2023

Weather, Climate and Catastrophe Insight

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Economic Loss
$313 billion
4% above the 21st century average

58%
Global Protection Gap

39
billion-dollar economic loss events (below the average of 40)

5th
costliest year on record for insurers

Insured Loss
$132 billion
57% above the 21st century average

75%
of global insured losses were recorded in the United States

19
billion-dollar insured loss events (tied with the 5th highest on record)

421
number of notable disaster events

$50-55 billion
insured loss from Hurricane Ian, 2nd costliest natural disaster for insurers on record (2022 $)

$4.0 billion
insured loss from Australia Floods in February/March, the costliest event for the local insurance industry on record

$3.4 billion
insured losses from Windstorm Eunice, the costliest individual European windstorm since 2010

Australia and South Africa
recorded the costliest insurance industry events on record

19,200
heat-related fatalities in Europe

0.86°C (1.55°F)
above the 20th century average (NOAA): World's sixth-warmest year on record for land and ocean temperatures dating to 1880

1.34°C (2.41°F)
above the 1991-2020 average: Hottest summer on record in Europe

40.3°C (104.5°F)
record high temperature in the United Kingdom

Executive Summary

Global natural disaster losses in 2022 are better covered by insurers who face their fifth costliest year in history; climate change drives new extreme weather records.

Global natural disasters in 2022 resulted in near-average economic losses totaling $313 billion. Half of those losses occurred in the United States and were driven by the devastating Hurricane Ian and multiple severe convective storm outbreaks. Three global drought events were among the 10 costliest disasters, which underlines the growing significance of the peril on a global scale. These occurred in the United States, Europe and China.

The insurance sector covered $132 billion — marking 2022 as the fifth costliest year for insurers on record. The industry also saw the second costliest event on record, as Hurricane Ian resulted in approximately $50-55 billion of insured losses covered by public and private entities. It is only surpassed by Hurricane Katrina with $99 billion on a price-inflated basis. With a protection gap of 58 percent, most disaster losses were uninsured. While this is one of the lowest protection gaps on record (only matched by a similar percentage from 2005), the remaining gap presents both a challenge for the global resilience, as well as an opportunity to facilitate further protection.

New extreme weather records were broken, and many regions saw prolonged drought and scorching heatwaves. This is a reminder that the impact of climate change on communities around the globe is tangible and that behavior of certain natural perils will continue to be affected.

Many disasters in highly exposed areas, including Hurricane Ian or the devastating floods in Pakistan, highlight the need to strengthen resilience, as socio-economic change and concentration of exposure and wealth in vulnerable areas remains a major loss driver. Through the adoption of effective adaptation strategies and better disaster management and warning systems, we can better protect the communities in which we live and work.

Foreword: Closing the Protection Gap to Mitigate and Protect Against Climate Risks

We are living in a time that has been deemed "The Great Volatility" by the world's leading economists. And there is no greater volatility we face — collectively — than the impacts of climate change. Mitigating and in some cases adapting to climate change is one of the biggest challenges we face. There are abundant opportunities, but success is not guaranteed. This is why collaboration between public, private and societal forces is essential.

Aon has been developing partnerships across the industry to advance climate solutions and close the protection gap. Our recent work with the International Federation of Red Cross and Red Crescent Societies to create the Disaster Response Emergency Fund (DREF), which provides emergency funding for communities in all kinds of disasters when needs exceed resources, illustrates this commitment. As our President Eric Andersen put it at the DREF Pledging Conference: "Big problems need to be solved by collaboration and this has been exactly that — humanitarian, private and public sectors partnering to prove that solutions can be found together."

This report explores the events and costs of catastrophes and natural disasters in 2022 that amounted to economic losses of $313 billion — $299 billion of which was the result of weather and climate events. That's a staggering amount of loss, and yet, only 42 percent were covered by insurance. This data highlights a tremendous opportunity to close this protection gap. In doing so, we can protect vulnerable communities and strengthen the economy.

There are three risks that we hear from our clients that could hold companies back from taking a leading role in solving the climate crisis. They are telling us the industry continues to:

1. Leave the playing field by excluding climate-related triggers and exiting challenged geographies;
2. Tax the net-zero transition by opting out of entire sectors and inadvertently making the transition to clean energy harder; and
3. Ignore the accelerators by moving too slowly on adjacent markets.

The good news is that there are examples of where the industry has forged a better path: choosing to stay in the game, facilitate a just transition and provide ways to bring new solutions to market quicker. For example, catastrophe bonds were created to provide post-event cover for traditional risks, but they also encourage pre-investment in research and development that would accelerate clean energy transitions by assuring certainty of funds to deal with the impact of traditional claims. In another case, we have developed an industry-leading capability to enable a company to accurately value its intellectual property, and then use it as an asset to finance growth. This allows them to bypass traditional funding and accelerate their time to market. For many green technology companies, this is becoming their best option.

We believe in our collective ability to address one of the greatest challenges of our times in a way that will better serve our clients and society as well. Aon's role continues to be working with our clients to help them build physical resilience, accelerate solutions to market and de-risk climate-related investments — connecting capital to opportunities.

Insurance exists to protect that which we cannot afford to lose, and when it comes to climate change, we all have a lot to protect.

Greg Case
Chief Executive Officer, Aon

How This Report Can Help Build and Promote Resilience

This report highlights the global natural disasters of 2022 to help quantify and qualify how topics such as climate change, socioeconomics and other emerging issues influence catastrophe risk. The data, statistics and analytics intend to aid interests in sectors such as insurance, government, academia, real estate, emergency management and banking.

Identify Trends

a. Explore global and regional catastrophe loss drivers
b. Quantify the cost of which areas are seeing higher annual or decadal losses
c. Detect climate change influence on individual event behavior and impacts

Enhance Risk Mitigation

a. Better establish risk mitigation efforts in the public and private sectors — with initial focus in the most vulnerable areas of the world — for enhanced disaster response and business continuity
b. Modernize building codes and mandate enforcement
c. Improve risk communication and explanation of uncertainty
d. Academic collaborations in climate research will aid in the development of new tools and solutions to push forward new ideas to lower risk and promote future mitigation and adaptation practices

Seize the Opportunities

a. Explore traditional and alternative insurance to protect people and assets
b. Grow the volume of assets dedicated to sustainable investment to accelerate green initiatives that will meet net-zero emissions goals
c. Economic, social and governance strategies to assess, disclose and manage risks, including climate
d. Build resilience through public-private collaborations to close the protection gap, protecting and enriching lives around the world

Key Learnings

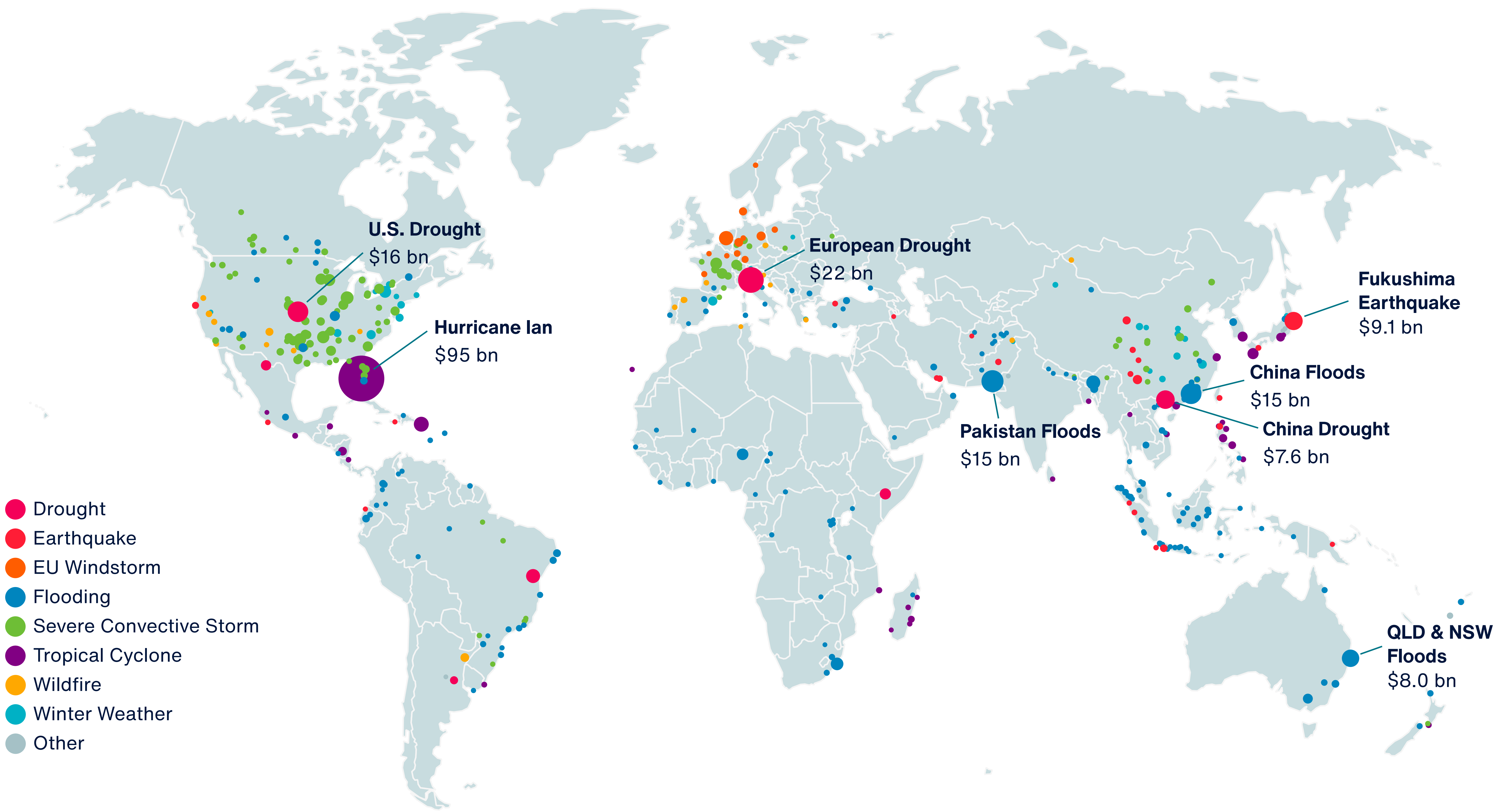
a. Through academic collaborations, we can turn climate science into action for both the private and public sector
b. Robust historical data is crucial for identifying natural disaster trends
c. Investments in real-time modeling and event response technology are vital to better mitigating risk and rebuilding post-event more quickly
d. For a more resilient workforce, organizations must develop plans that focus on the direct and indirect impacts of climate change on the health and wellbeing of their people
e. Re/insurers can drive the future of the global economy by helping to accelerate the journey to net zero emissions

Along with this report, we welcome readers to access current and historical natural catastrophe data and event analysis at catastropheinsight.aon.com

2022 Natural Disaster Events and Loss Trends

Global Economic Losses Near the 21st Century Average

Exhibit 1: Significant 2022 Economic Loss Events



Data: Catastrophe Insight, Aon

Direct economic losses resulting from natural disasters in 2022 are estimated at $313 billion. This is close to the 21st century average, after adjusting actual incurred damage to today's dollars using the U.S. Consumer Price Index. Though 2022 was far from record-breaking in terms of overall losses, it saw many impactful and costly events across the globe.

Visualizing the geographic distribution of 2022 events allows for distinguishing certain patterns, including higher frequency of medium-sized Severe Convective Storm (SCS) events in the U.S. and Europe, and the prevalence of flooding events in Africa, Southeast Asia and Oceania.

The map primarily shows the economic impact, which to some extent correlates with concentration of wealth — this is not a result of a reporting bias. What this map does not highlight is the humanitarian crises and displaced communities, as many events with significant human impacts do not necessarily translate into a high financial toll in terms of direct damage.

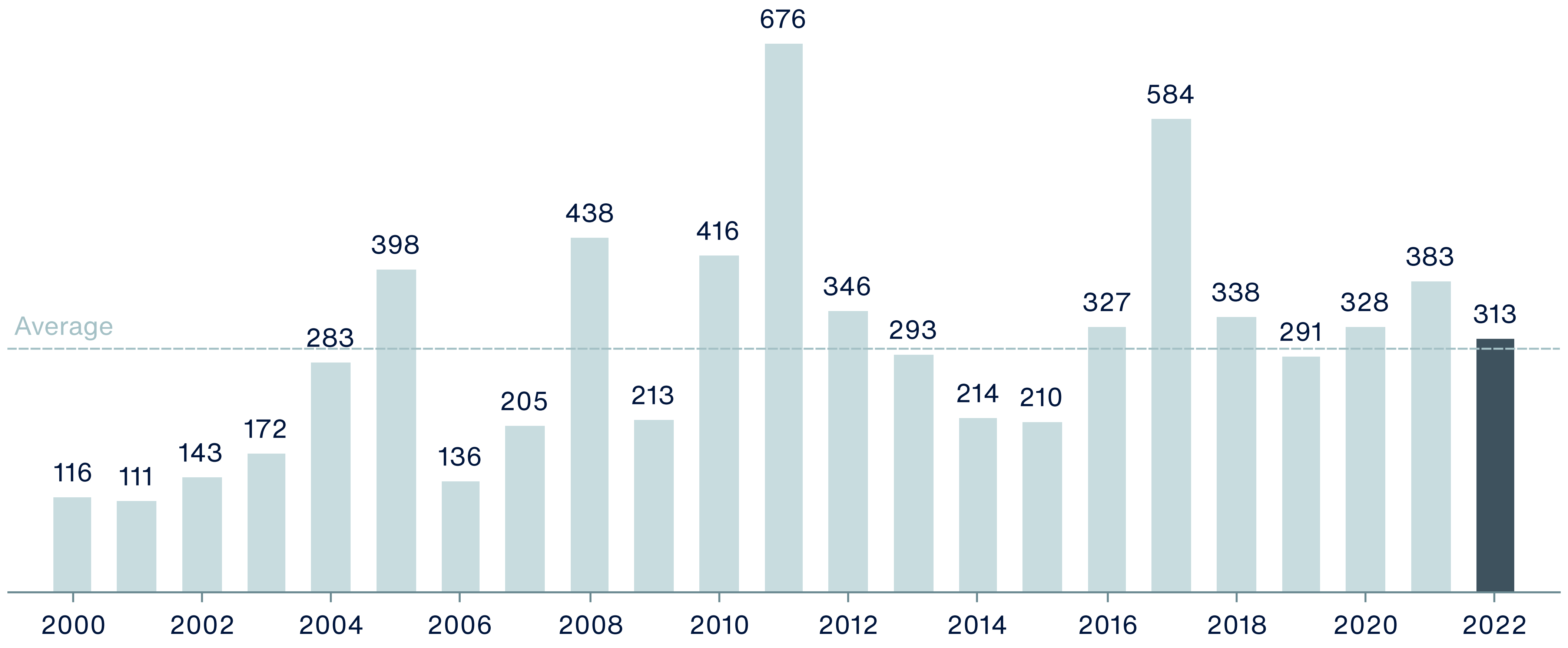
Note that significant price inflation throughout the year already resulted in notable increases of per-event losses.

Exhibit 2: Top 10 2022 Global Economic Loss Events

Date	Event	Location	Deaths	Economic Loss ($ billion)	Insured Loss ($ billion)
09/27 – 10/01	**Hurricane Ian**	United States, Cuba	157	**95.5**	52.5
Annual	**European Drought**	Southern, Western and Central Europe	N/A	**22.0**	3.0
Annual	**U.S. Drought**	United States	N/A	**16.0**	8.0
06/14 – 10/30	**Pakistan Seasonal Floods**	Pakistan	1,739	**15.0**	0.1
06/01 – 09/30	**China Seasonal Floods**	China	195	**15.0**	0.4
03/16	**Fukushima Earthquake**	Japan	4	**9.1**	2.9
02/23 – 03/31	**QLD & NSW Floods**	Australia	22	**8.0**	4.0
Annual	**China Drought**	China	N/A	**7.6**	0.2
02/18 – 02/19	**Windstorm Eunice**	Western and Central Europe	17	**4.5**	3.4
05/17 – 10/31	**India Seasonal Floods**	India	2,135	**4.2**	0.1
All other events			~27,100	**115.6**	57.4
Totals			**~31,300**	**313 billion**	**132 billion**

At least five events topped the economic loss threshold of $10 billion. Hurricane Ian dominated the ranking with an aggregated toll of approximately $95.5 billion — more than the next seven events combined. Three drought events in the table of 10 costliest events underline the growing significance of the peril on a global scale. Particularly, cumulative drought losses in European countries were at their highest since the historic summer of 2003, while the U.S. had the worst drought since 2012 in terms of overall economic losses. Floods in Pakistan were the costliest event for the peril, tied with seasonal flood losses in China, which were at their lowest since 2015. All but one event in the table were weather- and climate-related; the only two geophysical disasters that topped $1 billion in economic losses in 2022 were the March Fukushima Earthquake in Japan and September Sichuan Earthquake in China.

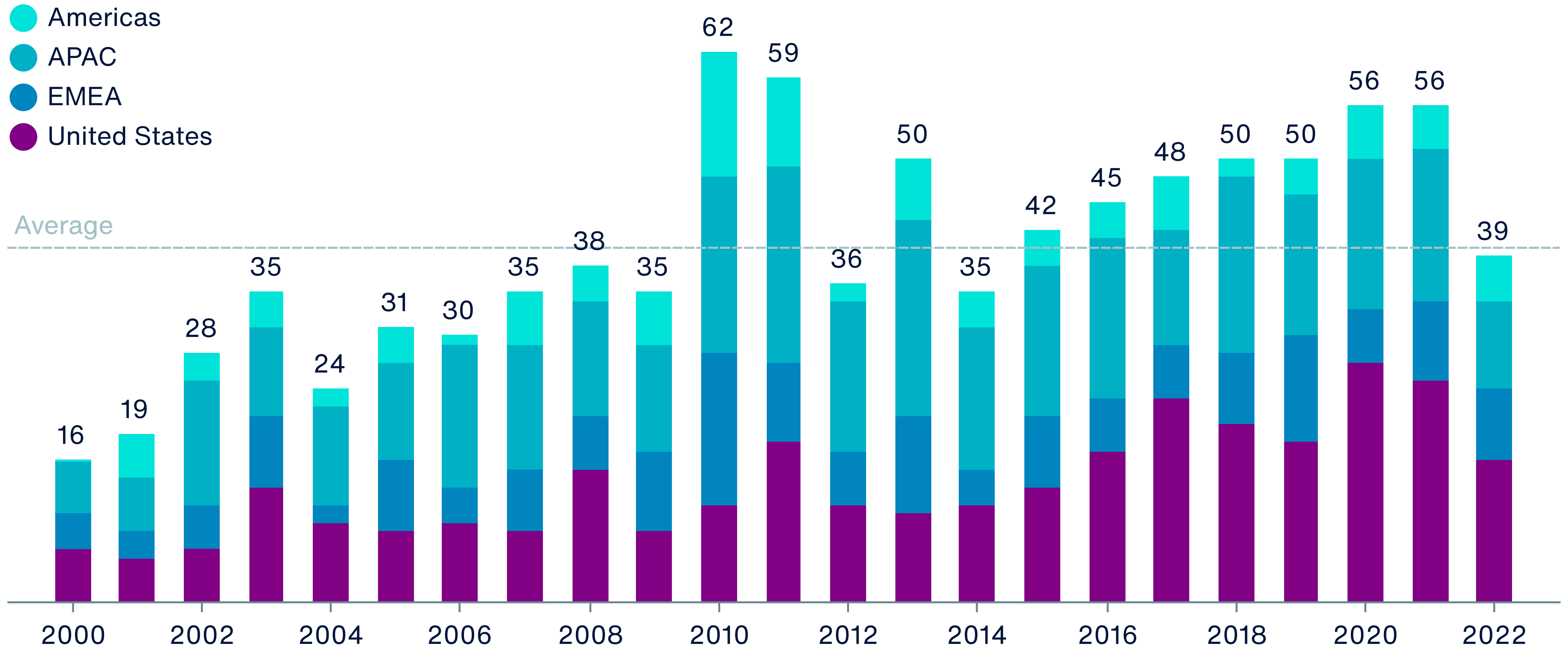
Exhibit 3: Global Economic Losses from Natural Disasters (2022 $ bn)



Data: Catastrophe Insight, Aon

Global economic losses from natural disasters in 2022 were close to the 21st century average ($301 billion) and median ($292 billion) on price-inflated basis and reached approximately $313 billion. They were 6 percent and 4 percent lower based on the average and median, respectively, of the last decade. Focusing on weather-related disasters only, total losses in 2022 were roughly 17 percent above the average since 2000, yet still lower than the short-term mean and median statistics and reached approximately a half of losses in the record year of 2017.

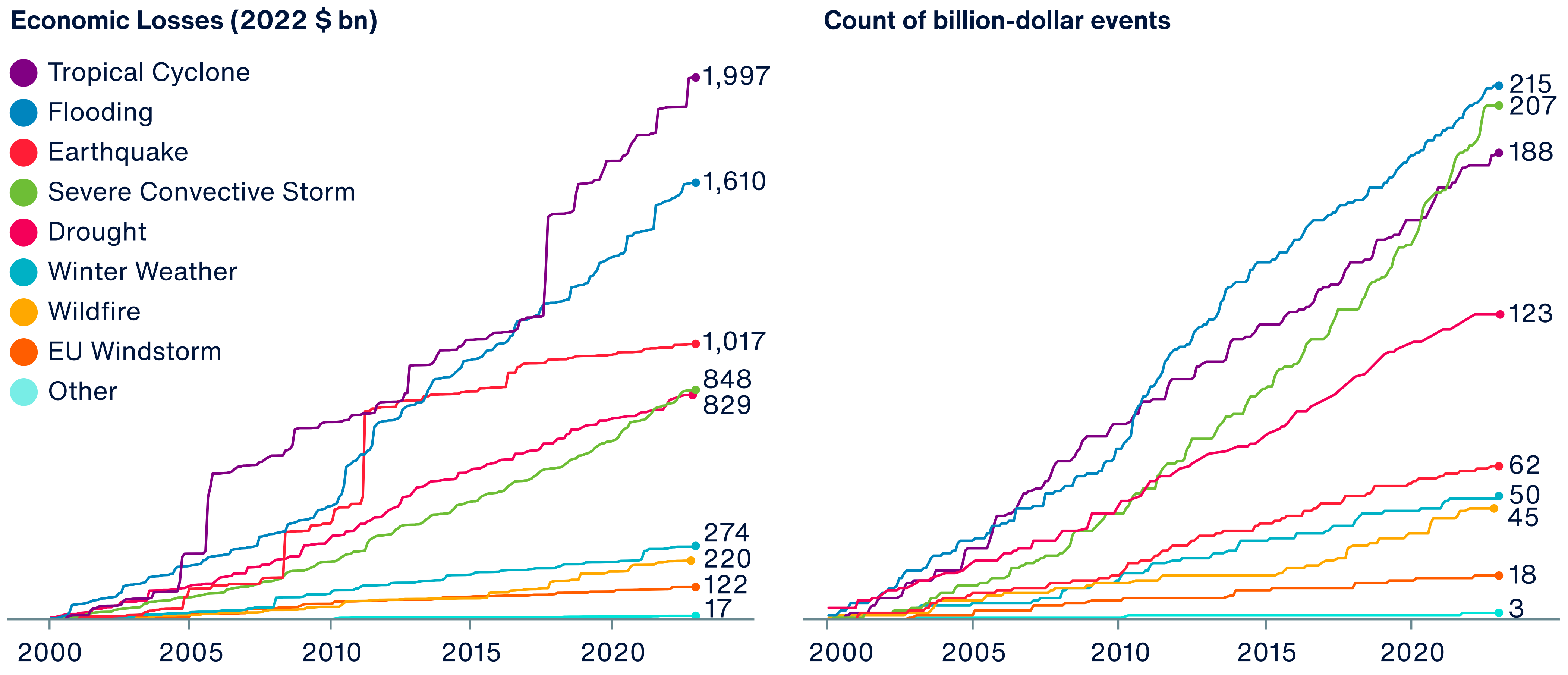
Exhibit 4: Global Billion-Dollar Economic Loss Events



Data: Catastrophe Insight, Aon

In 2022, there were at least 39 individual billion-dollar natural disasters, which was below the average of 40. Please note that U.S. wildfires are treated as individual events. For some years in the Exhibit 4, tropical cyclone events in the Atlantic Basin resulted in billion-dollar losses in both the U.S. and elsewhere in the Americas. Such occurrences are only included once. Please note that loss development for 2022 events expected in the coming months may increase of the total.

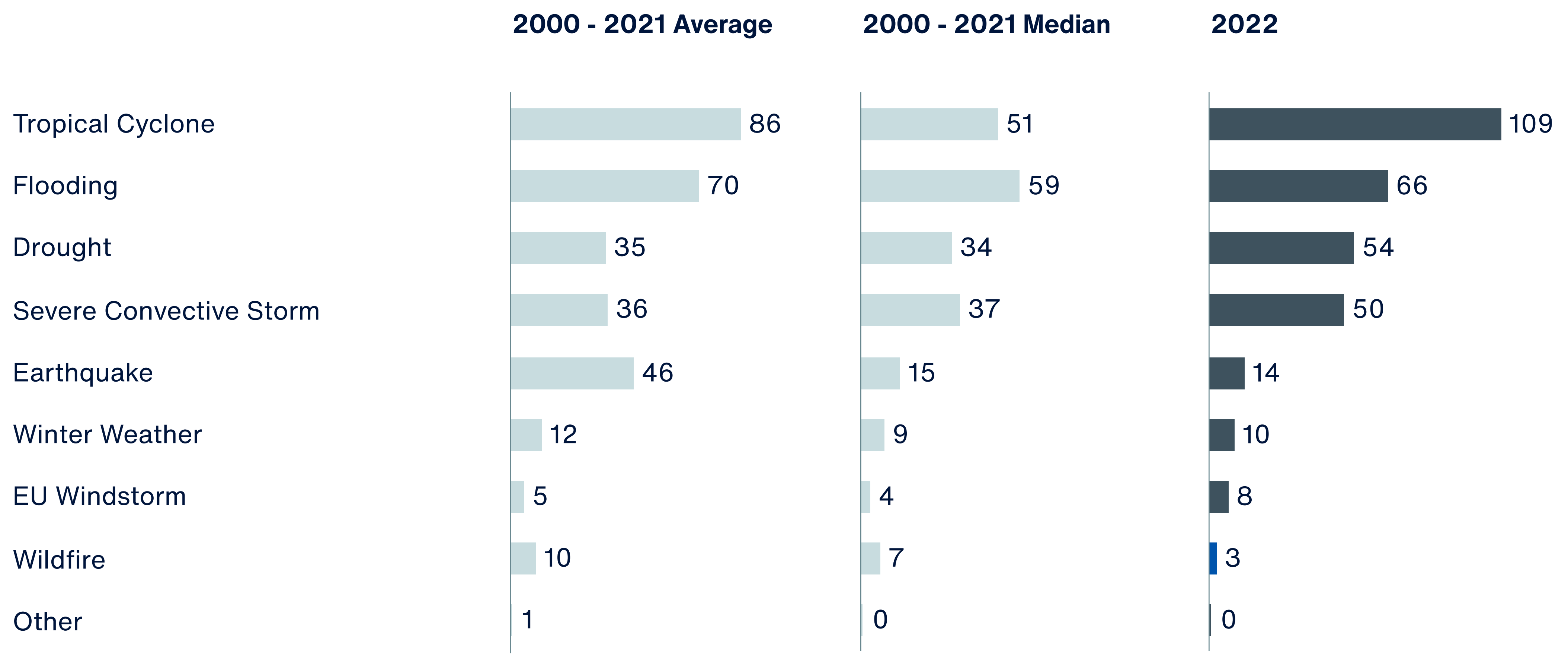
Exhibit 5: Cumulative Global Economic Losses by Peril



Data: Catastrophe Insight, Aon

Tropical cyclone remains the costliest peril on a cumulative basis since the start of the 21st century. Driven by extreme loss years, such as 2022, 2017, 2005 and 2004, it is nearing the $2 trillion aggregated loss. The historical record also shows that roughly half of these cumulative losses were caused by only 10 individual events, including Hurricane Ian. While the earthquake peril holds the title for the costliest natural disaster ever recorded, the Great Tohoku Earthquake and Tsunami in 2011, it failed to generate an event exceeding the $10 billion loss threshold since 2016.

Exhibit 6: Global Economic Losses by Peril (2022 $ bn)



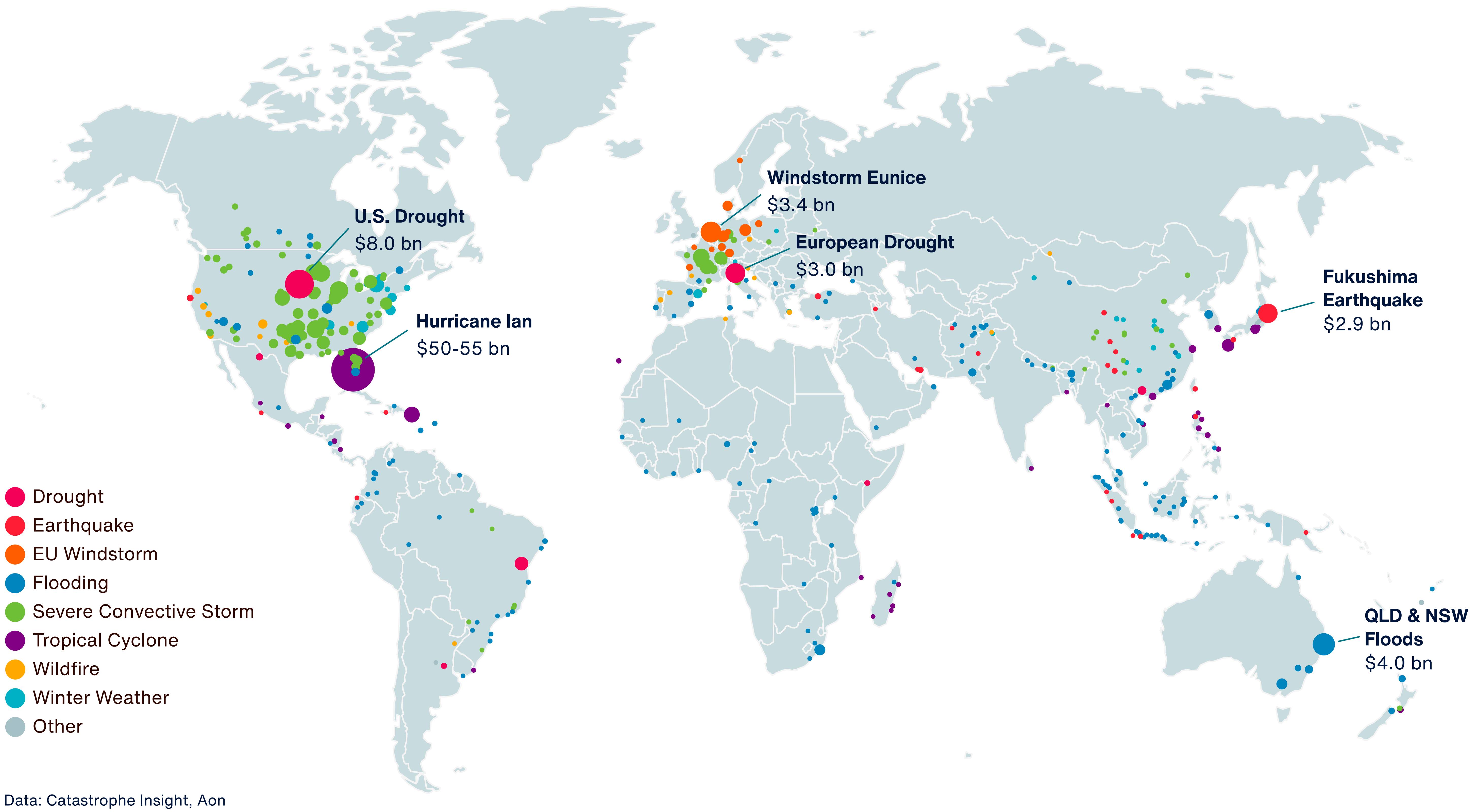
Data: Catastrophe Insight, Aon

Accelerating frequency of costly SCS events will likely result in the peril dominating the cumulative count of billion-dollar events in the following years.

With more than $100 billion of economic losses, tropical cyclone was by far the costliest natural peril of 2022, with vast majority of losses resulting from Hurricane Ian. The peril was well above its 21st century average and median statistics. Other perils that exceeded their mean losses were Drought, SCS and European Windstorm.

Global Insured Losses Surpass $100B for the Third Time in a Row

Exhibit 7: Significant 2022 Insured Loss Events



Data: Catastrophe Insight, Aon

Global insured losses from natural disasters in 2022 are estimated at $132 billion, well above the short-, medium- and long-term averages. Roughly 42 percent of direct aggregated economic losses were covered by public and private insurance entities, translating to a global protection gap of 58 percent. While a large part of the global disaster losses remains uninsured, this was one of the lowest protection gaps ever recorded, close to the record year of 2005 when roughly 40 percent of losses were covered.

This is largely because both years saw extremely costly hurricane events in the U.S., a country exhibiting a relatively mature insurance market. While Asia, a region with a developing market and relatively low coverage, saw costly flooding events in Pakistan, India and China, overall economic losses in the region were still below average.

The protection gap remains a critical reference point for the insurance industry, financial markets and governments as it highlights the vulnerability of communities and the opportunity for new solutions.

To read more regarding available re/insurance industry capital and the health of the overall market, please refer to Aon's Reinsurance Market Dynamics Report.

Exhibit 8: Top 10 2022 Global Insured Loss Events

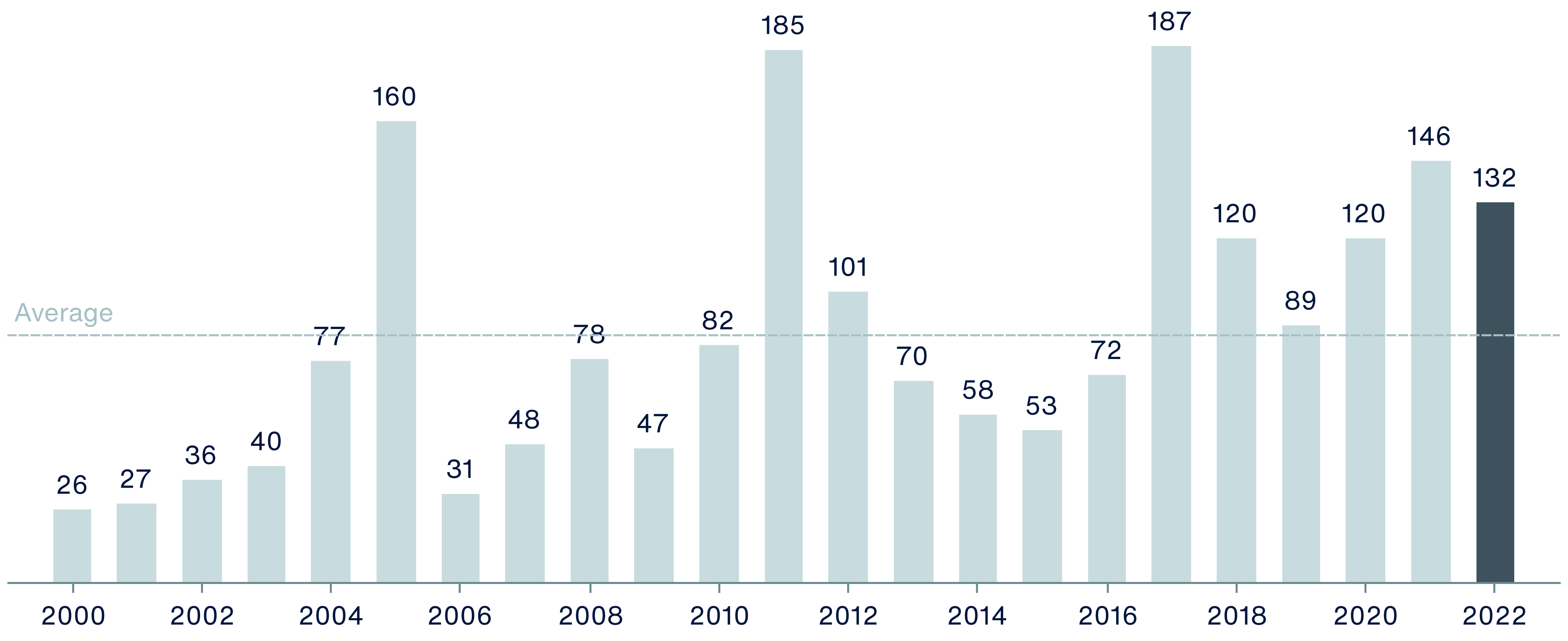
Date	Event	Location	Deaths	Economic Loss ($ billion)	Insured Loss ($ billion)
09/27-10/01	**Hurricane Ian**	United States, Cuba	157	95.5	**52.5**
Annual	**U.S. Drought**	United States	N/A	16.0	**8.0**
02/23-03/31	**QLD & NSW Floods**	Australia	22	8.0	**4.0**
02/18-02/19	**Windstorm Eunice**	Western and Central Europe	17	4.5	**3.4**
Annual	**European Drought**	Southern, Western and Central Europe	N/A	22.0	**3.0**
03/16	**Fukushima Earthquake**	Japan	4	9.1	**2.9**
06/11-06/17	**Severe Convective Storm**	United States	3	3.4	**2.7**
04/10-04/14	**Severe Convective Storm**	United States	1	2.8	**2.3**
05/11-05/12	**Upper Midwest Derecho (SCS)**	United States	5	2.7	**2.2**
05/19-05/22	**Severe Convective Storm**	United States	2	2.6	**2.1**
All other events			~31,100	146.1	**49.2**
Totals			**~31,300**	**313 billion**	**132 billion**

Hurricane Ian was by far the costliest event of the year for the global re/insurance industry and became the second costliest natural disaster ever recorded in terms of insured loss on a price-inflated basis, only surpassed by Hurricane Katrina, which resulted in more than $99 billion losses (in 2022 $) after its devastating impact in 2005. Ian is anticipated to surpass the second costliest disaster so far, the Great Tohoku Earthquake and Tsunami of 2011.

No other event reached the $10 billion-dollar mark, yet there were at least 10 multi-billion-dollar events. Remarkably, the floods in Queensland and New South Wales in February and March resulted in insured losses of $4 billion, the highest loss in the history of the Australian insurance sector. Similarly, April floods in South Africa were the costliest for the country, with estimated $1.8 billion in insured losses.

It is also noteworthy that two drought events (in the U.S. and Europe) are featured in the table of top 10 costliest events, which only occurred once before, in 2003.

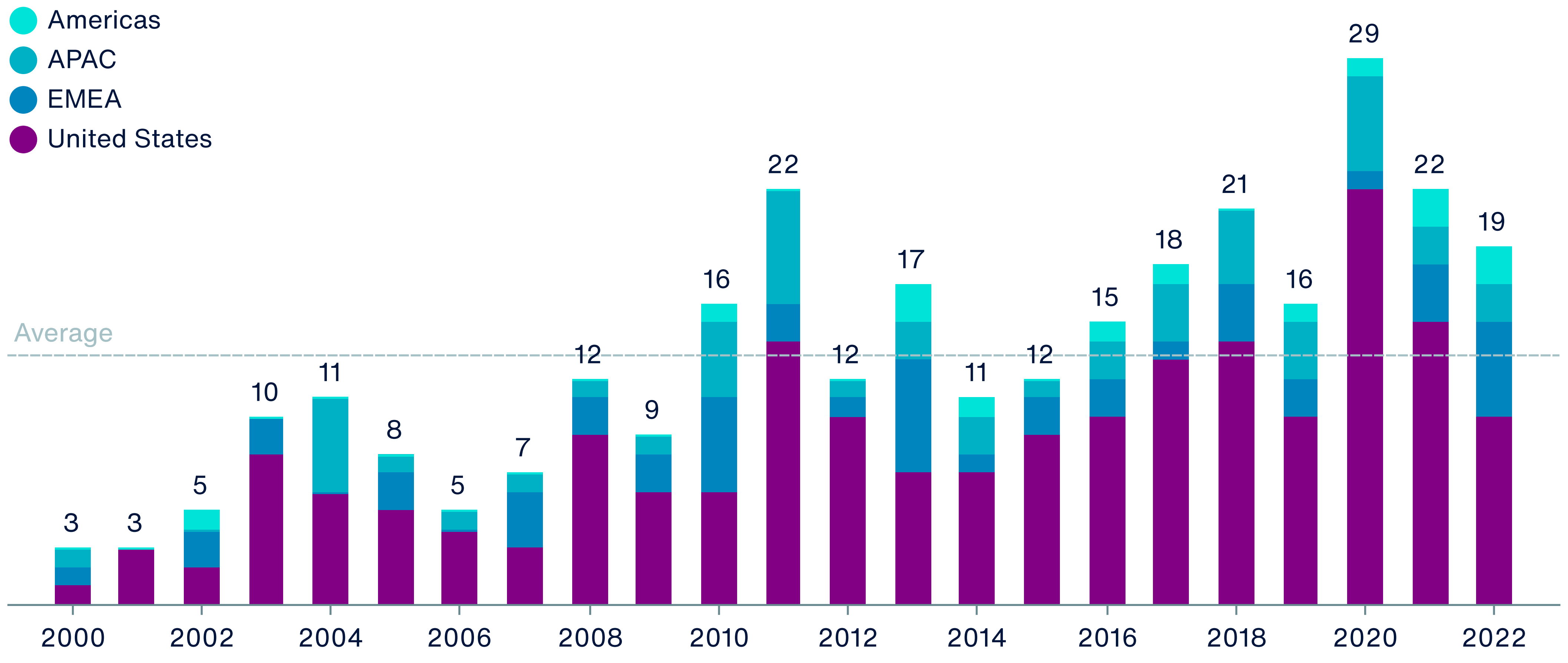
Exhibit 9: Global Insured Losses from Natural Disasters (2022 $ bn)



Data: Catastrophe Insight, Aon

Total insured losses were well above the 21st century average ($84 billion) and median ($75 billion), yet lower than 2021 ($146 billion) and slightly below the average of the last five years ($132 billion), during which the industry saw elevated losses. It was the third consecutive year when losses surpassed $100 billion, and only the 8th time that this threshold was exceeded. Depending on the eventual financial impact of Hurricane Ian and potential loss development for other significant events, 2022 is anticipated to rank as the fifth costliest year on record for insurers.

