Natural catastrophe risk and insurance

Current situation and outlook in the context of climate change

July 2025

Executive summary

The impact of climate-related and/or geological natural catastrophes on the insurance market has been increasing steadily for over 40 years, both in terms of frequency and severity. This pattern has been observed both at national level in France and globally. Looking ahead to 2050, the combined effect of wealth accumulation in insured areas and intensifying climate risks suggest that this trend will continue.

Given this context, we explore the following issues:

- Insurance industry stakeholders, particularly brokers, must play an active role in risk analysis and quantification by adopting Cat analytics tools and methods, which incorporate mapping and actuarial methods, artificial intelligence, and field-level risk analysis and prevention techniques. We argue that these methods, which are currently highly technical and very expensive, must become more widely accessible. While continuing to deliver and refine the current bespoke "haute couture" solutions, it is essential to craft a more accessible "ready-to-wear" value proposition tailored to mid-sized companies and key accounts with tighter profit margins.
- Insurance is expected to gradually transition from the conventional risk-based property line to a newly established line specifically for natural catastrophes. Following the long-standing treaty reinsurance model, both insurance and its associated facultative reinsurance are likely to evolve over the next decade towards dedicated underwriting for natural catastrophes—mirroring developments since 2002 for terrorism risks, and since 2010 (further reinforced in 2019) for strikes, riots and civil commotion exposures. This shift is inevitable, and it is essential that all stakeholders prepare by launching targeted technical, methodological, digital, organisational, and transactional initiatives. In this context, we examine a range of possible insurance solutions, including "Critical Cat" facultative insurance and reinsurance (typically positioned in excess of property damage programmes), alternative instruments (such as parametric insurance and Cat Bonds), and retention solutions—whether through captives and/or structured approaches.

Scan to read the interview with Florence Louppe (Managing Director, Diot-Siaci Corporate Solutions) and Frédéric Durot (Managing Director, Diot-Siaci Corporate Solutions Global P&C Business Unit) on anticipated developments in natural catastrophe insurance over the next 10 years.

Introduction

Property insurance is facing numerous challenges due to the increasing severity of both man-made and natural risks, whether climate-related or geological in nature. This concerns the issue of so-called "systemic" risks—those with far-reaching impacts geographically and over time. These risks are a growing threat to the resilience of insured companies. At the same time, they impose increasingly significant—even prohibitive—costs on risk carriers, both insurers and reinsurers, owing to their severe financial impact from concentrated portfolio exposure, whether from single events or cumulative annual or multi-year losses.

This position paper:

- Provides an overview of the financial impact of natural catastrophes on the economic structure of the property insurance sector;
- Considers potential developments in this financial impact;
- Explores possible methods for financing these evolving risks.

Trends in loss experience associated with natural catastrophes (geological and weather-related risks) and climate change

Global loss experience

Global loss experience continuous to deteriorate, with an increasing number of extremely costly years with over $100 billion in insured losses from major natural catastrophes.

The graph below is based on Swiss Re's data on large losses, defined as events costing over US$53 million each.

Whereas in the past this threshold was exceeded in fewer than one year out of five (2005, 2011 and 2017), it has been surpassed every year since 2021:

