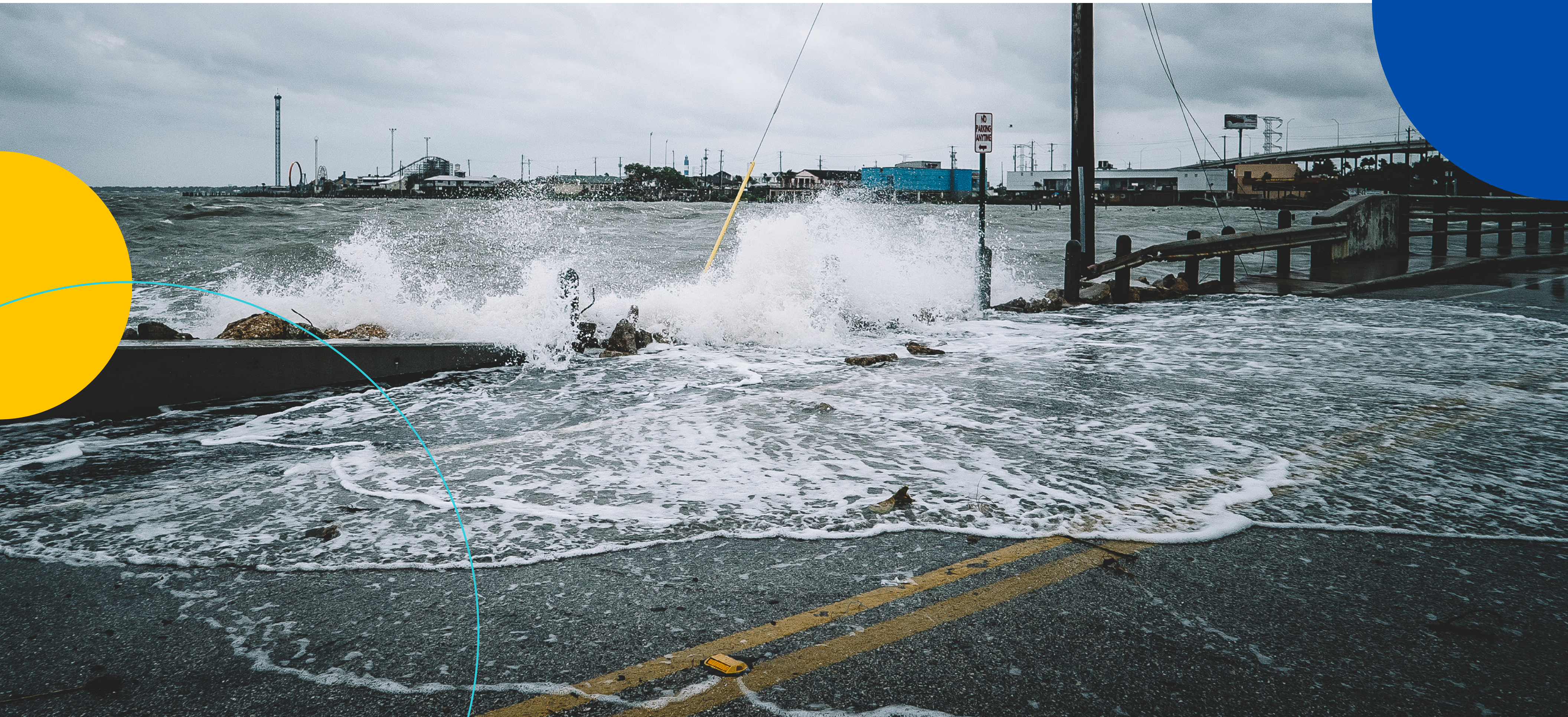
Verisk 2024 Global Modeled Catastrophe Losses



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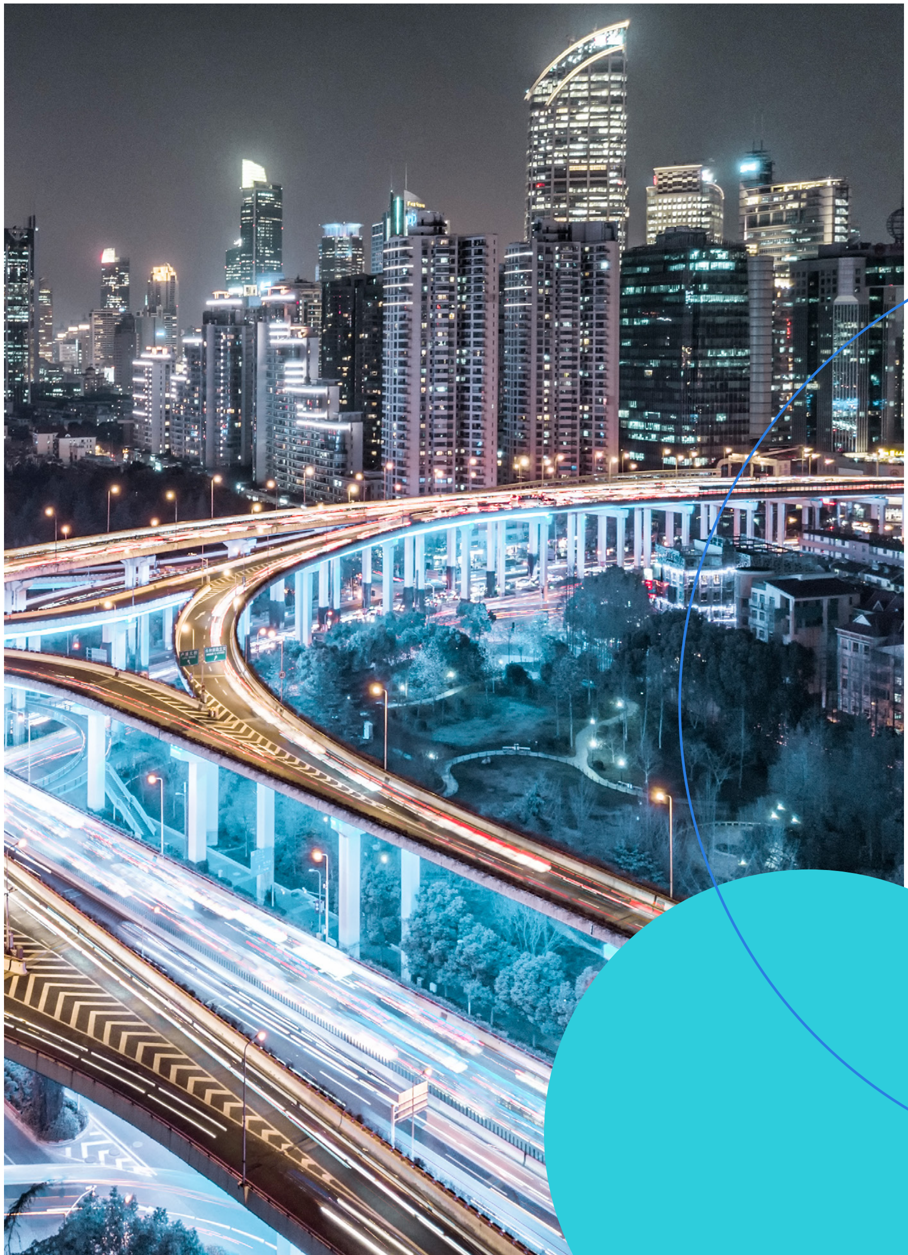

