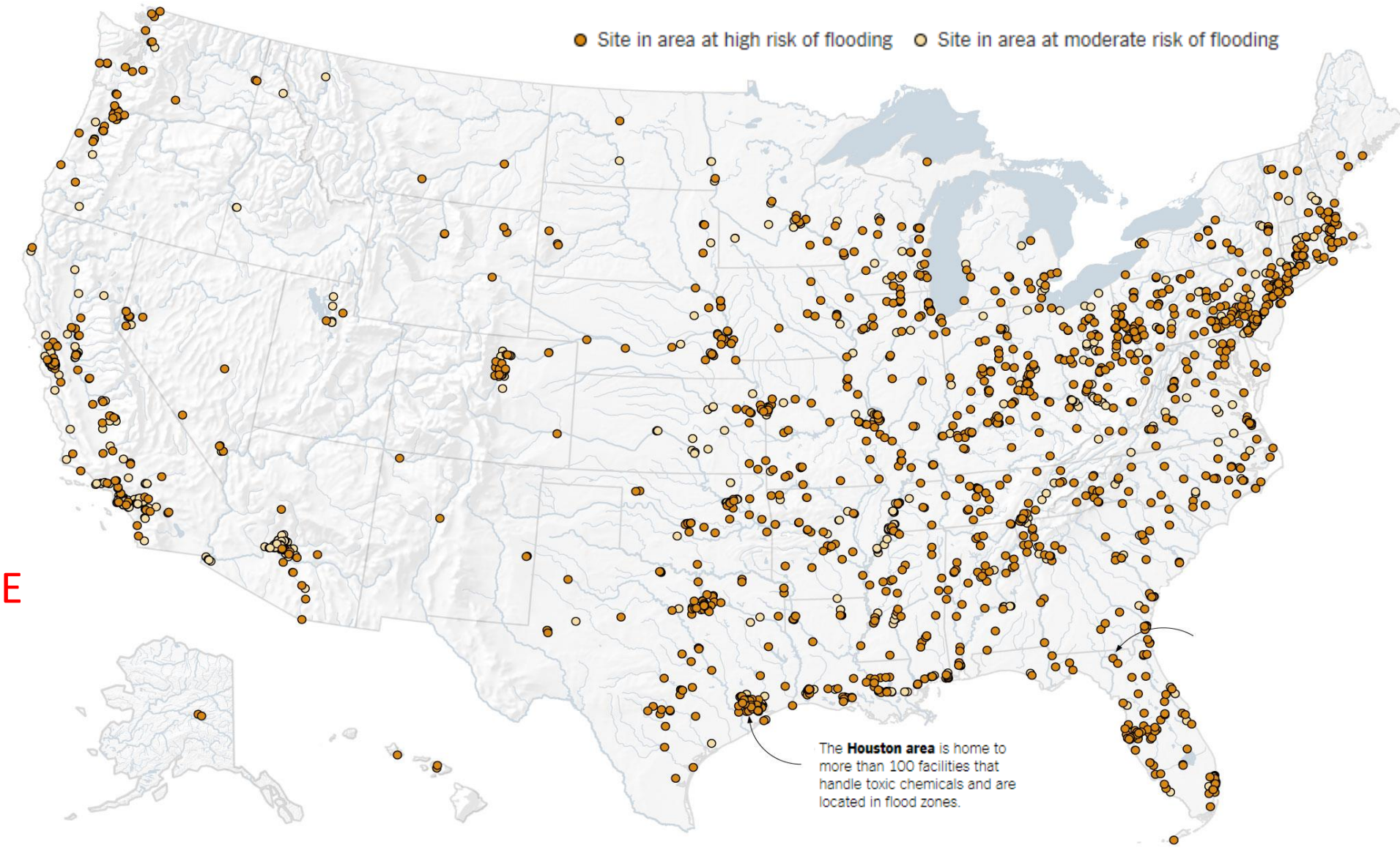
- Natech: Accidents initiated by a NATURAL HAZARD or DISASTER which results in the release of hazardous materials

- Natural Hazards
  - Hurricanes
  - Earthquakes
  - Tornados
  - Floods
  - Rain storms
  - Snow storms
  - Extreme hot weather
  - Extreme cold weather
  - High winds
  - Lightning
  - Freezing
  - Typhoons
  - Landslide
  - Mudslides
  - Etc…

Vulnerable Sites

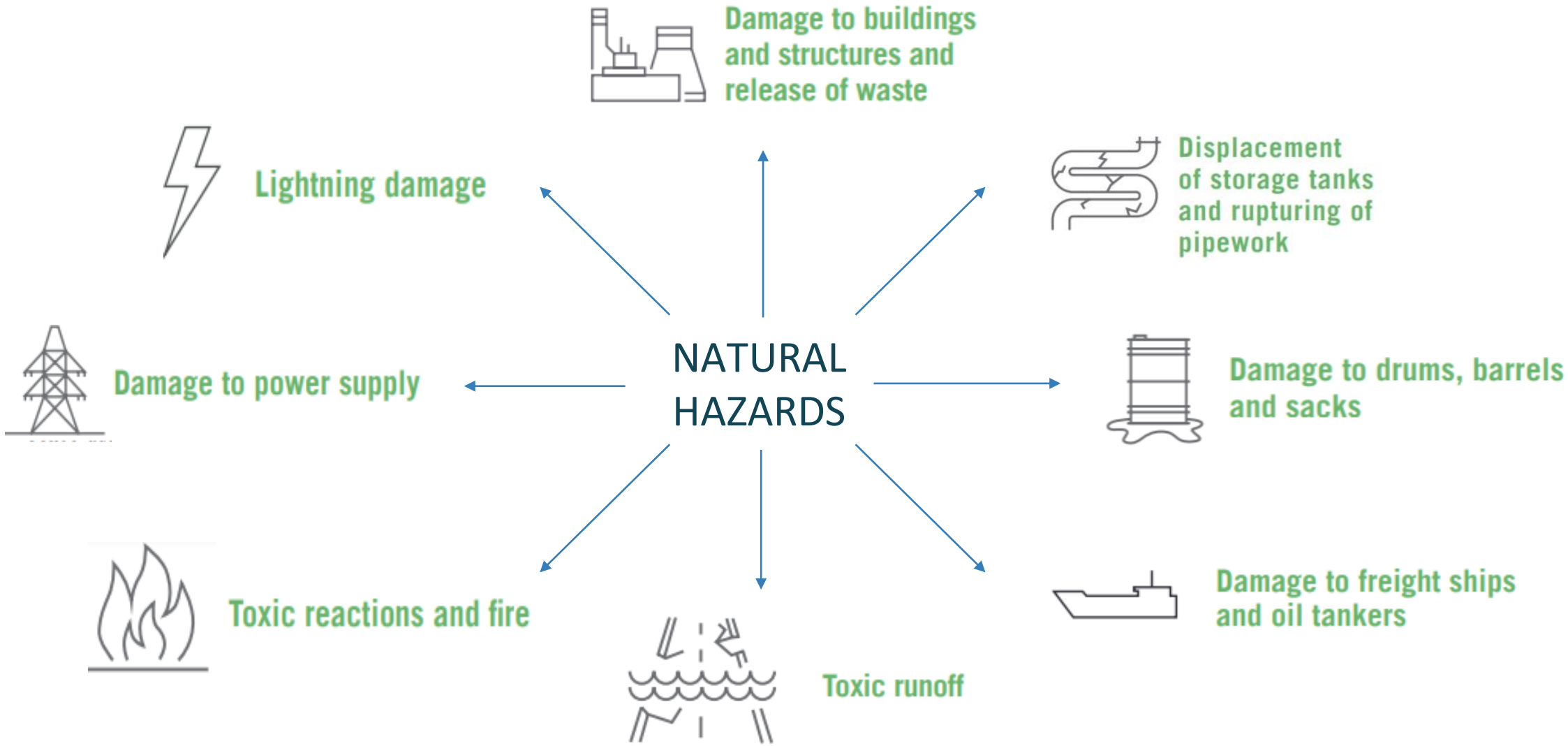
- Fuel storage sites, tank farms
- Petroleum or petrochemical industries
- Gas and oil pipelines
- Chemical facilities
- Waste storage sites
- Transport: railways, roads, rivers, sea
- Metallurgic industries
- Acid mine drainage (abandoned mines)
- Food processing plants
- Pesticide storage depots
- Tailing dams and ash ponds
- Hospitals, laboratories, pharmacies

HAZARDOUS CHEMICAL RELEASES ARE AT INCREASED RISK FROM STORM DAMAGE AND FLOODING



New York Times, 2018.

Mechanisms of Chemical Releases Caused by Natural Hazards



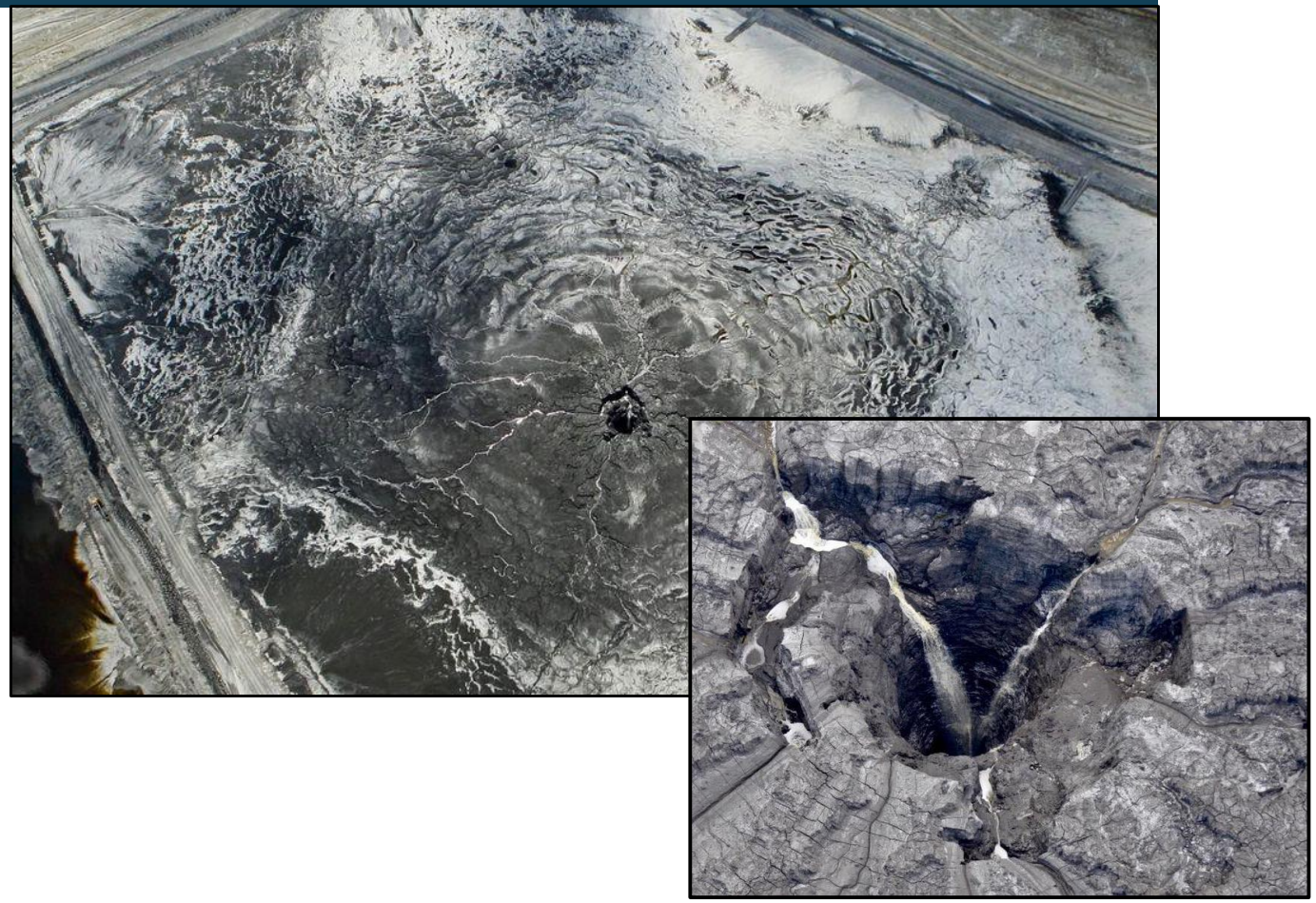
The World Health Organization, 2018.

Example: Flooding

- August 2017
- Chemical Plant in Crosby, TX
- Approximately 23,212 pounds of various chemicals released due to flood waters
- Over 350,000 pounds of organic peroxide combusted
- Hurricane Harvey resulted in approximately **$125 billion** in damages

CSB, 2018.

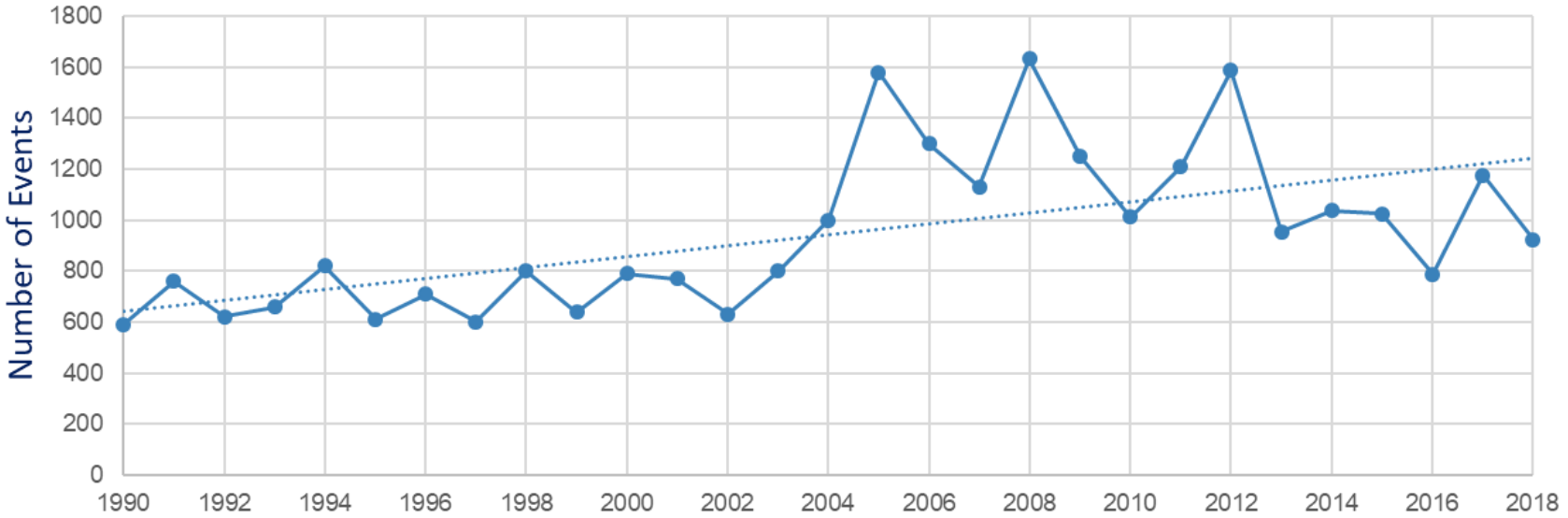
Example: Sinkhole

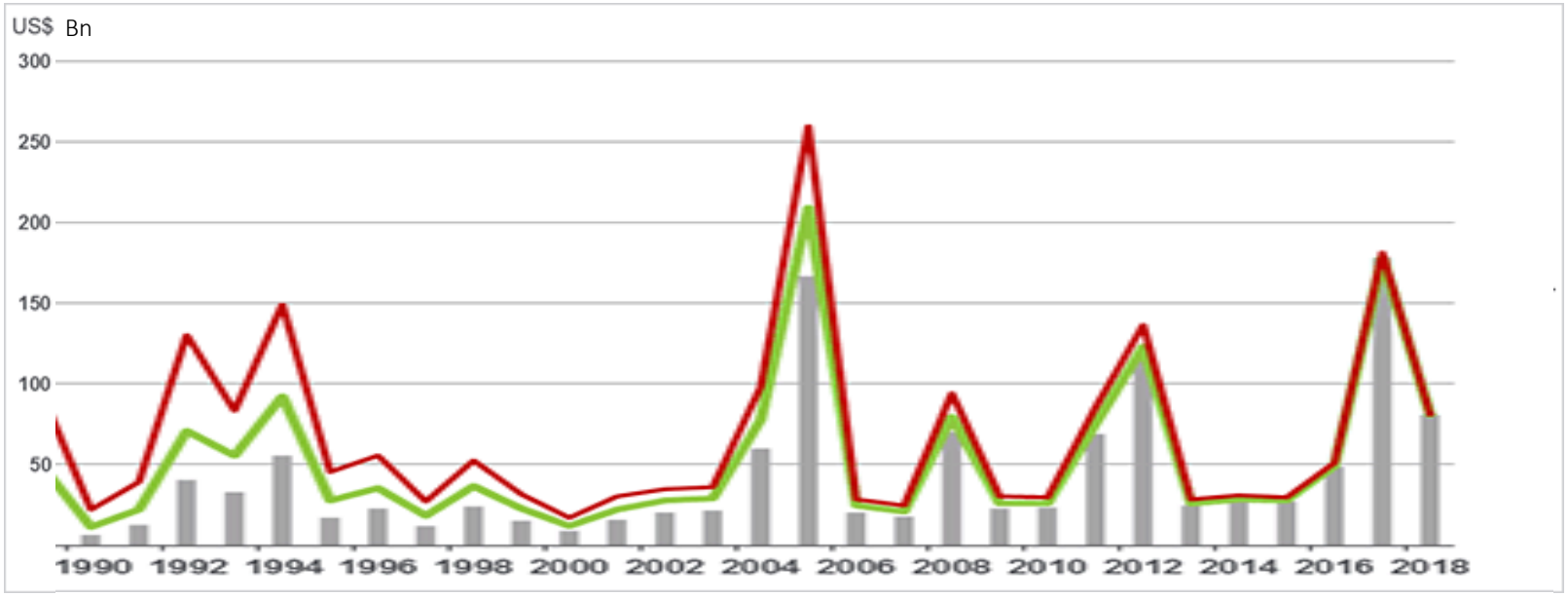


- September 2016
- Fertilizer Plant in Mulberry, FL
- Sinkhole released approximately 215 million gallons of wastewater (containing sulfate, gypsum, sodium, and radioactive phosphogypsum) into groundwater
- Repair costs approximately **$84 million**

