Managing Climate-Related Catastrophe Risk at SCOR: Challenges, Tools, and Innovations

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The SCOR Foundation Hybrid Workshop:
“A generic Multi-Risk (GenMR) Open-Source Platform”
(March 12, 2026, Zurich)

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Managing Climate-Related Catastrophe Risk

To effectively manage catastrophe risk, **our aim** is to forecast next year's potential losses from both natural and man-made catastrophic events, *globally*. This enables us to set fair premiums, optimize exposure, and maintain financial stability.

Past perspective

- Based primarily on extensive historical data and past loss experience.

Cat model view

- Using catastrophe models that simulate thousands of plausible future events under today's climate.

Forward view

- Integrates forward-looking climate science projections and scenarios.

To achieve a comprehensive view of risk, we combine historical experience, state-of-the-art catastrophe models, and forward-looking climate science.

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Key Challenges in Managing Climate-Related Catastrophe Risk
…not an easy task

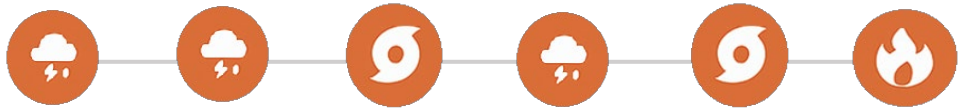
Data and Model Limitations

- Poorly modeled processes (frequency/severity, clustering, cross-peril dependence, etc.).
- “Unprecedented” events.
- Exposure data quality.

France Hail
May to July 2022
France’s costliest hail event ever

Italy Hail
July 2023
European hail size record was broken twice

California Wildfire
January 2025
Costliest wildfire event in U.S. history

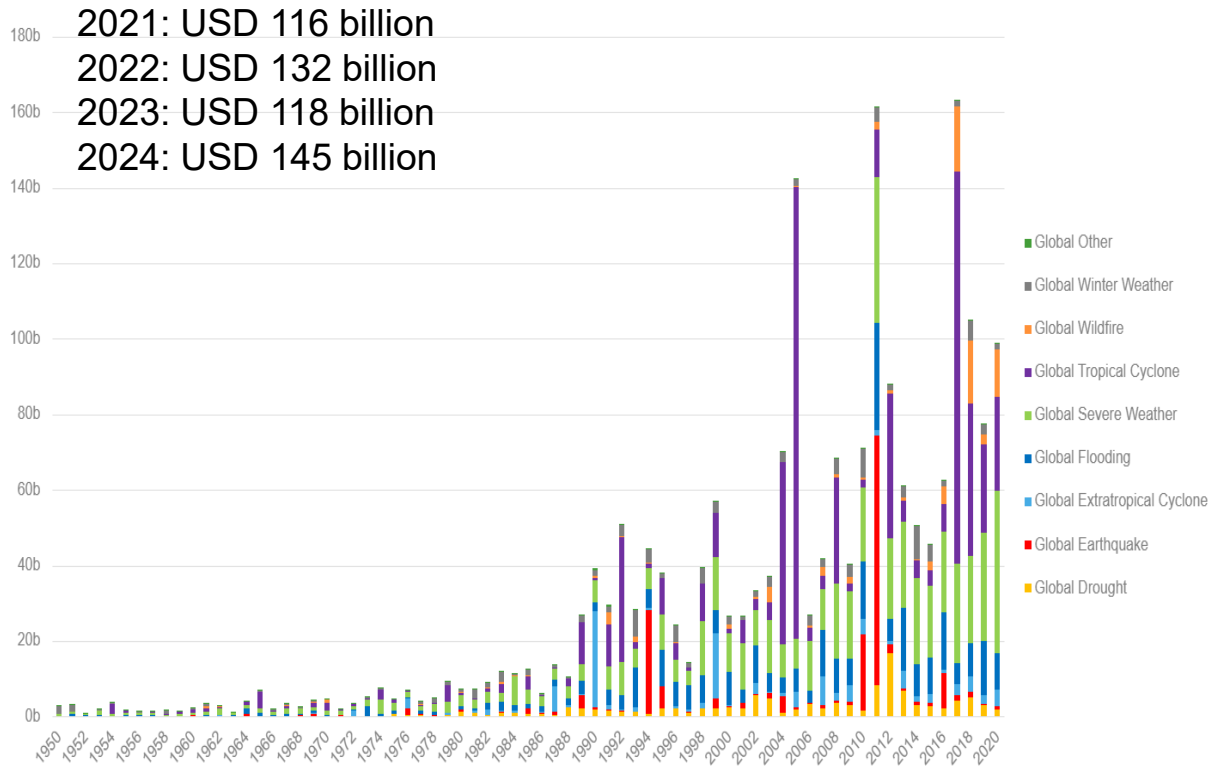


Bernd Flood
July 2021
Costliest natural disaster in Germany and Europe to date

Hurricane Otis
October 2023
Strongest hurricane on record to make landfall along Mexico’s Pacific coast

Hurricane Beryl
June-July 2024
Earliest-forming Category 5 hurricane on record in the Atlantic Ocean

Increasing trend in insured losses



Data sources: Aon (trended to 2020)

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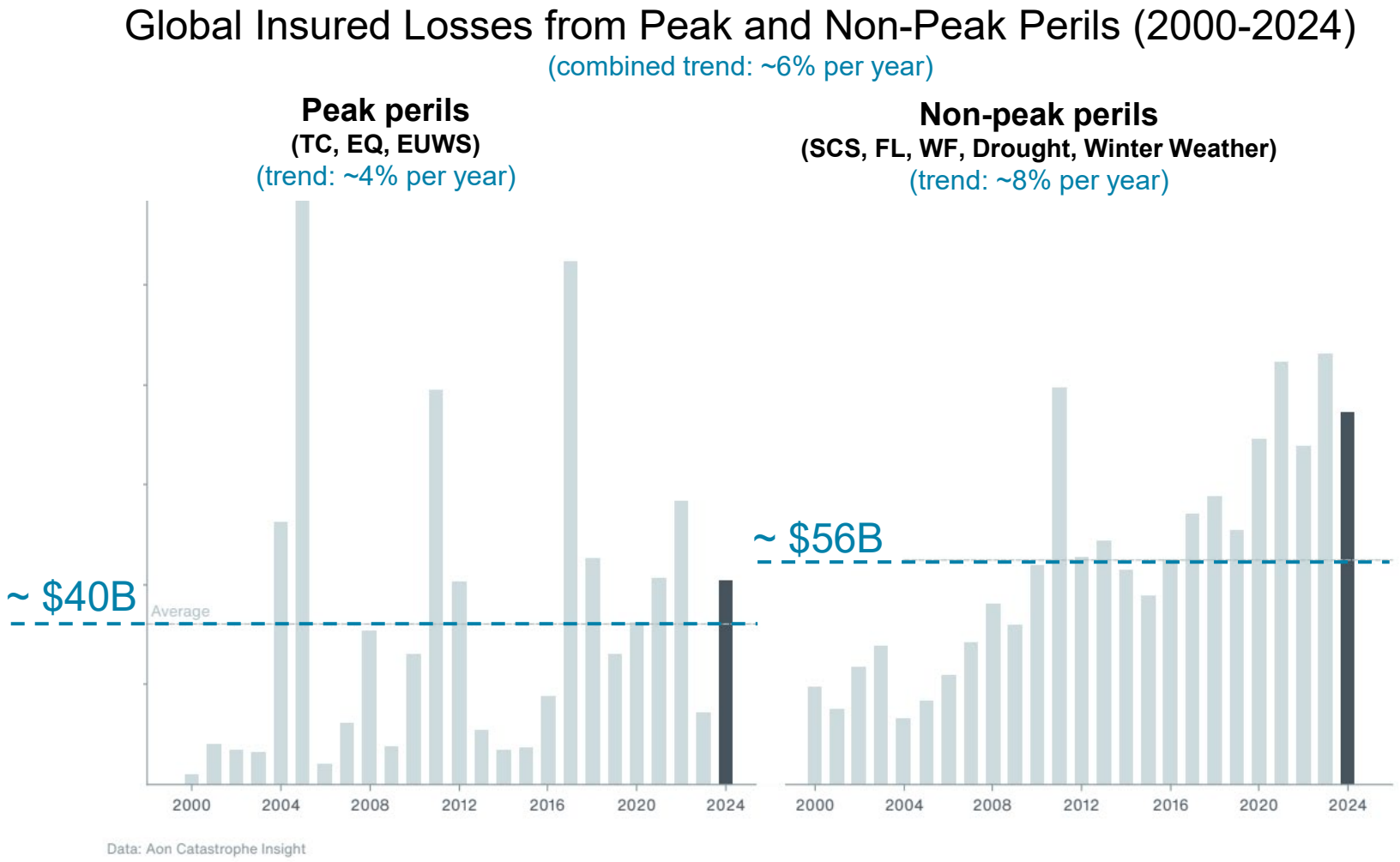
Nat Cat insured losses on the rise

- In the last ~25 years, non-peak perils account on average around 60% of the total annual losses.
- Most of the growth in global insured losses is driven by “Non-peak” perils, in particular SCS.
- Primary/Peak perils still hold most loss potential.



Source: Aon Catastrophe Insight 2025: Losses in 2024 $B.

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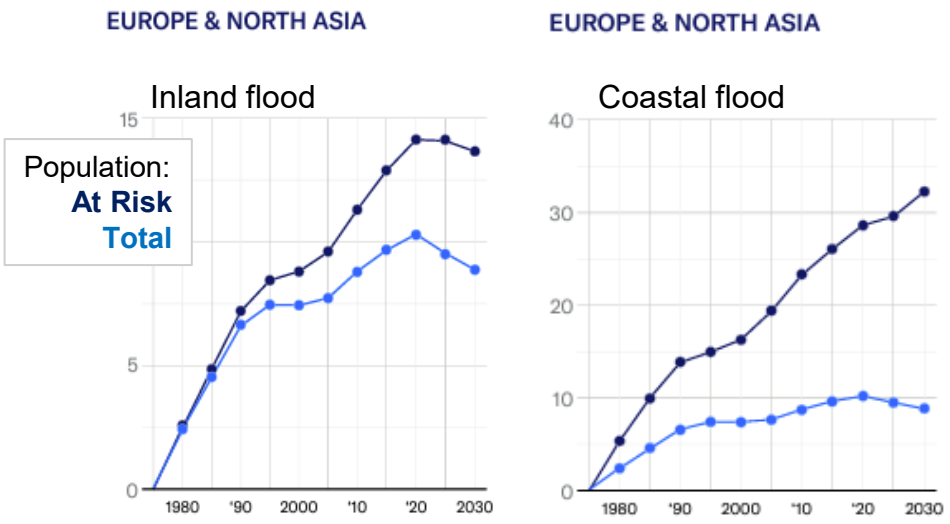
Aspects contributing to the upward trends in losses

RISKY EXPOSURE GROWTH

The number of people living in Nat. Cat. prone areas is growing faster than the number of people living outside of Nat. Cat. prone areas.



