



Climate resilience: **Five steps to strengthen** **supply chains**



Introduction

In today's interconnected and volatile world, supply chain risks are on the rise. Raw material shortages, tougher regulatory regimes, armed conflicts, IT breakdowns and cybercrime have all tested supply chain resilience and adaptability.¹ And while disruptions like the COVID-19 pandemic may be officially over, climate change will ensure supply chain disruption stays at the top of every business executive and risk professional's corporate agenda for decades to come.

The impact of climate-related disasters is already extensive. Marsh McLennan analysis shows that the number of flood disasters has increased by 181% worldwide since the 1980s.² Heatwaves are becoming more common and wildfires more devastating, scorching almost 23 million acres³ of land in 2021, according to a report from the World Resources Institute using data from University of Maryland research — a number that is likely to be exceeded in 2023, as record wildfires across the globe are leaving a trail of destruction. In Canada alone this year's wildfires have burned a record-breaking 20 million acres across the country — 21 times above the average over the last decade.⁴ The World Economic Forum's Global Risks Report names "Natural disasters and extreme weather events" as the second-most severe risk over the next two years.⁵ As these events become more frequent and widespread, the cost to business from supply chain disruption is increasing. Exhibit 1 summarizes some of the most prominent recent supply chain disruptions and their consequences.

1 Oliver Wyman: Supply Chain Risks Are Magnifying in an Uncertain World. See [here](#).

2 Based on decadal averages. See [here](#).

3 The Brussel Times. See [here](#).

4 BBC News. See [here](#).

5 World Economic Form: The Global Risks Report 2023. See [here](#).

Exhibit 1: Selected recent examples of supply chain disruptions

Disruption	Industry	Supply chain impact
Ongoing Canada wildfires (Canada 2023) Wildfires spread across Canada with over 8.1 million hectares (20 million acres) of land burned including rail tracks. Total insured losses are expected to exceed the \$4.3 billion faced in 2021. ¹	Oil and gas	Forced to halt production of at least 280,000 barrels of oil per day ²
	Transportation	In 2021, wildfires damaged tracks halting train shipments, creating a bottleneck of exports and a backlog at Vancouver port with 96 hour delays ²
Storm Uri, "Texas Big Freeze" (USA, 2021) The storm delivered an unprecedented and prolonged arctic wave of freezing temperatures, ice and snow to energy assets resulting in power blackouts. The damage was estimated to \$15 billion in insured losses. ⁶ Samsung alone incurred losses over \$270 million after closures. ⁷	Automotive	Shortage of chemicals used to make seats delayed production and Toyota and General Motors were forced to close facilities for over 2 weeks
	Pharmaceuticals	36% decline in pharmaceutical shipments above overall industries ⁴
	Oil and gas	Natural gas supplies curtailed by more than 50% leading to 10x price increases ⁵
	Electricity	Loss of 40% grid capacity resulting in price spikes to \$9,000/MWh ⁵
European droughts: Rhine River (Germany, 2018) Rhine River impacted by ongoing drought and heatwaves, impacting shipping routes. Estimates suggest a 0.5% decrease in Germany's GDP due to resulting supply disruptions. ⁸	Power	Reduction in water storage limited the generation of hydropower and nuclear power due to cooling system dependencies
	Agriculture	Limited water supply for live stock and crops, in some cases resulting in crop failure
	Oil and gas	Reduction in transport of goods led to production decline at various oil refineries including Shell
	Chemicals and metals	Disruptions to shipping traffic forced cuts to production for chemical manufacturer BASF and steel producer ThyssenKrupp
Hurricane Ian (USA, 2022) Caused extensive damage to housing and infrastructure across Florida and the Carolinas. Preliminary insured losses are estimated to USD50–65 billion⁹, production losses at \$1 billion¹⁰	Aerospace, automotive, chemicals, plastics, pharmaceuticals	Flooding and infrastructure damage affected some of Florida and the Carolina's ~10,000 production facilities; Boeing (closed for 3 days) and Volvo were amongst the affected facilities
	Agriculture	Extensive rain flooded agricultural lands and damaged infrastructure, irrigation systems and machinery
Henan Floods (China, 2021) Flooding in central China as a result of heavy rainfall caused estimated losses (RMB) of 4.7 billion. ¹¹	Automotive	Nissan automotive manufacturing plants forced to close for a number of days whilst SAIC Motor faced severe logistics impact

