Supply Chain Monitor

Q4-2023

Geopolitical tensions and climate change are adding pressure to supply chains

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Supply Chain Monitor Q4-2023

The supply chain monitor
This is the fourth edition of our quarterly supply chain monitor, following the *first quarter of 2023*, the *second quarter of 2023* and the *third quarter of 2023* monitors. Central to this is the supply chain heatmap, which we first published at the end of 2022 in our report *Rebuilding Supply Chains*. This heatmap shows, along the lines of various indicators (freight, production, demand, prices and uncertainty), where the pressure on Dutch supply chains has increased or decreased since the start of the Covid-19 pandemic.

What developments are visible in the heatmap?
The heatmap makes it clear that:

- There is a link between global disruptions (the Covid-19 pandemic, the Russian invasion of Ukraine, Israel-Hamas War, natural disasters, etc.) and pressure on supply chains. For example, in the first quarter of 2020, we see indicators related to uncertainty turning red, and in the first quarter of 2022, we see pressures increasing due to sharply rising fuel prices.
- There are various causes of pressure on supply chains: some are structural (including some shortages of materials and labour), and others are shorter-term disruptions. However, we can see that supply chain pressures have eased globally to pre-pandemic levels, as most indicators have turned green.

Against what background do we monitor?
Supply chain management traditionally focuses on efficiency. This makes sense: efficient supply chains mean effective production and distribution and significantly lower costs. However, the benefits of efficiency fade into the background when global disruptions occur. Then ‘efficient’ turns out to coincide with ‘vulnerable’. That is why we see resilience (and thereby flexibility) gaining importance in supply chain management and why companies are seeking a different balance. Furthermore, resilience is also an important aspect to consider when making investments in sustainable and digital transformation amidst short-term business pressures.

PwC Supply Chain Heatmap: Q4-2023 update

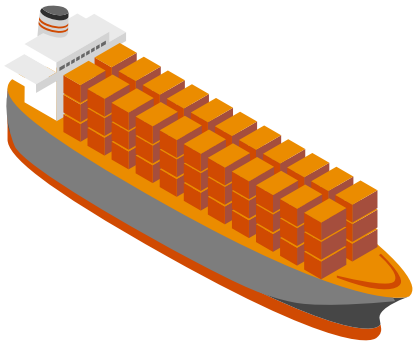
Category	Indicators	2020-Q1	2020-Q2	2020-Q3	2020-Q4	2021-Q1	2021-Q2	2021-Q3	2021-Q4	2022-Q1	2022-Q2	2022-Q3	2022-Q4	2023-Q1	2023-Q2	2023-Q3	2023-Q4
Global supply chains	Global supply chain pressure index (NY Fed)																
	World trade monitor (CPB)																
	Total global containerized freight volume per quarter (Kiel)																
Uncertainty	World uncertainty index (WUI)																
	World trade uncertainty index (WTU)																
Shipping	Average monthly proportion of goods per quarter that are on waiting container ships (Kiel)																
	Average daily percentage per quarter of global container ship cargo capacity in congestions around Shanghai and Zhejiang, China (Kiel)																
	Average daily percentage per quarter of global container ship cargo capacity in congestions around Hongkong and Guangdong, China (ports of HK, Yantian, Shenzhen and Guangzhou) (Kiel)																
	Average daily percentage per quarter of global container ship cargo capacity in congestions around Georgia and South Carolina, USA (ports of Savannah and Charleston) (Kiel)																
	Average daily percentage per quarter of global container ship cargo capacity in congestions around Southern California, USA (ports of Los Angeles, Long Beach and San Diego) (Kiel)																
	Average daily percentage per quarter of global container ship cargo capacity in congestions around North Sea, Europe (North Sea ports of the Netherlands, Belgium, Germany and the UK) (Kiel)																
	Average total daily capacity per quarter of container ships in the Red Sea and the Suez Canal, Middle-East (Kiel)																
	Baltic dry index - cost of shipping raw bulk materials (Eikon)																
	Port of Rotterdam throughput (IHS Markit)																
Air freight	Total air freight volume from NL (Eurostat)																
Road freight	Total road freight transport volume, NL (OECD)																
Rail freight	Total rail freight transport volume, NL (OECD)																
Inventories	Stock of finished products, NL (CBS)																
Production	Manufacturing purchasing managers' index, NL (NEVI)																
	Percentage of manufacturing firms experiencing shortage of materials, NL (EC)																
	Percentage of manufacturing firms experiencing labour shortage, NL (EC)																
	Observed production trend in recent months in manufacturing, NL (EC)																
	Assessment of current production capacity in manufacturing, NL (EC)																
	Current level of capacity utilization in manufacturing, NL (EC)																
	Construction confidence, NL (EC)																
	Retail confidence, NL (EC)																
	Services confidence, NL (EC)																
	Warehousing confidence indicator, NL (EC)																
Demand	Economic sentiment indicator, NL (EC)																
	Consumer confidence, NL (EC)																
	Consumer confidence, good time for major purchases, NL (EC)																
	Percent change in consumption of goods by households, NL (CBS)																
	Percent change in consumption of durable goods by households, NL (CBS)																
	Percent change in consumption of services by households, NL (CBS)																
	New orders in recent months in manufacturing, NL (EC)																
	Assessment of order book levels in manufacturing, NL (EC)																
	Duration of production assured by current order-book levels in months, NL (EC)																
Costs	World materials price index (IHS Markit)																
	Fuel prices, HWWI (CPB)																
	Primary commodities excluding fuels, HWWI (CPB)																
	Monthly labour costs per quarter, NL (Eikon)																

Sources: Freightos, Port of Rotterdam, Thomson-Reuters, NY Fed, Kiel Institute, European Commission, CBS, CPB, OECD, IHS Markit, WUI, ECB, PwC Analysis.