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Executive summary

Verisk's latest models estimate the global modeled insured average annual loss (AAL) from natural catastrophes at

$151 billion

Since 2012, Verisk has annually released a global report on extreme event risk. This report evaluates global risk using Verisk's industry exceedance probability (EP) curve, providing context for years with significant insured losses, such as 2017. The insights from this analysis are increasingly valuable given the current challenges faced by the global (re)insurance industry in managing recent catastrophe losses.

In the past five years, the actual annual insured losses from natural catastrophes averaged $106 billion, compared with less than $83 billion in the preceding five-year period. Verisk's latest models estimate the global modeled insured average annual loss (AAL) from natural catastrophes at $151 billion, with non-crop losses making up more than three-quarters of this figure at $119 billion. This suggests the insurance industry should be prepared to experience total annual insured losses, from natural catastrophes and crop, well more than $151 billion on average.

Although the largest single event is anticipated from a hurricane or an earthquake, severe convective storms, extratropical storms, wildfires and floods are a significant part of the risk, accounting for a little more than half of the $119 billion modeled (non-crop) AAL. Globally, these perils continue to erode earnings for insurers and in some cases for reinsurers, depending on markets and treaty structures. In 2023, insured losses were driven by an increase in non-hurricane and earthquake loss activity and, notably, no single event globally from any peril exceeded $10 billion in loss. The U.S. experienced a record-setting severe thunderstorm season, with losses contributing more than $57 billion to the total insured losses for 2023. To give some context to the growth in loss from U.S. severe thunderstorms, the adjusted AAL over the past five years is approximately $39 billion, up from around $23 billion in the previous five-year period and with a 10-year average of about $31 billion. The 2023 aggregate loss is not an outlier in the Verisk model, which models such loss with a return period of about 40 years.

While recent loss years are a reminder of the importance of managing a global view of risk across a range of perils, we must not overlook the risks posed by hurricanes and earthquakes. Recent seismic activity serves as a stark reminder of the destructive potential of these perils, which can cause catastrophic damage with little or no warning. For instance, a recent earthquake in Japan prompted the issuance of the country's first-ever "megaquake" advisory. Similarly, an earthquake near Los Angeles has heightened concerns about the possibility of a larger, more destructive quake in the complex fault systems underlying southern California and the Los Angeles basin.

Looking ahead, a year with a 1% EP or worse is likely to involve both high frequency and severity, affecting primary and secondary perils globally, with potentially significant losses from the U.S., Europe, and Japan. While there has not yet been a global-scale tail loss scenario, model simulations indicate such scenarios could result from various event combinations within a single year.

Climate change affects all atmospheric perils,, including tropical cyclones, but its impact is more immediate and pronounced on wildfire, flood, and severe thunderstorms. The effects on wildfire and floods are relatively well understood, whereas the relationship with severe thunderstorms is scientifically less established. Verisk is driving progress through high-resolution climate models and collaboration with the scientific community, including the Verisk Climate Advisory Council, to better understand changes in the seasonality, geographical extent, and severity of severe thunderstorms. Forward-looking views of hurricane activity, in the context of climate change, are also an active area of research and development, and Verisk will deliver a next-generation model for the Atlantic basin that is climate ready, giving better quantification of the risk we face in the near-present climate.

Currently, climate change accounts for approximately 1% of the annual increase in losses, with exposure growth and inflation being the main contributors. Nonetheless, its influence is expected to become more significant over the next few decades. The insurance industry needs to be proactive and utilize advanced, forward-looking models to better estimate risk and guide internal decision-making.

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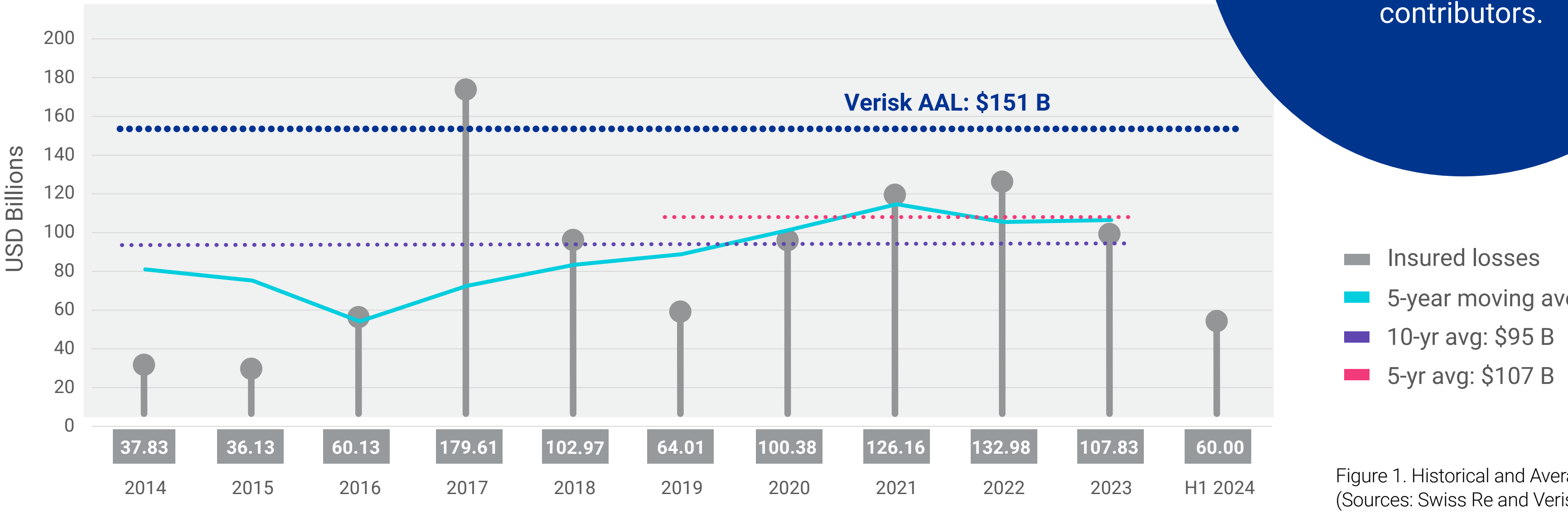


