Gallagher Re

The Weakest Link?

The impact of climate change on supply chains

COP28

Executive Summary

- Extreme weather events have exposed the fragility of global supply chains, with more than 50% of businesses reporting disruptions or delays to their production networks due to such conditions, according to one recent survey. The turmoil caused by COVID-19 and war, while unrelated to climate change, also illustrates the global economy's vulnerability to systemic shocks.
- Catastrophes are only one aspect of risk — increasing temperatures, rising sea levels, and many other effects are likely to lead to chronic, or stepwise impacts, with subsequent impacts on costs across supply chains.
- An unfortunate compounding factor is that many of the renewable-energy industries we depend upon to reduce and ultimately halt greenhouse gas emissions are themselves reliant on supply chains vulnerable to the effects of climate change.
- Businesses can address such concerns through deep mapping and risk analysis of their supply chains; a process they may already be familiar with thanks to a combination of regulatory pressure and the environmental, social and governance (ESG) agenda. Many firms may lack the resources to undertake this internally, but risk modelers in the insurance industry can help provide the necessary tools.
- As well as helping to identify concentrations of supply in risk-exposed regions, this analysis can also price the risk and secure the keenest terms in the (re)insurance market for business interruption cover — potentially through innovative new insurance products, such as parametric solutions.
- Companies are not the only actors involved. Many global supply chains depend upon service-critical transport and logistics infrastructure, much of which is publicly owned and/or managed. Governments and other public agencies can also draw upon this insurance-sector expertise in modeling and advisory work to improve its resilience.
- The changing nature of extreme events under global warming is difficult to predict, so the insurance industry's role in providing contingent business interruption cover has never been more crucial — insuring existing businesses against loss, but also providing increased security to those providing the capital needed for investment.

Holding the global economy together

Growing international trade has been crucial to the development of the world economy over the past century and has shaped business strategies, directed capital flows, and raised living standards for ordinary citizens across the globe.

Underpinning this prosperity[1] is a complex web of supply chains; the networks of companies and people that take raw materials, components and goods, and assemble them into products for sale to consumers. But as these networks have become more intricate and globalized over time, their fragility has also been exposed. Their links have been eroded by simmering trade wars and more directly damaged during outbreaks of armed conflict, such as the imposition of severe economic sanctions on one of the world's significant economies, Russia, due to its ongoing invasion of Ukraine.

In addition, COVID-19 dealt a particularly acute blow to supply chains. The onset of the pandemic led to a 15% drop in global trade in merchandise in the second quarter of 2020, compared to the same period 12 months earlier, according to the World Trade Organization.[2] The decline was short-lived, but the scale of disruption it caused has concentrated the minds of business and industry. It revealed the extent to which they are vulnerable to supply chain disruption.

By contrast, the challenges imposed by climate change represent a more systemic, long-term threat. Some of the risks are intuitively obvious, such as weather events that destroy harvests or wash away railway lines. But the full picture is more complex. For example, the transition to a low-carbon economy will create new supply chains with dependencies and risks of their own. Meanwhile, companies across many industries should also plan for significant changes to working conditions and practices — such as increased requirements for air conditioning in offices, for example, or the provision of sunscreen or shaded rest areas to outdoor workers in agriculture or construction.

For the (re)insurance industry, the main route by which supply chain problems lead to losses and claims is under Contingent Business Interruption (CBI) coverage. Standard BI coverage insures the business itself against financial losses caused by an interruption to its operations from an event such as a natural disaster. CBI coverage, typically offered as an extension to the BI portion of a property insurance policy, extends that protection to losses arising from similar events affecting suppliers.[3]

Anticipating, mitigating, and adapting to these risks will require a detailed understanding of how both current and future supply chains work in practice, combined with sophisticated risk analysis and modeling.

Supply chains are feeling the strain

Overt physical risks to supply chains are now a familiar feature of climate change. For its 2022 Climate Risk Report, the Business Continuity Institute surveyed 284 businesses across 52 countries and found 50% had experienced disruptions or delays in supply chains due to severe weather events.[4] A third had stockpiled goods to cope with these disruptions and a further third had to pay higher prices to source goods from an alternative supplier. At the far end of the spectrum, 8.8% had experienced a supplier going into liquidation because extreme weather had destroyed their business.

