

# MANAGING CLIMATE CHANGE PHYSICAL RISK IN EAST ASIA

Climate change and extreme weather are increasingly important for multiple stakeholders, including regulators, rating agencies, investors and risk managers. This briefing examines how climate change affects physical risks posed to insurers with Mainland China, Hong Kong, Japan, South Korea and Taiwan exposure and the evolution of regulation associated with this risk.

## Introduction

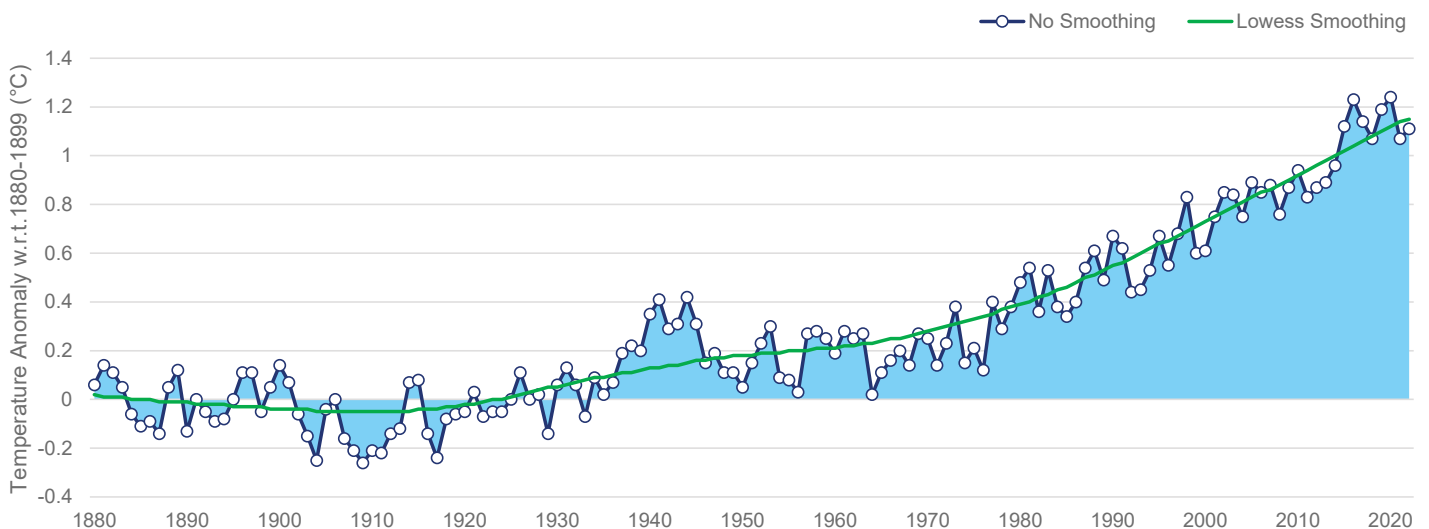
There is increasing pressure on insurers to understand climate change’s impacts on damaging weather. The National Aeronautics and Space Administration (NASA) reported that 2022 was the fifth-warmest year on record, with the average surface temperature 1.11°C warmer than during pre-industrial times (Figure 1).

The global temperature is projected to increase further and will reach 1.5°C around 2030 without a radical reduction in emissions. These seemingly small increases in temperature can have a large non-linear impact on a

wide range of perils, including drought, flood and tropical cyclone. If there are no reductions in emissions in the medium term, 3°C of warming is likely before the end of the century, which would bring more severe consequences.

Recent events such as the flooding associated with Typhoon Hagibis (2019) and extreme precipitation episodes in Mainland China (2020) have been partially attributed to climate change. (Re)insurers can avoid unexpected losses—and help achieve long-term growth and profitability—by quantifying their exposure to the physical risk of climate change.

Figure 1: Land-Ocean Global Surface Temperature Anomaly.



Source: GISTEMP Team, 2023: *GISS Surface Temperature Analysis (GISTEMP), version 4*. NASA Goddard Institute for Space Studies. Dataset accessed 2023-02-09 at [data.giss.nasa.gov/gistemp/](https://data.giss.nasa.gov/gistemp/).