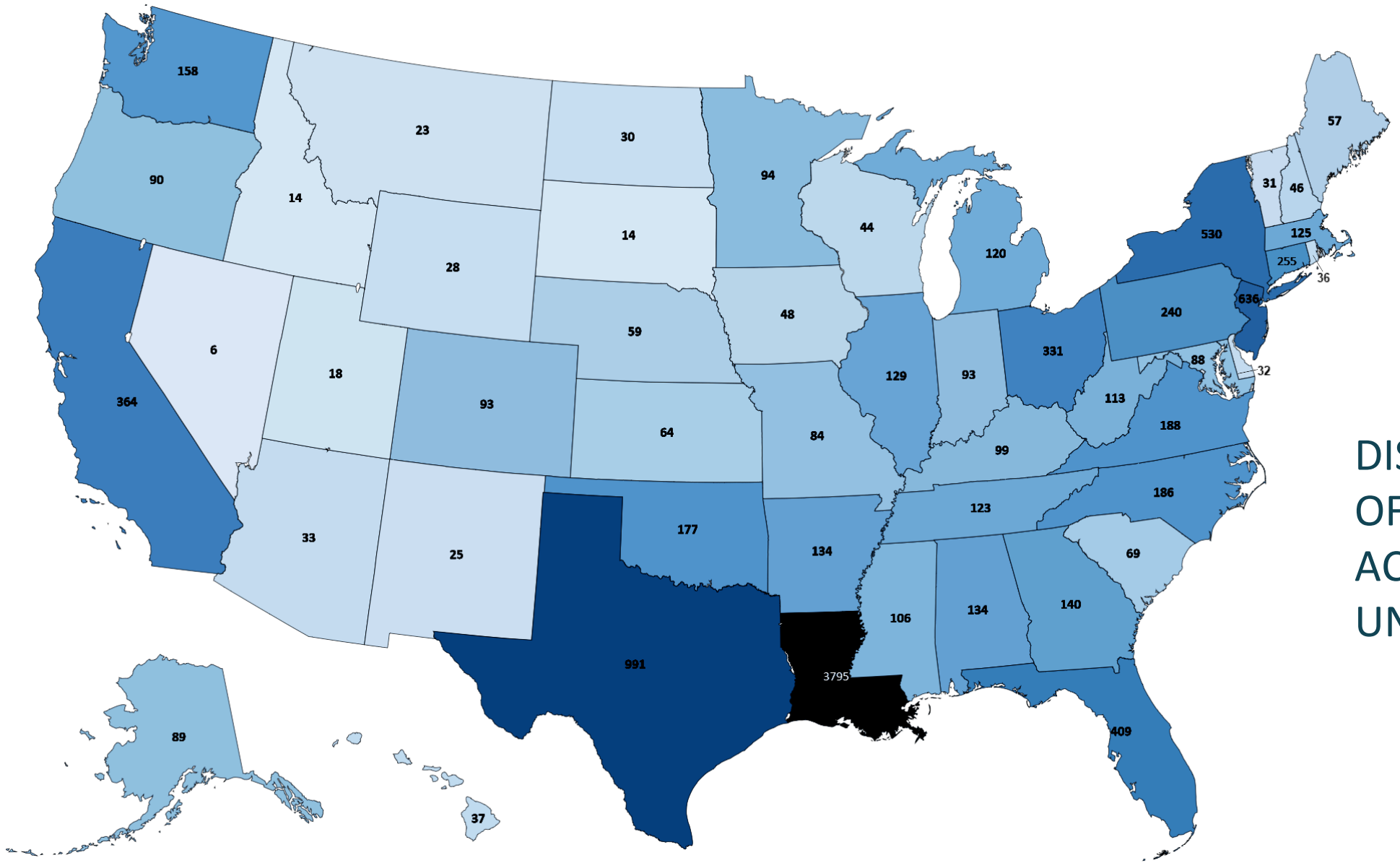
Tampa Bay Times, 2018.

Frequency of Natechs Compared to Insurance Losses





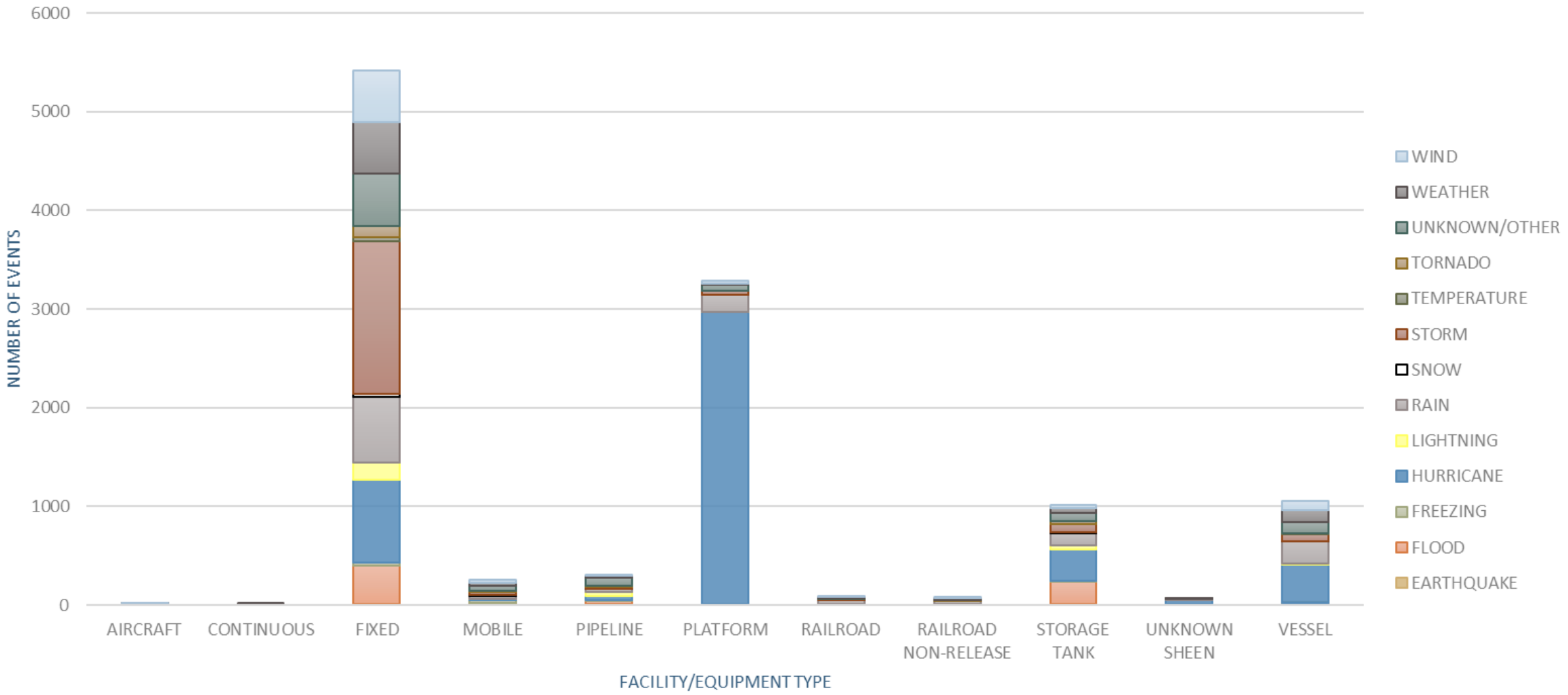
United States Coast Guard.

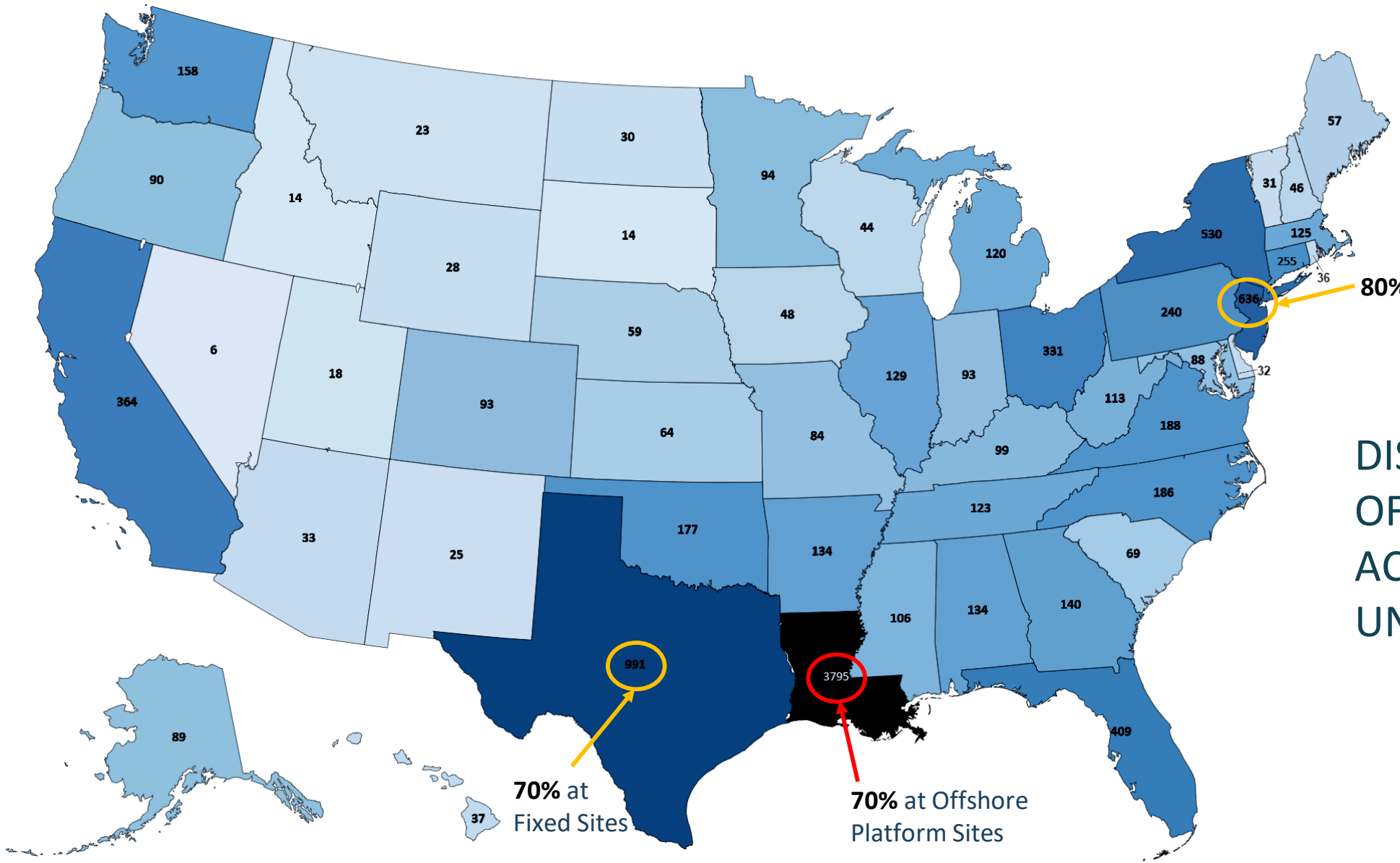


DISTRIBUTION OF NATECHS ACROSS THE UNITED STATES

United States Coast Guard.

Natechs by Facility/Equipment Type and Natural Hazard (2008-2019)





