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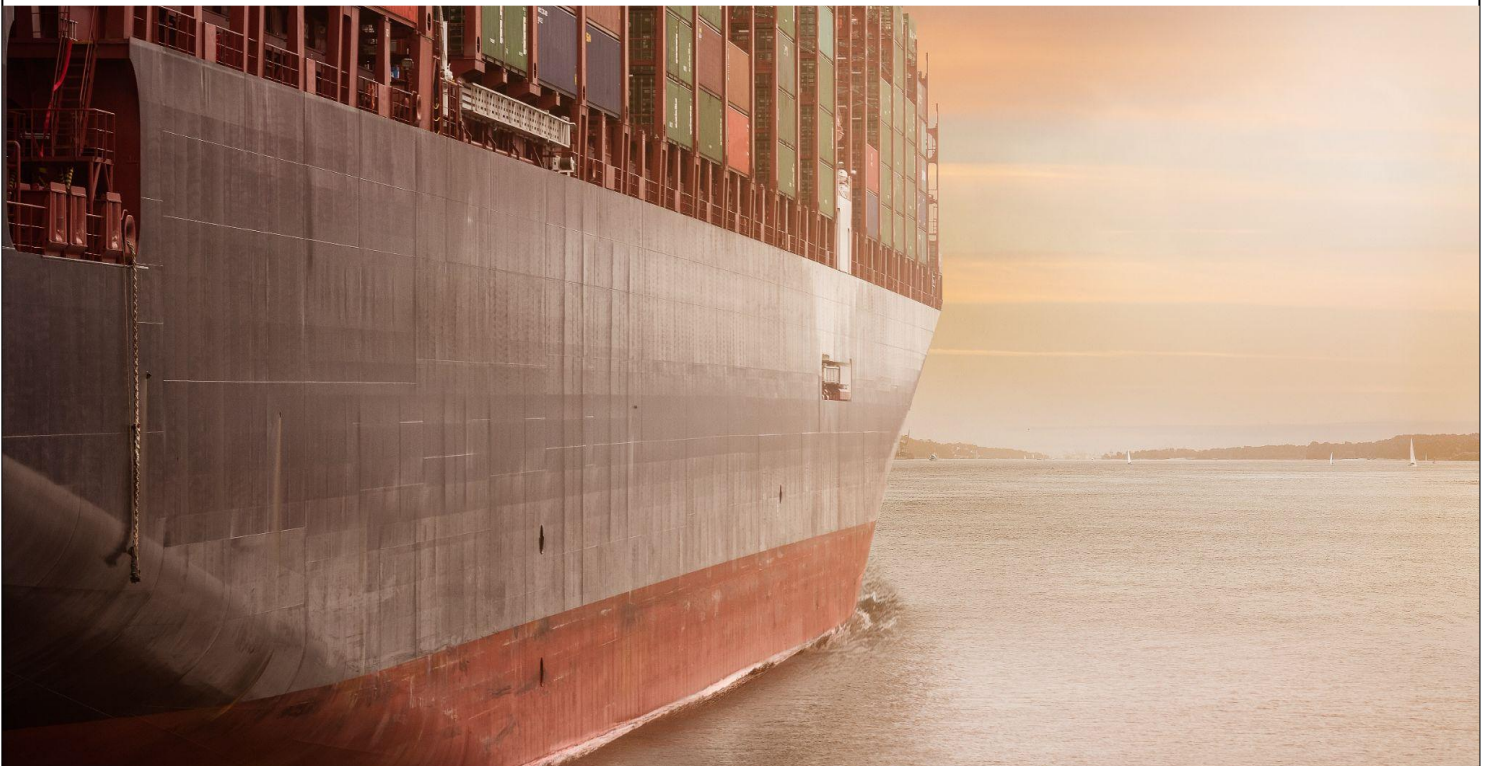   Innovation Company.

Tokio Marine
Innovation Lab
London

Managing Global Supply Chain Risk

Strategic report in collaboration with
**Tokio Marine Innovation Labs,
London**

SOSƏ

Foreword

DALJITT BARN
GLOBAL HEAD OF
CYBER RISK, TMHD

Every business has a supply chain, that is without doubt. As global insurers, Tokio Marine Group strives to understand those supply chains to help our clients better manage their risks to remain agile within their market. Existing supply chain insurance coverage is well understood by buyers, but it's primed for disruption. With business being more connected than ever, and data being omnipresent, all insurers have the opportunity to address evolving business models and tailor their solutions accordingly.

We will undoubtedly see more innovation in the supply chain with insurance triggers such as parametric, challenging traditional claims made / occurrence based insurance – especially with the increase of losses from secondary perils (related to natural catastrophe). Alongside this change, coverage and pricing are being influenced more than ever by technological advancements in AI and data analytics. With businesses making net zero promises to reduce their global carbon footprint, the focus will be on the efficient end-to-end protection of goods and services traversing the global supply chain.

UZI SCHEFFER
CEO, SOSA

The last four years have been characterized by unprecedented global economic shifts and disruptions. The impact of these events can be felt throughout the economy, and are particularly pronounced in the flow of goods via worldwide supply chains. Be it labor shortages, scarcity of materials, or month-long delays of basic goods, we are reminded that supply chain resilience is not just a buzzword; it is a strategic imperative that ensures continuity, sustainability, and growth.

In order to begin to cope with these sustained operational challenges, supply chain managers have increasingly turned to innovation and technology as the antidote to help adapt, overcome, and thrive in the face of adversity.

In this report, prepared in collaboration with our partners at Tokio Marine Innovation Lab, London, we shed light on the leading trends and emerging technologies in supply chain management, and new insurance solutions providing additional protection from unforeseen risks. From artificial intelligence-driven demand forecasting to blockchain-powered transparency and IoT-based smart logistics, we explore how these innovations are reshaping the supply chain landscape. We hope this report serves as a valuable resource in helping supply chain managers worldwide in building a strategic roadmap to fortify their supply chains against any future challenges that may be on the horizon.

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Introduction

From the curation of raw materials through the delivery of finished products, supply chains are the cornerstone of today's interconnected economy. Since the establishment of the World Trade Organization in 1995, global trade has grown at an average annual rate of 5% [1]. That consistent 30 year growth trend can in large part be attributed to the effective management of the intricate web of networks that make up the supply chain.

However, today's supply chain is being put to the ultimate test. Inflation reached record levels around the world over the past year, geopolitical tensions remain volatile on multiple fronts, and consumers continue to demand a seemingly never ending supply of products with the expectation of expedited delivery times.

This perfect storm of circumstances demands proactive risk management from supply chain managers and operators, to mitigate the chances of disruption. The smallest disturbance at the top of the chain has the potential to trigger material ripple effects throughout the economy. The result, as we've seen over the past 36 months, can range from the shortage of basic goods to significant and unchecked price fluctuations.

In this report, co-authored by Tokio Marine Innovation Labs (UK) and SOSA, we analyze today's modern supply chain infrastructure, how current events have impacted the global supply chain, and how managers are increasingly turning to technology and innovation to shore up supply chain resiliency. Importantly, the report will also discuss how insurance providers are uniquely positioned to continue supporting the industry's tech-driven transition by providing an additional layer of security across the chain.