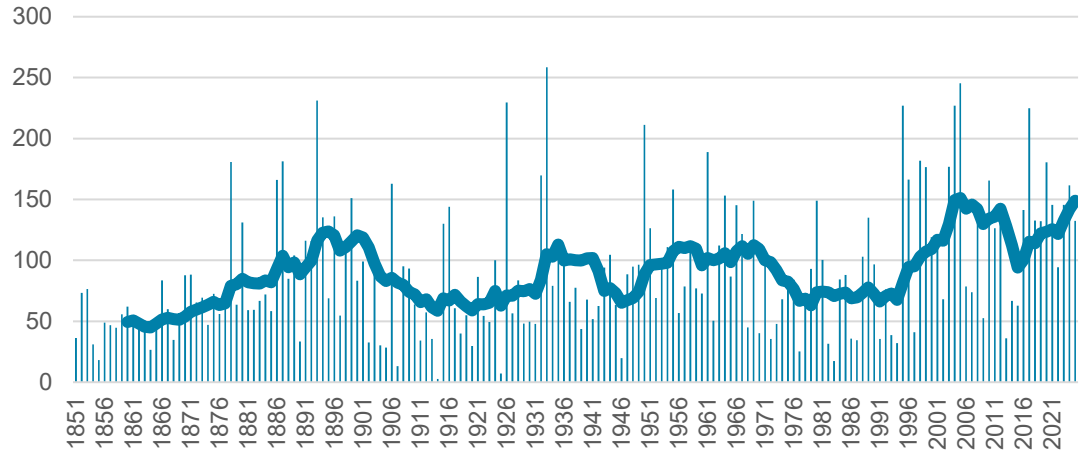
Total and **at flood risk** population *increase* since 1975 in **Europe and North Asia**

Source: Moody's RMS

CLIMATE VARIABILITY & TRENDS

Some climate perils exhibit significant variability and long-term trends. For example, tropical cyclones exhibit changes in frequency and intensity, floods are increasing in severity and duration, and wildfires are becoming more frequent and severe.

Historical Atlantic ACE (Accumulated cyclone energy - Wikipedia)



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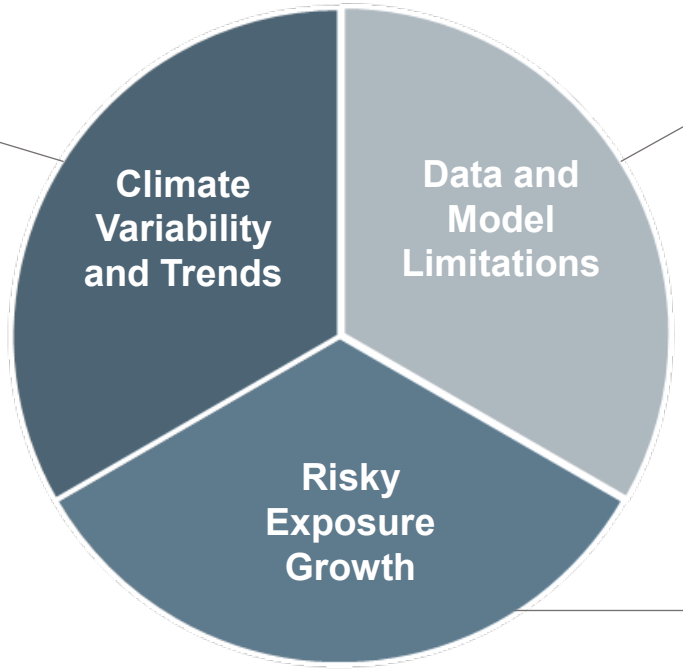
SCOR tools to manage climate-related catastrophe risk

SCOR has a comprehensive toolkit to assess and manage its exposure to climate risk.

- Calibration of catastrophe models using claims data embeds current trends in frequency/severity of natural perils into contract pricing.
- Continuously update catastrophe models and calibrate to reflect the latest scientific insights and trends.
- Apply forward-looking climate change tools and climate-adjusted models to better quantify the impacts of perils sensitive to climate.



- Catastrophe models validation and adjustments
- Expand historical data to improve sample size.
- Use counterfactual scenarios to benchmark empirical losses for model validation.
- Support climate research initiatives.

- Closely monitor and manage accumulated gross exposures.
- Implement underwriting strategies.
- Analyze the impact of non-modeled losses (e.g., inflation, litigation and regulatory changes) on overall claim costs.

SCOR has a comprehensive toolkit to assess and manage the exposure of its investments to climate risk and constantly working to better understand and quantify the material impacts of climate change on the underwriting business and is striving to reduce the contribution of the Group's operation to GHG emissions

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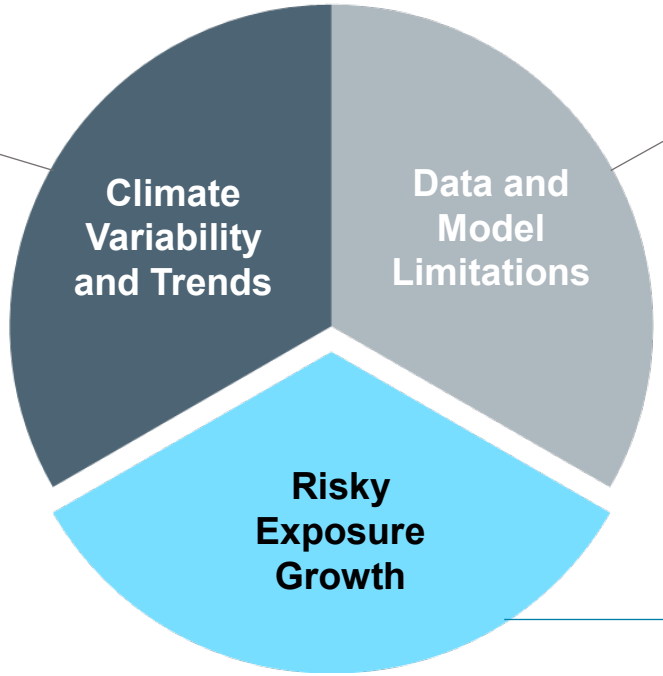

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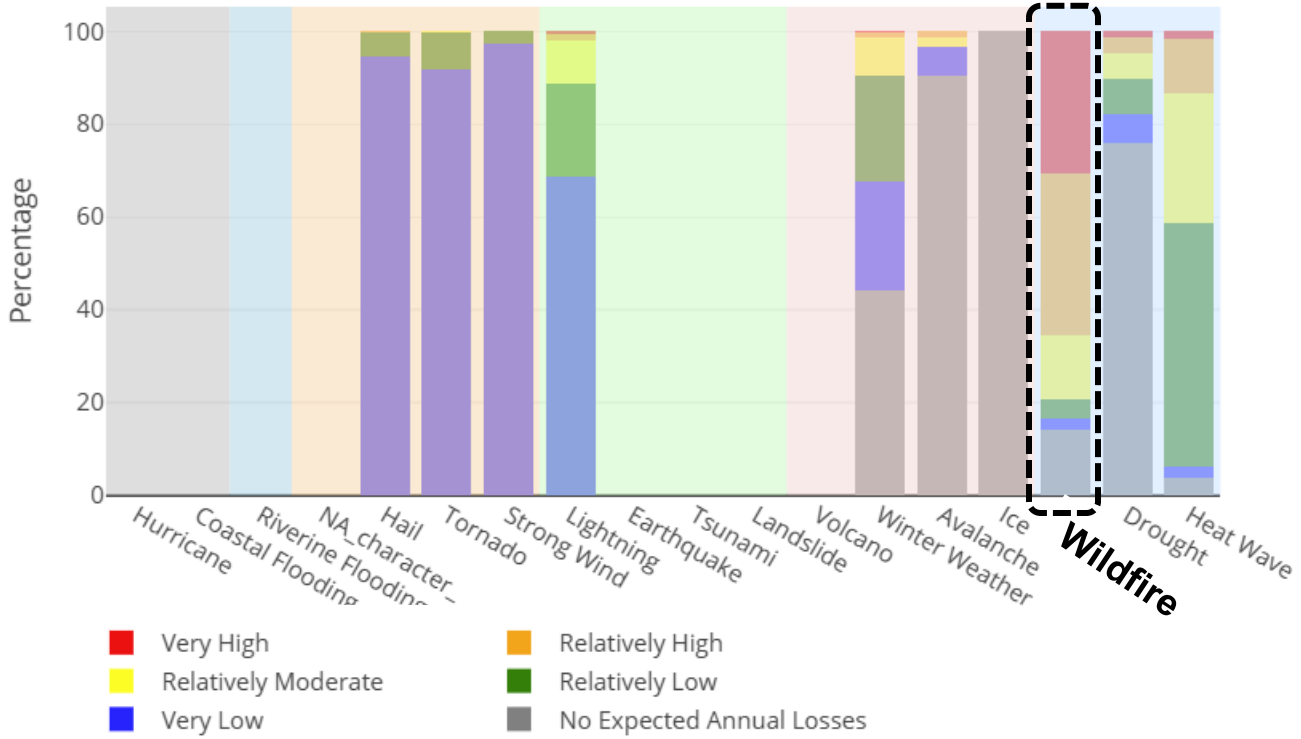
Managing risky exposure growth

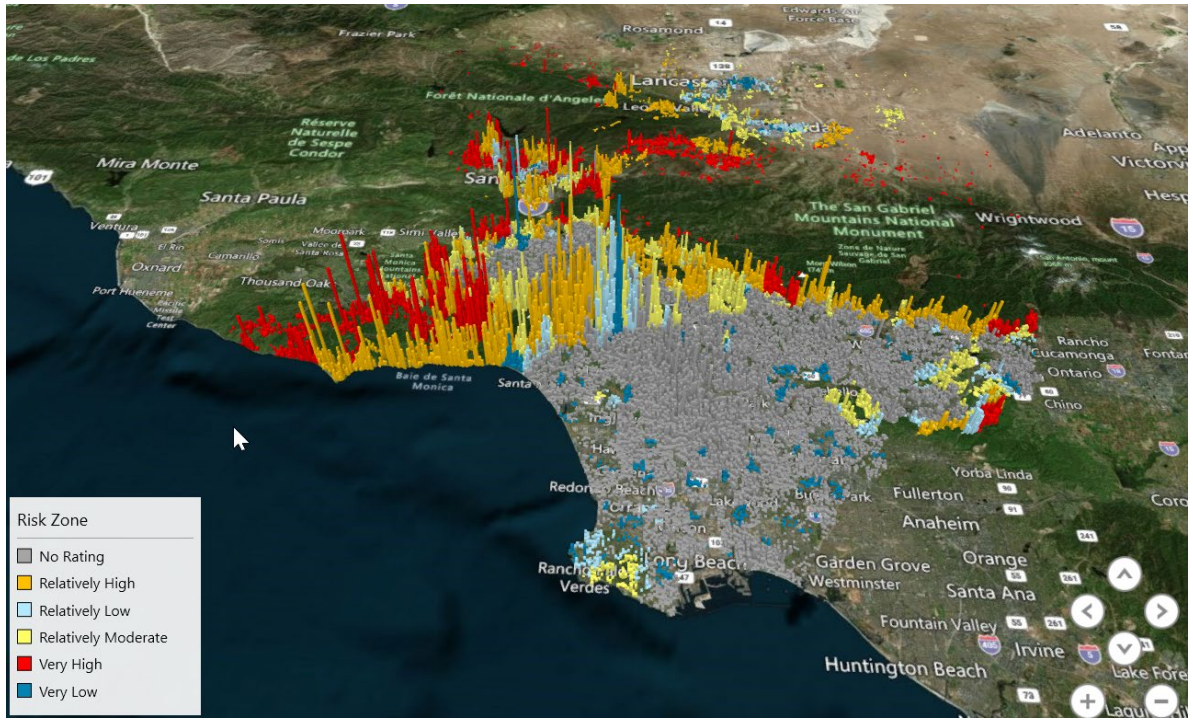
Monitor and manage accumulated gross exposures

We continuously monitor cedant exposures across different hazard risk areas:
Are we over-exposed in a particular high hazard risk zone?

Distribution of exposure by hazard



Monitoring exposures with wildfire hazard overlay



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Managing risky exposure growth

Underwriting strategies for climate-sensitive risks

- Increase attachment points on climate-sensitive treaties.
- Per occurrence instead of aggregate covers.
- Diversify & govern accumulations using EaR/CaR metrics.

Reduce portfolio volatility and ensure that SCOR is not exposed to smaller, more frequent losses, which are more likely to occur due to climate change.

