airmic

GUIDE 2019

COMPLEX SUPPLY CHAINS IN A COMPLEX WORLD

A GUIDE TO MANAGING SUPPLY CHAIN RISK & INSURANCE

IN ASSOCIATION WITH:

AIR | Gallagher (Insurance | Risk Management | Consulting) | HDI | LLOYD'S | sedgwick

AIRMIC

The leading UK association for everyone who has a responsibility for risk management and insurance for their organisation, Airmic has more than 450 corporate members and more than 1,300 individual members. Individual members include company secretaries, finance directors, internal auditors, as well as risk and insurance professionals from all sectors. Airmic supports members through training and research; sharing information; a diverse programme of events; encouraging good practice; and lobbying on subjects that directly affect our members. Above all, we provide a platform for professionals to stay in touch, to communicate with each other, and to share ideas and information. Follow Airmic on Twitter @Airmic; LinkedIn and YouTube.

AIR WORLDWIDE

AIR Worldwide (AIR) provides risk modelling solutions that make individuals, businesses, and society more resilient to extreme events. In 1987, AIR Worldwide founded the catastrophe modelling industry and today models the risk from natural catastrophes, supply chain, terrorism, pandemics, casualty catastrophes, and cyber incidents. Insurance, reinsurance, financial, corporate, and government clients rely on AIR's advanced science, software, and consulting services for catastrophe risk management, insurance-linked securities, longevity modelling, site-specific engineering analyses, and agricultural risk management.

AIR Worldwide, a Verisk (NASDAQ:VRSK) business, is headquartered in Boston, with additional offices in North America, Europe, and Asia. For more information, please visit www.air-worldwide.com

GALLAGHER

Founded by Arthur J. Gallagher in Chicago in 1927, Gallagher has grown to become one of the largest insurance brokerage, risk management, and human capital consultancy firms in the world. With a truly global reach, our organisation employs more than 30,000 people worldwide and our international network enables us to provide client service capabilities in more than 150 countries. In the UK, through a regional network of customer-focused branches in more than 70 locations, combined with our specialty London market operations, Gallagher offers tailored risk, insurance and consultancy solutions for both UK and international clients. Our focus is on providing local service and support to businesses, backed up by national industry specialism and global reach. Our people partner with businesses around the world to provide relevant and impactful professional advice. We continue to build on 90 plus years of expertise that spans a huge range of industries.

No matter the size of the organisations we partner with, their specific risks and human capital challenges, we work tirelessly and utilise our industry expertise to provide best in class solutions that maximise value for our clients and to deliver them with our world-class service. Our values are core to our culture. Passionate service, strategic innovation and ethical behaviour form the basis of how we do business. We help our clients go beyond their goals. It's 'The Gallagher Way'.
Find out more at ajg.com/uk Connect with us at LinkedIn @Gallagher-UK and
Follow us on Twitter at @GallagherUK

Insurance | Risk Management | Consulting

HDI

As an industrial lines insurer, HDI Global SE (HDI) meets the needs of SMEs, industrial companies and corporate customers with insurance solutions that are specifically tailored to their requirements. In addition to HDI's prominent position in the German and broader European market, the company also has operations in more than 150 countries through foreign branch offices, subsidiary and peer companies, and network partners. The company is thus able to offer its customers local policies for their global operations, which ensure that the established service and insurance protection are extended for all covered risks worldwide.

HDI Global SE is a company in the Talanx Group and manages the Industrial Lines Division within the Group. More than three thousand employees in this division generated gross written premiums of approximately EUR 4.7 billion in the year 2018. The rating agency Standard & Poor's has given the Talanx Primary Group a financial strength rating of A+/stable (strong).

LLOYD'S

Lloyd's is the world's specialist insurance and reinsurance market. Under our globally trusted name, we act as the market's custodian. Backed by diverse global capital and excellent financial ratings, Lloyd's works with a global network to grow the insured world – building resilience of local communities and strengthening global economic growth.
With expertise earned over centuries, Lloyd's is the foundation of the insurance industry and the future of it. Led by expert underwriters and brokers who cover more than 200 territories, the Lloyd's market develops the essential, complex and critical insurance needed to underwrite human progress.

SEDGWICK INTERNATIONAL UK

Sedgwick is a leading global provider of technology-enabled risk, benefits and integrated business solutions, incorporating 27,000 colleagues in 65 countries. Our clients trust us to deliver an extensive range of services across all lines of business, from commercial property claims, to third-party administration to major and complex losses to specialist services such as our cyber and forensic advisory services, construction and engineering.

At Sedgwick, caring counts®. Taking care of people and organisations is at the heart of everything we do. We provide the services and expertise you are looking for, wherever you are, when you need us most

"

This force addresses how easily suppliers can drive up the cost of inputs. It is affected by the number of suppliers of key inputs of a good or service, how unique these inputs are and how much it would cost a company to switch from one supplier to another.

The fewer the number of suppliers, and the more a company depends upon a supplier, the more power a supplier holds to drive up input costs and push for advantage in trade. On the other hand, when there are many suppliers or low switching costs between rival suppliers, a company can keep input costs lower increasing profits.

The Power of Suppliers – One of Richard Porter's 5 Forces

CONTENTS

This Guide has been produced in collaboration between Airmic members, AIR Worldwide, Gallagher, HDI, Lloyd's and Sedgwick International UK. Airmic recommends reading this Guide alongside the October 2019 Lloyd's innovation report: *Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework*, authored by AIR Worldwide

INTRODUCTION

The multitude of macro challenges presented to society and commerce are bringing the way trade is conducted around the world under strain. The spread of globalisation throughout the 20th and early 21st centuries has made businesses more international than ever before – from a giant multinational operating a complex web of suppliers and contractors across the globe, to a small regional manufacturer reliant on a multitude of 'just-in-time' parts arriving on a weekly basis.

The rise of nationalism and increasingly protectionist policies, however, is threatening to roll back free trade and, with it, global supply networks and cross-border relationships. A volatile and more extreme climate is highlighting the volume of stock and supply routes that reside in areas exposed to natural disasters.

An interruption to a supply chain can cause an array of problems – from loss of revenue and reputational damage, to breach of contract, loss of market share and damage to stock price.

The design and management of supply chains has always demanded a high degree of risk-reward analysis. Organisations want lean, efficient supply chains that bring down costs and provide maximum value. The desire for low-cost networks, however, can lead businesses to turn a blind eye to, or miss, the concentration of risk that may be building up and could result in a catastrophic event that can bring operations grinding to a halt.

The role of the risk and insurance professional should be to work closely with business continuity, procurement and supply chain managers to evaluate and manage the risks inherent in the supply chain. Their skills and knowledge in risk management and financing will be vital to ensure the supply chain remains resilient and the organisation is fully informed of the risks it is taking and the reasons for doing so, as well as the contingencies in place should something go wrong.

This Airmic Guide, produced in collaboration with AIR Worldwide, Gallagher, HDI, Lloyd's and Sedgwick, is designed to provide the risk professional with the information and guidance on how to understand, manage and identify appropriate risk financing solutions.

> "A consolidated supply chain gives us greater efficiencies, but it means the sensitivity to disruption is ever greater. We may have fewer locations, but we have bigger aggregation of risk.
>
> Airmic member

SECTION 1: COMPLEXITY

Globalisation and an increasing emphasis on cost optimisation have resulted in more complex supply chains with larger footprints. Natural disasters or other events that take place far away from the organisation's core business and properties can have a significant impact on operations and bring the organisation to a grinding halt.

