MULTIMODAL *TRANSPORT*

MT COURSE Frédéric Gauthier

Our learning objectives

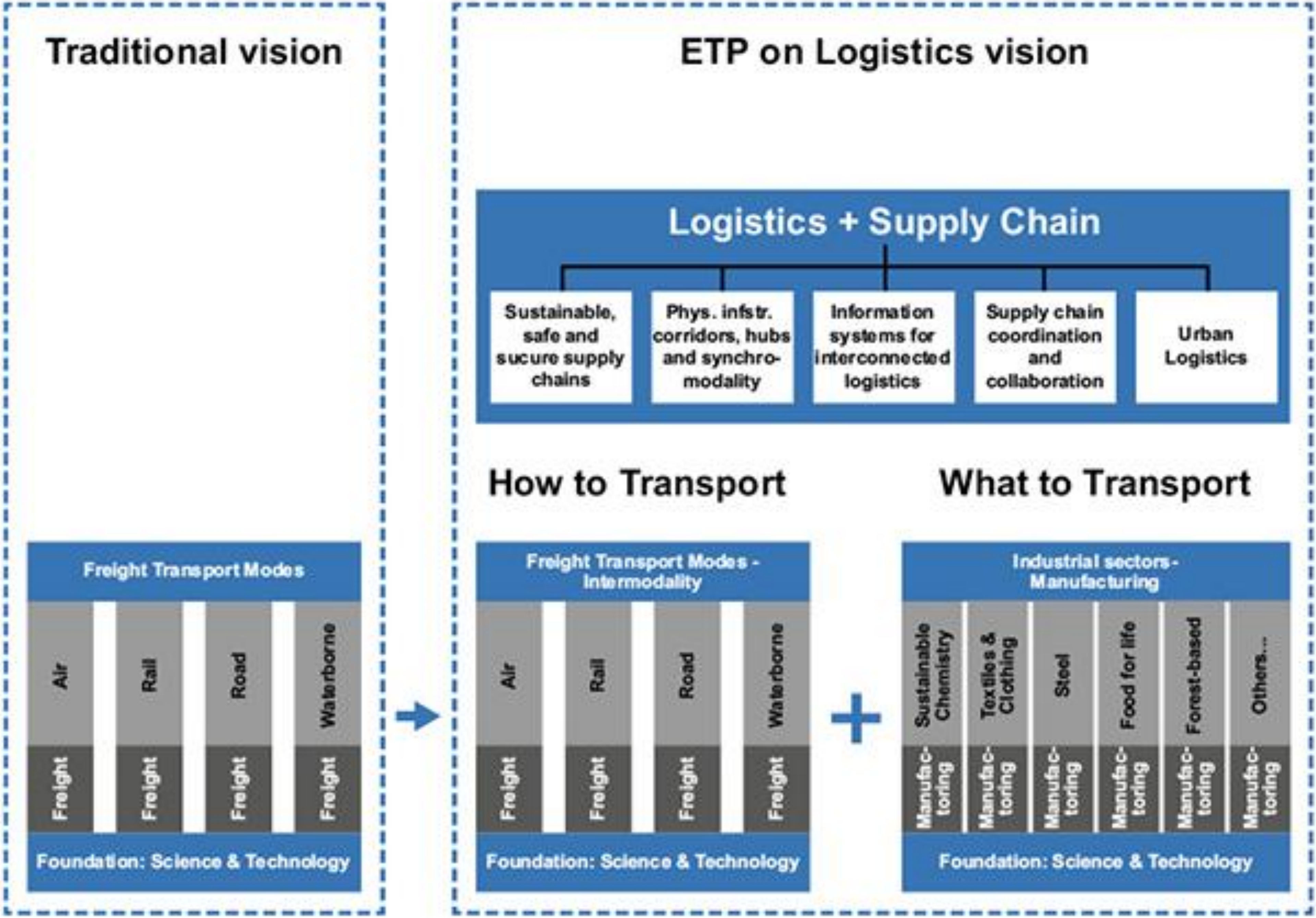
- Single Contract
  - entire journey is covered by one contract
- Efficiency
  - Multimodal transport can optimize routes, reduce transit times, and lower costs.
- Flexibility
  - in choosing the most efficient and cost-effective routes and modes of transport.
- Reduced Handling
  - transported in a single loading unit (like a container), which reduces the need for handling and the risk of damage.
- Environmental Benefits
  - by optimizing the use of different transport modes, such as using rail or sea for long distances and trucks for shorter distances

Programme

- At stake
- I- Multimodal intermodal definitions & transshipments
- II- World flows
- III- Intercontinental distances
- IV- Continental distances
- V- The multimodal Transport Operator
- IV- Information and regulation

Multimodal trends

- Electrification of freight transport
- AI powered route optimization
  - Reducing fuel use
  - Enhancing delivery accuracy
  - Predictive delivery (historical
- AI driven forecasting improve inventory and demand
- Self driving vehicles and drone development
- Cleaner fuels
- Cold chain expansion (IOT sensors)
- Outsource logistics through platforms



Traditional vision
Freight Transport Modes
Air
Rail
Road
Waterborne
Freight
Freight
Freight
Freight
Foundation: Science & Technology
ETP on Logistics vision
Logistics + Supply Chain
Sustainable, safe and sucure supply chains
Phys. infstr. corridors, hubs and synchro-modality
Information systems for interconnected logistics
Supply chain coordination and collaboration
Urban Logistics
How to Transport
What to Transport
Freight Transport Modes - Intermodality
Air
Rail
Road
Waterborne
Freight
Freight
Freight
Freight
Foundation: Science & Technology
Industrial sectors - Manufacturing
Sustainable Chemistry
Textiles & Clothing
Steel
Food for life
Forest-based
Others...
Manufac-toring
Manufac-toring
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Manufac-toring
Foundation: Science & Technology

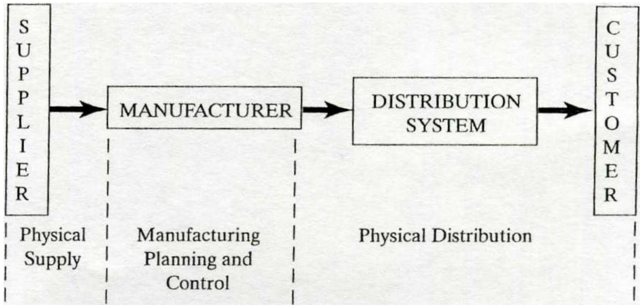
Performance characteristics

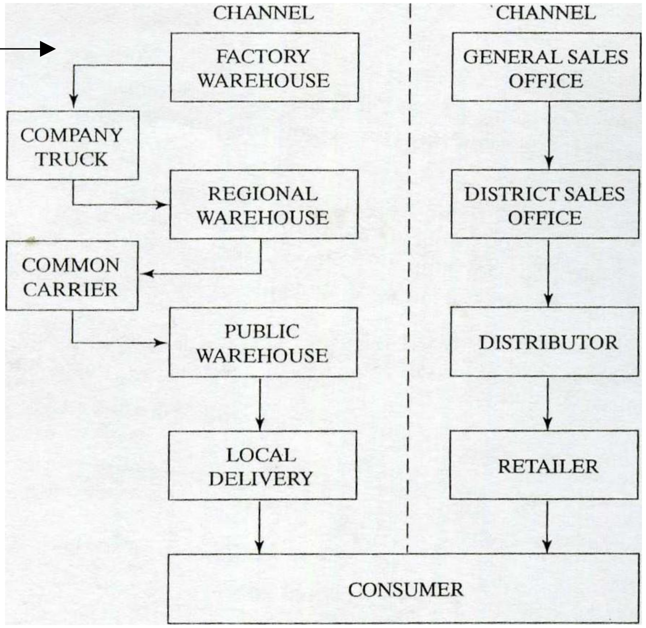
Mode of transportation	Cost 1=highest (b)	Average delivery time (c) 1=slowest	Delivery time ,variability Absolute 1= mOST		Loss and damage 1 = MOST
Rail	3	3	2		1
Truck	2	4	3		2
Water	5	5	1		4
Pipe	4	2	4		5
Air	1	1	5		3

b column per ton/mile
c door to door speed
d ratio of absolute variation in delivery time to delivery time

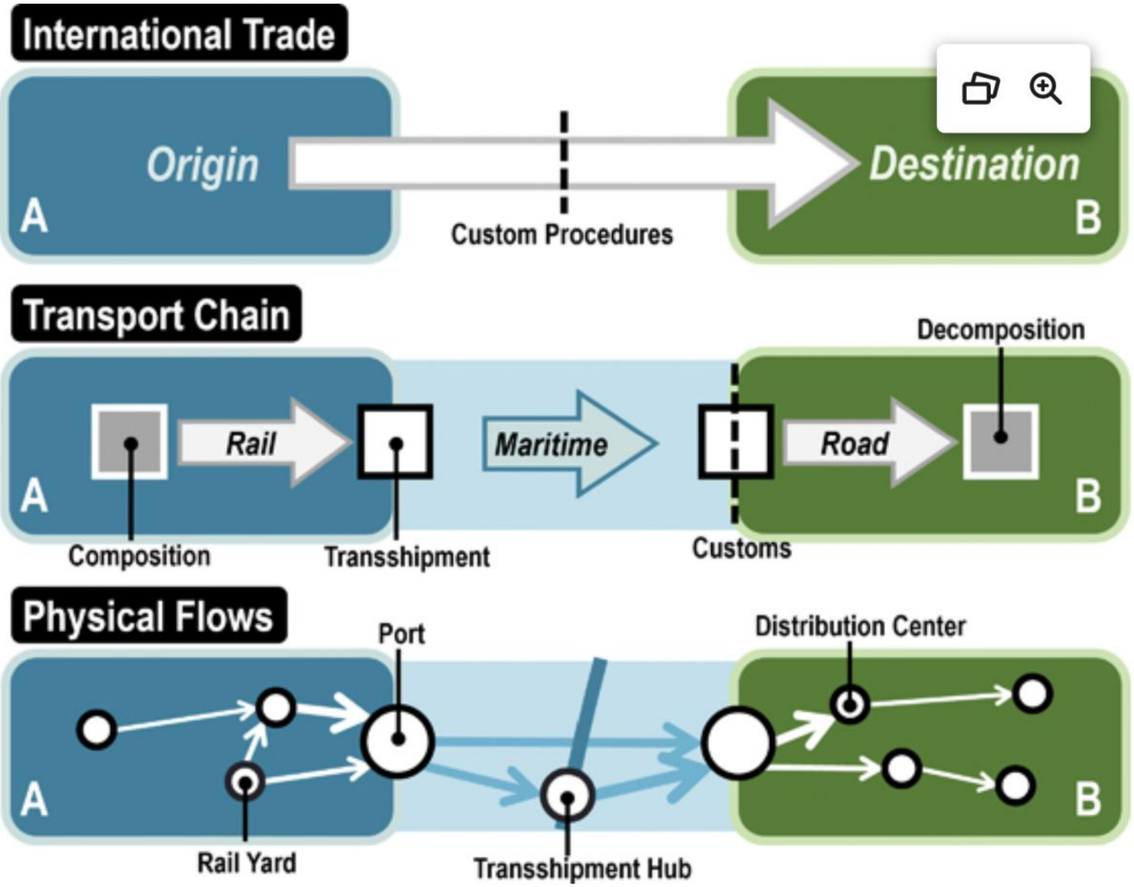
Presentation

- Multimodal transport & Physical distribution
  - Physical supply
  - Distribution
    - Fragmented
    - Than concentration
  - **Channels of distribution**
    - Transaction channel of distribution centers separated from factories
    - Distribution channel as a display function of models
    - Identification of logistics problems
      - Deciding the location, size and time
    - **Multimodal approach needed**
      - To the channels of distribution
      - The types of markets
        - Geography, orders, goods
          - Weight, density, fragility, perishability …
      - **And** type of transportation as available





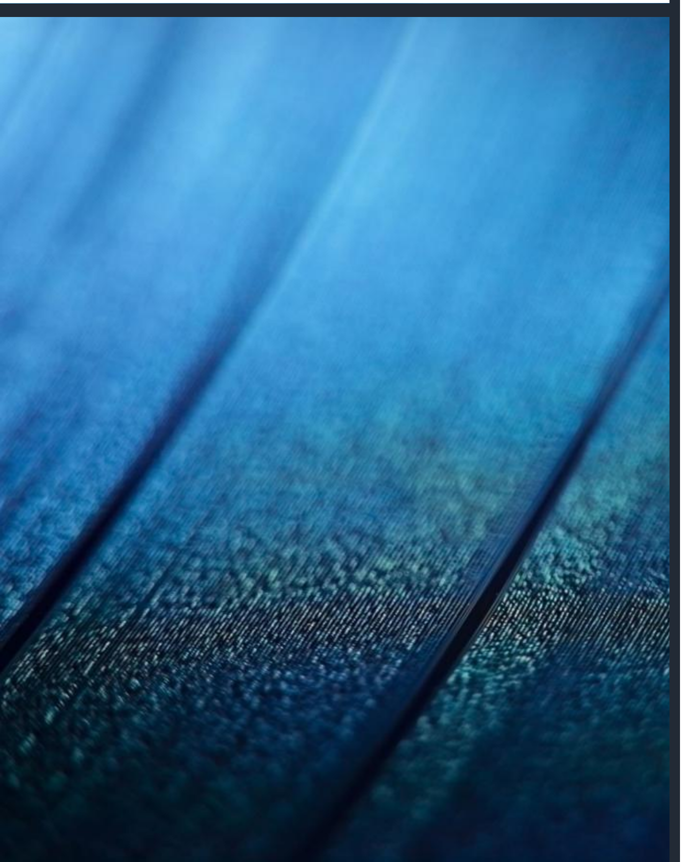
International Transportation



Direct derived demand and undirect

- Freight transportation
    - **movements of raw materials**
        - parts
        - finished products on modes such as trucks, rail, or containerships
        - transportation is directly the outcome of production and consumption functions.
- **Undirect**
    - **fuel consumption** from transportation activities must be supplied by an energy production system requiring
        - movements from extraction zones, to refineries and storage facilities and to places of consumption.
    - **Warehousing**
        - moving cargo directly from where it is produced to where it is consumed is virtually impossible.
- Induced transport demand
    - **Additional road capacity results in**
        - mode shifts
        - route shifts
        - redistribution of trips
        - generation of new trips
        - land use changes that create new and longer trips

Footprint



Transportation infrastructures = consumers of space

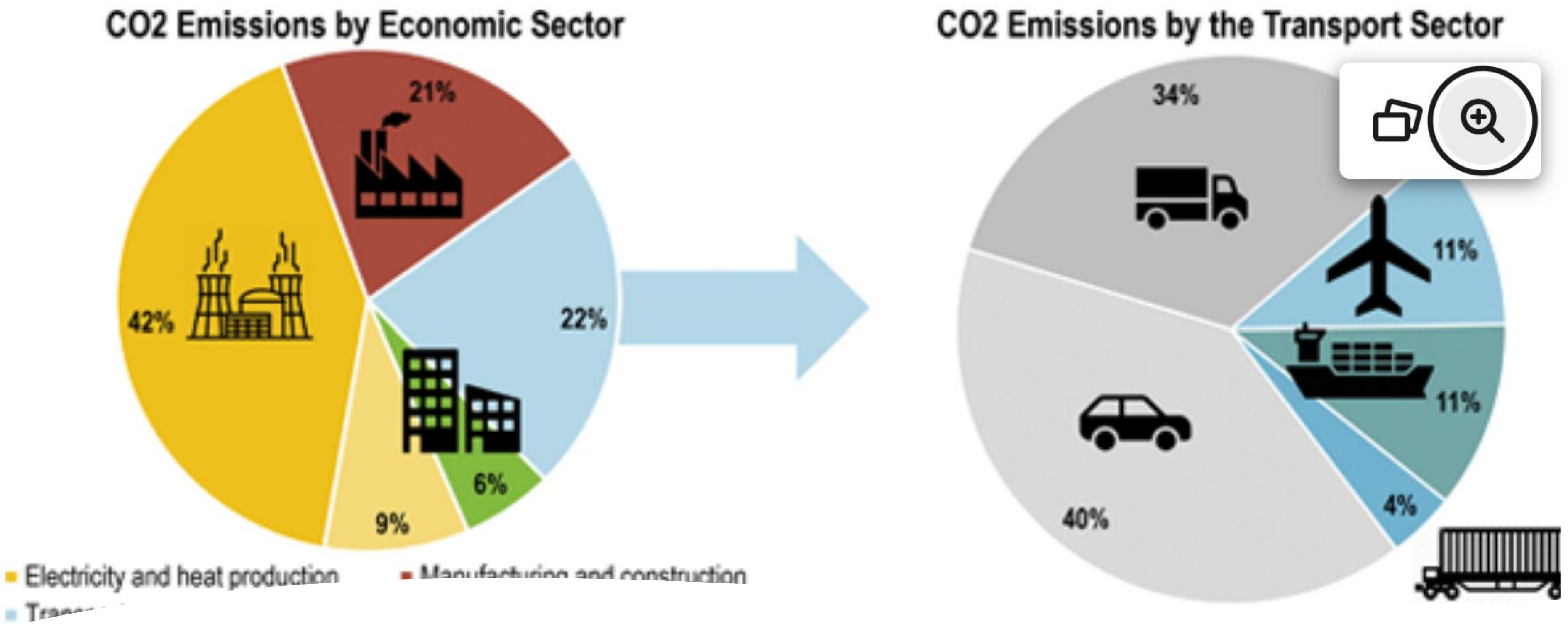
- the right of way (e.g. roads and rail lines)
- terminals

The more extensive a transport system and the higher the mobility level, the more extensive its footprint

- For instance, **roads and parking spaces** can consume up to 50% of the land in highly motorized cities.
- **Globalization** = setting of massive terminal facilities such as container ports, airports, and distribution centers.
- space consumed by
  - road infrastructure is mostly **linked with local and regional activities**
  - rail, port, and airport terminals is linked with activities taking place **at a larger scale**.

Energy

- Price level and volatility
- Technological and technical changes
- Environmental externalities
- Vehicle manufacture, maintenance and disposal (a ship to 2 years)
- Vehicle operation
- Infrastructure, construction and maintenance
- Management of transport operations
- Energy production and trade



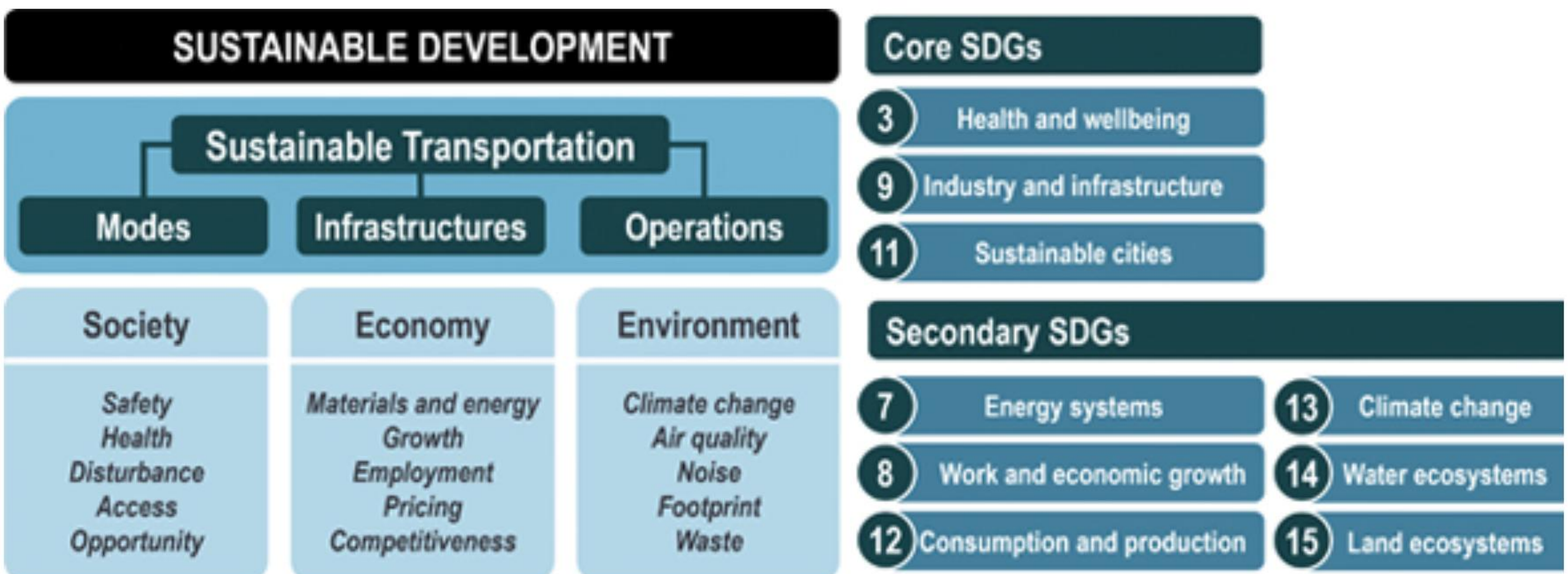
Energy and Cost

- Biofuels
- Natural gas
- Hydrogen and ammonia
- Electricity
- Hybrid vehicles
- Wind power ….

Energy & transport

Sustainable Development Goals

- (3) Health and well-being. Ensuring transportation safety and the provision of opportunities through improved mobility.
- (9) Industry and infrastructures. Supply chains and the mobility of freight.
- (11) Sustainable cities. Urban mobility and logistics

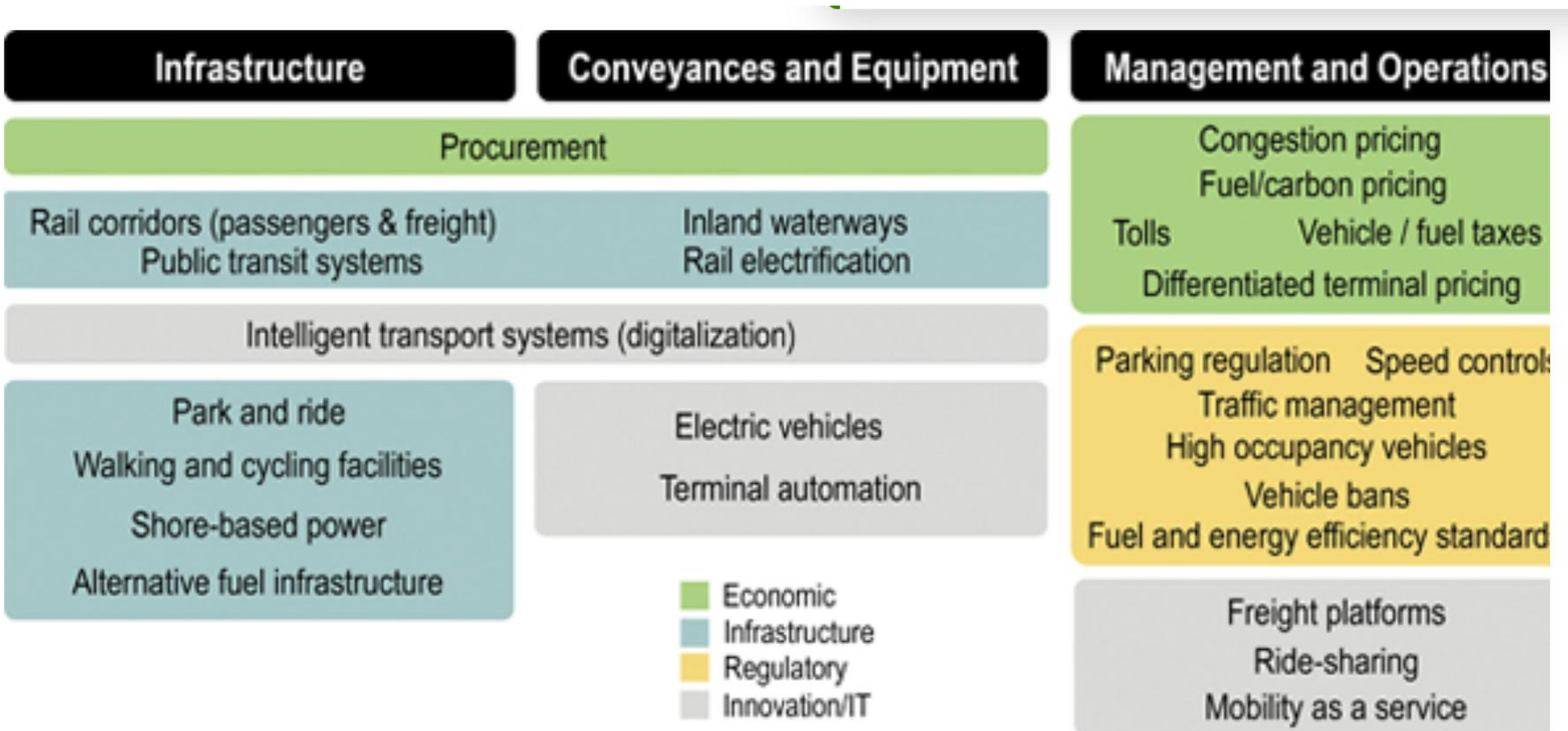


Energy & transport

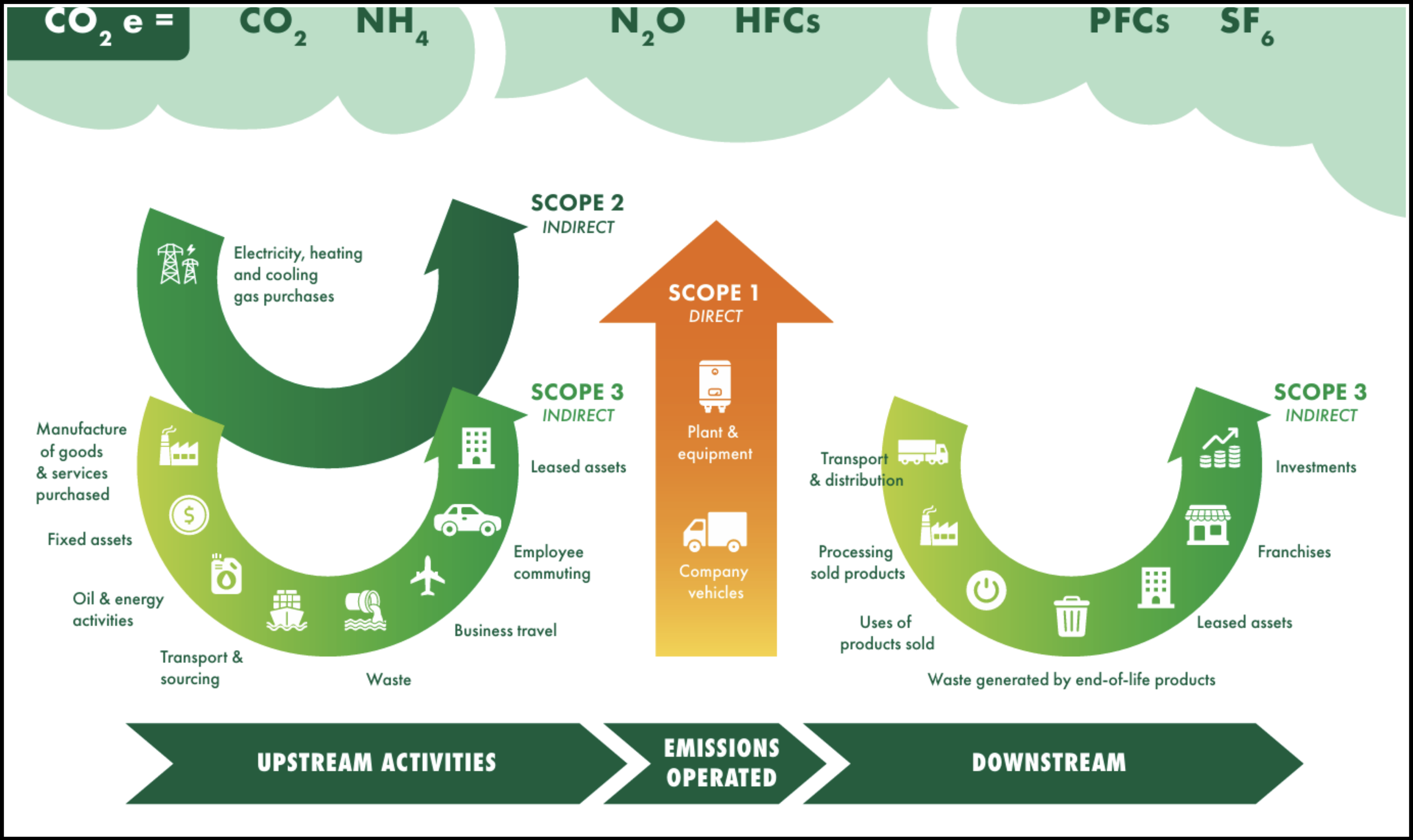
- Issues
  - **Mitigation**
    - improvement of **productivity and efficiency of existing modes**, terminals, and managerial approaches
      - so that environmental externalities are reduced
    - short to medium-term strategies.

  - **Adaptation**
    - **change in the level of use** and the market share of respective modes to reflect **better long-term trends**
      - higher energy prices
      - improved information technologies
      - stricter environmental regulations.

Energy & decarbonization



Green procurement and production



Green procurement and production

	SCOPE 3
EMISSIONS CALCULATION DATA	**Product and packaging - Emissions by sourced product:** • ***Lev. 0*: calculation based on spend or weight and standard emission factors by commodity type*** (no supplier data) • ***Lev. 1: emissions per product, supplier data*** (declared on the basis of the carbon footprint) • ***Lev. 2: emission data from an LCA (Life Cycle Analysis)*** carried out by the supplier **Handling equipment and supports:** • If purchased: same product and packaging + depreciation period • If leasing: CO_2 data supplied by the lessor, depending on usage
ANALYSIS DATA	• Product (or type) • Supplier • Country, factory or warehouse of receipt • Internal entity placing order **Note:** supplier emissions are mandatory for import into Europe.

** Reminder: levels 0, 1 and 2 correspond to the different maturity levels that can be encountered.*

DATA

	SCOPE 3
EMISSIONS CALCULATION DATA	• *Lev. 0: calculation based on spend and emission factor by mode* • *Lev. 1: loader calculates an aggregated emissions figure based on physical flows* (Fret 21 approach) • *Lev. 2: shipper calculates an emission amount per shipment, based at least on mode, weight, km (or departure and arrival points):* • **Weight** (including handling supports) and density • **Incoterm place of purchase** and warehouse **place of delivery** • **Loading rate** (or empty rate: 1- fill rate) • **Transshipment points** • **Type of energy** • **For each transport stage,** depending on the mode of transport: • **Road:** : vehicle type, emission standard (e.g. Euro 5), empty return rate, fridge Y/N • **Sea:** boat class and type, % speed reduction, loading rate, RORO (Y/N), trip n°. • **Air:** aircraft type, hold freight (Y/N) and passenger utilization rate, flight number • **Rail:** train type and weight (light -500t, medium 1000t, etc.), emission standard (e.g. EU UIC 1), empty return rate • **River or barge:** type of boat, emission standard (e.g. EPA tier 4)
ANALYSIS DATA	• Product (or type) • Supplier • Receiving plant or warehouse • Internal entity placing order

	SCOPE 3
EMISSIONS CALCULATION DATA	• *Lev. 0: no data provided by the carrier, calculation based on spend and emission factor per mode* (calculated by shippers) • *Lev. 1: carrier provides an aggregated emission volume* • *Lev. 2: carrier provides an emission volume per shipment* **Note:** in France, carriers must indicate CO_2 emissions on their invoices.
ANALYSIS DATA	• Product (or type) • Supplier • Receiving plant or warehouse • Internal entity placing order

Data – transport incoming

Collection by own fleet example

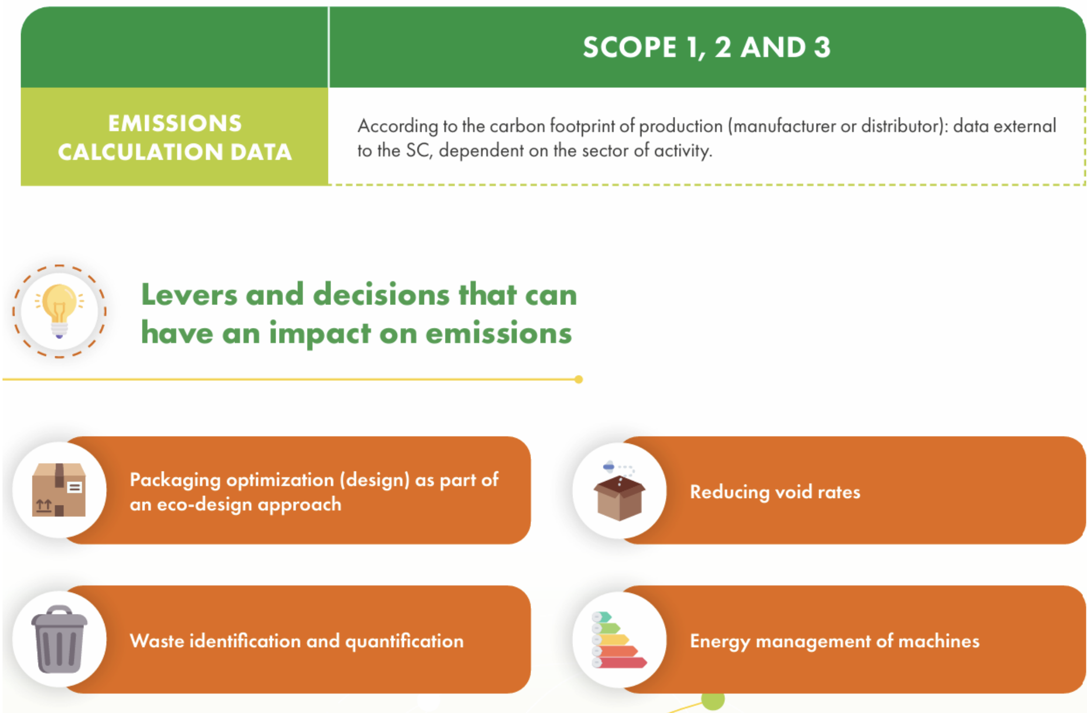
	SCOPE 1	SCOPE 2	SCOPE 3

EMISSIONS CALCULATION DATA	**Fuel combustion:**
	• ***Lev. 0: calculation based on overall fuel consumption***
	• ***Lev. 1: more precise global calculation*** by zone or region and per vehicle
	• ***Lev. 2: calculation of an issue amount per shipment:***
	  ◦ vehicle type, energy type, emission standard (e.g. Euro 5), fridge Y/N
	  ◦ km and consumption of the pick-up tour: sufficient to calculate emissions
		Consumption of Electric or Hybrid Vehicles:
		• ***Lev. 0: calculation based on kWh consumed*** and the emission factor for each country
		• ***Lev. 1: calculation based on total kWh consumed*** and the emission factor of the production country
		• ***Lev. 2: calculation based on totals*** provided by electricity suppliers
		• ***Lev. 2+: Calculation based on electricity supplier data*** for each shipment
			Fleet capitalization or leasing: calculation of vehicle construction emissions over the total km of use
			• ***Lev. 0: global calculation based on the amount of fixed assets or leases*** (with a monetary emission factor)
			• ***Lev. 1: more accurate overall calculation based*** on vehicle weight
			• ***Lev. 2: calculation based on the model and LCA of each vehicle*** (proxy if necessary)

ANALYSIS DATA	• Weight, including handling brackets • Fill rate • Empty return rate • If allocation per customer: number of km travelled per customer per year • If allocation by shipment: number of km of shipment		

Leverages to reduce GHG

Make and GHG


SCOPE 1, 2 AND 3
EMISSIONS CALCULATION DATA
According to the carbon footprint of production (manufacturer or distributor): data external to the SC, dependent on the sector of activity.
Levers and decisions that can have an impact on emissions
Packaging optimization (design) as part of an eco-design approach
Reducing void rates
Waste identification and quantification
Energy management of machines

	SCOPE 1 AND 2	SCOPE 3
EMISSIONS CALCULATION DATA	**Energy Consumption:** • ***Lev. 0: global calculation based on surfaces*** • ***Lev. 1: more precise global calculation based on actual consumption*** (by country) • ***Lev. 2: quantity and type*** (network or own, renewable or not) of electricity/gas/heat consumed by the lighting and air-conditioning warehouse **Fugitive Emissions Related to Cooling Systems:** • ***Lev. 0: overall calculation based on surface area and benchmark data*** • ***Lev. 1: calculation based on the number of cooling machines*** and their model • ***Lev. 2: calculation based on actual refrigerant consumption***	**Building Immobilization:** • ***Lev. 0: overall calculation based on actual surfaces*** • ***Lev. 1: more precise overall calculation*** based on surface area, construction method and country • ***Lev. 2: carbon immobilization of the building:*** • number of m² of floor space and building (with/without storey) • construction method (concrete or metal) • soil type and country before construction • construction date
ANALYSIS DATA	• Product weight / UVC / volume / surface area • Total warehouse capacity (weight / UVC / volume / surface area) • Temporal share (retention time in stock) because of annual data • Empty rate / warehouse use over time • Impaired inventories	

DATA – STORE (building owner)

DATA - STORE – Exclusive use

UVC consumer sales unit

	SCOPE 1 AND 2	SCOPE 3

EMISSIONS CALCULATION DATA	**Energy Consumption:**
	• ***Lev. 0, 1 and 2:***
	  • quantity and type (network or own, renewable or not) of electricity/gas/heat consumed by the warehouse lighting, air conditioning, mechanical equipment, forklift trucks
	  • refrigerant consumption
	  • forklift fuel/gas consumption
	  • site location
		Building renting:
		• ***Lev. 0 and 1: CO_2 emission data supplied by the lessor***
		• ***Lev. 2: emission calculated by the company:***
		  • Building carbon footprint:
		    • construction method (concrete or metal)
		    • soil type and country before construction
		    • construction date
		    • site location
		  • Carbon immobilization of machines (automation), photovoltaic panels and other equipment:
		    • equipment weight and emission factor
		    • installation date and service life

ANALYSIS DATA	• Product weight / UVC / volume / surface area • Total warehouse capacity (weight / UVC / volume / surface area) • Temporal share (retention time in stock) because of annual data • Impaired inventories	

Consumer sale unit UVC

DATA – STORE – Logistician building

	SCOPE 3

EMISSIONS CALCULATION DATA	• ***Lev. 0 and 1: CO_2 emission data supplied by the logistics provider***
	• ***Lev. 2: emissions calculated by the company on a pro rata basis:***
	  • Building carbon footprint:
	    • number of m^2 of floor space and building (with/without storey)
	    • construction method (concrete or metal)
	    • soil type and country before construction
	    • construction date
	  • Carbon immobilization of machines (automation), photovoltaic panels or others, landscaping:
	    • equipment weight and emission factor
	    • installation date and service life
	  • Quantity and type (network or own, renewable or not) of electricity/gas/heat consumed by warehouse lighting, air conditioning, mechanical equipment, forklift trucks, etc.
	  • Refrigerant consumption
	  • Fuel/gas consumption of forklifts
	  • Site location

ANALYSIS DATA	• Surface area - volume occupied by service provider / share • Product weight / UVC / volume / surface area • Temporal share (retention time in stock) due to annual data • Product type

Building where we store

- Use materials that emit less than concrete (during production and recycling), such as raw earth
- Favoring recycled materials
- Focus on high-quality, long-lasting buildings and constructions (paintwork, cladding, etc.) (and amortize emissions over their actual lifespan)
- New-build: HQE construction
- Improve insulation and use materials with thermal inertia (limit air conditioning)
- Building selection based on CO_2 emissi and energy consumption criteria
- Greening of space (CO_2 capture)

Energy and store

- Lighting: choice of equipment and regulation (relamping), presence detectors, use of daylight
- Automatic door opening and closin
- Solar panels
- Revegetation (climate reduction)
- White-painte (air-condition reduction)
- Adapt temperature to actual needs
- Recycle waste heat (emitted thermal energy)
- Segment and isolate hot and cold zones to heat/cool only the necessary volumes.
- Select refrigerants with the lowest (Global Warming Potential)

Equipment and operations

Equipment

- Lowest-emission forklift (full life cycle)
- Add sensors to measure machine consumption

Operations

- Optimizing the use of space and picking routes
- Reduce warehouse emptiness (over time)
- Optimizing packaging
- Selection of logistician according to optimized transport scheme / production site and/or customer delivery points
- Optimize inventory: see PlanWaste
- Waste: see Return

Outbond transport (deliver) : calculation by shipper

	SCOPE 3
EMISSIONS CALCULATION DATA	• *Lev. 0: calculation based on spend and emission factor by mode* • *Lev. 1: loader calculates an aggregated emissions figure based on physical flows* (Fret 21 approach) • *Lev. 2: shipper calculates an emission amount per shipment, based at least on mode, weight, km (or departure and arrival points):* • **Weight** (including handling supports) and density • **Incoterm place of purchase** and warehouse **place of delivery** • **Loading rate** (or empty rate: 1- fill rate) • **Transshipment points** • **Type of energy** • **For each transport stage,** depending on the mode of transport: • **Road:** : vehicle type, emission standard (e.g. Euro 5), empty return rate, fridge Y/N • **Sea:** boat class and type, % speed reduction, loading rate, RORO (Y/N), trip n°. • **Air:** aircraft type, hold freight (Y/N) and passenger utilization rate, flight number • **Rail:** train type and weight (light -500t, medium 1000t, etc.), emission standard (e.g. EU UIC 1), empty return rate • **River or barge:** type of boat, emission standard (e.g. EPA tier 4)
ANALYSIS DATA	• Product (or type) • Supplier • Delivery plant or warehouse • Internal entity responsible for the shipment

	SCOPE 3
EMISSIONS CALCULATION DATA	• *Lev. 0: no data provided by the carrier, calculation based on spend and emission factor per mode* (calculated by shippers) • *Lev. 1: carrier provides an aggregated emission amount* • *Lev. 2: carrier provides an emission amount per shipment* **Note:** in France, carriers must indicate CO_2 emissions on their invoices.
ANALYSIS DATA	• Product (or type) • Supplier • Delivery plant or warehouse • Internal entity responsible for the shipment

Transport levers

- Packaging optimization
- Optimized filling (and therefore loa
rates)
- Selection of road hauliers with the Objectif CO_2 charter or label
- Reducing empty returns (e.g. by sch
product or media returns)
- Transport pooling (between several sites or several shippers)
- Route optimization (own fleet)
- Choice of tires (own fleet)
- Lease vehicles instead of buying the
and extend the contract period (veh
maintenance) (clean fleet)

Return & recycling

Back

- Product return for repair/ replacement
- Back to handling supports
- Return of end-of-life products

Transport emissions: see DELIVER

Product recycling or destruction (end-of-life)

	SCOPE 3
EMISSIONS CALCULATION DATA	Depending on the availability of a recycling, reuse or destruction channel for the produc (no difference of maturity level for this step). **Incineration:** • volume / tonnage of product • transport to destruction site: see Transport - delivery • incineration / destruction: CO_2 data supplied by the organization in charge of the operatio **Storage:** • volume / tonnage of product • transport to storage site: see Transport - delivery • storage and recycling: CO_2 emission data supplied by the organization in charge

Return & Recycling levers

Equipment

- Measuring the rate and causes of returns
- Analyze the types and causes of returns to reduce them
- Analyze the benefits (economic and CO_2) of returning a product (vs. destroying it)

Back to handling supports

- Packaging design
- Use recycled plastic containers
- Use collapsible or nestable pallets: optimize returns
- Avoid the physical return of pallets: use pallet movement optimization and compensation platforms
- Use stackable and collapsible containers made of recycled plastic
- Repaired and refurbished wooden pallets

Product recycling/ destruction

- Decision on storage vs. incineration: incineration emits 3x more than storage for re-use (in a recycling chain)
- Emissions avoided by recycling are not deducted
- Circular supply chain

Levers in Supply Chain

Transport and sustainability

Transport and atmospheric pollution

- most developing economies still have **limited capabilities** for enforcing environmental standards
- trend is toward **greater control over emissions**, which will affect modes and their respective competitiveness, particularly if a mode is subject to a greater degree of legislation than another

Transport and water quality

- **Significant progress** has been made in a number of areas, such as ballast water, waste, and oil spills.
- **dredging,** where environmental constraints are placing a growing financial burden on ports seeking to deepen channels to keep pace with the growth of vessel size

Transport footprint

- enormous pressure on new infrastructures
- likely have an impact on how transport infrastructure is designed

Transport and climate change

- Transport activities, particularly vehicles, account for **24% of CO_2 emissions worldwide** *including passengers*
- regulatory pressures to improve their environmental performance regarding the greenhouse gases
- Severe weather occurrences disrupt transport systems
- The prospects of sea level rises are particularly challenging for coastal transport systems

Situation

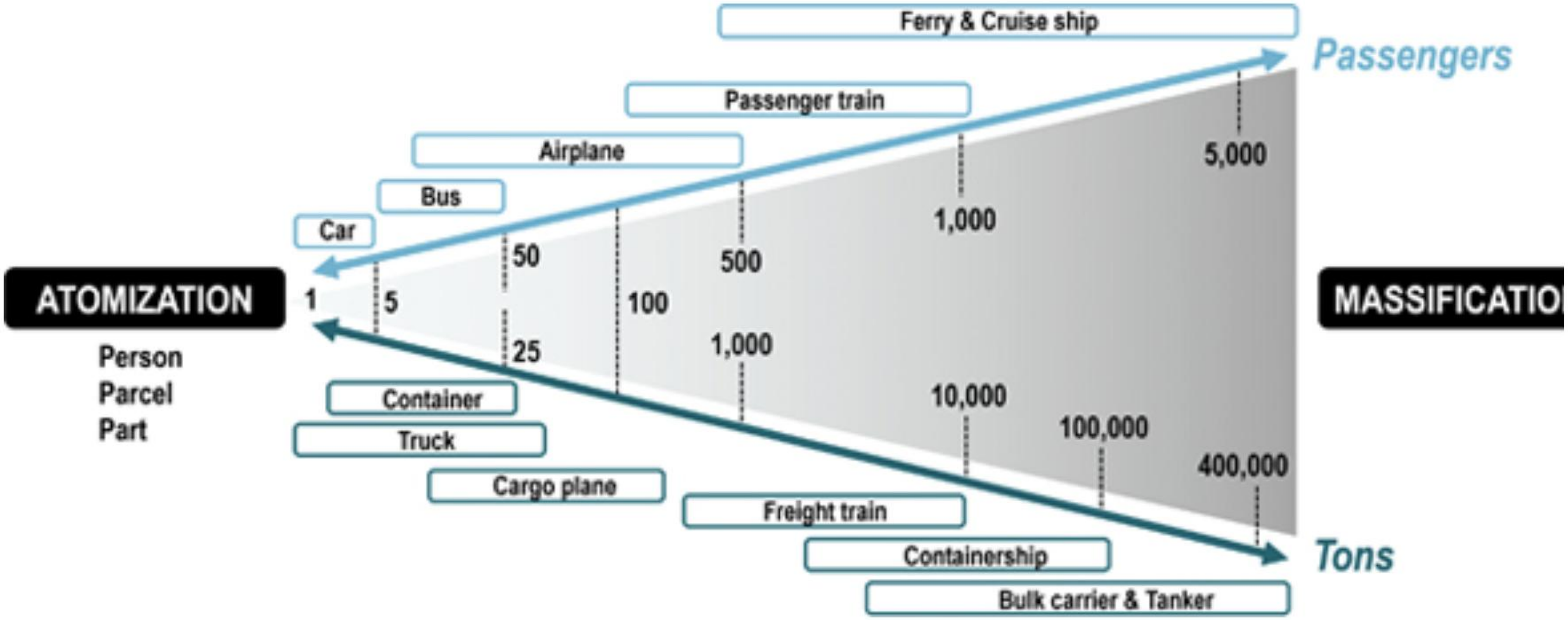
Environmental Impact

A Swedish company wants to reduce the carbon footprint of its international shipments.

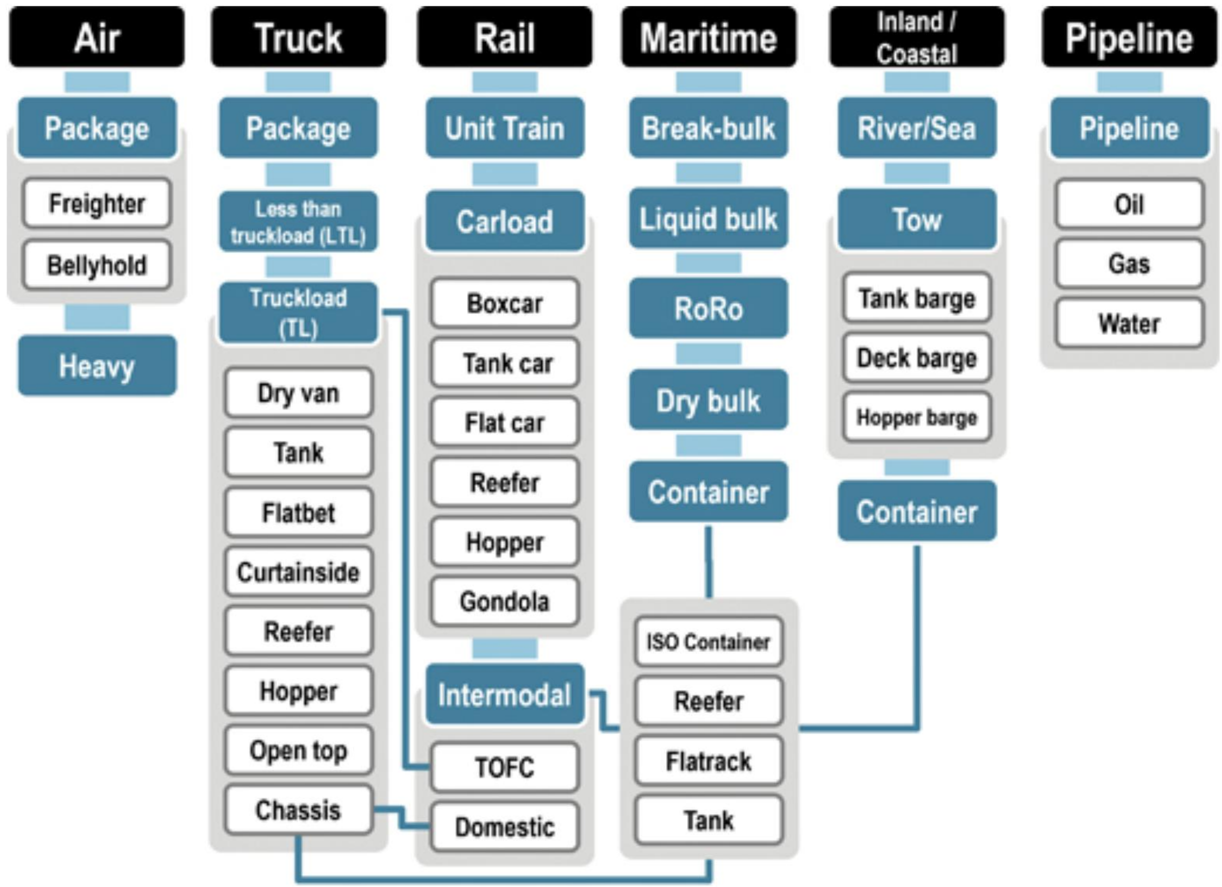
Questions :

- Assess the environmental impacts of different modes of transportation for international shipments.
- Offer solutions to reduce the company's carbon footprint while maintaining logistics efficiency.

First and last segment



Modes


Air
Package
Freighter
Bellyhold
Heavy
Truck
Package
Less than truckload (LTL)
Truckload (TL)
Dry van
Tank
Flatbet
Curtainside
Reefer
Hopper
Open top
Chassis
Rail
Unit Train
Carload
Boxcar
Tank car
Flat car
Reefer
Hopper
Gondola
Intermodal
TOFC
Domestic
Maritime
Break-bulk
Liquid bulk
RoRo
Dry bulk
Container
ISO Container
Reefer
Flatrack
Tank
Inland / Coastal
River/Sea
Tow
Tank barge
Deck barge
Hopper barge
Container
Pipeline
Pipeline
Oil
Gas
Water

- **Activities in distribution systems**
  - **Transportation**
    - The single highest cost of distribution
  - **Distribution inventory**
    - The second most important
  - Warehouses (distribution centers)
  - Materials handling : capital cost
  - **Protective packaging**
    - Contained, protected and identified
    - Fitting into transportation
  - Order processing and communication
    - Time element

Example
Transport rail cost $200
Transit time 10 days
Low value product
Inventory cost 10$ a day
Rail will be cheaper
Moved by air $1,000

- **Total cost concept**
  - Cost tradeoff
    - Transportation and carrying inventory
  - Interface
    - Supply/production/Distribution
  - Production
    - Cost of interrupting production
    - Availability of transportation
      - Raw material example and location

Transportation

Modes to be connected

- Road, rail, air, water, pipeline

Cost of carriage

- Basic physical elements
  - Ways, terminals, vehicles
- Fixed and variable cost
  - Purchase of the truck
  - Fuel, maintenance, ? driver's wage ?

Terminals

- Connections performance
- Maintenance
- owned by carriers or publicly owned

Vehicles

- All modes
  - Except pipelines

Intermodality

- Intermodality
  - **Recent reduction of transport cost … or not**
    - Containerization
    - Internationalization of standards
    - Rapid dissemination of information
    - Cure for land congestion but …

    _**Information technology**
    - Crossdocking
      - Immediately dispatched
      - Depends on IT tools
    - Warehouse management system
    - Vendor managed inventory system VMI

A record-breaking 44 container ships are stuck off the coast of California

Congestion

when the demand for mobility **exceeds** the capacity of the transport system.

when **random but predictable events** bring about a temporary service disruption, such as an accident or a natural hazard, such as flooding

- **increasing capacity** engenders a hidden, induced demand

Technology

The commercial diffusion of Global Positioning Systems (GPS)

- identification and routing of vehicles
- better utilization of these assets.

Automatic Identification Systems (AIS)

- standard on all ships, allowing the monitoring of their location, direction, and velocity.

