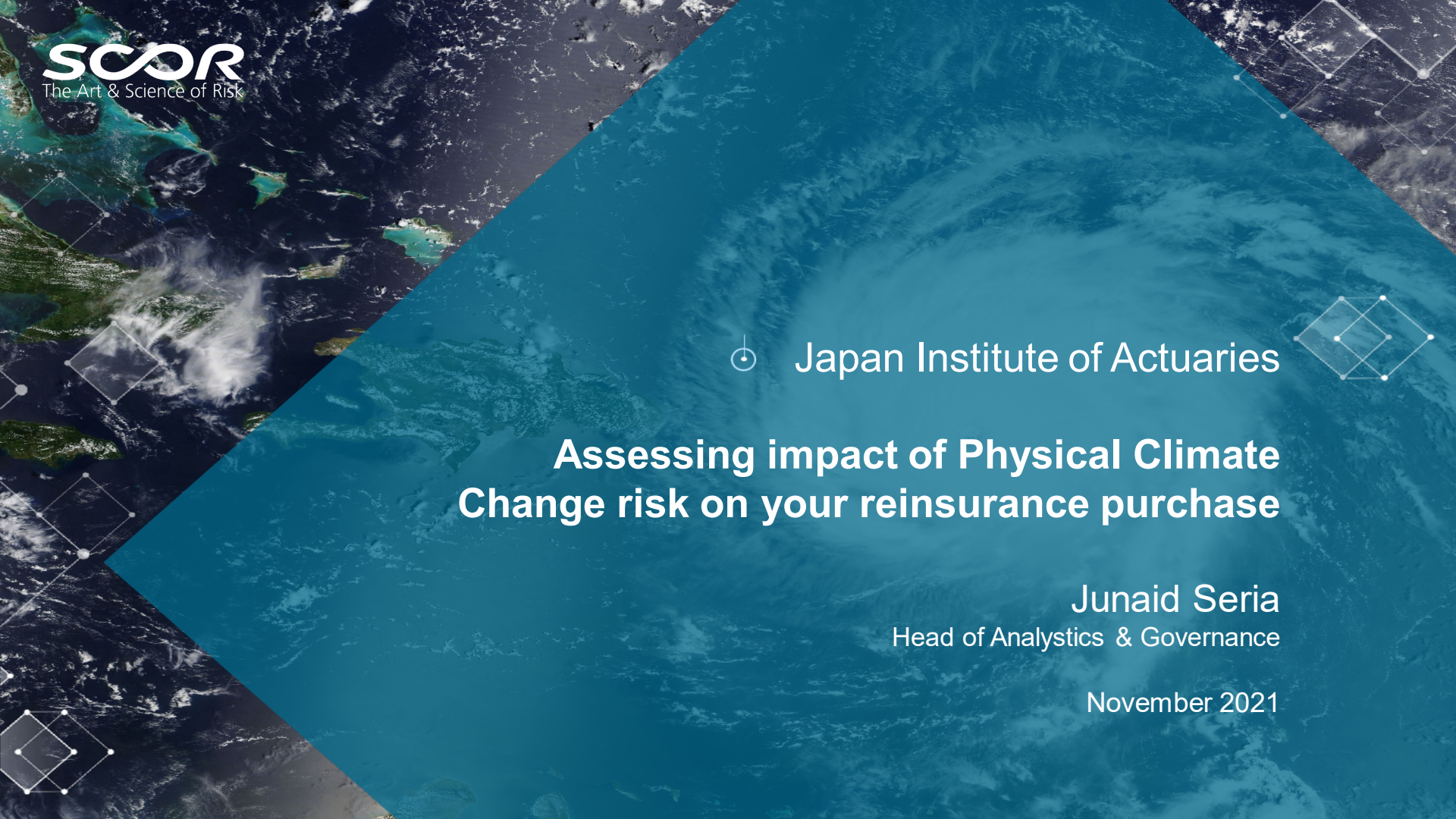


Japan Institute of Actuaries

Assessing impact of Physical Climate Change risk on your reinsurance purchase

Junaid Seria
Head of Analystics & Governance

November 2021

Aims

1. Describe the work we have done to understand how global warming influences extreme event frequency and severity.

2. Describe how we quantify climate signals over the short-to-medium term and where we have incorporated them in our costing of cat-exposed contracts.

3. We present a case study for how observed and modelled trends can be incorporated in pricing and your reinsurance purchase.