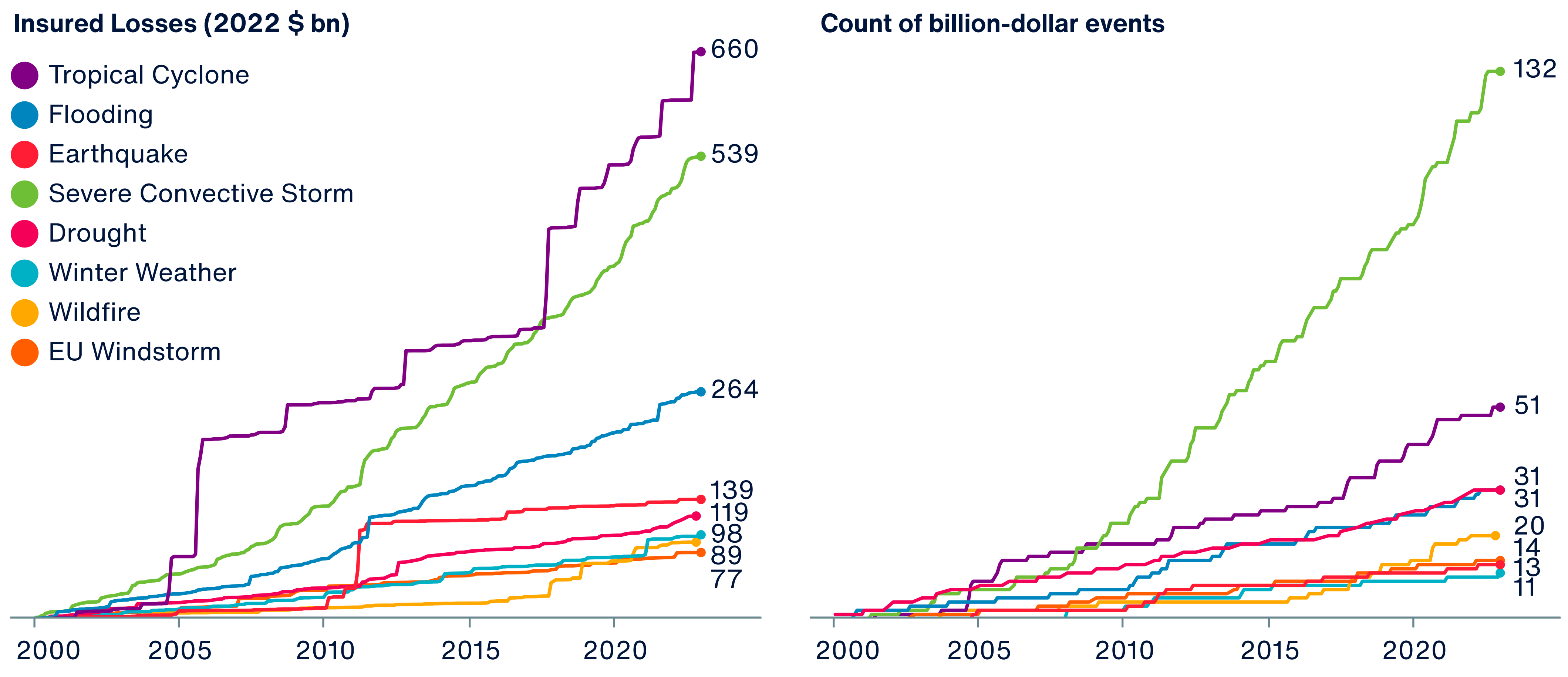
Exhibit 10: Global Billion-Dollar Insured Loss Events



Data: Catastrophe Insight, Aon

In 2022, there were at least 19 individual billion-dollar natural disasters, which was above the average of 13. Please note that U.S. wildfires are treated as individual events. For some years in the Exhibit 10, tropical cyclone events in the Atlantic Basin resulted in billion-dollar insured losses in both the U.S. and elsewhere in the Americas. Such occurrences are only included once.

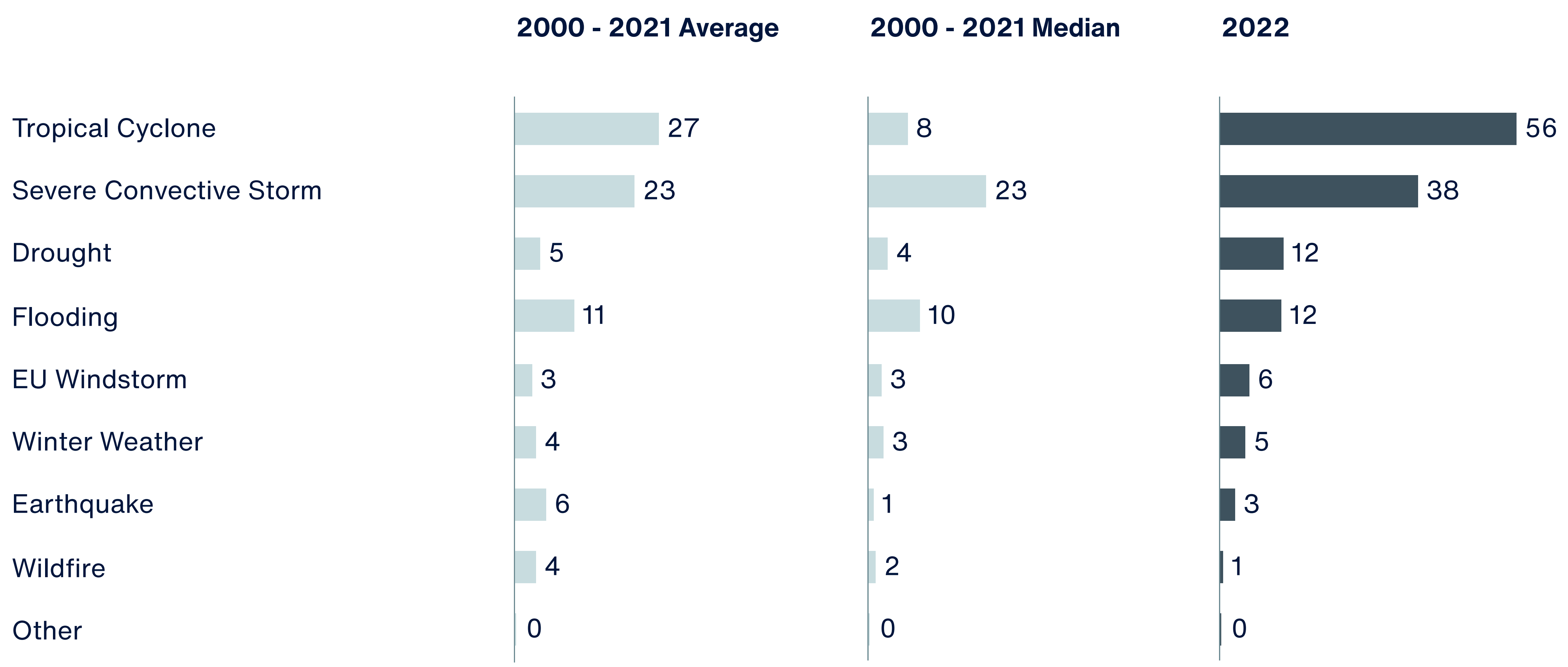
Exhibit 11: Cumulative Global Insured Losses by Peril



Data: Catastrophe Insight, Aon

When viewing insured losses on a cumulative basis since the start of the 21st century, Tropical Cyclone is the costliest global peril. Like Earthquake, it is largely driven by extreme loss years and single catastrophic events, as opposed to SCS losses, which are driven by an increasing frequency of events. Approximately 40 percent of cumulated losses from Tropical Cyclone were caused by only five Atlantic Hurricanes — Katrina, Ian, Irma, Ida and Sandy. On the other hand, the number of costly SCS events outpaced other perils by a large margin.

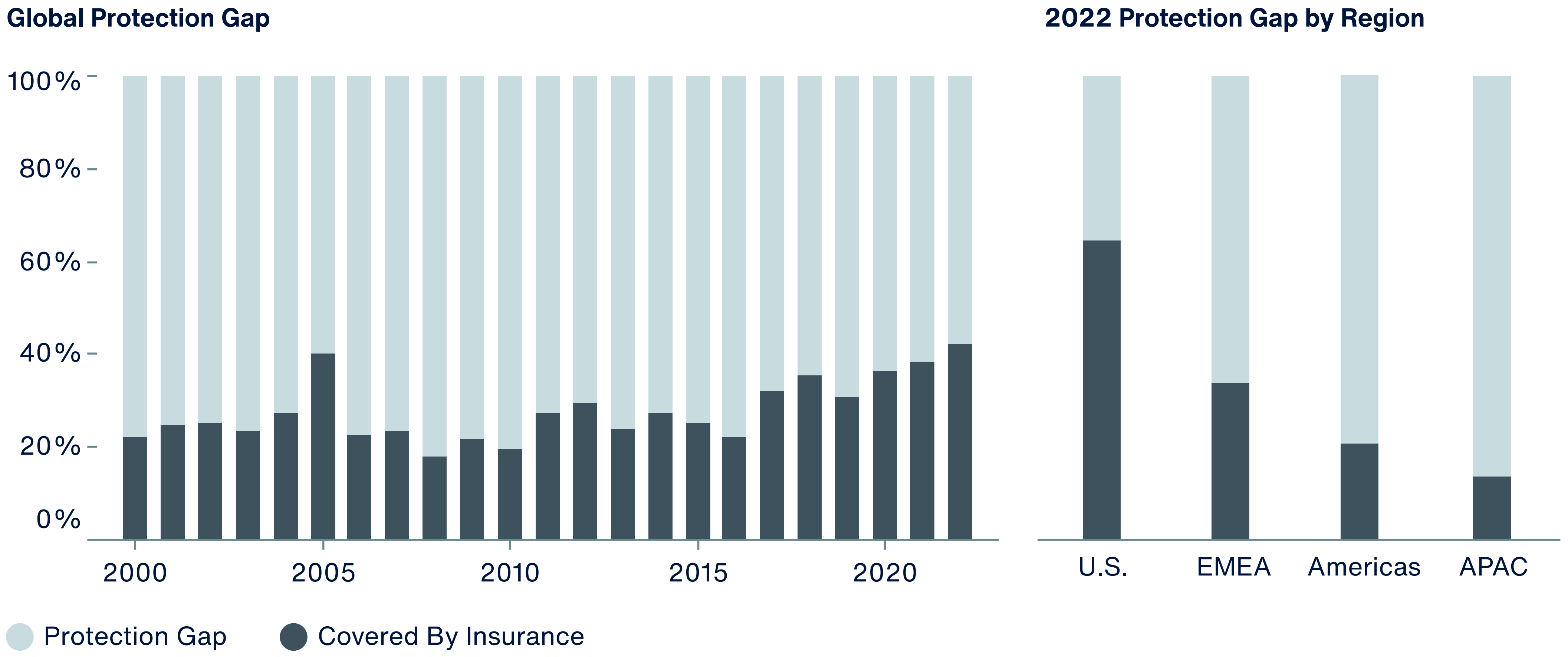
Exhibit 12: Global Insured Losses by Peril (2022 $ bn)



Data: Catastrophe Insight, Aon

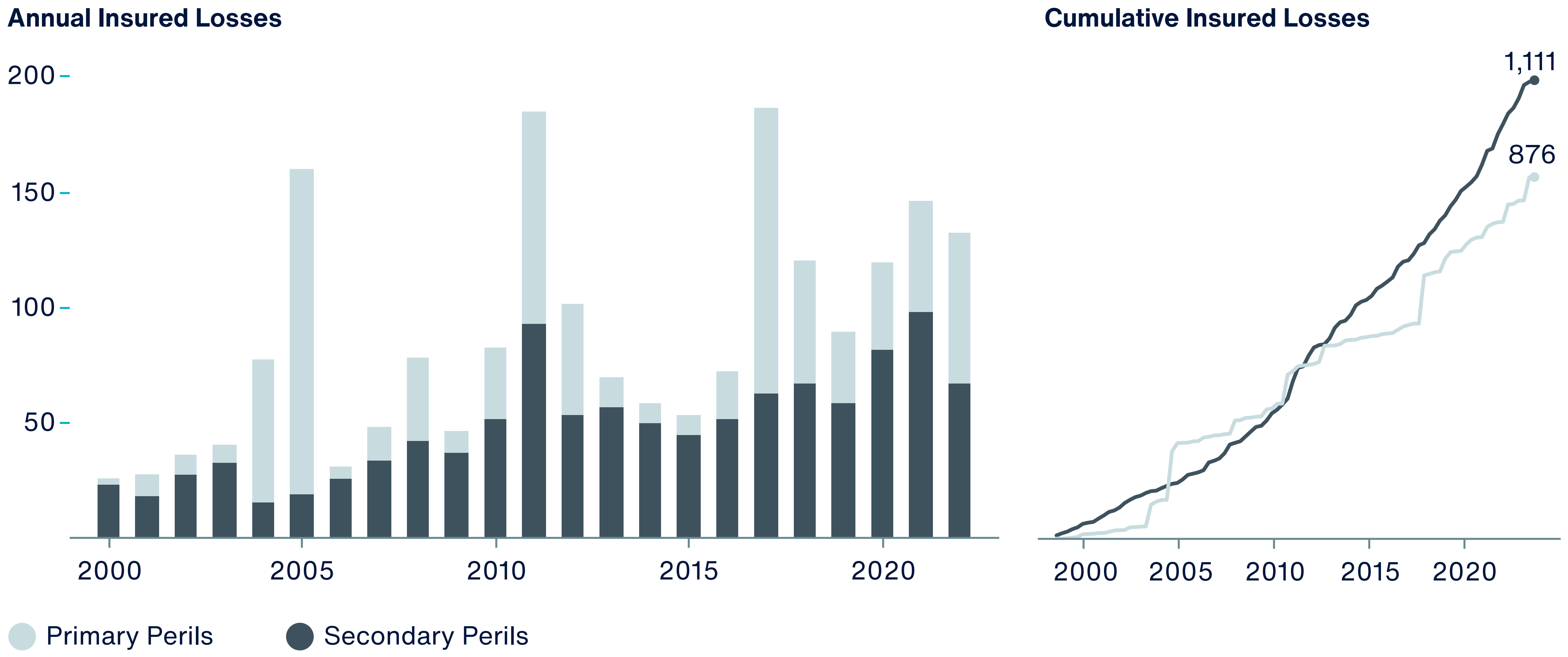
Tropical Cyclone was the costliest peril globally, followed by SCS. Notably, Drought had its second costliest year after 2012 due to elevated losses in both the U.S. and Europe. The only other peril that was above the long-term averages and medians was European Windstorm. Losses from the latter on an inflation-adjusted basis were the highest since 2013 and Windstorm Eunice became the costliest individual windstorm since Xynthia in 2010. The entire sequence of windstorms on February 16 to 21 — Dudley, Eunice and Franklin — resulted in aggregated losses of $4.7 billion.

Exhibit 13: Global Protection Gap



Data: Catastrophe Insight, Aon

Exhibit 14: Insured Losses from Primary/Secondary Perils (2022 $ bn)



Data: Catastrophe Insight, Aon

Closing the protection gap remains a global challenge. However, preliminary data shows that 2022 likely saw one of the lowest protection gaps on record with roughly 42 percent of losses covered; this is only matched by 2005. In both years, costly disasters occurred in the U.S. and losses in less-developed markets were below average. Since 2017, the protection gap was always under 70 percent, which previously only occurred in 2005.

While the natural perils traditionally considered as primary or peak (Tropical Cyclone, Earthquake and European Windstorm) have resulted in the highest individual event losses this century, aggregated losses from the other types of disasters have already outpaced their cumulative costs. One of the factors that are driving this shift is the consistent increase of SCS losses.

Global Fatalities Remain Below Average for 12 Years in a Row

Exhibit 15: Top 10 Human Fatality Events

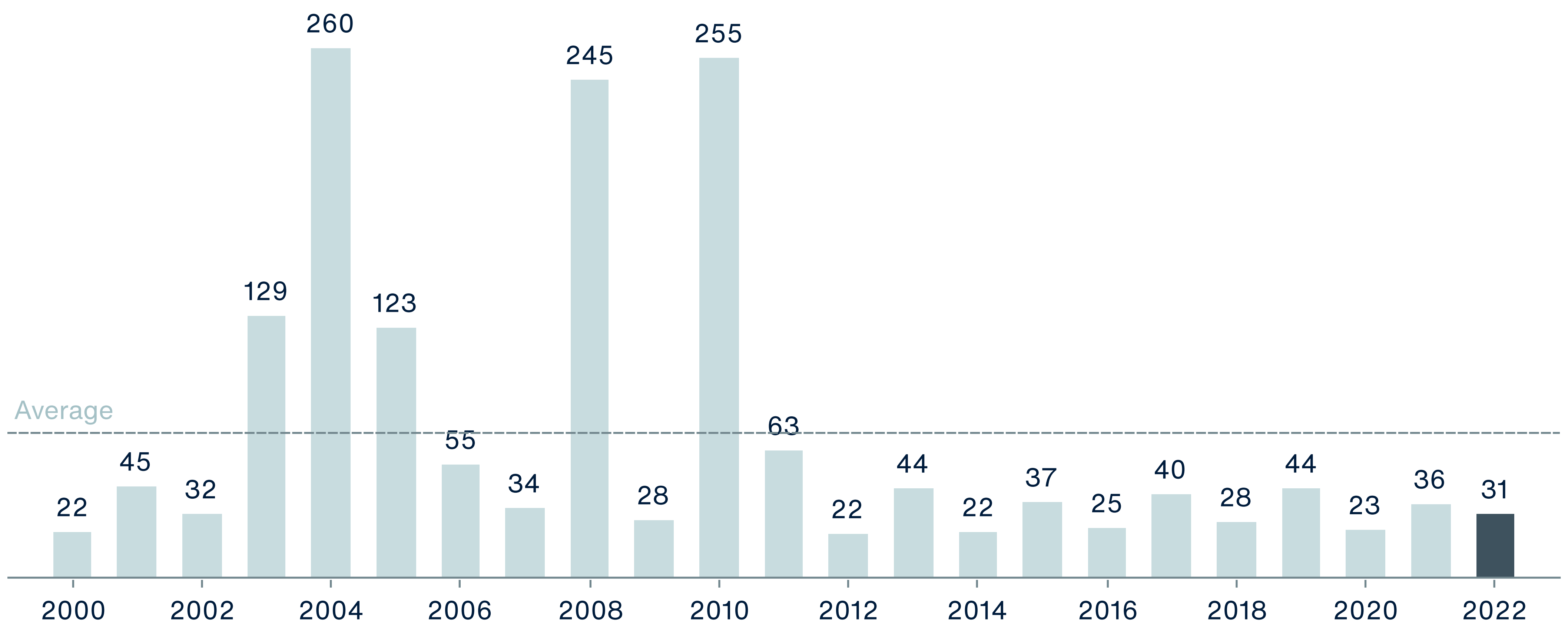
Date	Event	Location	Deaths	Economic Loss ($ billion)
07/10-07/20	**Heatwave**	Western, Southern and Central Europe	**15,450**	N/A
06/13-06/19	**Heatwave**	Western, Southern and Central Europe	**3,750**	N/A
05/17-10/31	**India Seasonal Floods**	India	**2,135**	4.2
06/14-10/30	**Pakistan Seasonal Floods**	Pakistan	**1,739**	15.0
06/22	**Earthquake**	Afghanistan, Pakistan	**1,163**	0.1
07/01-10/31	**Nigeria Seasonal Floods**	Nigeria	**660**	2.3
11/21	**Cianjur Earthquake**	Indonesia	**603**	0.4
04/08-04/15	**KwaZulu-Natal Floods**	South Africa	**455**	3.6
02/15-02/16	**Rio de Janeiro Floods**	Brazil	**232**	<0.1
04/08-04/13	**Tropical Storm Megi**	Philippines	**214**	<0.1
All other events			**~4,900**	287.0
Totals			**~31,300**	**313 billion**

Approximately 31,300 people lost their lives due to global natural catastrophe events in 2022, which was well below the 21st century average (73,200) and median (38,900). Roughly two thirds of these fatalities can be directly attributed to heatwaves that occurred in Europe in June and July. It is worth noting that heatwaves in China and other countries also resulted in significant health impacts, yet reliable estimates will not be released until later in 2023. Thousands of people were also killed in South Asia as a result of significant seasonal floods in India and Pakistan. Other notable floods included events in Nigeria and South Africa, as well as in China and Brazil.

The number of annual human casualties has shown a notable decline in recent decades. The improvements in forecasting, evacuation planning and strategies, increased public awareness and better building practices have all played a key role. Asia, Africa and South America show the greatest improvements with reduced fatalities.

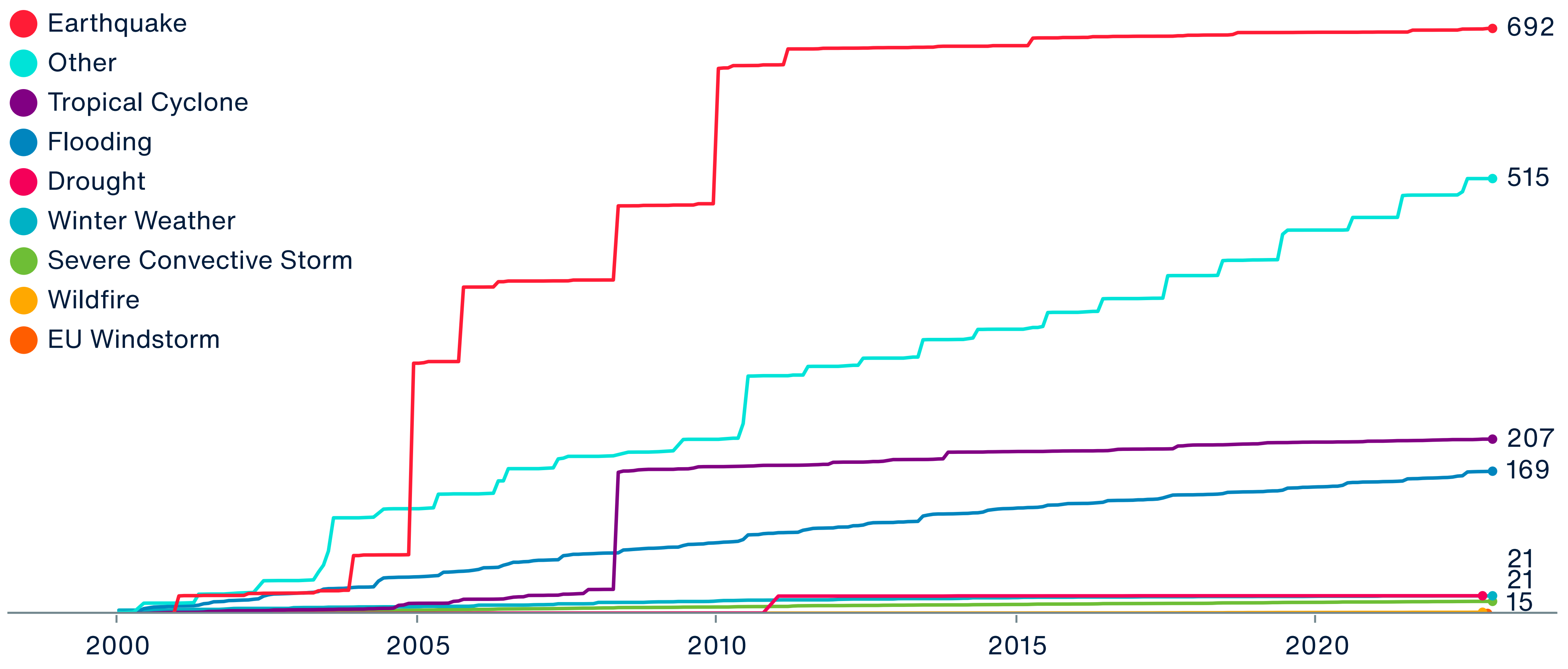
Please note that confirmed fatalities and missing people presumed dead are included in the totals.

Exhibit 16: Global Natural Disaster Fatalities (thousands)



Data: Catastrophe Insight, Aon

Exhibit 17: Cumulative Global Fatalities by Peril (thousands)



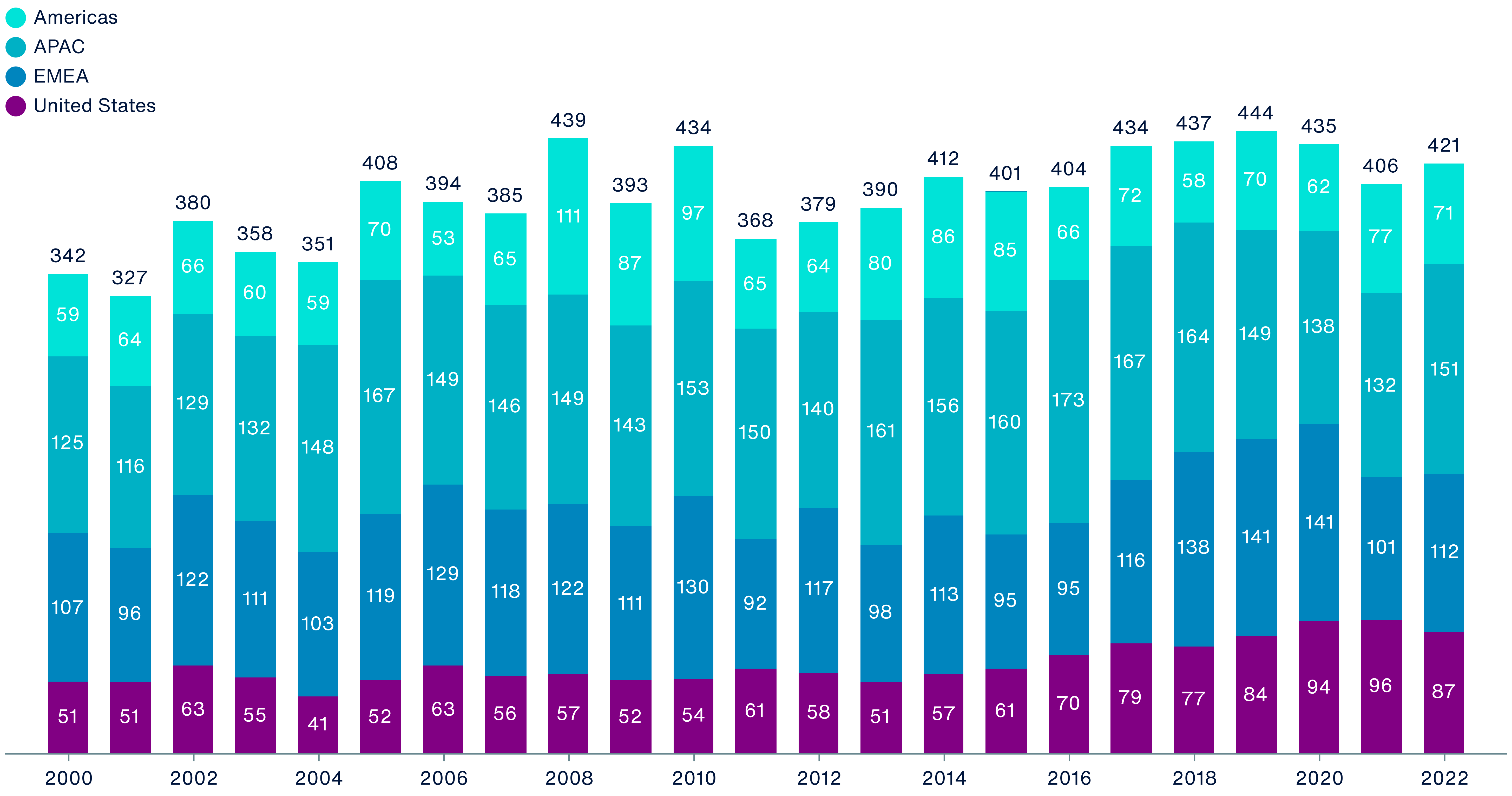
Data: Catastrophe Insight, Aon

Earthquake peril is responsible for the largest part of disaster-related fatalities in the 21st century. This human toll is mainly driven by individual catastrophic events in the Indian Ocean (2004), Haiti (2010), Pakistan (2005), China (2008) and Iran (2003). These five events alone account for more than 600,000 fatalities, or roughly a third of all deaths attributed to natural disasters since 2000. This statistic now accounts for heatwave-related fatalities in a more systematic manner and yearly totals are notably higher (see section on Heatwaves in the next chapter).

On the other hand, steadily increasing cumulative death toll from heatwaves (represented in the "Other" category) underlines the growing significance of perils that most importantly pose a threat to human health and wellbeing, and not necessarily a physical risk to property and infrastructure.

Natural Disasters Defined: Number of Events on the Rise

Exhibit 18: Number of Relevant Natural Disaster Events



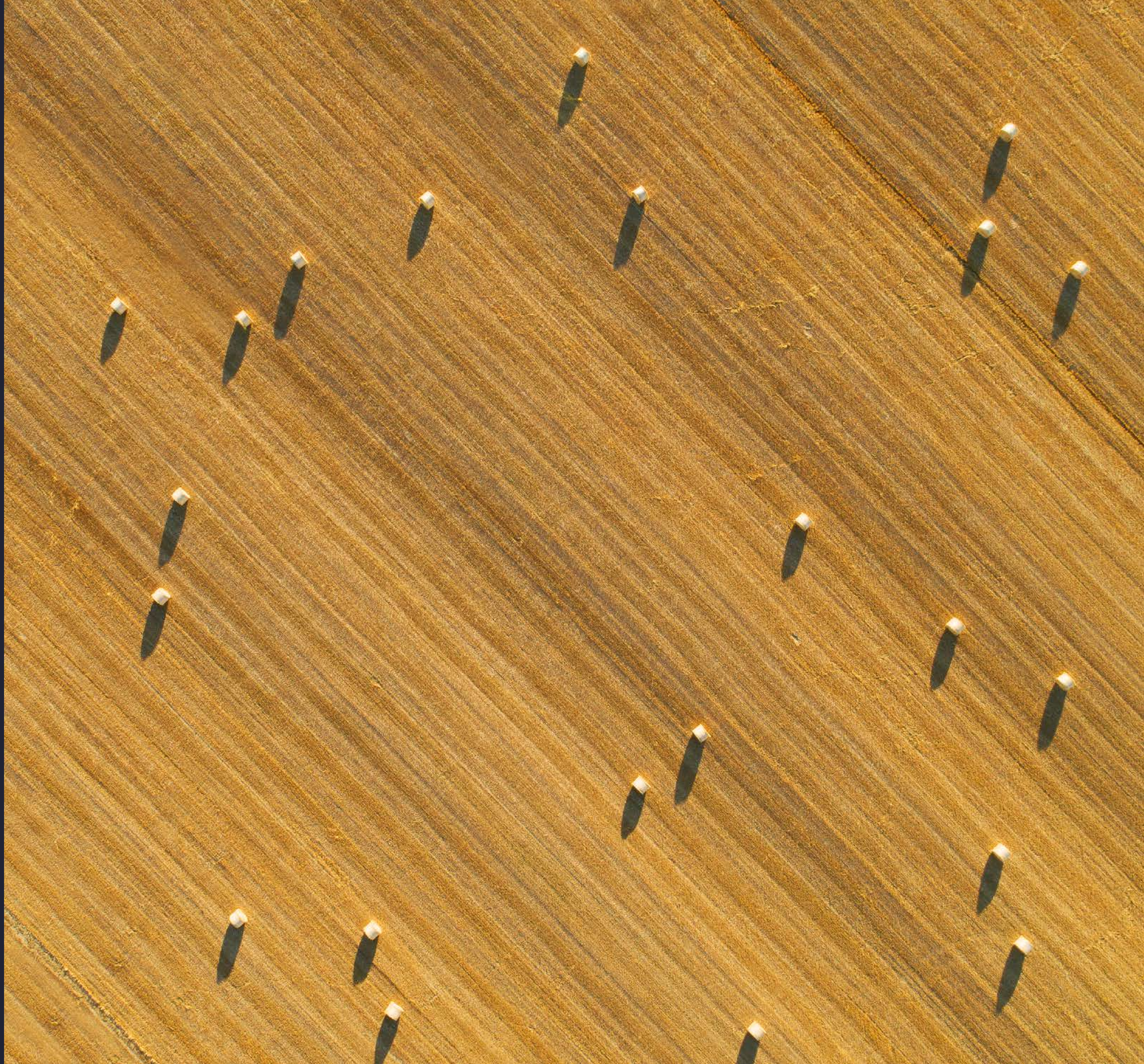
Data: Catastrophe Insight, Aon

An event must meet at least one of the following criteria to be classified as a natural disaster in the Aon's Catastrophe Insight Database:

- Economic Loss: $50 million
- Insured Loss: $25 million
- Fatalities: 10
- Injured: 50
- Structures Damaged or Filed Claims: 2,000

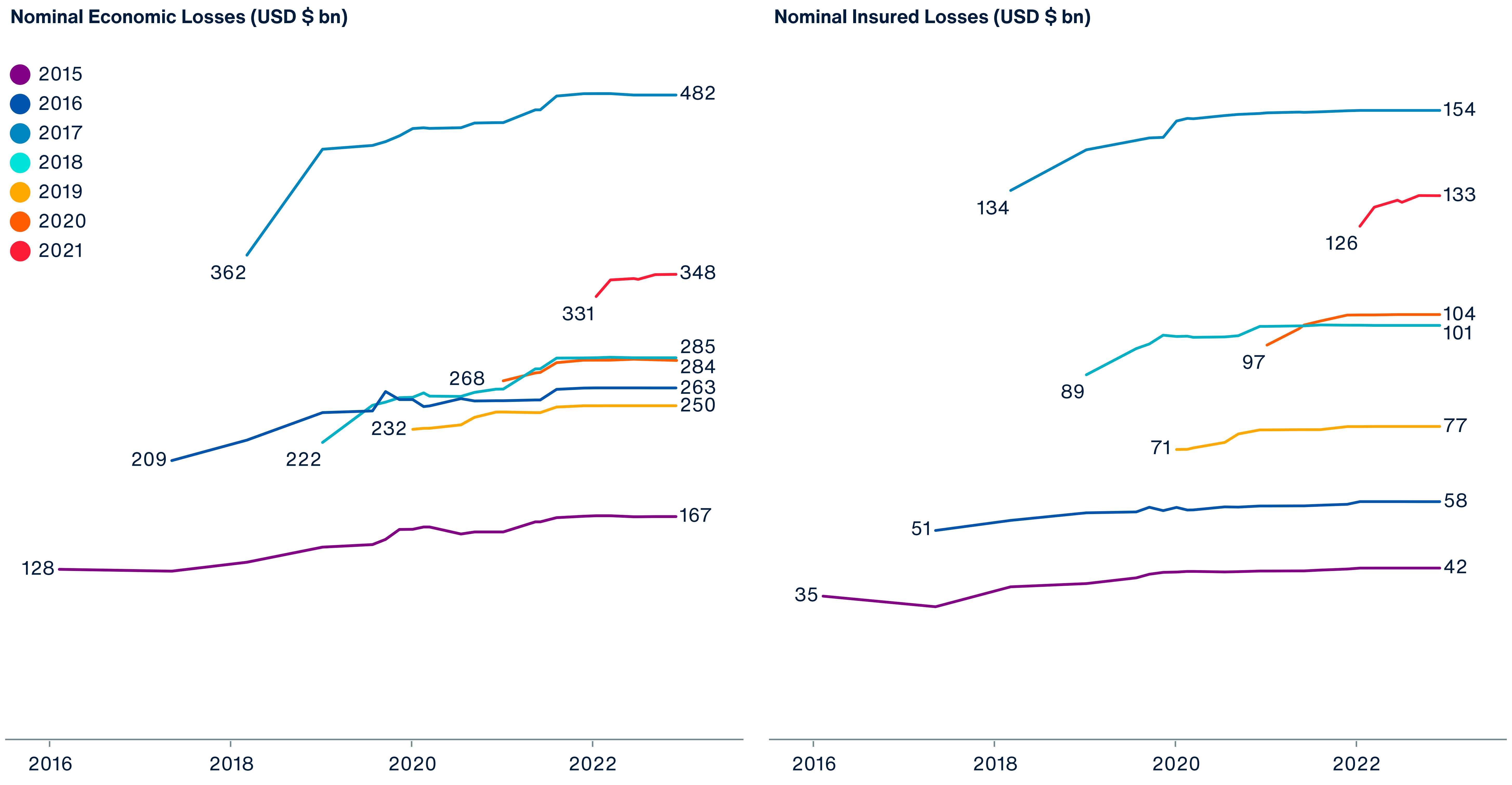
Based on the noted criteria above, there were at least 421 individual natural disasters in 2022, which was slightly above both the average (396) and median (398) since 2000. Additional 2022 events may be added later due to further research and data updates. As typically anticipated given the highest frequency of SCS, flood and tropical cyclones, the highest number of disaster events occurred during the second (133) and third (113) quarters.

Why Robust Historical Data Is Crucial for Identifying Trends



Loss Development and Historical Data Research

Exhibit 19: Revisions of Global Annual Nominal Losses since First Publication



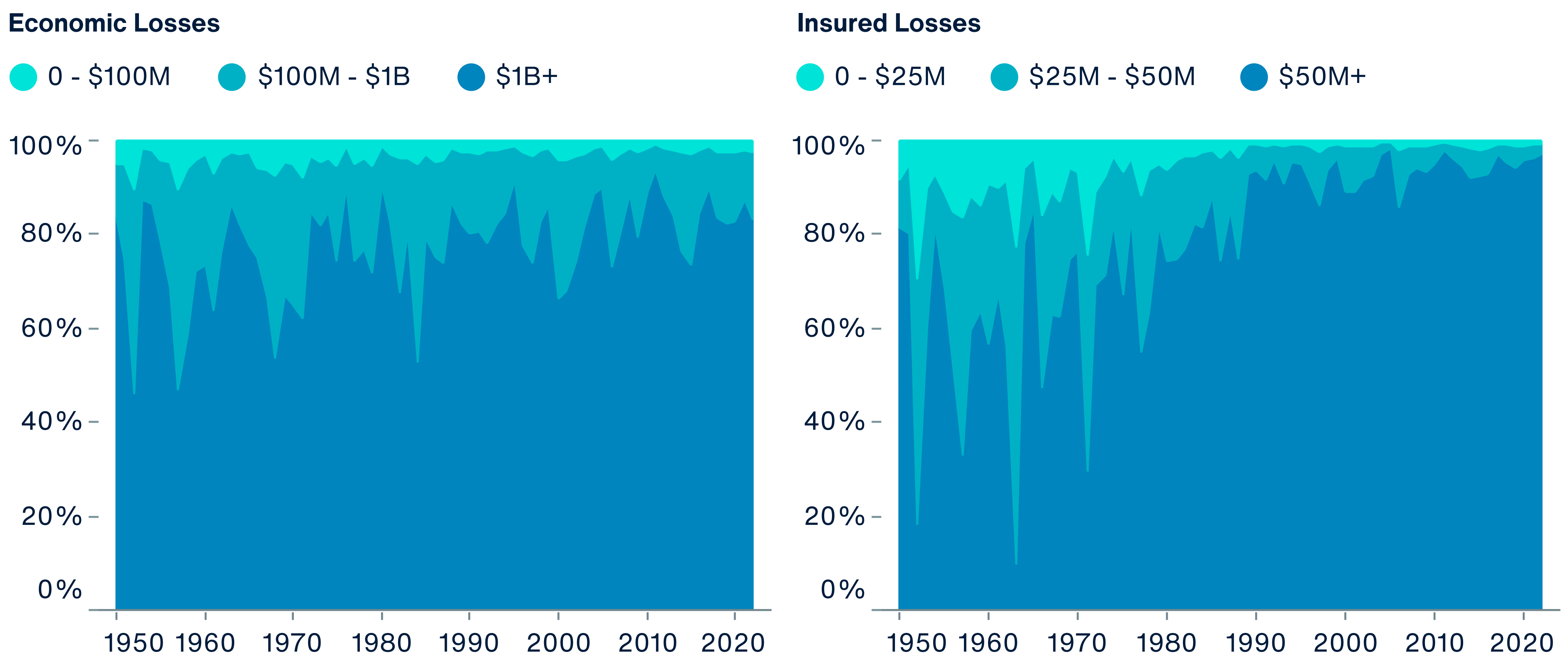
Data: Catastrophe Insight, Aon

Since the release of the 2018 Weather, Climate and Catastrophe Insight Report, Aon's Catastrophe Insight team has utilized a new historical natural disaster dataset. The change introduced many records previously not included in the analysis, largely due to thorough research of various sources, including academic papers and national databases. The change aimed to significantly improve data quality in previously underreported countries, which do not exhibit a breadth of data easily available.

This process helps fill data gaps in many regions around the world. Some countries, like the U.S. and various other developed nations, have much more detailed and prolonged data records available. Most countries, however, do not. This results in incomplete views of historical events beyond a few decades.

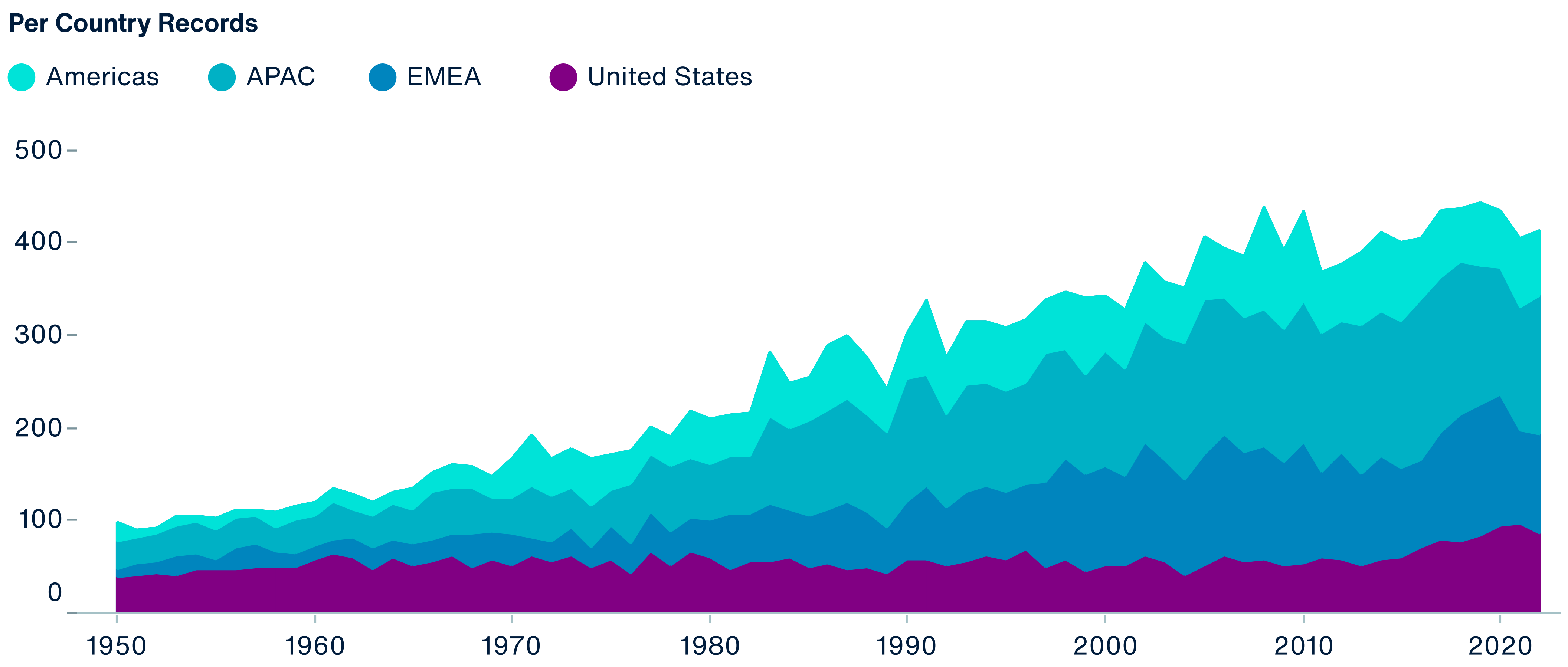
The Catastrophe Insight team also emphasizes updating existing event records as new data is identified. The "final" event loss total can dramatically change from its initial estimation extended over a multi-year period. The combination of topics like loss creep, claims litigation, Assignment of Benefits (AOB), higher replacement costs or demand surge, delayed releases of official damage estimates or agency releases on a quarterly or annual basis can all explain why losses may update years after event occurrence.