The heatmap shows Z-scores, computed by subtracting the mean from the observation at time t and dividing the difference by the standard deviation. The mean and the standard deviation are computed for as large historical samples as possible. Observations marked with "-" are not yet available. The colour grading goes from -3 (green), 0 (mean, yellow) to 3 (red) standard deviations.
*Approximate standartization.

Disruptions return in the fourth quarter of 2023

The first three quarters of 2023 were marked by reduced pressures on supply chains compared to 2021 and 2022. This 'breathing room' provided companies with the opportunity to re-evaluate their supply chain configuration and invest in the right strategic priorities to prepare for future disruptions. Hence, it was the right moment to invest in supply chain resilience and sustainability.



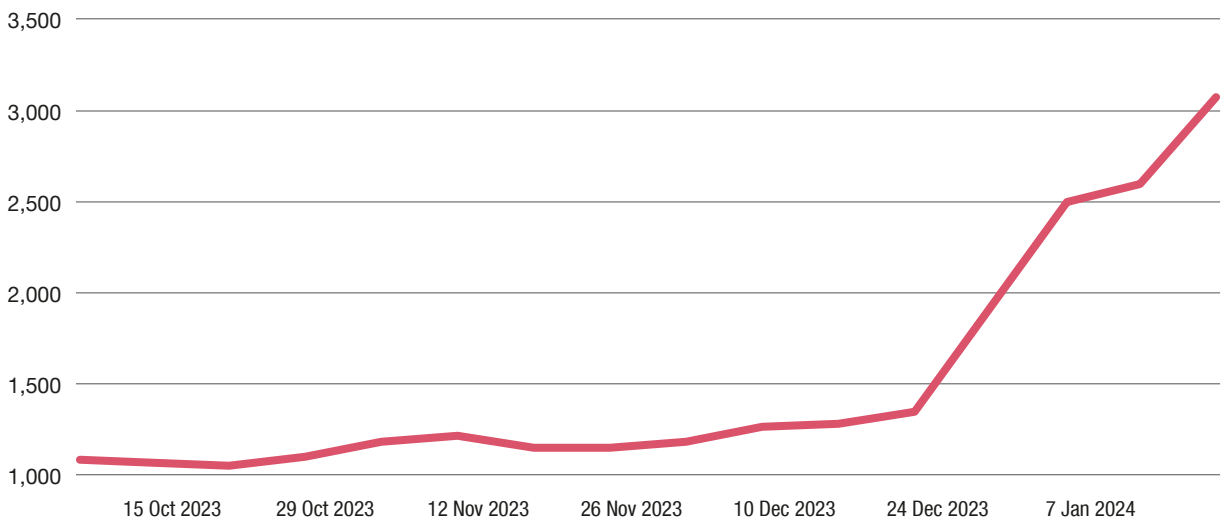
The fourth quarter of 2023 indicates why that was the right moment. Although there is no indication of pressures at the same level we saw during the Covid-19 pandemic,[1] disruptions are expected to be more common than before due to increased geopolitical instability and climate change.[2] The last few months have provided an example of each type of disruption: the Panama Canal operated below capacity due to low water levels, and, in the Red Sea, attacks by Houthi rebels limited shipping routes through the Suez Canal.

In Q4-2023, we see these trends developing:

- Shipping costs increased sharply in the last quarter. The Baltic Dry Index, which focuses on the cost of shipping raw bulk materials, reached a peak in early December before returning to the value of early November during January. But the Freightos Baltic Index, which measures global container freight rates, continued to increase in January, reaching a value almost three times as high as the one in mid-November. This could eventually add pressure to consumer prices, as happened during the Covid-19 pandemic, but the index is still significantly lower now than it was then.
- Besides, the macroeconomic context is very different now than it was during the peak of supply chain pressures. The economy is not 'running as hot', while consumer confidence remains low. In addition, the reduction of *new orders in recent months* in the last quarter is an indication that demand-side pressures are still low. During the Covid-19 supply chain crisis, there were massive pressures from the demand side, which stressed all parts of logistics networks, from origin factors to destination warehouses. Current crises are supply shocks, affecting ocean shipping more specifically.

1 11 January 2024 - Economist - Why spiking shipping costs cause inflation to surge?
2 21 November 2024 - CNBC - Geopolitical instability and a packed election calendar have strategists wary of 2024
3 11 January 2024 - CBS - Inflation down to 1.2 percent in December; 3.4 percent excluding energy