80% at Fixed Sites

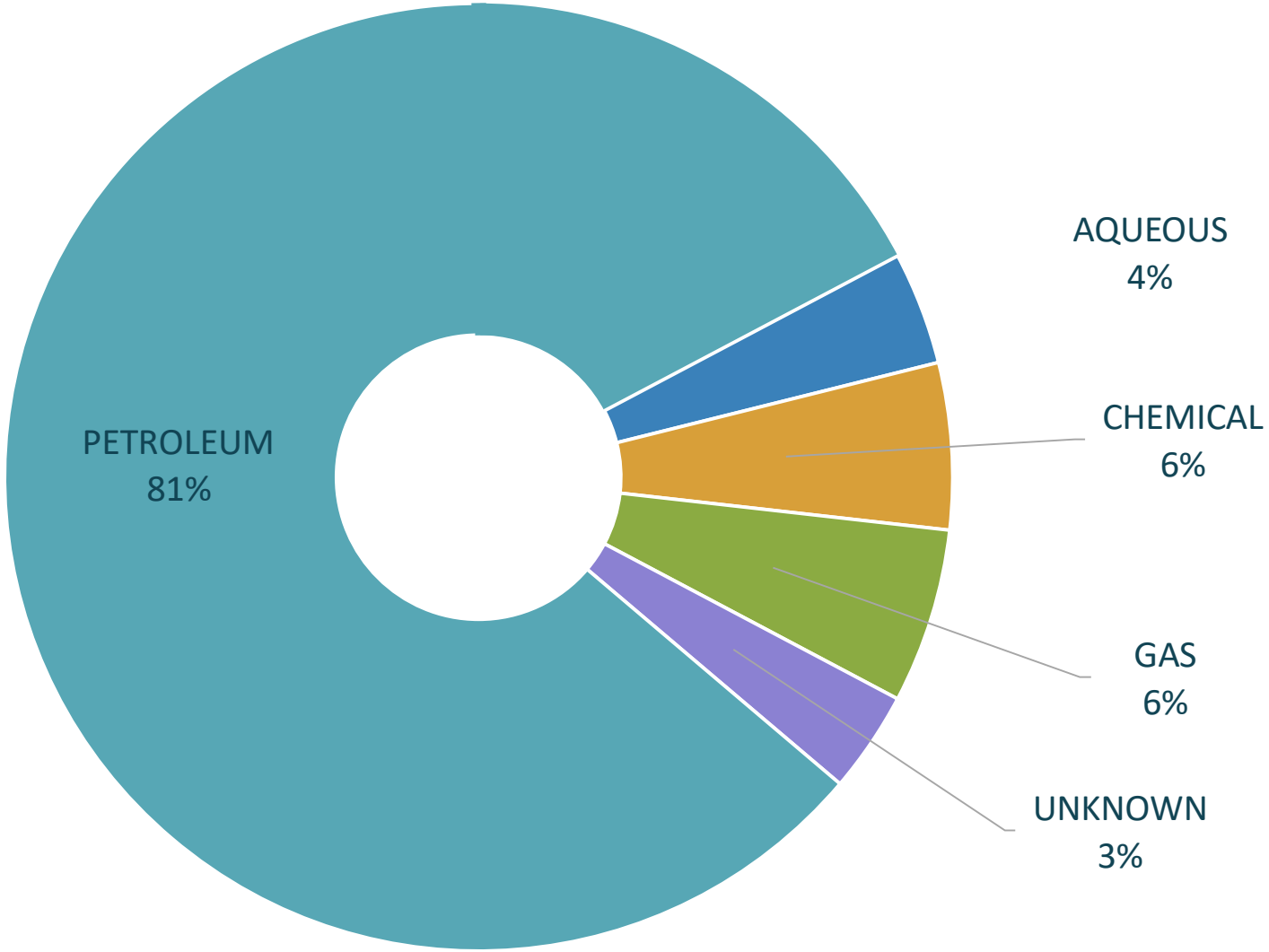
70% at Fixed Sites

70% at Offshore Platform Sites

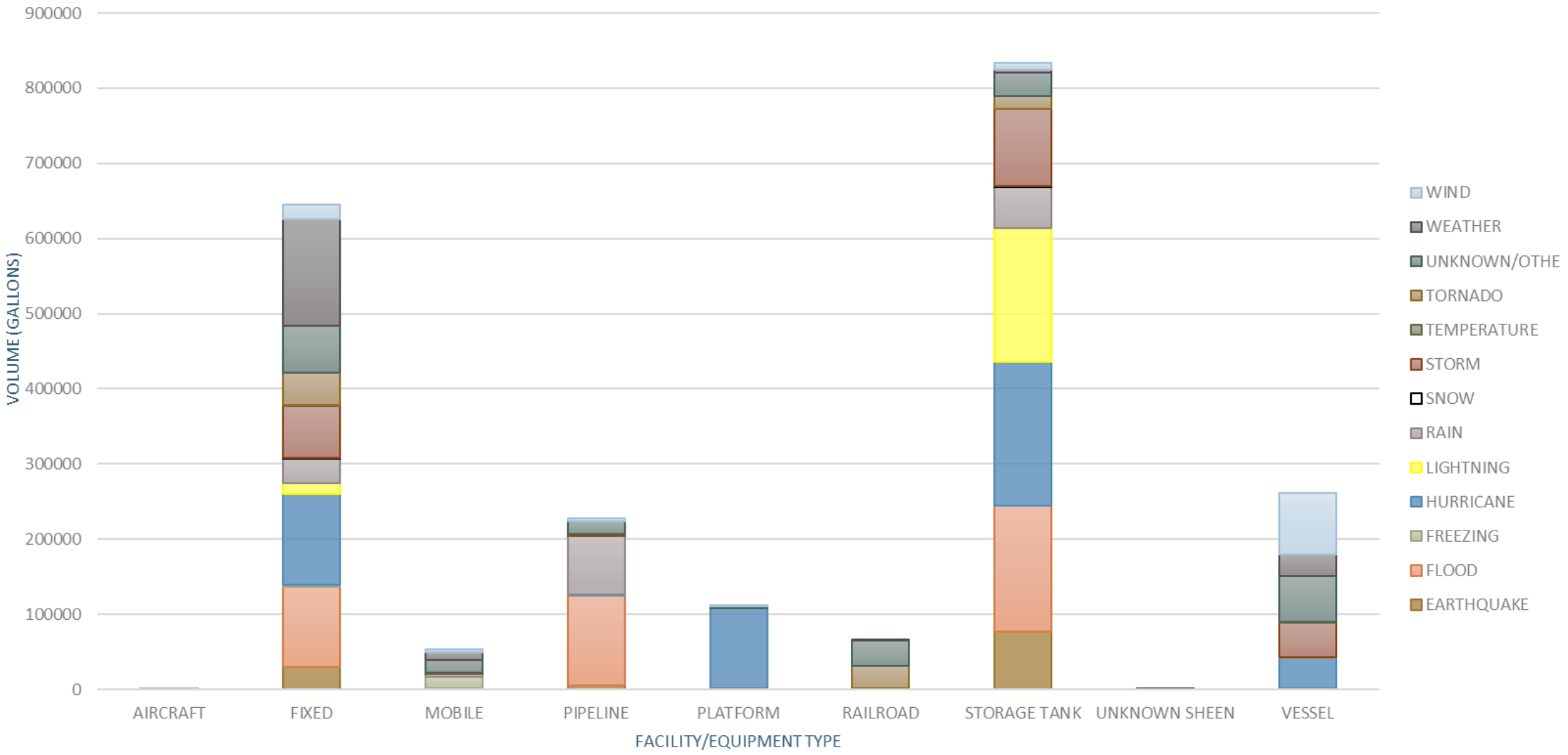
DISTRIBUTION OF NATECHS ACROSS THE UNITED STATES

United States Coast Guard.

Type of Material Released During Natechs (2009 - 2018)

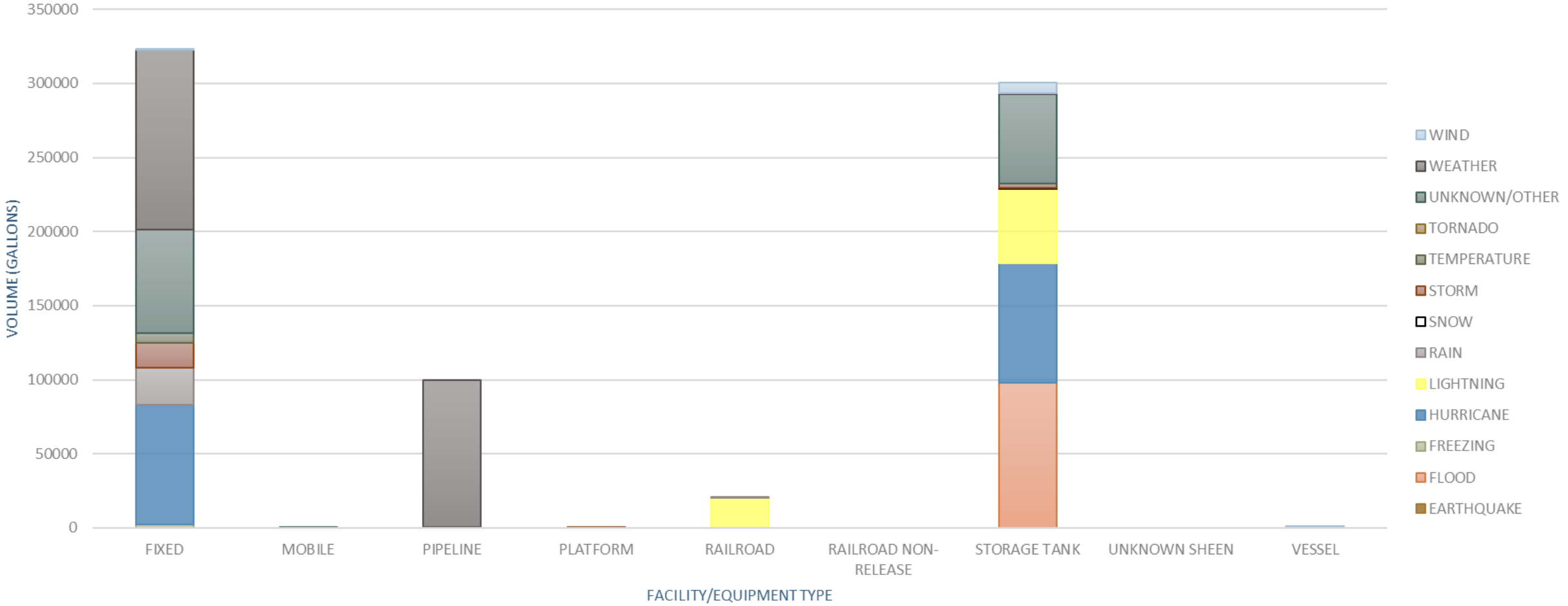


Volume of Petroleum Released by Natechs (2009-2018)



United States Coast Guard, 2009-2018.

Volume of Chemicals Released by Natechs (2009-2018)

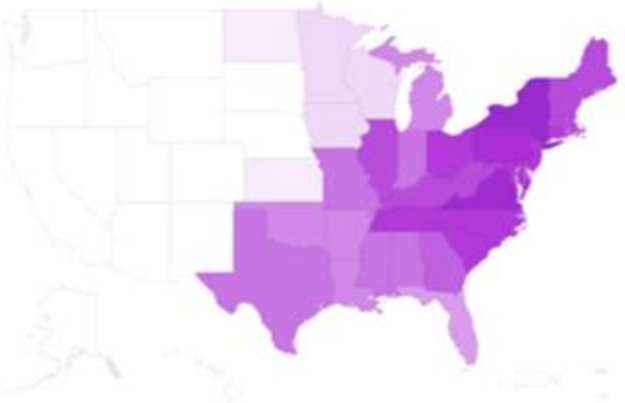


United States Coast Guard, 2009-2018.

U.S. Billion-Dollar Weather and Climate Disasters: 1980 - 2016

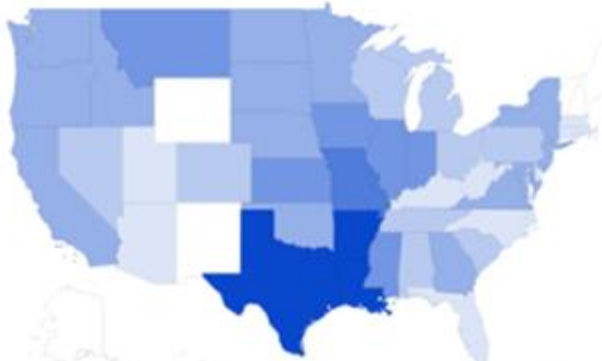
Droughts and Heat Waves

Winter Storms

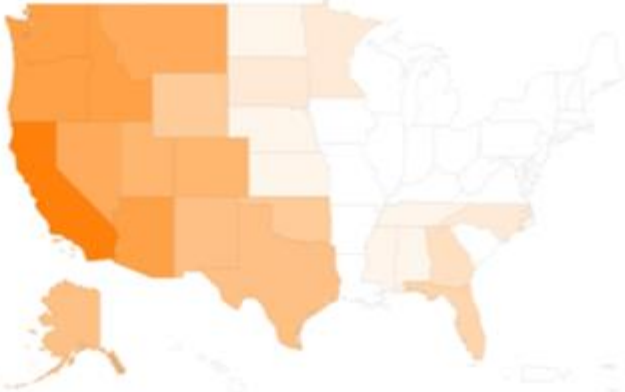


Tropical Cyclones

Flooding



Wildfires



Severe Local Storms

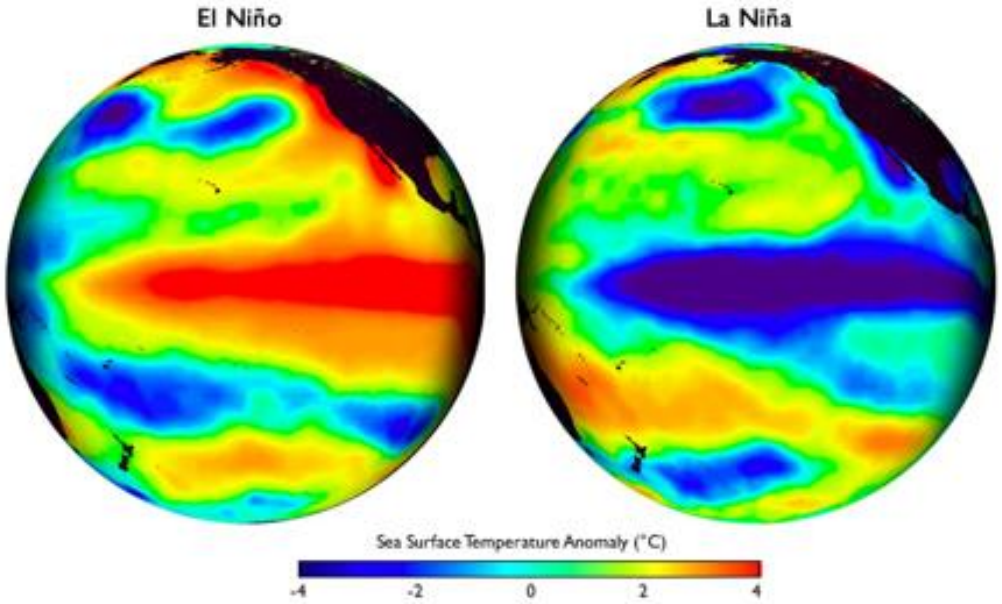
Climate.gov, 2017

Climate Trends and Catastrophe Modeling

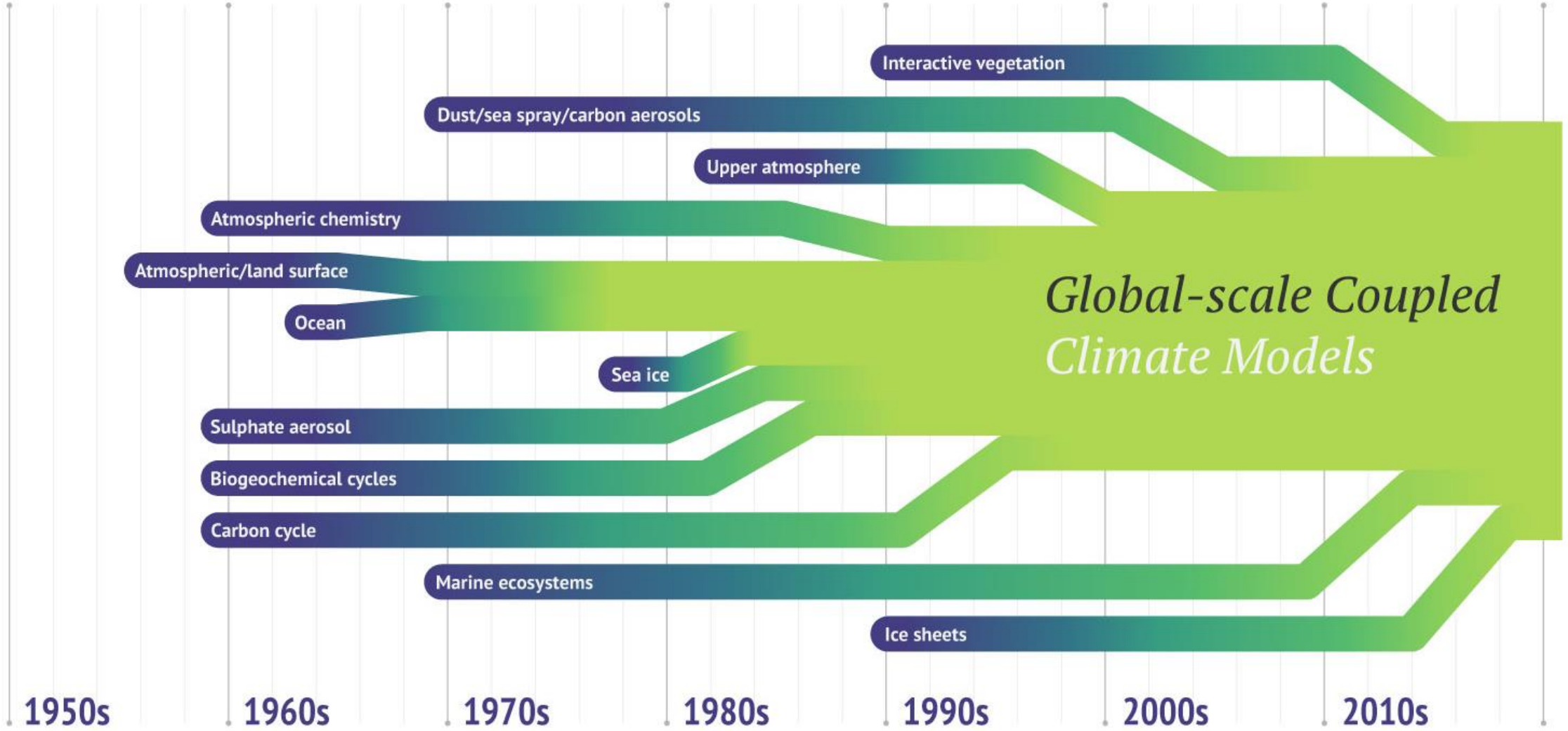
Crystal Stowell

Global Climate

- Climate: The weather conditions prevailing in an area over a long period
- Influencing factors:
  - Prevailing winds – The Jet Stream
  - Ocean currents – Thermohaline Circulation
  - Climate phenomena such as ENSO (El Nino and La Nina)



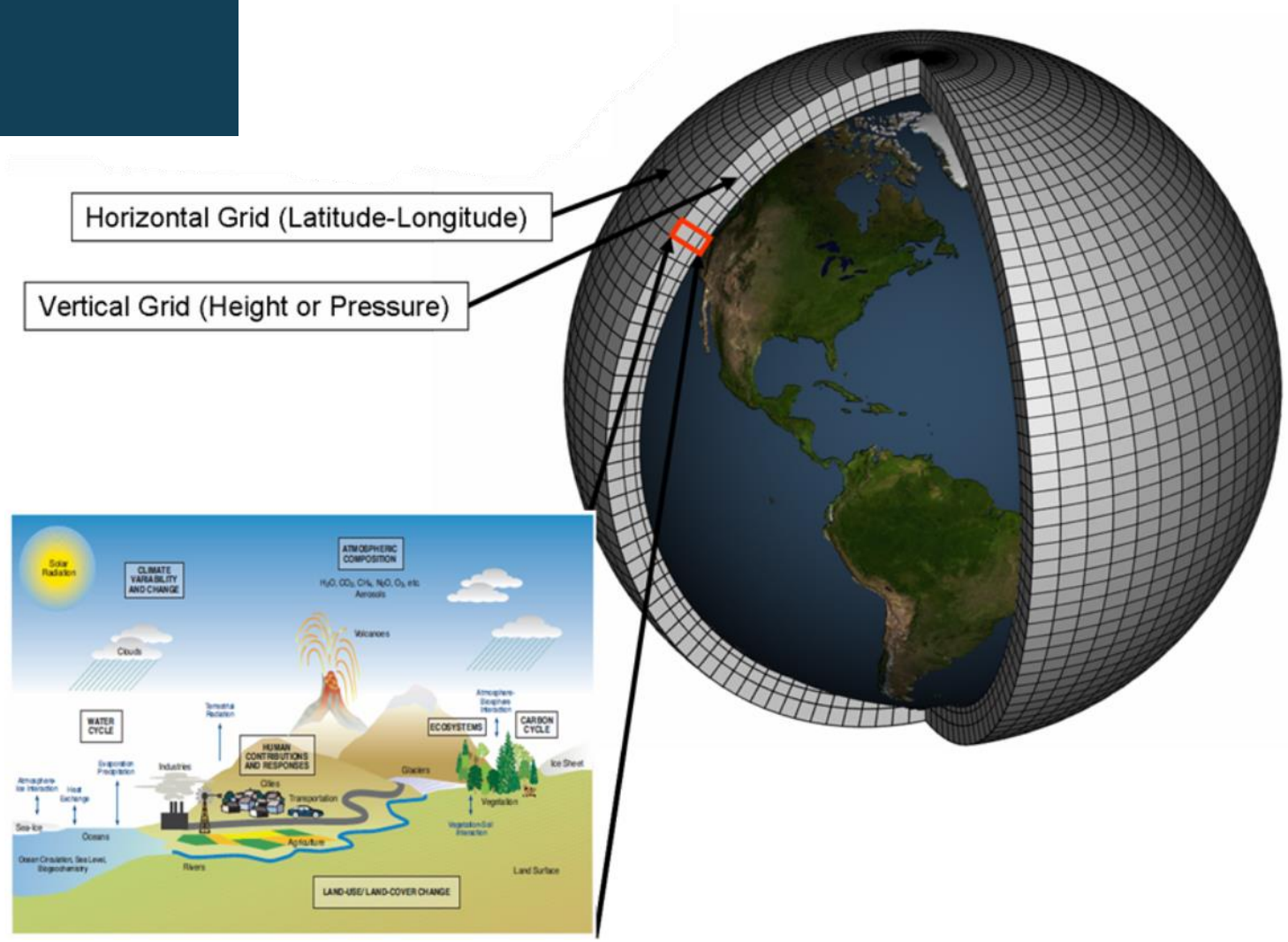
NOAA.