Figure 1. Historical and Average Losses
(Sources: Swiss Re and Verisk)

Exceedance probability metrics

Insured losses

Year	AAL (USD Billions)	Aggregate EP Loss (USD Billions)		
		5.0% (20-year return period)	1.0% (100-year return period)	0.4% (250-year return period)
2012	59.3	-	205.9	265.1
2013	67.4	-	219.4	289.1
2014	72.6	-	231.5	292.5
2015	74.4	-	232.8	304.8
2016	80.0	-	252.9	325.3
2017	78.7	-	246.9	325.3
2018	85.7	-	270.9	341.9
2019	91.8	-	288.2	366.2
2020	99.6	192.5	301.1	376.3
2021	106.3	203.4	320.5	397.0
2022	123.3	224.3	345.0	441.4
2023	133.0	238.2	372.0	452.7
2024	151.1	257.9	400.0	482.2

Table 1. Key insured loss metrics from Verisk's global industry EP curve for all regions and perils[1, 2] (Source: Verisk)

The global aggregate AAL and exceedance probability loss metrics for 2024 reflect changes in risk as a result of a new model (Verisk Inland Flood model for Canada) and updated models (Verisk Wildfire model for the United States, Verisk Earthquake model for Canada and Verisk Tropical Cyclone model for the Caribbean); they also include an updated Industry Exposure Database for Canada and updated premium data for all regions where crop is modeled.

Table 1 presents global insured AAL and key metrics from the aggregate exceedance probability (EP) curve from 2012–2024.

Average annual insured losses and the metrics from the aggregate insured EP curve—for all regions and perils modeled by Verisk—have generally increased since the first white paper was published in 2012. This is expected; the rise reflects both increases in the numbers and values of insured properties in areas of high hazard and the inclusion of regions and perils for which new models are now available.

A breakdown of contribution to global AAL by region and key aggregate EP metrics by region appears in Table 2.

Region	Aggregate Insured Loss (USD Billion)		
	AAL	1.0% (100-year return period)	0.4% (250-year return period)
Asia	24.4	71.0	91.5
Europe	19.7	79.2	105.4
Latin America[3]	6.3	56.3	85.5
North America[4]	96.9	333.7	415.1
Oceania	3.7	24.7	37.4
All exposed areas*	151.1	400.0	482.2

Table 2. AAL and EP metrics, by region, based on Verisk's global suite of models, including those introduced or updated in 2024 (Source: Verisk)
* Note that aggregate EP losses are not additive

Figure 2 shows the contribution to global insured AAL by peril.

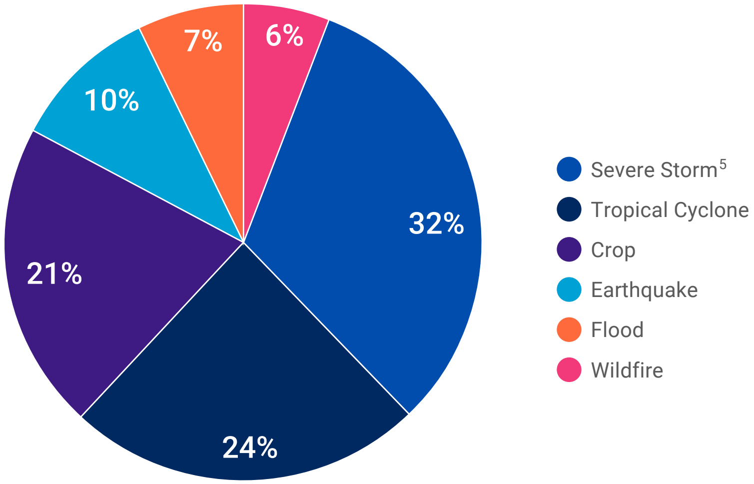


Figure 2. Contribution to global insured AAL by peril for all regions (Source: Verisk)
Includes Severe Thunderstorm, Winter Storm, and Extra-Tropical Cyclone models

It is important to note that AAL represents average expected losses over a long period, not what would be expected in any given year. As reflected in Verisk's stochastic catalogs, global aggregate losses in any given year may comprise a few large loss events in peak regions or lower losses from multiple perils across multiple regions; what is certain is that they are unlikely to look like the long-term AAL breakdowns shown in Figures 1 and 2.

Economic losses

Global economic losses include insured losses and uninsured sources, which may include properties without insurance, damage to infrastructure, and lost economic productivity. Comparing insured losses with reported economic loss estimates for natural disasters since 1990 (as reported by Swiss Re, Munich Re, Aon, AXCO, Lloyd's, and the Insurance Bureau of Canada), Verisk has determined that global insured losses make up less than a third of global economic losses on average when trended to current dollars. Based on Verisk's modeled global insured AAL, this would correspond to an economic AAL of more than $470 billion.

On a regional basis, the insured percentage of economic loss from natural disasters varies considerably (figure 3). In North America, for example, about 51% of the economic loss from natural disasters is insured, while in Asia and Latin America, insured losses account for only about 12% and 24% of economic losses, respectively, reflecting the very low insurance penetration in these regions. The portion of economic losses that are insured also varies significantly by peril.

