

# Transport and Logistics Services in Supply Chains

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Ekstern Lektor

# Agenda

## Transport Services

- Characteristics of transport modes
- Efficiency of Transport Services
- Multimodal, Intermodal and Combined Transport
- Transport Mode Selection, taking Belt-Road-Initiative (BRI) as an example

## Logistics Service Providers

- Freight Forwarder, 3PL, 4PL

## Case Study: Missing Boxes in Central Europe



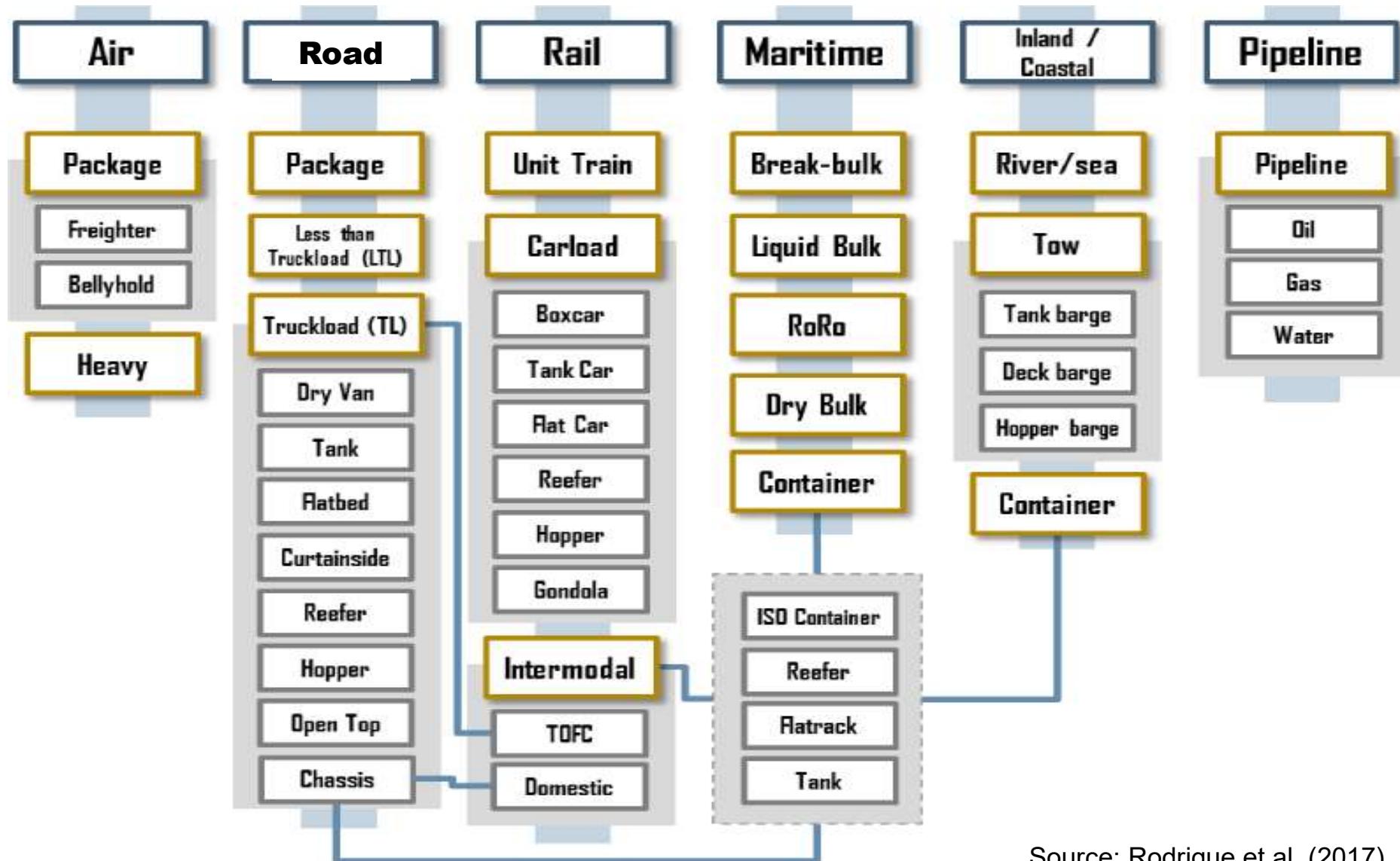
## READINGS:

### Textbook 4<sup>th</sup> ed. Chapter 6, 8 (3<sup>rd</sup> ed. Chapter 5, 7)

Rodrigue, J-P et al. (2020): *The Geography of Transport Systems*, Hofstra University, Department of Global Studies & Geography, Chapter 5.

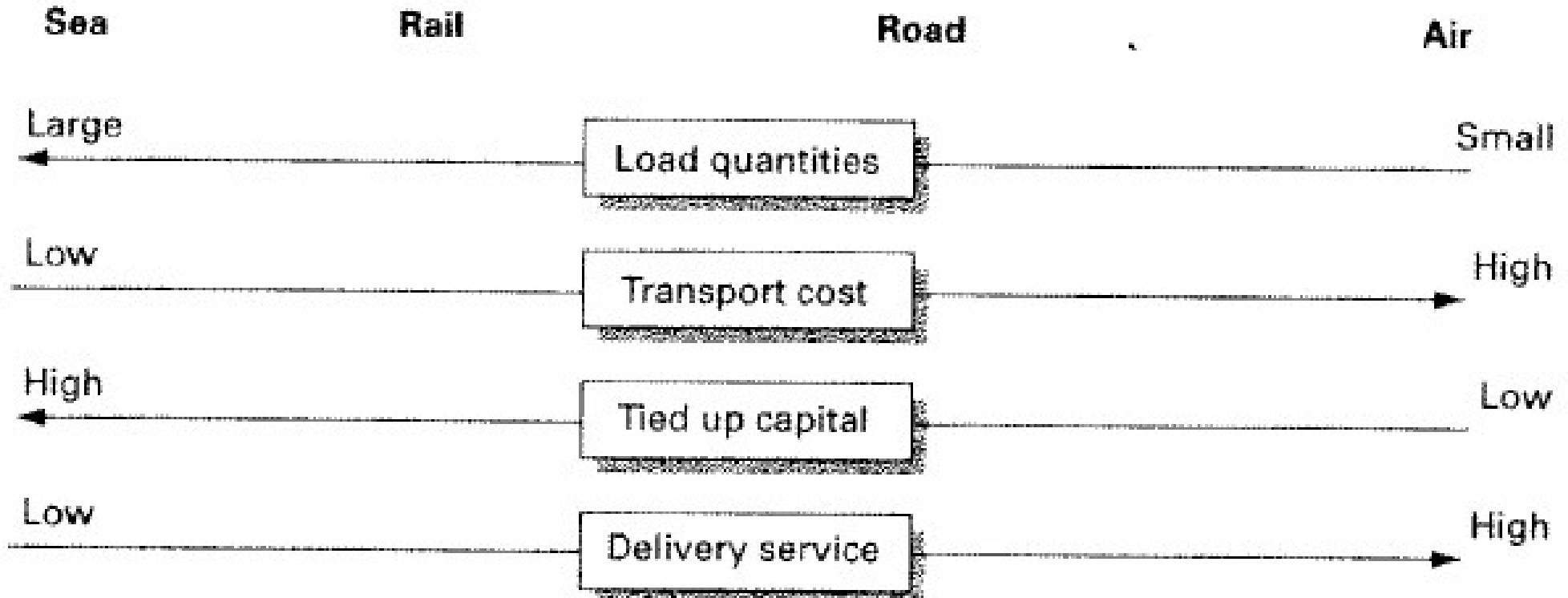
Zhang, X. and Schramm, H.J. (2020): Assessing the market niche of Eurasian rail freight in the belt and road era, *IJLM* Vol. 31, No.4, pp. 729-751.

# Classification of Transport Modes



Source: Rodrigue et al. (2017)

# Typical Characteristics of the Different Transport Modes

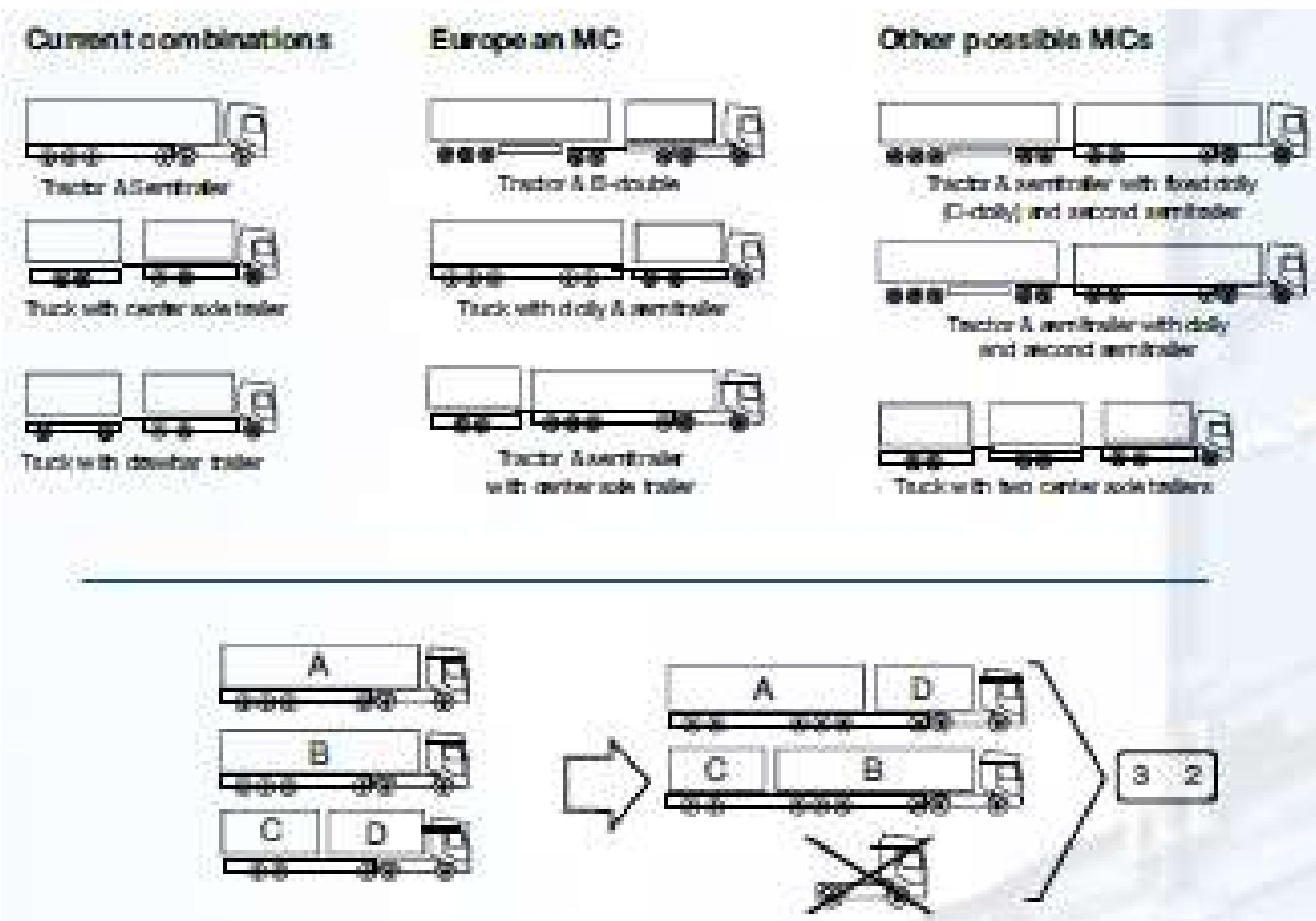


# Efficiency of Transport Services

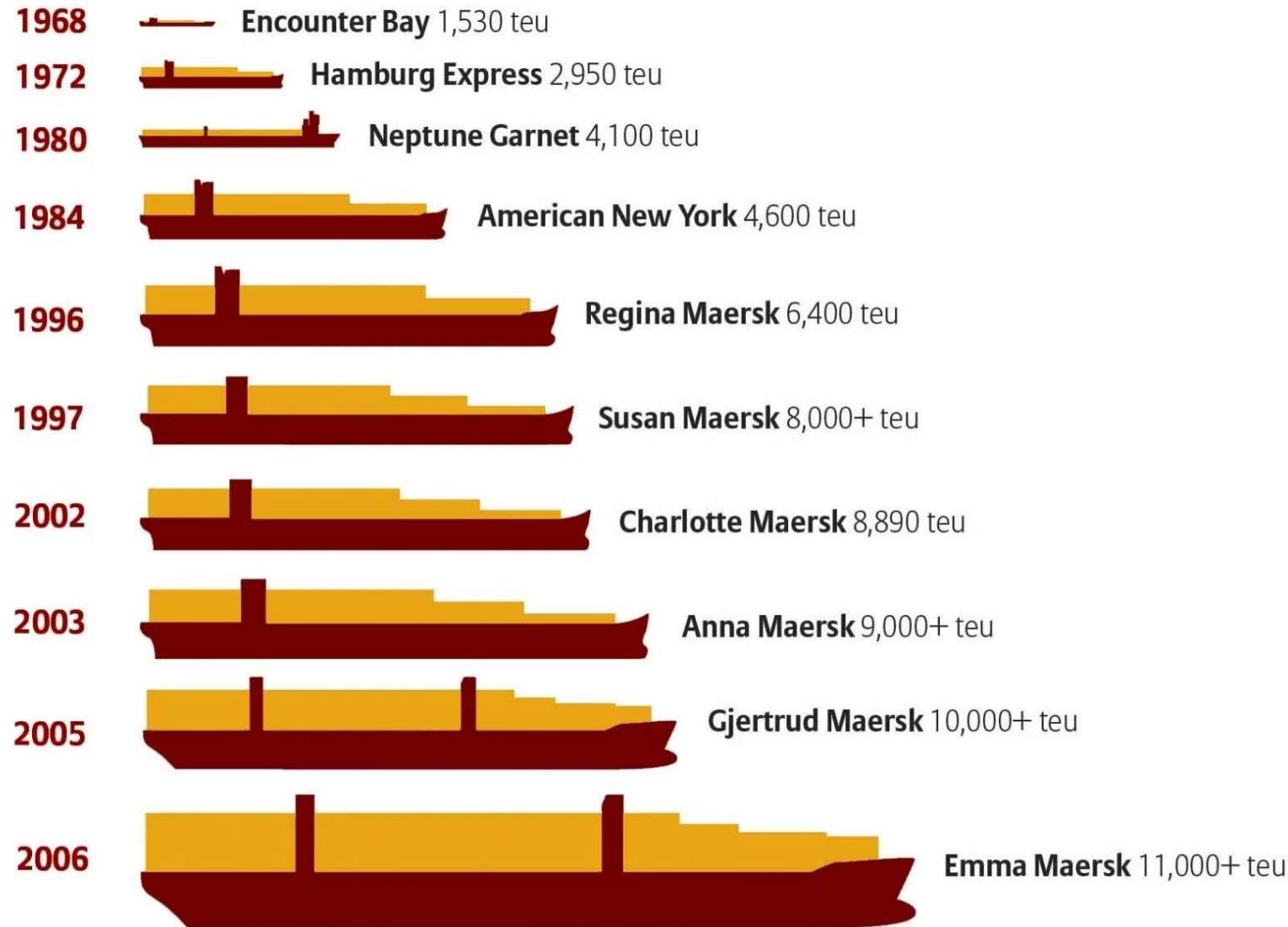
Vehicle	Capacity	Truck Equivalency
Barge	1500 Tons / 50-100 TEU 52,500 Bushels 453,600 Gallons	57.7 (865 for 15 barges in tow) 18 to 40 (intermodal)
Hopper car      Doublestack rail car	100 Tons / 4 to 5.3 TEU 3,500 Bushels 30,240 Gallons	2.0 (intermodal) to 3.8
100 car train unit 100 car intermodal train	10,000 Tons / 400 to 530 TEU 350,000 Bushels 3,024,000 Gallons	385
Semi-trailer truck	26 Tons / 2.65 TEU 910 Bushels 7,865 Gallons 9,000 for a tanker truck	1
Panamax containership	5,000 TEU	2,116
VLCC	300,000 tons 2 million barrels of oil	9,330
747-400F	100-125 tons (Depending on freight density and range)	5

Source: Rodrigue et al. (2020)