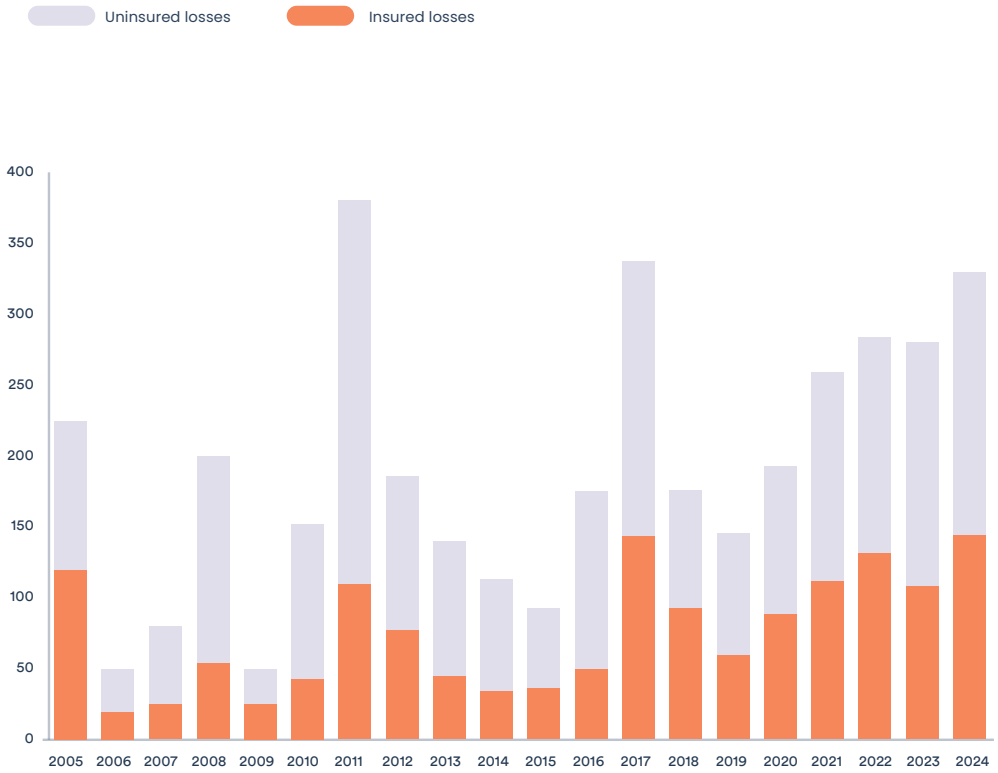
- 2021 (losses of US$112 billion): ice storm Uri in Texas in February: US$15 billion; flooding in Europe on 15 July: €13 billion; Hurricane Ida: €32 billion;
- 2022 (losses of US$132 billion): Hurricane Ian: US$60 billion (second costliest hurricane on record, after Katrina: US$80 billion); hailstorms in France on 22 June: US$6.4 billion;
- 2023 (losses of US$108 billion): numerous convective phenomena in the US caused losses of US$60 billion; torrential flooding in northern Italy in May and July resulted in US$3.5 billion in insured losses;
- 2024 (losses over US$140 billion): convective phenomena in the US caused losses of US$45 billion; Hurricanes Milton and Helene in the US caused losses of over US$40 billion; torrential rain in Valencia, Spain (Storm Dana) in late October caused nearly €5 billion in insured losses;
- 2025 opened on a grim note with the wildfire in Los Angeles in January, which caused over US$30 billion in total damage, including insured losses.

Mega-hurricanes regularly occur in the US and the Caribbean between August and October, but so-called "secondary events"—mostly unmodelled convective phenomena—are also increasingly frequent. These events typically cause several billion dollars in losses each, in contrast with the tens of billions caused by major catastrophes ("big ones"). Severe convective storms (SCS) generate tornadoes, torrential rains, violent thunderstorms and/or major hailstorms. These phenomena are clearly linked to climate change. Convection is, by nature, an atmospheric phenomenon driven by thermal flows resulting from temperature differences between the Earth's surface, the oceans or seas, and the atmosphere.

This trend is illustrated by the growing frequency and intensity of "Medicanes"—a portmanteau of "Mediterranean" and "hurricane". The Mediterranean Sea is particularly vulnerable to climate change because it is an enclosed body of water located in a region subject to extreme heat in the summer and autumn months.

Convective activity is fuelled by intense evaporation from the sea, followed by storm formation as this moist air encounters coastal terrain. Geographic and topographic conditions, combined with evaporation-fuelled energy amplified by climate change, create a conducive environment for these major storms.

This is what occurred in late October in the area around Valencia, Spain, when Storm Dana struck. These are not new phenomena. Memorable events include the torrential floods that devastated Vaison-la-Romaine in August 1992 and the severe Cévenol storms that regularly recur in the Cevennes region of southern France. These phenomena are clearly becoming more frequent and intense.



