Resilient and low carbon transport and logistics networks

outlook and perspectives

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ALICE Webinar

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Relationship between Resilience and Environmental Sustainability

https://bit.ly/3WN43Br

INNOVATION

Forbes

How Sustainable Supply Chains Get A Much-Needed Boost In Resiliency

http://bit.ly/3YXd2Qg

Resilience

↕

Decarbonisation

Gartner (2021): 87% of 1300 Supply Chain Professionals plan to invest in resilience within next 2 years

https://bit.ly/3RKsJZB

United Nations Climate Change **RACE TO ZERO**

8307 businesses committed to have net zero emissions by 2050 or earlier

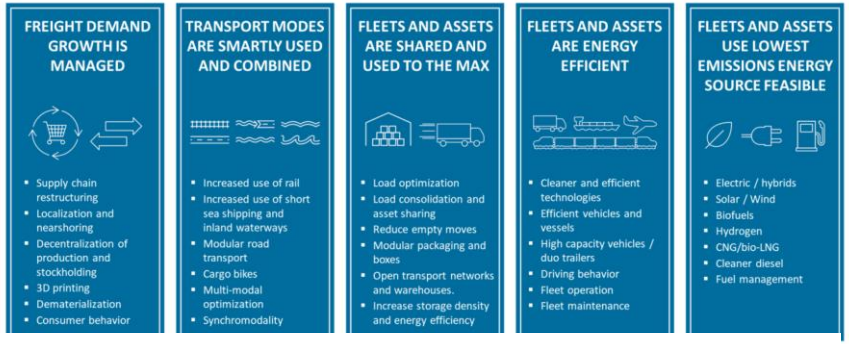
https://bit.ly/3f6svtD

In the management of supply chains, are resilience and decarbonisation objectives well aligned?

Where are the synergies and conflicts?

Interaction between Logistics Decarbonisation Levers and Supply Chain Resilience Options

Roadmap to Zero Emission Logistics 2050 (ALICE, 2019)



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JOURNAL OF BUSINESS LOGISTICS
STRATEGIC SUPPLY CHAIN RESEARCH

Journal of Business Logistics, 2019, 40(1): 56–65 doi: 10.1111/jbl.12202
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The Evolution of Resilience in Supply Chain Management: A Retrospective on Ensuring Supply Chain Resilience

Timothy J. Pettit[1], Keely L. Croxton[2], and Joseph Fiksel[2]

https://bit.ly/48LcGSb

International Transport Forum

Building Supply Chain Resilience: a Review of Challenges and Strategies

http://bit.ly/3fPdgIG

Supply chain decarbonisation levers

- Reduce the total amount of freight movement
- Shift freight to lower carbon transport modes
- Optimise the utilisation of logistics assets
- Increase the energy efficiency of logistics
- Cut the carbon content of logistics energy

Supply chain resilience options

- Localise sourcing */ shorten the supply chain*
- Decentralise production and warehousing
- Avoid over-dependence on high-risk sources
- Diversify the supply base / *multiple source*
- Raise inventory levels
- Extend order lead times

relax JIT pressures

- Employ multiple transport modes and carriers

Supply chain management practices supporting both decarbonisation and resilience-building efforts

Improving supply chain visibility: *for measure carbon emissions and assess supplier risk profiles*

EU Corporate Sustainability Reporting Directive

Applies to Scope 3 emissions from the '*whole value chain*'

http://bit.ly/3tmhoTz

BCI (2021) : 40% of Covid-related disruptions at 2nd tier or higher in the supply chain

https://bit.ly/3KXAwii

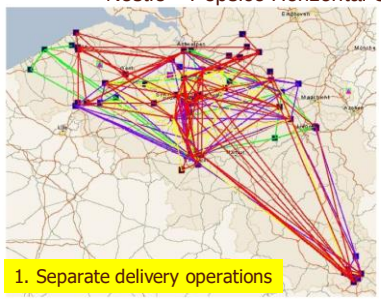
McKinsey: only 2% of businesses have a knowledge of operations above the 2nd tier.

https://mck.co/3tVbObU

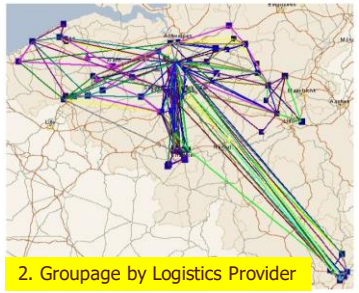
Promoting supply chain collaboration: *joint initiatives to cut carbon emissions and mitigate risk*

impact of supply chain collaboration on freight CO_2 emissions

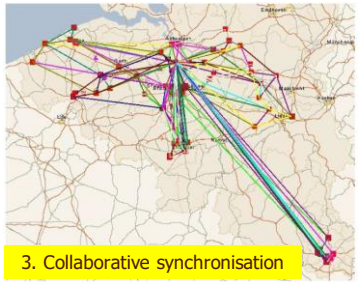
Nestle – Pepsico Horizontal Collaboration in Benelux