# European Modular System for Road Transport

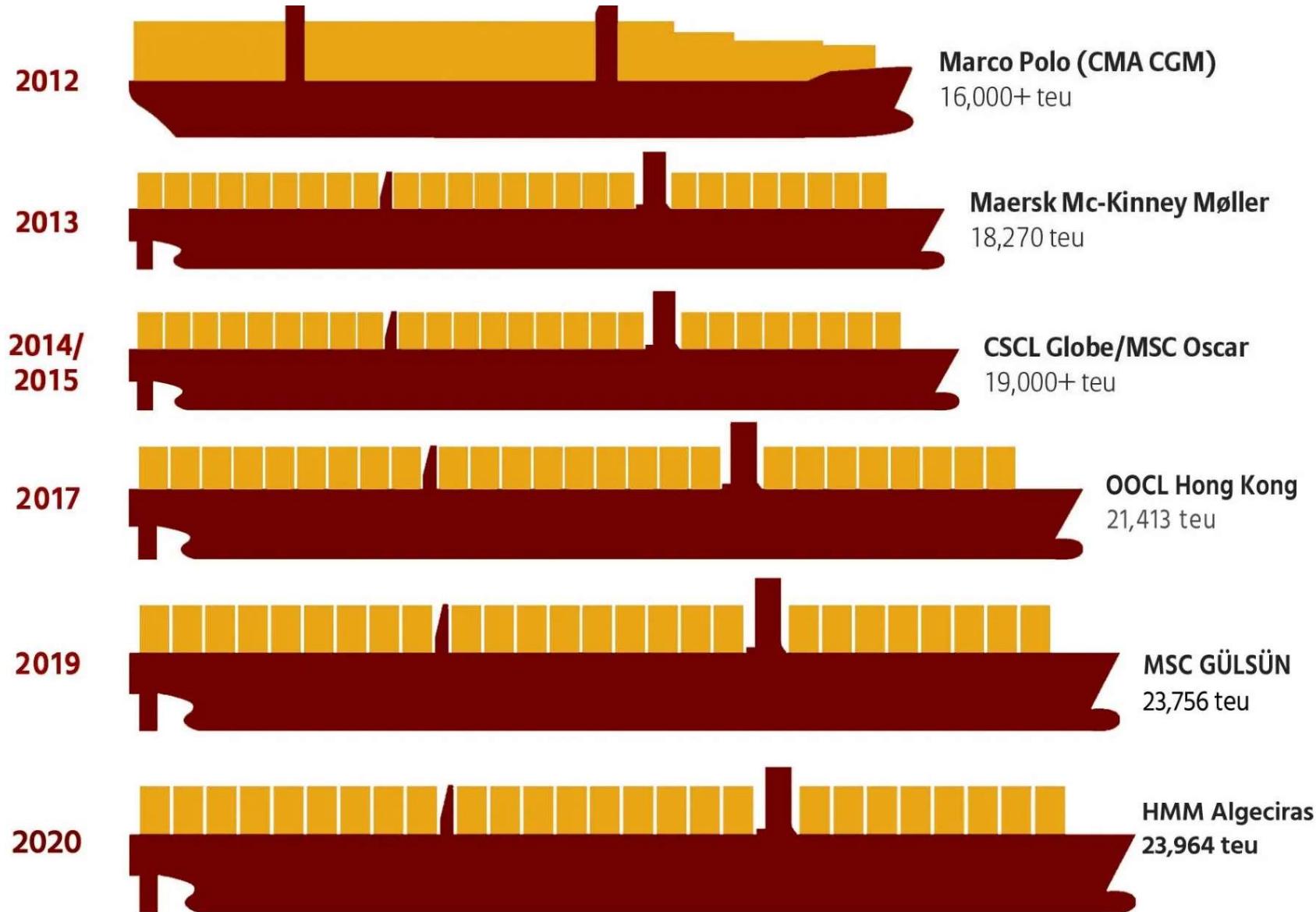


# Evolution of Containerships 1/2



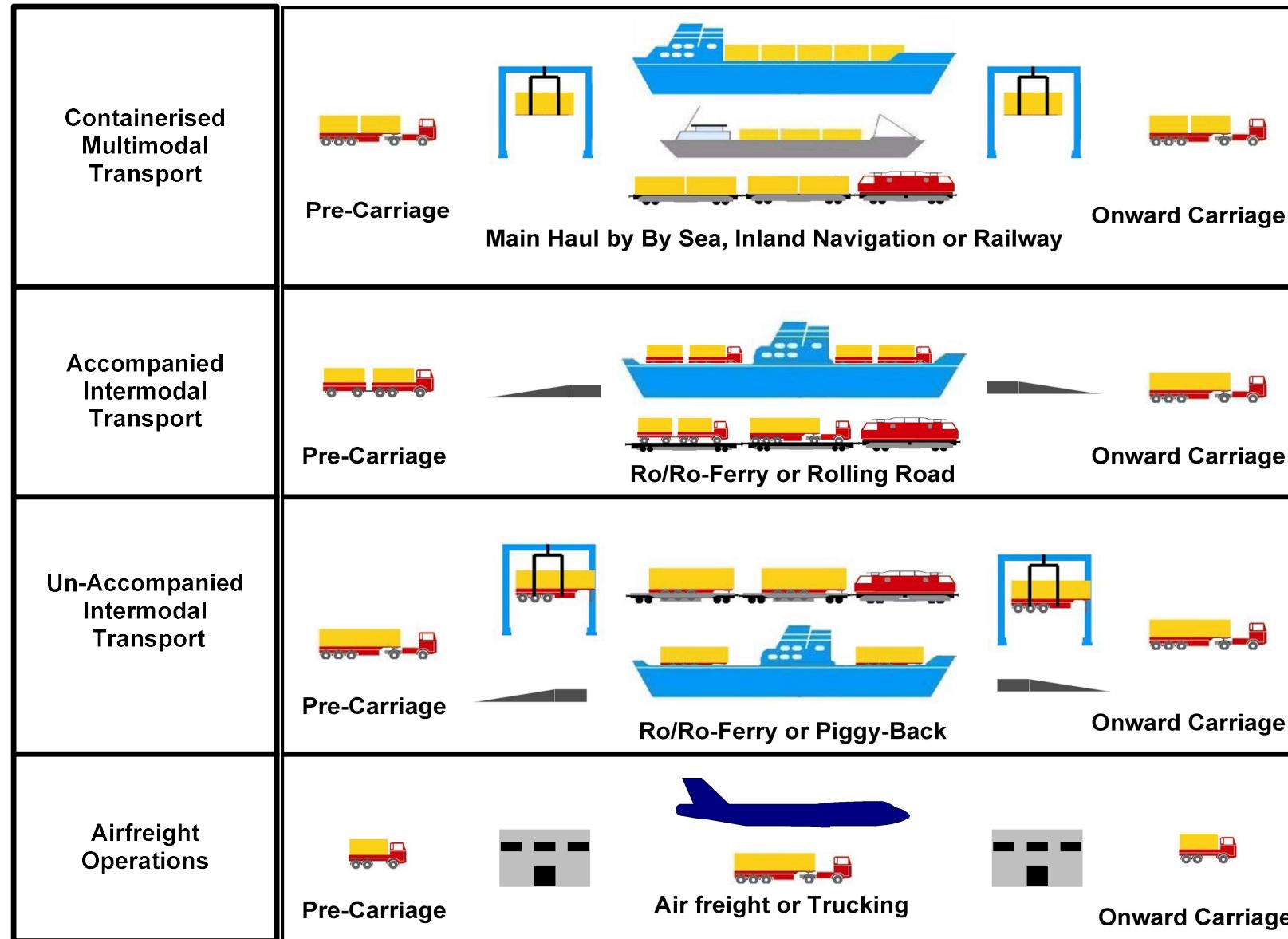
Source: <https://www.shippingandfreightresource.com/importance-of-proper-container-lashing-on-board-ships/>

# Evolution of Containerships 2/2



Source: <https://www.shippingandfreightresource.com/importance-of-proper-container-lashing-on-board-ships/>

# Multimodal, Intermodal and Combined Transport



Source: Kummer and Schramm (2004)

# Definitions

Definitions according to UN/ECE (2001)

## Multimodal transport

„Carriage of goods by two or more modes of transport“

## Intermodal transport

„Movement of in one and the same loading unit or road vehicle, which uses successively two or more modes of transport without handling the goods themselves in changing modes.

*By extension, the term **intermodality** has been used to describe a system of transport whereby two or more modes of transport are used to transport the same loading unit or truck in an integrated manner, without loading and unloading, in a [door to door] transport chain“*

## Combined transport

„Intermodal transport where the major part of the European journey is by rail, inland waterways or sea and initial and/or final legs carried out by road are as short as possible“

# Definitions Revisited

AIR

SEA

MULTIMODAL

INTERMODAL

COMBINED

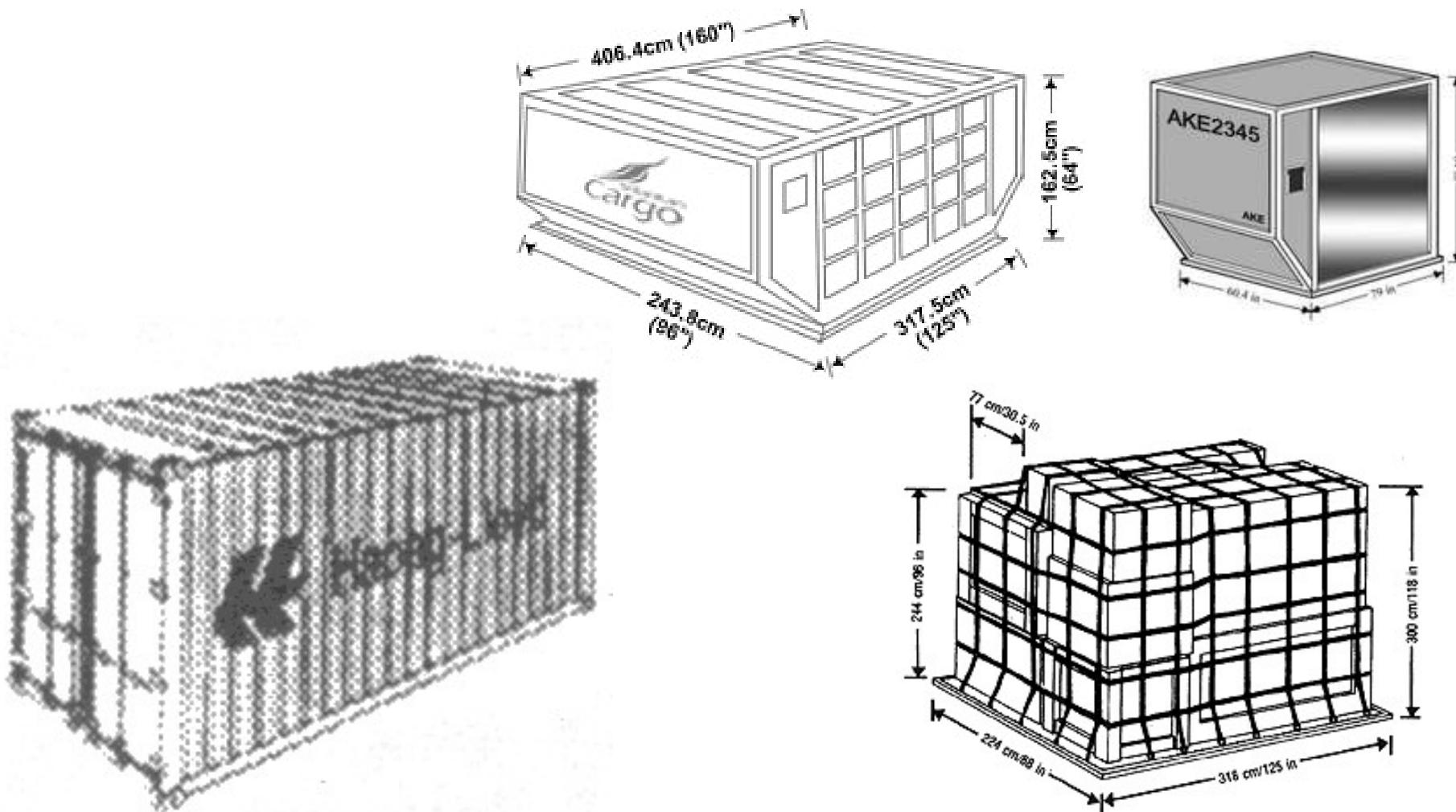
ULD BULK

FCL LCL

# Intermodal Transport Units

Various types of Intermodal Transport Units (ITUs):

- Standard sized containers (typically 20 and 40 feet in length)
- Unit Load Devices (ULD), 'Igloo' containers used in air freight



# Terminal Equipment for Intermodal Transport Units

**Straddle Carrier**



Circulate over container piles. Can go over stacks up to 3 in height. Density of 500 to 700 TEU per hectare.

**Rubber-tired Gantry**

High storage densities (1,000 TEU per hectare). Difficult to move from one stack to the other. High acquisition but low operating costs.



**Front-end Loader**



Use container top anchor points. Handle most containers. Can reach stacks up to 3 in height.

**Rail-mounted Gantry**

Highest storage density (widespan: +1,000 TEU per hectare); mostly used at port terminals. Lowest operating costs. Fixed to rail tracks.



**Reach Stacker**



Flexible side loaders. Can reach stacks up to 3 full or 5 empty containers in height. 500 TEU per hectare.

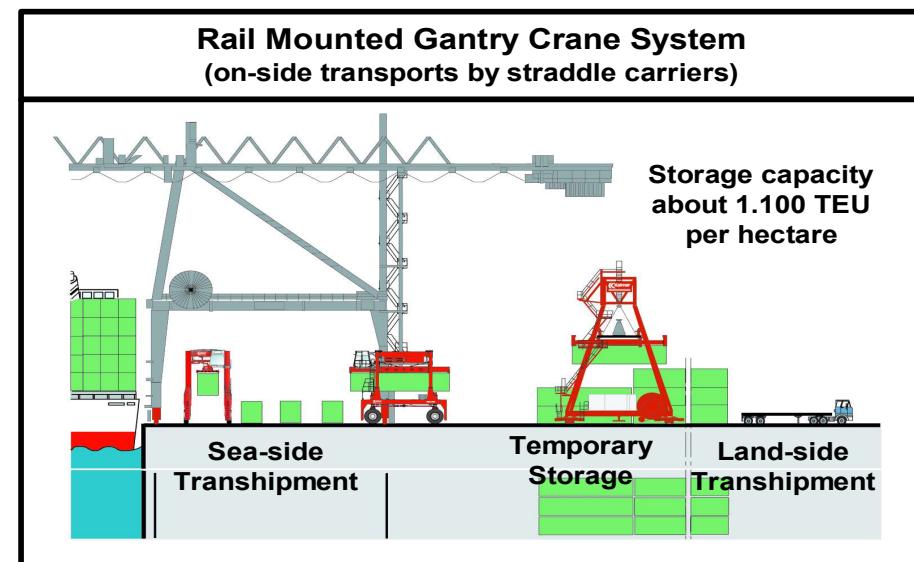
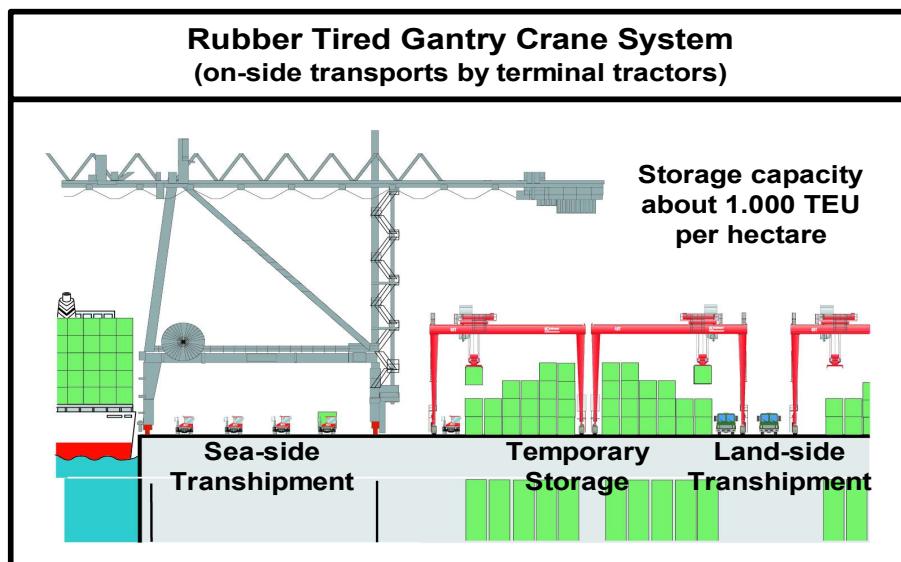
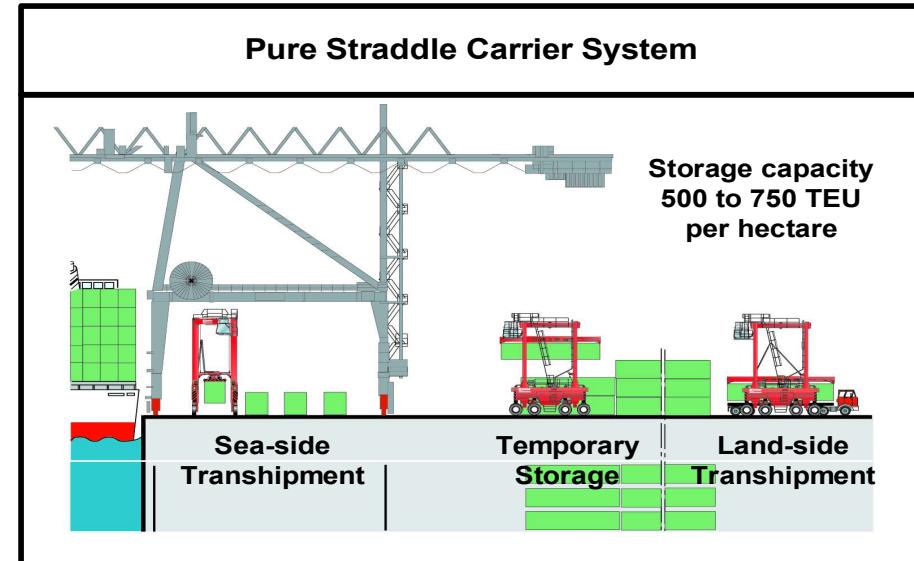
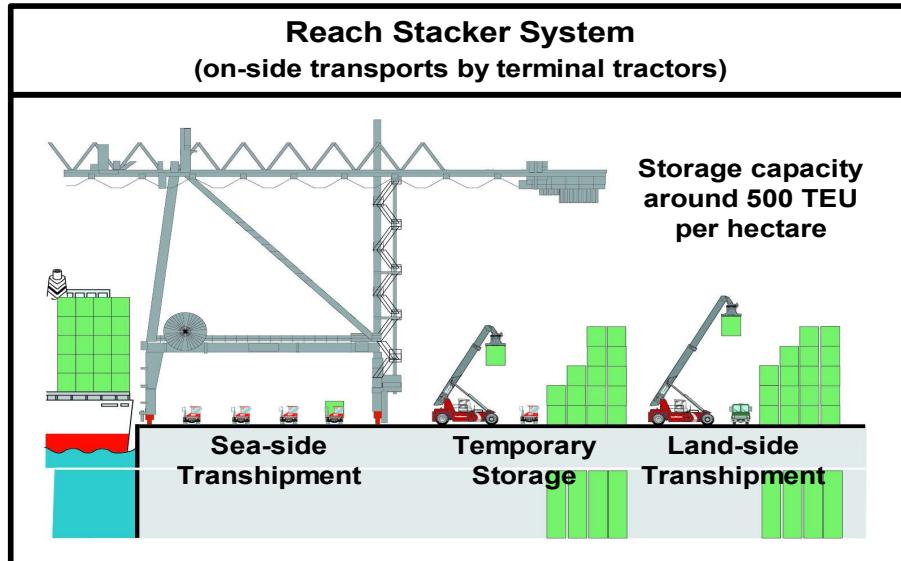
**Portainer**

Load and unload containerships. Various sizes (Panamax and Super-Panamax).



Source: Rodrigue et al. (2020)

# Container Terminal Types of Operations



Source: adapted from Kummer et al. (2009) and  
<http://www.kalmarind.com/show.php?id=1189178>



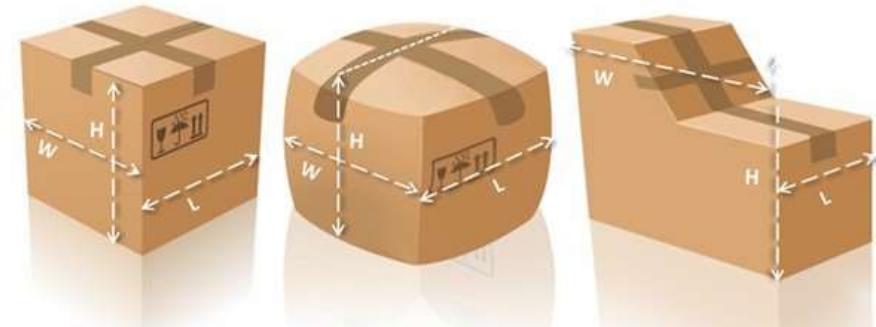
# Transport Mode Selection

A function of:

- Weight/volume and value of the freight
- Distance travelled
- Availability / reliability of transport services
- Freight rates to be charged
- ...