01

Global Supply Chain Management: Trends & Challenges

→ The Growth of Supply Chain Managed Services

CAGR 11.8%

$78.5 Billion

$25.7 Billion

2023   2033
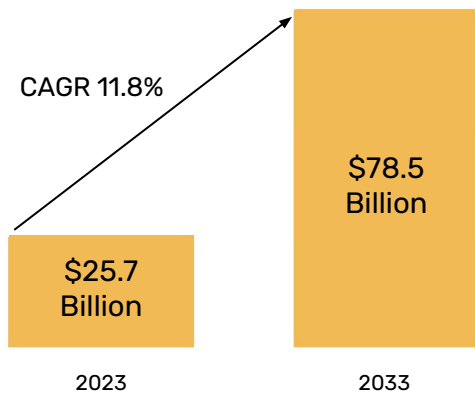
Source: Future Market Insights

In its most basic form, a supply chain is a network of entities, activities, and resources that work together to manufacture and deliver goods. In order to support the seamless movement of those goods, there is a massive and growing industry focused on management of the supply chain. This year, the global supply chain management (SCM) market is set to generate $25.7 billion of revenue. That market is forecast to grow at a CAGR of 11.8% over the next decade, reaching nearly $80 billion of revenue by 2033 [2].

While there are many factors behind the continued growth of the SCM market, such as the explosion of e-commerce and the subsequent investments made by governmental and private entities to bolster supply chain reliability, the other significant driver is technology. Network operators across the chain are increasingly investing in tools that provide capabilities such as real-time visibility, automation, and data-driven decision making to improve efficiency and profit margins.
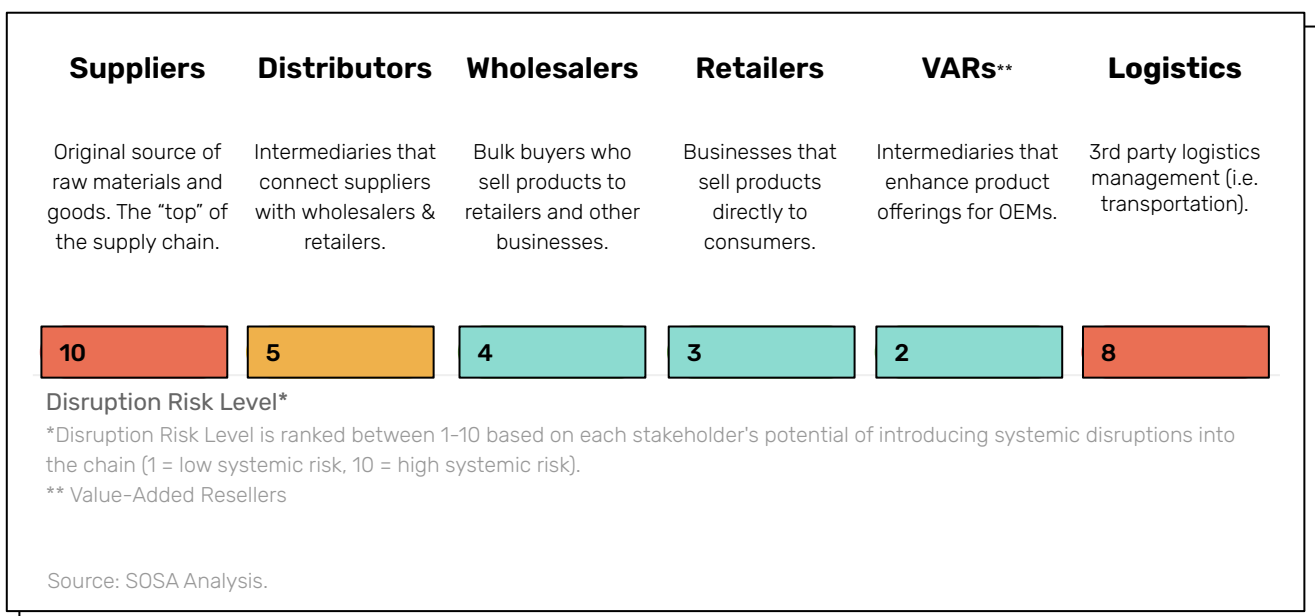
Proactively implementing new technology into supply chain operations is a necessary step in supporting the purchasing habits of today's modern consumers. However, proactivity is equally important in managing the risks associated with supply chain disruptions.

→ Mapping the Supply Chain

The interconnectedness that supply chain networks rely on to operate is also its achilles heel. Supply chains are inherently susceptible to cascading network effects. A single ship stuck in the Suez Canal can quickly escalate into $9.6 billion of daily trade value coming to a grinding halt (3).

In order to identify potential points of vulnerability across the chain, it's crucial to first untangle the web of stakeholders involved in its operation to understand how they interact with one another.

Supply Chain Stakeholders

Suppliers	Distributors	Wholesalers	Retailers	VARs**	Logistics
Original source of raw materials and goods. The "top" of the supply chain.	Intermediaries that connect suppliers with wholesalers & retailers.	Bulk buyers who sell products to retailers and other businesses.	Businesses that sell products directly to consumers.	Intermediaries that enhance product offerings for OEMs.	3rd party logistics management (i.e. transportation).
10	5	4	3	2	8

Disruption Risk Level*

*Disruption Risk Level is ranked between 1-10 based on each stakeholder's potential of introducing systemic disruptions into the chain (1 = low systemic risk, 10 = high systemic risk).
** Value-Added Resellers

Source: SOSA Analysis.

At the very beginning of the supply chain sit the suppliers, responsible for providing goods, materials, and services to OEMs and other producers. Within the universe of suppliers, there are multiple tiers based on the supplier's proximity to the OEM.

Tier 1 suppliers have a direct connection with OEMs, supplying components or subsystems that are incorporated into final products.
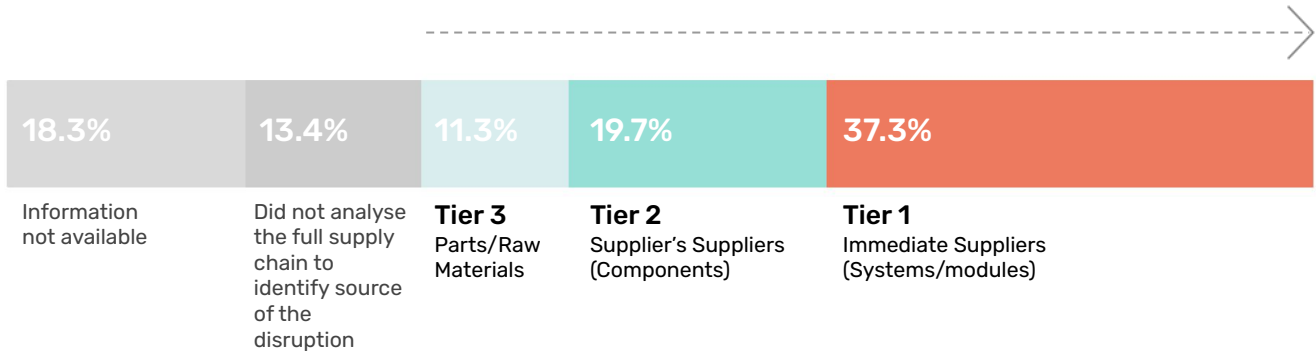
Tier 2 suppliers supply components or materials to T1 (usually not incorporated into final OEM products).