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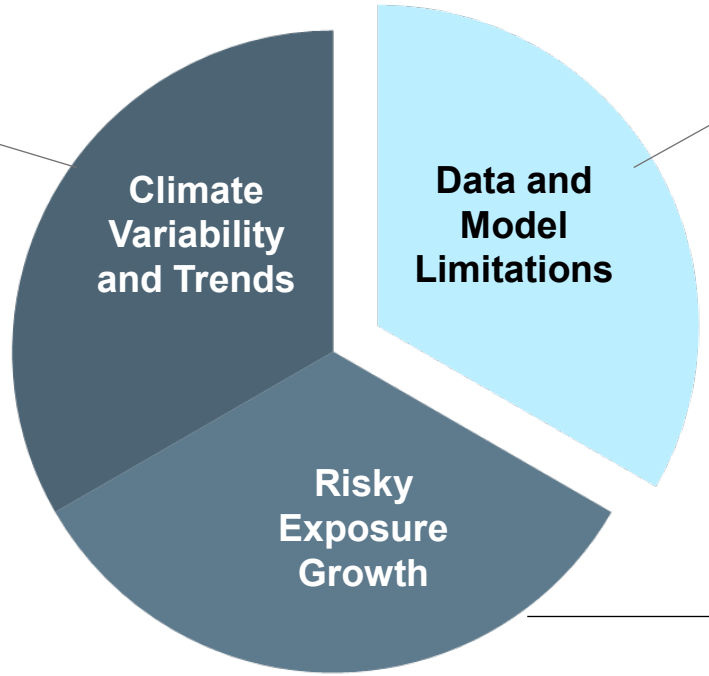

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Data and Model Limitations
Catastrophe models validation and adjustments

Purpose: ensure models reflect today's and tomorrow's risk.

Past perspective

- "As-if" analysis: What would be the loss of past events if they happened now?
  - Does the model reproduce key hazard and vulnerability characteristics?
  - How do modeled losses compare with actual past experience, both at aggregate level and by cedant?

Forward view

- Do the model's assumptions reflect current scientific research and expert consensus?
  - Is the hazard assessment consistent with the latest scientific evidence, including trends in frequency, severity, etc.?
  - Does the catastrophe model include a sufficient range of extreme scenarios, and are they scientifically credible?

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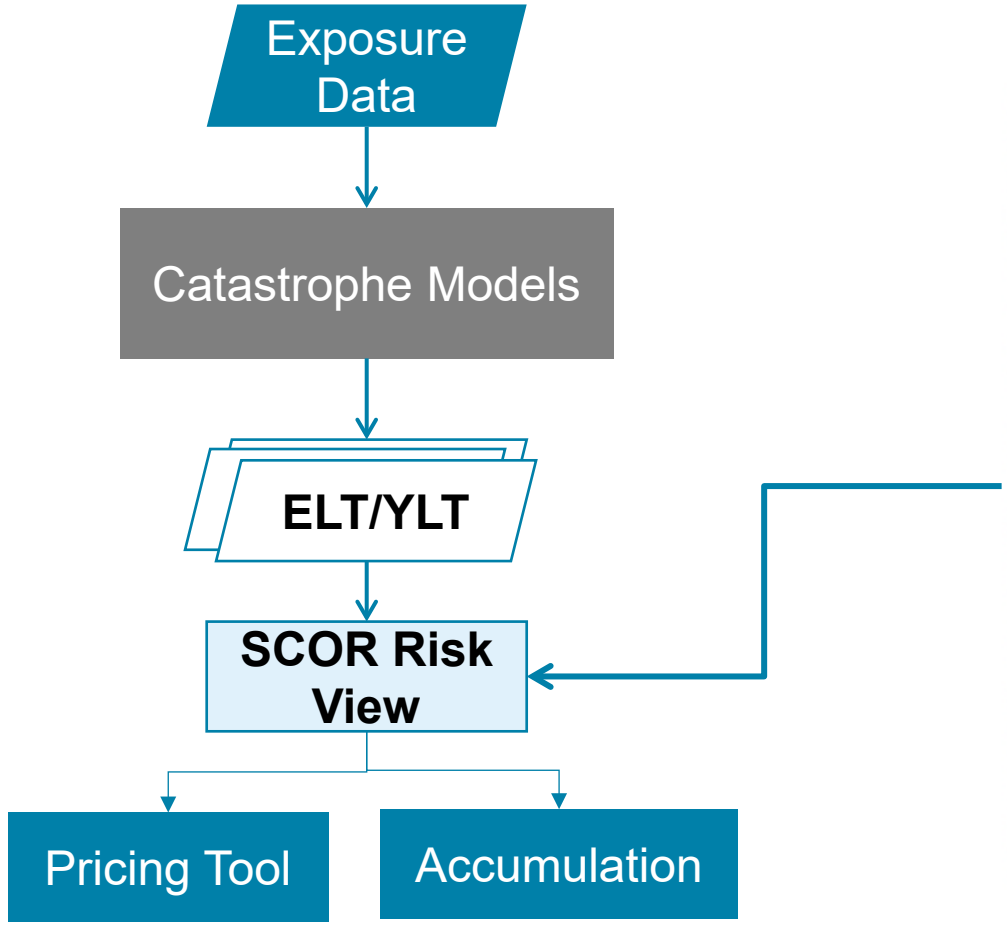
Data and Model Limitations

Catastrophe models validation and adjustments



Adjustment methods

Adjust SCOR's "view of risk'

Improve risk assessment to guide pricing and capacity decisions

- *Frequency and severity adjustments.*
- *Incorporate clustering effects using suitable statistical distributions.*
- *Reshuffle Year-Loss-Tables to introduce multi-peril correlations*
- *…*

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Catastrophe models validation and adjustments

Hurricane model validation: frequency analysis

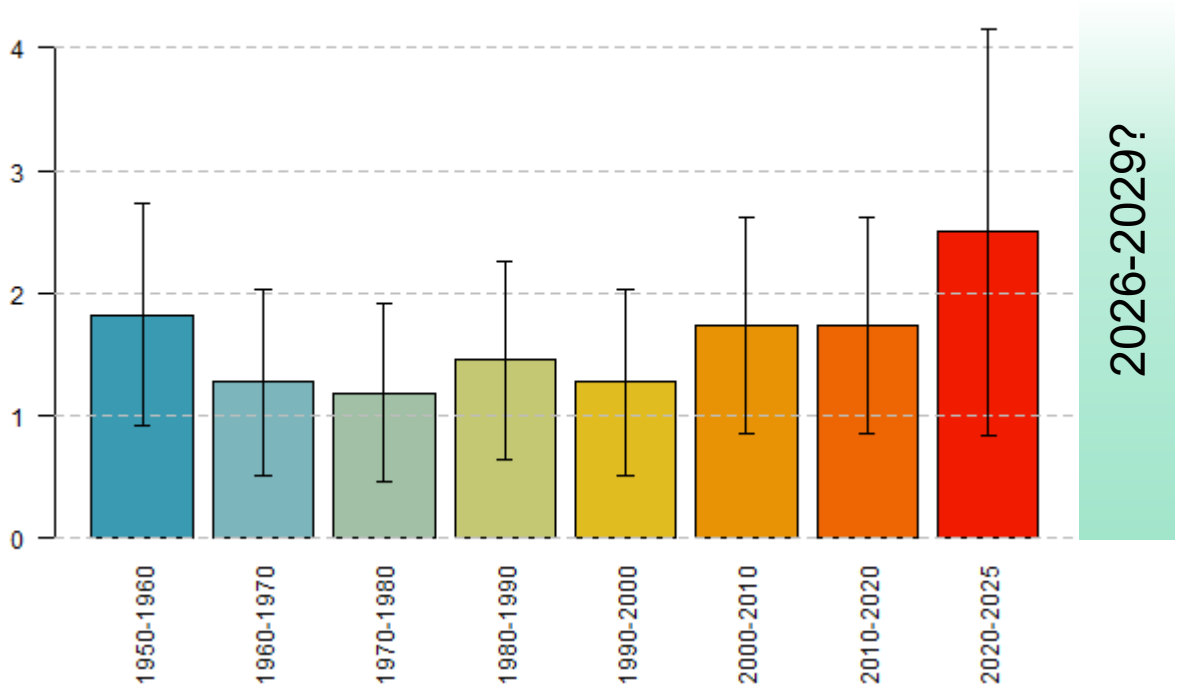
Present

- We are presently in a very active hurricane period.
- Observations show increased 24-hr intensification events and earlier onset of North Atlantic hurricane season.

Next 3 to 5 years:

- Looking back in history, what is the optimal reference time-period to calibrate the rates ?
- Looking forward, is the observed increasing frequency likely to continue or not?

Annual frequency of Category 1 and above hurricane landfalls in the continental US (from IBTrACS).



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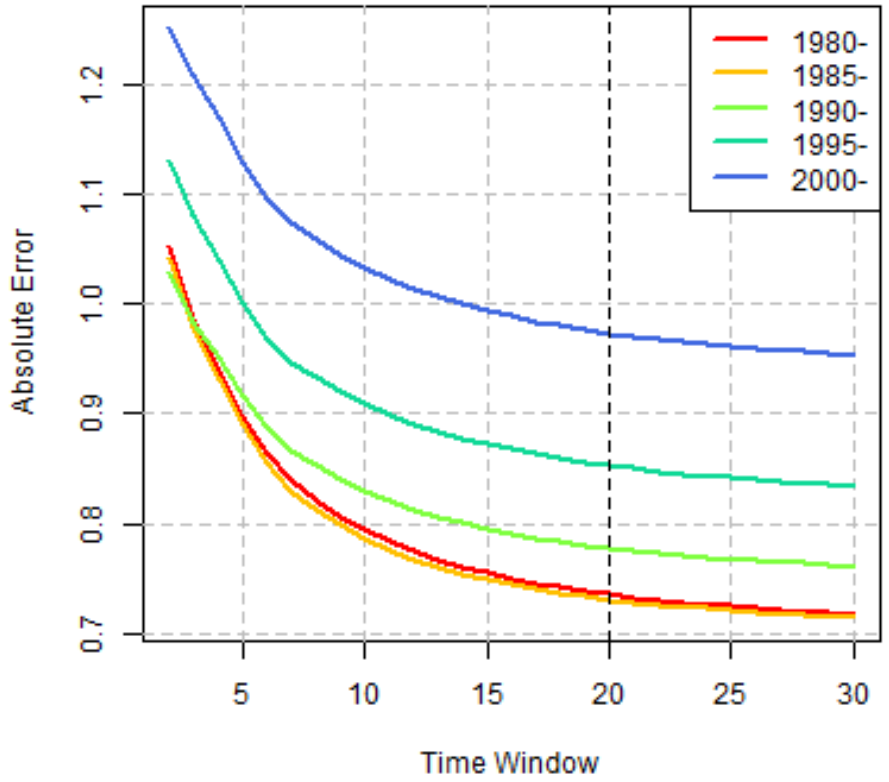
Catastrophe models validation and adjustments

Hurricane model validation: Is the observed elevated hurricane activity likely to continue or not?