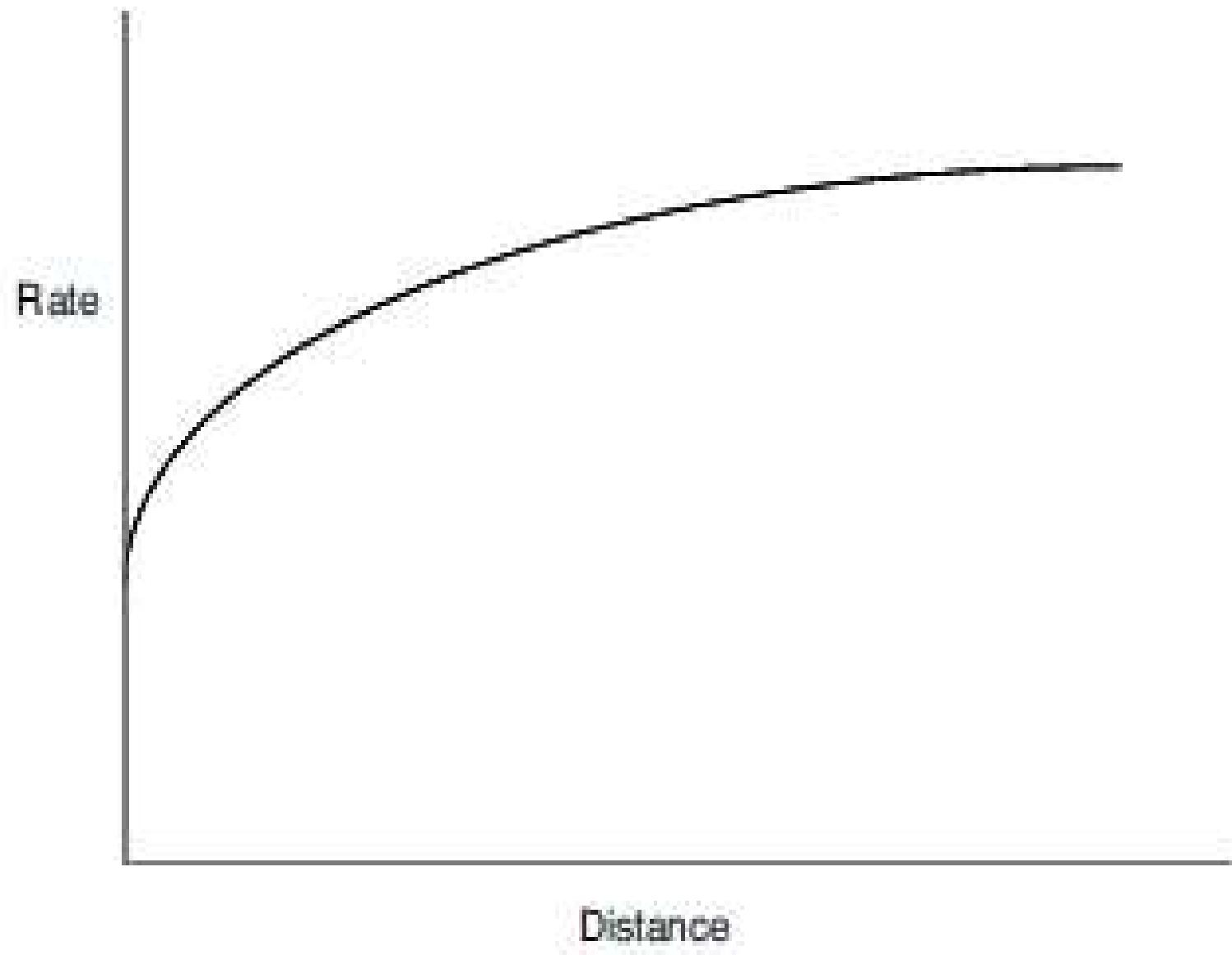
Instead of tare weight, carriers alternatively apply volumetric charging based on consignment dimensions (usually abbreviated by W/M):

- Road/rail 1:3 or 1 cbm = 333 kg
- Sea freight 1:1 or 1 cbm = 1,000 kg
- Air freight 1:6 or 1 cbm = 666 kg

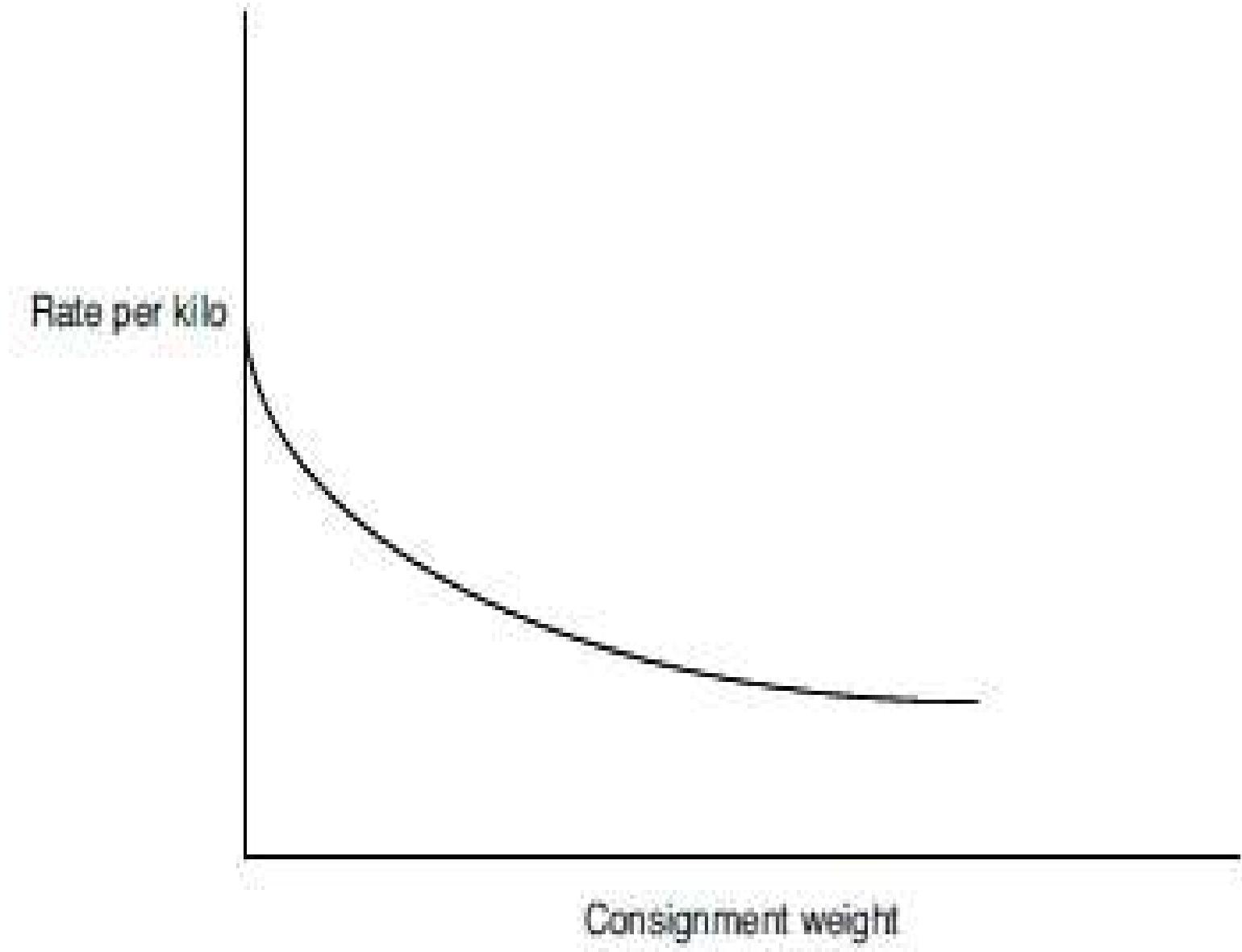


Always the higher one is taken!

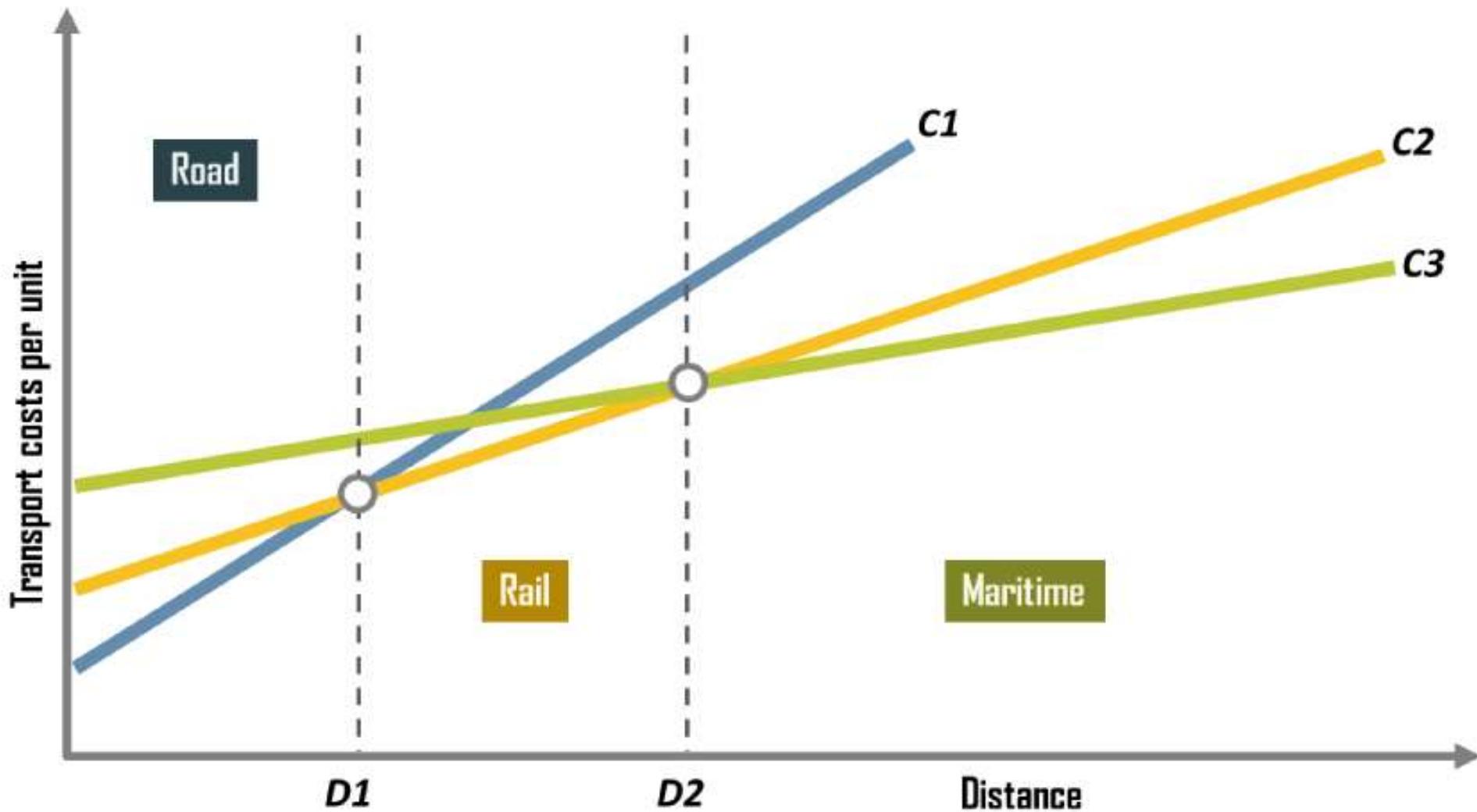
# Relationship between Freight Rate and Distance



# Relationship between Rate per Kilo and Consignment Weight



# Transport Cost Comparison between Road, Rail and Maritime



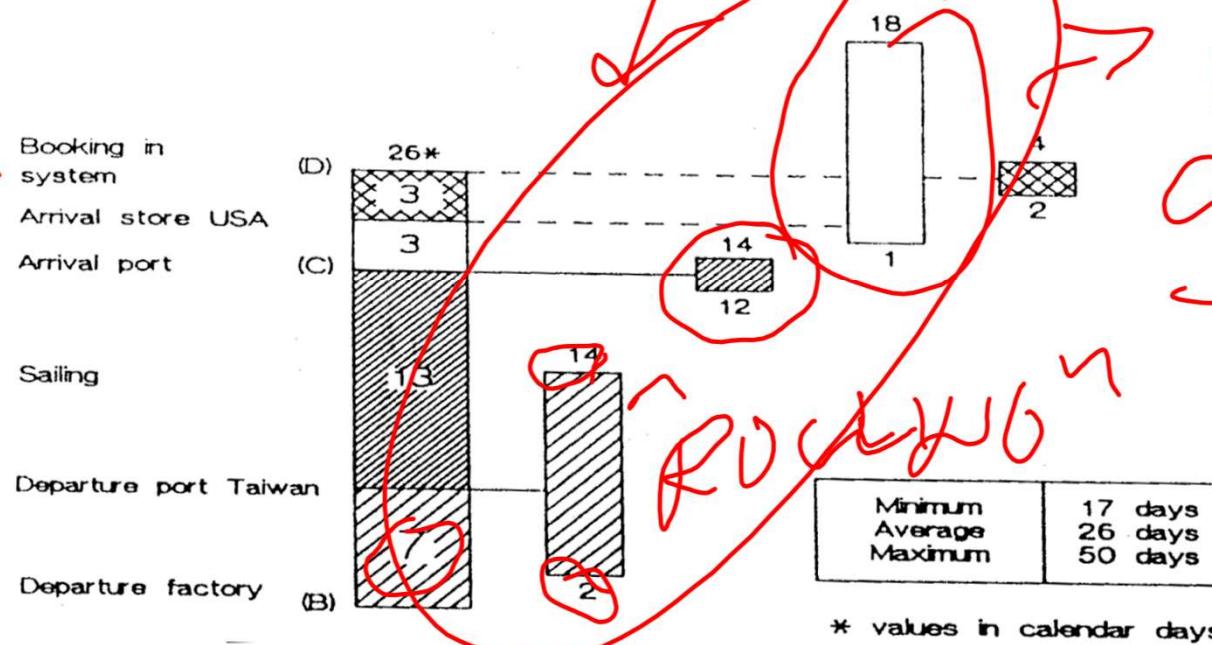
# Transport Mode and Lead Times

Lead times are closely related to decisions on transport mode.

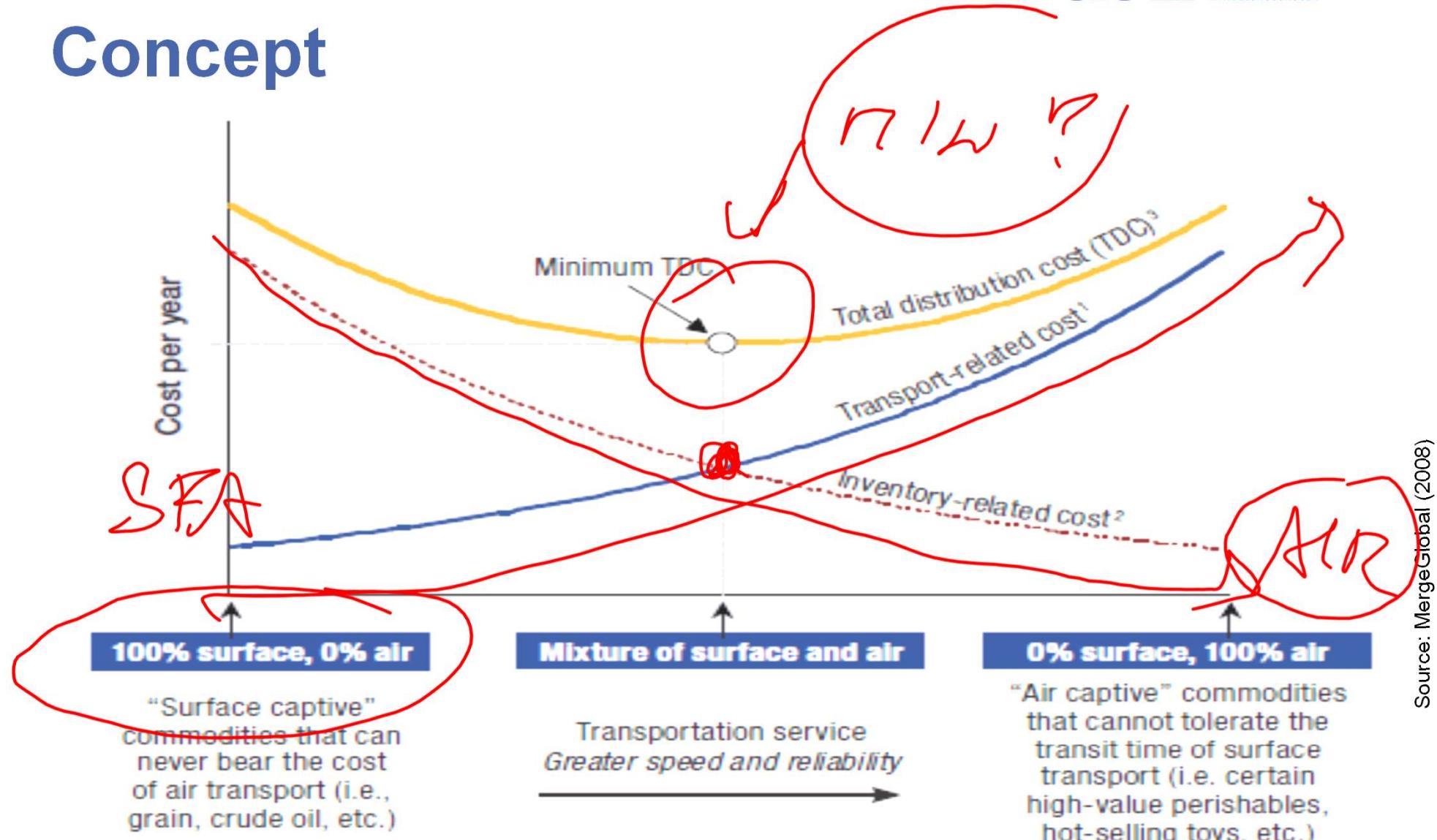
A valuable strategy is accounting logistics costs on a full-cost basis.

- Freight, insurance and handling costs
- Inventory carrying costs for products in transit and cycle stock
- Inventory carrying costs for safety stock
- Investment cost required to produce the inventory to fill the pipeline

VSA  
TW



# Total Distribution Cost Concept

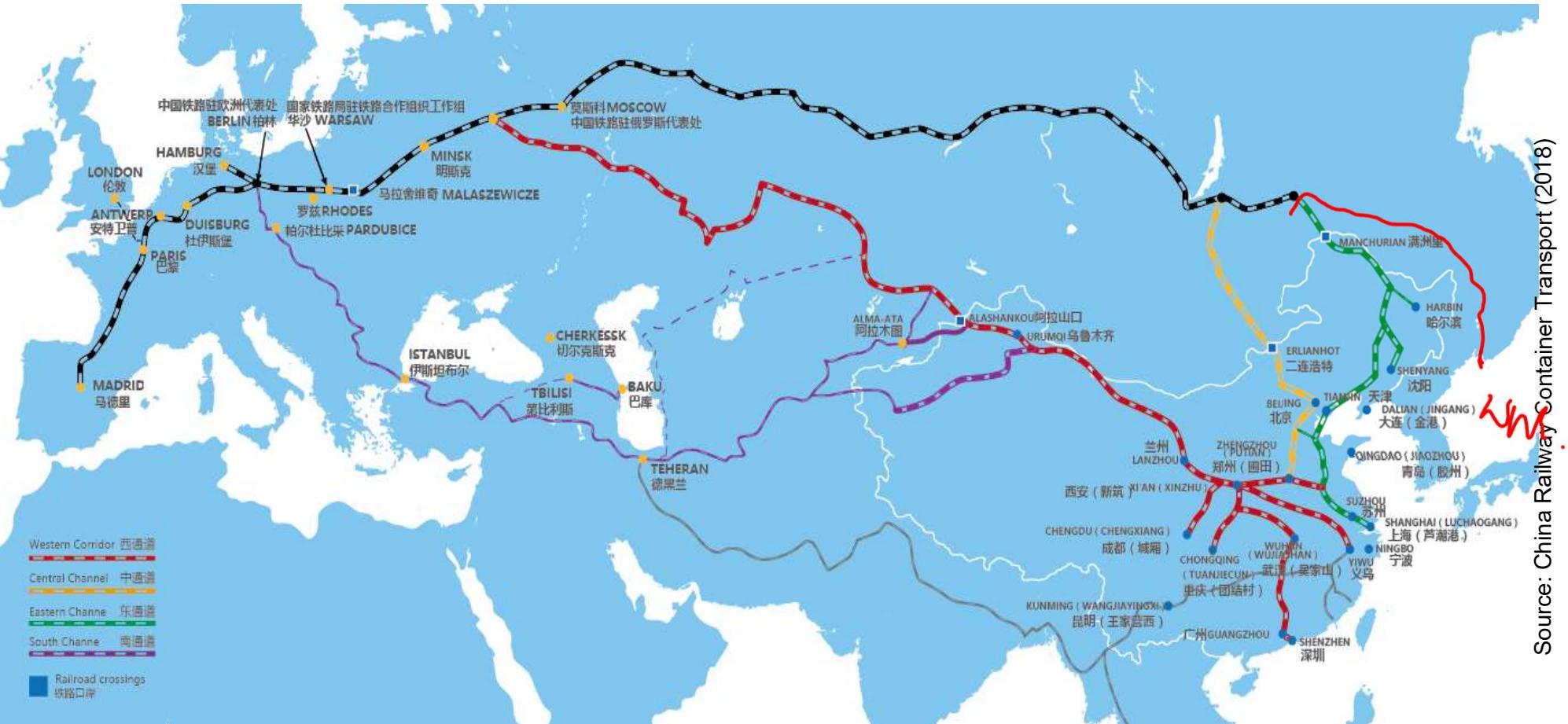


<sup>1</sup> Transport Related Costs reflect all costs associated with moving goods, including freight bills, documentation, customs brokerage, etc.