— To manufacturing/production — To shipping routes

Sources: 1. BBC News; 2. Off Shore technology; 3. Deringer; 4. Outsourcing Pharma; 5. American Institute of Chemical Engineers; 6. SwissRe; 7. The Verge; 8. Reuters; 9. SwissRe; 10. WGPU News; 11. Guy Carpenter

Recent disruptions shown in Exhibit 1 are just part of the story. Worldwide, the costs of climate-related disasters as a share of gross domestic product (GDP) have increased by more than 50% since the 1980s⁶ and will continue to increase as global temperatures rise. Guy Carpenter estimates that climate change will likely be responsible for further increases in losses over the coming decade and beyond.⁷ The Marsh McLennan Flood Risk Index shows how the impacts of climate change on infrastructure are already visible and set to grow over time, with power plants, international airports, and international ports under strain. This underlines that climate change is a risk multiplier, triggering cascading impacts across supply and value chains.⁸ Given these trends, it is no surprise that a recent Oliver Wyman survey of European executives found supply chain disruption among their top five concerns, alongside inflation and rising energy prices. Despite this, three out of four experts believe supply chain disruption preparedness to be insufficient, according to this year's Global Risks Report from the World Economic Forum.⁶

In this new normal, many companies, especially those in industries with particularly high supply chain risk exposure (e.g., Automotive and Manufacturing, Energy and Utility or Retail and Wholesale),⁹ must prioritize and act on supply chain resilience. Here are five steps that will help begin the effort:

1. Create a transparent supply chain, especially when it comes to climate- and nature-related risks

It seems obvious, but a stunning 82% of businesses do not have full visibility into their supply chain and logistics operations.¹⁰ Few can see beyond their first tier of suppliers, yet the biggest disruption risks often reside in the second and third tiers.

Achieving full visibility is far from straightforward, however. Getting suppliers to complete surveys can

be incredibly time-consuming and will likely still only result in partial information that soon goes out of date. A common challenge cited by supply chain managers is that suppliers may be reluctant to provide data about their own suppliers for fear of being disintermediated. While new analytical solutions are emerging to help companies map supply chains, the results still require rigorous verification.

Our work with clients has shown how innovative, AI-based analysis based on shipping and customs data combined with remote sensing and open-source intelligence can achieve comparable levels of supply chain visibility to survey-based approaches in a small fraction of the time, shortcutting a painful 18+ months process.

2. Uncover hidden vulnerabilities by asking “what if”

Mapping the supply chain can reveal critical vulnerabilities, exposing less-visible nodes that, if impacted, have the potential to disrupt downstream production or trigger wider brand and reputational consequences. Beyond mapping, the exercise requires a deep-dive evaluation to identify the nodes on which revenue continuity most depends.

Examples include suppliers for which there are limited alternative options or that are dependent on critical infrastructure, such as roads or waterways, which could act as logistical chokepoints if they became unusable. Bloomberg reported that the 2022 drought on the Mississippi River could have resulted in a \$20 billion economic loss involving food, wood, coal, and steel supplies. Our work with an automotive company identified a high-risk exposure at a tier 1 supplier of a critical component where a disruption would have resulted in significant production downtime, as the part was used early in the assembly process and the supplier could not be replaced easily due to regulatory constraints.

⁶ Based on analysis of EM-DAT data. For more information on EM-DAT See [here](#).

⁷ Guy Carpenter: Climate change and the industry: Where do we stand today? See [here](#).

⁸ Marsh McLennan: Staying Above Water, 2023. See [here](#).

⁹ Oliver Wyman Analysis.

¹⁰ Estimate based on cross-industry benchmarking data from the American Productivity & Quality Center (APQC). See [here](#).