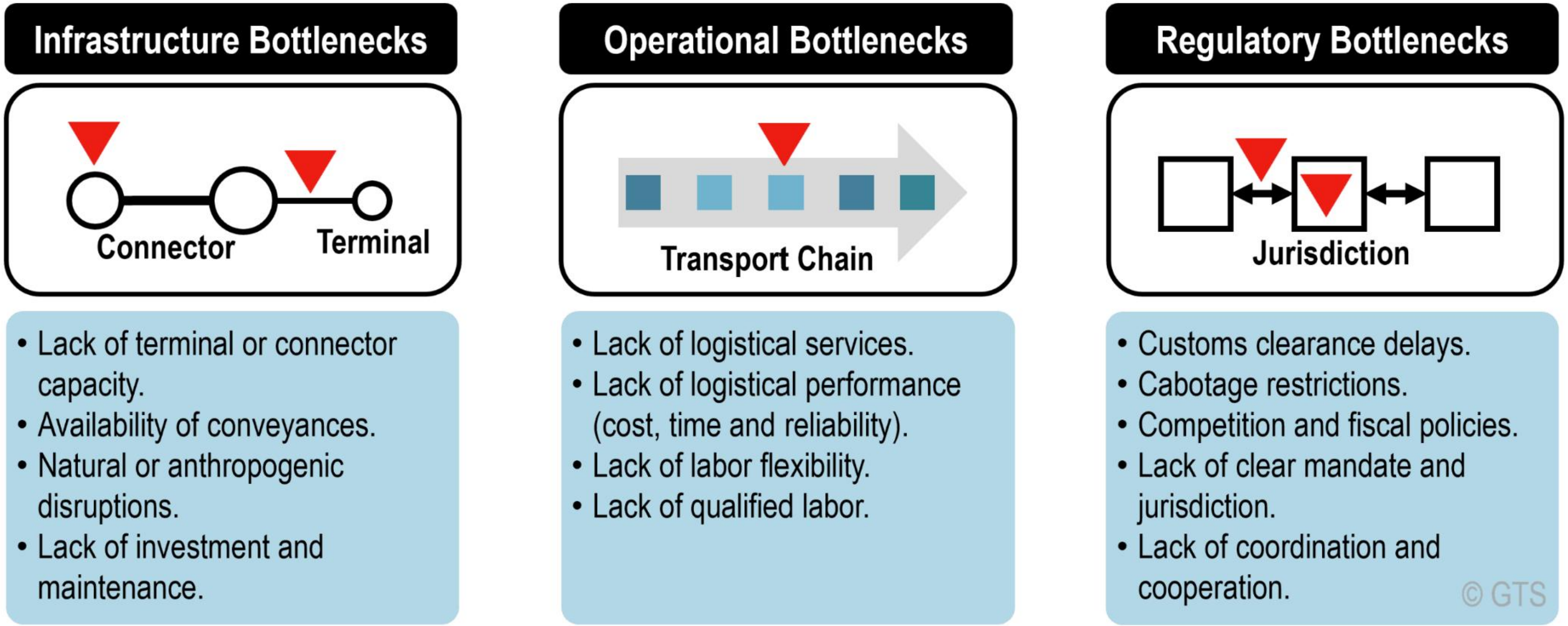
Standardization provided by the Internet in terms of communication protocols

- establish interfaces with a large customer base, which permitted new forms of retailing
- E-commerce

Intermodality

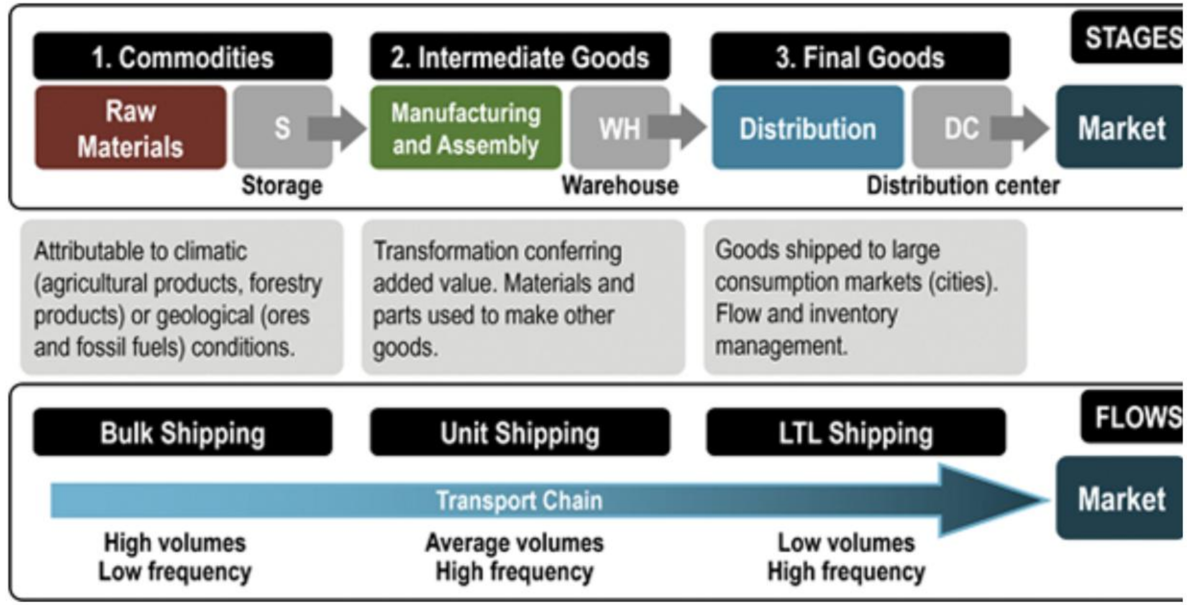
- **E-commerce**
  - and Big Data : G.P.S., W.M.S….
  - Resulting in a strong competition among networks
  - To reconfigure traditional transport patterns
  - Reducing transaction costs …
  - Could affect number, size and location of physical points of sale such as … shops
- **Logistics and global production networks**
  - Complying with **customer requirements**
  - A detailed understanding of inefficiencies
    - **Improvements through value stream mapping**
  - 3PL firms carry out logistics functions
    - Instead of first and second party
    - Major freight forwarders
  - Self reinforcing fashion and decline in transport cost … ?

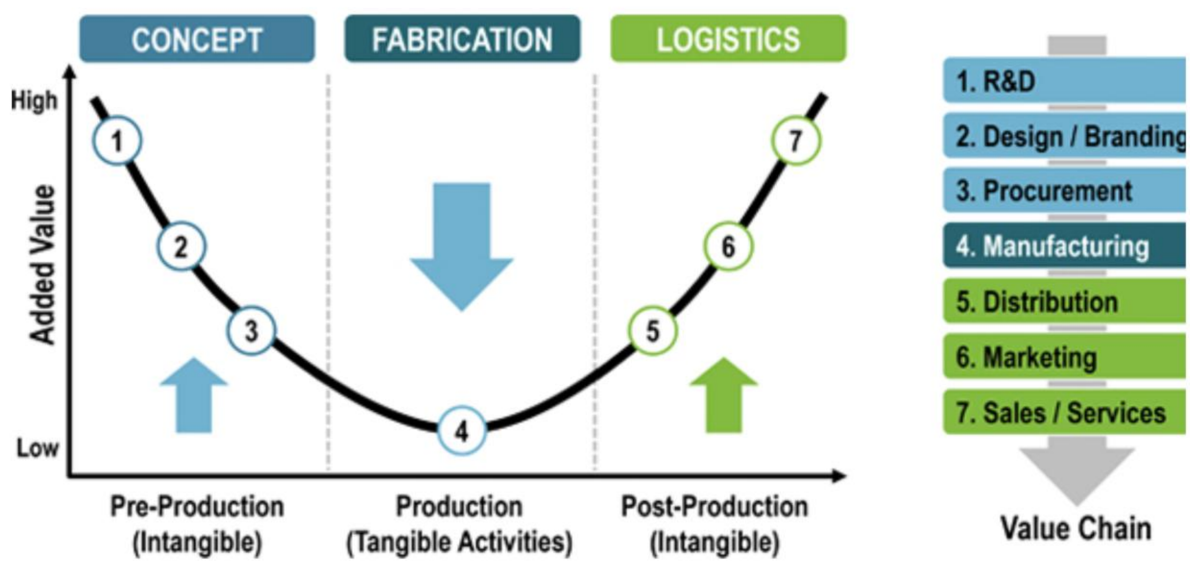
Bottlenecks identification



VALUE CHAIN

- A series of nodes, linked by various types of transactions, such as sales and intra firm transfers.
- First **stage** : bulk and low frequency
- Second stage : manufacturing : containers
- Third stage : distribution : L.T.L.





Transport and logistics multinationals

Carriers	Terminal Operators	Logistics Service Providers
• Transport passengers or freight. • Own or lease their equipment. • Contracts or spot rates.	• Transship passengers or freight. • Own or lease (concessions) terminals. • Contracts or spot rates.	• Offer services such transport, warehousing and supply chain management. • Arrange transport chains with thei own assets or through third partie (carriers and terminal operators). • Contracts or spot rates.
• Maritime shipping (Maersk). • Air carriers (Emirates). • Rail carriers (BNSF).	• Container terminals (HPH). • Airports (Vantage Airport Group). • Rail (Rail Management Services).	• Freight forwarders / Third Party Logistics (DHL). • Logistics real estate (Prologis).

US California

SUM UP

- Why is Multimodal transport key to global flows
- Why sustainable to coming years

After this main picture,
let's go further …
Multimodal transport is a critical solution but what's ABOUT multimodal transport

1- common characteristics

2- multimodal transport

3- intermodalism

4- combined transport

5- terminal and cargo handling equipment

1- Common characteristics

- **By at least two different modes of transport**
  - Multimodal transport
  - Intermodal transfer and transportation
  - Intermodal freight transportation
  - A single freight bill
    - *CEMT*

Single contract of carriage

- Through freight rate – liability storage – handling

Maritime access and use

- A network – all types of transportation
- Access
- Geography
- Economies of scale
  - Per unit cost – consolidation and break bulk
  - Infrastructure factor

2- multimodal transport

- Carriage of goods
- Containerised and non containerised transport
- General cargo
- Bulk cargo
- Neo bulk

• Several Contracts of Carriage (traditional concept)

• Single Contract of Carriage but liability of carrier is based on each leg of transport at latter stage.

MT COURSE Frédéric Gauthier

Advantages *the real multimodal*

Reduction in the costs and time for coordination and operation of logistics.

- Increased monitoring of shipments from stage to stage.

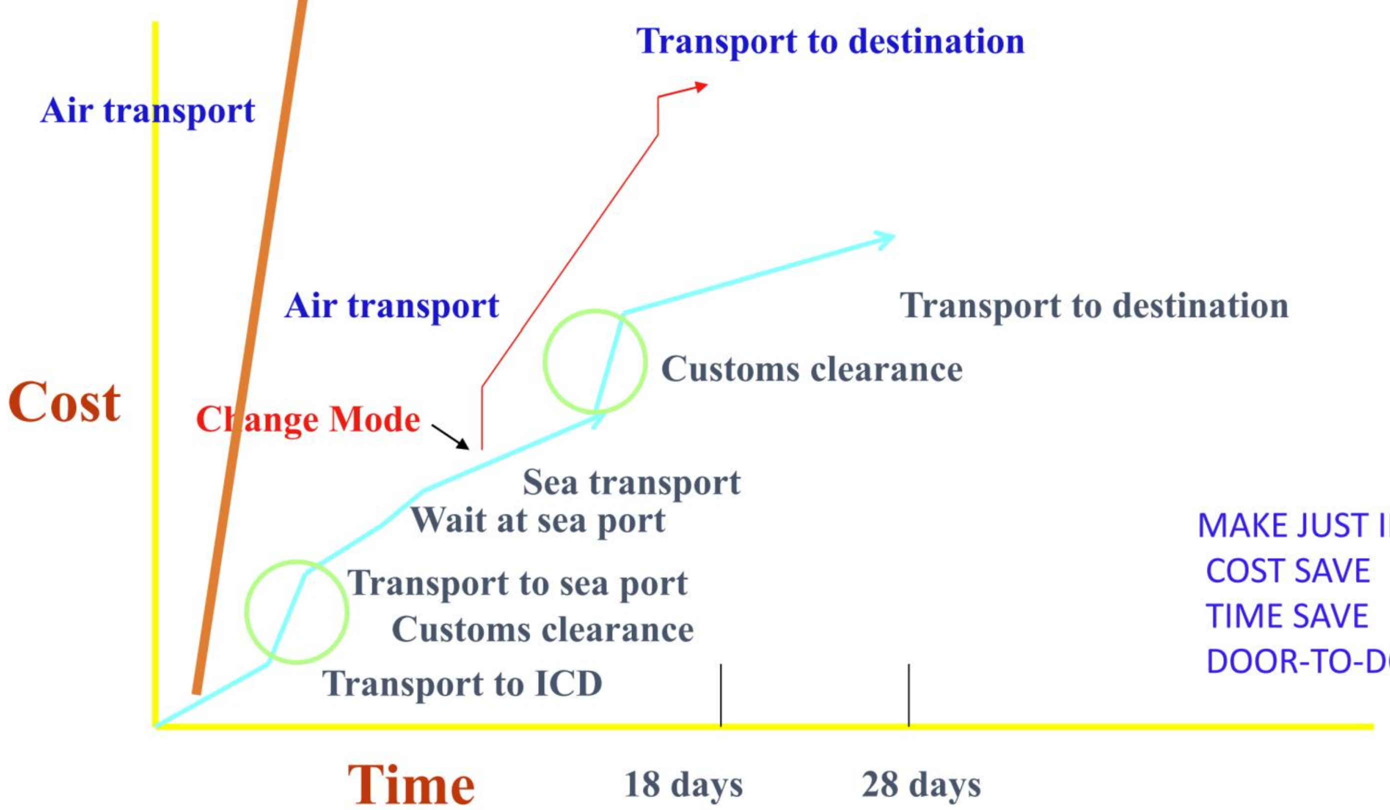
- **There is only one company in charge of meeting the shipment deadline**; therefore, there is better control on management and less risk of merchandise theft or loss while responsibility lies on just one entity.

- Scheduling routes, costs, staff, and logistics becomes easier.

- The FBL document has preference to enter and go through customs

Advantage of Multimodal Transport

TIME & COST MODULE



MAKE JUST IN TIME
COST SAVE
TIME SAVE
DOOR-TO-DOOR DELIVERY

Disadvantages

- The merchandise may encounter **legal and operational limitations** when international standards are applied
  - Infrastructures
  - Inspection
  - compatibility
- For **safety reasons**, inspections in terminals are frequent, which limits operations

3- Intermodalism

Development of cellular containerships and relevant ports

Quick turn around

Increased productivity – efficient cost – effective transport network

Integration

- The same loading unit – eliminating to unpack and repack
- Containerised movement of cargo
  - Quicker transfer of cargo
  - Heavy capital investments


CHINA SHIPPING LINE
SHIPPING

3-

Transport and handling cost

- storage

Utilization of vehicles and facilities

- infrastructures

Paper work and time

Prevention from loss

Driver-accompanied / unaccompanied

ISO containers

- Rail or road

Short sea - deep sea and barge

Advantages

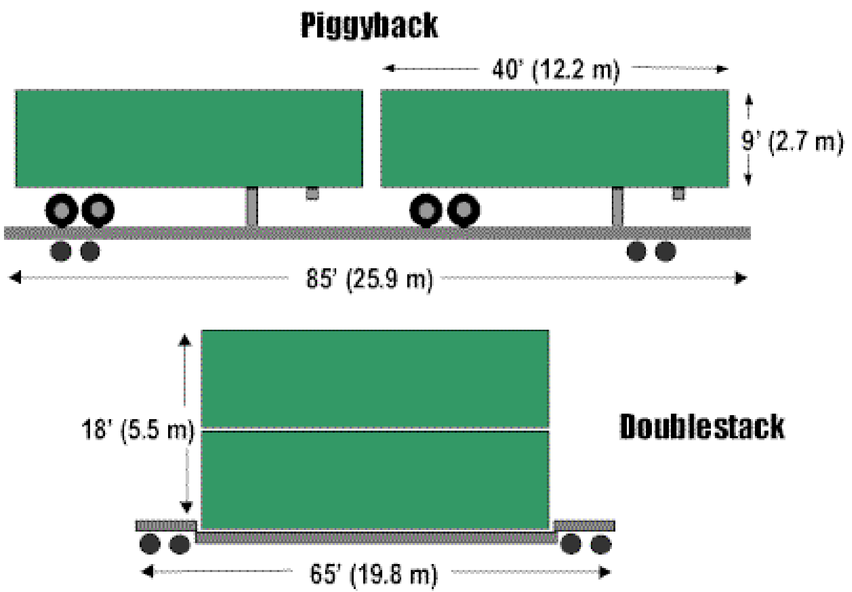
- Increased ability to **negotiate terms per stage or stretch of the route**
- Each supplier is responsible for its service
- Possibility to **choose carriers** and take advantage of the best rates for each stage or stretch of the route
- **Fewer inspections** because containers are sealed in advance
- Because everything is loaded in the same container, the **time it takes for loading and unloading is lower**
- **Increased flexibility and special handling** of loading and unloading in different ports.
- **Cheaper insurance** premiums.
- Consistent Capacity and service such as Rail and truck
- **Quality Service** because choice of selection

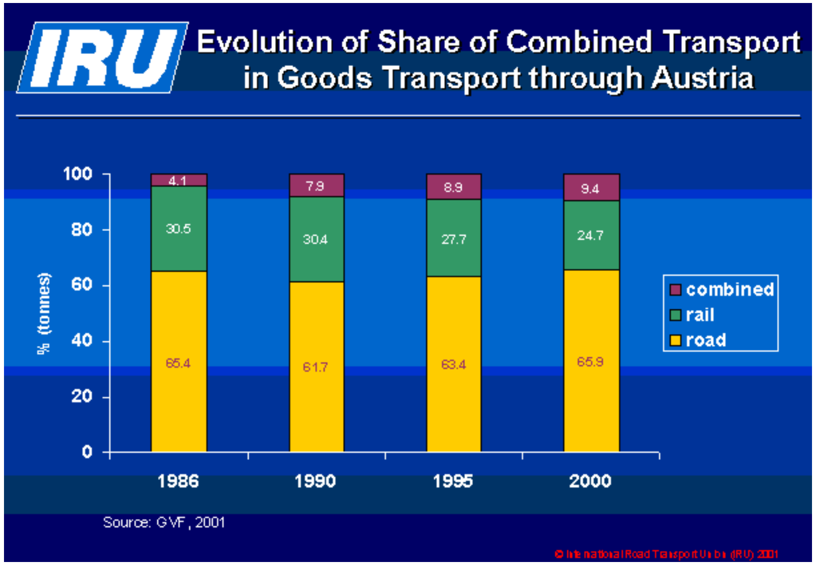
Disadvantages

- **Slower** because cost reduction is prioritized.
- **Less reliability** because there are several suppliers answering for their own services.
- Tracking all the suppliers and coordinating solutions to delays with them.
- **More expenditures** due to the need to coordinate several contracts with different suppliers.
- The i**nfrastructure** that makes intermodal transportation easier for example, cranes for containers, is scarce and more expensive.
- Additional packaging costs to mitigate damage when moving merchandise

Intermodalism & container

4-Combined transport

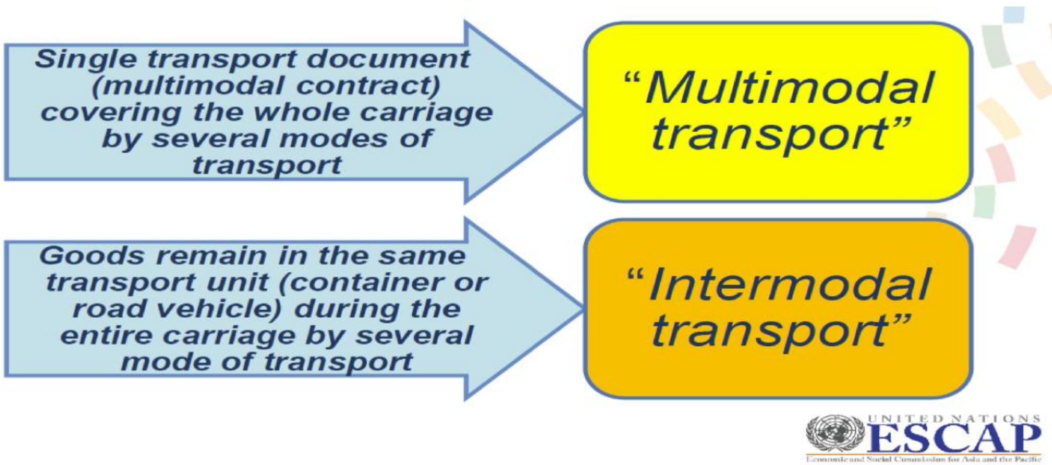




4-

- Definition
  - Intermodal transport units ITU
  - Remain in their original packaging
  - Roll on Roll off
  - Rolling road
  - Lift on lift off

SUM UP



Single transport document (multimodal contract) covering the whole carriage by several modes of transport
"Multimodal transport"
Goods remain in the same transport unit (container or road vehicle) during the entire carriage by several mode of transport
"Intermodal transport"
UNITED NATIONS ESCAP

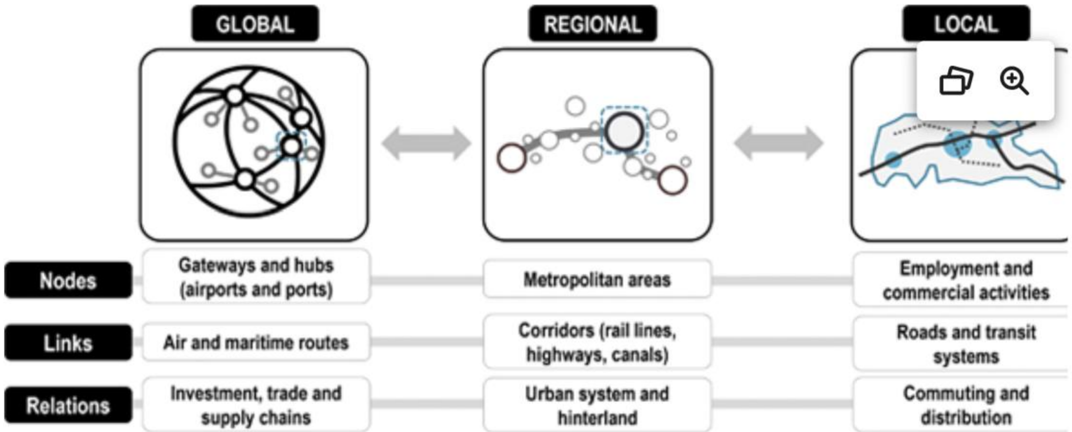
SUM UP

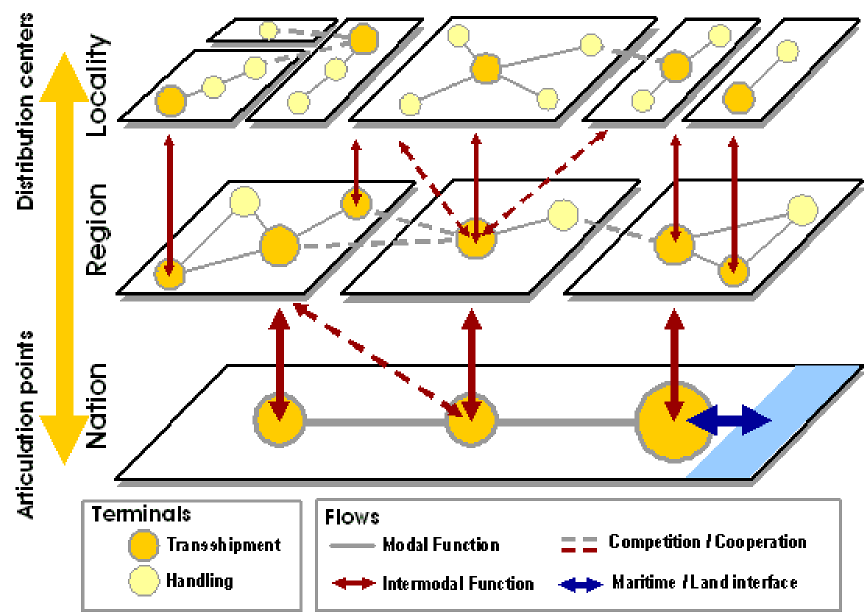
Definitions

- Multimodal
- Intermodal
- Combined

PREREQUISITE

5- Possible intermodal networks

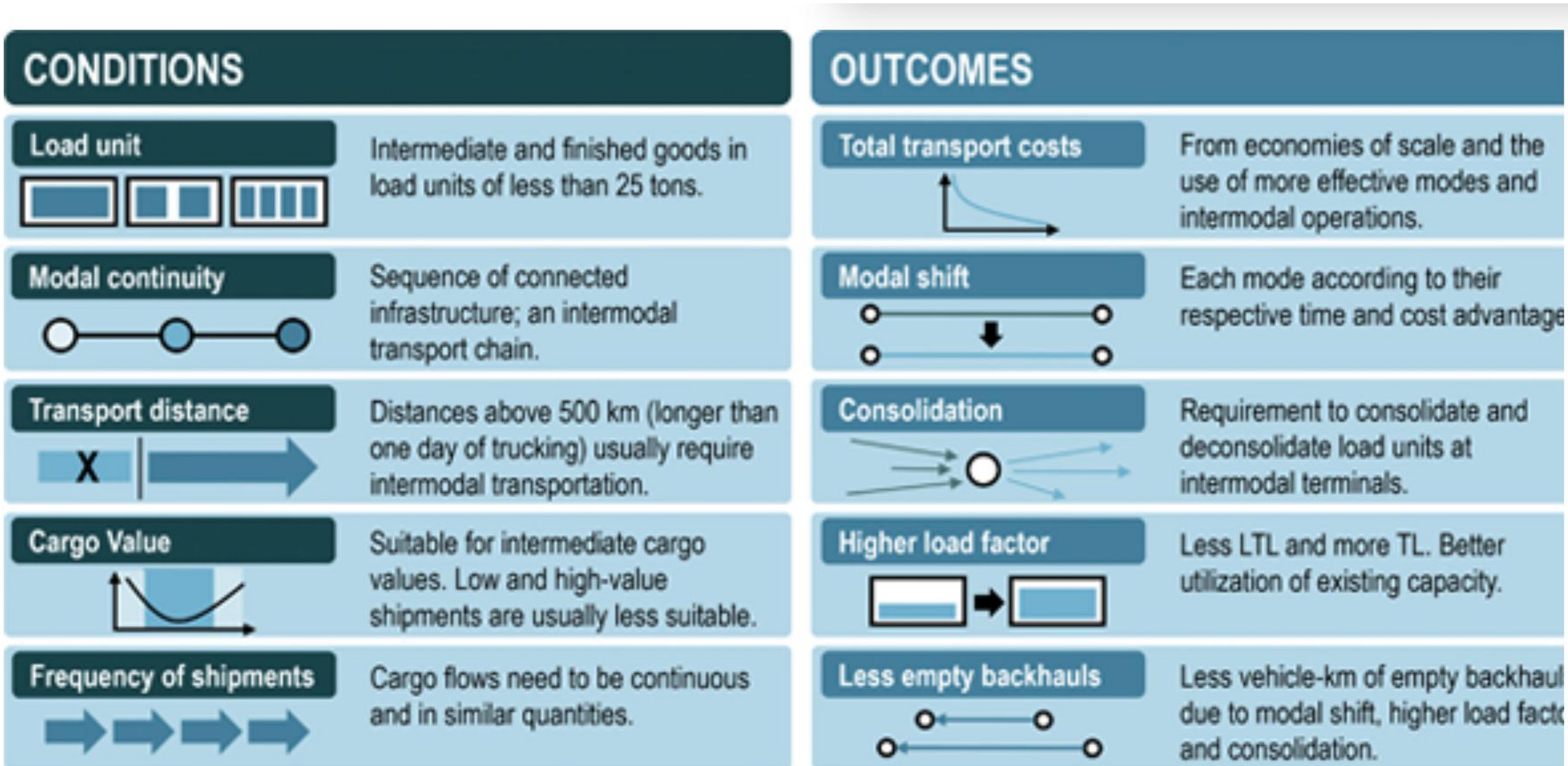




Scales

	NETWORK	FLOWS	SPATIAL CONSTRUCTS
LOCAL	• Transit systems • Street networks	• Commuting • Personal and social trips • Deliveries	• Activity space • District / Neighborhood • Terminal / Development zone • Town / City
REGIONAL	• Commuter rail • Regional air networks • National highway systems • National railway systems • Short sea shipping / feeders	• Intercity passenger flows • Distribution	• Metropolitan area • Market area • Hinterland / Corridor • Urban region
GLOBAL	• International air networks • Maritime shipping networks • Telecommunication networks	• Trade • Tourism and business trips • Migration	• Value chains • Landbridge • Trade area

Connections mode, container



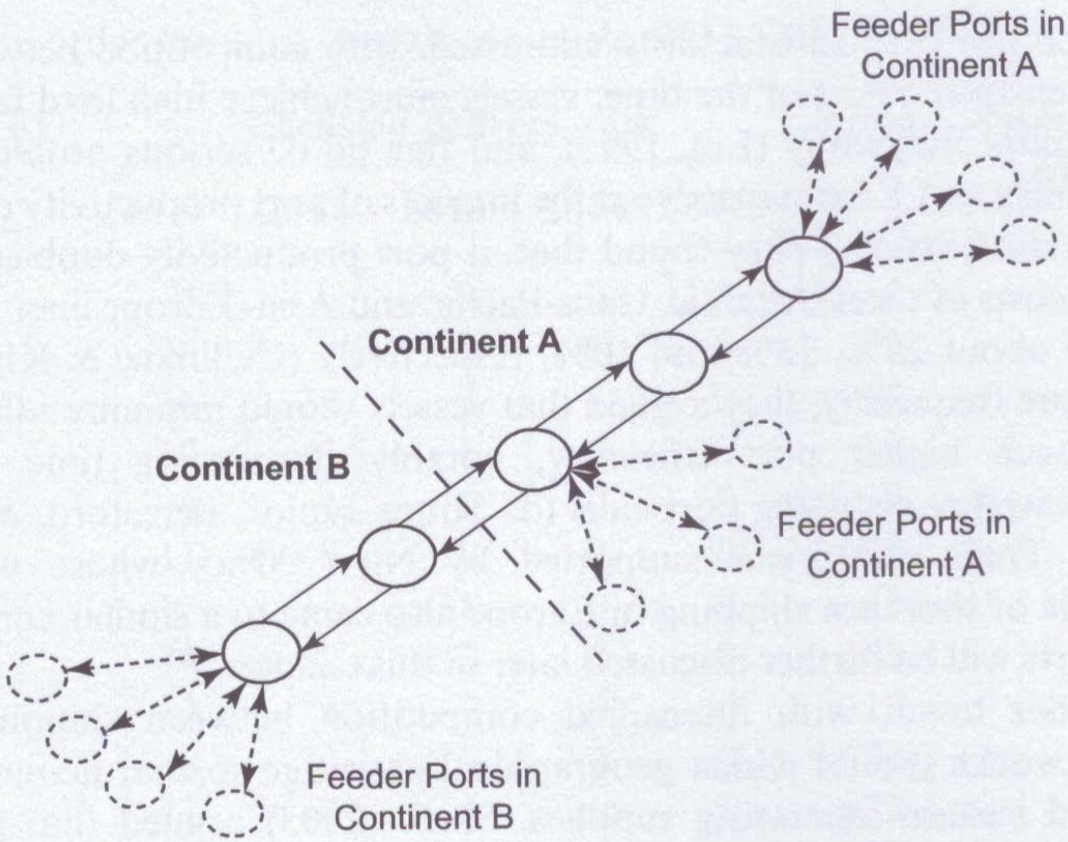
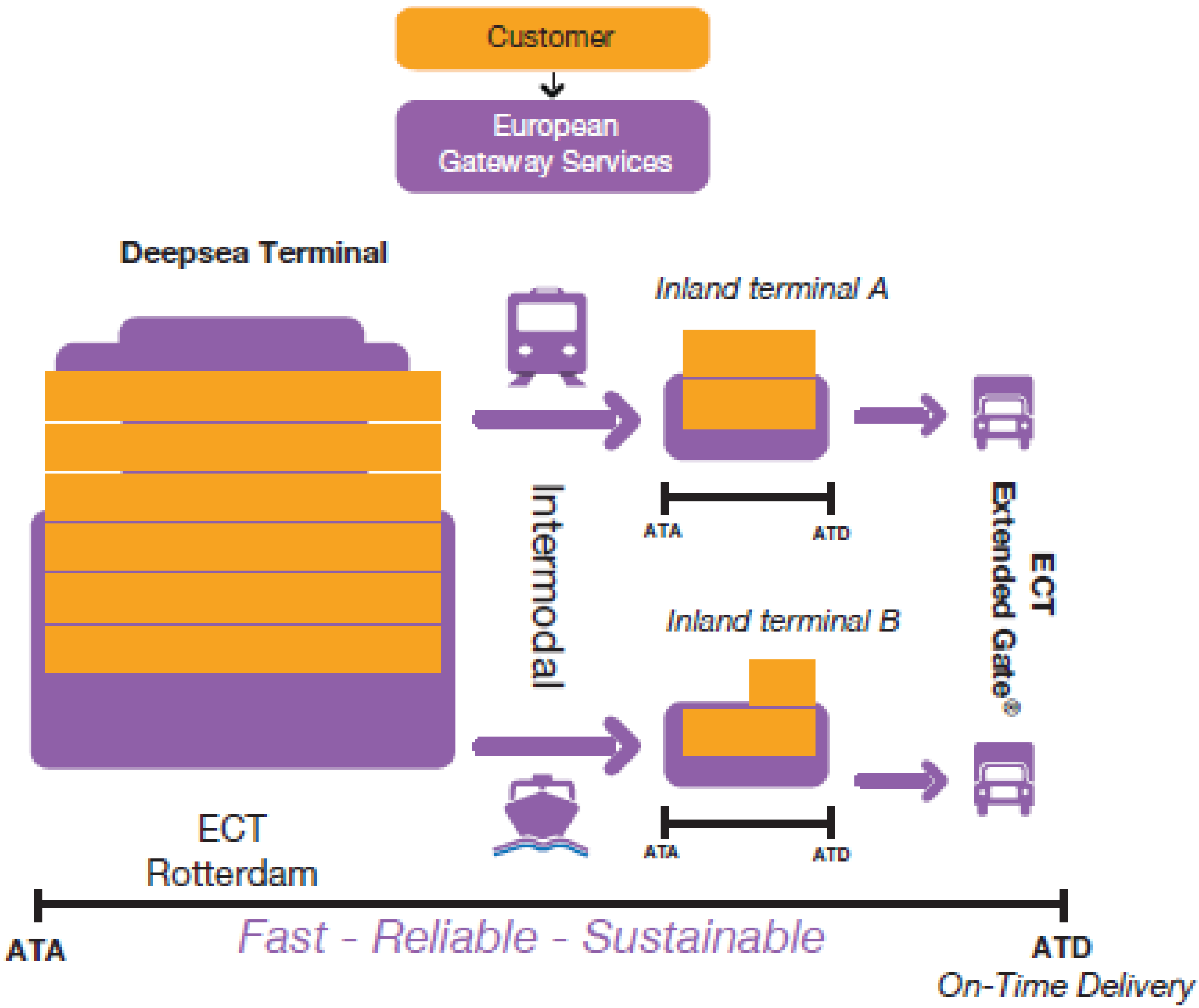
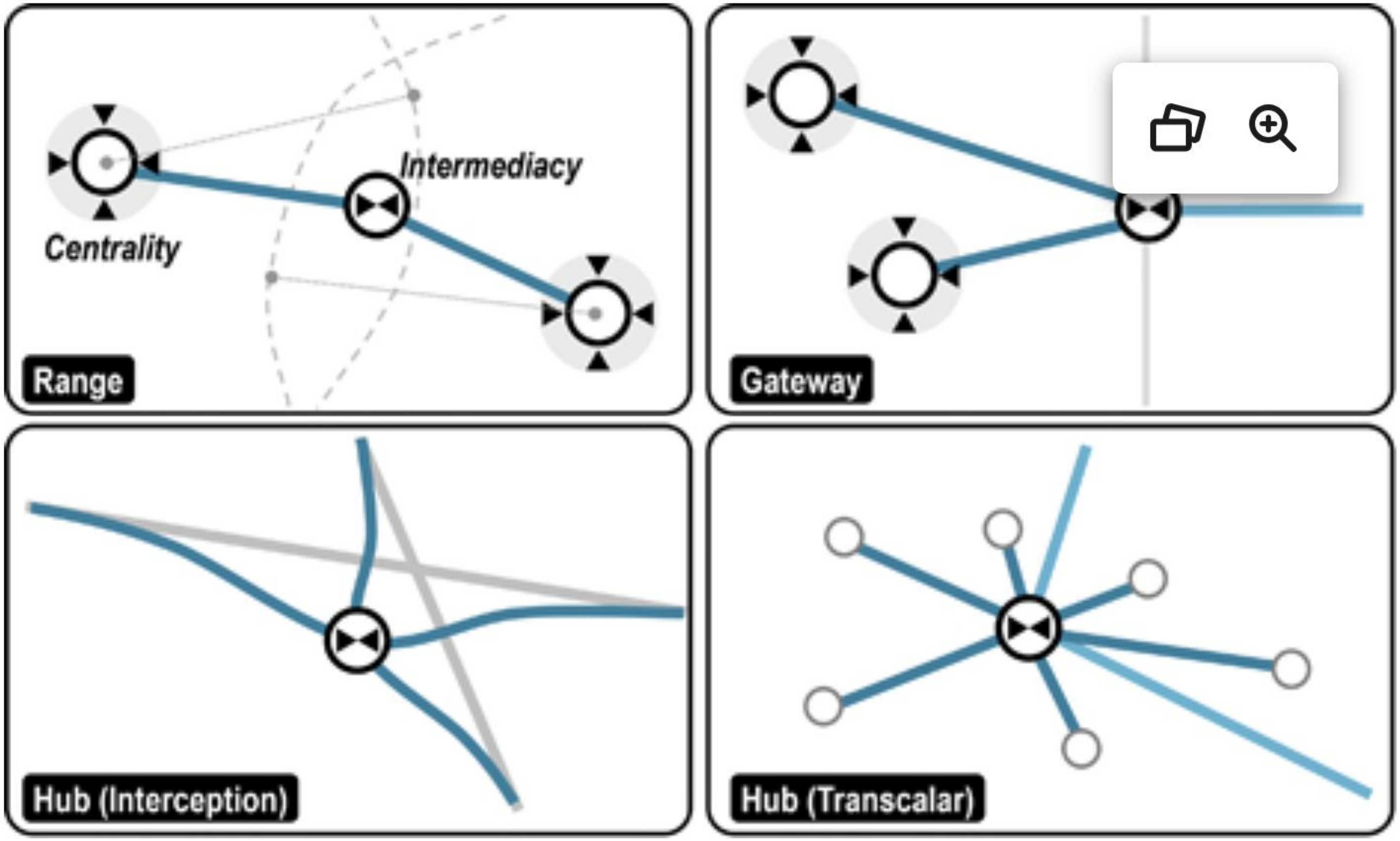


Figure 2.1: A diagram illustrating the trunk-and-feeder system in container liner shipping


Customer
European Gateway Services
Deepsea Terminal
Inland terminal A
Intermodal
ATA
ATD
Inland terminal B
ECT Extended Gate®
ATA
ATD
ECT Rotterdam
ATA
Fast - Reliable - Sustainable
ATD
On-Time Delivery

5- Liner production systems



Introduction

5-Liner production systems

High transport demand spread over the whole year

Additional stops, in the vicinity of the two end points

Additional cargo increases revenue

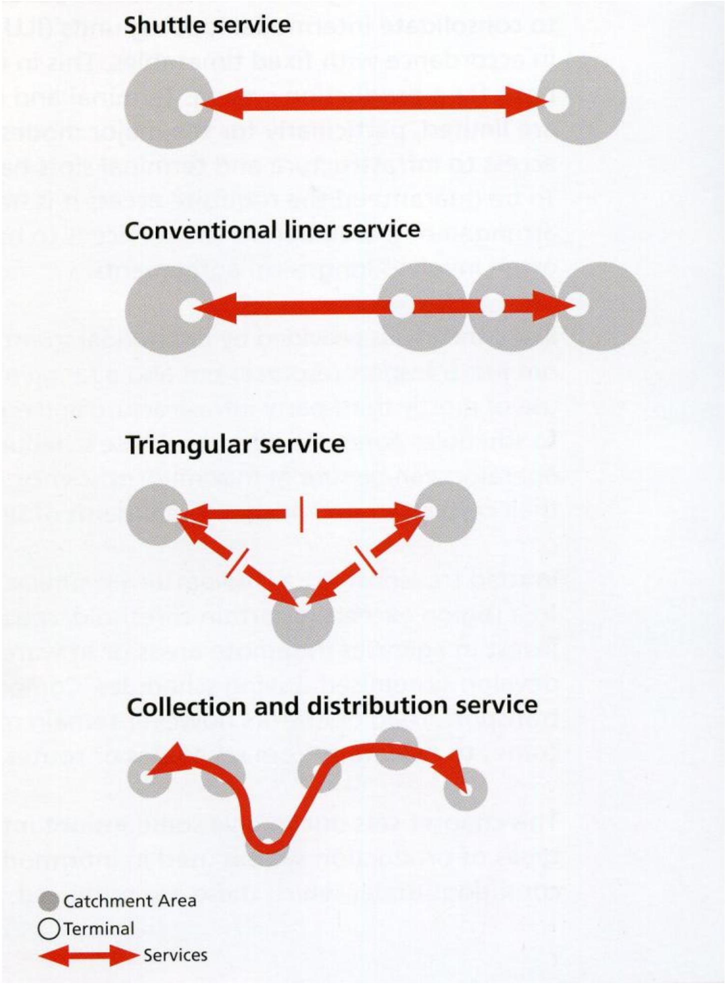
Additional stop costs time

Extra call may add to the trip distance

Triangular services

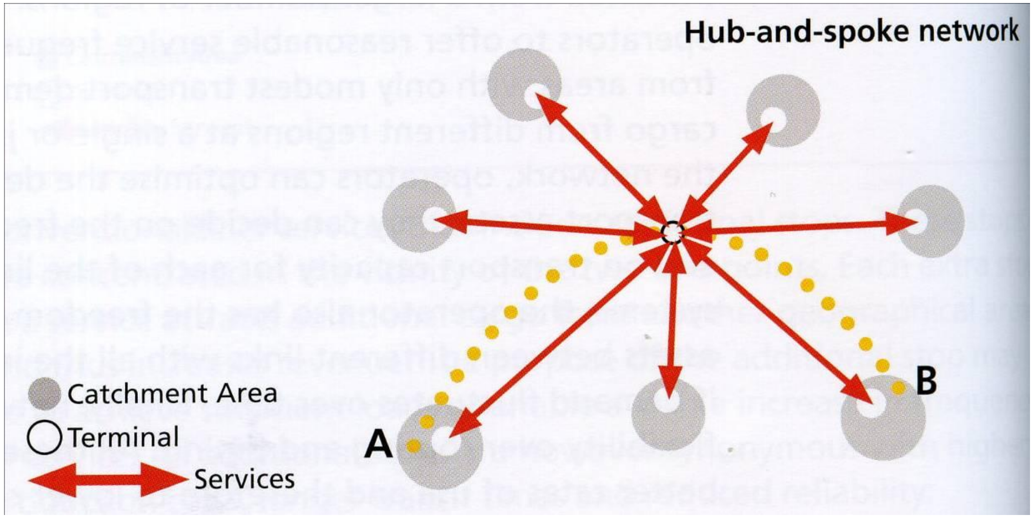
Short sea shipping

Regional distribution

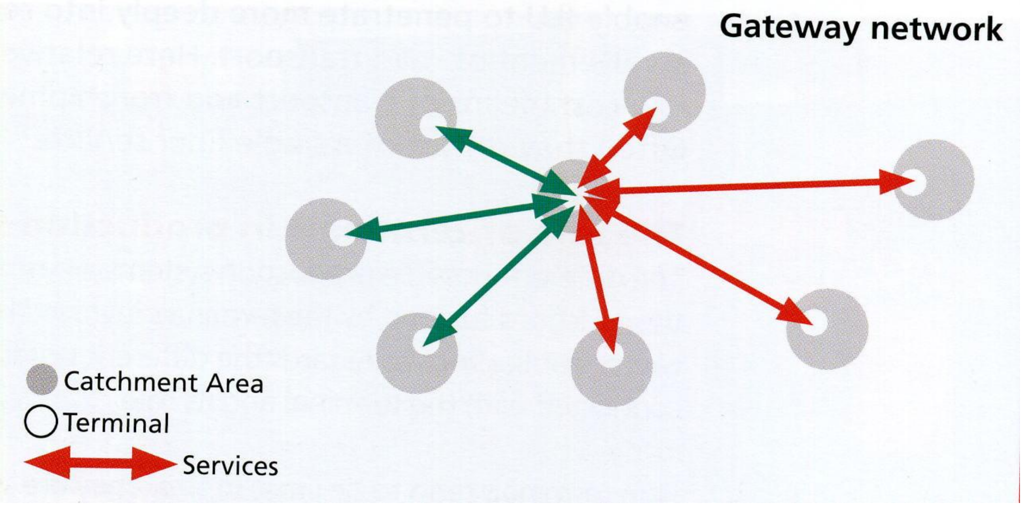


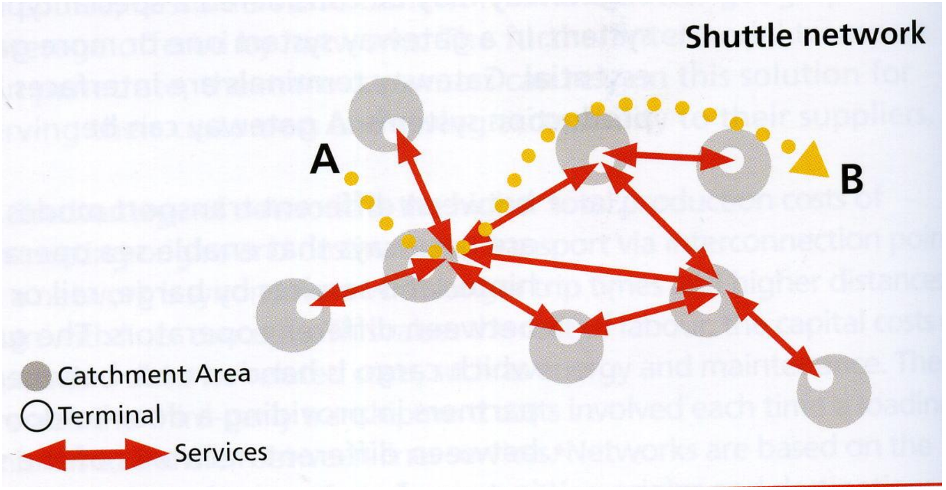
5- Network production systems

Interconnection points
- A larger number of regions
- Deployment of transport assets
- Better geographical coverage



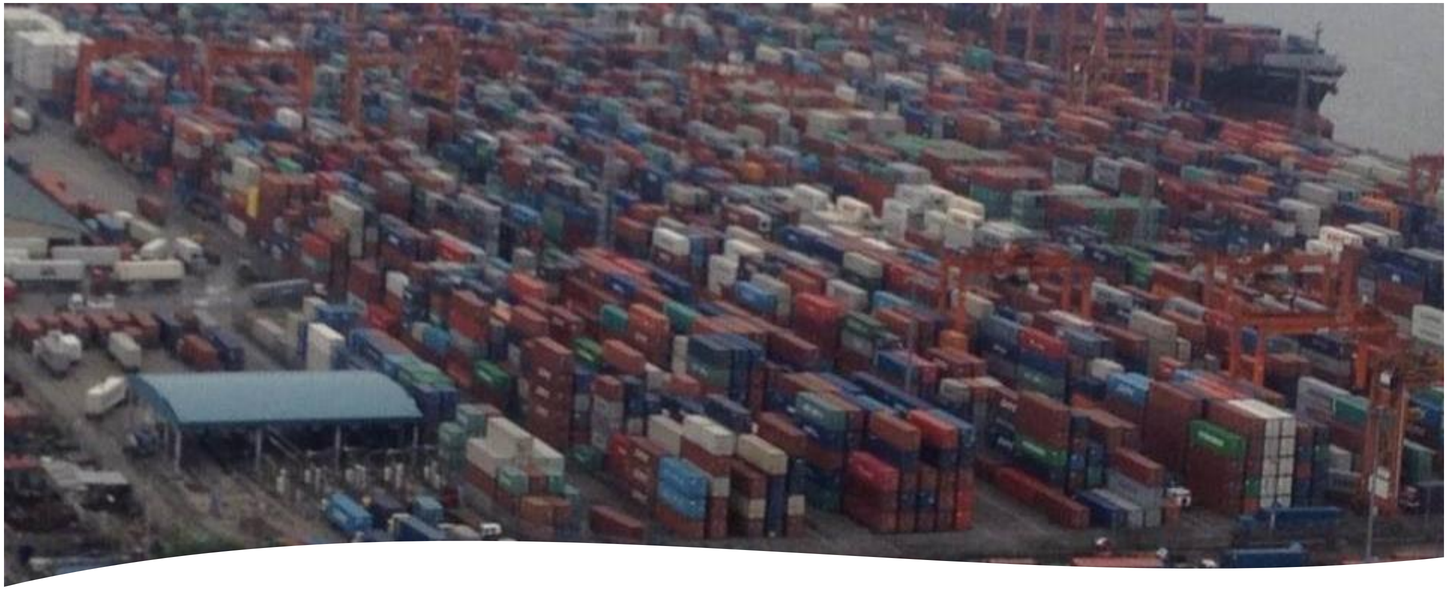
Interfaces between production systems
- Transport modes
- Operators
- Both





5- shuttle network

- Hub and Spoke
    - Large in size
    - Not necessarily linked to the close region
- Difference with gateway terminals
- Regional terminals



- PORT CONGESTION
- Optimization measures
  - Hinterland traffic diversion
  - Congestion pricing
  - Off-dock container yards
  - Fast rail shuttles
  - Expanded rail connections

PORT CONGESTION

Optimization measures

- Multi-pick lifting
- Truck appointment system
  - Synchronised time slot
- Extending gate opening hours
- Electronic document transmission
  - Customs as well as payment documents
  - Seaway bill example
- High speed gates
  - Optical character recognition
- Automated yard marshalling
  - Rotterdam


SCHELDE
SAFTINGENDOK
PSA - HNN
DEURGANCKDOK
ANTWERP GATEWAY

Table 7.2 Key figures for selected container ports

Characteristic	Port of Singapore[a]	Port of Shenzen[b]	Port of Hamburg[c]	Port of Los Angeles[d]	Port of Klaipeda[e]	Port of Riga[f]
# terminals	7	4	4	8	2	2
# berths[g]	57	58	25	31	6	2
quay length	17.350 m	17.505 m	7.570 m	9.336 m	1.908 m	645 m
# STS cranes	212	175	80	72	9[h]	7[i]
terminal area	700 ha	792 ha	440 ha	684 ha	54 ha	125 ha
mio TEU (2014)[j]	33,87	24,03	9,73	8,33	0,49	0,39
Transhipment share	85% (2013)[k]	50% (2013)[k]	36% (2015)[l]	<10% (to date)[m]	<10% (to date)[m]	<10% (to date)[m]

a PSA Singapore, 2016.
b Zheng and Park, 2016.
c Hamburg Port Authority, 2016.
d Port of Los Angeles, Container, https://www.portoflosangeles.org/, 2016.
e Drungilas, 2015.
f Freeport of Riga Authority, 2009.
g Berth length: about 300m
h Thereof 4 mobile cranes.
i Thereof 1 mobile crane.
j World Shipping Council, Top 50 world container ports, http://www.worldshipping.org/about-the-industry/global-trade/top-50-world-container-ports, 2016.
k Marine Information Service, 2015.
l Hafen Hamburg Marketing, 2016.
m Rodrigue, J.P., The geography of transport systems: Levels of transshipment incidence, https://people.hofstra.edu/geotrans/eng/ch4en/conc4en/transshipment_incidence.html, 2016.

Key figures for selected container ports

Ship To Shore STS

Yard operations

- Reefer container requirement
- Containers with hazardous goods
- Empty containers stacking
- Landside operations
- Terminal types
  - Pure transhipment terminal
  - Combined transhipment and gateway terminal
  - Pure gateway terminal
  - Trans terminal

Container terminal classification and KPIs

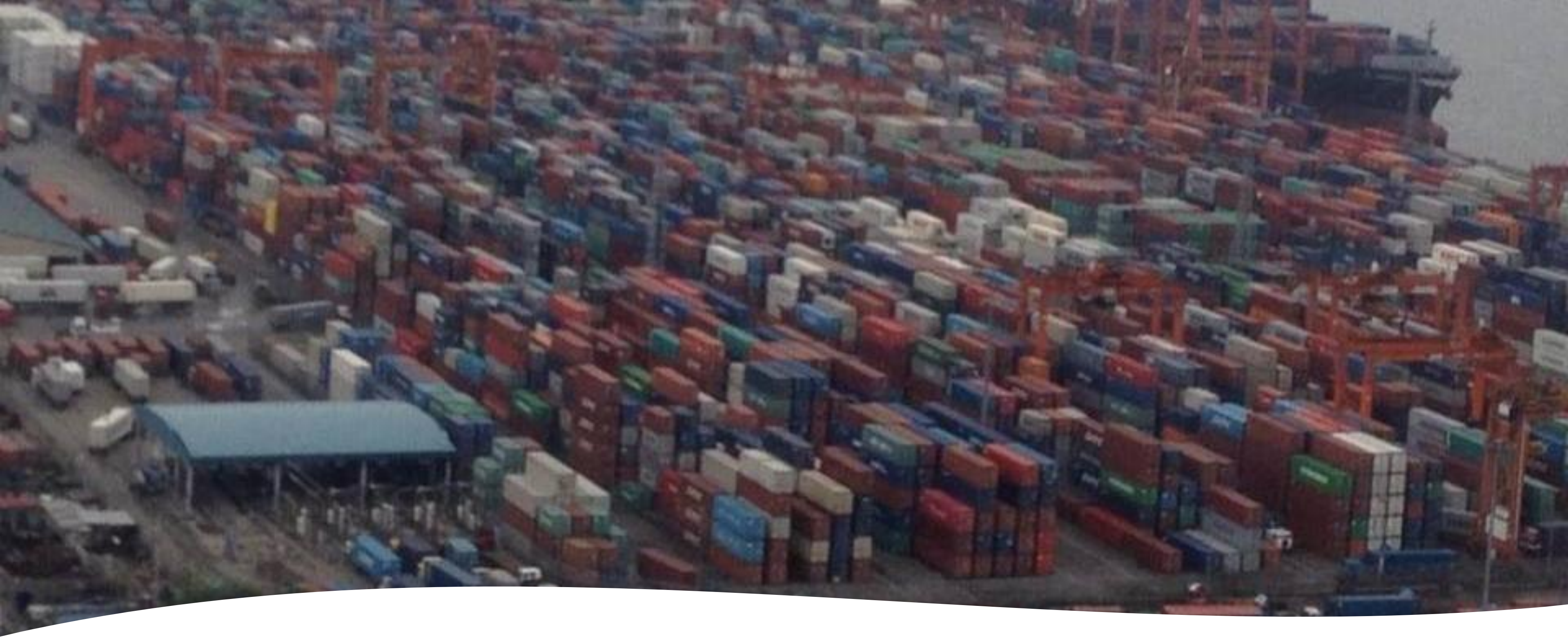
Table 7.1 Container terminal classification

Characteristic	*Type*		
	Trans Terminal	*TransGate Terminal*	*Gate Terminal*
Container flow	open sea ↔ open sea (transhipment cargo)	open sea ↔ open sea/port hinterland (transhipment and domestic cargo)	open sea ↔ port hinterland (domestic cargo)
Linked transport services	mainService ↔ mainService/ feederService	mainService ↔ mainService/feederService || mainService/ feederService ↔ inlandService	mainService/ feederService ↔ inlandService

Table 7.1 shows the characteristics of each of these terminal types.*

Available Port Data	Yield	Available Port Metrics	
Always		**Land Use**	
Channel & Berth Depth		TEU/Gross Acre	Gross/Net CY Acres
Berth Length		TEU Slots/CY Acre (Density)	Net/Gross Ratio
Berths		TEU Slots/Gross Acre	CY Utilization
Cranes & Types		TEU/Slot (Turns)	Moves/Container
Gross Acres		TEU/CY Acre	Avg. Dwell Time
Port TEU		**Crane Use**	
Avg. Vessel TEU		Number of Cranes	Avg./Max Moves per hour
Vessel Calls		TEU/Crane	TEU/Available Crane Hour
Sometimes		Vessel Calls/Crane	TEU/Working Crane Hour
Avg. Crane Moves/hr		Crane Utilization	TEU/Man-Hour
CY & Rail Acres		**Berth Use**	
TEU Slots		Number of Berths	Max Vessel DWT and TEU
Estimated		Length of Berths	TEU/Vessel TEU
Max Vessel TEU		Depth of Berth & Channel	Vessel TEU/Max Vessel TEU
Confidential		TEU/Berth	Berth Utilization - TEU
Costs		Vessels/Berth	Berth Utilization - Vessels
Man-hours		**Balance & Tradeoffs**	
Vessel Turn Time		Cranes/Berth	Net Acres/Berth
Rates		Gross Acres/Berth	Cost/TEU
Avg. Dwell Time		CY Acres/Berth	Man-Hours/TEU
Working Crane Hours		CY Acres/Crane	Man-Hours/Vessel

1 acre = 0.40 ha



- PORT CONGESTION
- Optimization measures
    - Hinterland traffic diversion
    - Congestion pricing
    - Off-dock container yards
    - Fast rail shuttles
    - Expanded rail connections

SUM UP

- What are transport production systems ?
- What are nodes ?
- What has multimodal transport to manage ?

