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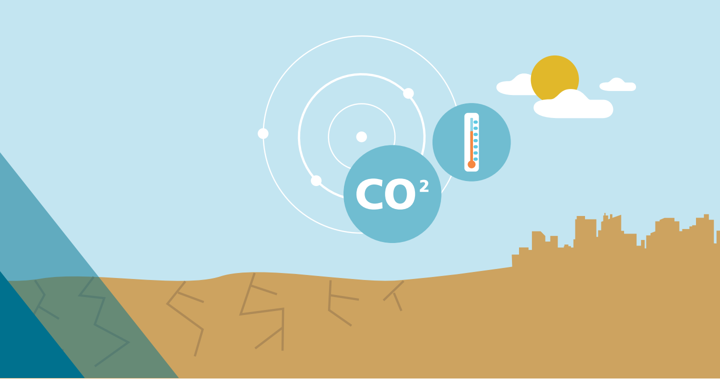

MODELLING CLIMATE CHANGE FOR THE (RE)INSURANCE INDUSTRY

A Practitioner’s Guide to Extreme Event Scenario Analysis

Part One of a Five-Part Knowledge Series

INTRODUCTION

Climate change is here!

In 1960 the carbon dioxide level in the atmosphere was 315 parts per million (ppm) - unprecedented in modern history but only 40 ppm above what it was two centuries earlier. The next 40 ppm were added in just three decades, and the 40 after that in just two. In May 2021, we almost reached 420 ppm[1]. This rapid increase in CO_2 has translated into accelerated global temperature increases over a short space of time. The evidence of rapid climate change is compelling. Climate models are only able to explain this rate of temperature increase by considering human activities[2]. Our oceans are warming, thus expanding, increasing sea levels and placing coastal cities at risk. These warmer oceans also provide the ingredients for hurricanes to travel further and unleash their wrath with greater intensity, threatening bourgeoning cities.

The link between greenhouse gas emissions and temperature increases is established in science. As for the impact of temperature increases on the frequency and severity of extreme events, this is less clear – especially when measuring the impact on (re)insurance programs over a contract period.

That being said, we are not an industry that shies away from uncertainty. What we know is that exposure continues to grow as people migrate to cities. Our homes and cars are being revolutionised by technology, further increasing replacement costs. We see more billion-dollar weather losses, eroding industry earnings, and more scientific studies are exploring how hydro-meteorological perils respond to a warming climate. Within the cat modelling industry, a transformation is underway: computational advancements make it easier to capture complex environmental phenomena, and industry experts are organising to understand how extreme events are evolving. We are seeing returns from investments in higher resolution data, and the end of cat models as black boxes is approaching.

For an industry of professionals whose business is uncertainty, at a time when climate risk transfer is a multibillion-dollar industry and significant progress is being made in technology and science, it’s surprising how few reinsurance deals today consider near-term climate trends.

We cannot predict the exact impact of warming temperatures on insured losses over the contract term for a given portfolio. We can, however, use cat models to construct sensible pathways between temperature and extreme event frequency/severity, and use our cat loss distributions to reveal how client (re)insurance programs could respond to near-term climate trends.

At SCOR, these ideas have grown into a conceptual framework to quantify the financial impacts of climate change. In 2020, under the sponsorship of our CEO for P&C business, a passionate team of modellers operationalised this framework. In this series of newsletters, we share how we leveraged expertise, models and industry partnerships to build these pathways between temperature, hydro-meteorological events, (re)insurance losses and ultimately risk transfer decisions.

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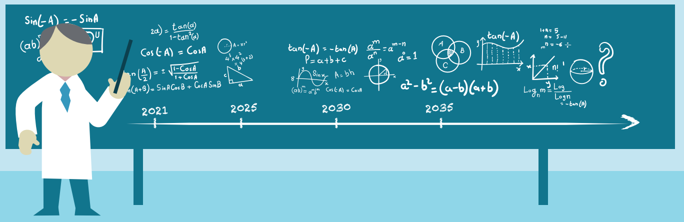
1. https://research.noaa.gov/article/ArtMID/587/ArticleID/2764/Coronavirus-response-barely-slows-rising-carbon-dioxide.
2. IPCC, Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate 2021.



In our industry, the assessment of *climate risk* is already a fundamental and necessary input in many risk transfer negotiations. The near-term financial impact of *climate change* is not. Our mission is to leverage our expertise, modelling platforms and market position to help make the loss assessment of climate trends commonplace in risk transfer negotiations.

