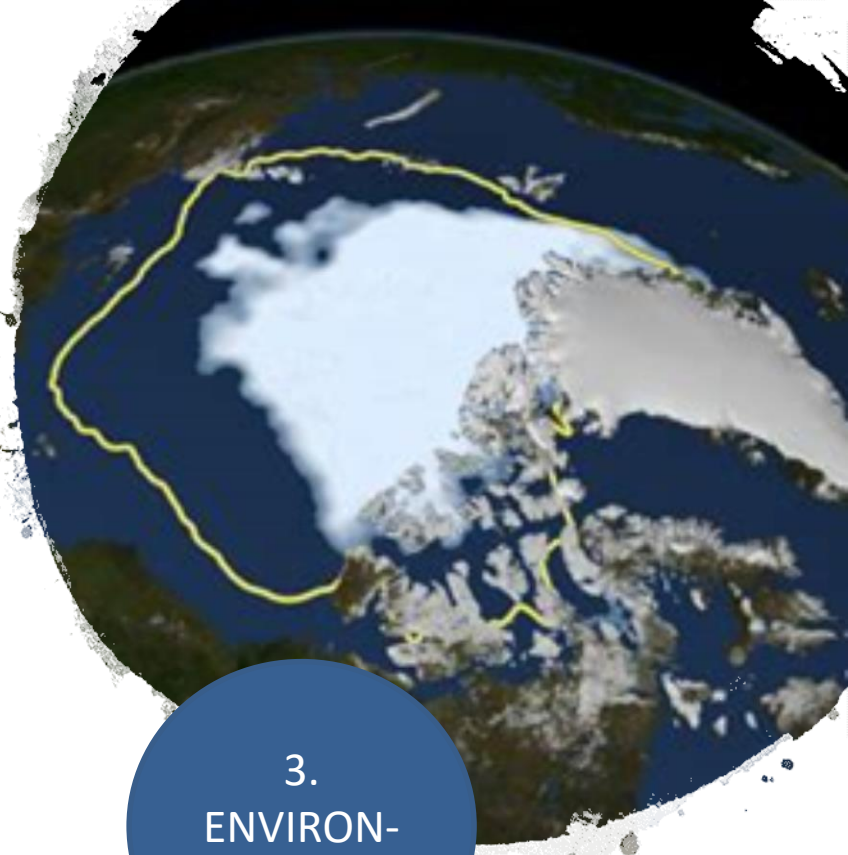
Dr Martin Stopford
Non- executive President, Clarkson Research

1. DIGITAL

2. REGIONAL



3. ENVIRON-MENTAL

Dr Martin Stopford, President Clarkson Research

Coming to terms with the new era for shipping and ports

Digital technology, regional re-alignment and environmental emissions are pushing the maritime industry into a new era: -

1. Strategies for reducing carbon emissions
2. Rethinking Europe's outdated sea transport system
3. Developing digital technology to support Europe's new transport system
4. Conclusions

The ship's emissions have become the industry's most pressing challenge

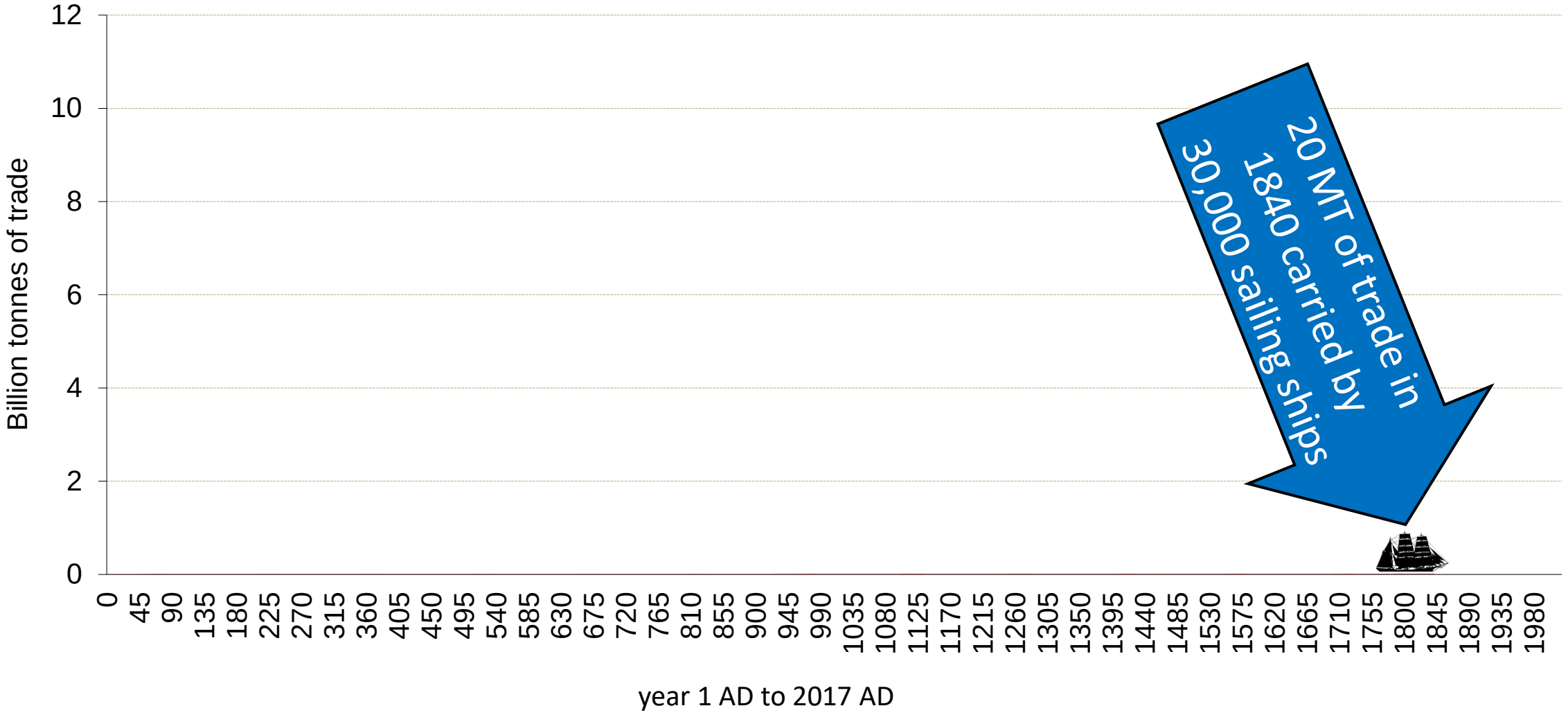
Part 1: Strategies for reducing carbon emissions

IMO’s Vision for eliminating greenhouse gas emissions – April 2018

“IMO’s vision is to reduce GHG emissions from international shipping.
Emissions should peak as soon as possible and fall by at least 50% by 2050 compared to 2008.
At the same time, the industry should pursue efforts towards phasing out GHG emissions entirely".

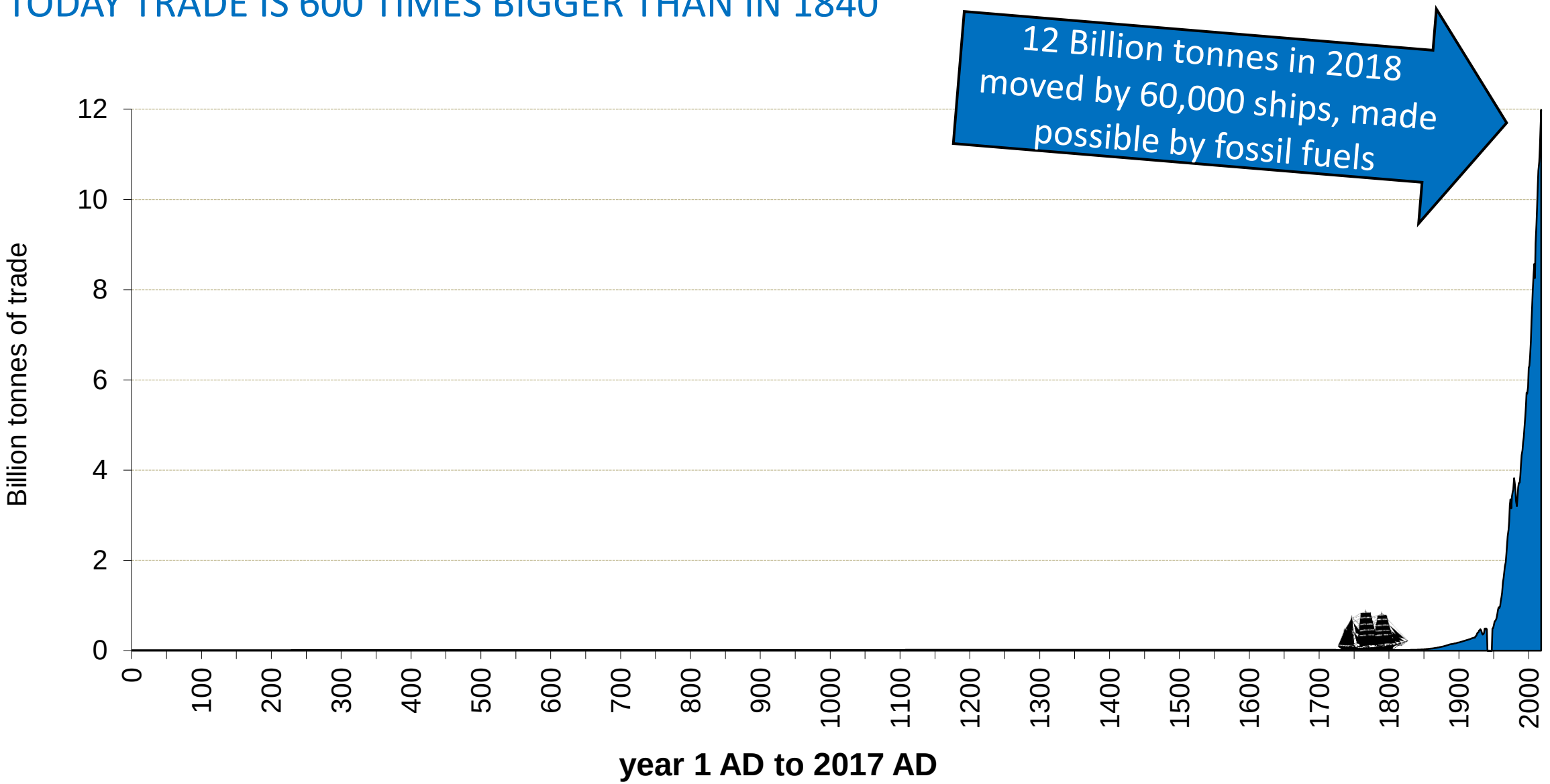
World Sea Trade in 1840 AD – before fossil fuels

In 1840, when shipping relied on the wind for power, Sea Trade was about 20 mill tonnes