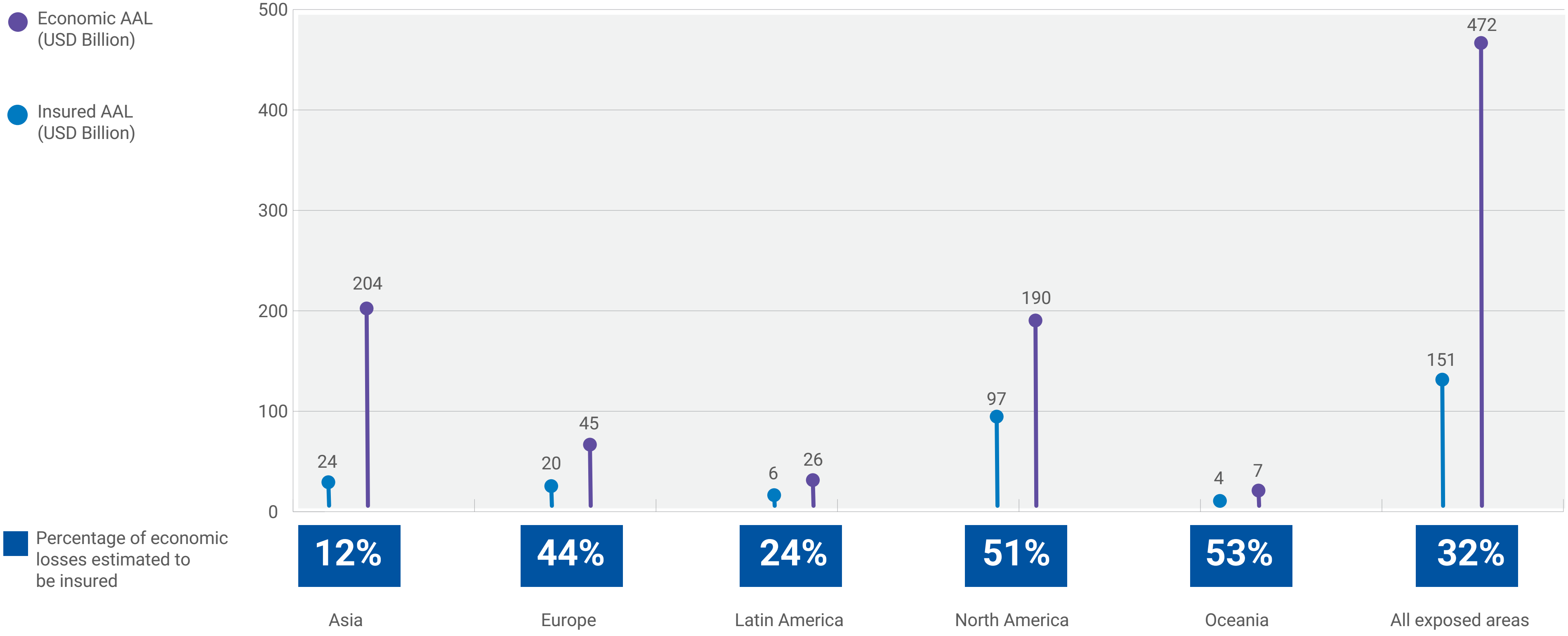


Figure 3. Insured and economic AAL by region* (Source: Verisk)
* Note that aggregate EP losses are not additive

Using the same techniques employed to quantify the protection gap on an AAL basis, the insured and economic losses for each region at the 1% exceedance probability (the 100-year return period) can be calculated. The difference between economic and insured losses—the uninsured losses—includes the potential losses to uninsured properties and losses that extend beyond the models' scope, including estimates of damage to roads, bridges, railways, and sewers, as well as global electrical and telecommunications networks and other infrastructure (Figure 4).

These metrics reinforce the need for additional risk financing solutions. In situations where insurance is not feasible or cannot be offered affordably, catastrophe modeling can help inform emergency management, hazard mitigation, public disaster financing, risk pooling, and other government-led risk and loss mitigation initiatives to enhance global resilience.

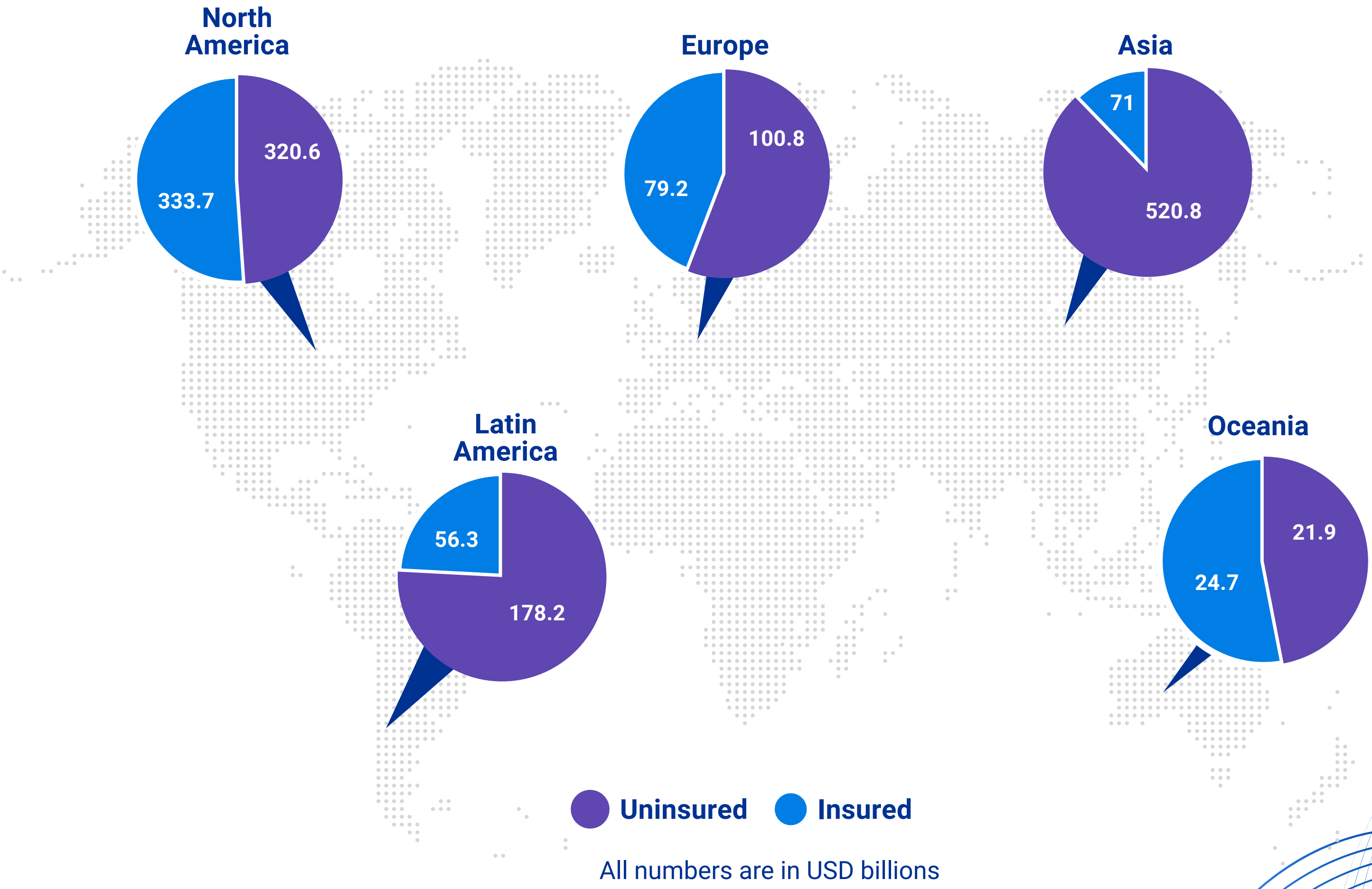


Figure 4. Gap between insured and total economic losses (sum of insured and uninsured losses), by region, at 1% exceedance probability (100-year return period) level (Source: Verisk)

Key drivers of modeled loss

As established through the latest analysis using Verisk's models, the global modeled insured average annual loss from natural catastrophes is $151 billion. In this section, we will review factors that are driving these increasing losses and are accounted for in the global modeled insured average annual loss number. These include the effects of climate change and climate variability; exposure growth, including rapid urban expansion; and increasing event frequency coupled with economic and social inflation.