Freightos Baltic Index has increased by almost 200% since October



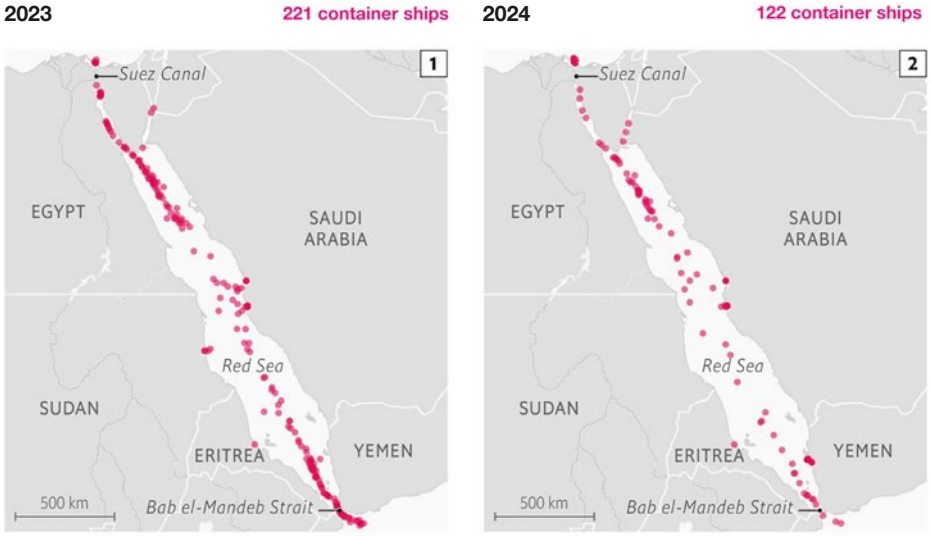
Source: Freightos

> While, in the first three quarters of 2023, around 35% of Dutch manufacturing companies reported labor shortages as a factor limiting production, this decreased to 31% in the last quarter.

- As a result, inflation is moderating, mainly driven by lower energy inflation. Annual inflation in the Netherlands has been below 1.5% in all three months of Q4-2023, and although higher when not considering energy (3.4%), inflation overall has been on a declining trend.[3]
- In addition, the last quarter saw a reduction in labor and material shortages. Although, both remain high by historical standards and have been a significant factor of concern for Dutch businesses since 2021. Therefore, even a slight relief is welcome news. While, in the first three quarters of 2023, around 35% of Dutch manufacturing companies reported labor shortages as a factor limiting production, this decreased to 31% in the last quarter. Regarding the shortage of materials, for the first time since Q1-2021, less than 15% of manufacturing companies reported that it was a factor limiting production.

Geopolitics will continue to affect supply chains: the Red Sea crisis

Container ships have re-routed from the Red Sea to the Cape of Good Hope
Red Sea and Suez Canal, container ships, 4 to 11 January



Cape of Good Hope, container ships, 4 to 11 January

Source: 18 January 2024 - Economist - Tracking ships in the Red Sea

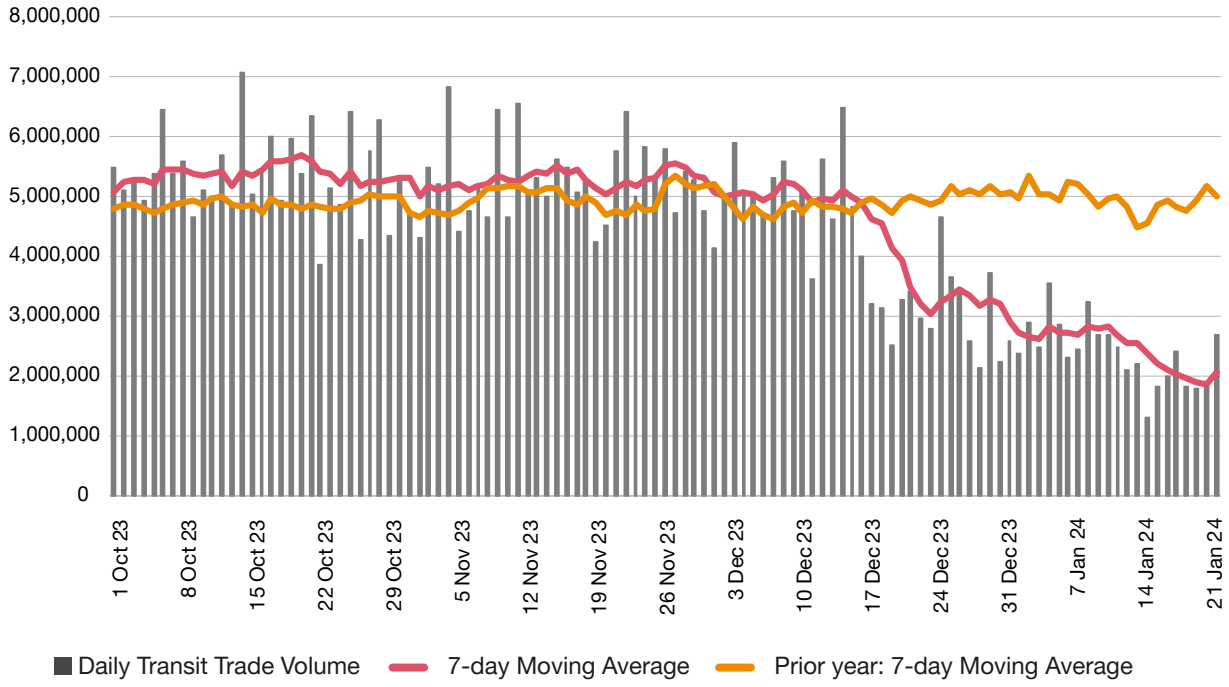
The Red Sea shipping crisis started on November 19th, when Yemen's Houthi movement hijacked a commercial ship in the Red Sea in the Bab el-Mandeb Strait. It is one of the most important global maritime chokepoints, as it is a link between the Red Sea and Arabian Sea and ultimately to the Indian Ocean.[4] An estimated 12% of global trade passes through the Red Sea every year,[5] including 8% of LNG and 12% of global oil flows.[6] This is a vital part of many shipping routes that bring goods from Asia to Europe.