Exhibit 20: Portion of Global Disaster Losses by Event Size



Data: Catastrophe Insight, Aon

Exhibit 21: Number of Events by Region



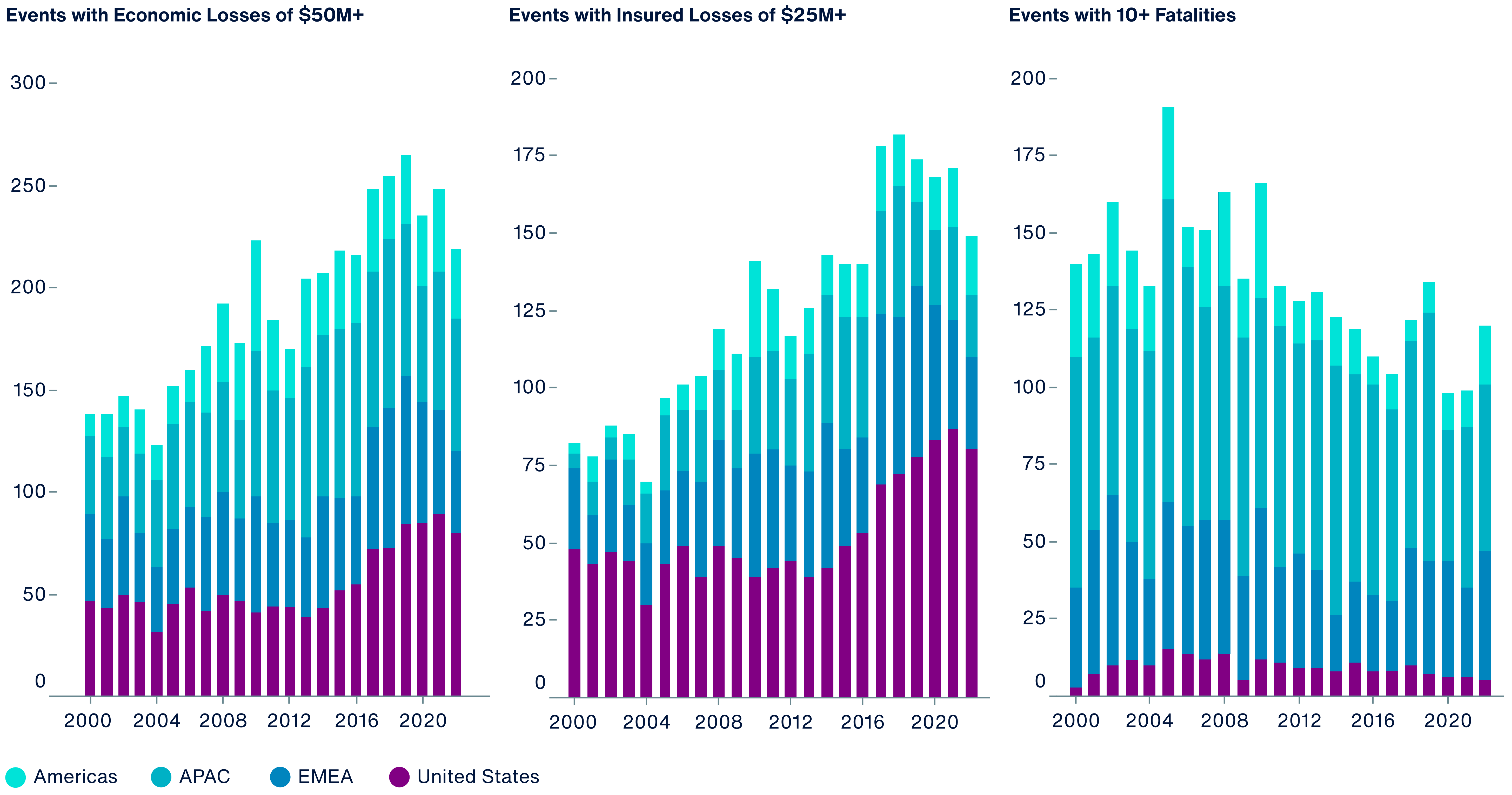
Data: Catastrophe Insight, Aon

It is generally understood that most natural disaster databases show a significant decline in the number of annual global events prior to 1980. While the biggest events are typically captured and are the most important to explain total losses, as captured on Exhibit 20, most small and medium-sized events are often missed. While Aon's data reanalysis process has not completely removed the data gap, it has made major progress in identifying a large portion of events not previously catalogued in other databases.

Along with the addition of events not previously included in the database, a significant effort has been made to ensure a full country-level breakout of event losses. In many instances, the loss breakout helps identify trends beyond the peril aggregate and down to a more regional or localized level. For example, thorough research since 2017 resulted in the increase in China-specific entries from 621 to 1,669. Similarly, number of Canada entries increased from 406 to 968.

Is the Number of Natural Disasters Increasing Globally?

Exhibit 22: Number of Natural Disaster Events Based on Different Criteria



Data: Catastrophe Insight, Aon

The answer to this question depends on how natural disaster is being defined. This is crucial before conducting any meaningful analysis and at least to some extent eliminates biases related to the reporting of events.

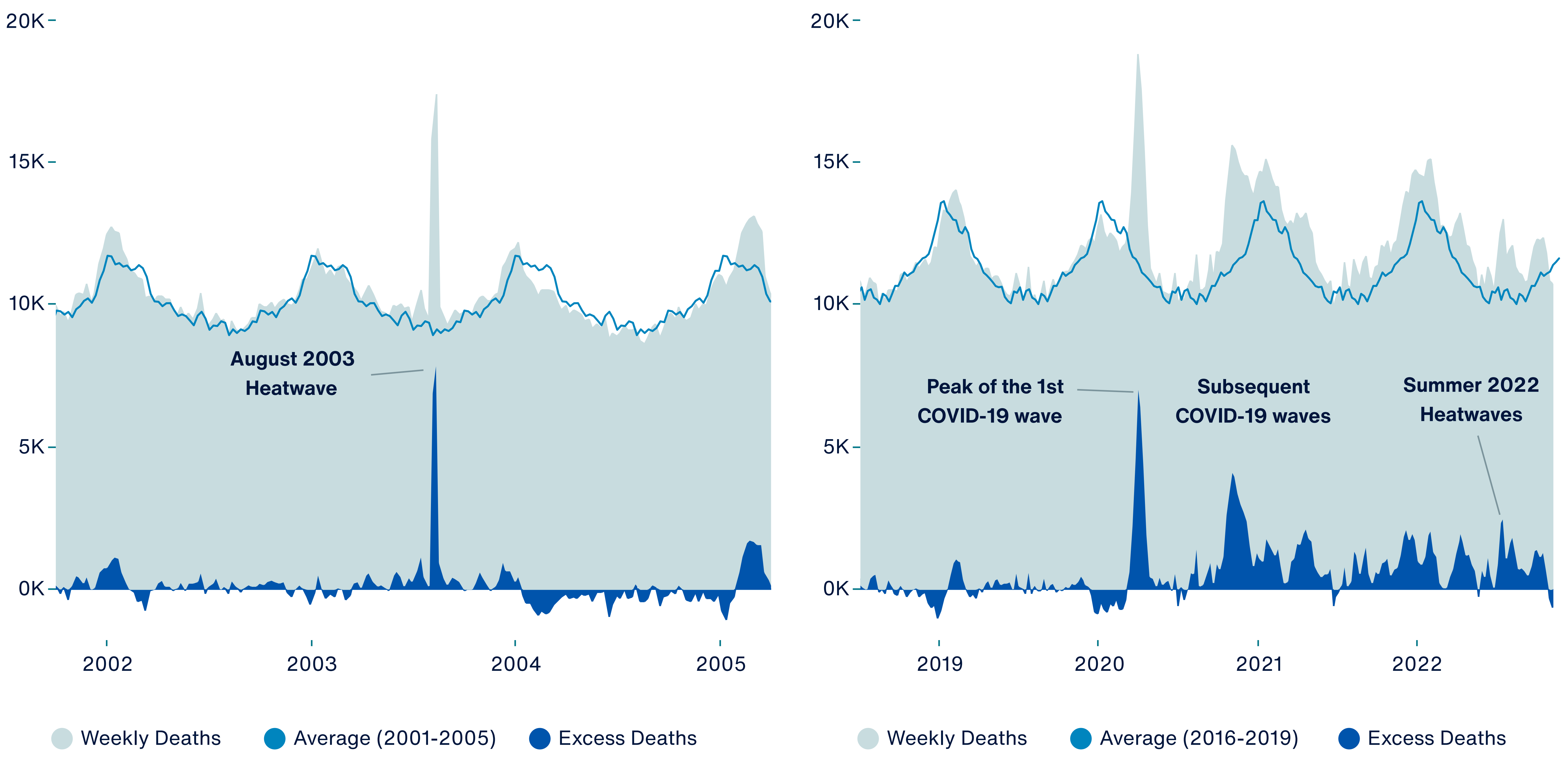
Expanding our knowledge through scientific research and climate modeling can help us determine whether the physical hazard itself is getting worse or not, what are the implications on different types of perils and how this varies across regions.

Looking at disasters as events that cause material and human impact, damage or fatality statistics can be used to define them. It is important to note that socio-economic factors remain the primary driver of an increasing number of damaging events. In 2022, the world human population exceeded 8 billion and since 2000 increased approximately 30 percent. In the same timeframe, the global GDP increased by a staggering 80 percent (in constant prices). Increasing exposure and wealth is expected to result in higher and more frequent losses, even if the hazard remained the same.

Remarkably, natural disasters defined as events that cause a certain number of fatalities has been decreasing globally this century, likely thanks to improving resilience, warning systems, disaster response or adaptation measures.

Heatwaves: Accounting for Climate-Driven Perils

Exhibit 23: Example of Weekly Mortality Data Assessment for France



Data: HMD. Human Mortality Database. Max Planck Institute for Demographic Research (Germany), University of California, Berkeley (USA), and French Institute for Demographic Studies (France). Available at www.mortality.org.
Graphic: Catastrophe Insight, Aon

Many regions of the world experienced severe and prolonged heatwaves in 2022, and their frequency and intensity are anticipated to increase in the coming decades. Catastrophe Insight started accounting for heat-related fatalities in a systematic manner using our own methodology and calculation to assess the heat impact. These assessments were primarily based on mortality data provided by Human Mortality Database (HMD) and methodology established in academic papers. The HMD provides detailed high-quality harmonized mortality and population estimates, particularly for European countries.

Individual heatwaves were identified according to meteorological conditions. Mortality data for the weeks when a heatwave occurred were then compared with average mortality based on previous and following years to estimate excess mortality attributable to the heatwave. Weekly data, when available, also allows the assessment of individual heatwaves throughout the year. Additionally, COVID-19-related deaths, which complicate analysis of heatwaves in 2020-2022, were excluded.

As a result of filling this gap, the number of heat-related fatalities increased by nearly 410,000 — from 90,000 to almost 500,000 deaths.

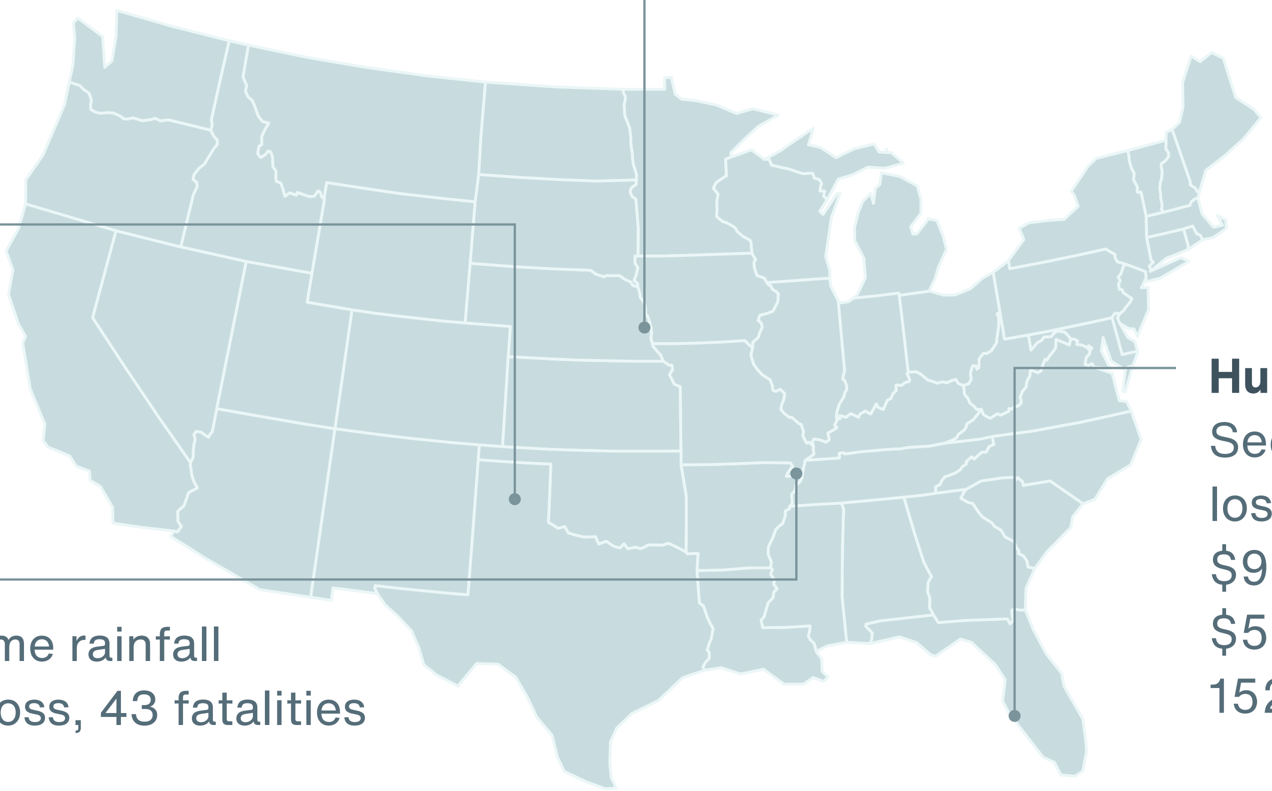
2022 Regional Catastrophe Review

United States

Severe Convective Storm Outbreaks
12 billion-dollar events in total
$37B economic loss,
$29B insured loss

Widespread Drought
Severe drought conditions throughout the year
$16B economic loss,
$8B insured loss

Missouri and Kentucky Flooding
1,000-year flooding triggered by extreme rainfall
$1.4B economic loss, $450M insured loss, 43 fatalities



Hurricane Ian
Second costliest insured loss even on record globally
$95B+ economic loss,
$50-55B insured loss,
152 fatalities

1.39°C (2.5°F)

U.S. summer temperature anomaly; the third-hottest summer (Jun 1-Aug 31) in 128 years

-22.2˚C (-40˚F)

Temperature drop in just 30 minutes, recorded in Cheyenne, WY, on Dec 21

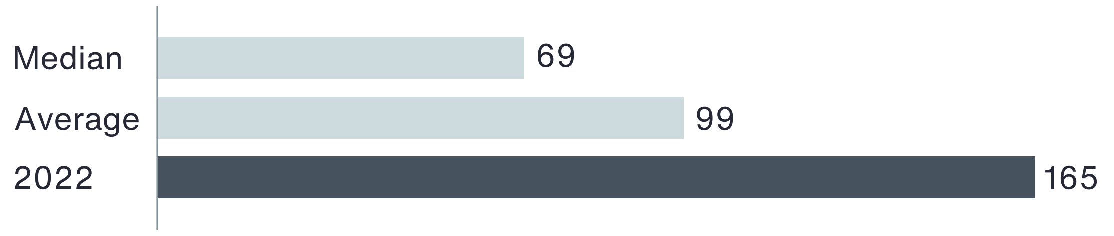
66,255

Number of wildfires across the U.S.; the highest number in 10 years

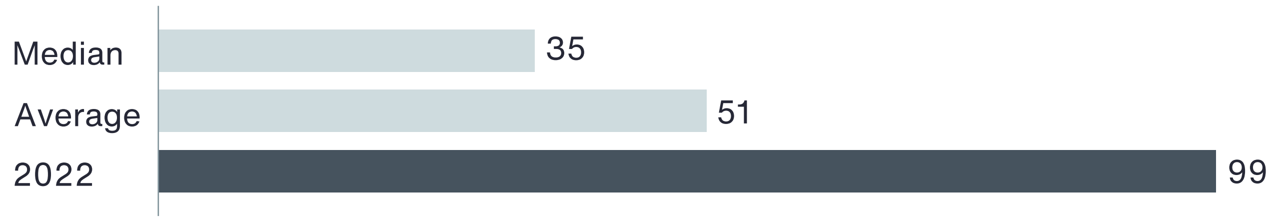
81.2 in (206 cm)

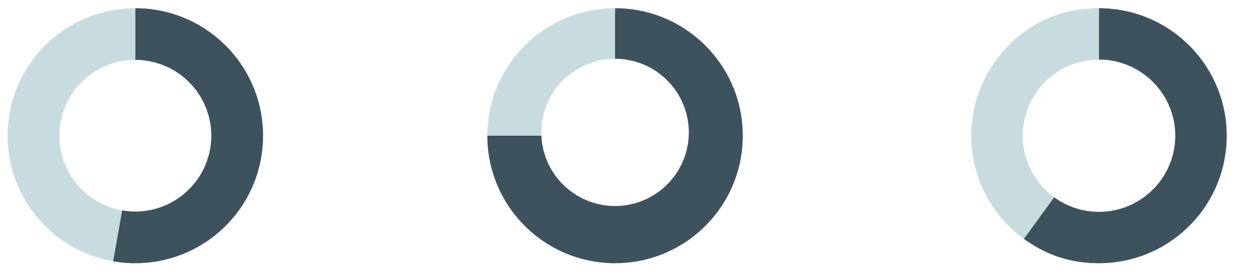
Highest 3-day snowfall accumulation in lake-effect snowstorm reported in Hamburg, NY

Economic Losses ($ billion)



Insured Losses ($ billion)



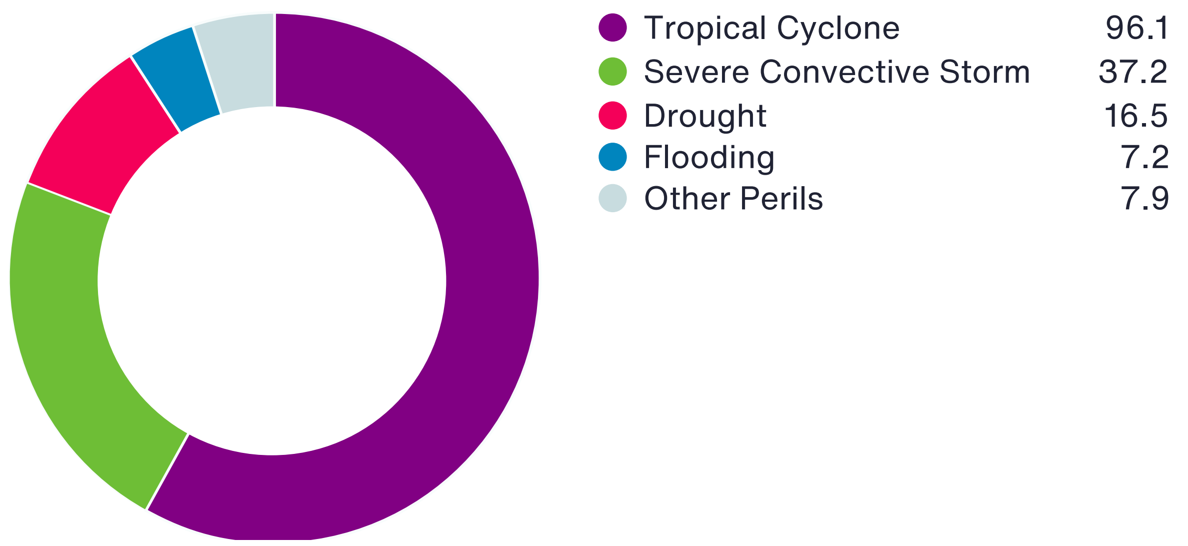


53% of global economic losses

75% of global insured losses

60% of losses covered by insurance

Economic Losses ($ billion)



Economic and insured losses from natural disasters in the U.S. were substantially above the long-term means in 2022. Total economic losses were preliminarily estimated at $165 billion, which was more than 65 percent above the average since 2000 and about 140 percent higher than the the median of the same period. Public and private insurers covered approximately $99 billion, which was more than 90 percent, or approximately 180 percent above the average and median, respectively.

Despite initial expectations of a relatively active season, only two significant tropical cyclones made landfall on the U.S. mainland. One of them, however, ended up being the second costliest event in term of insured loss in recorded history. Hurricane Ian made landfall in Florida on September 28 as a Category 4 storm and caused widespread destruction and 152 deaths. With insured losses well into the tens of billions, the event sent shock waves through the re/insurance industry in an already challenging period.

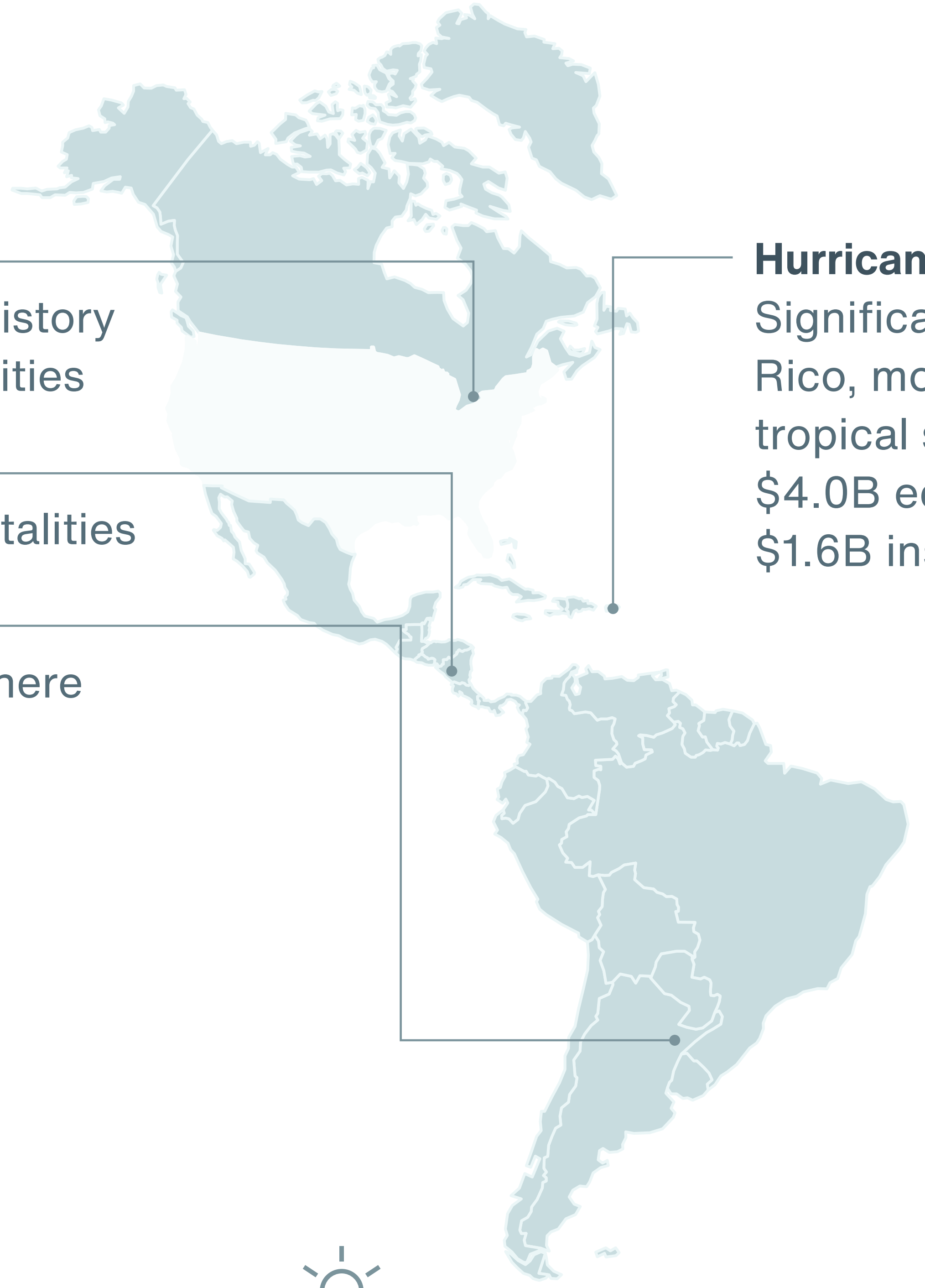
The only other significant tropical cyclone to affect the U.S. in 2022 was Nicole, which impacted Florida in November.

SCS events once again drove substantial part of the total financial toll. The peril generated nearly $29 billion of insured losses in total, which makes 2022 the third costliest year for the peril in the country, only behind 2020 and 2011. There were at least five multi-billion-dollar outbreaks in April, May and June. The costliest event of the year was the outbreak on June 11-17, which resulted in total economic losses of $3.4 billion and insured losses of $2.7 billion.

Late-December Arctic outbreak and winter storms across the central and eastern United States resulted in dozens of fatalities and significant financial loss but did not reach the intensity and extent of the historic freeze event from February 2021.

The Western U.S. continued to experience severe drought conditions, driving the annual nationwide economic losses from the peril well beyond $10 billion. Crop insurance payouts due to drought were at their highest since the historic losses experienced in 2012.

Americas (Non-U.S.)



Southern Canada Derecho
One of the costliest SCS outbreaks in Canada's history
$1.2B economic loss, $0.9B insured loss, 12 fatalities

Hurricane Julia
$760M economic loss, <$50M insured loss, 91 fatalities

South America Drought and Heatwaves
Agricultural losses in Brazil, Argentina and elsewhere
$6.0B economic loss, $1.1B insured loss

Hurricane Fiona
Significant impacts in Puerto Rico, most intense post-tropical storm to hit Canada
$4.0B economic loss,
$1.6B insured loss, 31 fatalities

1,000 km (620 mi)

Approximate length of the May derecho in Canada

41.1°C (106.0°F)

Buenos Aires, Argentina's capital, saw its second hottest day since 1906 during mid-January heatwave

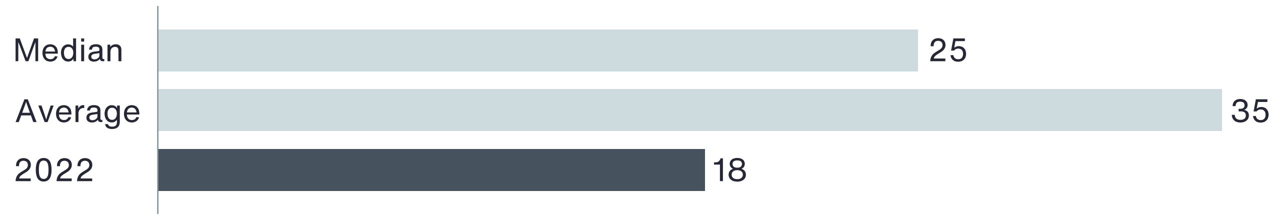
125 mph (201 kph)

Sustained wind speed during Ian's landfall in Cuba on September 27

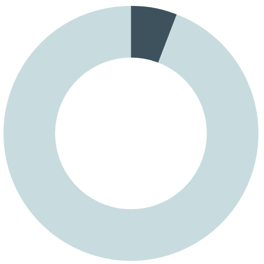
931.6 mbar

Fiona's central pressure during landfall in Canada, breaking national all-time record from 1977

Economic Losses ($ billion)

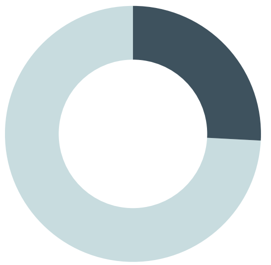


Insured Losses ($ billion)



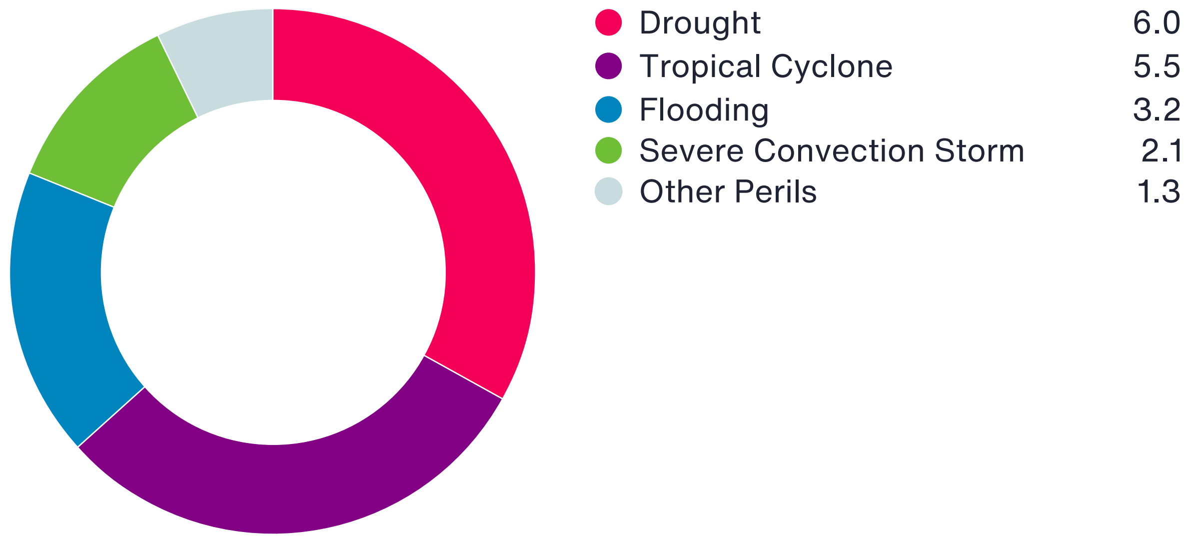
6%
of global economic losses

4%
of global insured losses



26%
of losses covered by insurance

Economic Losses ($ billion)



The overall economic loss total for the Americas (non-U.S.) was roughly $18 billion, of which public and private insurance entities covered $4.8 billion.

Economic losses in 2022 were lower than this century's average ($35 billion), yet this statistic is skewed by extreme loss years of 2010 and 2017. The losses were also lower than the median of the same period ($25 billion). Insured losses were also below average by 20 percent, but 33 percent higher than the median.

While 2021 brought impactful events mainly to Western Canada, main disaster activity in 2022 shifted to the eastern half of the country. Hurricane Fiona became the strongest tropical or post-tropical storm to impact the country, as it brought significant wind-related damage and coastal impacts to the eastern provinces.

On May 21, a significant derecho with a span of approximately 1,000 km (620 mi) impacted the most densely populated area of the country, including major cities in Ontario and Quebec. The storm system became one of the country's costliest SCS outbreaks on record.

Prior to making landfall in Eastern Canada, Fiona brought significant impacts to the Caribbean, and Puerto Rico in particular, causing multi-billion-dollar economic losses to the island severely devastated five years prior by Hurricane Maria.

Julia was another notable tropical cyclone to affect Central America and to some extent also parts of South America. Some of the most severe impacts were reported from Nicaragua.

While much of Brazil continued to face drought conditions at the beginning of the year, multiple notable flooding events impacted the country. In particular, the northeastern states of Pernambuco and Alagoas endured flooding in May and July, while Rio de Janeiro saw deadly flooding with 232 fatalities in February.

Significant drought losses were not limited to Brazil and were also reported from other Latin American countries, including Mexico and Argentina.

EMEA (Europe, Middle East and Africa)

February Windstorm Series
Windstorm Eunice became the costliest individual storm since 2010
$6.2B economic loss, $4.7B insured loss, 26 fatalities

European Drought and Heatwaves
Severe drought with substantial losses in agriculture, amplified by major, deadly heatwaves in June and July
$22.0B economic loss, $3.0B insured loss, 19,200 fatalities

Nigeria Seasonal Floods
Severe floods affected more than 4.4 million people across Nigeria
$2.3B economic loss, <$100M insured loss, 660 fatalities

KwaZulu-Natal Floods
One of the deadliest and costliest flood events on record in South Africa
$3.6B economic loss, $1.8B insured loss, 455 fatalities

40.3°C (104.5°F)

Highest national temperature ever recorded in the United Kingdom; record set on July 19

196 kph (122 mph)

Wind gust recorded at The Needles during Windstorm Eunice, highest on record for England

6

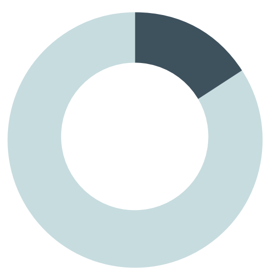
Number of cyclones that affected Madagascar and caused 220 deaths

1.5M ha (3.7M acres)

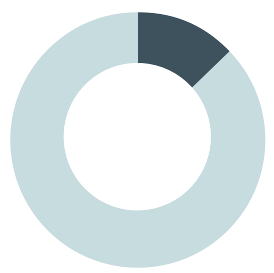
Total area burnt by forest fires in Europe, Middle East and North Africa

Economic Losses ($ billion)

Insured Losses ($ billion)



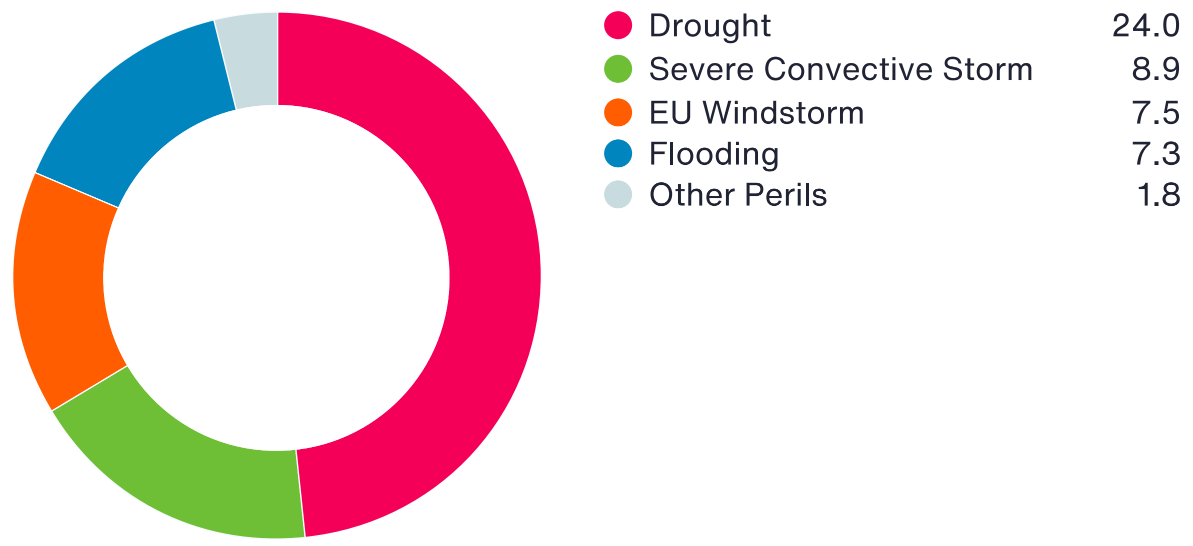
16%
of global economic losses



14%
of global insured losses

36%
of losses covered by insurance

Economic Losses ($ billion)



Total economic losses from natural disasters in EMEA region in 2022 reached approximately $50 billion. This was roughly 12 percent above the average since 2000 ($44 billion), yet significantly lower than 2021, which ranks as the fifth costliest year on record for the region with total losses of $82 billion.

Insurers covered $18 billion, which was nearly 36 percent of total economic losses and well above the long-term average ($12 billion) and median ($11 billion).

The most significant event for the insurance industry in Europe was a sequence of windstorms that affected the continent in February. Storms Dudley, Eunice and Franklin resulted in aggregated insured losses of $4.7 billion. Storm Eunice was the most intense of the three and became the costliest individual storm to affect Europe since Xynthia in 2010. European Windstorm losses were thus well above average, despite the lack of any significant storms and practically negligible losses in the fourth quarter of the year. The quarter was the quietest first half of a windstorm season in this century.

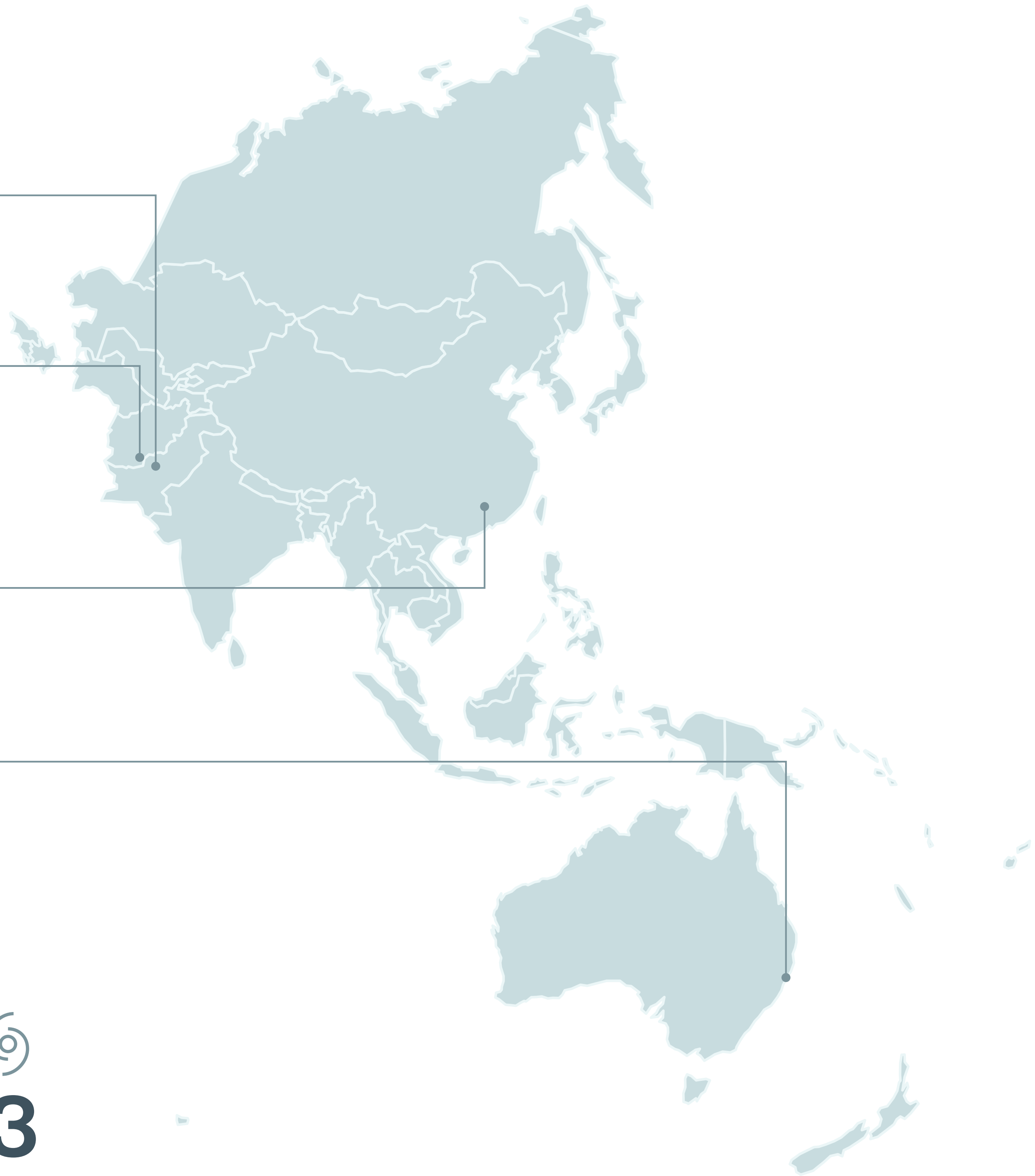
Severe Convective storms also resulted in above-average losses for insurers and the peril had the third costliest year on record, only behind 2013 and 2021. These losses were largely driven by significant hailstorms that impacted France in May and June.

Drought conditions affected much of Europe and were amplified by deadly heatwaves in June and July, when numerous temperature records were broken, including the record high temperature in the United Kingdom. Aggregated drought-related impact, including agricultural losses or property damage due to land subsidence, reached more than $22 billion. Severe drought also continued to affect the Horn of Africa, amplifying the humanitarian crisis in the region.

Other parts of the African continent experienced notable flooding events. In particular, deadly floods in the KwaZulu-Natal Province, including the city of Durban, resulted in 455 fatalities and multi-billion-dollar losses. The floods became the costliest event for the national insurance industry on record.

Widespread seasonal flooding also impacted several countries in West Africa, notably Nigeria, affecting millions of people.