SCOR
The Art & Science of Risk
Introductory remarks

1. Climate change is a key topic for SCOR

PRESS RELEASE

GROUP

SCOR builds on its climate leadership by co-launching the Net-Zero Insurance Alliance and confirms phased coal withdrawal

SCOR 2021 Investor Day

SCOR is assessing and managing the impacts of climate change across all areas of its activity

- Calibration of catastrophe models using historical data embeds current trends in frequency/severity of natural perils into contract pricing
- Ongoing development of catastrophe models to better quantify the impacts of perils sensitive to climate change (e.g. Wildfire, Tropical Cyclone)
- Ongoing project to quantify the impacts of climate change on material physical risk exposure for P&C and Life &Health risks
- Ongoing commitments to reduce underwriting exposure to the most carbon-intensive sectors

- Quantification of acute physical risk exposure using natcat models; use of Carbon Risk Real Estate Monitor to measure alignment of real estate portfolio with 2°C and 1.5°C warming pathways
- Use of stress testing/scenario analysis to measure resilience of the portfolio to physical and transition risks
- Measurement of the carbon intensity of the invested asset portfolio
- Portfolio screening & exclusion of sensitive sectors
- Reducing greenhouse gas emissions from direct operations via e.g. energy consumption management initiatives, carbon offsetting projects and reduction of emissions from business travel

SCOR has a comprehensive toolkit to assess and manage the exposure of its investments to climate risk, is 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 operations to GHG emissions.

2. Our modelling leverages a deep pool of expertise and latest technology

Dedicated resource

- **100+ experts** dedicated to P&C modelling and pricing, working autonomously from risk and underwriting functions:
  - ca. 10% of SCOR Global P&C workforce
  - with presence in APAC, Americas, EMEA
    - 60% are Pricing Actuaries
    - 40% are Cat experts, 20+ PhDs in geophysical hazards

- **R&D function**, with expertise across wind perils, earthquake and flood:
  - Regular review of models in context of scientific discoveries and lessons learnt from cat events
  - Forming & refining in-house view of risk via model adjustments,
  - Exchange with academia,

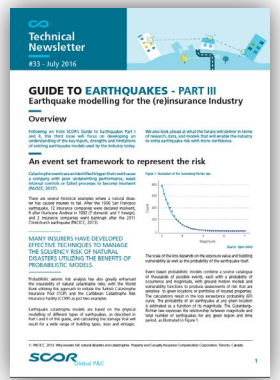
Best in class in models, single system

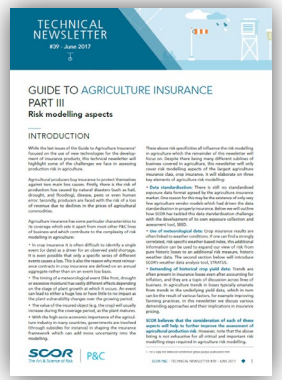
- Leverage the best modelling technology available

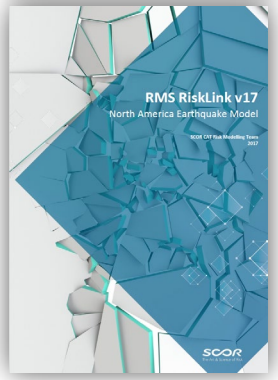
- Multi-model framework enables comparison & benchmarking
  - Nat Cat models: RMS, AIR, AON / IF, etc.
  - SCOR models: where vendor models weak / non-existent => complete scope
  - Historical data: claims, geophysical data
  - Beyond just processing of 3rd party vendor tools

- Single pricing system governed by consistent processes across the globe:
  - Global guidelines
  - Local handbooks
  - Governance over change

3.From Research, Expertise and Technology, we gain insights which we share via client publications