Elsewhere, the Texas Freeze of February 2021 caused the biggest energy blackout in US history. As well as causing rail service suspensions, the blackout forced the temporary closure of two semiconductor plants. These closures coincided with a shortage of semiconductors in the global market due to COVID-19 lockdowns in China and Taiwan.

The risk of similar climate-related interruptions to supply chains is rising. The consultancy McKinsey & Company has conducted research into the risk of hurricanes in East Asia interrupting semiconductor production and has suggested disruptions could be two to four times more frequent by 2040.[5] The same research also examined the supply of rare earth metals, which are concentrated in southeast China, where heavy rainfall is a key climate risk. Due to climate change impacts on intense rainfall, the McKinsey analysis suggested that by 2030, the probability of severe disruption to rare earth supply could increase by a factor of two to three.

Business interruption has become one of the most significant concerns of industry, a view reinforced by the COVID-19 pandemic. Allianz conducted an annual survey of risk professionals across 94 countries, and found that 34% of them identified business interruption as the most concerning risk in 2023, placing it second (behind cyber incidents).[6]

One way in which companies have sought to mitigate supply chain risks has been the near-shoring or onshoring of supply. Such strategies can be effective, but because some raw materials are only available in certain countries, many supply chains are likely to remain global.

James Hargreave, director and data solutions practice lead at Moody's, explains, "When you go back down a supply chain, a lot of raw materials are sourced from a limited area — for example, 70% of the world's cobalt comes from the Democratic Republic of the Congo. Let's say you exit a relationship with a supplier in Taiwan and source from factories in your home country; the raw materials that you need may well be coming from the same place that the supplier in Taiwan was using, so the supply chain risk is the same. In fact, the new supplier might have different ways of doing things, which could affect the quality and consistency of materials or could change the reliability of shipping, adding additional risks to the supply chain."

A prudent assessment of risk requires an extensive mapping of supply chains. Many executives will already be familiar with deep supply-chain audits thanks to the efforts of regulators and environmental, social and governance (ESG) campaigners. These stakeholders have put pressure on businesses to address a range of ESG risks in their supply chains, from carbon emissions and human rights violations to the risk of international sanctions. Physical climate risk adds further pressure and will make sophisticated supply chain analysis an essential feature of business in the years ahead.

Case study: Toyota's preparedness for disruption

The earthquake that hit Japan in 2011 dealt a blow to supply chains across the country, including leading automotive manufacturer, Toyota. In response, Toyota carried out a deep analysis of its supply chains,[7] asking its tier-one suppliers (suppliers that provide products directly to Toyota) for details of their suppliers (i.e., Toyota's tier-two suppliers). In this way, the company pushed as deep as possible into its full network of supply connections. The investment in this analysis paid dividends when COVID-19 hit, once again causing major disruptions to the company's supply chains. Toyota was able to identify its potential shortages earlier than its rivals and act more quickly to adapt. Toyota was far from immune to the disruption, but it was more resilient than many. In the future, this kind of comprehensive supply chain analysis could be directed at identifying physical climate hazard risks, such as supplier factories based in regions exposed to an increased chance of flooding.

Such detailed mapping of supply chains is a major undertaking, particularly for companies that lack the commercial scale and influence of a multinational. The further a company tries to reach along a supply chain, the less ability it has to extract detailed information. In the case of privately owned suppliers, public data may be elusive or nonexistent.

This is one area where advisory groups working in tandem with the insurance industry can bridge the gap. One example of this is a supply chain modeling system developed by risk consultancy Moody's, which works directly with shipping data suppliers to map directly how goods are transported and the various stop-off points along the way. The result is a dynamic geographic map of supply chains.

Hargreave explains, "Historically, we provided clients with access to a database of company information. Typically, while they know the companies they directly work with, there are gaps (further down the chain). The requirement to look at supply chains has increased massively — not just the companies you work with but also the businesses they work with. That has been a challenge because that data is not available. But, due to the advancements that we've made in the last year or so, we can help our clients map out their supply chains more fully. This detailed visibility allows us to provide insights into potential risks within these supply chains, creating an opportunity for our customers to proactively manage and mitigate these risks."