A focus on capacity building

To do this, our industry needs to build its capacity to design and implement climate change scenario analyses. At SCOR, we've initiated a range of client initiatives to illustrate practically how climate change scenarios can be used to assess the resilience of their reinsurance purchase. There are many ways to do this – ours is just one. However, we believe our methods are proportionate given the uncertainties, the available resources and the urgent need to act. With near-term climate change impacts quantified for over 500 client portfolios across the world, our clients can now benefit from this tangible and structured assessment. We hope that illustrating the potential loss sensitivity of (re)insured portfolios to evolving climate parameters will enable risk professionals to better fulfil their responsibilities and thus deliver value to their businesses and communities.

A focus on physical risks

This series focusses on the physical risks related to climate change: that is, the positive or negative impact of global temperature increases on extreme event frequency and/or severity, and hence on financial assets and liabilities. We confine our work here to the impacts on liabilities, particularly property (re)insurance claims from P&C business. This is not to downplay transition risks and climate litigation risks, which will be the subject of a future newsletter.

The Knowledge Series

This knowledge series comprises five parts. In this first part, we present a framework for operationalising climate change risk assessments. As it is written for practitioners, it assumes knowledge of some cat modelling principles. The next four parts describe how we implemented this framework for each of the four main hydro-meteorological perils covered in our industry: drought, flood, extra-tropical cyclones and tropical cyclones. Our geographical scope was global, with five asset hotspots covering both mature and fast-growth markets: the United States, Europe, Japan, China and India.

A learning journey

The framework is now fully operational, but our work is by no means done. It's a journey of continuous learning for our experts, our underwriters and our risk managers, in which we refine certain approaches and completely revise others. More fundamentally, in some markets, the exposure data we receive is so aggregated that we are unable to implement our scenarios, to the detriment of our clients. A revolution in climate risk assessment requires a revolution in the methods used to capture, structure and store exposure, hazard and claims data. For decision-making, we have begun incorporating our climate scenarios into retro strategy, tolerance setting, portfolio steering and wording assessments. While the extent to which they impact decision-making varies, we see evidence of superior performance, where climate trends are considered explicitly. We hope that in partnering with clients, we can exchange insights gained, thereby helping both them and us to become more resilient.

CLIMATE CHANGE SCENARIO ASSESSMENT FRAMEWORK

Our scenario assessment framework (Figure 1) comprises five steps in the form of a cycle, to reflect evolutions in data, modelling and decisions. Guidance on how to complete each step are set out below.

STEP 1: REVIEW SCIENTIFIC LITERATURE

The first step is to review available scientific literature that summarise ensemble climate model experiments for near-term forecasts. Where available, compute trends from empirical hazard data to compare with climate model results. The outcome of this exercise is a list of key climate trends for key perils driving portfolio profitability and solvency.

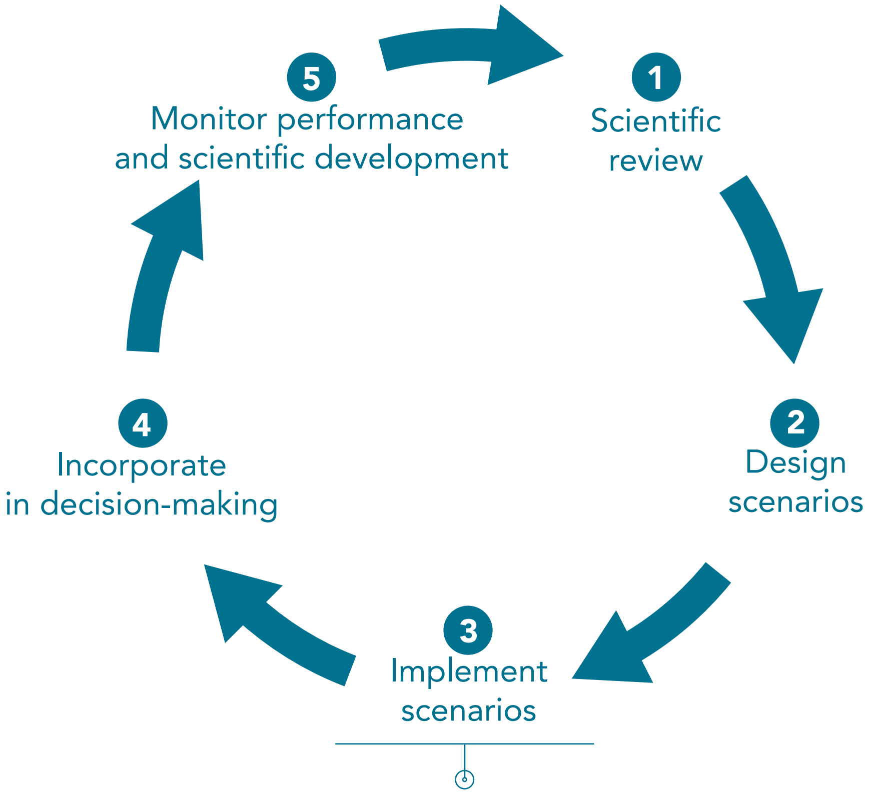


FIGURE 1: SCENARIO ASSESSMENT FRAMEWORK

Source: SCOR

The literature review and empirical analysis provide a hazard rate of change over a chosen time horizon. However, the quantum of change is also a function of the baseline level of hazard in the cat models to which the adjustment will be applied. For a given time horizon (say, 5-10 years), the older the hazard baseline, the bigger the hazard adjustment.

