Location and Procurement Decisions

Production in stable regions strengthens resilience but can increase procurement costs

Production in stable regions strengthens resilience but can increase procurement costs

Supply chain disruptions are influenced by geography. Decisions about the location of facilities are costly and difficult to reverse, so it is important to choose locations that ensure the system performs well. Sourcing in stable regions may reduce risks, but may also lead to higher procurement costs. High cost areas tend to have a higher GDP per capita, which 'correlates positively with the price levels of relevant input factors, such as wages, thereby raising procurement costs. Intense price competition may force companies to relocate to lower-cost, unstable locations.

Which factors influence this trade-off? E.g., dependencies related to suppliers, customers, geopolitics, tech, finances or regulations.

Is this trade-off relevant for us?

☐ Yes ☐ No

Which dimensions are affected?

☐ Eff ☐ Res ☐ Sus

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Location and Procurement Decisions

Diversification (multi-sourcing, regions) strengthens resilience but can increase procurement costs

Diversification (multi-sourcing, regions) strengthens resilience but can increase procurement costs

Single sourcing relies on one supplier, which streamlines logistics and guarantees consistent quality, but poses risks during supplier disruptions. For instance, single sourcing semiconductors caused major carmakers to lose billions of revenue due to shortages in 2021. On the other hand, using two suppliers, e.g., across regions, reduces over-reliance but potentially increases costs and complicates communication. However, it requires careful management of quality and coordination. A prominent example is Apple's multi-sourcing strategy for iPhone components.

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Location and Procurement Decisions

Considering "sustainability" when selecting suppliers can increase procurement costs

Considering "sustainability" when selecting suppliers can increase procurement costs

Selecting suppliers based on sustainability can increase costs due to investments in technologies and labour practices. There is often tension between minimising emissions and controlling costs in ISN design. This can be considered an environmental network problem (higher protection level, but higher overall costs). While the higher prices of eco-friendly materials and practices can raise short-term costs, they may yield long-term benefits. Investments in sustainability often lead to better long-term economic and environmental outcomes.

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Location and Procurement Decisions

Nearshoring strengthens resilience and reduces emissions, but can lead to higher procurement costs and dis-advantages for developing countries

Nearshoring strengthens resilience and reduces emissions, but can lead to higher procurement costs and disadvantages for developing countries

As companies move production back to their home countries, they are relocating activities according to one of three alternatives: backshoring, nearshoring and further offshoring. These options help companies resolve the cost-risk vs distance dilemma by choosing lower-risk locations that don't necessarily provide the biggest savings. Backshoring and nearshoring strengthen resilience by minimizing logistics, geopolitical uncertainties and transportation emissions, but nearshoring can result in higher costs due to increased operational costs in regions with higher wage standards.

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Risk Management

Improved planning capacities (e.g., for risk management) strengthen resilience but can result in higher operating costs

Improved planning capacities (e.g., for risk management) strengthen resilience but can result in higher operating costs

A risk is the chance of something bad happening at some point in the future. In supply chains, a risk is the variation in possible outcomes and how likely they are. But definitions of supply chain risk are often vague, making them difficult to assess and monitor. However, better planning can help. Forecasting demand, better coordination through information sharing, joint relationships, and SCM software integrated with ERP and business intelligence tools can strengthen resilience. But setting up these systems can increase operating costs due to technology, training and maintenance.

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Supplier Relationship Management

Investments in supplier development strengthen sustainability but can increase procurement costs

Investments in supplier development strengthen sustainability but can increase procurement costs

Companies may invest in helping suppliers to adopt sustainable production methods, improve labour conditions and comply with environmental regulations. While these initiatives strengthen long-term sustainability, they can initially increase procurement costs and create obstacles, particularly when there is limited influence over the supplier due to contract volumes or a lack of relationships. However, collaborating on ordering decisions consistently lowers the cost of emission reductions compared to firms acting independently, even if it does not always reduce total supply chain emissions.

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Supplier Relationship Management

Demand for transparency in supplier relationships can strengthen resilience and sustainability but at the same time impair partnerships (e.g., suppliers who are not prepared to create transparency may leave)

Demand for transparency in supplier relationships can strengthen resilience and sustainability but at the same time impair partnerships (e.g., suppliers who are not prepared to create transparency may leave)

Understanding the supplier's processes enables the adoption of resilient and sustainable (e.g., ethical sourcing and fair labour) practices. In contrast, resilient supply chains focus on minimising economic uncertainties. Suppliers must be transparent about sensitive data in order to implement certain resilience and sustainability standards. However, strict transparency requirements can put a strain on partnerships, as suppliers may be reluctant to share their data. Pressure to be transparent can lead to tension, reduced trust and even the breakdown of supplier relationships.