1. Separate delivery operations



2. Groupage by Logistics Provider



3. Collaborative synchronisation

	Kg CO2 / tonne
1. Separate delivery	43.8
2. Groupage	27.3
3. Collaborative synchronisation	20.3

EU project: CO

Source: Jacobs et al 2014

Ways collaboration can enhance resilience

- sharing of risk data and good practice
- joint contingency planning
- pooling of assets and inventory during crises

COVID19 Supply Chain Collaboration Group

(20 large grocery and household appliance manufacturers in the UK) https://bit.ly/2Z0amoi

Unilever PREMIER FOODS BOSCH

Option 1: Shorten international supply chains*: deglobalisation, reshoring and near-shoring*

likely impact on resilience?

Supply chain myths in the resilience and deglobalization narrative: consequences for policy Thakur-Weigold and Miroudot (2023) https://bit.ly/3TPdsct

- over-simplified, one-dimensional view of globalisation process – *under-estimates value chain complexity*
- reconfiguring value chains can be a long process – *too soon to judge the trend*
- does not necessarily minimise supply chain risk – *can have the opposite effect, concentrating risk in home market*
- possible to improve the resilience of globalised supply chains in other less disruptive and less costly ways

likely impact on carbon emissions

'it is necessary to move beyond an overly simplistic view whereby reshoring is synonymous with sustainability'. Carbone and Moatti (2021) https://bit.ly/47uvuE1

Reducing the amount of trade-related transport could yield substantial CO_2 reductions BUT…

- minimising the distance goods travel does not necessarily minimize product life cycle (PLC) emissions
- 50 - 80% of embodied emissions in internationally-traded manufactured goods come from production https://bit.ly/3sqKd1x
- on a PLC basis, it is often more carbon-efficient to source from distant low-carbon locations

Around **31%** of international trade (by value) yields a net reduction in carbon emissions because production-related emissions in the exporting country are lower than those in the importing country (Cristea et al, 2013)

https://bit.ly/48NUwPL

Option 2: Relax Just-in-Time pressures – *increase inventory*

likely impact on resilience?

Supply chains: companies shift from 'just in time' to 'just in case'

Businesses exposed by pandemic shortages and shipping bottlenecks are being forced to rethink their operations

Balancing just-in-time with just-in-case: Profitable redundancy in supply chains

https://pwc.to/39a4CBq

Just-in-time for supply chains in turbulent times

Thomas Y. Choi[1] | Torbjørn H. Netland[2] | Nada Sanders[3] | ManMohan S. Sodhi[4] | Stephan M. Wagner[2]

https://bit.ly/3S9ruER 2023

'debunk misconceptions underlying the arguments in the popular press'

'The problems experienced by companies since the disruptions of 2020 and beyond were not because of JIT practice but because companies had moved away from the original tenets of JIT, including the focus on the lead time between order and delivery.'

- JIT is a whole business philosophy – *not just a stock control system*
- production operations, delivery systems and storage capacity are adapted to JIT replenishment
- time and investment to move to more agile, higher-inventory production and distribution model

Selective relaxation of JIT pressures on sourcing of **more critical materials and components**

Option 2: Relax Just-in-Time pressures – *increase inventory*

likely impact on decarbonisation?

factors constraining vehicle utilisation

- Logistical cost trade-offs
- Demand fluctuations
- Uncertainty about transport requirements
- Unbalanced traffic flows
- **Just-in-Time delivery**
- Vehicle size and weight restrictions
- Unreliable delivery schedules
- Health and safety regulations
- Nature of packaging / handling equipment
- Limited storage capacity at destination
- Incompatibility of vehicle for back-loading
- no logistics / procurement co-ordination

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Relaxation of JIT – possible impacts on carbon intensity of freight transport

more time to consolidate loads and find backhauls:
improves vehicle utilisation

easier *modal shift* to slower, lower-carbon transport modes

lowering *vehicle speeds* saves energy

Freight Transport Deceleration: Its Possible Contribution to the Decarbonisation of Logistics

McKinnon (2016)
https://bit.ly/3jCmm9e

- JIT is business paradigm that minimizes waste
- contributes to energy and CO_2 savings in production and warehousing
- need a **holistic assessment** of the impact of relaxing JIT on CO_2 emissions from the whole production and supply chain operation and not just transport