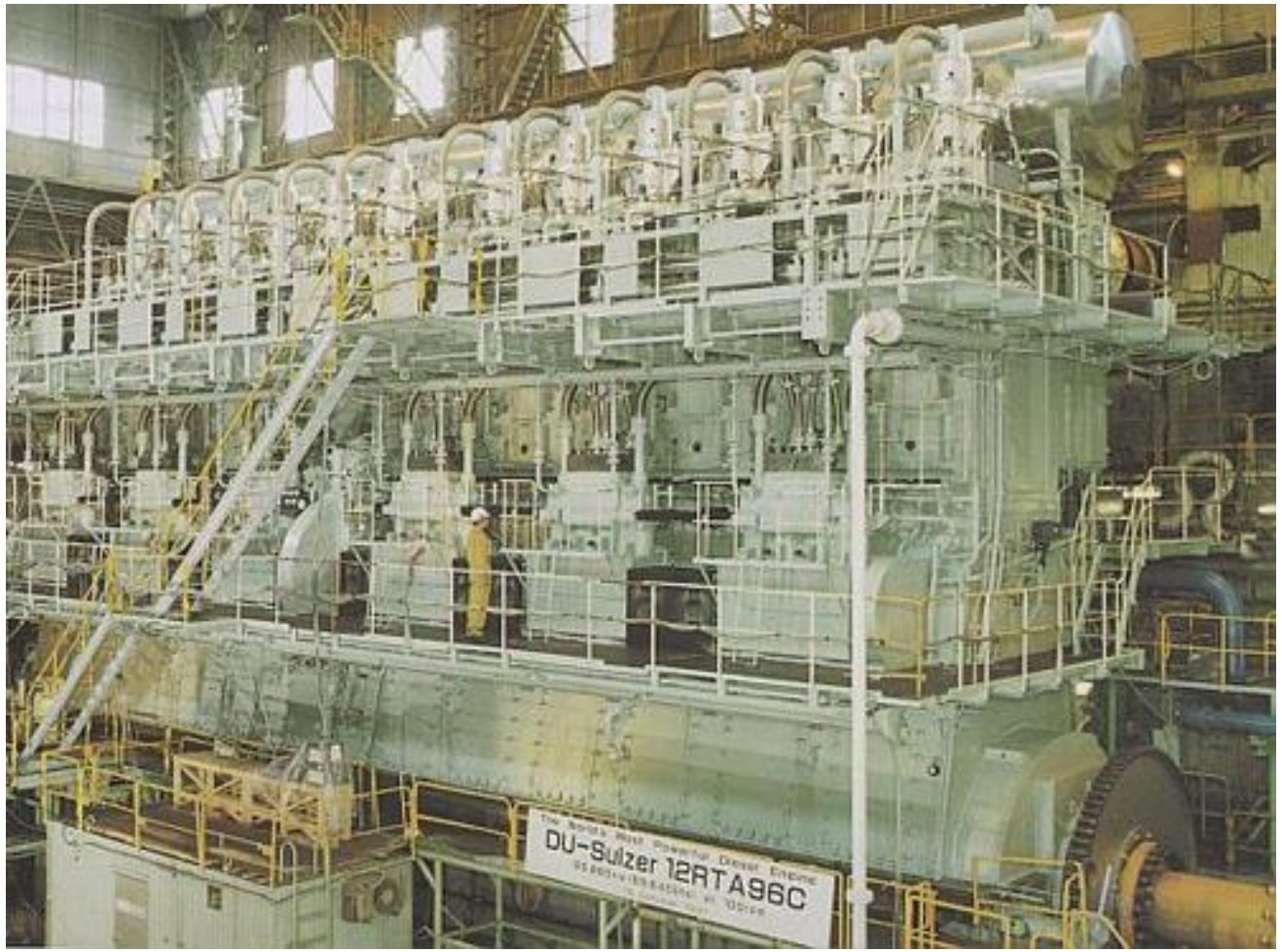
World Sea Trade 1 AD to 2017 AD

TODAY TRADE IS 600 TIMES BIGGER THAN IN 1840



Fossil fuel engines made this possible … this is the Emma Maersk's Engine

- Thanks to fossil fuel, this engine generates 109,000 HP (82 MW)
- It does the work of about 3 million people (working 8 hour shifts)
- If people powered the Emma Maersk they would need a town the size of Athens to live in
- They would eat about 9 billion calories a day (3,000 tonnes of grain)!
- Every tonne of bunkers produces 3.3 tonnes of carbon
- This is the ELEPHANT in the room.



How can we replace this enormous beast ?

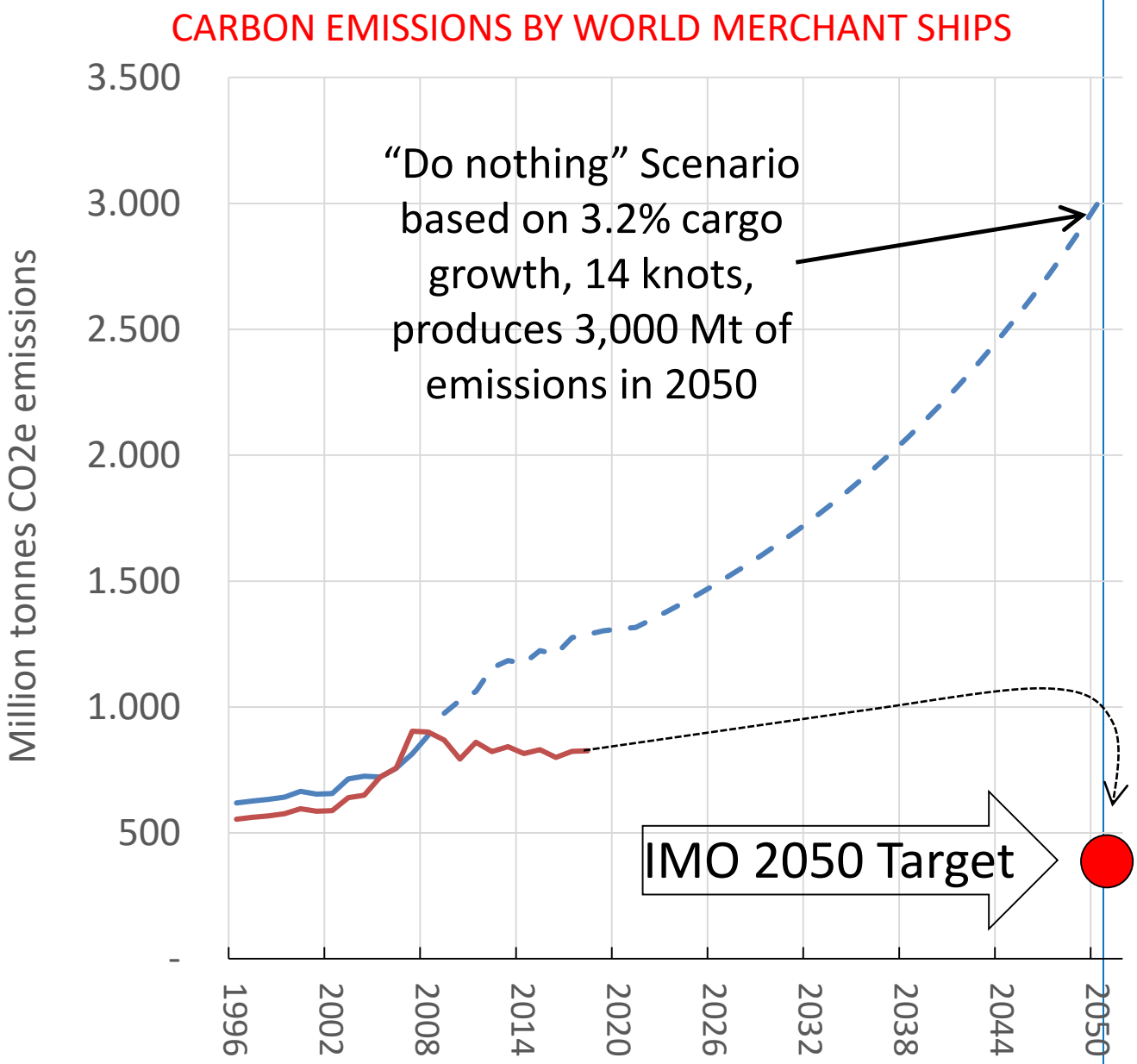
Four ways to implement IMO's vision of a 50% cut in carbon by 2050

Stratgy 1: Less cargo: Transport less cargo by a) changing trading patterns, b) new transport policies, c) pricing and d) information systems for better decisions.

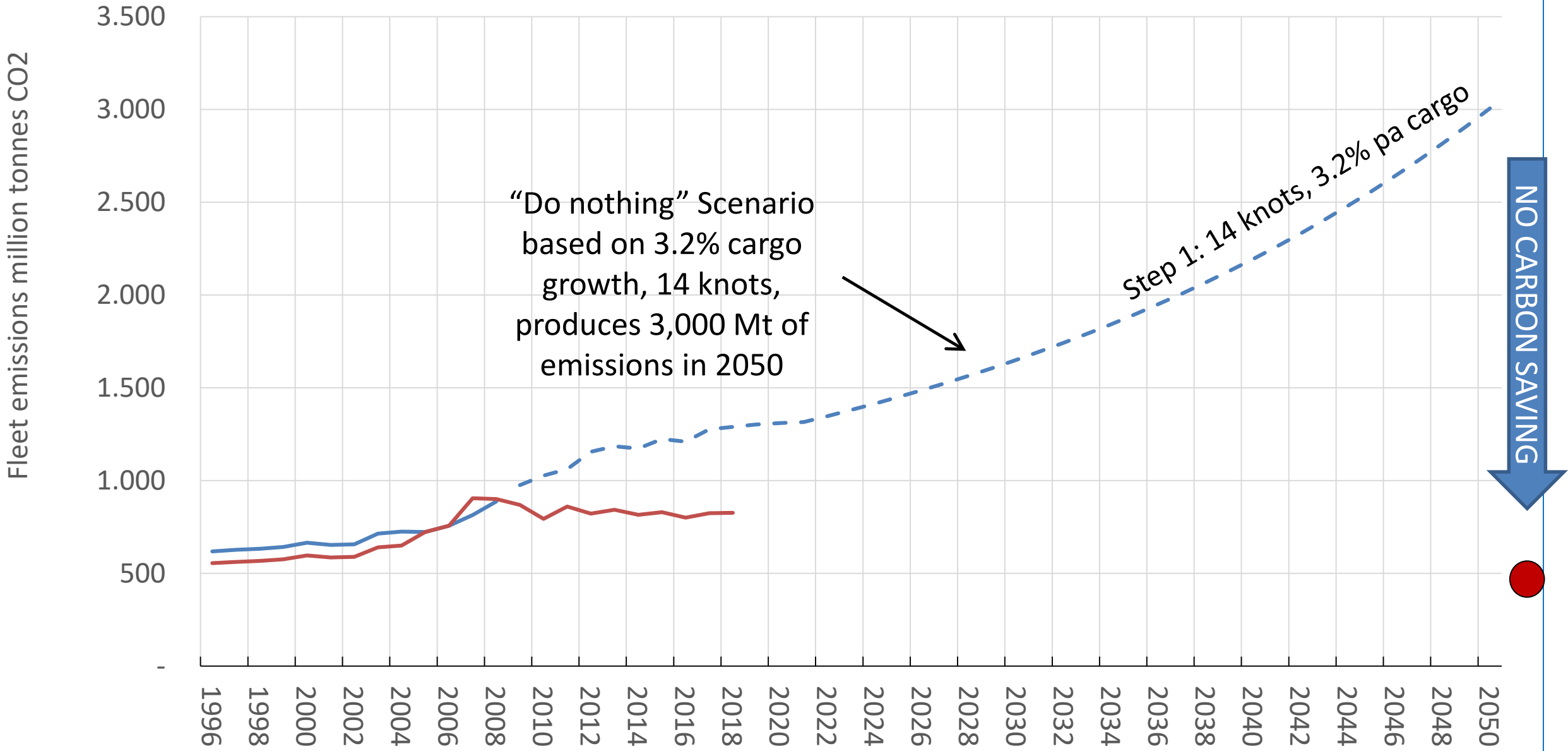
Strategy 2: Slow down etc: Cut carbon emissions/ship km by a) slowing down to 10 knots; b) use bigger (small) ships; c) better designs; d) LNG fuel, e) retrofitting for safe operation at slow speeds etc.