Gallagher Re has reviewed supply-chain risk modeling products from Moody's Risk Management Services (RMS) division and from its competitor Verisk, which uses AIR's supply-chain exposure database. At present, the available models are provided only on a consulting basis.

This is a complex risk to model — even for non-climate perils, such as terrorism or pandemic — because providers need to analyze the ways in which companies in the supply chain are themselves interdependent on one another. Gallagher Re is also exploring the use of a newer offering from a digital technology called One Concern, which is building a digital product suite that aims to map physical infrastructure, its connectivity, and vulnerability to disaster. By mapping connection points to the electrical grid, for example, it can consider the increased vulnerability of a company's property to the risk of a power outage — something not captured in traditional cat models.

The second stage is to add on climate change risk analysis, exploring how current patterns of extreme events are shifting in a warming world. There are many climate-risk tools available from several providers; some are commercial, while not-for-profit resources are also available, such as the Climate Impact Explorer from Climate Analytics, which is supported by philanthropic organizations and the German government.

Gauging the full spectrum of supply chain risks

Climate change is likely to increase the risk of major catastrophes — severe storms, floods, and so on. But a more insidious problem for supply chains may just be a rising cost of doing business due to rising heat stress, more unusual adverse weather, or water shortages, for example. These effects may not interrupt supply but can nevertheless threaten businesses' sustainability as suppliers pass increased costs through to buyers.

These risks are extraordinarily complex to model and in many cases lack precedent, but nevertheless are a major threat, according to Claire Souch, head of global models and climate risks at Moody's RMS.

"We look at the classical physical risks — such as flooding, tropical storms, hurricanes, and so on — that have direct physical impacts. But we're also looking at some more subtle things, such as heat stress and water stress. Heat stress can have less obvious impacts on supply chains. If you are dependent on suppliers located in regions where heat stress is going up significantly, their costs of dealing with that stress will go up too. So, there is the risk from physical impacts, such as materials just not getting through, but there are also significant risks from costs feeding through to businesses from suppliers affected by climate change. Very few people have a real grasp on that second type of impact," says Souch.

Insuring the risk

For insurers, covering the risk of business interruptions arising from supply chains is not without its challenges. In an article[8] published alongside the 2022 edition of Allianz's risk survey, Philip Beblo, property industry lead at Allianz Global Corporate & Specialty, observed that at that time, "Capacity for large business interruption and contingent business interruption risks is currently limited, especially where there is a lack of transparency. The better the transparency and data, the more meaningful capacity that we, as insurers, are able to provide. We still see clients where their mapping of supply chain risk is not as detailed as it should be." year later,[9] Allianz's survey again concluded, "Many companies have yet to improve supply chain transparency or are unable to provide good quality data."

These data issues, in turn, feed through to the reinsurance market. Gallagher Re has observed this year that reinsurers have been particularly reluctant to accept CBI risks where suppliers are not named. Reinsurers have also been asking keen questions about cedants' underwriting policies, the extent to which sub-limits are applied, and even specific queries like whether the policies include Thailand flood exposure (following the 2011 Thai floods; see next section).

The requirement for more and better data is a common thread that runs through both parts of the insurance industry, helping cedants answer queries on their exposures and reinsurers to build confidence. That can then also feed more sophisticated modeling and analysis, which then results in more innovative (re)insurance solutions.

Gallagher Re expects to see increasing use of parametric cover — which pays out as soon as a named event occurs, as opposed to asking clients to demonstrate a loss. This can be a standalone product or deployed as part of a hybrid coverage model. And such innovation in coverage can also help unlock alternative forms of finance to back the policies, such as insurance-linked securities (ILS).

Transition supply chains

The process of transition is itself a focus of supply chain risk. In an unfortunate irony, renewable energy projects' supply chains are no less vulnerable to climate-related hazards in general, and the risk is compounded by the concentration of some green industries in particular places.