As supply chains have become longer, the gathering of manufacturing or sector-specific specialists in groups has created clusters. These clusters are cost-effective for the whole chain and facilitate knowledge sharing and expertise in production, but they weaken resilience by building exposure groupings often in areas susceptible to natural disasters.

The 2011 Thai floods had a huge impact on Japanese and American carmakers as well as global technology companies which had utilised the country as a core manufacturing base. During the floods, Honda, Toyota, Ford and Isuzu Motors all had to close production plants. Before the flood, the Rojana Industrial Park was home to 240 manufacturers, but 20% left the park after the natural disaster. These clusters not only produce a concentration of risk, but may also supply one another or share suppliers, which increases the risk further and lowers resilience.

The interdependency of multiple suppliers adds a further layer of complexity. According to Toyota

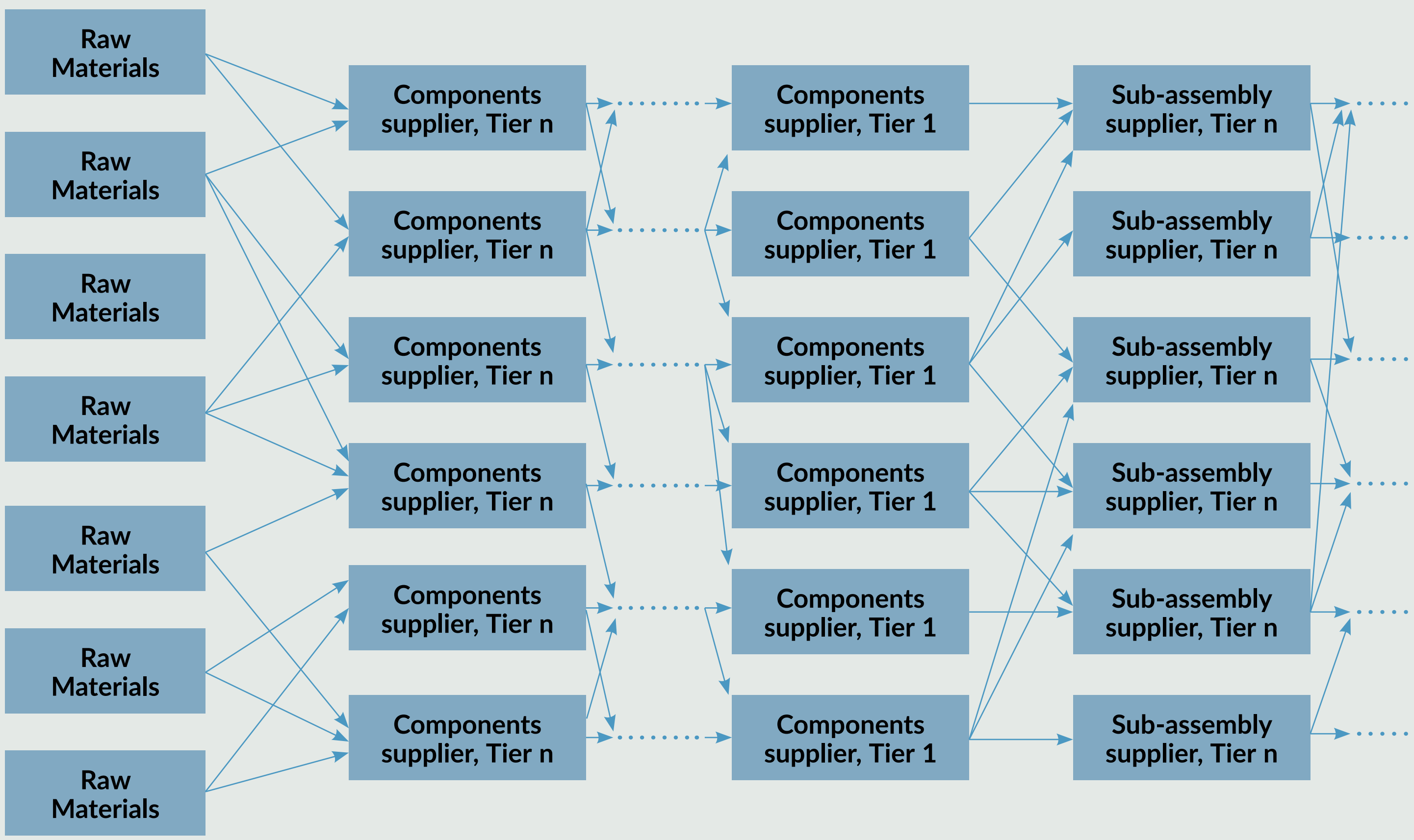
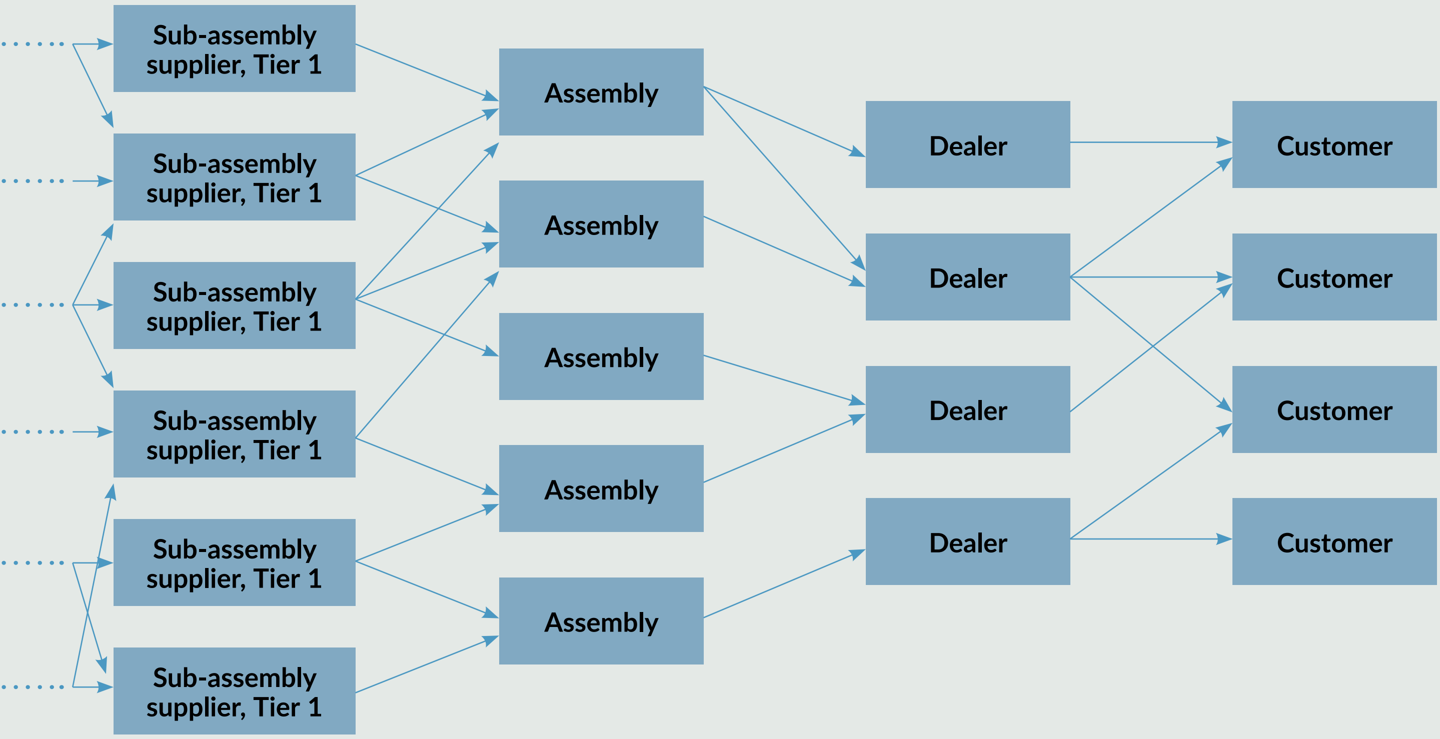