APAC (Asia and Pacific)



Pakistan Floods
Severe monsoonal floods affected much of the country
$15B economic loss, 1,739 fatalities

Afghanistan and Pakistan Earthquake
Deadliest tremor of 2022 and the deadliest in Afghanistan since 1998
$120M economic loss, 1,163 fatalities

China Drought and Heatwave
Record number of heatwave days
$ 7.6B economic loss

Queensland and New South Wales Floods
Costliest event on record for Australian insurance sector
$8.0B economic loss, $4.0B insured loss, 22 fatalities

+180% and +243%

Rainfall anomalies in Pakistan as the country recorded its wettest July and August since 1961

3

Number of super typhoons in 2022 (Hinnamnor, Nanmadol, Noru)

2,530 mm (99.6 in)

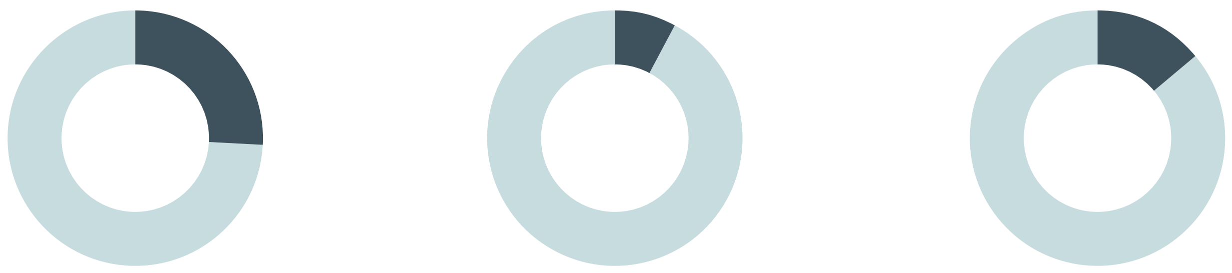
Wettest year on record for Sydney, Australia

40.9°C / 105.6°F

Hottest day on record in Shanghai since records began in 1873 (July 14)

Economic Losses ($ billion)

Insured Losses ($ billion)

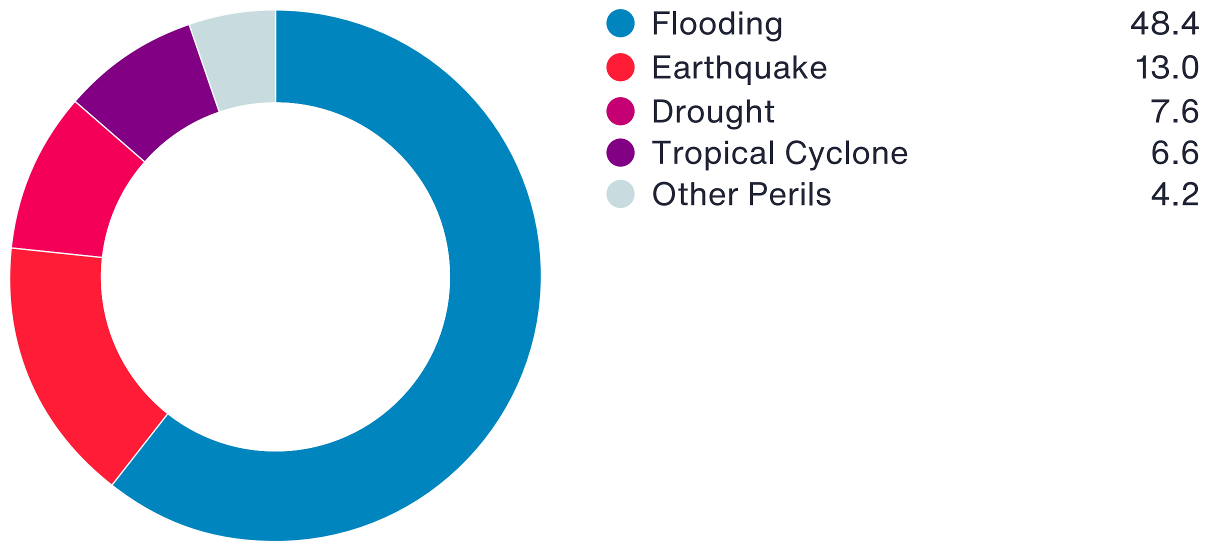


26% of global economic losses

8% of global insured losses

14% of losses covered by insurance

Economic Losses ($ billion)



Total economic losses in the APAC region in 2022 reached $80 billion with a substantial protection gap of 86 percent. Flood losses continued to maintain dominance as the costliest peril for the third consecutive year, accounting for more than 61 percent of the loss total. Much of the flood losses in 2022 occurred in South Asia, where the insurance penetration remains very low.

Economic losses were 35 percent lower than the average and 21 percent below the median of the 21st century.

Insured losses in the APAC region reached approximately $11 billion and were notably below the average ($15 billion), yet as the statistic is skewed by an outlier year of 2011, losses were 18 percent higher than the median. Roughly a third of the APAC losses were related to catastrophes in Australia.

Widespread flooding in Queensland and New South Wales in February and March resulted in $8 billion of economic and $4 billion of insured losses. The event thus became the costliest event for the local insurance sector on record on an inflation-adjusted basis.

In Asia, flooding remained a recurring threat with annual losses exceeding $30 billion every year since 2010. Many places saw record rain and significant flooding in 2022 — Pakistan, India, southern China and South Korea.

In particular, the South Asia floods resulted in $19 billion economic loss and flooding in China contributed another $16 billion.

Tropical cyclone losses for Asia and Oceania were 75 percent and 91 percent below their 21st century averages, respectively. This greatly contributed to the relatively low natural disaster losses for 2022. Number of fatalities from tropical cyclones were also lowest in at least 66 years. This is not only a result of below-average activity, but also improved disaster response and adaptation measures.

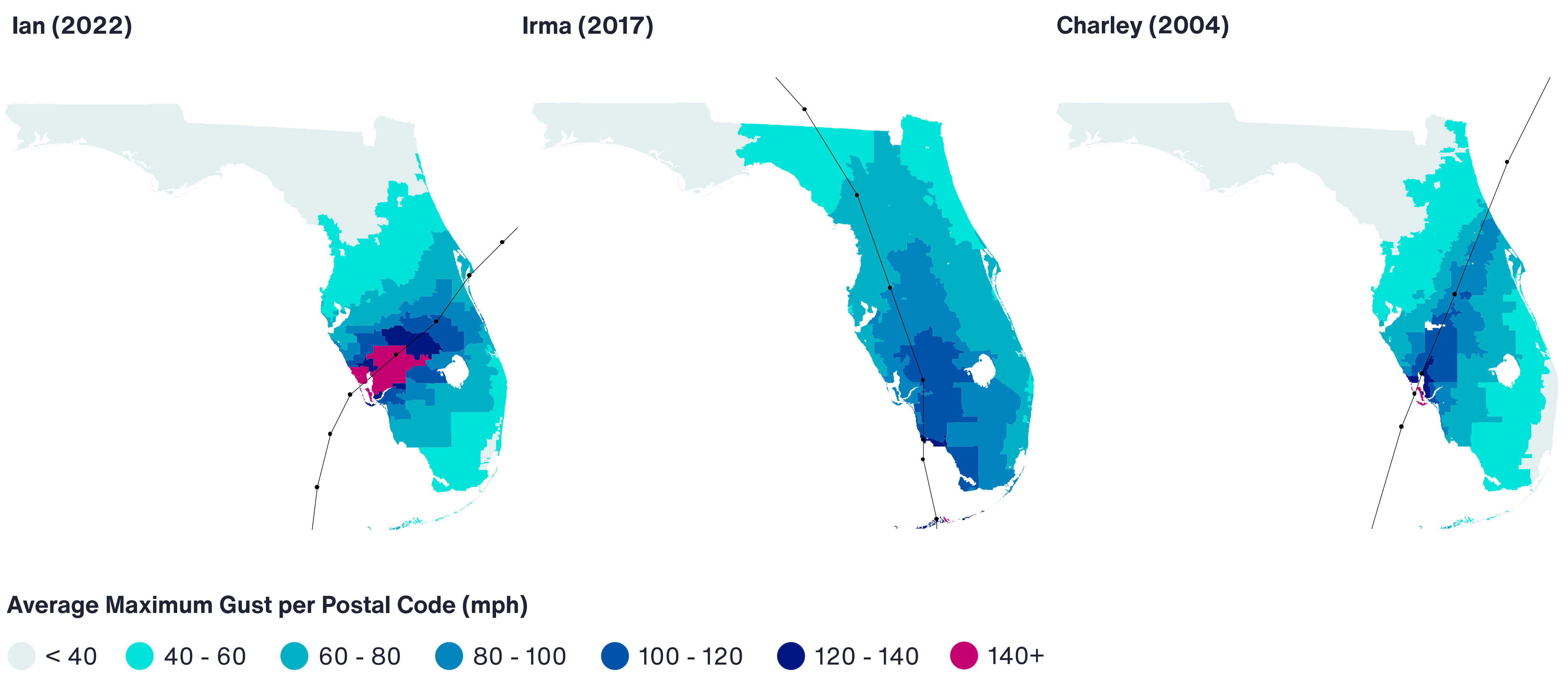
The APAC region was rocked by several large earthquakes in 2022. Nearly 2,000 fatalities were reported and at least 300,000 homes were damaged in total, most notably from the earthquakes in Afghanistan, Pakistan, Indonesia, China, the Philippines and Japan.

High temperatures hit India and Pakistan early in March, leading to the hottest March for both countries. In Japan, a record number of people were admitted to hospitals due to heatwaves, which followed an early end to the plum rain season. China had its second driest summer and most extensive and longest heatwave on record.

2022 Natural Peril Review

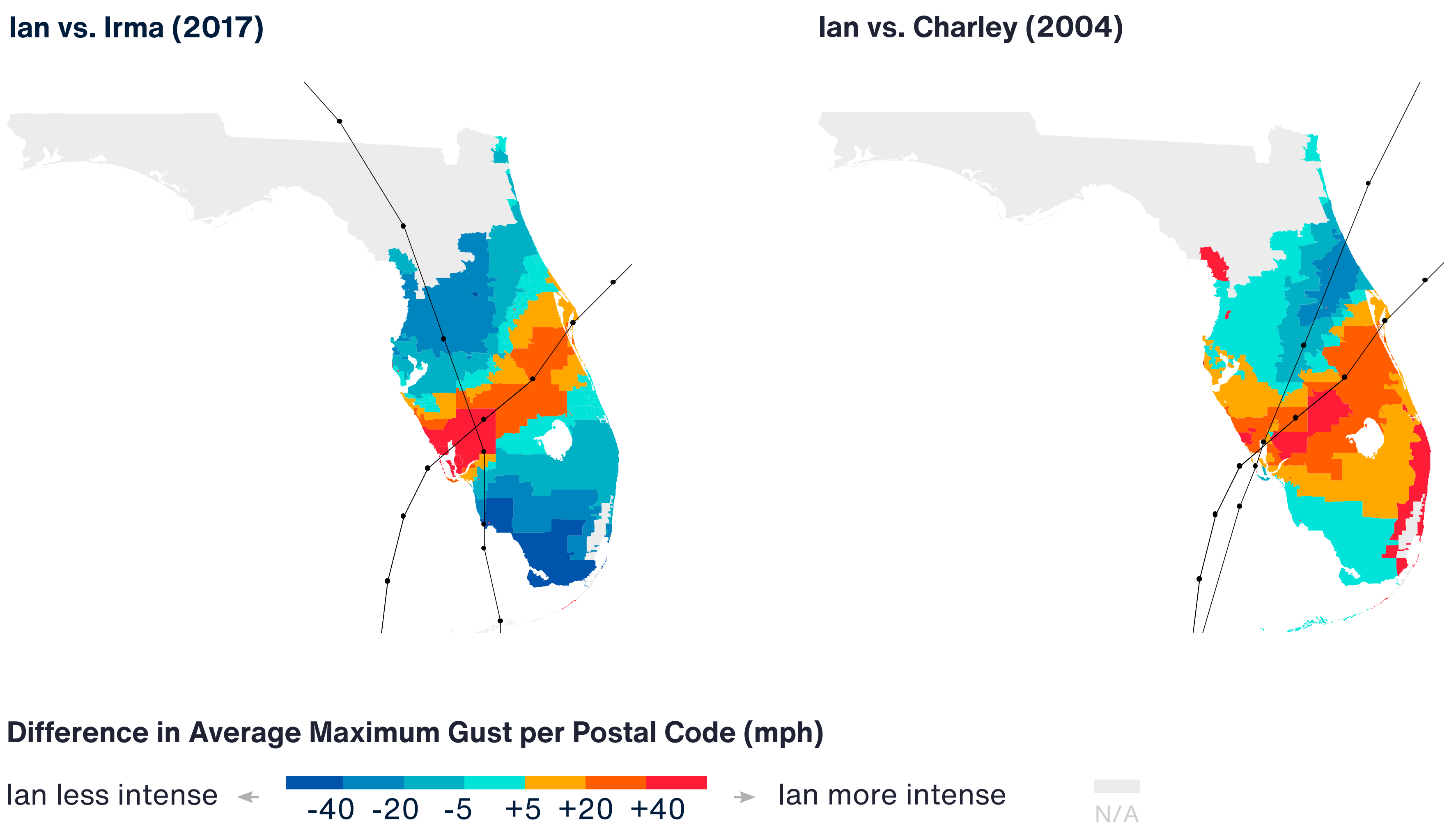
Hurricane Ian Second Only to Katrina For Insured Loss

Exhibit 24: 2022 Wind Footprints of Hurricanes Ian, Irma and Charley



Data: Impact Forecasting, NOAA

Exhibit 25: 2022 Comparison of the Wind Footprints



Data: Impact Forecasting, NOAA

Hurricane Ian made its devastating landfall in southwestern Florida on September 28 and resulted in tremendous damage across the peninsula, with additional damage incurred later in the U.S. Southeast. The storm tied as the fifth strongest hurricane to make landfall in the U.S. inflicting one of the highest damage totals (>$95 billion) in Florida. Ian became the second costliest insured loss event on record globally, surpassed only by Hurricane Katrina (2005). Apart from wind damage, Ian also resulted in severe storm surge, aided by the shallow bathymetry off the coast of southwestern Florida. Low pressure and Category 4 winds pushed a 10 to 15 ft (3 to 4.6 m) surge inland.

Hurricane Ian's wind footprint can be compared to those of hurricanes Irma (2017) and Charley (2004). While Ian was characterized by the highest landfall intensity out of the 3 storms, it affected a smaller portion of Florida than Irma. At the same time, it retained major hurricane status further inland. While Hurricane Charley (2004) impacted Florida with a similar intensity and made landfall in almost the same location as Ian, its overall impact differed due to different storm characteristics, structure, interaction with land, as well as other factors.

Hurricane Ian's devastating impact provided a valuable lesson for communities in vulnerable areas to take proactive steps to protect their homes and businesses.

Florida's enhanced building codes proved effective in mitigating damage from Hurricane Ian — serving as a success story for other states similarly vulnerable to hurricanes. Commercial and residential properties with mitigation measures such as flood vents, updated roofs and hurricane shutters inherent to their construction were able to withstand the storm's wrath and limit damage.

Eight Atlantic hurricanes formed in 2022. Only two attained major hurricane status (Category 3+): Fiona and Ian. Despite an above-average hurricane season suggested by most forecast, the 2022 Atlantic Hurricane season eventually saw a near normal number of named storms (14). Overall seasonal activity still fell within NOAA's lower-bound estimates. This season is the first in eight years not to have a pre-season named storm before June 1, and tropical cyclone activity further ceased between July 3 and August 31 due to increased vertical wind shear, suppressed upper-tropospheric moisture, and the advection of the Saharan dust layer. The Accumulated Cyclone Energy (ACE), a metric that accounts for storm and/or seasonal intensity and longevity, ended up at 95 for the Atlantic Basin; 22 percent below the 1991-2020 average.

Hurricane Nicole was the only other hurricane to make landfall in the mainland United States in 2022, as it landed in North Hutchison Island, Florida, as Category 1 storm.

Hurricane Fiona, also a Category 1 storm, resulted in significant damage in Puerto Rico and continued to strike eastern Canada as a post-tropical cyclone.

Eastern Pacific

The 2022 Eastern Pacific Hurricane season was slightly more active compared to 2021, with above-normal number of named storms (19), ten hurricanes, and four major hurricanes. The aggregate ACE was 116.5, up over 20 units from last year. The 2022 season finally saw an end to the consecutive streaks of November named storms.

Most storms in the Eastern Pacific did not track near land. However, four hurricanes made landfall, all in the Pacific coast of Mexico, during the season: Agatha, Kay, Orlene and Roslyn. This was the third time the record for the number of Pacific hurricanes landfalling in Mexico was reached. The previous years were 1996 and 2021. Additionally, Hurricane Agatha became the strongest hurricane to make landfall during the month of May in the Eastern Pacific basin since records started in 1949.

Northwest Pacific

The northwest Pacific basin recorded another successive year of below-normal tropical cyclone activity under prevailing La Niña conditions, with 22 named storms, 12 typhoons, and five category 3+ typhoons. This was lower than the basin's climatology from 1991-2020 with 25 named storms and 16 typhoons. ACE value dipped to 163.2, approaching half of the basin's long-term average, and was the fifth lowest since 1991. The bottom four also occurred during La Niña.

South Korea, Japan, and the Philippines each faced a super typhoon between late August and September. Super Typhoon Hinnamnor, which lasted as a typhoon for eight days, packed the highest seasonal ACE (39) out of all basins' tropical cyclones this year. In China, Typhoon Muifa became the strongest typhoon to strike Shanghai on record.

Exhibit 26: 2022 Global Tropical Cyclone Activity by Basin Compared to Climatology*

Basin	Named Storms		Hurricanes		Major Hurricanes		ACE	
	2022	Climo	2022	Climo	2022	Climo	2022	Climo
Atlantic	14	14	8	7	2	3	95.1	122.5
East Pacific	17	17	10	9	4	5	116.5	132.7
West Pacific	22	25	12	16	5	9	163.2	299.6
North Indian	7	5	1	2	0	1	10.5	24.3
Northern Hemisphere	**60**	**61**	**31**	**34**	**11**	**18**	**385.3**	**579.1**
South Pacific	5	10	1	5	0	2	20.4	69.4
South Indian	16	16	6	9	6	4	143.3	138.4
Southern Hemisphere	**21**	**26**	**7**	**14**	**6**	**6**	**163.7**	**207.8**
Global	**81**	**87**	**38**	**48**	**17**	**25**	**549.0**	**787.0**

*Compared to the 1991-2020 climatological average. Southern Hemisphere statistics include full calendar year 2022 events.

Source: National Hurricane Center; Joint Typhoon Warning Center; Colorado State University

North Indian Ocean

The 2022 North Indian Ocean cyclone season generated the lowest economic losses this century. Activity was near normal, with seven named storms and one hurricane, Asani, which made landfall in India only as a deep depression in early May. A dozen of precursor depressions formed in the basin, but majority of those dissipated before reaching storm status. Combined with the activity in northwest Pacific, economic losses arising from tropical cyclones in Asia were one of the lowest this season.

Southern Hemisphere

During the calendar year 2022, Cyclones Batsirai, Emnati and Gombe caused significant damage to southeastern Africa, particularly Madagascar. In Oceania, Cyclone Dovi caused notable damage in New Caledonia, New Zealand, and Vanuatu. No major damages were incurred in Australia.

Atlantic Ocean

- 2022 marked the first year with no tropical cyclones forming in a La Niña August. In fact, there were no named storms in the basin for at least 60 days
- Not only was Hurricane Ian the deadliest hurricane to strike the state of Florida, it also ranked globally as the second costliest insured loss event ever recorded
- Hurricane Fiona became the strongest recorded landfalling storm in Canada
- Hurricane Nicole was the first hurricane to make landfall on Florida's east coast since Katrina (2005)
- Hurricane Julia recorded the second most southerly course after Tropical Storm Bret (1993) by passing just off the coast of Venezuela
- With the first named storm Alex on June 5, pre-season storm formation finally ended after eight years
- Tropical Cyclone Bonnie made first crossover from the Atlantic to the Pacific since Hurricane Otto (2016)

Pacific and Indian Oceans

- Tropical cyclone losses in Asia dropped to one of its lowest with ACE scores in the northwest Pacific and north Indian respectively reaching their fifth and fourth lowest values since 1991
- Super Typhoon Noru became the fourth Category 5 equivalent storm to make landfall in the Philippines in the past three years.
- Typhoon Muifa is now the strongest typhoon to strike Shanghai on record
- Hurricane Agatha became the strongest hurricane to make landfall during the month of May in the Eastern Pacific basin since records started in 1949
- The Pacific coast of Mexico tied the record for the number of landfalling hurricanes in a second consecutive year
- Tropical Storm Ana, formed on January 20, became the latest first named storm in the basin since 1997

Technology Revolutionizes Real-Time Modeling and Response

Recent years have seen weather events drive up claims costs for businesses, communities and governments — increasing the need for real-time catastrophe monitoring, instant response and rapid assessment of damage.

Speed is critical: For communities, it's about an effective escape route while governments need to ensure the continuation of essential services. For insurance companies, it's about knowing where to send experts to survey the damage and deliver claims payments to help customers quickly repair or rebuild.

Modeling a storm before and during landfall

To better inform insurers and organizations as soon as possible, Aon's Impact Forecasting team developed Automated Event Response (AER). AER covers everything from windstorms in Europe to North Atlantic hurricanes and typhoons in Japan — using windstorm or tropical cyclone forecasts from different meteorological institutions with Impact Forecasting's catastrophe models and insurer's portfolio data to produce automatic predictions of loss each time a new forecast data is issued.

Customized reports are sent to insurers automatically within 30-60 minutes of a forecast to help quantify the geographic scope, severity and projected cost of the event — even before the storm makes landfall. Insurers are then better equipped to make more decisions about managing claims adjustor resources, setting loss expectations and evaluating impacts to reinsurance structures.

AER allows businesses to protect and prepare their physical locations and staff. Consider a retailer with thousands of locations across a region that receives updated forecasts multiple times per day as a hurricane makes landfall. The business can gauge which locations likely to be hardest hit and how severely, while taking steps to ensure the safety their employees and the site location's security. That knowledge allows companies to prepare early — often quickening claims processing.

Using technology and data to improve disaster recovery

Sophisticated and instant response methods are equally important for assessing damage post event. Technology such as satellite imagery and drones are increasing used to immediately assess damage, particularly in hard-to-reach areas. For example, within 48 hours after an event, Aon's property claims team fly drones in impacted areas, then immediately send the footage to clients to measure their damage. Real-time footage helps expedite the payment of claims and increases claims assessment accuracy.

After Hurricane Ian in Florida, Aon used satellites to send clients images of initial damage on Captiva Island, located off Florida's Gulf Coast. Damage was extensive, and local authorities prohibited people and even drones from entering the island during rescue operations. While the satellite images weren’t as clear as those generated by drone technology, they helped assess large-scale damage, such as partially or completely blown off roofs.

Technology has enabled better insight as catastrophes unfold; it has also meant faster and more thorough assessment of damages after an event. Rapid adjustment and remediation often result in lower claims. And with claims costs rising due to factors like climate change, inflation and supply chain issues, clients are seeking savings opportunities as they build resilience.

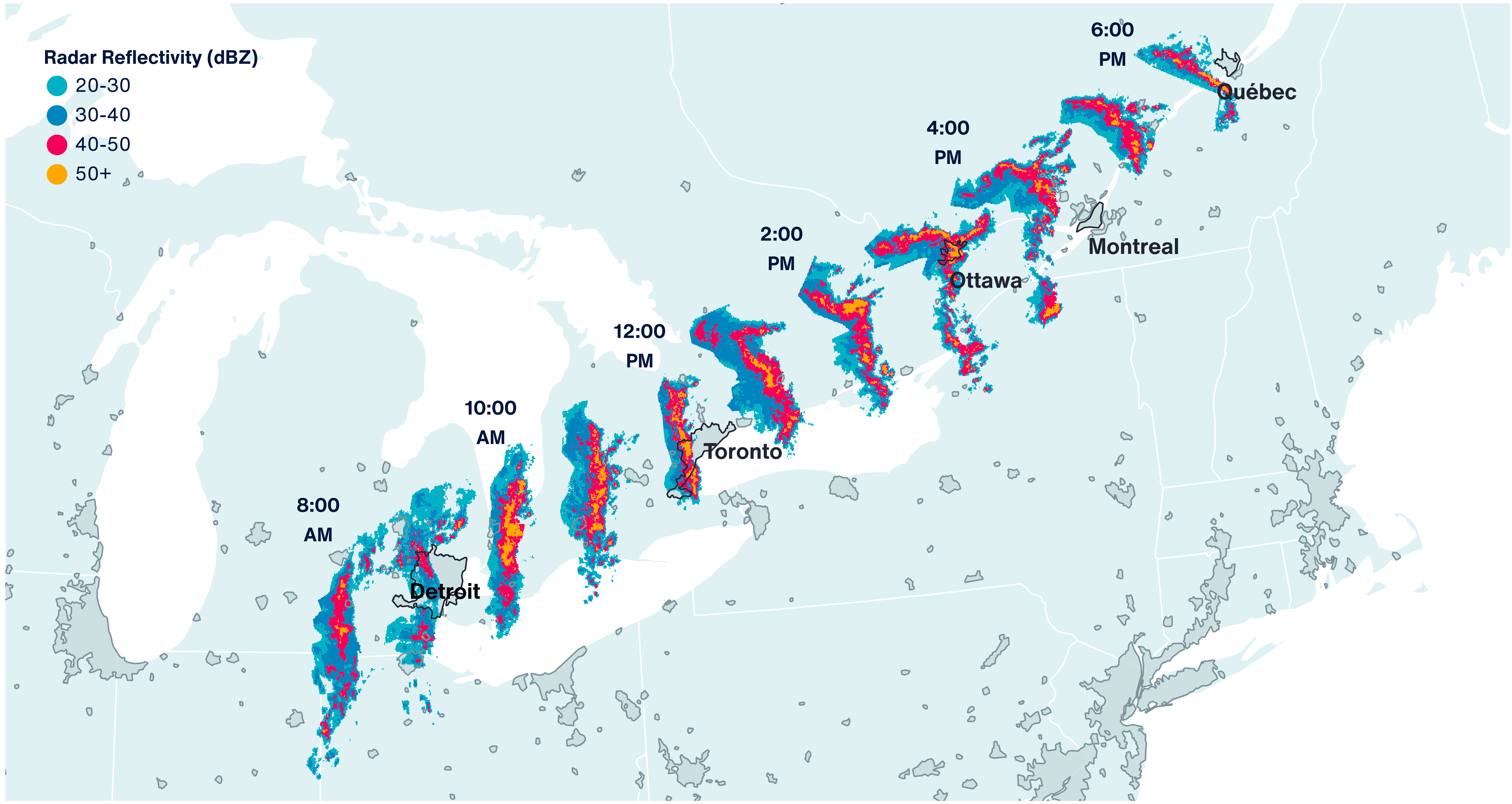
Jill Dalton
Group Managing Director, Property Risk Consulting

Radovan Drinka
Head of Tropical Cyclone Model Development, Impact Forecasting

Will Skinner
Head of Business Development, Impact Forecasting

Severe Convective Storm Peril Marks the Fourth-Costliest Year on Record

Exhibit 27: Southern Canada Derecho on May 21 — Approximation of the Path Based on Radar Data



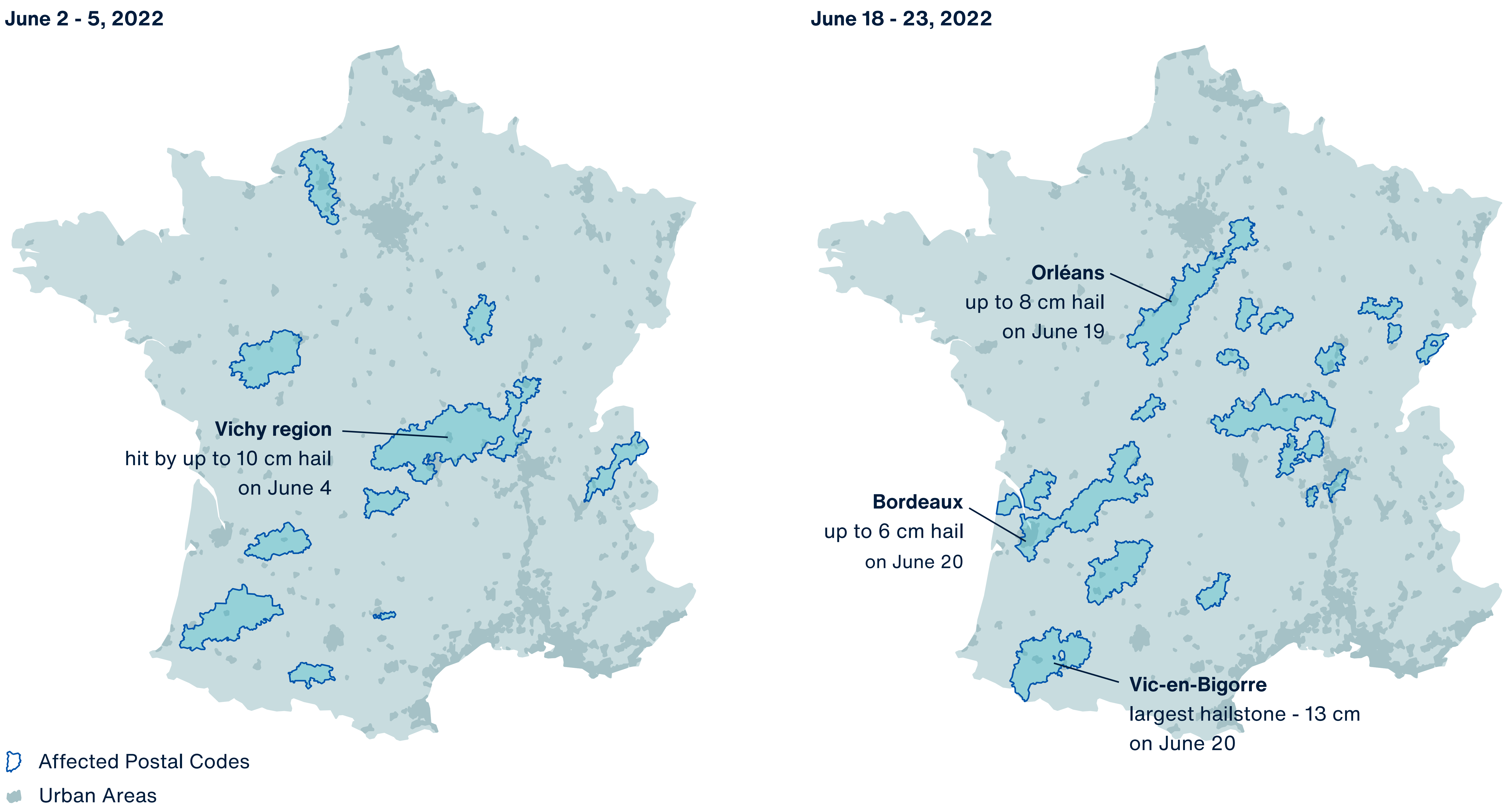
Data: NOAA. All times are in EST

Severe Convective Storm peril once again generated a significant insured loss total in its fourth costliest year on record and reaffirmed its position as perhaps the most significant of those perils that are traditionally referred to in the industry as secondary. The losses, which have steadily increased this century, were again driven by a high frequency of medium-size events, and 78 percent of these losses occurred in the U.S., which is close to the average.

While majority of the loss was associated with hail, multiple wind-related events were particularly noteworthy. On May 21, a rare and deadly derecho (defined as a widespread, long-lived windstorm associated with a band of swiftly moving thunderstorms), tracked an estimated 1,000 km (620 mi) through highly populated regions of southern Ontario and Quebec in Canada. The event generated extraordinary straight line wind damage along its entire path, as it effectively hit all the major population centers in the region.

While the current scientific understanding of the SCS peril does not provide a conclusive, comprehensive answer to how exactly it is and will be affected by climate change, the Canadian derecho example shows that the geographic location and socio-economic aspects are crucially important loss factors.

Exhibit 28: June 2022 Hailstorms in France



Data: Impact Forecasting, ESWD

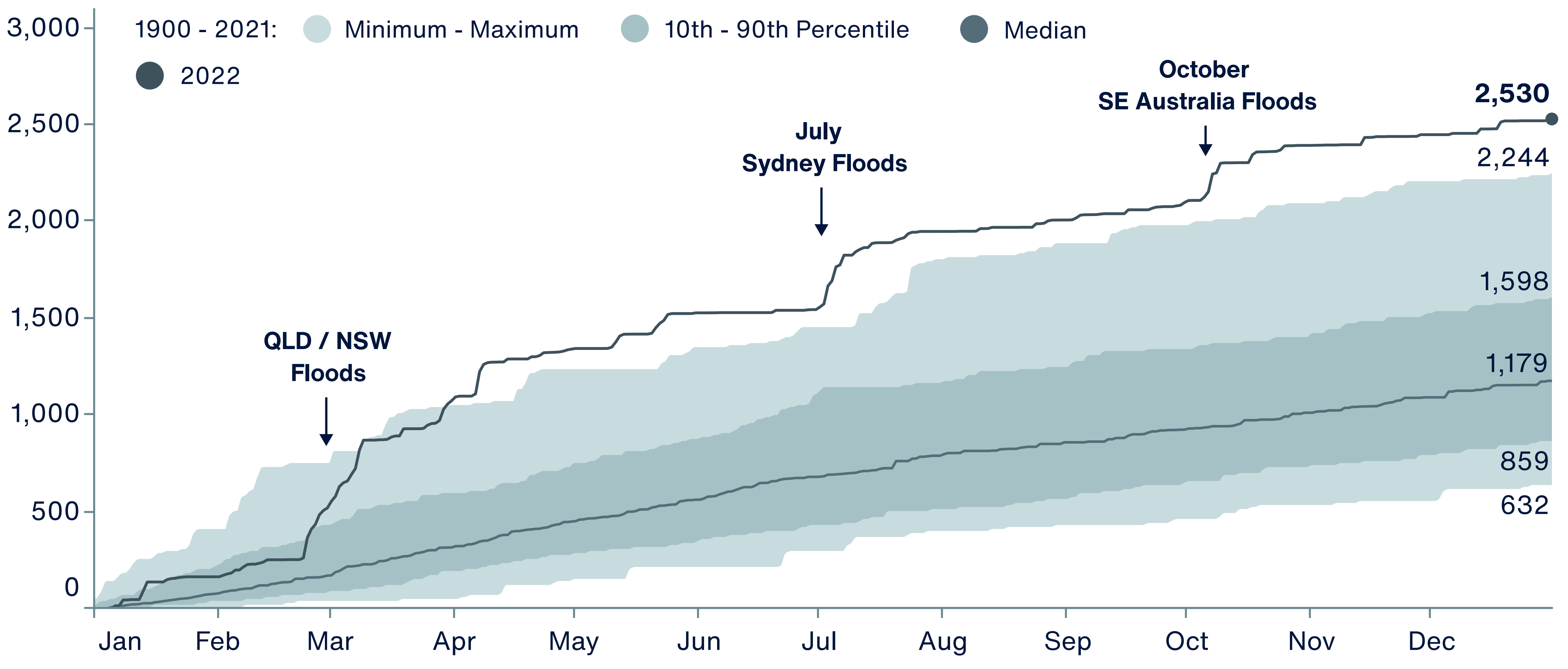
Significant SCS events also occurred outside of North America. In Europe, the peril generated insured losses totaling approximately $6.7 billion. Even though the European Windstorm peril (or winter storms) is considered "primary" in the region and is responsible for the costliest individual events historically, annual losses from SCS (or summer storms) actually outpaced windstorms in nine out of the last 10 years. In fact, SCS was the costliest peril in Europe in seven out of the last 10 years overall.

In 2022, majority of the European insured losses from SCS occurred in France as the country recorded its costliest year for the peril by far and the second costliest year overall. This was driven by relentless thunderstorm activity, which affected the country from mid-May to early July with multiple notable hailstorms. During six separate outbreaks, the local insurance industry received roughly a million claims with losses totaling €3.9 billion ($4.1 billion).

While the combined footprint of the hailstorms was relatively large, much of the losses occurred in a few spatially limited areas as large hailstones hit "the target" in a form of densely populated communities, including Vichy on June 4, the outskirts of Orléans on June 19 and Bordeaux on June 20.

Rainfall Extremes Drive Flood Losses in Asia-Pacific

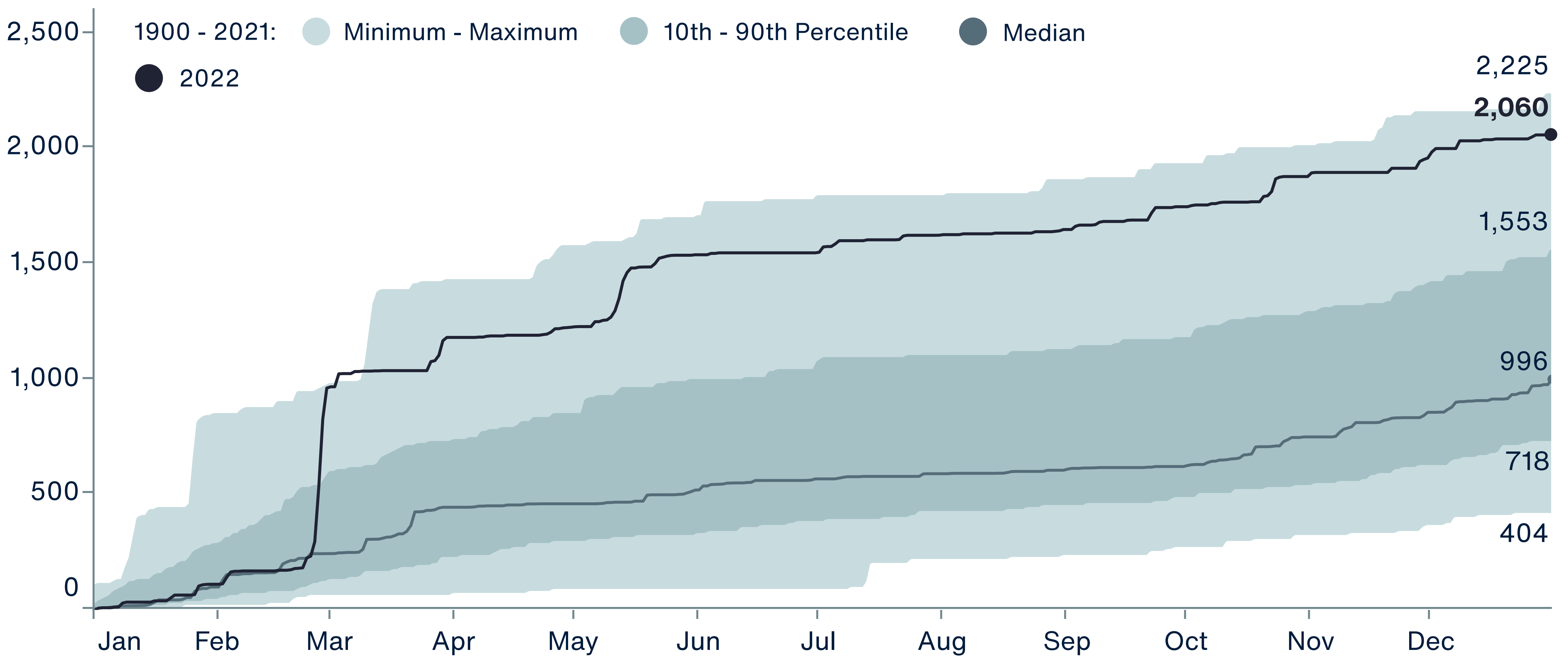
Exhibit 29: Cumulative Rainfall in Sydney (mm)



Data: Bureau of Meteorology

A series of dynamic weather patterns involving a stalled trough and blocking high and later an East Coast Low successively trained moisture streams towards Southeast Queensland and New South Wales in the first quarter of 2022. The long-lasting event occurred over 17 days, from February 21 to March 9. Brisbane recorded its highest three-day rainfall totals at 677 mm (26.7 in) on February 28, breaking the 600 mm (26.3 in) record set in 1974. Dozens of other locations observed rainfall in excess of 1,000 mm (39.4 in), setting up catastrophic flooding especially in Lismore and Ballina. The eastern Australia floods eventually evolved to become the costliest natural disaster event ever recorded in Australia on an inflation-adjusted basis.

Exhibit 30: Cumulative Rainfall in Brisbane (mm)



Data: Bureau of Meteorology

Additionally, the Insurance Council of Australia declared a significant event in early July for the Central Coast covering the Hunter region and Greater Sydney, one catastrophic event in October for southeastern Australia, and another significant event in early November for the Central West. Persisting La Niña conditions, negative Indian Ocean Dipole, and positive Southern Annular Mode, which prevailed for the majority of the second half of the year, drove above-average annual rainfall (10th decile) in much of New South Wales. At 2,530 mm (99.6 in), Sydney broke its second-highest annual rainfall record set in 1950.

Flooding typically generates the highest economic losses from natural disasters in Asia. Extended summers accompanied by continuing La Niña conditions drove prolific rainfall in Sydney (Australia), Sindh (Pakistan), or Meghalaya (India), increasing risks of deadly landslides and/or overflowing rivers.