Regulation and brand constraints frequently limit optionality and tie companies to key suppliers or production regions. For example, labelling and provenance-based marketing in the food and beverage sector can leave companies critically dependent on climate-exposed suppliers. This scenario applied to a Florida orange juice producer when extreme weather forced it to source juice concentrate from Mexico, which went against its marketing strategy and claims on packaging.

3. Use the right tools to assess risks

At any one moment, there will be multiple threats with the potential to shut down activity and paralyze downstream production. There are climate-related perils, such as flood, storm, extreme temperature, wildfire, and drought; geophysical threats from events such as earthquakes or tsunamis; and man-made hazards, such as war and other geopolitical instability or cyberattacks.

Because they are evolving, climate-related risks need to be understood in current and future terms. What is an acceptable likelihood of a flood event today may become unbearable in 10 years. This longer-term view of risk is important not just for risk management, but also supply chain strategy.

This diversity of risk is a challenge for risk managers. Disparate data sources are hard to collate, harder to compare, and even harder to aggregate. Converting different risk data into a common currency, such as a standardized score or financial metric, can support decision-making and simplify risk management.

Scoring risk can provide a basic level of insight about the level and nature of risk at critical vulnerabilities as well as providing points of comparison and weighting. At a more advanced level, risk modelling techniques can be used to stress test the supply chain and estimate potential financial impacts in terms of damages, downtime, and revenue loss. For example,

our work to quantify flood risks in the supply chain of an automotive client revealed how over 90% of revenue at risk was driven by seven critical suppliers, several at lower tiers. Understanding concentration of risk exposure proved crucial in informing mitigation options for this client, who prior to this tech-driven mapping and quantification exercise had no visibility beyond tier 1.

4. Pre-empt risks through mitigation

History shows how businesses that proactively manage supply chain risks hold a competitive advantage. Global supply chains are often dependent on regional hubs where suppliers of a key component or material are clustered. For instance, consider the impact of COVID-19 on semiconductor factories in Taiwan and electric vehicle battery manufacturers in Eastern China, which led to shutdowns of assembly lines in the United States. When disaster strikes, companies that have taken action to mitigate risks suffer less disruption and are quicker to recover, providing them with an opportunity to seize market share while competitors struggle to get back on their feet.

Companies can work with suppliers or local authorities to reduce risk near supplier facilities by investing, for example, in flood prevention or reinforcement of buildings and infrastructure.

Risk assessments and resilience measures can be introduced into supplier-selection criteria. Preparedness measures can include real-time monitoring and early warning systems, recovery plans for critical suppliers, and contingency plans for alternative supply lines.

Quantification of risks allows companies to establish their appetite for operating with risk, define thresholds, and optimize risk management strategies by comparing the cost of different measures to the reductions in risk that they offer.

5. Transfer risks where possible

Risk transfer can supplement risk reduction. For some vulnerabilities, it may not be possible or practical to reduce the risk to an acceptable level. In these cases, it may make sense to transfer the risk.

Historically, this hasn't always been easy. While companies can buy business interruption insurance to protect against revenue losses arising from damage to their own operations, it's more difficult to secure coverage against losses from damage suffered by upstream suppliers. This becomes even more complicated when the business interruption involves suppliers beyond the first tier.

The key is to identify the level of exposure to various suppliers, understand the most material hazards at those facilities, quantify the level of risk, and work with brokers to develop a risk transfer program.

In addition to contingent business interruption, parametric insurance can be designed to protect companies against specific supply chain risks. For example, we worked with an agribusiness to develop a parametric solution to protect its revenue from transportation disruptions. The company depended on US waterways to transport grain, which exposed it to periods when the waterways might become unnavigable because of drought or flooding. The solution was a parametric cover with pay-outs tied to water levels and revenue at risk.

Marsh McLennan's experience working with clients has shown how these five steps are fundamental to supply chain resilience and that success rests upon effective collaboration across business functions, including Supply Chain, Procurement, Risk Management and Strategy. In a world that is heating up, supply chain resilience is a competitive advantage.

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