## Evolving Risk Landscape

The frequency and severity of natural catastrophes are expected to increase due to climate change. The subsequent impact on insured loss is highly dependent on the peril and region of interest, and is described in the section "**Climate Change Impact by Peril**" on page 4.

Climate change is not the only factor influencing how the financial catastrophic risk to re(insurers) changes from year to year. Climate change generally changes the risk gradually over time, although the financial impact may only be realised when a significant event occurs. In contrast, other factors can lead to more abrupt changes in risk, for example, inflation in rebuilding costs or the implementation of flood defences. These other factors will often have a larger impact than climate change, and we compare examples of them with climate change in Table 1 below.

**Table 1:** Factors influencing insured catastrophic risk.

Factors	Examples
Climate change	Warming air can hold more moisture resulting in increased flash flooding.
Natural variability	El Niño-Southern Oscillation (ENSO) impacts the location of tropical cyclone activity in the Northwest Pacific.
Population growth	Increases in the number of insured properties.
Population migration	Urbanisation; increases in the proportion of people living in coastal regions.
Adaptation	Improved flood defences; updated building codes.
Insured value	Solar panel installation on existing residential buildings; increases in insurance penetration.
Economic conditions	Inflation in rebuilding costs.
Planning legislation	Changes in rules determining whether properties can be built in high-risk areas such as floodplains can increase or decrease the risk.

Source: Guy Carpenter

## THE FREQUENCY AND SEVERITY OF NATURAL CATASTROPHES ARE EXPECTED TO INCREASE DUE TO CLIMATE CHANGE.

### Regulation

Climate change presents 2 key forms of financial risk: those associated with a transition to a lower-carbon economy, and those related to the physical impacts of climate change. The physical impacts can be assessed and reported as either chronic or acute. Chronic physical risks are gradual changes in weather patterns, such as rising sea levels, droughts and extreme temperatures. Acute physical risks are sudden and severe events that can cause significant damage to property and infrastructure, such as hurricanes, floods, wildfires and storms. Regulators have started to ask companies to assess their exposure to both types of risk.

Mandatory climate change financial reporting, often aligned with the recommendations of the Task Force on Climate-Related Financial Disclosures (TCFD), has come into effect in several jurisdictions. Given the uncertainties of these risks, responses are expected to be proportionate to the size, nature and complexity of the business.

In the East Asia region, supervisors are engaging with the (re)insurance industry to build capacity and understanding of climate risks and their impact on financial stability. Several countries have announced mandatory disclosures for listed companies, with most supervisors issuing guidelines on the management of climate risks.

In Hong Kong, the Green and Sustainable Finance Cross-Agency Steering Group (CASG) was established in May 2020 and encompasses a number of financial authorities (including the Insurance Authority). CASG's Strategic Plan covers 6 key focus areas and includes mandating TCFD-aligned disclosures across relevant sectors no later than 2025 and supporting the development of International Sustainability Standards Board (ISSB) global sustainability reporting standards.

Similarly in Japan, revisions to the Corporate Governance Code encourage companies to develop and disclose initiatives and policies on sustainability as well as enhance the quality and quantity of climate-related disclosures

based on TCFD recommendations, particularly for Prime Market listed companies.

Voluntary guidelines have been widely published across East Asia. The FSS in South Korea has introduced a guideline on the management of climate risks in the financial sector through a dedicated climate risk forum, and Japan's FSA published Supervisory Guidance on Climate-related Risk Management and Client Engagement.

Taiwan's FSC Guidelines on Climate-related Financial Disclosures of Insurance Companies require insurance companies to establish appropriate mechanisms for climate-related risk management and opportunities based on the scale and nature of their business activities. Mainland China's CBIRC has also launched its Green Finance Guidelines for banks and insurance companies to promote green finance, improve the level of sustainability, due diligence and risk management, encourage disclosures, and assist in pollution prevention and control. These guidelines are highlighted in Table 2.

Scenario analysis and stress testing have emerged as key forward-looking tools to assess the potential impact of climate risks. South Korea has announced it is considering industry-wide climate stress testing. In August 2022, Japan's FSA together with the Bank of Japan published the results of a pilot scenario analysis that focused on physical risks (acute risks by typhoons and floods) related to underwriting business using three Network for Greening the Financial System scenarios (Net Zero 2050, Delayed Transition and Current Policies).