Strategy 3: Zero carbon power: develop new propulsion systems but tricky. a) Electric fuel cells look the best bet for volume and performance, b) maybe nuclear?

Strategy 4: Organization: Make strategies 1-3 possible by a complete re-think of the industry's organization and personnel.



World cargo fleet CO2 Emissions – 4 steps to a 50% reduction



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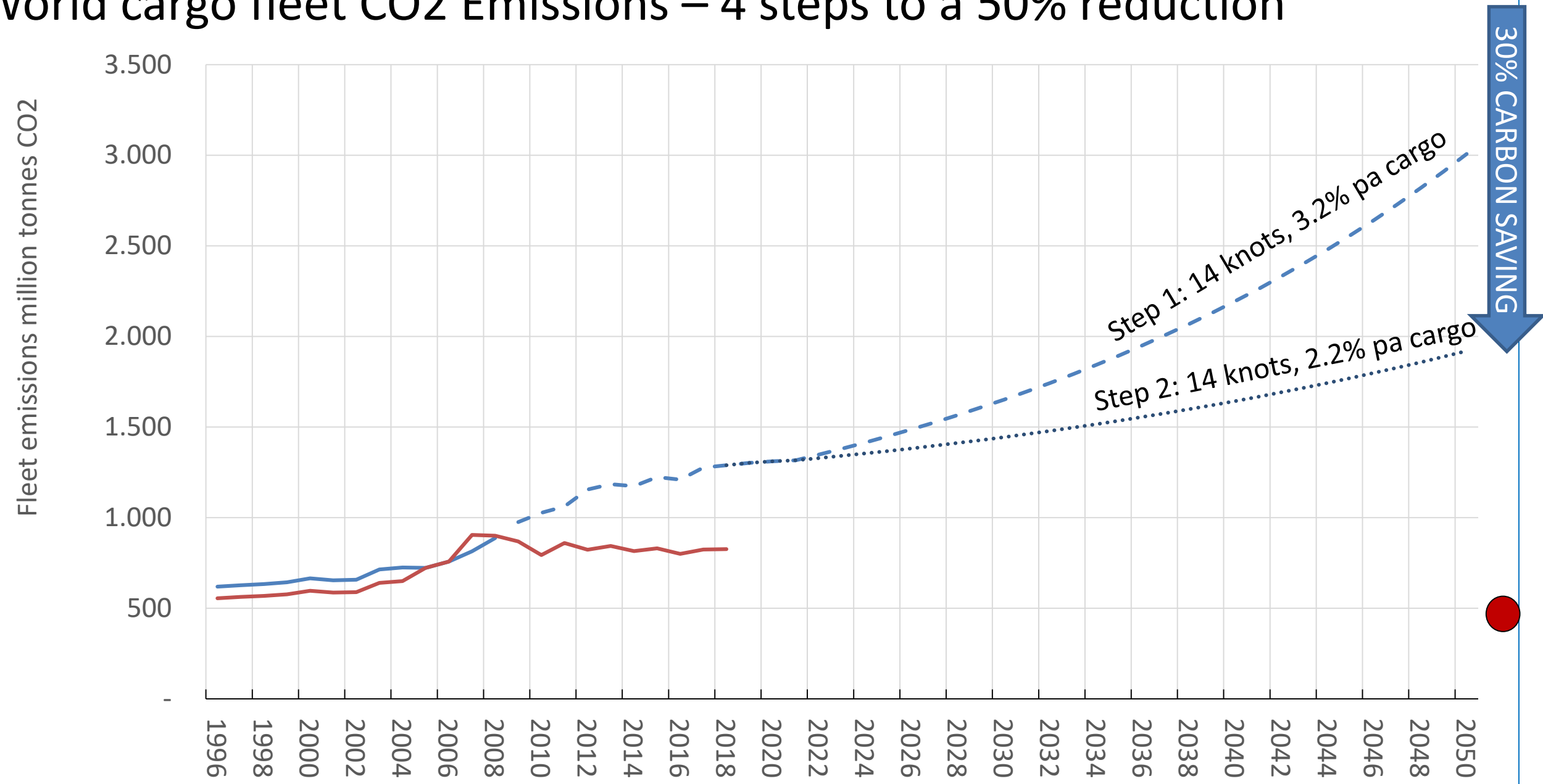

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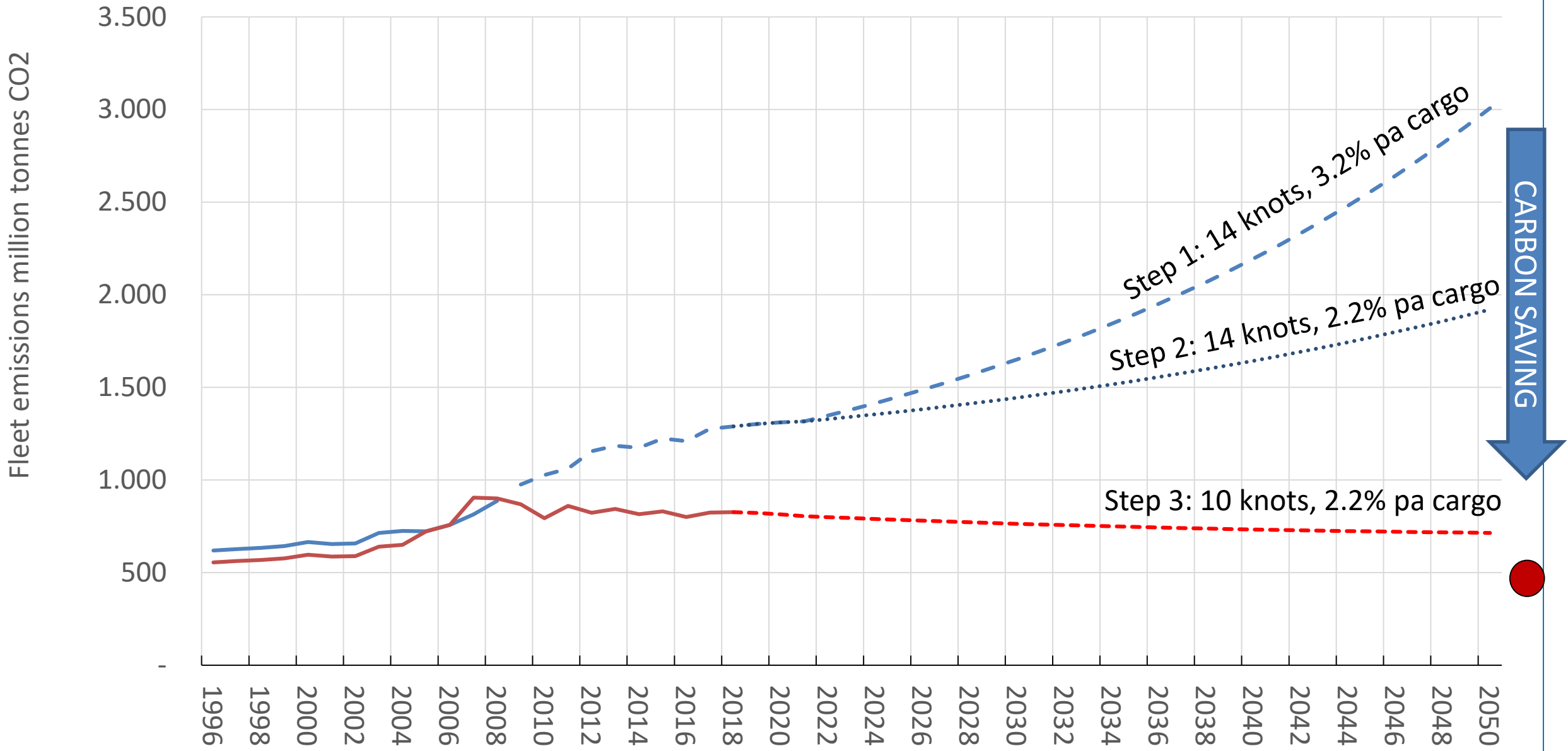