4. We engage actively in industry initiatives on climate change

BANK OF ENGLAND

A framework for assessing financial impacts of physical climate change

A practitioner's aide for the general insurance sector

May 2019

THE GENEVA ASSOCIATION

DF Insurance Development Forum

InsuResilience GlobalPartnership

PSI Principles for Sustainable Insurance

LOSS MODELLING FRAMEWORK

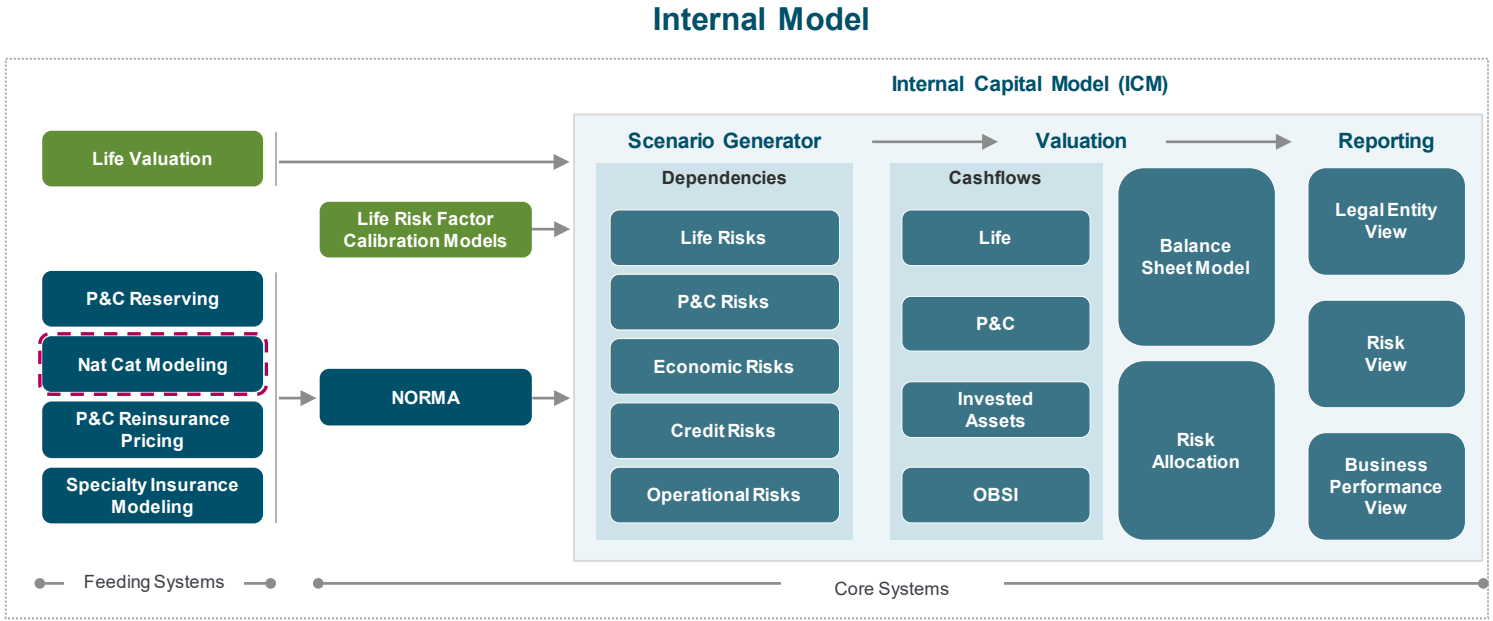
eiopa EUROPEAN INSURANCE AND OCCUPATIONAL PENSIONS AUTHORITY

SOCIETY OF ACTUARIES

SCOR The Art & Science of Risk | P&C

1. Cat Risk within P&C Internal Model

Assessment of Climate Risk is part of the SCOR Internal Capital Model



NatCat Modelling is one of the SCOR's Internal Model feeding systems. It covers natural catastrophe losses based on SCOR's risk profile. The scope of the Natural Catastrophe model is the property class of business in SCOR P&C, i.e. both the P&C reinsurance and specialty insurance segments. The perils covered are tropical cyclones, earthquakes, extra tropical cyclones, flood, convective storms, drought, snow pressure, volcano, wildfire, winters storm, and other perils.

Costing of Climate Risk

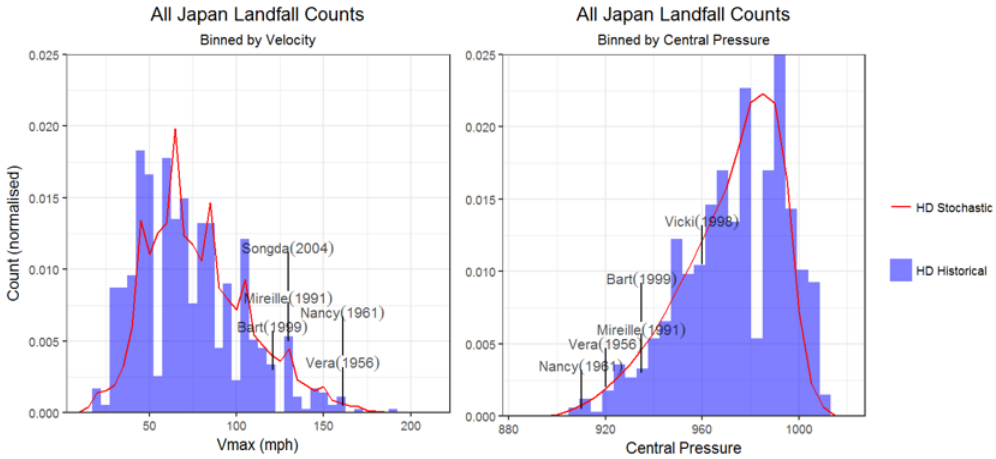
As we are estimating future claim costs over a **one-year** time horizon, incorporating climate change in modelling means:

- ensuring models are calibrated to current climate,
- with allowance for near-term trends, where robust.