Tier 3 suppliers are typically specialized manufacturers, distributors, or service providers who supply components, raw materials, or services to T2 suppliers.

The transportation of goods between each of those stages are managed by a broad network of logistic providers, such as freight carriers and forwarders, third party logistics providers, warehousing and distribution centers, parcel delivery services, and last mile delivery providers.

→ Supply Chain Disruptions

Sources of Disruption, by Tier

18.3%	13.4%	11.3%	19.7%	37.3%
Information not available	Did not analyse the full supply chain to identify source of the disruption	**Tier 3** Parts/Raw Materials	**Tier 2** Supplier's Suppliers (Components)	**Tier 1** Immediate Suppliers (Systems/modules)

Source: BCI survey, 2022

While the share of Tier 1 disruptions continues to grow year-over-year, it is believed that the increase is due to the adoption of more granular reporting capabilities. In other words, operators are actively investing in the implementation of more sophisticated reporting tools that allow them to better pinpoint sources of disruption.

Despite these technologies being available to supply chain operators, 13.4% of respondents reported that they rarely investigate the original source of supply chain disruptions when they occur.

An illustrative example of the risk of butterfly effects in supply chain operations can be observed in the aftermath of Russia's war in Ukraine. According to Forbes, Russian companies acted as T1 suppliers to an astounding 3,100 European and US-based businesses [5].

As a result of the sanctions imposed on Russia in the aftermath of the invasion, there were extensive disruptions across multiple sectors, including the oil, fertilizer, grains, and industrial gasses industries. The immediate consequences have severely impacted global logistics, leading to outcomes such as blockages in key inland routes and a standstill in Black Sea vessel operations.

Observing the secondary consequences of the war's impact on the supply chain reveals a clear link between the scarcity of commodities previously sourced from Russia and the subsequent rise in inflation rates. As the cost of living surged, employees across various industries, including supply chain logistics, began advocating for higher wages to counteract the negative effects of inflation. This resulted in some instances of strikes or workers seeking better-paying career opportunities outside the industry. A recent report examining supply chain turbulence revealed a staggering 92% increase in labor disruptions in 2022. Unsurprisingly, labor concerns specifically in transport and logistics were noted as one of the top concerns for supply chain managers over the next few years [6].

Events Disrupting the Supply Chain, 2011-2023
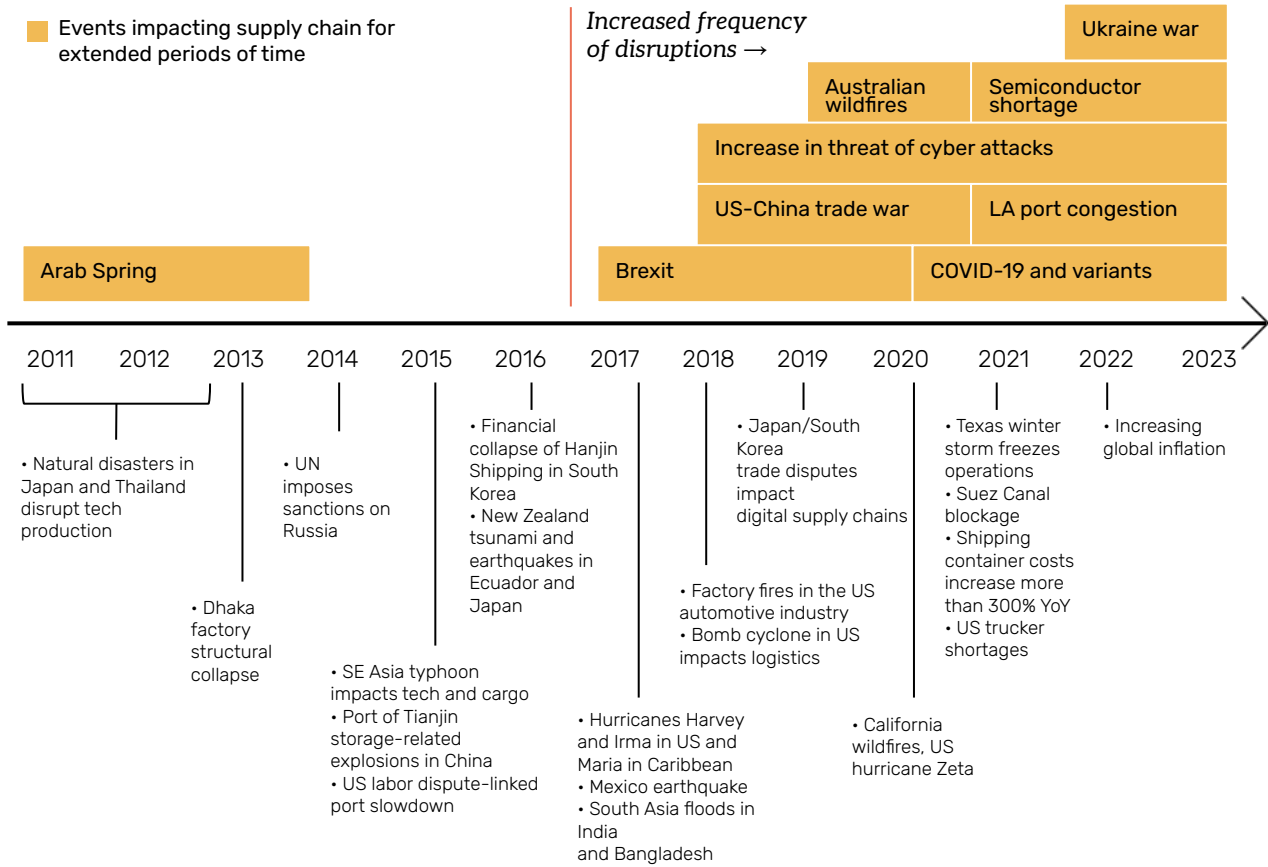
Source: Bain & Company, 2022

In addition to geopolitical and labor related risks, natural disasters and unpredictable weather patterns, and cyber-attacks and data breaches were also identified as major points of concern for supply chain managers.

Cyber and Climate Risk by the Numbers

According to DHL, global infrastructure cyber attacks doubled between 2021 and 2022. Everstream Analytics predicts a **70% chance** that supply chains will be impacted by growing threats of cyber crime (8).

A 2022 Harvard Business Review study showed that **only 11% of suppliers** in areas of "extreme weather volatility" in the US, China and Taiwan were fully prepared for climate related disruptions (9).

→ **According to the Economist, supply chain disruptions can cost companies an average of 6-10% of their annual revenue, in addition to reputational damage** (10).

→ **Case Studies & Market Insights**

Below we highlight a few recent instances of significant disruptions in the supply chain, the ripple effects they caused, and the key lessons they offer to supply chain managers.