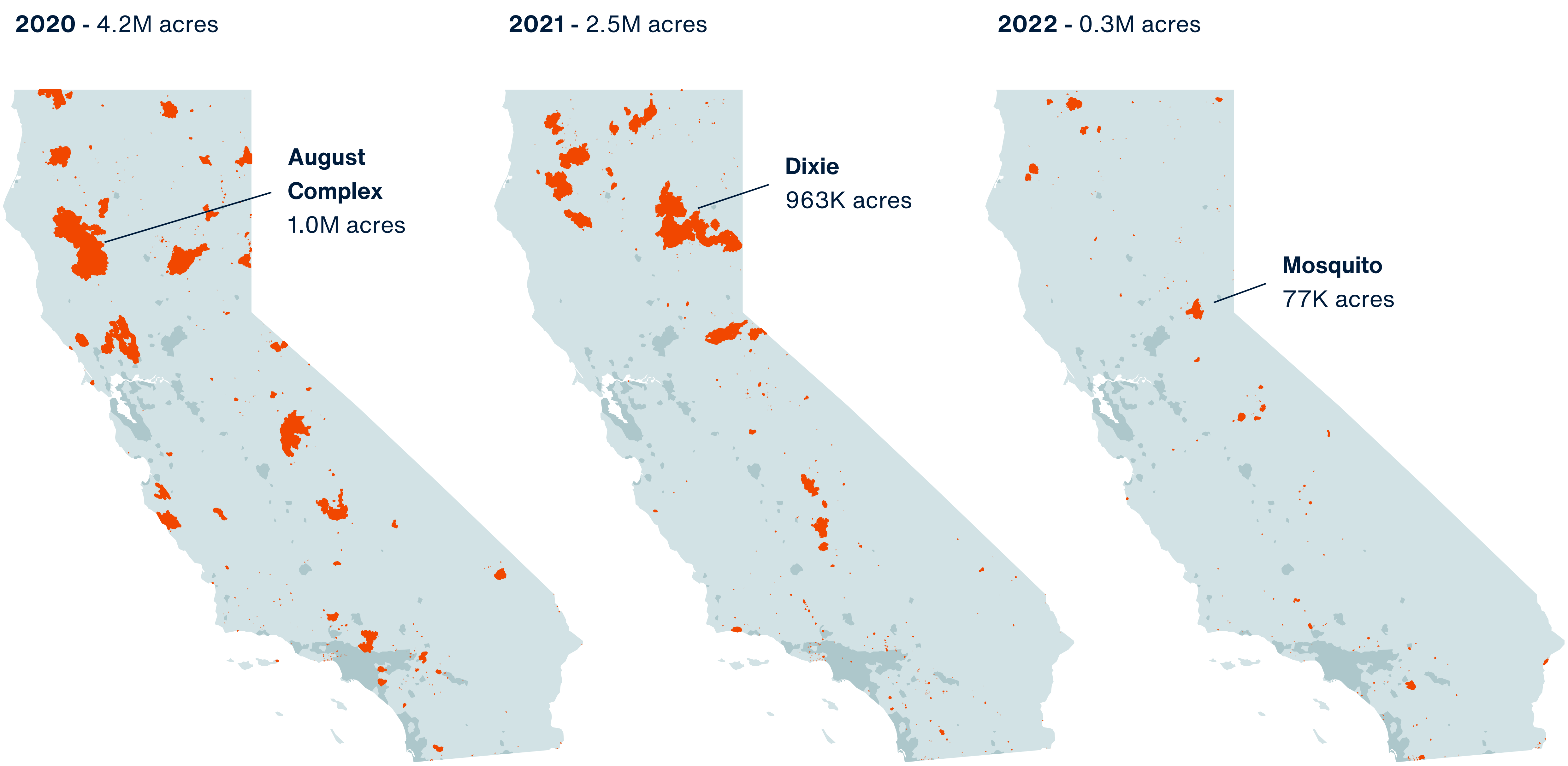
Much of the Indian subcontinent received above-average precipitation totals and the monsoon extended further westward than usual towards Pakistan, causing widespread flooding. In a summary of the 2022 monsoon season, the Pakistan Meteorological Department noted that country-wide rainfall in July to September was 175 percent above average. Regionally, the anomaly was the most significant in Balochistan (450 percent) and Sindh (426 percent), and was also above the long-term mean in Punjab, Gilgit-Baltistan and Khyber Pakhtunkhwa.

A large part of the country was under water for an extended period of time in August. The event highlighted many issues facing countries in Asia in context of disaster resilience and ability to respond to ongoing events. A significant number of fatalities in Pakistan during summer were not due to the flooding itself, but rather secondary challenges that stemmed from the event, such as acute malnutrition or waterborne diseases such as typhoid, diarrhea, and malaria. Hospitals were overwhelmed as thousands of health facilities were destroyed in flooding. Industries were also beginning to experience effects from the secondary impacts, with textile factories shut down due to cotton shortages.

Pakistan remains one of the countries vulnerable to potential financial costs and physical risks associated with climate change. As the event affected a large part of the nation's population, the country faces long-term challenges to rebuild to mitigate against the next deadly waves of natural disasters.

Wildfire Season Quiet in California, Second Worst This Century in Europe

Exhibit 31: Wildfire Perimeters in California and Largest Fires Annually From 2020-2022

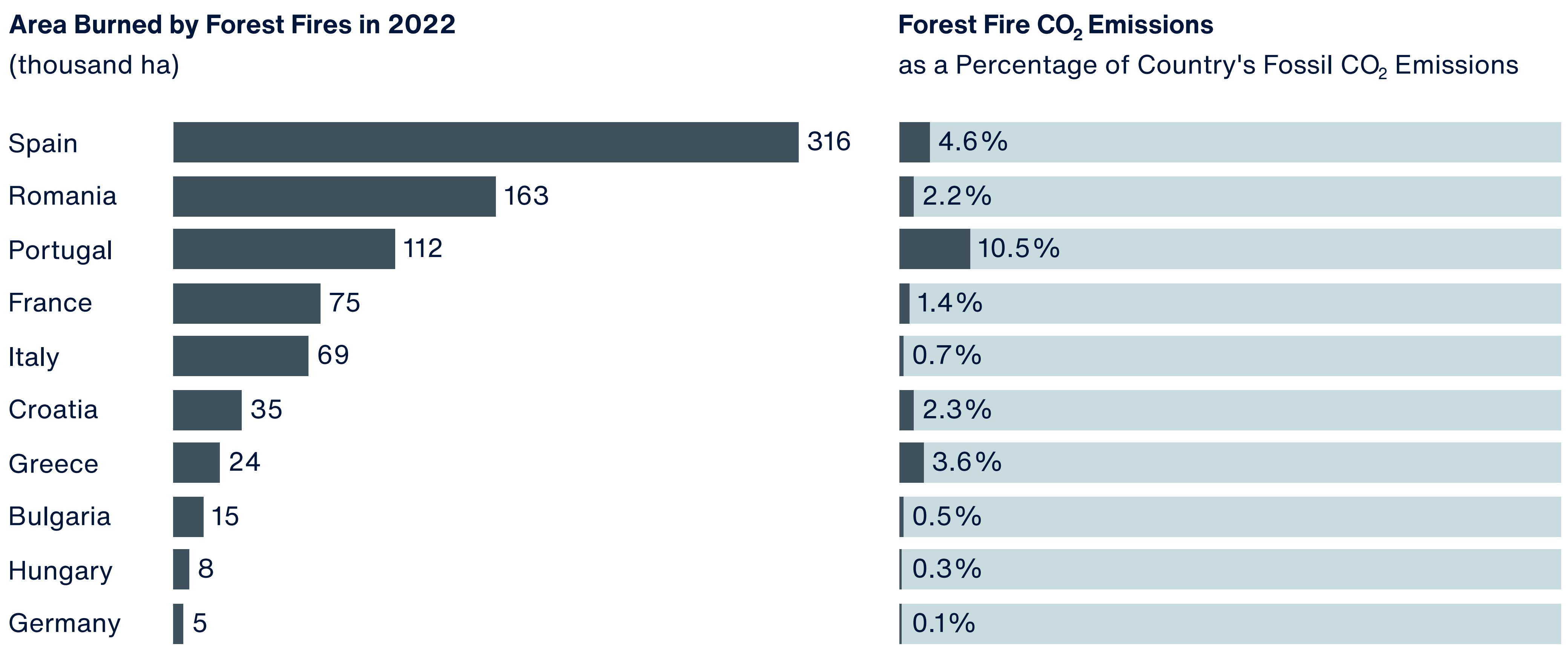


Data: National Interagency Fire Center

Insured losses from wildfires in the U.S. dropped below $1 billion for the first time after staying above the threshold for seven years.

Wildfires in the U.S. were above the 10-year average in terms of number of fires and acres burnt. However, the acres burnt per fire was below average, highlighting that most fires were isolated breakouts. Wildfires in California, for example, burned significantly lower extent than in 2020 and 2021, with a total burnt area of 0.3 million acres. The largest wildfire event, the Mosquito fire, only burned 77,000 acres (31,000 ha). For comparison, the Dixie fire in 2021 (California's largest single and non-complex wildfire) burned 963,000 acres (390,000 ha).

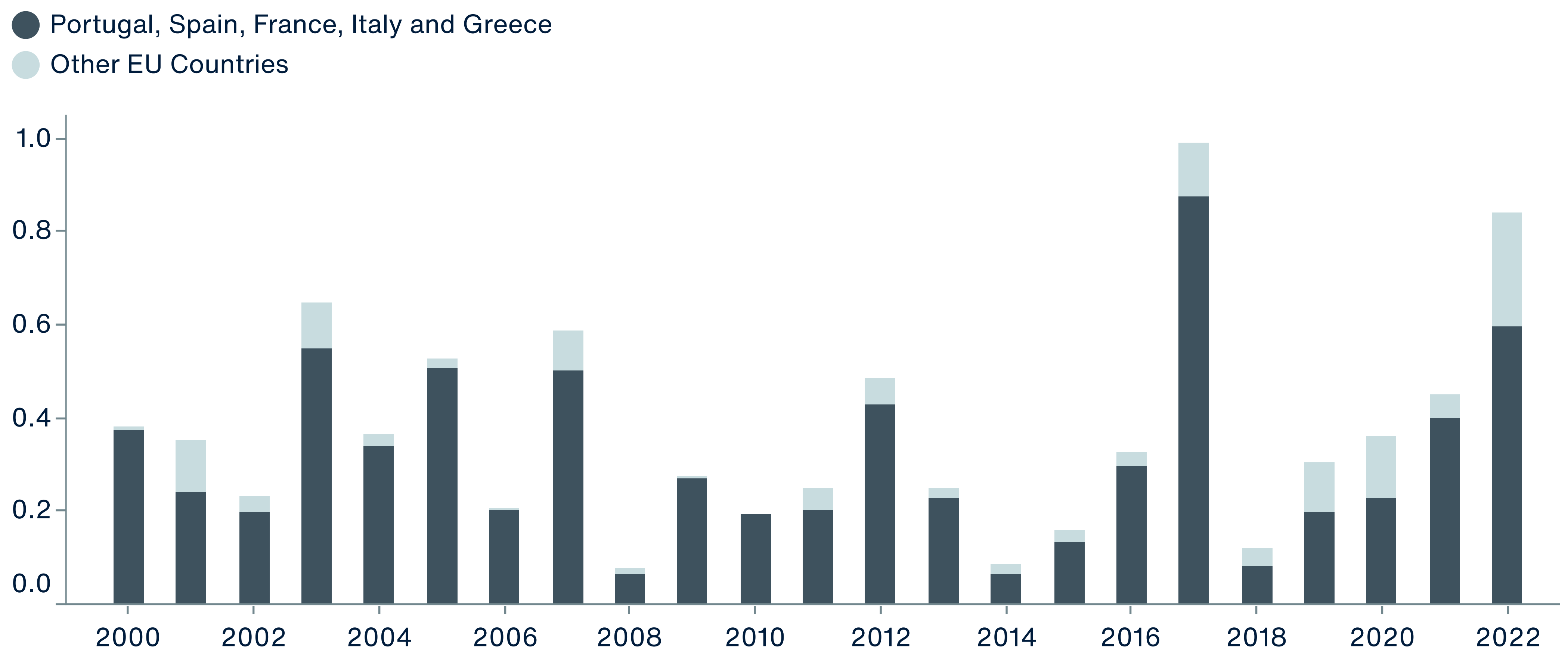
Exhibit 32: Extent Burned and Emissions from Forest Fires in 2022



Data: EFFIS, EDGAR

Spain recorded the largest area burned by forest fires in the European Union in 2022. This included a large fire in the Zamora province, which burned more than 30,000 ha. The European Forest Fire Information System (EFFIS) also includes information on estimated amount of CO2 emissions released from the fires. Comparison with respective country's fossil emission is displayed on the right.

Exhibit 33: Extent Burned by Forest Fires in the European Union (M ha)

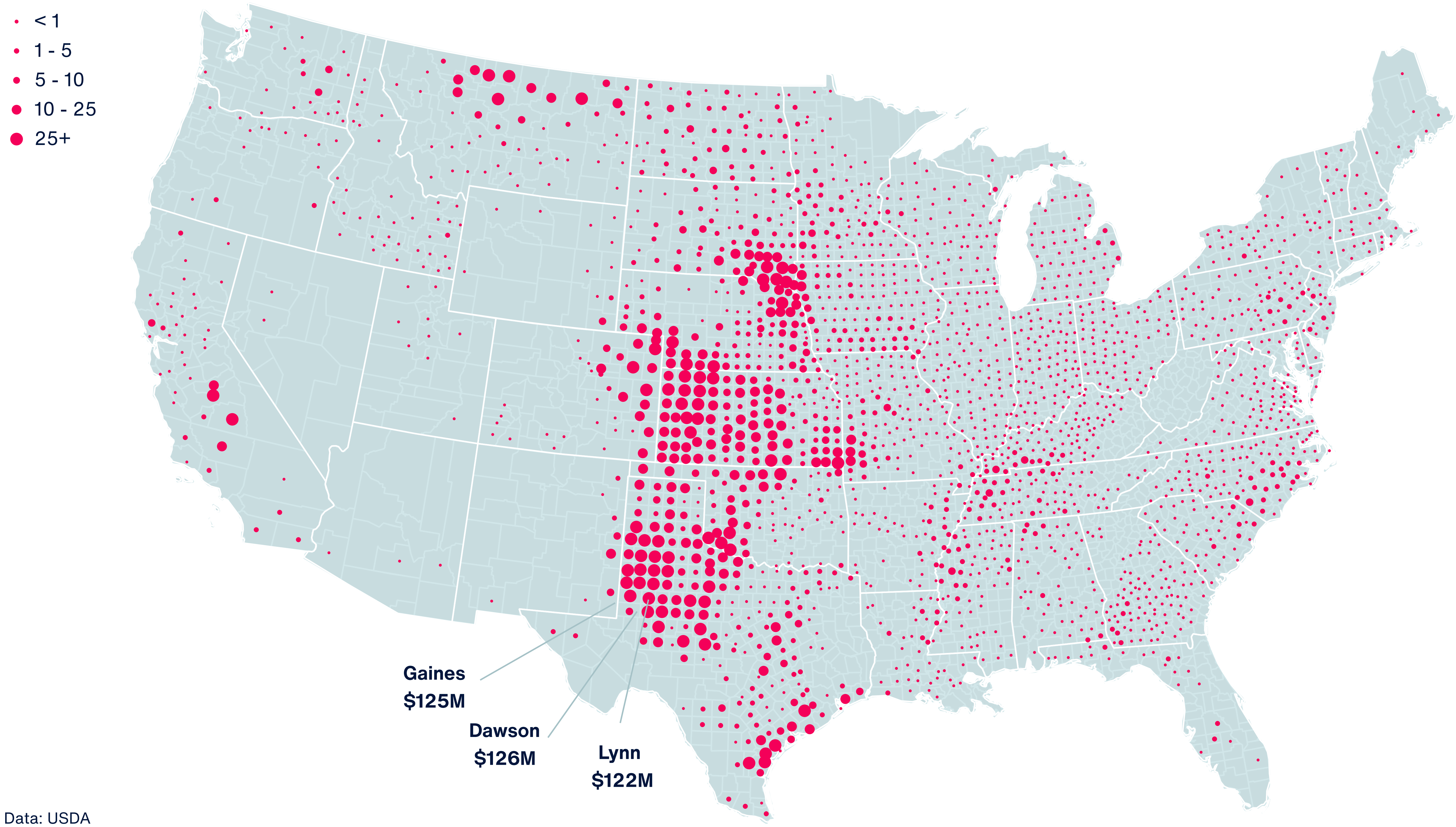


Data: EFFIS

According to the satellite-derived data from EFFIS, total extent burned by forest fires in the European Union in 2022 was the second highest this century, only surpassed by 2017, the year of the devastating fires in Portugal. It is also noteworthy that unusually large part of the extent occurred outside of the five southern European countries that typically constitute most of the burned extent. This was largely due to fires in Romania.

Drought Conditions Result in Considerable Payouts Globally

Exhibit 34: U.S. Crop Insurance Payouts from Drought, Heat, Excess Sun and Hot Wind per County (M $)



Data: USDA

United States

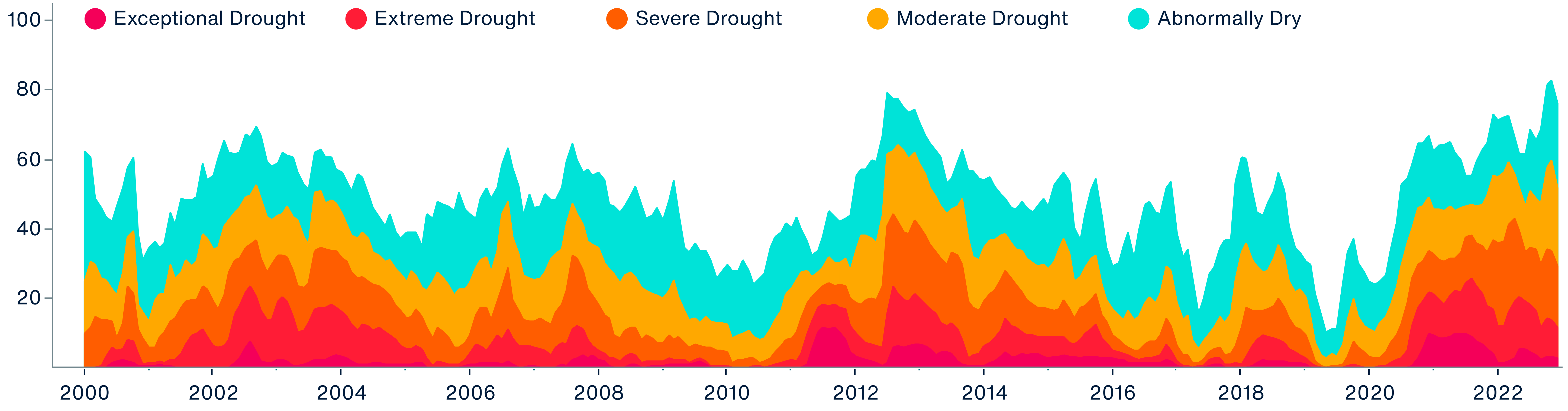
Prolonged, severe drought conditions across the U.S. since 2020 continued to affect agricultural sector in the country in 2022. While the percentage of the national territory under extreme or exceptional drought was generally lower than in 2021, total area under Moderate drought or worse was the largest since the disastrous year of 2012. Maximum reached in November 2022 (63 percent) was close to the maximum in September 2012 (65 percent).

Part of the continental U.S. that exhibited “abnormally dry” conditions under the U.S. Drought Monitor in November 2022 reached the highest percentage since reliable record keeping began 2000.

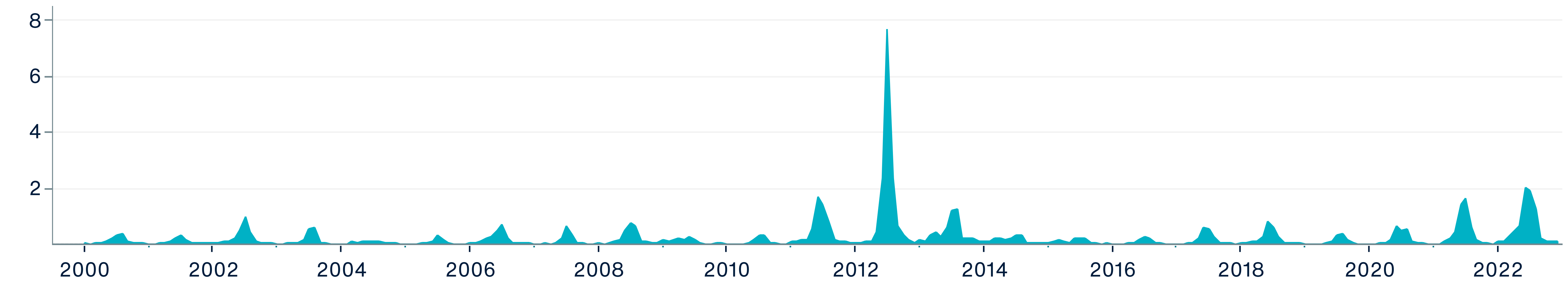
The drought conditions resulted in considerable payouts via the United States Department of Agriculture’s (USDA’s) Risk Management Agency (RMA) crop insurance program. More than $8 billion in indemnity payouts were made; second only to 2012, when payouts due to drought, heat, excess sun and hot wind reached $18 billion (in 2022 $).

Exhibit 35: U.S. Drought Conditions and Crop Insurance Payouts

Percent of Continental U.S. Territory in U.S. Drought Monitor Categories



Monthly Crop Insurance Payouts from Drought, Heat, Excess Sun and Hot Wind



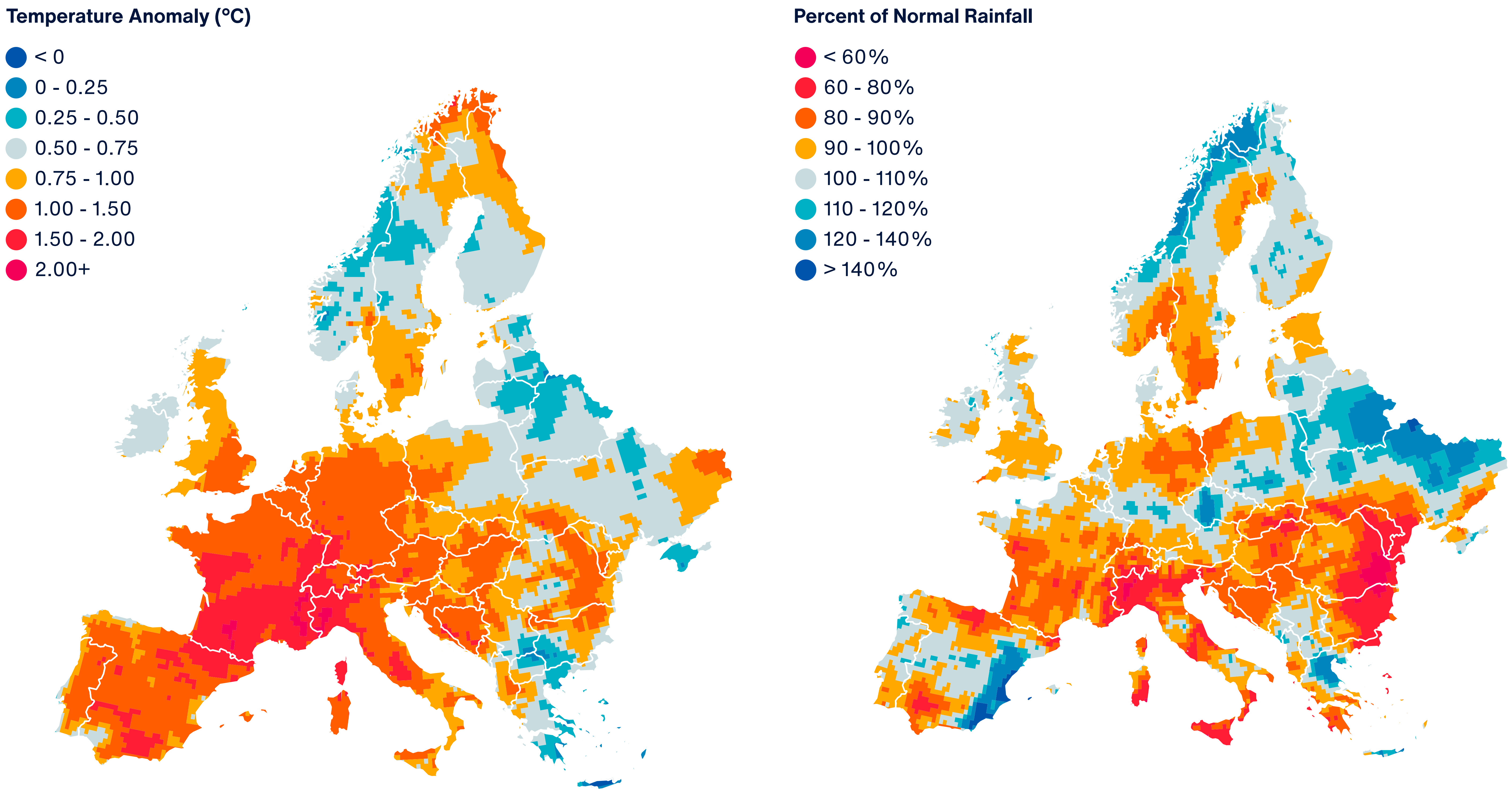
Data: USDA, NOAA, University of Nebraska-Lincoln

The largest amount of the crop insurance payouts was concentrated in Texas, with nearly $2.6 billion, followed by Kansas ($1.7 billion), Nebraska ($800 million) and South Dakota ($615 million). Most of the payments were related to damage to corn (32 percent), cotton (27 percent), soybeans (16 percent) and wheat (12 percent).

Europe

Parts of Europe were engulfed by severe drought conditions throughout the year. These conditions led to substantial losses of approximately $22 billion across the Western, Southern and Central part of the continent. In mid-August, nearly 50 percent of Europe was under orange warning conditions and 17 percent under red alert conditions, according to the Combined Drought Indicator by European Drought Observatory, indicating areas that may be affected by agricultural drought. Billion-dollar losses to agriculture, buildings and infrastructure were reported in France, Spain, Italy, Germany, Hungary, and Romania. The cumulative severe precipitation deficit led to reduced river discharges, significantly affecting many sectors of the economy and their supply chains. Water and heat stress substantially reduced crop yield.

Exhibit 36: Temperature and Precipitation Anomaly in Europe



Data: Copernicus Climate Change Service, ECMWF

Low water levels disrupted cooling systems of power plants and lowered hydropower generation in the energy sector. Additionally, shipping on several important European rivers (Danube, Rhine, Po) was disrupted due to low water levels.

European drought in 2022 became the second costliest after the historic summer of 2002, which severely affected a large part of Europe, generating total economic losses of $27.6 billion (in 2022 $). Recorded temperature increases and climate projections suggest that Europe is generally warming faster than the global average and prolonged drought periods are expected to become more frequent.

The drought also resulted in notable insurance payouts of roughly $3 billion — due to agricultural losses, but also damage to property due to land subsidence related to drought conditions.

Historic Heatwaves Highlight Impact on Health and Economy

Numerous all-time or monthly extreme heat records were broken in many areas of the world in 2022 and Europe was among the regions severely affected by the peril. Two separate major heatwaves hit Europe in mid-June and mid-July, affecting hundreds of millions of people — particularly in Western, Southern and Central parts of the continent, leading to more than 19,200 heat-related fatalities, as derived from excess mortality rate data. Heatwave periods occurred in a continuation to a relatively dry and warm spring and early-summer months and further enhanced drought and wildfire risk across Europe. July event transpired due to an anomalous ridge of high pressure, which stretched from Morocco in northwestern Africa through France and towards the British Isles. Concurrently, an upper low-pressure system located west of the Iberian Peninsula played a pivotal role in the intensification of the pattern and creation of an aptly named Spanish plume, which advected extremely hot air toward France and Great Britain. As a result, a broad area of Europe experienced extreme maximum temperatures, exceeding 40°C (104.4°F) locally, often greater than 10°C (18°F) above normal. The heatwave resulted in the first-ever recorded temperature reading above 40°C (104.4°F) and in the first-ever red warning for exceptional heat in the United Kingdom.

This pattern resulted in a particularly intense and lasting heatwave in France, where temperature maximums culminated on July 18, as the western coastal region experienced maximums reaching 42°C (107.6°F). In Germany, six federal states established new all-time state-level heat records. The highest summer temperature of 47.0°C (116.6°F) was recorded in Pinhão, Portugal, on July 14.

Extreme summer heat was also seen several times in Argentina (January and December), in India and Pakistan (March-April), or in China (June-August), where this-year heatwave impacts are expected to be one of the worst in China's history, leading to tens of thousands of heat-related deaths (official data for China are not yet available)

Extreme events that occurred worldwide are in line with the global trend and support conclusions from the last IPCC Assessment Report, which indicates an increase in the frequency and intensity of these perils. Consequently, Europe and other regions may face more frequent implications for human health and wellbeing, food supplies and agriculture, transport, energy prices, or impact on natural ecosystems. It is important to note that numbers of heat-related fatalities are approximated, and totals are expected to be even higher.

Climate Change's Health Impacts Now a Focus of Workforce Resilience Plans

Employers are contending with a variety of challenges from the human health effects of climate change; from direct health issues like heat stroke, asthma and emotional distress to indirect factors such as worker absenteeism, reduced productivity and supply chain disruption.

As organizations focus on developing a resilient and agile workforce, they are also considering how a changing climate affects health and how that shapes their goals. This can mean:

- Enhancing plans to help their workforce contend with changing health and safety conditions
- Limiting outdoor work during unsafe conditions
- Developing contingency plans for locations not traditionally considered prone to certain natural
- Disasters, but which are now susceptible
- Ensuring healthcare access for vulnerable populations.

This topic is also getting more attention from global climate stakeholders. In November 2022, the United Nations COP27 meeting discussed the health impacts of climate change — during which, the Sharm el-Sheikh Implementation Plan was devised to address climate's role on human health and different population groups. It advised, parties should "respect, promote and consider their respective obligations on human rights, the right to a clean, healthy and sustainable environment, the right to health, the rights of indigenous peoples, local communities, migrants, children, persons with disabilities and people in vulnerable situations."

Together, risk, health and human capital stakeholders can develop innovative ways to help companies protect their people after natural disasters. Recently, Aon worked with a large technology firm in the U.S. to separate what would cause a trigger for a catastrophe bond (an earthquake, in this case) and allocate a one-time payment to colleagues to help them through a disruption to their lives. The cat bond was created 20 years ago as a property insurance concept to rebuild the company's physical offices, but the firm wanted to modify the trigger to become more relevant to its business and people today.

Location analytics and job assessments also play a role in protecting a business and its employees. When dealing with a natural disaster, if a resilient and agile organization knows where its people are and which roles can be performed remotely, it can redeploy resources so affected employees can work from safer locations and still be productive.

Climate-related events may cause poor physical health; they can impact employees' mental and emotional wellbeing. A resilient workforce can proactively address the holistic needs of employees and wellbeing tools should be readily available to help employees when they need it most — whether that be mental health benefits or flexible time off.

In short, a successful people-driven organization:

- Has the resilience to bounce back during volatility
- Is agile enough to bounce forward and seize opportunities for growth
- Is engaged with employees to repeat this process.

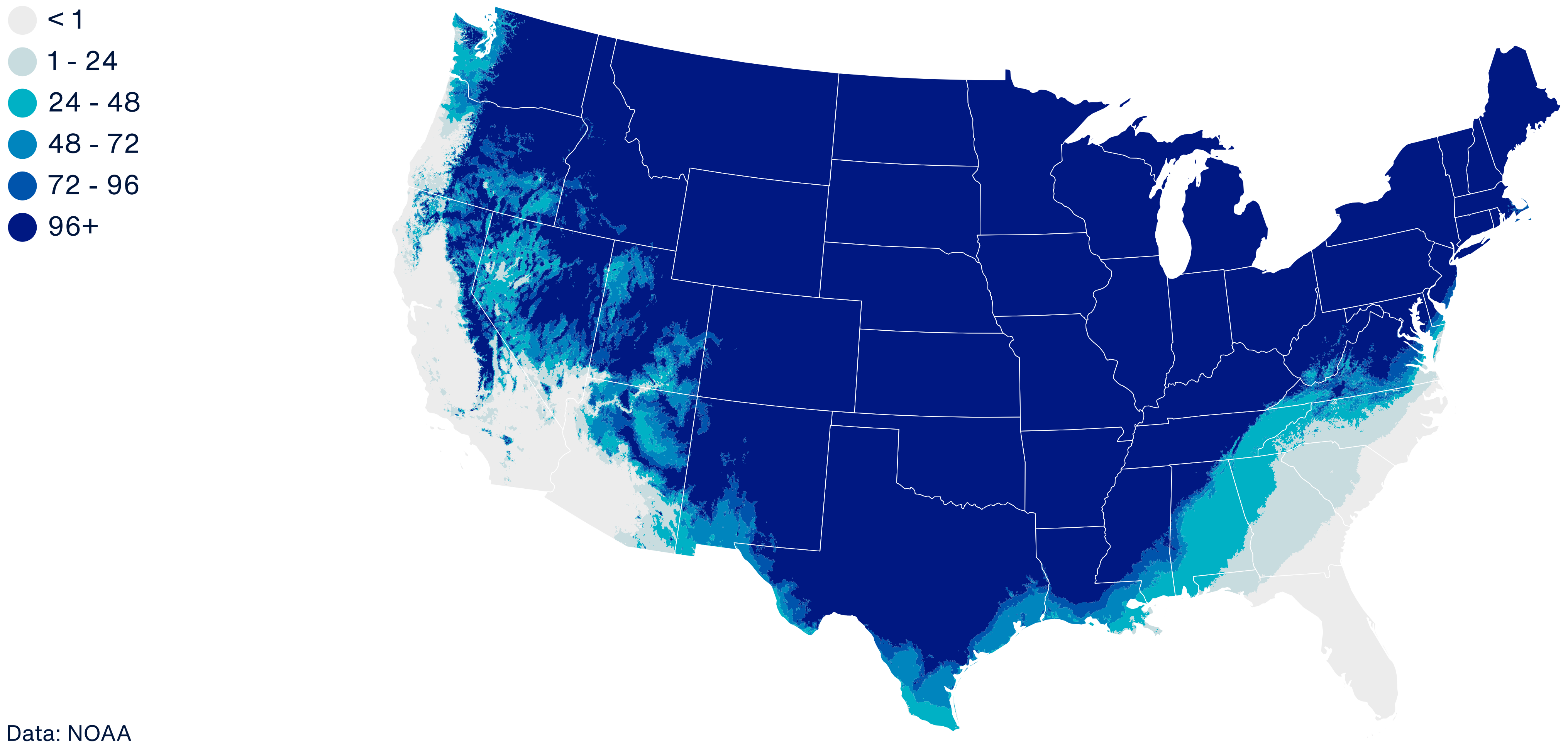
When an organization is developing programs to achieve these goals, it's critical to include how a changing climate impacts people — and that includes its significant influence on our health.

Stephanie DeLorm
Senior Vice President, Aon Health Solutions

Peter Bentley
Chief Innovation Officer, Aon Human Capital Solutions

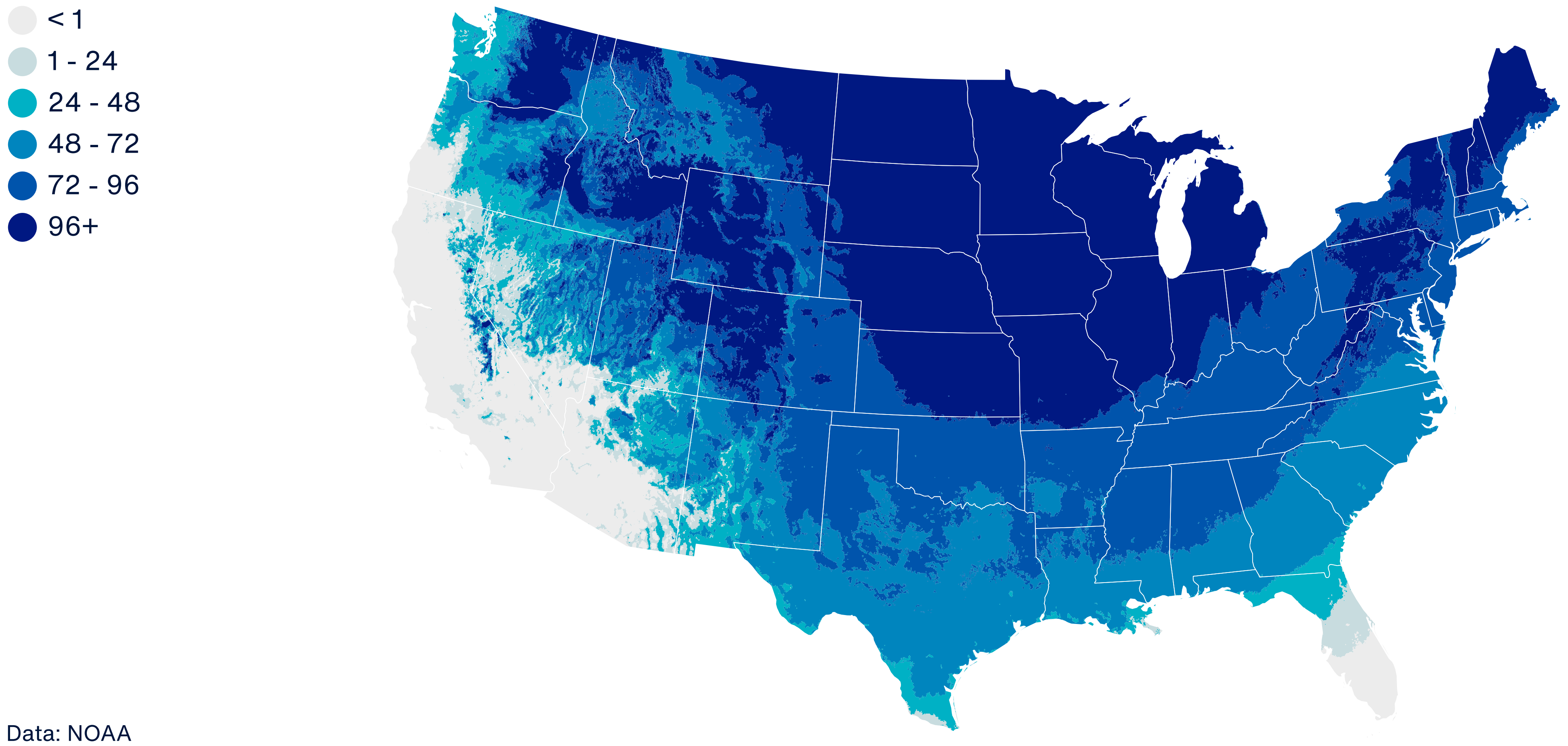
Significant Winter Weather Events Test Infrastructure Vulnerabilities

Exhibit 37: Hours at or Below Freezing during February 13-19, 2021



Data: NOAA

Exhibit 38: Hours at or Below Freezing during December 22-26, 2022



Data: NOAA

Total economic losses from the winter weather peril in 2022 were $9.7 billion, below the long-term average (skewed by 2021) and close to median. The only billion-dollar economic and insured loss event was the December North American Winter Storm, which caused power outages to more than 2.6 million people across the continent, once again highlighting the vulnerabilities of the electrical infrastructure grid. Although the extent of damage has not been fully evaluated yet, initial damage assessments suggest that insurance market losses may potentially reach into the single-digit billions (USD). This considerable event is not expected to generate losses like those incurred during the historic mid-February Texas Freeze in 2021, which resulted in 17 billion (in 2022 $) of insured losses and 28 billion (in 2022 $) of total economic losses.

One of the main differentiating features was the duration of below-zero (freezing) temperatures. The analysis of both events shows that the duration of freezing temperatures in the 2021 was much longer and more widespread across the U.S., particularly Texas. Similar winter weather events initiate discussion on whether this is now a peril that needs consideration as a more dominant and regular future loss driver. The intensity and longevity of the 2021 event uncovered vulnerabilities that exist within the current infrastructure and highlighted the need for better preparedness.

Notable Events Caused by Additional Perils

Earthquake

A total of 11 magnitude-7.0 and greater earthquakes occurred globally in 2022. The strongest earthquakes, registered at magnitude-7.6, rocked Papua New Guinea and Mexico — both in September. The costliest event of the year was the earthquake that struck near Fukushima, Japan in March and resulted in economic losses of $9.1 billion. Another costly event occurred in Sichuan, China in September and caused $2.3 billion in total economic losses. Other notable tremors included the Cianjur earthquake in Indonesia, the North California earthquake in the United States, and the event that occurred near the Afghanistan-Pakistan border on June 22 and killed 1,163 people, becoming the deadliest geophysical event of the year.

Volcanoes

The Hunga Tonga–Hunga Ha'apai volcano eruption in January caused atmospheric shockwaves to propagate around the globe and ash plumes to propel 57 km (35.4 mi) into the lower mesosphere. The undersea eruption was also violent enough to trigger widespread tsunami waves, which travelled as far as the coast of Japan and Americas, but eventual losses were minimal due to the isolated location of the volcano in the South Pacific. Other notable events included the Mauna Loa eruption in Hawaii, which disrupted carbon dioxide monitoring at the Mauna Loa Observatory in late November and December. The Semeru volcano in Indonesia erupted on December 4, exactly one year after its devastating eruption in 2021, but impacts were eclipsed by the consequences of the last year's event, as many places remained buried or damaged by volcanic ash.

European Windstorm

Aggregated insured losses from European Windstorms for the calendar year reached $5.7 billion, which was well above long-term averages ($3.2 billion) and at its highest since 2013. Most of those losses, $4.7 billion, were related to a windstorm series (storms Dudley, Eunice and Franklin) that affected Western and Central Europe in February. Storm Eunice was the most intense and became the costliest individual storm to affect Europe since Xynthia in 2010. On the other hand, the lack of any significant storms resulted in negligible losses in the fourth quarter of the year. Even though the peril remains the costliest for European insurers (largely because of the peak events in 1990s), its average annual losses have been surpassed by summer storms (SCS) in recent years.

How Climate Science Unites with Technology to Drive a More Resilient World

Navigating climate change means our industry must prepare for the risks of tomorrow, equipped with tools to measure both the near- and long-term risks. This is where academic research and innovation can unite to bring emerging climate research directly into the insurance industry and create actionable insights.

To integrate these insights into our catastrophe models, Aon's analytics and Impact Forecasting model development team are collaborating with a global network of academic climate experts, including:

- Columbia University (global tropical cyclone)
- University of California,
- Merced and University of California, Los Angeles (U.S. wildfire)
- Karlsruhe Institute of Technology (KIT — European flood and windstorm)
- University of Illinois Urbana-Champaign and Central Michigan University (U.S. SCS)

What have we discovered so far?

U.S. Hurricane:

Higher aerosol emissions lead to fewer tropical cyclones, according to research from Columbia University. Aon's academic collaborators explored different ways to quantify moisture in the air and ran Shared Socioeconomic Pathways scenarios with different climate policy assumptions to assess the impact of varying levels of future greenhouse gases and aerosols. This climate data will be incorporated into Aon's tropical cyclone models to better understand future financial losses.

U.S. Wildfire:

The historic drought currently on-going in the Western U.S. and Canada is consistent with the signal we see in many state-of-the-art climate models — a hotter, drier West. Combined with the increased risk of human-induced ignition due to development in the wildland urban interface, these drier conditions look to significantly impact the fire risk for many areas. Exactly how these changes translate into changes in burned area and insured loss is the focus of our collaboration with the University of California, Merced and University of California, Los Angeles.

European Flood and Windstorm:

Atmospheric circulation patterns play a key role in driving extreme weather events, such as flood and windstorms. With KIT we found that extreme hydrological events strongly depend on catchment size and physical features of the terrain. For example, heavy rainfall in highly permeable areas can cause insignificant flooding, while the same rainfall in areas with narrow valleys can cause a catastrophe — as confirmed by the devastating Bernd flood in Germany in July 2021.