While access to geoscientists and review papers can accelerate work in this step, establishing a model baseline can be time-consuming if detailed hazard information for events in the stochastic catalogue are not available. In this regard, our assessment of Japan typhoon was much easier thanks to the support of AIR's teams in London and Singapore. Similarly, we could easily access hazard data for our in-house models, such as US Wildfire and China flood.

STEP 2: DEFINE SCENARIOS

Our understanding of the future response of weather phenomena to a warming climate is still developing. Scenario analysis therefore offers a transparent approach to assessing the potential future impacts of physical climate change risk.

Step 2 begins by compiling a list of quantifiable, plausible scenarios that illustrate the potential impact of near-term climate trends on the portfolio under review. For simplicity, a scenario constitutes the implementation of a single human-induced enhancement for a given region-peril. The enhancement is reflected by modifying the modelled frequency and/or severity, over a given time horizon. Multiple enhancements can be considered together in one scenario, however this requires a deep understanding of how the components of a peril interact, along with similar levels of confidence in all the enhancements being combined. Because this is rarely the case, the results from such a scenario construction could be misleading.

The meaning of the scenario should be clearly communicated. Is it a prediction or forecast based on an extrapolation of climate trends and climate model forecasts that point to a consensus? Or is it rather one plausible outcome among a range of outcomes that represent a collection of competing views? A scenario designed as one plausible outcome could be interpreted as a forecast, potentially misleading decision-makers.

For global portfolios that drive profitability and solvency, a representative set should be compiled covering a range of regions and perils: not so many that they overwhelm

stakeholders or erode the rigour required to carry out this work, but not so few that decision-makers are unable to appreciate the range of impacts. This could make it harder to form a view of loss sensitivity across scenarios and hence where mitigating action may be necessary. That being said, resource constraints may mean that only one region-peril can be reviewed.

For signal selection, climate signals with strong consensus and high loss sensitivity are most likely to impact decision-making. Signals with lower loss sensitivity are useful for comparability. Less impactful are signals with little or no scientific consensus. However, in these cases, one could design a scenario representing each of the main competing views, to illustrate a range of potential impacts.

Where possible, use common assumptions across all scenarios, e.g., same time horizon, same global surface temperature change or Representative Concentration Pathway (RCP). This enables comparability of results. Where it is difficult to reconcile empirical trends with climate model forecasts, consider having variants of the same scenario, being careful not to anchor with terms such as 'low', 'medium', 'high.'

STEP 3: IMPLEMENT SCENARIOS

Implementation depends heavily on internal systems, available resources, models and methods used. Therefore, clarify system constraints before implementing scenarios. Decide whether the computation of scenario impacts is a one-off exercise or should be set up so that it can be repeated every few years, as portfolios evolve and new scientific insights emerge. The method of implementation should capture the non-linearity of forecasted hazard changes. For instance, one approach applies loss-based hazard adjustments to each event or simulated coverage year, resulting in different impacts at different points along the cat loss distribution. Allow ample time to review results, in order to detect any potential bias in the implementation. Inherent bias in an event catalogue can be exaggerated when adjusting the events.

STEP 4: INCORPORATE IN DECISION-MAKING

What is a scenario impact analysis if it cannot support business decisions? As scenarios, they should not be used exclusively, but rather as a complement to standard business analytics. Key business decisions that could benefit from this scenario analysis include:

- Risk appetite & tolerance setting
- Assessing the resilience of underwriting plans
- Reinsurance / retro purchase
- Costing of natural peril risk in (re)insurance contracts
- Updating underwriting guidelines
- Exposure management / deployment of capacity
- Internal model calibration

The scenario results may also be useful for internal and external reporting to regulators and rating agencies.

STEP 5: MONITOR

As we learn from new catastrophes, new scientific evidence, new/updated cat models and updates to our internal systems, we revisit the process and methods underlying the scenario analysis as this may trigger updates to methods and possibly results.

SCOR CASE STUDY: THE APPLICATION OF THE FRAMEWORK

While SCOR has a deep pool of cat experts within Pricing & Modelling, Underwriting and ILS, our teams are organised such that project work typically runs from February until September, after which teams shift focus to reinsurance renewals. We therefore set ourselves the ambitious target of completing, within this period, the literature reviews, scenario design, and loss impact analysis for all impacted perils in our cat risk portfolio.