Longer journeys, higher costs

Since the initial attacks, more than two dozen commercial ships have been attacked. This led major shipping companies to increasingly avoid the region and use an alternative route around Africa and through the Cape of Good Hope.[7] The number of containers shipped in the Red Sea has plunged since December from 500,000 to 200,000 per day.[8]

4 2021, Gunathilake - Maritime choke points and its implications for the global economy if disturbed
5 21 January 2024 - BBC - Hundreds of cargo ships and tankers are being rerouted around the southern tip of Africa to avoid Houthi attacks in the Red Sea. But just how easy is it to divert the world's biggest ships?
6 16 January 2024 - ING - What the Red Sea crisis could mean for commodity markets
7 3 January 2024 - BBC - Red Sea attacks: 'Our shipping costs have jumped 250%'
8 11 January 2024 - Kiel - Cargo volume in the Red Sea collapses

Transit trade volume (measured in metric tons) has plummeted in the Bab el Mandeb Strait



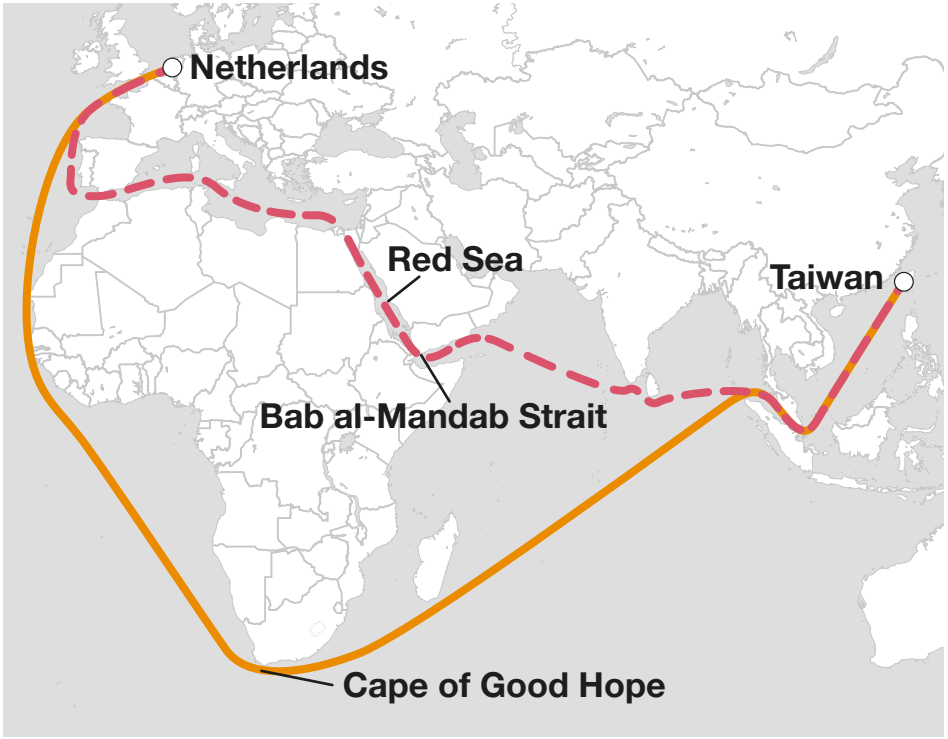
Source: IMF PortWatch

Avoiding the Red Sea leads to a longer route

Using Red Sea/Suez Canal
10,000 nautical miles
(18,520km)
25.5 days*

Around Cape of Good Hope
13,500 nautical miles
(25,002km)
34 days*

* Based on ultra large container vessels's average speed of 16.48 knots



Source: 3 January 2024 - BBC - Red Sea attacks could push up prices, UK firms warn

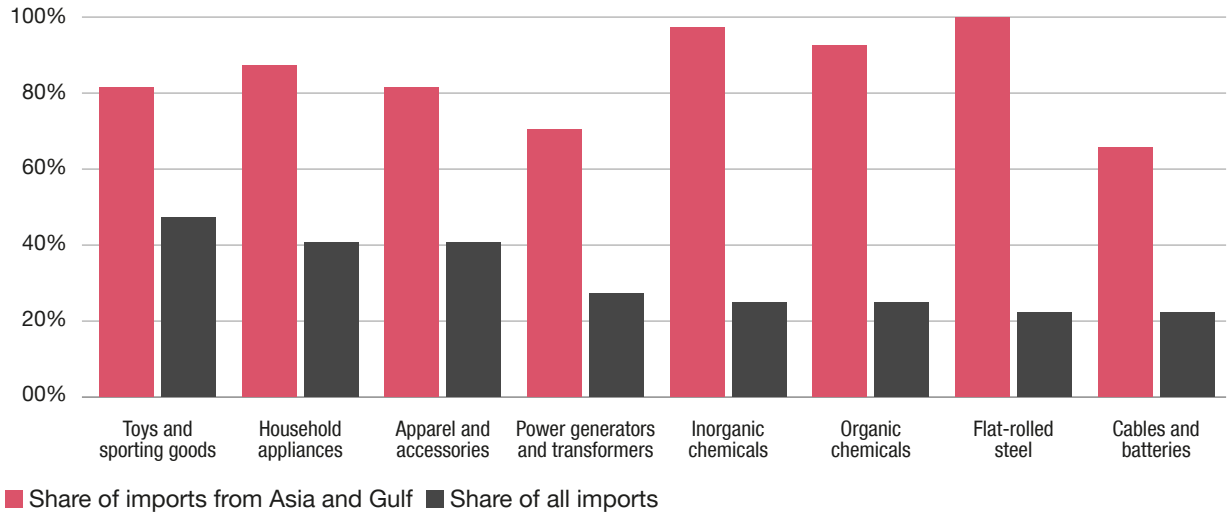
This does not come without cost. By avoiding the Yemeni coast, ships are prevented from using the Suez Canal. The alternative route adds between one week and twenty days to the journey.[9]

The consequences are vast. The most obvious one is that it can lead to delays. But more than that, a longer route also represents higher fuel costs and emissions. In addition, to operate with the same cargo capacity, more ships (and crews) are actually needed as they stay longer in the sea, increasing supply chain pressures.