Practically applying the research

For businesses and communities, this data and analysis enables more opportunities to help de-risk climate focused innovations such as low-carbon technologies and new forms of renewable energy, as well as inspiring more relevant coverage and risk management for a more resilient future.

For insurance companies, having the insight to develop climate action strategies for underwriting and reinsurance is critical when considering practical steps in response to evolving risk. Communicating the "why" and "how" is also imperative, informing internal and external stakeholders, including boards of directors, investors, and employees, in addition to meeting regulatory needs and developing robust responses to disclosure requirements.

Together, we will be able to achieve so much more as we navigate climate change and unlock new opportunities.

Daniel Raizman
Director, Catastrophe Modeling

Megan Hart
Managing Director, Catastrophe Management

2022 Climate Review

COP27 Summit Highlights Need for Climate Action

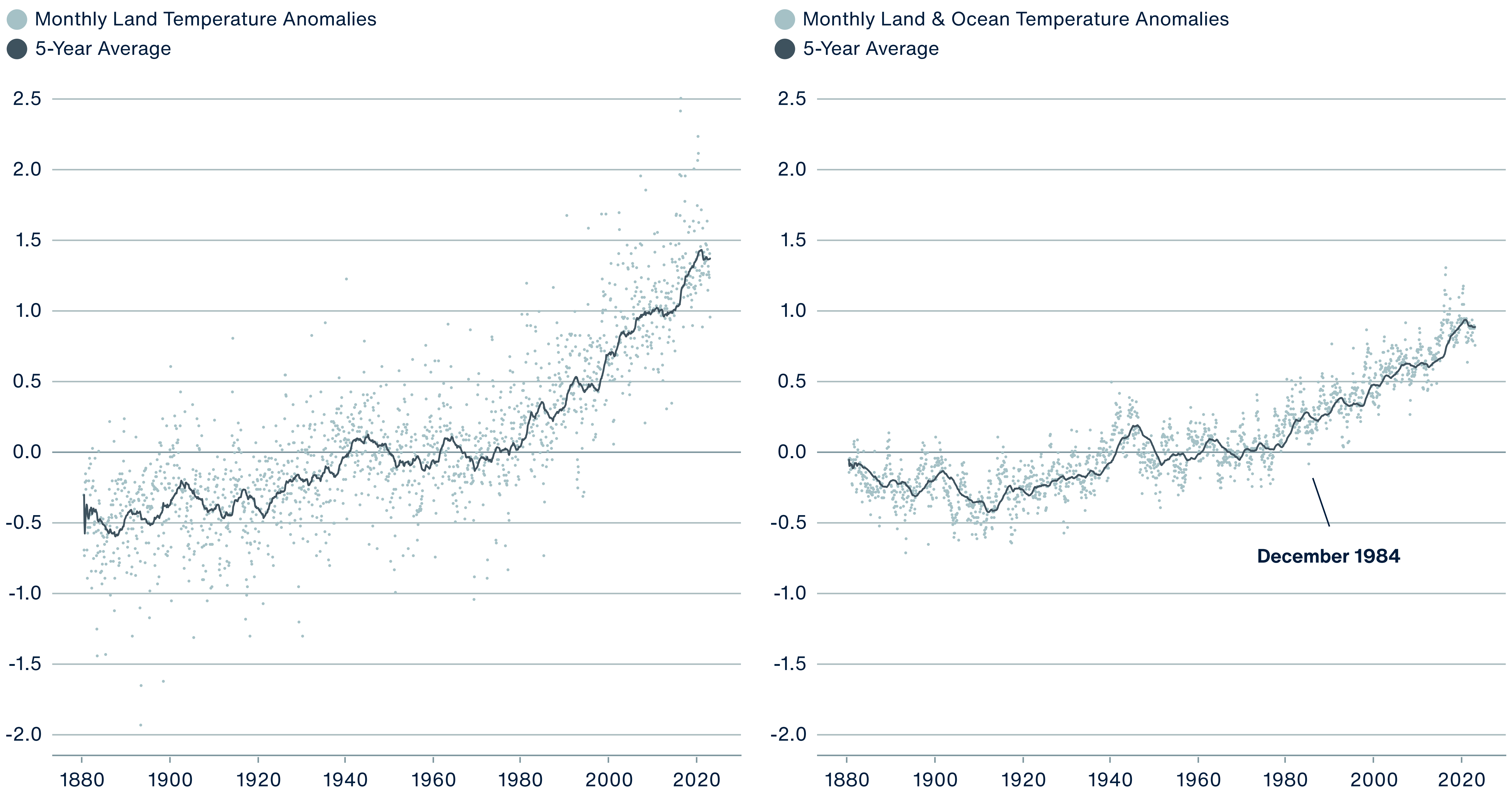
The 27th United Nations (UN) Climate Change Conference (COP27) was held at a critical moment during the fight against climate change. Global leaders in government, industry, finance, and civil society from more than 190 countries gathered in Sharm el-Sheikh, Egypt, on November 6-18, 2022. By the number of participants, the COP27 was the second largest after the COP26 in Glasgow. Attendees highlighted the need to accelerate action to achieve the goals of the Paris Agreement and the UN Framework Convention on Climate Change. The conference has been held annually since 1995 and is used as a platform where attending parties agree on policies to limit global temperature rise and adapt to impacts associated with climate change.

Selected takeaways from the COP27:

- The conference covered topics such as climate finance, decarbonization, climate change adaptation, agriculture, water, biodiversity, or gender
- There is a need to focus on clean energy, zero-emissions mobility, green shipping
- The conference led to an agreement of the first loss and damage fund, a pooled fund arranged to help the most affected and vulnerable countries tackle losses and damage related to climate change.
- At least 150 countries signed the Global Methane Pledge to lower methane emissions by 30 percent by 2030, which is 50 more countries than last year at COP26, but still excluding China as a major methane polluter. Attendees agreed that the greenhouse gas emissions, particularly methane emissions, must be tracked sufficiently (Climate Trace) to detect the world's worst polluters.
- The progress on adaptation fell far short of what is needed to address accelerating and severe impacts.
- Many stakeholders are still not taking any significant steps to curb emissions, which are critical to limit temperature rise to 1.5°C (2.7°F).
- Now there is a fifty-fifty chance that global temperatures will be at or above the 1.5°C (2.7°F) threshold set in the 2015 Paris Agreement over the next five years. The threshold based on the preindustrial age temperature average (1850-1900).
- Still not too late: Changes in emission output and human behavior can bring meaningful near-term improvements.

2022 Marks the Sixth-Warmest Year on Record Dating to 1880

Exhibit 39: Global Land and Ocean Temperature Anomalies: 1880-2022 (°C)



Data: NOAA

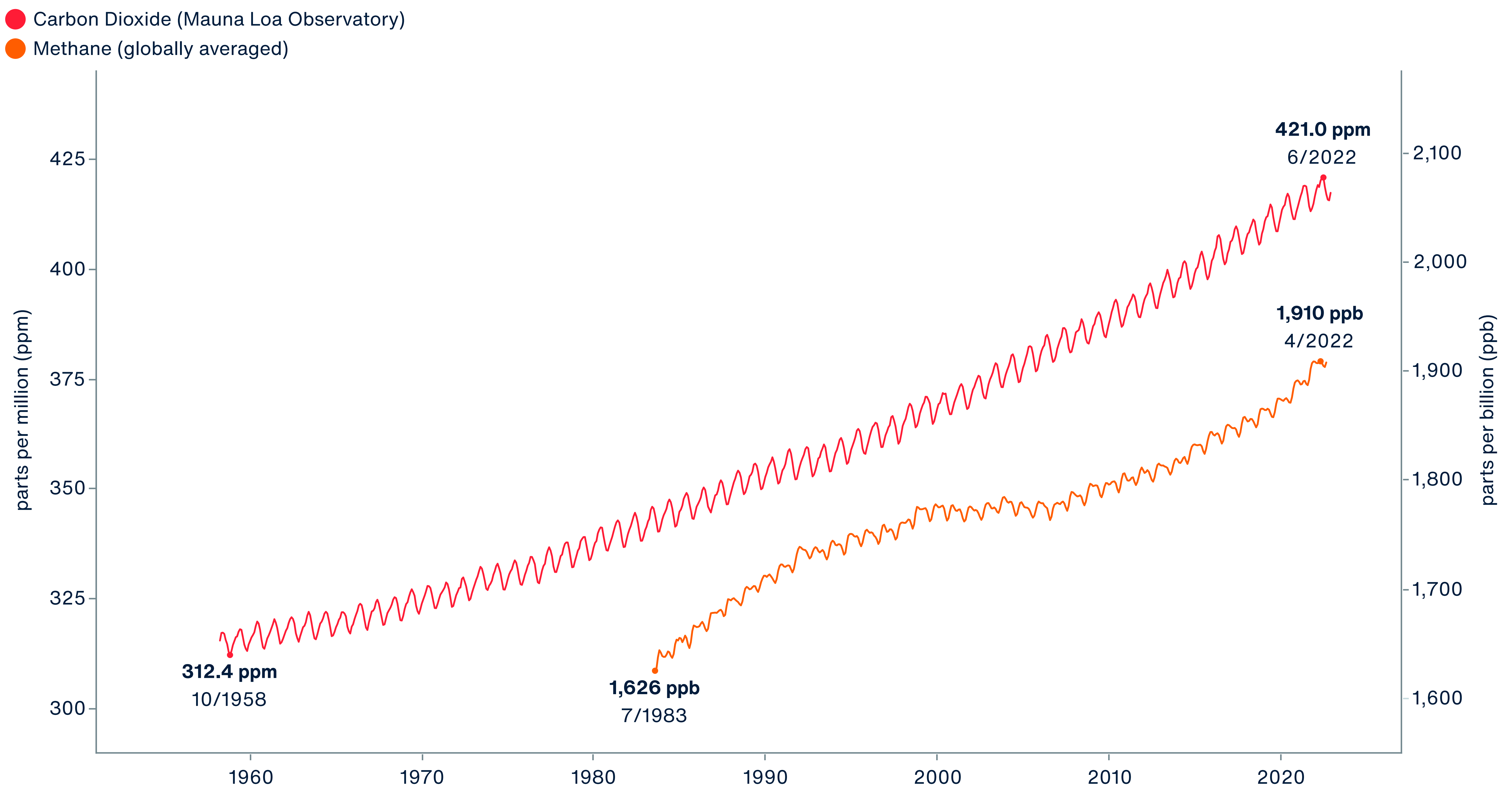
2022 marked the continuation of the overall long-term warming trend of the planet. Preliminary official data from the National Centers for Environmental Information (NCEI), noted that 2022 was 0.86°C (1.55°F) above average global land and sea surface temperatures. This marked the sixth-warmest year on record dating to 1880, when comparing against NCEI's 20th century average (1901-2000). European Union's Copernicus Climate Change Service declared 2022 the fifth-warmest based on ERA5 dataset, while NASA suggested that 2022 tied as the fifth-warmest.

It was previously assumed that El Niño years comprise most of the warm year lists since it amplifies warming. The opposite was always assumed to be true for La Niña — meaning that historical data typically shows that the globe tends to cool during such phases. Despite enduring La Niña conditions throughout the year, 2022 was still anomalously warm. This suggests that land and ocean temperatures continue to warm at an accelerated rate regardless of any influence from natural variability, volcanic eruptions, or solar cycles. It is further evidence anthropogenic activity is driving most of the warming.

The last below-average year for the globe occurred in 1976, while the last individual month to be below average was December 1984 at -0.08°C (-0.15°F) lower, and before that November 1976. December 2022 marked the 456th consecutive month with above average global temperatures.

Greenhouse Gas Concentrations Continue to Increase with Accelerated Pace

Exhibit 40: Monthly Carbon Dioxide and Methane Concentrations



Data: NOAA

Data from the NOAA Earth System Research Laboratory (ESRL) showed carbon dioxide (CO2) concentrations increased for another consecutive year and averaged 417 parts per million (ppm). The highest monthly average was observed in May and June at around 421 ppm, with new daily record CO2 reading of 422.06 ppm recorded on April 26. Data collection at the observatory was suspended from November 29 following the eruption of Mauna Loa. Measurements had only paused in two other years since 1960.

NOAA noted that current CO2 levels are at the highest in 4 million years. This was during the Mid-Pliocene Warm Period when carbon dioxide concentrations ranged from 380 to 450 ppm. Atmospheric CO2 levels have a scientifically proven correlation with global temperature, supported by data from ice cores and the geological record. Concentrations annually peak in May as plants begin to grow in the Northern Hemisphere with the arrival of spring. After peaking, a gradual decline occurs through the month of September as the growing season ends.

It is worth noting that the annual rate of growth in CO2 concentration has increased over the course of multiple decades. The rate is the difference in concentration between the end of December and the start of January of that year. If used as an average for the globe, it would represent the sum of all CO2 added to, and removed from, the atmosphere during the year by human activities and by natural processes. NOAA also applies a four-month interpolating technique to account for month-to-month variability

Three Ways the Re/insurance Industry Can Accelerate Net Zero by Facilitating Capital

The emerging impacts of climate change are increasingly felt across the re/insurance industry, with much uncertainty ahead. But the industry now has a chance to transform volatility into opportunity. Today, forward-thinking insurance companies are driving the global economy by originating solutions that safeguard businesses, governments and communities.

However, more work needs to be done as our role in improving resilience in the economy evolves. Re/insurers can help solve the climate crisis by matching capital to risk where it's needed, such as via clean tech solutions, and by de-risking projects and technology development, which will encourage faster and more meaningful investment. There are three primary ways the industry can help accelerate the journey to net zero emissions.

First, instead of moving away on arbitrarily short timescales from carbon-intensive and high-emission industries, re/insurers should be enabling and supporting these industries to transition to lower carbon operations. This can be done by both supporting and incentivizing these industries to transition, and by de-risking investments in low-carbon technologies, for example carbon capture and storage and new types of renewable energy. In order to fully grasp this opportunity, the re/insurance industry must change some of its mindset to formulate a consistent forward-looking pricing model for new risks.

Second, the industry should consider the need for longer policy terms than our usual annual renewal cycle. New clean tech industries, for example, are often not investable at scale, and re/insurance coverage's stability and predictability over longer periods could free up capital flows. This "duration mismatch" is impeding financing for green technologies as the long-term insurability of assets comes into question — which in turn increase risk for investors. We're leveraging the existing longer term approach in some existing lines of business and working with new and existing capital providers to increase appetite for longer-term risks. Working with pension and investment markets could also inform longer-term thinking about assets and liabilities — enabling us to apply these insights to the general reinsurance world more systematically.

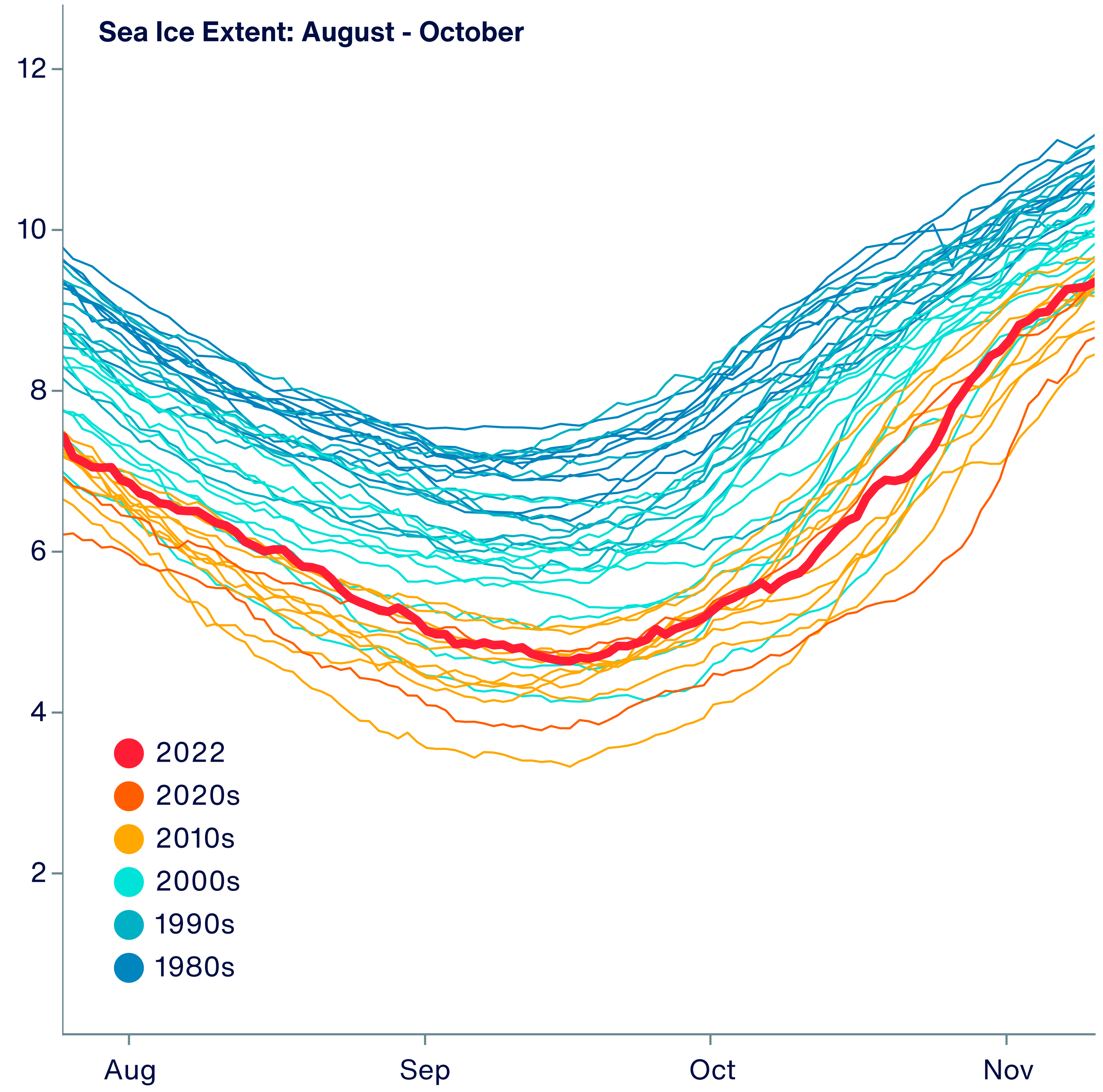
Finally, the re/insurance industry must collaborate and innovate with stakeholders, including existing and alternative sources of capital, green technology startups, risk mitigation firms and the public sector, so our society can decarbonize at scale. As a recent example, Revalue Nature, which provides nature-based carbon offset projects, collaborated with Aon to insure those investments against unforeseen events such as wildfires or bug infestations (read more here).

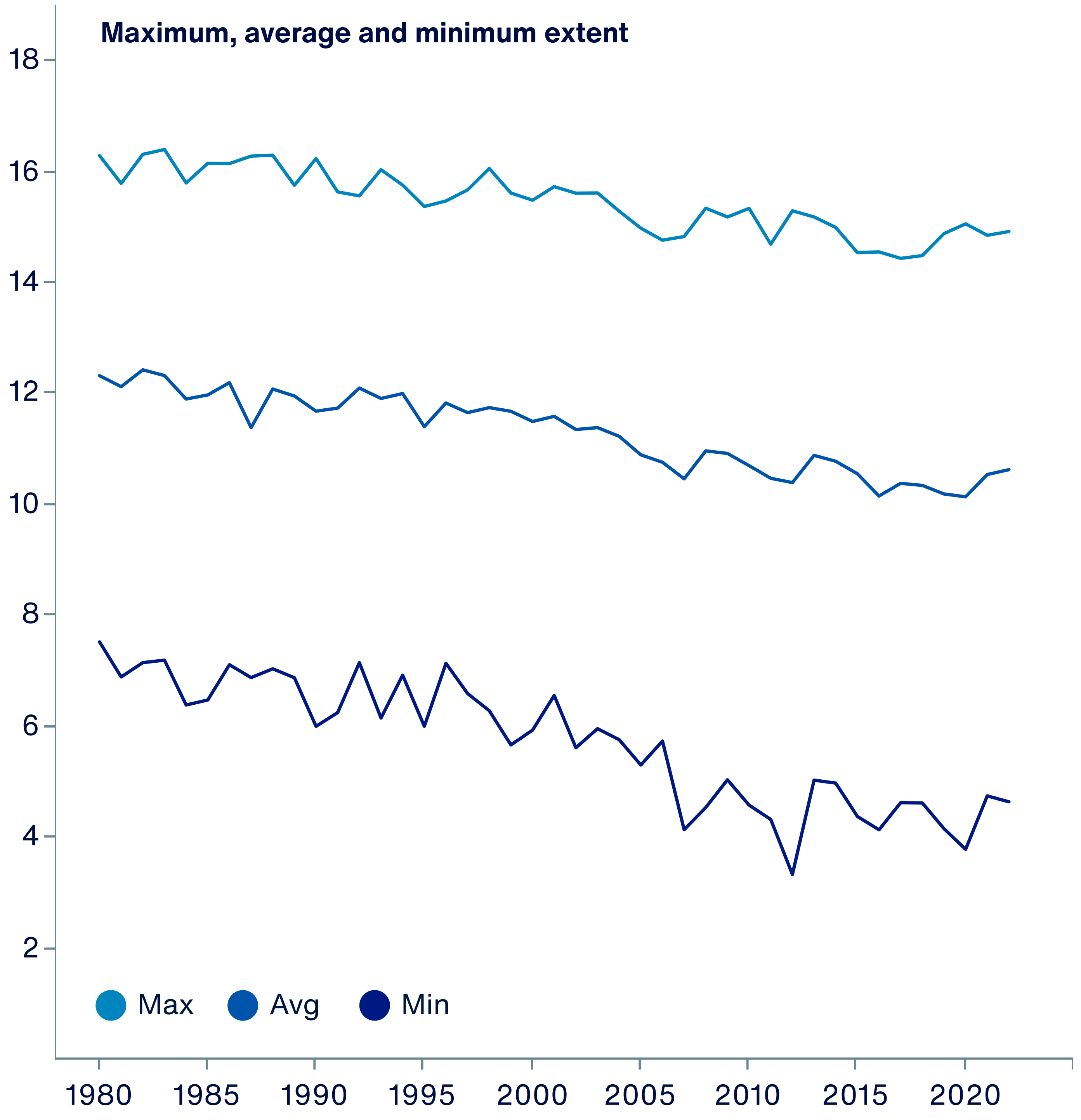
Decarbonization is changing the risk landscape and any un-insurability of increasingly volatile weather presents a risk to our economy. But by engaging new talent, partners and stakeholders, the re/insurance industry can play a truly transformational role in the climate transition by enabling better decisions for a more sustainable future.

Richard Dudley
Global Head of Climate Strategy, Aon

Sea Ice: Antarctica Records New Low

Exhibit 41: Arctic Sea Ice Extent in Million Square Kilometers: 1980-2022



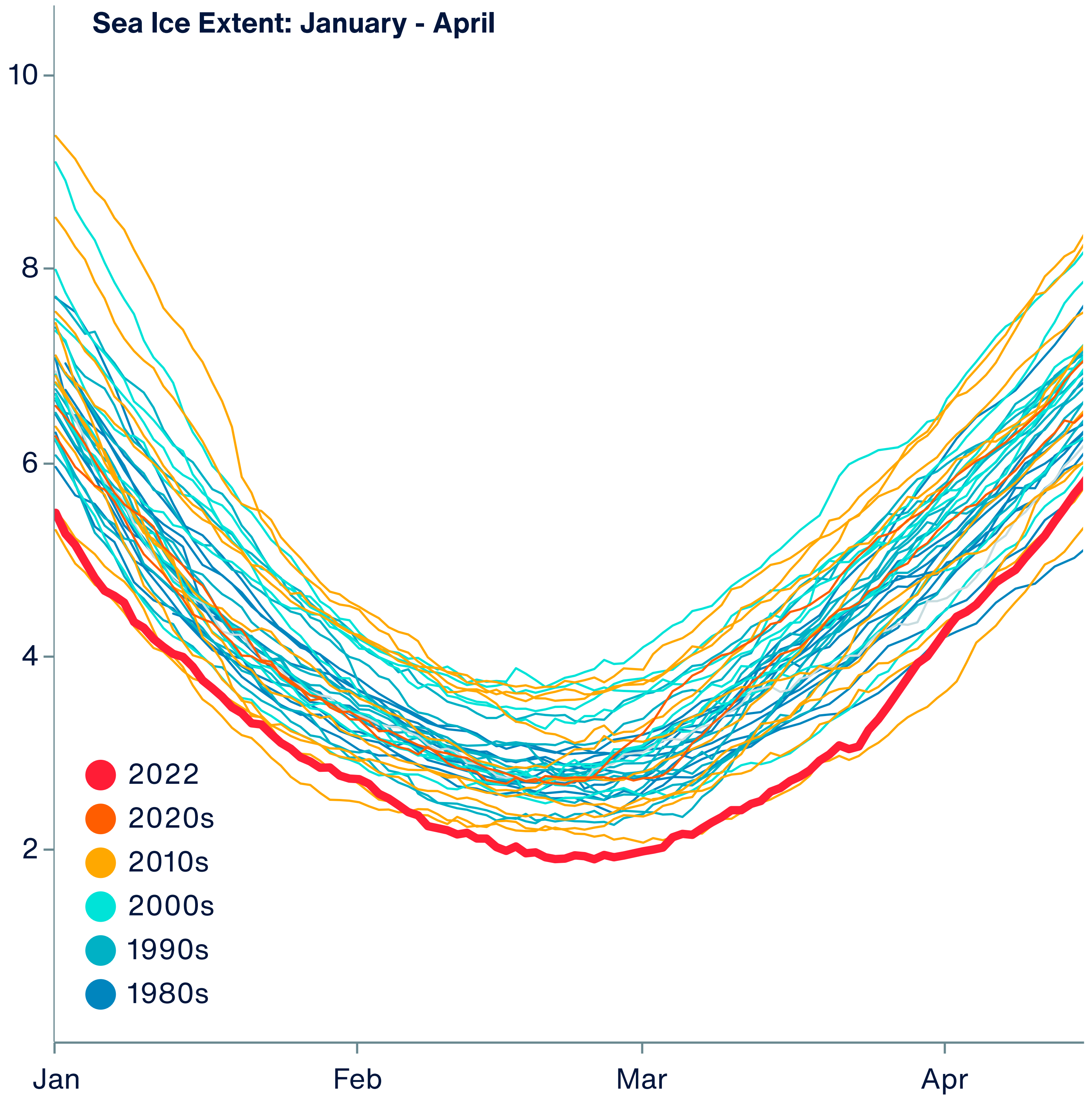


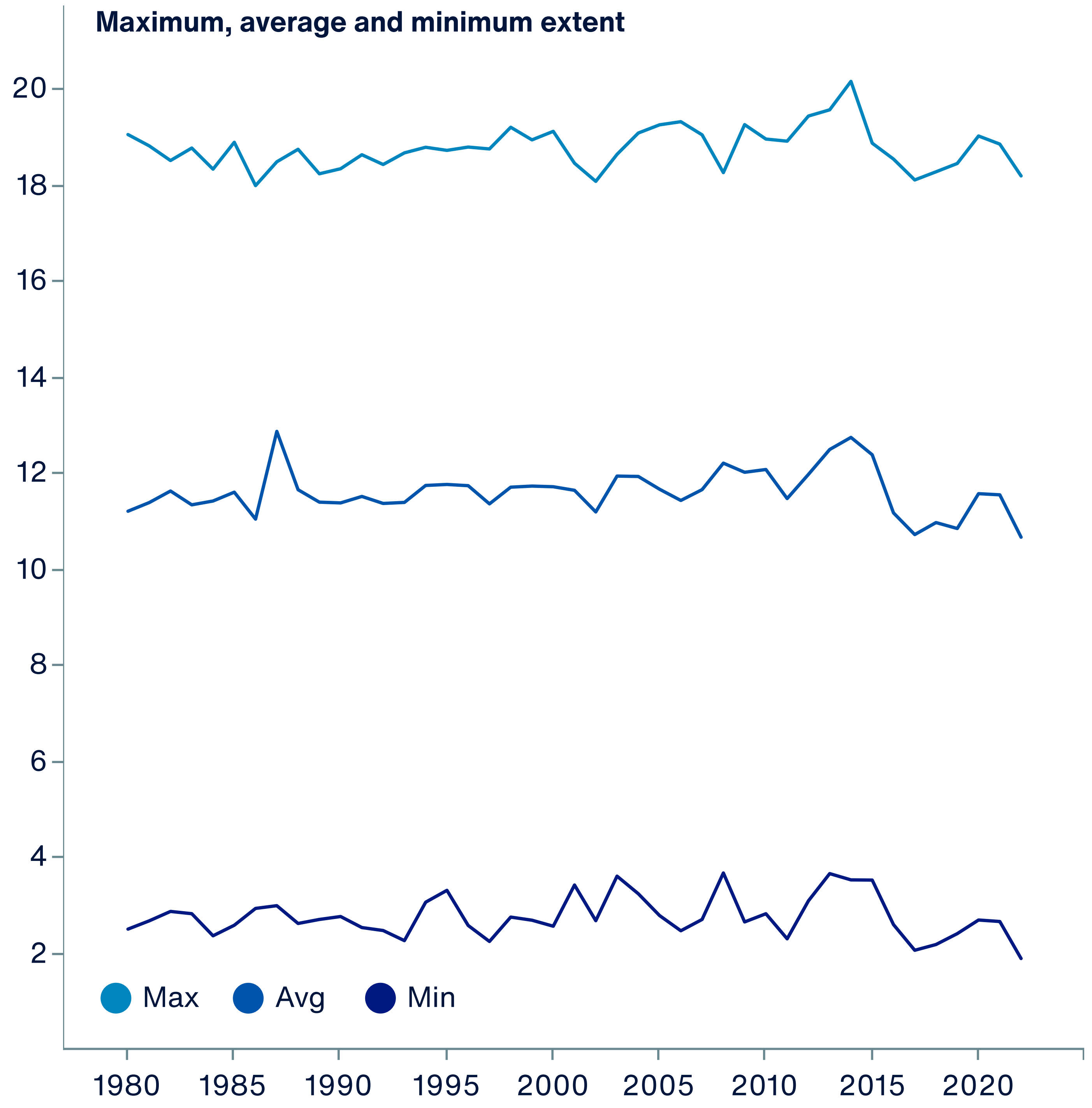
Data: Fetterer, F., K. Knowles, W. Meier, M. Savoie, and A. K. Windnagel. 2017, updated daily. Sea Ice Index, Version 3. Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center. [1/1/2023].

The well-documented decline of the Arctic sea ice extent and volume since the 1980s affects essential climatic feedback mechanisms, which then influence global circulation patterns. Surface air temperatures in the Arctic region have increased at a rate twice as fast as in the rest of the globe, with far-reaching impacts for the entire Arctic ecosystem. Some of these impacts include a reduction in natural habitats, but also increased accessibility of the Arctic Ocean for shipping since some areas no longer freeze at any point of the year.

This year's Arctic minimum extent tied for tenth lowest on record. However, an even bigger concern is that the amount of multi-year ice, which stands at a near-record low. An analysis of satellite data from NASA and the National Snow and Ice Data Center (NSIDC) showed that the 2022 minimum extent measured 4.67 million km^2 (1.8 million mi^2) on September 18. It represents a 1.55 million km^2 (0.6 million mi^2) reduction from the 1981-2010 September climatology. The 2022 extent was the tenth lowest in the 44-year satellite record, tying minimum extent in 2017 and 2018. The last time that Arctic sea ice extent was above climatology was in 2001.

Exhibit 42: Antarctica Sea Ice Extent in Million Square Kilometers: 1980-2022



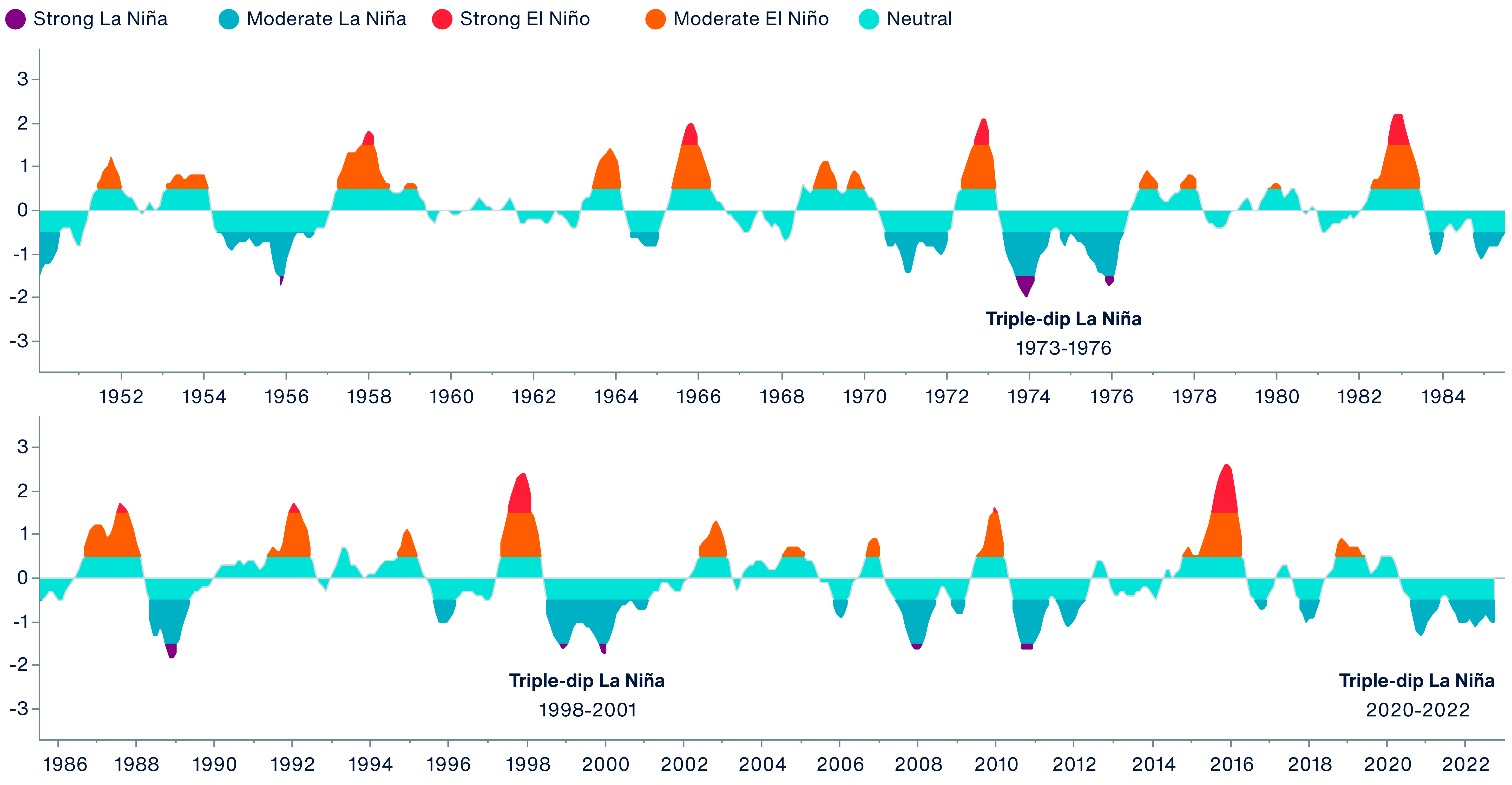


Data: Fetterer, F., K. Knowles, W. Meier, M. Savoie, and A. K. Windnagel. 2017, updated daily. Sea Ice Index, Version 3. Boulder, Colorado USA. NSIDC: National Snow and Ice Data Center. [1/1/2023].

On the opposite side of globe, the Antarctic is responding less rapidly to climate change than the Arctic. Despite moderate warming, the amount of sea ice and its volume in the Antarctic have yet to show a substantial decreasing trend. However, the sea ice extent in this region set a new record minimum in 2022. For the first time since the satellite record began in 1979, the extent fell below 2 million km^2 (772,000 mi^2), reaching a minimum extent of 1.92 million km^2 (741,000 mi^2) on February 25. Surprisingly, this year record-breaking minimum followed the unusually early and above-average sea ice maximum extent from previous year (reached on September 1). However, two regions of high interest to researchers, Thwaites Glacier and the central Weddell Sea, remained locked in ice. With a continued moderation in temperatures, a recent study suggested that Thwaites Glacier Shelf could collapse within the next three to five years. This is a huge concern since it is one of the largest and highest glaciers in Antarctica and is roughly the size of the U.S. state of Florida. Should the glacier fully collapse into the ocean, scientists fear that it could raise levels by 65 centimeters (25.6 inches). It already accounts for four percent of global sea level rise.

La Niña Affects Global Weather Patterns for the Third Year in a Row

Exhibit 43: Oceanic Niño Index and ENSO Phase Conditions by Month



Data: Climate Prediction Center / NOAA

One of the climate oscillations that has a robust global influence on regional weather is the El Niño/Southern Oscillation (ENSO): a warming or cooling cycle of ocean waters across the central and eastern Pacific. The cycle is often associated with changes in the orientation of various atmospheric patterns and ocean currents. Warming periods are noted as El Niño cycles, while cooling periods are known as La Niña cycles. The Niño 3.4 or the Oceanic Niño Indices, which measure the three-month running average temperature of the ocean waters in the central Pacific, are used to determine ENSO phases/cycles by the Climate Prediction Center. ENSO phases with a peak value above 1.5°C (El Niño) or below negative 1.5°C (La Niña) are considered strong.

For the first time in the 21st century, the world saw a "triple-dip" La Niña event, as the cooling phase spanned three consecutive northern hemisphere winters into late 2022. Moderate La Niña conditions from 2021 continued into 2022 and persisted throughout the year. Many forecasting centers are expecting a weakening of La Niña conditions in early 2023, with a return to ENSO-neutral around February. There were two other occurrences of a "triple-dip" La Niña since 1950: 1973 to 1976, and 1998 to 2001. La Niña is an important climate driver for Australia. For example, a strong La Niña year in 1974 contributed to a severe deluge in Queensland.

Appendix

Appendix A: 2022 Global Disasters

United States

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/01-12/31	Drought	Nationwide	N/A	16.0+ billion
01/02-01/03	Winter Weather	Southeast, Mid-Atlantic	5	525+ million
01/08-01/09	Severe Convective Storm	Plains, South	0	64+ million
01/14-01/17	Winter Weather	Southeast, Mid-Atlantic	3	955+ million
01/21-01/22	Severe Convective Storm	California	0	186+ million
01/28-01/30	Winter Weather	Mid-Atlantic, Northeast	4	53+ million
02/01-02/05	Winter Weather	Rockies, Plains, Mid-Atlantic, Northeast	10	526+ million
02/16-02/18	Winter Weather	Plains, South, Mid-Atlantic, Northeast	0	373+ million
02/21-02/22	Severe Convective Storm	Plains, South	0	1.2+ billion
03/05-03/07	Severe Convective Storm	Midwest, Mid-Atlantic, Northeast	8	820+ million
03/11-03/13	Severe Convective Storm	South, Mid-Atlantic	0	228+ million
03/14-03/16	Severe Convective Storm	Plains, South	0	540+ million
03/17-03/19	Severe Convective Storm	Plains, South	0	36+ million
03/17-03/25	Wildfire	Texas	1	31+ million
03/21-03/23	Severe Convective Storm	Plains, South	5	856+ million

United States

Date(s)	Event	Location	Deaths	Economic Loss (USD)
03/29-04/01	Severe Convective Storm	Plains, South	2	1.3+ billion
03/30-04/01	Wildfire	Tennessee	0	233+ million
04/02-/04	Severe Convective Storm	Florida	0	304+ million
04/03-04/07	Severe Convective Storm	Plains, South	3	1.4+ billion
04/04	Severe Convective Storm	Northwest	0	46+ million
04/06-05/31	Wildfire	New Mexico	0	495+ million
04/10-04/14	Severe Convective Storm	Plains, Midwest, South	1	2.8+ billion
04/12-04/15	Wildfire	New Mexico	2	155+ million
04/15-04/17	Severe Convective Storm	Plains, South	0	882+ million
04/18-04/19	Winter Weather	Northeast	0	26+ million
04/21-04/24	Severe Convective Storm	Plains, Midwest	0	624+ million
04/25-05/10	Flooding	Plains, Midwest	0	52+ million
04/26-04/30	Severe Convective Storm	Plains, Midwest	3	583+ million
05/01-05/03	Severe Convective Storm	Plains, Midwest	0	1.1+ billion
05/04-05/06	Severe Convective Storm	Plains, South, Mid-Atlantic	0	1.0+ billion

United States

Date(s)	Event	Location	Deaths	Economic Loss (USD)
05/09-05/10	Severe Convective Storm	Plains, Midwest	0	2.0+ billion
05/11-05/12	Wildfire	California	0	51+ million
05/11-05/12	Severe Convective Storm	Plains, Midwest	5	2.7+ billion
05/13-05/16	Severe Convective Storm	Plains, South, Mid-Atlantic	0	704+ million
05/17-05/19	Severe Convective Storm	Midwest	0	219+ million
05/19-05/22	Severe Convective Storm	Plains, South, Midwest	2	2.6+ billion
05/21-05/23	Severe Convective Storm	Midwest, Mid-Atlantic, Northeast	0	77+ million
05/23-05/25	Severe Convective Storm	Plains, South	0	373+ million
05/26-05/27	Severe Convective Storm	South, Northeast	0	51+ million
05/29	Severe Convective Storm	Plains	0	204+ million
05/30-06/02	Severe Convective Storm	South, Plains	0	704+ million
06/01-06/30	Heatwave	Arizona, Tennessee, Texas	55	N/A
06/01-06/03	Severe Convective Storm	Plains	0	101+ million
06/02-06/06	Flooding	Florida	0	383+ million
06/04-06/08	Severe Convective Storm	Plains, Midwest, Mid-Atlantic	0	1.9+ billion
06/09-06/10	Severe Convective Storm	Plains, South	0	25+ million

United States

Date(s)	Event	Location	Deaths	Economic Loss (USD)
06/11-06/14	Flooding	Rockies	0	50+ million
06/11-06/17	Severe Convective Storm	South, Midwest, Northeast	3	3.4+ billion
06/16-06/18	Severe Convective Storm	Midwest, South, Mid-Atlantic	1	60+ million
06/19-06/21	Severe Convective Storm	Plains, Midwest	0	76+ million
06/22-06/23	Severe Convective Storm	Mid-Atlantic, Northeast	0	126+ million
06/23-06/24	Severe Convective Storm	Plains	0	76+ million
07/07-07/13	Severe Convective Storm	Mid-Atlantic	0	936+ million
07/15-07/25	Flooding	Southwest	2	176+ million
07/17-07/21	Severe Convective Storm	Mid-Atlantic, Midwest, Southeast	3	76+ million
07/21-07/25	Severe Convective Storm	Mid-Atlantic, Midwest	0	1.3+ billion
07/22-07/31	Wildfire	California	0	151+ million
07/25-07/28	Flooding	Missouri, Kentucky	43	1.4+ billion
07/26-07/31	Flooding	Southwest	3	284+ million
07/29-08/10	Wildfire	California	4	151+ million
08/01-08/04	Severe Convective Storm	Midwest	1	201+ million

United States

Date(s)	Event	Location	Deaths	Economic Loss (USD)
08/05-08/12	Flooding	Southwest, West	2	30+ million
08/11-08/12	Severe Convective Storm	Northwest	0	126+ million
08/11-08/14	Severe Convective Storm	Southwest	0	58+ million
08/18-08/22	Flooding	South	2	831+ million
08/20-08/21	Severe Convective Storm	Iowa, Illinois	0	675+ million
08/27-08/29	Severe Convective Storm	Midwest	4	252+ million
08/28-09/07	Severe Convective Storm	West, Mid-Atlantic	1	372+ million
09/01-09/04	Severe Convective Storm	Arizona	0	68+ million
09/02-09/09	Wildfire	California	2	101+ million
09/06-09/16	Wildfire	California	0	151+ million
09/11-09/12	Severe Convective Storm	Midwest	0	146+ million
09/18-09/21	Severe Convective Storm	Midwest	0	497+ million
09/28-10/01	Hurricane Ian	Florida, North Carolina, South Carolina	152	95+ billion
10/01-10/04	Severe Convective Storm	Arizona	0	130+ million
10/15-10/16	Severe Convective Storm	Southwest	0	225+ million

United States

Date(s)	Event	Location	Deaths	Economic Loss (USD)
10/24-10/25	Severe Convective Storm	Texas	0	219+ million
10/29	Severe Convective Storm	Alabama, Mississippi	0	75+ million
11/04-11/10	Hurricane Nicole	Florida	5	1.0+ billion
11/04-11/05	Severe Convective Storm	Washington	0	130+ million
11/04-11/05	Severe Convective Storm	Southwest, Midwest	2	375+ million
11/11	Severe Convective Storm	Texas	0	155+ million
11/27	Severe Convective Storm	Pennsylvania, West Virginia	0	105+ million
11/29-11/30	Severe Convective Storm	Southeast	2	115+ million
12/10-12/12	Winter Weather	California	0	100+ million
12/12-12/15	Severe Convective Storm	Southeast, Southwest	3	345+ million
12/20	Earthquake	California	0	250+ million
12/21-12/26	Winter Weather	Northeast, Midwest	98	2.7+ billion

Remainder of North America (Non-U.S.)