By the end of the study, we completed literature reviews for key hydro-meteorological perils in most of the regions material to SCOR. We designed scenarios for a subset of these and further constrained the scenario list at the implementation stage. This ambitious target provided the impetus to focus on key milestones and balance scientific rigour with operational constraints. This section highlights a few practical aspects of the project. We describe how we organised ourselves, the climate signals and perils we selected, the key assumptions we made and how we defined and implemented our scenarios.

Project setup and team organisation

Ahead of the kick-off, considerable planning went into designing a framework that would be applied to all scenarios. In particular:

- We defined a first phase of work that extended beyond a literature review, embarking instead on a scenario impact analysis on SCOR's global portfolio
- We defined a second phase of work to explore how to incorporate the findings in decision-making.
- We designed a common template for literature reviews.
- We set assumptions upfront that would apply to all scenarios.
- We formulated an approach to implement scenarios via our cat systems.

With a framework established, we kicked off by setting up workstreams, each focussing on a particular peril. A project lead met regularly with workstream leads to provide technical support and ensure consistency. A project manager helped us stay on track. We also presented updates to a steering committee, attended by our P&C CEO. The first phase of the project ran from February 2020 until September 2020, after which the team transitioned to renewal pricing. In 2021, our focus shifted toward more formal communication of results and use in decision-making.

The project was internally resourced with a core team of 10 geoscience experts, supported by local modellers, who brought market expertise, as well as IT/system experts, underwriters, and colleagues from the Risk Management team, who provided a Group-wide perspective. AIR's teams in London and Singapore supported the computation of adjustments for our Japan typhoon scenarios. We also held knowledge exchange sessions with brokers and other vendors, which was most useful in the literature review and scenario design steps.

STEP 1: REVIEW SCIENTIFIC LITERATURE – INVESTIGATION OF SIGNALS AND PERILS

We started with the hydro-meteorological region-perils most costly to our industry today, but which are also likely to be portfolio risk drivers over the next decade.

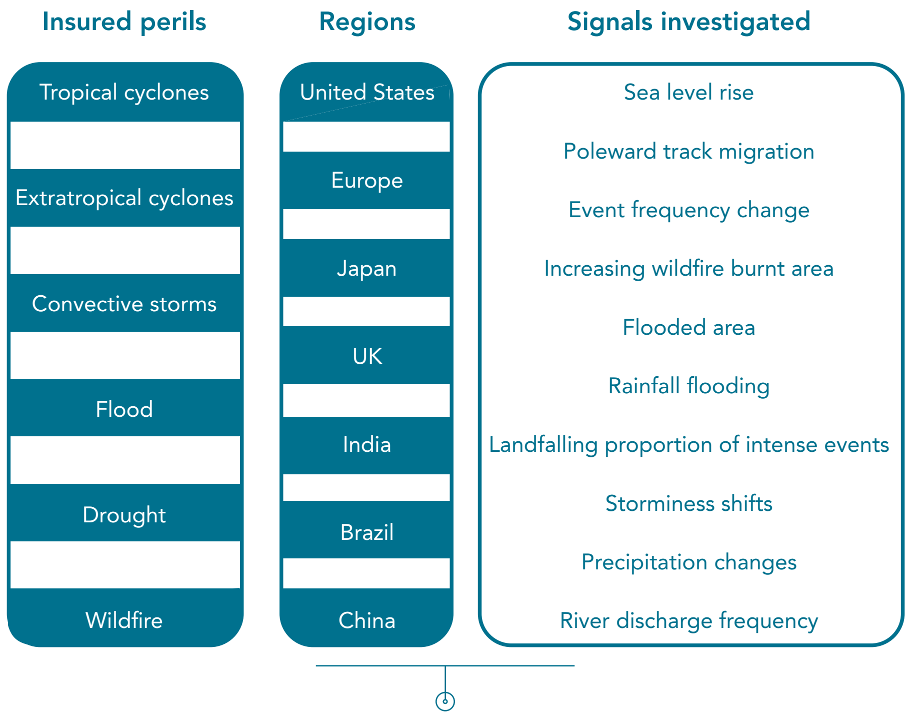
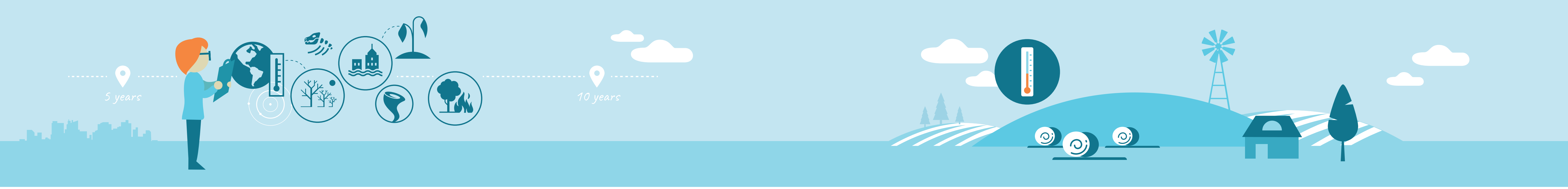


FIGURE 2: SIGNALS AND INSURED REGION/PERILS INVESTIGATED

Source: SCOR



We considered perils that threaten solvency, as well as those that pose an earnings threat. Given the impact of climate change on the frequency and severity of agricultural drought, hail and frost events, scenarios were designed for both Property and Agriculture lines of business.