6- terminal and cargo handling equipment

Inter port competition has intensified

Less fidelity of shipping lines

Example of New York and Maersk 570 m $

Efficient infrastructures

- Coopetition and regional port governance
- Busan and Rotterdam

Le Havre Hamburg ranges 130 ports more than 120 million ctrs,

The Pearl River Delta

Figure 2.2: The ownership structure of Copenhagen Malmo Port
Source: Copenhagen Malmo Port (2011).

Synchronization between ports is needed :
Container transhipment traffic
+ 32% in Europe
+ 25% in Far East
+ 51% South East Asia
+ 31% Latin America
+ 33% in Africa

6- terminal and cargo handling equipment

- Some definitions
  - Terminal
    - Transshipment and storage of ITU's
    - Any location where either **originate, terminate or are handled in the transportation process**.
    - Central and intermediate locations in the mobility of freight.
    - require specific facilities and equipment to accommodate the traffic they handle.
    - A utilization rate of 75–80% of design = to be optimal, above this level, congestion starts to rise
  - Hub
    - Central distribution point

6- terminal and cargo handling equipment

- Efficient infrastructural facilities
  - Crane
  - Gantry crane
  - Straddle carrier
    - Rubber tired overhead lifting vehicle
  - Reach stacker
  - Spreader
    - Adjustable fitting for containers
- Bulk cargo transfer
- Containerized cargo transfer
  - Including pipelines to tank containers

Inland port

- Railroads
- Water access
- road

6-

- **Inland container depots**

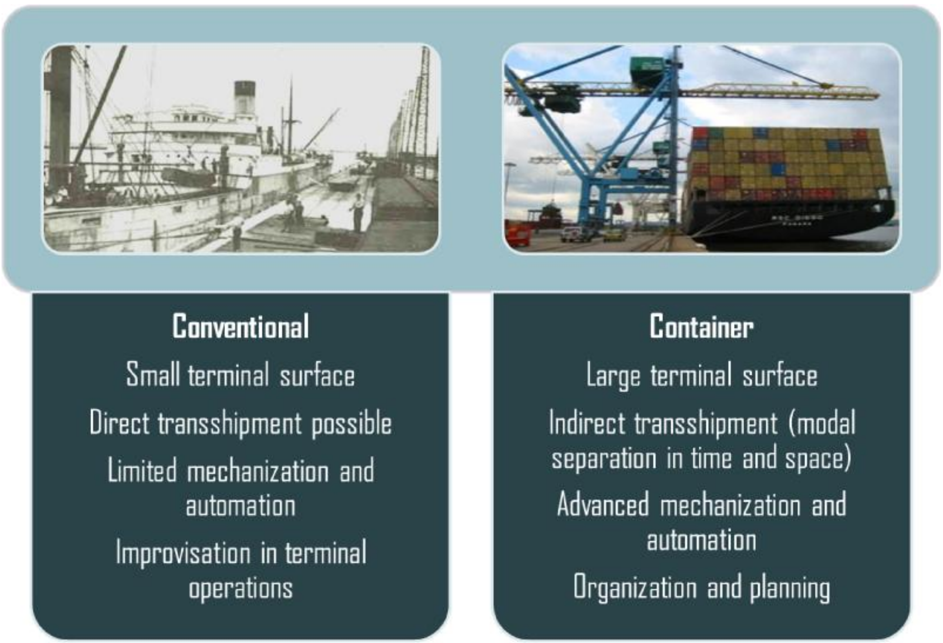
  also called dry ports

- A kind of warehouse area
  - To relieve congestion at the ports
  - To extend continuous movement of containers
  - Handling containers
  - Special containers
  - Receipt and delivery
    - Weighing, inspection of seals and damages, container information control
    - Consolidation and distribution
  - Depot function
  - Maintenance and repair
  - Customs clearance activities at inland terminals and not at port location
  - Under bond
  - Physical distribution services

- Dry port
  - An ICD with large logistics area

- Container freight stations
  - Stuffing / destuffing service
  - Consolidation points
  - Customs formalities
  - Customs service
  - LCL cargo / FCL shipments
  - CFS to ICD

6-



6-

- Terminal characteristics
  - **Intermodal interchange**
    - Road rail / road barge
  - Location
    - Small package industry
    - Access
      - Airports as well as Ports
  - **Productivity**
    - Port hinterland operations
      - Adequate terminal access for various modes
      - Meet scheduling
      - Level of throughput and…
      - Of course, profitability

Terminal flows

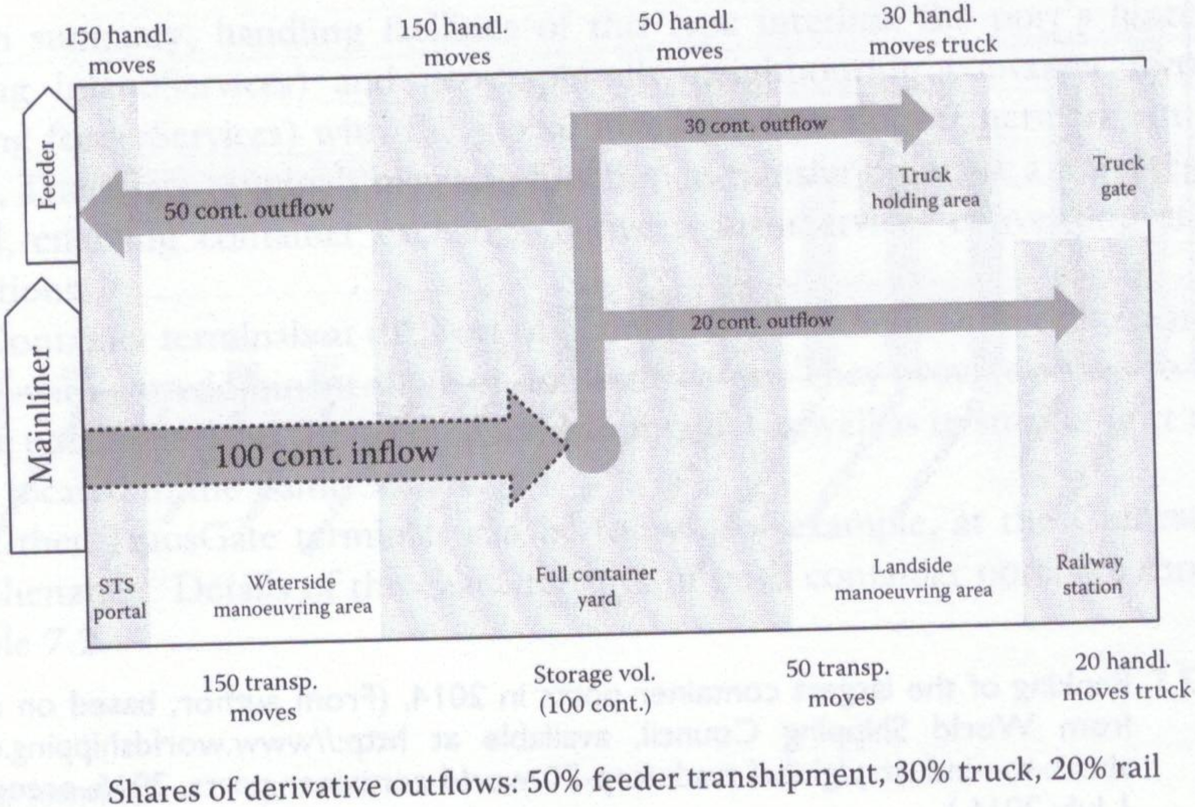
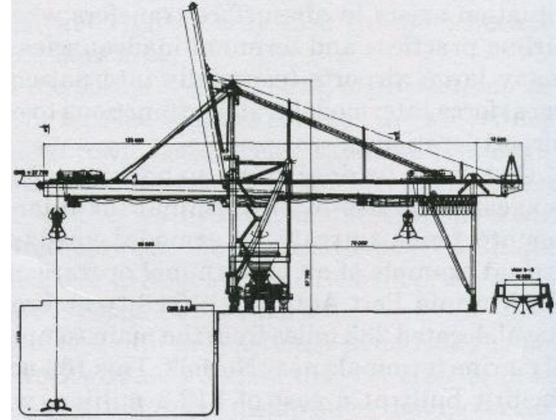


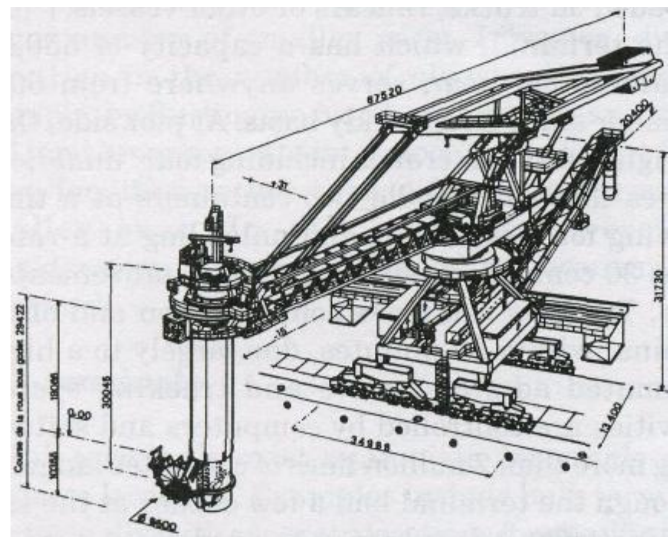
Figure 7.6 Original main service inflow of 100 containers and resulting derivative outf with associated logistical requirements (example).

6-

- **Cargo transfer**
  - Skilled staff and container equipment
  - All necessary documents
  - Maintain a status report
  - **Preplan all loading / Unloading**
  - Maintain security and … supervision
- **Intermodal** equipment for bulk freight transfer at ports
  - Continous vs discontinous bulk movement
  - Types of sea port bulk handling equipment
  - Environmental and political concerns



Grab bucket

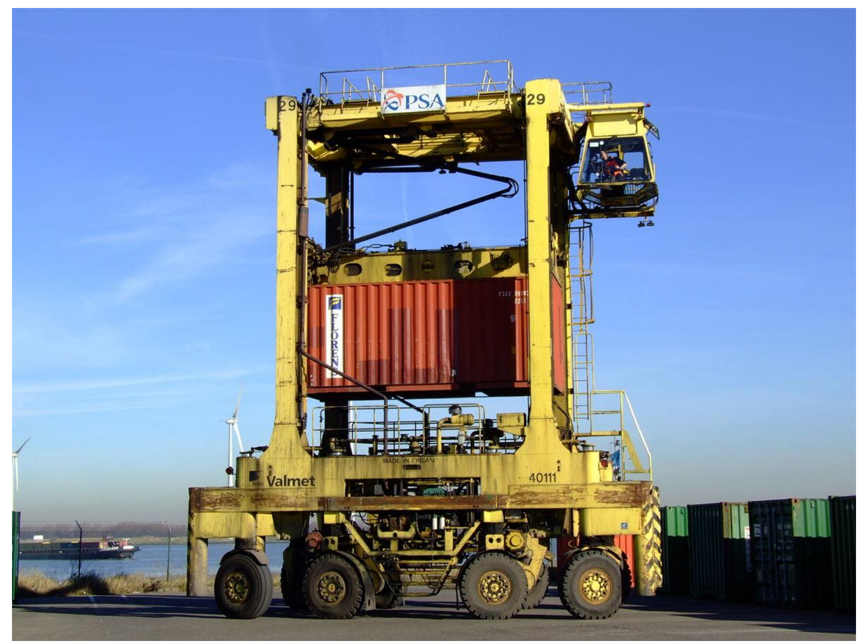


6-

• Container ports and equipment

- LCL infrastructure
- Computation of moves
- **Cranes**
  - Shore based
  - Rail mounted
  - Ahinged boom crane
- Spreaders and frames
- Straddle carriers
  - Bigger ships need biggercranes
- Stacking cranes
- Container handlers

Spreader



Straddle carrier

Comparative tasks

Trans terminal inbound to **outbound feeder**

Trans gate terminal : **feeder to mainliner hub**

Each of them is separated

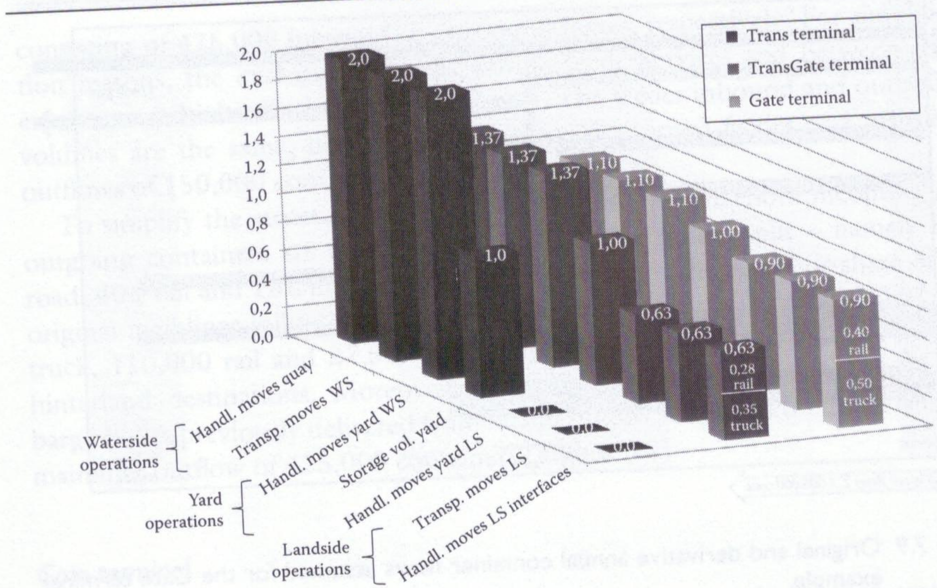


Figure 7.10. Overview of logistics requirements* for all example terminals differentiated according to terminal operations areas.

Comparative tasks

Trans terminal inbound to outbound feeder

Trans gate terminal : feeder to mainliner hub

Each of them is separated

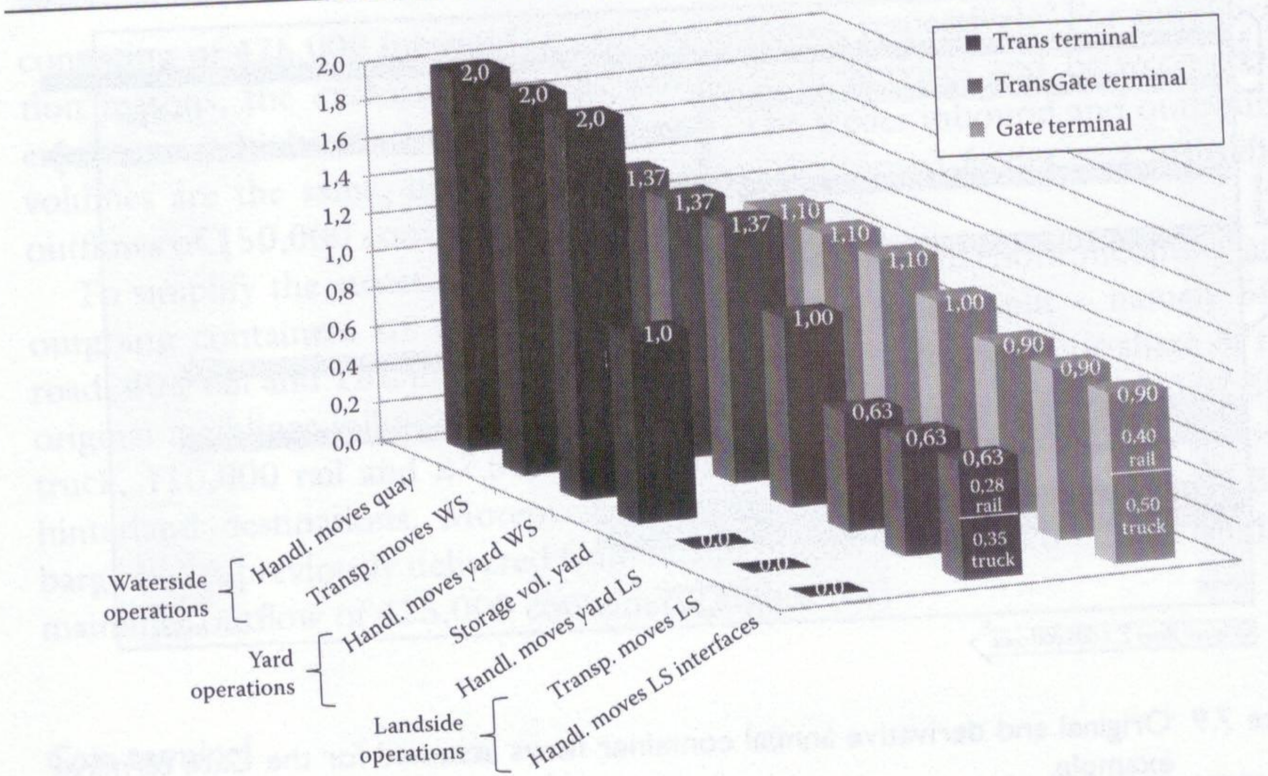


Figure 7.10. Overview of logistics requirements* for all example terminals differentiated according to terminal operations areas.

Land Intermodal terminal design example

- Location
- Marshalling
- Slopes and tracks availability
- Electrification of tracks and terminals
- Signalling systems connected to the terminal
- Paving
- Truck entry and exit capacity
- Lighting (security)
- Local road network
- Security
- A yard for wagons and containers
- Sufficient length

Terminal costs

Table 6.1 World Bank toolkit

No.	Section
1	Introduction and basic conditions
2	Handover
3	Project control and finance
4	Extension works
5	Operations
6	Fees
7	Legal and insurance
8	Hand back
9	Legal and insurance
10	Performance
11	Legal and insurance

Source: Adapted from Monios, J., Bergqvist, R., *Research in Transportation Business & Management* (*RTBM*), 14 (March). 1–3, 2015.

Loading and unloading ships at an intermodal container terminal, we can manage, *average waiting time*

- Utilization of the system is less than 100%
  - no ship has to wait
  - **U = p/m * a** where p is the **number of hours** needed to load/unload a ship,
    - **a** is number of hours that pass between arriving to be loaded/unloaded
    - **m** number of **container cranes**
  - U < 100 %
- But **existing variability** following a given probability distribution to be predicted with
  - Tq = p/m * (u (exp squareroot(2*m+1))-1) /(1-u) * (((CV*a exp2) +(CVp exp2))/2)
  - Cva and CVp represent the coefficients of variation of the probability distribution used to model variation in the processing and inter- arrival time.

$$T_q = \frac{p}{m} * \frac{u^{\sqrt{(2*(m+1))}-1}}{1-u} * \frac{CV_a^{\ 2} + CV_p^{\ 2}}{2}$$

Intermodal life cycle

Length	Planning, funding and development 3 to 10 years	Finding an operator 1 to 2 years	Operations and governance More than 10 years	Extension strategy More than 15 years
Main stake holders	Public infrastructures (authorities) Terminal operators Large shippers Ports Rail operators	Public infrastructure Terminal operator Terminal owner	Public infrastructure Terminal operator Terminal owner Rail operator	Public infrastructure Terminal operator
Main activities	Planning and design Funding construction	Business design Ownership model Contract development	Responding to changes in technology and demand	Renewed concessions Potential changes in ownership Potential expansion
Main influences	Market demand Location of competitors Avaibility of innovation and technology	Public policy Market structure to terminals and rail operations	Market structure (rapid change) Competition and technology	Declining demand Changes in distribution strategies Competition Demand for land
Relevant policy and regulatory issues	Interface between transport administration and infrastructure owner Government policy	Interface Rail regulations	Interface Rail regulations Government policy	Gobernment policu (modal shift, economice development) Incentives

SUM UP

Discussion

- Compare for and against
  - Bulk
  - Container
- What key indicator we look for

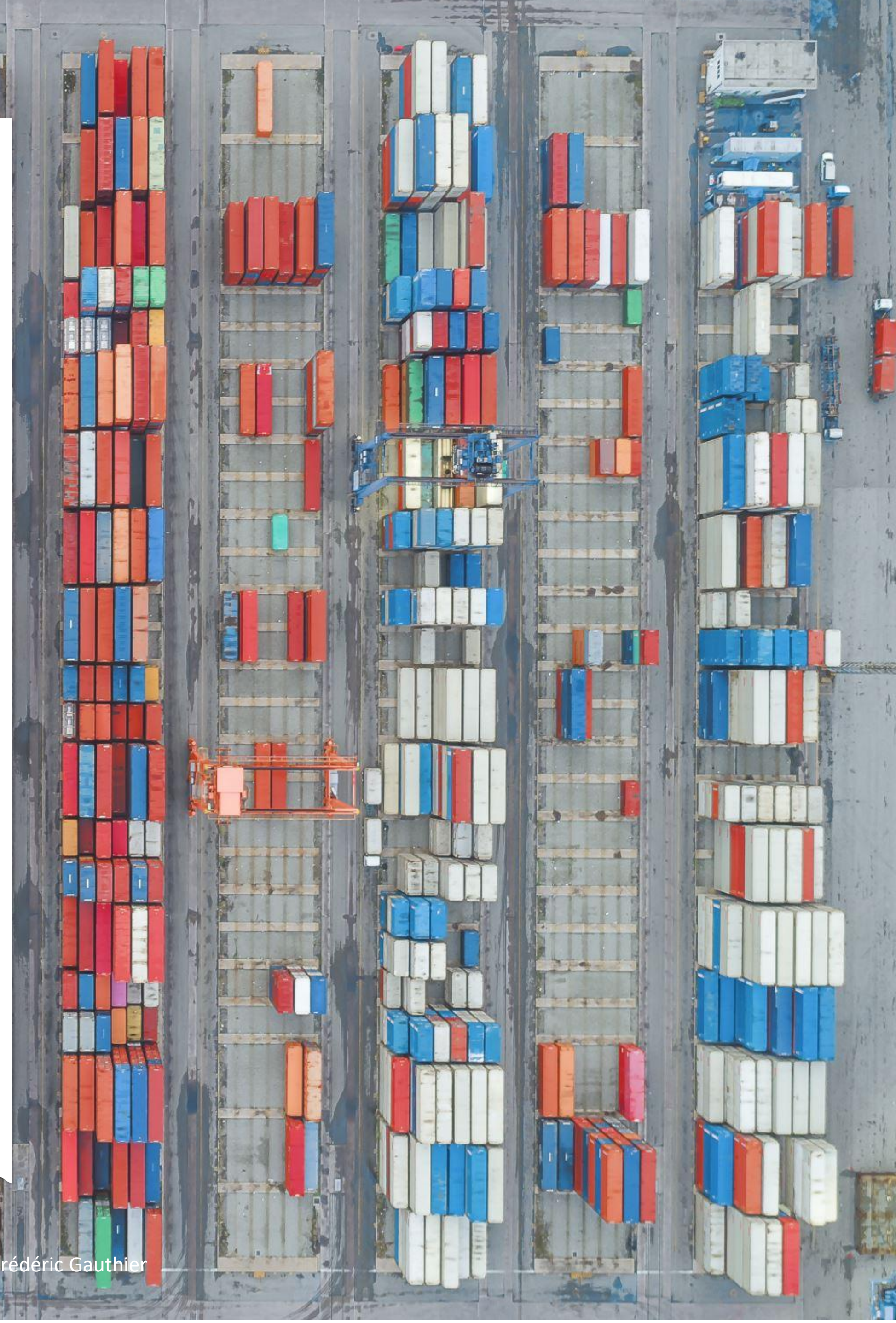
	Ro-Ro operations	Lo-Lo operations
Number of TEU carried in 7x24 hours	2800	2100
Round trip time	84h	108h
Time in port per round trip	12h	36h
Transport time stack to stack	42-48h	54-72h
Transport cost stack-to-stack per unit (20 /40ft)	209 / 338	338 / 399

- Improvement in port performance
  - Ports and opening hours
  - **Terminals**
    - Indicators ISO
    - Global 40 €per TEU
    - Value example
      - PSA Singapore purchased 20% of Hutchinson port Hong-Kong 4.4 billions $
  - World leading ports by productivity

1. **Shanghai** (China): 47.28 M TEU +0.5% compared to 2021
2. **Singapore** (Singapore): 37.29 M TEU -0.5% compared to 2021
3. **Ningbo-Zhoushan** (China): 33.36 M TEU -6.8% compared to 2021
4. **Shenzhen** (China): 30.04 M TEU +4.3% compared to 2021
5. **Qingdao** (China): 25.66 M TEU +7.6% compared to 2021
6. **Guangzhou** (China): 24.60 M TEU +1.7% compared to 2021
7. **Busan** (South Korea) 22.07 M TEU -2.9% compared to 2021
8. **Tianjin** (China): 21.03 M TEU +3.7% compared to 2021
9. **Los Angeles-Long Beach** (United States): 19.04 M TEU -5.3% compared with 2021
10. **Hong Kong** (China): 16.64 M TEU -7.0% compared to 2021
11. **Rotterdam** (Netherlands): 14.46 M TEU -5.8% compared to 2021
12. **Jebel Ali** (UAE): 13.97 M TEU +1.6% compared to 2021
13. **Antwerp-Bruges** (Belgium): 13.50 TEU -5.5% compared to 2021
14. **Port Kelang** (Malaysia): 13.22 -3.8% compared to 2021
15. **Xiamen** (China): 12.42 TEU +3.1% compared to 2021
16. **Tanjung Pelepas** (Malaysia): 10.51 M TEU -6.5% compared to 2021
17. **New York** (United States): 9.49 M TEU +5.3% compared with 2021
18. **Kaohsiung** (Taiwan): 9.49 M TEU -3.9% compared to 2021
19. **Laem Chabang** (Thailand): 8.74 M TEU +2.5% compared to 2021
20. **Hamburg** (Germany): 8.35 M TEU -5.4% compared with 2021

Main gateways

- Gateway regions are groupings of gateways that are organized along a major corridor.
    - **The Yangtze River Delta** (Shanghai, Ningbo, Nanjing) is the most important gateway region, with a combined index of 8.9% of the world's containerized and air cargo freight
    - **the Pearl River Delta** (Hong Kong, Shenzhen, and Guangzhou) (8.6%)
    - **the Strait of Malacca** (Singapore, 6.7%)
    - **the Rhine/Scheldt Delta** for Western Europe (Antwerp, Rotterdam, 3.5%)
    - **Southern California** (Los Angeles area, 1.4%) for the American West Coast.
- **Air**
    - air cargo carries a high share in gateways such as Dubai, Seoul, and Bangkok



Classification

Port	Country	Container Volume (TEU)	Remarks
Port of Shanghai	China	47.0 million	Largest container port in the world
Port of Singapore	Singapore	37.2 million	Known for its efficiency
Port of Rotterdam	Netherlands	14.8 million	Largest port in Europe
Port of Hamburg	Germany	8.7 million	Investments in green technologies
Port of Los Angeles	United States	9.2 million	Largest port in the United States

Referring Porter model

determinant	components	Container port competitiveness
Factors	Endowment hierarchy	Availability of skilled, motivated human resources Favourable maritime access Strategic geographical location Stable climate High quality port infrastructure Good transportation network to access hinterland Communication infrastructure Available capital investment Available knowledge (technical …) Support to factor creation

Endowment = dotation

determinant	components	Container port competitiveness
Demand conditions	Composition Size and growth pattern internationalisation	Quality of demand to answer properly Segment structure of demand to develop proper priorities to terminal operator Sophisticated users window to future user needs Size of demand (scale economies, uncertainty and technological requirements) Important number of users = faster innovation Rapide demand growth = facilitate investments Early saturation pressure to upgrade Domestic user needs into foreign users to internagtional demand base Local users can provide customer base

Endowment = dotation

determinant	components	Container port competitiveness
Related and supporting industries	Supplier industries Related industries	Presence of internationally competitive supplier industries and supplier related industries

Endowment = dotation

determinant	components	Container port competitiveness
Firm strategy Structure rivalry	Goals Domestic rivalry New business formation	Management practices and mode of organisation must occur with national circonstances Succeed when goals and motivation stimulate unusual commitment and effort Status of national priority znf/or prestige attracts outstanding talentand resources Importance of sustained commitment Successful operators compete intensely for home market and pressure each other to improve and innovate New business formation feeds the process of innovation

Endowment = dotation

determinant	components	Container port competitiveness
Chance	Events beyond ability of firm and government influence	Capitalise on opportunities created from discontinuities that shift competitive advantage Potential impact from government policies
Role of government	National, regional and local	Opportunitiey to work together with government to reinforce competitive advantage

Endowment = dotation

$$T_{xt}^{k} = 2G_{xt}^{k}F_{xt}^{k}\frac{\sum_{h=1}^{n}V_{xt}^{kh}}{n} = 2G_{xt}^{k}F_{xt}^{k}W_{xt}^{k} \qquad \ldots(7.1)$$

where: T denotes ASC, which is measured in TEUs, that called at port X for a particular service k for time period t;

G number of calls made at port X for the whole service loop;

F frequency of call in a year;

V_h capacity of vessel h for n vessels employed; and

W average capacity of vessels employed for $W_{xt}^{k} = \frac{\sum_{h=1}^{n}V_{xt}^{kh}}{n}$.

Annualized Slot Capacity

- Service AES2 of the CHKY alliance
  - Port of rotation
    - Hamburg-Le Havre-Singapore-Hong Kong-Kobe-Nagoya-Tokyo-Shenzhen-Hong Kong-Singapore-Port Said-Rotterdam-Felixstowe-Hamburg
  - Regions connected to : NW Europe, SE Asia, East Asia and Near East
  - Trade routes connected to : Europe – Far East
  - Service partner : COSCO, Hanjin, K Line, Yangming
  - Service frequency : weekly
  - Vessels employed : 8 (by K Line)
  - Total vessel capacity employed : 44,780 TEUs
  - 1x5500 TEU, 5x5600 TEU and 2x5640 TEU

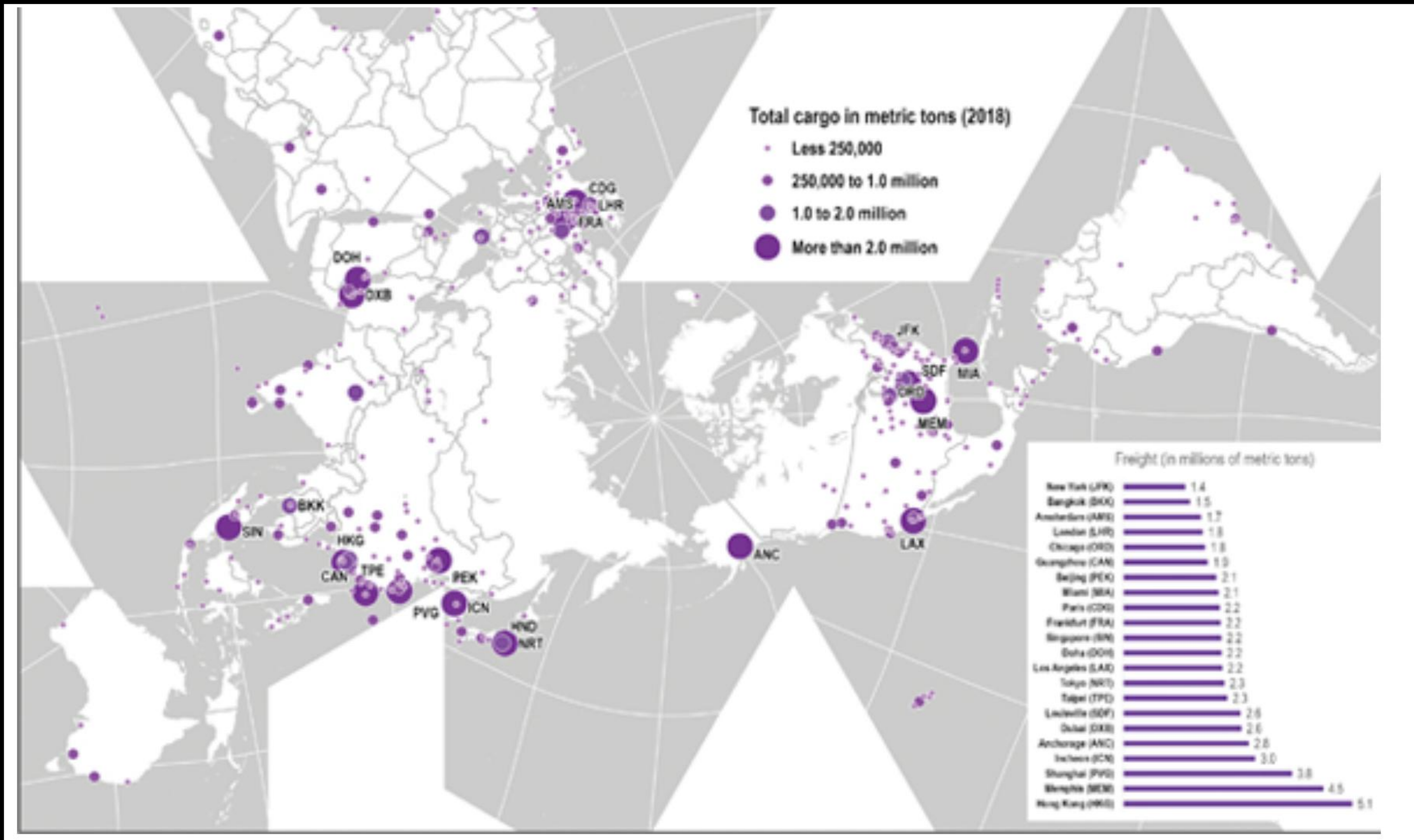
for $G_{xt}^{AES2} = 1$; $F_{xt}^{AES2} = 52$; and $W_{xt}^{AES2} =$

Gauthier

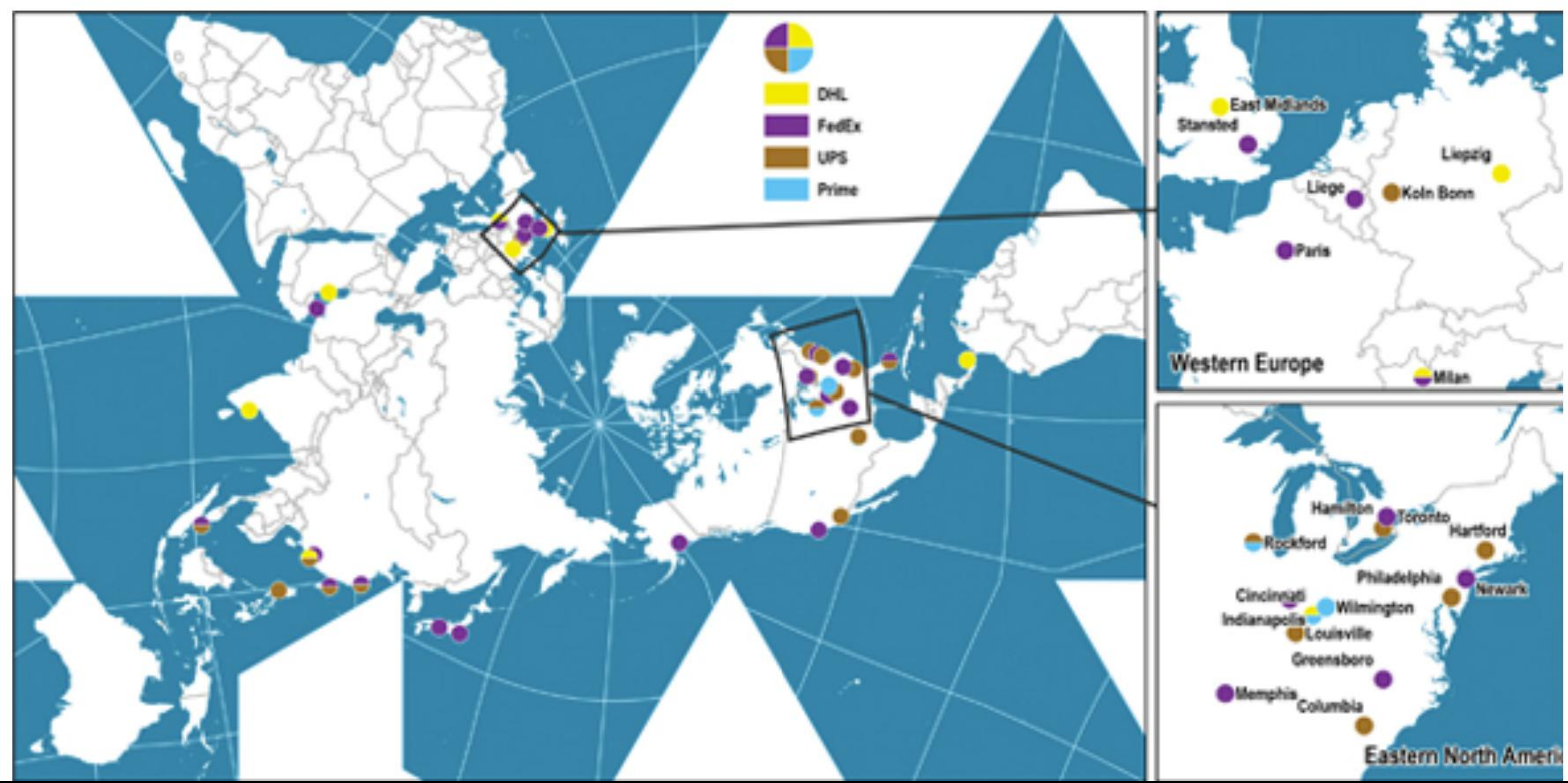
5,597.5).

- Other modes
  - RoRo forklift trucks
    - Very short mast
  - Inland transport development
    - Russian federation
      - More than 200 millions tons
    - Yangtze river
      - More than 1billion tons
    - Wuhan more than 300 000t 1000 kms from Shangai
    - **Railway transport**
      - EU
      - Russia
      - USA
        - More than 3 billion ton km
      - Corridors
        - Asia / Europe mainly China

6-

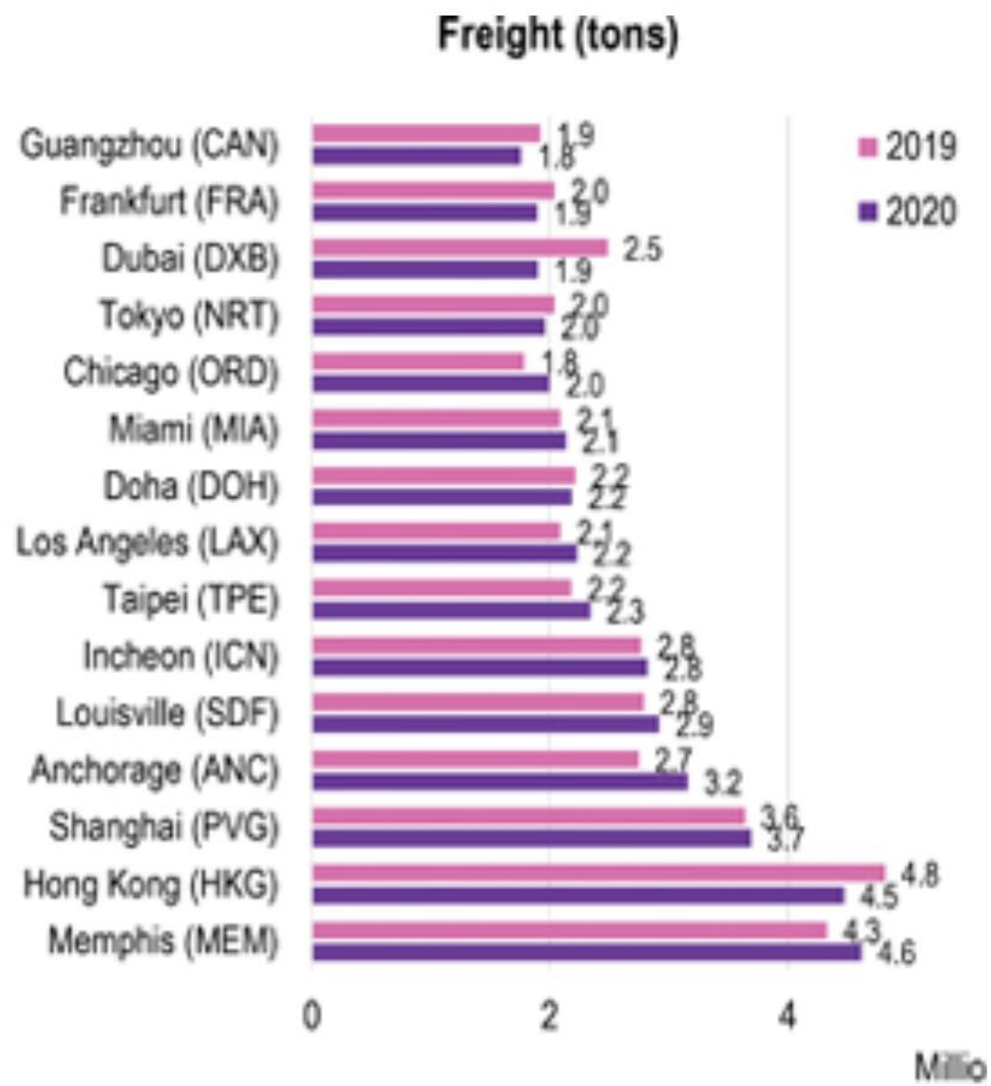


Airport terminals location



Major freight integrators

Freigth tons



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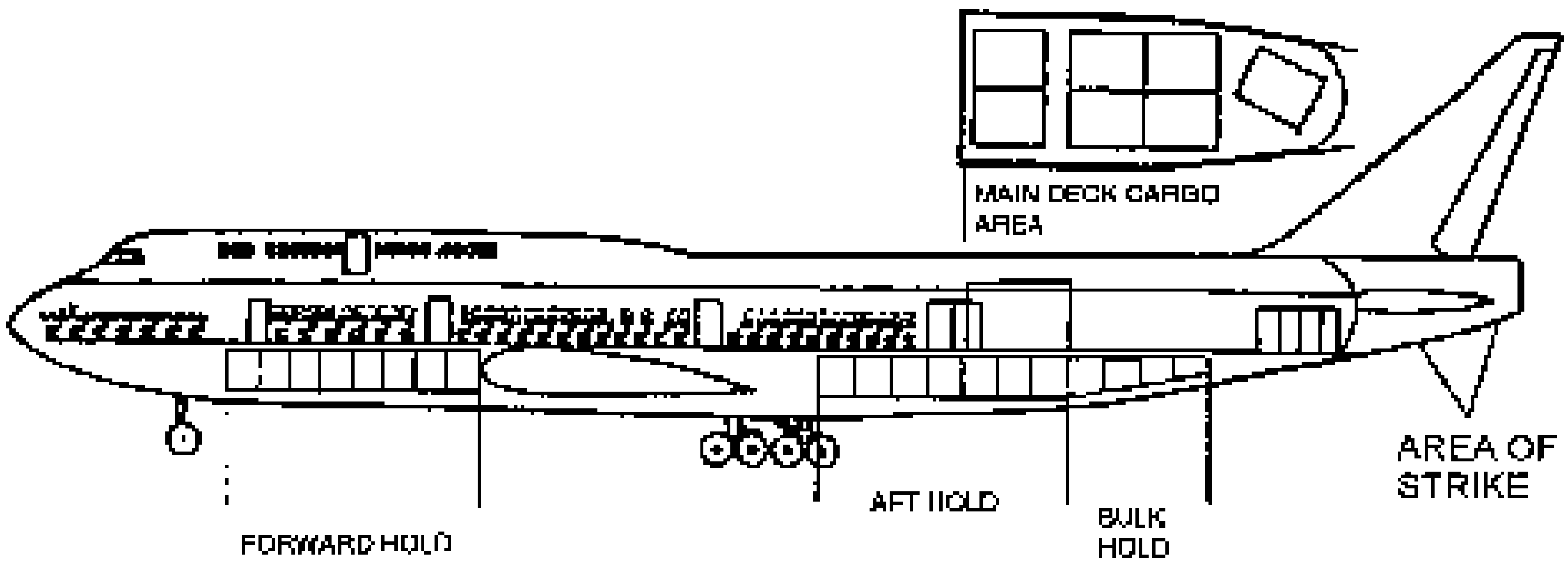


- Cargo handling at airports
  - Traditional airports
    - Primarly passenger traffic
  - Freight for domestic flights
    - Frequent schedules
  - Freight for international flights
    - Stored at gateways
    - Seasonal fluctations
  - Terminals and equipment
    - More storage space
    - Handling equipement

6-

REMINDER

- Cargo handling at airports
  - International shipment
    - Tracking and clearing systems
    - Taking priority import freight ?
  - Classification of handling equipment
    - Combi airplane
    - Scissor lift platform …
    - Nose : mechanical loading
  - Intermodal air surface containers
  - Small package express equipment
    - Door to door
    - Upper segments
  - Intermodal airports and equipment
    - Strategically located
    - And traditional carriers

SUM UP

Discussion

- Port and airport performance key indicators
- Port and airport according to transport flows

Part II- goods flows in the world

1- Global Production Networks

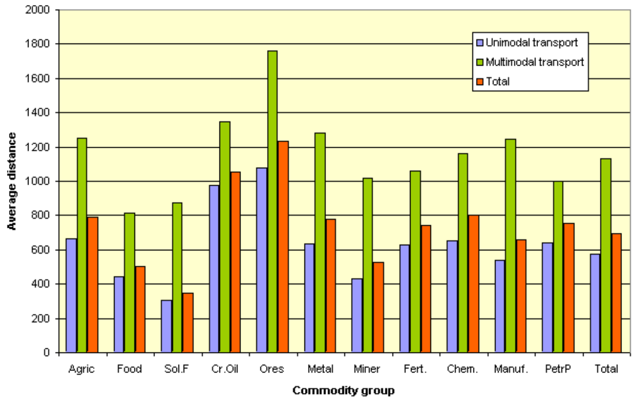
2- trends

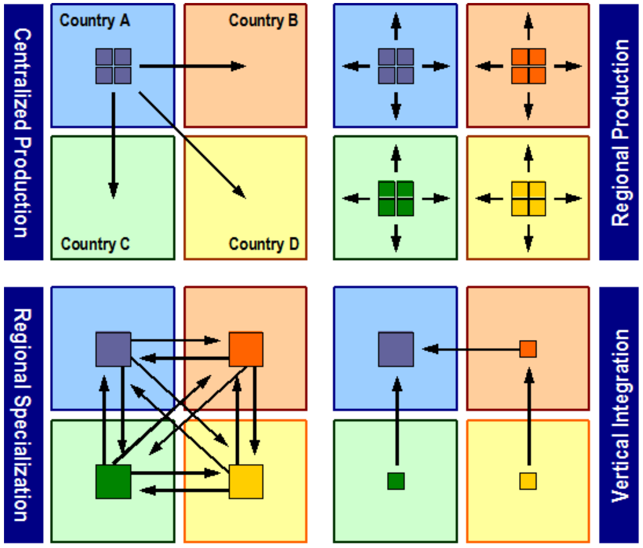
3- flow studies

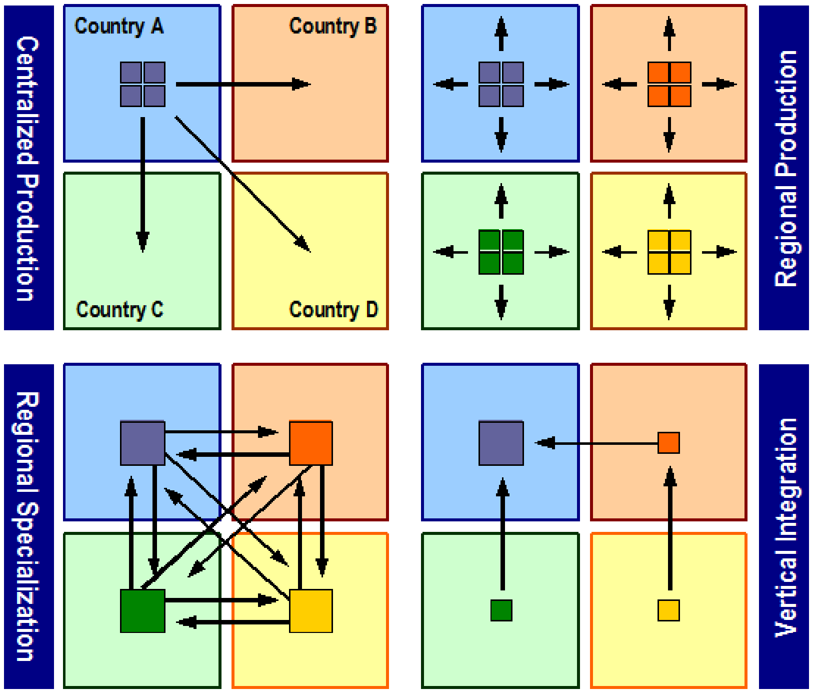
4- multimodal and intermodal transport, possible answer to congestions

1- Global Production networks

- Concept : a cross border arbitration
- GPN and Supply Chain Management
  - Fragmented now and shifted toward periphery
  - Global and regional
    - close interrelationship
  - Horizontally integrated
    - Vertically disintegrated
    - Small and large companies
    - **Goal :** a large number of products through a few processes
    - Maximum revenue through economies of scale

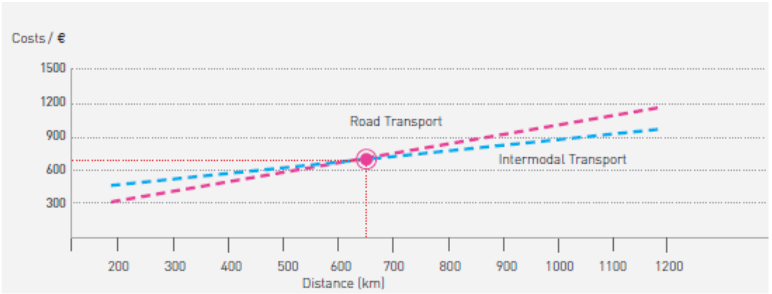






1- Global Production networks

- GPN and global Production /Distribution
  - Major transport modes have made new manufacturing locations
    - Combining labor cost, services, other ressources
  - Transnational corporations
    - More then 40% of US imports from overseas subsidiaries
  - Free trade agreements
    - EU, NAFTA, APEC …
  - Transport deregulation
  - Trade concentration



4- Multimodal and intermodal transport possible answers to congestions

- Continental approach
  - Multimodal and inter continental leading
- Underutilization
  - In continental distances
- Transport cost by mode
  - More than 50 billions @ in EU in congestion

4- multimodal and intermodal transport possible answers to congestions

Shippers and consignees

- Supply chain : risk of stock-out, lost business
- Level of safety stock : delayed shipment, longer transit time congestion over charges, higher inventories

Shipping lines

- Longer waiting time for berth
- Bypassing intended ports of call : higher fuel costs, lost business, higher feeder costs, reduced capacity

Container terminal operations

- Additional stack movements : longer cycle times, increasing handling cost, higher labor cost, reduced capacity
- Intermodal operators
  - Disruption to schedule, longer waiting times, missed connections, higher operating costs

Safety gantry for containers

- Evolution

Decade	Cost	Height	Reachable deck
1960	0.75 M $	19 m	Till 35 m
1970	2.4 M $	25 m	Till 39 m
1980	6 M $	30 m	Till 47 m
2000 …	8 M $	40 m	53 m and more

4- multimodal and intermodal transport possible answers to congestions

Traditional players and new ones

Horizontal and vertical integration

Rail integrating forward

Better loyalty

(ERS carrier haulage, Merchant Haulage market)

Seaport terminal market (Hutchinson, P.SA.A, P&O, Eurogate…) vs specialization = railway operator, shortsea operator (ECT, DeCeTe)

Explosion in BRIC trade : Brazil, India, Russia … ? China

Asian ports more than 55% of container traffic and 50% export

Port ranking examples

Asia : Shanghai, Singapore, Hong-Kong

Middle East :Dubai, Salaha, Jeddah

Europe : Rotterdam, Antwerp, Hamburg

Africa : Port Said, Durban, Tangier Med

Part III- Intercontinental distances

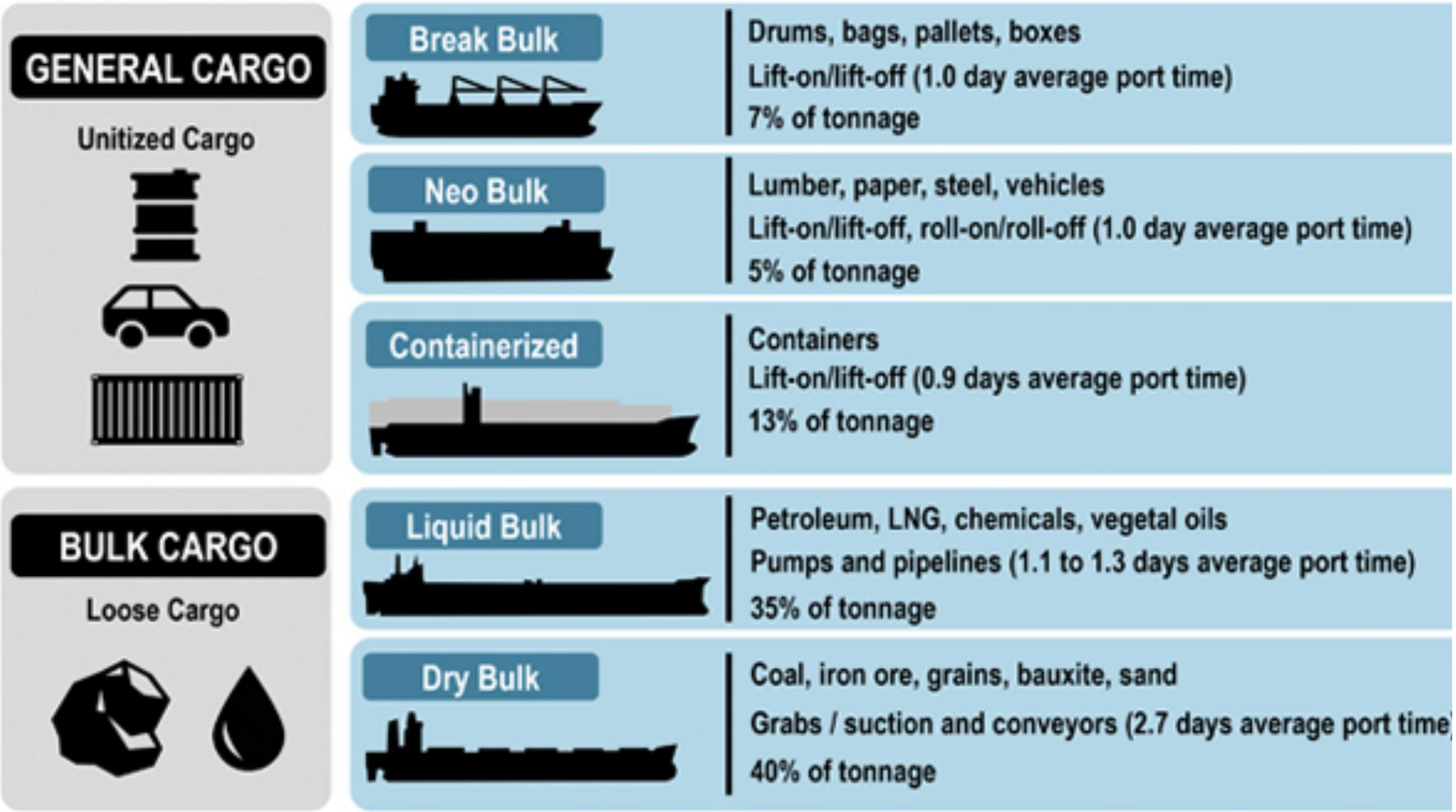
1- International transportation

2- Loading units

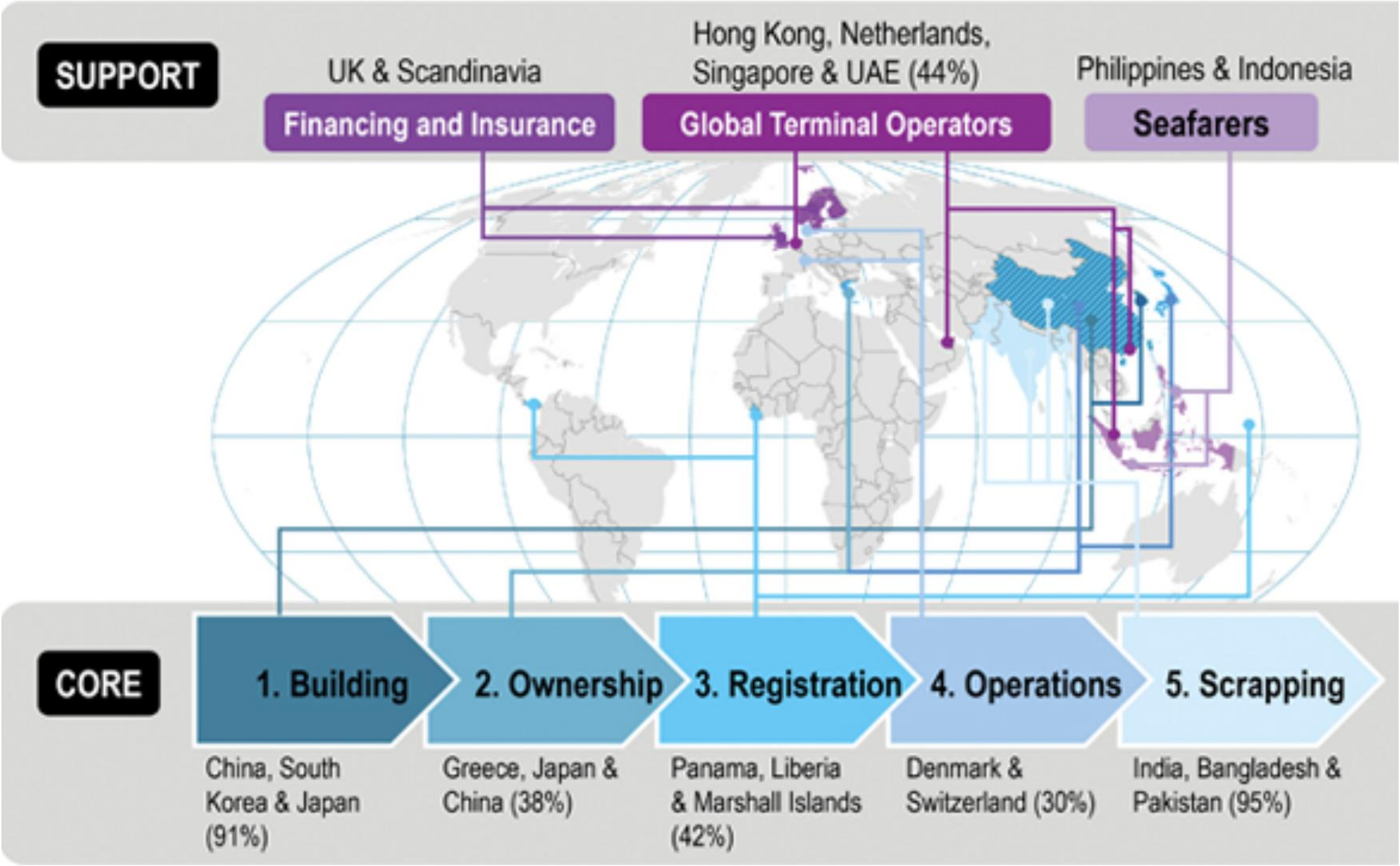
3- Combination of modes

4- Case studies

SEA TRANSPORT



Sea industry



1- International transportation

- **Development of ships**
  - Ship : vary considerably in size
  - Set routes
  - Sea containers
  - ISO standards
    - ISO 668:1995 classification, dimension and rating
    - ISO 6346:1995 Coding, identification and marking
    - ISO 1161:1984 Corner fittings- specification
  - Short sea shipping – semi trailers
- Development of relevant infrastructures

Set routes

- **Planning and designing Transportation Route Transport geography**
  - It refers to the possibility to transport the goods on such route from origin to destination **via available transit points.**
  - Selection of the modes of Transport and routes.
  - Hub or Connecting Point Along the designed corridors, **where is the best hub to be used**. Some time
    - not necessary to use Major Hub.
  - Availability of Common Carrier in designated planning of transport routes
    - **Common Carrier** is very important factor = when planning and designing for Transportation Route whether they are available in such planned routes.
    - Such carriers are able to carry the goods **according to the nature of the goods.**
    - Measures of Carrier rules may not allow to do something with their equipment.

      example DHL use SOC from EU to Japan

Current Situation along the corridor

MTO shall identify = current situation from origin to hub or connecting point and from **connecting point** to next connecting point and final destination.