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Delivery Flexibility and Reliability
Higher inventories strengthen resilience but tie up capital and increase opportunity and obsolescence costs

Higher inventories strengthen resilience but tie up capital and increase opportunity and obsolescence costs

While strategic stock improves a company's resilience, it also increases costs. Conversely, a lean inventory helps to achieve agility by reducing waste and costs. However, the downside is reduced resilience. If a key supplier experiences a delay, the company could end up with no stock. This is particularly pertinent for imported goods, which experience longer stockouts and higher inflation rates than goods produced domestically. To boost resilience, businesses need to either hold more inventory or have multiple suppliers, which contradicts the principles of lean inventory.

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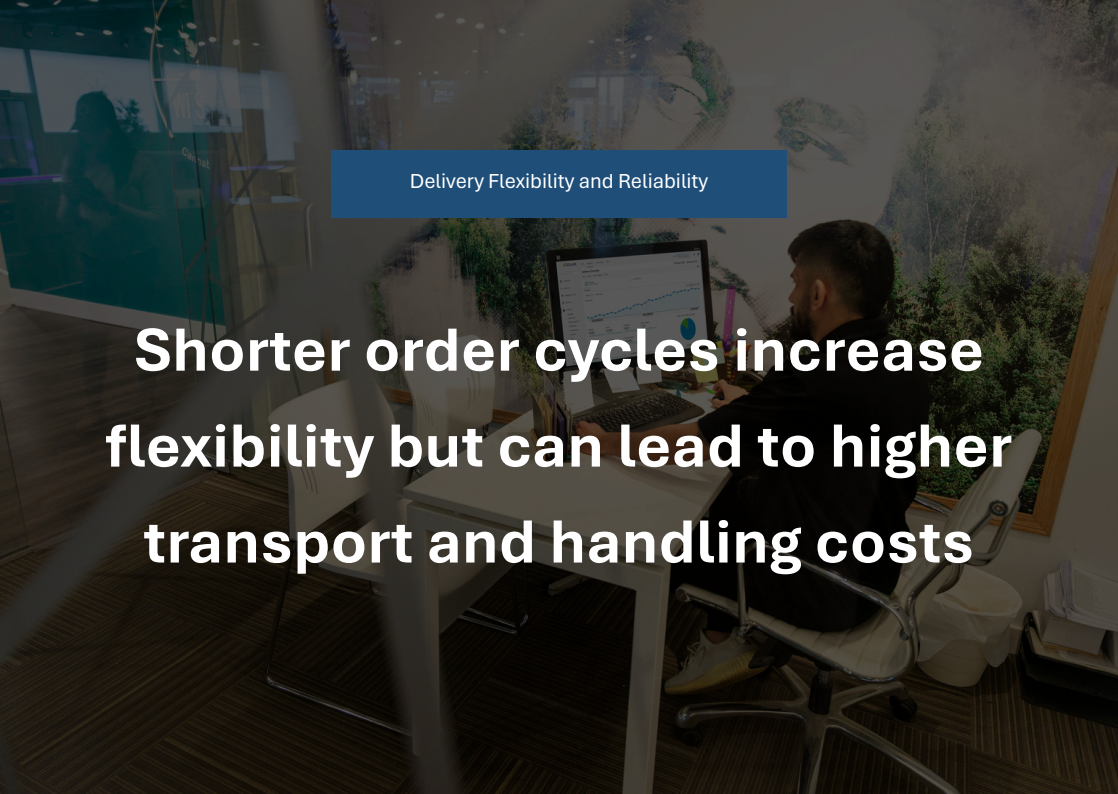

Delivery Flexibility and Reliability

Shorter order cycles increase flexibility but can lead to higher transport and handling costs

Shorter order cycles increase flexibility but can lead to higher transport and handling costs

Unanticipated demand and rush orders are high-probability, moderate-impact disruptions. Speeding up cycle time improves supply chain efficiency, enabling companies to respond quickly to such disruptions. This improves customer satisfaction and reduces stockouts, which is particularly valuable for functional goods with high holding costs. However, increased responsiveness can result in higher costs due to more frequent shipments and the need for rapid processing. Therefore, the benefits of flexibility must be balanced against the potential rise in costs.