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/01-12/31	Drought	Mexico	N/A	1.5+ billion
01/24	Earthquake	Haiti	2	Millions
01/30-01/31	Flooding	Haiti, Dominican Republic	5	Millions
02/04-02/06	Flooding	Puerto Rico	0	17+ million
02/17-02/19	Winter Weather	Canada	0	230+ million
03/06	Winter Weather	Canada	0	16+ million
04/15-04/16	Severe Convective Storm	Canada	0	28+ million
04/22-04/25	Flooding	Canada	0	162+ million
04/30	Flooding	Guadeloupe	3	26+ million
05/01-09/11	Flooding	Guatemala	42	204+ million
05/21	Severe Convective Storm	Canada	12	1.2+ billion
05/28-05/31	Tropical Cyclone Agatha	Mexico	9	51+ million
05/30-05/31	Flooding	Canada	0	36+ million
06/02-06/06	Flooding	Cuba	3	25+ million
06/13-06/15	Flooding	Canada	0	50+ million

Remainder of North America (Non-U.S.)

Date(s)	Event	Location	Deaths	Economic Loss (USD)
06/16-06/17	Severe Convective Storm	Canada	0	59+ million
06/18-06/20	Severe Convective Storm	Canada	0	46+ million
06/20-06/21	Severe Convective Storm	Canada	0	40+ million
06/23-06/24	Severe Convective Storm	Canada	0	166+ million
06/28-06/29	Severe Convective Storm	Canada	0	40+ million
07/01-07/03	Tropical Storm Bonnie	Nicaragua, El Salvador, Costa Rica	5	25+ million
07/07-07/08	Severe Convective Storm	Canada	0	39+ million
07/15-07/17	Severe Convective Storm	Canada	0	84+ million
07/18-07/21	Severe Convective Storm	Canada	0	127+ million
07/23-07/25	Severe Convective Storm	Canada	0	40+ million
07/29-07/31	Severe Convective Storm	Canada	0	50+ million
08/01-08/04	Severe Convective Storm	Canada	0	65+ million
09/13-09/14	Flooding	Canada	0	369+ million
09/17-09/20	Flooding	Central America	15	11+ million
09/18-09/25	Hurricane Fiona	Caribbean, Canada	31	4.0+ billion

Remainder of North America (Non-U.S.)

Date(s)	Event	Location	Deaths	Economic Loss (USD)
09/19	Earthquake	Mexico	4	25+ million
09/27	Hurricane Ian	Cuba	5	500+ million
10/05-10/10	Hurricane Julia	Central America, Mexico	37	762+ million
10/23	Hurricane Roslyn	Mexico	4	Unknown
10/31-11/05	Hurricane Lisa	Central America, Mexico	0	100+ million
11/04-11/05	Flooding	Caribbean	0	27+ million
11/04-11/10	HU Nicole	Bahamas, Dominican Republic	6	Unknown
12/21-12/26	Winter Weather	Canada	4	179+ million
12/23-12/27	Winter Weather	Canada	0	75+ million

South America

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/01-12/31	Drought	Argentina	N/A	531+ million
01/01-12/31	Drought	Brazil	N/A	4.0+ billion
01/01-05/31	Flooding	Ecuador	11	399+ million
01/01-01/14	Flooding	Brazil	15	90+ million
01/15-02/28	Wildfire	Argentina	0	770+ million
01/16-01/17	Flooding	Brazil, Uruguay	0	Millions
01/20	Severe Convective Storm	Brazil	2	26+ million
01/27-01/30	Flooding	Brazil	31	72+ million
01/28-02/01	Flooding	Ecuador	28	53+ million
02/07-02/09	Severe Convective Storm	Brazil	0	23+ million
02/08	Flooding	Colombia	16	Millions
02/12-02/13	Severe Convective Storm	Brazil	1	Millions
02/15-02/16	Flooding	Brazil	232	27+ million
02/18-02/19	Flooding	Colombia	1	11+ million
03/01-05/31	Flooding	Suriname	0	21+ million

South America

Date(s)	Event	Location	Deaths	Economic Loss (USD)
03/16–10/31	Flooding	Colombia	237	406+ million
03/24-03/25	Flooding	Brazil	0	Millions
03/26	Earthquake	Ecuador	0	Millions
03/31-04/02	Flooding	Brazil	23	136+ million
04/07-04/10	Severe Convective Storm	Brazil	0	11+ million
04/15-04/30	Flooding	Venezuela	0	Millions
04/22-04/23	Severe Convective Storm	Brazil	0	21+ million
05/01-05/30	Flooding	Brazil	2	18+ million
05/04-05/06	Flooding	Brazil	3	93+ million
05/15-05/18	Tropical Cyclone Yakecan	Brazil, Uruguay	2	51+ million
05/25-05/28	Flooding	Brazil	129	459+ million
06/21	Flooding	Brazil	0	12+ million
07/01-07/05	Flooding	Brazil	12	264+ million
07/13	Earthquake	Peru	0	10+ million
08/15	Severe Convective Storm	Brazil	0	10+ million

South America

Date(s)	Event	Location	Deaths	Economic Loss (USD)
09/22-09/23	Flooding	Venezuela	10	Negligible
10/03-10/04	Severe Convective Storm	Brazil	0	Millions
10/05-10/10	Hurricane Julia	Venezuela	54	Unknown
10/10-10/12	Flooding	Brazil	0	100+ million
11/29-12/04	Flooding	Brazil	10	Millions
12/04	Landslide	Colombia	34	Negligible

Europe

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/01-12/31	Drought	Western, Southern and Central Europe	N/A	22.0+ billion
01/09-01/12	Flooding	France	1	12+ million
01/12-01/13	Windstorm Gyda	Norway	0	19+ million
01/16-01/17	Windstorm Hannelore	Northern, Eastern and Central Europe	1	118+ million
01/24-01/25	Winter Weather	Greece	0	23+ million
01/29-01/30	Windstorm Malik	Western, Northern and Central Europe	7	540+ million
01/30-01/31	Windstorm Corrie	Western Europe	0	21+ million
02/03-02/06	Winter Weather	Austria, Switzerland	11	Negligible
02/06-02/07	Windstorm Roxanna	Western and Central Europe	1	160+ million
02/16-02/17	Windstorm Dudley	Western and Central Europe	9	921+ million
02/18-02/19	Windstorm Eunice	Western and Central Europe	17	4.5+ billion
02/20-02/21	Windstorm Franklin	Western and Central Europe	3	811+ million
04/01-04/04	Winter Weather	Western Europe	0	930+ million
04/04	Windstorm Mirella	Germany, Poland	0	30+ million
04/06-04/07	Windstorm Nasim	Western and Central Europe	0	256+ million

Europe

Date(s)	Event	Location	Deaths	Economic Loss (USD)
04/08-04/09	Windstorm Diego	Western and Central Europe	0	86+ million
04/22	Earthquake	Bosnia and Herzegovina	1	26+ million
05/02-05/03	Flooding	Spain	0	33+ million
05/15-05/16	Severe Convective Storm	Western and Central Europe	0	39+ million
05/19	Severe Convective Storm	Western and Central Europe	0	71+ million
05/20	Severe Convective Storm	Western and Central Europe	1	476+ million
05/22-05/25	Severe Convective Storm	Western and Central Europe	0	480+ million
06/02-06/06	Severe Convective Storm	Western and Central Europe	2	1.7+ billion
06/09-06/10	Severe Convective Storm	Central and Southeastern Europe	2	12+ million
06/11-06/25	Wildfire	Spain	0	55+ million
06/11-08/20	Wildfire	Germany	0	42+ million
06/13-06/19	Heatwave	Western, Southern and Central Europe	3,750+	N/A
06/15-06/16	Severe Convective Storm	Central Europe	0	58+ million
06/18-07/31	Wildfire	France	0	25+ million
06/19-06/24	Severe Convective Storm	Western and Central Europe	5	2.4+ billion

Europe

Date(s)	Event	Location	Deaths	Economic Loss (USD)
06/25-07/31	Wildfire	Italy	0	13+ million
06/26-06/29	Severe Convective Storm	Western and Central Europe	2	1.3+ billion
06/30-07/01	Severe Convective Storm	Western and Central Europe	0	344+ million
07/02-07/31	Wildfire	Greece	0	12+ million
07/02-07/31	Wildfire	Portugal	0	25+ million
07/03	Landslide	Italy	11	Negligible
07/04-07/05	Severe Convective Storm	Southern and Central Europe	1	97+ million
07/07-07/20	Heatwave	Western, Southern and Central Europe	15,450+	N/A
07/09-07/31	Wildfire	Spain	0	100+ million
07/20-07/23	Severe Convective Storm	Western and Central Europe	0	95+ million
07/24-07/31	Wildfire	Czech Republic	0	Millions
07/25	Severe Convective Storm	Germany	0	51+ million
08/04-08/06	Severe Convective Storm	Western and Central Europe	1	29+ million
08/12-08/13	Severe Convective Storm	Italy	0	25+ million
08/14-08/17	Severe Convective Storm	Western, Central and Southern Europe	0	28+ million

Europe

Date(s)	Event	Location	Deaths	Economic Loss (USD)
08/17-08/21	Severe Convective Storm	Western and Central Europe	13	249+ million
08/25-08/28	Severe Convective Storm	Germany, Spain	0	60+ million
08/30	Severe Convective Storm	Spain	1	25+ million
09/02	Flooding	Bulgaria	0	47+ million
09/02-09/08	Severe Convective Storm	France, Italy	0	25+ million
09/15-09/16	Flooding	Italy	12	Millions
09/25-09/27	Flooding	Spain	0	10+ million
10/08-10/12	Flooding	Southern Europe	0	Unknown
10/31-11/01	Windstorm Karsta	Western Europe	0	15+ million
11/11-11/12	Flooding	Spain	1	79+ million
11/17	Windstorm Regina	Western Europe	0	18+ million
11/19-11/20	Flooding	Southeastern Europe	6	Millions
11/26	Flooding	Italy	12	Millions
12/07-12/13	Flooding	Southern and Eastern Europe	0	211+ million
12/13	Flooding	Spain, Portugal	0	111+ million
12/15-12/21	Winter Weather	Western and Central Europe	7	Unknown
12/30-12/31	Windstorm Liddy	Western and Northern Europe	0	11+ million

Middle East

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/01-01/06	Flooding	Oman, Iran	14	101+ million
03/17	Earthquake	Iran	0	36+ million
06/24-06/27	Flooding	Turkey	0	245+ million
07/02	Earthquake	Iran	0	143+ million
07/22-07/29	Flooding	Iran	95	201+ million
07/23-07/24	Flooding	Yemen	14	Unknown
08/01-08/05	Flooding	Yemen	16	Unknown
10/05	Earthquake	Iran	0	Unknown
11/23	Earthquake	Turkey	2	50+ million
12/11-12/12	Flooding	Turkey	0	Millions

Africa

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/01-12/31	Drought	Somalia, Ethiopia, Kenya, Malawi	N/A	2.0+ billion
01/01-01/25	Flooding	Rwanda	15	Negligible
01/08-01/09	Flooding	South Africa	10	70+ million
01/13-01/20	Flooding	Zambia	3	Millions
01/15-01/16	Flooding	South Africa	1	105+ million
01/17	Flooding	Madagascar	10	Negligible
01/21-02/02	Severe Convective Storm	DRC	26	Negligible
01/22-01/25	Tropical Storm Ana	Madagascar, Mozambique, Malawi	142	27+ million
02/02-02/07	Cyclone Batsirai	Madagascar, Mauritius, Reunion	123	200+ million
02/15-02/16	Cyclone Dumako	Madagascar	14	Millions
02/22-02/24	Cyclone Emnati	Madagascar	15	16+ million
03/08-03/18	Cyclone Gombe	Madagascar, Mozambique, Malawi	72	99+ million
04/08-04/15	Flooding	South Africa	455	3.6+ billion
04/23-04/25	Flooding	DRC, Rwanda	20	Millions
04/26	Flooding	Tanzania	10	Millions

Africa

Date(s)	Event	Location	Deaths	Economic Loss (USD)
04/26-04/27	Tropical Storm Jasmine	Madagascar	10	Millions
05/01-09/30	Flooding	Sudan	146	10s of Millions
06/01-10/31	Flooding	Chad	22	Millions
06/01-09/30	Flooding	Niger	195	Millions
06/16-06/21	Flooding	Ivory Coast	12	Millions
07/01-10/31	Flooding	Nigeria	660	2.3+ billion
07/01-10/31	Flooding	Mali	10	Millions
07/01-10/31	Flooding	Central African Republic	13	Millions
07/25-10/31	Flooding	Mauritania	19	Millions
07/30-08/01	Flooding	Uganda	29	Millions
07/30-10/31	Flooding	Gambia	6	Millions
08/01-10/31	Flooding	Cameroon	2	15+ million
08/01-10/31	Flooding	Liberia	0	Millions
08/14-08/21	Wildfire	Algeria	44	Unknown
09/01-10/31	Flooding	Benin	41	Millions

Africa

Date(s)	Event	Location	Deaths	Economic Loss (USD)
09/06	Landslide	Uganda	15	Millions
01/11-12/31	Flooding	Malawi	40	Millions
11/17-11/18	Flooding	DRC, Rwanda	35	Millions
11/27	Landslide	Cameroon	14	Unknown
12/03	Flooding	South Africa	14	Unknown
12/10-12/11	Flooding	South Africa	0	Unknown
12/12-12/13	Flooding	DRC	169	Unknown
12/20-12/26	Flooding	Uganda	10	Unknown

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/01-12/31	Drought	China	N/A	7.6+ billion
01/01-01/05	Flooding	Indonesia	0	34+ million
01/01-01/06	Flooding	Pakistan, Afghanistan	14	Millions
01/02	Earthquake	China	0	54+ million
01/06-01/09	Flooding	Indonesia	8	Millions
01/07-01/08	Winter Weather	Pakistan	23	Negligible
01/08	Earthquake	China	0	541+ million
01/09-01/13	Flooding	Indonesia	4	29+ million
01/14	Earthquake	Indonesia	0	23+ million
01/17-01/24	Flooding	Indonesia	2	36+ million
01/17	Earthquake	Afghanistan	28	Negligible
01/20-01/24	Winter Weather	China	0	107+ million
01/20-01/25	Flooding	Pakistan	12	Negligible
01/22	Earthquake	Japan	0	53+ million
01/25-01/29	Winter Weather	China	0	297+ million

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/31	Flooding	Indonesia	1	Millions
02/01-02/03	Winter Weather	China	0	147+ million
02/05-02/09	Winter Weather	China	0	84+ million
02/05-02/06	Flooding	Indonesia	3	20+ million
02/06	Winter Weather	Afghanistan	15	Negligible
02/10-02/13	Flooding	Indonesia	1	12+ million
02/11-02/14	Winter Weather	China	0	302+ million
02/15-02/17	Flooding	Indonesia	1	20+ million
02/16-02/22	Winter Weather	China	1	795+ million
02/21-02/22	Flooding	Indonesia	2	Millions
02/25	Earthquake	Indonesia	27	39+ million
02/25-03/02	Flooding	Malaysia, Thailand	12	14+ million
02/26-03/05	Flooding	Indonesia	13	62+ million
03/08-03/22	Flooding	Indonesia	10	166+ million
03/14–03/17	Severe Convective Storm	China	0	109+ million

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
03/16	Earthquake	Japan	4	9.0+ billion
03/20-03/22	Flooding	China	0	24+ million
03/26-03/29	Flooding	Indonesia	1	Millions
03/27-04/02	Severe Convective Storm	Vietnam	0	148+ million
03/31-04/02	Winter Weather	China	0	23+ million
04/01-09/22	Wildfire	Mongolia	0	23+ million
04/03-04/05	Flooding	Thailand	0	13+ million
04/05-04/06	Flooding	Indonesia	0	Millions
04/08-04/13	Tropical Storm Megi	Philippines	214	65+ million
04/11-04/15	Severe Convective Storm	China	3	134+ million
04/12-04/15	Winter Weather	China	1	23+ million
04/13	Flooding	China	4	26+ million
04/15-04/16	Flooding	Indonesia	1	23+ million
04/23-04/25	Severe Convective Storm	China	0	124+ million
04/24-04/26	Flooding	China	0	31+ million

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
04/27-04/29	Flooding	China	4	41+ million
04/27-04/30	Flooding	Indonesia	2	19+ million
04/28-05/09	Heatwave	India, Pakistan	90	N/A
05/01-09/30	Heatwave	Japan	80	N/A
05/02-05/07	Flooding	Afghanistan	29	Negligible
05/07-05/10	Flooding	Indonesia	0	15+ million
05/09-05/13	Flooding	China	1	245+ million
05/10-05/13	Flooding	Vietnam	3	11+ million
05/11-05/13	Severe Convective Storm	China	4	92+ million
05/13-05/14	Winter Weather	China	0	46+ million
05/17-10/31	Flooding	India	2,135	4.2+ billion
05/17-09/30	Flooding	Bangladesh	141	510+ million
05/17-05/28	Flooding	Indonesia	4	111+ million
05/19-06/01	Severe Convective Storm	Nepal	20	Negligible
05/19-05/22	Severe Convective Storm	China	0	31+ million

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
05/22-08/25	Heatwave	South Korea	7	N/A
05/22-05/31	Flooding	Vietnam	0	16+ million
05/23-05/29	Flooding	China	9	532+ million
05/23-05/26	Severe Convective Storm	China	7	77+ million
05/23-06/09	Wildfire	Pakistan	0	19+ million
05/28-05/29	Severe Convective Storm	China	7	77+ million
06/01	Earthquake	China	4	42+ million
06/01-09/30	Flooding	China	195	15.0+ billion
06/10-07/03	Flooding	Nepal	19	Negligible
06/10	Earthquake	China	0	94+ million
06/10-06/14	Severe Convective Storm	China	13	302+ million
06/14-09/10	Flooding	Pakistan	1,739	15.0+ billion
06/18-06/29	Flooding	Indonesia	11	19+ million
06/19-06/23	Severe Convective Storm	China	5	181+ million
06/20-06/24	Winter Weather	Afghanistan	12	Negligible

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
06/21-06/22	Flooding	Afghanistan	19	Negligible
06/22	Earthquake	Afghanistan, Pakistan	1,163	121+ million
06/29-06/30	Flooding	Indonesia	4	Millions
07/02-07/04	Typhoon Chaba	China	3	463+ million
07/05-07/11	Flooding	Afghanistan	63	Millions
07/08-07/19	Flooding	Indonesia	10	Millions
07/09	Flooding	Indonesia	0	Millions
07/13-07/16	Flooding	Indonesia	3	17+ million
07/24-08/01	Flooding	Afghanistan	39	Negligible
07/25-07/28	Severe Convective Storm	China	24	634+ million
07/25-08/18	Flooding	Nepal	15	Negligible
07/27	Earthquake	Philippines	11	151+ million
08/03-08/04	Flooding	Japan	2	141+ million
08/05	Flooding	Indonesia	0	Millions
08/08-08/09	Flooding	South Korea	14	423+ million

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
08/10-08/12	Tropical Depression Mulan	Vietnam, Laos, Thailand	6	Millions
08/13	Flooding	Afghanistan	31	Negligible
08/13-08/14	Tropical Storm Meari	Japan	0	Millions
08/16-08/21	Flooding	Afghanistan	63	Negligible
08/18-08/21	Flooding	Indonesia	1	14+ million
08/23-08/26	Tropical Storm Ma-on	Philippines, China, Laos	4	78+ millions
08/25-09/06	Flooding	Indonesia	3	61+ million
08/26-09/01	Severe Convective Storm	China	18	151+ million
09/01-09/06	Super Typhoon Hinnamnor	Japan, South Korea, Philippines	14	1.3+ billion
09/05	Earthquake	China	117	2.3+ billion
09/10-09/17	Flooding	Indonesia	3	27+ million
09/14-09/16	Typhoon Muifa	China	0	583+ million
09/15-09/20	Flooding	Nepal	26	Negligible
09/18-09/21	Earthquake	Taiwan	1	50+ million
09/18-09/21	Typhoon Nanmadol	Japan	5	2.0+ billion

Asia

Date(s)	Event	Location	Deaths	Economic Loss (USD)
09/20-09/24	Flooding	Indonesia	1	Millions
09/23-09/24	Tropical Storm Talas	Japan	3	752+ million
09/25-09/29	Super Typhoon Noru	Philippines, Vietnam, Thailand	20	597+ million
09/27-10/11	Flooding	Nepal	47	Negligible
10/01	Earthquake	Indonesia	1	13+ million
10/02-10/11	Flooding	Indonesia	21	173+ million
10/02-10/06	Winter Weather	China	0	58+ million
10/05-10/08	Flooding	Thailand, Vietnam, Cambodia	16	211+ million
10/11-10/12	Tropical Depression Maymay	Philippines	0	18+ million
10/13-10/20	Typhoon Nesat	Philippines, Taiwan, China	0	40+ million
10/14-11/07	Flooding	Indonesia	32	166+ million
10/15	Tropical Storm Sonca	Vietnam	10	65+ million
10/24	Tropical Storm Sitrang	Bangladesh, India	35	21+ million
10/25	Earthquake	Philippines	0	25+ million
10/27-11/3	Typhoon Nalgae	Philippines, China	164	418+ million

Asia

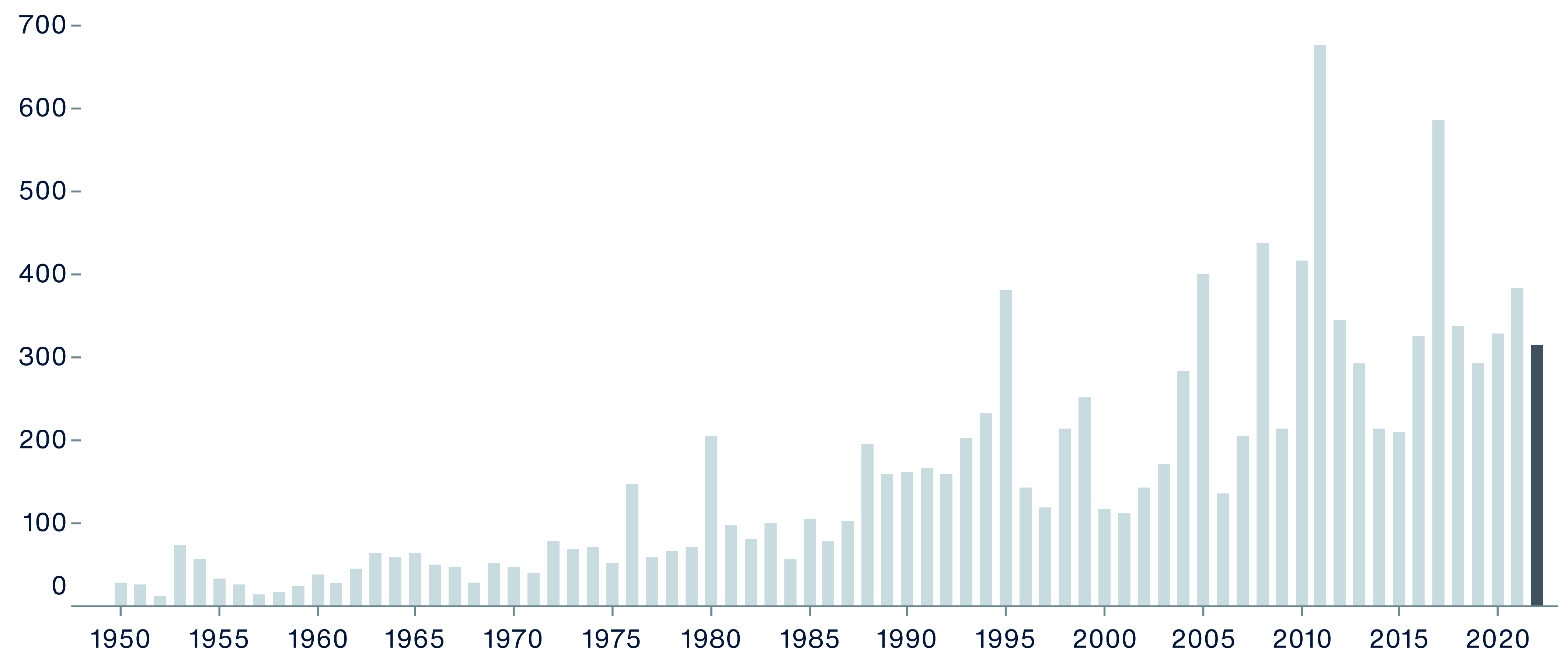
Date(s)	Event	Location	Deaths	Economic Loss (USD)
11/11-11/18	Flooding	Malaysia	0	Millions
11/11-11/12	Flooding	Thailand	0	Millions
11/11-11/25	Flooding	Indonesia	14	112+ million
11/21	Earthquake	Indonesia	603	371+ million
11/26-11/30	Winter Weather	China	0	49+ million
11/28-12/02	Flooding	Indonesia	4	13+ million
12/01-12/04	Flooding	Vietnam	5	Millions
12/06-12/09	Cyclone Mandous	India, Sri Lanka	9	12+ million
12/07-12/08	Flooding	Indonesia	0	22+ million
12/12-12/14	Flooding	Indonesia	0	Millions
12/15-12/23	Winter Weather	Japan, China, Russia	19	42+ million
12/16	Landslide	Malaysia	31	Negligible
12/18-12/20	Flooding	Malaysia, Thailand	17	44+ million
12/24-12/25	Flooding	Philippines	52	11+ millions
12/26-12/27	Severe Convective Storm	India	0	Millions

Oceania

Date(s)	Event	Location	Deaths	Economic Loss (USD)
01/08-01/13	Flooding	Australia	2	80+ million
01/15-10/16	Volcano	Tonga, Pacific Rim	4	118+ million
02/01-02/08	Flooding	Fiji	0	105+ million
02/09-02/13	Cyclone Dovi	New Zealand, Vanuatu, New Caledonia	0	84+ million
02/23-03/31	Flooding	Australia	22	8.0+ billion
03/20-03/21	Severe Convective Storm	New Zealand	0	118+ million
06/09-09/14	Severe Convective Storm	Australia, New Zealand	1	19+ million
07/01-07/08	Flooding	Australia	0	466+ million
08/18-08/21	Severe Convective Storm	New Zealand	1	68+ million
09/10	Earthquake	Papua New Guinea	10	Millions
10/12-10/28	Flooding	Australia	2	1.3+ billion
11/12-11/16	Flooding	Australia	0	300+ million

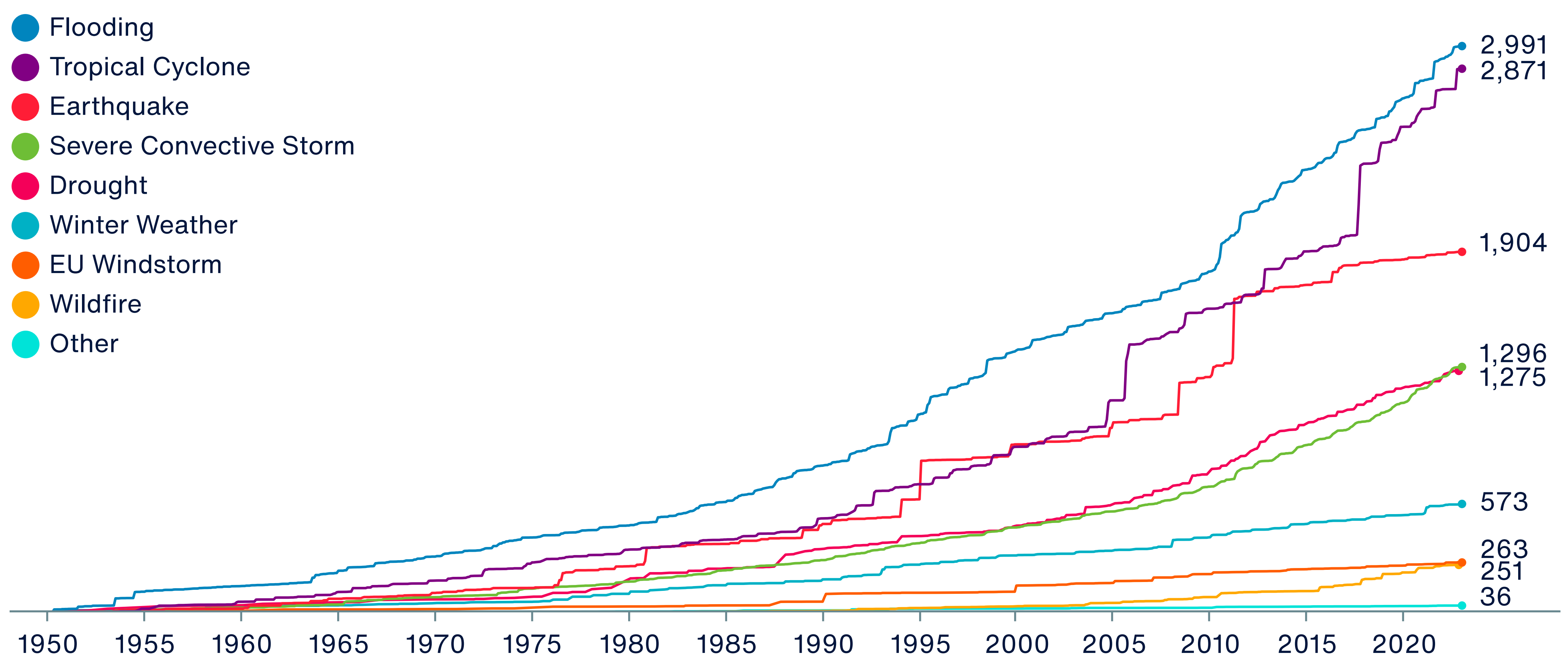
Appendix B: Long-term Natural Disaster Trends

Exhibit 44: Global Economic Losses Since 1950 (2022 $ bn)



Data: Catastrophe Insight, Aon

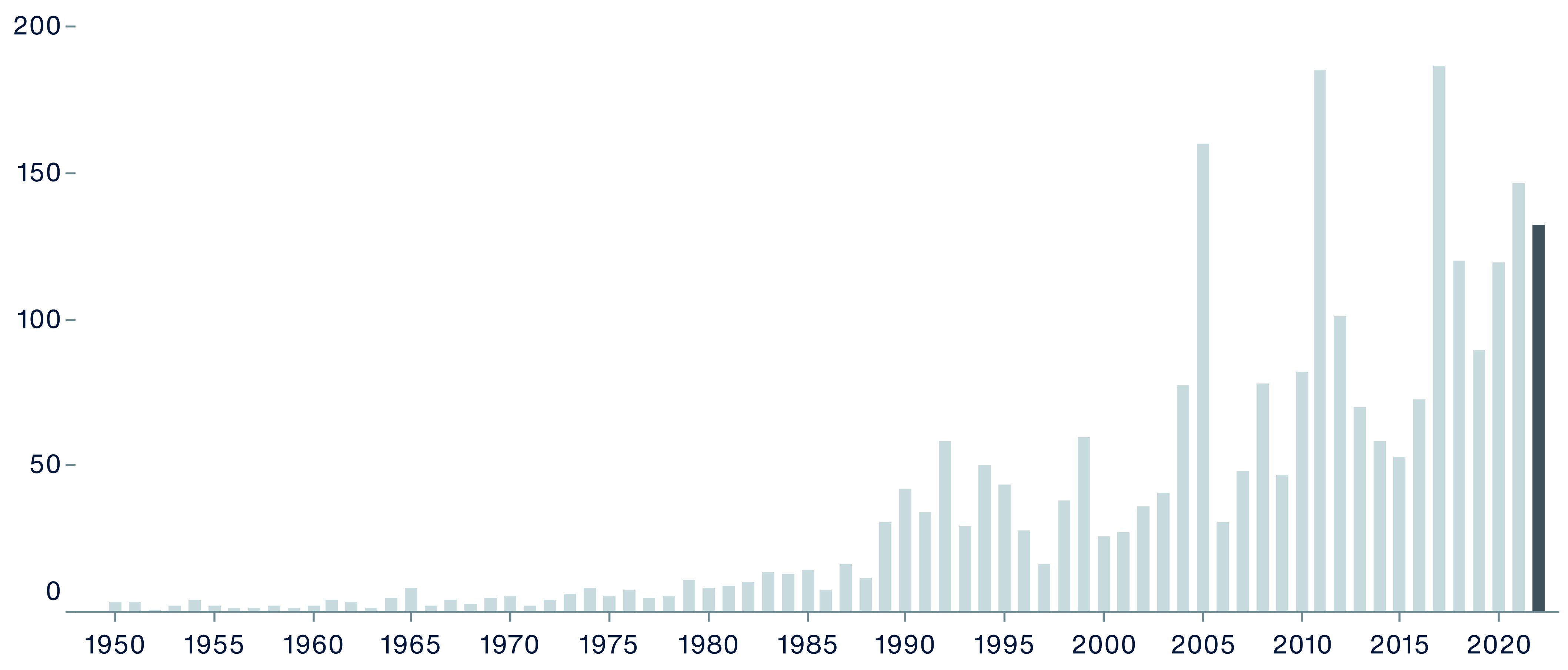
Exhibit 45: Cumulative Global Economic Losses Since 1950 (2022 $ bn)



Data: Catastrophe Insight, Aon

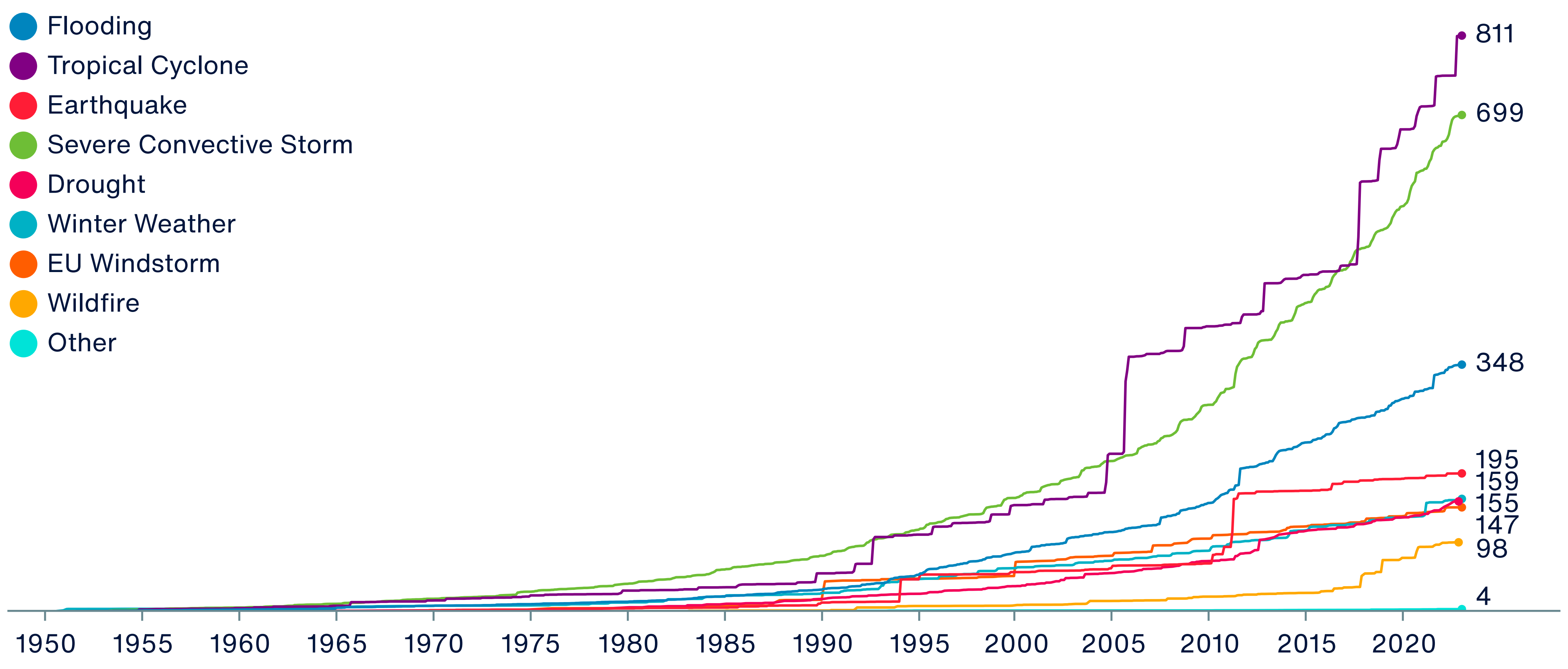
Appendix B: Long-term Natural Disaster Trends

Exhibit 46: Global Insured Losses Since 1950 (2022 $ bn)



Data: Catastrophe Insight, Aon

Exhibit 47: Cumulative Global Insured Losses Since 1950 (2022 $ bn)



Data: Catastrophe Insight, Aon

Appendix C: Historical Natural Disaster Events

The following tables provide a look at specific global natural disaster events since 1900. Please note that the adjusted for inflation (in 2022 $) totals were converted using the U.S. Consumer Price Index (CPI). Insured losses include those sustained by private industry and government entities such as the U.S. National Flood Insurance Program (NFIP). Inflation-adjusted losses are used since they represent actual incurred costs in today's dollars. Normalized values, while very valuable for analyzing historical scenarios using today's population, exposure, and wealth, are hypothetical. Please note that some of these values have been rounded to the nearest whole number.

For additional top 10 lists, please visit http://catastropheinsight.aon.com.