Set routes

- Planning and designing Transportation Route Transport geography
  - Example
    - **Pain Point in wrongly selection of Hub** – real life
      - Normally, shipment ex Bangkok to Rotterdam transit time is 24 days.
      - **Back log of sea freight was two weeks**, shipper has no choice but to call MTO to find solution that shipment should arrive within one month
      - MTO decided to use Bangkok – Dubai by sea and connect from Dubai to Rotterdam by Air as the best route.

    Pain Point in wrongly selection of Hub – real life

      - After shipped out MTO **found out that Dubai port was congested** and containers were remained in port for two weeks whist the transit time from Bangkok to Dubai took already two weeks.
      - Getting the goods out of the port, MTO in Dubai faced to **back log of the airfreight another one week.**
      - Total Transit time is 5 weeks and two days.

Set routes

- Planning and designing Transportation Route Transport geography
  - Alternative Transport Corridors and Customer Needs **The best plan is to match** with the customer needs and requirement
  - there should be **flexible to have alternative corridors** in the plan.
  - It is not necessary that major hub or gateway shall be used at all time.
  - **CASE STUDY : Shipment ex Laem Chabang, Thailand to Kaiserslautern, Germany**
    - Laem Chabang – Rotterdam – Mannheim – Kaiserslautern
    - Laem Chabang – Hamburg – Mannheim – Kaiserslautern
    - Laem Chabang – Hamburg – Mainz – Kaiserslautern

Infrastructure and Equipment at transit or connecting point

The **availability of** Free Zone, ICD including standard or special equipment is important based on nature of the goods, handling method, and customs formality at transit point.

Set routes

- Planning and designing Transportation Route Transport geography
  - Operation of Transit / Transshipment at Transit point
    - The **customs process of transit point is very important factor**.
    - It could create delay with full range of formality in some countries or even transit could not be made
    - for **example in Cambodia**, there is no regulation for transit for the time being.
  - Operation of Transit / Transshipment at **Transit point In Singapore**
    - Only registered as Forwarder, cargo agents can submit Transshipment permit application if the shipment is covered by Through B/L or Airwaybill in order to perform transit procedure.
  - **In Thailand**
    - If MTO are not licensed Transit Operator (must place Bank Guarantee with Customs) , such MTO must place Bank Guarantee to cover the Customs Debt before processing transit formality.

Set routes

- Planning and designing Transportation Route Transport geography
  - **Operation of Combination Transport system in ASEAN – CASE STUDY**

    a) Shipper at First Philippine Industrial Park wishes to send his goods to Dagon 2 in Yangon, Myanmar.

      a) use SEA/SEA mode transshipped at Singapore if he controls transportation **but the shipment is FCA term.**

    b) **Consignee prefers** to use Multimodal Transport via Singapore, Malaysia and Thailand to Myanmar due to some **reasons such as customs procedure, transit time** .

    c) **Possible mode of transport**

      Feeder vessel from Manila South Port to Singapore Truck from Singapore to Yangon

    d) **Players involve**: Myanmar MTO, Philippines MTO and Singapore MTO In Transit Truck Operator

    MTO Philippines use Feeder vessel to Singapore and request his agent, MTO Singapore to handle trucking to Yangon.

    MTO Singapore has no truck license of in transit transport under AFAFGIT and AFAFIST , then he has **to hire Licensed Truck Operator**.

    MTO Philippines acts as Carrier for MT operation

    MTO Singapore acts as subcontractor of MTO Philippines

Set routes

- Planning and designing Transportation Route Transport geography
  - **Operation of Combination Transport system in ASEAN – CASE STUDY**

    MTO Singapore enters into ACTS as **Principal and responsible for customs debts** along the transport corridor from Singapore-MalaysiaThailand-Myanmar where his guarantors shall be located there.

    Transit Transport Operator (Licensed Truck) is responsible to carry the goods along the corridors according to their Standard Trading Conditions or applicable international laws or local laws.

    MTO Philippines issue MT Document to Shipper and Shipper send such MT Document to Consignee.

    MTO Myanmar acts as MTO Philippines ‘s Agent – **Delivery Agent**

    Who is Who in this scenario:

    MTO Philippines = Principal or Carrier on MT Document MTO Singapore = Agent of MTO Philippines and Principal in ACTS MTO Myanmar = Destination Agent of MTO Philippines LICENSE TRUCK OPERATOR = COMMON CARRIER MTO Myanmar deals with Consignee for the carriage **but Shipper in Philippines is the party who concludes the contract of carriage with MTO Philippines**.

    Note:

    1. If MTO Singapore wishes not to become Principal in ACTS, he may **ask Licensed Truck Operator to act as Principal in ACTS** , in case both parties agree so.
    2. **Cross border transport Operators** can be divided in two types
        1. a) Licensed Truck Operator – owner of trucks
        2. b) Principal which can be Licensed Truck Operator or MTO, forwarder or exporter, who enters into ACTS declaration.

Set routes

- Planning and designing Transportation Route Transport geography
  - **Selection of Agents and Competitive Cost**
    - Select Strongest Agents in the planned Corridors. It is recommended to have Agents within the **same group of network** rather cross networking for a better communication during the journey of carriage.

      ASEAN MTO might have a weak point on networking when compare with Multinational Company likes Big 4 as their offering to client might be lower by using Cost Center scheme than Profit Center scheme.

  Risk assessment

  Political today,

  Port Congestion,

  Strike, Riot,

  Back log of common carrier,

  unforeseen cost from special handling

  Total Cost Computing

  Stuffing / Unstuffing charge and Loading / Unloading Trucking charge/ Terminal Handling Charge

  Customs Clearance Charge

  Transportation of each leg Duty & Tax (awareness of H.S.Code and declaration) Other Transport Surcharges; BAF, CAF, FAF, AMS, ENS, WAR risk, demurrage/detention etc.

  Document fee

  Agent handling charge

  Special equipment hire

Together

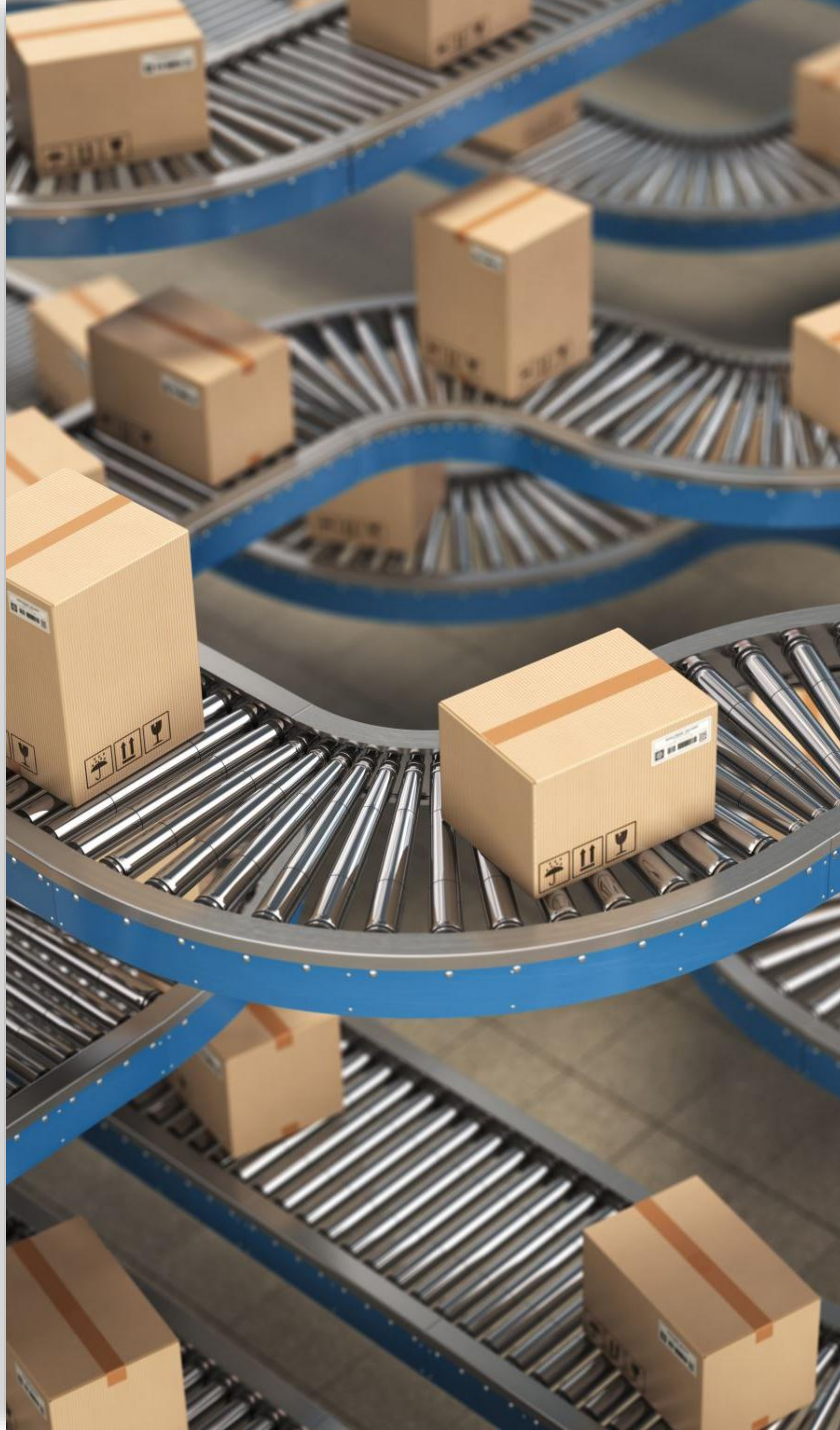
Choice of Mode of Transport

A company located in Lyon, France, needs to ship 10 tons of electronic parts to a customer in New York, USA. The most appropriate mode of transport (air, sea or rail) should be chosen taking into account the following criteria:

1. Cost
2. Delivery time
3. Reliability
4. Environmental impact

- **Questions :**

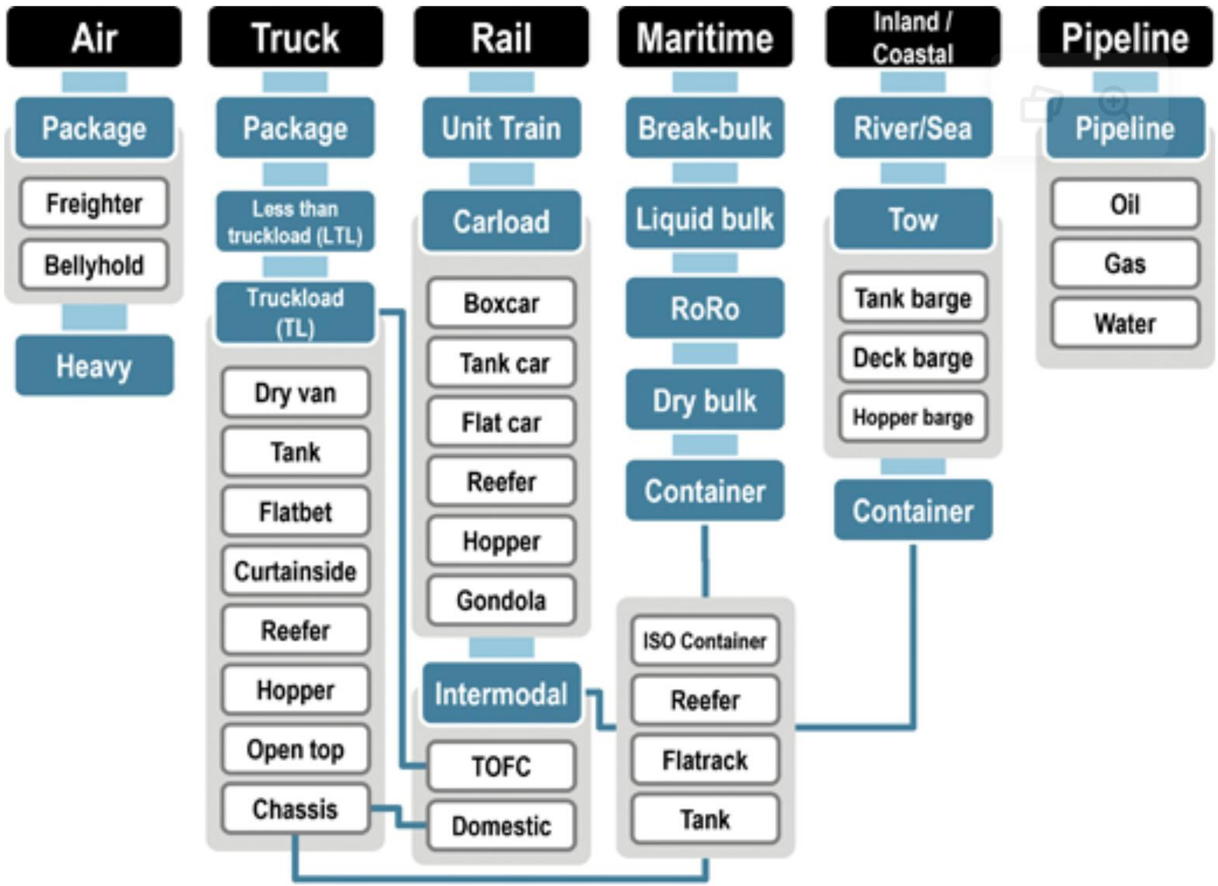
1. Compare the pros and cons of each mode of transportation for this shipment.
2. Recommend the most appropriate mode of transportation and justify your choice.



Equivalent to

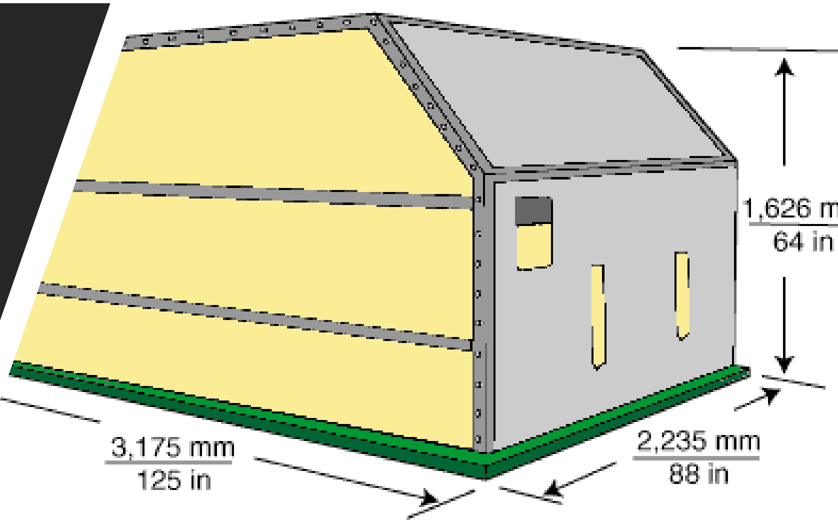
- 1 mm = 0,03937 inch
- 1 cm = 0,3937 inch
- 1 m = 1,094 yards
- 1 km = 0,6214 mile
- 1 cm3 = 0,061 cubic inch
- 1 kg = 2,2046 pounds
- 1 m ton = 0,9842 ton

Loading Units

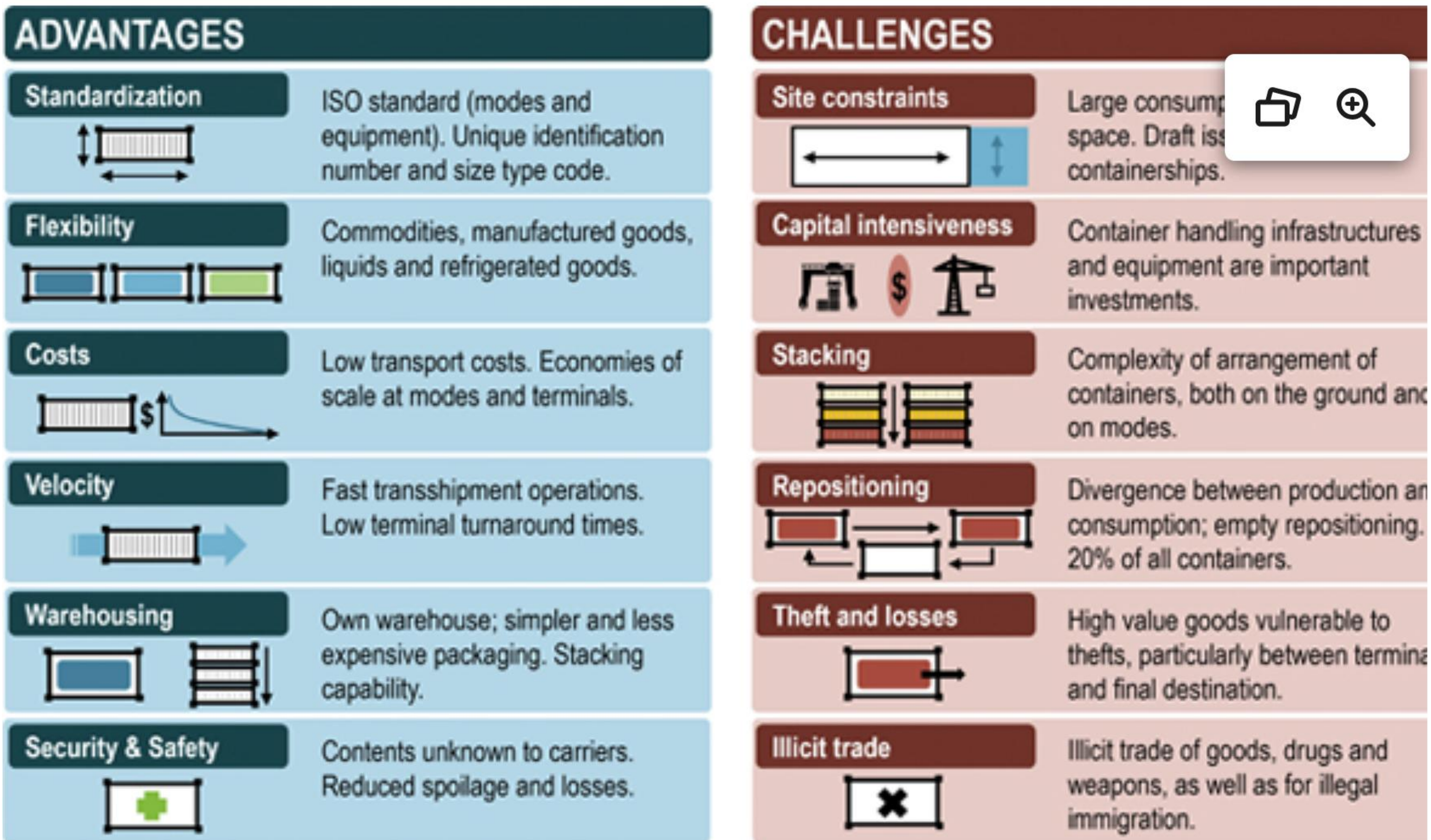


2- loading units

- Containers
- Air container
- Maritime container
  - Investments
  - 20’ 40’ containers
- Container service
  - Transit time – handling – reducing number of individual pieces of cargo
  - Substantial savings in packaging
  - No need for covered warehouse



containers


ADVANTAGES
Standardization
ISO standard (modes and equipment). Unique identification number and size type code.
Flexibility
Commodities, manufactured goods, liquids and refrigerated goods.
Costs
$
Low transport costs. Economies of scale at modes and terminals.
Velocity
Fast transshipment operations. Low terminal turnaround times.
Warehousing
Own warehouse; simpler and less expensive packaging. Stacking capability.
Security & Safety
Contents unknown to carriers. Reduced spoilage and losses.
CHALLENGES
Site constraints
Large consump
space. Draft is
containerships.
Capital intensiveness
$
Container handling infrastructures and equipment are important investments.
Stacking
Complexity of arrangement of containers, both on the ground and on modes.
Repositioning
Divergence between production an consumption; empty repositioning. 20% of all containers.
Theft and losses
High value goods vulnerable to thefts, particularly between termina and final destination.
Illicit trade
Illicit trade of goods, drugs and weapons, as well as for illegal immigration.

- Container applications
  - One way shipping
  - Static ground storage
  - Economical way to add warehouse
  - Most common size of containers
    - Standard width
    - Non ISO overlength and over width containers
    - Regional pressures
    - To cohabit at interface points

ISO Containers

Also exist **45’ (2.42 m wide), 53’**

- ISO Norm 668 to **20’ and 40 ‘ dry containers**
- Minimum size

	Length	Width	Height
	mm	mm	mm
20 ‘	5 867	2 330	2 350
40 ‘	11 998	2 330	2 350

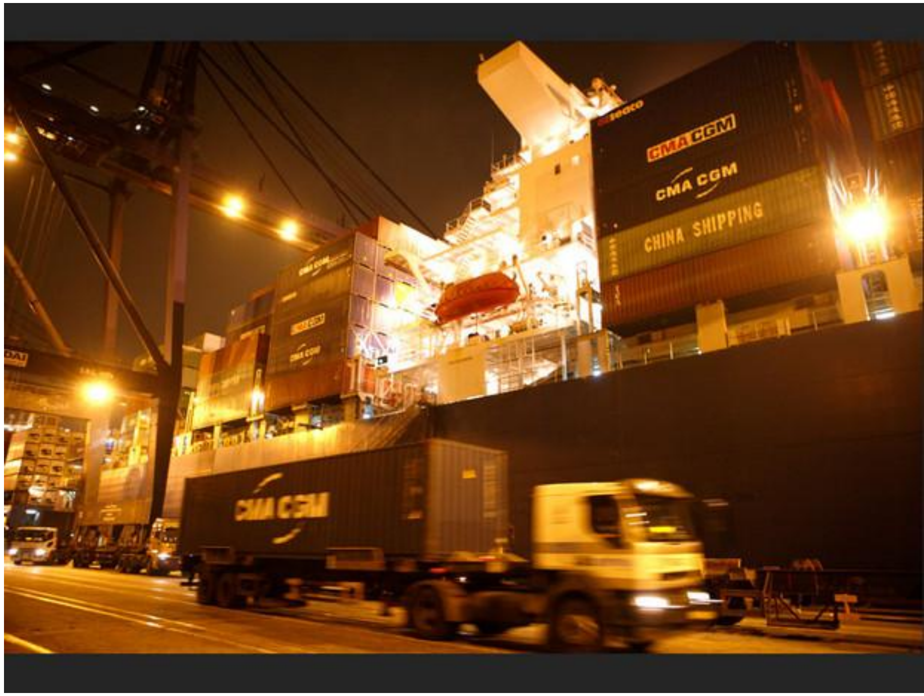
- Usual size : 2 350 wide and 2 390 mm high

	Width	Height
	mm	mm
20’	2 286	2 261
40’	2 286	2 261

Usual door opening : 2 340 en largeur et 2 280 mm en hauteur

2-

- Various containers
  - Standard
  - Hard top
  - Open top
  - Flat rack
  - Platform
  - Ventilated container
  - Refrigerated
  - Tank



- Density answer
  - Heavy goods – shorter container
  - Low density – larger containers

Discussion

- Container advantages and inconvenience

- Registration of containers
  - Interchange among carriers
  - Identification
  - Rolling stock registration
  - With a rail car

- Container identification
  - Owner MSK for Maersk example
  - U for freight container
  - Registration number (6)
  - Check digit

- Container type
  - Length
  - Width
  - Container type

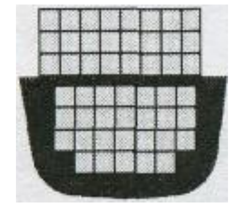
- 3 metre side height
- opening 3 sides
- 100 m³ go volume
- stackabl
TelliB x
DAF
Picture 31

- Sea container ships example
  - Fully cellular containerships
  - Breakbulk vessels
  - Container ship evolution
- Container leasing sector
  - Two major companies
  - Minor companies
  - Middle group
  - 38% of containers
- Ro/ro vessels

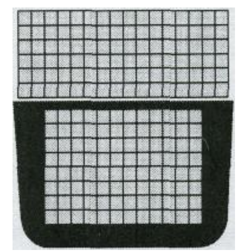
2-

1st generation

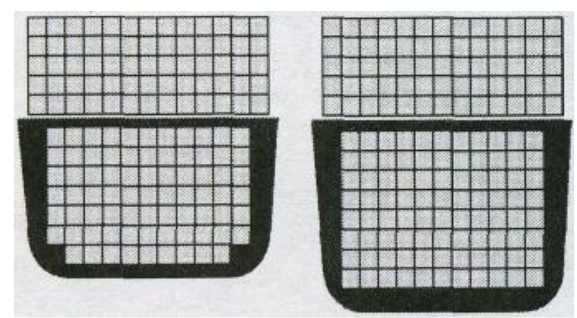
2nd generation



3rd generation



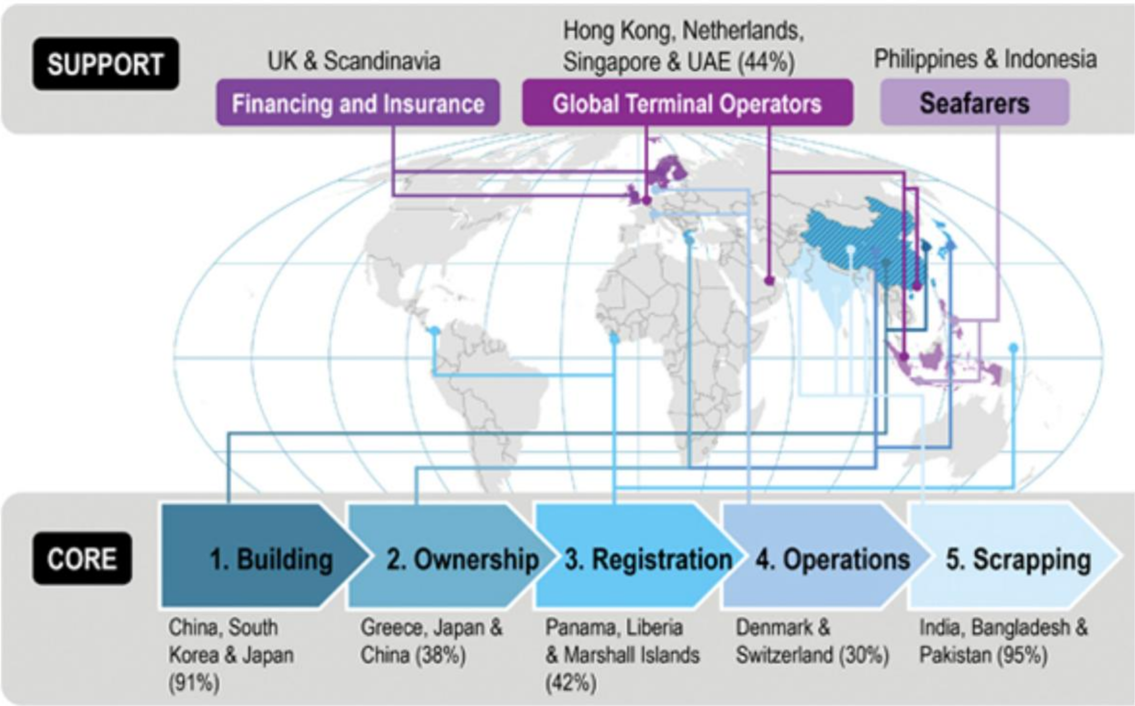
4th generation



5th generation

	TEU	Dead-weight (t)	Speed (kn)	Reefer	Length over all (m)	Breadth over all (m)	Gross Tonnage	Net Tonnage	Power (kW)	Delivery
Berlin Express	7506	100019	25.0	700	320.38	42.88	88493	36175	68640	2003
Hong Kong Express	7506	100016	25.0	700	320.38	42.88	88493	36175	68640	2002
Hamburg Express	7506	100006	25.0	700	320.38	42.88	88493	36175	68640	2001
Shanghai Express	7506	100003	25.0	700	320.38	42.88	88493	36175	68640	2002

SHIPS


SUPPORT
UK & Scandinavia
Financing and Insurance
Hong Kong, Netherlands, Singapore & UAE (44%)
Global Terminal Operators
Philippines & Indonesia
Seafarers
CORE
1. Building
2. Ownership
3. Registration
4. Operations
5. Scrapping
China, South Korea & Japan (91%)
Greece, Japan & China (38%)
Panama, Liberia & Marshall Islands (42%)
Denmark & Switzerland (30%)
India, Bangladesh & Pakistan (95%)

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Containership choice

- Annualized slot capacity
  - Eastern/Western routes 75% world capacity
  - Transpacific 35%
  - Europe Far East 20%
  - Mediterranean / Far East 10%
  - Transatlantic 10%
  - Mediterranean / US : growing
- Secondary Routes
  - 25% North / South
  - East coast / South America 8%
  - Australasia 14%
  - West coast / South America 4%
  - South Africa 3%
  - West Africa 3%

Containership choice

- Factors of container service shipping lines
  - Type of capacity vs slot charter
  - Type of arrangement : independent, pooling…
  - Size of ship
  - Type of ship : cellular …or not
  - Number of ships : round trip and service level
  - Service frequency : daily …
  - Service speed
  - Service reliability
- Ports of calls
  - Depend on trade routes
    - Asian Europe 15
    - Transpacific 7

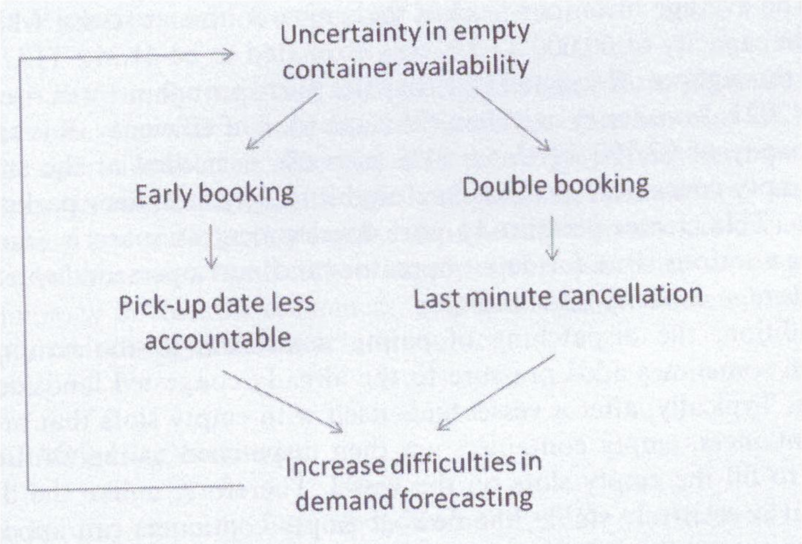

Figure 3.2: Container booking adverse cycle

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Container flows

Relocation of empty containers

Cost over 20 billions $ a year

Including

Inventory

Piggy back

Utilization of vessel space

Double booking and concellation


MAERSK LINE
© Jtashipphoto.dk

Discussion

Containership evolution after COVID 19 ?

3- combination of modes

- Airway
  - Air freight traffic
  - Intermodal air-surface containers
  - Improving aircraft turnaround
- Air / road
  - Road transport connected with long distances
  - Intermodal movements by air
    - The nature of air cargo
    - Growth in air freight cargo
    - Planned intermodality helps airfreight economics

AIR PLAYERS

Combination airlines (e.g. Korean Air)

- fleets with freighters and passenger aircraft able to carry freight
- Most of the freighter operations involve long-haul services.

Dedicated cargo operators (e.g. Cargolux) maintain a fleet of cargo-only aircraft

- regularly scheduled services between the airports they service.
- offer charter operations to cater to specific needs.

Air freight integrators (e.g. FedEx Express) operate air and ground freight services

- seamless (at least from the customer’s perspective) door-to-door deliveries.

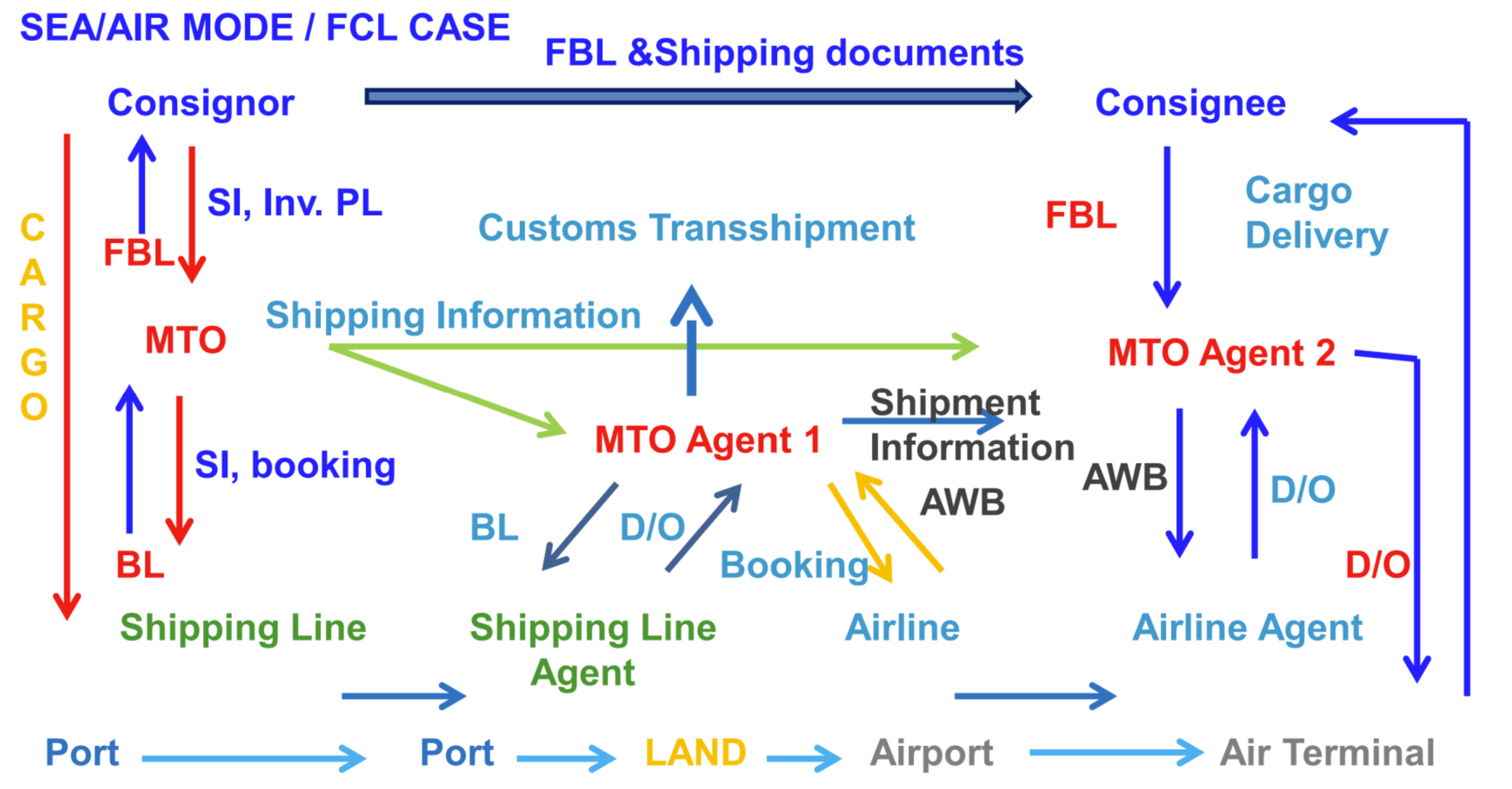
Specialized operators (e.g. Volga-Dnepr Airlines) fulfilling niche services

- cater to specific cargo requirements (e.g. heavy loads) that do not fit the capabilities of standard cargo aircraft.

3-

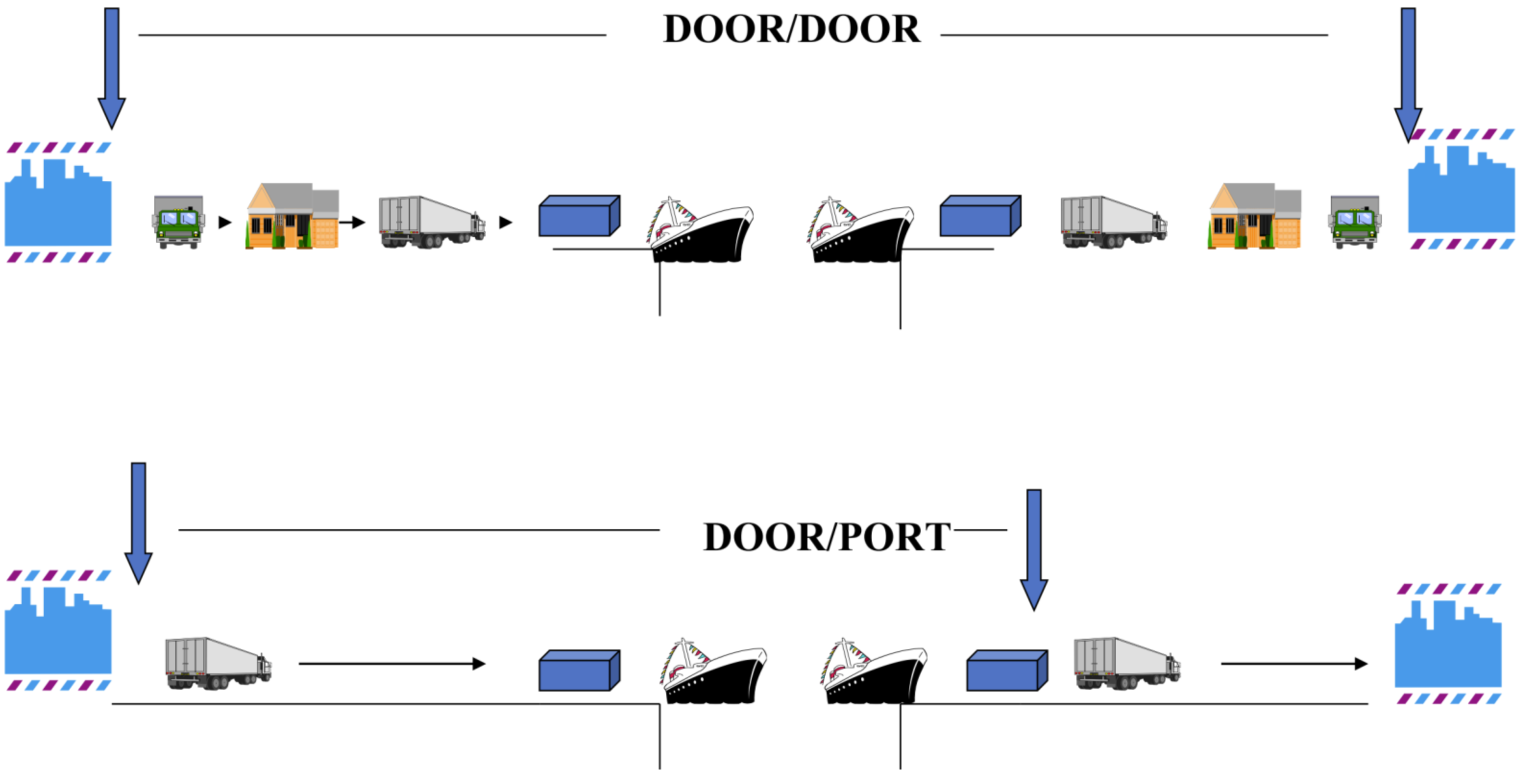
Sea-air intermodal operations	• Availability of aircrafts • To maximize sea use • Large industrialized centers
Sea air to China	
Difficulty in tracking sea air shipments	• Smaller or bigger aircrafts • Air-ground alternative
Convenient corridors	• Far East to Europe • North America / Asia
Intermodal containers	• Weight inconvenience

SEA AIR

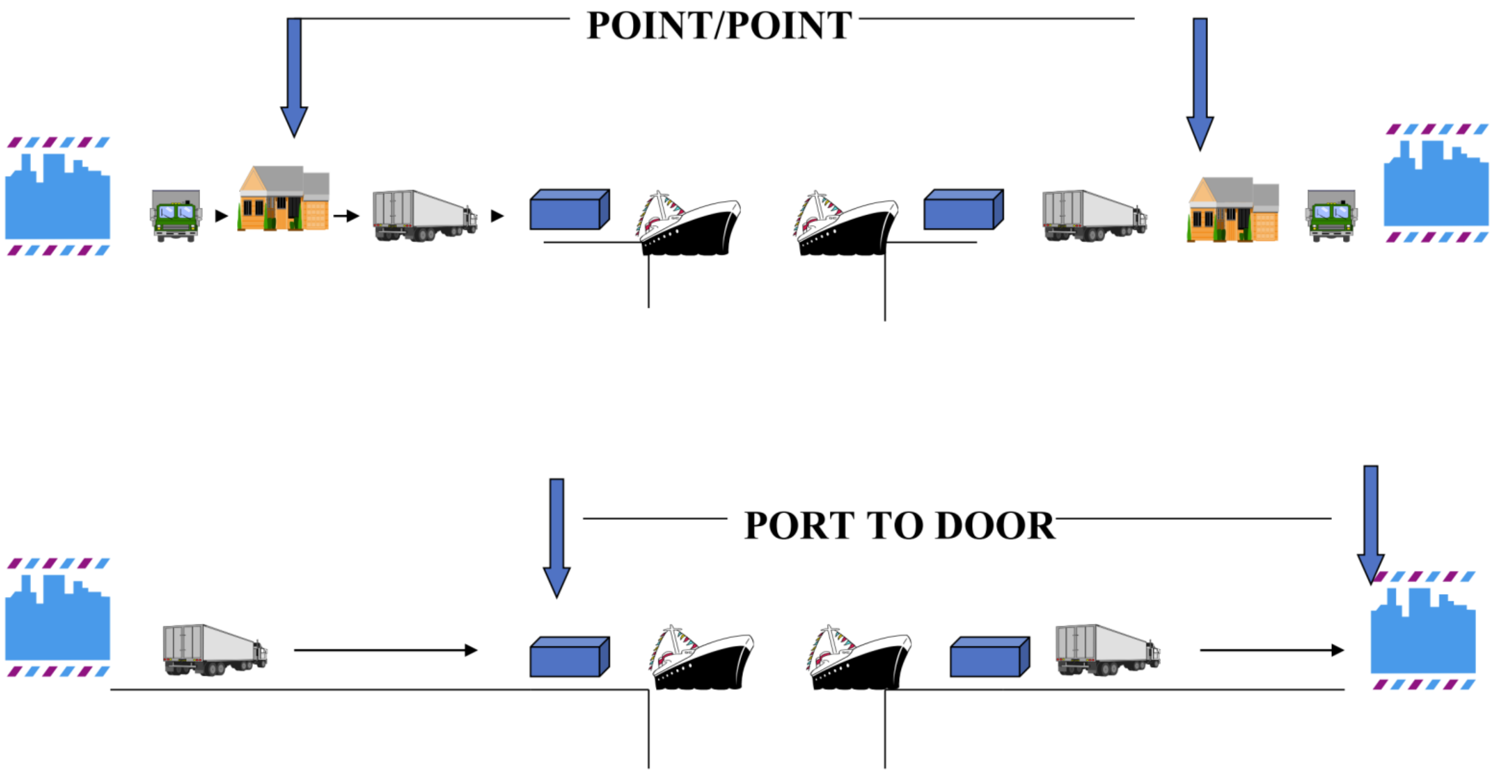


SEA/AIR MODE / FCL CASE
FBL &Shipping documents
Consignor
Consignee
SI, Inv. PL
FBL
C
A
R
G
O
Customs Transshipment
FBL
Cargo
Delivery
Shipping Information
MTO
MTO Agent 2
MTO Agent 1
Shipment
Information
SI, booking
AWB
AWB
D/O
BL
D/O
BL
Booking
D/O
Shipping Line
Shipping Line
Agent
Airline
Airline Agent
Port
Port
LAND
Airport
Air Terminal

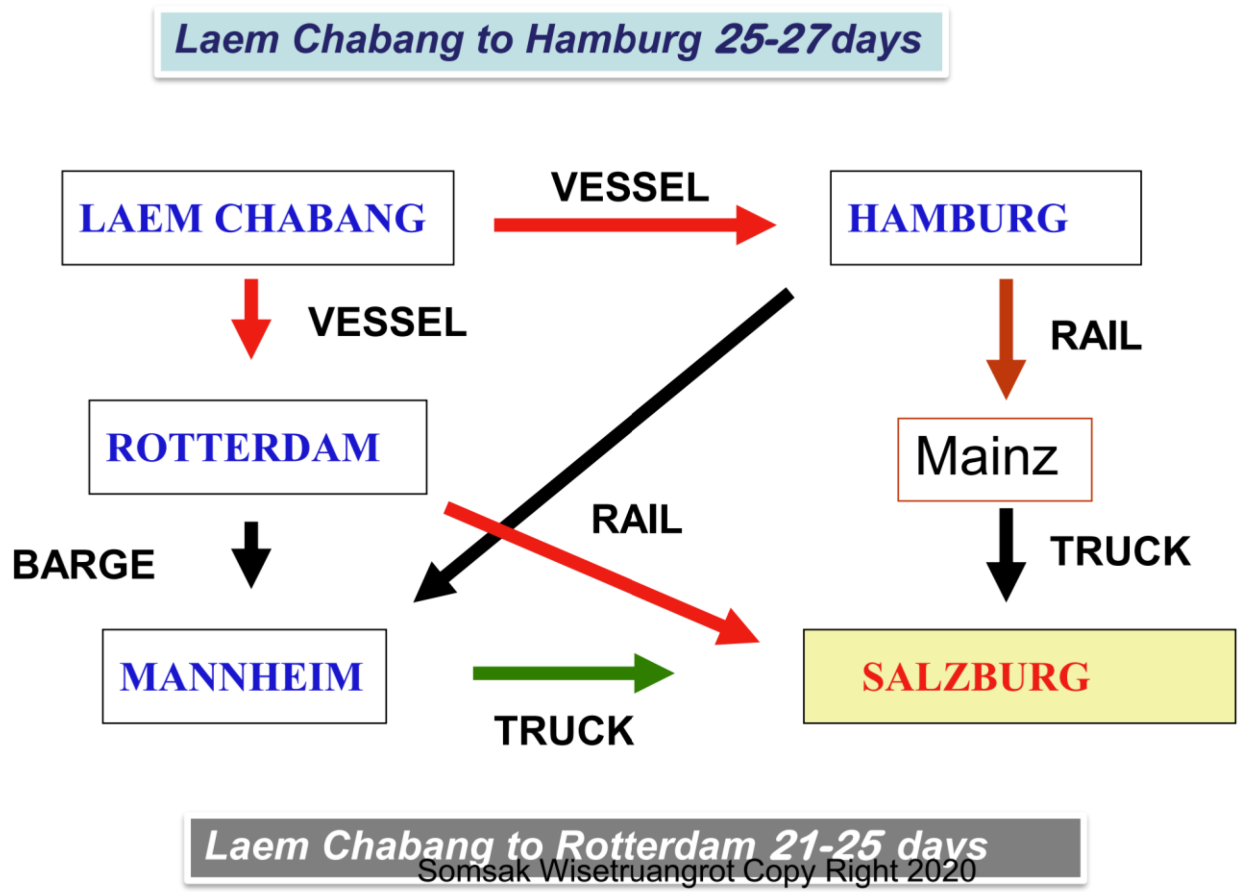
Single corridor



Single corridor



Multiple corridor



Multiple corridors

Hub of Multiple Corridors is referred as the place where the mode of transport is changed to move forward the goods to next destination. Some may refer as “**Transshipment Hub**” in Forwarder World.

However, in fact Transshipment refers as the **Customs procedure** under which goods are transferred under Customs control from the importing means of transport to the exporting means of transport within the area of one Customs office which is the office of both importation and exportation.

- *Source Kyoto Convention Specific Annex E*

Example of major hub

Singapore is not only hub for maritime transport but it is multimodal transport hub as well. Example:

- a) The meat from New Zealand is shipped by sea and connect with air transport to EU. This is the collaboration between PSA and SATS
- b) The Garment from Cambodia is shipped by sea and connected by air transport to USA.
- c) Singapore also could serve as hub for South Africa which those shipment may come from ASEAN

Malaysia is a hub for Brunei using both Unimodal Transport and Multimodal Transport as well as the gateway of Halal food to Middle East.