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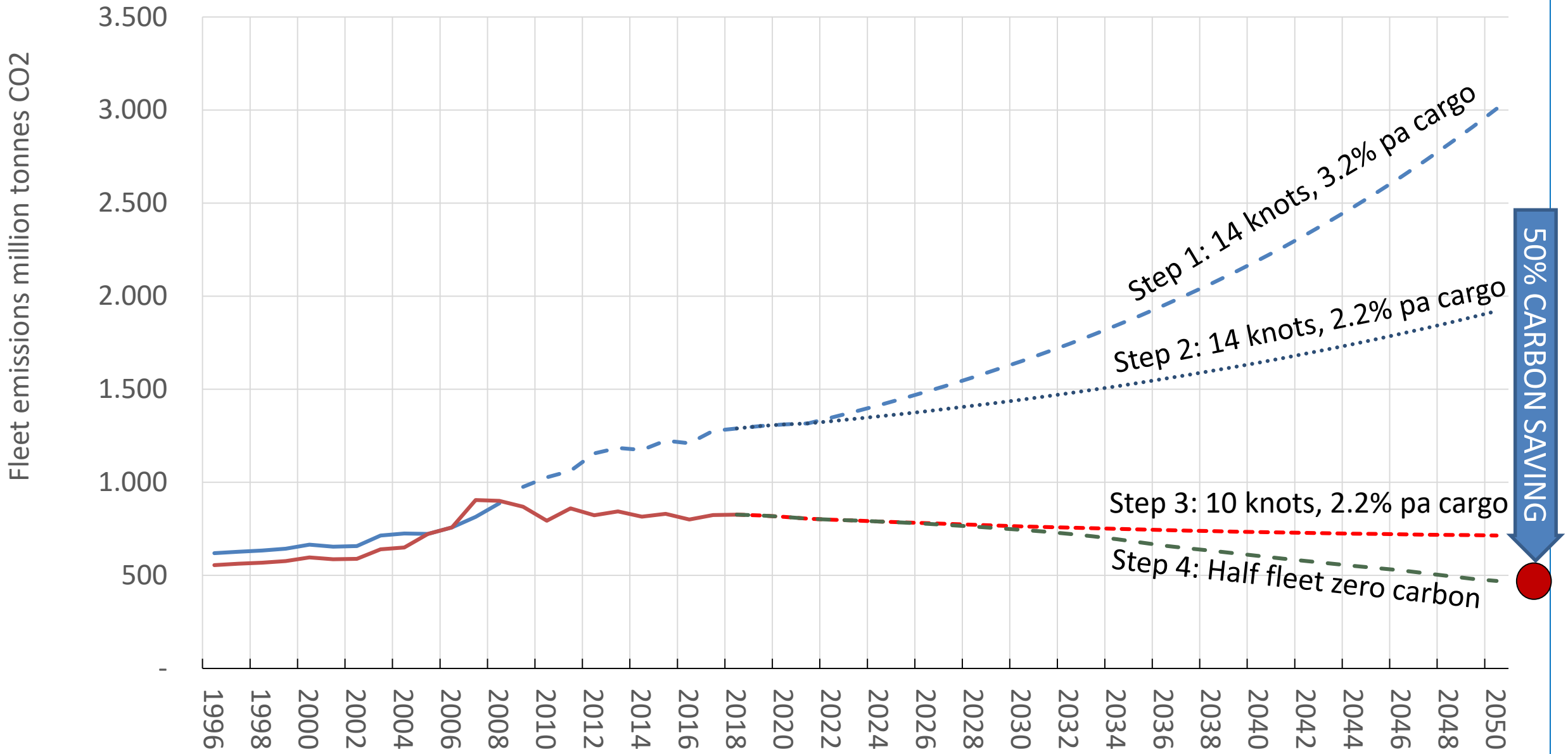
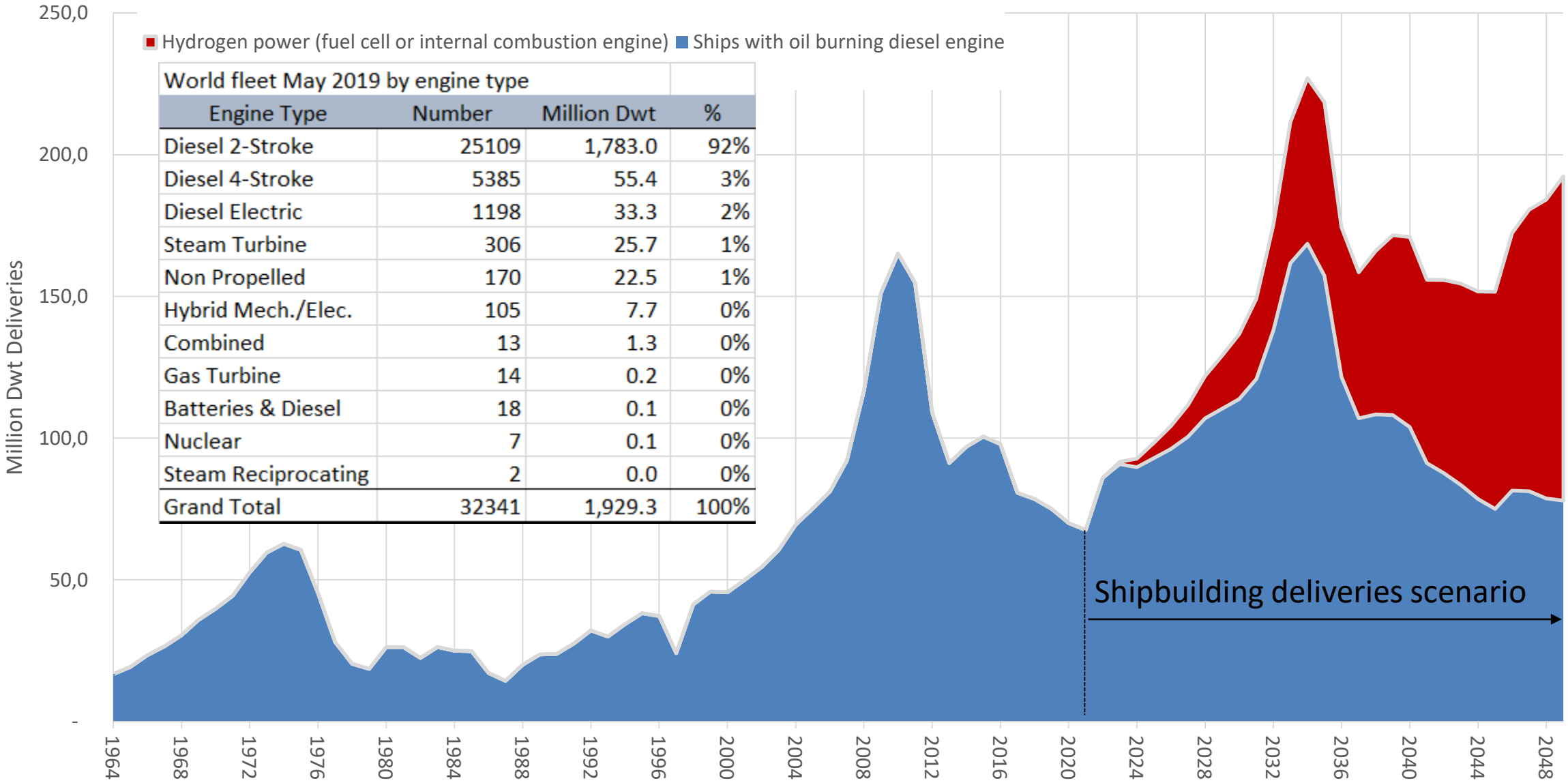


The shipbuilding scenario 2018-2050 (2.2% trade growth)



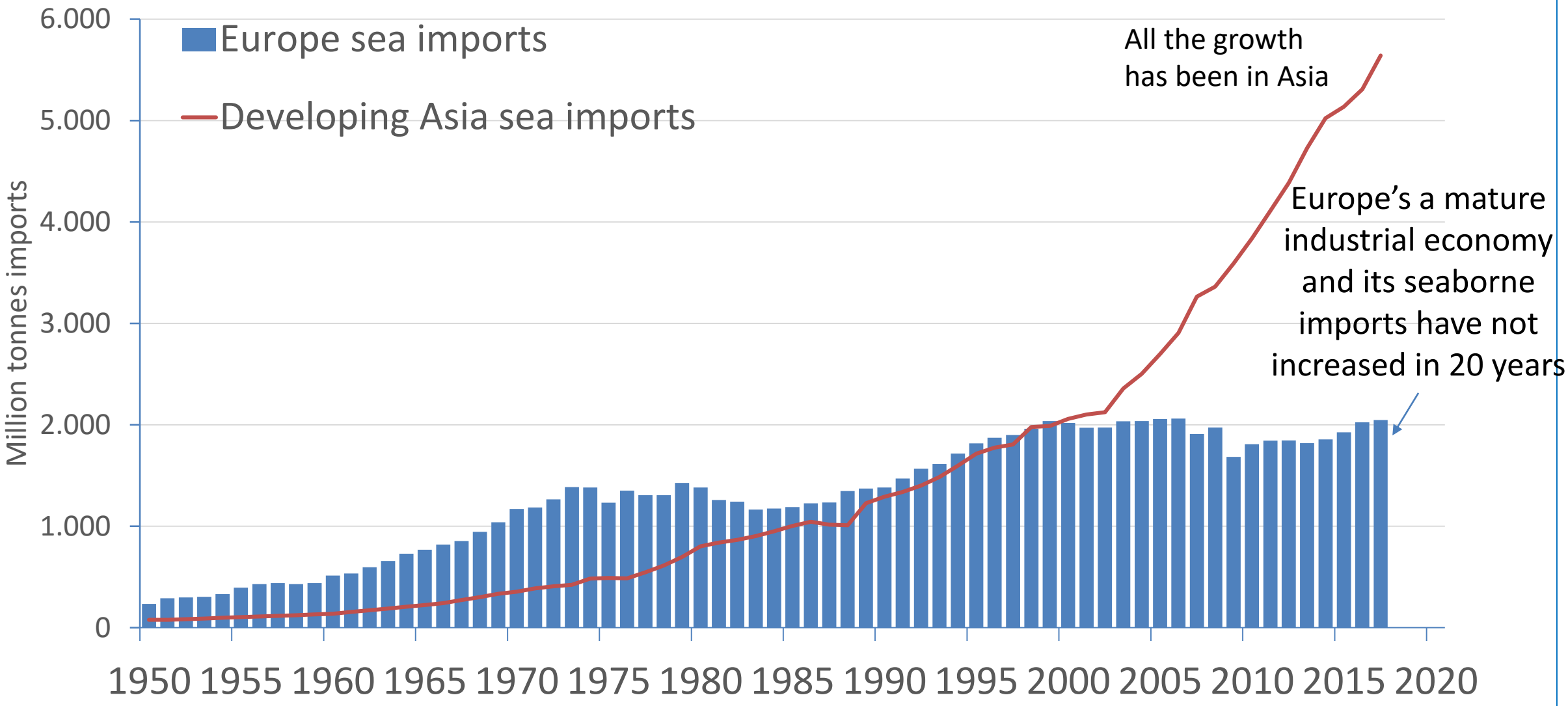
World fleet May 2019 by engine type

Engine Type	Number	Million Dwt	%
Diesel 2-Stroke	25109	1,783.0	92%
Diesel 4-Stroke	5385	55.4	3%
Diesel Electric	1198	33.3	2%
Steam Turbine	306	25.7	1%
Non Propelled	170	22.5	1%
Hybrid Mech./Elec.	105	7.7	0%
Combined	13	1.3	0%
Gas Turbine	14	0.2	0%
Batteries & Diesel	18	0.1	0%
Nuclear	7	0.1	0%
Steam Reciprocating	2	0.0	0%
Grand Total	32341	1,929.3	100%

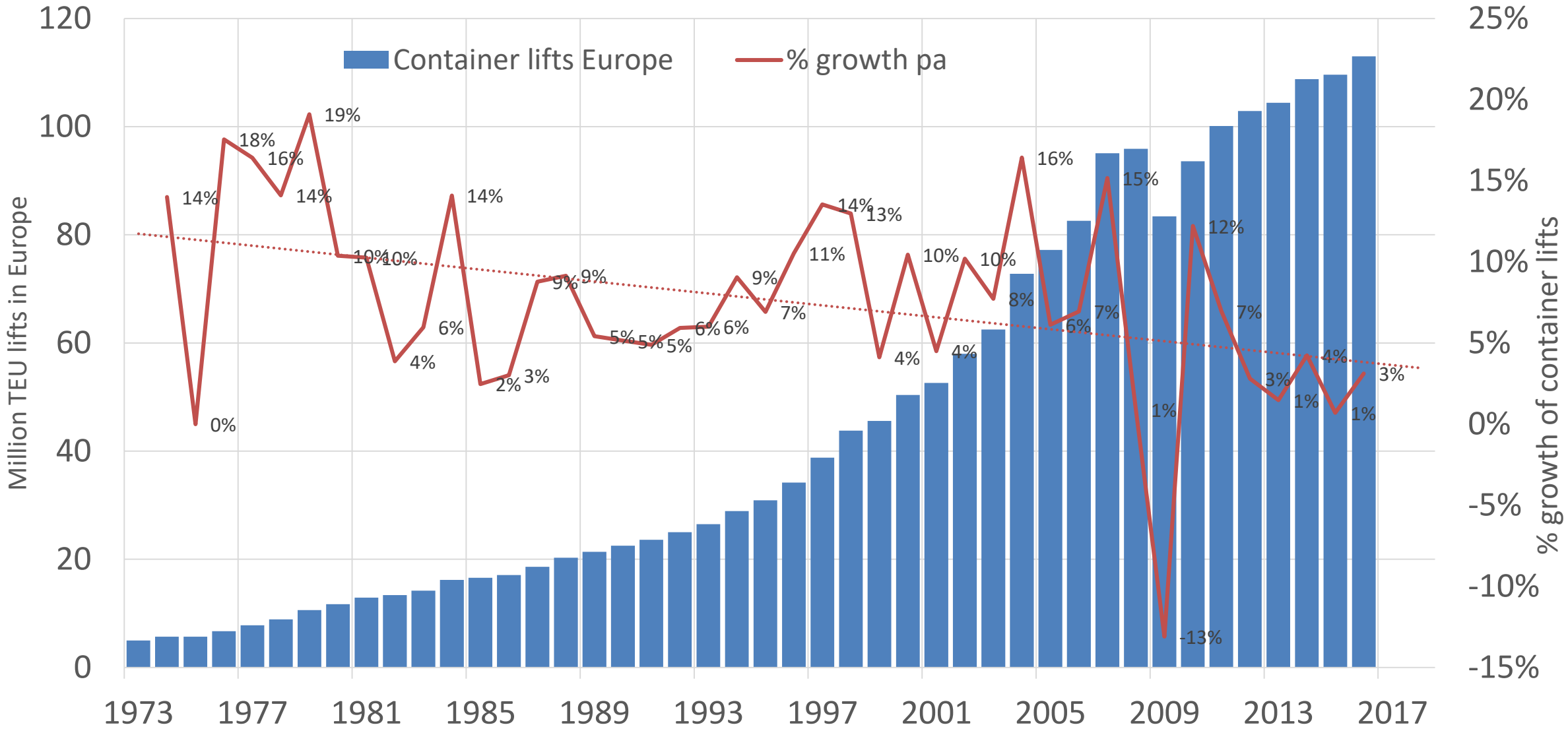
For 50 years the maritime trade has been global, lead by OECD multinationals sourcing raw materials & cheap manufactures. Today multinationals are in retreat. The digital revolution is ideal for regional B2B services