Case Study #1 | Transportation Failures

Transportation failure is one of the most common supply chain disruptions, caused by a myriad of factors that can lead to delays or outright stoppages in the movement of goods. Transportation failures can occur for a number of reasons, including:

→ Complex networks: Multiple transportation modes across different locations
→ Reliance on external providers: Limited control over a third party's operations
→ Regulatory and compliance factors: Legal risks, delays in regulatory approvals
→ Nat cats and unforeseen events: Storms, accidents, labor strikes, pandemics, etc.
→ Geopolitical factors: War, trade conflicts, political complications

Consequences of transportation failures can range from delays, to increased costs, inventory shortages, and overall customer dissatisfaction.

Evergreen | Suez Canal Blockage   March 2021

What happened? Ever Given, a large container ship, crashed into the bank of the Suez Canal in March 2021. The ship became wedged horizontally in the canal, blocking all movement for 6 days.

Why is it significant? The Suez Canal handles around 12% of daily global trade, including 1M barrels of oil and approx. 8% of the world's liquefied natural gas.

What was the impact?

→ Ship backlogs and reroutes around the Southern tip of Africa extended journeys by weeks.

→ Incident disrupted global trade, leading to shortages, delays, and increased shipping costs.

→ Daily revenue loss for the Canal of $14–15 million.

→ Approximately $9.6 billion worth of trade was halted daily, equivalent to $6.7 million per minute and 3.3 million tonnes of cargo per hour.

→ Cascading effects rippled through multiple industries and supply chains worldwide [11].

Case Study #2 | Natural Disasters

As of the beginning of June, the United States had already experienced nine climate disasters in 2023, each resulting in losses of more than $1 billion(12). This staggering figure has already surpassed the 20-year trailing average of 8.1 annual disasters, highlighting a growing frequency and severity of climate-related events.

The consequences of natural disasters for supply chains can be catastrophic, ranging from transportation delays to total inventory loss. Supply chain managers can take important steps, such as contingency planning, assessing vulnerable points across the chain, and investing in technology such as weather intelligence platforms to predict major events before they occur.

State of Texas | Winter Storm Uri   February 2021

What happened? A severe winter storm hit Texas in February 2021, causing widespread power outages, water supply disruptions, and significant damage to critical infrastructure. It brought extremely cold temperatures, snow, and ice to parts of Texas that were unaccustomed to such weather.

Why is it significant? Winter storm Uri impacted the supply chain in a number of ways, including damages to critical production facilities and by causing major transportation delays due to the unsafe conditions on roads and railways. What some consider to be a black swan event, Uri highlighted how unprepared some economies are for unpredictable, destructive weather.

What was the impact?

→ Agriculture losses caused by Winter Storm Uri amounted to more than $608 million.

→ Damage to physical infrastructure, power outages, and forgone economic opportunities are all factors contributing to $130 billion in financial losses as a result of the storm.

→ Nearly 75 percent of the nation's chemicals are produced in Texas. Cold temperatures and blackouts damaged these plants, causing supply chains to be delayed (13).

→ GM, Ford Motor, Toyota, Nissan, and other auto manufacturers halted production at plants from Texas to Indiana because of rolling blackouts, natural gas shortages, and icy conditions.

→ Walmart was forced to temporarily close as many as 500 stores across the South and Midwest (14).

Case Study #3 | Cyber Attacks

39% of businesses in the UK reported instances of cyber attacks in 2022 (15). Companies supporting supply chain operations have become prime targets for cyber criminals, as the consequences of those attacks can be severe. Having a sophisticated cybersecurity infrastructure is no longer a nice to have, it's an absolute requirement for supply chain logistics companies.

Maersk | Malware   June 2017

What happened? In June 2017, Maersk, the largest shipping container company in the world, fell victim to a widespread ransomware attack. Maersk employees received messages about file system repairs, with a demand for a $300 bitcoin in exchange for the decryption key to access their files (16).

Why is it significant? The attack, characterized by its rapid and automated spread, affected numerous organizations worldwide, including FedEx's European subsidiary, TNT Express, several French companies, a Pennsylvania hospital, and Merck pharmaceuticals. The extensive reach of the attack resulted in approximately $10 billion in damages and global supply chain disruptions (17).

What was the impact?

→ Maersk incurred a loss of $200-300 million as a result of a cyber attack that severely disrupted their critical systems.

→ The impact on the global supply chain, with Maersk playing a vital role, was extensive, resulting in cumulative losses reaching billions of dollars.

→ The ransomware attack paralyzed Maersk's IT infrastructure, causing disruptions in container terminals, port operations, and the global shipping network.

→ The attack also had wide-ranging effects on dependent companies, including supply chain partners and customers.

These incidents demonstrate the vulnerability of the supply chain to widespread disruption, and emphasize the need for proactive risk management and substantial investments in technology to effectively mitigate such risks.

CNBC recently reported that a staggering 93% of CEOs are making preparations for an impending recession, while economists estimate a probability of 61% that a recession will occur within the next 12 months (18, 19).

This looming threat of recession has forced supply chain managers to face the reality that now is the time to invest in proactive risk management solutions. To remain competitive in today's volatile and fast-paced economic environment, companies need access to real time information in order to quickly respond to business disruptions. Digitizing key processes in the supply chain are one of the most effective ways to hedge against some of the developing macroeconomic threats that may or may not be on the horizon.