Thailand is a hub for Lao PDR on road-sea mode and few in road-air mode.

- Cambodia on road-air mode Myanmar on road-sea and road-air mode To/from USA, EU, Japan

Examples of major hub

- Vietnam is a hub for Lao PDR to access sea transport.
  - Most of shipment is intermodal transport rather than multimodal transport.
- Hong Kong is major hub for China for the shipment to and from any parts of the world.
- Chengdu new Corridor – to/from Europe by Rail
- “**silk road**”
  - Fiat engines have been loaded into containers at Foggia (Italy) factory and dray the containers to Nuremberg.
  - These containers are transferred to DHL train that first reached the **Polish terminal Mataszewicze,** which is directly on the external EU border to Belarus, using western corridor via Kazakhstan up to the west Chinese city of **Chengdu** and convey to the port in China for sea transport to **final destination** in Yokohama Japan.
  - Sea Transport takes 60-65 days.
  - Total transit time 35 days.

Example of major hub

- **Middle East Dubai** in UAE is major hub for Europe for the shipments from South East Asia which are shipped by sea and connect to air transport.
  - Bandar Abbas in IRAN is major hub for CIS countries. (Commonwealth of Independent States – 12 States)
- **AFRICA**
  - Mombasa in Kenya as gateway for the East African Coast
  - Nairobi as the hub of East and Central Africa
  - Cape town and Durban in South Africa is traditional hub for Africa
  - WEST AFRICA
    - Lome in Togo, Accra in Ghana is the hub for West Africa

Example of major hub

USA

Miami is major hub for South America for the shipment from Europe or Asia under sea-land-sea mode.

The Gateway of this corridor is Los Angles or Long Beach

South America

- Airport Gateway : Sao Paulo in Brazil, El Dorado in Colombia,
- Top 5 sea ports in South America = Santos, Brazil Colon, Panama Balboa Panama Cartagena, Colombia Manzanillo, Mexico

Example of major hub

- **Europe**

  All major sea ports in Europe is the gateway and hub to connect with road, rail and inland waterways transport to EU East Block. Schiphol Airport in Amsterdam and Frankfurt Airport in Germany are the major hub for Multimodal transport in EU

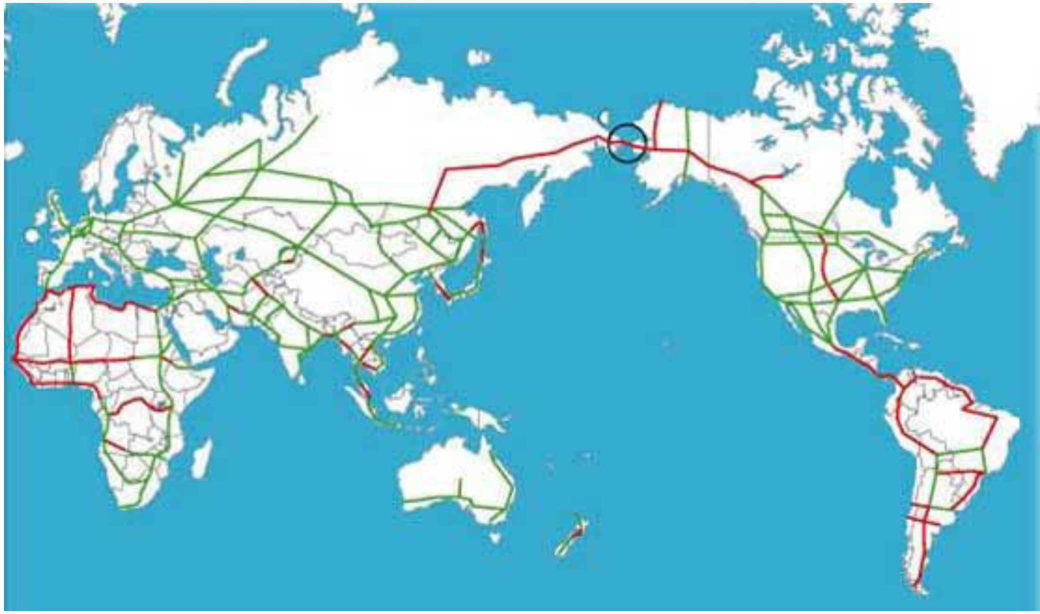
Major hubs examples

the 25 largest container ports handling more than 49.8% of global traffic in 2020

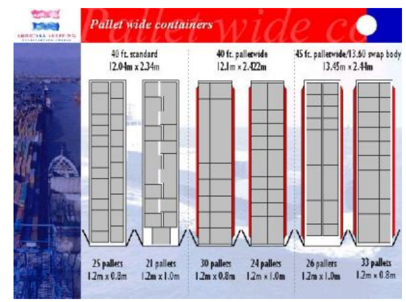
Airway

- **Offer evolution**
    - Longer distance, less energy
    - Container size to fit aircraft
    - Lower deck containers
    - Unit load device
- Thus smaller **airplanes** increasing presence
- **Intermodal facilitators**
    - NVOCC approach
    - The compulsory international air cargo agents
- Integrated carriers
    - Door to door service compared with airlines' competitors

- Sea shipping services
  - Deep sea
  - Land bridges
    - Sea land or sea land sea route
    - Flat rate
    - Important international trade routes
  - Land bridge train



- Minibridges : through bill of lading - TBL
- Micro bridges
- Existing port adjacent intermodal facilities
  - Port terminal
    - Road sea and rail sea traffic
    - Ships – railway tracks
  - Transfer of containers
    - Container handling equipment
      - Fittings – handling – be stacked – eight high
      - Oval shaped holes – Inter Box Connectors
      - Oversized forklifts



- Sea/rail/road/inland waterways
  - By sea and one or more inland transport
  - Combination containership/LASH ocean vessels
  - A wide range of cargo
  - Rates are lower
  - Connections water / deep-sea
  - Hybrid vessels are in the minority
  - Combination vessels

Dunkirk example

Example

Sum up

Rank modes combination in easy or not and why ?

Part IV- continental distances

1- continental loading units

2- Continental modes

3- India

4 – European Union

5 – multicontinental issues

6- case studies

Table 2.4 Comparison between the container and semi-trailer shipping segments

Factor	*Container*	*Semi-trailer*
Geographic transport market	Trans-ocean/deep sea/ short sea	Intra-European/short sea
Modal competition	Air for deep sea leg Rail and road for feeder leg	Rail and road + fixed connections
Business priority	Utilising economies of scale	Providing customer convenience
Port geography	Few large hub ports + feeder ports	Many ports – partly bridge substitute
Hinterland depth	Deep	Shallow
Transport time/speed	Fast	Fast
Precision	Day	Hour
Order time	Week	Day/minute
Frequency	Weekly	Daily/hourly
Transport service coordinator	Shipping line, line agent or sea forwarder	Shipper, road haulier or general forwarder
Cargo dwell time in port	Days	Accompanied – minutes or none Unaccompanied – hours
Empty unit dwell time	Days/weeks	Hours/days
Port work content	Substantial	Limited
Rail technology	Very simple – flat wagon/ twist-locks	Complicated – pocket wagon/ king-pin box
Road technology	Awkward at end points	Simple and accessible
Road-rail transhipment technology	Fairly simple – automation possible	Dimensioning factor in weight and handling

Source: Woxenius, J. and Bergqvist, R., *Journal of Transport Geography*. 19(4), 680–688, 2011.

1- Continental loading units

Missing interoperability

- Unit load

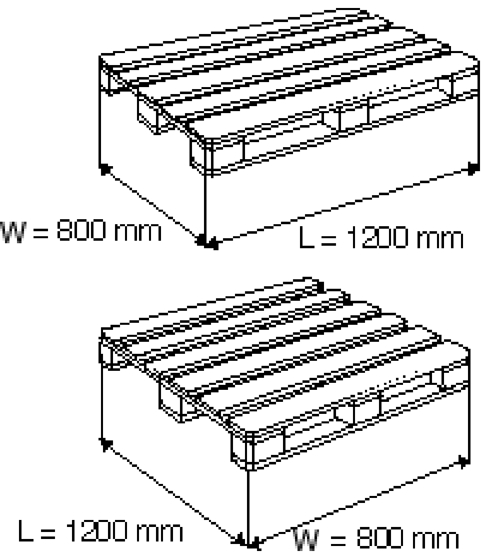
Pallets

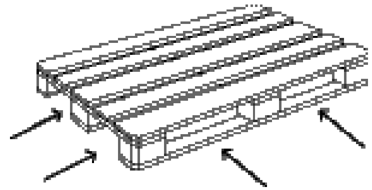
- From start to finish : efficient handling
- Stability
  - Might be shrink wrapped
  - Carton glue and corner boards
- Numerous materials
  - Wood, steel, aluminium, plastic, corrugated fibreboard
- Single trip …. Or not

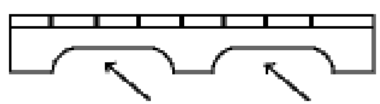
1-

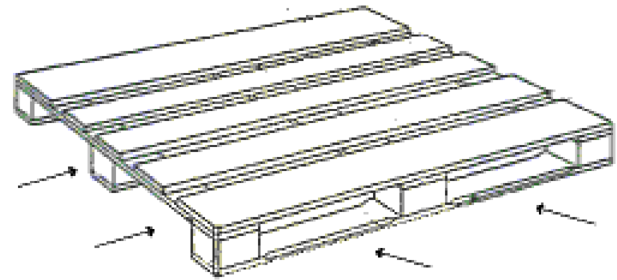
Pallet

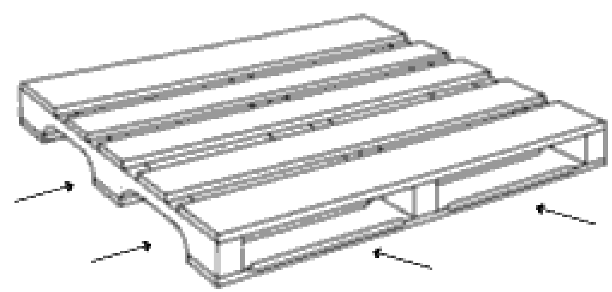
4 ways entry of 2 ways entry











- Loading unit
  - Intermodal transport unit
  - European size containers
    - 45’
  - Swap body
    - To road vehicle dimension
  - Bi modal semi trailer
    - Less used
  - Low floor wagon
    - To carry ITUs
  - Pocket wagon
    - To accept axle/Wheel
  - Basket wagon
    - Demountable subframe
  - Rolling road wagon
    - Low floor wagon for rolling road

Swap body

Pocket wagon

Continental modes

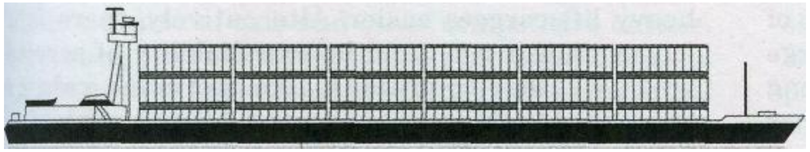
- Short sea shipping
  - Short distances
  - Advantages
    - Energy use
    - Extra capacity
  - Inconvenience
    - Long lead time
    - Low reliability
  - Feeder services
    - Liner services
    - With long distances traffic density decreases
  - RORO services
    - Including unaccompanied intermodal transport
  - Barge
    - Can moor to parallel tracks

Continental modes

- Inland waterway terminal
  - To offer trimodal terminals
- Waterways shipping
    - Intermodal movements by coastal and inland waterways
- European Inland waterway services
  - The Rhine key river
    - Hinterland terminals
    - Number of calls
    - Possible dwell time at sea port
- Rhine and … Danube
  - 2 millions containers estimation in Rotterdam
  - Roll on Roll off to avoid Switzerland for heavy trailers
  - Duisburg
    - From 110000 containers in 1990 to more than 2 500 000 containers today

2-

Different types of inland waterways service

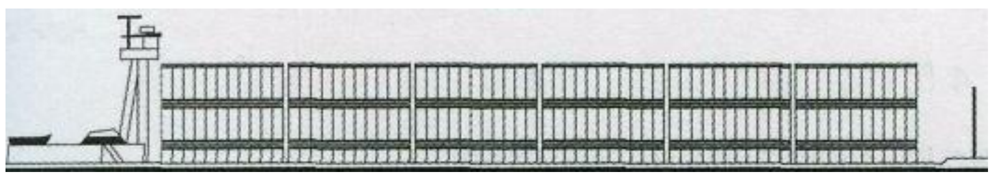


EUROPASCHIP

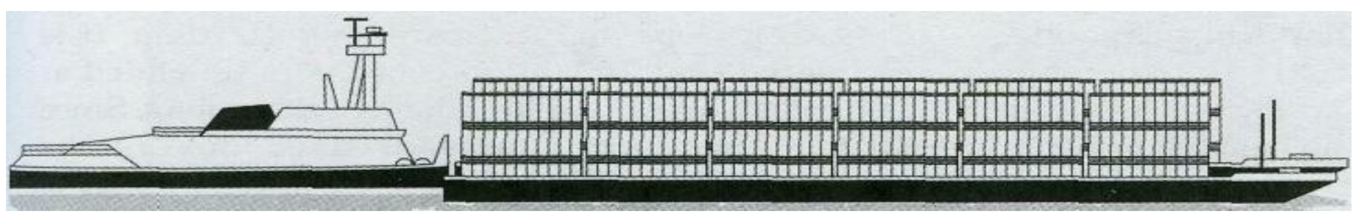
Typical container capacity per ECMT class.

Class		Typical TEU capacity	Typical TEU configuration (l x w x h)
II	Kampine barge	24	6x2x2
III	Dortmunder	54	9x3x2
IV	European class	90	10x3x3
Va	Rhine vessel	208	13x4x4
Vb	1x2 push barge	384	13x4x4 + 11x4x4
VIa	2x1 push barge	352	Twice 11x4x4
VIb	2x2 push barge/ largest motor vessel	450-500	

** no container traffic in Classes 0 and I



EUROPEBARGE



KOPPELVERBAND

- Infrastructure
  - Canal, locks and bridges
- River ports to challenge as Duisburg
- IWT Classification examples
- Connecting inland, coastal and ocean services at stake
- European coastal services
  - Developping in the U.S., to make fewer ship calls
  - Bremen to Hamburg and Scandinavian ports
    - 100 to 400 TEUS capacity, more than 16 knots speed
  - Short Sea Shipping Rotterdam
    - Oil, containers, fruits, coal, ore, scrap metal reach in 24 hours European ports
  - Amsterdam Portugal equivalent to 180 000 trucks a year
  - Black Sea: RoRo developping : Turkey, Russia, Eastern Europe
  - Baltic sea more than 400 ports with over 950 millions tonnes a year
- Market rules conditions are depending on ….
  - International Rhine
  - Rhône …
- Larger ocean containerships fewer port calls

Inland waterway network connected to Rotterdam

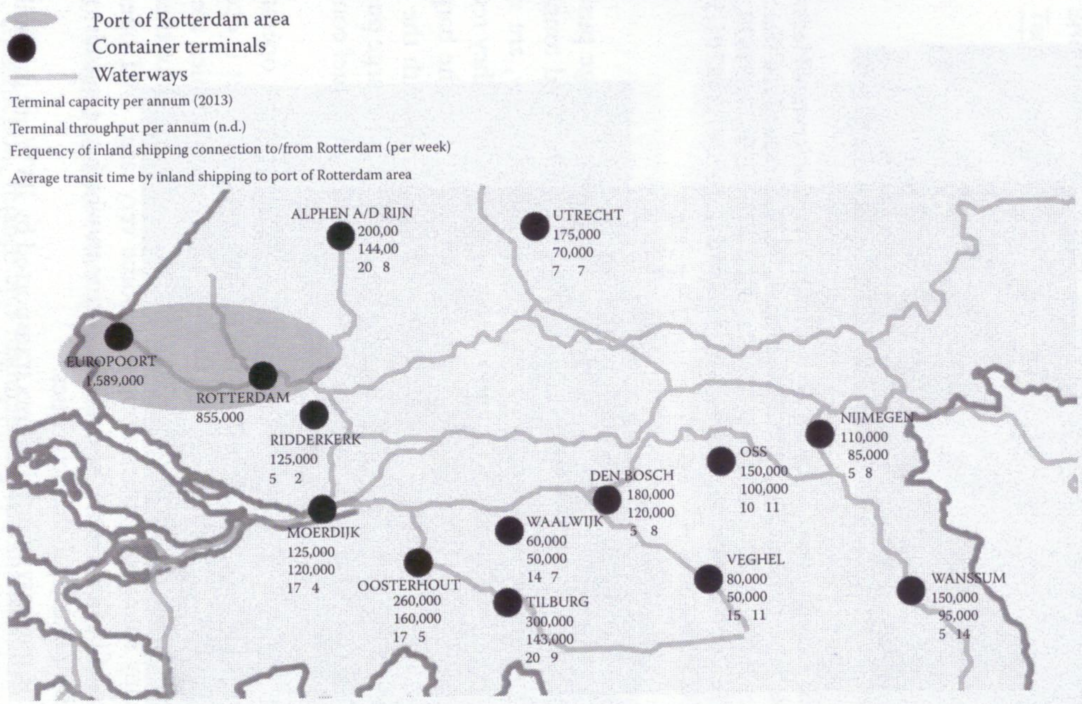


Figure 4.3 IWW network for the Port of Rotterdam. (From Fan, Y., The design of a synchromodal transport system: Applying synchromodality to improve the performance of current intermodal freight transport system, Master's thesis, Delft University of Technology, 2013.)

Table 4.2 Fleet statistics: Number of vessels

	W-Europe	*Europe Danube*	*United States*	*China*
Self-propelled				
Dry cargo	6.753	373	635	n.a.
Tank	1.992	37	2	n.a.
Total#	8.745	410	635	132.000
Push barges				
Dry cargo	3117	2559	23418	n.a.
Tank	155	233	3220	n.a.
Total#	3.272	2.792	26.638	33.000
Pushers	1039	422	3442	n.a.
Total	n.a.	n.a.	n.a.	165.000

Source: Adapted from Hekkenberg, R. and Liu, J., *Inland Waterway Transport: Challenges and Prospects*, Routledge, London, 2016.

IW fleet

4.4 A tugboat pushing barges up the Monongahela. (From https://rutheh.com/2010/03/10/tugboat-pushing-barges-up-the-monongahela.)

Saving load and fuel

Keep in mind global warming and tides as well as water levels

Table 4.4 Factor costs in inland waterway transport (reference date: 2008)

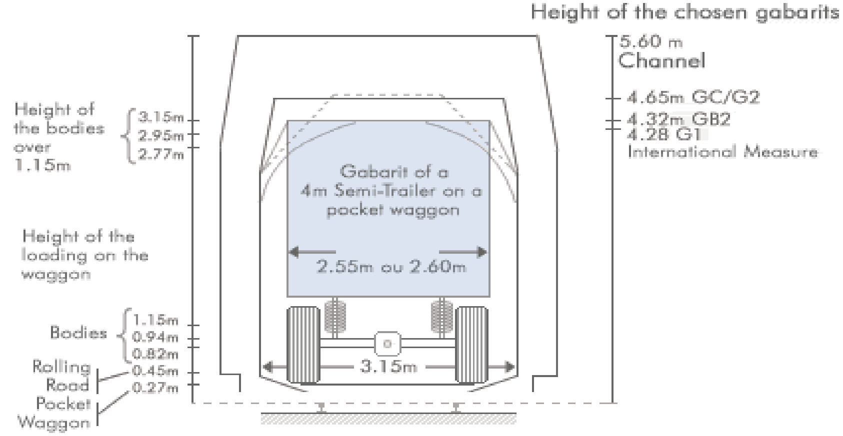
	Measure	*Rhine vessel (Class Va)*	*Rhine-Herne vessel (Class IV)*
Vessel characteristics			
Type of vessel		Motor dry freight vessel	Motor dry freight vessel
Capacity	TEU	208	90
Dimensions (L × W × D)	Metres	110 × 11.40 × 3.60	86 × 10.50 × 3.20
Tonnage	Tons	3.500	2.000
Fixed costs			
Capital costs	€/year	784.750	350.000
Labour costs			
Day operations	€/year	140.000	120.000
Semi-continuous operations	€/year	285.000	250.000
Continuous operations	€/year	660.000	510.000
Variable costs			
Fuel costs			
Loaded vessel	€/km	10	7.54
Empty vessel	€/km	4.78	3.62
Repair and maintenance costs	€/km	0.72	0.37
Overheads	€/year	n.a.	n.a.
Business hours			
Day operations	Hours/year	3.500	3.500
Semi-continuous operations	Hours/year	4.500	4.500
Continuous operations	Hours/year	7.800	7.800
Direct cost hour coefficient			
Day operations	€/hour	264	134
Semi-continuous operations	€/hour	238	133
Continuous operations	€/hour	185	110
Kilometre cost coefficient			
Loaded vessel	€/km	10.72	7.91
Empty vessel	€/km	5.50	3.99

Source: Adapted from NEA (2009).

Discussion

What makes **intercontinental vs continental moves different** as far as transport modes are concerned ?

- Rail move
  - Infrastructure design
    - Railway track gauge and clearance parameters
    - To 3000 t
    - and 1,27 mm uncertainty
  - The more wheels, the more traction
    - Two bogies : 2 driving axles
    - 20-25t per axle
  - Traffic safety and control systems
    - New infrastructures
    - New freight lines
  - The AGTC network
    - The UIC C Standard clearance gauge, height up to 4 m
    - UIC B to 2.9 m high, containers and swapbodies



GAUGE

PURPOSE BUILT CARS

RAIL

- **Penetration lines.**
  - to link a port city with its hinterland, particularly to access natural resources such as minerals, agricultural products, and wood products.
  - to convey large amounts of materials in a manner that would be prohibitive for road transport.
  - the initial stages of rail development
    - the United States,
    - Africa and Latin America)
    - areas have several gauges and limited cross-border connectivity and thus offer limited competitiveness with trucking.
- Regional networks.
  - servicing high-density population areas of developed countries
  - network type initially started as penetration lines or interconnected city pairs and evolved to form a lattice
  - highest rail density are Western Europe, the Northeastern part of North America, Coastal China, and Japan.
- Transcontinental lines.
  - to improve territorial accessibility and for the setting of national sovereignty.
  - the United States, Canada, Russia, and Australia,
  - , transcontinental rail lines have seen a renewal in interest by their capability to attenuate the discontinuity of maritime transportation by transporting containers such as over the North American Landbridge and the Eurasian Landbridge=chain in the global intermodal transport system.

Rail movement

- *Eight variables influencing capability for freight*
  - Track and route mileage
  - Electrified track miles
  - Permissible line speeds
  - Gauge capability
  - Route availability
  - Length capability
  - Gradients(slope)
  - Total tonnage capability

RAIL

- Bridges and tunnels
  - the Seikan tunnel between the islands of Honshu and Hokkaido in Japan, with a length of 53.8 km
  - Channel Tunnel between France and England reaches 50.5 km
  - Gotthard Base Tunnel, which opened in 2016, was built mostly to carry rail freight through the Alps, totaling 57.1 km
  - in China. The 1,142 km line links Golmud in Qinghai province to Lhasa in Tibet. Some parts go through permafrost and altitudes of 16,000 feet, conferring its status as the world's highest rail line.

The table below shows some of the network parameters.

Infrastructure parameters for the network of major international combined transport lines	A		B
	Existing lines which meet the infrastructure requirements and lines to be improved or reconstructed		New lines
	at present	target values	
1. Number of tracks	(not specified)	(not specified)	2
2. Vehicle loading gauge		UIC B 2/	UIC C 2/
3. Minimum distance between track centres 1/		4.0 m	4.2 m
4. Nominal minimum speed	100 km/h	120 km/h	120 km/h
5. Authorised axle-loads:			

RAIL and double stacking

overhead clearance inadequate for **double-stack** trains for tunnels and bridges

several rail companies, notably in **North America**, have invested massively in double-stacking projects

economies and improved capacity of double-stacking have justified investments in raising the clearance from 5.33 m (17’6”) to 8.1 m (20’6”) along major long-distance rail corridors

Europe is less advanced

Clearance thus forbids the usage of double-stacking on most European rail corridors

China, doubles-staking corridors are under development, particularly between major container ports and inland cities, but their use remains limited.

Another salient example of a 75-km double-stacked corridor is across the **Isthmus of Panama**, allowing it to support canal operations as a portage option.

COST ANALYSIS France €

	Long distance	Exchange	Combined
Distance cost	457.15	453.29	36.86
Driver cost	200.54	182.41	79.08
Structure cost	154.07	77.04	35.68
Valenton 94 / Avignon			450
TOTAL	811.76	712.74	601.62

Table 2.5 UIC wagon codes

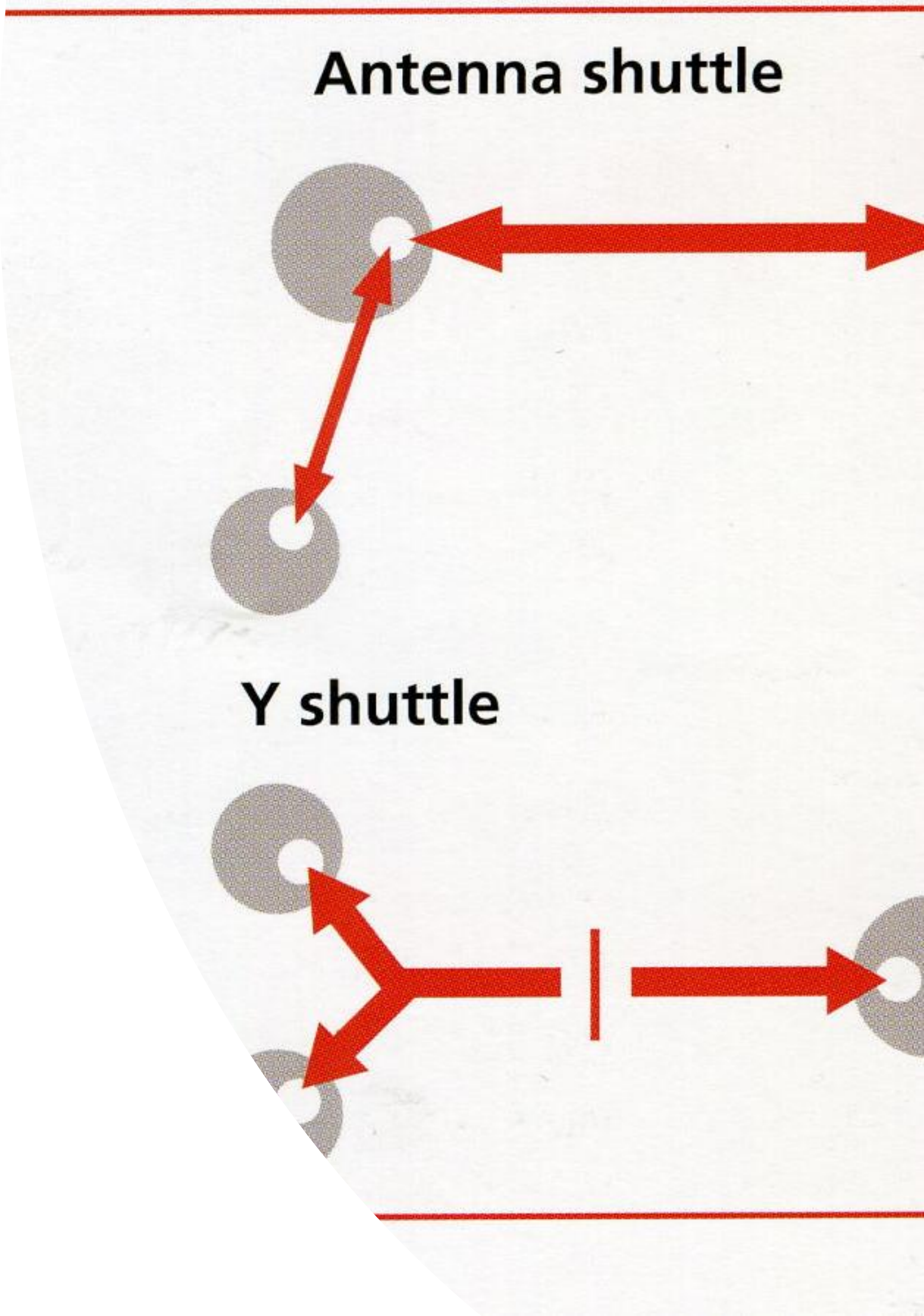
Class	*Wagon type*
E	Ordinary open high-sided wagon
F	Special open high-sided wagon
G	Ordinary covered wagon
H	Special covered wagon
I	Refrigerated van
K	Ordinary flat wagon with separate axles
L	Special flat wagon with separate axles
O	Open multipurpose wagon (composite open high-sided flat wagon)
R	Ordinary flat wagon with bogies
S	Special flat wagon with bogies
T	Goods wagon with opening roof
U	Special wagons
Z	Tank wagon

Figure 2.20 Open wagon with tarpaulin cover. (From Wascosa.)

Wagons

- Rail freight operators **often lease wagons** from manufacturers or leasing companies
- Locking pins are used depending on the loading unit (swapbody, container …)
- In UK conveyance of 9’6’’ is too constrainted (low floor or pocket wagons)
  - But existed 60’ long wagon : 1x20’ + 1x40’

- Rail shuttles
- Block trains (not fixed)
- The antenna shuttle and Y shuttle
- The hub and spoke system …
- The gateway system
- Shuttle network
- Single wagon production
- Trimodal production systems
- Rail corridors
  - Rotterdam Genoa
  - Compatibility



- Rail road

2-

  - Swap bodies
    - minimal upper body
    - cannot be stacked
    - It is one type of standard freight containers for road and rail transport. Many swap bodies are fitted with four up-folding legs under their frame.These legs make it possible to change, or swap, their body from one carriage to another, or to leave the swap body at a destination, without using extra equipment such as crane or hoist.
  - Piggyback
    - combination
    - speed and reliability
    - with Trucks
    - trailer train
    - Using concept of long haul /short haul (Rail/Road mode) which is popular in Europe. The goods are packed onto the trailer and the trailer is moved to rail flat car for final station, then truck will continue carry the goods to final destination
  - Rolling road
    - combined transport
    - without comitting to specific investment
    - mobile ramps
- Outlook
  - E.U. standard to 775m train length

PIGGYBACK

SWAPBODY

RESEARCH WORK

- WORKING GROUP FOR NEXT TIME
  - LET'S COMPARE MAIN INTERMODAL RAIL ROAD OPERATORS ON THE UK MARKET
    - IDENTIFICATION
    - WEAKNESS AND STRENTGH

- Landbridge train
  - European rail shuttle
  - Combine their management of the inland movement of container
  - East west trade in Europe
  - Door to door services
  - Russian railways joint venture : 2 Block trains a week
  - China and Russia developing agreement
  - Transport corridor Berlin-Warsaw-Minsk-Moscow
  - Transalpine traffic, Chunnel …
  - Malaysia a daily train to ICD
  - USA, double stock container service in South California

Belt and Road Initiative China/Europe

** CO2 : moyenne en grammes / tonne - kilomètre (source : OCDE 2008)*

Import China - Europe		
TC 40' (25T)	**SEA FREIGHT**	**RAIL FREIGHT**
Leg	Shanghaï - Hambourg	Shanghaï - Duisbourg
Distance	22 735 km	8 838 km (- 60%)
Carbonic gas emission*	12,5 g/t-km = 7,1 T	30 g/t-km = 6,63 T (- 6.6%)
Transtit time (days)	32	19 (- 40%)
ALL IN	1 950 USD	5 575 USD (x 2,85)
Fréquency (/week)	1	6

TYPE	LENGTH M	WIDTH M	HEIGHT M	VOLUME CBM	DEAD WEIGHT	LOAD T
box	7,15	2,55	2,30	39,3	NA	NA
tautliner	13,6	2,55	2,3to2,49	77	4to4,5	28,5
tarpaulin	13,6	2,55	2,35	77	3,4	NA
reefer	13,6	2,6	2,6	variable	5to5,5	28
Mega volume	13,6	2,55	2,95	100	5,85	28

Caisses mobiles fourgon 7,45 m

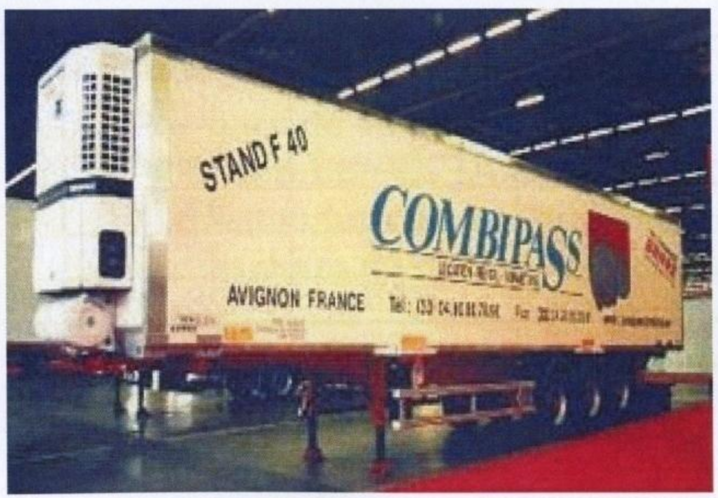
Caisse mobile 30′

Caisse mobile tôlée

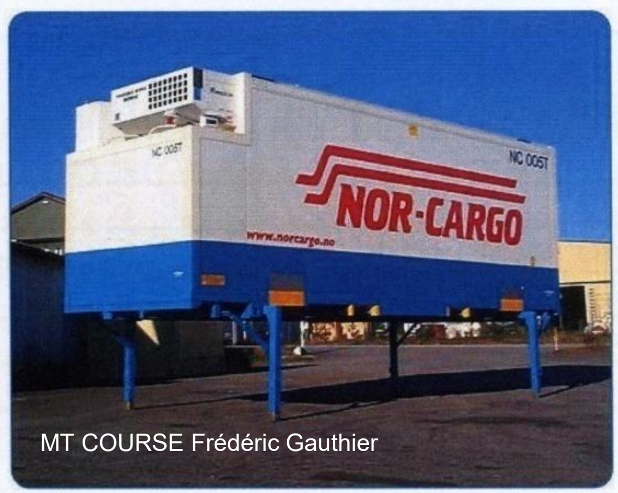
Caisse tautliner 13,6 m

Caisse mobile 7,45 m

Caisse frigo 13,6 m



Caisse frigo 7,45 m



Caisse Mega-Com

Loading units comparison

	Number of pallets 80x120	Number of pallets 100x120	Load
Trucks Rail car SNCF	Till 33 44	Till 26 36	25.5 t 40t (average)
Container 20’ Container 40’ Swapbody TRAIN LENGTH	11 25 33 750 m to 850 m	9 22 26	28 28 29 1,800t
Unit type Combined container Swapbody CEMT Swapbody A1219 Swapbody A1360	External dimensions Wide x high x long 2.5x2.59x7.45 2.5x2.67x7.45 2.5x2.67x12.192 2.5x2.67x13.6	Euro pallet 18 18 30 33	UK pallet 14 14 24 26
Disruption to solve			
Bulk	Dedicated handling equipment	To move to containers	To transform raw material from close storage place
Pallets / big bags … Containers	Forklift Simple but dedicated	Handling equipment on barge with working operations Gantries, infrastructures	Storage / consolidation/ cross docking Close to consuming area Customs /ICDs availability
Heavy packages	High cost handling infrastructures	Disruption, horizontal handling RoRo	Useful inlandwaterway combined with road transport on short distances

Road transport systems

- Large scale to large operators
- Flexibility
- Production system with large customers
- Terminal cartage solutions
  - C passed on to the consignee
  - Extremely short, short, long distances
- Intermodal production and chain integration
  - Organizational and commercial ones
- Local distribution and flexibility

Road

- **New materials** (ceramic, plastic, aluminum, composite materials), fuels (electricity, hydrogen, natural gas
- **information technologies** (vehicle control, diagnostic, location, navigation, and toll collection) are continuously integrated into road vehicles
- Countervailing forces are at play, such as **congestion**, the aging of the population, and even information technologies (teleworking). For trucking, demand continues to grow, driven by rising incomes, global supply chains, and e-commerce.

Efficiency model for road transport

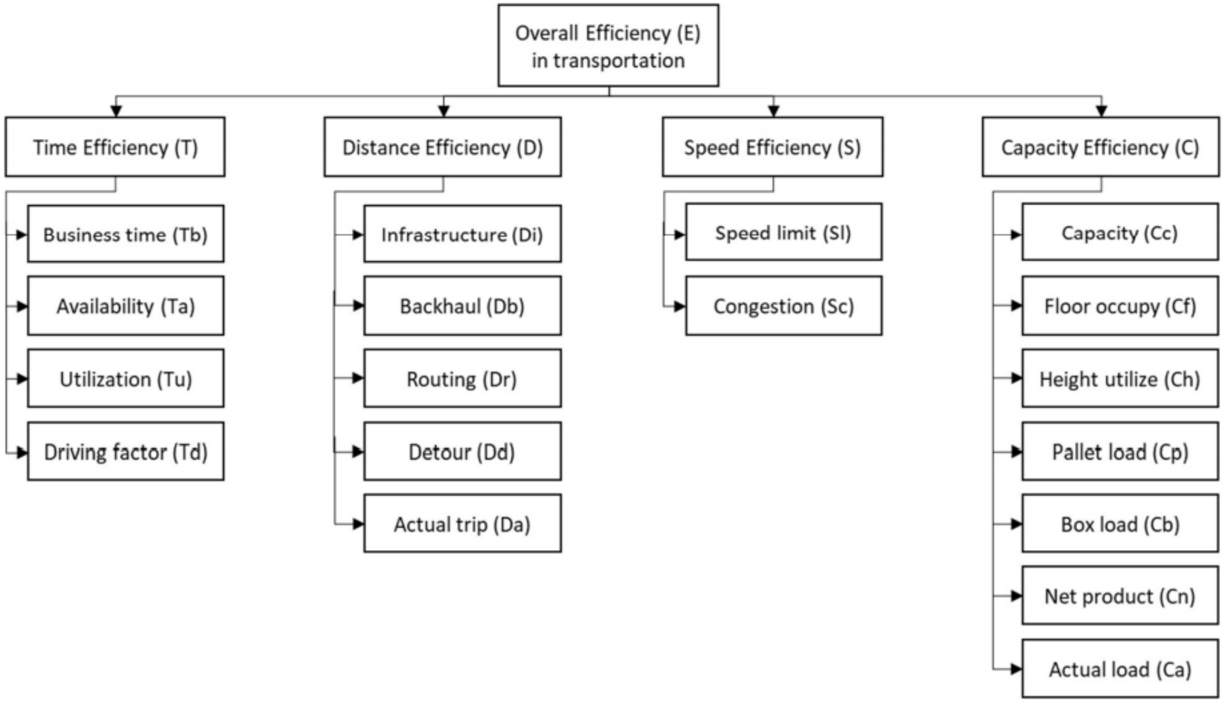


Figure 2. 1 Four-dimensional overall efficiency model for road transportation

Source: (Samuelsson and Tilanus, 1997)

Challenges to integrate pre and post Haulage

Road is 73% of inland E U freight

E U goal 30 % road freight shifted to other modes by 2030

Offer fragmented so Many empty trips

so pre post carriage can be primary source for long transit time and lead time unreliability

Urban distribution

Availability of infrastructures

Concentration of freight demand

Congested roads including with Cars

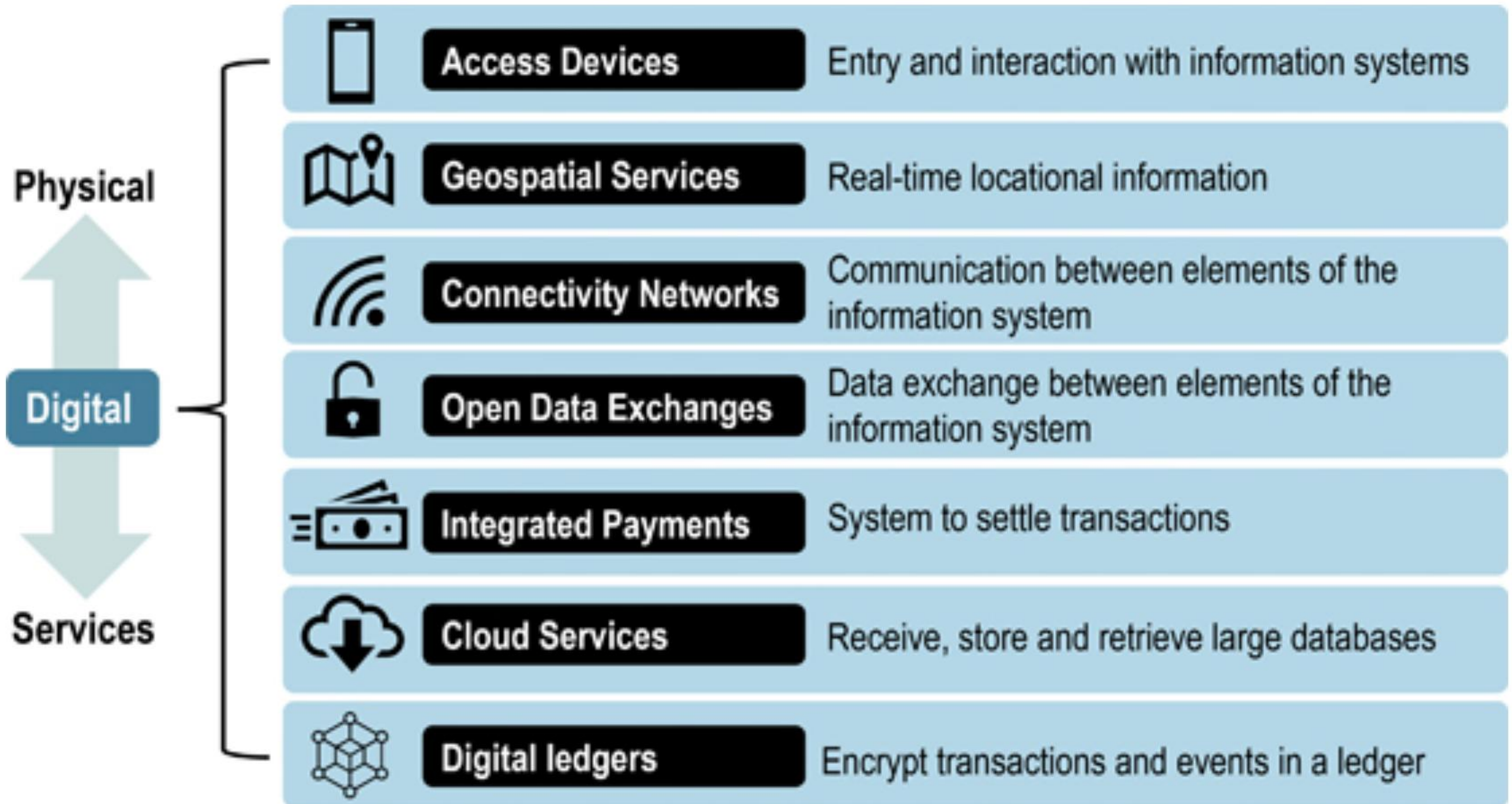
Road terminals are easily location changed which is not the case for rail terminals

Having closer terminals to shippers and receivers will decrease PPH (delay) cost and Congestion

But these networks are separated

Road focus

Digitalization and transport



Digitalization

Access devices. A whole array of computing devices, such as computers and smartphones, can access telecommunication networks and retrieve, process, and send information.

Geospatial services. Computing devices able to provide real-time locational information that can be used for a variety of purposes including vehicle tracking and navigation. They can also include other sensors that can be used to supply visual information (optical character recognition or environment processing) or attribute

Connectivity networks. A range of telecommunication systems enabling components of the information system to communicate, which include wired and wireless networks.

Open data exchanges. A set of standards allowing information exchange and storage that all devices can handle.

Integrated payments. A system that allows actors, such as financial institutions, to settle transactions, such as contracts, purchases, tolls, or fares.

Cloud services. A distributed network of servers is able to offer massive storage, retrieval, and processing of data.

Digital ledgers. An encrypted digital ledger system, such as a blockchain, is able to accurately record events and transactions.

BLOCKCHAIN

A blockchain is a **distributed electronic ledger** shared across a network of servers that records transactions in cryptographic units that are called blocks in a permanent and verifiable manner. They are often referred as digital ledger technologies (DLT).

ach block is a **unique digital object** which is stored on multiple servers (nodes) in a peer-to-peer network that verifies if each block copy matches its equivalent on all nodes.

Blockchain

- Moving from to permitting using blockchain

BLOCKCHAIN

- The replacement of processes that tend to be slow and manual with automation.
- The origin and characteristics of passengers and cargo (raw materials, parts, and final goods).
- Information about passengers and cargoes to ensure a continuity of payments, insurance, and customs duties.
- Information about the conditions of the passengers and cargo to ensure their integrity it terms of the mode and their locations in transit.
- Information for regulatory authorities about the passengers and cargo, the actors involved (importer, exporter) and the carriers.

The Core Principles of Digital Ledgers

Distributed Digital Ledger

Sequence of Blocks

Creation and transfer of unique digital objects in a decentralized structure

Digital Trust

Encryption, transparency, verifiability and immutability

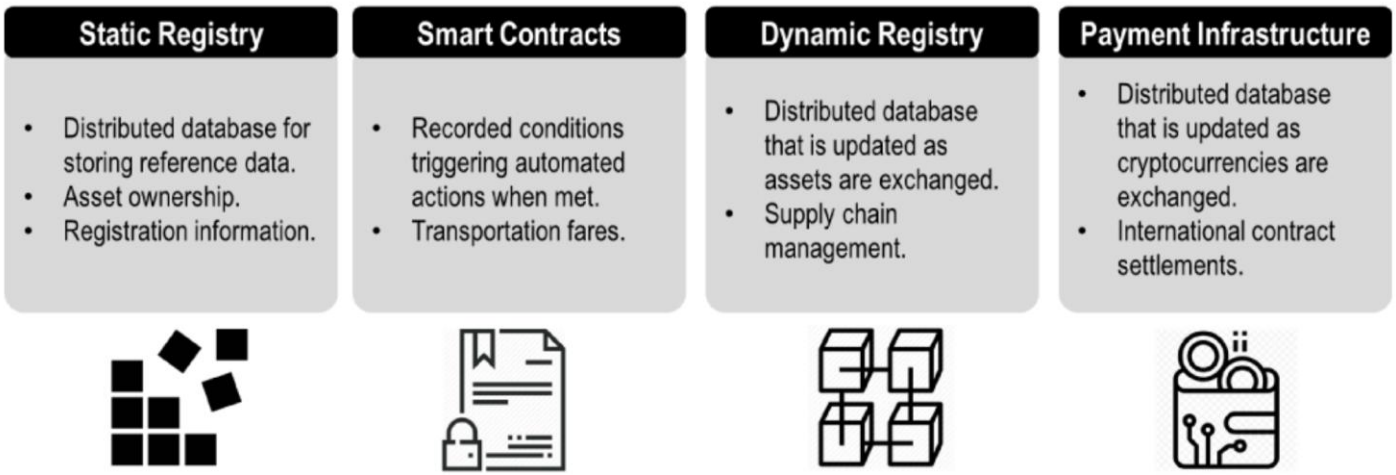
Smart Contracts

Programmable actions that can be traced

Open Source

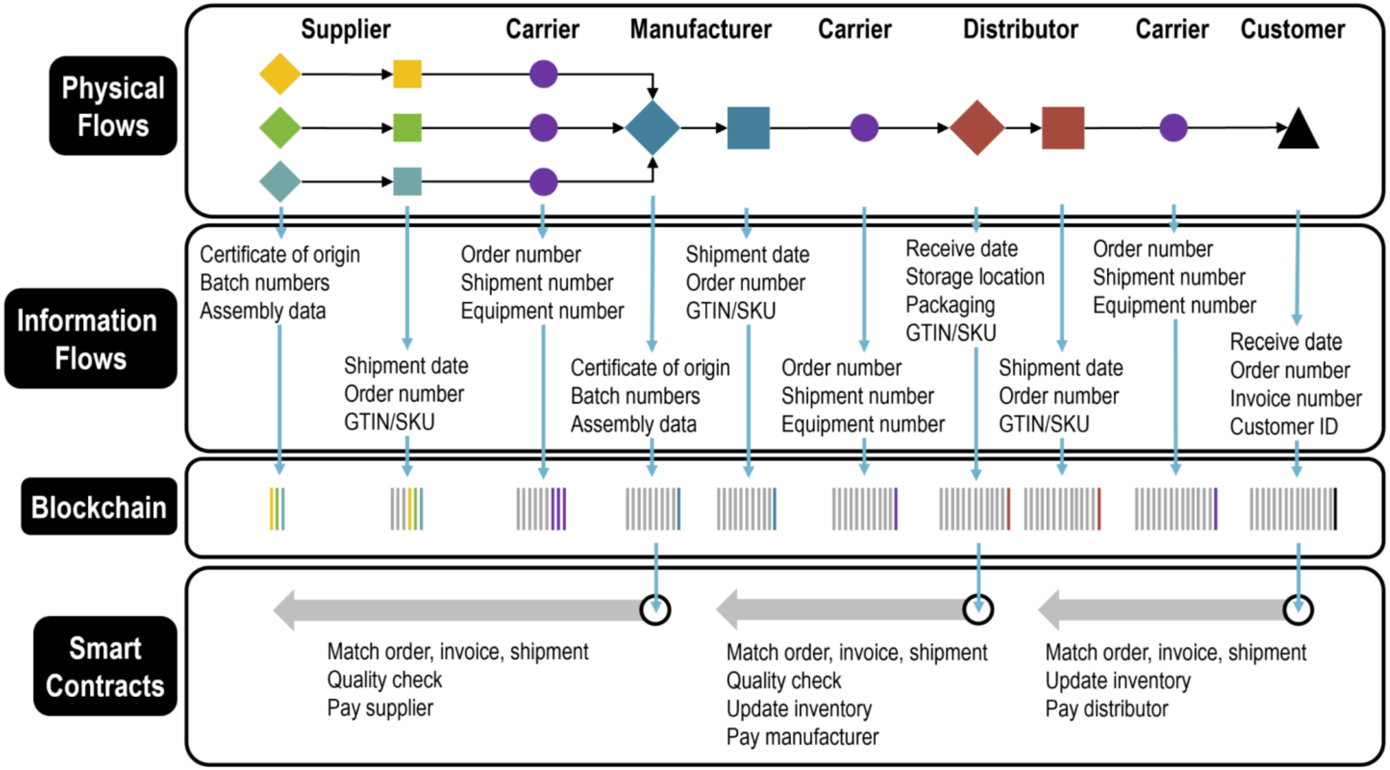
Accessibility and inclusiveness

Main Types of Blockchain Uses



Main Types of Blockchain Uses

Supply Chains and Blockchains



Supply Chains and Blockchains

Supply Chains

Velocity of Supply Chains

Faster transactions.
Less latency, improving cash flow and inventory carrying costs.

Supply Chain Visibility (Tracking)

Track shipments along an intermodal transport chain and identify issues causing delays.
Create a market where service providers bid to handle “blocs”.

Supply Chain Security (Tracing)

See where, when and how a specific event took place (e.g. cold chain logistics).
Counterfeiting and the use of sub-par materials easier to detect.

Standards and Certification Compliance

Proof that cargo was handled by specific modes, carriers and distribution centers.
Calculate accurately energy use and environmental impacts (e.g. $CO2$ footprint) .

Moving to

Improved Tracking & Transparency

real-time tracking of shipments

reducing fraud and errors

Automated Smart Contracts

reducing paperwork and delays

Payments and approvals happen automatically when predefined conditions

Supply Chain Optimization

optimize inventory management

reducing costs

improving delivery times

Fraud Prevention & Security

Data tamper proof

Preventing unauthorized changes

Cost reduction

Eliminating intermediaries

Better efficiency

Together

Route Optimization

Your company needs to transport electronic goods from Shenzhen, China, to São Paulo, Brazil. Your task is to find the most cost-effective and time-efficient multimodal transport route. Consider factors such as different modes of transportation, transit times, costs, and potential bottlenecks.