2. RETHINKING EUROPE'S SEA TRANSPORT SYSTEM

Europe’s seaborne imports have been flat since 1999

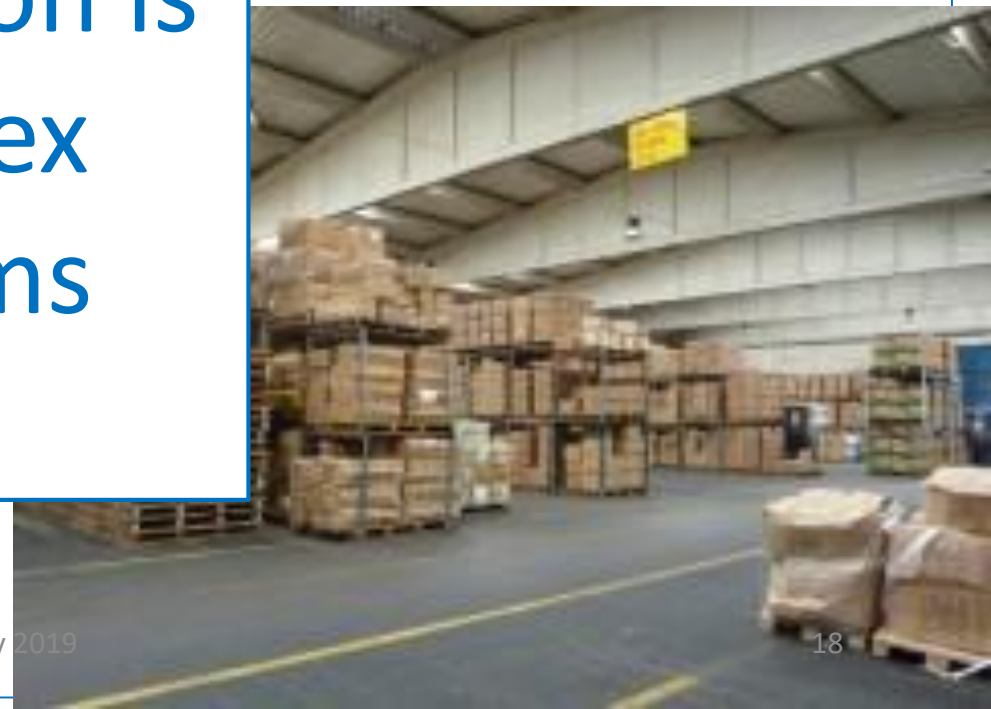


Also Europe's container imports have slowed to 2-4% pa growth

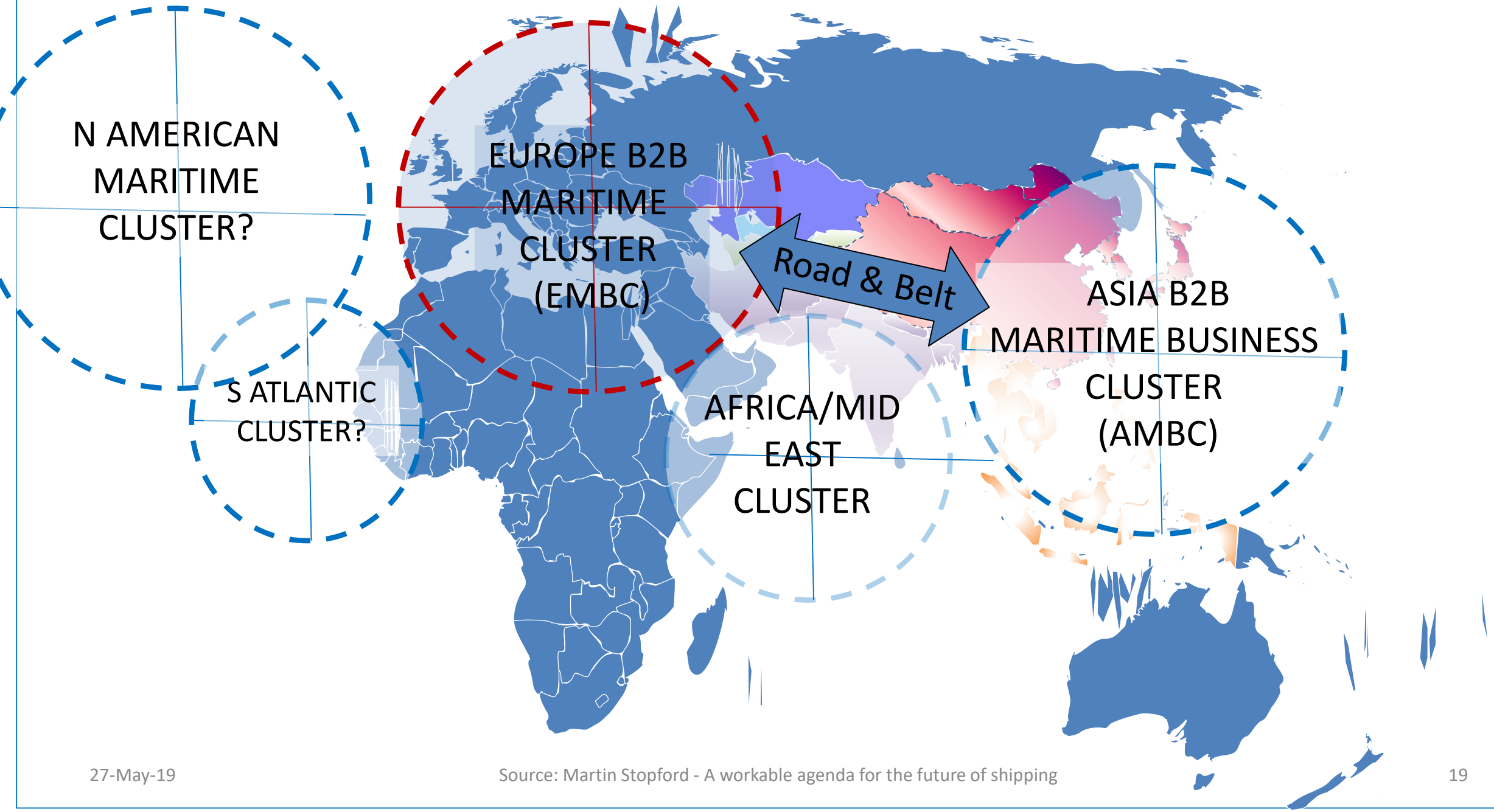


Meanwhile … inland transport is being transformed

Digital information is making complex logistics systems viable



Future focus: short sea systems supporting regional B2B commerce



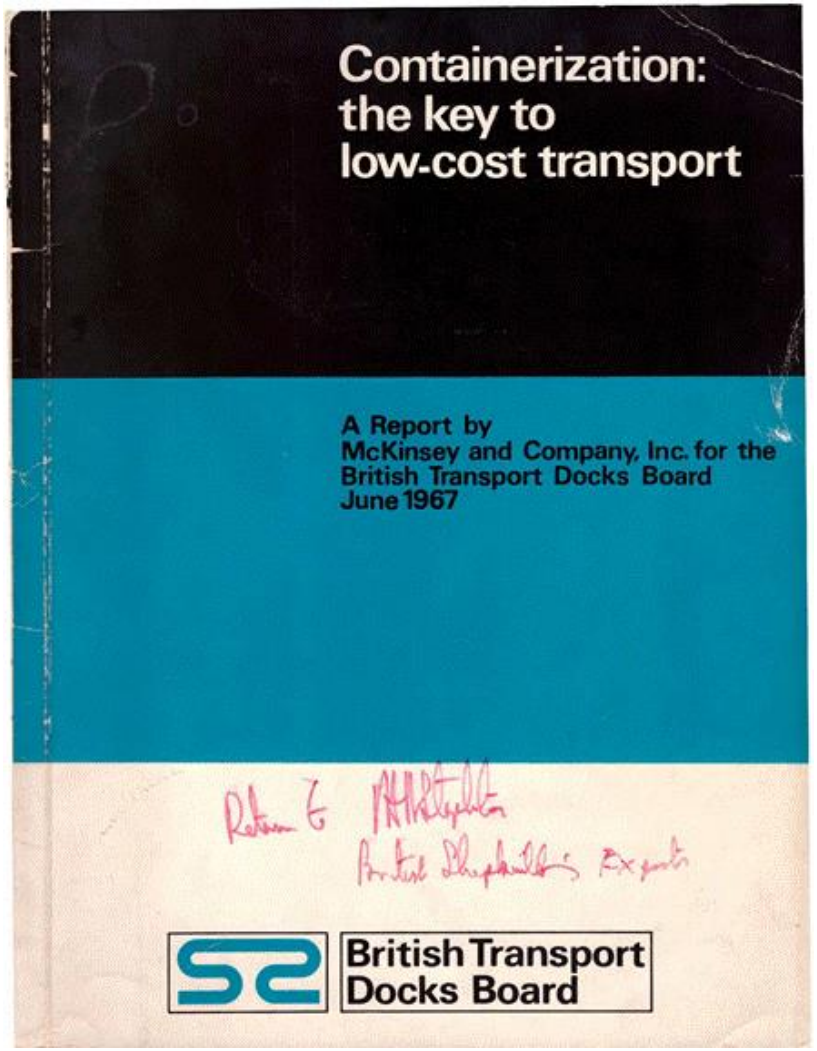
Source: Martin Stopford - A workable agenda for the future of shipping

The container revolution – “Still has unfinished business”