Natural disasters that affect industrial production can have consequences that spread far beyond the affected country's borders. In the summer of 2021, large-scale floods that hit Henan province in central China — including the provincial capital Zhengzhou — caused widespread disruption to supply chains for coal, cars, and electronics.[10] A less recent but no less significant example is the protracted flooding that hit Thailand in 2011, which battered the country's industrial production. This had a significant effect on global supply chains, particularly in the electronics sector.[11] The UN Office for Disaster Risk Reduction (previously known as UNISDR) estimated that these floods reduced world industrial production by 2.5%.[12]

With insured losses of USD20 billion in today's dollars, according to Gallagher Re estimates, the Thai floods rank as one of the costliest-ever flood disasters for the global (re)insurance industry. CBI claims contributed significantly to the total.[13] The growth and success of the country's manufacturers had led to a high concentration of risk and much larger losses than insurers expected. Researchers at Swiss Re[14] concluded, "The experience has led to changes in the global (re)insurance industry, from more accurate flood risk modeling to a better understanding of emerging market and supply chain risk."

While many factors contribute to flood risk, the long-term warming of the atmosphere due to climate change makes extreme rainfall events more likely. The same dynamic applies to most natural disasters — while it is difficult to attribute any one particularly severe hurricane, hailstorm, or drought to the process of climate change, such events are nevertheless more likely in a warming world.

So the geographic concentration of industries vital to renewables production is a real cause for concern. The situation is particularly acute in solar power, where China produces close to 95% of some of the key building blocks for photovoltaic panels, according to the International Energy Agency.[15] The country's Xinjiang province alone accounts for around 42% of the worldwide supply of one important input material, polysilicon.

This concentration of supply sources is clearly a significant risk. In 2020, explosions at factories in China owned by GCL-Poly Energy dealt a blow to polysilicon supplies, causing the global price to rise by 56%.[16] While this disaster was unrelated to climate change, it is not difficult to imagine a flood or extreme wind event having similar knock-on effects.

Robert McMillan, Renewable Energy practice leader at Gallagher Re, points out that such risks are especially challenging for projects with longer timelines for completion, notably offshore wind.

"There is very little fat on these projects and a supply chain breakdown can kill companies. I know of one offshore project that faced supply problems during the pandemic. Some of the companies involved had to ask themselves whether they could continue with it. Some companies ended up taking on the cashflow problems of the others so the project could stay above water," says McMillan.

To tackle such risks before they emerge, companies can turn first to the supply chain mapping and modeling referred to above. This process is essential to understand how those risks can be mitigated — most effectively through the diversification of supply.

And it will also help assess the financial impact of any disruption to the business, which in turn will help price the risk for insurance (and reinsurance) purposes.

Strategic adaptation: A public-private partnership

The adaptation of public infrastructure at the national or city level will require coordination and partnership between the public and private sectors, likely including a blend of financing between the two. Emerging economies, which face some of the greatest risks from climate change, also have the greatest requirements for capital to finance the net-zero transition.

One of the most significant outcomes of the COP27 gathering in 2022 was the proposed creation of the USD100B loss and damage fund, through which developed nations would help developing countries address the effects of climate change. A transitional committee has been working since March 2023 to draw up the rules for the fund, and a final deal on its terms was finally struck in early November, ahead of the COP28 gathering in Dubai.[17]

What is clear, however, is that assistance for loss and damage must be integrated with efforts to make these economies more resilient to the effects of a changing climate, as well as their own transition to sustainability.

Antoine Bavandi, global head of Public Sector, Parametric & Climate Resilience Solutions at Gallagher Re, explains, "Many emerging economies such as Pakistan, Bangladesh, or Somalia are being affected by brutal and recurring events such as droughts or floods. They should rightly be eligible to some funding from development partners and donors that will go into investment to adapt. But those risk-reduction investments will never eliminate the risk of a major climate event altogether."

He continues, "You really need to combine adaptation and resilience investments here, that is, risk reduction and insurance, to address the scale and broader nature of the risk more effectively. This leads to strategic and political questions about the spending priorities of those governments, and crucially, about the most effective role of private sector insurance in the bigger picture."

Bavandi also suggests that this is where the (re)insurance industry can contribute its expertise.