The results suggested that climate change may increase claims payments (through the intensification of tropical cyclones and increase in rainfall and river flow). However, the results should not be interpreted as a conclusive evaluation of the effects of climate risks. Going forward, the FSA will promote conducting climate scenario assessments using the same risk model (developed by the General Insurance Rating Organization of Japan). They may also ask insurance companies to conduct stochastic analysis that considers the probability of occurrence of various scenarios that incorporate the impact of future climate change.

Overall, although the regulation in the region remains at an early stage, there is a growing interest from supervisors in bolstering capabilities and understanding of climate change financial risk management across the industry.

## SCENARIO ANALYSIS AND STRESS TESTING HAS EMERGED AS A KEY FORWARD-LOOKING TOOL TO ASSESS THE POTENTIAL IMPACT OF CLIMATE RISKS.

**Table 2:** Guidance from regulators for the assessment of physical climate change risk for (re)insurers in East Asia.

Country	Regulator	Guidelines
Mainland China	The China Banking and Insurance Regulatory Commission (CBIRC)	Green Finance Guidelines for the banking and insurance industries.
Hong Kong	The Insurance Authority (IA)	CASG (of which IA is a member) Strategic Plan includes mandating TCFD-aligned disclosures and developing ISSB reporting standards.
Japan	Financial Services Agency (FSA)	Supervisory Guidance on Climate-related Risk Management and Client Engagement.
South Korea	Financial Services Commission (FSC) and Financial Supervisory Service (FSS)	Guideline on the management of climate risks in the financial sector.
Taiwan	Financial Supervisory Commission (FSC)	Guidelines on Climate-related Financial Disclosures of Insurance Companies.

Source: Guy Carpenter

## Climate Change Impact by Peril

We evaluate the impact of climate change on a peril based on observations, climate models and our understanding of the physical drivers. In cases where we have a consistent view—a long observational record, high-resolution climate model output and a good understanding of the physical drivers—then we will have high confidence in our assessment. Conversely, there are many reasons why we would have lower confidence, for example, if an observational record is short or unreliable, or if there is disagreement between different climate models. Here we summarise the climate change impact on tropical cyclones (TCs) and floods. Note that climate change does have a significant impact on a wide range of other perils, including wildfire, hail, drought and heat stress, but these typically have lower insured losses associated with them in East Asia.



### Climate Change Impacts on Tropical Cyclone

Climate change affects the frequency, severity and location of TCs in the Northwest Pacific basin, as outlined in Table 3. The impacts are wide-ranging, as the energy source of TCs (the ocean), the winds that inhibit their growth (wind shear) and the large-scale circulation pattern that steers them are all affected. There are also implications for the precipitation and coastal flooding associated with TCs, included in Table 4.

**Table 3:** Summary of climate change impacts on tropical cyclones (TCs).

TC Characteristic	Climate Change Impact	Scientific Confidence	Impact on Loss
Overall frequency	Different climate models project both increases and decreases in the frequency of TCs.	Low confidence	Unclear
Proportion of intense TCs (category 4-5)	Warmer oceans provide additional fuel for TCs, raising the proportion of the most intense storms.	Medium confidence	Increase in the loss for the most severe events.
Areas affected	Changes in large-scale circulation and warmer oceans mean TCs can survive further north.	Medium confidence	Increased risk for South Korea and Japan.

Source: Guy Carpenter



### Climate Change Impacts on Flooding

The impact of climate change on floods is complex. Intense rainfall has a relatively direct link to surface water flooding, and therefore the climate change impact is generally well understood. In contrast, the response of river flooding to precipitation is dependent on a large number of factors, including soil moisture, temperature, snowmelt and catchment characteristics, and therefore changes are harder to predict and highly regional.