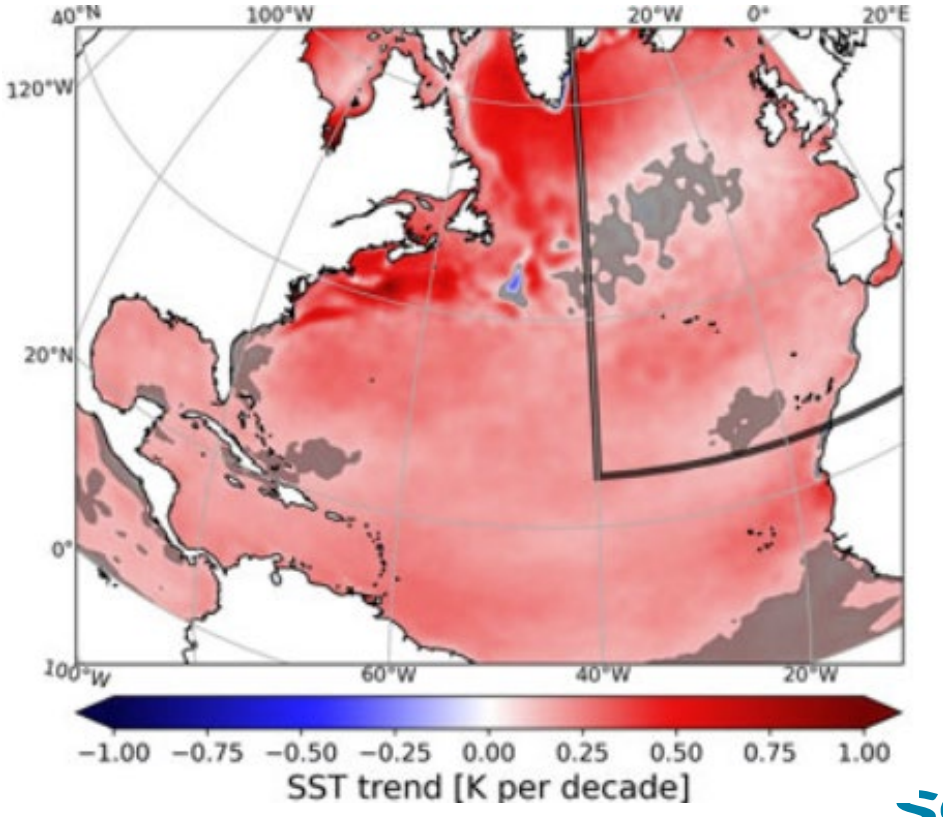
Past perspective

Looking back in history, what is the optimal reference time-period to calibrate the rates ?



Forward view

Looking forward, is the observed increasing frequency likely to continue or not?



Long-term SST trend from 1982-2019, Source: Lima et al., (2021)

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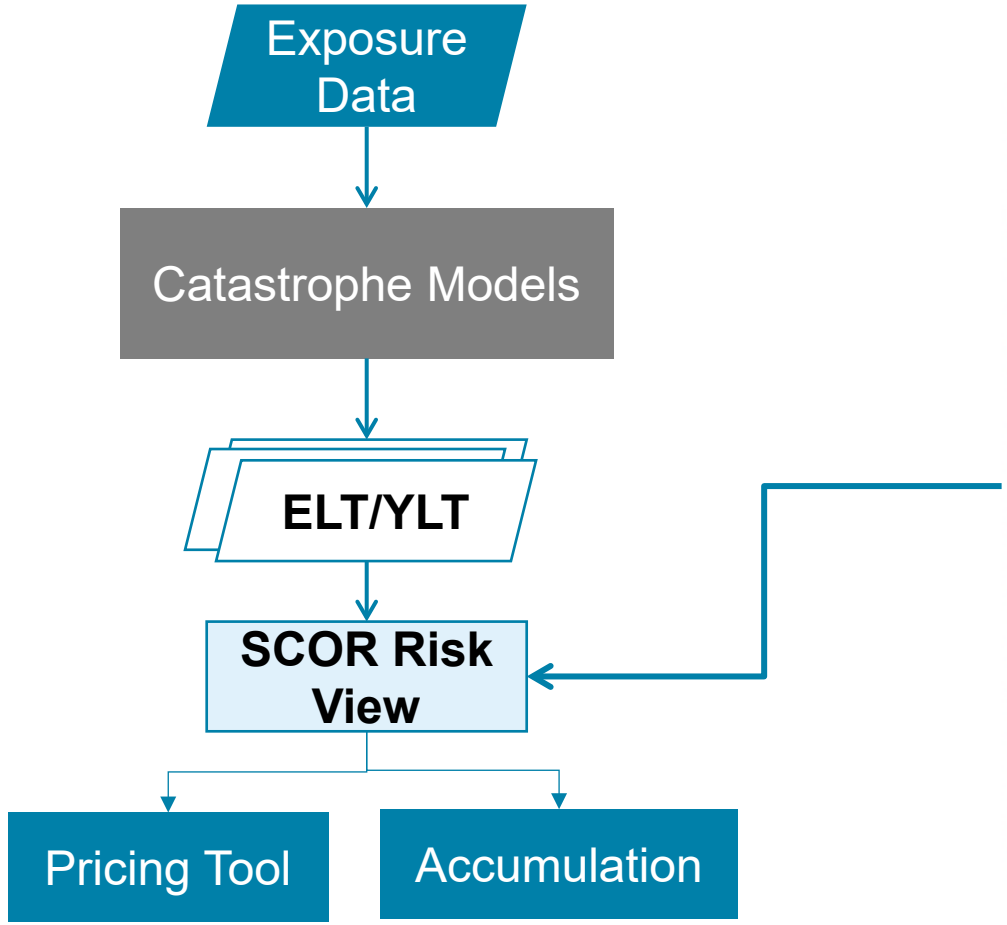
Catastrophe models validation and adjustments

Hurricane model validation: Is the observed elevated hurricane activity likely to continue or not?



Adjustment methods

Adjust SCOR's "view of risk'

Improve risk assessment to guide pricing and capacity decisions

- SCOR has adjusted the North Atlantic Hurricane Model **event rates by region** based on our projected outlook for the next three to five years.
- SCOR has developed its own **clustering** methodology, adjusting for the observed overdispersion, different **by region and by return period**.

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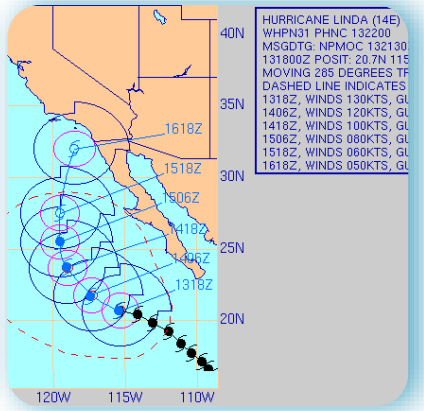
Data and Model Limitations

What if…

... a F5 Tornado hit London?

Source: AI generated

… a hurricane made a direct landfall in California?

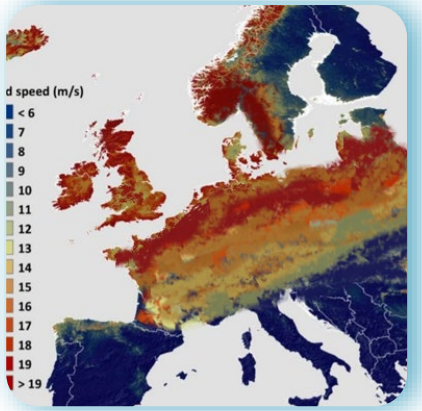


Source: Navy/NRL Tropical Cyclone Page (link)

…large part of Paris gets submerged by a massive flood?

Source: AI generated

…a windstorm inducing severe damage in large part of Europe?



Source: Adjusted from Jung and Schindler, (2024) (link)

…the Thames Barrier failed?

Source: UK Environment Agency (link)

- Is it physically plausible for these catastrophic events to occur?
- And can we quantify some upper physical bounds?

- How frequently can such events occur?
- Are they present within the stochastic representations of my cat model?

- How might a warming climate influence these events?
- Should we expect changes in their frequency or severity?

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Data and Model Limitations

What if…

... a F5 Tornado hit London?

Source: AI generated

Great London Tornado of 1091

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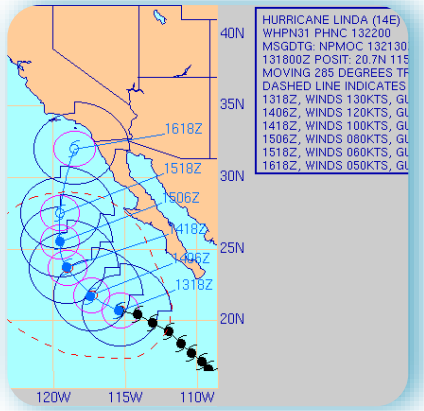


Source: Navy/NRL Tropical Cyclone Page (link)

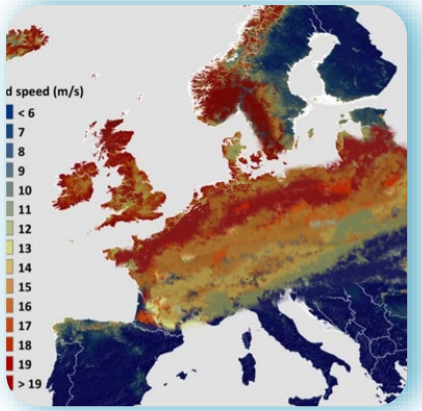
The San Diego hurricane of 1858

…large part of Paris gets submerged by a massive flood?

Source: AI generated

The Paris Great Flood of 1910

…a windstorm inducing severe damage in large part of Europe?



Source: Adjusted from Jung and Schindler, (2024) (link)

…the Thames Barrier failed?

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Data and Model Limitations

Digging into history archives

SCOR & University of Ulm student project

Wikipedia

Category:Natural disasters by century

Category Talk Read

From Wikipedia, the free encyclopedia

This is a **container category**. Due to its scope, it should contain *only* subcategories.

Subcategories

This category has the following 38 subcategories, out of 38 total.

*
- Natural disasters in the United States by century (5 C)

+
- 1st-millennium BC natural disasters (2 C, 1 P)
- 1st-millennium natural disasters (11 C)
- 2nd-millennium natural disasters (11 C)
- 3rd-millennium natural disasters (4 C)

0–9
- 1st-century natural disasters (1 C, 4 P)
- 1st-century BC natural disasters (3 P)
- 2nd-century natural disasters (3 P)
- 3rd-century natural disasters (2 P)

- 21st-century natural disasters (15 C)

A
- Avalanches by century (2 C)

C
- Cold waves by century (5 C)

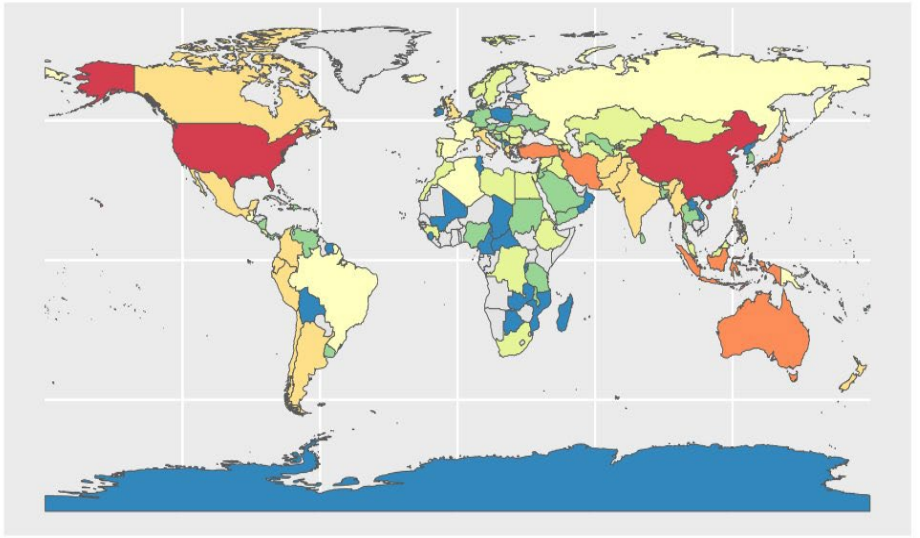
D
- Droughts by century (4 C)

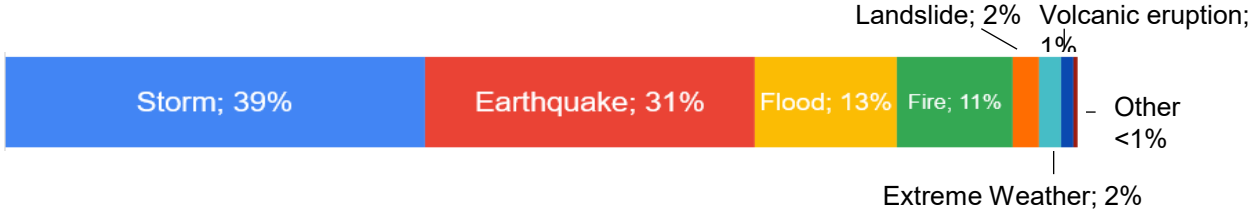
E
- Earthquakes by century (21 C)