2005
US$120 billion in insured losses, including Katrina (US$80 billion), Wilma and Rita

2011
US$110 billion in insured losses, including Fukushima (US$38 billion), floods in Thailand (US$16 billion)

2012
including Sandy (US$37 billion in insured losses)

2017
US$144 billion in insured losses, including Harvey, Irma and Maria ($92 billion), and wildfire in California (US$14 billion)

2020
$89 billion in insured losses, including US$76 billion caused by natural events. No major events, but increased frequency of secondary events

2021

- US$112 billion in insured losses, including US$105 billion caused by natural events
- Winter storm Uri (Texas, February): US$15 billion
- Cyclone Ida in the US (September, US$32 billion)
- Floods in Belgium and Germany (July, US$13 billion, of which US$1.2 billion was covered by the Belgian pool)
- + various bushfires

2022

- Floods in Australia (February and March): US$6.6 billion in losses, of which US$3.9 billion in insured losses
- Earthquake in Japan (March, Fukushima): US$8.8 billion in losses, of which US$2.8 billion in insured losses
- Storms in Europe (February): US$5.6 billion in losses, of which US$4.3 billion in insured losses
- Floods in China (May): US$5 billion in losses, of which $0.5 billion in insured losses
- Hurricane Ian (September and October, US and Cuba): US$100 billion in losses, of which US$50-60 billion in insured losses

2023

- Earthquakes in Turkey and Syria (February): US$58 billion in losses, of which US$6.2 billion in insured losses
- Cyclone Gabrielle floods in New Zealand (February): US$2.4 billion in losses
- SCS in Italy (May): US$10 billion in losses, of which US$0.6 billion in insured losses
- Earthquake in La Laigne, France (June): €350 million in insured losses (CCR)
- Wildfire in Hawaii (August): US$3.5 billion in losses
- SCS in the US (18 events): US$50 billion in insured losses
- Earthquake in Morocco (September, Marrakesh): mostly uninsured losses
- Hurricane Otis (October, Acapulco, Mexico): US$2.5-4.5 billion in insured losses
- Cyclone Tammy in Guadeloupe (October): €12-15 million (CCR)
- Storms Ciaran and Domingos (Europe, including France, November): US$1.3 billion in insured losses
- Floods (Hauts-de-France, October): US$640 million in insured losses (CCR, November 2023-January 2024)

2024

- Japan earthquake (1 January): US$10 billion in economic losses, of which US$2 billion in insured losses
- Floods in the UAE and Oman (January): economic losses of US$8.3 billion, of which US$2.8 billion in insured losses
- Cyclone Belal in La Réunion (January): €100 million (France Assureurs February estimate)
- Earthquake in Taiwan (3 April): US$4.6 billion in economic losses, of which $800 million in insured losses
- Floods in Brazil (April-May): US$7 billion in economic losses, of which US$2 billion in insured losses
- Floods in Europe, particularly in Germany (late May and early June): $5 billion in economic losses, of which US$2,2 billion in insured losses
- Category 5 Hurricane Beryl (late June and early July): US$8.5 billion in economic losses, of which $3.6 billion in insured losses. Insured losses of US$3.7 billion in the US (RMS) + US$3 billion in the Caribbean and Mexico
- Tornadoes and hailstorms in North America: US$60 billion in economic losses ($45 billion in the US), of which $44 billion in insured losses (US$34 billion in the US)
- Hurricane Helene (late September): US$56 billion in economic losses, of which US$16 billion in insured losses
- Hurricane Milton in Florida (October): US$38 billion in economic losses, of which US$25 billion in insured losses
- Typhoon Yagi (early November) in the Philippines, China and Vietnam: US$14 billion in economic losses, of which US$1 billion in insured losses