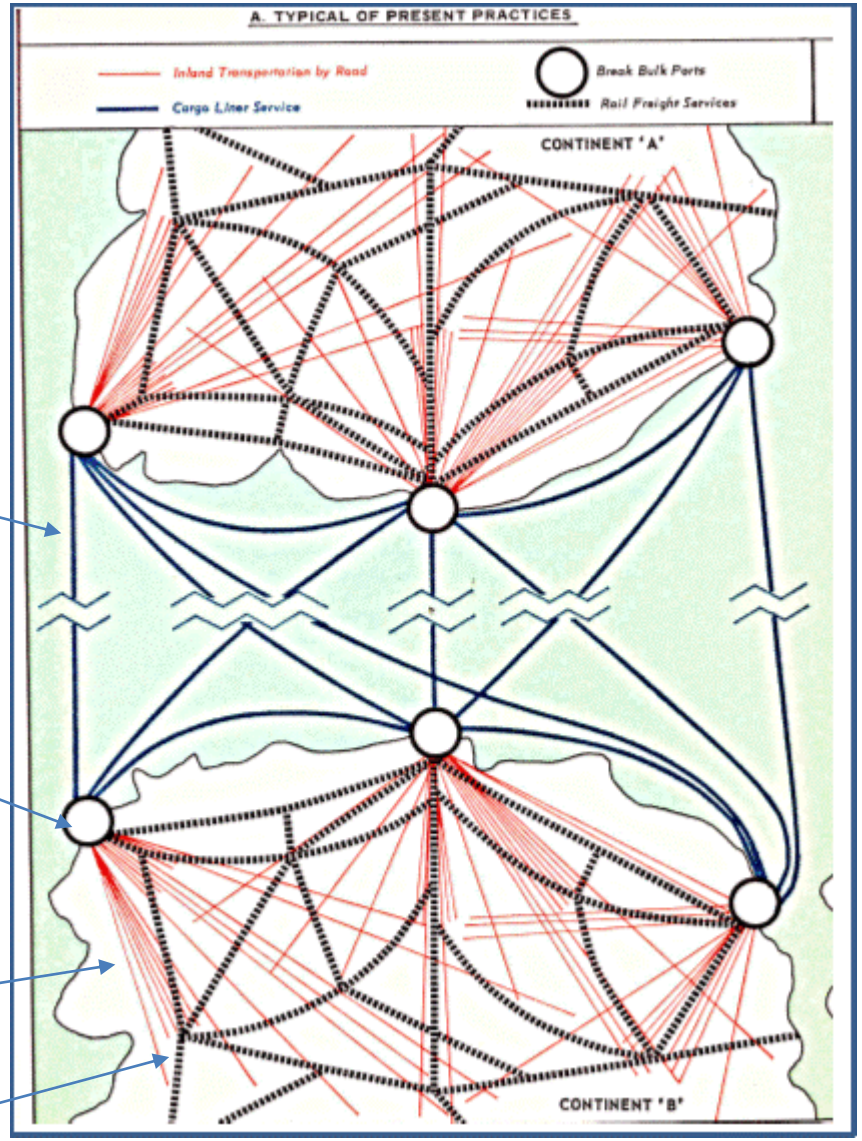
In 1967 McKinsey were retained by British Transport Docks Board to report on containerisation. Their conclusions were:-

1. There would be a reduction in transport costs of over 50%
2. The relative economics of rail, sea and road transport will change. The most significant change will be the economies of scale with large containerships trading to a few ports .
3. Shipping organization will change, with the emergence of a few large international organizations.
4. The focus would be on transport as an integrated process from origin to destination, leading to a small number of liner companies operating globally.

McKinsey’s forecast 1967



McKinsey thought the new container system would be hub & spoke



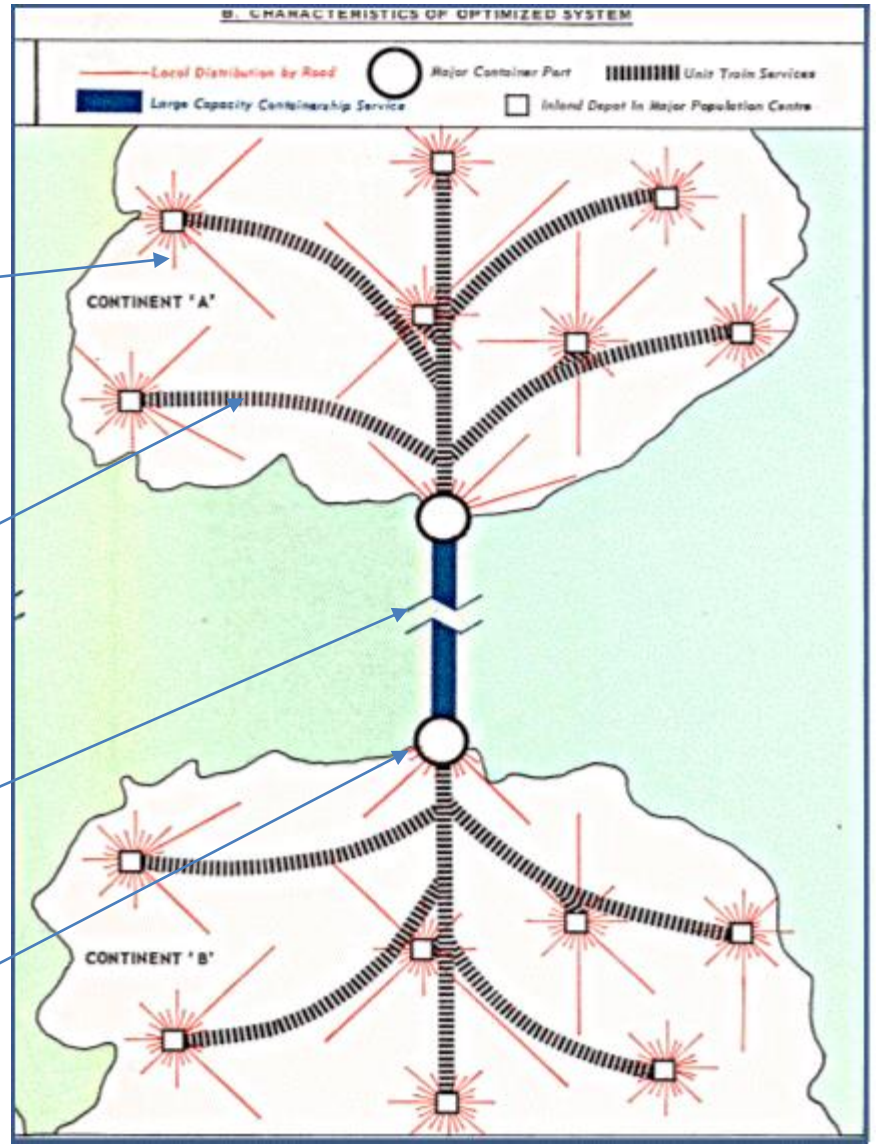
Cargo liner services

Break bulk ports

Road transport

Rail transport

THE OLD CARGO LINER SERVICES IN 1967



Local distribution by road

Unit train services

Large capacity containership services

Main container port – one per region

MCKINSEY CONTAINER TRANSPORT MODEL

1966: first deep sea container services offered door to door transport

MacLean saw containerisation as direct transport - just like the trucking business

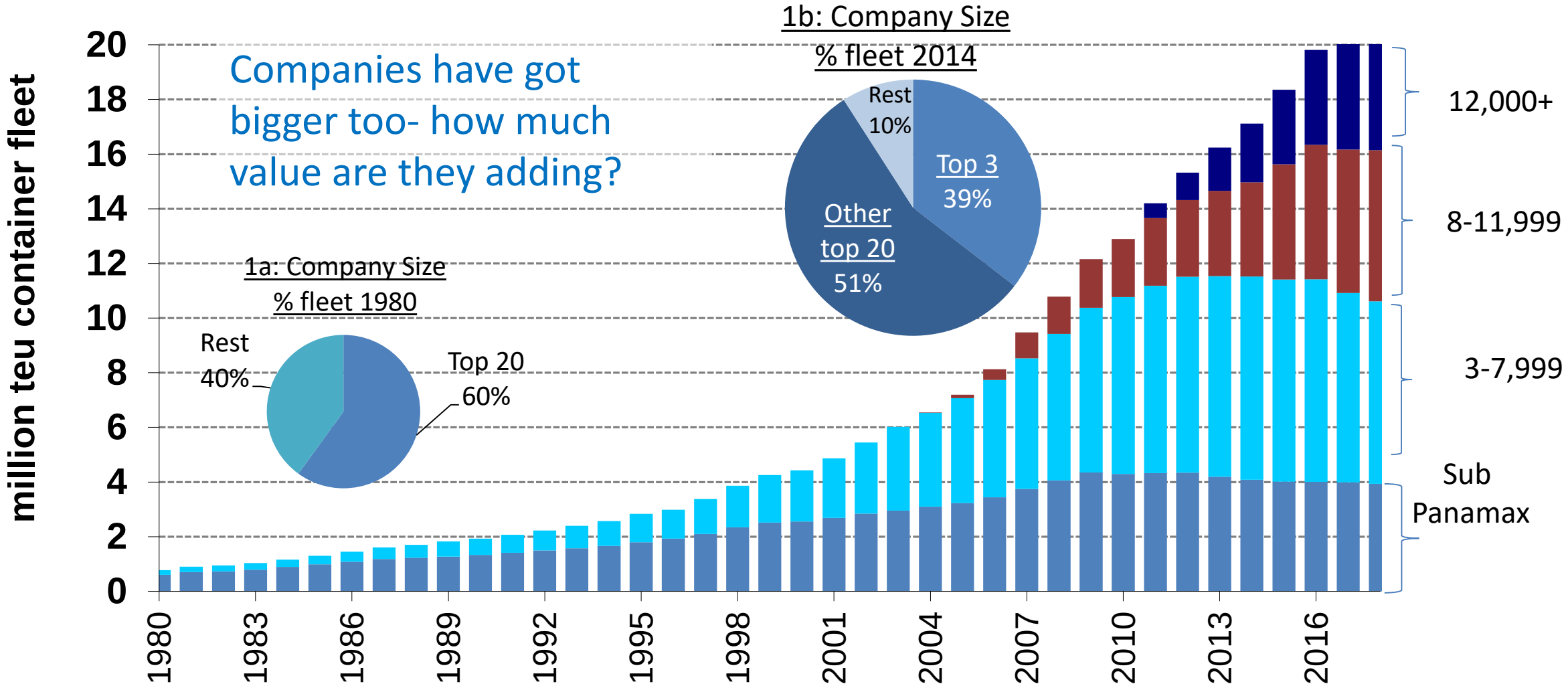
Loading the first container onto a trailer

First transatlantic service – the *Fairlane* discharging onto trailers at Rotterdam May 1966.

But as trade volume grew service operators could not make integrated transport work!