The literature review leveraged review papers by expert panels. Where available, we cross-checked against other synthesis papers by colleagues in the industry. Where necessary, we contacted authors directly and engaged geoscientists in the vendor and broker community. We're grateful to our industry colleagues, who demonstrated what it means to be a cat modelling community. Figure 2 outlines the list of insured perils and regions we chose to include, and the signals identified in the literature review for further investigation. We actually reviewed many more signals than those shown, but our final selection was based on the materiality of the insured perils, and how well the model projections validated against empirical trend analysis. All the signals identified are noted in the IPCC's 2021 publication[3]. These signals will be described in more detail in later newsletters.

STEP 2 AND 3: DESIGN AND IMPLEMENTATION OF THE SCENARIOS

1) Scenario definition

Considering the baseline average hazard from our cat models, the empirical trends for the signals selected and climate model forecasts, the following scenarios were specified with impacts quantified over a 5-10-year time horizon. (See table)

2) Key assumptions

Earlier, we noted the importance of common assumptions to allow comparison across scenario results. In this way, we can identify where losses are potentially more sensitive to near-term climate trends. We describe three important assumptions:

Choice of time horizon

The goal of our study was to produce results useful for strategic decisions, typically affecting business over a time horizon of 1-3 years. In contrast, many climate model experiments project impacts to the end of the century. Some provide mid-century forecasts. We therefore chose to compute hazard impacts over a single decade or 5-10 years, balancing time horizons of business with outputs from climate models.

Region-Peril	Scenario description	Line of business
US Tropical Cyclone	1. Increase in coastal flood severity due to sea level rise 2. Increase in rainfall flooding 3. Increase in proportion of intense hurricanes	Property
Japan Typhoon	4. Increase in coastal flood severity due to sea level rise* 5. Increase in rainfall flooding* 6. Increase in proportion of intense typhoons* 7. Poleward migration of the latitude of maximum intensity of a typhoon*	Property
European Extra-Tropical Cyclone	8. Increase in storminess 9. Increase in coastal flooding due to sea level rise*	Property
UK Flood	10. Change in river discharge frequency	Property
China Flood	11. Increase in flooded area along the Yangtze	Property
California Wildfire	12. Increase mean burnt area for large fires*	Property
India Drought	13. Increase in frequency of extreme drought	Agriculture

** For these scenarios, we implemented at least two variants of the perturbation listed, reflecting the underlying uncertainty in results from empirical trend analyses and climate projections. Including these variants, we had a total of 20 scenarios for Property cat business.*

Empirical studies were useful here in validating decadal climate impacts. We made the heroic assumption that model projections can be scaled linearly to infer a decadal rate of change.

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3. IPCC. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate. [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L.].

Choice of temperature increase based on a literature review

We assumed an increase in global mean surface air temperatures of 0.95°C to 1.2°C for the period 2020-2030, as compared to 1850–1900. This was based on CMIP5[4] projections, observed anomalies for each of the past five years, and ten-year average temperature anomalies from Met Office Hadley Centre datasets[5]. In particular, we used the observed increase in temperature anomaly of ~0.2 °C per decade since the 1970s as a basis for adjusting temperature-based hazard perturbations (i.e., assuming x% per 1 degree increase implies decadal change of 0.2*(x%)). A simplifying assumption, which will not be necessary if academic studies can produce climate projections over a single decade and update them when we make major breakthroughs in scientific understanding.

Where ensemble climate model experiments provided results on multiple Representative Concentration Pathways (RCP), we consistently used results based on RCP4.5. Temperature changes for all RCPs are quite close over a 5-10 year time horizon. However, we found RCP2.6 and RCP4.5 to produce temperature projections more in line with our temperature projection (i.e., 0.95°C to 1.2°C for the period 2020-2030).

Insured exposure and market conditions

For property scenarios, we kept exposures constant to isolate the effects of hazard changes on loss. We didn't allow for potential future changes in building codes or building stock, as we saw following the 2011 Tohoku earthquake, or for changes in loss inflation, as we are seeing following Covid-19. We reported changes to expected losses, and hence modelled portfolio profitability, based on current risk-adjusted returns on capital. Portfolio profitability in 5-10 years could be materially different depending on demand for reinsurance capital, (re)insurance rates and/or claims activity. For agriculture scenarios we considered changes in technology, farming practice and infrastructure that have a significant impact on crop yields.