<sup>2</sup> Inventory Related Costs include all other elements of logistics costs – from storing and handling product to write-downs of obsolete or spoiled goods.

<sup>3</sup> Total Distribution Cost = Transport-Related Cost + Inventory-Related Cost.

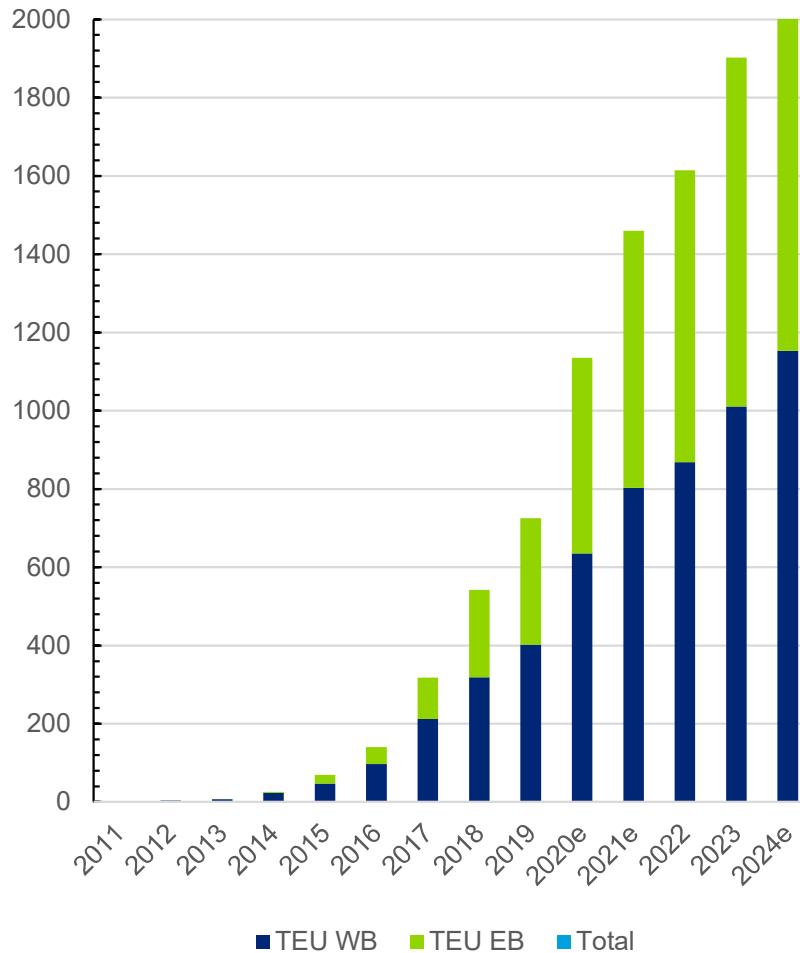
# Example: Belt-Road-Initiative (BRI) and New Eurasian Land Bridge (NELB)



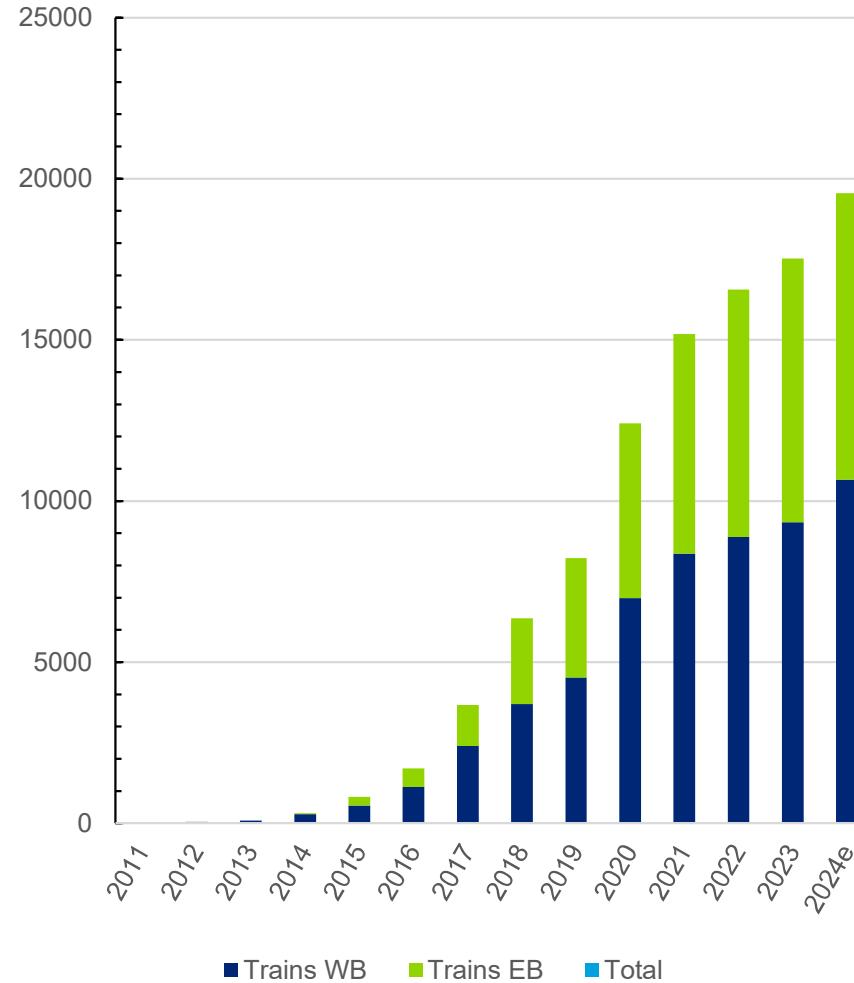
50% of transit time by sea and coming  
along with much more reliability today...

# A Success Story!

Tsd. TEU transported p.a.



Container Block trains p.a.

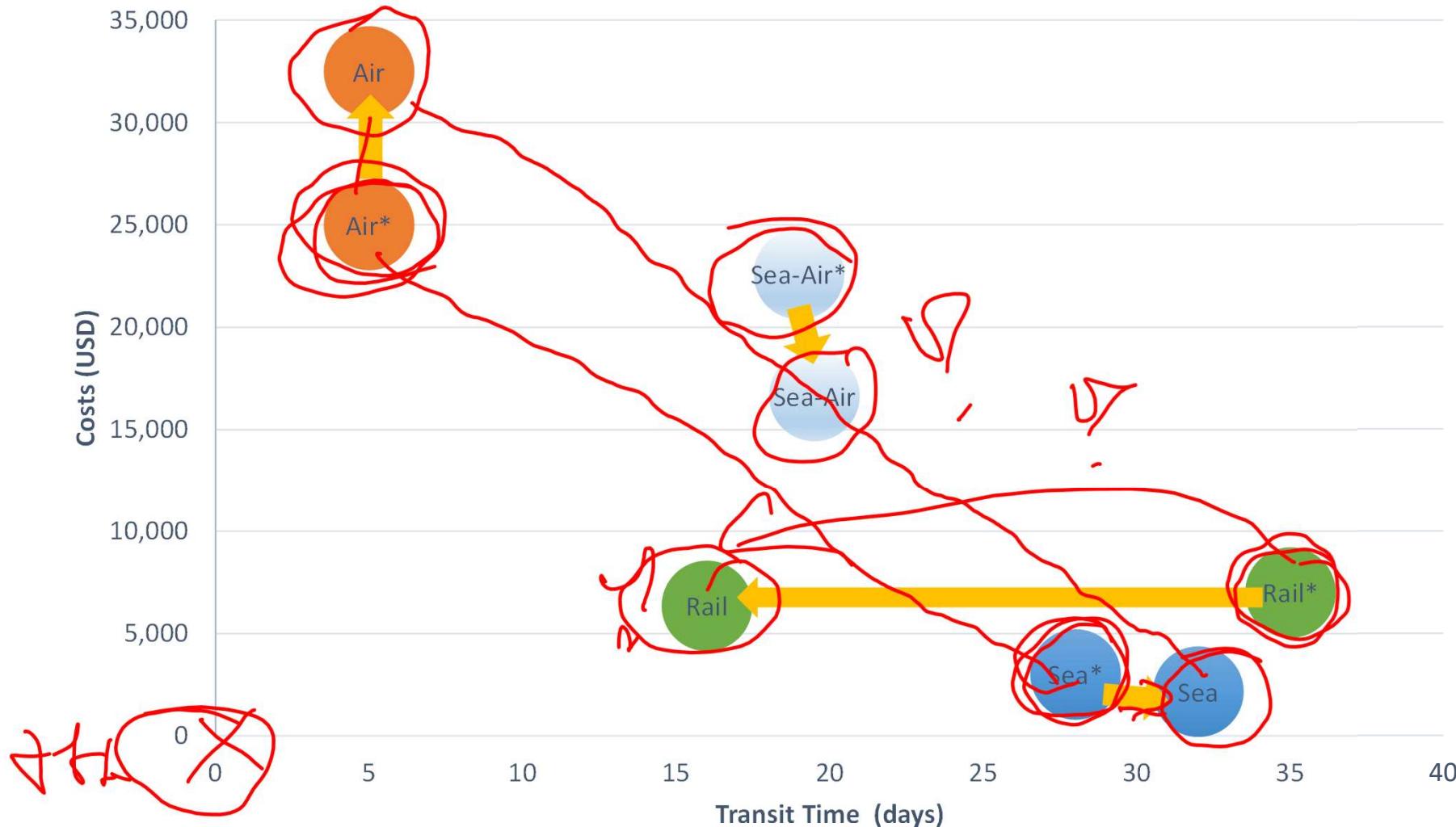


Source: China Railway Container Transport (2018)

# Cost and Transit Time Comparisons

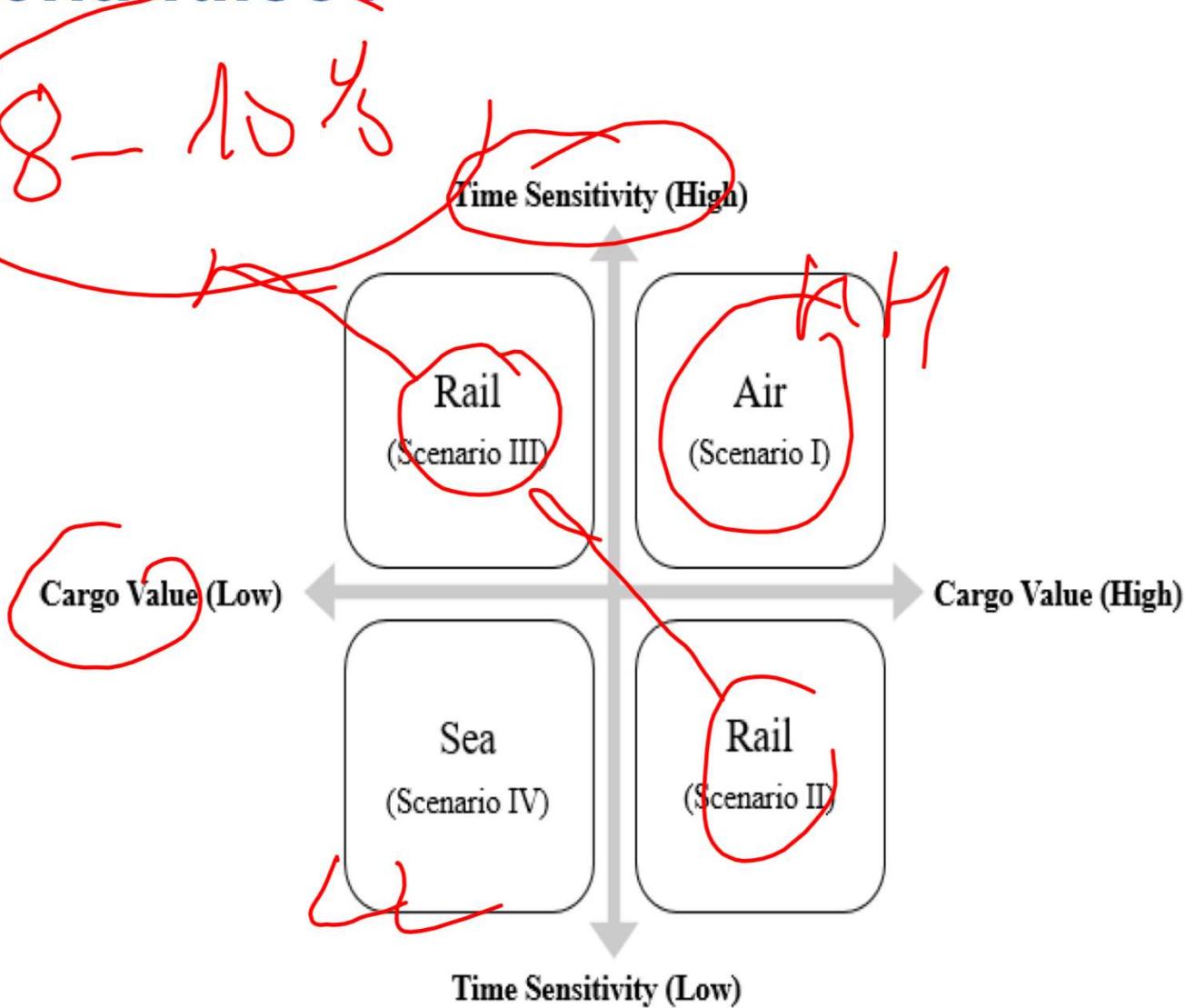
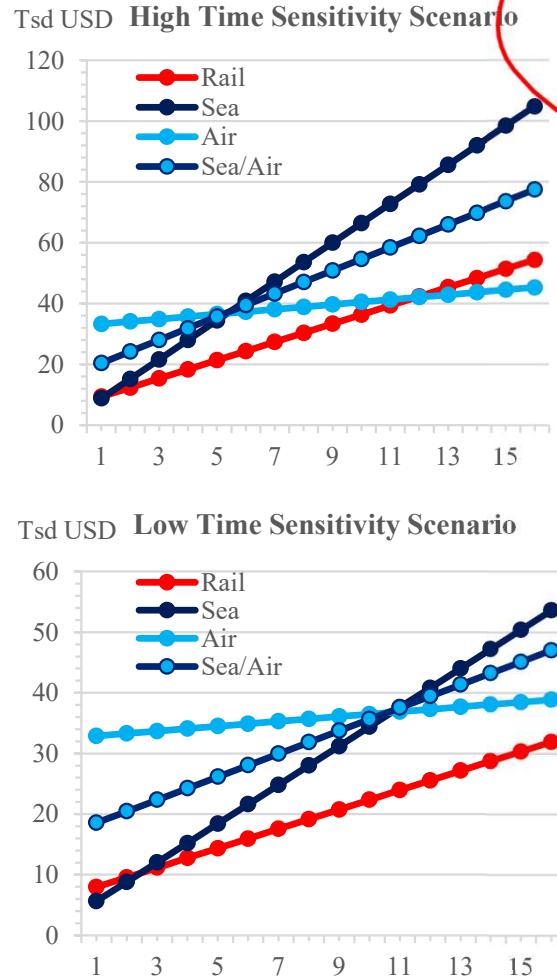
Costs and Transit Time 2006\* vs. 2017

(40' Container with 10 t from Shanghai, China to Hamburg, Germany)



Source: U.S. Chamber of Commerce (2006), Zhang (2017), own calculations

# Which Mode for Which Merchandise?



Source: Zhang and Schramm (2020)

# And what about Road Haulage?

The screenshot shows the International Road Transport Union (IRU) website. At the top, there's a navigation bar with links for "Who we are", "What we do", "Where we work", "Join us", "Resources", a search icon, a lock icon, and the language "En". Below the navigation, a breadcrumb trail reads "Home > Resources > Newsroom > First China to Europe TIR truck secures trade flow in record time". The main content area features a large photograph of a red MAN truck with "alblas" and "TIR" branding. A red circle highlights the "TIR" sign on the front of the truck. A man in an orange vest stands next to the truck, which is positioned under a white gantry with various sensors and cameras. In the background, another person stands near a red barrier. A blue button labeled "Press release" is visible on the left side of the image.



First China to Europe TIR truck secures trade flow in record time

27 Nov 2018 Beijing

The success of the first TIR journey by road from China to Europe proves the system's cost, time and security advantages. It is set to boost trade between China and Europe, unlocking a critical Belt and Road route and offering development opportunities across Eurasia

Read more about

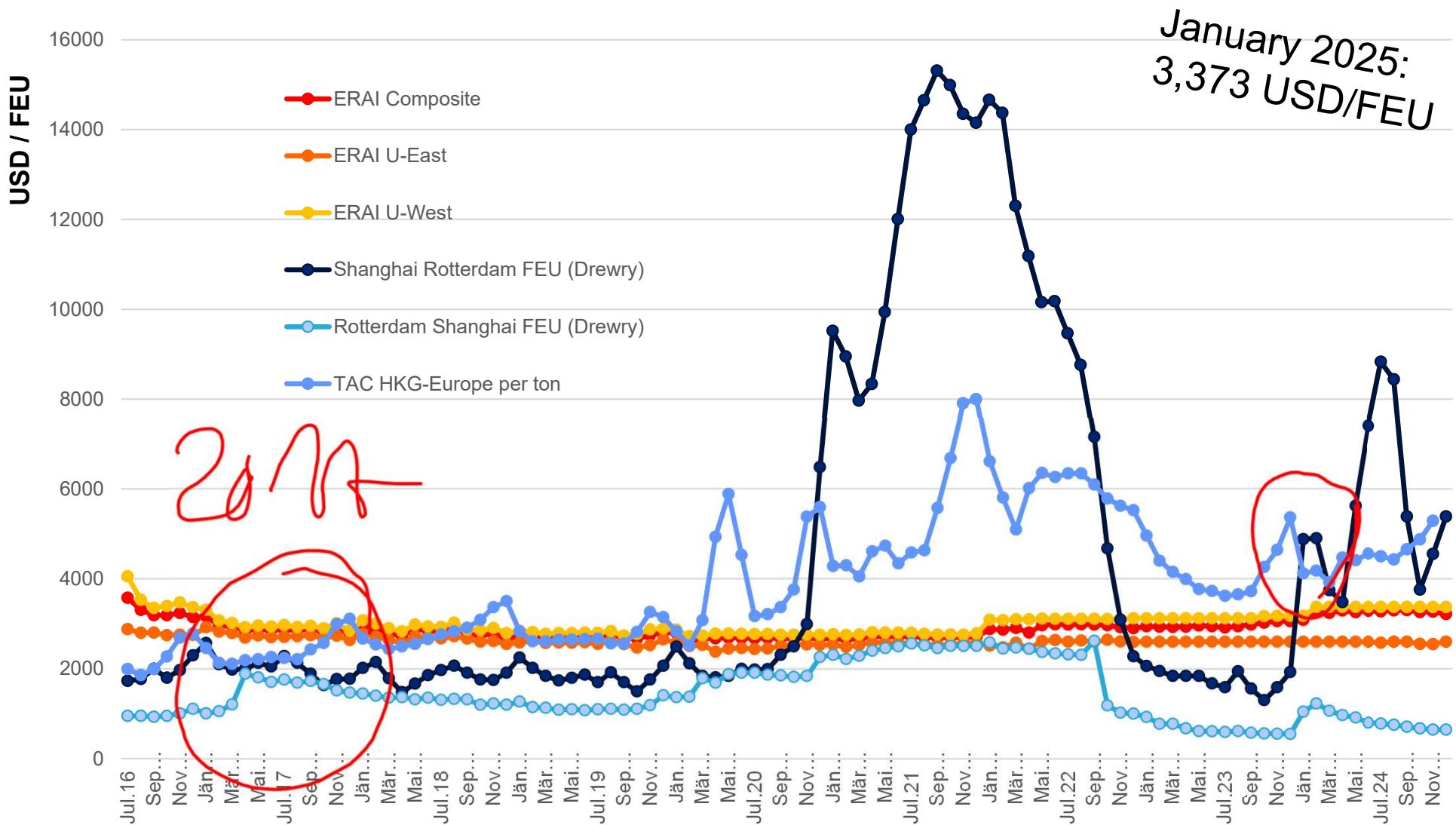
[IRU in Eurasia & Russia](#)