We achieve this by:

1. Using probabilistic cat models, which contains a rich distribution of events including plausible but not observed in the historical loss record.

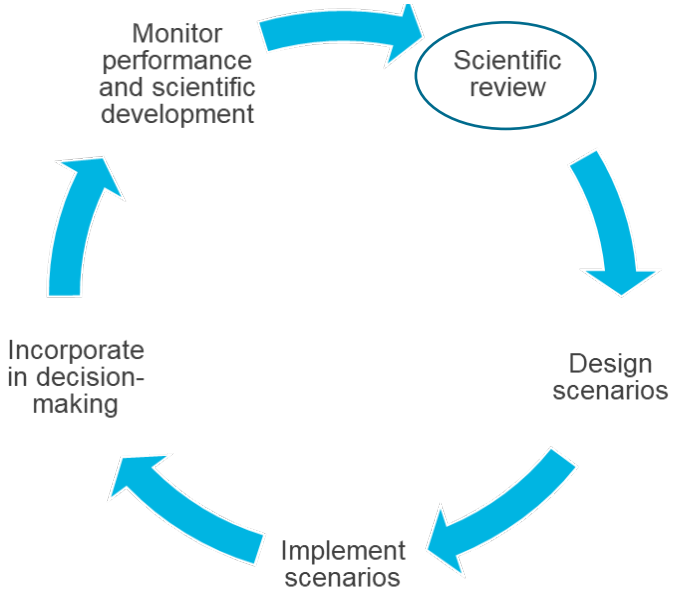
2. Checking that cat modelling vendors tune modelled hazard to reflect what we observe from latest observations



3. Adjusting our loss curves each year to reflect client losses and where necessary account for emerging trends (such as wetter or more intense hurricanes).

2. Climate Change Framework

SCOR Scenario Analysis Framework



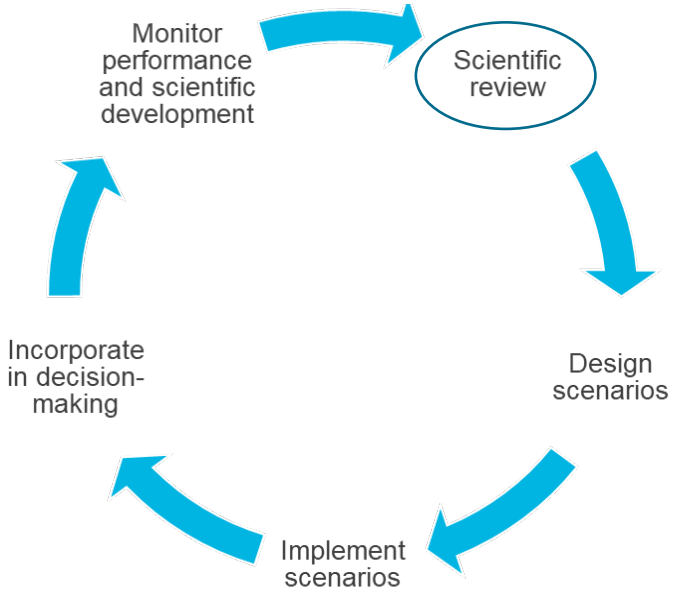
Step 1: Scientific review

1. Review scientific papers and industry reports, leveraging modelling / geoscience expertise within your organization, where these resources exist.
2. Engage internally and externally, with cat modelling vendors, industry professionals and scientists
3. Start with perils and regions key to your portfolio
4. Assess baseline hazard of cat models for region-perils selected

Step 2: Define scenarios

1. Climate signals with strong consensus and high loss sensitivity are most useful for decision-making. Signals with lower loss sensitivity are useful for comparability. Less valuable are signals with little / no consensus, but can help understand possible range of impacts
2. Not too many, not too few: enough to appreciate range of impacts, form a view, not so many to overwhelm stakeholders
3. Common assumptions enables comparability
4. More robust if scenarios grounded in / blend observed trends and climate model projections (=> easier to use shorter time horizons)