Rapid urban expansion

The modeled AAL and insured losses are likely to increase over time because of rising property exposure. In recent years, fast-rising global inflation has substantially increased property exposure value, which in turn helps drive increases in insured losses. While price inflation is returning to normal worldwide, exposure growth will continue to contribute to rising insured losses.

Insurers and reinsurers need detailed and current exposure data to track the location and value of exposure and accurately model losses. To help the industry capture these updated risks, Verisk annually updates the Industry Exposure Databases for most modeled countries based on the Verisk Global Capital Stock Index (VGCSI).[6] Verisk develops industry exposure indexes using the VGCSI to reflect changes in a country's total industry exposure. The index reflects country-level changes in physical asset values across all business lines. The VGCSI is the culmination of internal research on modeling capital stock (physical assets) for more than a decade.

Exposure growth within a country can vary due to population shifts and increased urbanization. For example, the most recent data from the U.S. Census Bureau finds that population continues to grow fastest in the U.S. South, with the largest urban expansion occurring in the Dallas-Fort Worth, Texas, metropolitan area. Population growth in this area has led to rapid, outward development as residential suburbs overtake rural land.

The rapid expansion of the Dallas-Fort Worth area is visible over time using remotely sensed impervious surface data available from the U.S. Geological Survey's National Land Cover Database (NLCD) (Figure 5 and Figure 6). Population growth and development are concentrated in rural suburbs outside of Dallas and Fort Worth, such as Celina, Princeton, Anna, Prosper, and Forney. All five of these cities were in the 10 fastest-growing U.S. cities in 2023. Celina is the fastest-growing U.S. city, with the population growing 26.6% in 2023—more than 53 times faster than the country's population growth rate of 0.5%. As the Dallas-Fort Worth area expands outward, exposure to natural catastrophes is increasing. According to the National Weather Service, large hail, damaging winds, flooding, and tornadoes occur nearly every year in the region.

Over the past decade, at least eight severe storm events have affected the Dallas-Fort Worth area, causing at least $1 billion in total (inflation-adjusted) damage (NOAA National Centers for Environmental Information [NCEI], 2024). Rapid urban expansion contributed to increased losses over time. Based on population growth over the past decade, a $1 billion event 10 years ago could be nearly 20% more costly today in the Dallas Fort Worth area just from new construction—before accounting for higher inflation.

Figure 5. 2001 Urban impervious surface in the Dallas-Fort Worth area
(Source: Verisk on Basemap provided by Esri)

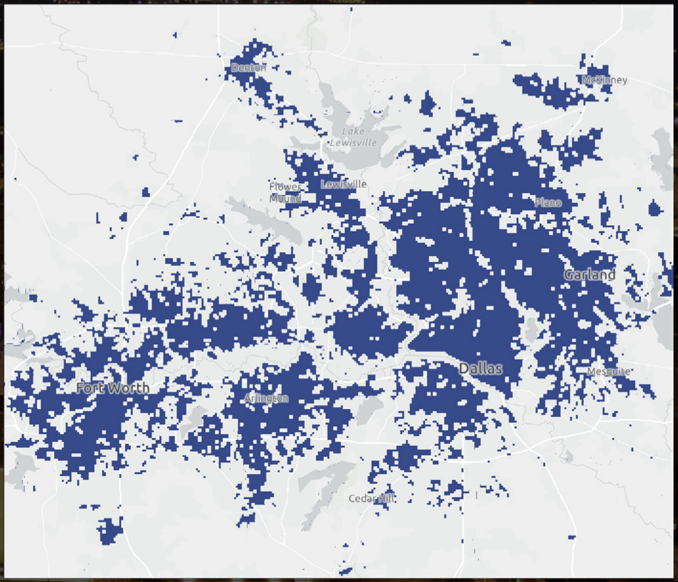
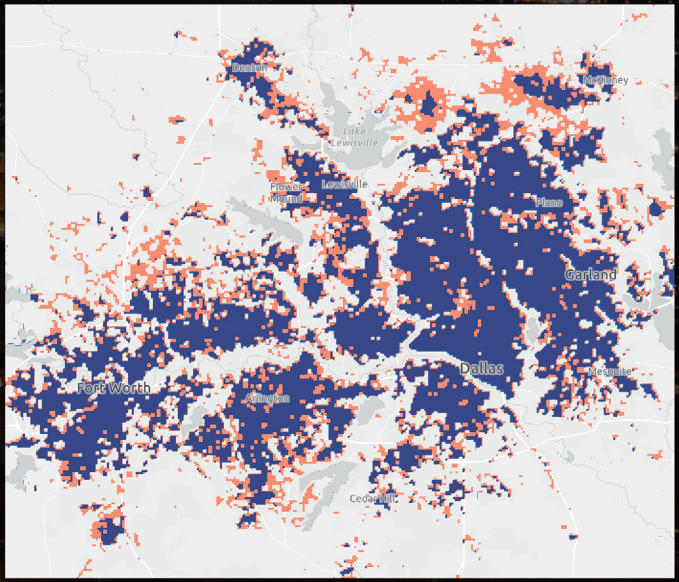


Figure 6. 2021 Urban impervious surface in the Dallas-Fort Worth area
(Source: Verisk on Basemap provided by Esri)



Today, more than half of the world's population lives in urban areas. Across the globe, nearly 58% of cities with a population of at least 300,000 are highly exposed to one or more natural hazards. The impact of urbanization and population growth on exposure levels varies by country. In fast-growing, developing countries, new cities continue to form while others expand outward. In developed countries, urbanization also contributes to rising exposure levels. In England, for example, one in 13 new homes (8%) built in the past decade is in a flood zone.

Exposure growth: New activity and inflation

Changing exposure patterns and rising repair costs make it critically important for insurers to regularly reassess their exposures, particularly in times of increased inflation and in the urban and coastal areas that are most vulnerable to natural hazards. The models used for this task rely on accurate property characteristics to produce a realistic projection of potential losses, with up-to-date replacement values playing a particularly large role in driving modeled losses.

Across modeled countries, exposure growth varies by region. Table 3 shows annual exposure growth by region over the past five years (2019–2023)[7]. On average, exposure growth across countries increased 7.2% per year, ranging between 6.7% (Latin America, Oceania) and 8.2% (Asia) per year. During this period, new construction (real exposure growth) grew 2.6% annually, while construction prices increased 4.4% annually. New construction was slowest in North America and Oceania (2.0%) and fastest in Asia (3.9%). Price increases ranged between 4.1% (Asia, Latin America) and 5.4% (North America) per year.