Carbon-capped Distribution Planning: A JIT Perspective

Ashkan Memari [a,*], Abd. Rahman Abdul Rahim [b], Nabil Absi [c], Robiah Ahmad [b], Adnan Hassan [a]

https://bit.ly/47omK2f

Option 3: Avoid over-dependence on high-risk sources

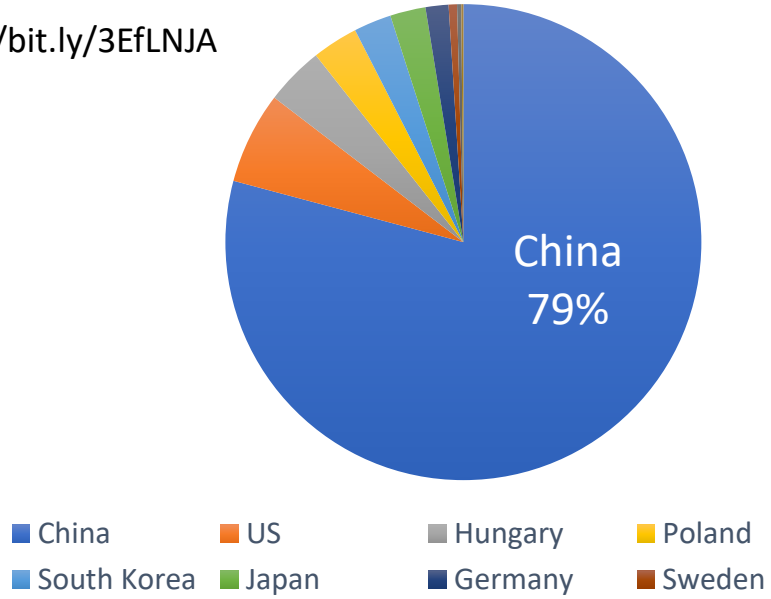
transition to low-carbon energy

'The battery will be the defining technological and supply chain battleground for the industry in the next decade'

Graham Evans, IHS Markit (2022) http://bit.ly/3NSTXe3

% of EV battery production (Gwh) in 2021

http://bit.ly/3EfLNJA



Democratic Republic of Congo (DRC) **56%** of battery-grade cobalt

- '*deteriorating security situation*' (United Nations)
- humanitarian crisis
- child labour
- environmental degradation

Forecast that DRC's % of global cobalt production will drop to 17% by 2030 as mining expands in Australia, Indonesia, Vietnam, Finland and Morocco http://bit.ly/3NSTXe3

80% of cobalt processing is currently in China http://bit.ly/3WOpBNT

Switch from fossil-fuels to renewables likely to concentrate energy dependency on a few, geopolitically-risky states

Risks in transitioning freight transport to alternative, low-carbon energy: e.g.

- future availability and cost of this energy?
- rate at which recharging and refuelling infrastructures will develop?
- residual values of the new generation of low-carbon freight vehicles, vessels and rolling stock?

Option 4: Employ multiple transport modes and services: *modal shift / service diversification*