[IRU in Asia & Pacific](#)

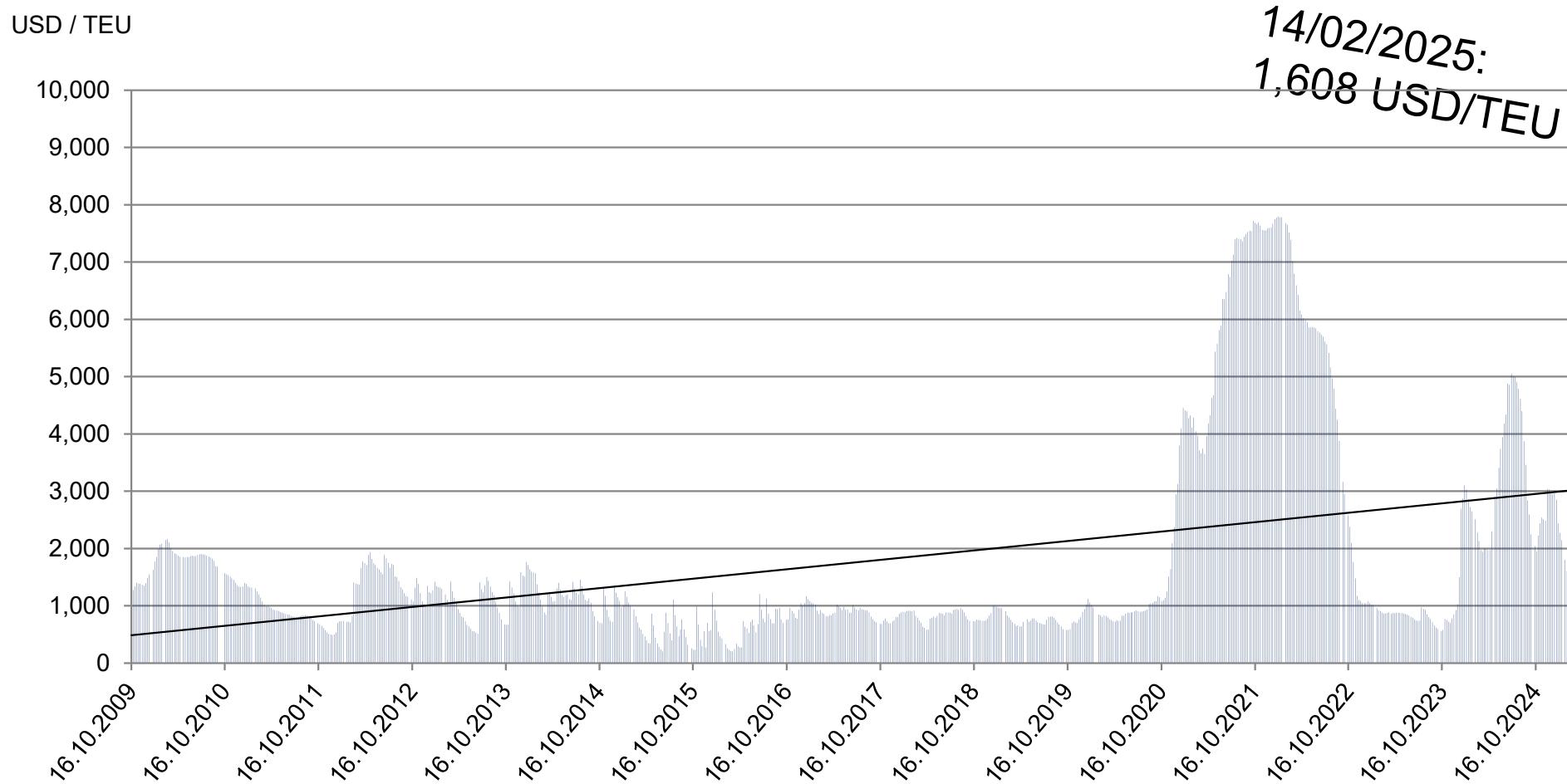
[TIR](#)

12 days - believe it (or not): <https://www.youtube.com/watch?v=uVF19tl4by8>

# Further Development of Eurasian Railway - ERAI U-West



# Example: Container Freight Rates Shanghai to North Europe (SCFI) since 2009



Source:: SCFI of Shanghai Shipping Exchange, <http://en.sse.net.cn/>

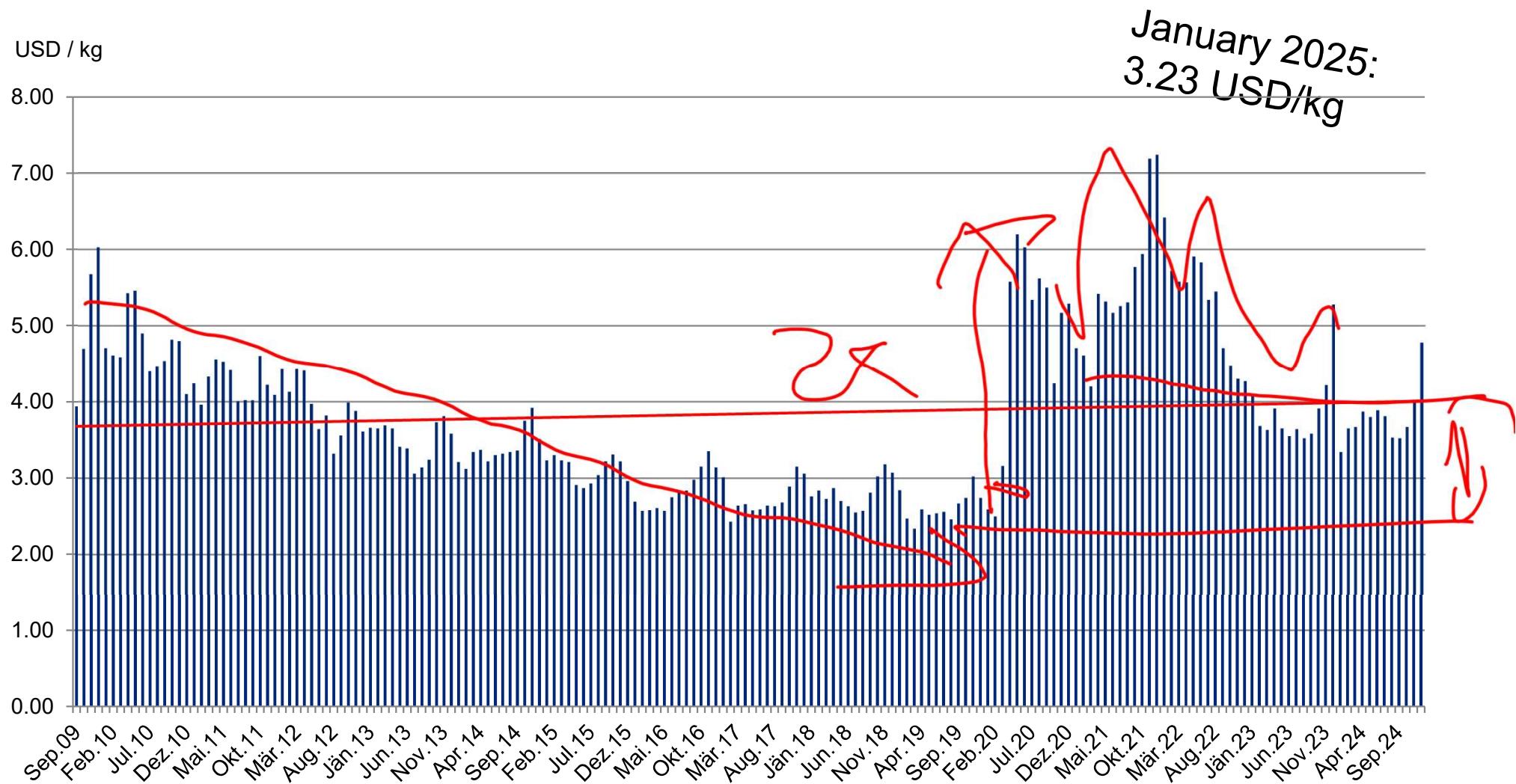
The freight indices reflects the ocean freight and the associated seaborne surcharges of individual shipping routes on the spot market.

Reported are major container trade routes export from Shanghai to base ports e.g. in Europe Hamburg/Antwerp/Felixstowe/Le Havre.

It includes freight price export CIF, CY-CY including seaborne surcharges like Bunker Adjustment Factor (BAF)/ Fuel Adjustment Factor (FAF), Emergency Bunker Surcharge (EBS) / Emergency Bunker Additional (EBA), Currency Adjustment Factor (CAF) / Yen Appreciation Surcharge (YAS), Peak Season Surcharge (PSS), War Risk Surcharge(WRS), Port Congestion Surcharge (PCS), Suez Canal Transit Fee / Surcharge (SCS) / Suez Canal Fee (SCF) / Panama Transit Fee (PTF) / Panama Canal Charge (PCC) whenever applicable.

Unit of measurement is USD/TEU for a general dry cargo container (USD/FEU with general cargo for US west coast and east coast services)

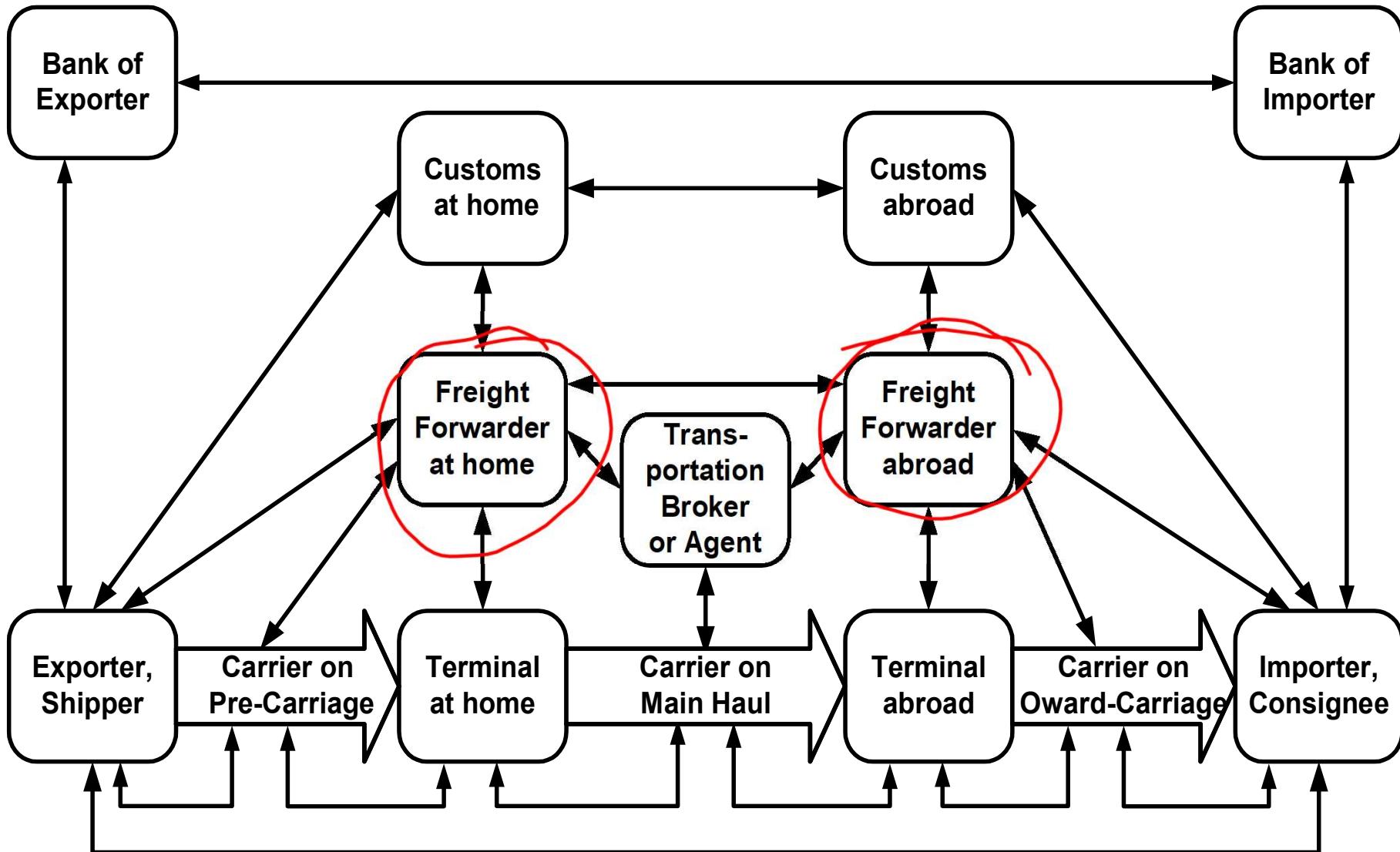
# Drewry Air Freight Price Index: on East-West Destinations since 2009



Source: JOC by the numbers, Journal of Commerce and American Shipper

The Drewry East-West Air Freight Price Index is a weighted average of all-in airfreight "buy rates" paid by forwarders to airlines for standard deferred airport-to-airport airfreight services on 21 major east-west routes for cargoes above 1,000 kilograms. Rates are expressed in dollars per kilogram and include three components: the base rate, the fuel surcharge and the security surcharge. They exclude door delivery costs

# Transport and Communication Flows along a Transport Chain



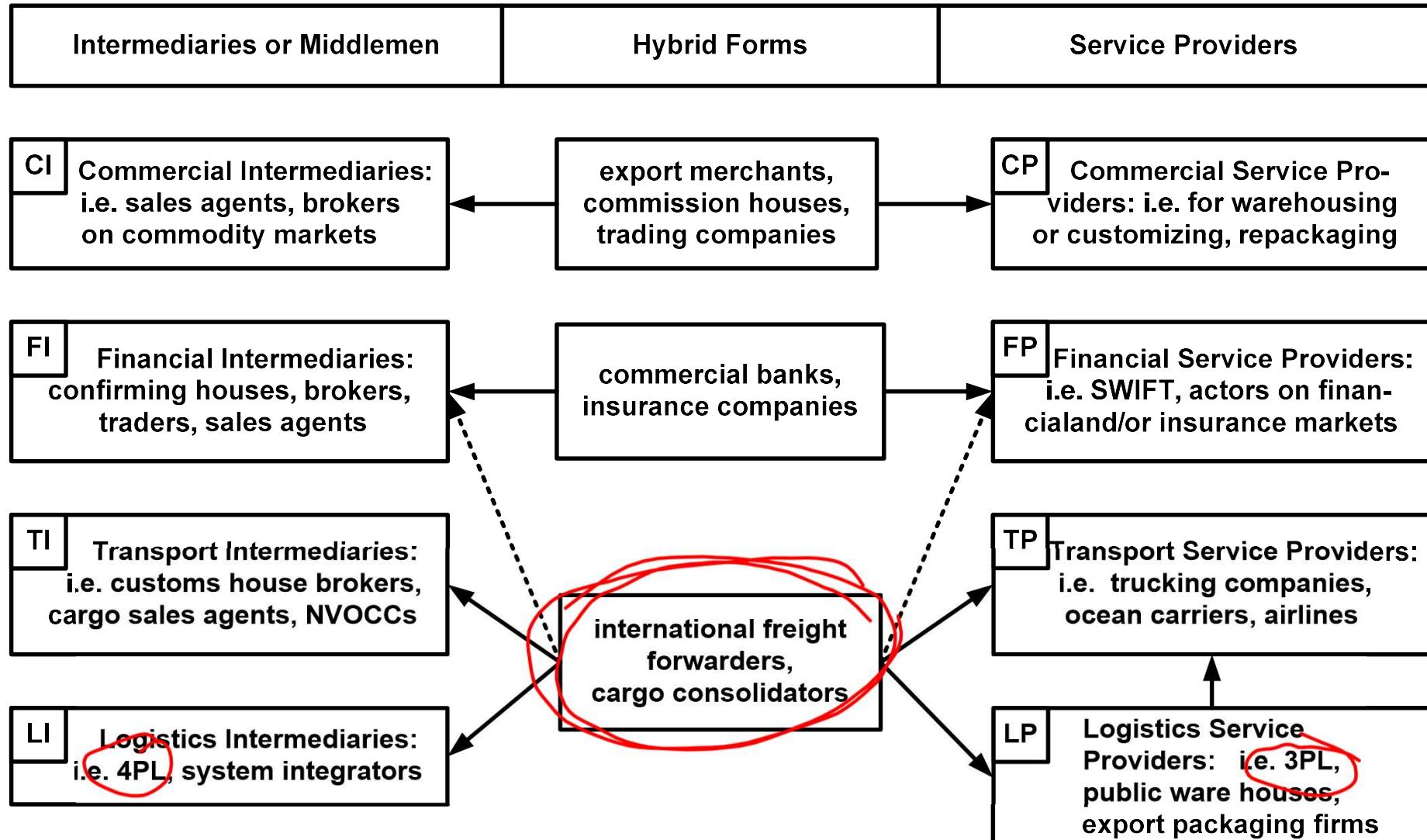
Source: Kummer and Schramm (2004), Kummer et al. (2010)

# Comparison of Multimodal Transport Chains with a Leg by Sea or Air

Stylized Model Framework	SEA	AIR
Transport mode	Main haul by sea	Main haul by air
Carrier on the main haul	Shipping company	Airline
Organisational forms per- and onward carriage	Carrier haulage or merchant haulage	Airline or agent trucking
Points of transhipment	Container terminal at seaport	Cargo terminal at airport
Main actor at transhipment	Terminal operator	Groundhandler
Types of transport brokers	Loading broker, discharging broker or non-vessel operator	Air freight broker or non-vessel operator
Types of transport agents	Shipping or liner agent	IATA cargo sales agent
Unit loads used	Seagoing containers	Unit load devices
Legal regime	Hague, Visby, or Hamburg Rules	Warsaw or Montreal Convention and IATA Resolution 600a
Accompanying transport document	Bill of Lading (B/L) or seaway bill (SWB)	Air waybill (AWB)
Applicable trade terms according to Incoterms® 2020	EXW, FCA, FAS*, FOB*, CFR*, CIF*, CIP, CPT, DAP, DPU, DDP	EXW, FCA, CIP, CPT, DAP, DPU, DDP

Source: Schramm (2012), with updates

# Intermediaries and Service Providers



Source: Kummer et al. (2009), Schramm (2012)

# Actual Freight Forwarder Definition by FIATA and CLECAT

*"Freight Forwarding and Logistic Services" means services of any kind relating to the carriage (per-formed by single mode or multimodal transport means), consolidation, storage, handling, packing or distribution of the Goods as well as ancillary and advisory services in connection therewith, including but not limited to customs and fiscal matters, declaring the Goods for official purposes, procuring insurance of the Goods and collecting or procuring payment or documents relating to the Goods. Freight Forwarding Services also include logistical services with modern information and communication technology in connection with the carriage, handling or storage of the Goods, and de facto total supply chain management. These services can be tailored to meet the flexible application of the services provided."*

Source: FIATA SECRETARIAT Doc. CL04/06 2004-10-29

# International Freight Forwarder's Functions

1. Gives advice to customers on the quickest and most economical means of transportation (**consultancy function**),
2. Gives advice to customers on packing problems (**packaging function**),
3. Cares for customs clearance (**clearance function**),
4. Secures compliance with foreign trade regulations and Letter of Credit instructions (**documentary function**),
5. Makes choice of the most suitable carrier and the conclusion of the contract of carriage (**affreightment function**),
6. Provides groupage service as a particular contribution to economy (**consolidation function**),
7. Gives insurance coverage during transportation (**insurance function**),
8. Gives advice to customers on warehousing and distribution (**logistics function**),
9. Provides carriers' as well as forwarders' documents (**fiduciary function**),
10. Provides supervision of the movements of goods (**supervision function**).
11. Credits freights, fees, duties payable at once and bills it later on or collects and submits money on behalf of the consignor (**quasi-banking function**) or
12. Acts as an carrier on own account (**transport function**)

Source: FIATA (1975) for 1.) to 10.), Schramm (2012) for 11.) to 12.)