Today's super-ships deliver quayside to quayside

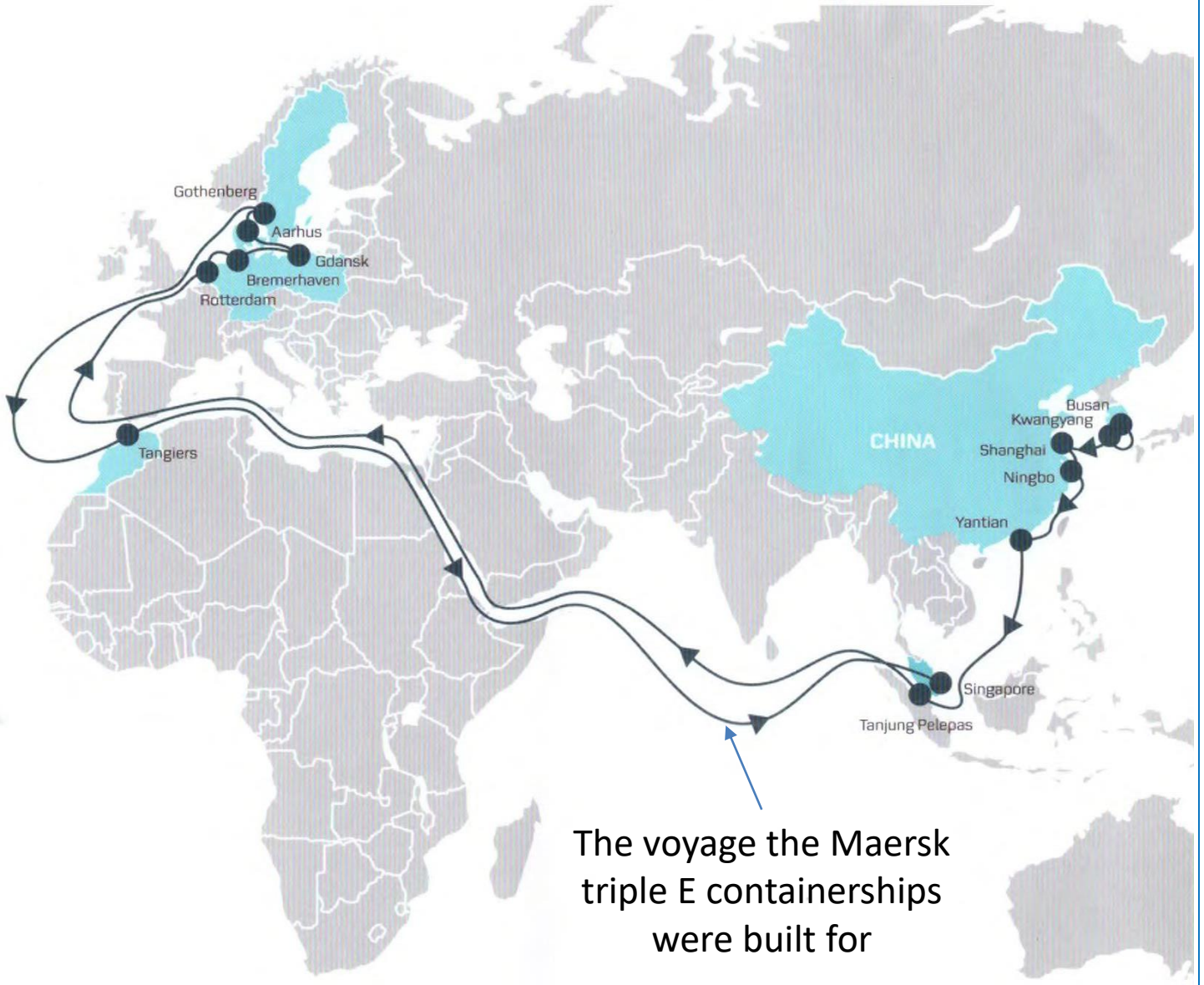
Since 1996 average ship size has doubled and average terminal throughput has trebled



A few examples of issues with the present system

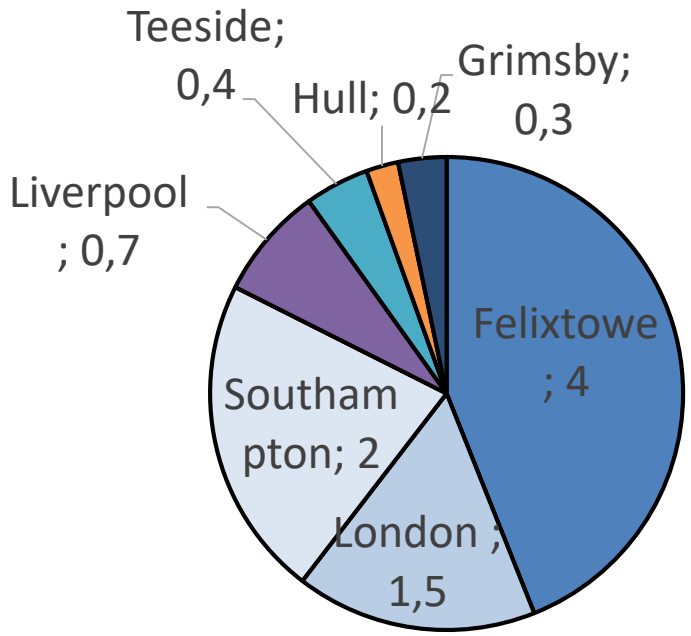
Example 1: Distribution by super-ships: 12 port calls

1. McKinsey saw big ships visiting one port per region but…
2. Today's system closer to the old cargo liner system with many port calls with road & rail doing final distribution
3. Door to door abandoned in the 1980s because of the limitations of Electronic Data Interchange (EDI) for scheduling & paperwork.
4. Could hub abd spoke do the job better?"

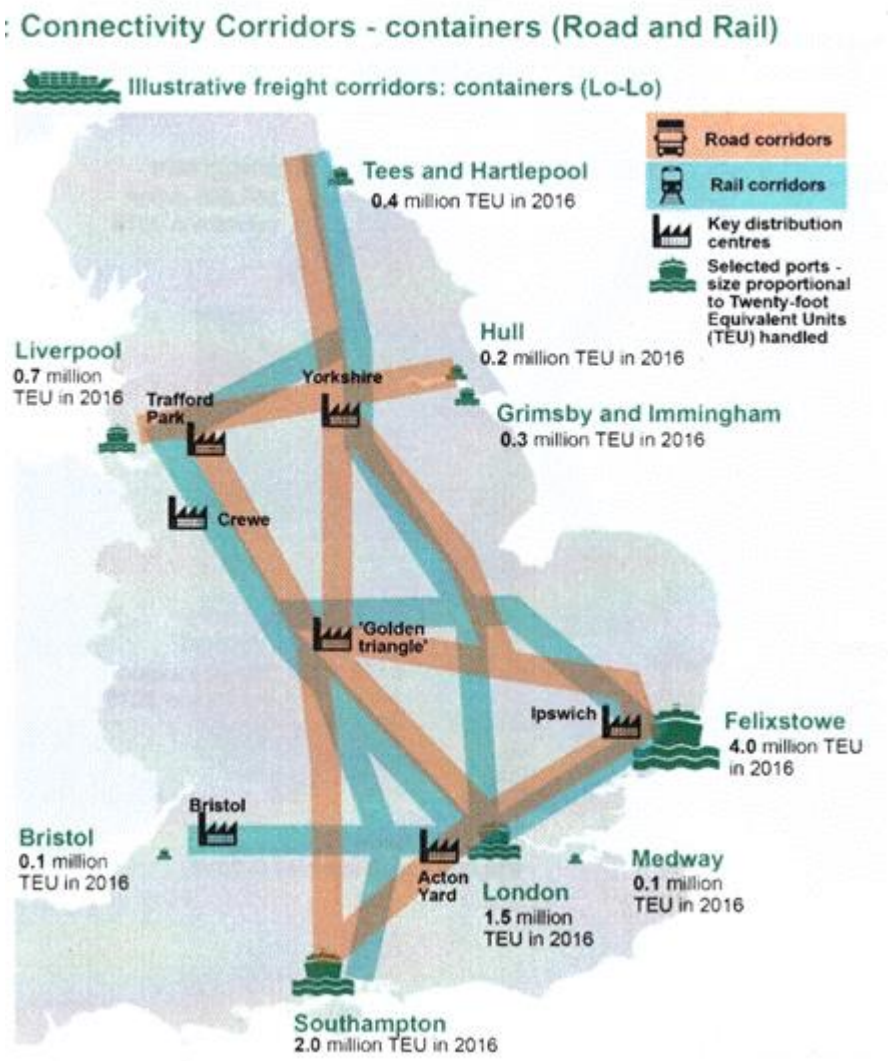


Example 2: Legacy port systems: the UK relies mainly on road and rail distribution

- UK has 200 active ports.
- About 80% of UK containers are shipped through 3 ports in the congested south east and distributed by road & rail
- Could short sea distribution services develop using local, cheap ports (Easy jet model?).



English ports container traffic TEU 2016



Source: DFT connectivity study 2018

Example 3: short sea services can cut carbon by taking traffic off road & rail

- Rover engines moved from Valencia to UK plants by rail.
- Could this be a viable short sea trade?:-
  1. The distance is longer.
  2. Available short sea service is patchy
  3. Carbon footprint ought to be better
  4. Railways under pressure.
- In New York the UBER service grew much faster in the suburbs because they created new markets. The same would probably happen if regional short sea container services were introduced.

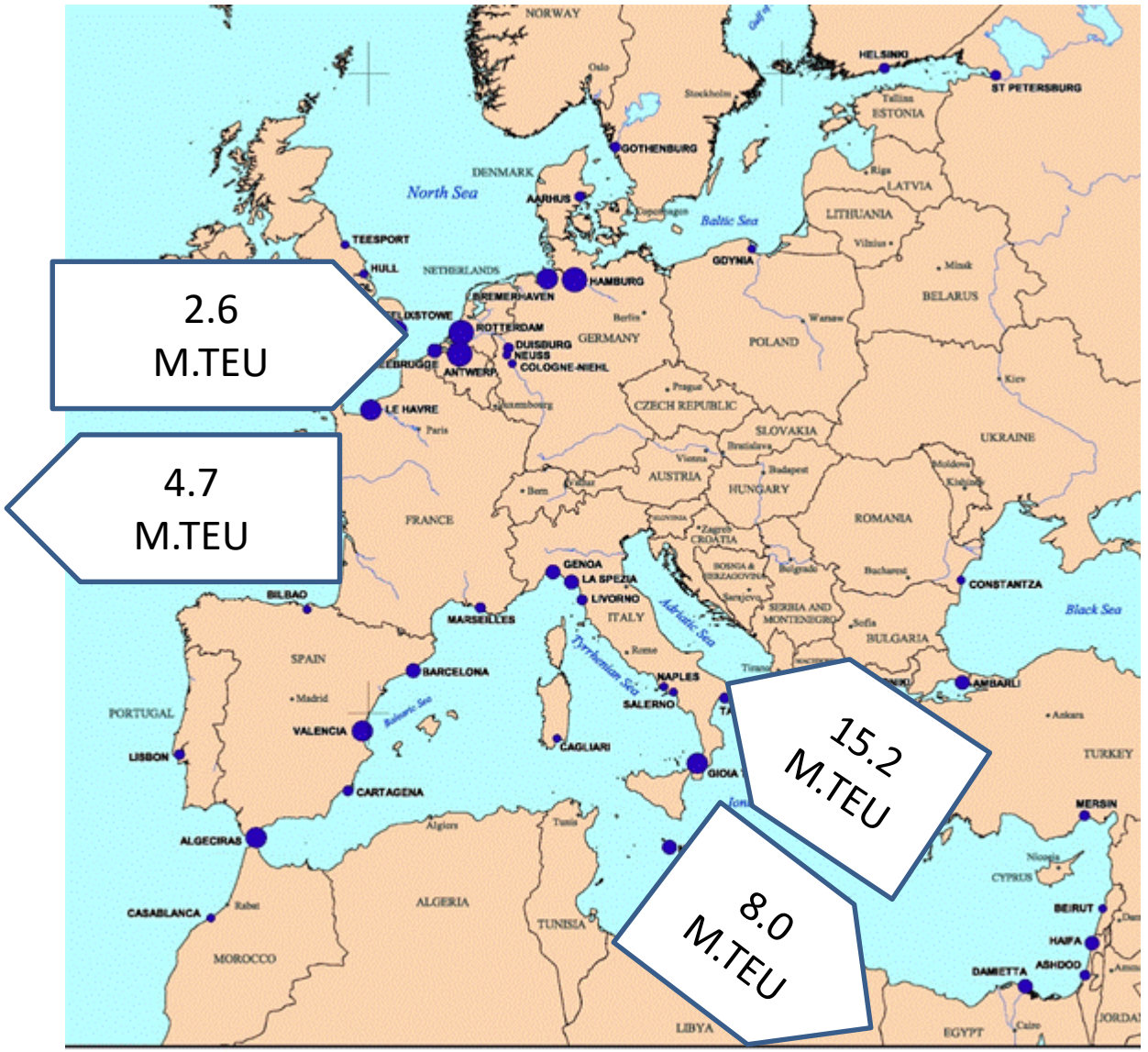
Rail transport route for engines (Source: Jaguar Land Rover)

Example 4: Electric containership replaces 40,000 truck journeys

- The vessel will operate in Norway, in a cargo transit between Yara's fertiliser plant in Porsgrunn to ports in Brevik and Larvik.
- Delivery 2020, length 80 metres; beam 15 metres; cargo capacity of 120 TEU.
- It will replace 40,000 truck journeys a year.
- An interesting niche

Example 5: Europe has critical mass to support regional short sea distribution

1. In 2017, containerships moved 17.8 million TEU into Europe and 12.7 million out.
2. That's:-
    1. Deep sea: about 3.3 super-shiploads in and 2.3 super-shiploads out/day.
    2. Short sea (if distributed by sea): about 200 shiploads a day.
    3. Land: about 40-50,000 lorry loads a day.
3. "Hub and spoke" would be a better way to handle these volumes e.g.using UBER style short sea distribution system

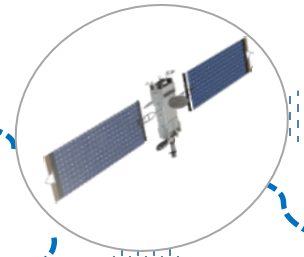


There is a torrent of new technology to help in improving B2B transport

3. DIGITAL TECHNOLOGY FOR B2B INTRA-EUROPE TRANSPORT & SERVICES

1. Manage fleets of short sea ships as "Transport Factories"

7. PORTS & THROUGH TRANSPORT

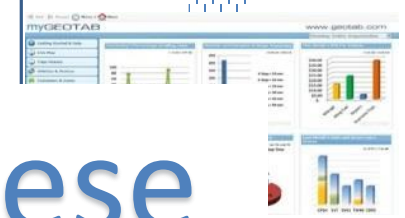


Warehouse (on cloud?)