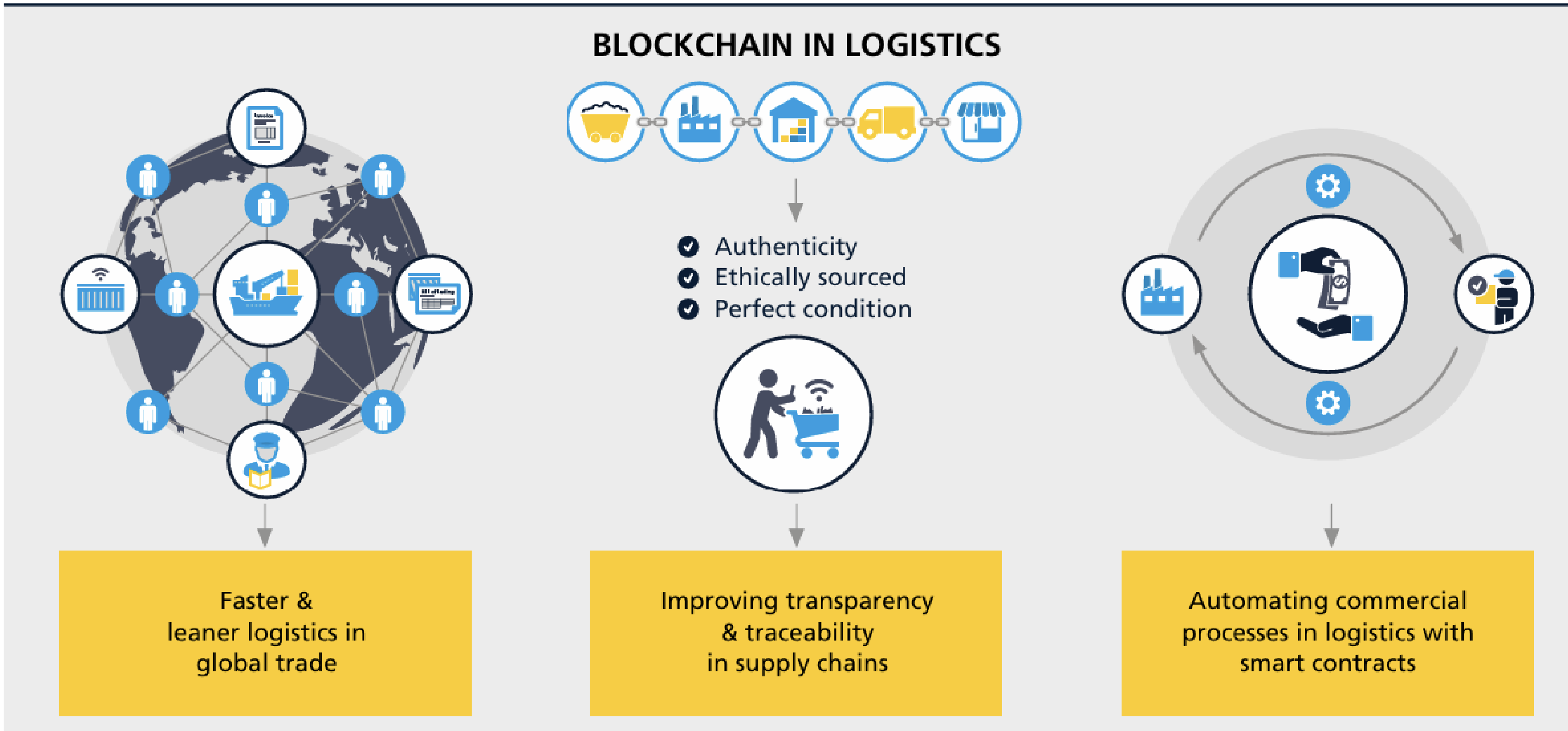
Questions

1. Identify and compare at least three potential multimodal transport routes.

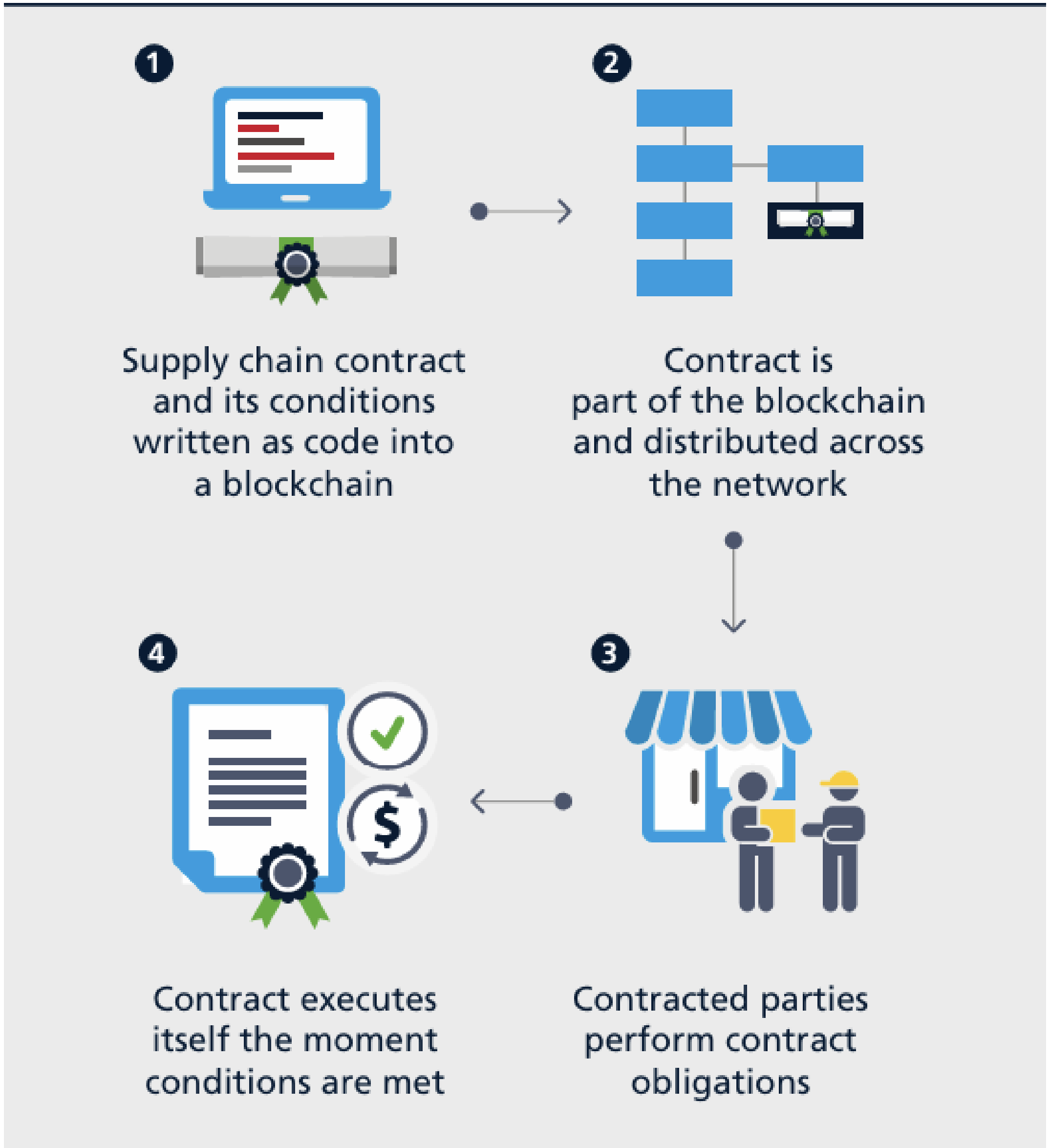
2. Calculate the total cost and transit time for each route.

3. Analyze the risks and challenges associated with each route.

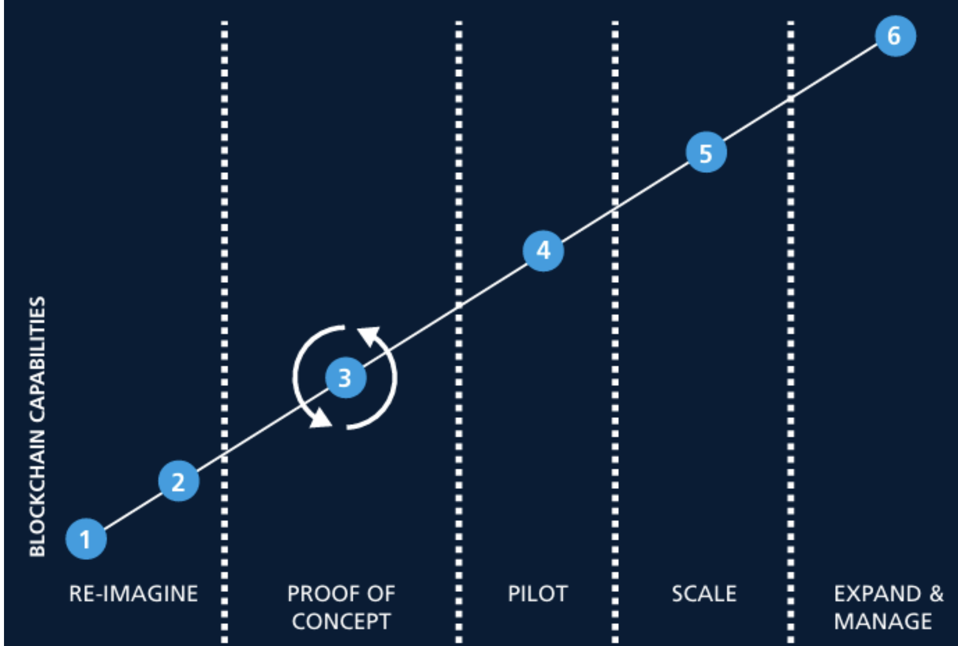
4. Recommend the best route based on your analysis and justify your decision.


BLOCKCHAIN IN LOGISTICS
Authenticity
Ethically sourced
Perfect condition
Faster & leaner logistics in global trade
Improving transparency & traceability in supply chains
Automating commercial processes in logistics with smart contracts

Smart contracts



Doing it



1. STRATEGY
Set the vision for how blockchain can support the business challenges or opportunities.

2. DEVELOP & PLAN
Define the specific business areas for blockchain value. Develop the plan to execute PoC(s) on high value areas and opportunities.

3. PROOF OF CONCEPT
Controlled learning of blockchain technology with focus on a select use case. Incorporate learnings from PoC phase into pilot.

4. PILOT
Continued learning on the blockchain-based use case. Complete high level assessment, blueprint and roadmap to transition.

5. SCALE
End-to-end implementation of a blockchain-based solution for targeted business challenges, aligned to strategy.

6. EXPAND & MANAGE
Expand the platform to additional business units and deploy ongoing improvements.

Bitcoin

- Bitcoin = leading digital currency
  - stored on a global, decentralized peer-to-peer blockchain
- Other digital currencies are available
  - Ether
- creation or 'mining' of bitcoins
  - through computers solving complex equations

Together

Technological Integration

A shipment of high-value electronics needs to be transported from Tokyo, Japan, to Madrid, Spain. The use of technology such as IoT and blockchain can enhance the visibility and security of the shipment.

Questions

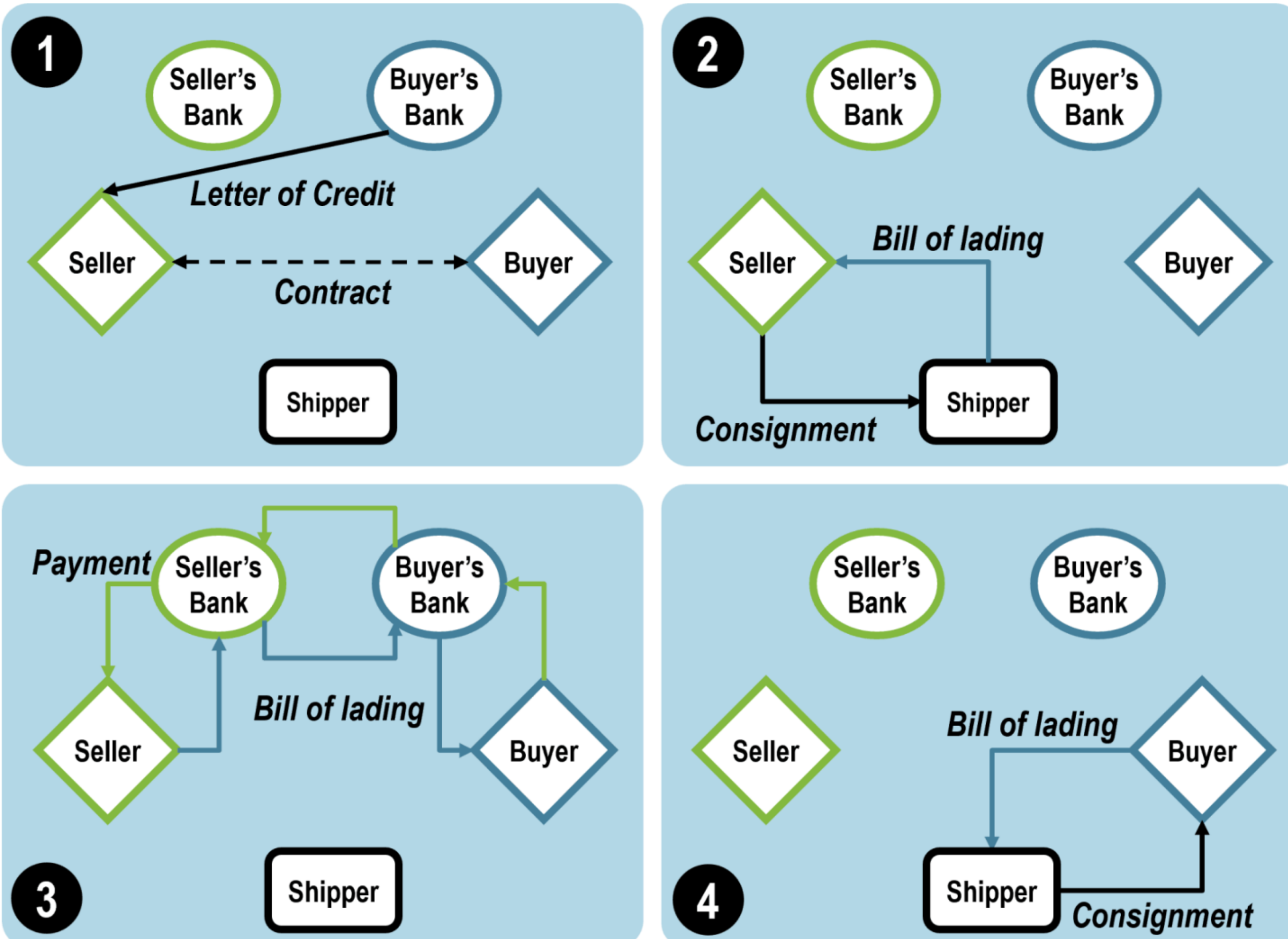
1. Explain how IoT can be utilized to monitor the shipment in real-time.

2. Discuss the role of blockchain in ensuring the security and integrity of the shipment.

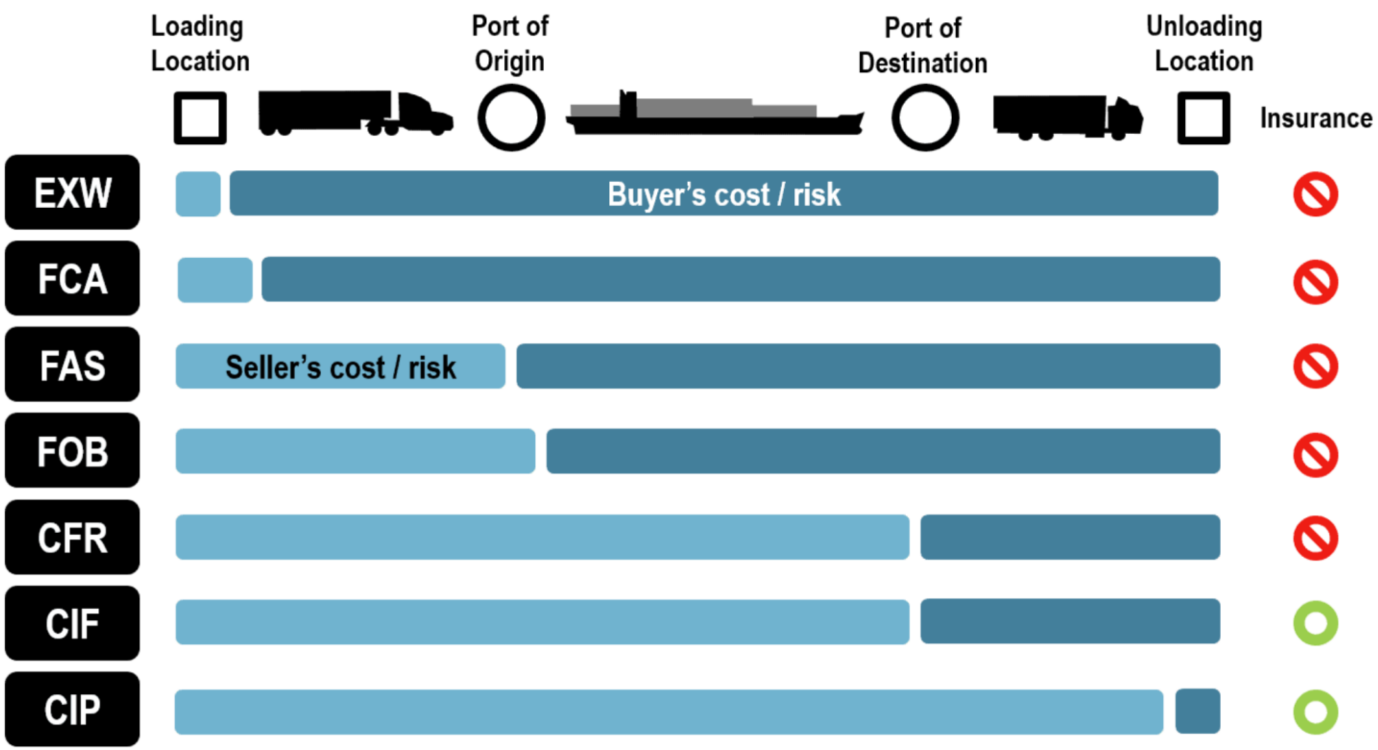
3. Propose a technology integration plan for this shipment.

4. Evaluate the potential challenges and benefits of implementing these technologies in international freight transport.

Letters of Credit and Bills of Lading in Commercial Transactions

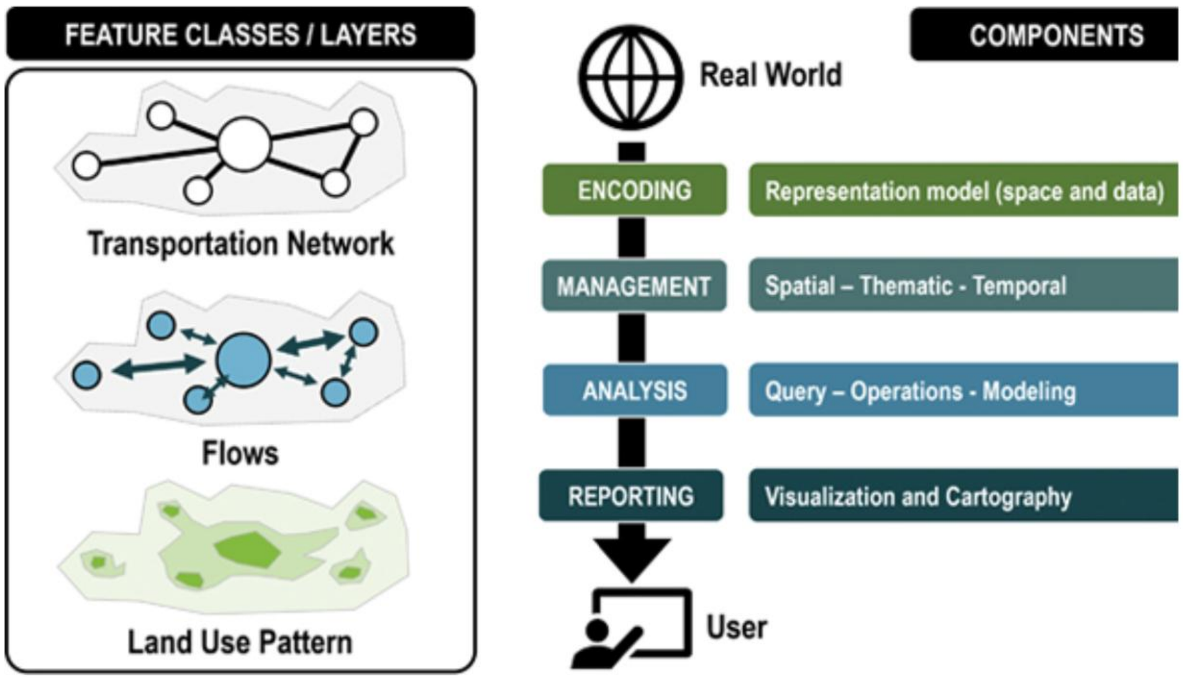


Selected International Commercial Terms (Incoterms)



Selected International Commercial Terms Incoterms

GEOGRAPHIC INFORMATION SYSTEM



Urban distribution

- European and North American cities, warehousing have been **decentralized**
- Rail centers remain **unfortunately in centers** which have to be moved to suburban areas
- A modal shift to lower gas emission will be possible that way
- Artificial intelligence (how to load small loads in the proper priority)
- Information tower
- Non Greenhouse emission vehicles
- Mobile containers

Types of urban structures

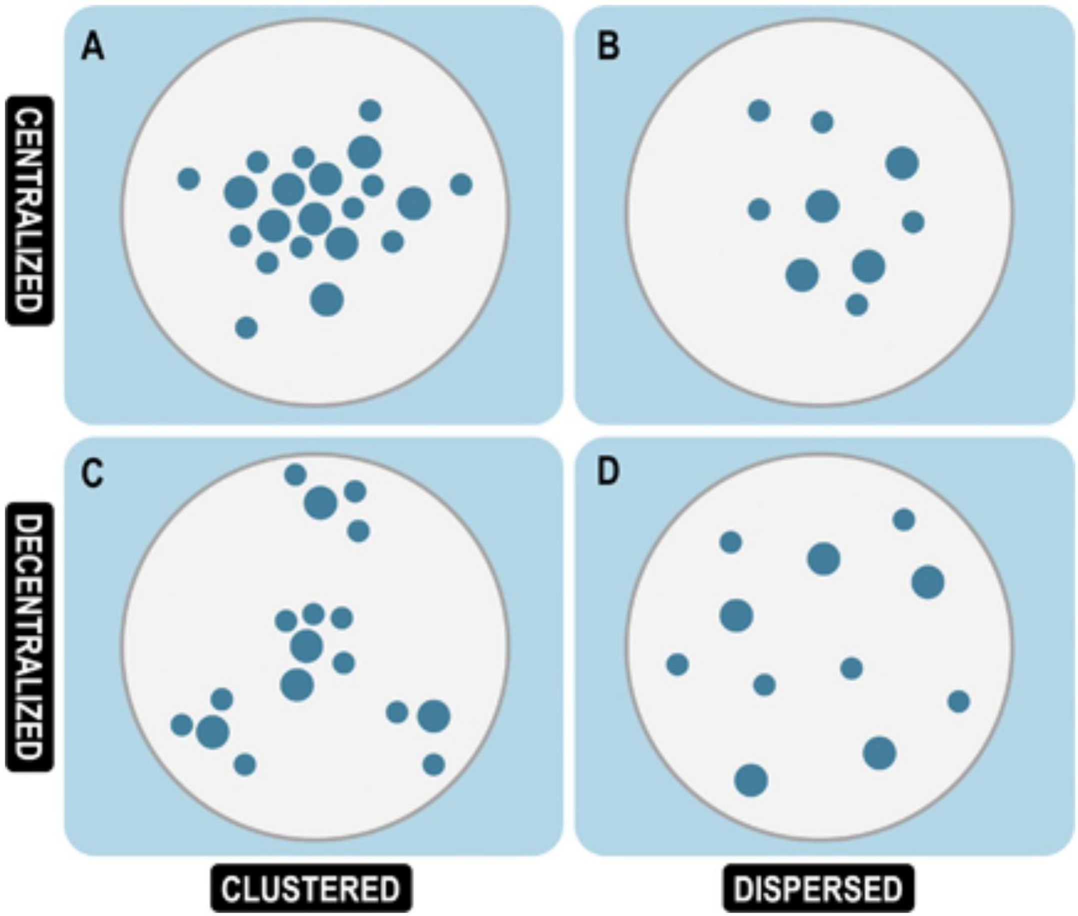


Table 5. 1 Example system design characteristics

	Intermodal terminal	Road haulage	Distribution centre
Capacity	• I reach stacker	• 2 trucks • 22 trailers (either 1*40 ft or 2*20 ft per trailer) • 5 lorry drivers	Between 1 2 and 24 gates • Staffing 2 shifts of 14 on average per shift
Opening/ operating hours	Mon-Fri 05.00-18.00	Mon—Fri 04.30-23.30	Mon-Thu 06.00-23.00 Fri 06.00-16.00 Sat 06.00-20.00
Activity and lead times	• Loading/unloading time: 2—5 min per trailer • Outside opening hours: • Time for marshalling of trailer including leaving/picking up trailer at the gate: 20-35 min	Transport time: 30-35 min (one-way).	Time for marshalling of trailer including leaving/picking up trailer at the gate: 20—35 min

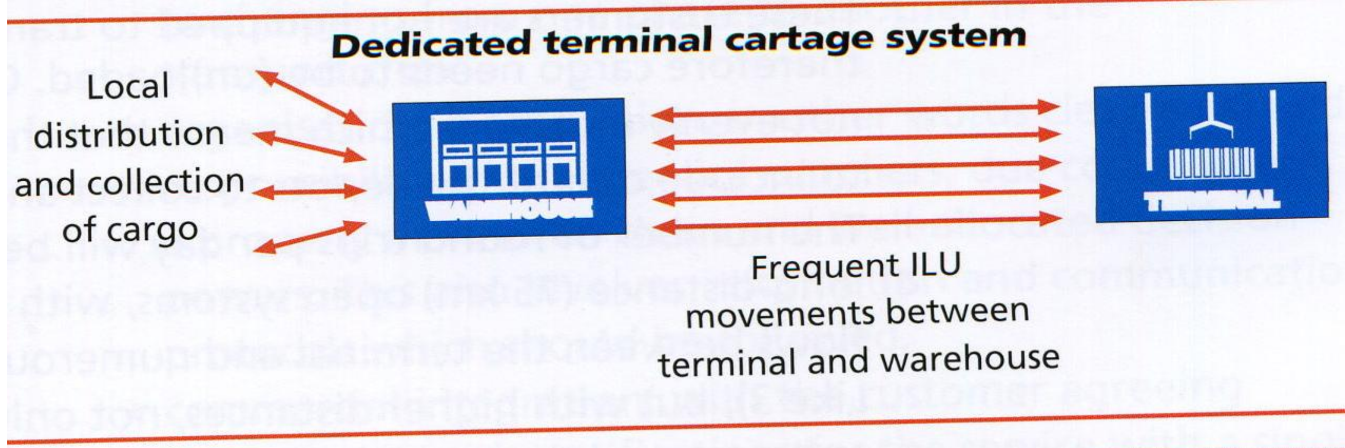
Road focus

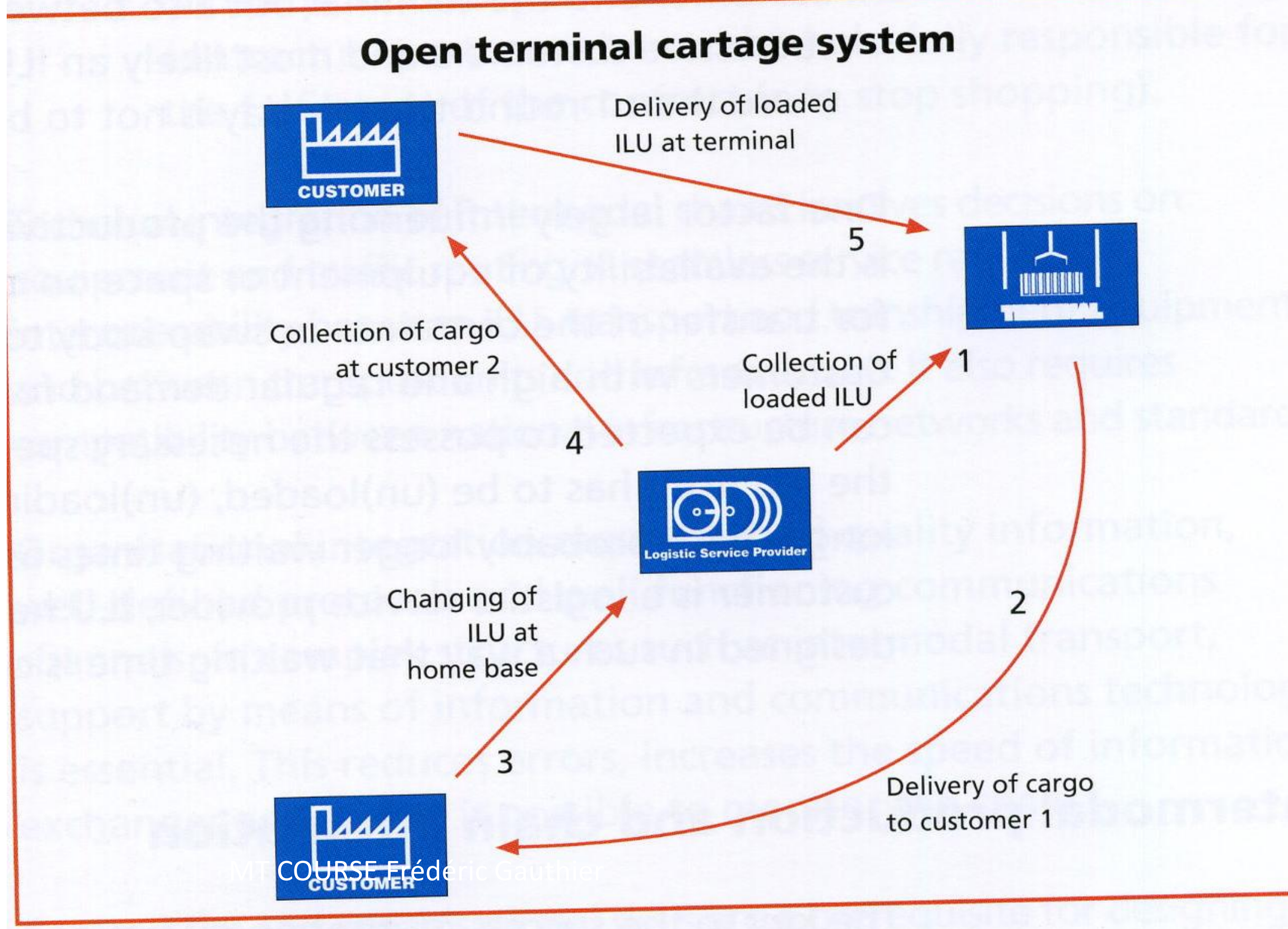
- **Last mile**
  - Looking for closer distance between terminal and operators
  - Extended terminal opening hours but extra cost ; Acquire more trailers
- **Final leg** is stripping / stuffing
- **Empty repositioning of containers** are depending on
  - Number of Containers stored at the terminal
  - Opening hours of the terminal
  - Number of trucks and working hours of drivers
  - Capacity of trucks
  - Number of trailers
  - Opening hours and manning of central warehouse
  - Difficulty to take into account = fluctuations

Road focus

- Example in EU **inbound train than truck on delivery**
  - Truck returns the empty container
  - In the US, containers remain on the chassis

    Or
  - Truck coming with an empty container contacts the reach Stacker driver that he arrived and takes a full container at the yard
  - Then deliver to the D C he **advised by radio**
  - than DC can allocate discharge (and plan in advance)
  - And truck driver can take an empty container
  - **Save significant round trip time**


Dedicated terminal cartage system
Local distribution and collection of cargo
Frequent ILU movements between terminal and warehouse

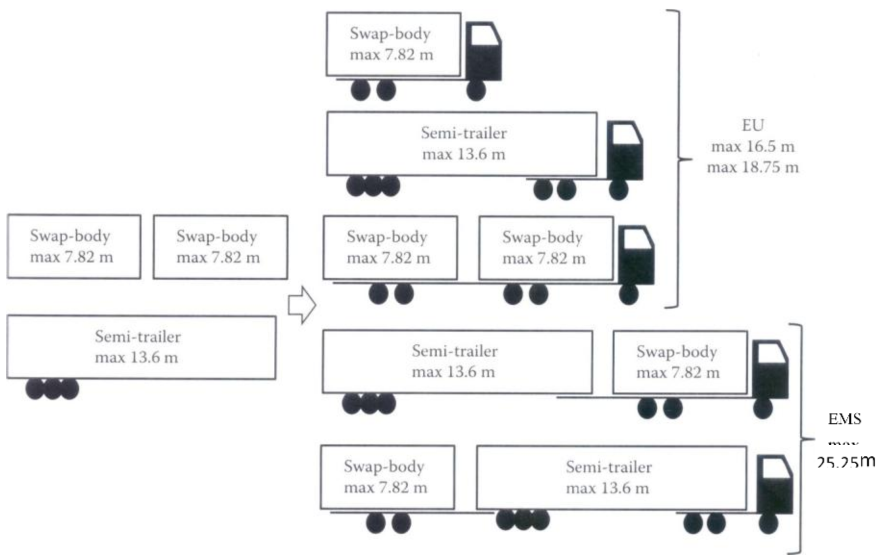

Open terminal cartage system
CUSTOMER
Delivery of loaded ILU at terminal
5
Collection of cargo at customer 2
4
Collection of loaded ILU
1
Logistic Service Provider
Changing of ILU at home base
2
3
Delivery of cargo to customer 1
CUSTOMER

Road focus

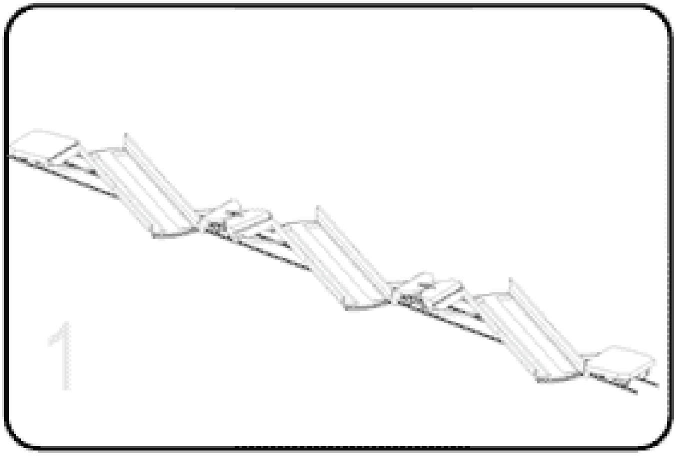
High capacity transport

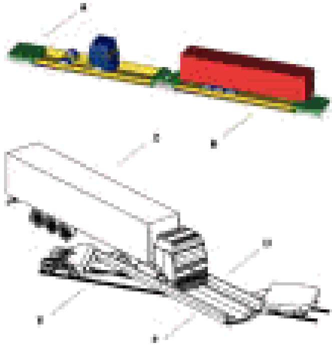
- Maximum length on cross border traffic = 16.50 m
- And 18.75m for articulated vehicles
- 44 t when transporting containers

- Will 25. 25 in Sweden , Finland , NL with weight restrictions
- Possible new regulation for 25.25m and 60 t

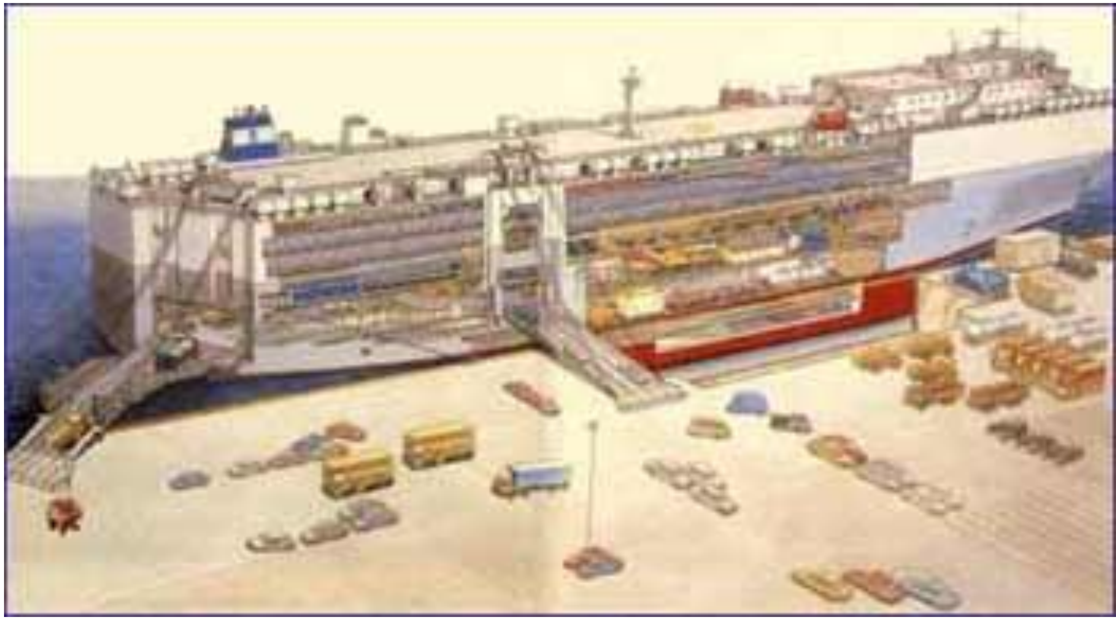


- Piggyback
  - Channel tunnel
    - Hazardous goods
    - Reefer trailers
  - Modalohr
    - Pivot on each wagon
    - Retractable ramp
    - Heavy goods vehicles
    - Where road traffic is saturated
    - As railway sidings do not exist – improved rail road combined transport
    - Multimodal platform





- Roll on roll off : short sea crossing
  - Roll on to water based
    - Tractors – buses – trucks
    - Safest and most inexpensive
    - No need for dismantling and reassembly
  - RoRo vessels
    - Outsized cargo
    - Multi-port operation



- Lift on lift off
    - Lifted into
    - Similar to RORO
    - Stored below the deck

3 – Continental approach

Handling facilities

- Adequation
- Cost of moving
- Inland movement of containers

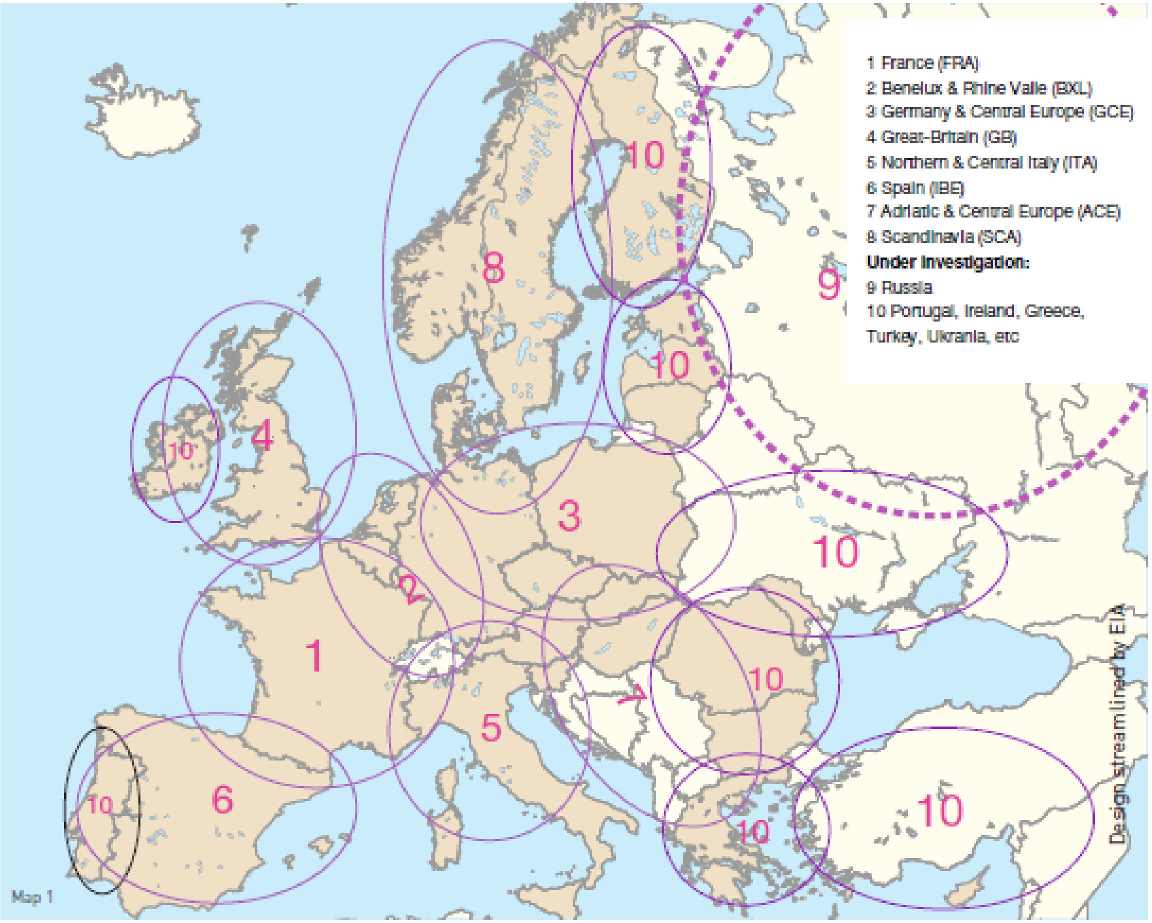
Container Corporation of India Case Study

- Development of inland container handling facilities
- Railway use
- Traffic
- ICD/CFS

COVID 19 vaccine example

- **Pfizer forecast**
  - Filling process in Kalamazoo plant in Michigan
  - **Special shipping boxes** = 0.40x0.40x0.56 m packed with dry ice
  - **Each box** contains 975 flasks containing each 5 vaccine doses
  - Six **trucks daily** to ship to Fedex, UPS, DHL
  - **Delivery time** : 1 to 2 days in the U.S. and 3 days worldwide
  - 20 daily's flights
  - **Authorization for dry ice** to Fedex in Boeing 767 and 777 (to avoid gas emission)
  - **At destination** : each box will be opened briefly twice a day
  - Dedicated to big vaccine centers
  - **To be stored 2 weeks** in the original refrigerated box
  - **Production this very year … to start** : 50 millions doses
    - 20 to 30 millions delivered in the U.S. this year and 70 millions more in 2021
    - Europe : 200 millions ; 120 millions Japan, 30 millions U.K.
  - **Then competitors** as from first quarter 2021 will have their own on the market
    - Moderna, Astra Zeneca, Johnson & Johnson, Sanofi …

CMA CGM case


1 France (FRA)
2 Benelux & Rhine Valle (BXL)
3 Germany & Central Europe (GCE)
4 Great-Britain (GB)
5 Northern & Central Italy (ITA)
6 Spain (IBE)
7 Adriatic & Central Europe (ACE)
8 Scandinavia (SCA)
Under investigation:
9 Russia
10 Portugal, Ireland, Greece, Turkey, Ukrania, etc
1
2
3
4
5
6
7
8
9
10
Design streamlined by EIA
Map 1

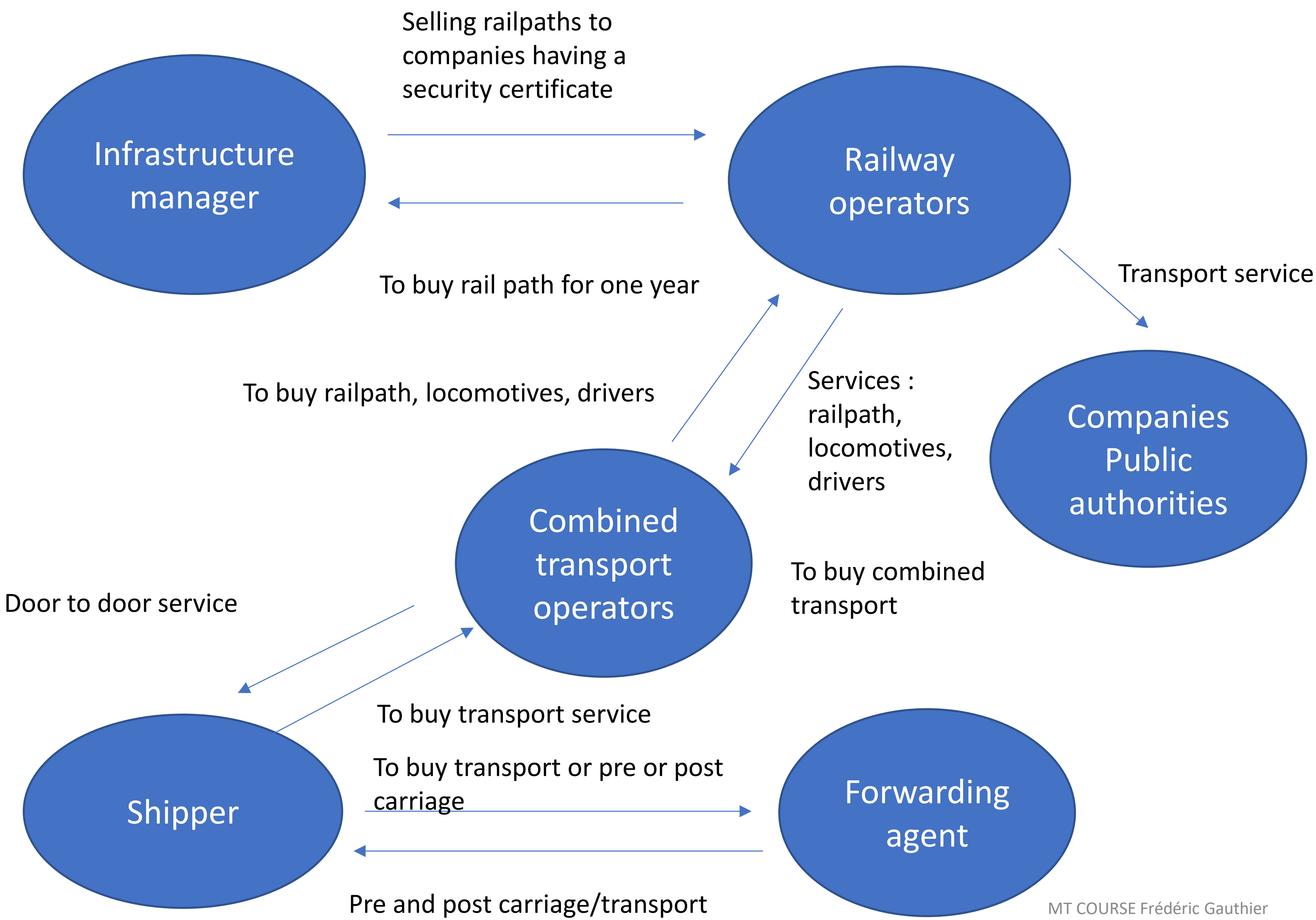
3-

- Short sea shipping in EU
  - Imo Fal
  - Marco Polo Programme
    - Programme
    - Structure
  - Loading units
  - Customs procedures for short sea shipping
  - A growth
  - Analysis per countries

Continental & Multimodal choice

About	Inlandwaterway	Railway
Full distance	From a short distance to 200 kms	More than 200 kms Some cases less than 200 kms
Pre/post carriage	From 0 km on short distance Till 150 km on a long distance	Less than 40 km Latest km might increase drastically total cost
Volumes	General cargo from 1 FCL Bulk : 250 t as a minimum (Freycinet barge) Heavy and over sized goods	22 to 24 rail cars 80 to 100 cbm Filling rate more than 85 %
Services	On request to bulk or operating cycle or liner shipping	Round trip or one way
Frequency	Just in time is possible	Can meet with rigidity (timetable, location which is compulsory, Investment justified with flows (locomotive, raicars) highest productivity as a goal
Regular flows	Non specific constraint : taking care of mode disruption	Regular and sustainable flows
Goods	Heavy bulk or heavy general cargo, intermodal transport unit	Heavy goods (steel, construction material, drinks) and bulk sand, cereals, coal …)
Offer	10 to 15 brokers in France Several shipowners Direct chartering	One historical rail carrier in France 2 competitors Network RFF in France : to get train pathes

Road and rail



- Intermodal freight transport in Europe
  - Main evolution
    - Increasing by free trade
    - Land use and different transport systems and .. infrastructures
  - European ports ranking
  - Trends in freight transport
    - Increasing number of terminals for all kinds of shifts
- 24% of freight vehicles in E.U. run empty
- The average loading of the rest is 57%
- There is an estimated recoverable loss for the E.U. of € 160 bn

V- Operators

1- Physical distribution

2- Network

3- Multimodal transport operator

4- Selection methods

1- Physical distribution

Legal types of carriage

For hire

- Common carrier

Or private

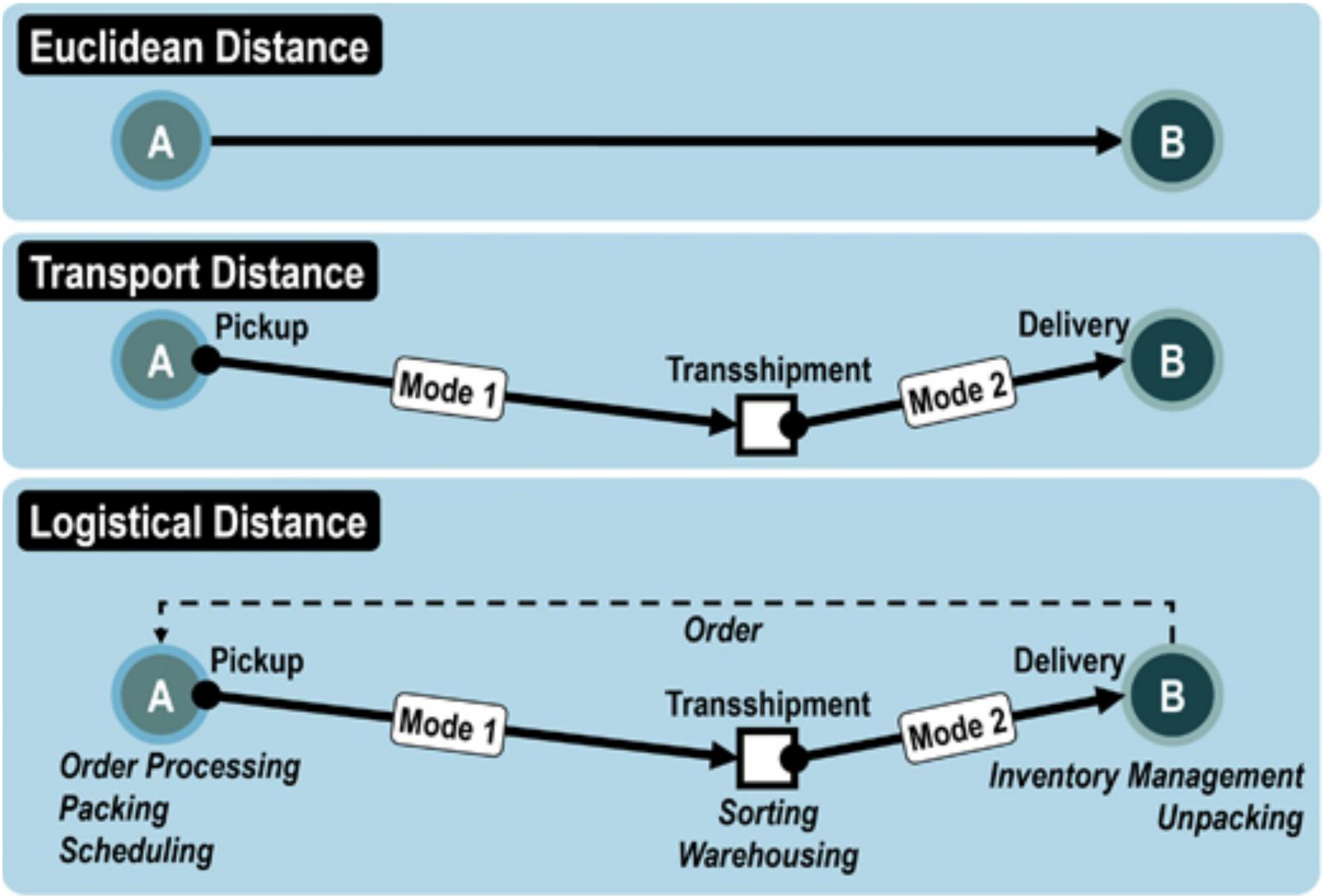
Service capability

- Market place under schedules and regulations

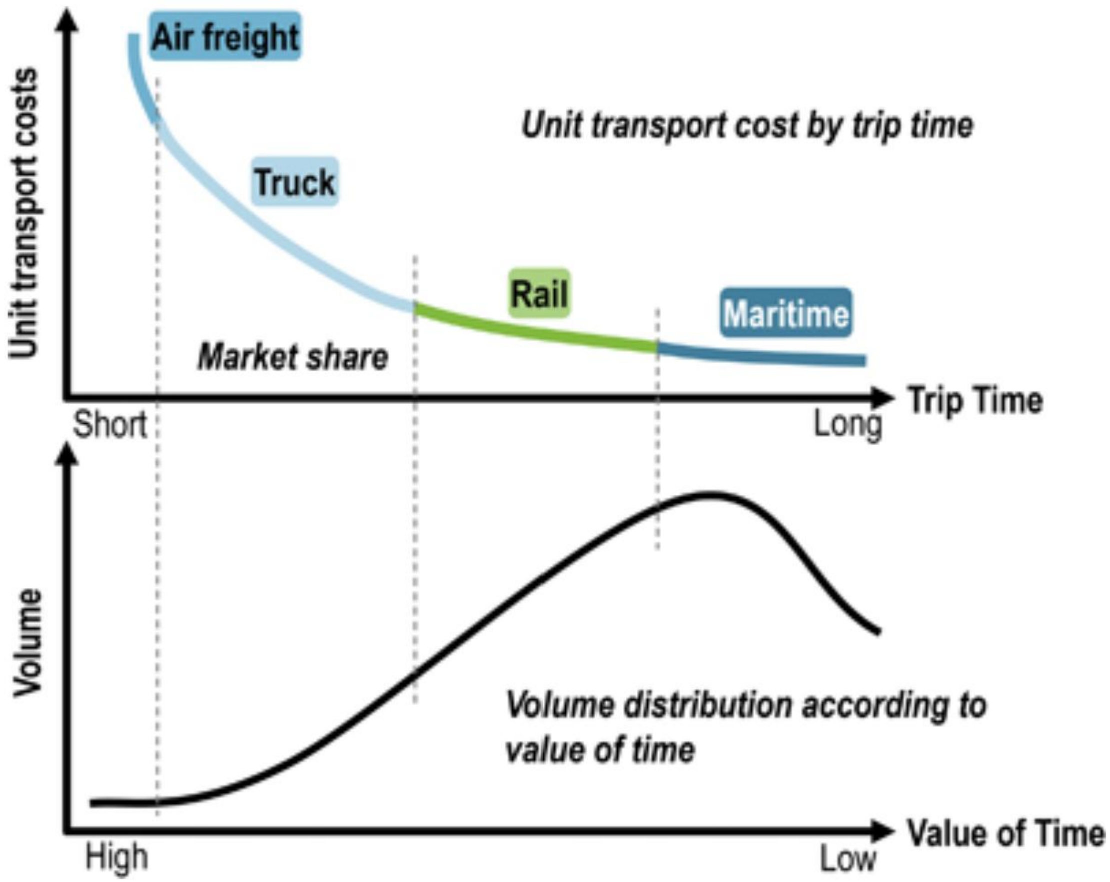
Other transportation agencies to remember

- Post office
- Freight forwarders

Distance factor TO REMIND



Time and transport market



1- Physical distribution

- Transportation cost elements
  - **Line-haul costs**
    - Distance factor
    - Limitations to weight and cubic volume
  - **Pick-up and delivery costs**
    - And consolidation to reduce possibly the cost
  - **Terminal handling**
    - Number of times to load, handle and disload
    - consolidation factor is also critical
  - **Billing and collecting**
    - And paperwork
  - **Total transportation costs management**
    - Decreasing costs
      - Line haul (by increasing weight),
      - Pick up (by reducing number),
      - Terminal, billing
  - **Insurance**
    - Value and density
    - Perishability
    - Packaging
    - Two rate structures LTL and FTL

1- Physical distribution

- **Warehousing**
  - Plant, regional, local and … wholesalers
  - Role of warehouses
    - General and distribution
    - Transportation reduced by using warehouses
    - Product mixing (different locations)
  - **Market boundaries**
    - Laid-down cost
    - Example Toronto / Boston
      - LTL cost 0.20 $ Product cost at Boston 70$ and 10$ in Toronto and 500 miles distance
  - **Effect on transportation costs of adding more warehouses**
    - Full truckload : cost increase and L.T.L. cost decrease
      - More distribution centers
      - Saving decrease with the major first distribution centers
    - Package care
    - Unitization
      - Pallets

2- network

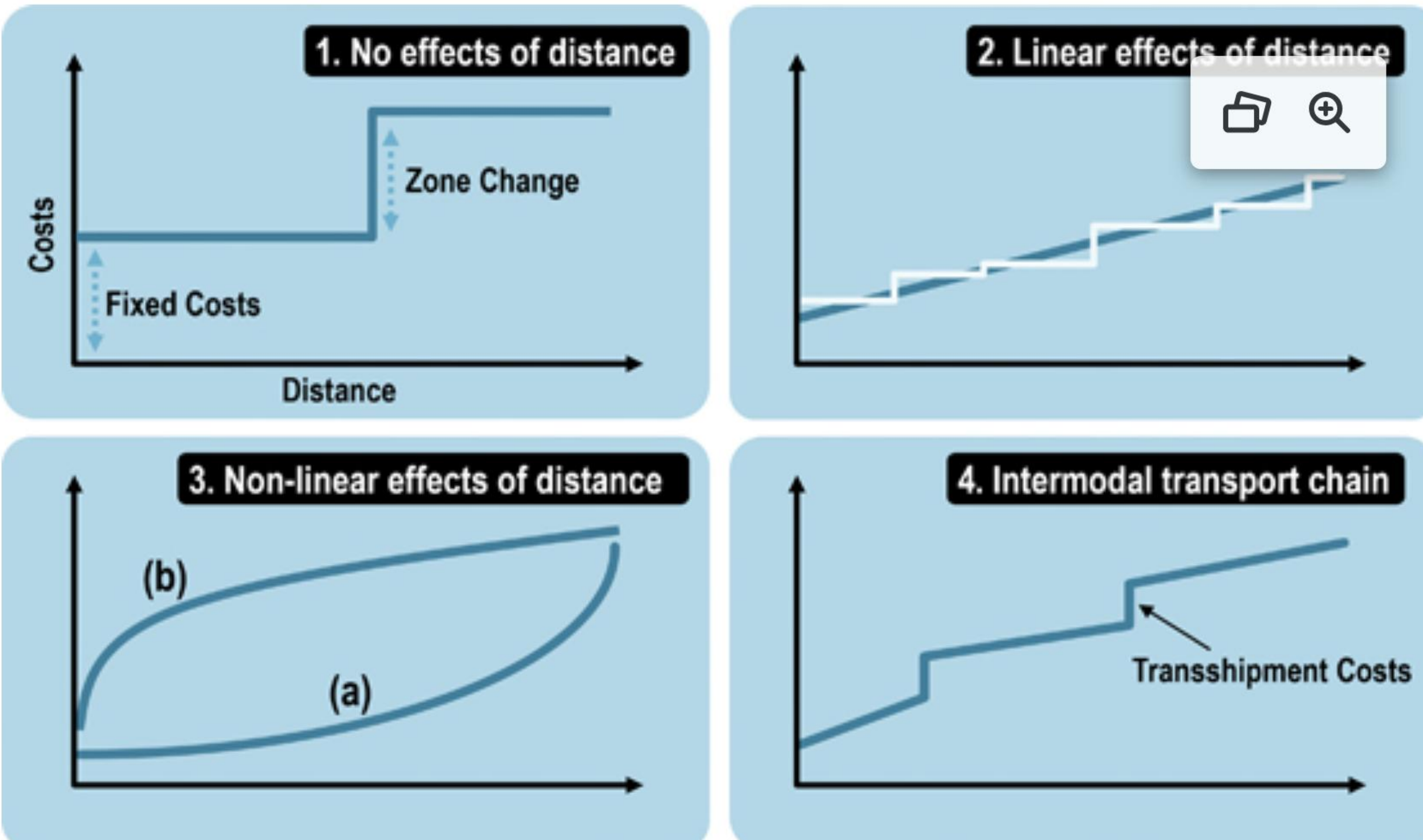
Situation

Types of transportation

Forwarding agent

- Cost
  - **Variable and fixed costs**
    - Line haul
    - Fixed costs depends on mode
  - Common or join costs
    - Arbitrary cost allocation
    - The back haul

cost

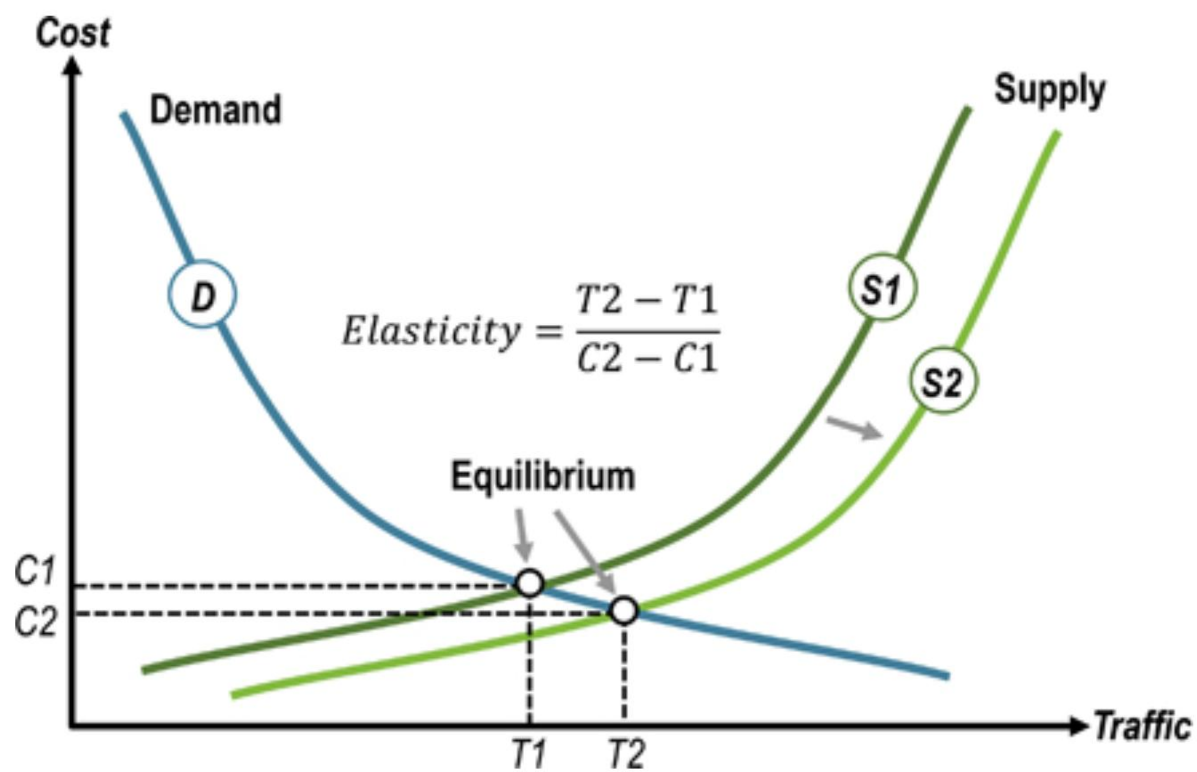


1. No effects of distance
Costs
Zone Change
Fixed Costs
Distance
2. Linear effects of distance
3. Non-linear effects of distance
(b)
(a)
4. Intermodal transport chain
Transshipment Costs

Factors REMINDER

- **Transport time**
  - Concerns the real duration of transport
  - Geographical **constraints** such as weather or technical
  - Transport time on roadways is technically limited to legal speed limits.
  - The limitation of maritime and air concerns fuel economy and design speed. Although rail can accommodate a variety of speeds, schedules impose limited variations.
- **Order time**
  - advance preparation, mainly to secure a capacity, an itinerary, and a rate.
  - some cases, the **order time is short** and a matter of queuing on a first-come, first-served basis
  - **large shipments**, orders must be secured months in advance so that capacity can be made available. This is the case for maritime shipping
  - also the presence of a **spot market** where capacity can be booked with limited advance notice, but subject to higher rates and the likelihood that there will be no capacity available.
- **Timing**
  - Involves the usage of a specific departure time
  - While air and rail travel timing is commonly tight due to **fixed schedules** and access to a terminal capacity commuters and trucking have more flexibility
  - **trucking companies** may elect to modify their schedule accordingly (earlier or later delivery).
- **Punctuality.**
  - The longer the distance, the more likely potential disruptions may affect schedule integrity
- **Frequency**
  - The number of departures for a specific time range
  - Combining **long-distance travel and high frequency** is an expensive undertaking for transport providers as a greater number of vehicles must be assigned to a specific route, as in the case of maritime container shipping.