3) Building conditioned catalogues

An experienced cat modeller will be proficient in how to adjust frequency and severity in a stochastic event catalogue. We applied these skills to build catalogues conditioned on an assumed climate change enhancement. The main benefit of this approach is that once built, these catalogues can be used again, to refresh the climate change scenario analysis in light of new scientific evidence, changes in business mix and market conditions. For climate signals that are implemented as a severity adjustment, a severity load was applied to qualifying stochastic event(s) or year losses. For signals implemented as frequency adjustments, the rate of qualifying events was adjusted.

System setup and workflow will define where in the modelling process the adjustment is applied. In Figure 3, we illustrate our modelling workflow and the application of climate change adjustments in the Year Loss Table, before applying SCOR's terms and conditions. However, depending on system setup, it may be easier to apply adjustments elsewhere – for instance via:

- direct adjustment of hazard data (e.g., for sea level rise, by increasing surge heights directly or as a proxy, or by reducing digital elevation values)
- adjustment of exposure values, building characteristics or insurance terms to approximate a change in average hazard
- adjustment of vulnerability curves to approximate a change in hazard intensity
- adjustment of the resultant Event Loss Table to reflect a change in frequency or severity

For all scenarios, we wrote algorithms that implemented a sequence of rules based on hazard info for each stochastic event. These procedures loop through each simulated year, applying perturbations. As procedures sometimes include random selections within a stochastic year, we produced hundreds of iterations and then selected the optimal catalogue that minimised potential bias in the sampling procedure.

By way of illustration, the following procedure was applied for a US tropical cyclone scenario which perturbs the landfalling proportion of category 4-5 hurricanes:

1. We computed the mean landfall windspeed across all events across all simulated years for a given stochastic catalogue – this is the model mean Vmax. We then computed the implied proportion of landfalling category 4-5 hurricanes

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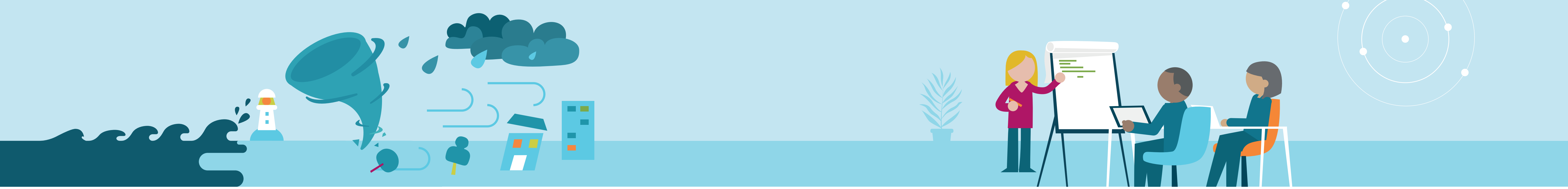
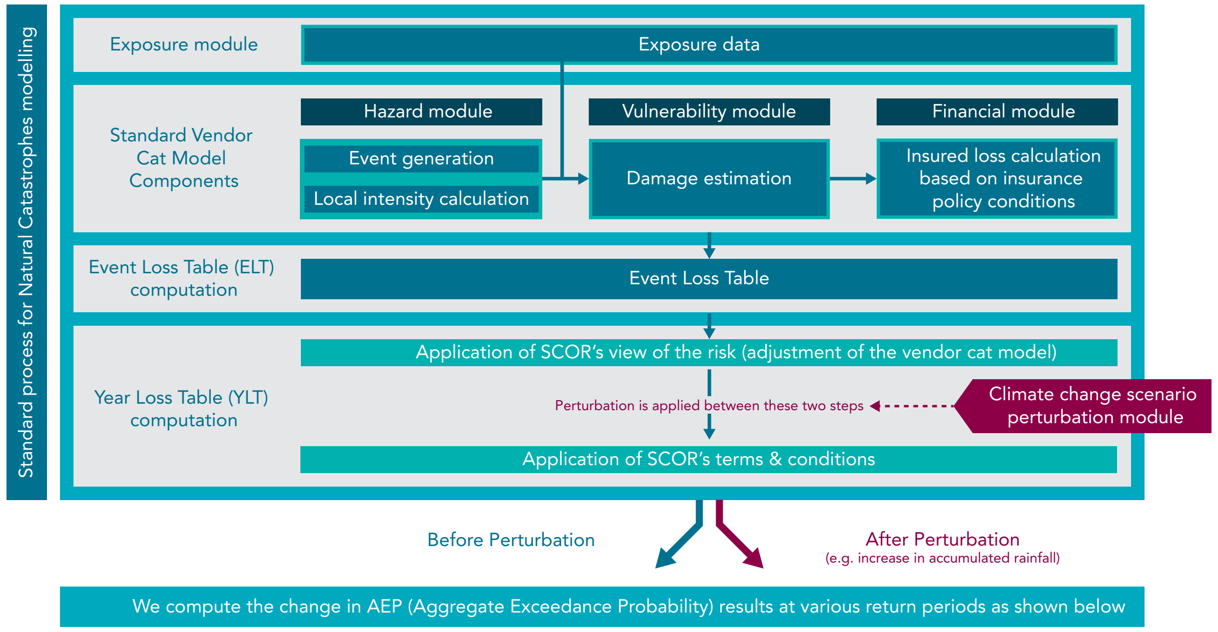
4. Coupled Model Intercomparison Project Phase 5.
5. https://www.metoffice.gov.uk/hadobs/hadcrut4/