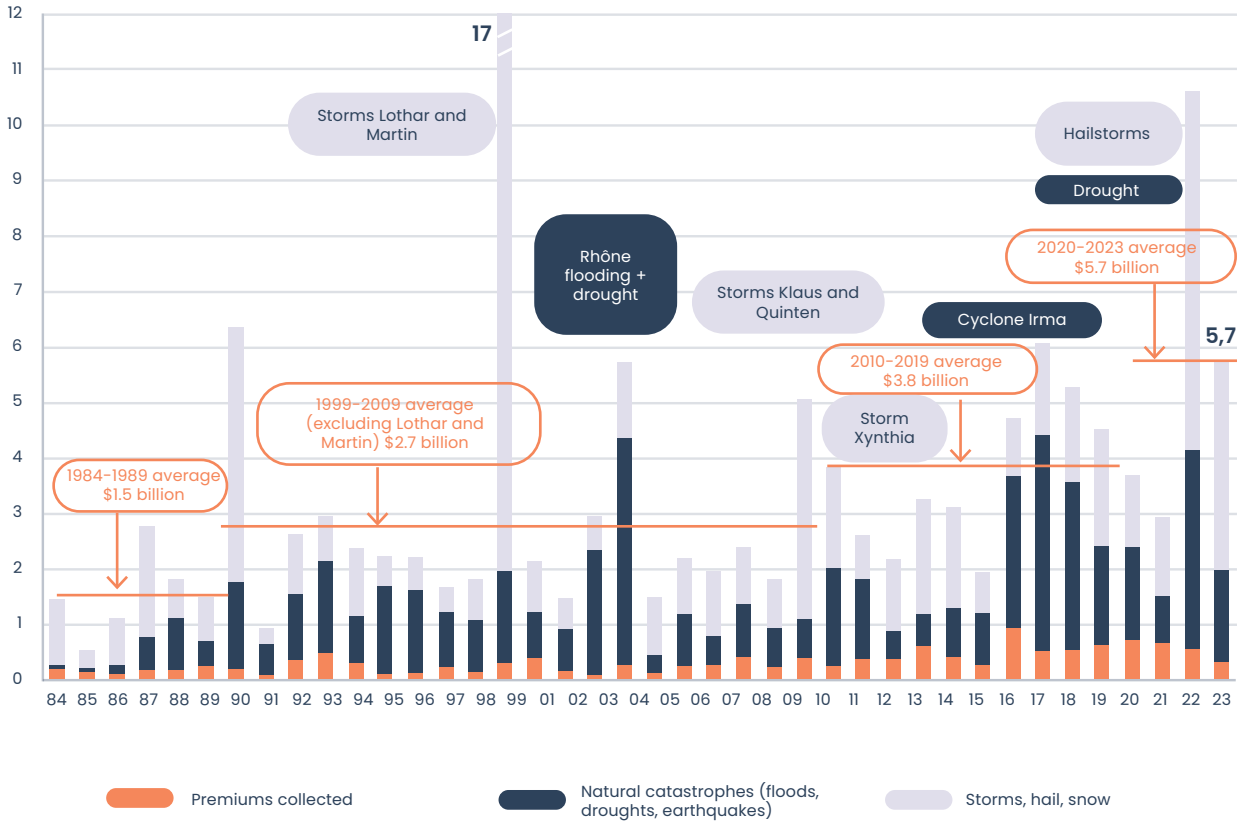
Focus on France

Here are some eye-opening figures from France showing the rising average cost of natural catastrophe events:

- Between 1984 and 1989, the annual average cost was €1.2 billion (constant euros);
- It then rose to €3.8 billion between 2010 and 2019;
- The average cost then grew to €5.7 billion between 2020 and 2023. Over the past three years, the following trends have emerged:
  - €10.6 billion in 2022 (the second costliest year after 1999: €16 billion, including €13 billion due to Storms Lothar and Martin on 26 and 27 December);
  - €6.5 billion in 2023; and
  - €5 billion in 2024.

TRENDS IN THE COST OF NATURAL CATASTROPHE EVENTS IN FRANCE

(PRESENTED BY YEAR OF OCCURRENCE, IN BILLIONS OF US DOLLARS, ADJUSTED TO 2023 VALUES)



Source : France Assureurs

Outlook

There are no global benchmark studies, aside from the extensive mapping data published by reinsurers—notably the CatNet (Swiss Re) and NATHAN (Munich Re) platforms—which model changes in exposure by climate peril and IPCC scenario, for the time horizons 2030, 2050, and 2100. However, this hazard data alone does not quantify financial impact, which must be assessed using stochastic modelling applied to a defined risk portfolio, within a specific geographic area ("cluster") and for a given modelled peril.

Several forward-looking studies have been published in France by CCR, France Assureurs and Covea, respectively.

The CCR study of October 2023 examines the projected evolution of claims under the statutory Cat Nat scheme through 2050. The financial impact in 2050 is projected to increase by 60%, with one-third attributed to growth in insurable assets.

The white papers published by France Assureurs (October 2021) and Covea (February 2022) discuss a number of climate perils, whether or not covered by the Cat Nat scheme.

According to France Assureurs, the financial burden of natural disaster claims is forecast to rise by 93% by 2050, in constant euros. France Assureurs attributes 53% of this rise to the growth in insurable assets (wealth accumulation), and 35% to the increasing severity of natural events as a result of climate change.