02

Strengthening Supply Chain Resiliency: Preventive Technology Solutions

As detailed earlier in this report, supply chain businesses face a range of existing and emerging risks that pose significant threats to their operations. From global disruptions to unpredictable events, organizations must adapt and adopt proactive measures to mitigate vulnerabilities and ensure continuity
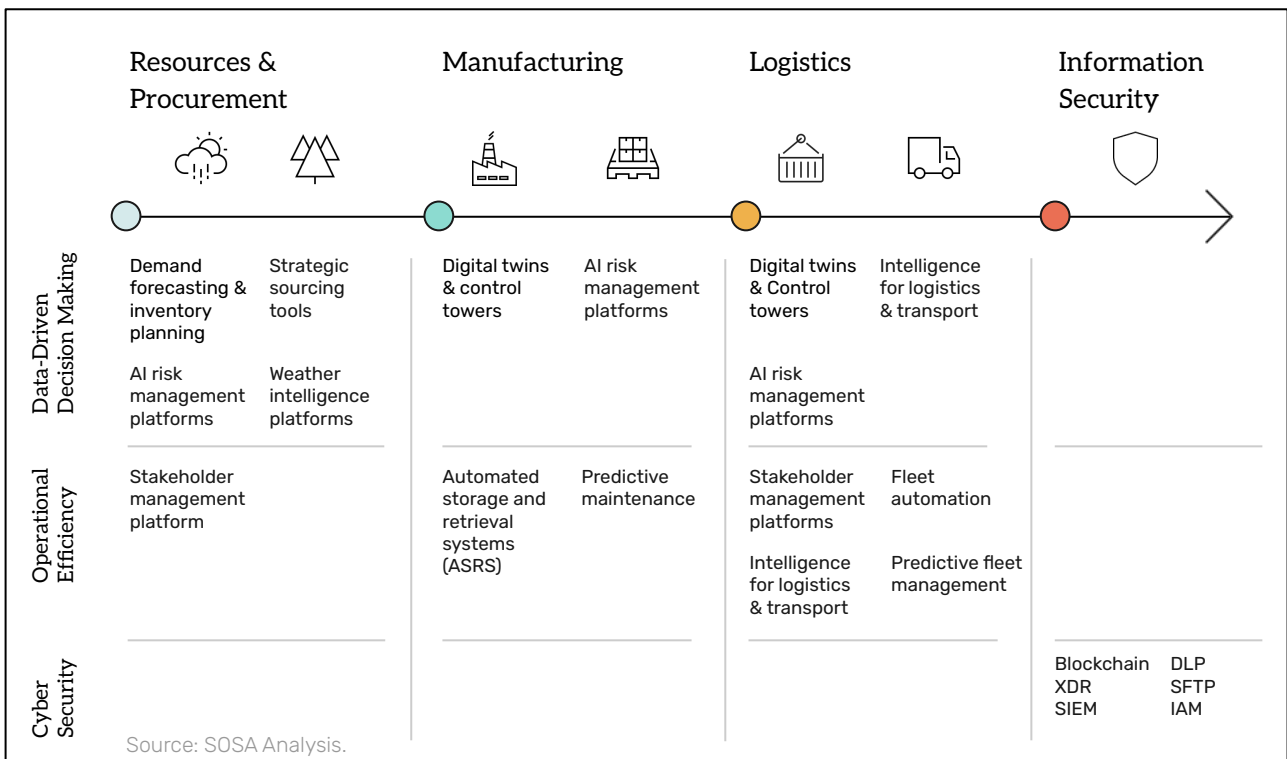
75%

of commercial supply chain management systems will incorporate integrated advanced analytics, artificial intelligence, and data science by 2026.

Source: Gartner

In this chapter we explore how technology solutions can help to strengthen supply chain resiliency in various ways, by helping organizations to navigate the complexities of supply chain management.

Supply Chain Technology Matrix

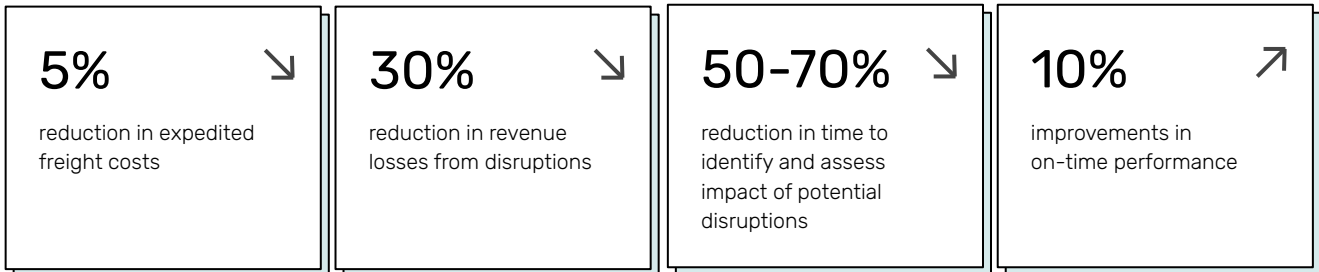|	Resources & Procurement		Manufacturing		Logistics		Information Security
Data-Driven Decision Making	Demand forecasting & inventory planning	Strategic sourcing tools	Digital twins & control towers	AI risk management platforms	Digital twins & Control towers	Intelligence for logistics & transport	
	AI risk management platforms	Weather intelligence platforms			AI risk management platforms		
Operational Efficiency	Stakeholder management platform		Automated storage and retrieval systems (ASRS)	Predictive maintenance	Stakeholder management platforms	Fleet automation	
					Intelligence for logistics & transport	Predictive fleet management	
Cyber Security							Blockchain DLP
							XDR SFTP
							SIEM IAM

Source: SOSA Analysis.

→ Data-Driven Decision Making: Planning and Analytics Tools

Accurately tracking products as they move through the supply chain is a major pain point for supply chain managers. The lack of real-time visibility makes it nearly impossible to identify and address potential issues that could have otherwise been avoided. To tackle this challenge, managers are increasingly investing in implementing planning and risk management tools - artificial intelligence and advanced analytics-based systems that can optimize operations, and identify, assess, and mitigate various risks.

These systems leverage a wide range of data sources, including historical data, real-time information, and external factors (such as weather conditions) to generate actionable insights and enable supply chain managers to make informed decisions. Armed with this information, managers can more accurately forecast demand patterns, optimize inventory levels, evaluate supplier performance, and, importantly, identify potential risks and proactively develop contingency plans. The global market for AI risk management platforms was valued at $8.9 billion in 2021. By the end of 2022, the market had grown to $11.36 billion, and is forecast to continue growing at a CAGR of 11.3% through 2030 [21].

Potential Impact of AI-powered Risk Management Platforms

5% ↘	**30%** ↘	**50-70%** ↘	**10%** ↗
reduction in expedited freight costs	reduction in revenue losses from disruptions	reduction in time to identify and assess impact of potential disruptions	improvements in on-time performance

Sample Technology Companies

| everstream ANALYTICS	‹› resilinc
AI-based supply chain visibility & insights	**AI-based supply chain risk management software**
Everstream provides businesses with an AI-based, predictive insights and risk analytics platform to identify and flag potential supply chain disruptions before they occur. This supports companies in building more autonomous supply chains, while increasing their competitive advantage.	Resilinc's software enables users to map manufacturing facilities, identify disruptions in close proximity to suppliers locations, assess supply chain vulnerabilities, and access advanced data on part origins, offering multi-tiered capabilities for supply chain understanding.
Notable clients: Apple, Google, Schneider Electric, Unilever, Campbell.	Notable clients: IBM, General Motors, EMC, Amgen and Western Digital.
HQ: San Marcos, California, United States	**HQ: Milpitas, California, United States**

As the market for planning and risk management software continues to develop, startups operating in the space are also integrating elements of machine learning algorithms for improved risk prediction, and the incorporation of natural language processing and sentiment analysis to monitor social media and other unstructured data sources. Additionally, there is a growing emphasis on the development of explainable AI models that offer transparent insights into risk factors, facilitating better decision-making.

By implementing these AI-powered planning and risk management platforms, managers can overcome the challenges of real-time visibility and enhance their ability to mitigate risks, ultimately leading to improved operational efficiency and resilience in the supply chain.

→ Operations and Asset Management Solutions

Integrating technology into the supply chain goes beyond risk management. It's an instrumental tool that can also help to drive operational efficiencies. From optimizing processes to improving communications with suppliers, technology is empowering supply chain managers to streamline operations and achieve greater productivity.