Region	Annual Nominal Exposure Growth	Annual Real Exposure Growth	Annual Price Change
Asia	8.2%	3.9%	4.1%
Europe	7.1%	2.2%	4.8%
Latin America[8]	6.7%	2.5%	4.1%
North America[9]	7.5%	2.0%	5.4%
Oceania	6.7%	2.0%	4.5%
All exposed areas	**7.2%**	**2.6%**	**4.4%**

Table 3. Annual exposure growth by region (2018-2023) measured using the Verisk Global Capital Stock Index

Note: Annual nominal exposure growth includes growth from new construction and inflation. Annual real exposure growth includes growth from new construction activity. Annual price change measures construction price inflation. Annual figures are average of the countries in each region and calculated as the compound annual growth rates from 2019 to 2023. Annual figures exclude Venezuela and Lebanon as both countries are experiencing periods of hyperinflation, which skew results.

In the United States, residential reconstruction costs grew 7.4% per year over the past five years. As inflation has slowed, reconstruction costs increased 3.8% in the past year (January 2023 to January 2024) . It is important to note that even a 3.8% increase in exposure value from construction cost inflation alone would result in nearly a 45% increase in losses over a 10-year period.

Demand surge and other sources of loss inflation can lead to further increases in insured losses in a given year or region. Loss inflation is the increase in the value of claims from losses beyond the expected value from the event alone. Demand surge is one component of loss inflation and accounts for the temporary increase in the cost of material, services, and labor due to the increased demand for them following a catastrophe. For significantly large events, a disruption in the construction market can trigger demand surge, leading to delays in claim settlement time longer than a year while increasing repair costs over the prolonged claim settlement time. When demand surge occurs, the magnitude of the phenomenon will vary based on economic conditions at the time of the event. For example, as inflation returns to long-term averages, the magnitude of demand surge may be lower than it was during periods of high inflation, such as 2021 and 2022.

Surge in event frequency

Extreme scenarios for global modeled losses are deteriorating over time, and the increasing frequency of events may be a contributing factor. Verisk's plot of global modeled losses with a 100-year return period (Figure 6) shows an increase almost every year since this report was first issued in 2012—along with modeled average annual losses and other loss breakdowns.

Climate change is widely expected to raise the frequency and intensity of catastrophic weather events. Still, given the relatively short time span, it's unlikely that Figure 6 shows any discernible climate change signals. Over the long term, climate change effects within Verisk's atmospheric peril model suite can be expected to increase in small increments, with each update incorporating more near-present impacts on frequency and intensity of events.

A notable exception is the 2024 update to the Verisk Wildfire Model for the United States, in which both the AAL and the 100-year loss have roughly doubled, with AAL increasing from $4.5 billion to $9.1 billion and the 100-year loss increasing from $25 billion to $47 billion. However, wildfire only contributes 6% to global losses and thus is unlikely to have a significant impact on the overall picture of modeled losses.

Experienced risk modelers agree that the dominant effects leading to visible short-term increases in modeled risk are growth in exposure and inflation in dollar terms. The latter, both economic and social, has been especially steep in recent years.

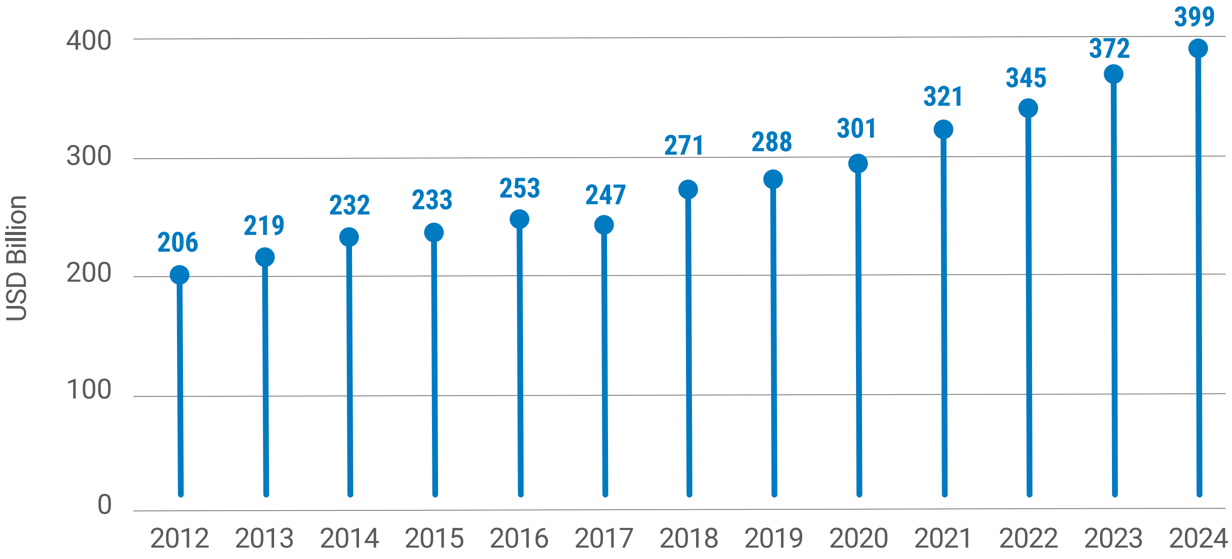
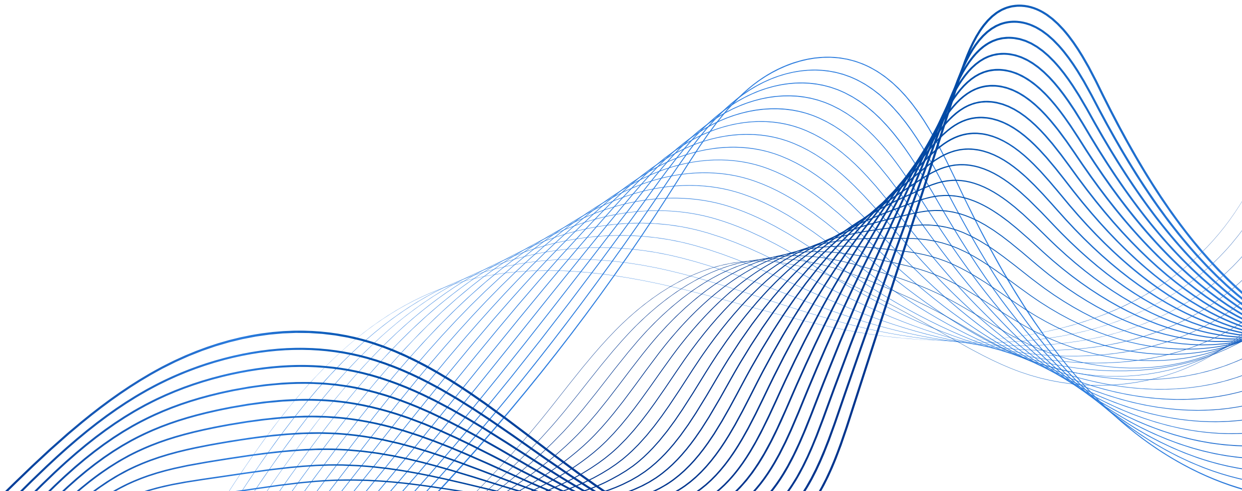


Figure 7. Verisk global modeled 100-year insured losses over time (Source: Verisk)



Climate variability and climate change

Extreme weather events contribute 90% of the total Verisk global modeled average annual loss (AAL). These events are part of the Earth's dynamic climate system, continuously evolving across multiple periods.