Figure 2: High-level view of a complex supply chain: automobile manufacturing

"Most organisations have a web of relationships, it is not linear. The Tier 1 and 2 suppliers may be supplying each other, and the organisation might not be aware of that linkage. The complexity is not because of the number of suppliers, it is actually the relationship between the suppliers, manufacturers and the customers."
Iain Bell, Director, Major Risks Practice, Gallagher

Motor Company, one passenger car contains approximately 30,000 parts. These are provided by a multitude of suppliers, which may in turn use common materials. Steel, for example, is present in many of the parts that make up a passenger car. Therefore, a disruption in steel manufacture in a particular region of the world has the potential to disrupt certain locations of engine production or motor vehicle body production, depending on global trade flows and procurement patterns. In this respect, it is more problematic to identify how a disruption can affect a complex supply chain rather than a simple one. Below are an example of a simple supply chain (Figure 1), in this case an apparel product, and an example of a complex supply chain (Figure 2) – a passenger car.

Figure 1: High level view of a simple supply chain: apparel manufacturing



Source: *Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework*

CO^2 Shortage – A Perfect Storm

Key supplier case study

It is not only complexity that can present new challenges. While organisations and their procurement departments are often attracted to single-source suppliers to bring down costs and increase efficiencies, in some areas, the market has no choice but to rely on a select number of providers.

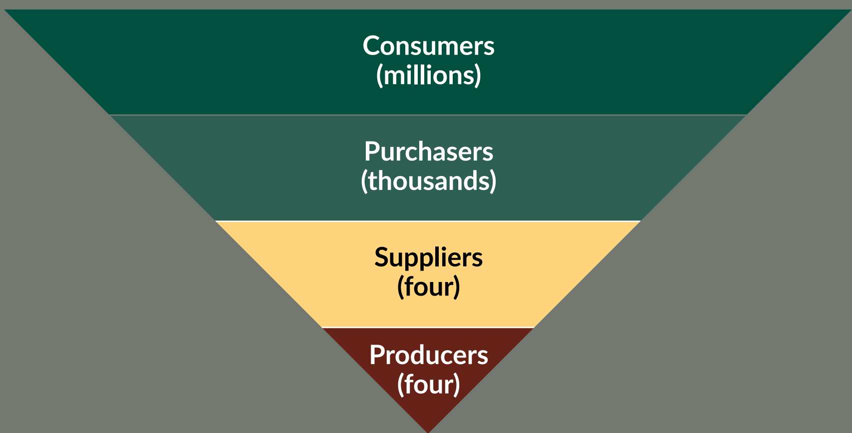
In the summer of 2018, the reliance on a handful of carbon dioxide producers and suppliers by thousands of UK businesses was put under severe pressure by a culmination of events. A report produced by the Food & Drink Federation (fdf)[1] said: “For a commodity that is critical to large parts of UK food supply, the CO^2 chain was poorly understood by purchasers, government and the public.”

While the use and importance of CO^2 are apparent in soft drinks and beer, the gas is also a vital enabling component to the whole food and drink supply chain. It is used for dispensing drinks in pubs and restaurants, to ‘stun’ animals during slaughter, in food packaging and transportation as dry ice and snow. The food and drink industry accounts for between 50% and 60% of the UK’s demand of CO^2, but other significant users are fire suppression and extinguishers, medical uses and the energy industry.

FACTORS THAT LED TO THE SHORTAGE

As CO^2 is a relatively low-value product, it is usually produced as a by-product of industrial processes, such as ammonia and bioethanol production. This reliance on by-product means that supply does not match demand and producers are unable, or unwilling, to respond in times of need. A summer heatwave, combined with England’s successful World Cup campaign, produced a higher than usual demand for beer and fizzy drinks. In Europe, producers such as fertiliser and bioethanol plants had been closed for maintenance, while there were also breakdowns at ammonia plants. The four UK suppliers declared force majeure on their contracts, but many customers only knew of the shortage when expected deliveries did not arrive on time.

Figure 3. The UK CO^2 supply chain



1. Falling flat: lessons from the 2018 UK CO^2 shortage. https://www.fdf.org.uk/publicgeneral/falling-flat-lessons-from-the-2018-UK-CO²-shortage.pdf

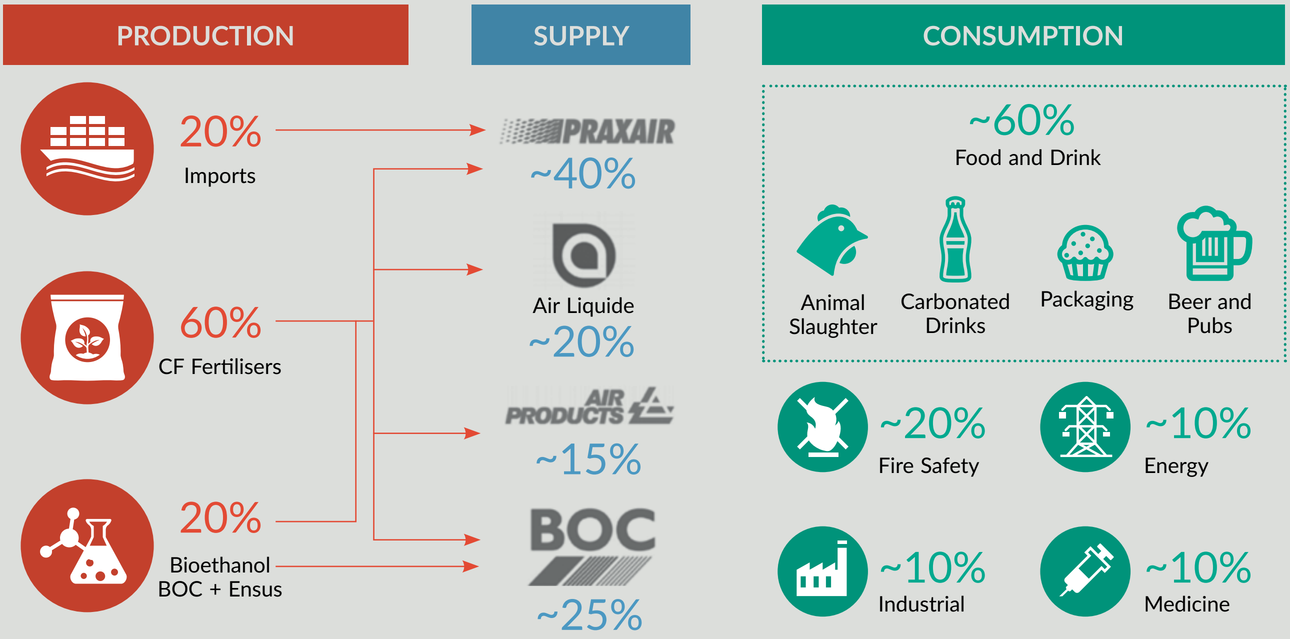


Figure 4. The UK CO2 supply chain

DISRUPTION

While most CO² customers suffered a shortage of supply, others were cut off entirely. Those businesses that needed to secure new sources of CO² paid significantly higher prices, and the UK CO² supply chain took almost two months to return to "normal working conditions and guaranteed supply", according to the fdf.