Carbon Brief.

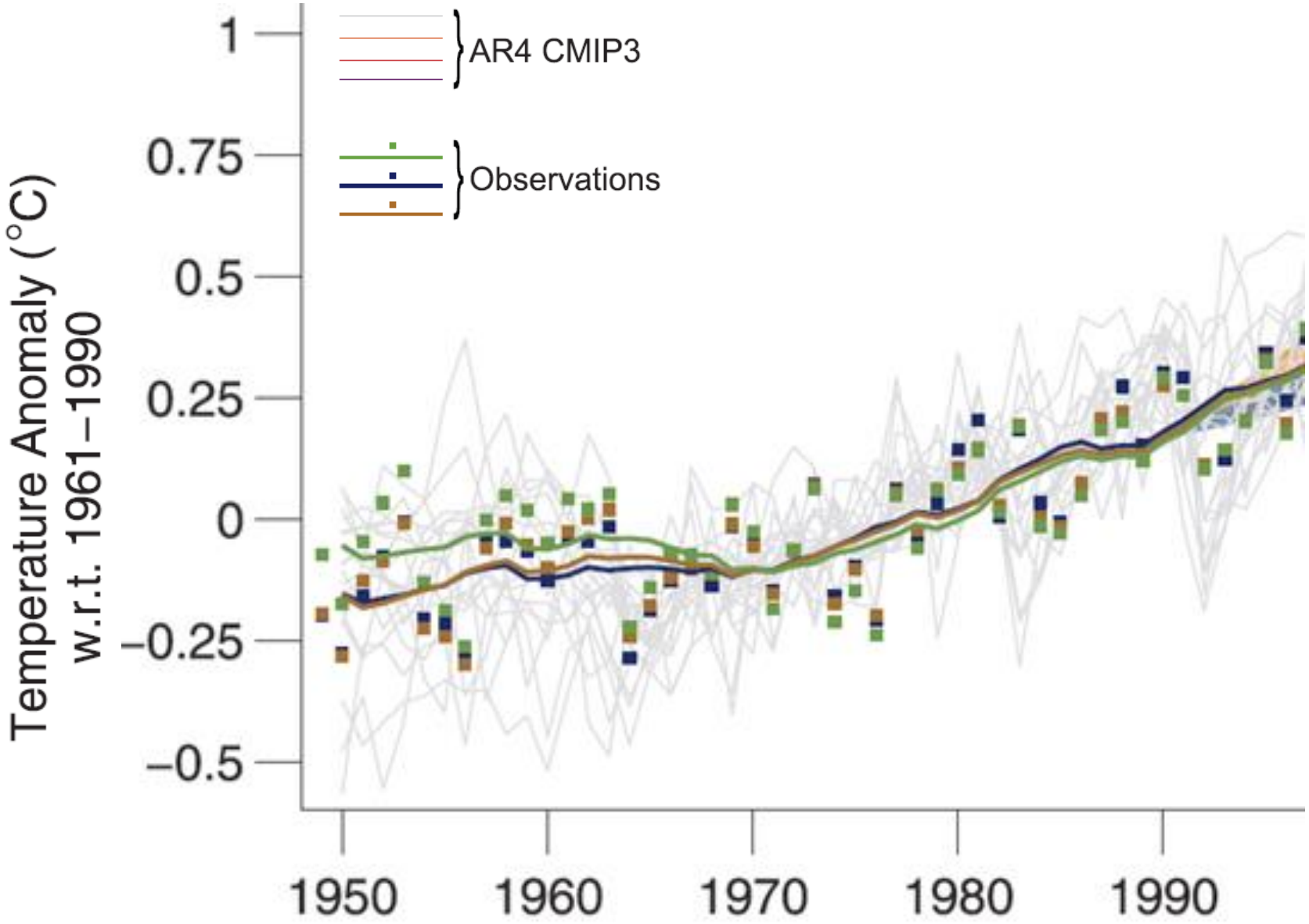
Climate Models

- Winds
- Heat transfer
- Radiation
- Moisture content
- Surface hydrology
- Many more…



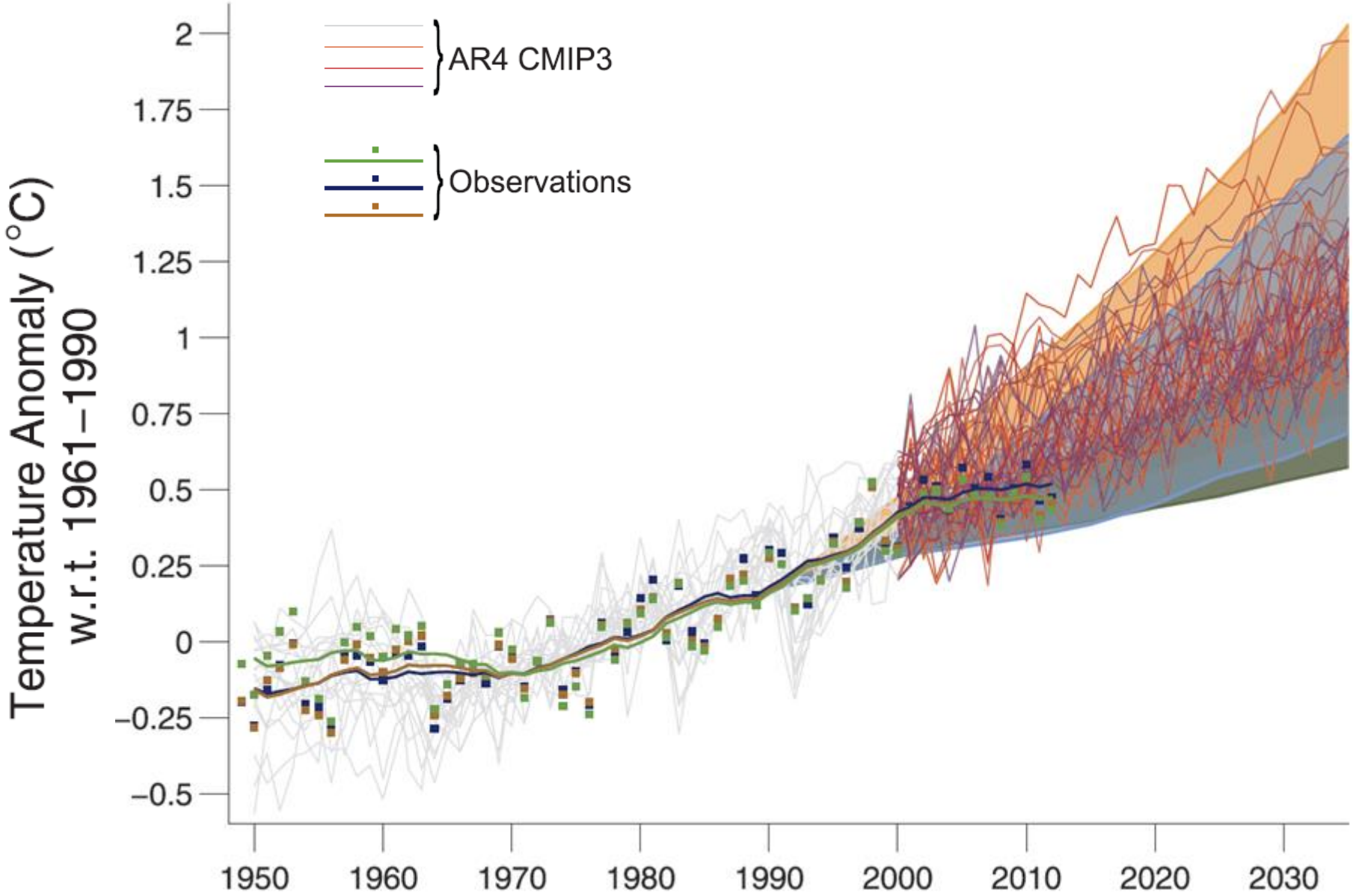
NOAA.

Global Mean Temperature Anomaly



IPCC, 2013.

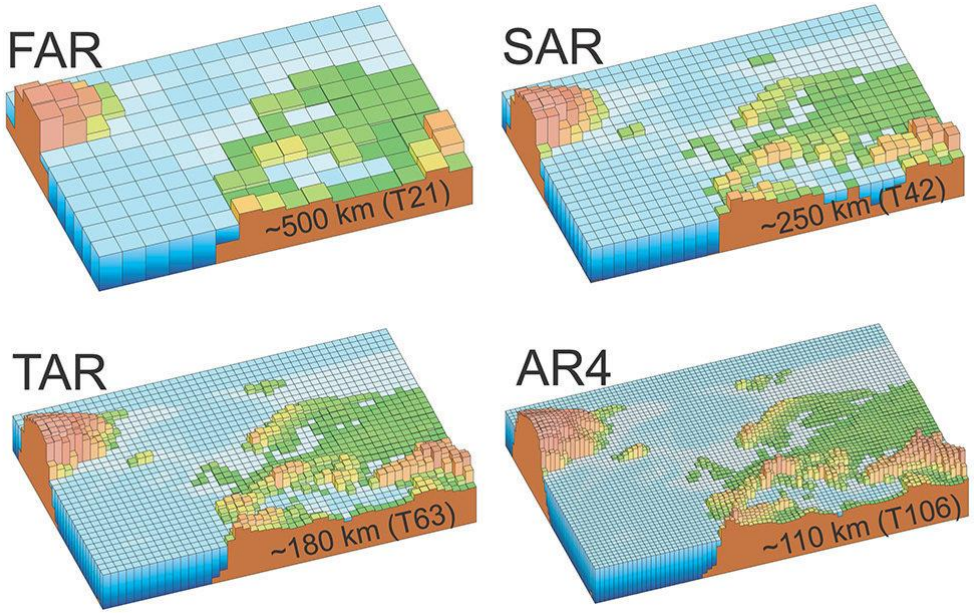
Global Mean Temperature Anomaly



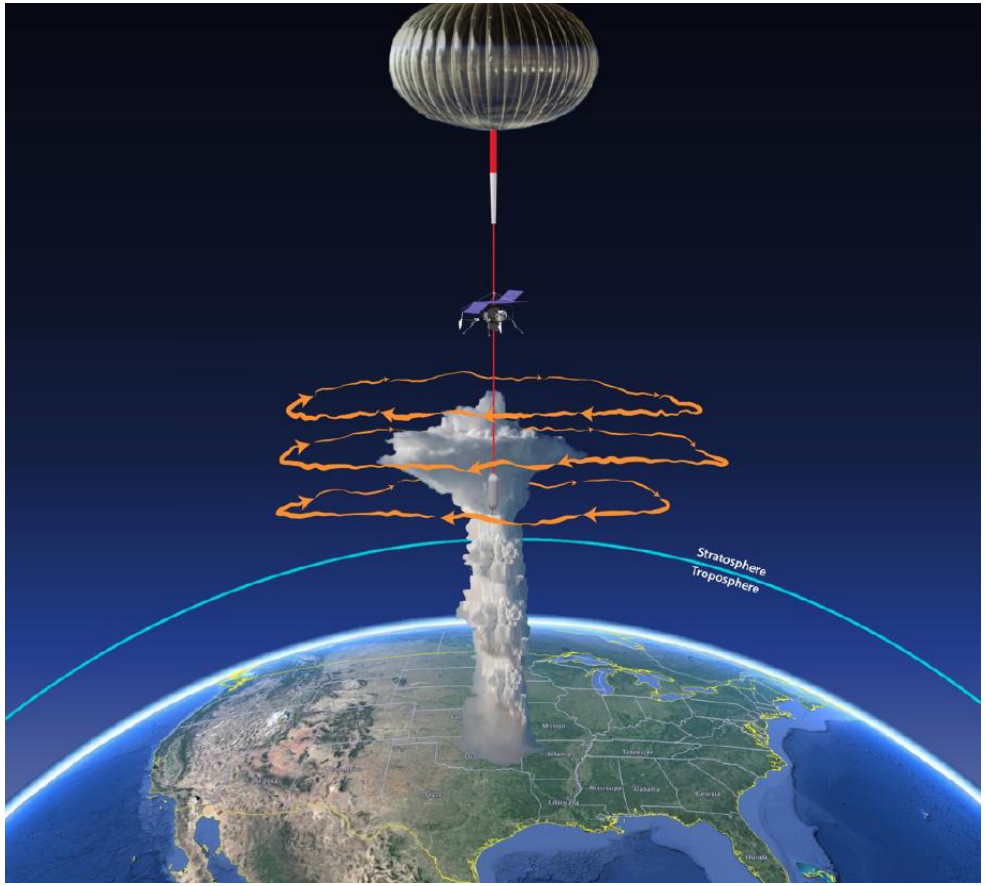
IPCC, 2013.

Advanced Measurement Capabilities

- Increased resolution
- Increased robustness of data

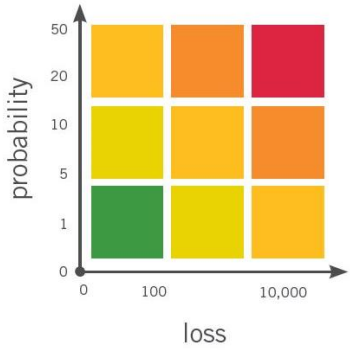


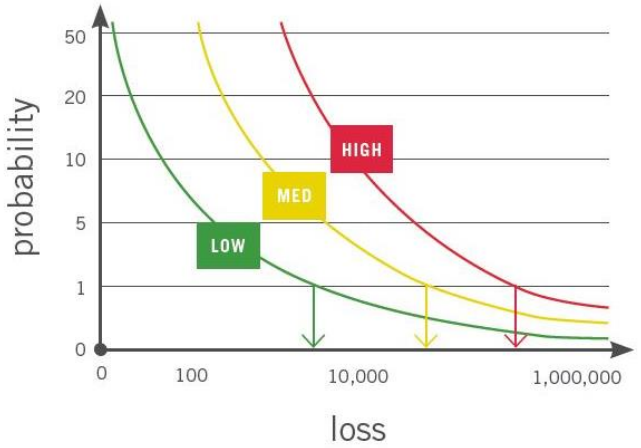
IPCC, Fig 1.2.



The Anderson Research Group, Harvard University.