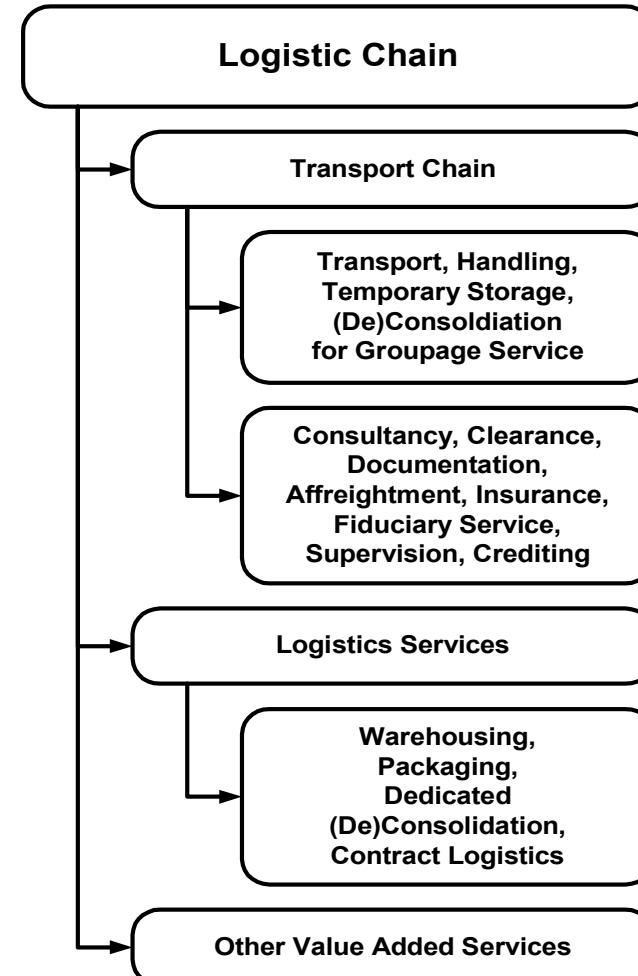
# Transport Chain versus Logistic Chain

"A transport chain is a sequence of technical and organizational processes tied together, where persons or goods are moved from a source to an end.

The transport chain has to be regarded as system.[...] The organizational connection is reached by coordination of information and control systems for legal and commercial issues.

The transport chain as a system holds close relationships to other neighbouring systems like manufacturing and consumption of goods.“

(DIN 30 781, Part 1:94)



Source: Schramm (2012)

# LSPs versus 3PLs

Considerable overlap between the terminology

All companies that provide transport/logistics services are LSPs

LSPs that provide multiple logistics services, often integrated, are third party logistics providers (3PLs).

Typical 3PL services are:

- Transportation, customs clearance
- Warehousing, pick and pack
- Light manufacturing (e.g. parts assembly)
- Vendor managed inventory (VMI)
- Trade financing
- Managing reverse logistics
- Parts distribution
- Inventory management

# Fourth Party Logistics (4PLs ®)

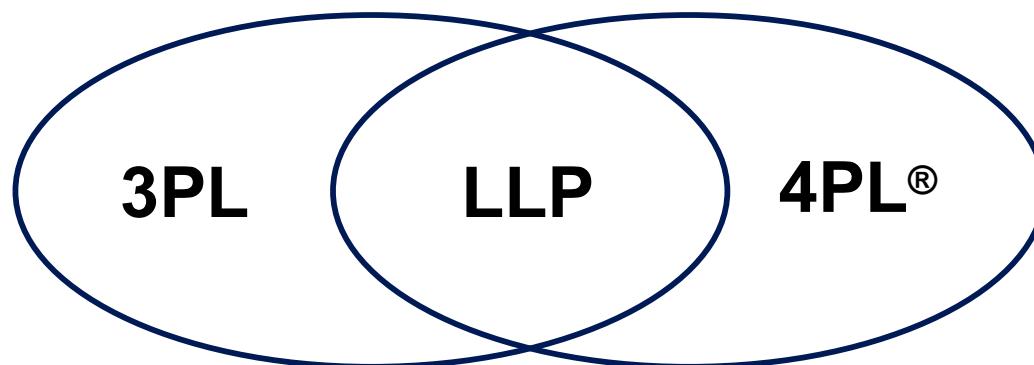
Offering total outsource supply chain solutions

Originally trademarked by Accenture in 1996

- A supply chain integrator that assembles and manages the resources, capabilities and technology of its own organisation, with those complementary logistics service providers, to deliver a comprehensive supply chain solution
- Actually asset-free, independent logistics intermediary

But the line between 3PL and 4PL® is now blurred as a lot of 3PLs now offer 4PL® type solutions, too.

Kühne&Nagel  
e.g. claims to be  
a Lead Logistics  
Provider (LLP)

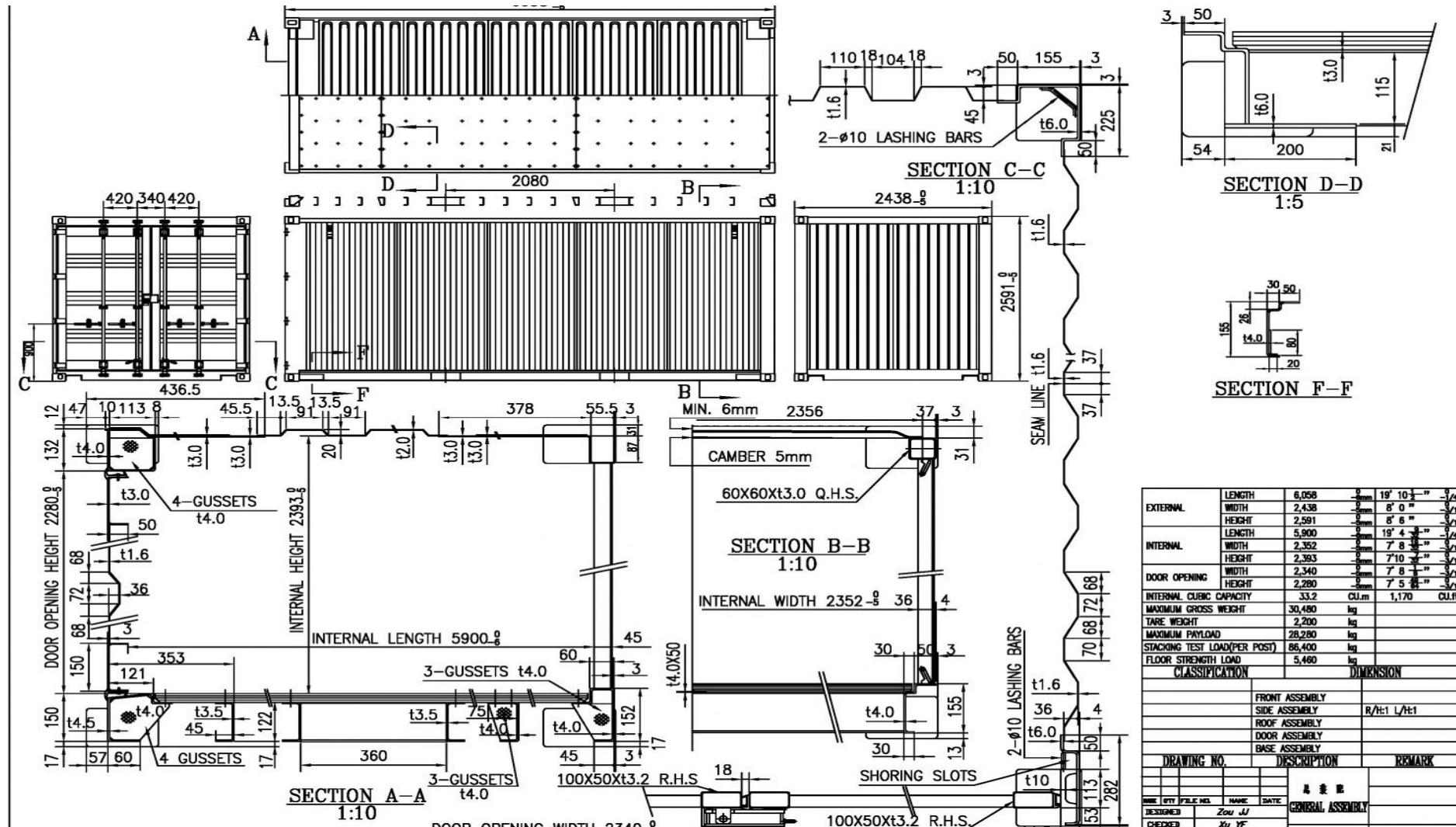


# Case Study: Missing Boxes in Central Europe

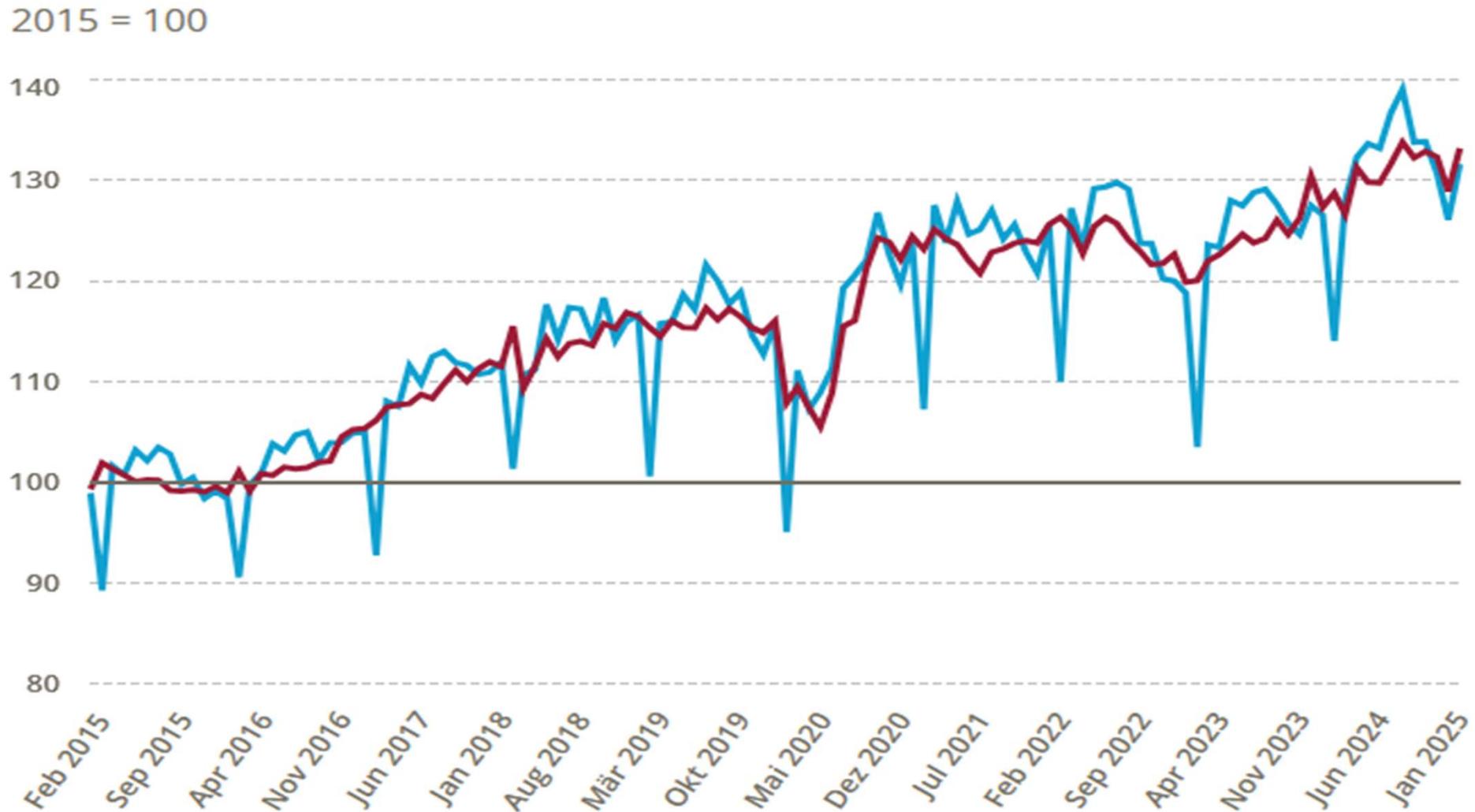
- 1) What is the object of analysis and the key challenges there?
  
- 2) What are the main actors involved?
  
- 3) Going now into more detail, please map physical / information / financial flows!
  - a) How does the physical flow look like?
  - b) What about the information flows?
  - c) What about the financial flows?
  
- 4) Please make suggestions, how we can help Jessica and resolve the issues!



# The Box (20ft / 1 TEU)



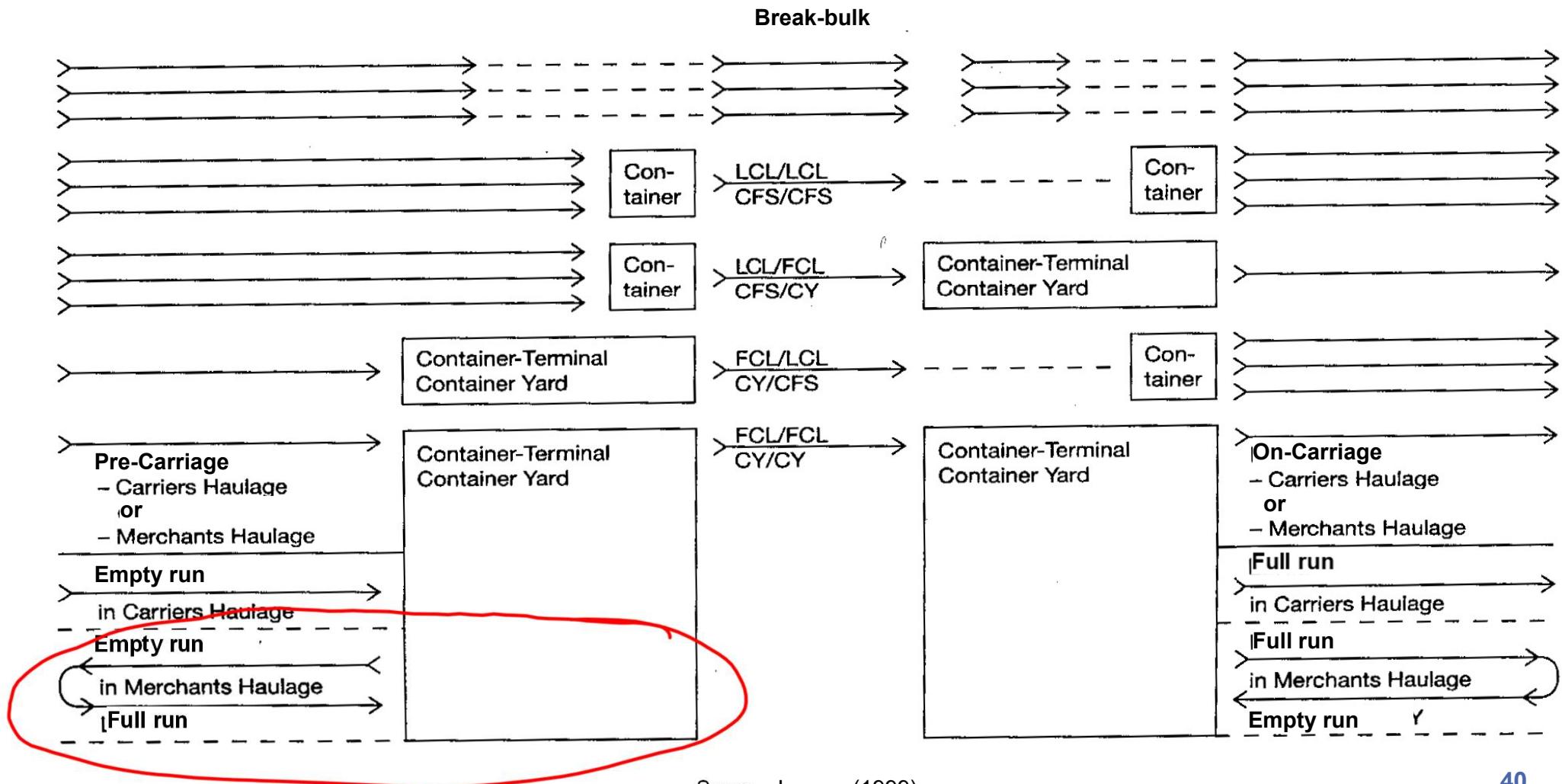
# Impact of CNY on RWI/ISL-Container Throughput Index



Source: <https://www.rwi-essen.de/en/research-advice/departments/macroeconomics-and-public-finance/highlight-topic/rwi-isl-container-throughput-index>