> An estimated 12% of global trade passes through the Red Sea every year, including 8% of LNG and 12% of global oil flows.

9 11 January 2024 - Kiel - Cargo volume in the Red Sea collapses

Consumer goods, clothing and chemicals are among the exposed sectors
Seaborne imports to Europe, Middle East and North Africa, 2023



Source: S&P Global Market Intelligence. ©2023 S&P Global.
Data compiled on 17 December 2023

Businesses relying on Asia and the Gulf are most affected

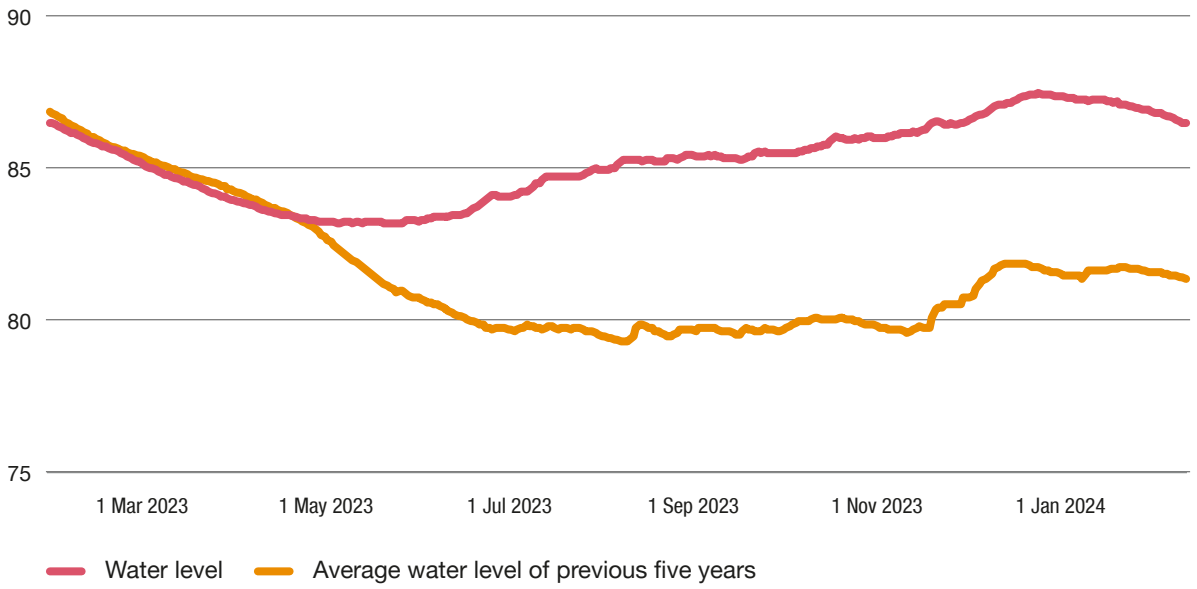
Businesses are already seeing the consequences. For example, Tesla announced a halt in production at its main production site in Germany due to delays in the delivery of parts caused by the Red Sea crisis.[10] Volvo faced similar difficulties, pausing output at its plant in Ghent, Belgium.[11] In addition, the introduction of surcharges and increased transaction costs, as the appropriate value of those can be hard to estimate, are adding cost pressures to companies.[12] These pressures, however, do not affect all companies equally. Businesses that rely more heavily on imports from Asia and the Gulf are the most affected. But this can be a wide group, ranging from electric vehicle manufacturers to many sub-industries of consumer goods.

> The pressures do not affect all companies equally.

10 12 January 2024 - Guardian - Tesla pauses German production after Red Sea shipping attacks
11 13 January 2024 - Reuters - Tesla, Volvo Car pause output as Red Sea shipping crisis deepens
12 18 January 2024 - FD - Bedrijven willen steun EU in strijd tegen Rode Zeetoeslagen

Climate change will increase the frequency of supply chain disruptions: the low water level in the Panama Canal