Even without external forces, the climate system produces a great diversity of weather—day-to-day, season-to-season, and year-to-year. At regional and multidecadal scales, the climate experiences uneven cycles of similar weather patterns. One example is the El Niño Southern Oscillation, which affects the Eastern Pacific and is defined by three states: the coupled El Niño, marked by above-average sea surface temperatures, and La Niña, marked by below-average sea surface temperatures, with a third neutral phase marked by average sea surface temperatures. Such departures from the average—from daily fluctuations to multi-year cycles—are examples of climate variability, the innate range of weather attributable to the chaos of the physical forces governing the atmosphere, oceans, and their interaction.

Science has firmly established that the earth is now undergoing rapid climate change that also contributes to the human experience of climate variability. Accelerating increases in human-caused emissions of greenhouse gases since the Industrial Revolution have uniquely destabilized the climate system. The resulting distribution of weather on the ground is shifting slowly and subtly—yet systematically—against the background of natural climate variability.

For many atmospheric perils, climate change means more frequent and intense extreme weather events are likely over time. The challenge lies in detecting and measuring relatively small human-caused climate change signals alongside the large, natural, internal variability of the climate system. Natural variability creates a background of "noise" against which a localized uptick in hazard could conceivably be part of ongoing change—or merely a short-term statistical fluke.

Small climate signals in large events

Detecting a climate change signal in global losses from extreme events again raises the challenge of separating annual variability from more subtle long-term shifts due to increasing catastrophes. This is even more difficult, given the added complications of changes in exposure and inflation, but Verisk's global suite of catastrophe models for atmospheric perils provides some valuable insight. These models' hazard components use deep physical and statistical expertise to capture both climate variability and climate changes that have already detectably affected the distribution of the near-present climate. The Verisk modeling framework used in this report holds exposure and inflation constant at today's values, so variations in modeled loss reflect the contribution from the representation of internal climate variability of atmospheric extremes.

It is possible to estimate the "noise" deriving from internal variability in the climate system by using the coefficient of variation (COV), which is calculated by dividing the standard deviation by the mean of annual loss. The estimate of the COV of Verisk's global modeled annual loss from weather events is 42%. This compares favorably to the COV of 52% from Swiss Re data on reported insured losses from weather events between 2010 and 2021 (which should be larger than modeled results, given increases in exposure over the reporting interval). Together, these findings suggest that the climate's contribution to variability in the global insured AAL is a high double-digit percentage.

Verisk's future climate projected risk modeling products can provide some insight into the relative contribution of climate change to atmospheric peril losses as well. To date, Verisk has released projections for its Hurricane model for the United States, Tropical Cyclone model for the Caribbean, and Wildfire model for the United States. These projections suggest the AAL will increase at least 1% year-on-year for each of these perils due to climate change. Projections vary by peril and region: Verisk expects wildfire losses to increase at a higher rate than hurricane losses, for example. Yet these studies give a sense of the relative scale of annual increases due to climate change versus internal variability.

Although the annual impact of climate change on loss is small relative to the interannual change from climate variability, the former is a compound growth rate. These estimates and the compounding together suggest that by 2050, the overall climate change impact on AAL could become comparable to today's variability in loss deriving from internal climate variability. With careful planning for multidecadal increases in risk, incremental adjustments in risk management strategy can help keep insurance affordable to consumers and protect insurers' solvency.

> These projections suggest the AAL will increase at least 1% year-on-year for each of these perils due to climate change.

Global protection gap

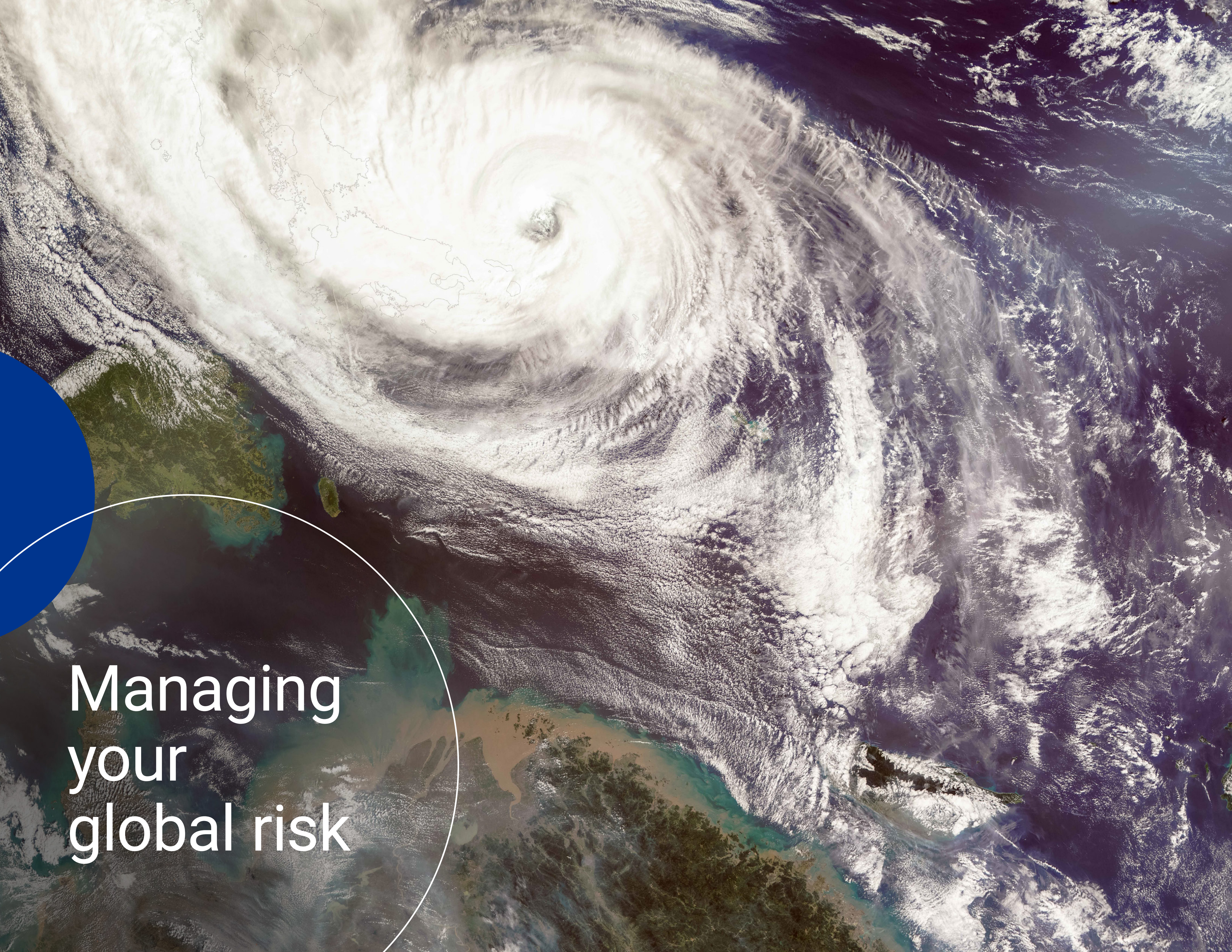
Global economic losses encompass insured losses and uninsured sources, which may include properties with no insurance, infrastructure, and lost economic productivity. Comparing insured losses with reported economic loss estimates for natural disasters since 1990 (as reported by Swiss Re, Munich Re, Aon, AXCO, Lloyd's, and the Insurance Bureau of Canada), Verisk has determined that global insured losses make up less than a third of global economic losses on average when trended to current dollars. Based on Verisk's modeled global insured AAL, this would correspond to an economic AAL of more than $470 billion.