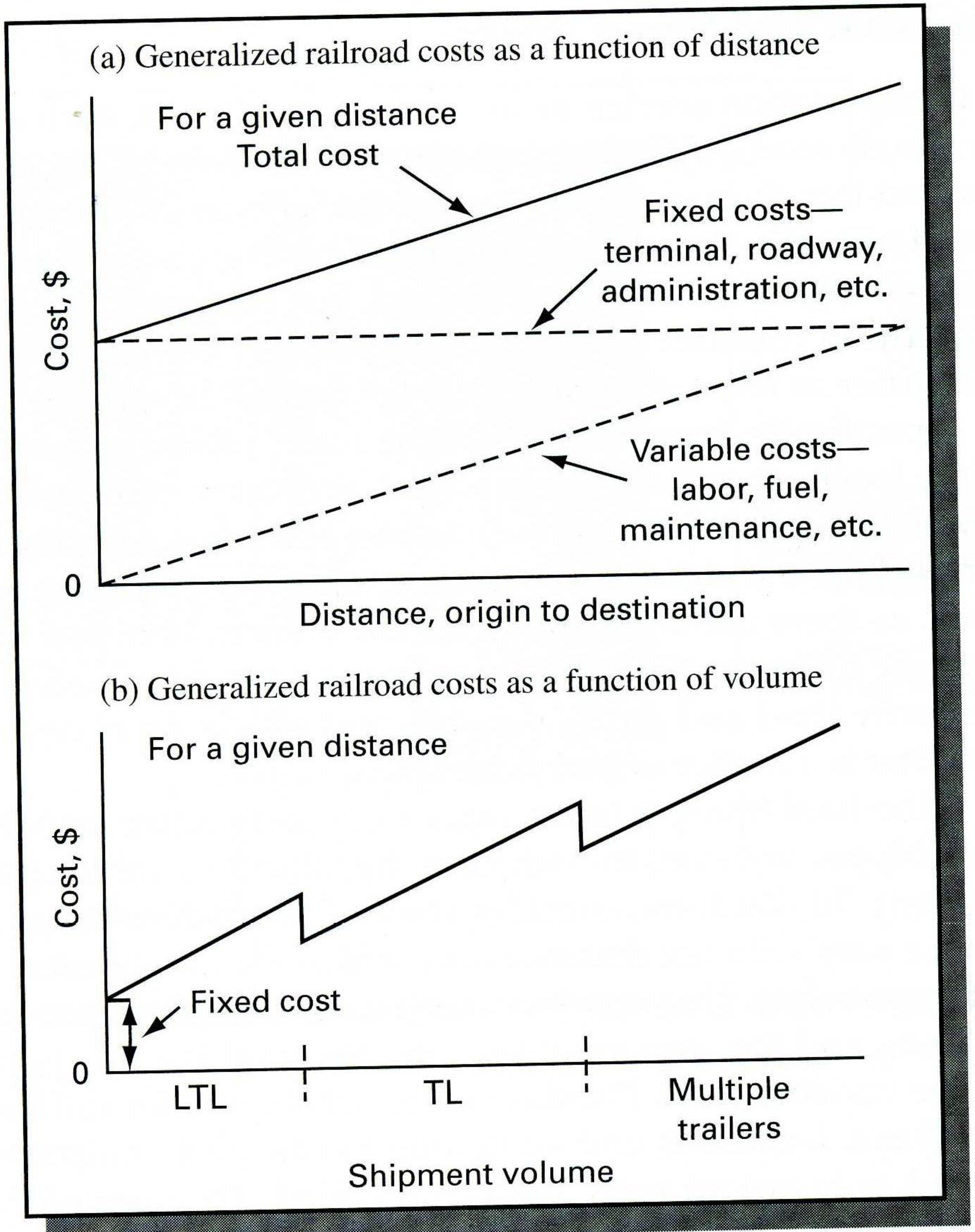
Supply tends to be larger than demand



"If costs are high, transport providers would be willing to supply high quantities of services since high profits will likely arise under such circumstances. If costs are low, the quantity of transport services would be low as many providers would see little benefits operating at a loss."

Total cost

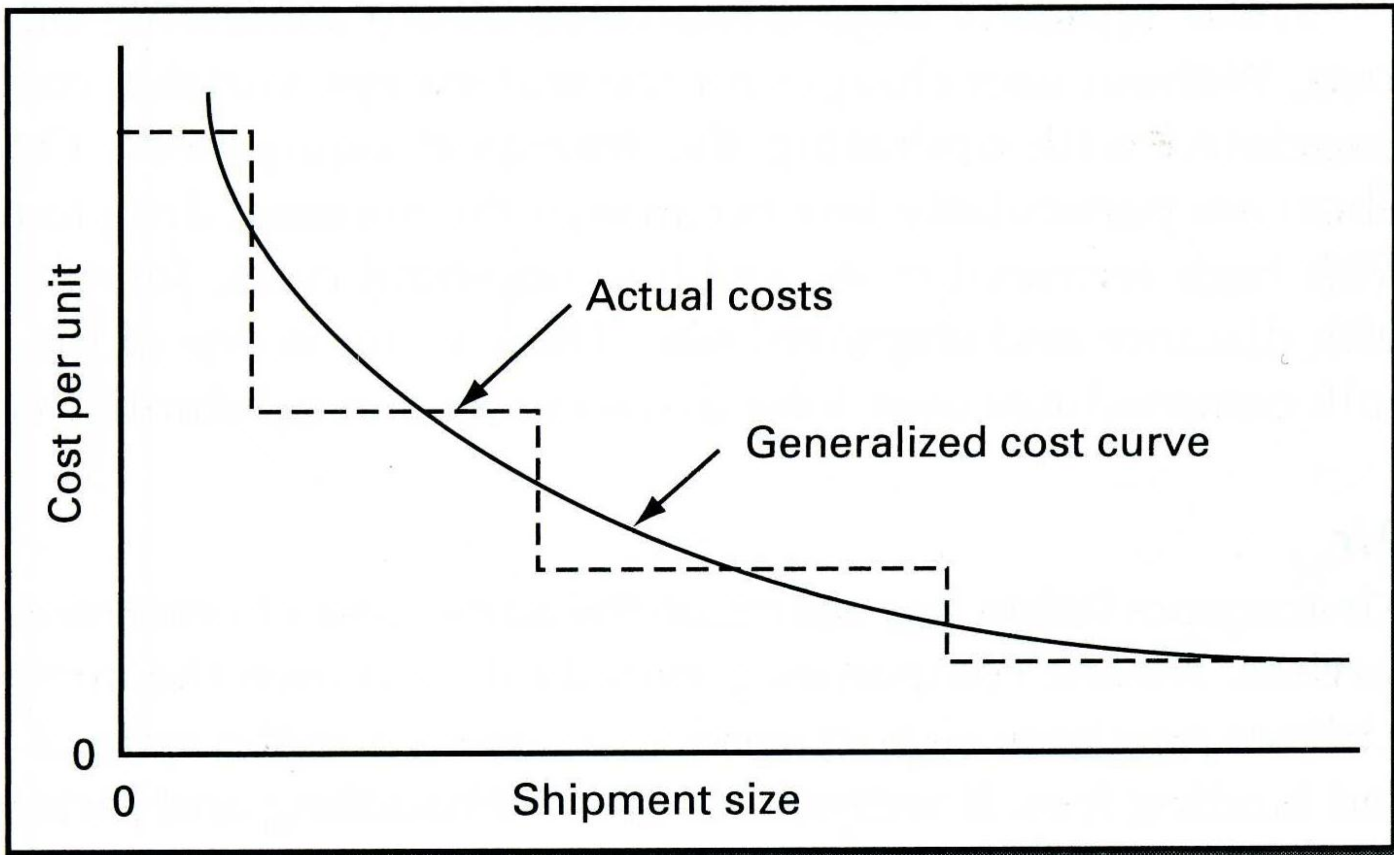
Figure 6-4
Generalized Railroad Costs (and Revenues) As Functions of Volume and Distance



- Cost characteristics by mode
  - **Rail**
    - Terminal cost
    - To add to fixed cost
    - Rail road
    - Economies of scale
    - To maximize time utilization

Shipment size

Figure 6-5
Generalized Surface Carrier Cost Structure Based on Shipment Size

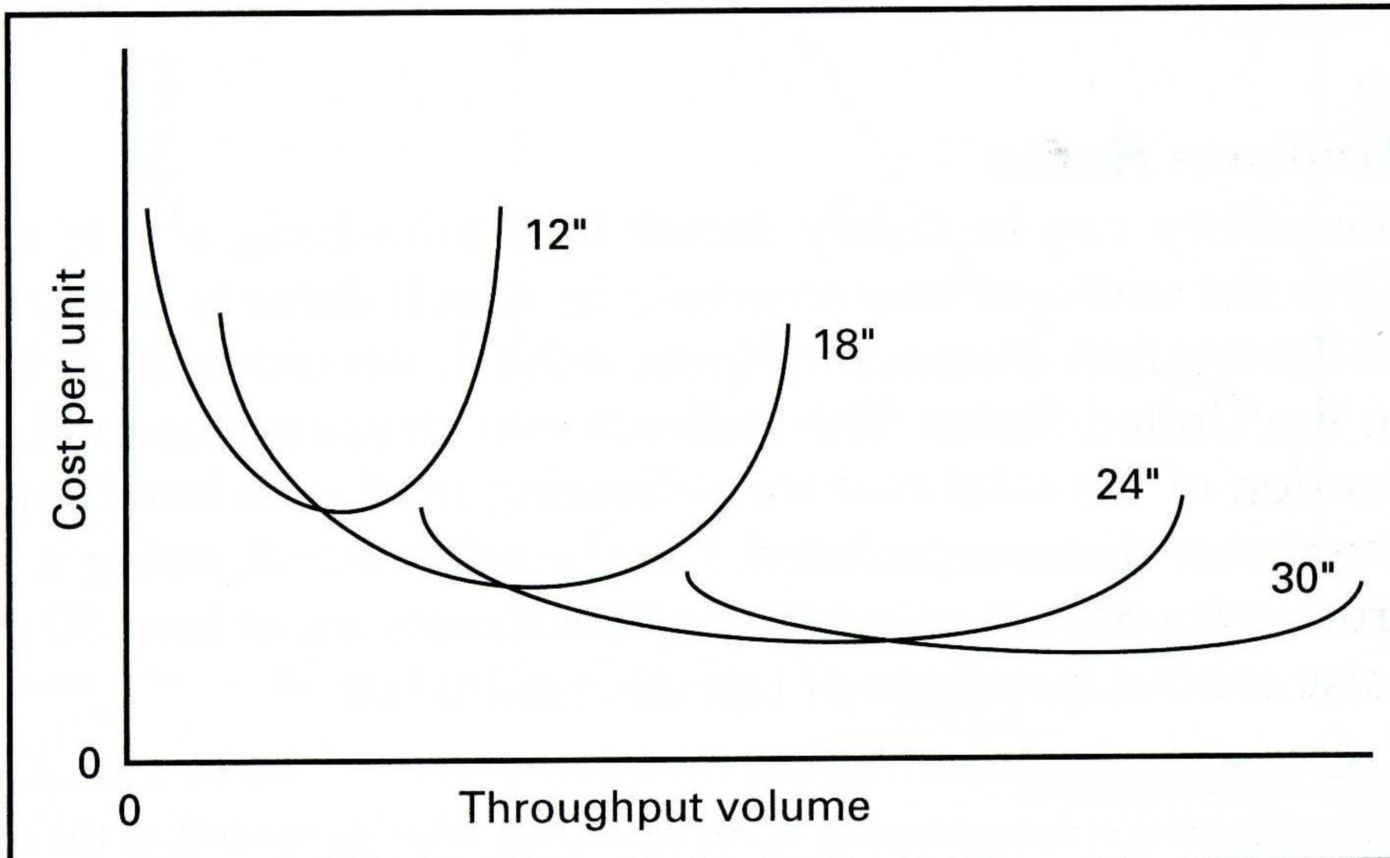


- **Costs and rates in Europe**
  - Highway
    - Variable cost
  - Water
    - Equipment and terminal
    - Loading and unloading : slow and high cost
  - Air
    - Includes usually air space and terminal
    - Variable cost influenced **by distance**
  - Pipeline

Pipeline

17% in the U.S.

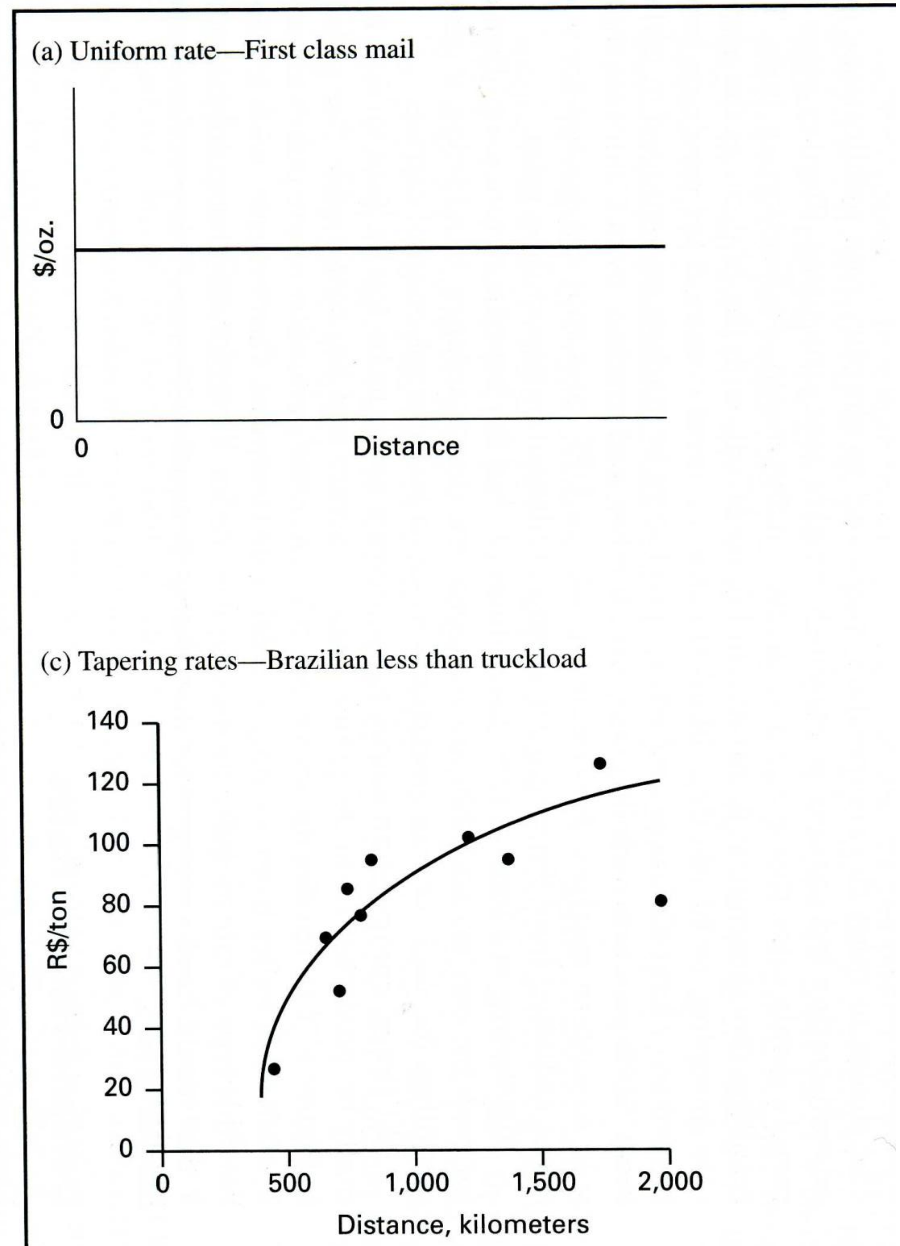
Figure 6-6
Generalized Pipeline Costs As Functions of Pipe Diameter and Throughput Volume



- **Rate profiles**
  - Volume related rates
    - Any quantity rate
  - Distance related rates
    - Uniform rates
      - Example Mail and handling

Uniform rates

Figure 6-7 Four Distance-Related Freight Rate Structures



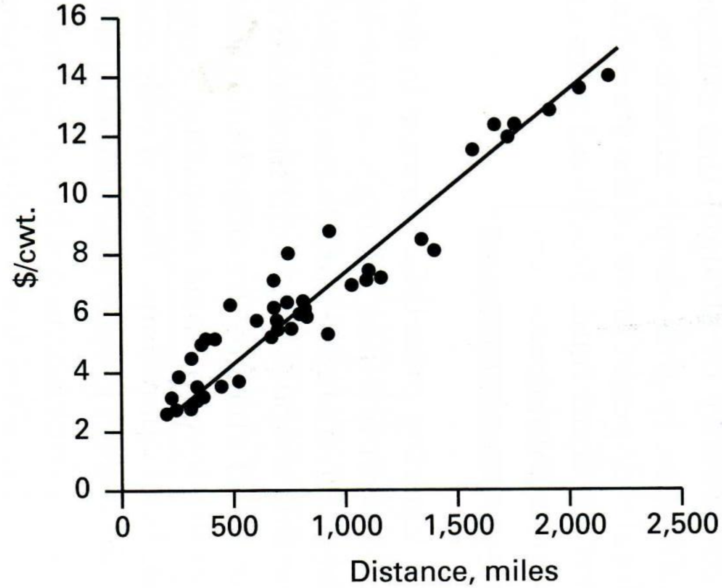
Tapering rates cost

increasing with distance but at a decreasing rate

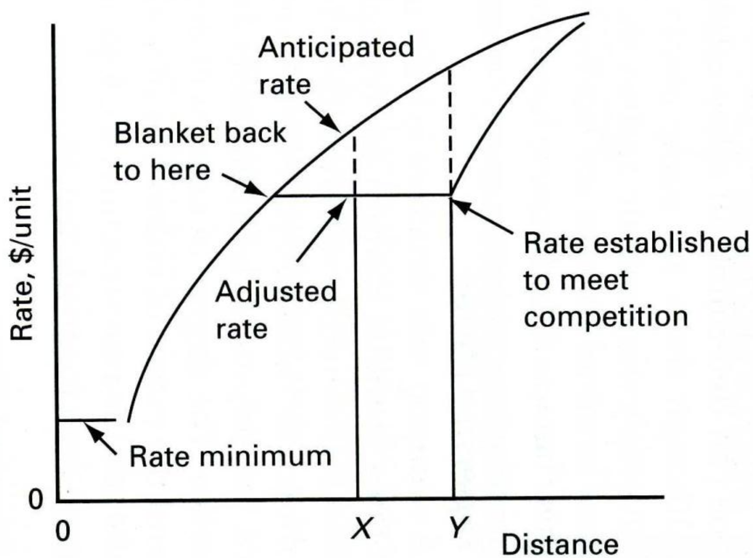
Blanket rates, area

Demand-related rates

(b) Proportional rates—Truckload



(d) Blanketing rates



Transport added value

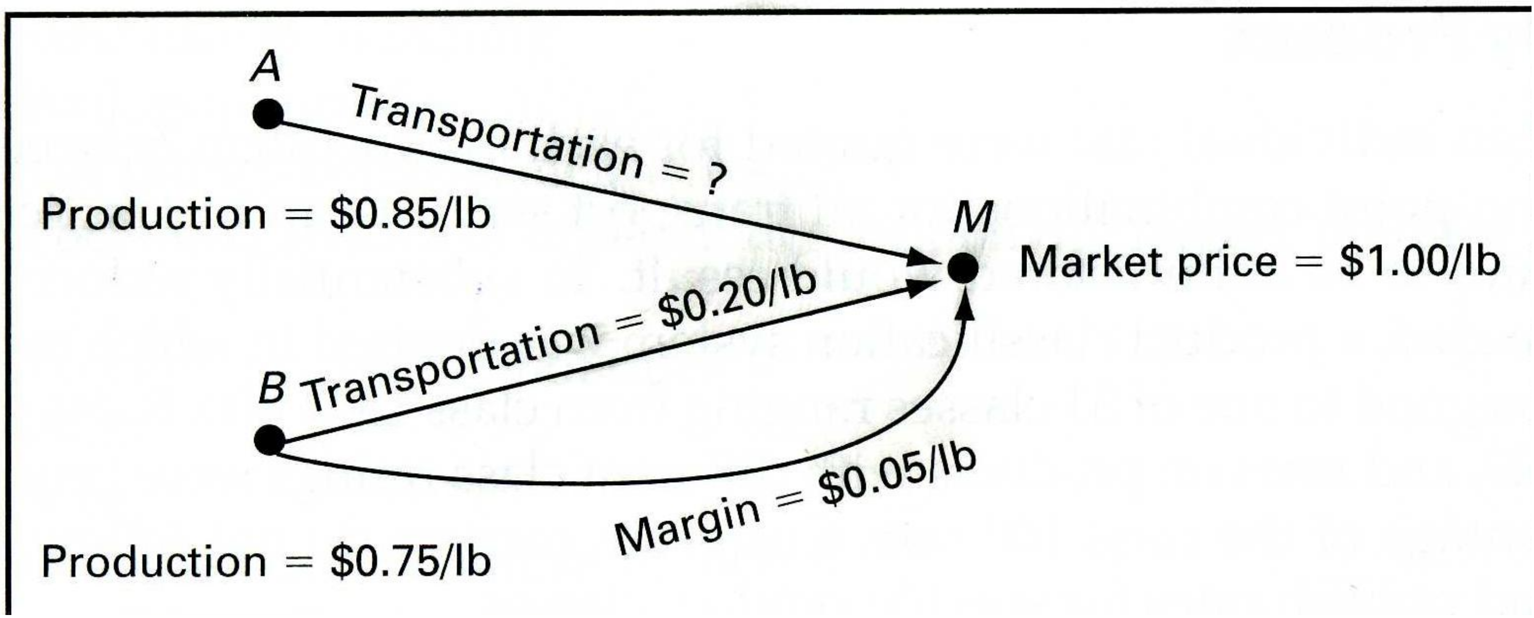


Figure 6-8 Value of Transportation Service

By product

- Uniform freight classification
- Factors as density, stowability, ease of handling and liability
- Ratings of analogous articles
- Other factors : value, injury to other goods, risks, kind of package

Class rates

- Break weight
- Next rate x next weight divided by current rate

Table 6-4 National Motor Freight Classification for Selected Products

Item Number	Description	Less-Than Truckload	Truckload	Minimum Weight, lb
	ABRASIVES GROUP:			
	Alundum, Corundum, Emery or other Natural or Synthetic Abrasive Material, consisting chiefly of aluminum oxide or silicon carbide:			
1070-00	Crude or lump, LTL, in bags, barrels or boxes: TL, loose or in packages	55	35	50,000
1090-00	Flour or grain, in packages	55	35	36,000
2010-00	Refuse, including broken wheels, wheel stubs or wheel grindings, in packages; also TL, loose	55	35	40,000
2030-00	Wheels, pulp grinding, on skids or in boxes or crates	55	40	30,000
2055-00	Cloth or Paper, abrasive, including Emery Cloth or Paper or Sandpaper, in packages	55	37.5	36,000
2070-00	Accessories or Furniture, cat or dog, in boxes and having a density on pounds per cubic foot of:			
2070-01	Less than 1	400	400	AQ[a]
2070-02	1 but less than 2	300	300	AQ[a]
2070-03	2 but less than 4	250	250	AQ[a]
2070-04	4 but less than 6	150	100	12,000
2070-05	6 but less than 8	125	85	15,000
2070-06	8 but less than 10	100	70	18,000
2070-07	10 but less than 12	92.5	65	20,000
2070-08	12 but less than 15	85	55	26,000
2070-09	15 or greater	70	40	36,000
	ADVERTISING GROUP:			
	Advertising Matter, NOI, prepaid, in packages			
4660-01	Cloth or oilcloth	85	55	24,000
4660-02	Paper or paperboard, other corrugated or fluted	70	40	30,000
4740-00	Almanacs, prepaid, in packages	77.5	55	24,000

Contract rates

- Special rates

Freight all-kinds

By shipment size

- Minimum quantity

Table 6-6 Selected Class Truck Rates in $ per cwt. by Classification Number and Weight-Break Quantity in lb for Shipments from Louisville, Kentucky, to Chicago, Illinois

MC[a] $75.40

Class	<500	≥ 500	≥ 1,000	≥ 2,000	≥ 5,000	≥ 10,000	≥ 20,000	≥ 30,000	≥ 40,000
500	165.39	132.31	99.26	82.70	59.51	54.44	28.67	28.67	28.67
400	139.03	111.22	83.43	69.51	50.03	45.76	24.10	24.10	24.10
300	110.26	88.21	66.17	55.13	39.68	36.68	19.11	19.11	19.11
250	95.88	76.70	57.54	39.55	34.50	31.56	16.62	16.62	16.62
200	79.10	63.28	47.47	39.55	28.46	26.04	13.71	13.71	13.71
175	69.51	55.61	41.72	34.76	25.01	22.88	12.05	12.05	12.05
150	62.32	49.86	37.40	31.16	22.43	20.51	10.80	10.80	10.80
125	52.73	42.19	31.65	26.37	18.98	17.36	9.14	9.14	9.14
110	52.34	40.27	30.21	25.17	18.11	16.57	8.73	8.73	8.73
100	47.94	38.35	28.77	23.97	17.25	15.78	8.31	5.69	4.37
92.5	45.54	36.43	27.33	22.77	16.39	14.99	7.89	5.41	4.15
85	42.19	33.75	25.32	21.09	15.18	13.89	7.31	5.01	3.85
77.5	39.79	31.83	23.88	19.90	14.32	13.10	6.90	4.72	3.63
70	37.39	29.91	22.44	18.70	13.46	12.31	6.48	4.44	3.41
65	35.48	28.38	21.29	17.74	12.77	11.68	6.15	4.21	3.23
60	34.04	27.23	20.43	17.02	12.25	11.20	5.90	4.04	3.10
55	32.60	26.08	19.56	16.30	11.73	10.73	5.65	3.87	2.97
50	31.16	24.93	18.70	15.58	11.21	10.26	5.40	3.70	2.84

[a] MC = minimum charge in $

Source: Southern Motor Carriers' CZAR-LITE software.

- **Other incentive rates**
  - In excess rates, quantity exceeding the vehicle minimum load
  - Unit trains example
    - Single commodity trains

Table 6-7 Examples of Transportation Charge Computations for Different Shipment Combinations of Class Ratings, Distances, and Shipment Weights

Example	Shipment Specifications	Calculation Rate, $/cwt.	Actual Freight of Charges	Charges	Comments
A	Item 2070-02; Louisville, KY, to Chicago, IL; Volume = 300 lb.	MC = $75.40, $110.26	$110.26 × 3 = $330.78	$330.78	Class = 300 from Table 6-4; Rate from Table 6-6
B	200 lb of paper calendars; Louisville, KY, to Chicago, IL	MC = $75.40, $37.39	37.39 × 2 = $74.78 Pay minimum charge	$75.40	Class = 70 for item 4800-02 in Table 6-4; Rate from Table 6-6
C	Cat furniture; New York, NY, to Portland, OR; Volume 15,000 lb at a density of 5 lb/cu. ft.	MC = $197.25, $58.19	$58.19 × 150 = $8,728.50 Break quantity is 17,680 lb[a]	$8,728.50	Class = 100 for item 2070-05 from Table 6-4; Rate from Table 6-5
D	150 lb of books printed on glossy paper; Louisville, KY, to Chicago, IL	MC = $75.40, $39.79	$39.79 × 1.5 = $59.69 Pay minimum charge	$75.40	Class = 77.5 for item 4860-02 from Table 6-4; Rate from Table 6-6
E	18,000 lb. of bags with advertising; Louisville, KY, to Chicago, IL	LTL: $15.78 @100 TL: $6.48 @70[b]	LTL: $15.78 × 180 = $2,840.40 TL: 6.48 × 200 = $1,296.00	$1,296.00 Ship TL at lower class and rate	Class = 100 LTL and 70 TL for item 4745-00 from Table 6-4; Rates from Table 6-6
F	Grain in packages; Louisville, KY, to Chicago, IL: Volume 27,000 lb	$5.65@20,000 $3.87 @30,000	$3.87 × 300 = $1,161.00 Break quantity is 20,549 lb	$1,161.00	Class = 55 for item 1090-00 from Table 6-4; Rates from Table 6-6
G	Class 100 item; New York, NY, to Little Rock, AR; Volume = 40,000 lb; 40% rate discount	$17.56 less 40% = $10.54	$10.54 × 400 = $4,216.00	$4,216.00	Rate from Table 6-5
H	40,000 lb of refuse; Louisville, KY, to Chicago, IL	TL Class = 35 Rate @35% of 4.37 = 1.52[c]	$1.52 × 400 = $608.00	$608.00	Class = 35 for item 2010-00 from Table 6-4; Base rate from Table 6-6
I	Class 100 item; New York, NY, to Dallas, TX; 45,000 lb; Minimum volume for truckload = 36,000 lb; in-excess rate offered = $15.00/cwt.[d]	TL: Rate = $20.52	TL: $20.52 × 360 = $7,387.20 EX: $15.00 × 90 = $1,350.00 Total $8,737.20	$8,737.20	Rate from Table 6-5

[a]Break quantity = (51.44 ÷ 58.19) × 20,000 = 17,680 lb
[b]Rate for class 70 and shipping weight of 20,000 lb
[c]Rate is approximate as a percent of class 100 rate. A truckload rate is likely to be quoted separately from the tabled rates.
[d]Rate applies to all weight in excess of the minimum volume. The minimum volume moves at the CL rate.

By route

Miscellaneous rates

- Cube rates
- Import/export rates
- Deferred rates : increasing delays
- Released value rates

Ocean rates

special service charges

- Diversion and reconsignement, waiting for the ultimate destination
- Special line Haul services
- Transit privileges

STOP OFF PRIVILEGE

Figure 6-9
Example of Stop-Off Privilege to Complete Loading

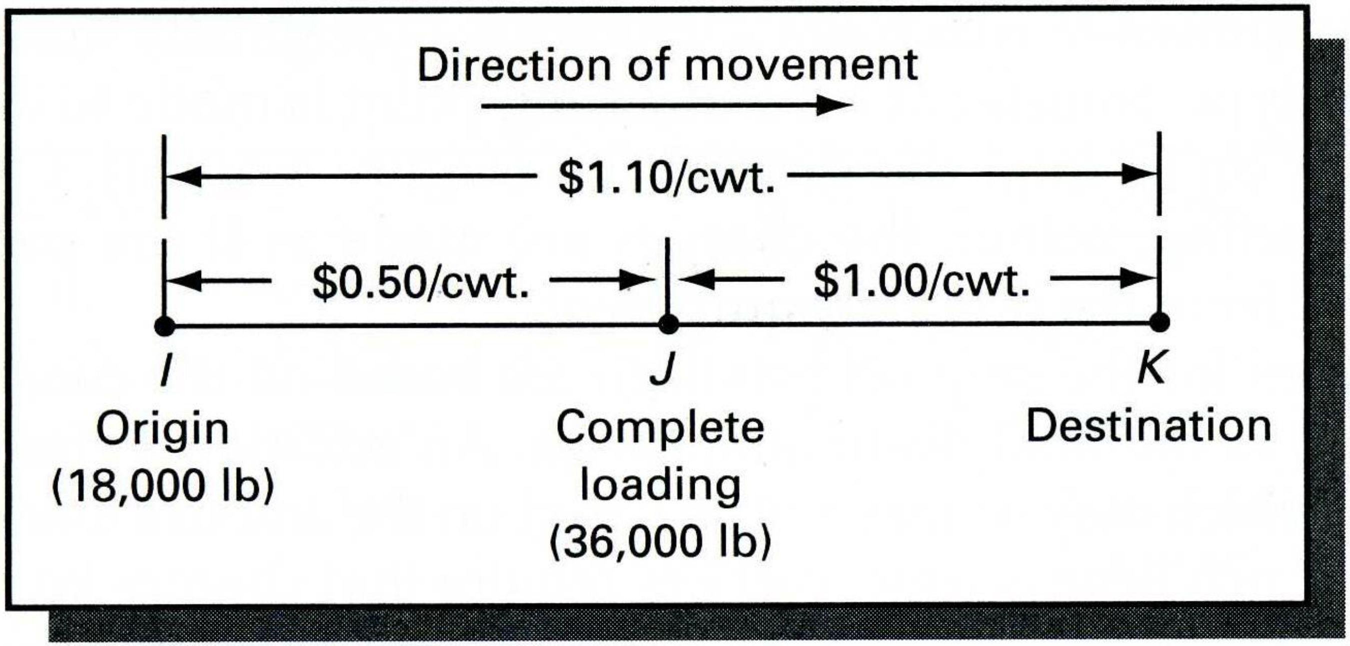


Table 6-8 Freight Charges for Example Problem with and Without a Stop-Off Privilege

Loading	Route	Rate	Charges Without Stop-Off Privilege	Rate	Charges With Stop-Off Privilege
18,000 lb at *I*	*I* to *J*	\$0.50/cwt.	\$ 90.00	—	—
additional	*I* and *J*	\$1.00/cwt.[a]	540.00	\$1.10/cwt.[b]	\$594.00
36,000 lb at *J*	to *K*	stop-off charge	—	stop-off charge	25.00
		Total charges	\$630.00	Total charges	\$619.00

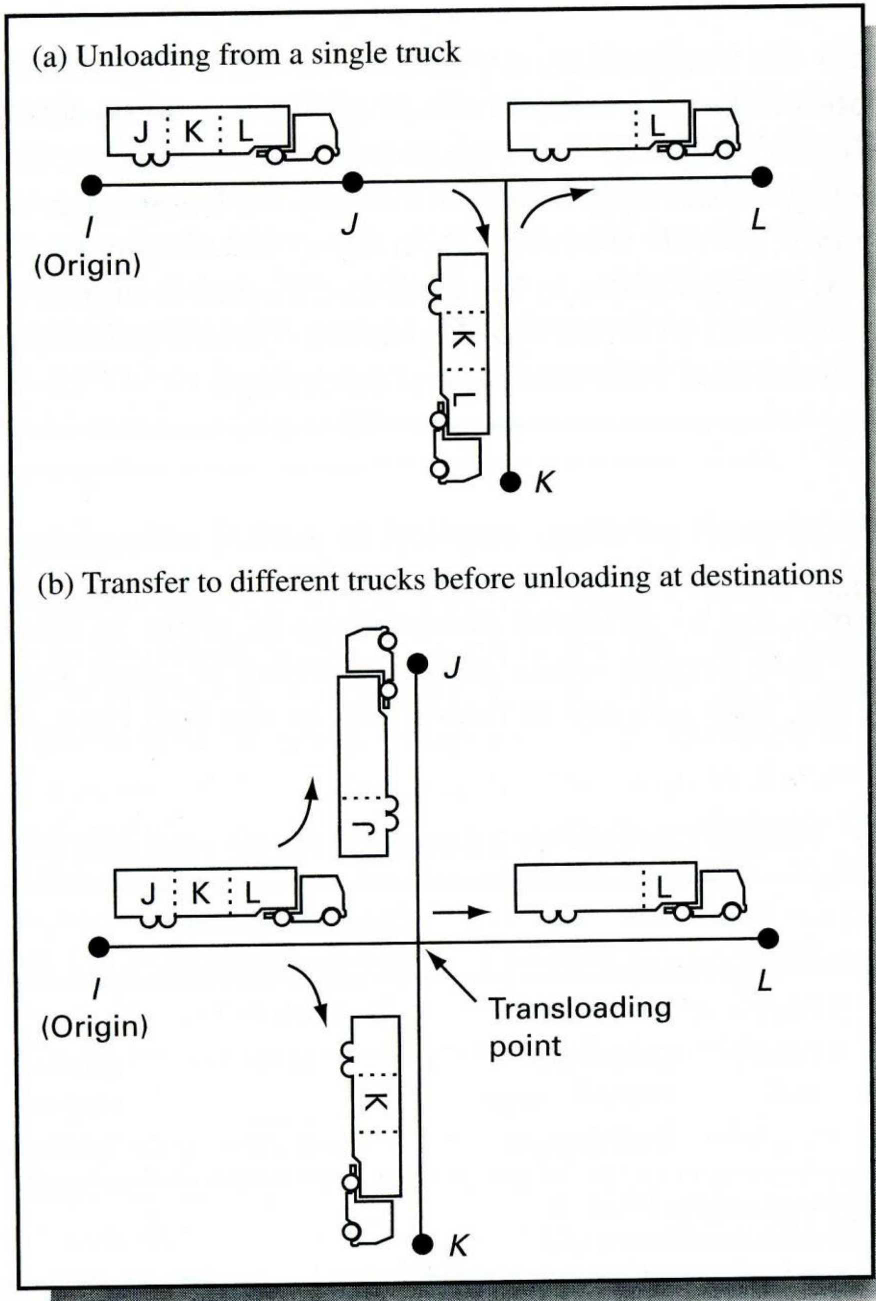
[a]Based on the combined weight of 54,000 lb.
[b]Rate applies from point *I* on complete load.

Table 6-9 A Comparison of Total Charges for Partial Unloading of Two Points With and Without a Stop-Off Privilege

	Without Stop-Off Privilege				With Stop-Off Privilege			
	Load, lb	Points	Rate, \$/cwt.	Freight charges	Load, lb	Points	Rate \$/cwt.	Freight charges
	8,000	*I* to *J*	3.05	\$ 244.00	30,000	*I* to *J*	3.00	\$900.00
	12,000	*I* to *K*	3.35	402.00			3 stops @ \$15/stop[a]	45.00
	10,000	*I* to *L*	3.60	360.00				
Total	30,000	Total charges		\$1,006.00			Total charges	\$945.00

[a]The endpoint *L* also incurs the stop-off charge.

Figure 6-10
Examples of Stop-Off Privilege for Partial Unloading



Also …

- Protection
- Interlining
- Terminal service
- Pick up and delivery
- Switching from sidings
- Demurrage and detention
- Private carrier costing

- Particular physical characteristics

4- Multimodal Transport Operator

- Emergence of **horizontally linked global corporations** that, through acquisitions and mergers
  - similar operating companies in different markets.

- development of **vertically integrated corporations** that have grown by merger and acquisition
  - control several segments of the transport chain, namely modes and terminals.

- **Intermediaries** that provide transport services on a global scale
  - 3PL companies operate in many markets and are major actors in the transport chain.

- **Alliances**, informal groupings of transport providers that pool resources and offer joint services between major global markets
  - partners combine their respective regional networks.

4- MULTIMODAL Transport Operator

MT Convention

- “Any person who on his own behalf or through another person acting on his behalf concludes a multimodal transport contract and who acts as a principal, not as an agent or on behalf of the consignor or of the carriers participating in the multimodal transport operations, and who assumes responsibility for the performance of the contract.”

Acts as Principal/Carrier who enters into the contract of carriage for the entire route of transport

- There are two types of MTO:

- NVO-MTO: a non vessel operating common carrier multimodal transport operator

- VO-MTO : a vessel operating common carrier multimodal transport operator

Difference between

Multimodal Transport Operator as Principal is the party who assumes responsibility for the performance of the contract of carriage commencing from the goods have been handed over to and accepted for carriage by him until delivery at the place of destination.

• Therefore, the responsibility of Principal is to carry the goods from origin point to destination point according to the contract of carriage. • MTO who acts as Principal is the party who issues the Transport Document

• Principal responsibility is cover to acts and omissions of his servants or agents, when any such servant or agent is acting within the scope of his employment, or of any other person of whose services he makes use for the performance of the contract

Difference between

- **Principal liability** may be based on
  - a) Sea Transport :such as Hague Rules 1924, Hague Visby Rules 1968, **Hamburg Rules** 1978, Domestic laws or Back Clause of the Bill of lading
  - b) Air Transport: Warsaw Convention 1929, (**Montreal Convention**)
  - c) International Road Transport: **CMR 1956**
  - d) International Rail Transport: COTIF 1980 e) Any local applicable laws and regulations or oversea applicable law and regulations including Tort.
  - Multimodal Transport : **UNTAC/ICC Rules**, AFAMT (ASEAN Framework Agreement on Multimodal Transport), national laws where applicable.
  - when **performing Multimodal Transport Principal is liable on loss**, damage and delay in delivery of the goods after taken in charge until the time of delivery and/or any tort done by him or his agent, servant or other person of whose services he makes use for the performance of the contract

Difference between

- **Agent in Multimodal Transport concept** is the party who acts on behalf of either
    - Consignor – as Customs broker or traditional Freight Forwarder
    - Consignee – as Customs broker or traditional Freight Forwarder
    - MTO Principal – as servant or subcontractor or Agent
    - If Agent signs bill of lading on behalf of MTO, shall he liable for the third party? Please refer to MTO definition of AFAMT.

Agent **liability** may be based on

- Consignor – Tort / wrongful act, infringement of a right, error and omission when he acts as Agent for Consignor
- Consignee – Tort / wrongful act, infringement of a right, error and omission when he acts as Agent for Consignee
- Principal – Tort / wrongful act, infringement of a right, error and omission when he acts as Agent for MTO.
- Third Party – Tort or any applicable laws

Difference between

- Agent liability may be based on
  - Consignor when **Agent signs on MT Doc on behalf of MTO** (Principal)
  - Consignee when **Agent delivers the goods on behalf of MTO** (including Transit Agents who perform mode shift.)
  - AFAMT Article 24 para 2 **Claim can be made against** servant, agent or other person whose services the multimodal transport operator has used in order to perform the multimodal transport contract of MTO.

Other persons who are involved with Multimodal Transport

Other person whose services the multimodal transport operator has used in order to perform the multimodal transport contract of MTO can be referred as Airline, Shipping Line, MTO Agent is the party that possibly the claim could be filed according to Article 24 para 2 in AFAMT.

M.T.O.

- SUBCONTRACTOR OR AGENTS/PARTNERS OF MULTIMODAL TRANSPORT OPERATOR **who is Principal**:
  - Transit Subcontractor or Agents/Branches who performs transit procedure on behalf of MTO Principal
  - Destination Subcontractor or Agent/Partner of MTO Principal who performs delivery at destination as Delivery Agent/break bulk Agent (including own branch offices)

- **Other related Services acting as MTO** (or either Freight Forwarder)
  - 1. Customs Broker including **hiring truck for local delivery** – As Agent of Consignor or Consignee.
  - 2. International Forwarding **by assisting Traders** to deal with Common Carriers moving the goods internationally and invoice only his Service charge and Handling charges, not freight charges – As Agent of Consignor or Consignee.

M.T.O.

- Acting as **FREIGHT FORWARDER** Transport Service Provider:
  - Air Transport : become Agent of Airlines
  - Sea Transport : becomes principal or carrier as NVOCC taking responsibility as Common Carrier for FCL shipment
  - Truck Transport: international and Local service - Agent or Principal
  - Rail Transport: International & (Local service) – Principal
- Other related Services acting as FREIGHT FORWARDER
  - **Auxiliary Services**: Packing Service – non Transport sector
  - Cargo Consolidation:
    - a) provides LCL consolidation services acting as Carrier
    - b) performs Buyer Consolidation Service on behalf of Single Consignee acts as either Agent or Principal
    - c) perform on behalf of Shipper making consolidation for various consignees at destination, acts as Principal or Agent

M.T.O.

- Acting as FREIGHT FORWARDER

  Ship Broker/Chartering Broker – acts as Agent

  Tank / Container Operator - acts as Principal

  Project Cargo Transport Operator – act as Principal or Agent

  Removal Service – act as Principal

  Exhibition Service - act as Principal

  Dangerous Goods Transport Operator - act as Principal

  Perishable & Live Animal Transport Service - act as Principal

  Warehouse Service – act as Principal or Agent - Common warehouse operator - Distribution & Cross Dock Service - act as Principal or Agent - Free zone and Bonded warehouse - In house warehouse operation and management

  Cold Chain and distribution service - act as Principal or Agent

M.T.O.