Potential Impact of Stakeholder Management Platforms

20%   ↗

average increase in working efficiency per professional
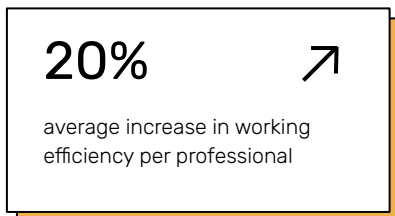
The efficiency of a supply chain, as an example, relies heavily on the effectiveness of communication between all of its stakeholders. Managers have therefore increasingly invested in Supplier/Stakeholder Relationship Management (SRM) platforms to help streamline communication and measure the performance of its suppliers. In a recent survey of 180 Chief Procurement Officers, both supplier procurement and supplier risk management software ranked as the number one and two tools that CPOs mentioned as priority for future integration into their internal processes [22].

On the asset management side of supply chain operations, managers are adopting technology solutions to effectively track, monitor, and optimize physical assets throughout the supply chain. Companies like Zebra Technologies offer asset tracking and management solutions that utilize RFID technologies, barcode scanners, and software applications to provide real-time asset visibility, while companies like Fleet Complete offer fleet management solutions, including GPS tracking and maintenance scheduling, which help managers optimize transportation assets while reducing expenditures [23,24].

Sample Technology Companies

elementum

Supply chain operations management platform

Elementum's platform equips businesses with real-time insights, analysis, and early warning signals, enabling effective risk management, monitoring of KPIs, and shipment tracking. This empowers organizations to ensure seamless operations and proactively mitigate disruptions.

Notable clients: Siemens, Barilla, Starbucks, Novartis, Dyson, McGee & Co, Hitachi, Corning, Patterson Dental, Vitamix.

HQ: Lehi, Utah, United States

coupa

Supplier & third-party risk management software

Coupa Software offers integrated cloud-based solutions for efficient spending management, supplier optimization, and streamlined supply chain operations, promoting financial stability with a user-centric approach to comprehensive supplier and third-party risk management integrated across all Business Spend Management (BSM) processes.

Notable clients: Unilever, Sanofi, Uber, Airbus, Philip Morris International, Engie, Barclays, Saleceforce.

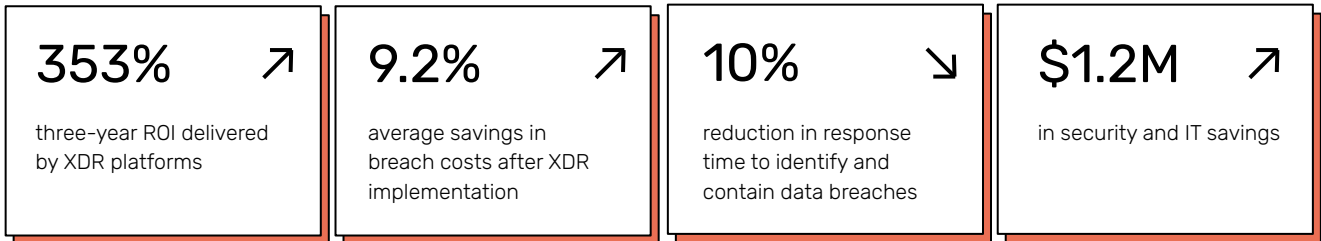**HQ: San Mateo, California, United States**

While there are many point solutions focused on optimizing specific elements of supply chain operations, companies like Elementum provide a comprehensive suite of services that offer end-to-end visibility and control over the entire supply chain. Their services include supplier management, procurement, inventory optimization, logistics management, and analytics all in one platform [25].

→ Supply Chain Cyber Security

The increased usage of digital tools in supply chain management means an increased risk of cyber attacks. With the ongoing adoption of cloud-based solutions, APIs, and collaborations with external vendors, the attack surface of supply chains widens. IBM reports that cloud-based breaches account for 45% of all security incidents, underscoring the significance of safeguarding supply chains against such risks [26].

Technology solutions like AI-driven extended detection and response (XDR) play a vital role in enhancing supply chain cyber security. By leveraging advanced AI algorithms and machine learning techniques, XDR solutions have the capability to analyze vast amounts of data from various sources, including networks, emails, applications, and cloud workloads, among others. With AI-driven XDR, organizations can detect and respond to cyber attacks in real-time, enabling faster threat mitigation, minimizing the impact of security incidents, and safeguarding the integrity and resilience of their supply chain operations.

Potential Impact of AI-driven XDR

353% ↗
three-year ROI delivered by XDR platforms

9.2% ↗
average savings in breach costs after XDR implementation

10% ↘
reduction in response time to identify and contain data breaches

$1.2M ↗
in security and IT savings

Organizations that utilized XDR solutions decreased the time it took to identify and contain data breaches by one month compared to organizations that did not use the software (26).

Sample Technology Companies

cynet

Automated security management platform

Cynet offers an extended detection and response platform (XDR) designed to simplify security support across the board. By collecting network activity, establishing a baseline, and correlating indicators, the company's real-time monitoring solution targets and remediates unknown threats.

Notable clients: NEC, Catalina, Becker, Carrefour, SPIE Switzerland.

HQ: Boston, Massachusetts, United States

SentinelOne

AI-powered cloud-based cybersecurity platform

SentinelOne's platform utilizes AI and machine learning to identify and respond to threats across endpoints, networks, and cloud environments protecting supply chain environments across all digital tools and platforms.

Notable clients: Estée Lauder, Pandora, Aston Martin, Samsung, Hitachi, Kenneth Cole, Electronic Arts, Norwegian Air Shuttle.

HQ: Mountain View,, California, United States

Organizations aiming to strengthen their security infrastructure should also consider integrating XDR with other critical systems, such as Security Information and Event Management (SIEM), Data Loss Prevention (DLP), Secure File Transfer Protocol (SFTP), and Identity and Access Management (IAM), to comprehensively address security risks surrounding supply chain operations.

→ **Other Sample Technology Companies** | Supply Chain Resiliency

Data-driven decision making: planning and analytics tools

AI-powered risk management platforms	Supply chain digital twins	Supply chain control towers	Demand forecasting & inventory planning	Strategic sourcing tools	Weather intelligence platforms
everstream ANALYTICS	WORLDS	RL	remi	LEVADATA	tomorrow.io
resilinc	entopy	634Ai	avercast A TransImpact Company	PartAnalytics	JUPITER

Operations and asset management solutions

Stakeholder management platform	Predictive maintenance	Intelligence for logistics & transportation	Predictive fleet management	Automated storage and retrieval systems (ASRS)	Fleet automation
elementum	Samotics	SHIPPEO	NEMODATA		einride
coupa	AUGURY	flexport.	SpinFRAME NextGen vehicle visuals	EXOTEC	INCEPTIO TECHNOLOGY

Supply chain cyber security

AI-driven extended detection and response (XDR)	Security information and event management systems (SIEM)	Data loss prevention systems (DLP)	Secure file transfer protocol (SFTP)	Identity and access management (IAM)	Blockchain technology
cynet	exabeam	Nightfall AI	COVIANT Software	okta	SyncFab
SentinelOne	securonix	TESSIAN	Kiteworks	ForgeRock	HeraSoft.