LESSONS LEARNT

While CO² shortages had happened before and are most likely to occur during the summer when demand for ammonia and bioethanol is low and CO² is high, many businesses were caught by surprise, with little contingency planning in place. The fdf has reported the following steps are being taken by businesses, and Airmic members have used the lessons learnt to apply similar measures to other key suppliers and cross-site materials.

- Refocusing on relationships with CO² suppliers
- Contracting with more than one CO² supplier
- Increasing contracted volumes against spot volumes
- Reviewing contracts with a particular focus on the terms of *force majeure* clauses
- Contracting with suppliers for 'virtual stock' – options on additional supply in times of shortage
- Reviewing current production practices for where CO² can be safely and cost-effectively replaced with other more secure inputs
- Putting in place 'Plan B' for future shortages
- Exploring additional storage options.

Source: *Falling flat: lessons from the 2018 UK CO2 shortage*

SECTION 2:
UNDERSTANDING AND MANAGING

Getting to grips with an organisation's supply chain should start with internal collaboration through working with procurement, operations and the supply chain manager, if the organisation has one. The organisation needs to understand the whole supply chain, beyond its Tier 1 suppliers. Knowing who supplies the suppliers is critical to understanding the risks and any concentration of risk, and to building resilience.

Internal actions	External actions
Do I understand our supply chain exposures? Obtain list of all known suppliers and customers (external and internal)	Research business profile of all known suppliers and customers – who else do they supply and who supplies them?
How are these being managed across the supply chain?	What are the key risks presented?
What is our exposure in the event of an interruption across the supply chain?	Loss-scenario planning, financial impact.
Can I verify that any risk is being effectively managed?	Are suitable contracts in place with suppliers/customers to protect us?
What is our strategy if suppliers/ customers are found to be deficient?	Identify back-up/dual source or supply, diversify, etc.
How can we tell if we are getting there in driving improvements?	Service and quality measurement.

***Source**: Gallagher*

Governance

The importance and significance of an organisation's supply chain should also make it a high-level item on the board's risk committee. A critical failure in a company's supply chain can have a devastating impact on operations and revenue, and can lead to severe scrutiny of the boardroom, putting directors at risk of legal action. Ensuring ongoing and effective governance of the supply chain should prompt the formation of a cross-functional risk board "with participants representing every node of the value chain". This risk board should "periodically review supply chain risks and define mitigating actions, improving the resilience and agility of the supply chain". [2]

The European Commission is currently studying human rights due diligence in supply chains and its Director General for Justice and Consumers has commissioned the British Institute of International and Comparative Law (BIICL) to lead a project in this area. The European Confederation of Directors Associations (ecoDa) has warned against holding companies legally accountable for the behaviours of all their suppliers and subcontractors, but the pending study suggests greater scrutiny and potential legal ramifications down the road. [3]

>

2. A practical approach to supply-chain risk management, McKinsey & Company. https://www.mckinsey.com/business-functions/operations/our-insights/a-practical-approach-to-supply-chain-risk-management
3. Press Release - Due diligence in supply chains:More legal burdens will not ensure business transformations. http://ecoda.org/news-details/article/press-release-due-diligence-in-supply-chainsmore-legal-burdens-will-not-ensure-business-transform/

Collecting and translating data

Supply chain data typically resides on disparate and ubiquitous systems across the enterprise, and so coalescing this fragmented data to bring about a partial view of the supply chain is difficult. Corporations tend to look at supply chains more from a 'cost' or 'spend' perspective and thus put more effort into mapping out suppliers based on spend. In this process, companies frequently overlook the most vulnerable part of the network from a risk perspective. Current methods to track the supply chain are both time- and labour-intensive and do not scale well for companies that manufacture complex products. Even companies with mature supply chains do not have full visibility into their supply chains (Figure 5).

Typically, businesses employ a piecemeal approach by mapping their supply chains based on reactive strategies after the disruption happens. In a Business Continuity Institute survey of global corporations, nearly 69% of respondents said they did not have full visibility of their supply chains (BCI 2017). According to KPMG, 54% of Chief Procurement Officers admit that their firms don't have visibility beyond their direct (Tier 1) suppliers (KPMG 2014). An additional survey by Deloitte (2018) indicated that 54% of the final respondents had limited visibility below Tier 1 and only 6% of them had full transparency of the supply chain. With limited data on an insured's supply chain, (re)insurers are often faced with the dilemma of making 'faith-based' underwriting decisions. This could lead to severe underestimation of risk and expose (re)insurers to risk aggregation that might be happening in the invisible part of the supply chain.

Currently, a typical 'data standard' for CBI underwriting does not exist in the (re) insurance industry. Developing a data standard would allow the insurance community to identify and harmonise the key attributes they need to collect about enterprises to make informed underwriting decisions. In addition, an insurance data standard would create awareness and incentivise the corporate community to start gathering relevant data in return for better policy coverage and premiums. The application of 'quantitative' supply chain risk modelling is still in its early stages of research and needs to be actively explored.

> "Supply chain is a big-data problem. Mapping and digitising supply chain networks is the first step in understanding an organisation's supply chain risk.
> **Dr. Kamban Parasuraman, AIR Worldwide**