Exhibit 48: Top 10 Costliest Global Economic Loss Events (1900-2022)

Date(s)	Event	Location	Economic Loss (Nominal $ billion)	Economic Loss (2022 $ billion)
March 11, 2011	Tohoku EQ/Tsunami	Japan	235	314
January 16, 1995	Great Hanshin EQ	Japan	103	203
August 2005	Hurricane Katrina	United States	125	190
May 12, 2008	Sichuan Earthquake	China	122	168
August 2017	Hurricane Harvey	United States	125	152
September 2017	Hurricane Maria	Puerto Rico, Caribbean	90	109
October 2012	Hurricane Sandy	U.S., Caribbean, Canada	77	99
September 2022	Hurricane Ian	U.S., Cuba	96	96
September 2017	Hurricane Irma	U.S., Caribbean	77	93
January 17, 1994	Northridge EQ	United States	44	90

Exhibit 49: Top 10 Costliest Global Insured Loss Events (1900-2022)

Date(s)	Event	Location	Insured Loss (Nominal $ billion)	Insured Loss (2022 $ billion)
August 2005	Hurricane Katrina	United States	65	99
September 2022	Hurricane Ian	U.S., Cuba	53	53
March 11, 2011	Tohoku EQ/ Tsunami	Japan	35	47
September 2017	Hurricane Irma	U.S., Caribbean	33	40
August-September 2021	Hurricane Ida	U.S., Caribbean	36	39
October 2012	Hurricane Sandy	United States	30	39
August 2017	Hurricane Harvey	United States	30	36
September 2017	Hurricane Maria	Puerto Rico, Caribbean	30	36
August 1992	Hurricane Andrew	U.S., Bahamas	16	34
January 17, 1994	Northridge EQ	United States	15	31

Exhibit 50: Top 10 Costliest Tropical Cyclones: Economic Loss (1900-2022)

Date(s)	Event	Location	Economic Loss (Nominal $ billion)	Economic Loss (2022 $ billion)
2005	Hurricane Katrina	United States	125	190
2017	Hurricane Harvey	United States	125	152
2017	Hurricane Maria	U.S., Caribbean	90	109
2012	Hurricane Sandy	U.S., Caribbean	77	99
2022	Hurricane Ian	U.S., Cuba	96	96
2017	Hurricane Irma	U.S., Caribbean	77	93
2021	Hurricane Ida	U.S., Caribbean	75	82
1992	Hurricane Andrew	U.S., Bahamas	27	58
2008	Hurricane Ike	U.S., Caribbean	38	52
2004	Hurricane Ivan	U.S., Caribbean	27	43

Exhibit 51: Top 10 Costliest Tropical Cyclones: Insured Loss (1900-2022)

Date(s)	Event	Location	Insured Loss (Nominal $ billion)	Insured Loss (2022 $ billion)
2005	Hurricane Katrina	United States	65	99
2022	Hurricane Ian	U.S., Cuba	53	53
2017	Hurricane Irma	U.S., Caribbean	33	40
2021	Hurricane Ida	U.S., Caribbean	36	39
2012	Hurricane Sandy	U.S., Caribbean, Canada	30	39
2017	Hurricane Harvey	United States	30	36
2017	Hurricane Maria	U.S., Caribbean	30	36
1992	Hurricane Andrew	U.S., Caribbean	16	34
2008	Hurricane Ike	U.S., Caribbean	18	25
2005	Hurricane Wilma	U.S., Caribbean	13	19

Exhibit 52: Top 10 Costliest Severe Convective Storm Events: Economic Loss (1900-2022)

Date(s)	Event	Location	Economic Loss (Nominal $ billion)	Insured Loss (2022 $ billion)
August 2020	Midwest Derecho	United States	13.6	15.6
April 2011	2011 Super Tornado Outbreak	United States	10.2	13.5
May 2011	Joplin Tornado/SCS	United States	9.1	12.0
April 1965	Palm Sunday Outbreak	United States	1.2	11.4
Oct-Nov 2018	Storm Vaia	Europe	8.3	9.8
April 1974	Super Outbreak 1974	United States	1.5	9.5
March 1973	United States SCS	United States	1.3	8.7
May 2003	United States SCS	United States	4.5	7.3
July 2013	Storm Andreas	Europe	5.3	6.7
April 1979	Texas Tornadoes and Flooding	United States	1.5	6.3

Exhibit 53: Top 10 Costliest Severe Convective Storm Events: Insured Loss (1900-2022)

Date(s)	Event	Location	Insured Loss (Nominal $ billion)	Insured Loss (2022 $ billion)
August 2020	Midwest Derecho	United States	9.2	10.5
April 2011	2011 Super Outbreak	United States	7.3	9.7
May 2011	Joplin Tornado/SCS	United States	6.9	9.1
May 2003	United States SCS	United States	3.2	5.2
July 2013	Storm Andreas	Europe	3.8	4.9
May 2019	United States SCS	United States	3.7	4.3
April 2016	San Antonio Hailstorm	United States	3.2	4.0
June 2014	Storm Ela	Europe	3.1	3.9
June 2021	European June 17-25 Outbreak	Europe	3.5	3.8
April 2001	St. Louis Hailstorm	United States	2.2	3.7

Exhibit 54: Top 10 Costliest Floods: Economic Loss (1900-2022)

Date(s)	Event	Location	Economic Loss (Nominal $ billion)	Economic Loss (2022 $ billion)
June-December 2011	Thailand Floods	Thailand	45	59
June-September 1998	Yangtze River Floods	China	31	57
July-August 2010	Yangtze River Floods	China	39	53
July 2021	Western Europe Floods (Bernd)	Europe	46	50
June-August 1993	Mississippi Floods	United States	21	43
June-September 2020	China Seasonal Floods	China	35	40
July-August 1931	Yangtze River Floods	China	2.0	40
June-August 1953	Japan Floods	Japan	3.2	36
May-August 2016	Yangtze River Floods	China	28	35
June-September 2021	China Seasonal Floods	China	31	34

Exhibit 55: Top 10 Costliest Earthquakes: Economic Loss (1900-2022)

Date(s)	Event	Location	Economic Loss (Nominal $ billion)	Economic Loss (2022 $ billion)
March 11, 2011	Tohoku EQ/Tsunami	Japan	235	314
January 16, 1995	Great Hanshin EQ	Japan	103	203
May 12, 2008	Sichuan Earthquake	China	122	168
January 17, 1994	Northridge EQ	United States	44	90
November 23, 1980	Irpinia EQ	Italy	20	70
April 14, 2016	Kumamoto EQ	Japan	38	47
October 23, 2004	Chuetsu EQ	Japan	28	44
February 27, 2010	Chile EQ	Chile	30	41
December 7, 1988	Armenian EQ	Armenia (Present Day)	16	40
July 27, 1976	Tangshan EQ	China	6.8	36

Exhibit 56: Top 10 Costliest Individual Wildfires: Insured Loss (1900-2022)

Date(s)	Event	Location	Insured Loss (Nominal $ billion)	Insured Loss (2022 $ billion)
November 2018	Camp Fire	United States	10.0	11.8
October 2017	Tubbs Fire	United States	8.7	10.5
November 2018	Woolsey Fire	United States	4.2	5.0
October 1991	Oakland (Tunnel) Fire	United States	1.7	3.7
October 2017	Atlas Fire	United States	3.0	3.6
May 2016	Horse Creek Fire	Canada	2.9	3.5
September-October 2020	Glass Fire	United States	3.0	3.4
August-September 2020	CZU Complex Fire	United States	2.5	2.9
December 2017	Thomas Fire	United States	2.2	2.7
December 2021	Marshall Fire	United States	2.5	2.7

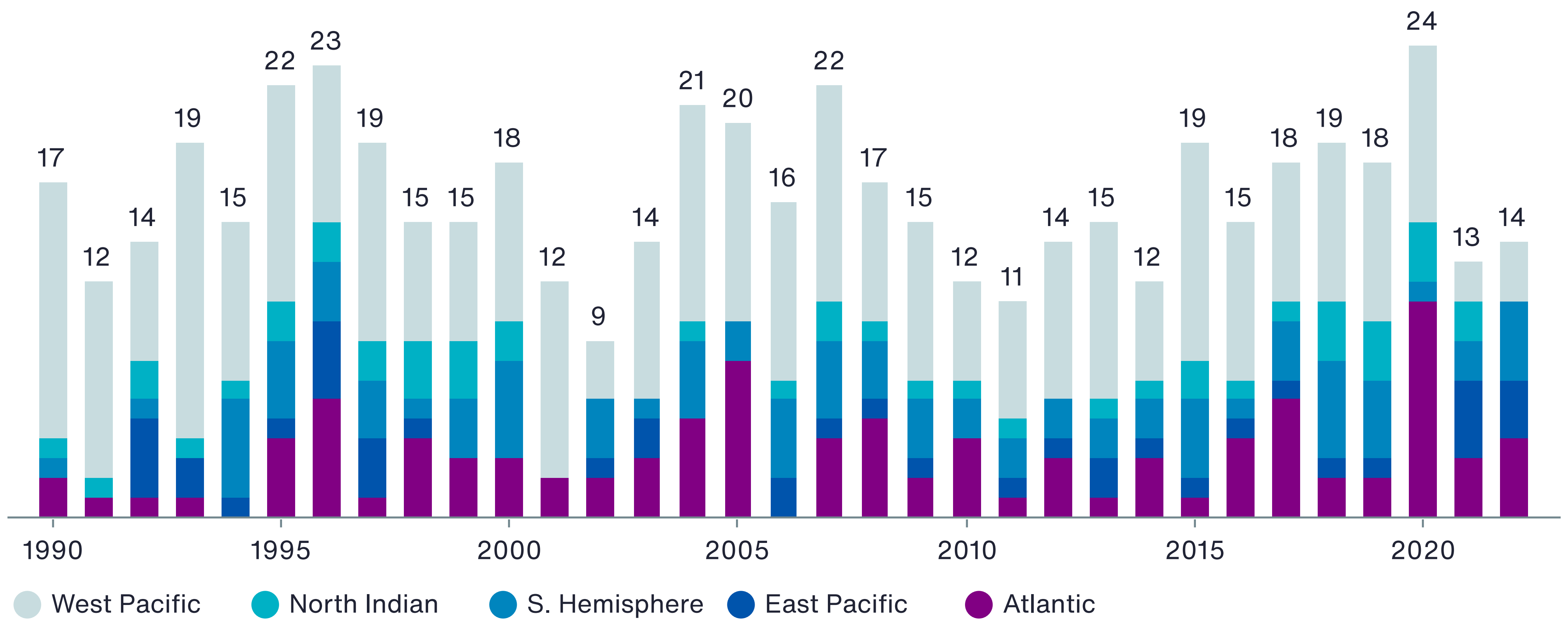
Exhibit 57: Top 10 Global Human Fatality Events in the Modern Era (1950-2022)

Date(s)	Event	Location	Economic Loss (Nominal $ billion)	Fatalities
November 12, 1970	Cyclone Bhola	Bangladesh	0.7	300,000
July 27, 1976	Tangshan EQ	China	36	242,769
July 30, 1975	Super Typhoon Nina	Taiwan, China	6.6	230,029
December 26, 2004	Indian Ocean EQ/Tsunami	Indian Ocean Basin	29	227,898
January 12, 2010	Port-au-Prince EQ	Haiti	11.0	160,000
April 1991	Cyclone Gorky	Bangladesh	3.9	139,000
May 2008	Cyclone Nargis	Myanmar	17.8	138,366
August 1971	Vietnam Floods	Vietnam	N/A	100,000
October 8, 2005	Kashmir EQ	Pakistan	10.0	88,000
May 12, 2008	Sichuan EQ	China	167	87,652

Appendix D: Global Tropical Cyclone Activity

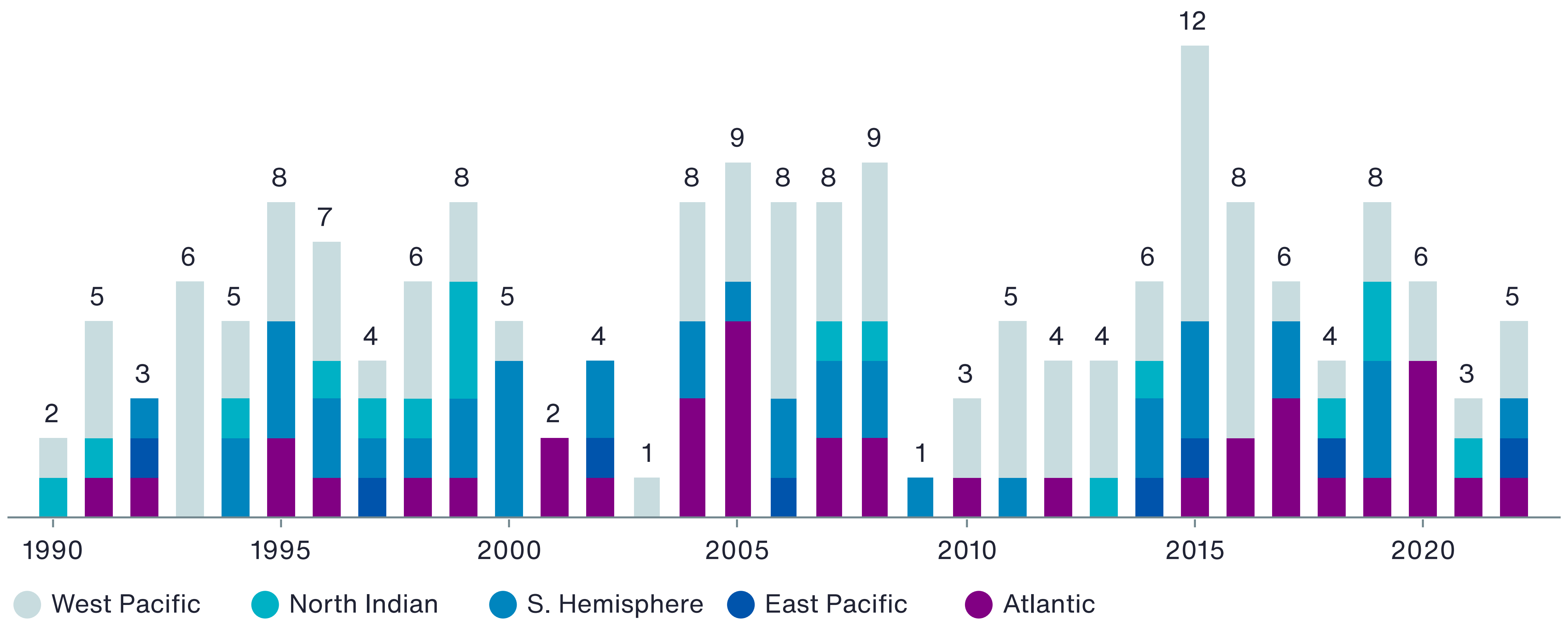
Please note that 1990 is generally considered the first year when global tropical cyclone data are best verified in every basin. Data from the Southern Hemisphere prior to 1990 is still subject to future reanalysis by official tropical cyclone agencies. While there continues to be increasing instances of costlier and more impactful landfalling tropical cyclones, there has yet to be any obvious shift in landfall trends across the globe. This suggests that losses are largely being driven by the increased levels of population and exposure along vulnerable coastal locations. However, as thoroughly referenced elsewhere in this report, emerging trends indicate that tropical cyclones are intensifying at a faster rate and reaching the highest intensity levels for longer periods and near the point of landfall. This is a concerning trend and one that portends to greater future losses for the peril.

Exhibit 58: Global Tropical Cyclone Landfalls (Category 1+)



Data: NOAA

Exhibit 59: Global Tropical Cyclone Landfalls (Category 3+)

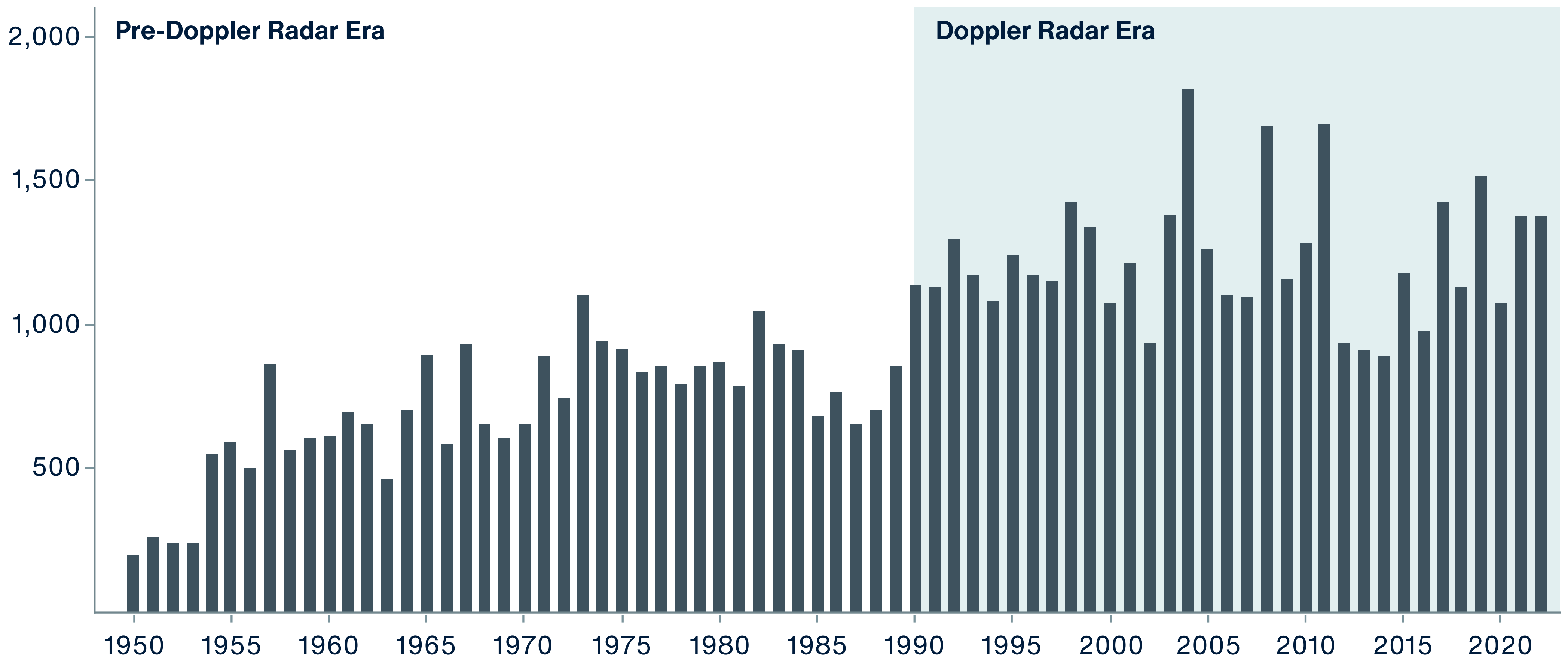


Data: NOAA

Appendix E: United States Storm Report Data

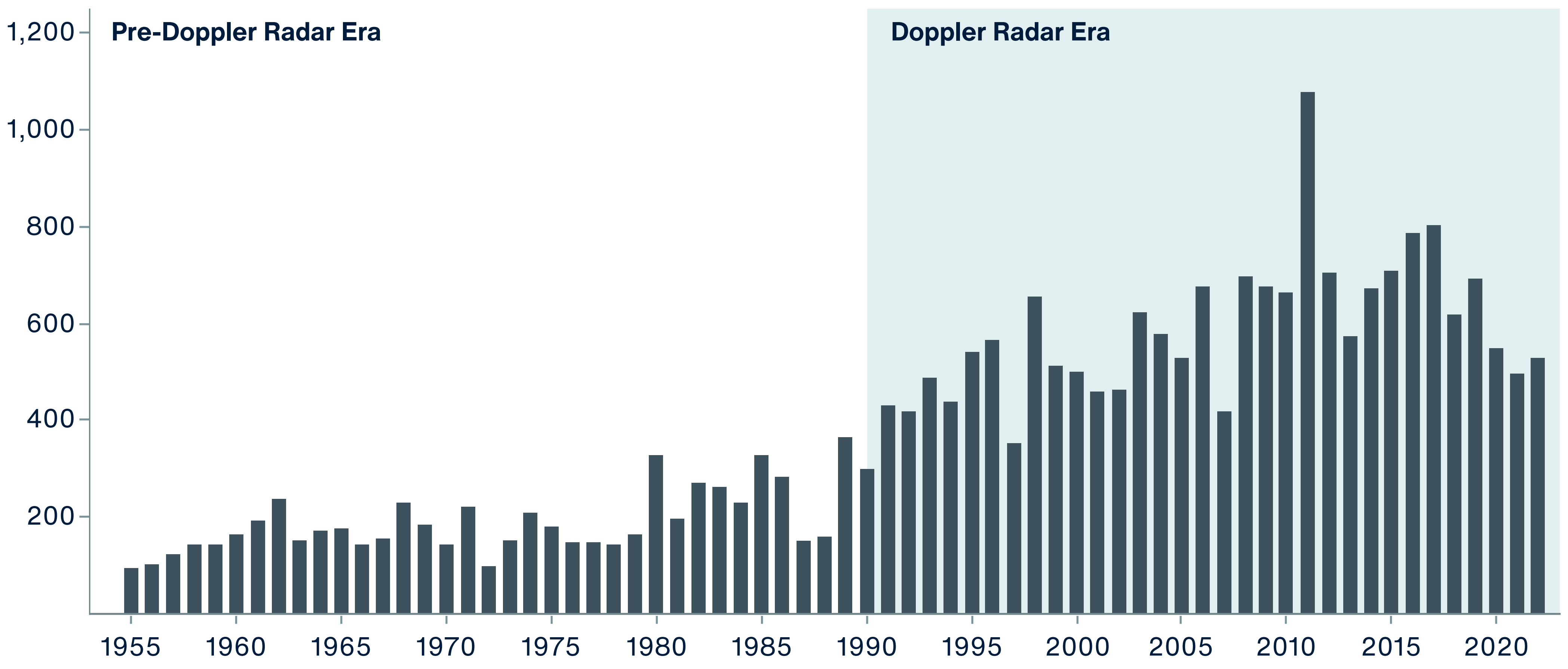
Given the increased cost of severe weather-related damage in the United States during the past decade for insurers, the following is a number of tornado and large hail (2.0" or larger) reports. The data comes via NOAA's Storm Prediction Center. Please note that data prior to 1990 are often considered incomplete given a lack of reporting. The implementation of Doppler radar, greater social awareness and increased reporting has led to more accurate datasets in the last 30 years. Data from 2022 is to be considered preliminary.

Exhibit 60: U.S. Tornadoes (F0/EF0+)



Data: NOAA

Exhibit 61: U.S. Large Hail Reports (2.0" or Larger)



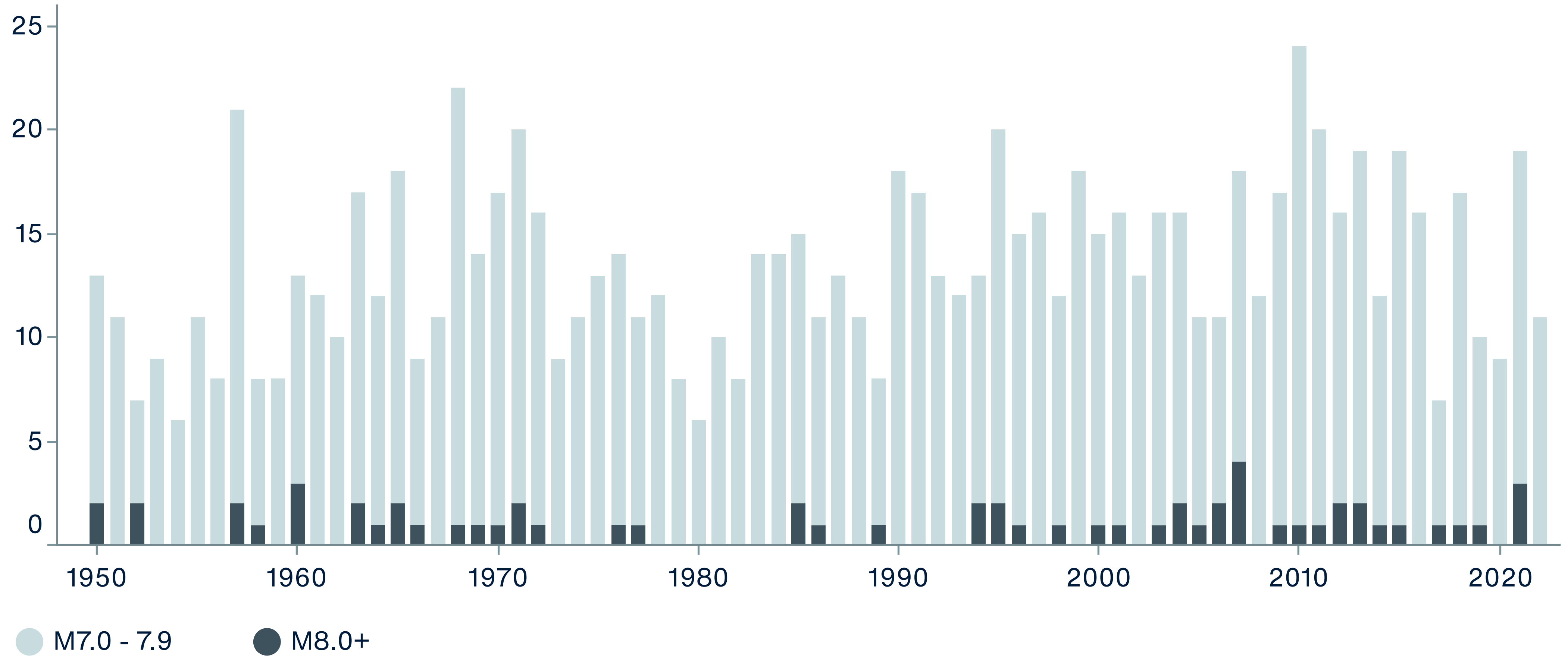
Data: NOAA

Appendix E: United States Storm Report Data

Appendix F: Global Earthquakes

Based on historical data from the United States Geological Survey, 2022 saw at least 128 earthquakes with magnitudes of 6.0 or greater. Overall earthquake activity does not often show large fluctuations on an annual basis. This is especially true given the extensive network of global seismograph stations that has led to an improved and more robust dataset in recent decades.

Exhibit 62: Global Earthquakes (M7.0+)



Data: USGS

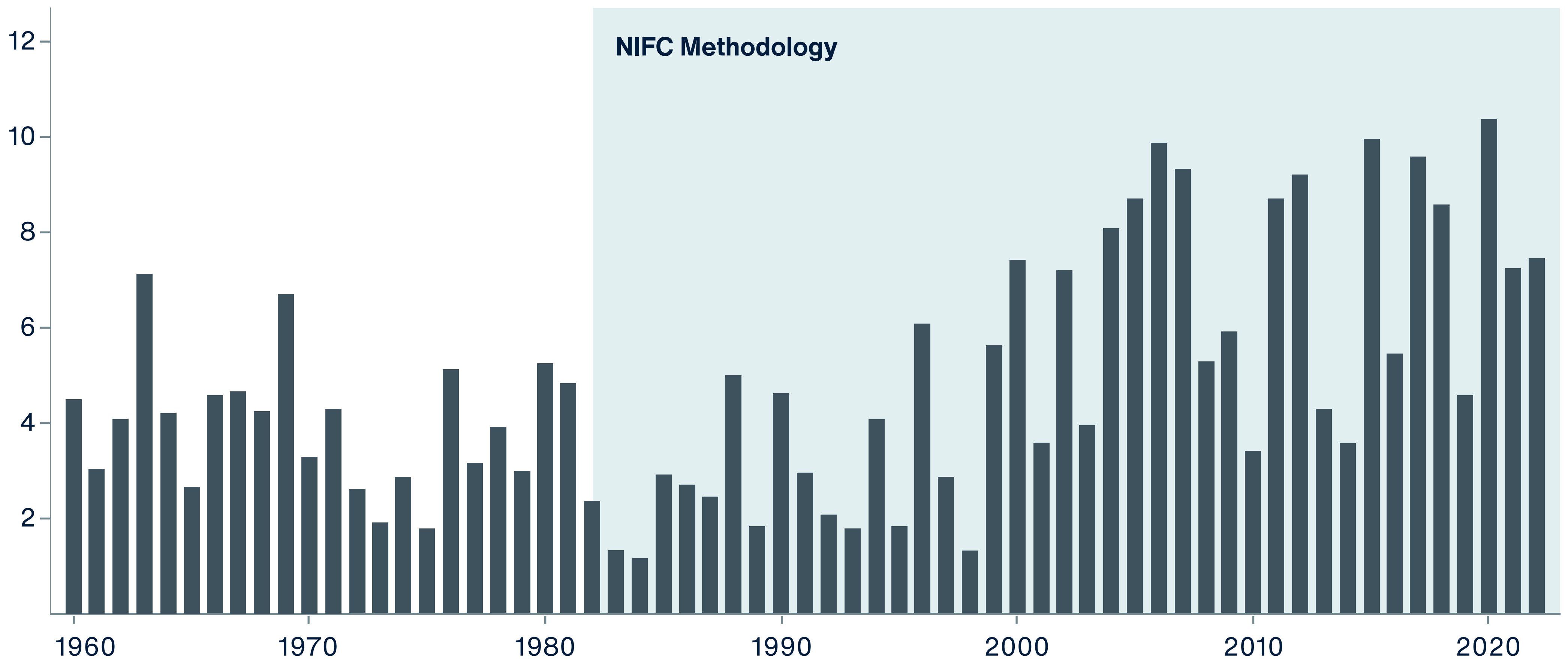
Exhibit 63: Global M6.0+ Earthquakes in 2022

Data: USGS

Appendix G: United States Wildfire Data

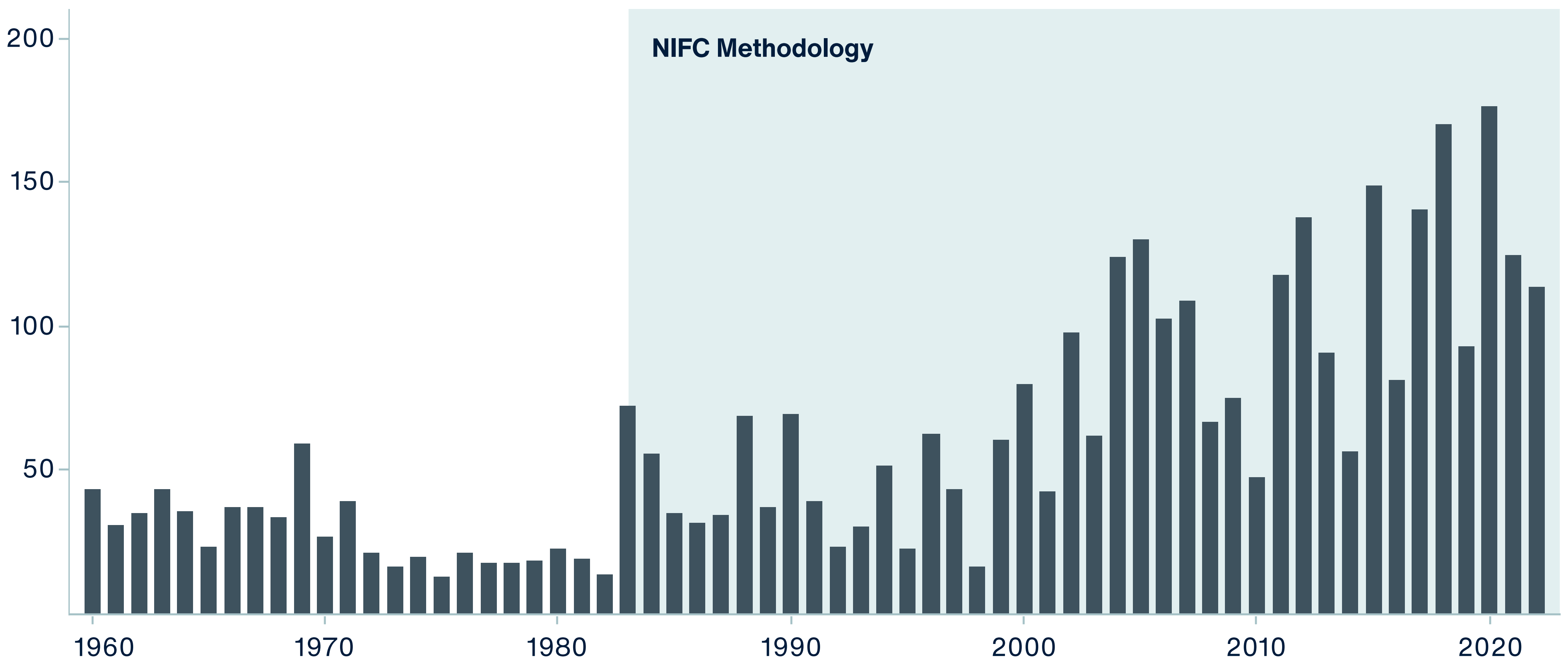
The following wildfire data in the United States is provided from the National Interagency Fire Center (NIFC), which began compiling statistics under their current methodology in 1983. Previous data was collected by the National Interagency Coordination Center (NICC) from 1960 to 1982 but used a different methodology. It is not advised to compare pre-1983 data to post-1983 data given these different data collection methods. The European data comes via the European Forest Fire Information System (EFFIS), which is maintained by the European Union's Copernicus group.

Exhibit 64: Area Burned by Wildfires in the United States (M acres)



Data: NIFC. NICC

Exhibit 65: Area Burned per Fire in United States Wildfires (acres)



Data: NIFC, NICC

Additional Report Details

All financial loss totals are in US dollars ($) unless noted otherwise.

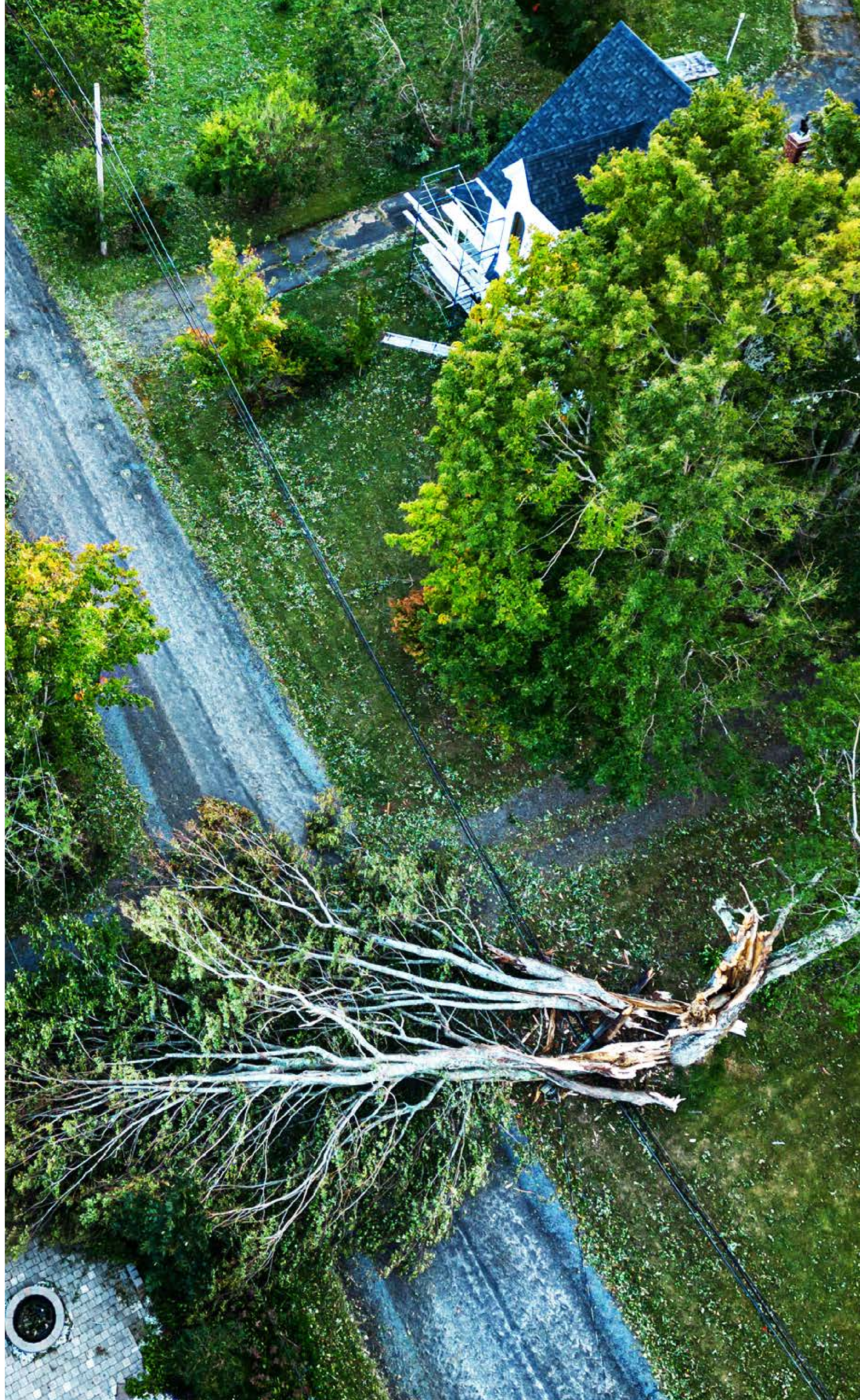
DR = Drought, EQ = Earthquake, WS = EU Windstorm, FL = Flooding, SCS = Severe Convective Storm, TC = Tropical Cyclone, WF = Wildfire, WW = Winter Weather, VL = Volcano, HW = Heatwave, LS = Landslide

TD = Tropical Depression, TS = Tropical Storm, HU = Hurricane, TY = Typhoon, STY = Super Typhoon, CY = Cyclone

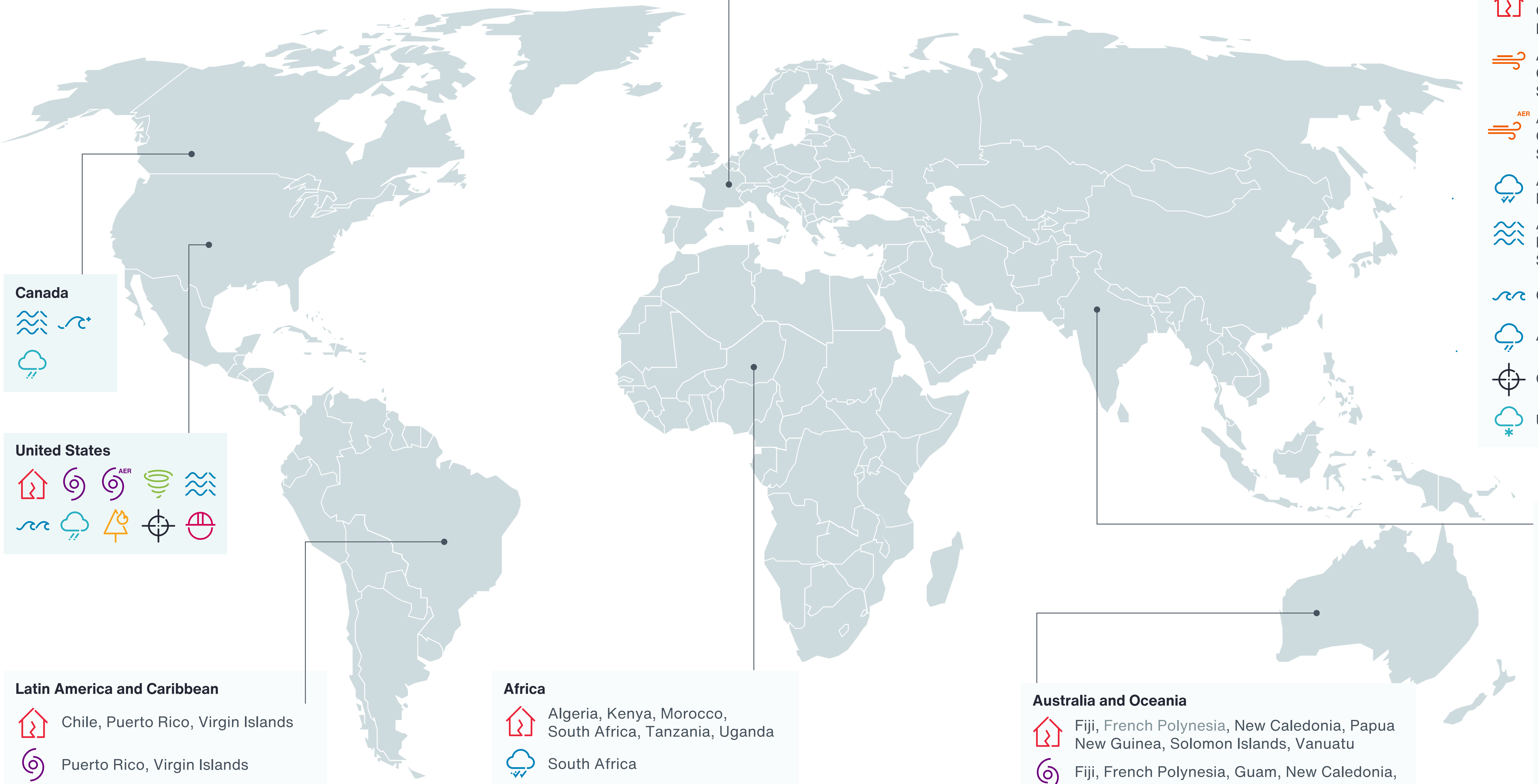
Fatality estimates as reported by public news media sources and official government agencies.

Structures defined as any building — including barns, outbuildings, mobile homes, single or multiple family dwellings and commercial facilities — that is damaged or destroyed by winds, earthquakes, hail, flood, tornadoes, hurricanes or any other natural-occurring phenomenon. Claims defined as the number of claims (which could be a combination of homeowners, commercial, auto and others) reported by various public and private insurance entities through press releases or various public media outlets.

Damage estimates are obtained from various public media sources, including news websites, publications from insurance companies, financial institution press releases and official government agencies. Damage estimates are determined based on various public media sources, including news websites, publications from insurance companies, financial institution press releases, and official government agencies. Economic loss totals are separate from any available insured loss estimates. An insured loss is the portion of the economic loss covered by public or private insurance entities.
In rare instances, specific events may include modeled loss estimates determined from utilizing Impact Forecasting's suite of catastrophe model products.



Impact Forecasting Model Coverage Map



Europe

- earthquake: Austria, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Germany, Greece, Hungary, Iceland, Montenegro, Romania, Serbia, Slovakia, Slovenia, Switzerland
- windstorm: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Ireland, Luxembourg, Netherlands, Norway, Poland, Slovakia, Sweden, United Kingdom
- windstorm (AER): Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Ireland, Luxembourg, Netherlands, Norway, Poland, Slovakia, Sweden, United Kingdom
- hail: Austria, Belgium, Czech Republic, France, Germany, Liechtenstein, Netherlands, Poland, Slovenia, Switzerland
- fluvial flood: Austria, Czech Republic, France, Germany, Hungary, Liechtenstein, Netherlands, Poland, Portugal, Slovakia, Switzerland, United Kingdom+
- storm surge: Germany, Netherlands, United Kingdom+
- pluvial flood/cloud burst: Austria, Czech Republic, Sweden
- terrorism: Germany, United Kingdom
- freeze: United Kingdom

Canada

- fluvial flood, storm surge, pluvial flood/cloud burst

United States

- earthquake, tropical cyclone, tropical cyclone (AER), severe convective storm, fluvial flood, storm surge, pluvial flood/cloud burst, bushfire, terrorism, workers' compensation

Asia

- earthquake: Bahrain, Indonesia, Iran, Israel, Kazakhstan, Kuwait, Nepal, Oman, Pakistan, Phillppines, Qatar, Saudi Arabia, Singapore, Thailand, Turkey, United Arab Emirates, Yemen
- tropical cyclone: China, Hong Kong, India, Malaysia, Phillippines, South Korea, Taiwan, Thailand, Vietnam
- fluvial flood: China, India, Indonesia, Japan, Malaysia, Saudi Arabia, Thailand, Vietnam
- storm surge: Vietnam
- pluvial flood/cloud burst: China, Indonesia, Malaysia, Saudi Arabia, Vietnam

Latin America and Caribbean

- earthquake: Chile, Puerto Rico, Virgin Islands
- tropical cyclone: Puerto Rico, Virgin Islands
- fluvial flood: Brazil, Mexico, Entire territory
- tsunami: Chile

Africa

- earthquake: Algeria, Kenya, Morocco, South Africa, Tanzania, Uganda
- hail: South Africa
- fluvial flood: South Africa
- pluvial flood/cloud burst: South Africa

Australia and Oceania

- earthquake: Fiji, French Polynesia, New Caledonia, Papua New Guinea, Solomon Islands, Vanuatu
- tropical cyclone: Fiji, French Polynesia, Guam, New Caledonia, Northern Mariana Islands, Papua New Guinea, Solomon Islands, Vanuatu
- fluvial flood: Australia, Australia+

Map Icons

earthquake · tropical cyclone · severe convective storm · windstorm · hail · fluvial flood · storm surge · freeze · tsunami · pluvial flood/cloud burst · bushfire · terrorism · workers' compensation

AER Automated Event Response
Country scenario model only
\+ third party models

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