Technology has and will continue to play a crucial role in the shoring up of supply chain resiliency. The pursuit of a robust and future-proof supply chain, however, should also encompass an extra layer of security in the form of bespoke, targeted insurance coverages. Innovative insurance offerings have emerged as a powerful tool to safeguard supply chains from unforeseen disruptions and challenges and complement efforts in building resilient and sustainable supply chains.
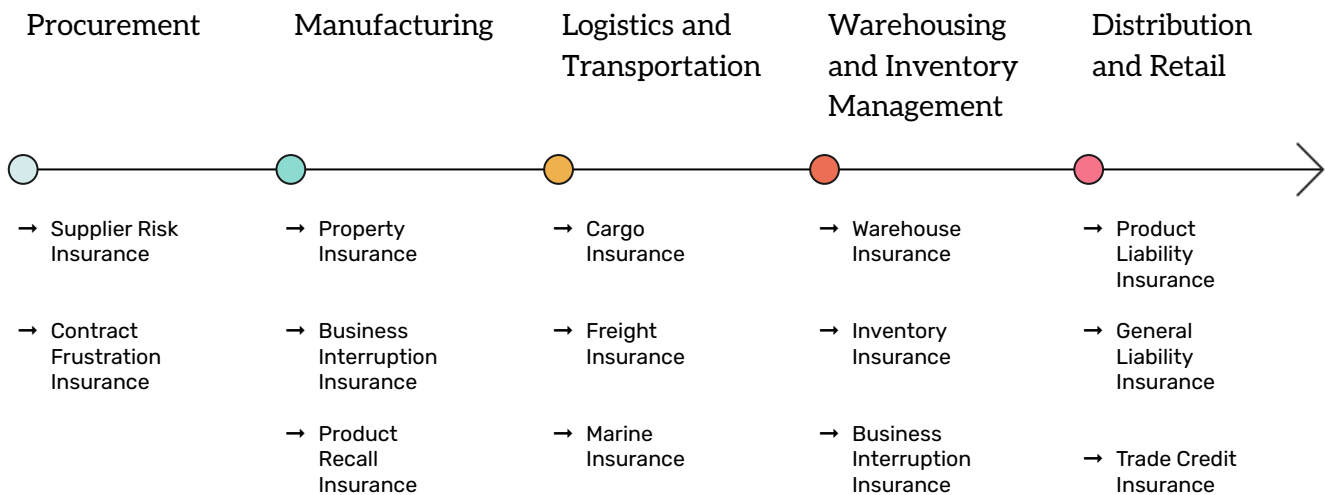
03
Novel Insurance Offerings and Models for Supply Chain

No supply chain, regardless of how technologically advanced it is, can be fully immune to risk. Supply chain operators, particularly in today's complex economic and geopolitical environment, have increasingly turned to commercial insurance providers to address both new and existing protection gaps. Premiums for US P&C lines, as an example, increased by 9.6% year-over-year in 2022, marking the second consecutive year of almost double digit premium growth [27].

Supply-chain specific insurance can provide protection against a range of disruptions throughout the supply chain, safeguarding businesses from losses caused by damage to suppliers or customers' operations [28].

Existing Supply Chain Coverage Options

| Procurement	Manufacturing	Logistics and Transportation	Warehousing and Inventory Management	Distribution and Retail
→ Supplier Risk Insurance	→ Property Insurance	→ Cargo Insurance	→ Warehouse Insurance	→ Product Liability Insurance
→ Contract Frustration Insurance	→ Business Interruption Insurance	→ Freight Insurance	→ Inventory Insurance	→ General Liability Insurance
	→ Product Recall Insurance	→ Marine Insurance	→ Business Interruption Insurance	→ Trade Credit Insurance

Source: SOSA.

While there are many factors contributing to the growth of global premiums, part of the multi-year trend can be attributed to the development of new, specialized coverage options designed to effectively address modern day supply chain complexities.

→ Parametric Insurance

Parametric Insurance is an innovative coverage option that provides automatic payouts based on predefined parameters, rather than traditional loss assessment. In the context of supply chains, parametric insurance can be designed to cover specific risks such as weather-related disruptions, natural disasters, or commodity price fluctuations.

CAGR 9.9%

$11.7 Billion
2021

$29.3 Billion
2031
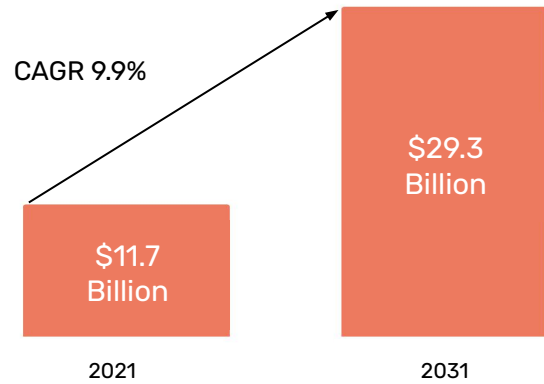
Source: Allied Market Research

Parametric insurance as a category gained popularity during the pandemic, as businesses sought parameter-specific coverages to protect against black swan events. According to Allied Market Research, the global parametric insurance market is expected to almost triple in value from 2022 to 2031 [29].

→ **Trigger-Based Payouts:**

Instead of assessing individual risk profiles, parametric insurance uses predefined triggers, like earthquake magnitude, rainfall amount, or wind speed, to determine payouts, offering a faster claims process and enhanced risk management.

→ **Simplicity and Speed:**

Parametric insurance offers a faster and more straightforward claims process because the payout is automatically triggered once the predefined event occurs, eliminating the need for complex claims investigations.

→ **Specialized Coverage:**

Parametric insurance is often used for covering risks that are challenging to assess through traditional underwriting.

Examples of Parametric Insurance Events and Triggers

Extreme Weather	Supplier Risk	Currency Exposure
Event: Earthquake	**Event:** Supplier insolvency	**Event:** Currency fluctuations
Payout Trigger: Seismic activity that registers above a certain level	**Payout Trigger:** Specific financial metrics or formal bankruptcy declarations	**Payout Trigger:** Predefined currency movements to mitigate financial impact

Parametric Technology Companies

OTONOMI

Blockchain-enabled parametric platform

Blockchain-enabled parametric platform, delivering cost-effective and transparent digital products. Dynamic pricing and advanced risk scenarios open new markets and drive profitability. Smart-contract technology ensures rapid claim adjudication, while secure event-triggers protect against supply chain disruptions.

Notable clients: OAG, BMS Group.

HQ: New York, United States

Pattern

Parametric embedded insurance

Insurance distribution platform enabling online businesses to seamlessly integrate insurance offerings into their customer journey. Utilizing parametric insurance, their technology tackles diverse issues like cloud service provider downtime, utility outages, supply chain disruptions, weather-related incidents, etc.

Notable clients: Tokio Marine, AXA, Amadeus, Spinnaker Insurance, Invia.cz.

HQ: Palo Alto, California, United States

→ Cargo Insurance with IoT Integration

Cargo insurance traditionally covers physical loss or damage to goods during transportation. However, with the integration of Internet of Things (IoT) devices in the supply chain, insurers are leveraging real-time data to enhance cargo insurance offerings. IoT-enabled cargo insurance can provide real-time visibility into the location, condition, and security of goods in transit, allowing insurers to offer more accurate coverage and tailor policies based on specific risk factors.