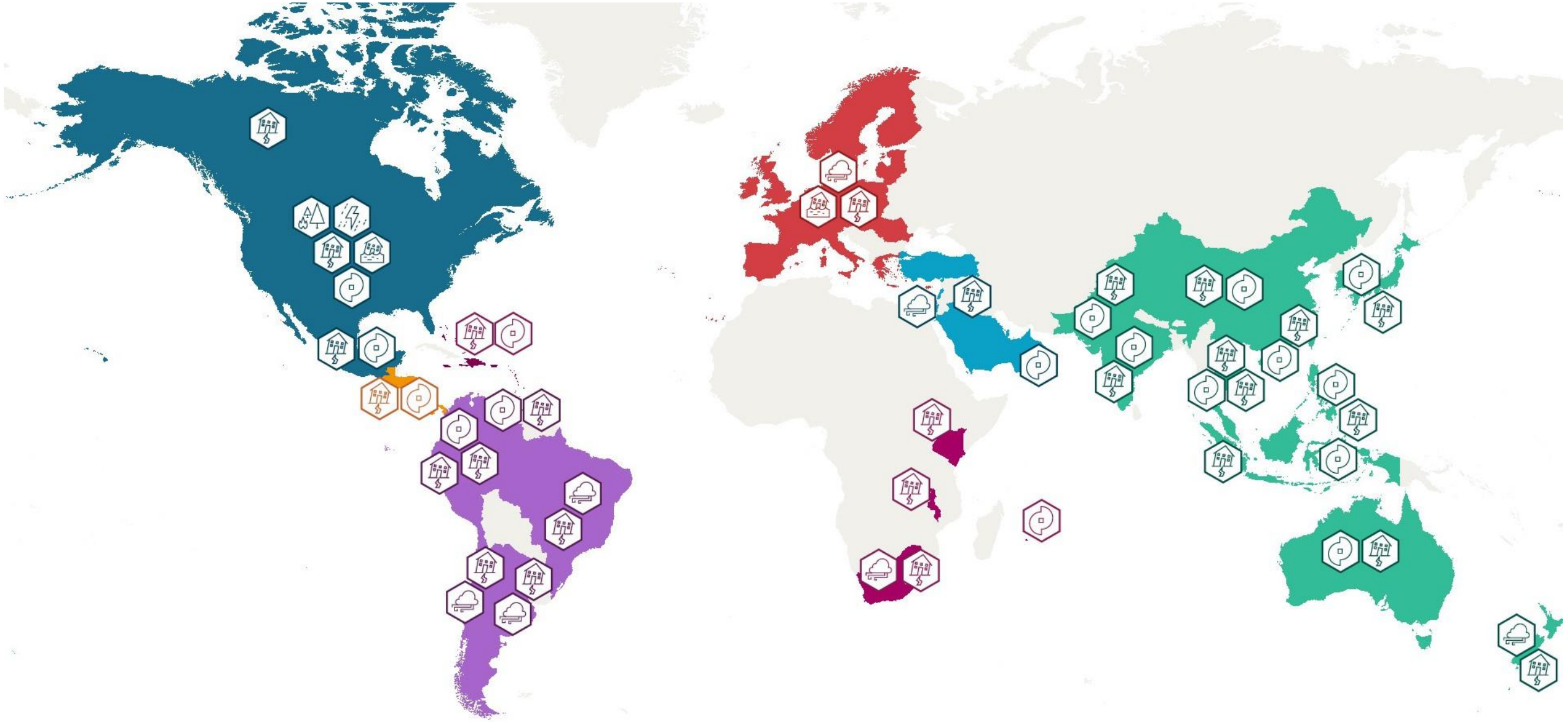
Catastrophe Modeling Framework





Hazard → Vulnerability → Financial

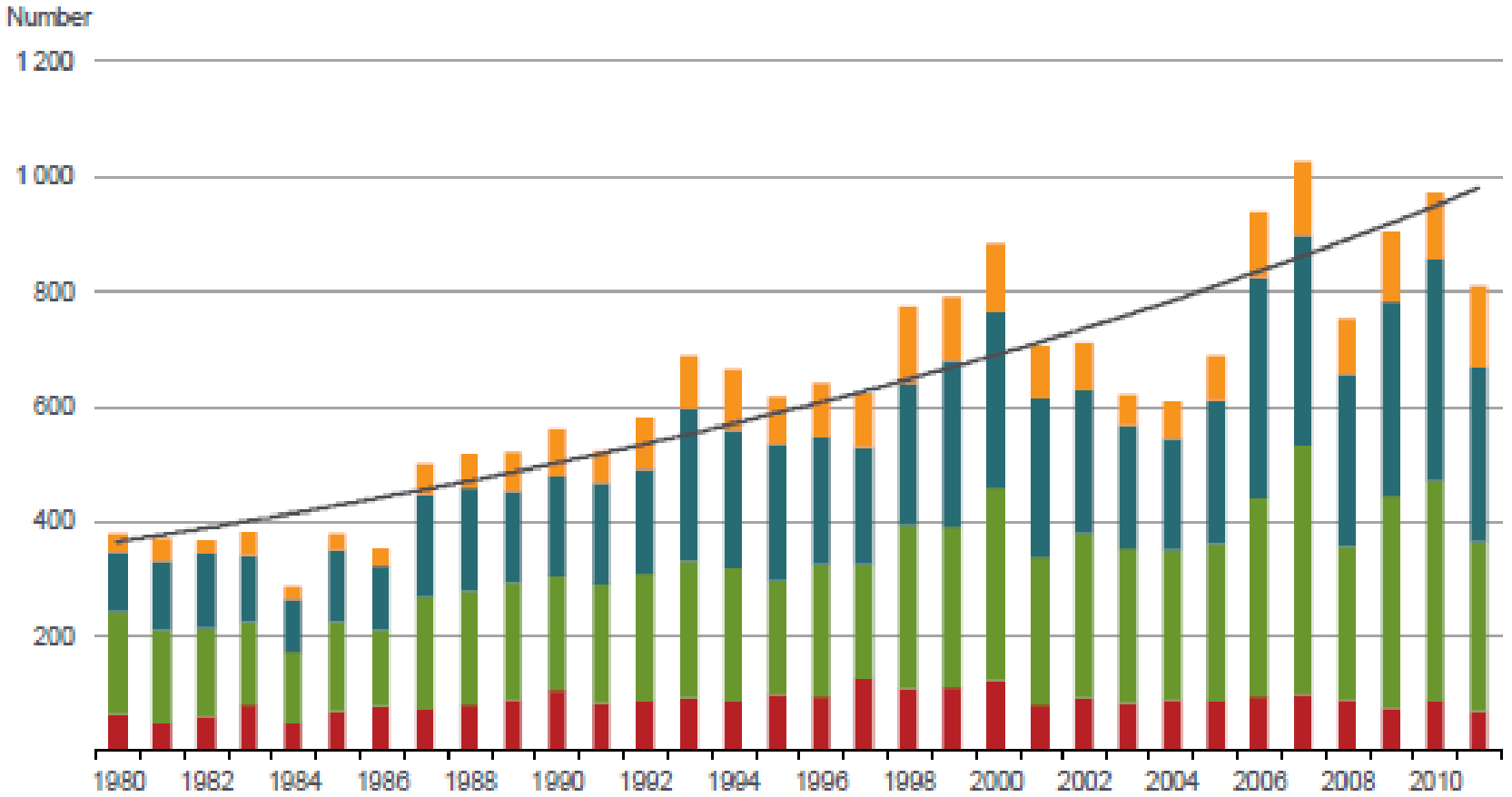
Natural Hazards Across the Globe



Core Logic, 2019.

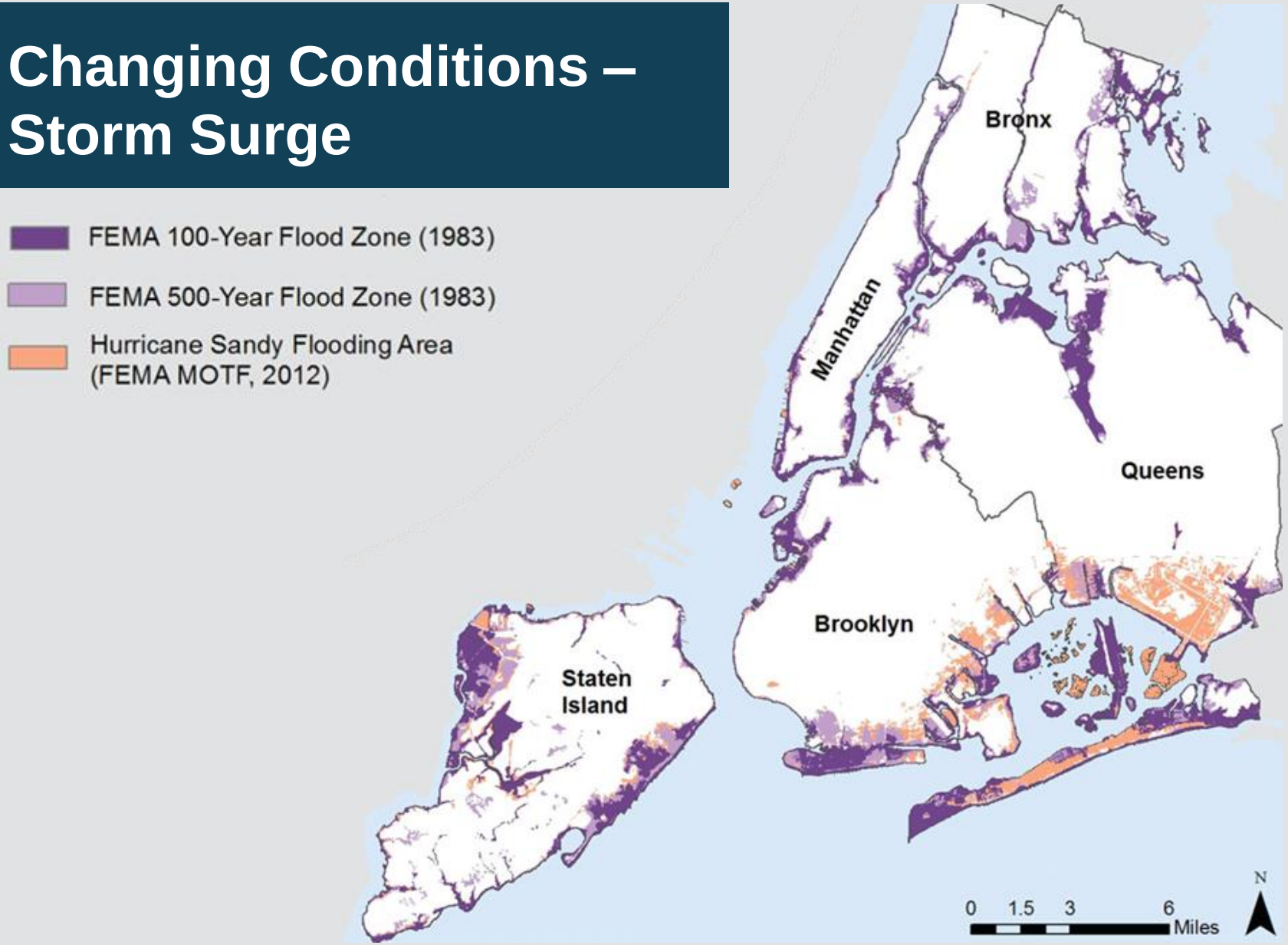
Changing Conditions – Climate Trends

- Geophysical events 7%
  Earthquake, tsunami, volcanic activity
- Meteorological events 33%
  Storm
- Hydrological events 50%
  Flood, mass movement
- Climatological events 10%
  Extreme temperature, drought, wildfire



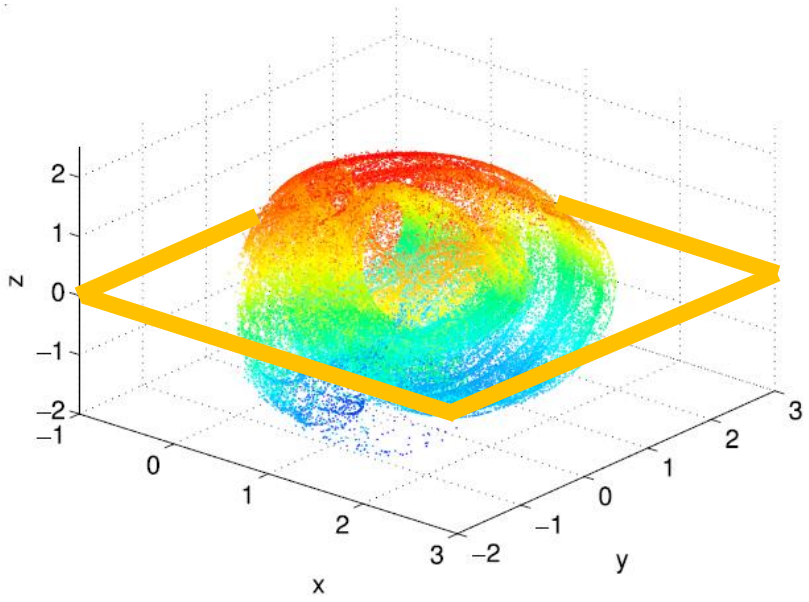
Munich RE, 2012.

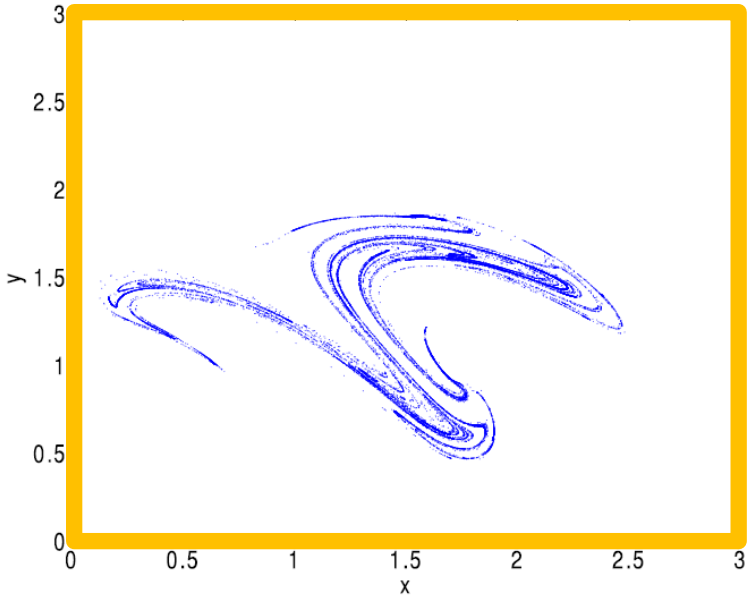
Changing Conditions – Storm Surge

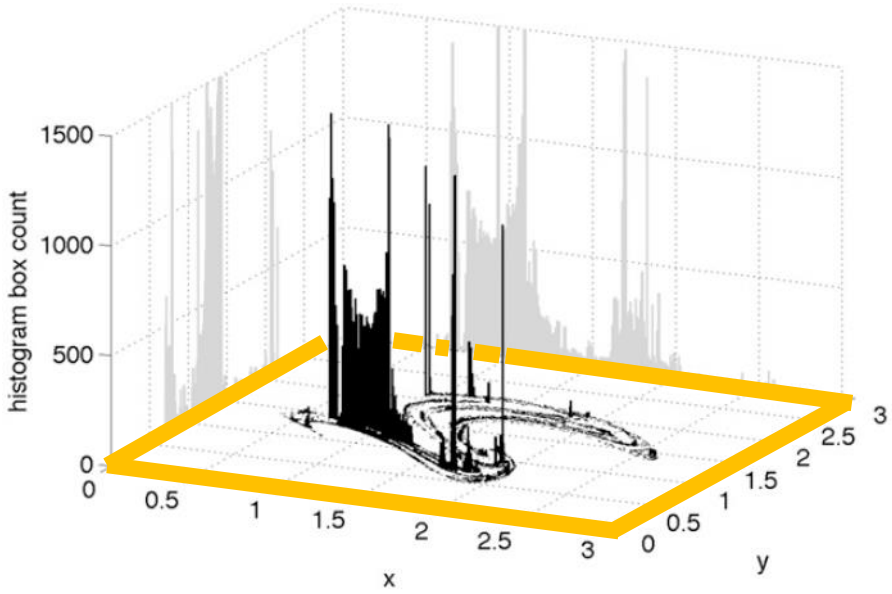


Patrick et al., 2015.

Coupled Models







Journal of Climate.