6. SHIPBUILDER & EQUIPMENT SUPPLIERS

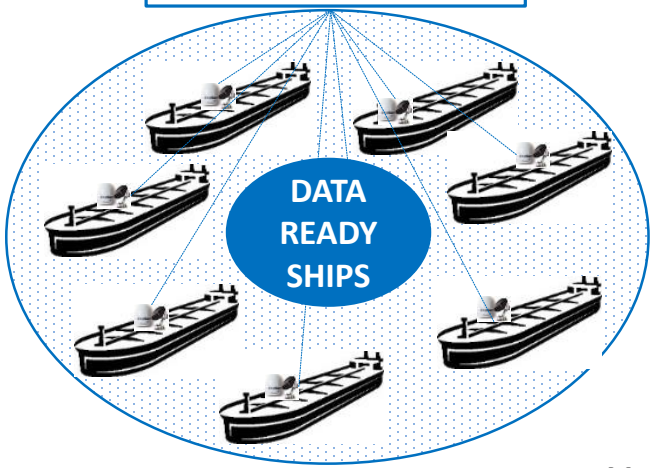
Company Systems:-

1. Process management
2. STQ monitoring
3. Messaging system
4. Intranet & dashboards



2. SHORE TEAMS

But… how do you link all these systems together?



Core systems

1. Navigation
2. Operations
3. Comms.

TECHNICAL TEAMS

1. Technical support
2. Maintenance systems
3. Regulatory reports
4. Fleet performance
5. Personnel management

1. Support systems
2. Process data
3. Automation
4. Build apps
5. Manage stats

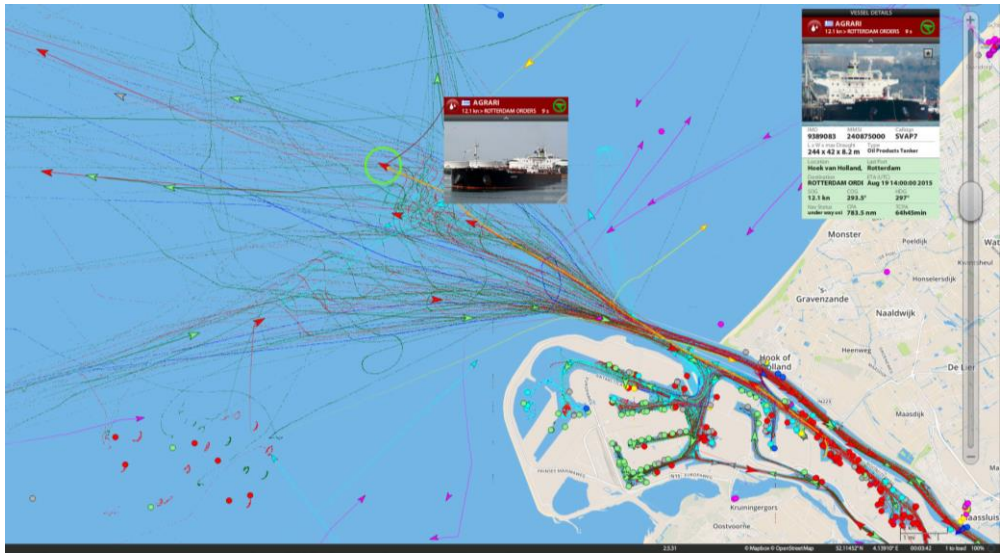
3. SYSTEMS. TEAMS

Source: Martin Stopford 2016

2: Seamless - voyage management systems

Terminal scheduling team

Data exchange to & from ships



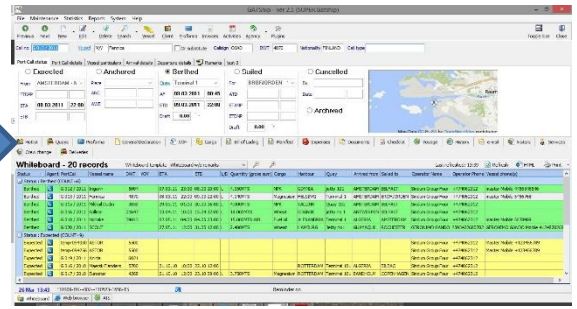
Voyage monitoring and weather planning system

Shipping office voyage analysis team

Terminal management dashboard

Ship managers

Fleet liaison manager



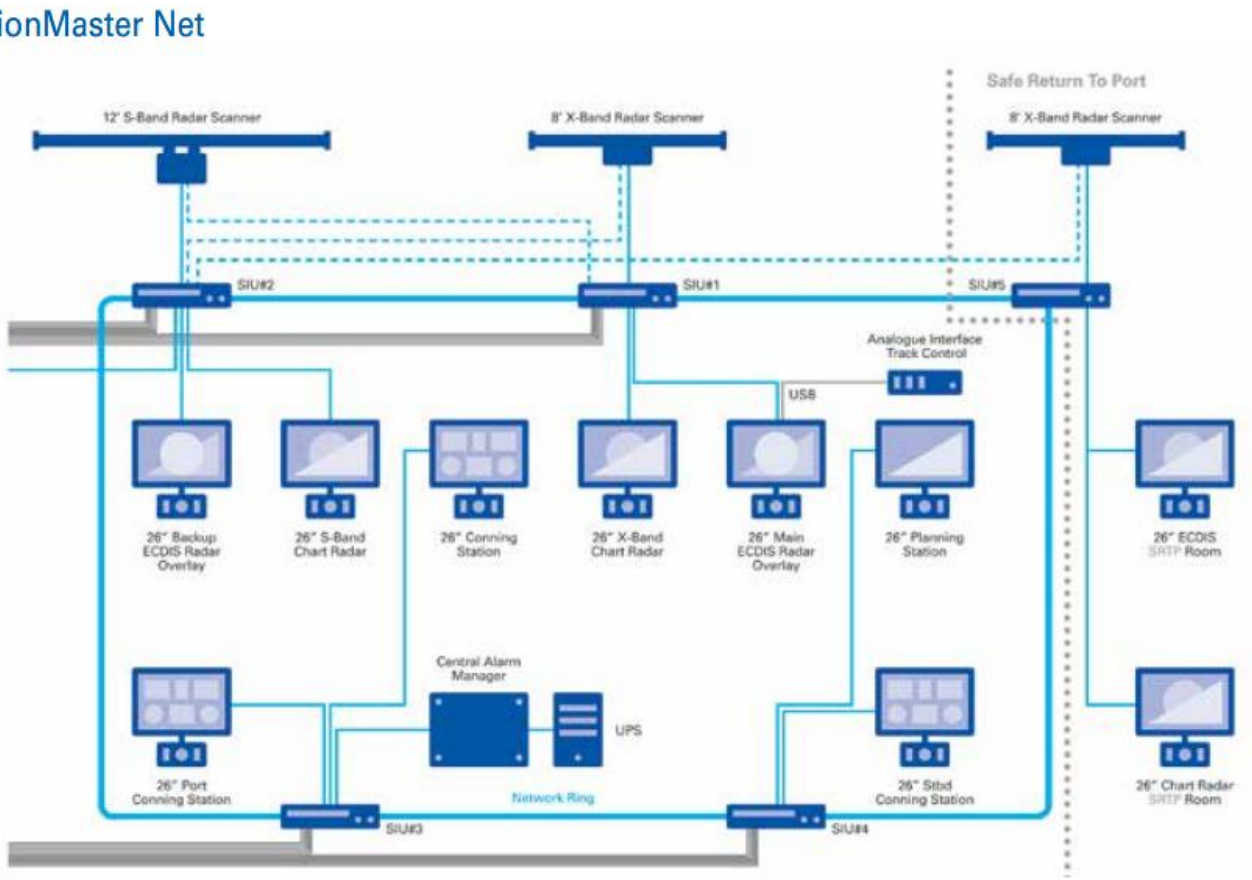
Fleet management dashboard

3: 25,600 dwt self-discharging, ice classed, LNG-powered bulk carrier

- *Haaga* and *Viikki have* self-discharging cranes.
- Sensors, cameras and laser scanners, analyse the topography of each cargo hold and determine the optimal lifting points.
- An self-learning algorithm ensures the bucket is not overloaded and compensates for heeling to ensure even unloading. The algorithm also calculates which shoreside hopper to discharge into.

4: Networked navigation kit & ship/shore integration

- Sperry Marine's Vision Master Net is a modular networked navigation system
- Covers radar, chart radar, ECDIS, Conning information display, central alert manager, and "total watch"
- Consistent user interface & flexible location.
- Fully viewable on board and on shore



"When you get an incident at sea, at best you might have the master talking over a satellite phone. But now we're giving them a whole bridge of information; whether its speed, heading, radar or chart picture" James Collett Sperry MD

Moormaster 400 units, have two suction cup panels of twenty tons power. System delivers mooring force of 160 tons.

5: Many ways to fine tune logistics performance

- Autonomous mooring systems
- Microbubbles
- Flettner rotors
- Twin propellers
- Robot hull cleaning at berth
- Algorithms to optimise container cargo stowage
- Sophisticated multimodal logistics systems link ship, truck
- Digital passage planning
- Better weather info in restricted areas
- Fleet management systems.
- Autonomous cranes for servicing small ports.
- Improved inland waterway capacity & integration
- Advanced traffic management systems

4. CONCLUSIONS

The challenge is to develop Business to Business (B2B) transport systems (promised in the 1960s but never delivered). It will make tomorrow's European business clusters more efficient, with fewer emissions.

Conclusions

1. Digital technology, regional re-alignment and environmental emissions are pushing the maritime industry into a new era.
2. Europe's sea transport system is now 50 years old and it's time to review the strategy
3. The way we handle regional distribution of cargo to minimise carbon emissions deserves special attention.
4. Digital technology now makes B2B transport possible, especially in the short sea trades to local ports.
5. The case for a regional hub and spoke system deserves re-evaluation, given today's technology
6. Ports, terminals, shipping companies, cargo & governments would all need to participate
7. Is it possible? Or should we just go on as we are?