Source: *Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework*

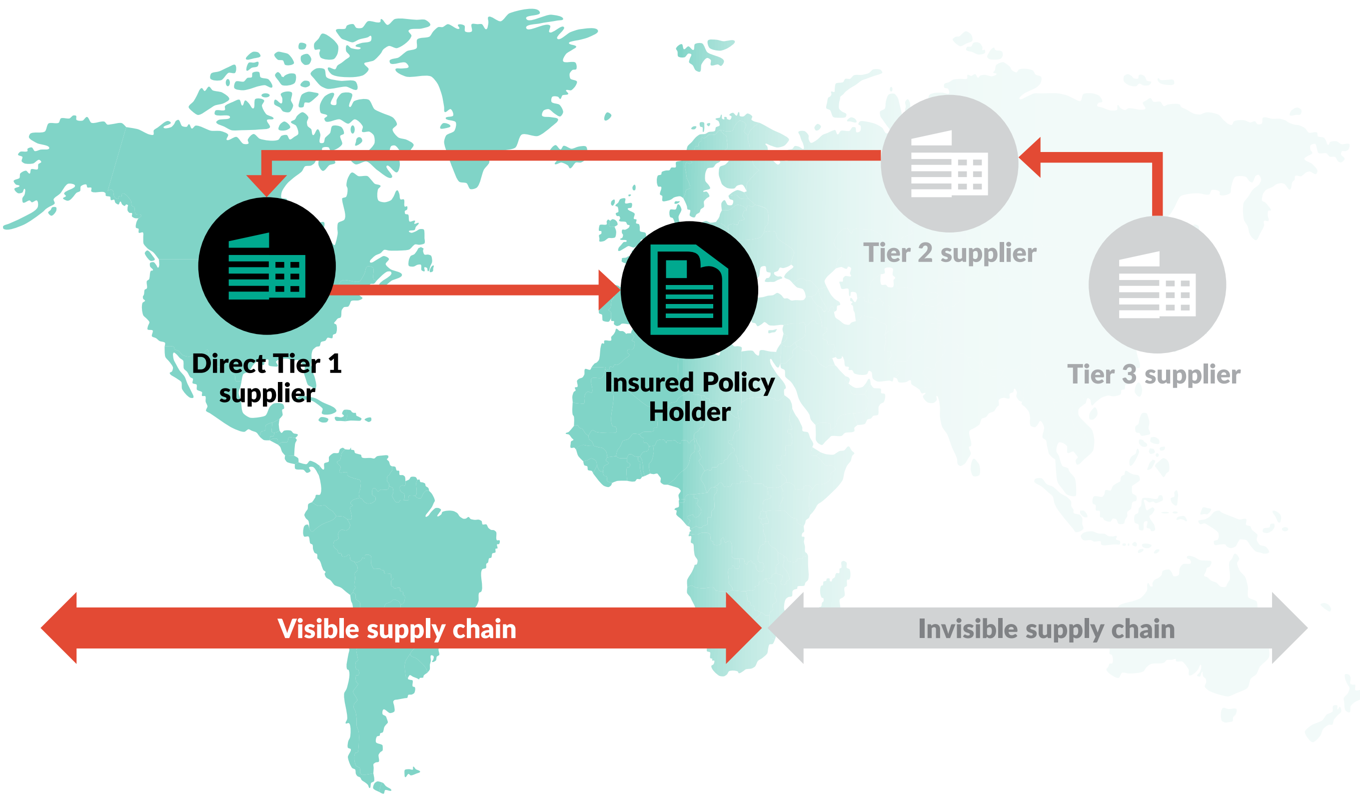


Figure 5. Schematic of the invisible supply chain

***Source**: Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework*

The task of uncovering the deeper and sometimes 'invisible' elements of the supply chain can be made harder by regional nuances in business structures and transactions. In China, for example, it is common practice for agent companies to act as a 'front' for a supplier. What the organisation might view as a direct Tier 1 supplier might in fact just be an agent company, with the actual supplier sat behind it in Tier 2. While such a structure may inadvertently hide the true profile of an organisation's suppliers, it can also lead to insurance coverage disputes. If an insurance policy only stipulates cover for Tier 1 suppliers, the insured may not be covered when they had expected to be.

Truly understanding the business and profile of all levels of the supply chain will help avoid such misunderstandings. Some of the information may already be held by the procurement function, but may not be used to influence risk management, resilience planning and insurance purchasing. According to the BCI's annual Supply Chain Resilience Report, only 52% of disruptions occur at Tier 1 level. As such, it is not only essential to conduct an ongoing review of all suppliers and their revenue, but also to put in place a checklist of questions to answer when selecting new suppliers.

Key factors to consider when selecting your suppliers:

- What is their financial health?
- Where does their core revenue come from?
- What infrastructure is supporting their revenue?
- What is their supply source?
- What is their geographic footprint?
- What weather events are they exposed to?
- What political environment do they operate in and what political risks are they exposed to?
- What contingency plans do they have in place, and what is their recovery period?

***Source:** Sedgwick International UK*

Contract management

The above questions should all be included in an effective supplier selection and due diligence process when entering into new contracts. This research will help inform the organisation when drafting contracts with suppliers, and identify and protect against potential risks by assigning clear responsibility on either side and setting out indemnification clauses. In the case of the 2018 CO2 shortage, for example, purchasers felt unable to take legal action against suppliers when they declared *force majeure*, because such circumstances had not been discussed or defined in advance.

Time pressure

When conducting their own assessment, risk and insurance managers should also understand any 'just-in-time' exposures within the supply chain. A relatively short delay of one component arriving at a plant can have a significant impact on production if the whole production line is reliant on that part's arrival. What might appear to be a minor part provided by one small, single-source supplier might in fact have the potential to bring all production to a halt.

Risk concentration

As businesses have looked to achieve more cost efficiencies in their supply chain, they have become more reliant on single-source suppliers. Lack of diversification in suppliers ensures the concentration of risk will increase and leaves less room for manoeuvre in the event of an incident. Risk and insurance managers should work with their procurement, business continuity and supply chain colleagues to identify back-up suppliers which are able to step in should a single-source supplier become unavailable. The same analysis and onboarding steps should be taken with second-option suppliers in advance so they are ready to step up.

Concentration of risk can also apply to large warehouses containing a significant proportion of stock. Online supermarket Ocado reported that £110 million worth of property, equipment and inventory was destroyed during a fire at its warehouse in Andover. More than 30,000 orders, approximately a tenth of Ocado's total capacity, were processed at the location every week. Ocado was able to reduce the impact on sales, however, by increasing capacity at a new warehouse in Erith, southeast London.

Internal supply chain

Understanding and monitoring the role, profile and health of external suppliers is essential in managing the supply chain, but internal processes need to be understood as well. The internal supply chain includes those activities that take place within the company and will include purchasing, production, sales and distribution.

The internal supply chain can be disrupted by events, including change in customer demand, the breakdown of machines, property downtime, network outage or strikes.

> “
> Supply chain risk management should be a continuous process that is understood by all stakeholders,
> **Julia Graham, Deputy CEO, Airmic**

A surge in customer demand can put the supply chain under increased strain and highlight a lack of capacity to increase production and supply when required. Alternatively, a drop in demand may require additional storage space to hold stock.

Reliance on technology and connectivity

IT outages, cyber-attacks and data breaches were identified among the top five causes of disruption in the Business Continuity Institute's Supply Chain Resilience Report 2018.[4] The fourth industrial revolution has led to more advanced automated production lines, a raft of connected devices through the Internet of Things (IoT), and greater communication and tracking of moving parts along the supply chain. The increasing reliance on technology has transformed the risk profiles of supply chains, and risk professionals must respond by understanding how the supply chain will react to an IT outage, cloud disruption or cyber-attack, either on their organisation directly or one of the suppliers in their chain.

Sustainability and reputation

As the geographic footprint of supply chains has grown, the carbon footprint has expanded. Organisations, whether under pressure from governments and regulators or their own customers, are increasingly looking to improve their sustainability credentials and reduce their carbon emissions.

According to CPD, a non-profit organisation that promotes the disclosure of environmental impact data, a company's supply chain can be responsible for up to four times the amount of greenhouse gas emissions of its direct operations. Despite this, only 25% of organisations say they engage their suppliers in efforts to reduce emissions. CPD is now rating companies in regard to how they manage sustainability in their supply chains. By not understanding and taking into consideration the environmental credentials of key suppliers, organisations and their suppliers may be at risk of falling foul of new requirements being placed on businesses that need a licence to operate. In February 2019, Volkswagen announced it was placing an ultimatum on its 40,000 suppliers to work with them on cutting carbon emissions.

Reputational damage, listed as the number one business risk in the 2019 Airmic Survey,[5] can also be caused by suppliers. The 2013 collapse of the eight-storey Rana Plaza, in Bangladesh, killed 1,100 people and put the poor working conditions at factories supplying high-profile brands such as Walmart, Matalan and Adidas in the spotlight. Primark announced in 2015 that it had paid out more than $14 million in compensation to 672 workers (or their dependants) who died or were injured as a result of the collapse. While businesses using factories in Bangladesh signed up to the Accord on Fire and Building Safety, which aims to safeguard employees through common building standards enforced by independent inspection programmes, Primark has deployed its own structural engineers as part of its ethical trade team.