Water level (feet) in the Gatun Lake is below average



Source: Panama Canal Authority

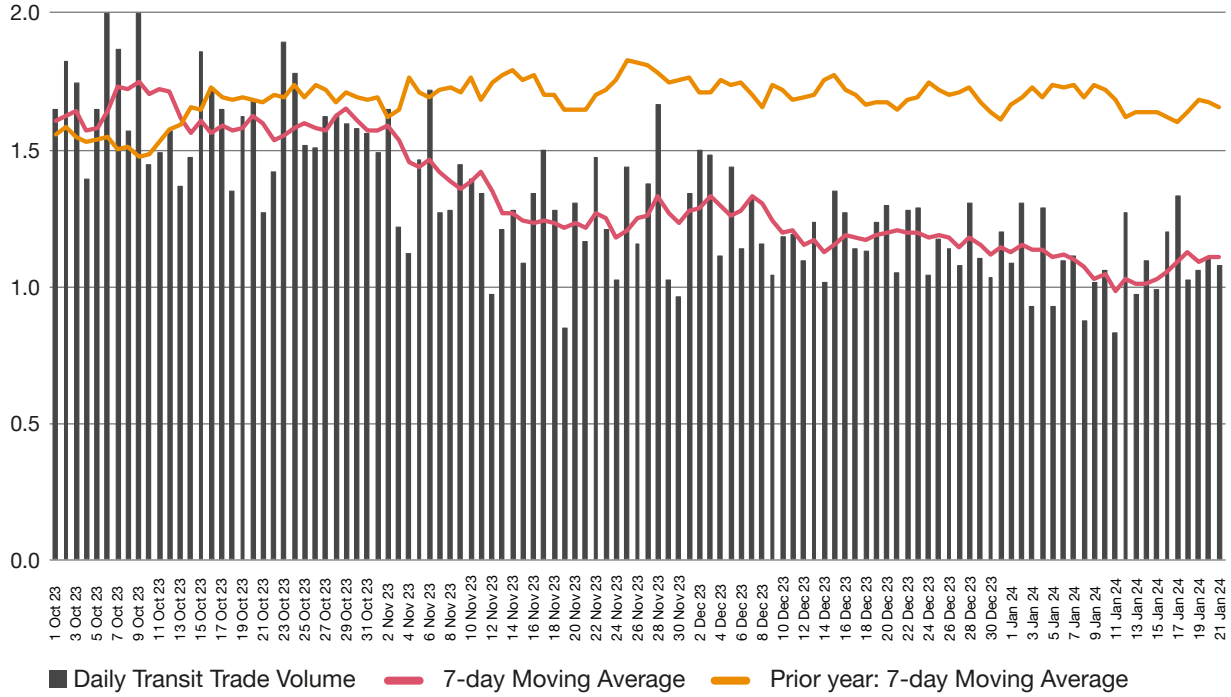
Roughly 5% of the seabourn world trade runs through the Panama Canal. For it to run smoothly, water levels should be high enough. But last year, the rainy season, which runs from late April to November, saw significantly less precipitation than usual. As a result, the water levels in the canal's main reservoir, Lake Gatun, fell to unprecedented lows.[13] This caused the number of vessels allowed daily to transit the canal to fall by more than a third in December, from the typical 36 to 22.[14]

Low water levels might become more common

It is probably not just a sporadic episode. In the short run, it is important to consider that the dry season is just starting and that more constraints can occur in the first months of 2024.[15] In the long run, more frequent and severe weather events mean that low water levels in the Panama Canal will become more frequent.[16] The viability of the Panama Canal as a shipping route in the long run is being questioned by businesses, governments and shipping companies.[17,18]

13 15 January 2024 - Foreign Policy - The Panama Canal Is Running Dry
14 29 December 2023 - Nikkei - Panama Canal backup forces detours for Asia-bound grain ships
15 31 October 2023 - S&P Global - Panama Canal faces prolonged impact from El Nino, climate change
16 28 June 2021 - Wall Street Journal - Panama Canal tackles climate-change puzzle: too little rainwater or too much
17 15 January 2024 - Foreign Policy - The Panama Canal Is Running Dry
18 3 January 2024 - Bloomberg - Saving the Panama Canal Will Take Years and Cost Billions, If It's Even Possible

Since October the transit trade volume (in millions of metric tons) in the Panama Canal is significantly below the previous year



Source: IMF PortWatch

19 29 December 2023 - Nikkei - Panama Canal backup forces detours for Asia-bound grain ships
20 11 January 2024 - CNBC - Panama Canal drought forces Maersk to start using 'land bridge' for Oceania cargo

Panama Canal issue leads to higher costs and more complexity

The lower capacity of the Panama Canal leads to cost increases. One option for companies is to engage in auctions for transit slots, but winning bids for slots were reaching up to US$2m in December, a value that is not financially viable for the transportation of certain goods. In addition, greater unpredictability is added to the equation as shipping companies become unsure about how long it will take vessels to be allowed in the canal. This is reflected in higher spot rates, which increased by up to almost 70% in a month up to early December.[19] Using alternative routes is an option, but that adds extra days to the journey. And one alternative route between the east coast of the United States and Asia would be the Suez Canal, which currently faces another type of crisis.

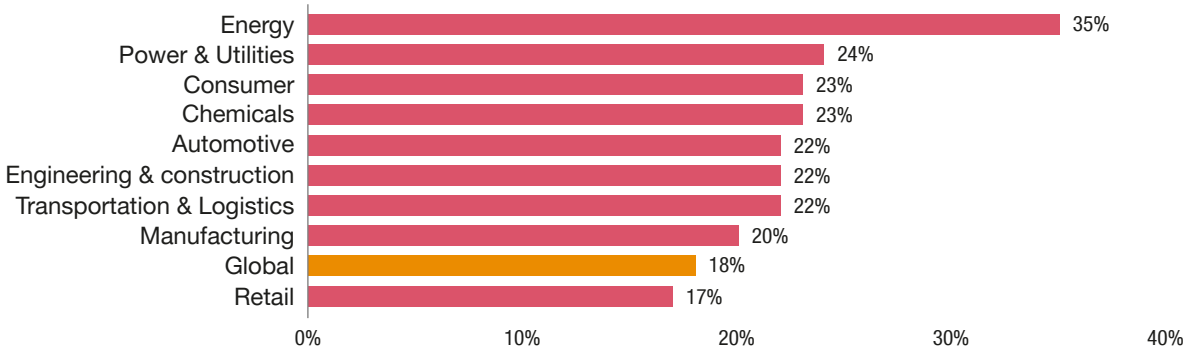
Companies are already looking for alternatives

Maersk, one of the world's leading shipping companies, announced it would start to use a 'land bridge' to avoid the Panama Canal. In other words, it would unload vessels in Pacific ports, transport cargo to Atlantic ports by land and load the cargo on other vessels there (or the other way around).[20] This adds costs and complexity compared to a normal operation.