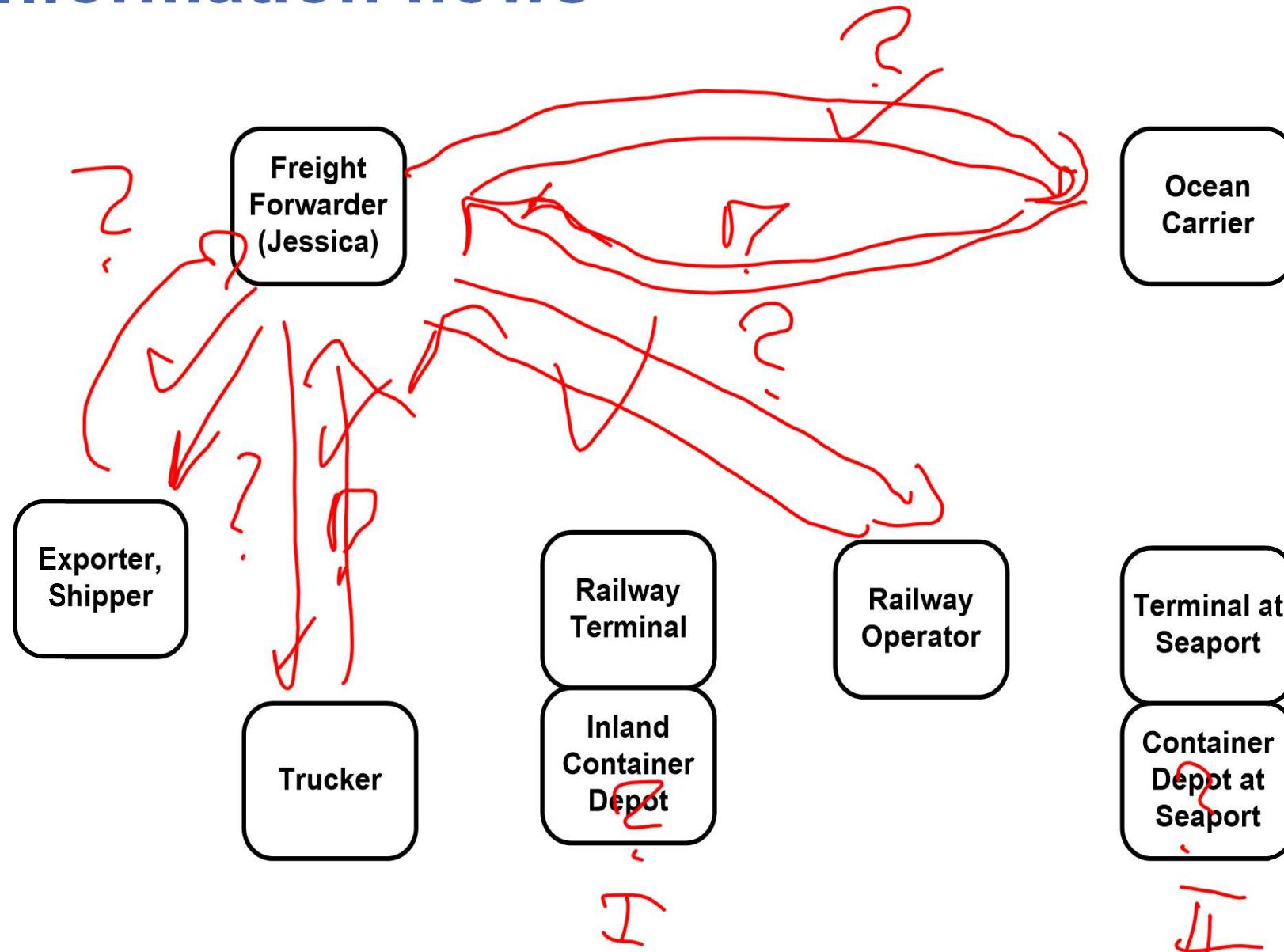
# Flow of Containers

Shipper / origin	Pre-Carriage By truck By rail By barge	Port of Departure		Maritime Shipping Port to Port	Port of Arrival		On-Carriage By truck By rail By barge	Consignee/ destination
		- Kai	- Kai-schuppen		- Packing-Center CFS	- Kai		

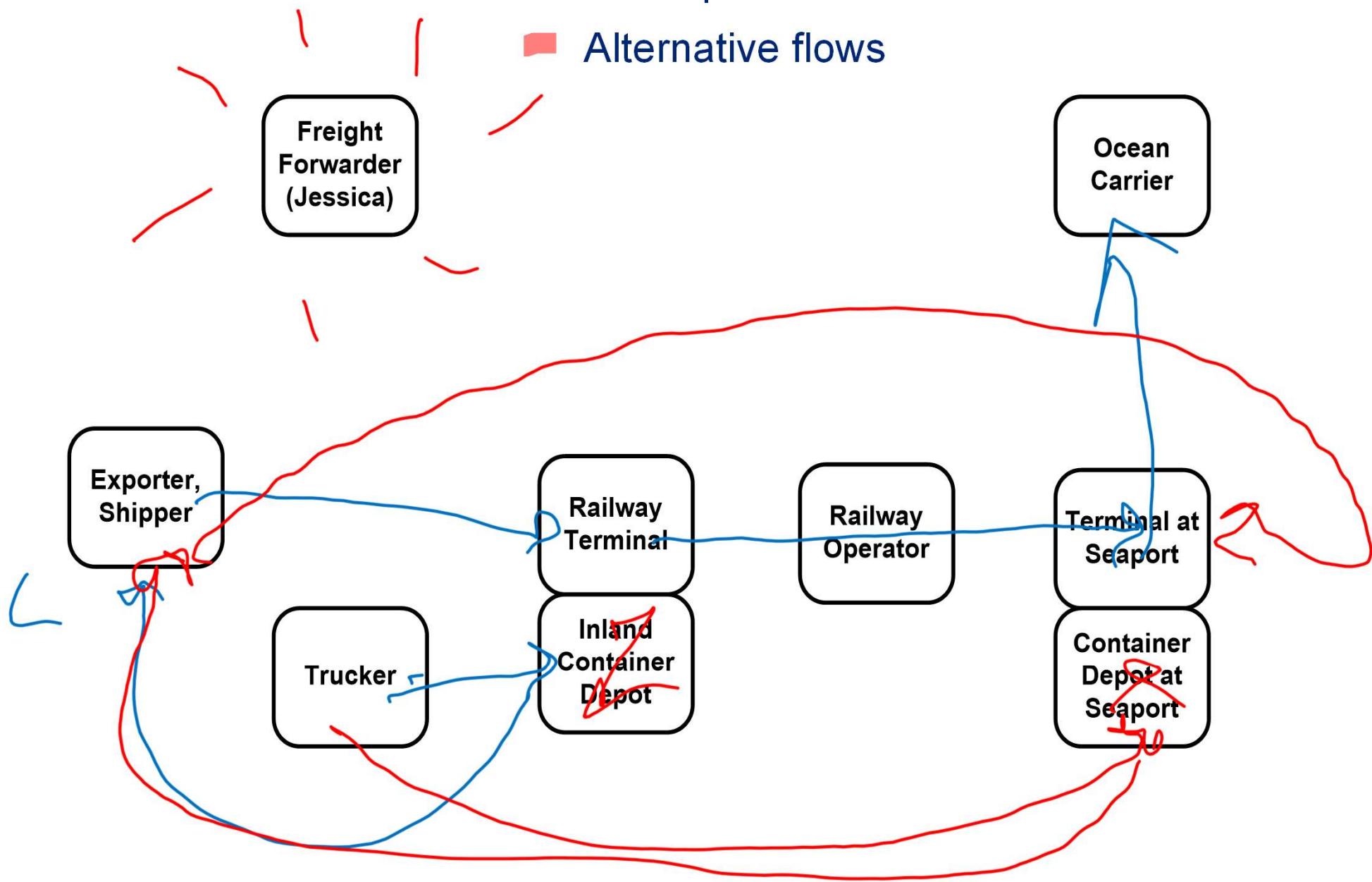


Source: Lorenz (1999)

# Information flows



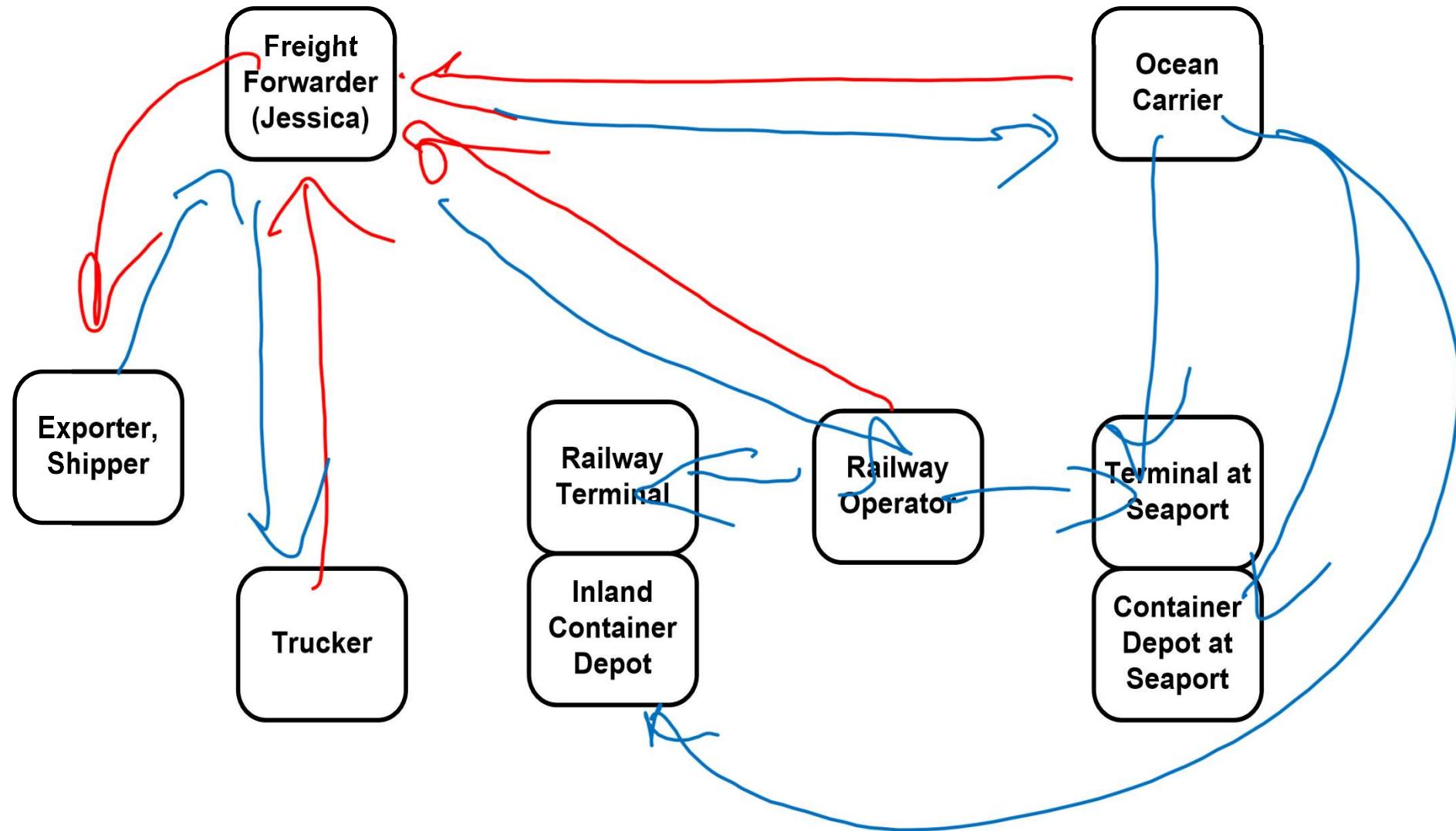
# Physical flow



# Financial flows

Flow of bills

Payment flows



# Discussion

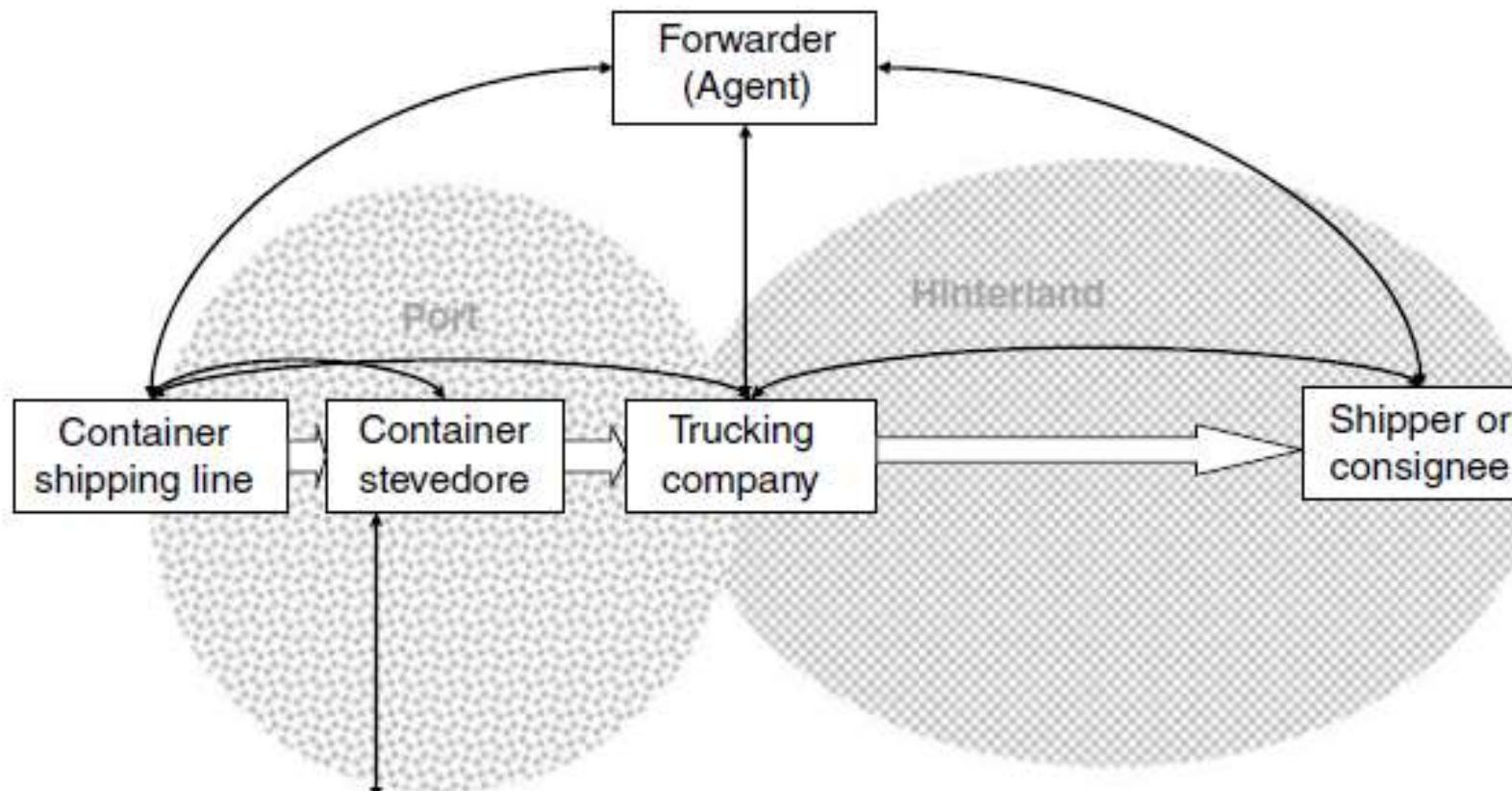


**How we can help Jessica  
and resolve the issues of  
missing containers?**

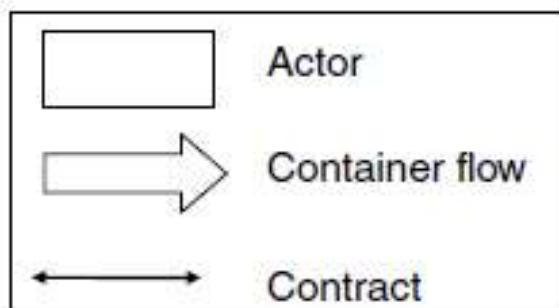
# Slides for Discussion

- BUYERS OR COMBINERS (SOC)
- SELLER FROM SOC
- CASE STUDIES
- P2W AND IT
- P2Y126 V ITM D2D  
↳ kreditmøn rapport om Lomber  
bwD RELATE. -.

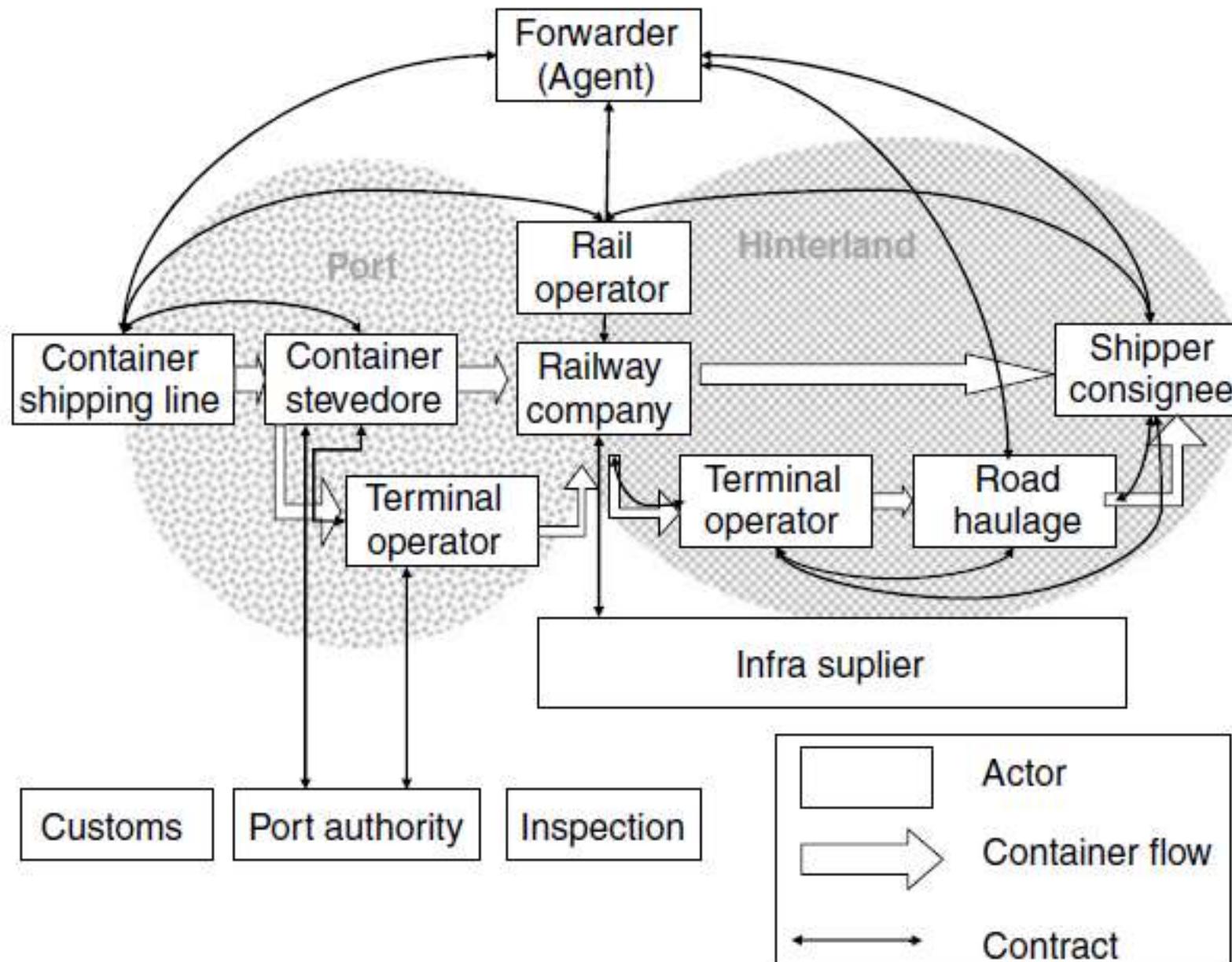
# Trucking Hinterland Chain (Import)



Van de Hoist and de Langen (2008)