4. BCI Supply Chain Resilience Report 2018. https://www.thebci.org/uploads/assets/uploaded/c50072bf-df5c-4c98-a5e1876aafb15bd0.pdf
5. Risk Management. 2020 Vision. The 2019 Airmic member survey. https://www.airmic.com/technical/library/2019-airmic-member-survey

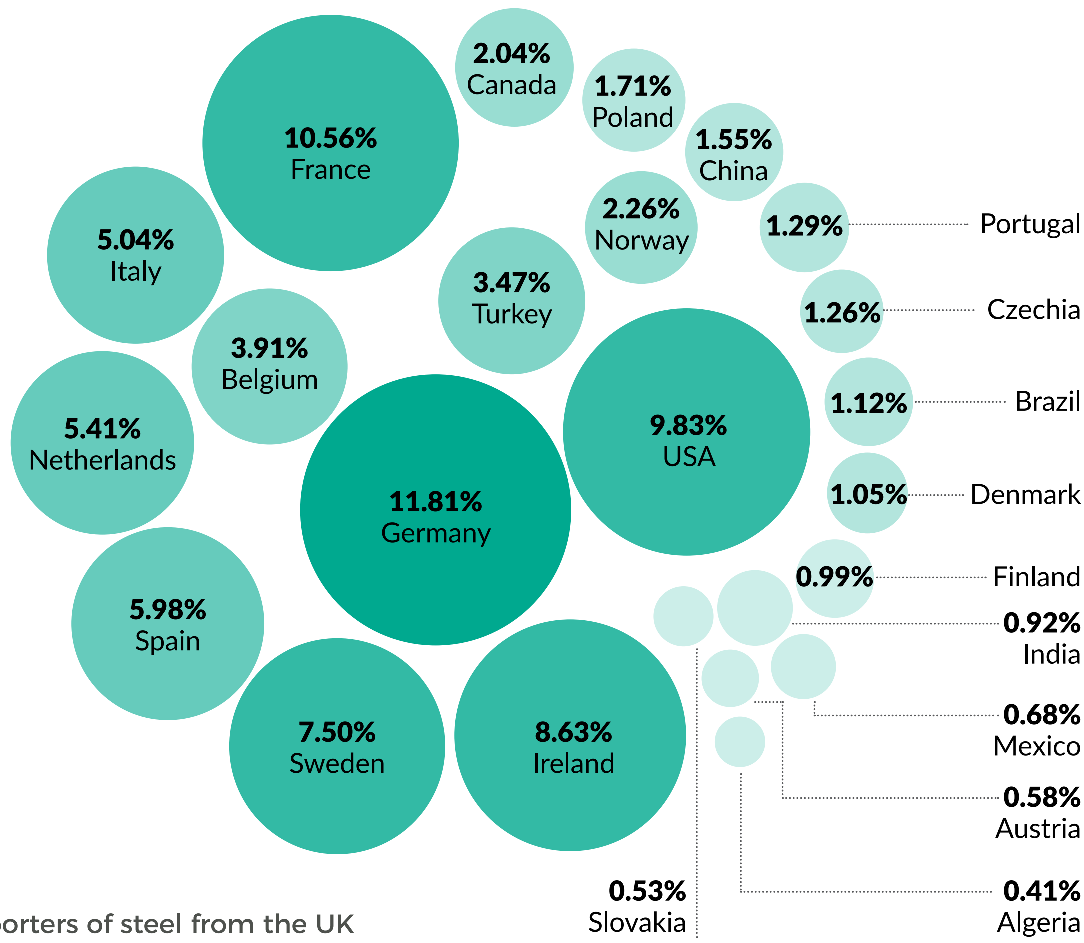


Figure 6. Top importers of steel from the UK

Climate crisis

In the 2018 BCI survey, adverse weather rose from sixth to second place as the most common cause of supply chain disruption.[6] It is also identified as among the biggest threats in the next 12 months and the next five years. These events pose unique logistical challenges as warehouses, entire industrial parks or specialist centres can be taken out of action.

The climate crisis is expected to increase the severity of natural catastrophe events and put further strain on critical infrastructure that manufacturing and distribution networks rely upon. "Elevated sea levels are expected to displace populations and industries by permanently inundating coastal regions," says the Lloyd's report *Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework*. "Understanding the impact of climate change risks to interconnected systems can assist insurers and corporations in reshaping their portfolios and businesses."

Brexit, political risks and tariffs

Widespread trade disruption can take place when import and export patterns are interrupted by macroeconomic events such as increased tariffs, economic sanctions, trade embargos and recessions.

Figure 6 shows the top importers of steel from the United Kingdom. The impact of Brexit on the steel industry and its supply chain is a clear example. In the event of a no-deal Brexit, the European Union could impose tariffs on steel trade with the United Kingdom, driving up manufacturing costs across industries because steel is integrated across several different value chains. "The potential shift in trade patterns could signify a change in exposure footprint for certain suppliers or new vulnerabilities emerging for an insured or insurer's portfolio," says the *Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework* report.

6. BCI Supply Chain Resilience Report 2018. https://www.thebci.org/uploads/assets/uploaded/c50072bf-df5c-4c98-a5e1876aafb15bd0.pdf

Disruption to the UK automotive supply chain as a result of Brexit is expected to be complex. As with steel, more than half of car exports go to the European Union, but supply to manufacturers is exposed as well. On a single day, there are 1,100 lorries originating from the EU that deliver to UK car and engine plants, and components worth £35 million are delivered 'just in time'.

Once produced, the industry's supply to its customers has the potential to be disrupted by sudden tariffs. A +10% tariff on exports is expected to cost the sector £1.8 billion in costs, while a +10% tariff on imports will add £2.7 billion in costs. Delays at the border will also slow down deliveries and stifle production.

Toyota announced in August 2019 that it had already brought forward "a couple of days' extra inventory" in preparation for a 31 October Brexit and said it plans to halt production on Friday, 1 November to minimise disruption before restarting on the following Monday and Tuesday.

Key factors to consider when reviewing your supply chain resilience and developing your own business continuity measures:

- How important is your business to their business?
- Are they your only supplier of that product?
- What contingency plans does the business have should there be an interruption to existing supply in raw material, transportation and logistics, etc.?
- Have you integrated risk management processes into your supply chain management approaches?
- What is the impact to your revenue should the supplier/ supply chain be interrupted? What is the impact on your customers, reputation, revenue?
- What are the current and future business plans for expansion globally and how will this change your supply chain profile?
- Have you fully mapped your critical supply chains upstream to the raw material level and downstream to the customer level?
- Have you integrated risk management processes into your supply chain management approaches?
- Do you have routine, timely systems for measuring the financial stability of critical suppliers?
- Do you understand your Tier 1 production facilities and logistic hub exposures to natural catastrophes?
- Is supply chain risk management integrated into your enterprise risk management approach?
- Do you record the details of supply chain incidents and the actions you have put in place to avoid future incidents?
- Do your Tier 1 suppliers have business continuity plans that have been tested in terms of their viability?
- Have you provided risk training to your supply chain management team?
- Is risk on the agenda at performance meetings with your strategic suppliers?