Peril: Japan Typhoon	**Scenario: Increase in accumulated rainfall flooding**		
Change in metrics	+ 2.5%	+ 5%	+ 10%
Expected loss			
1-in-10 year AEP			
1-in-50 year AEP			
1-in-200 year AEP			

FIGURE 3: CAT MODELLING WORKFLOW

Source: SCOR

2. We computed a target mean landfall windspeed based on future climate forecasts and empirical decadal trend – this is the target mean Vmax. We then computed the implied target proportion of landfalling category 4-5 hurricanes.
3. We computed the average change required for model mean Vmax to equal target mean Vmax.
4. Assuming an increase in mean Vmax, we looped through each simulated year, and for each:
   - randomly selected an event from anywhere in the catalogue with a Vmax higher than the model mean Vmax. We add this event to the simulation year being perturbed.
   - randomly selected an event with hazard value lower than the mean. We then deleted this event from the same simulation year. This preserves the event count per year.
5. We repeated the above steps to create ~100 iterations or catalogues
6. We computed loss changes at specified percentiles for each catalogue relative to the baseline catalogue. We then computed the average loss change at these same percentiles across all conditioned catalogues, also relative to the baseline. We then computed the root mean square error (RMSE) for each catalogue based on its loss change relative to the average across the 100 catalogues, selecting the catalogue with the lowest RMSE.

In our procedure, the events compiled above comprised loss-generating events with the most intense landfall occurring in the continental US. We also implemented a replication cap, so that one event wasn't replicated too often in the procedure. For simplicity, the procedure was not applied to bypass events.

A different approach was used for agriculture, where loss modelling is based on experience. First, we produced an estimate of the climate - and non-climate - related contributions to the yield trends of major crops in India. Based on these yield trends, crop yields were projected to the near future. Changes in future losses due to climate change were then estimated using the projected yields. In addition, a long time series of precipitation data was analysed to estimate changes in the frequency of severe drought events.

STEP 4: INCORPORATE IN DECISION-MAKING

Later newsletters will describe insights from the scenario impact analysis for specific region-perils and their link to decision-making. Based on our experience to date, we outline here how the results have been considered in strategic/portfolio steering decisions and client engagement.

Reflections on Pricing & Modelling

- **US hurricane:** the project enabled us to update our loading for rainfall flooding, so that the adjustment is applied systematically to all programs, with due consideration for NFIP[6] coverage and take-up rates.
  The magnitude of the uplift factor differed by hurricane intensity, duration overland and forward speed.
- **European extra-tropical cyclone:** the impact analysis was presented in the context of natural climate variability. While the results did not point to an overall gap in pricing, the tidal values used were found to be outdated relative to the current climate.
  The key takeaway is that we need to keep modelled hazards in line with the current climate.
- **Japan Typhoon:** the project underscored the importance of coastal- and rainfall-based flood modelling, two elements not modelled in some vendor cat models.
  While wind losses can be loaded to capture these flood components, the study highlighted the limitation of using smoothed loading factors.
  Explicit modelling of rainfall and run-off processes is preferred.
- **European flood:** increases in extreme precipitation, changes in river discharge rates for some countries (like the UK in our scenario) and recent events all underscore the importance of keeping modelled hazard in line with current climate.
  Given recent experience, the implementation of hazard updates will be included as part of our review of European flood modelling.
- **US and China flood:** the project provided further impetus to place higher credibility on cat models that capture changes in hazard and exposure.
- **US wildfire:** modelled losses were found to be very sensitive to changes in the size of large wildfire events in California. Empirical studies and climate model projections point to increasing footprints.