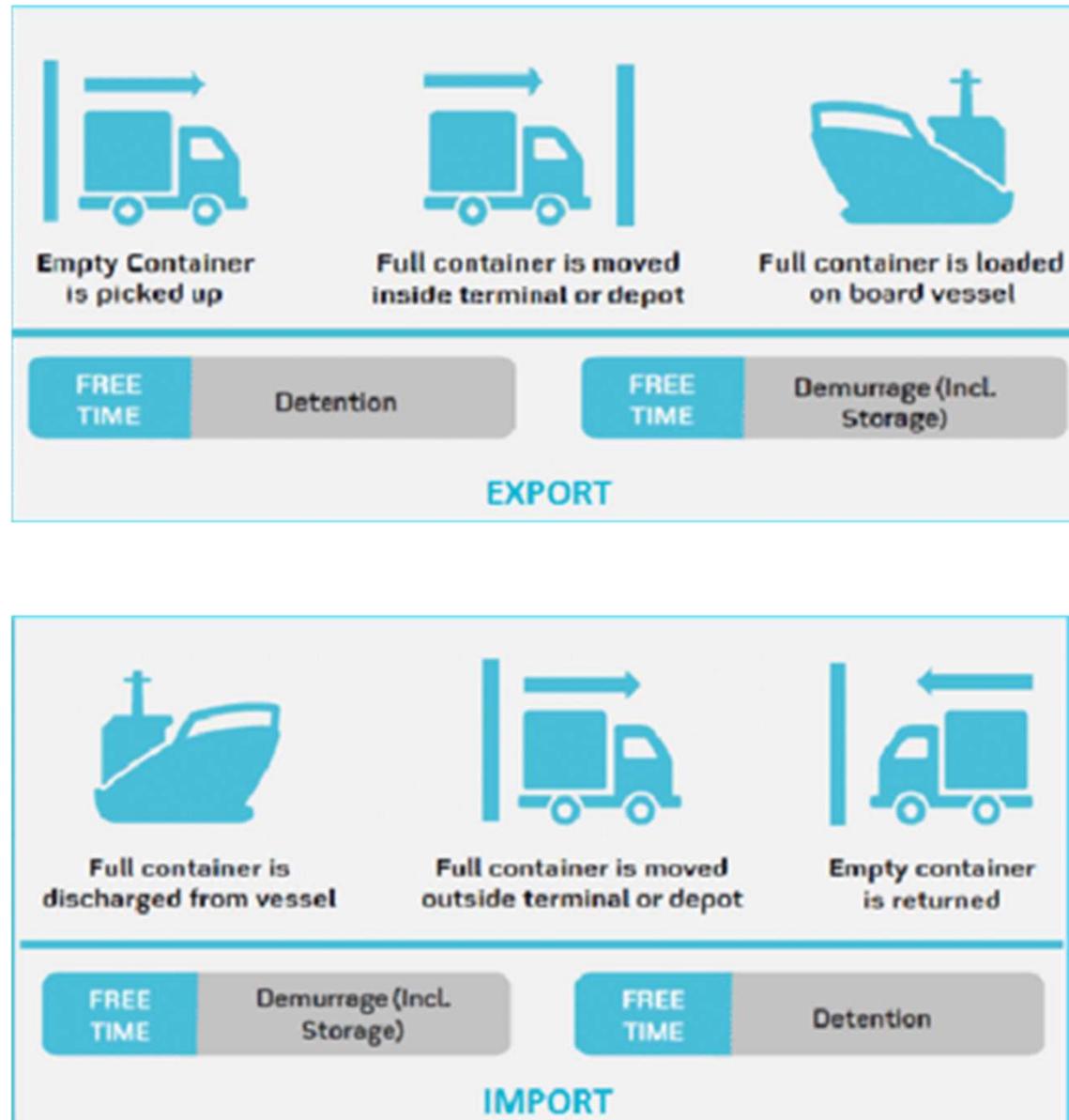


# Railway Hinterland Chain (Import)



Van de Hoist and de Langen (2008)

# Demurrage and Detention

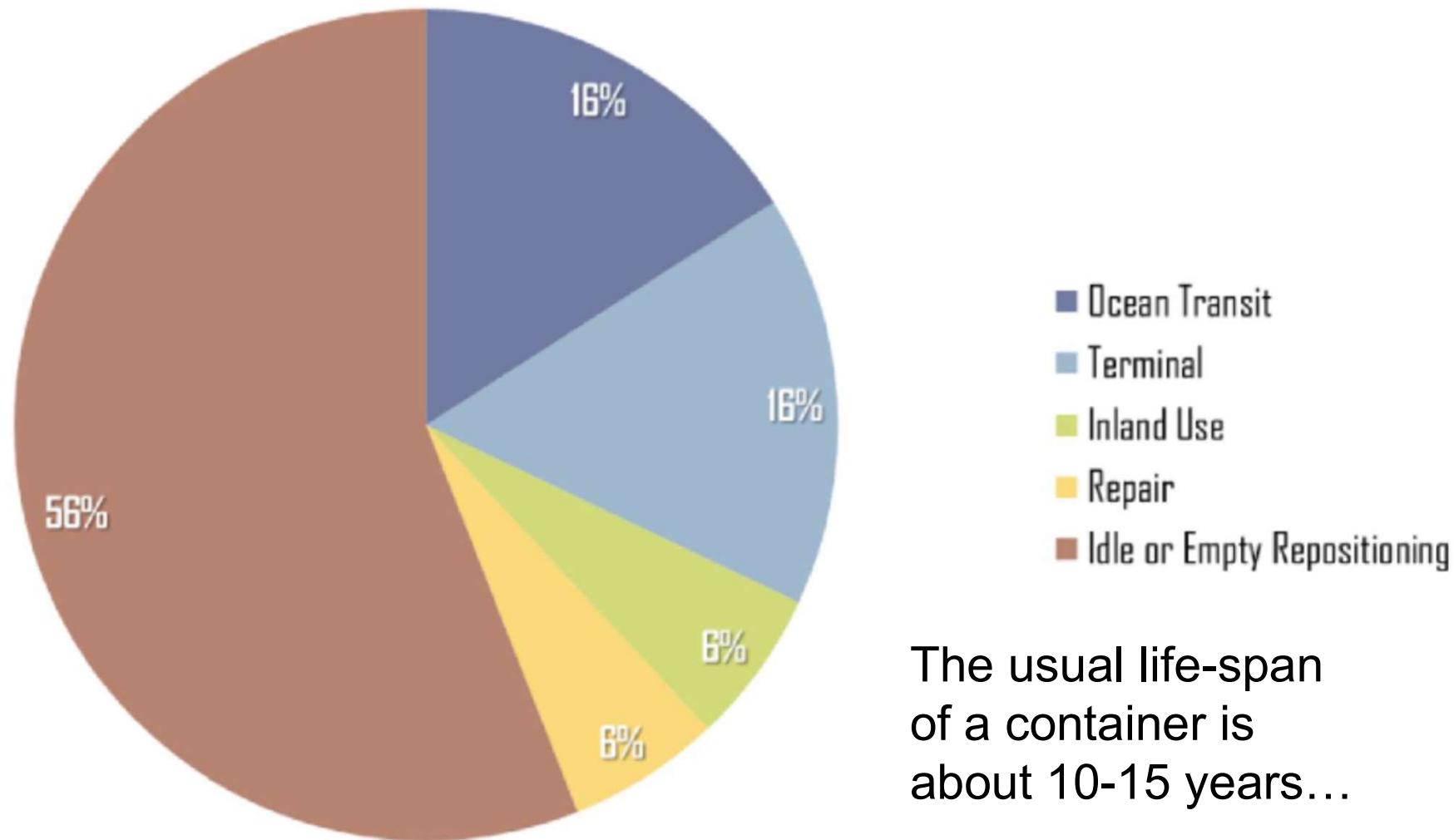


**Hapag-Lloyd**

**Export Demurrage (EDO) and Export Inland Terminal Demurrage (DIO)**

Germany		20 n. Container + IMO incl. DDC, except Reefer						20 n. Container + IMO incl. DDC + Tank, except Reefer						20 n. Container + IMO incl. DDC, except Reefer					
Country	Charge	Period	Calender Days	Cost	Rate per day	Calender Days	Cost	Rate per day	Calender Days	Cost	Rate per day	Calender Days	Cost	Rate per day	Calender Days	Cost	Rate per day		
Germany	Demurrage	Prestime	6	—	—	6	—	—	6	—	—	2	—	—	2	—	—		
		1st Period	6	EUR 65	6 EUR 100	6	EUR 70	6 EUR 100	6	EUR 90	6 EUR 140	6	EUR 100	6 EUR 140	6	EUR 110	6 EUR 155		
		Thereafter	6	EUR 75	6 EUR 140	6	EUR 90	6 EUR 140	6	EUR 110	6 EUR 155	6	EUR 110	6 EUR 155	6	EUR 120	6 EUR 165		
Germany	Storage	Storage included / not charged separately				Storage included / not charged separately			Storage included / not charged separately			Storage included / not charged separately			Storage included / not charged separately				
		Prestime	6	—	—	6	—	—	6	—	—	6	—	—	6	—	—		
		1st Period	6	EUR 70	6 EUR 110	6	EUR 80	6 EUR 110	6	EUR 100	6 EUR 120	6	EUR 110	6 EUR 120	6	EUR 115	6 EUR 165		
Germany	Demurrage	20 n. Container + IMO 1/1 incl. DDC, except Reefer	Calender Days	Cost	Rate per day	20 n. Container + IMO 1/1 incl. DDC, except Reefer	Calender Days	Cost	Rate per day	20 n. Container + IMO 1/1 incl. DDC, except Reefer	Calender Days	Cost	Rate per day	20 n. Container + IMO 1/1 incl. DDC, except Reefer	Calender Days	Cost	Rate per day		
		Thereafter	6	EUR 100	6 EUR 140	6	EUR 120	6 EUR 165	6	EUR 140	6 EUR 180	6	EUR 160	6 EUR 180	6	EUR 170	6 EUR 200		
		Thereafter	6	EUR 120	6 EUR 165	6	EUR 140	6 EUR 180	6	EUR 160	6 EUR 195	6	EUR 170	6 EUR 195	6	EUR 180	6 EUR 210		
Germany	Storage	Storage included / not charged separately				Storage included / not charged separately			Storage included / not charged separately			Storage included / not charged separately			Storage included / not charged separately				
		Plug in	—	—	—	Plug in	—	—	Plug in	—	—	Plug in	—	—	Plug in	—	—		
		Monitoring	—	—	—	Monitoring	—	—	Monitoring	—	—	Monitoring	—	—	Monitoring	—	—		
Germany	Electricity	Electricity included / not charged separately				Electricity included / not charged separately			Electricity included / not charged separately			Electricity included / not charged separately			Electricity included / not charged separately				
		Calculation starts at 00.01 the day after discharge and continues until arrival at vessel destination.																	
		For containerized cargo, the calculation starts at 00.01 the day after discharge and continues until arrival at vessel destination.																	
<b>Arrival date:</b> arrival date at vessel destination. For containerized cargo, the arrival date is the day after discharge.																			
<b>For non-containerized cargo:</b> the day after discharge. Hapag-Lloyd will offer a free time of up to 24 hours for each vessel.																			
<b>Calculation starts at 00.01 the day after departure of first possible vessel departure and continues with vessel calendar days.</b>																			
<b>Calculation continues at 00.01 the first calendar day after arrival at vessel destination and continues with vessel days.</b>																			
<b>In case of forced discharge from inland terminal:</b> 5 days from arrival until discharge (plus 1 day).																			
<b>Source:</b>																			
<a href="https://www.hapag-lloyd.com/en/online-business/tariffs/detention-demurrage.html">https://www.hapag-lloyd.com/en/online-business/tariffs/detention-demurrage.html</a>																			

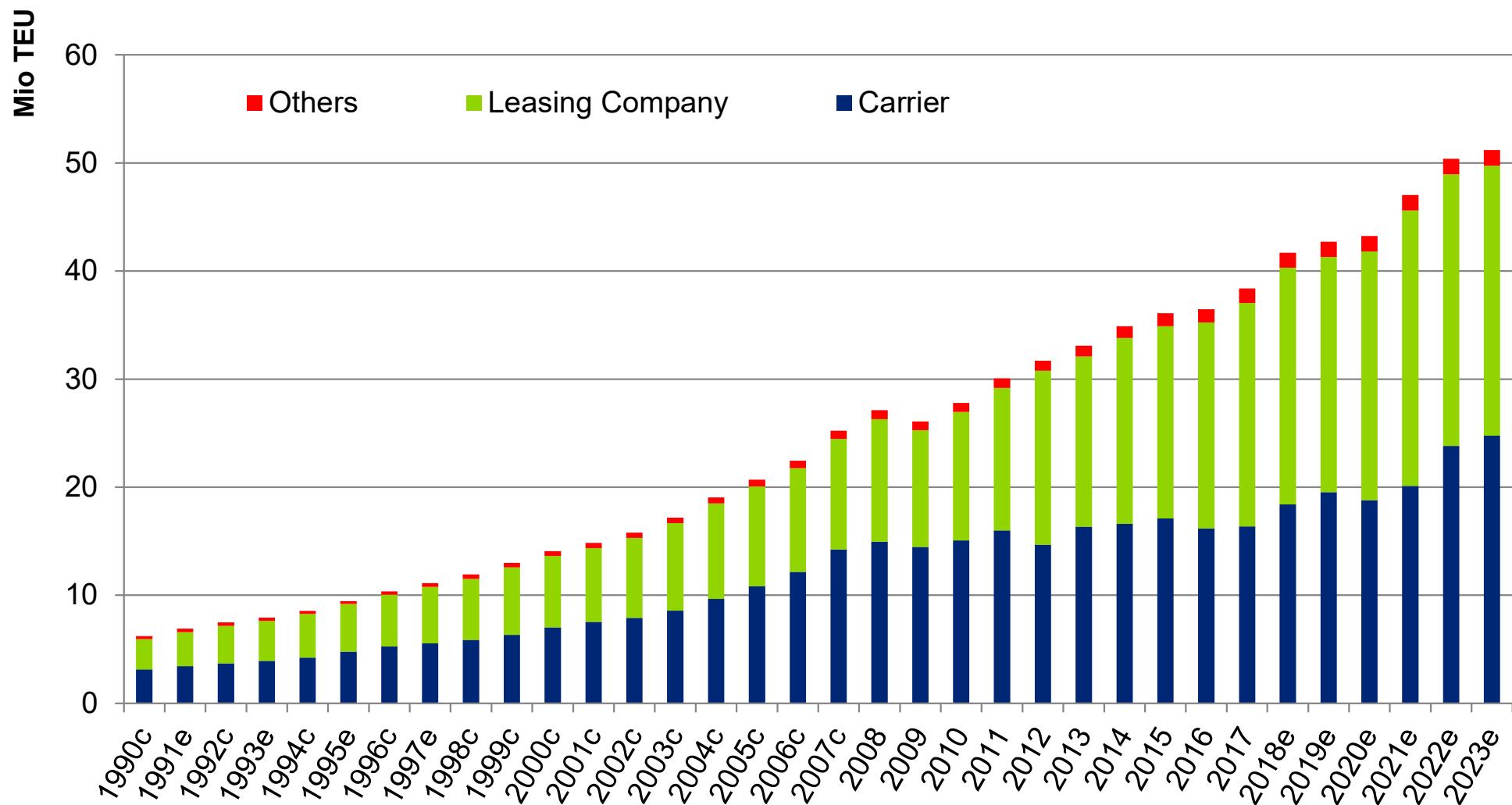
# Container Usage during his Life-span



The usual life-span  
of a container is  
about 10-15 years...

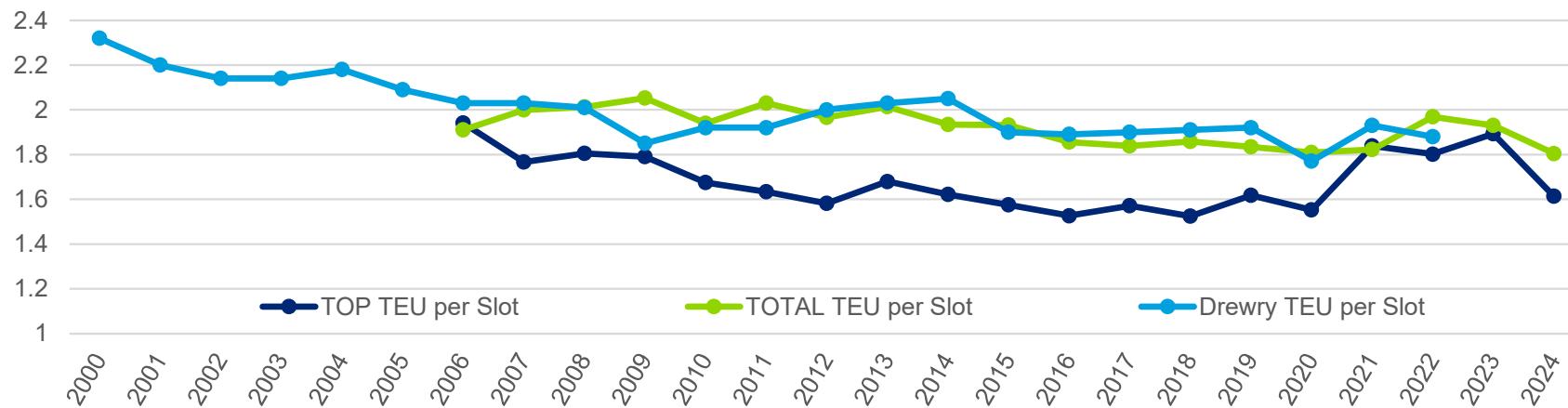
Source: Rodrigue et al. (2017)

# Maritime Containers by Ownership in TEU 1990-2023

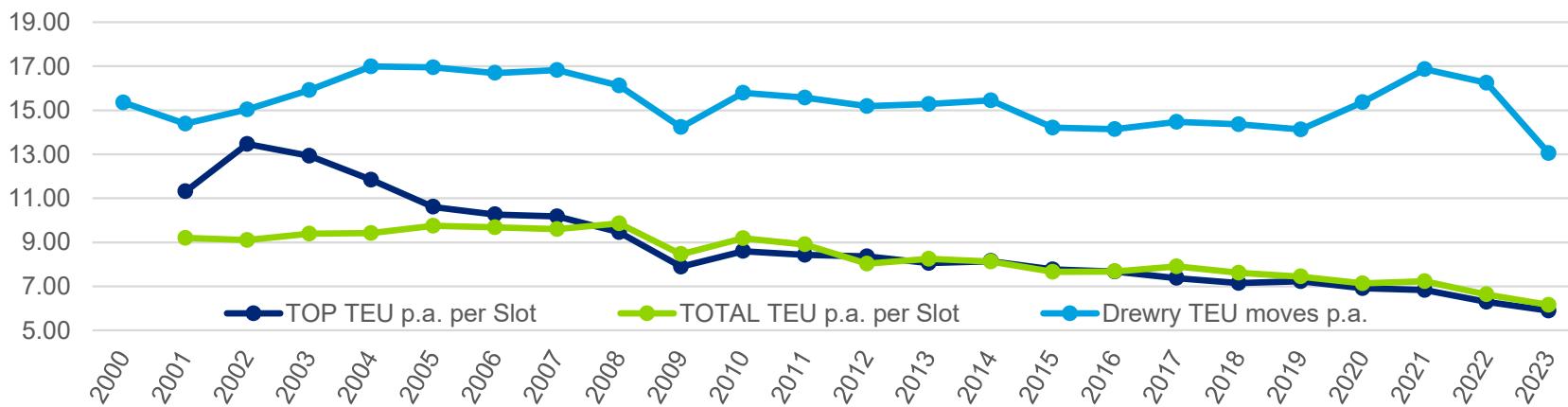


# TEU to Slot Ratio, Moves p.a. per Slot, and Effective Container Moves p.a.

## TEU to Slot Ratio



## Container Moves per Slot per Year



Source: Drewry (2002, 2014, 2017), Dynamar Trades Review

# Grey Box – an Alternative?



# Suggestions for Jessica

- Upfront planning – every year, CNY happens and you can prepare yourself whenever you augment it ;-)
- Pile up containers for CNY => Problem of detention fees, as you are only allowed to keep a container provided from a carrier for a few days for free (and this only if your make merchant haulage). In the case of carrier haulage, you have only 1-2 hrs to load the container (and not more) as the trucker is stand by.
- Buying containers / container ownership: quite rarely the case, most of non-carrier container are specialized equipment like tanks, reefers. Moreover, permanent maintenance of a small container fleet is costly.
- Leasing containers -> yes, it is an option if you get one around CNY
- Better relationship with the ocean carrier => can work, but this need long term bulk contracting with them.
- Greybox => starting to pool / share container fleet was attempted already attempted several times but failed because of moral hazard issues and the unique design of all the shipping lines (have a look on the next slide). However, to some extent it happens within the strategic container alliances....