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Delivery Flexibility and Reliability

Higher stock levels strengthen resilience but increase the risk of waste (e.g., BBD)

Higher stock levels strengthen resilience but increase the risk of waste (e.g., BBD)

Streamlining processes results in a significant reduction in waste. However, this restricts the ability of the supply chain to quickly adapt its production to a variety of products. Resilient supply chains are built on agile and flexible principles in order to handle market and demand volatility. However, the efficiency gained through waste reduction reduces available buffers, such as inventory, capacity or time, and decreases the system's overall flexibility. This renders rapid reconfiguration infeasible, despite the fact that these quick adaptations can be crucial when competing in markets for products with short life cycles.

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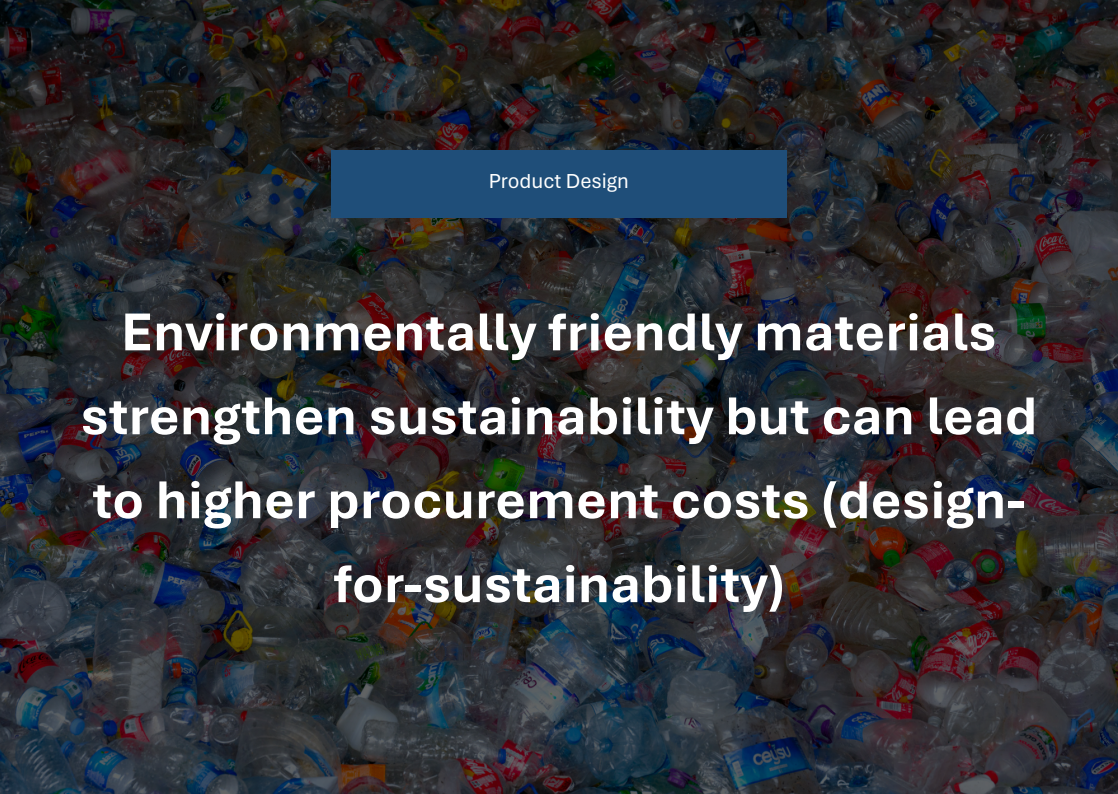
Product Design
Environmentally friendly materials strengthen sustainability but can lead to higher procurement costs (design-for-sustainability)

Environmentally friendly materials strengthen sustainability but can lead to higher procurement costs (design-for-sustainability)

Sustainable materials are important for the environment but often increase costs. While decarbonisation is essential for supply chains, companies also deal with material challenges such as resource extraction and waste. A key part of this is the circular economy, where products, components and materials are reused and remanufactured. Nearly 60% of companies are implementing circularity strategies, extending products' lifespan, and this allows them to meet sustainability goals whilst staying efficient. However, stricter environmental standards can come at a high cost.