The sizable difference between insured and economic losses—the protection gap—represents the cost of catastrophes to society, much of which governments ultimately bear. Increasing insurance penetration can ease much of the burden while providing profitable growth opportunities for the insurance industry.

Global insured losses are typically less than a third of global economic losses when adjusted for current dollars. Based on Verisk's model, this means that the economic annual average loss (AAL) would be over

$470 billion

Taking a recent example, Italy experienced two extreme losses across two very different perils in 2023—hail and flood. Both perils' economic losses were roughly €10 billion, but they had vastly different insured losses. Hail losses were reported to exceed €5 billion, while flood losses were only around €500 million. The economic loss was the same, but the insured flood loss was just one-tenth of the insured hail loss. The standard fire insurance policy covers hail, but flood insurance is purchased as an additional coverage. Hence the societal resilience from the same economic loss varies widely, with flood requiring much more state support. As part of the new Italian budget law, all legal entities will be required to have flood, earthquake, and landslide insurance by December 31, 2024, reducing the protection gap—for businesses.



Managing your global risk

Verisk products and analytics help companies stress-test their portfolios so they can account for the impacts of climate change, demand surge, or social inflation.

This paper has examined how global insured losses continue to increase after a period of lower-than-average losses. Factors driving these increasing losses include the effects of climate change and climate variability; exposure growth, including rapid urban expansion; and increasing event frequency coupled with economic and social inflation.

Companies can take constructive steps to ensure that they are well-prepared for future catastrophes. This can be done primarily by focusing on four key areas:

Ensure that a complete suite of peril models has been run, including tropical cyclone, earthquake, severe thunderstorm, wildfire, and flood models.

Ensure that attributes of as many buildings as possible are accurately captured, including the construction, occupancy, and year built, which are primary determinants of how these structures respond to the damaging conditions produced by catastrophes.

Ensure that as many properties as possible are accurately geocoded to represent their actual location within the models. Floods, severe thunderstorms, and wildfires are increasingly important drivers of loss and are particularly sensitive to a property's exact location.

Ensure that books reflect the real, current replacement values of every property. Accounting for both inflation and rising prices in many high-risk/high-value areas requires frequent, comprehensive reassessments to confirm that outdated information is not being used to assess risk.

With confidence in the data represented in modeled books and after running the full suite of peril models, the output of the models warrants much greater trust, helping to avoid unpleasant surprises in the wake of any catastrophic event. Going beyond the standard model output, Verisk has also provided tools to help companies stress-test their portfolios so they can account for the impacts of climate change, demand surge, or social inflation.

Verisk's global suite of catastrophe models helps provide context for the losses the industry has experienced over the past few years. Perils are modeled in more than 120 countries and territories, capturing a range of both natural catastrophes as reviewed in this paper and man-made events, including terrorism and extreme casualty events.

While actual annual insured losses over the past five years have been high, averaging $106 billion, they should not be seen as outliers. The Verisk global AAL at $151 billion represents the scale of potential loss for a given year. With this information, companies can prepare for large loss years and truly own their risk with confidence, so they can weather these challenging years without risking their solvency.

As organizations continue to understand and manage these losses, Verisk's models, used with Touchstone and Touchstone Re, and the EP curves they generate can give companies around the world the information they need to benchmark their own potential losses and manage their catastrophe risk with confidence.

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Endnotes

1. From 2012 to 2022 figures included losses from U.S. Terrorism events. Starting in 2023 losses from man-made events are no longer included.
2. Loss figures from prior years have not been trended to the current year, and instead represent the loss figures generated by Verisk models at the time of the analysis using the set of models available at that time.
3. Includes the Caribbean, Central America, and South America
4. Includes Canada, the United States, Bermuda, and Mexico
5. Includes Severe Thunderstorm, Winter Storm, and Extratropical Cyclone models
6. Verisk provides global industry exposure indexes for most modeled countries and areas, with some exceptions. Exposure indexes for the United States and China are available on the **Client Portal** (client login required). Verisk does not provide indexes for Albania, Macedonia, and Serbia because they are outside the scope of the VGCSI.
7. Annual figures exclude Venezuela and Lebanon as both countries are experiencing periods of hyperinflation, which skew results.
8. Includes the Caribbean, Central America, and South America.
9. Includes Canada, the United States, Bermuda, and Mexico.

Wilder & Mackun, Sunshine State Home to Metro Areas Among Top 10 U.S. Population Gainers From 2022 to 2023, 2024

Wilder & Mackun, Population Rebounds for Many Cities in Northeast and Midwest, 2024

National Weather Service, The Climate of Dallas/Fort Worth

Verisk analysis of U.S. Census Bureau, 2014-2023 Resident Population in Dallas-Fort Worth-Arlington, TX (MSA) [DFWPOP], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/DFWPOP, July 22, 2024

Gu, D., Exposure and vulnerability to natural disasters for world's cities, 2019

Aviva, One in thirteen new homes built in flood zone, 2024

Verisk 360Value® Residential Replacement Cost Index. U.S. averages are averaged across all 50 states and D.C.

Natural Catastrophe and Climate Report: 2023, Gallagher Re page 13: https://www.ajg.com/gallagherre/-/media/files/gallagher/gallagherre/news-and-insights/2024/january/natural-catastrophe-and-climate-report-2023.pdf

Climate and Catastrophe Insight, 2024, Aon pages 83-84: https://assets.aon.com/-/media/files/aon/reports/2024/climate-and-catastrophe-insights-report.pdf

PERILS 2024: https://www.perils.org/losses?year=2023&classification=454&status=#event-losses