ROUX

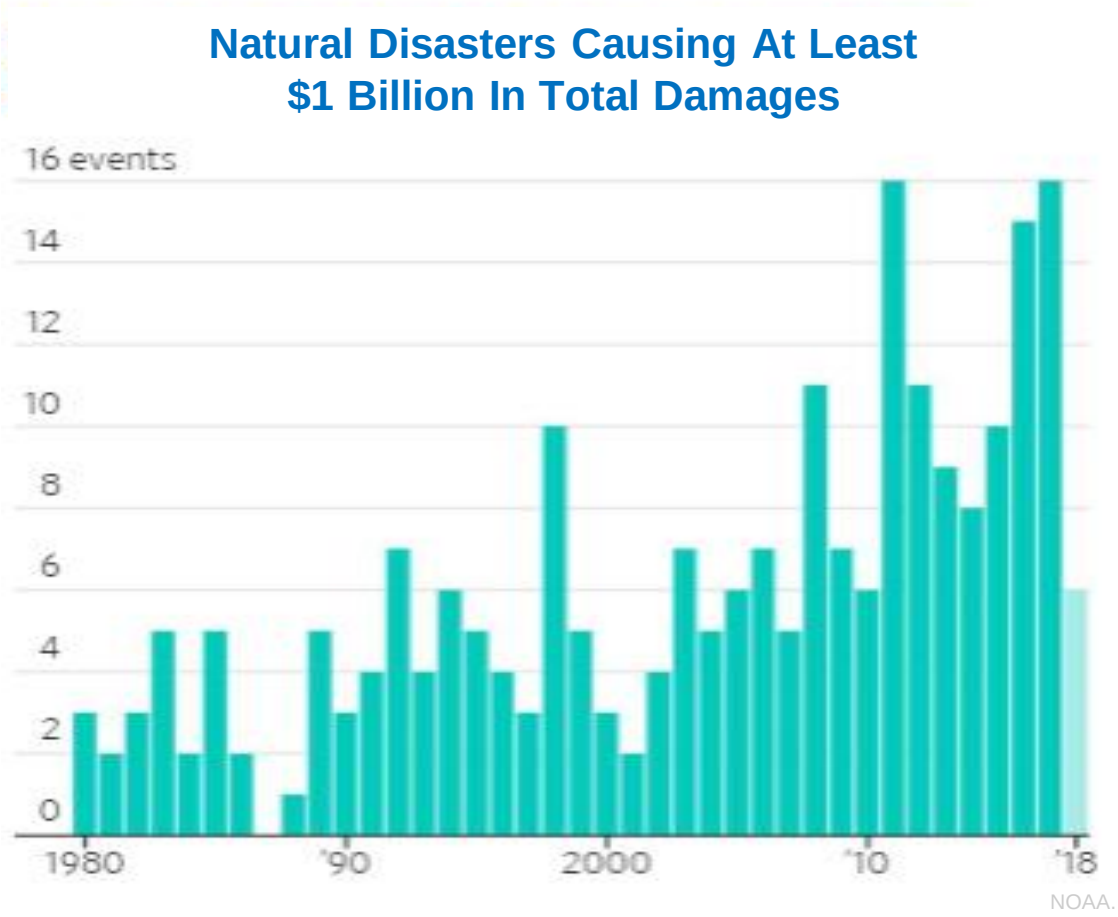
Climate Change Impacts on Underwriting

Rachel Miller

“We don’t just want to insure people against an event happening; we want to make sure whatever the impacts of that event are, it’s less than it would have been.”

– Chief Risk Officer of Underwriting

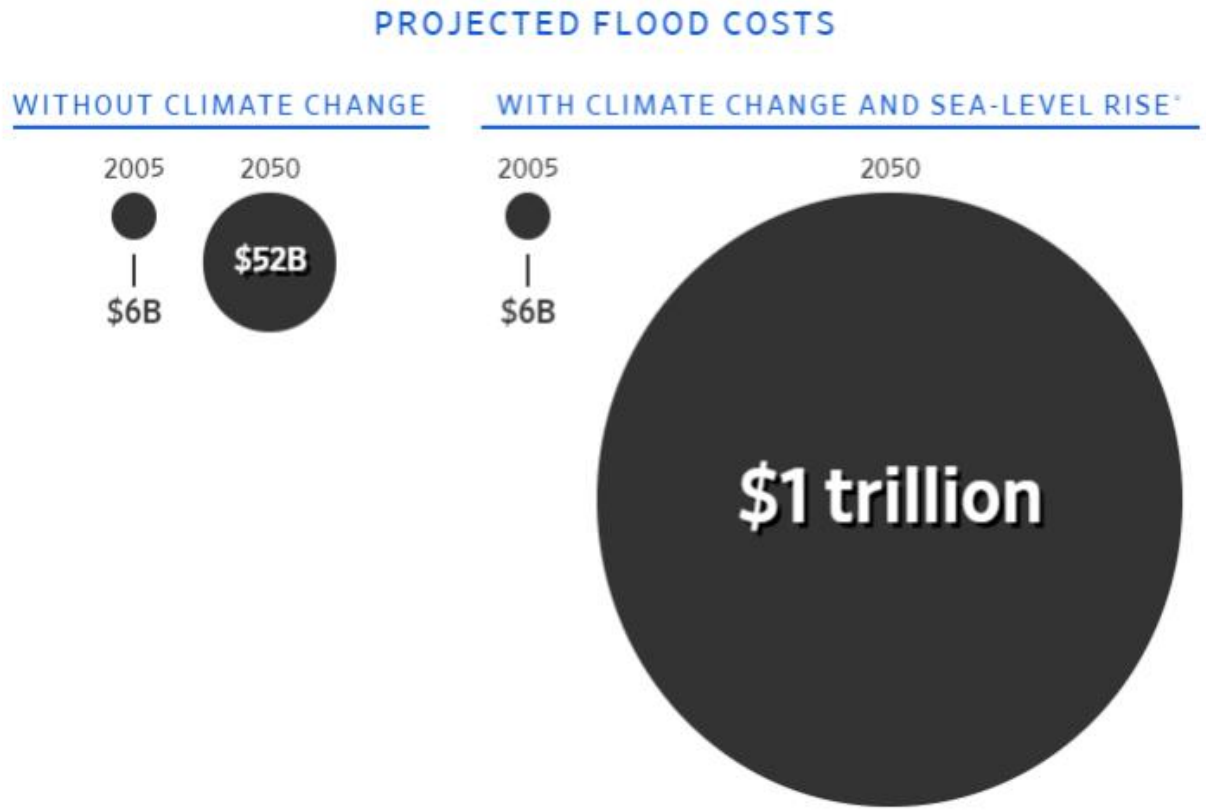
Main Losses Due to Climate Change



- Fire
- Flooding
- Mold
- Hurricanes
- Rising sea level
- Wind

Underwriting for Climate Change

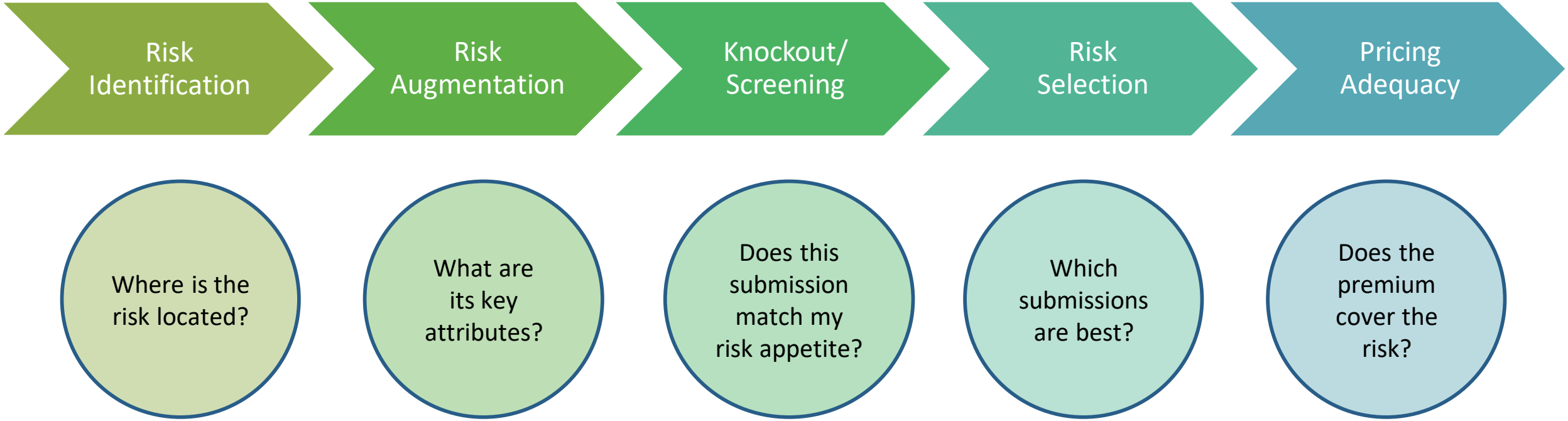
- Underwriting with climate change in mind helps protect carriers from liability and future claims
- Two-thirds of property and casualty insurers do not account for climate change when underwriting



Accenture Insurance, 2017.

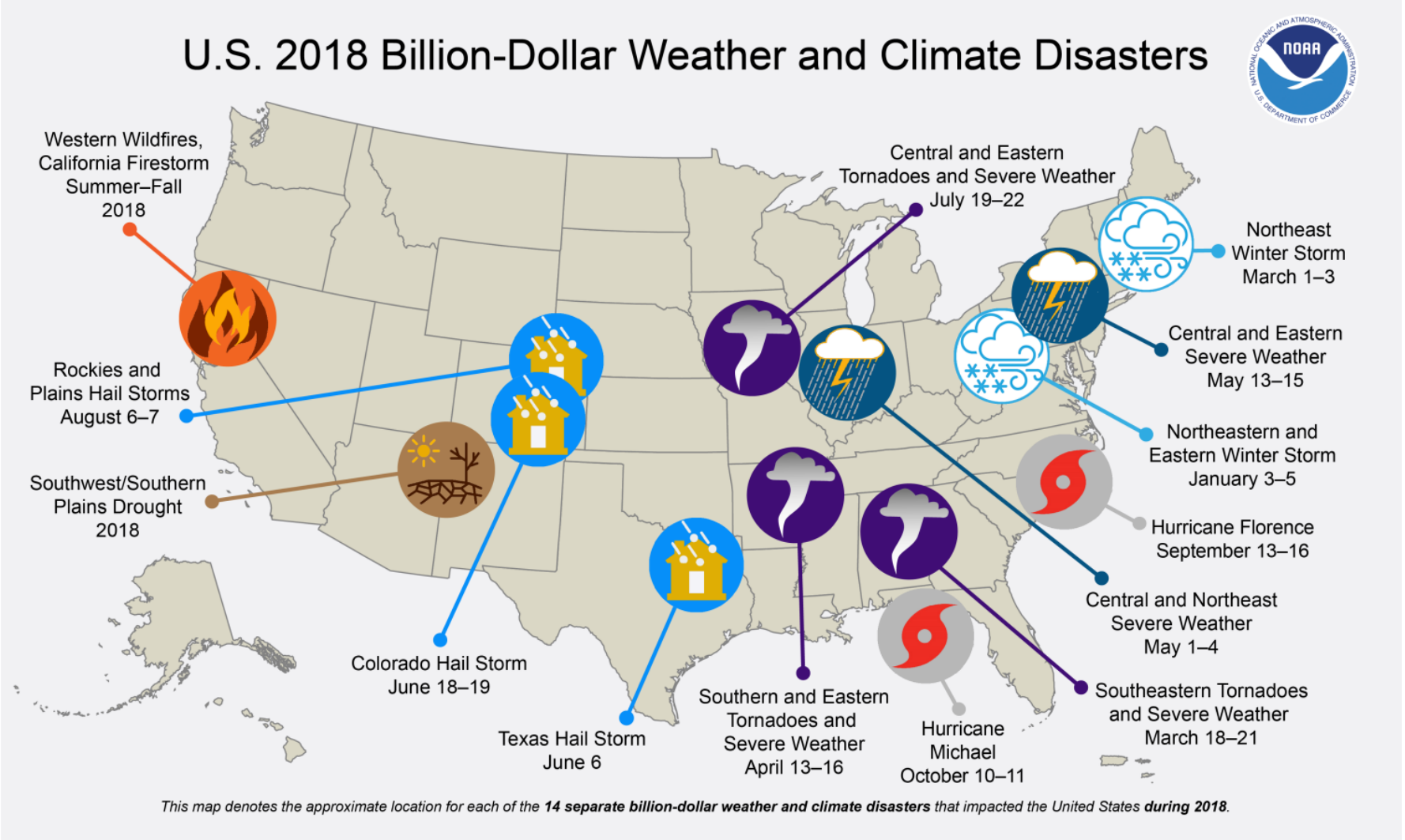
Nature.

Underwriting Process



Risk Identification

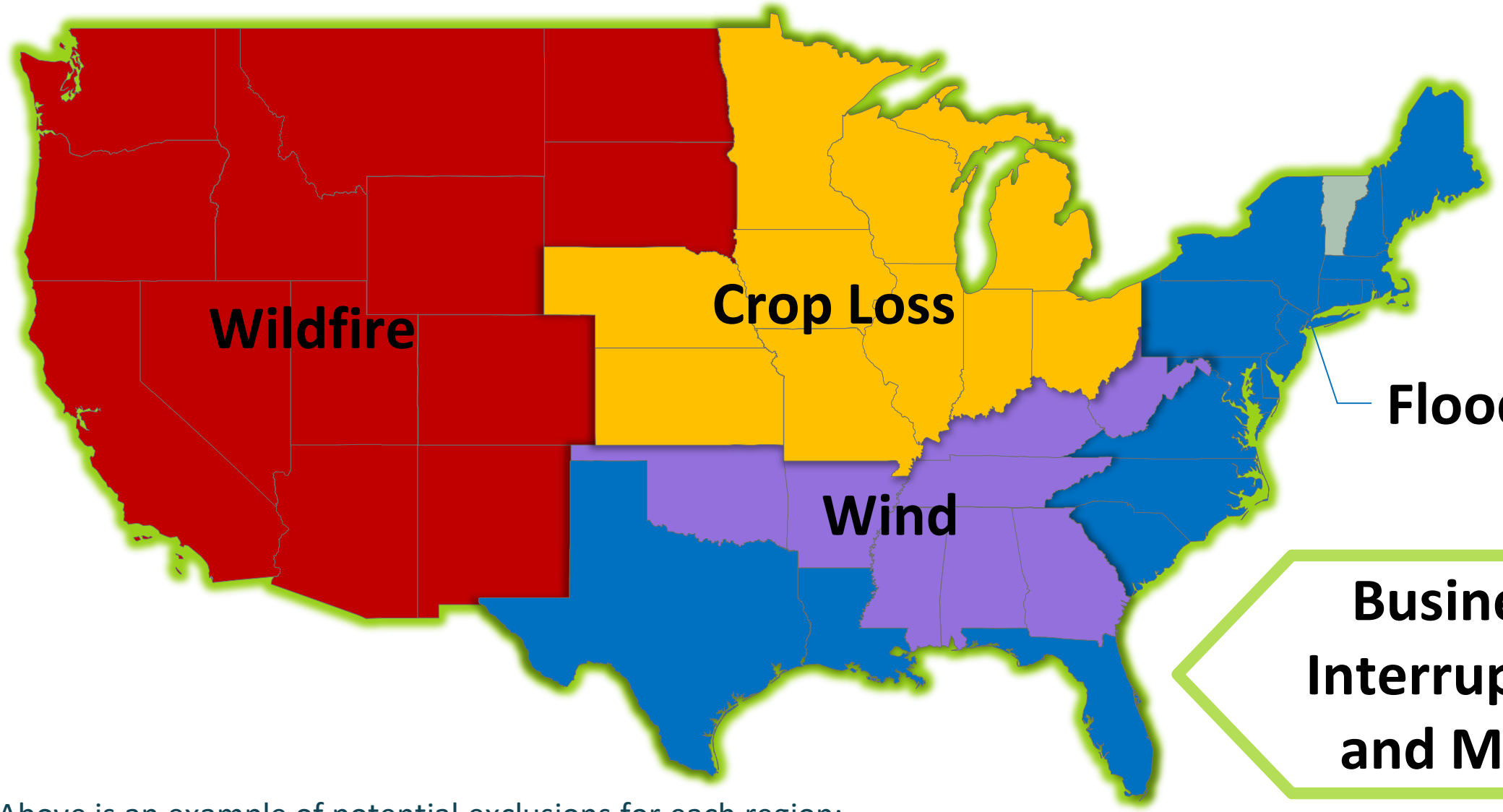
Where is the risk located?



NOAA, 2019


Loss Control Evaluation
Site Location
Current Conditions
Knowledge of Local Climate Change Damages
Worst Case Scenario Forecasting
How to Mitigate Liability

Potential Exclusions for Consideration by Region



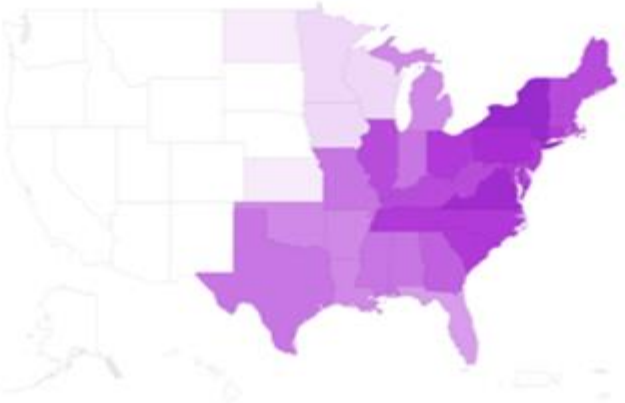
Business Interruption and Mold

* Above is an example of potential exclusions for each region; exclusion regions are not mutually exclusive.