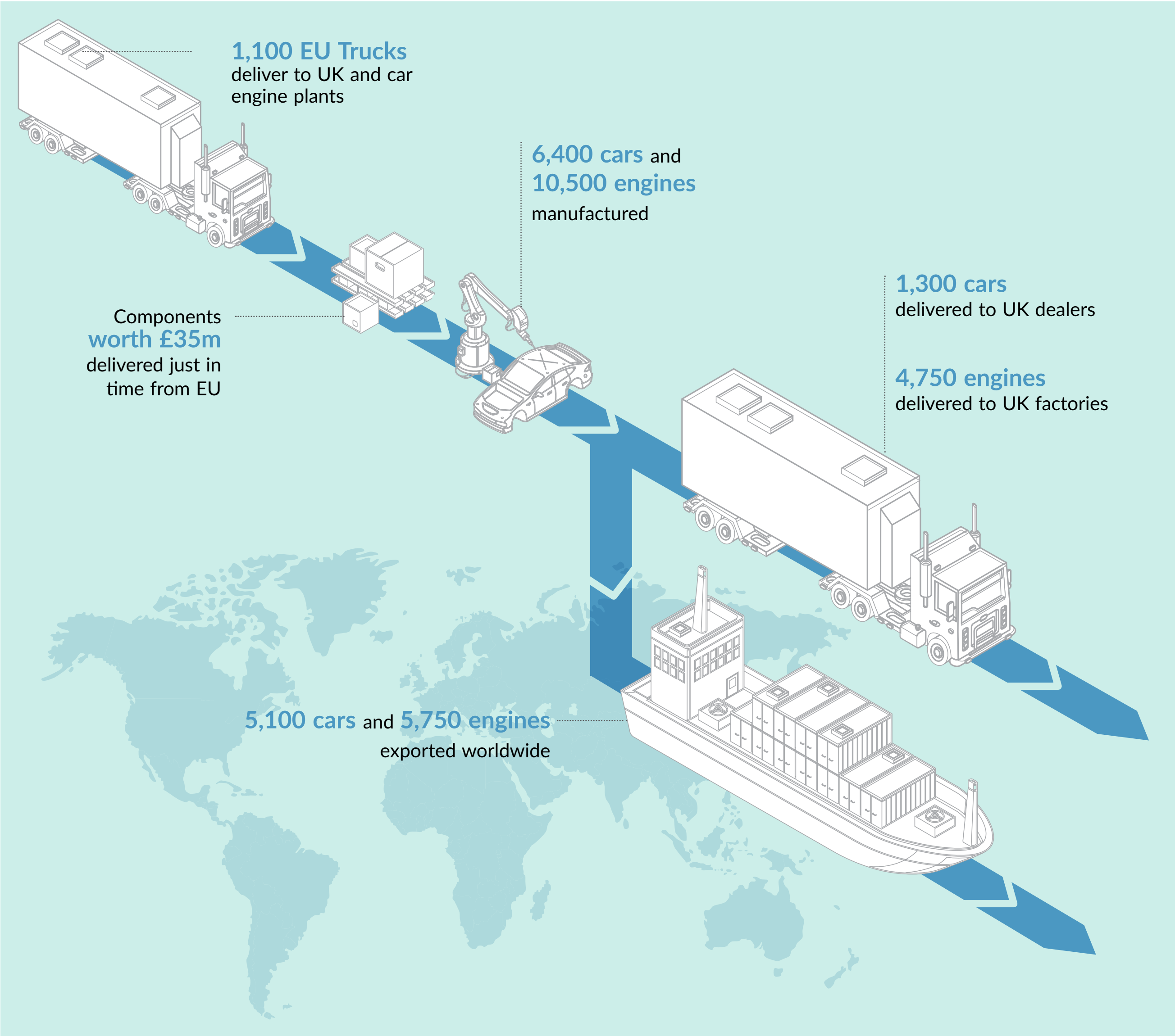
Source: *Sedgwick International UK*

"

Political risks and the escalating trade disputes have global companies caught in the crossfire. The evolving political risk landscape will continually force companies to move capacity and redraw the geographic footprint of their supply chains. Mitigating these emerging threats is key to sustainability.

Dr. Kamban Parasuraman, AIR Worldwide

Figure 7. A single day in the UK automotive industry



Source*: The Society of Motor Manufacturers and Traders (SMMT)*

SECTION 3:
QUANTIFICATION AND RISK FINANCING

As with any risk financing decision, building a deep understanding of the exposures and accurately profiling the risk will help organisations identify the right solution. An accurate picture of the supply chain will also help the insured build certainty and transparency into contracts with insurance partners.

Insuring the interconnected business interruption and contingent interruption has become more challenging as supply chains have grown more complex. A lack of historical claims data and emerging risks has meant no systematic method for an insurer or a corporate risk manager has been produced to quantify a supply chain's risk and project it for future scenarios. As a result, many insurers set relatively low limits, high deductibles and policy exclusions to constrain losses emerging from possible intangible aggregation scenarios in their portfolios.

Even without sophisticated modelling, however, risk and insurance professionals should be engaging with their broker to begin

Modelling your risk

AIR Worldwide has collaborated with Lloyd's to propose a modelling framework for supply chain risk that can be found in the *Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework* paper cited at the start of this Guide.

The framework is designed to bridge data gaps and knowledge limitations, providing insurers and corporate risk managers with a rich set of quantitative metrics, which are more reflective of the actual risk to the businesses.

The supply chain modelling framework analyses millions of disruption scenarios against the exposure (supply chain network) and obtains losses for each event. From the loss results, the model calculates exceedance probability (EP) curves and average annual loss (AAL) estimates. These metrics are more reflective of the risk to a business as they account for hidden vulnerabilities and future aggregation scenarios. Standardisation can be done by transforming the risk metrics into equivalent risk scores, as illustrated in Figure 8. For example, the ratios between AAL and the 100-year return period (1% EP) losses could form the basis for individual supplier scores, which can then be scaled between 1 and 100 to arrive at an equivalent risk score. The indexed risk scores are easy to understand, enabling insurers and risk managers to identify the nodes in their value chain needing the most attention.

Source: *Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework*

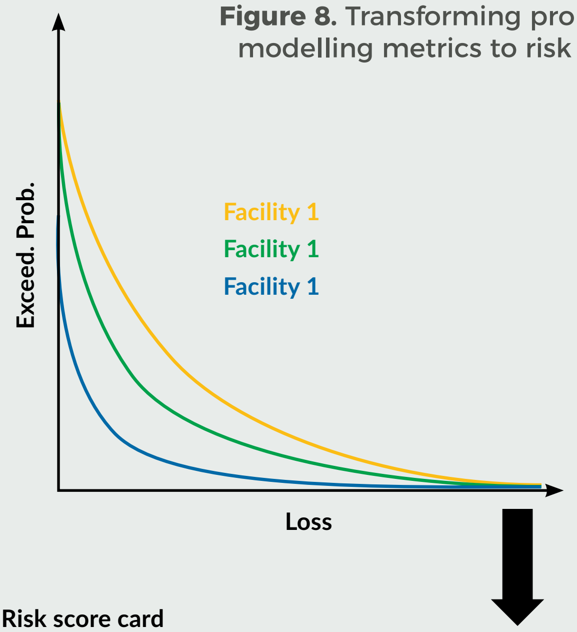
to educate them on the organisation and supply chain profile. In order to prepare for a new insurance purchase or a renewal, insurance managers should take the following steps with their broker:

- Give the broker the time commitment so they are aware of the exposure
- Request brokers to retain wording experts to review policies
- Run claims scenarios with broker, claims team and insurer (optional) before renewals
- Organise pre-loss reviews so everyone is familiar with the processes.

When reviewing policy wordings, insurance managers should particularly consider:

- Specified supplier limit/unspecified limit
- Interdependency limit when there is a master policy in place for global territories and significant reliance on intercompany supply
- Dependency on internal and external suppliers and direct and indirect suppliers, and the need for further cover/specific cover.