A ‘post-adaptation’ moment

Industries that feel highly exposed to geopolitical conflict...

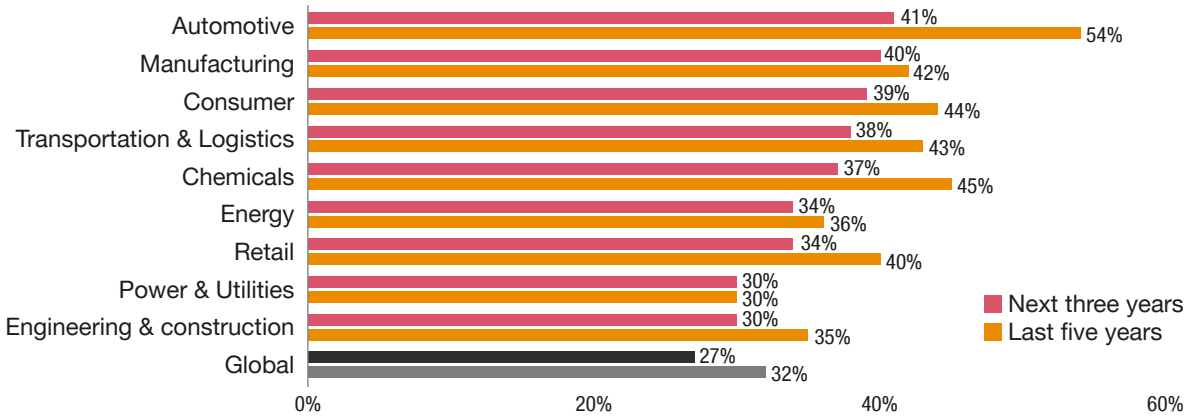
Percentage of CEOs that believe their companies are highly exposed to geopolitical in the next 12 months



Source: PwC’s 27th CEO survey

...still consider supply chain instability a strong driver of change

Percentage of CEOs for which supply chain instability drive changes to the way their companies create, deliver and captures value in a large extent



Source: PwC’s 27th CEO survey

Supply chain disruptions will continue to happen. More shocks are now systemic. In the past, they used to be idiosyncratic. In other words, shocks used to be more simple and isolated, such as a single port closure, a single product demand surge or a factory closure. And now more of them are multi-sector and complex. Think of extreme weather events in different regions, a global pandemic or the limitations on the viability of key supply chain chokepoints.[21]

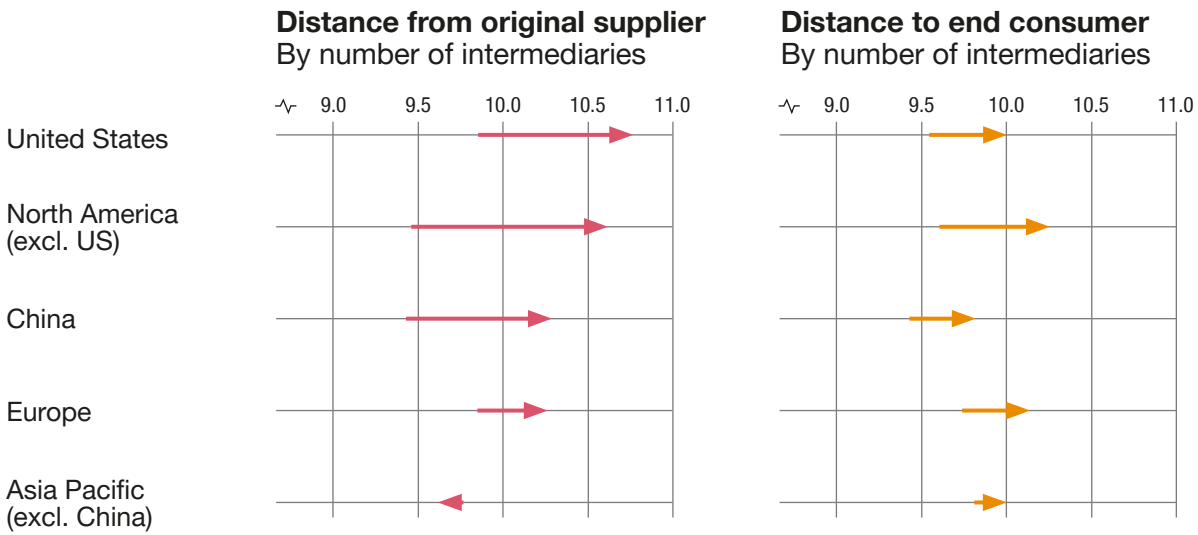
A large part of CEOs see supply chain instability as a key driver of change

CEOs seem to agree with that, according to the results of PwC’s 27th CEO survey. More than a quarter of them believe that supply chain instability will be a key driver of change in the coming three years.[22] This is less than the percentage of those believing that supply chain instability has been a key driver of change in the past five years. However, the result highlights the increased prominence of supply chain management in recent years, rather than CEOs not expecting supply chains to play a key business role anymore.