The Covea group (Maaf, MMA, GMF) published its own white paper in February 2022 predicting a 60% increase in natural catastrophe claims by 2050. Aside from some differences in scope, the studies diverge primarily in their estimates of the change in financial impact over this timeframe:

- Wind-related losses: Covea projects no change, whereas France Assureurs anticipates a 46% increase;
- Losses due to drought: Covea forecasts an increase of 60% and France Assureurs a rise of 215%;
- On the other hand, Covea anticipates a greater impact from floods: an increase of 110% for lowland flooding and of 130% for flash floods and floods due to torrential rains, whereas France Assureurs forecasts an increase of 87%.

Risk analysis and prevention: key action drivers

In response to events that are becoming more frequent, intense and volatile, the following technical levers can be applied:

- Supporting risk analysis and preventive action:
  - A key tool is a type of quantitative risk analysis known as "Cat analytics". This quantitative analysis is conducted using mapping methods that integrate climate change factors, scenario analysis, and stochastic actuarial modelling—commonly referred to as "Cat modelling";
  - Specialised field engineering for natural hazards using expert engineers. However, these services remain highly customised and costly—akin to "haute couture"—typically costing two to three times more than a standard fire inspection. It is essential that stakeholders in the risk and insurance industry develop simpler, more pragmatic risk audit solutions—a "ready-to-wear" approach.

Insurance tools

Negotiations with the markets rely on the rigorous structuring of insurance and reinsurance programmes. This structuring draws on Cat analytics to define appropriate cover limits.

It also enables the segmentation of cover layers in alignment with market appetite, which is directly tied to risk criticality, defined as the assessment of event probability (or return period) and severity.

Negotiation of Cat cover terms and conditions with specialised markets is informed by insights from Cat analytics, in order to:

- Structure Cat capacity programmes based on study results, particularly Cat modelling outputs;
- Leverage the analysis of the most critical sites identified by Cat analytics—particularly through Cat modelling, which highlights key driving locations. This helps to appropriately tailor the documentation submitted to the markets and supports more informed decisions on risk reduction measures;
- Use the annual average loss estimated through Cat modelling to more effectively assess and challenge the premiums proposed by the market.

Insurance and reinsurance markets of the future

Brokers already have a range of levers at their disposal, which are set to become increasingly important in the future as, over the next 10 years, property insurers gradually withdraw from underwriting major natural catastrophe risks, except under mandatory schemes such as France's Cat Nat and Spain's Extraordinary Risks systems.

It is already possible to access the following types of markets:

- Currently, natural catastrophe cover is provided by property insurers and reinsurers under statutory schemes in France, Spain, and Belgium for simple and commercial risks, with similar programs under development in Italy and Greece.
- Indemnity markets that specialise in natural catastrophes and provide cover in excess of property insurance programmes. These "Critical Cat" markets break down as follows:
  - The London markets;
  - Reinsurers in continental Europe;
  - Regional markets close to the risk: experience shows that certain players, particularly major reinsurers, have a greater appetite for underwriting regional risks—i.e. underwriting close to the source of exposure. By developing legitimacy and expertise, they are given priority within their group when capacity is allocated to a specific Cat cluster.
- Parametric insurance providers offering complementary solutions—particularly for risks that indemnity insurers are unwilling or unable to cover:
  - Ultraprimary lower layers, such as deductible buybacks or protection of captive retentions;
  - Business interruption losses without property damage;
  - Denial of access without physical damage within a short radius of the insured site;
  - Buyback of cover for assets traditionally excluded from property insurance, such as engineering structures, roads and other networks, fences, standing timber, etc;
  - More difficult to place is high-level capacity (excess or umbrella), which is harder to assess due to the greater risk that the parametric cover will not be triggered (basis risks).
- Cat Bonds and other Insurance-Linked Securities (ILS), structured either as traditional indemnity-based contracts or as financial instruments using parametric or index triggers. Historically (since the late 1990s), Cat Bonds have been used primarily to protect insurers as an alternative to conventional indemnity-based reinsurance treaties. These solutions are now available to clients. It should be noted that this solution is suited to high-value exposures and requires a multi-year commitment. Our Analytics & ART team has already carried out a number of studies for clients.
- And, of course, self-insurance through captive insurance or reinsurance vehicles remains a key option—particularly to cover financial losses without property damage or to insure assets and ultraprimary layers that the market is either unwilling to underwrite or would only insure at prohibitive rates (rate on line) due to their adverse risk profile.

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