F
- Floods by century (14 C)

AI & web scraping

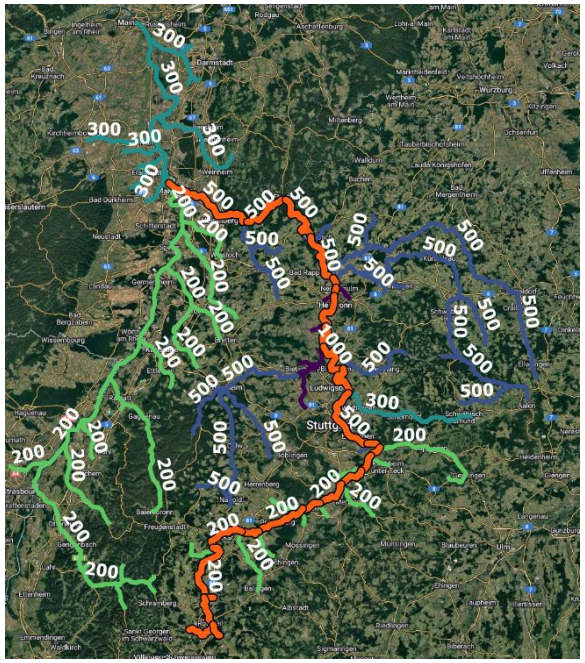
4944 natural catastrophes in total from 1888-2025

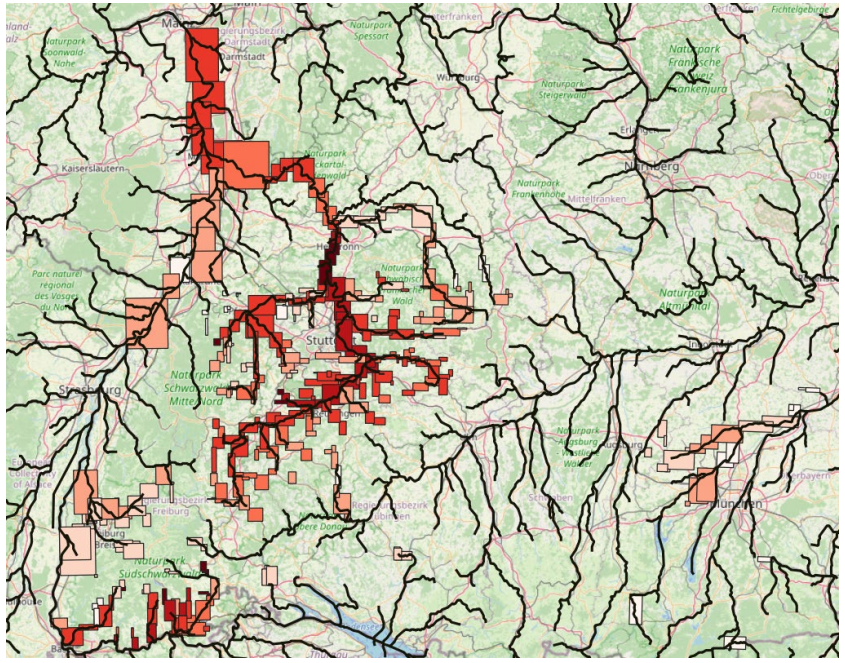




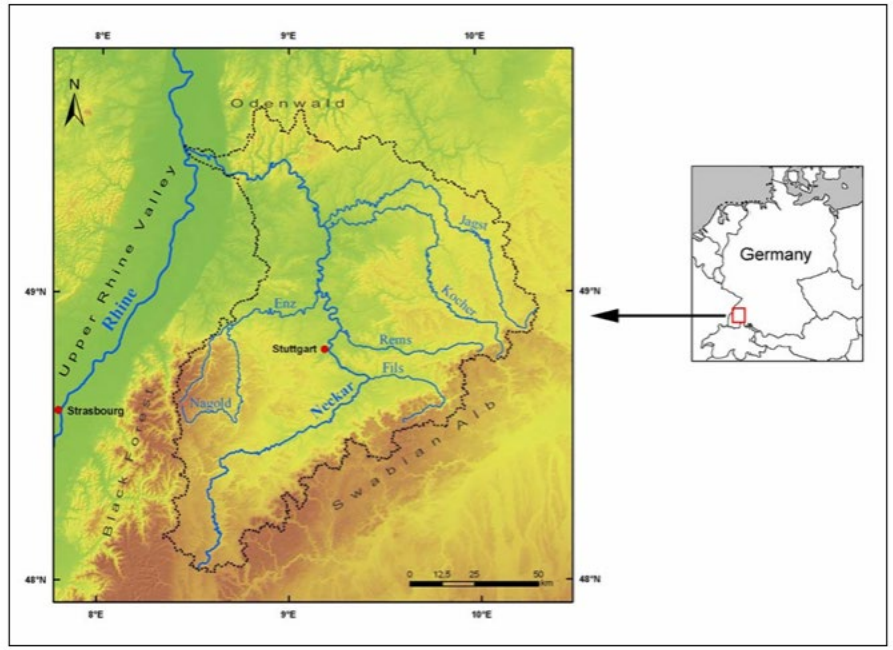
Data and Model Limitations
Historical reconstructions

- The 1824 flood is the most severe event within the last 500 years in the Neckar River.
- “Analogue” events in **Impact Forecasting Germany Flood** cat model stochastic set.





Source; Dostal et al., 2008 (link)



Germany Market insured loss: ~ €11 Bn (with a range between 4 to 16 billion Euros)

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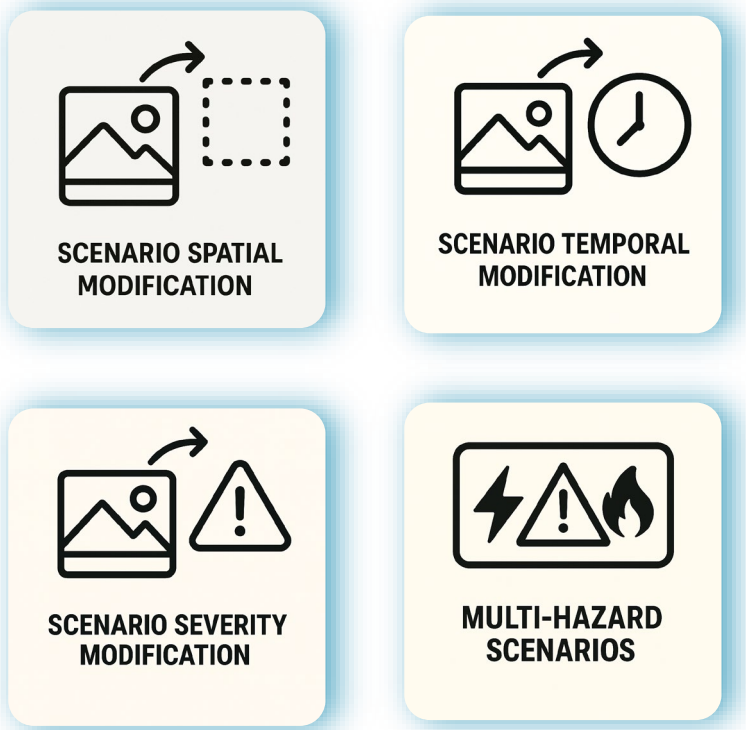
Data and Model Limitations
Counterfactual scenarios

Constructing hypothetical historical scenarios can offer valuable insights into hazard events different from those recorded so far — **provided those scenarios remain physically plausible.**



Making decisions

- Stress testing to identify tail risks and potential aggregation hotspots.
- Supporting Regulatory and Auditor requests.
- Enhancing Model Calibration:
  - Are there similar scenarios present in the stochastic set?
  - **Benchmark empirical losses for model assessment**

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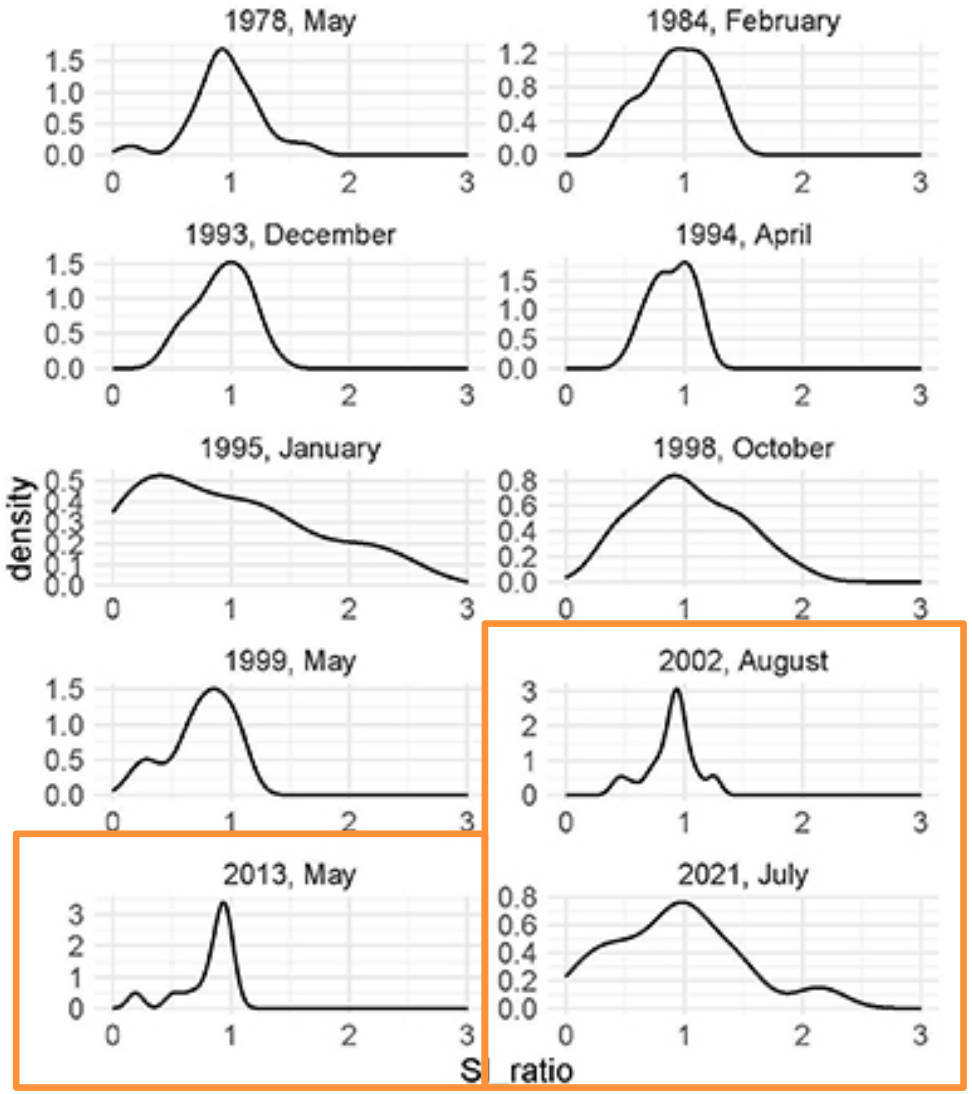
Counterfactual scenarios
Germany Flood example

Merz et al., *Spatial counterfactuals to explore disastrous flooding* (2024).

24 scenarios with observed precipitation shifted:
- in eight directions (N, NE, E, SE, S, SW, W, NW) and
- by three distances (20, 50 and 100 km).

Assumptions:
- Damage is directly proportional to the flood severity indicator “SI”.
- Each counterfactual has the same probability of occurrence.

Comparison of the severity of the observed floods and their spatial counterfactuals for the ten most disastrous floods in Germany.