21 2023, Baldwin et. - Supply chain disruptions: Shocks, links, and hidden exposure
22 January 2024 - PwC - 27th CEO Survey

Distance from original suppliers and to consumers is increasing
Global value chains, by region of company operation

2021 to 2023



Source: 2023, H. Qiu et al. - Mapping the realignment of global value chains

> According to the results of PwC's 27th CEO survey, more than a quarter of CEOs believe that supply chain instability will be a key driver of change in the coming three years.

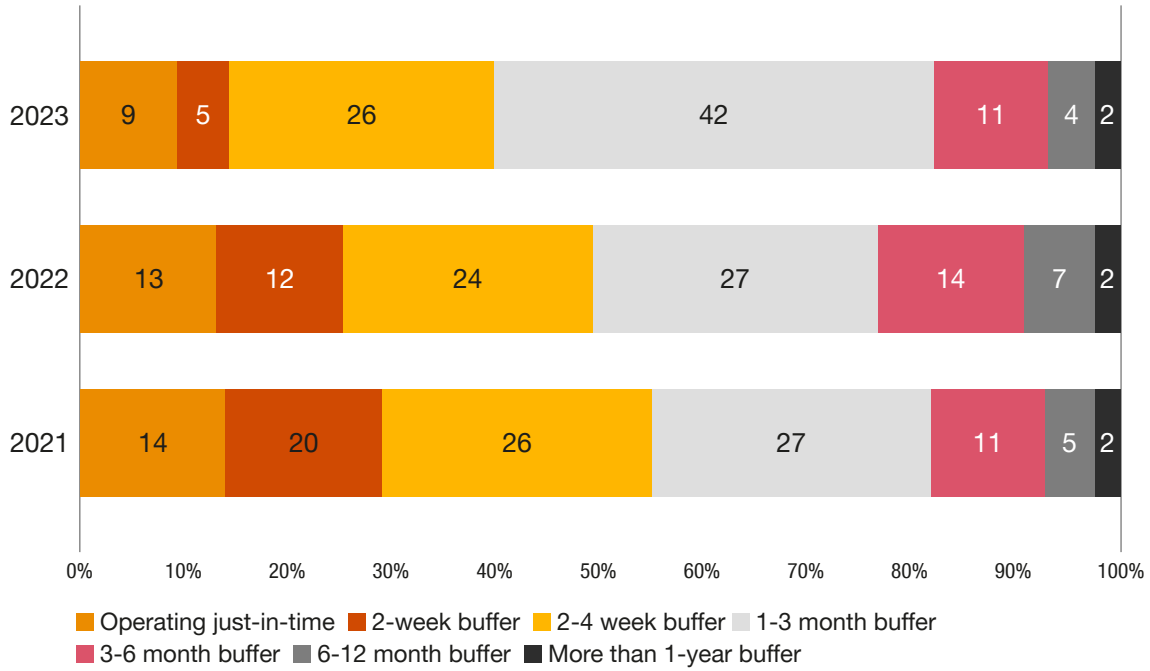
The percentages are even higher in industries dealing with important physical supply chains. As one could expect, industries in which more respondents perceive supply chain instability as a driver of change also feel more exposed to geopolitical conflict than average (the exception is retail).

Reducing risks sometimes means increasing complexity

But actions that effectively reduce the risks are not always straightforward. Attempts to move away from China, for example, have created a false sense of security. Western companies started to rely more on countries that were dependent on China. In an attempt to decrease their direct dependency, they increased their indirect dependency. This threatens to increase the distance from the original supplier, making the supply chain more complex and potentially creating new vulnerabilities. Diversification can also be tricky to implement. The average number of customers and suppliers has actually decreased in global supply chains from December 2021 to September 2023, suggesting that the 'China Plus One' strategy cannot be widely seen yet.[23]

23 14 November 2024 - Economist - Don't be fooled by America's "new" supply chains

Inventory buffer strategies have changed



Source: 2024, Economist Impact - Trade in transition: navigating tides of uncertainty

Adjustments in inventory management

On the other hand, there are signs of some adjustments in inventory management. Companies have shifted to adopting some inventory buffers, but not very large ones. The percentage of companies operating just-in-time or with less than two-week buffers has decreased. But at the same time, there are also fewer companies adopting buffers larger than three months, likely due to the extensive costs of keeping large stocks.

A permanent need for re-evaluation

As companies developed and matured their supply chain strategies in 2023, some of them entered a new moment. Although, in changing circumstances, there is a permanent need for re-evaluation, in the past few years the focus has been on assessing the risks and adapting to increase flexibility and improve resilience. Eventually, a moment of acceptance will come. In a more uncertain world, it will not be financially viable to avoid all risks. And when this cannot be done, it is important to, with a good understanding of what the vulnerabilities and the consequences of a disruption are, incorporate those risks into the business model.

Contact

Contacts

Rolf Bos
Director Supply Chain Management
PwC Netherlands
E: rolf.bos@pwc.com

Annemieke Moerkerken
Director Digital Operations
PwC Netherlands
E: annemieke.moerkerken@pwc.com

Jan Willem Velthuijsen
Chief Economist
PwC Netherlands
E: jan.willem.velthuijsen@pwc.com

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