Figure 8. Transforming probilistic modelling metrics to risk scores



Risk score card

Insured Locations	EQ	IF	TC
Facility 1 (JPN)	64	21	19
Facility 2 (CAN)	57	27	15
Facility 3 (USA)	58	27	16
Facility 4 (USA)	58	27	16
Facility 5 (UK)	56	16	12
Facility 6 (SA)	61	19	12
Facility 7 (JPN)	87	21	19

***Source**: Hidden Vulnerabilities in Supply Chain Risk: A Quantitative Risk Modelling Framework*

“

You are the client so you have the right to demand what you want, but to make those demands, you have to understand your business and the supply chain that underpins it. Don’t work in silos, work together to understand the supply chain risks.

Josephine Suppiah, Partner, Sedgwick International UK

> We have worked with organisations to identify several single-source suppliers who are very critical for the business and conducted a property survey of the locations. They start to ask their suppliers more questions about risk mitigation and prevention planning.
>
> Dr Verena Brenner, HDI Risk Consulting GmbH

Policy options

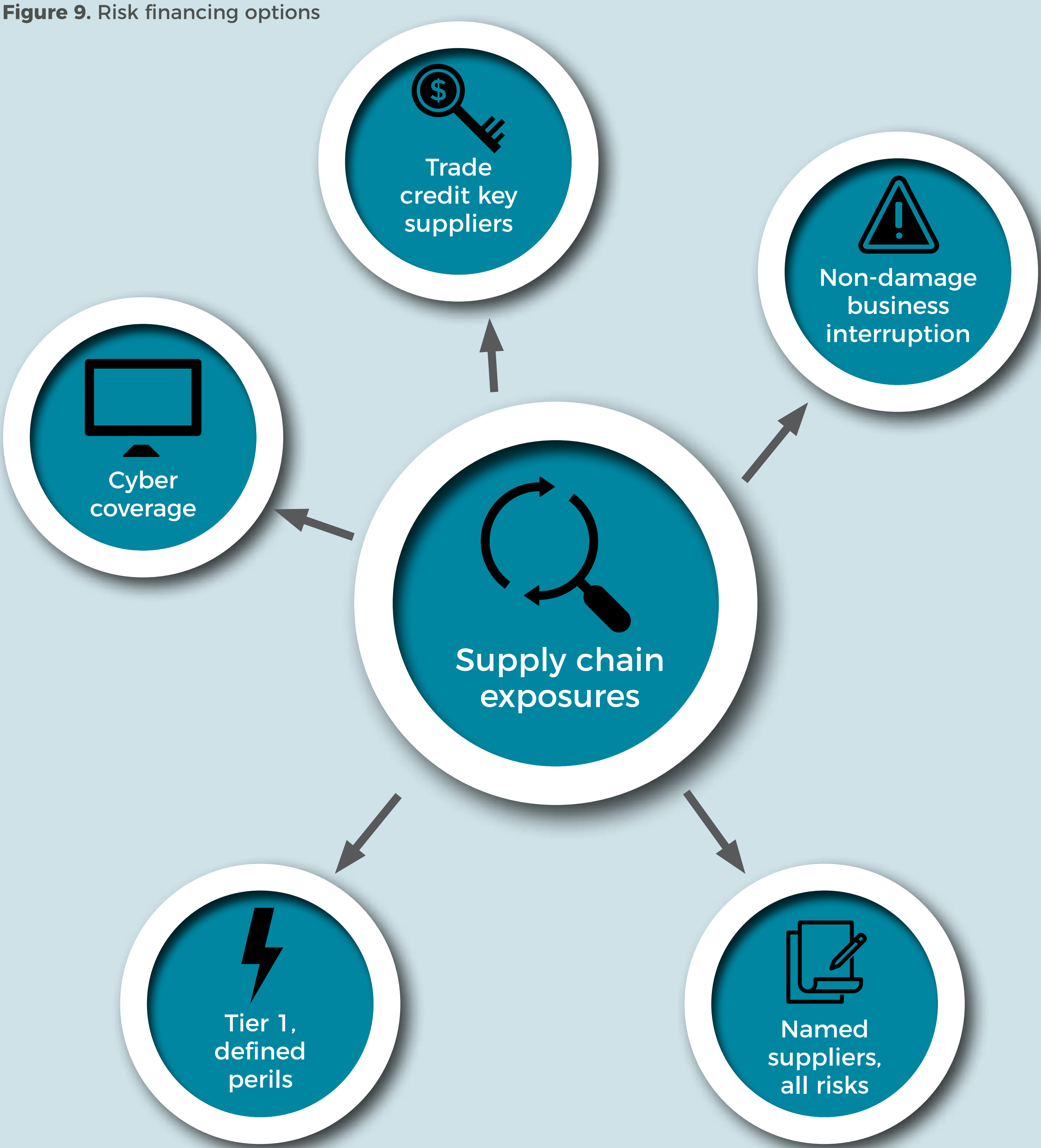
It has been common practice for insureds to add coverage for Tier 1 and Tier 2 suppliers as an extension to business interruption policies, with damage and non-damage cover often included. Non-damage can encompass damage in the vicinity of the supplier's premises and infectious disease, for example.

Purchasing standalone supply chain cover is rare in the market, but non-damage business interruption policies can be bought to include coverage for events such as regulatory shutdown (including pre-emptive shutdown) and strikes occurring at the supplier's premises which adversely affect the earning capacity of the policyholder. Demand for this cover came predominantly from the pharmaceutical sector. A standalone product was developed due to its highly specialist nature, with only a couple of insurers able and willing to write it.

Some trade credit insurance policies can be used to cover the failure of a key supplier to deliver paid-for commodities due to events such as insolvency or political risk, while contract frustration policies are also available but are largely limited to political force majeure events. It is also possible to buy supply chain interruption cover for cyber-attacks against the insured or its suppliers from a select group of insurers.

In the Lloyd's market, coverage can be found for named suppliers as an extension to a company's own insurance on modest sub-limits, covering all risks, although there may be regional limits imposed on some risks. It also possible to purchase coverage for unspecified suppliers, but with named perils and on a restricted basis. Tier 1 suppliers can be fully covered against defined perils, with lower tiers covered on a restricted basis. While full supply chain cover is rare, because of pricing challenges, it can be available on simpler, shorter supply chains that can be easily understood.

Figure 9. Risk financing options



“

Standalone supply chain policies have been discussed for 10 years, but they remain uncommon and take-up is low. Whilst a full risk assessment of the supply chain is necessary before buying a policy, insurers also need to address the buyer's principal concern, i.e. that any reduction in supply that leads to a loss of output or gross profit is insurable.

Iain Bell, Director, Major Risks Practice, Gallagher

KEY TAKEAWAYS

- Collaborate across functions to gain full transparency of the organisation's supply chain
- Build a robust governance structure providing oversight of the full supply chain
- Identify suppliers and understand their risk profile
- Create agility by avoiding single-source suppliers and have pre-approved back-up ready to step in where necessary
- Educate brokers and insurance partners on the total supply chain risk exposure
- Review insurance contracts to identify coverage and overlap.
- Continuously scan the horizon to ensure emerging supply chain risks are identified and embraced as part of the organisation's overall system for managing risk
- Integrate supply chain management as part of the organisation's framework for business continuity and crisis management

Marlow House
1a Lloyd's Avenue
London,
EC3N 3AA

Tel: +44 207 680 3088
Fax: +44 207 702 3752
Email: enquiries@airmic.com
Web: airmic.com

GUI-0060-1019