  These can be explicitly adjusted using our in-house OASIS-format model and this update is in the pipeline.
- **US & European convective storm:** while the climate change study highlighted competing loss impacts of projected changes in CAPE[7] and vertical windshear, we also identified material loss trends for some countries.
  These may well be due to climate trends, but also to changes in exposure and building stock. Severity assumptions were updated to reflect these trends.

Business Unit & Group decisions

There is a clear intention at the Group Management level to incorporate our study findings in strategic decisions. To date, the climate change results have been considered in:

- The revision of SCOR's Group cat budget from 7% to 8% for 2022.
- Our external retro planning discussions: we considered the overall pattern of loss changes, which together with recent cat experience and other key metrics, resulted in changes to the design of the programme.

The results will also be considered when setting the profitability targets for the next three-year strategic plan, which will run from 2023 to 2025.

Underwriting guidelines & strategy

Our underwriting colleagues reviewed the study findings in the context of SCOR's underwriting guidelines and strategy. This led to updates to guidance on the following topics:

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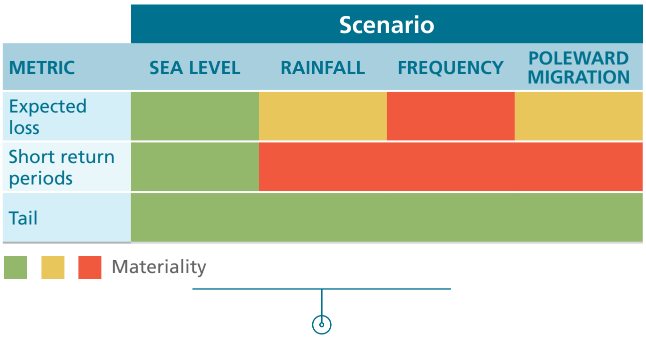
[6] National Flood Insurance Program.
[7] Convective Available Potential Energy.

- monitoring and referral of aggregate covers,
- event definition,
- hours and distance clauses,
- contract features that expand sideways coverage (multiple reinstatements, cascading covers, etc.) and
- per-event cat coverage within Risk XLs

Client engagement

Thanks to our systems-based implementation, we can compute loss impacts on reinsurance programs for large clients with material exposure to the region-perils covered by our study. Where clients express an interest, we can share insights on relative loss sensitivity to the climate signals studied, at various points along the cat distribution.

An example for Japanese typhoon risk is shown in Figure 4. The magnitude of loss impact is rated green, amber or red, with amber and red ratings requiring further review/action. Impacts are computed after the application of SCOR T&Cs and represent potential loss changes to modelled Japanese typhoon risk over the next 5-10 years. These results can complement key performance indicators used by clients to assess their reinsurance purchase.



	Scenario			
METRIC	SEA LEVEL	RAINFALL	FREQUENCY	POLEWARD MIGRATION
Expected loss	🟩	🟨	🟥	🟨
Short return periods	🟩	🟥	🟥	🟥
Tail	🟩	🟩	🟩	🟩

🟩 🟨 🟥 Materiality

FIGURE 4: SIMPLIFIED VIEW OF IMPACTS FOR JAPANESE TYPHOON RISK

Source: SCOR

STEP 5: MONITOR

As new scientific evidence emerges and cat events reveal new insights about our changing climate, we have an opportunity to refine our analysis. For instance, our initial scenario for increased flood severity from tropical cyclones was based strictly on projected increases in rainfall rates. However, later research suggested hurricanes could also slow in a warmer climate implying further increased cumulative rainfall. We therefore revised our 'wet hurricane' scenario by perturbing cumulative rainfall per event, in an attempt to capture both signals.

CLOSING REMARKS

Since 1950, globally there have only been four years with multiple $10 billion weather losses, on an inflation-adjusted basis[8]. These multi-cat loss years have all occurred since 2004, with 2020 and 2021 potential additions to the list. The resulting impact on profitability and solvency has led to challenge from Boards, shareholders, regulators and rating agencies.

As a cat modelling community, we have responded noting that our modelling tools can capture exposure changes as people migrate to cities, insurance take-up increases and building stock evolves. Our experts evaluate catastrophe models and calibrate them to reflect our risk profile and with each major cat event, we tweak our models. However, is the recent string of under-predicted average annual losses just normal uncertainty or could we be missing something systematic in our models?

Studies such as ours, once operationalized provide a powerful diagnostic tool that helps to detect model bias at a global scale. As detailed above, the reporting of loss sensitivity from climate signals alerted us to plausible increases in global flood severity from a combination of sea level rises, increased rainfall from hurricanes and general increases in intense precipitation. This global perspective together with recent cat claims has provided the impetus to introduce a range of model updates to strengthen flood pricing globally.

We hope this study provides further motivation to embark on climate change studies and remain committed to supporting our clients on this journey.

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[8] Impact Forecasting Cat Insight database.

The Art & Science of Risk

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