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Product Design

Sustainable and durable product design strengthens sustainability but can reduce profits in the short term as fewer products are sold (build-to-fail)

Sustainable and durable product design strengthens sustainability but can reduce profits in the short term as fewer products are sold (build-to-fail)

Sustainable materials are important for the environment but often increase costs. While decarbonisation is essential for supply chains, companies also deal with material challenges such as resource extraction and waste. A key part of this is the circular economy, where products, components and materials are reused and remanufactured. Nearly 60% of companies are implementing circularity strategies, extending products' lifespan, and this allows them to meet sustainability goals whilst staying efficient. However, stricter environmental standards can come at a high cost.

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Investment Decisions

Measures to increase resilience and sustainability incur investment costs in the short term but can lead to cost savings and more stable processes in the long term

Measures to increase resilience and sustainability incur investment costs in the short term but can lead to cost savings and more stable processes in the long term

A resilient supply chain must demonstrate its competence through innovation. By contrast, a sustainable supply chain must be able to adapt to future markets and self-adjust to meet demand. Achieving a balance between this adaptability and current competencies is a central challenge for supply chains. Sustainability initiatives are often initially associated with higher costs, as are resilience efforts. The financial and operational benefits of these measures are often long-term, and competition and price pressure in the global market can make it difficult to free up capital for investment.

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Production Methods

More sustainable production (e.g., OHS) and avoidance of outsourcing strengthen sustainability but increase production costs

More sustainable production (e.g., OHS) and avoidance of outsourcing strengthen sustainability but increase production costs

Focusing on sustainable production often increases production costs. While in-house production enables better control over processes and quality standards, it can limit scalability and flexibility, resulting in higher costs and difficulties in meeting fluctuating demand. The following example is taken from the interviews: “The extraction of calcium carbonate has a significant environmental impact (e.g. large-scale mining operations) & is costly. Due to environmental restrictions, we had to use mechanical extraction instead of blasting, which significantly increased costs and reduced efficiency.”

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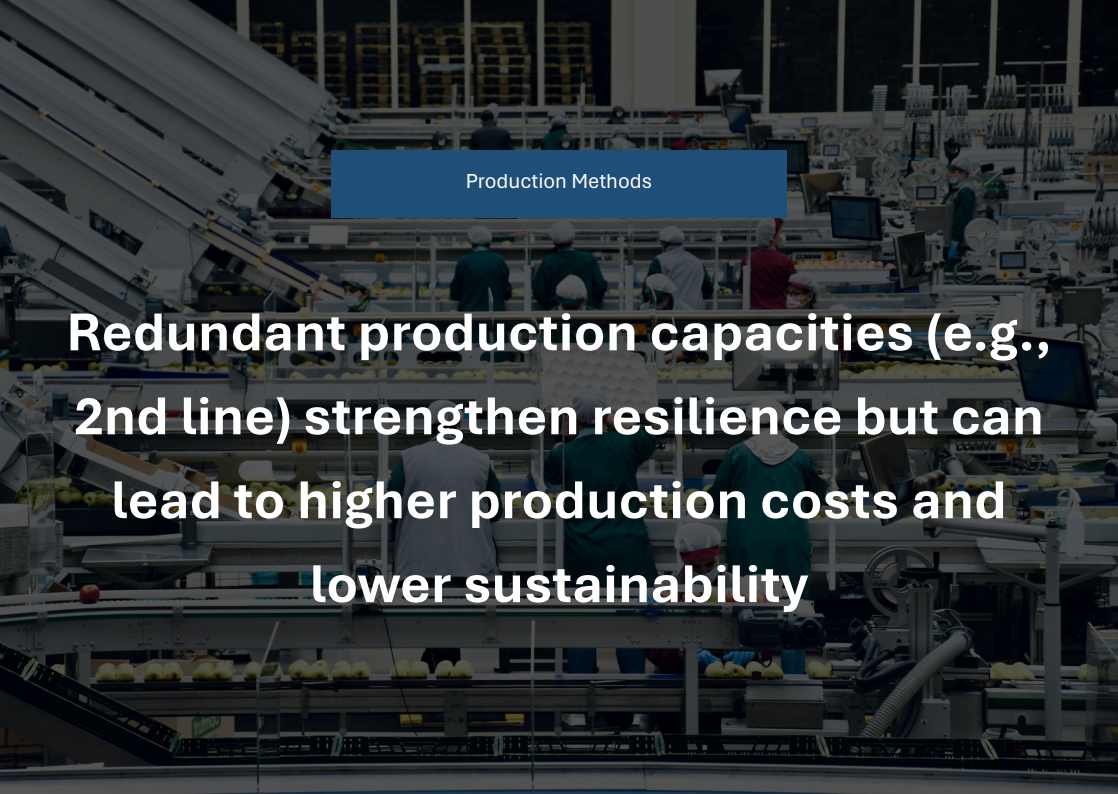
Production Methods
Redundant production capacities (e.g., 2nd line) strengthen resilience but can lead to higher production costs and lower sustainability