average carbon intensity of freight transport modes: *gCO_2 / tonne-km*

source: DBEIS / DEFRA 2020
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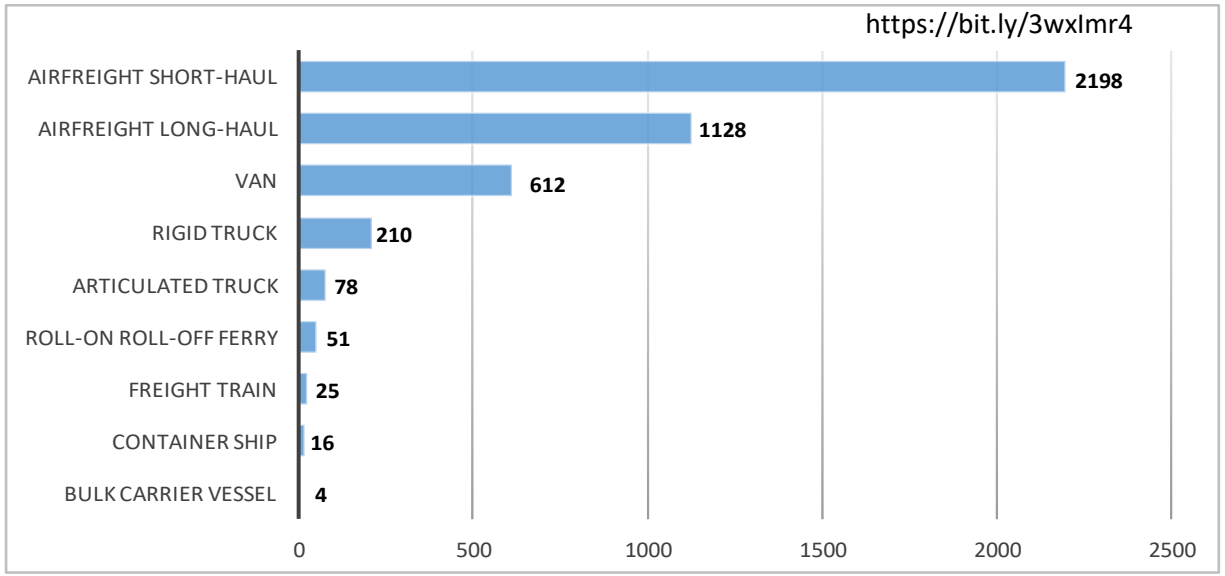
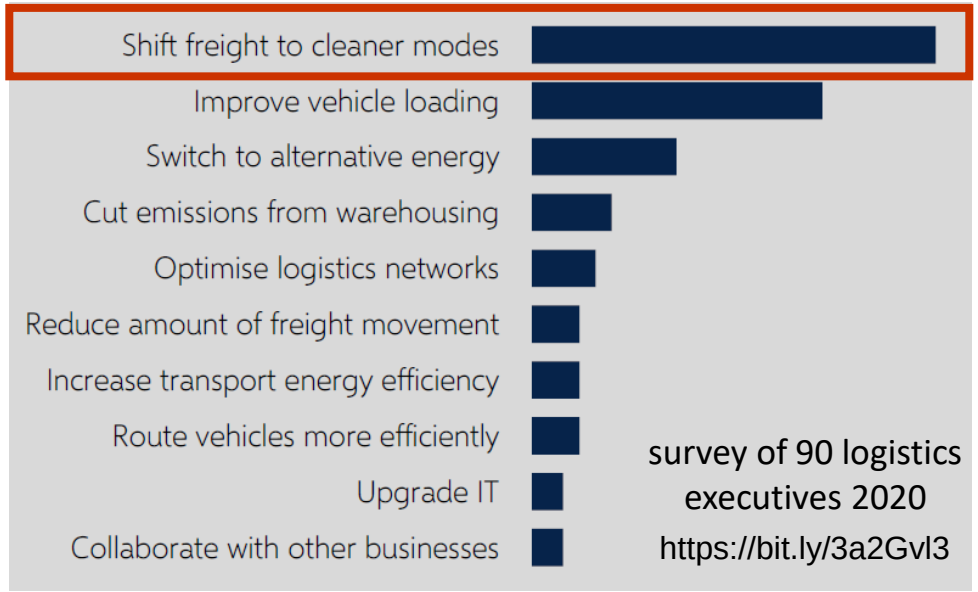


most cost-effective methods of decarbonising logistics



effectiveness as a risk-mitigation initiative depends on:

- *ability to co-ordinate multiple transport modes*
- *relative vulnerability of different freight transport modes*

extreme heat and drought in Europe in 2022 disrupted inland waterway and railfreight services

'European inland waterways might be one of the few sectors where climate change can have negligible, or even positive, impact.'

Christodoulou et al (2020)
https://bit.ly/3EkA1hm

Conclusions

- Supply chain resilience and decarbonisation are now both high on corporate agendas
- There is reasonable, but not perfect, alignment between resilience and decarbonisation objectives
- Both will benefit from efforts to increase visibility and collaboration across the supply chain
- Efforts to decarbonise the global economy should help to mitigate climate risk to supply chains
- Relationship between two much-debated resilience options (deglobalisation and relaxing JIT) and decarbonisation is more complex than generally portrayed
- Need to observe the resilience-decarbonisation relationship in both directions.
- Geopolitics is likely to exert an increasing influence on both supply chain resilience and decarbonisation

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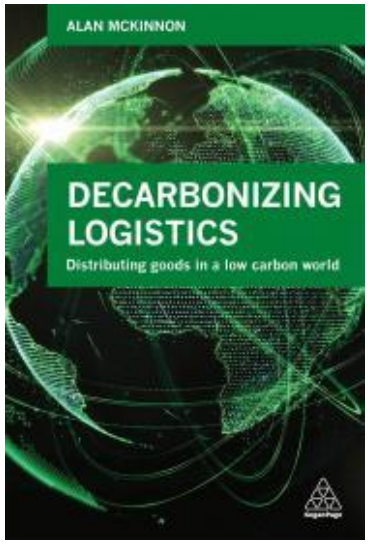

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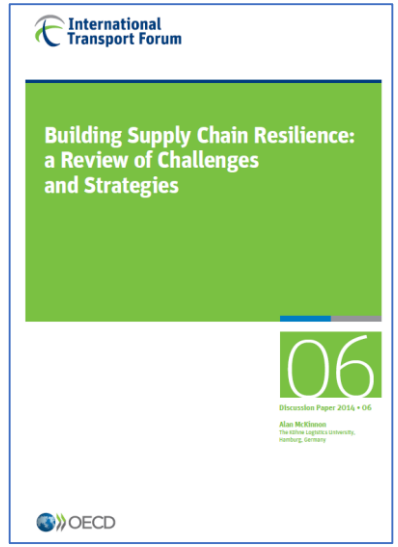

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