**Table 4:** Summary of climate change impacts on flood

Flood Characteristic	Climate Change Impact	Scientific Confidence	Impact on Loss
Flash flooding—intense rainfall, including rainfall associated with TCs	An increase in the moisture-holding capacity of the atmosphere leads to increases in extreme rainfall.	High confidence	Significant increase in surface water flood losses for most regions.
Riverine flooding—total rainfall and evaporation	Intensification of the hydrological cycle increases global rainfall, leading to increases in most regions. Evaporation also increases, lowering soil moisture levels, which can increase and decrease flooding.	High confidence in global increase Moderate confidence associated with the regional impacts	River flood losses are expected to increase in the majority of areas within Mainland China, Hong Kong, Japan, South Korea and Taiwan.
Storm surge from TCs	Rising sea levels and an increased risk from a higher proportion of category 4-5 TCs.	High confidence	Higher losses for any storm-surge-exposed region, and possibility of new areas at risk.

Source: Guy Carpenter

## Quantifying your Climate Change Physical Risk

There are a growing number of reasons for quantifying your climate change risk:

- Responding to regulatory requests.
- Representation of risk to third parties—for example, credit rating agencies, investors or reinsurers.
- Making a TCFD-aligned climate disclosure.
- Incorporating climate change into risk management, pricing and capital decisions.

The type of risk assessment to carry out will be dependent on the use case. Important questions to consider before making any climate change assessment include the following:

- Is a qualitative or quantitative assessment required?
- What scenarios are of interest? This could be a specific emissions pathway and time horizon, for example SSP5-8.5 in 2050, or instead a global warming level scenario, for example 1.5°C.
- Do you require an assessment of whether existing climate change is adequately represented in your current view of risk?
- What form of data is required to embed the climate change assessment in your existing decision-making processes?

Guy Carpenter is helping our clients address these questions and quantify their climate change physical risk through a variety of methods. For the quantification of the risk, Guy Carpenter has developed proprietary tools ranging from underwriting and accumulation layers to adjustments to third-party catastrophe models and in-house probabilistic models developed for climate change. Furthermore, we have a broad overview of market practices that can help clients benchmark their own activities.

We have model adjustments that provide a fully probabilistic climate change assessment for inland floods. In addition, for Japan, we also have a tropical cyclone model adjustment.

## Conclusions

An improved scientific understanding of how perils are changing and an increasing number of regulators exploring climate-related disclosures means quantifying your climate change risk has never been more important. Doing so may also help avoid unexpected loss from evolving tropical cyclones and flood risk. It is also important to be aware that climate change may not be the most significant driver of changes in loss for your portfolio. Other factors, such as natural variability and inflation, should be properly considered to inform risk management, pricing and capital decisions.

### About Guy Carpenter

Guy Carpenter & Company, LLC is a leading global risk and reinsurance specialist with 3,400 professionals in over 60 offices around the world. Guy Carpenter delivers a powerful combination of broking expertise, trusted strategic advisory services and industry-leading analytics to help clients adapt to emerging opportunities and achieve profitable growth. Guy Carpenter is a business of Marsh McLennan (NYSE: MMC), the world's leading professional services firm in the areas of risk, strategy and people. The Company's more than 85,000 colleagues advise clients in 130 countries. With annual revenue of over \$20 billion, Marsh McLennan helps clients navigate an increasingly dynamic and complex environment through four market-leading businesses including Marsh, Mercer and Oliver Wyman. For more information, visit [www.guycarp.com](http://www.guycarp.com) and follow us on LinkedIn and Twitter.

Guy Carpenter & Company, LLC provides this report for general information only. The information contained herein is based on sources we believe reliable, but we do not guarantee its accuracy, and it should be understood to be general insurance/reinsurance information only. Guy Carpenter & Company, LLC makes no representations or warranties, express or implied. The information is not intended to be taken as advice with respect to any individual situation and cannot be relied upon as such. Statements concerning tax, accounting, legal or regulatory matters should be understood to be general observations based solely on our experience as reinsurance brokers and risk consultants, and may not be relied upon as tax, accounting, legal or regulatory advice, which we are not authorized to provide. All such matters should be reviewed with your own qualified advisors in these areas.

Readers are cautioned not to place undue reliance on any historical, current or forward-looking statements. Guy Carpenter & Company, LLC undertakes no obligation to update or revise publicly any historical, current or forward-looking statements, whether as a result of new information, research, future events or otherwise. The trademarks and service marks contained herein are the property of their respective owners.