U.S. Billion-Dollar Weather and Climate Disasters: 1980 - 2016

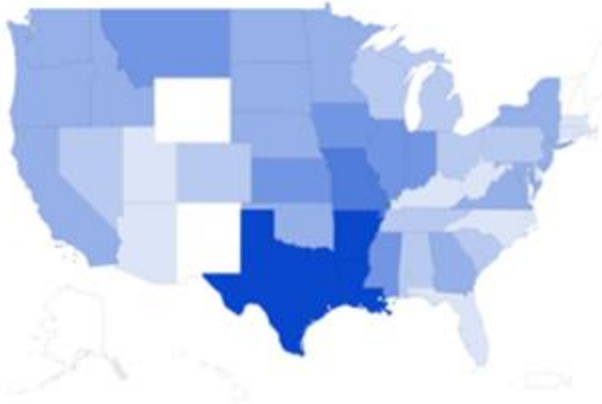
Droughts and Heat Waves

Winter Storms

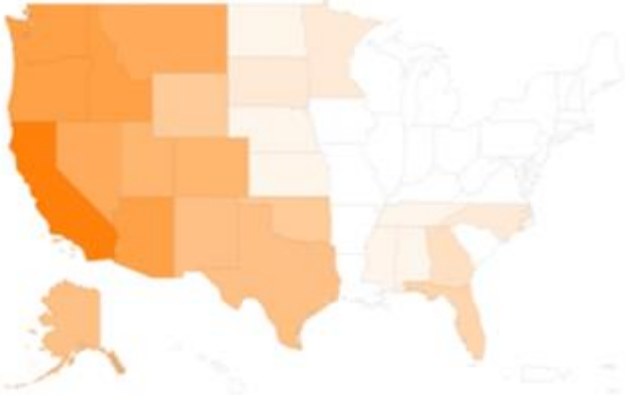


Tropical Cyclones

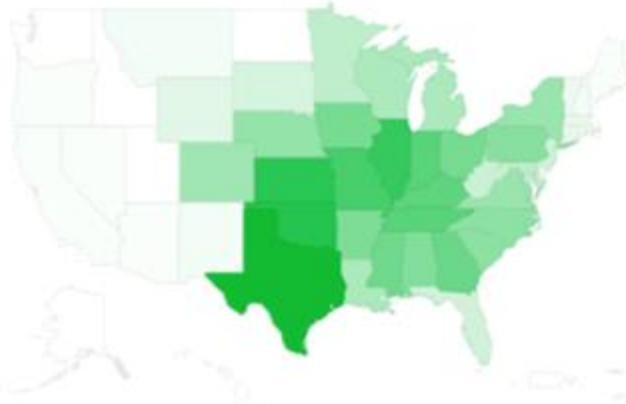
Flooding



Wildfires

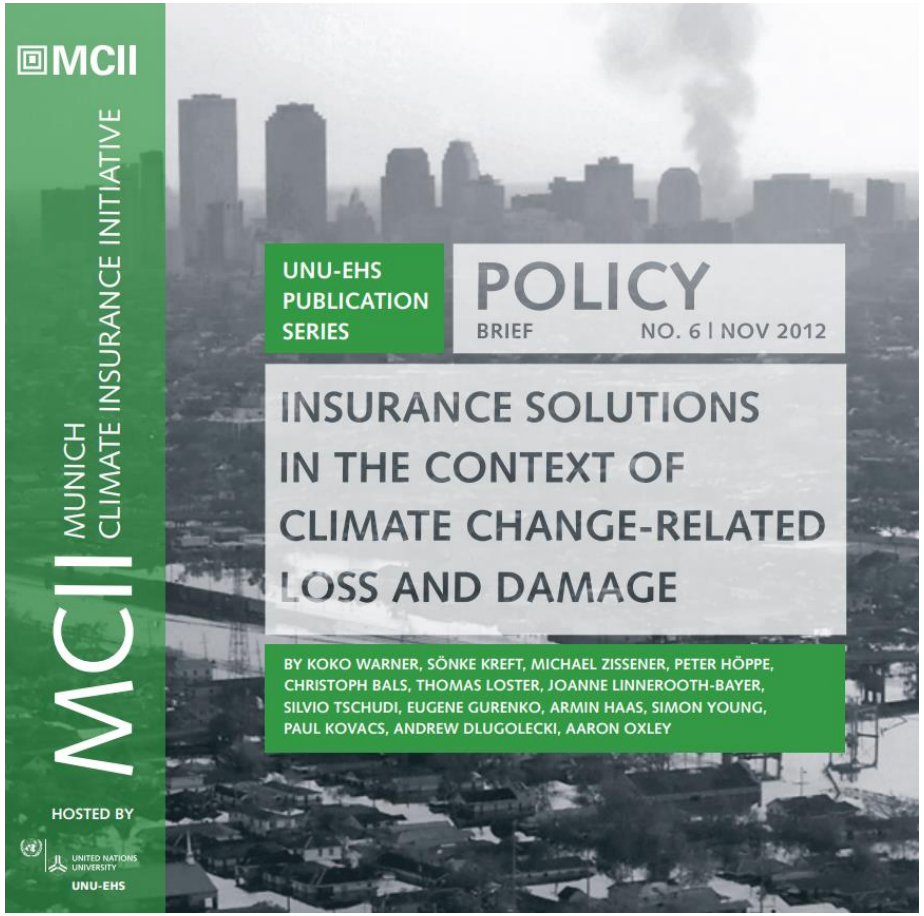


Severe Local Storms



Climate.gov, 2017

Mitigating Losses



- Risk-based pricing
- Emerging clean-energy sources provide an underwriting opportunity
- Munich Climate Change Initiative
- Worst case scenario forecasting

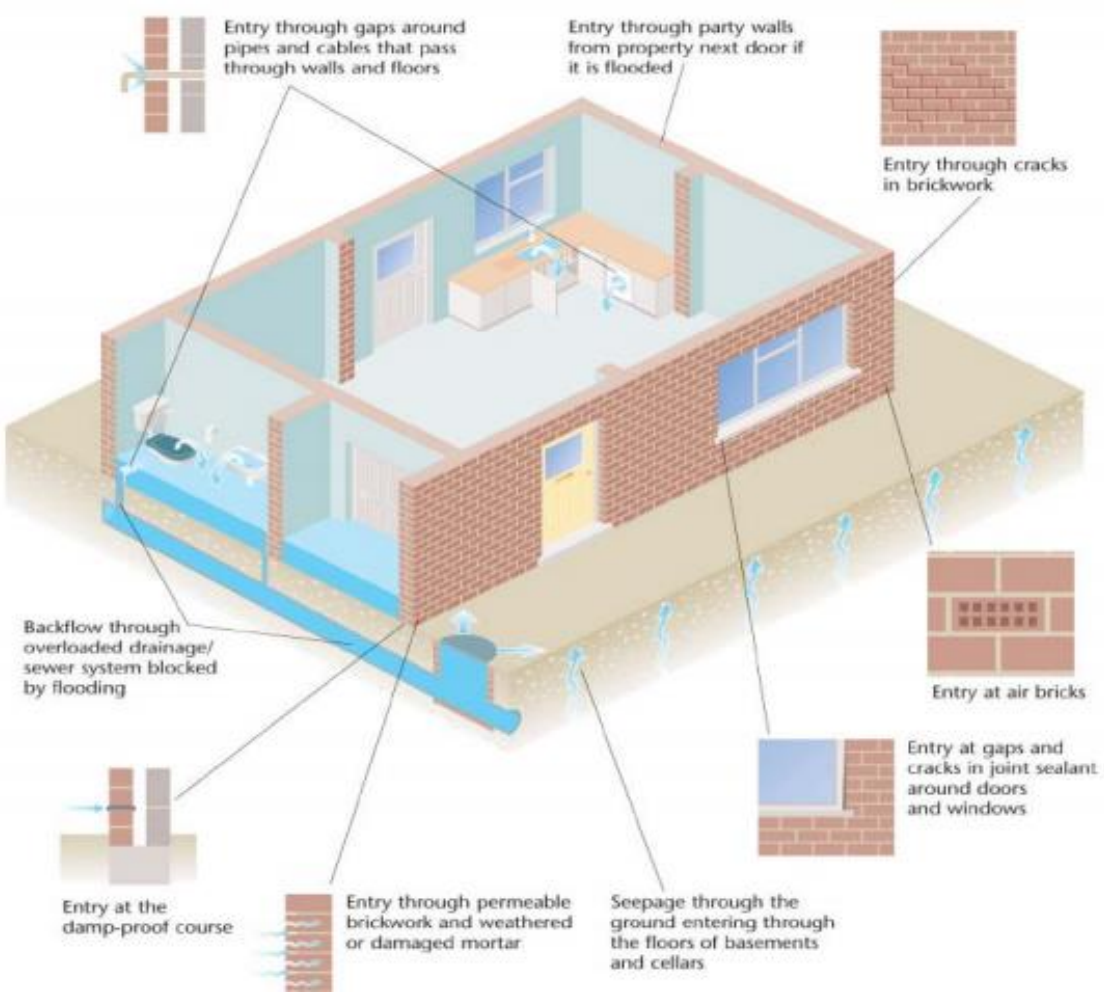
Opération Sequana
Paris, France

- 100-year flood simulation on the Seine River
- Assessed potential crippling damages
- Implemented engineering flood controls
- The river flooded 3 months later and damages were reduced

AXA, 2016.

Protecting Businesses and Homes from Climate Change

- Sewer backup prevention devices
- Improved fireproofing
- Directing storm water runoff away from the property
- Waterproofing



Environmental Agency.

Incentivizing Insureds

- Provide the opportunity for “Green Businesses” to be rewarded
  - Reduce premiums
  - Limit exclusions
  - Longer policy terms

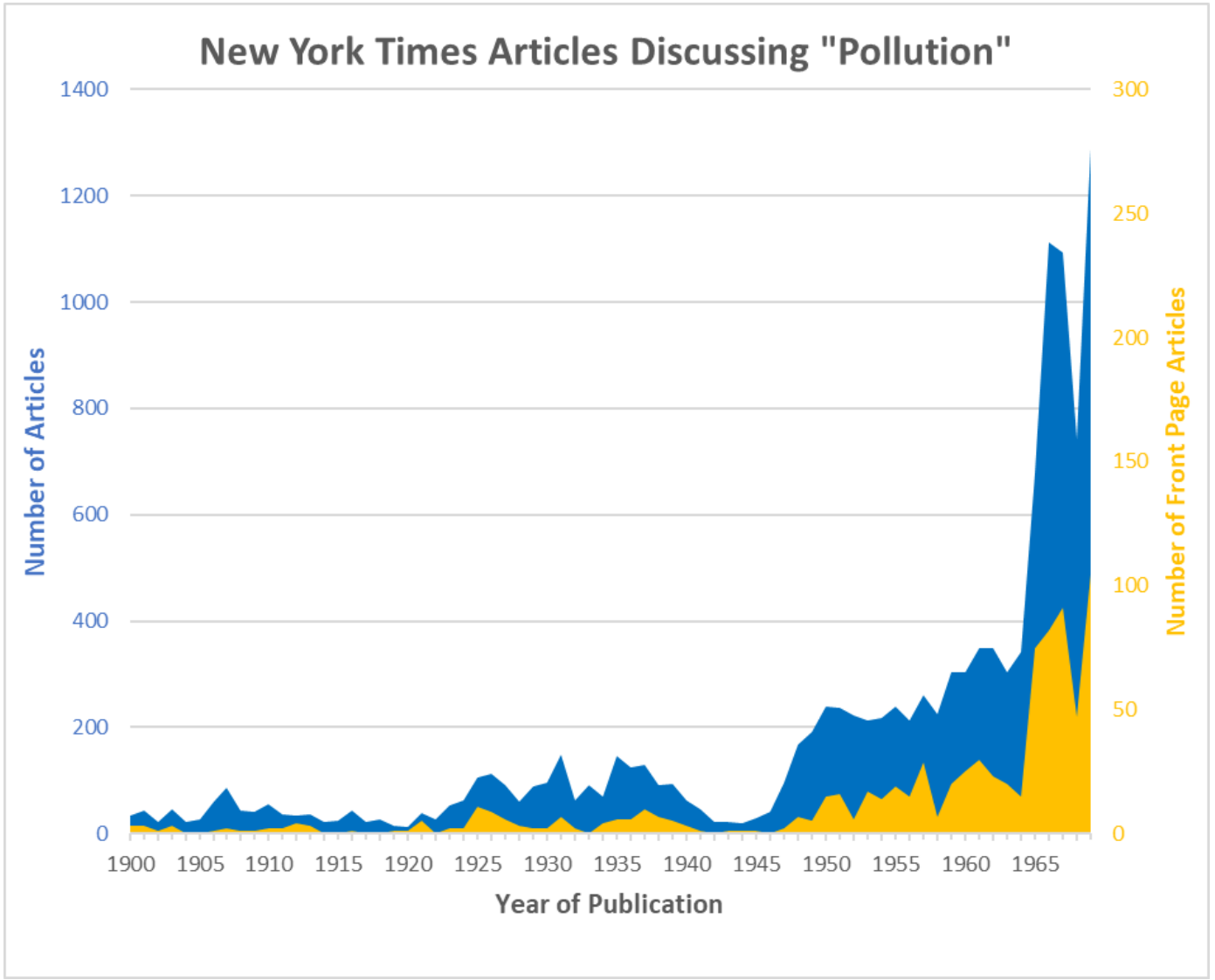
Challenges

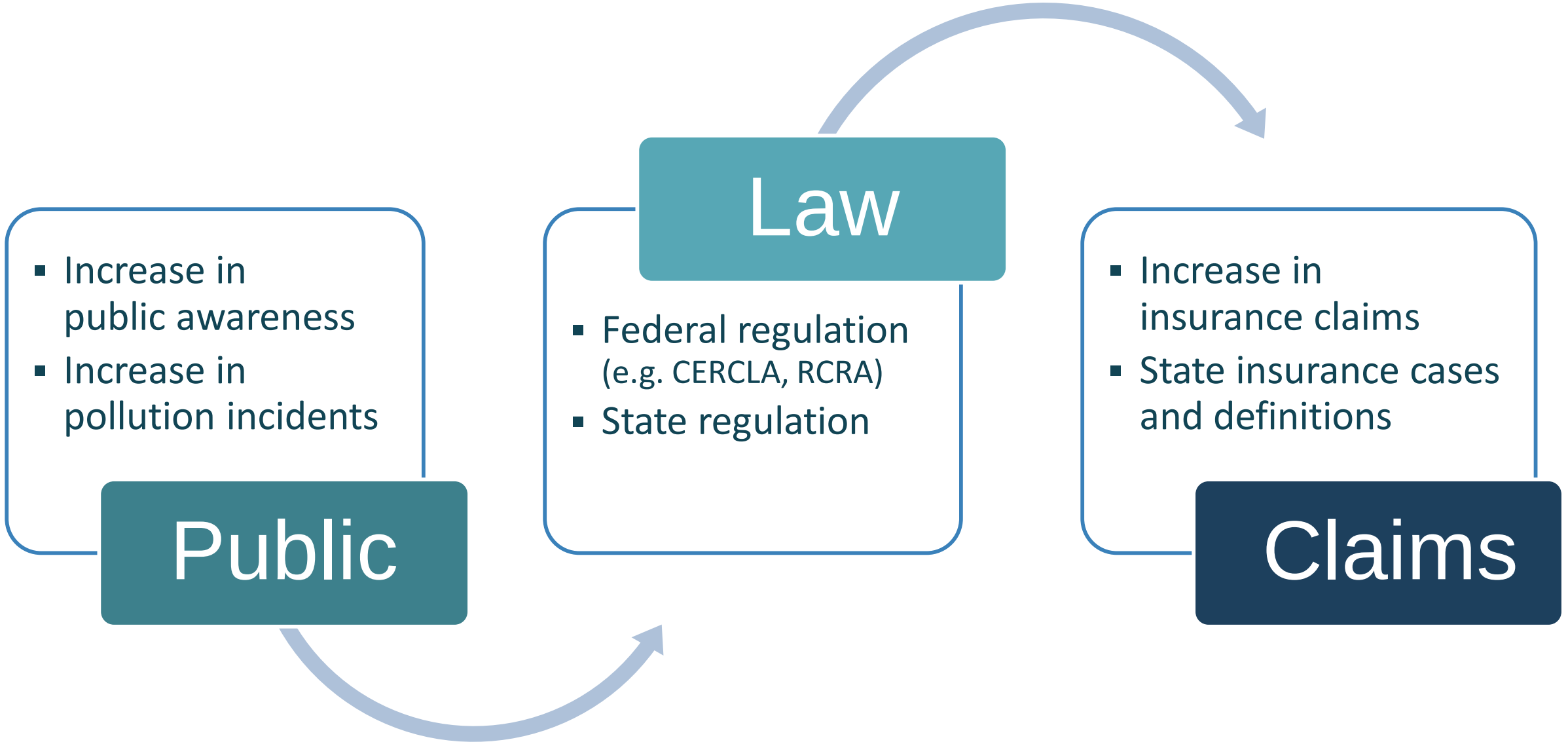
- Short term vs. long term risk
- Models need to be adapted for worst case scenario
- Underwriting is a highly competitive market