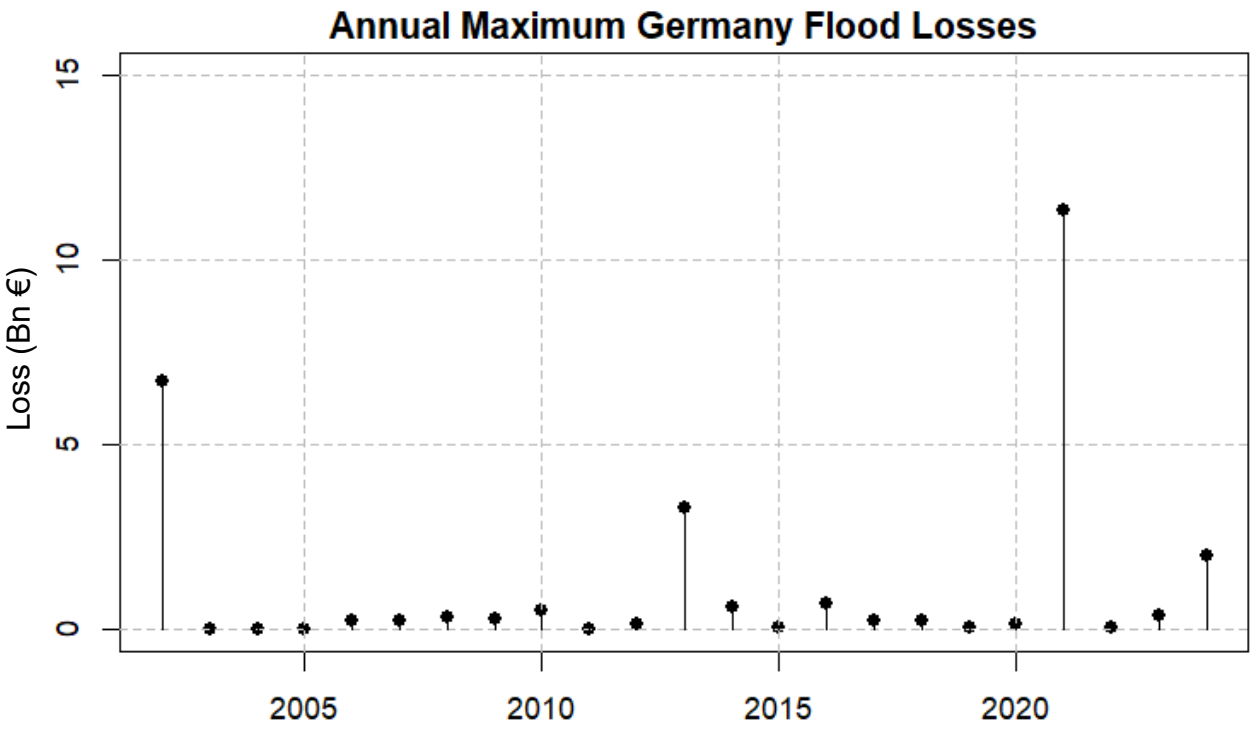
Source: Merz et al., (2024)

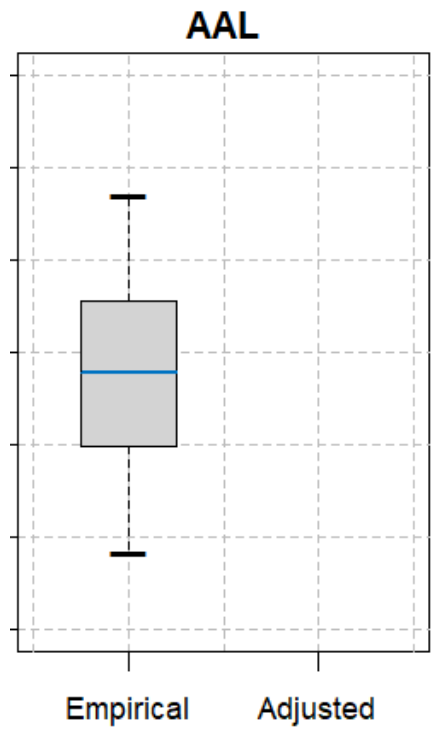
Using counterfactual analysis to benchmark empirical losses

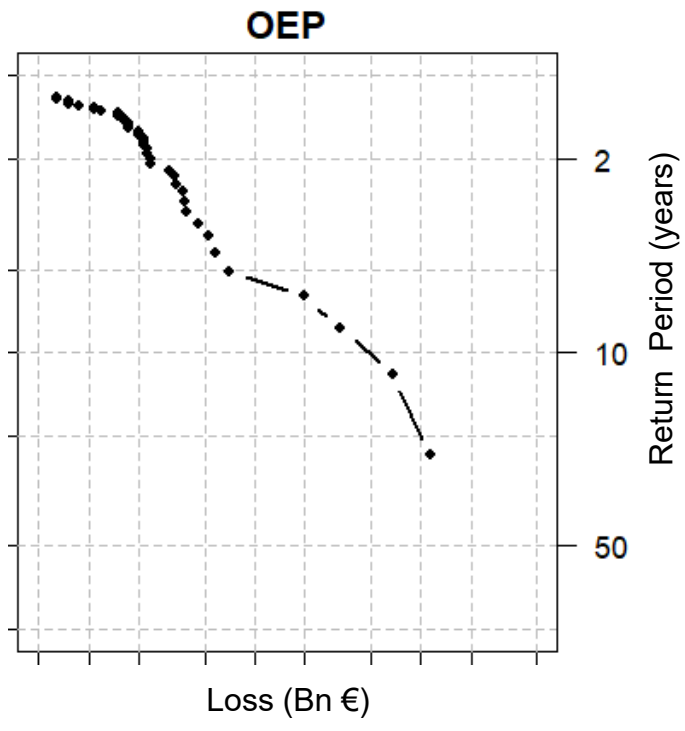
Bernd “as-if” Loss: €11.3 Bn

Empirical AAL: €1.39 Bn

Bernd Empirical RP: 1-in-23 years







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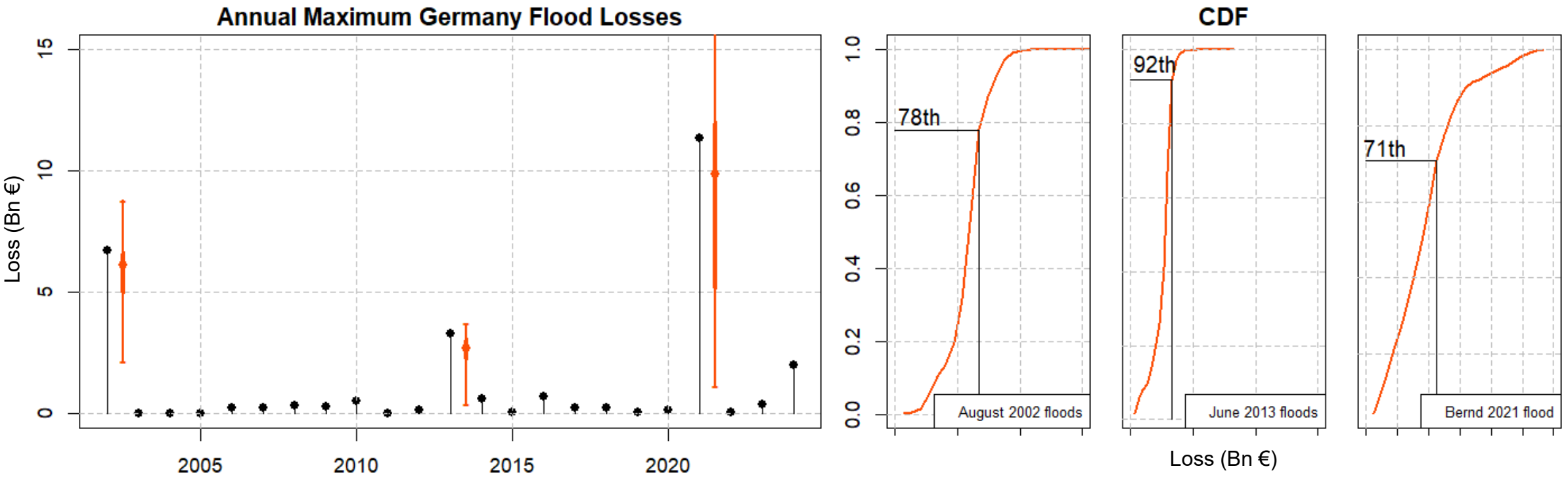
Using counterfactual analysis to benchmark empirical losses

Bernd avg. “as-if” Loss: €9.6 Bn



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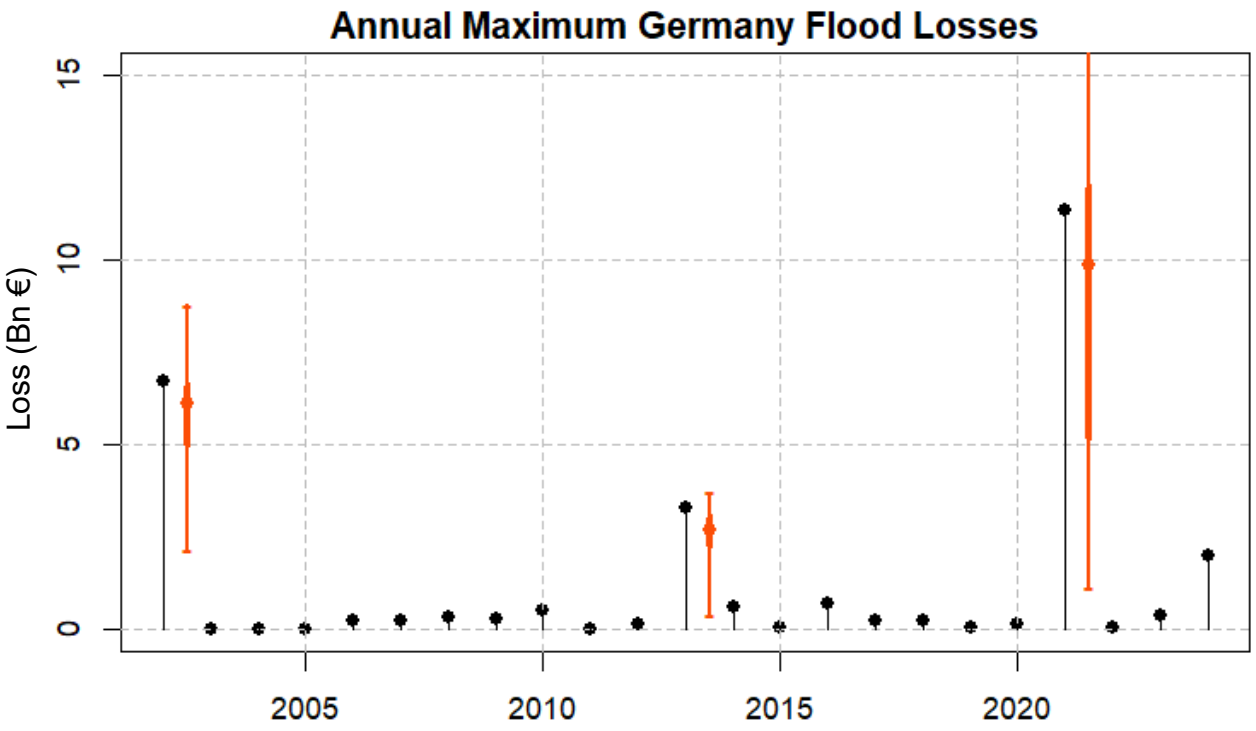
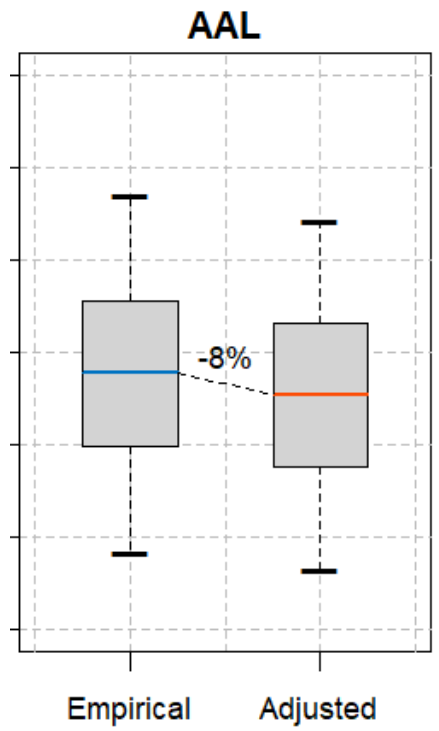
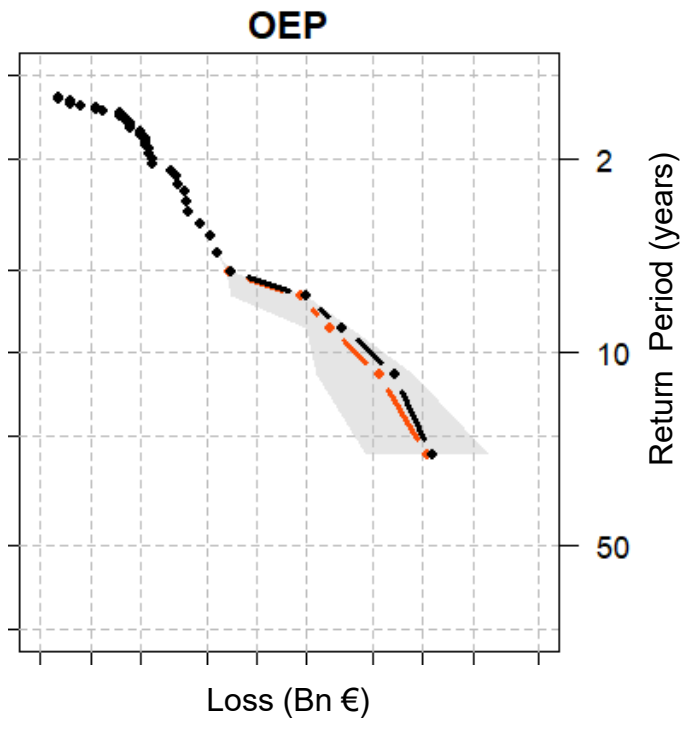
Using counterfactual analysis to benchmark empirical losses