He says, "To answer these questions, countries will need decision-making support, powerful cost-benefit analysis capabilities, and robust financial risk management frameworks. As an insurance and reinsurance broker and risk advisor, which sits at the top of the risk transfer value chain and is exposed to both public and private sector clients, that is Gallagher's core business and niche expertise."

Strategic financial analysis at country and regional levels is one of the main services offered by Gallagher Re's Public Sector, Parametric & Climate Resilience Solutions practice. The practice aims to help authorities assess risks and mobilize public and private sector investment, as well as identify any insurance solutions.

The (re)insurance sector is ideally placed to provide such advisory services; doing so is both a responsibility and an opportunity for the industry as a whole.

Insurance can strengthen the chain

International trade has been a major contributor to economic growth over many decades, and longer supply chains have been a crucial element in that success. But as the world's climate shifts out of balance, its resilience is increasingly likely to be tested.

Even the urgent demand for investment in renewable energy itself depends upon newly developed supply chains, which bring added risks of concentration in climate-vulnerable areas.

The insurance industry is ideally placed to address this challenge. The modeling required to assess direct physical climate threats to businesses needs to extend further into supply chains. Those models will need to be global to allow businesses to understand the full extent of their exposure.

The insights that insurers, reinsurers, brokers, and associated third-party risk analysis companies can provide will be essential in two ways. Firstly, they will be vital to companies' strategies for adapting and enhancing the resilience of their businesses. And secondly, their analysis will support the pricing and purchase of financial protection. Because risk can never be wholly eradicated, the insurance industry's role in providing CBI cover has never been more crucial — insuring existing businesses against loss, but also providing increased security to those providing the capital needed for investment.

The fragile web of supply chains that crisscross the globe is itself a reminder that climate change and its effects can only be successfully tackled if doing so is a shared endeavor.

Contributing authors

Antoine Bavandi
Global Head of Public Sector, Parametric & Climate Resilience Solutions, Gallagher Re

Dr. Marie Ekström
Divisional Director, Climate and ESG, Gallagher Re

Robert McMillan
Renewable Energy Practice Leader, Gallagher Re

References

[1] "Globalization Enabled Nearly All Countries to Grow Richer in Recent Decades," Peterson Institute for International Economics, June 2022

[2] "World Trade Primed for Strong but Uneven Recovery After COVID-19 Pandemic Shock," WTO, March 2021

[3] "Contingent Business Interruption Insurance: Key Considerations for Manufacturers," Gallagher, 2022

[4] "BCI Extreme Weather and Climate Change Report 2022," Business Continuity Institute, 2022

[5] "Could Climate Become the Weak Link in Your Supply Chain?," McKinsey & Co, August 2020

[6] "Allianz Risk Barometer 2023, Allianz," January 2023

[7] "Toyota, Citing Lessons Learned from 2011 Earthquake, Expects No Major Semiconductor Impact," Supply Chain Dive, May 2021

[8] "Allianz Risk Barometer 2022 — Rank 2: Business Interruption," Allianz, January 2022

[9] "Allianz Risk Barometer 2023," Allianz, January 2023

[10] "From Coal to Cars, Chinese Floods Tangle Supply Chains," Reuters, July 2021

[11] "Thailand Floods May Affect Global Electronics Production," PC World, October 2011

[12] "Flood Risks and Impacts: A Case Study of Thailand's Floods in 2011 and Research Questions for Supply Chain Decision Making," Masahiko Haraguchi and Upmanu Lall, ScienceDirect journal, December 2015

[13] "Lloyd's Faces Third-Biggest Loss From Thai Flood," Reuters, February 2012

[14] "The World's Costliest Flood: the 2011 Thailand Flood, 10 Years On," Swiss Re, September 2021

[15] "Solar PV Global Supply Chains," International Energy Agency, July 2022

[16] "Polysilicon Price Soars After Blasts at Key Chinese Plant," *Financial Times*, August 2020

[17] "'Loss and Damage' Deal Struck to Help Countries Worst Hit by Climate Crisis," *The Guardian*, November 2023

Learn more about our client-focused, collaborative approach.
Connect with us today at **GallagherRe.com**.

It's the *way* we do it.

Gallagher Re