Redundant production capacities (e.g., 2nd line) strengthen resilience but can lead to higher production costs and lower sustainability

The resilience concept includes two approaches: proactive (resistance) and reactive (recovery). In order to prepare effectively for both of these approaches, redundancy (e.g. high safety stock and additional production capacity) and flexibility (e.g. alternative suppliers, transportation depots and delivery methods) are required. However, while these concepts help to manage bullwhips in supply chains, they involve surplus resources that could distract from sustainability and agility goals. Furthermore, such capacities often require greater energy and material usage.

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Distribution Network & Location Planning

Centralised production and warehousing reduce production and storage costs, but can weaken the resilience of the supply chain

Centralised production and warehousing reduce production and storage costs, but can weaken the resilience of the supply chain

Globalisation and the trend of outsourcing make supply chains more complex and less observable and controllable, making them more sensitive to disruption. Increased specialisation and geographical centralisation of manufacturing are used to increase agility. In effect, disruptions to one node can ripple through almost all the nodes and links in the supply chain, thereby compromising its resilience. However, this approach increases vulnerability to disruptions such as natural disasters, political instability, and infrastructure failures, since the entire supply chain relies on a few locations.

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Distribution Network & Location Planning

Centralised production and warehousing reduce production and storage costs, but can lead to higher CO2 emissions due to longer transport distances

Centralised production and warehousing reduce production and storage costs, but can lead to higher CO2 emissions due to longer transport distances

Centralising facilities minimises operational expenses by leveraging economies of scale and reducing overheads. However, it often increases the distance between production sites and end markets, resulting in higher transport emissions. In the long term, support can be achieved through other strategies, such as electrifying the fleet, optimising routes, and consolidating transport, which can reduce emissions.

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Shipping and Transport Management

Logistics outsourcing can reduce logistics costs, but reduces flexibility and control

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Delegating logistics to 3PLs can reduce costs and improve service and effectiveness. It's now a key corporate strategy, set to become more common. A lot of logistics is being outsourced: transport (69%), freight forwarding (60%), and international transportation (52%) are increasing, and only warehousing (43%) is decreasing. But added complexity can make firms lose control over 3PLs. The decision to use 3PLs is a version of the make-or-buy problem. As a key strategy, choosing to buy parts of products can restrict a company's ability to change direction in the future.

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Shipping and Transport Management

Fast and flexible transport strengthens resilience but increases CO2 emissions and transport costs

Fast and flexible transport strengthens resilience but increases CO2 emissions and transport costs

Faster transport modes, such as air freight, improve responsiveness, but lead to higher emissions and are often more expensive. In contrast, cheaper, slower modes of transport (sea or rail) lower emissions but increase lead times. Responsiveness is often prioritised for innovative products with high demand uncertainty and high profit margins, which leads to high emissions. Functional products, which are characterised by stable demand and lower profit margins, typically rely on slower transport to reduce emissions, sacrificing responsiveness in the process.

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Shipping and Transport Management

Safe route selection strengthens resilience, but can cause higher CO2 emissions and transport costs

Safe route selection strengthens resilience, but can cause higher CO2 emissions and transport costs

Selecting safer transportation routes improves resilience by minimizing exposure to risks such as geopolitical instability, natural disasters, or infrastructure deficiencies. But prioritizing safety can lead to longer or less direct routes, increasing fuel consumption and, consequently, CO2 emissions. Additionally, these extended routes often increase transportation costs due to longer distances and travel times, and fuel consumption. As transport is a major cost factor in supply chains, choosing resilience affects sustainability and leagility.

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Shipping and Transport Management

Consolidation of transport loads reduces emissions but can increase delivery times and storage costs

Consolidation of transport loads reduces emissions but can increase delivery times and storage costs

In transportation, there is usually a trade-off between cost and carbon footprint. Studies conclude that adopting strict environmental policies will increase transport costs by an average of 8%. One such policy is transport load consolidation, which reduces the number of transports and consequently the carbon footprint. However, this also slows down order cycles, reducing a supply chain's ability to react to changes in the market.

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