Bernd avg. “as-if” Loss: €9.6 Bn

Updated AAL: €1.26 Bn







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Using counterfactual analysis to benchmark empirical losses

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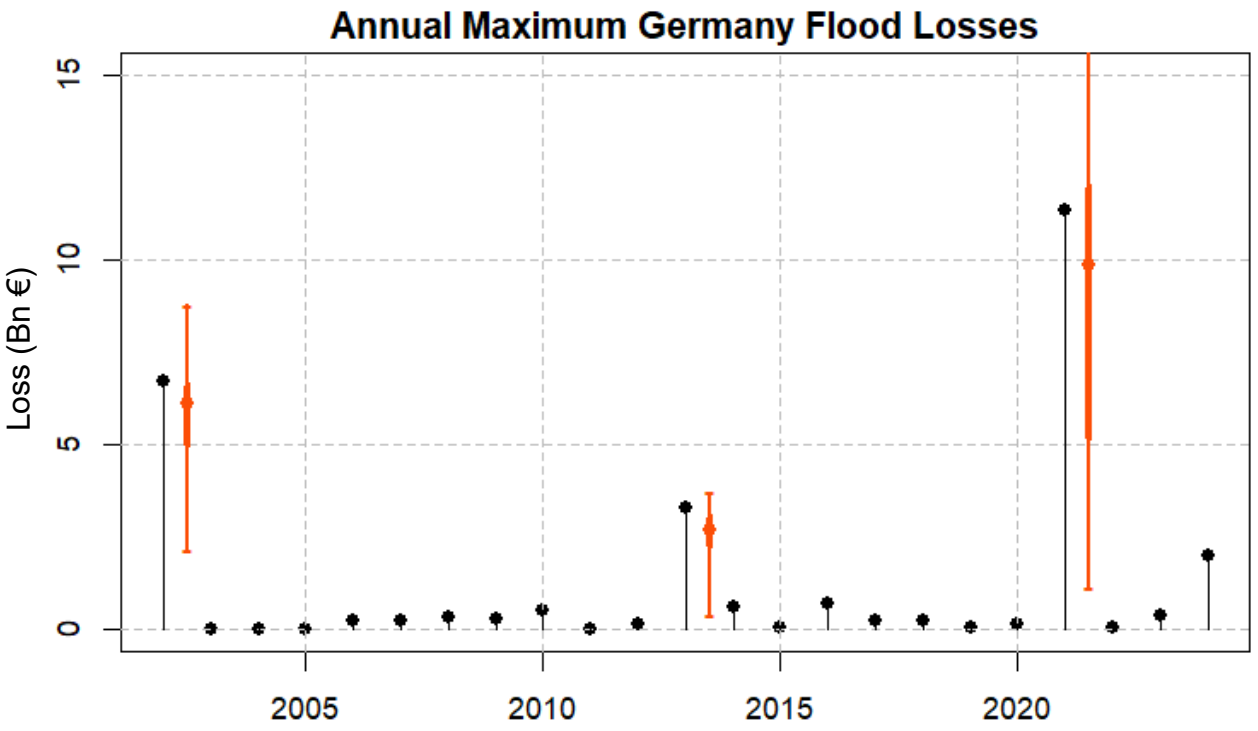
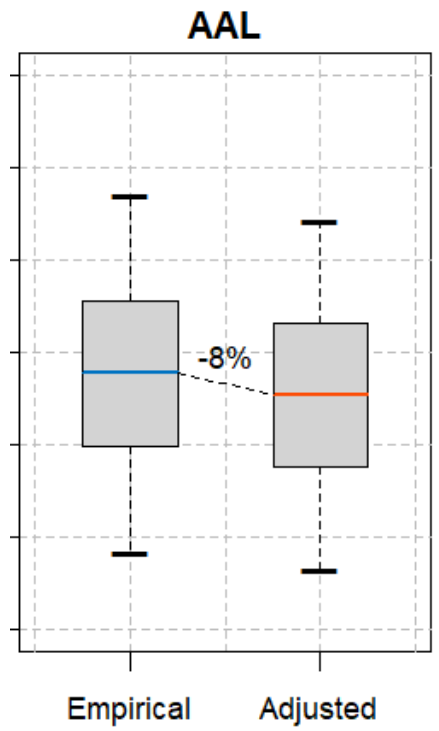
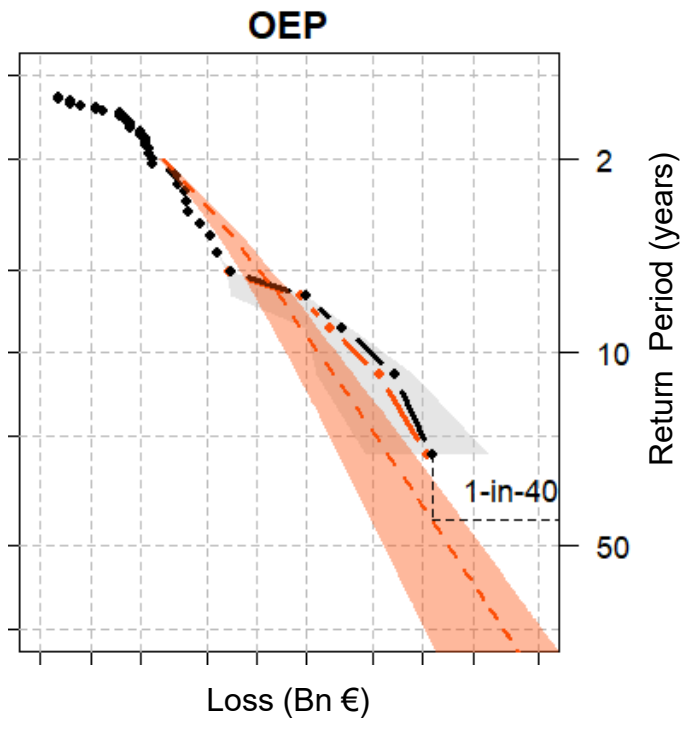
Updated AAL: €1.26 Bn

Bernd estimated RP: 1-in-40 years







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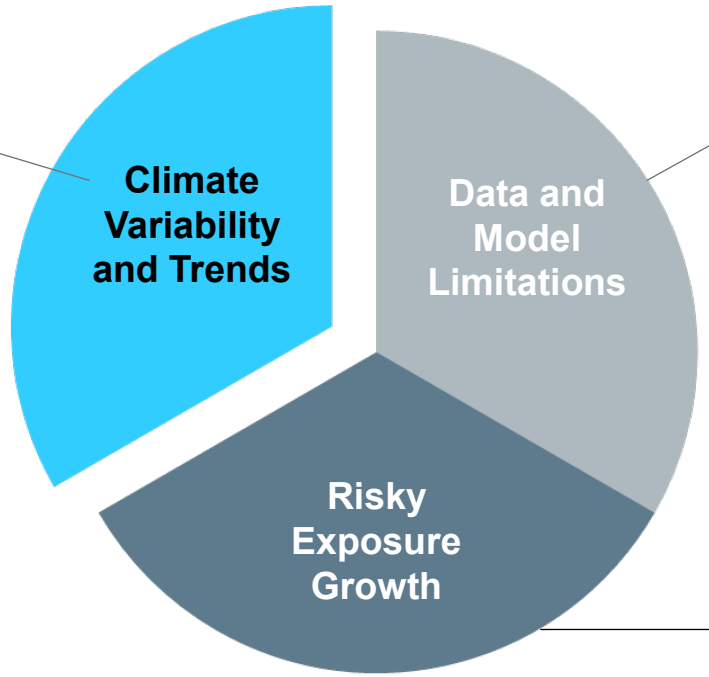
SCOR tools to manage climate-related catastrophe risk

- Calibration of catastrophe models using claims data embeds current trends in frequency/severity of natural perils into contract pricing.
- Continuously update catastrophe models and calibrate to reflect the latest scientific insights and trends.
- **Apply forward-looking climate change tools and climate-adjusted models to better quantify the impacts of perils sensitive to climate.**



- Catastrophe models validation and adjustments
- Expand historical data to improve sample size.
- Use counterfactual scenarios to benchmark empirical losses for model validation.
- Support climate research initiatives.

- Closely monitor and manage accumulated gross exposures.
- Implement underwriting strategies.
- Analyze the impact of non-modeled losses (e.g., inflation, litigation and regulatory changes) on overall claim costs.