Impacts on Coverages and Claims

Molly Diggory

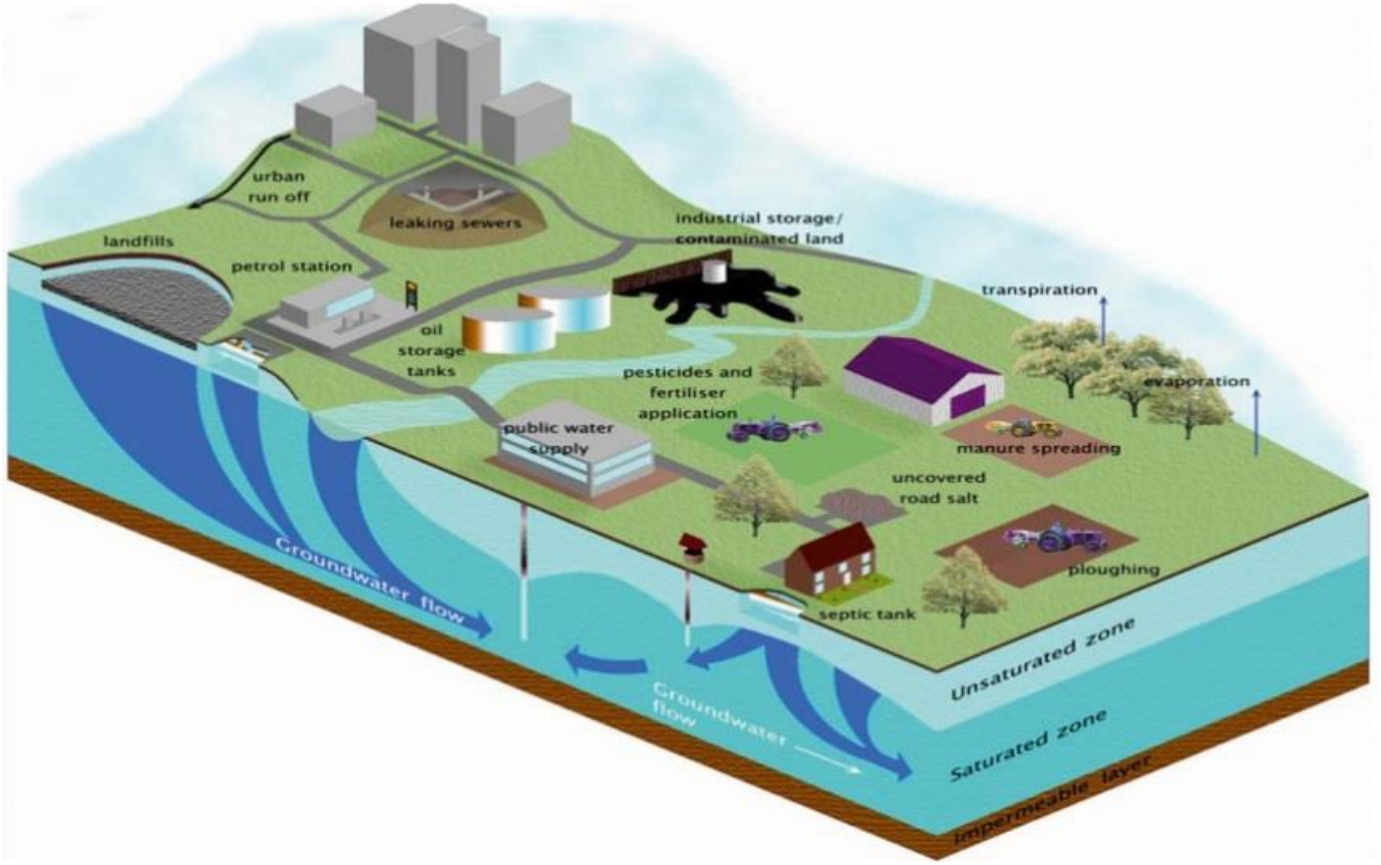
Public Awareness of Emerging Issues




Law
Federal regulation (e.g. CERCLA, RCRA)
State regulation
Public
Increase in public awareness
Increase in pollution incidents
Claims
Increase in insurance claims
State insurance cases and definitions

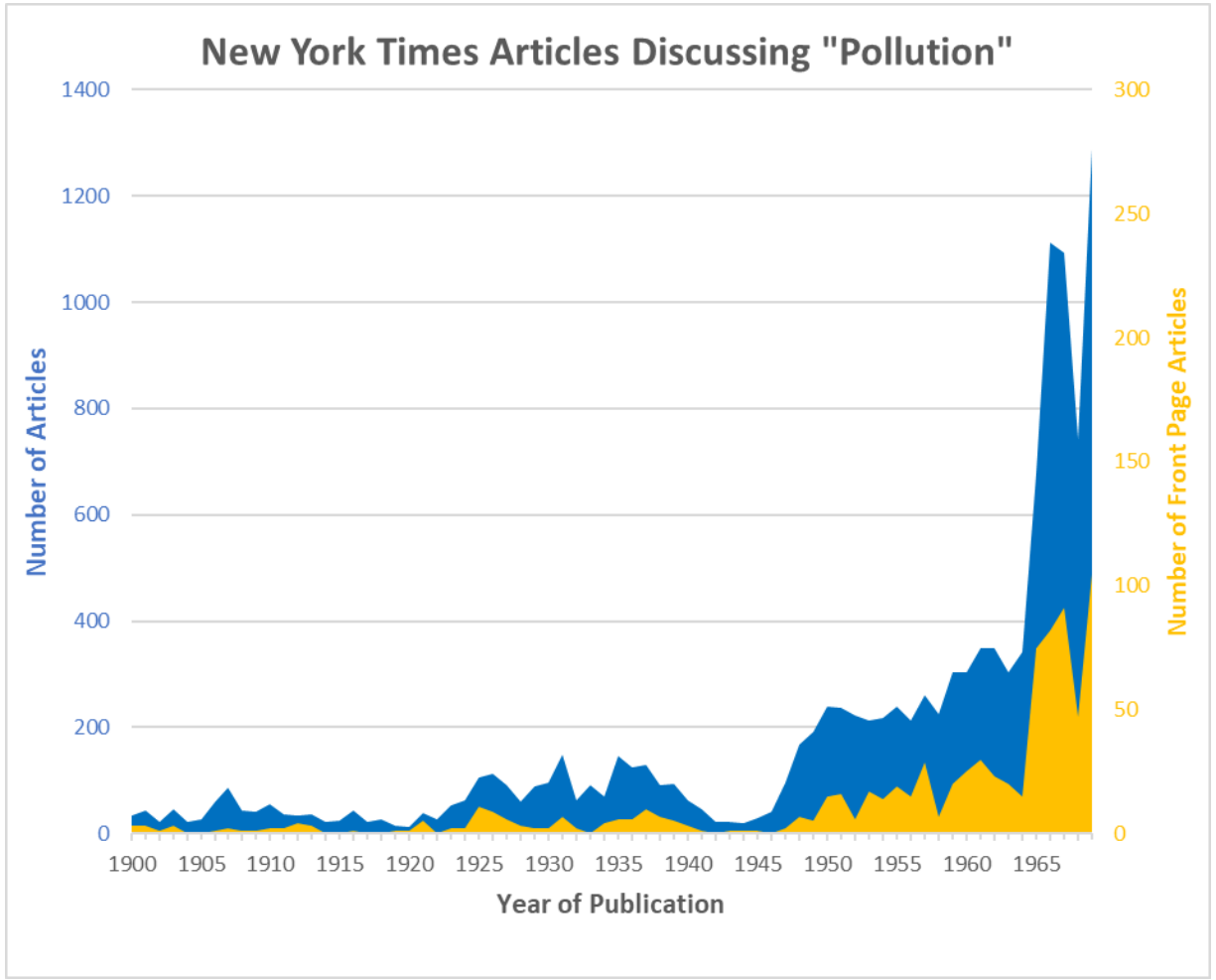
State Law and Pollution

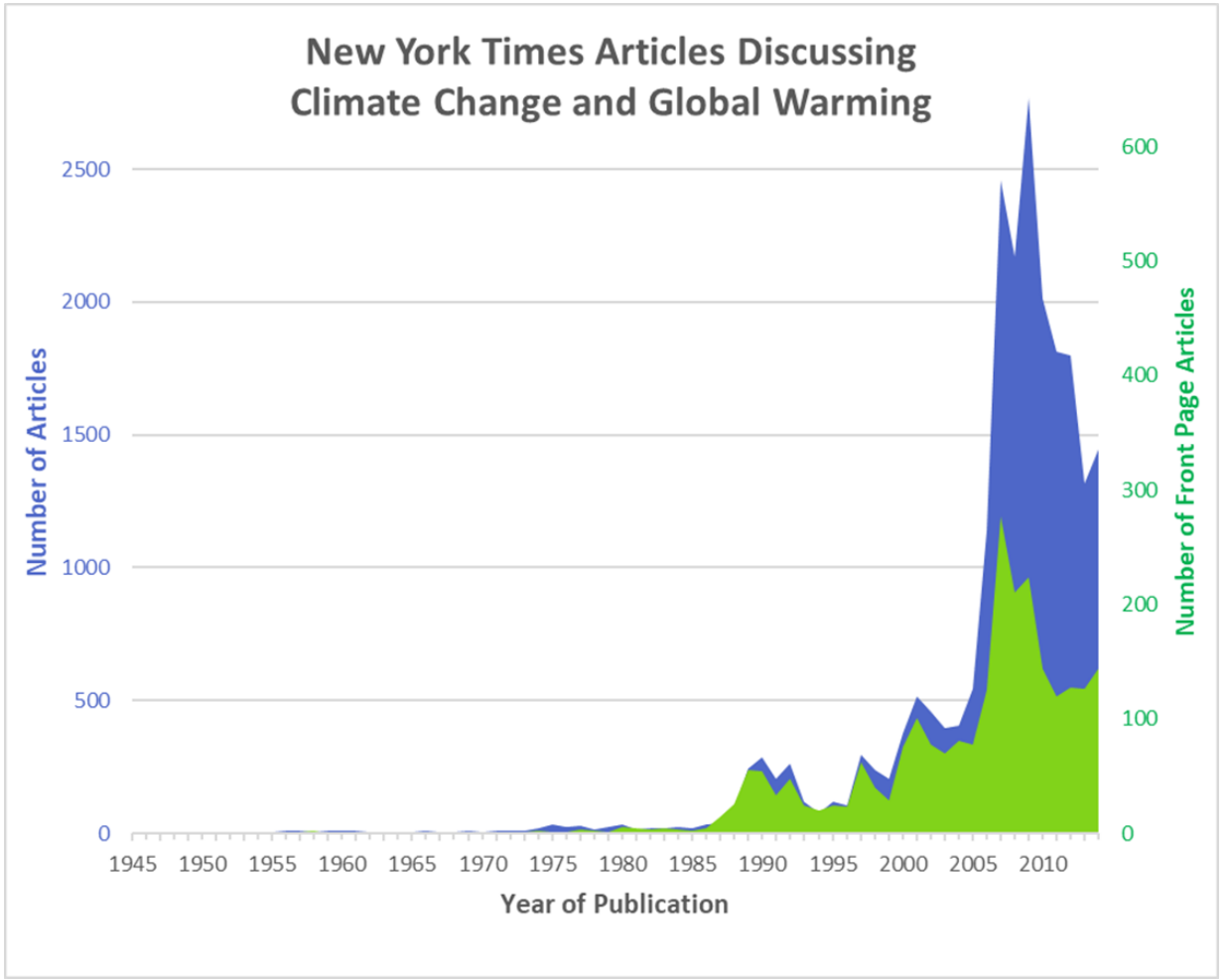
- Almost all 50 state court systems have resolved cases related to “Pollution Exclusion” and its definition of coverage
- Property damages and occurrences are defined by most states
- Can these definitions carry over to climate change-related damages?

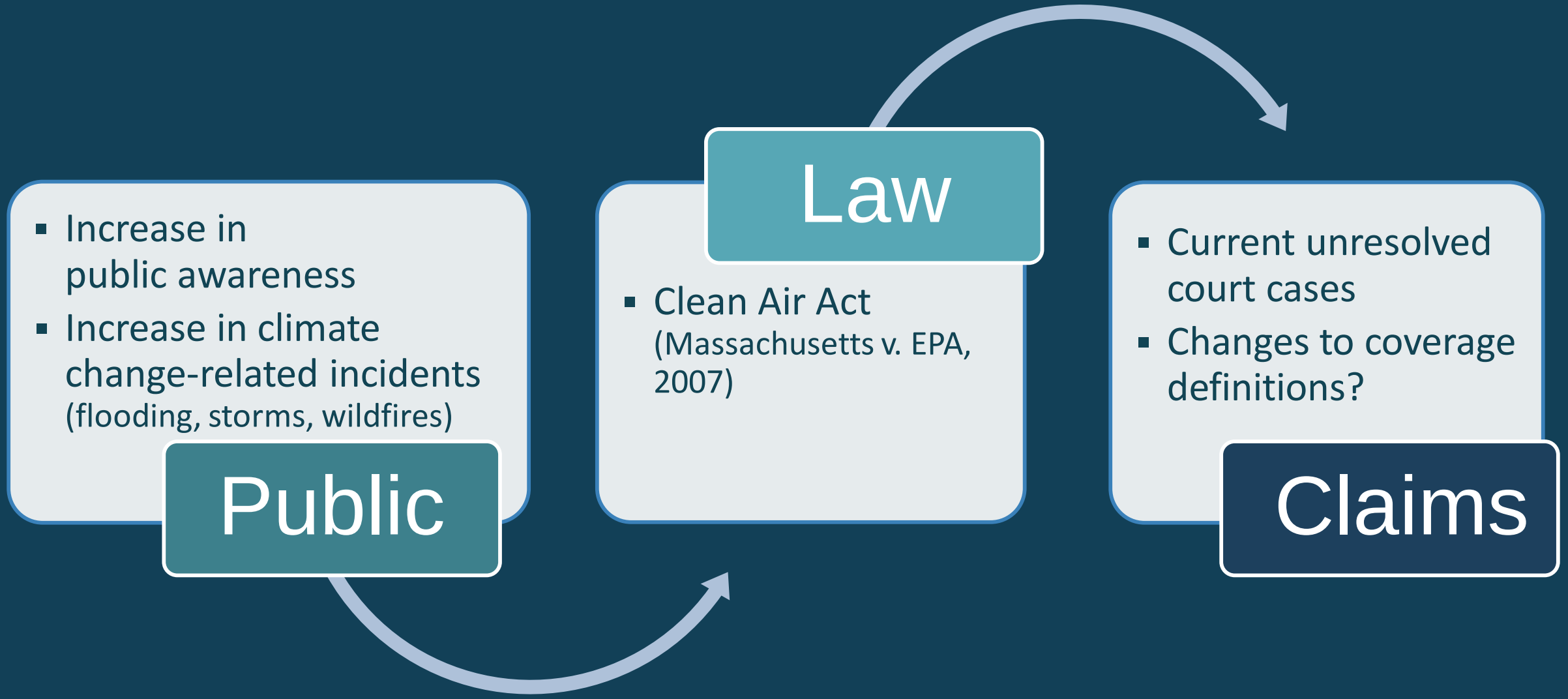


IntechOpen, 2013.

Public Awareness of Emerging Issues






Public
Increase in public awareness
Increase in climate change-related incidents (flooding, storms, wildfires)
Law
Clean Air Act (Massachusetts v. EPA, 2007)
Claims
Current unresolved court cases
Changes to coverage definitions?

Current Court Cases and Investigations

- "Big Ten" – Municipalities v. Fossil Fuel Industry
- Juliana et al. v. United States
- Investigations into fossil fuel industry

Takeaways

- Natural hazards are becoming more frequent and more severe than before, resulting in an increased frequency of Natechs (chemical releases).
- Coupling climate and CAT models will help companies and insurers to better prepare for the financial impact of these natural hazards.
- An underwriter's policy will need to be adapted in the future based on region, business operation, and knowledge of local climate change factors.
- Changes to policy definitions may follow a similar pattern from pollution to climate change

Thank you!

For more information,
contact Tanya Bissell at:

tbissell@rouxinc.com

or

1-800-322-7689

www.rouxinc.com