SCOR Scenario Analysis Framework



Step 3: Implement scenarios

1. Worthwhile to understand system constraints before going ahead with scenario implementation
2. Automated system-based approaches enables a repeatable solution that can be updated as scientific understanding evolves

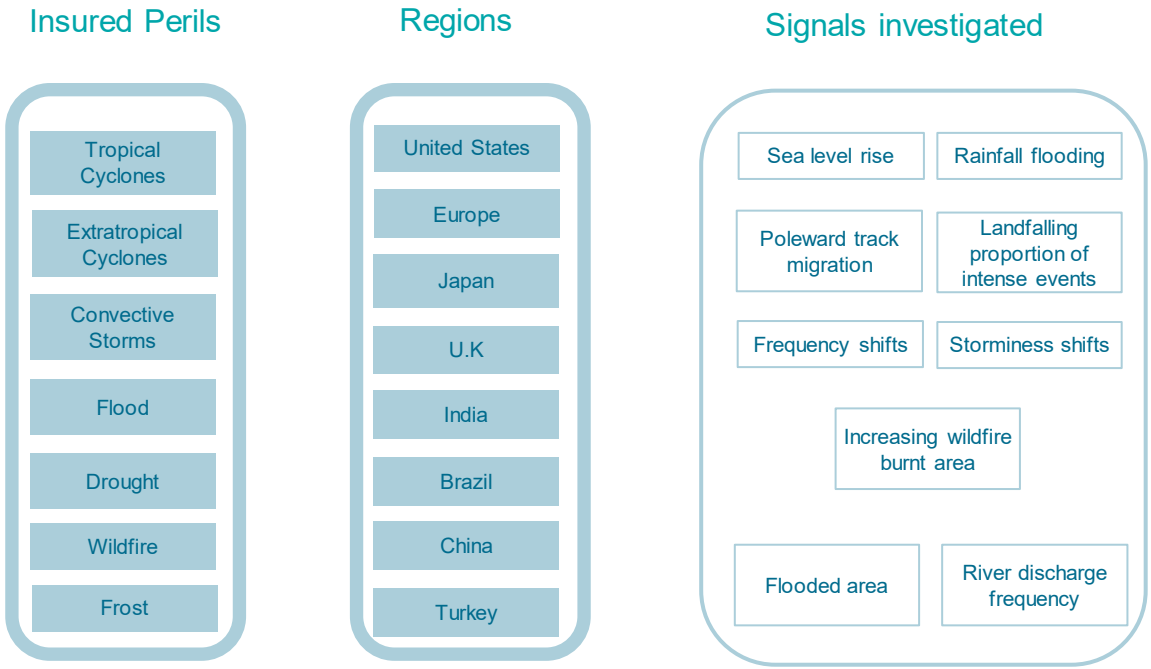
Step 4: Link to decision making

1. Make the link to key business decisions:
   a. Risk appetite & tolerance setting
   b. Resilience of your Underwriting plan
   c. Reinsurance / retro purchase
   d. Costing natural perils
   e. Underwriting T&Cs
   f. Exposure management
   g. Internal model calibration

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.

Implementing the Framework – SCOR Case Study
Scope of Work following comprehensive literature review



Scenario Specification

The meaning of a scenario needs to be clear to users of the analysis.
To ensure results are comparable, we need assumptions to be consistent across scenarios.

1. 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.
2. 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.
3. All scenarios are based consistently on a global mean temperature increase relative to pre-industrial temperatures. We assume a temperature increase of [0.95ºC:1.2ºC] for 2020-2030 relative to 1850-1900, or ~0.2° C warmer than 2010-2020. 2020-2030 is chosen as our scenarios target a 5-10 year time horizon.
4. RCP4.5[1] is used as a basis for quantifying impacts over the period 2020-2030.
5. Scenarios are implemented as an adjustment to one or more hazard parameter(s) in a cat model for a given region-peril, based on both the extrapolation of observed trends and climate model projections of these hazard parameters
6. As climate model projections are longer term, we adjust (linearly) to match our time horizon. For example, a 25% increase over 50 years would be implemented as a 5% increase over the next decade: crude, but practical given available science and business time-horizons. We expect (and will actively advocate for) ensemble climate model studies to publish projections over shorter time horizons more relevant for near-term planning.
7. For some scenarios, we used a time-independent approach. That is, if a hazard parameter (e.g., rainfall from hurricanes) was expected to increase by 17% per 1° C warming, we implemented an increase of 3.4% for an assumed 0.2° C increase over one decade.
8. The Property scenarios do not consider mitigating effects, such as changes in underwriting, building stock resilience, sea/river defences or insured exposure. Agri scenarios consider technology improvements. Future studies could consider these advancements.
9. The constant-exposure baseline portfolio used is our P&C Property Cat and Agri in-force portfolios at 1st July 2020.