The insurance industry's usage of IoT devices is poised to grow at a remarkable CAGR of 55.7% during the period from 2023 to 2030 [30].

IoT Technology Companies for Cargo Insurance

Parsyl

Data-powered cargo insurance for cold chain

Parsyl is an IoT supply chain data platform that delivers pioneering cargo insurance solutions for shippers of perishable goods. Parsyl's combined hardware and software solution helps shippers understand, mitigate and insure risks to goods as they move through the supply chain, both in transit and storage.

Notable clients: Lineage Logistics.

HQ: Denver, Colorado, United States

TAG-N-TRAC

Smart sense tags for parcels

Tag-N-Trac provides a comprehensive IoT Platform as a Service (PaaS) tailor-made for supply chain and logistics enterprises, enabling seamless tracking and tracing. Their innovative solution utilizes trackable labels, equipped with Bluetooth or Cellular connectivity, to monitor temperature, humidity, location, acceleration, pressure, and light levels.

Notable clients: Cisco Meraki.

HQ: San Diego, California, United States

→ ESG Risk Insurance

While Environmental, Sustainability, and Governance (ESG) factors are becoming an integral part of supply chain management, conventional insurance policies may not adequately cover ESG-related risks, leading to protection gaps. ESG risk insurance provides an innovative alternative insurance product tailored to address the specific challenges that ESG poses. These policies cover risks related to environmental damage, labor rights violations, ethical sourcing, and compliance with sustainability standards across a company's supply chain.

ESG Technology Companies

we2sure BUILDING BETTER TOGETHER	STEEL CITY RE
Insurance-based parametric solutions for ESG risks	**Parametric reputation insurances and risk management**
We2Sure offers insurance-based ESG services. Their parametric products expedite planet decarbonization, facilitate the adoption of green technologies, bolster human resilience, empower loyalty schemes for organizations and platforms, and advance socially responsible platform technologies in today's world.	Steel City Re specializes in reputation risk services, offering parametric insurances and advisory solutions influenced by behavioral economics. They provide a comprehensive range of risk management and financing products, including cutting-edge reputation risk governance & enterprise management systems.
Notable clients: Lloyd's, Electrical Power RI.	Notable clients: Tokio Marine Kiln, Lloyd's.
HQ: Dublin, Ireland	**HQ: Pittsburgh, Pennsylvania, United States**

→ Embedded Insurance for Supply Chain Operators

Embedded insurance is a growing trend throughout the insurance industry, and supply chain operators have begun to understand its synergistic potential in mitigating risk and creating shared value.

Embedded insurance usually comes in the form of an add-on protection premium to an existing service or product, at the point of purchase. For instance, a logistics service provider may offer their client to add cargo insurance (from a partner insurance provider) during the placement of an order.

By embedding insurance into supply chain operators' offerings, insurers can leverage advanced analytics to enhance existing data (e.g. shipment tracking, stakeholder information, weather forecasts, etc.) and offer personalized coverage, with minimal sales and distribution costs. Data and analytics and artificial intelligence are also used for fairer pricing on a per shipment basis, and parametric triggers can be used for automatic claims.

Supply Chain Embedded Insurance Technology Companies

ANANSI	COVER GENIUS
Embedded shipping insurance solutions	**Embedded insurance solutions for various insurance types**
Anansi provides an API-integrated embedded solution that enables third-party-logistics providers (3PL's) and e-commerce platforms to offer their clients automated shipping insurance. Their solution leverages existing data sources for their platform, offering customizable coverage setup, real-time cargo tracking, automated claims, and claims status view.	Covergenius's distribution platform, Xcover, offers embedded protection to their global customers tailored for any kind of shipment. Dynamic, data-driven product recommendations and pricing optimization through the XCover API ensures customers get relevant policies and turns protection into a profit center.
Notable Clients: Arch Insurance, Wowcher	Notable Clients: Amazon, eBay, Descartes ShipRush, Freightos, ShipStation
HQ: London, England, United Kingdom	**HQ: Sydney, Australia**

Conclusion

The increasing complexity of global supply chains, along with the evolving regulatory landscape, has created significant challenges and exposure to risks of disruptions, urging players to strategically innovate their supply chain management practices.

This report has outlined several strategic points of focus for businesses to consider in the face of these shifts. Implementing them can lead to a more resilient and adaptive supply chain, better equipped to navigate uncertainties and disruptions in the ever-changing business environment. This, in turn, will help businesses maintain a competitive edge, setting a strong foundation for long-term success and growth.

Key Strategic Takeaways | Supply Chain Resiliency

→ Supply chain risk management is key for long-term resilience. Businesses must identify potential disruptions, efficiently assess their impact, and continuously develop strategic contingency plans for optimal response.

→ Businesses must diversify and strengthen their supplier relationships to minimize their vulnerability. Establishing flexible supply chains while increasing transparent communication with suppliers, ensures companies are better prepared for supply chain disruptions.

→ Technological advances in artificial intelligence, data analytics, cyber security, and more, have enabled the development of innovative solutions that help businesses mitigate risks of supply chain disruption and better comply with existing and emerging regulations. Innovation will continue to play a crucial role in the future strategies of supply chain management.

→ Innovative insurance offerings, such as parametric insurance, cargo insurance with IoT integration, ESG risk insurance, and embedded insurance, are addressing the evolving needs of supply chain operators, providing extensive coverage for various potential disruptions, further enhancing supply chain resilience.

Appendix

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Authors & Contributors

Dani Forman, Polina Gohman, Shani Yona, SOSA
Daljitt Barn, Jessie Callendar, Tokio Marine Innovation Labs

About Tokio Marine

Tokio Marine Group consists of Tokio Marine Holdings and its subsidiaries and affiliates located worldwide, operating extensively in the non-life insurance business, life insurance business, and financial and general businesses. As the oldest and largest Japanese property/casualty insurer (established in 1879), Tokio Marine Group has been expanding its business globally from the domestic non-life insurance business to the life insurance business and the international insurance business. With a presence in 46 countries and expanding, Tokio Marine ranks as one of the world's most globally diversified and financially secure insurance groups.

Tokio Marine Innovation Lab's mission is to accelerate digital innovation amongst our companies and clients. The Lab network consists of USA (Silicon Valley & New York) , Asia (Tokyo, Singapore, Taipei), London and Sao Paulo, giving Tokio Marine's Innovation Lab true global coverage. The London Lab has been built on 4 pillars: Collaboration, Information Sharing (including technology scouting), Education & Mentoring. These pillars ensure Tokio Marine promote an innovative culture for the benefit of the business.

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SOSA is an open innovation company. We work with innovation teams and business units in corporations (like LG, HP, Schneider Electric, RBC, Swiss Re, and Zurich Insurance) and governments (like Australia, Brazil, Canada, Japan, and Taiwan). We scout and validate tech companies and technologies to bring our clients the solutions they need to solve business problems, identify opportunities, or build new products.

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