SCOR has a comprehensive toolkit to assess and manage the exposure of its investments to climate risk and constantly working to better understand and quantify the material impacts of climate change on the underwriting business and is striving to reduce the contribution of the Group's operation to GHG emissions

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Climate Variability and Trends
Assessment of climate change impacts

Increasing model completeness

Methods	**Climate change stress tests** *footprint scenarios specifically designed to illicit impact of future losses*	**Climate conditioned event-sets** *Frequency and/or severity adjustments of catastrophe event-sets or losses*	**Climate conditioned catastrophe models** *Hazard event set developed under climate change conditions (i.e., include changes not only due to frequency and severity, but also track shifts, etc.)*	**Mitigation & adaptation views**
Implementation at SCOR	**SCOR footprint scenario assessments**	**CC-Tool**	**Vendor Models**	**Vendor Models**
Pros/Cons	- Qualitative results, more appropriate for long-term views - Time consuming, - Scenarios also available by regulators (BoE CBES, Lloyds RDS)	- Simplified - Easy implementation - Only works at aggregate level (no cedant view)	- Cedant level view - Limited availability	- Complete view - Large uncertainty - Limited availability

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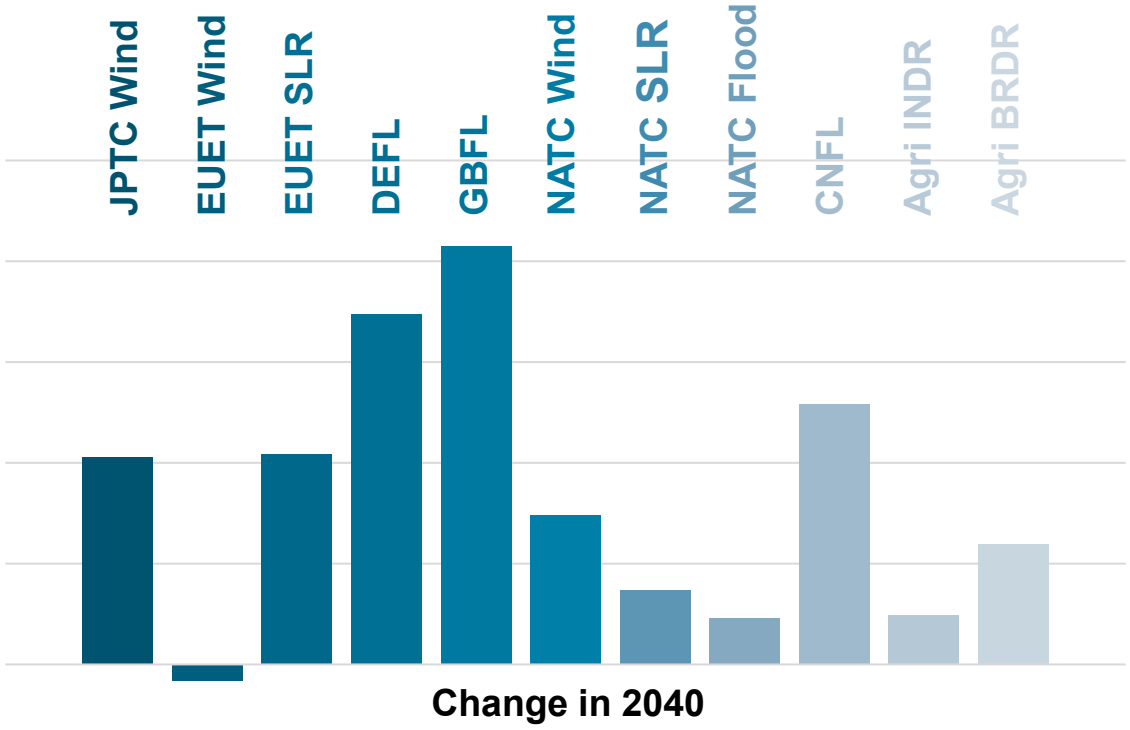
Climate Variability and Trends
Assessment of climate change impacts

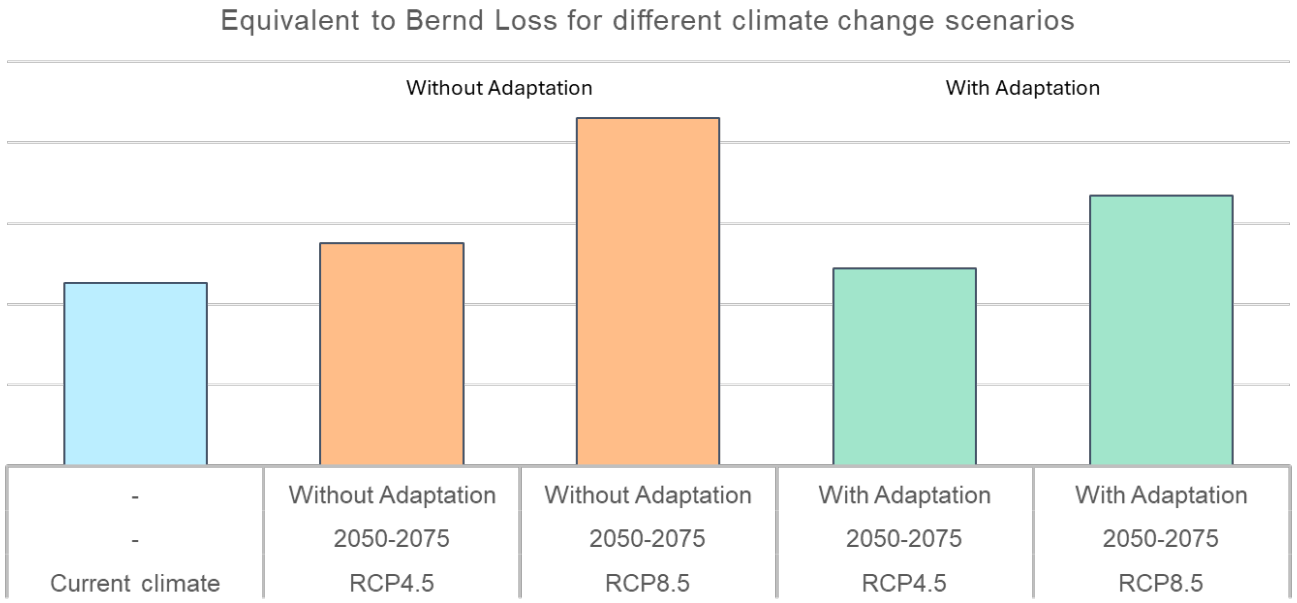
2023 ACPR Climate Stress Test

SCOR assessed physical risk impacts under climate change scenarios on its property portfolio.



Bernd-Type Floods in Future Climate Scenarios

Impact Forecasting Germany Flood “climate-conditioned” model projects losses for Bernd-type events to rise by 8%–90% by 2050–2075.



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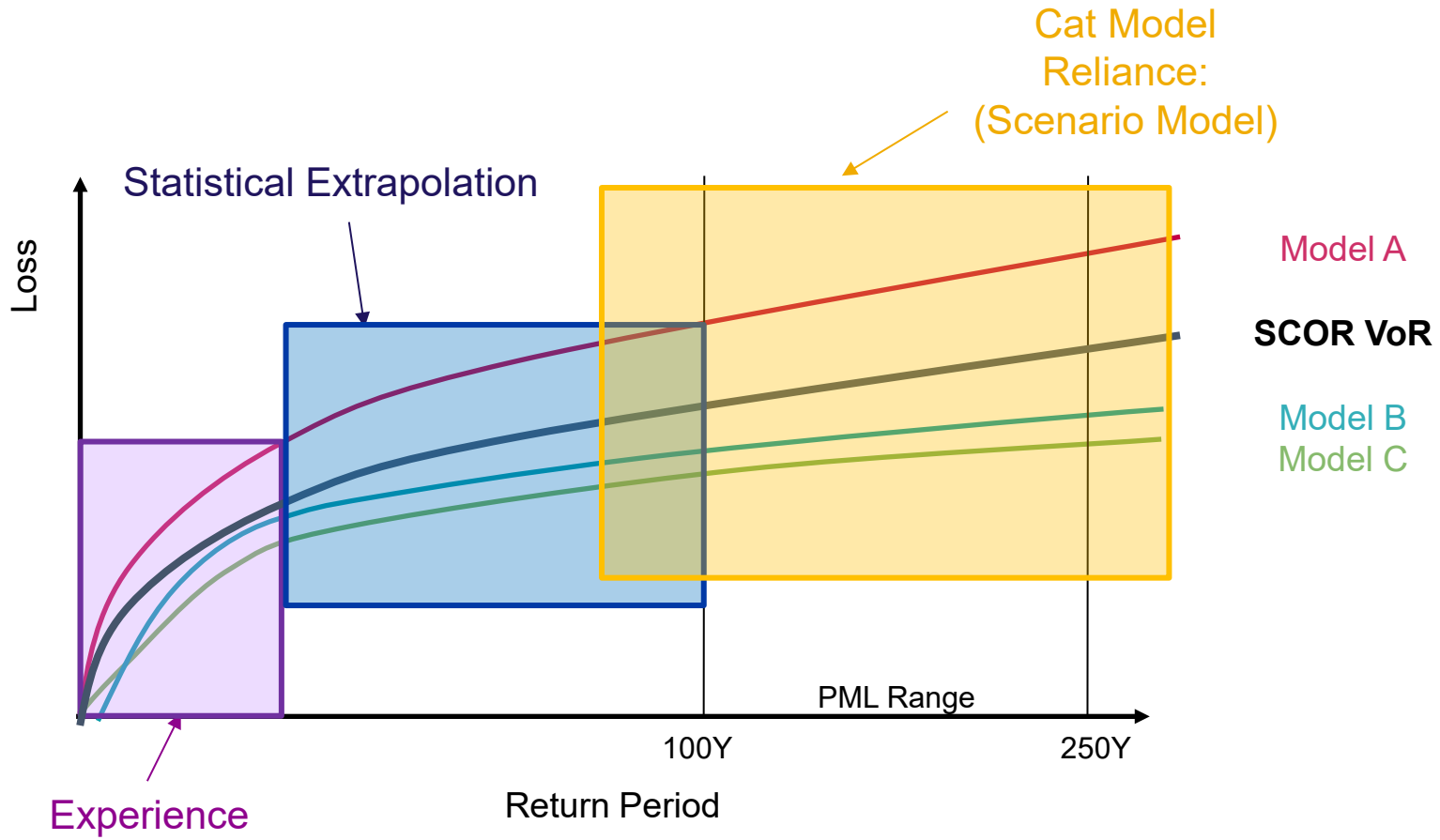
Catastrophe models validation and adjustments

- **Calibrate with real-world experience and new loss data**
- **Strengthen the tail view**
  - Apply statistical and counterfactual techniques.
  - Incorporate forward-looking science, including effects of climate change.
- **Blend model views to reduce bias**
  - Combine multiple vendors to mitigate model weaknesses.
  - Produces a more stable and diversified view of risk.



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Application of the generic Multi-Risk (GenMR) Open-Source Platform

- Challenge current risk view
- Validate NatCat models
- Incorporate perils dependencies
- Extend the natcat vendor model coverage

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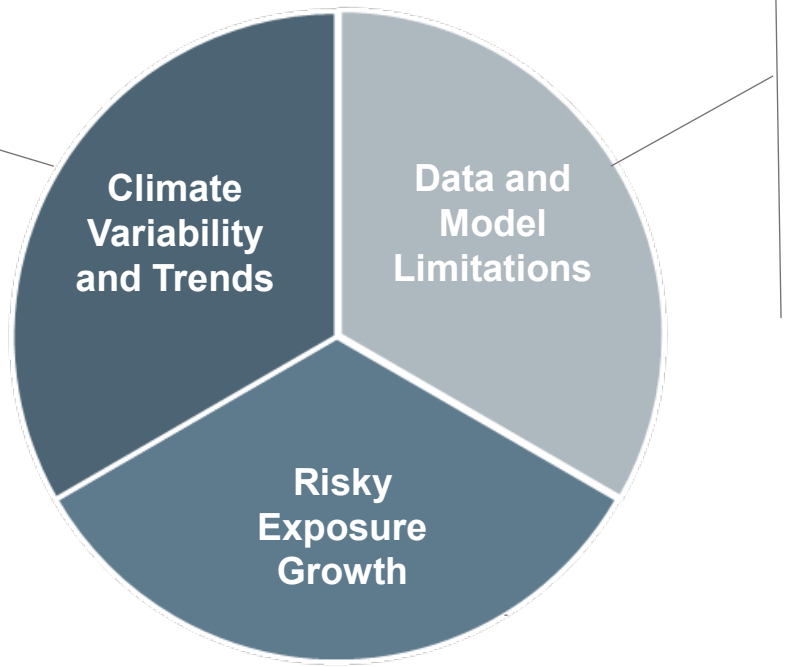
Conclusion

SCOR has a comprehensive toolkit to assess and manage the exposure to climate risk and continuously working to refine our understanding of risk and quantify the impacts of climate-related perils on its underwriting business.

- Calibration of catastrophe models using claims data embeds current trends in frequency/severity of natural perils into contract pricing.
- Continuously update catastrophe models and calibrate to reflect the latest scientific insights and trends.
- Apply forward-looking climate change tools and climate-adjusted models to better quantify the impacts of perils sensitive to climate.



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Thank You!

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Thank You

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