Case Study – Japanese typhoon risk

Our study highlighted four signals, clear enough and material enough to use for scenario impact analysis

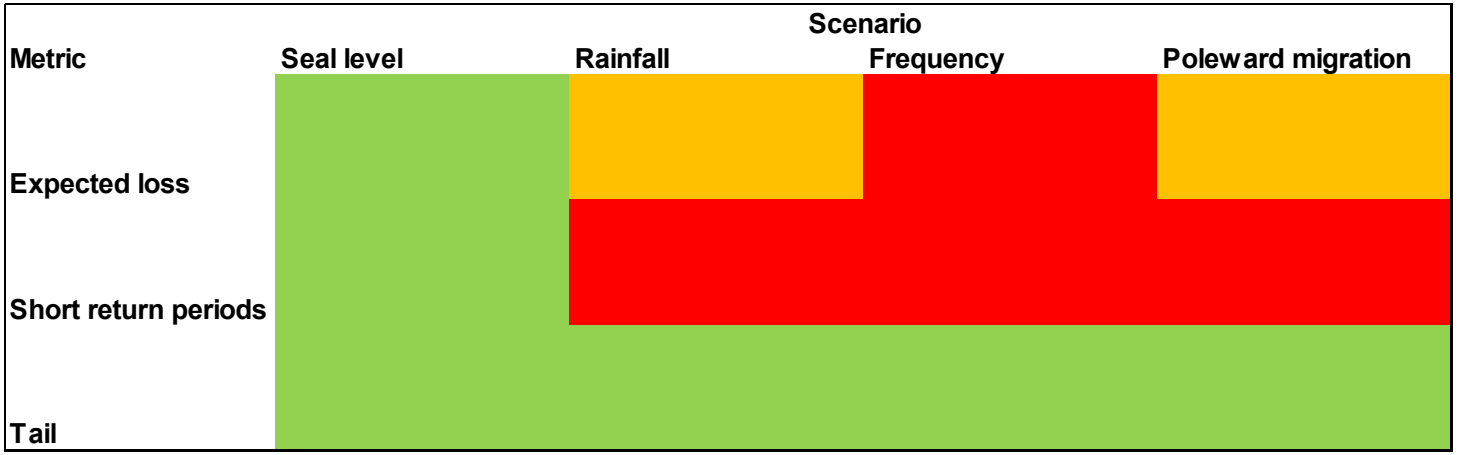
1. Sea level change leading to an increase in storm surge severity (not risk!)
- Reductions on west coast by 2mm / year
- Increase on east coast by 0.5mm/year

2. Increase in rainfall leading to greater inland flood severity
- Average increase in the rainfall rate of ~2% / decade, combined with slowing forward speed of hurricanes, leading to increase in cumulative rainfall per event.

3. Increase in wind intensity, increasing the proportion of Cat4-5s hurricanes making landfall
- Two scenarios were implemented, changing the baseline of Cat4-5 events from 4.4% to 5% and 5.5% respectively

4. Poleward migration resulting in a change to landfall rates, placing higher latitude areas at risk of damage beyond what is planned for in building design codes
- Three scenarios were implemented, 0.5%, 2.5% and 5% increase in mean latitude of lifetime maximum intensity (LMI)

Case Study: CatXL impact & link to decision-making



- Impacts represent what we could see over the course of this decade, based on current exposures
- Relatively higher impacts at shorter return periods for 3 of 4 scenarios.
- Loss changes highest for the frequency scenario, and at shorter return periods, illustrating how wind intensity increases could influence the pattern of insurance losses and the loss limiting features of reinsurance terms & conditions

2021 Schedule of Work

Internal Capacity building

- Delivered SCOR SE Board climate change knowledge series
- Delivered training to global Underwriting community which also included broader ESG topics
- Supporting Risk management teams globally as they respond to regulatory requests

External Capacity building

- Client workshops – add detail
- Campus / Conferences
- Webinars
- Technical newsletters
  - Intro & General concepts
  - Drought
  - Tropical Cyclones
  - European windstorm
  - Flood
  - Conclusions & Client propositions