



Memo of Findings

***Ask:** I wanted to know if there are any literature that once can use to help reenergize the need for organization to have a domestic manufacturing/resiliency strategy? At one point I think I saw some stats highlighting what it meant to have these ocean liners carry the kinds of cargo to get us products from across the seas in terms of energy output, carbon footprint, etc... I am trying to make a case to other organizations that they cannot let go of that strategy so I thought perhaps I can reference some things from AMMA or something that AMMA supports.*

The first section of this document looks at the environmental impacts of moving goods worldwide. The second is a look at how CEOs can lead the discussion to build a resilient supply chain. The third examines various medical manufacturing shortages and their impacts - and what can be done about it.

Environmental Impact of Shipping Cargo:

[Air Freight vs Sea Freight Carbon Footprint \(The Real Numbers in 2023\)](#)

Every form of transit has environmental impacts. A cargo ship produces 16.14 grams of CO₂ per metric ton of goods shipped per kilometer. On the other hand, container ships emit an average of 140 million metric tons of carbon dioxide annually, while bulk carriers emit 440 million metric tons of carbon dioxide.

Shipping lags behind the damage that Air Freight contributes to the environment. However, regardless of the method, moving items from one side of the world to another will generate adverse environmental impacts. [Environmental Performance: Comparison of CO₂ Emissions by Different Modes of Transport | International Chamber of Shipping](#)



Comparison of typical CO₂ emissions between modes of transport, in grams/tonne-km

Source: ICS Fuelling the Fourth Propulsion Revolution: Full Report, based on IMO, Second GHG Study, 2009

*AP Moller-Maersk, 2014

Sea Freight: Environment Cons

Ocean liners release their wastes directly over or into the ocean, and these greenhouse emissions directly contribute to the acidification of the sea. Some of the greenhouse gasses emitted by these vessels include: sulphur dioxide, carbon dioxide, nitrogen oxides, etc. The gasses are formed in the combustion engines of the ship and are hazardous to the environment when released.

For instance:

- Hydrocarbons accumulate in the crops, soil, and food and pose a significant health risk
- Nitrogen oxides acidify the soil.
- Ozone formed by the interaction of other pollutants damages the root and leaves of crops, leading to lower crop yields.
- Ships risk spreading alien organisms to vulnerable ecosystems, and the natural resources and energy used are considerable

In addition, the biggest cause of local environmental impact from maritime transport is accidents. The ship might leak its own fuel or other important substances, or the tank of the ship might leak dangerous chemicals such as crude oil. ([The Environmental Impact of Maritime Transport: Combating Emissions | Kogan Page](#))

There are two exhaust gases that have been discussed lately in relation to maritime transport, namely sulphur and carbon dioxides. Sulphur dioxide (SO₂) reduces air quality and affects public health. It dissolves easily into water, causing acidification of water systems and the ground. Crude oil pumped from the ground always contains sulphur, though the amount differs between oil drilling areas. Sulphur has been removed from car fuel for decades, but unpurified sulphur-rich fuel in sea traffic may still be used. **The consumption of these unpurified fuels has made maritime transport the worst producer of sulphur emissions.**

What Smart CEO's and industry can do to build a resilient supply chain.

[3 Steps to Prepare Your Supply Chain for the Next Crisis](#)

Derisking your supply chain - this was identified as the third step in this report. CEOs need to consider a series of risk-mitigation actions that encompass the three elements of the supply chain: sourcing the raw materials, components, and other parts of products; manufacturing the products; and delivering the parts to the factories and the products to the customers.

Take manufacturing, for example. CEOs should review their make-or-buy strategy, consider investing in digital technologies such as 3D printing, and above all, **switch manufacturing to locations at home (reshoring), closer to home (near-shoring), or closer to consumer markets (regionalization)**.

CEOs should also consider taking back control of their critical raw materials and component supplies. They can do this in a couple of ways.

Even McKinsey has weighed in on what smart leaders can do. In a piece called [Supply chains: To build resilience, manage proactively](#), they outline the massive risks related to even a short-term impact on supplies. New risks, like the war in Ukraine, build upon old risks, like COVID. This was a noteworthy line from the report.

For companies in most sectors, a single prolonged shock to production could wipe out 30 to 50 percent of one year's earnings before interest, taxes, and depreciation. Clogged ports, expensive cargo capacity, and emergency shipments became prevalent during the COVID-19 pandemic.

The authors advocate for a series of steps to ensure "structural resilience" in the supply chain. These include reevaluating just-in-time inventory management, building more robust sourcing by genuinely examining the risks in the supply chain, and planning for disasters in advance.

The healthcare supply chain is experiencing 'tremendous' shortages

Shortages in the healthcare industry have arrived and are having noteworthy effects:

By the numbers: Big health systems are seeing shortages of 600 products and 200-300 drugs a month, per [Premier](#). Providers are 2.5 times likelier to experience product shortages in markets, with two or fewer manufacturers accounting for more than 80% of the market share.

Nearly half of respondents (48.6%) to a Premier survey of health and supply chain officials said they had to cancel or reschedule cases or procedures at least quarterly in 2022 due to product shortages.

They are not alone. This month, the Food and Drug Administration recommended health care facilities ration tourniquet cuffs used in emergency and trauma settings and elective limb surgeries, per [Becker's Hospital Review](#).

As we look overseas, supply chain pressures in China contributed to a [shortage of contrast media](#) that kept 10% of hospital inpatients from getting a CT scan or other advanced imaging as part of their care. Our reliance on the global supply chain puts patients at risk at home.

There is a deeper look at the Medical Manufacturing/Public Health Manufacturing space in this National Academies of Science report. [Untangling Why Critical Drug and Medical Supply Shortages Keep Happening | National Academies](#) In it, they explore the N95 mask respirator shortage and emphasize the risks and realities associated with a reliance on China as the leading manufacturer of public health supplies. The authors identify remedies as diverse as:

- Reshoring manufacturing - this was helpful in remedying the saline bag shortage
- Identifying the risks to the supply chain
- Creating a transparent & public database to help prepare and respond
- Using a "Resilience" contracting model in healthy systems - including cultivating reliable capacity in the USA

As AMMA looks at making the case to our elected officials and business leaders, these three discussion points can be a starting point.