- acting as FREIGHT FORWARDER
  - **Stevedoring Service** – acts as Principal or Agent
  - Related Logistics Services such as VMI, Cross dock, In house Customer service, 3PLs, 4PLs, and Lead Manager – act as Principal
  - Last Mile Delivery - act as Principal
  - Courier Service - act as Principal
  - Business Consultant – Free service
  - Insurance Broker - As Agent

Registration of an MTO

- In ASEAN context, **MTO is required to make registration with competent national body**:
  - MTO shall possess the legal capacity as required by the provision where he applies and MTO shall have domicile where he applies
  - MTO shall have an insurance policy or P&I club (Protection and Indemnity) or alternative financial character
  - MTO **shall have an insurance policy**, a coverage from a protection and indemnity club, or an alternative of a financial character to cover payment of obligations for loss, damage or delay in delivery of goods under multimodal transport contracts, as well as contractual risks;
  - MTO shall maintain minimum assets equivalent to 80,000 SDR or provide an equivalent guarantee

Registration of an MTO

- **Form of Multimodal Transport Documents**
  - House Multimodal Transport Bill of Lading
  - FIATA Multimodal Transport Document
  - Sea Waybill
  - Air Waybill
  - e- Bill of Lading
  - Memo Bill of Lading for cross trade shipment

Registration of transport documents might be needed according to countries

4- Partners relationship

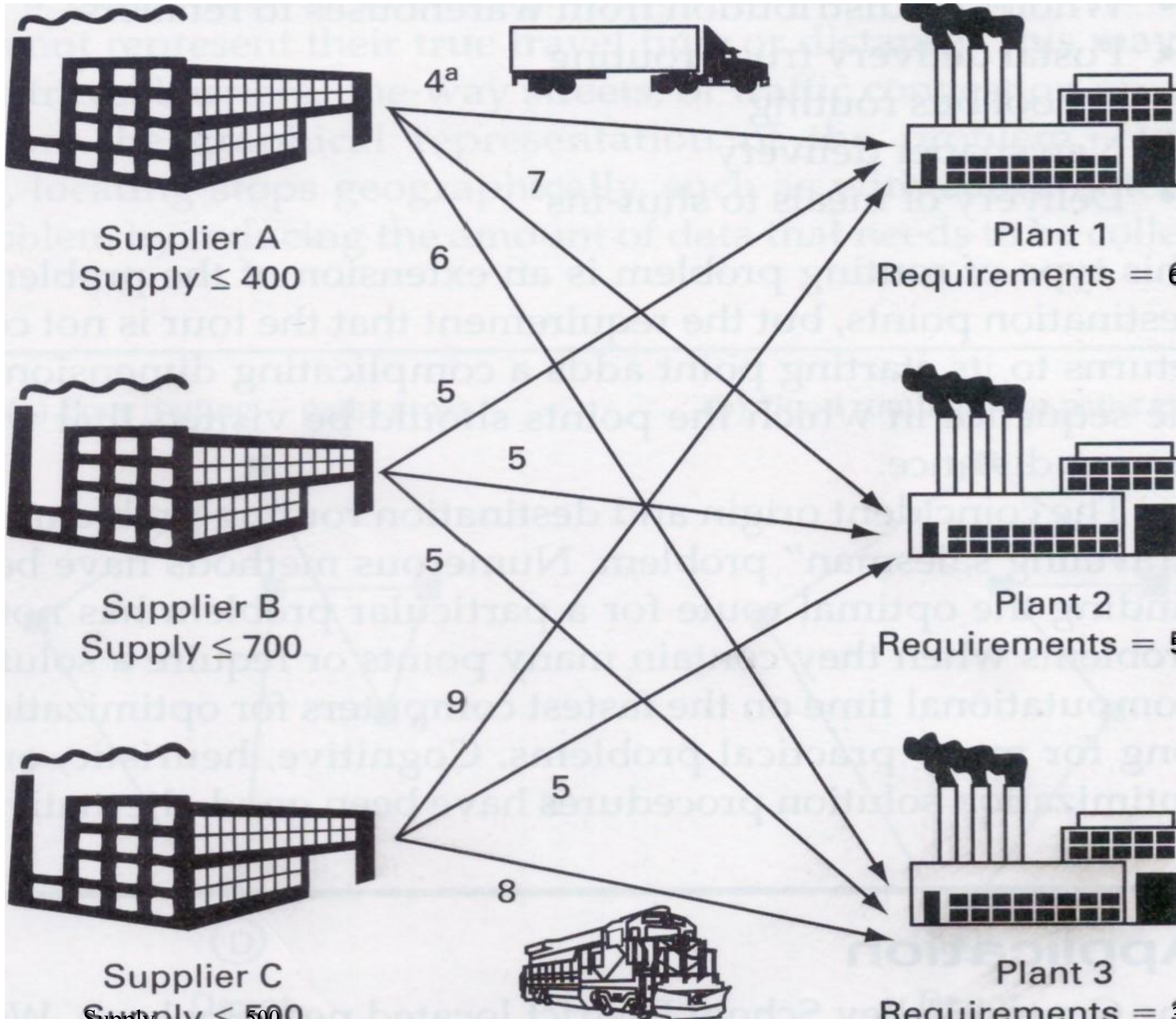
- Effective cooperation between supplier and buyer about price and service is **doubful** when separate entities are concerned
- A competing supplier in the distribution channel
- High quality service connected to … **price**
- Changes in conditions
- Inventories impact

Shortest way

- The shortest route method
- **Comparing the total times to reach the unsolved nodes**
- Than to identify the solved nodes and to use the solved one for next iterations and to compare it with unsolved nodes
- Minimizing
  - Time
  - Distance

Multiple origin and destination points

- More than one vendor, plant, or warehouse to serve more than one customer for the **same product**
- When the source points are restricted to the amount of the total customer demand that can be supplied from each location
- A special class of the **linear programming** algorithm
- Familiar examples
  - Beverage delivery to bars and restaurants
  - Currency delivery and scheduling at ATM machines
  - Dynamic sourcing and transport of fuels
  - Home appliance repair, service, and delivery
  - Internet-based home grocery delivery
- Example
  - Three soda ash (used in glassmaking) suppliers at various locations to supply three manufacturing facilities



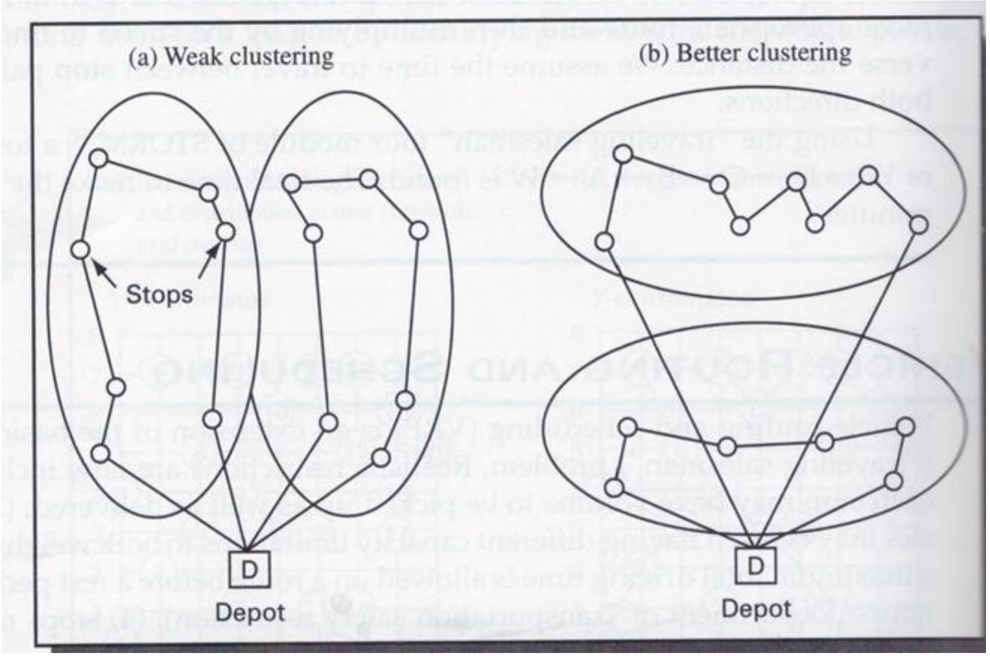
4a
7
6
5
5
5
9
5
8
Supplier A
Supply ≤ 400
Supplier B
Supply ≤ 700
Supplier C
Supply ≤ 500
Plant 1
Requirements = 600
Plant 2
Requirements = 500
Plant 3
Requirements = 300

Vehicle routing

- Points are spatially related
  - We know that **good stop sequences** are formed when the paths of the route **do not cross**
  - Clustering Stops by Day of the Week
    - When stops are to be served **during different days of the week**, the stops should be segmented into separate routing
  - Build routes beginning with **the farthest stop** from the depot.
  - Once the farthest stop is identified, selecting the volume from the tightest cluster of stops around this key stop

Principles for good routing and scheduling

- Load trucks with stop volumes that are in the **closest proximity to each other**
- The sequence of stops on a truck route should form a **teardrop pattern**
- Time window restrictions and the forcing of stop pickups after **deliveries may cause route paths to cross**
- **Minimizing total distance cluster**



Principles for good routing and scheduling

The most efficient routes are built using the largest vehicles available

Pickups should be mixed **into delivery** routes rather than assigned to the end of routes

A stop that is greatly removed from a route cluster is a good candidate for an alternate means of delivery (stops isolated with low volume)

Time window restrictions on narrow stops have to be avoided, can force stop sequencing away

Example

The Case Casket Company manufactures and distributes a complete line of burial caskets to funeral homes

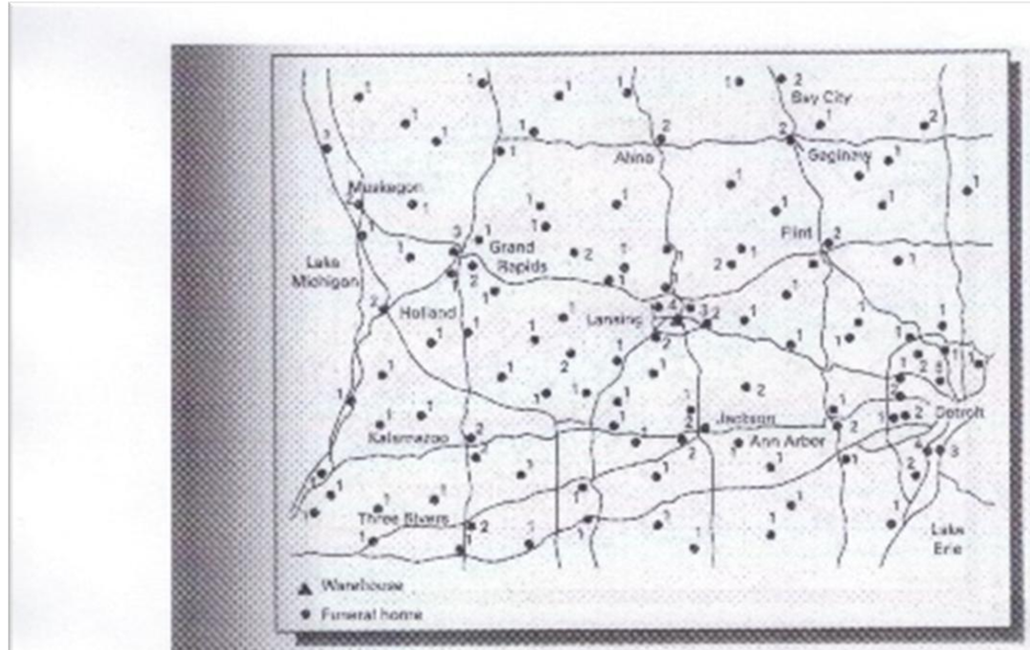
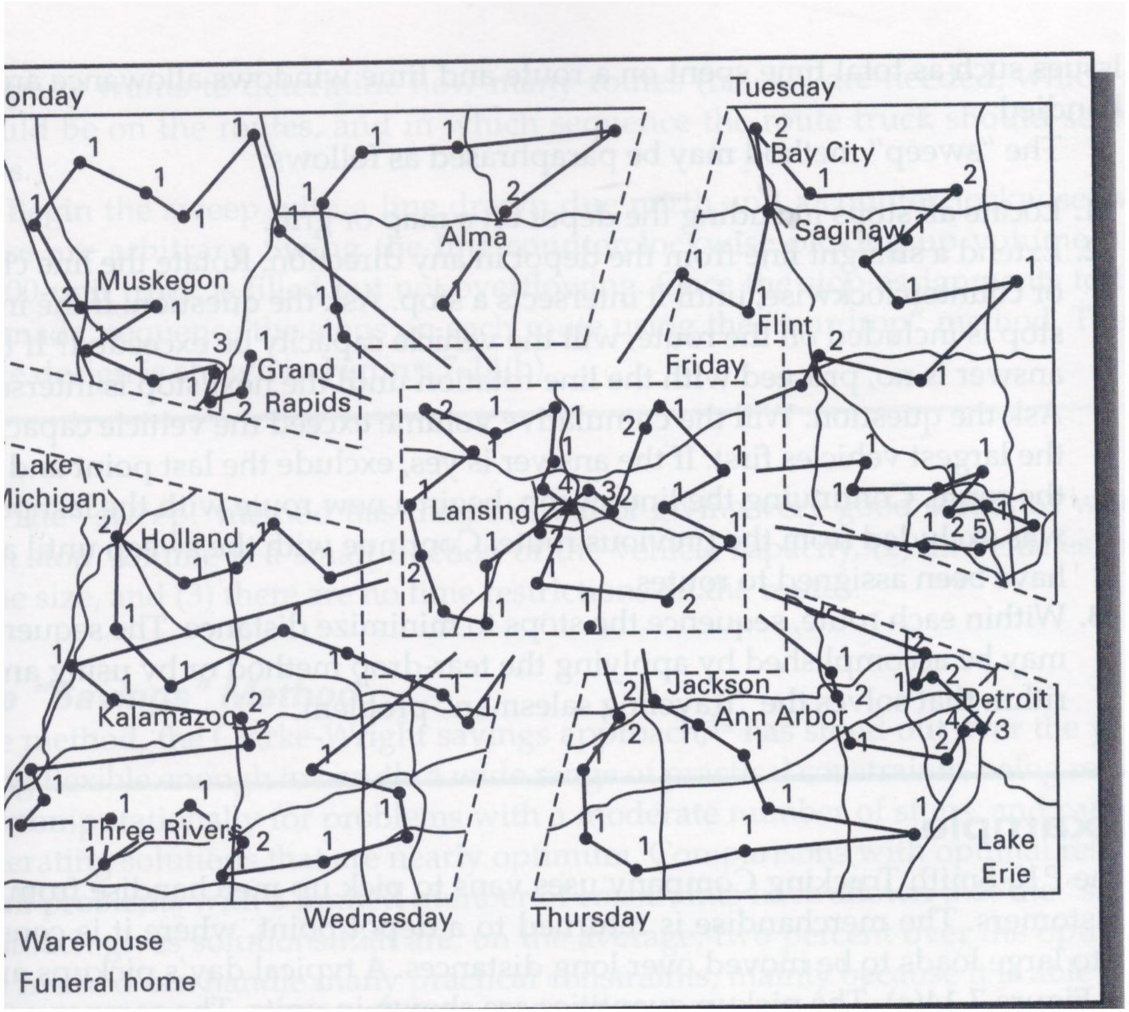


Figure 7-11 Funeral Home Locations and a Typical Week's Casket Orders from the Central Michigan Territory of the Case Casket Company

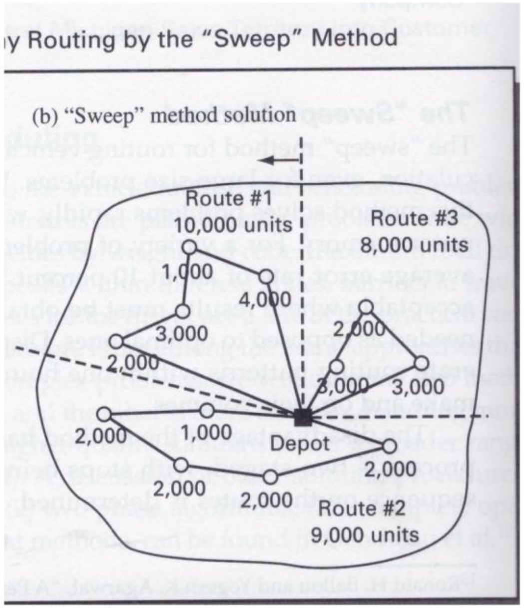
- Begin by **segmenting the territory** into five daily customer clusters based on five delivery days per week.
- Customers should be clustered starting with the **farthest customer** and then adding customers by progressively moving toward the warehouse
- Four customer groups for outlying stops for the first four days of the week, and one group for the fifth day that serves stops close to the warehouse

And the result …



The Sweep method

- Locate all stops including the depot **on a map grid**
- Extend a straight line from the depot in all directions
- **Rotate the line until it intersects a stop**
- If the inserted stop is on the route, check the truck capacity
  - Use the largest vehicle first
- Continue the line sweep, begin a new route with the last point excluded from the previous route
- **Within each route, sequence stops to minimize distance** (tear drop method)
- Constraints : total **time** spent on the route and time windows allowance



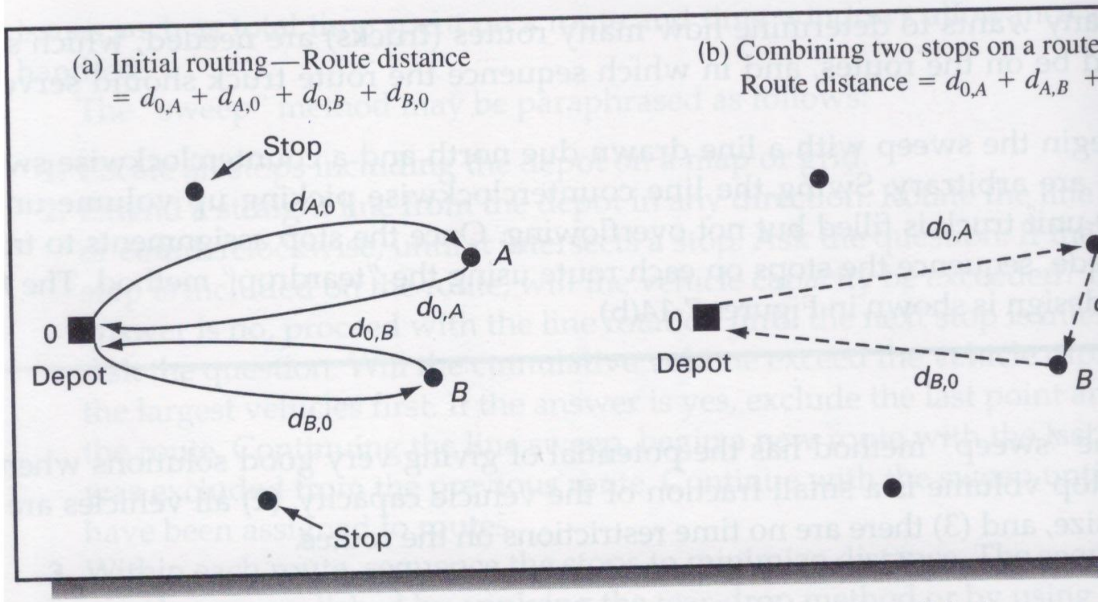


Figure 7-15 Reduced Travel Distance Through Stop Consolidation on a

The savings method

- More precise : **to minimize** the distance and minimize number of vehicles
- To begin with a dummy vehicle serving each stop and returning to the depot
  - Resulting in the **maximum distance to be experienced**
  - Next two stops are combined on the same route so that one vehicle can be eliminate et the distance reduced
- Example A and B
  - Saving result : doa+dbo-dab
  - This calculation is carried out for all stop pairs and we continue to combine
  - If a point is inserted on the same route, example :
    - S= doc +dco+dab-dac-dcb

Regalado in Toledo, Ohio, U.S.
x= 460 y= 720
5 trucks with a hauling capacity fo 40,000 lb each

Construction Site	X	Y	Order Size, lb
Milwaukee, WI	220	800	3,000
Chicago, IL	240	720	31,500
Detroit, MI	470	790	16,500
Buffalo, NY	670	860	6,000
Cleveland, OH	540	730	4,500
Pittsburgh, PA	630	680	6,750
Cincinnati, OH	420	570	3,750
Louisville, KY	370	490	6,000
St. Louis, MO	130	500	7,500
Memphis, TN	180	270	9,000
Knoxville, TN	480	360	5,250
Atlanta, GA	480	210	18,000
Columbia, SC	660	250	3,000
Raleigh, NC	760	390	6,750
Baltimore, MD	810	640	11,250
Total			138,750 lb

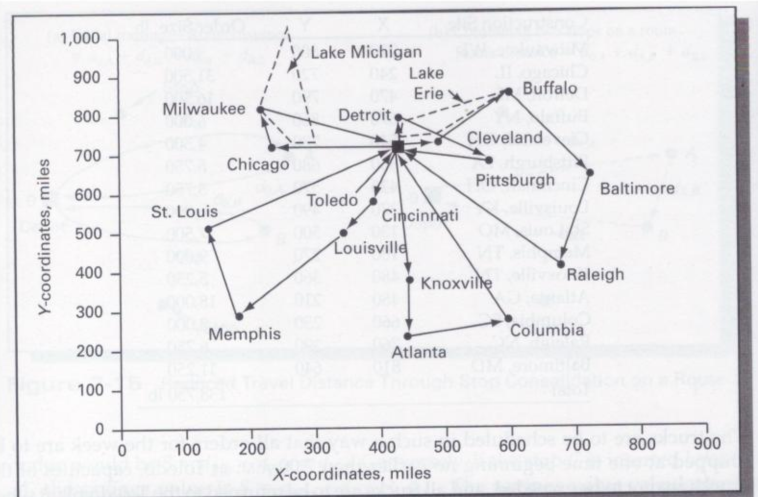


Figure 7-16 Routing Plan for Regal Metal's Deliveries As Generated by the "Savings" Method in ROUTER

Table 7-5 Arrival Time Summary for Regal Metals' Deliveries

Stop	Arrival Time	Day	Stop	Arrival Time	Day
Milwaukee	3:49 P.M.	1	St. Louis	5:16 P.M.	2
Chicago	1:19 P.M.	1	Memphis	9:28 A.M.	2
Detroit	8:47 A.M.	1	Knoxville	4:43 P.M.	1
Buffalo	3:17 P.M.	1	Atlanta	8:51 A.M.	2
Cleveland	8:57 A.M.	1	Columbia	2:49 P.M.	2
Pittsburgh	4:27 P.M.	1	Raleigh	5:46 P.M.	2
Cincinnati	10:45 A.M.	1	Baltimore	10:05 A.M.	2
Louisville	2:32 P.M.	1			

Result

Stops[a]	Time: Start	Day	Return	Day	Route Distance, mi	Route Time, (hr)	Route Weight, (lb)	Truck Size, lb
2,1	7:00 A.M.	1	1:44 P.M.	2	787	30.7	34,500	40,000
3,6	7:00 A.M.	1	9:11 A.M.	2	609	26.2	23,250	40,000
5,4,15,14	7:00 A.M.	1	5:03 P.M.	3	1,503	58.1	28,500	40,000
7,8,10,9	7:00 A.M.	1	3:22 P.M.	3	1,418	56.4	26,250	40,000
11,12,13	7:00 A.M.	1	3:40 P.M.	3	1,459	56.7	26,250	40,000
					5,776 mi.	228.1 hr.	138,750 lb	

s in sequence of their delivery.

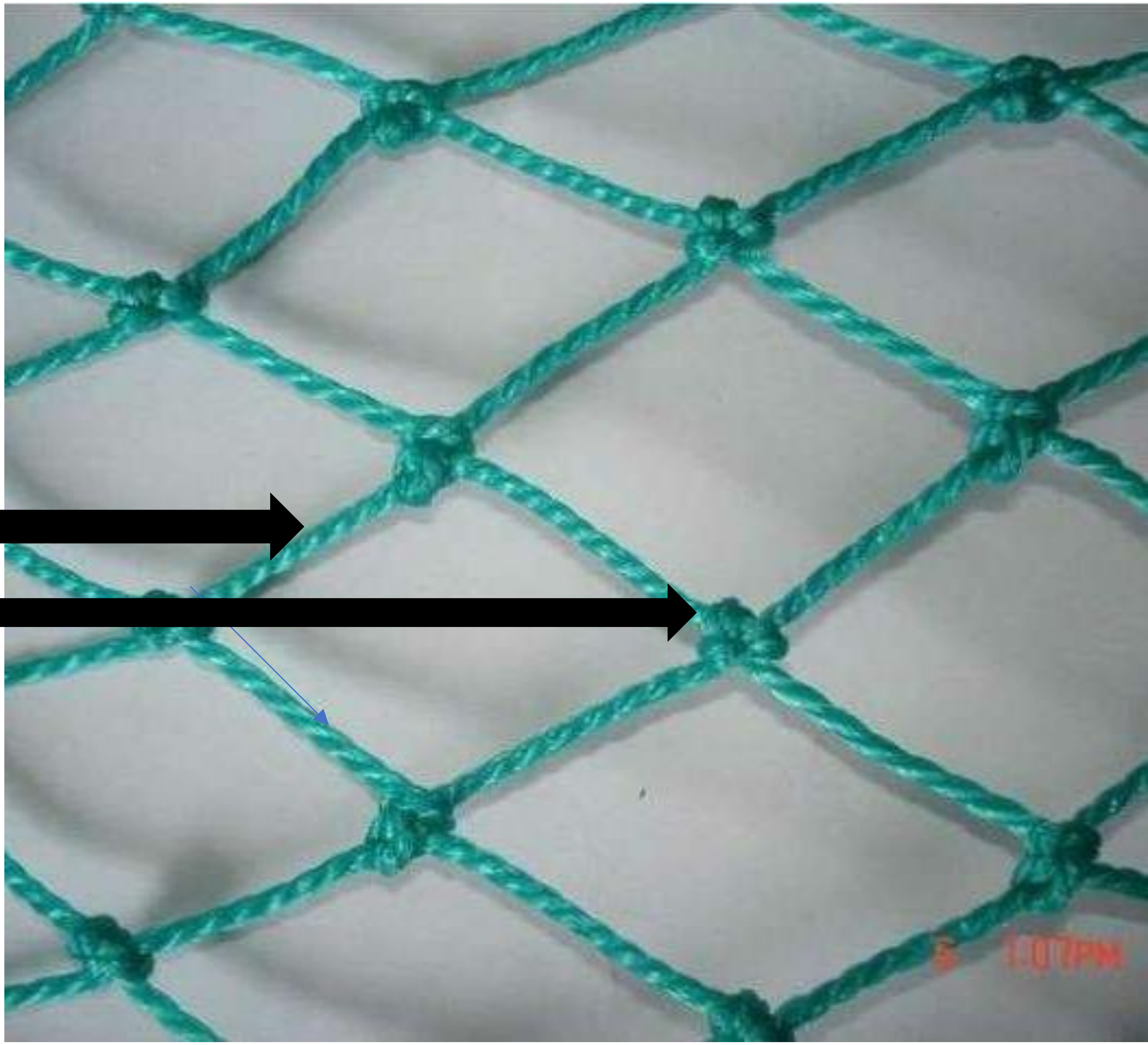
NETWORK FLOW

- A network
- The shortest way
- Minimum spanning tree
- Maximum flow

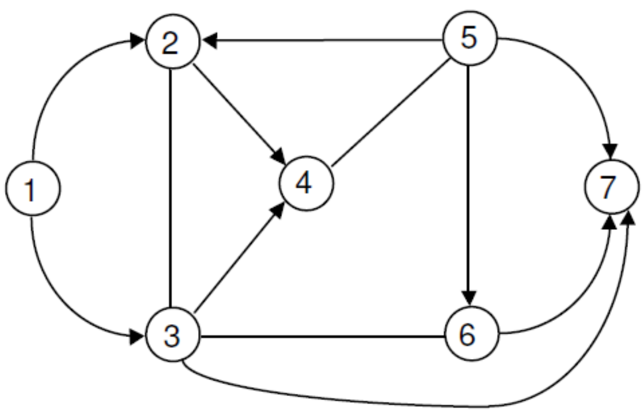
- From origin to destination, oriented or not
- Each edge is labelled
- Is able to connect nodes

  (i,j)

- A minimum spanning tree (MST) or minimum weight spanning tree is a subset of the edges of a <u>connected</u>, edge-weighted undirected graph



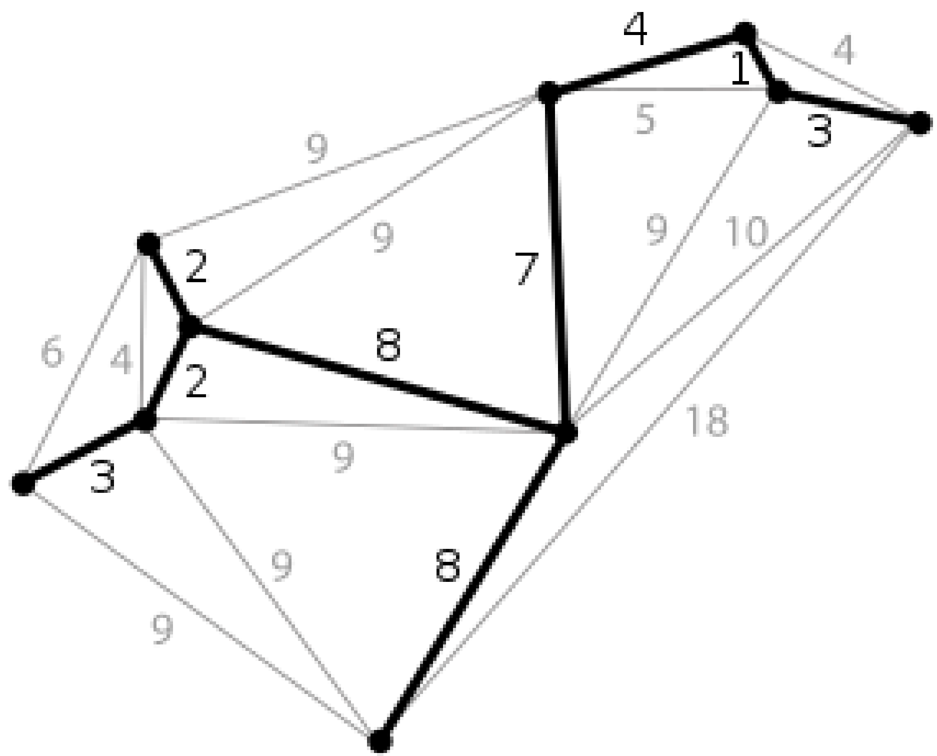
Definition



- Each edge might be
  - A length
  - A cost
  - A capacity
  - A duration …
- Resulting in possible algorithms

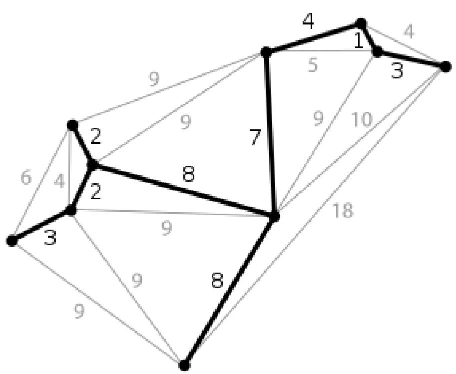
Shortest way

- The shortest route method
- Comparing the total times to reach the unsolved nodes
- Than to identify the solved nodes and to use the solved one for next iterations and to compare it with unsolved nodes
- Minimum
  - Time
  - Distance



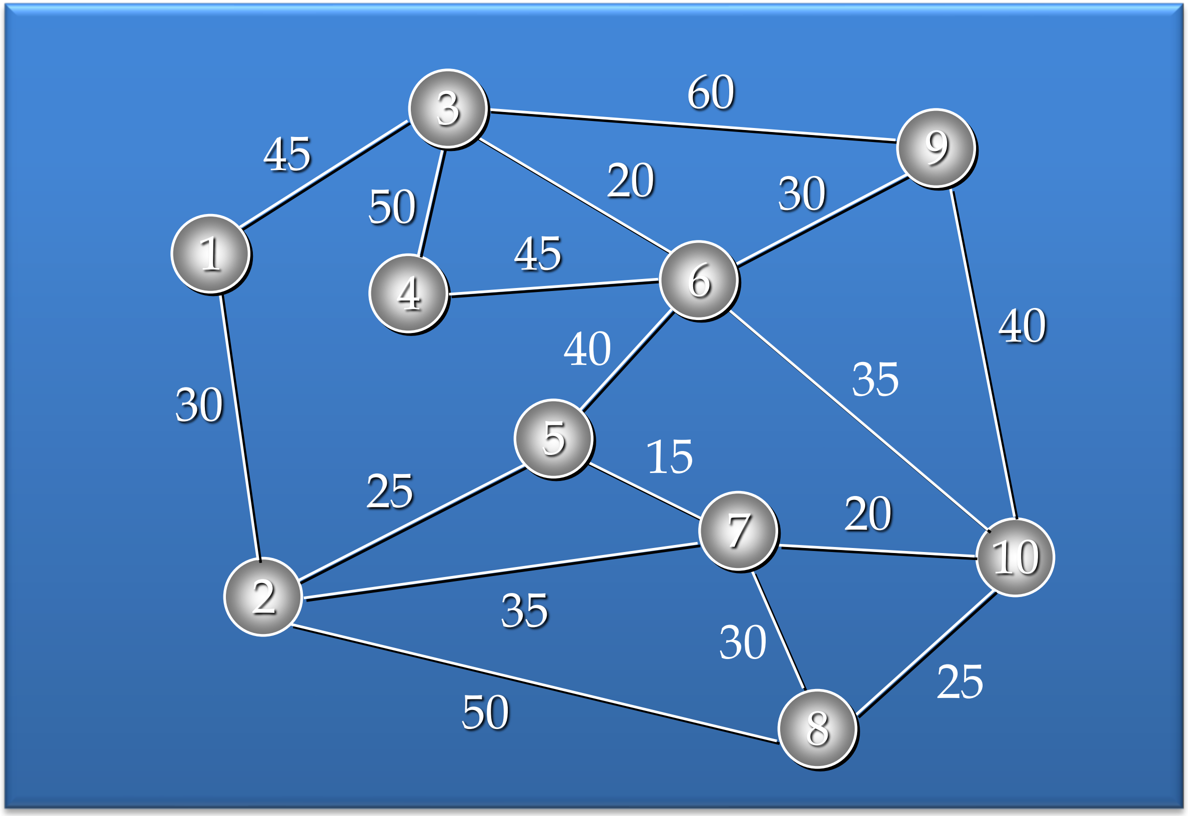
Minimum spanning tree

A network connection



- Examples would be a telecommunications company trying to lay cable in a new neighborhood. If it is constrained to bury the cable only along certain paths (e.g. roads),…
- Also gas or electric cables, computer, telecom, transportation, water …
- Is a minimum length of the linked network without any loop in a graph
- Starting point : anywhere as all points will be connected

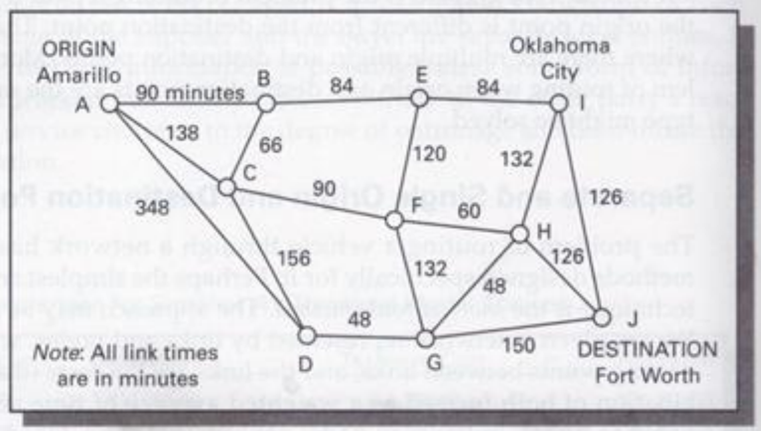
Let’s do it …



Let’s do it by yourself

Suppose that we have the problem shown in Figure 7-2. We seek a minimum-time route between Amarillo and Fort Worth, Texas. Each link has an associated driving time between nodes, and the nodes are road junctions.

Figure 7-2
A Schematic Representation of the Highway Network Between Amarillo and Fort Worth, Texas, with Driving Times



Performance indicators in Multimodal

freight density.

- standard measure of transport efficiency represents the number of passengers or freight units per distance unit

Mean distance traveled

- measure of the ground covering capacity of networks and different transport modes and used to assess the relative performance of transport modes

Mean per capita ton output (freight)

- measure of the material intensity of an economy. Economies having an important manufacturing sector tend to have more tonnage output per capita than service-based economies

Mean utilization coefficient

- measure comparing the frequency a transport asset is used over the total period this asset is available. Especially useful with the increasing complexity of logistics associated with containerization, such as the problem of empty returns

Performance indicators in Multimodal

- Transport time/speed/turnover
  - expression of the velocity of freight along segments (speed) and at terminals or distribution centers (turnover)
- Reliability
  - consistency of operations within defined parameters such as capacity, safety, duration, and punctuality
- Punctuality
  - on-time performance of transport services. Particularly important for scheduled services such as containerized maritime shipping, transiting
- Load factor
  - level of transport asset utilization of modes and terminals in relation to their capacity. High load factors may indicate congestion and limited capacity to handle additional traffic

Performance indicator on flights

- Air carrier delay (5.15%)
  - cause of the cancellation or delay was due to circumstances within the airline's control (e.g. maintenance or crew problems, aircraft cleaning, baggage loading, fueling, etc.)
- Extreme weather (0.51%)
  - Significant meteorological conditions (actual or forecasted) that, in the carrier's judgment, delay or prevent the operation of a flight, such as a tornado, thunderstorm, blizzard, or hurricane
- National Aviation System (5.80%)
  - Delays and cancellations attributable to the national aviation system refer to a broad set of conditions, such as non-extreme weather conditions, airport operations, heavy traffic volume, and air traffic control.
- Late-arriving aircraft (6.75%).
  - previous flight with the same aircraft arrived late, causing the present flight to depart late. This is the outcome of propagation effects on schedule integrity since a plane is usually scheduled for several flights during the day
- Security (0.04%)
  - Delays or cancellations caused by evacuation of a terminal or concourse, re-boarding of aircraft because of a security breach, inoperative screening equipment, and long lines in excess of 29 minutes at screening areas

Performance indicators on road

- Road conditions
  - Physical attributes of the road such as its type (paved, non-paved), number of lanes, width of lanes, design speed, and vertical and horizontal alignment
- Traffic conditions
  - Attributes of the traffic using the road, such as its temporal distribution and direction
- Control conditions
  - Attributes of the control structures and existing traffic laws such as speed limit, one-ways, and priority
- Speed is the rate of distance covered per unit of time
  - The average speed is the most commonly used measure to characterize traffic on a road.
- Volume
  - number of vehicles observed at a point or a section over a time period
- Density
  - number of vehicles occupying a section at any time. For example, a road section having a volume of 1,000 vehicles per hour with an average speed of 50 km/hour will have a density of 20 vehicles/km

5- Asset based benchmarking

- *Vehicle fill:* - measured by payload weight, pallet numbers and average pallet height.

- *Empty running:* measured as the number of miles the vehicle travelled empty and the number of miles the vehicle travelled with only returnable items.

- *Time utilisation:* measured on an hourly basis as one of seven activities (running on the road; rest period; loading or unloading; preloaded and awaiting departure; delayed or otherwise inactive; maintenance and repair; and empty and stationary) over a 48-hour period.

- *Deviations from schedule:* measured as problem at collection point, problem at delivery point, own company actions, traffic congestion, equipment breakdown and lack of driver.

- *Fuel efficiency of tractor and trailer:* measured as km per litre, ml fuel required to move one standard industry pallet 1 km.

Infrastructure based benchmarking

Creation of an information system for electronic exchange and data transfer for combined freight transport.

Creation and implementation of UN/EDIFACT form.

Development of a decision support system for intensified utilization of combined transport.

Investigation of infrastructure conditions of combined and integrated transport from the standpoint of wider exploitation in transport and logistic systems.

Research into changes in the vehicles fleet-split needed for combined transport use.

Indicators to airfreight

- Delivery to the airline.
- Collection by/delivery to the agent.
- Flown as booked.
- Arrived as agreed.
- Aircraft arrival.
- Collection.

Indicators to shortsea shipping

- Time.
- Cargo care.
- Compliance.
- Customer service.

Logistics chain

Performance indicators on logistics costs.

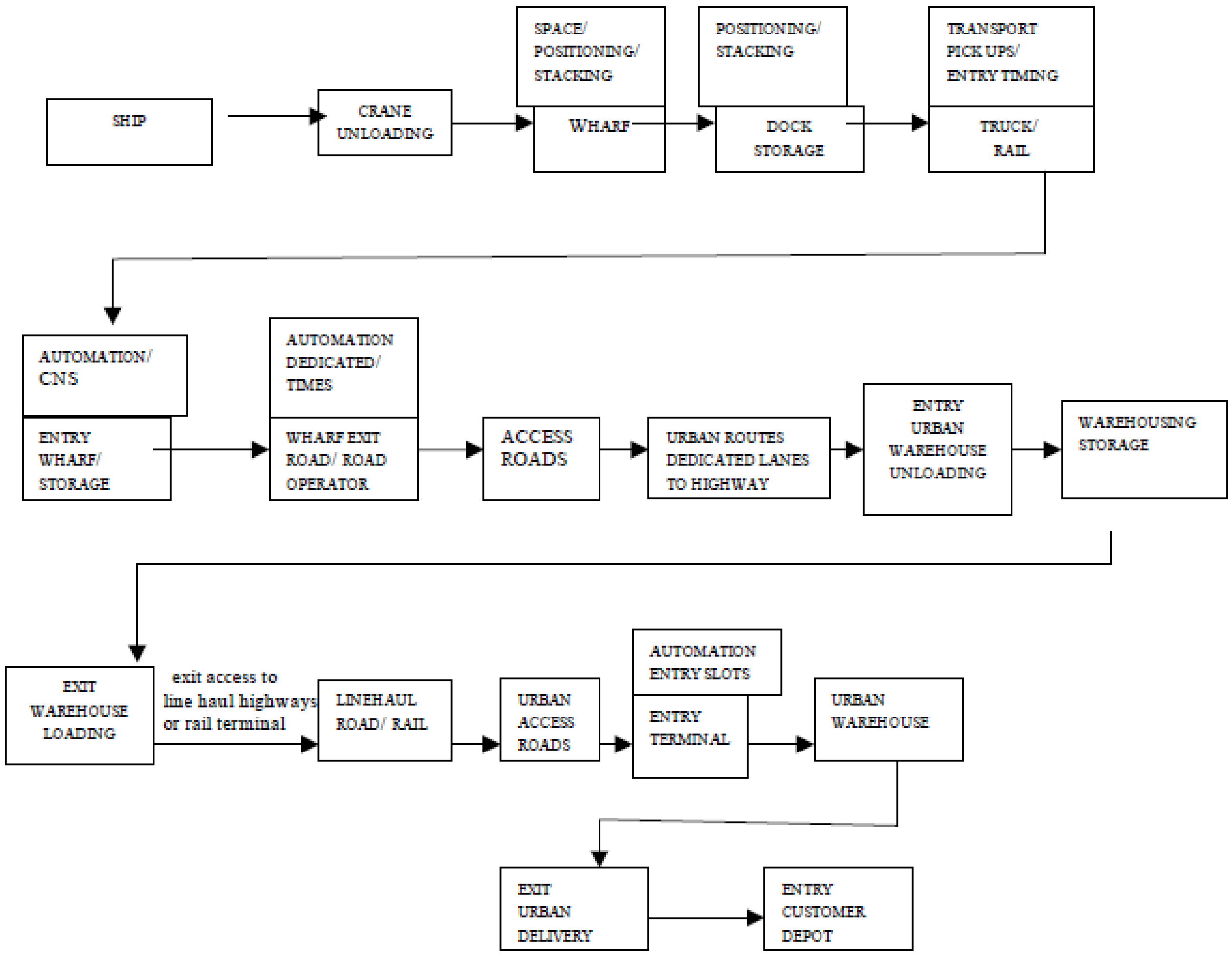
Logistics-related social costs and charges.

Benchmarking on road safety

Logistics cost and service

- Transport cost.
- Inventory cost.
- Sorting and packing cost.
- Packaging cost.
- Quality indicators include the following:
- Knowledge of goods and customer services.
- Availability of goods.
- Lead-time from order to delivery, and its accuracy.
- Flexibility: response time to special orders.
- Ability to organise information: time, accuracy, and details of contents.
- Response and restoration time when a mistake or problem occurs.

Importer intermodal supply chain example



6- multimodal transport operator

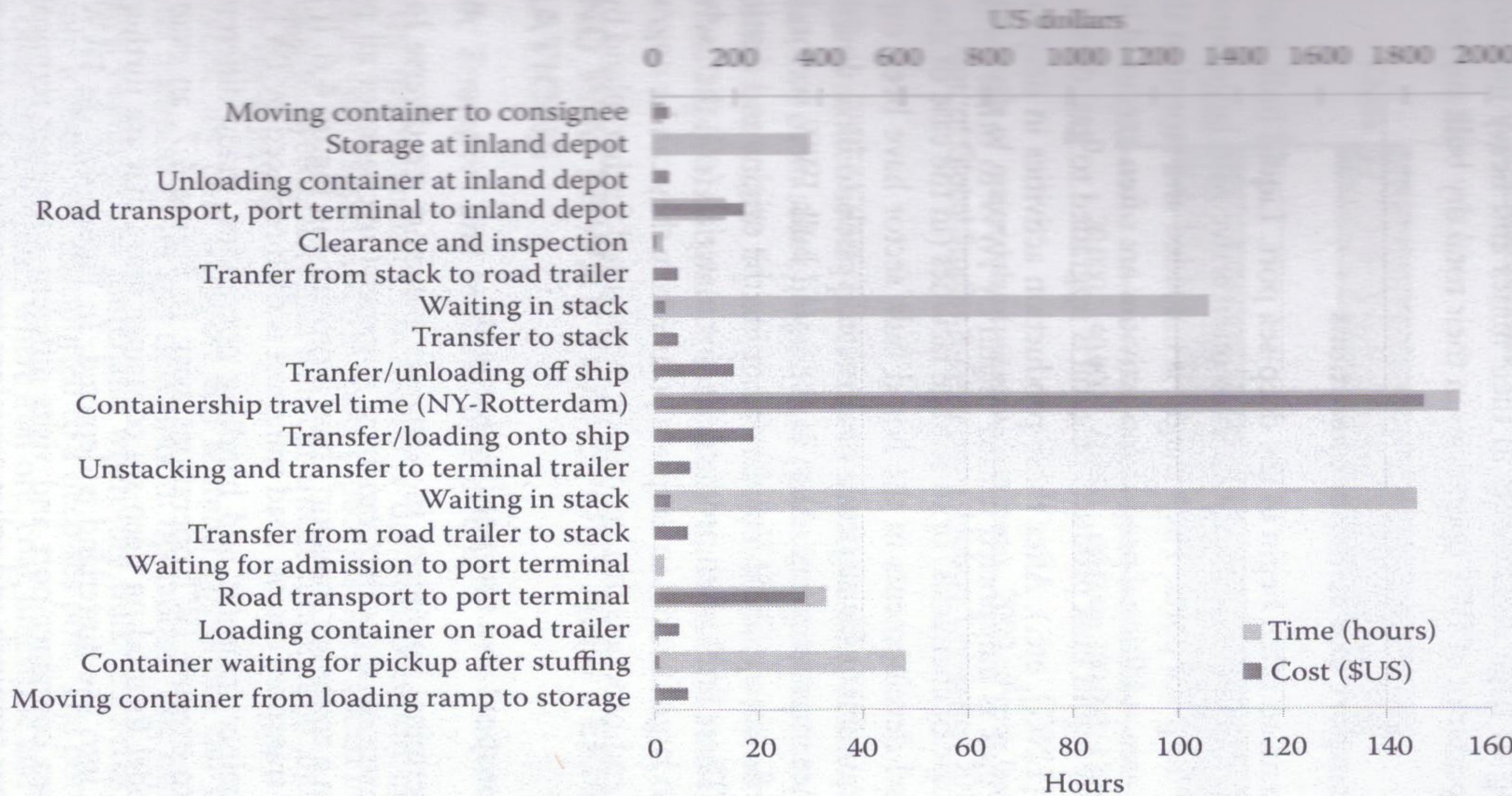
Freight forwarder

Integrator

Non vessel operating common carriers

Inland waterway market

- **Freight flows**
  - Dry bulk, regular transport flow
    - Ore , coal, limestone to deep sea
    - Then semi manufacture goods, steel products, construction material
    - Arcelor Mittal
  - Liquid bulk
    - Start in deep sea
    - Gas, diesel, liquefied gas
    - Shell, Vopak
  - Rising sector : containers
    - Connection and by the way collecting time is long : till one week
- USA
  - 5 majors 50% of the market
- Europe
  - Majority owns 1 to 3 vessels
- China
  - Both models



ure 4.6 Overview of freight transport operations. (From Jean-Paul Rodrigue, Dept. of Global Studies & Geography, Hofstra Universi

Break down cost

2- Transport documents

multimodal transportation act

carrier, consignee, consignement, consignor, delivery, endorsee, goods

mode of transport, multimodal transportation, multimodal transport contract, multimodal transport operator

multimodal transport document

responsabilities and liabilities of the multimodal transport operator

Content

- **Example:**
  a) Intended journey route, modes of transport and places of transshipment if known
  b) Freight of Each mode of transport including currency, if expressly agreed between the parties including the extent payable by consignee
  c) Date or Period of delivery at the place of delivery if expressly agreed upon between the parties
  d) About consignee name
  e) Nature of goods

     The nature of the goods is related to: which type of transport modes and means are suitable for such transportation of such goods. Bulk, Container, RO/RO, Project Cargoes, Dangerous Goods

Content

- FUNCTIONS
  1. Evidence of Contract - Contract of Carriage
  2. Document of title – negotiable
  3. Cargo receipt – taken in charge by the carrier
  4. Financial instruments – string sales

  CONTRACT OF CARRIAGE

  Multimodal transport contract is the contract of carriage between WHO and WHO?

  In INCOTERM 2020 term EXW, FCA, FOB and FAS states that Buyer is the party who enters into the contract of carriage.

  The rest of terms is Seller. It is the fact that Buyer will deal with MTO for the carriage and cost of transportation and is the party who pays the freight charge, nominating MTO as carrier to pick up the goods at Seller premise or nominated precise point of pick up the freight.

Content

- **Consignor**
  - AFAMT: "Consignor" means the person who concludes the multimodal transport contract with the multimodal transport operator.
  - FIATA: “Consignor“ means the person who concludes the multimodal transport contract with the Carrier
  - UNCTAC/ICC Rules is same as AFAMT
- **Consignee**
  - AFAMT: "Consignee " means the person entitled to receive the goods from the multimodal transport operator
  - FIATA: “Consignee“ means the person entitled to receive the goods from the Carrier.
  - UNCTAC/ICC Rules is same as AFAMT "Consignee" means the person entitled to receive the goods from the multimodal transport operator

Content

- Contract of carriage
  - **Hague-Visby Rules Art. 3.4 •** Such a bill of lading shall be **prima facie evidence of the receipt by the carrier of the goods** as therein described in accordance with paragraph 3 (a), (b) and (c). However, proof to the contrary shall not be admissible when the bill of lading has been transferred to a third party acting in good faith.
  - With respect to the responsibility for information in the MT document, the expression in art. 3.4 of the Hague-Visby Rules, "third party", shall not be used, since the governing factor is whether or not the consignee has relied and acted upon the information and not his position as a "party" or "third party" in relation to the MTO. In particular, such an expression may be misleading where the seller has handed over the goods to the carrier and the buyer under an FOB or an FCA contract has concluded the contract of carriage. In such a case, the **FOB/FCA buyer- although relying on the information in the MT document - could not be considered a "third party"**.

Content

- Contract of carriage

  The information in the MT document shall be **prima facie evidence of the taking in charge by the MTO** of the goods as described by such information unless a contrary indication, such as “shipper’s weight, load an count”, “shipper-packed container” or similar expressions, has been made in the printed text or superimposed on the document. Proof to the contrary shall not be admissible when the MT document has been transferred, or the equivalent electronic data interchange message has been transmitted to and acknowledged by the consignee who in good faith has relied and acted thereon.

  FIATA MT Doc is applicable for unimodal transport - There is nothing state in AFAMT so.

  - **The Carrier shall be responsible for the acts and omissions of his servants or agents acting within the scope of their employment**, or any other person of whose services he makes use for the performance of the contract evidenced by this BL, as if such acts and omissions were his own.

Content

- Contract of carriage
  - **FIATA MT Document**

    Method and Route of Transportation

    - Without notice to the Merchant, **the Carrier has the liberty to carry the goods on or under deck** and to choose or substitute the means, route and procedure to be followed in the handling, stowage, storage and transportation of the goods

    Consignor fails to inform dangerous goods

    - The goods may at any place be unloaded, destroyed or rendered harmless, as circumstances may require, without compensation.

      The Merchant shall indemnify the Carrier against all loss, damage, liability, or expense arising out of their being taken in charge, or their carriage, or of any service incidental thereto.

Content

- **MTO liability**
  - AFAMT: covers the period from the time the multimodal transport operator has taken the goods in his charge to the time of their delivery.
  - FIATA: The responsibility of the Carrier for the goods under these conditions covers the period from the time the Carrier has taken the goods in his charge to the time of their delivery.
  - UNCTAC/ICC Rules: The responsibility of the MTO for the goods under these Rules covers the period from the time the MTO has taken the goods in his charge to the time or their delivery.
  - **for his servants, agents and others persons**
    - AFAMT: The **multimodal transport operator** shall be responsible for the acts and omissions of his servants or agents, when any such servant or agent is acting within the scope of his employment, or of any other person of whose services he makes use for the performance of the contract, as if such acts and omissions were his own.
    - FIATA: **Carrier shall be responsible** for the acts and omissions of his servants or agents acting within the scope of their employment, or any other person of whose services he makes use for the performance of the contract evidenced by this BL, as if such acts and omissions were his own.
    - UNCTAC/ICC Rules: **responsible for the acts and omissions of his servants or agents**, when any such servant or agent is acting within the scope or his employment, or of any other person of whose services he makes use for the performance of the contract, as if such acts and omissions were his own.

Content

- MTO liability
  - **for loss, damage and delay in delivery**
    - AFAFMT: The multimodal transport operator shall be liable for loss resulting from loss of or damage to the goods, as well as loss resulting from delay in delivery, if the occurrence which caused the loss, damage or delay in delivery took place while the goods were in his charge, unless the multimodal transport operator proves that he, his servants or agents or any other person took all measures that could reasonably be required to avoid the occurrence and its consequences.
      - The multimodal transport operator shall not be liable for loss following from delay in delivery unless the consignor has made a declaration of interest in timely delivery which has been accepted by the multimodal transport operator
    - FIATA
      - FIATA: Similar to AFAMT and in accordance to UNCTAC/ICC Rules The Carrier shall be liable for loss of or damage to the goods as well as for delay in delivery if the occurrence which caused the loss, damage or delay in delivery took place while the goods were in his charge, unless the Carrier proves that no fault or neglect of his own, his servants or agents or any other person has caused or contributed to such loss, damage or delay.
      - However, the **Carrier shall only be liable for loss following from delay in delivery if the Consignor has made a declaration of interest in timely delivery** which has been accepted by the Carrier and stated in this BL

Content

- MTO liability
  - **Delay in Delivery**
    - AFAMT: Delay in delivery occurs when the goods have not been delivered **within the time expressly agreed upon o**r, in the absence of such agreement, within the time which it would be reasonable to require of a diligent multimodal transport operator, having regard to the circumstances of the case.
    - FIATA: Arrival times **are not guaranteed by the Carrier**, however, delay in delivery occurs when the goods have not been delivered within the time expressly agreed upon or, in the absence of such agreement, within the time which would be reasonable **to require of a diligent Carrier**, having regard to the circumstances of the case.
- What is Delivery.
  - UNCTAD/ICC Rules: "Deliver", "Delivered" or "Delivery" means

a. The handing over of the goods to the consignee,

b. The placing of the goods at the disposal of the consignee in accordance with the multimodal transport contract or with the law or usage of the particular trade applicable at the place of delivery,

c. The handing over of the goods to an authority or other third party to whom, pursuant to the law or regulations applicable at the place of delivery, the goods must be handed over. NOTE: non of this clause in FIATA Bill of Lading

MTO ensure delivery of the goods When MT document has been issued in a Non-Negotiable form, to the person named as Consignee in the document upon proof of his identity. When no document has been issued, to a person as instructed by the consignor or by a person who has acquired the consignor or consignee ‘s right under MT contract to give such instruction

Content

- **MTO liability**
  - **Delivery of the goods**
    - When MT document has been issued in negotiable Form to ‘Bearer’ to the person surrendering one original Document ‘to order’, to the person surrendering one original Document duly endorsed. “a named person” to that person upon proof of his identity and surrender one original document.
  - **Non Delivery within 90 Consecutive days**: Treat the goods as lost.
    - AFAMT: If the goods have not been delivered within ninety consecutive days following the date of delivery determined in accordance with the preceding paragraph, any person entitled to claim the goods may, in the absence of evidence to the contrary, treat the goods as lost.
    - FIATA: If the goods have not been delivered within ninety consecutive days following such date of delivery as determined in Clause 6.3., the claimant may, in the absence of evidence to the contrary, treat the goods as lost.
  - **Exclusion of Liability AFAMT vs. FIATA back clause**

    a. force majeure (appear in Hague Visby Rules as Act of God and AFAMT) •

    b. Act or neglect of the consignor, the consignee or his representative or agent;

    c. Insufficient or defective packaging, marking, or numbering of the goods;

    d. Handling, loading, unloading, stowage of the goods effected by the consignor, the consignee or his representative or agent;

    e. Inherent or latent defect in the good

Content

- **MTO liability**
  - **Exclusion of liability**

    f. Strikes or lockouts or stoppage or restraint of labour from whatever cause, whether partial or general;

    g. With respect to goods carried by sea or inland waterways, when such loss, damage, or delay during such carriage has been caused by: (i) act, neglect, or default of the master, mariner, pilot or the servant of the carrier in the navigation or in the management of ship, or (ii) fire unless caused by the actual fault or privity of the carrier.

Proof

FIATA

- **Claimant shall prove**

a) an act or omission of the Merchant,

b) insufficiency or defective condition of the packaging or marks and/or numbers;

c) handling, loading, stowage or unloading of the goods by the Merchant or any person acting on behalf of the Merchant;

d) inherent vice of the goods;

e) strike, lockout, stoppage or restraint of labour.

unseaworthiness of the ship, the MTO has to prove their due diligence

Loss of damage

- Unless the nature and value of the goods have been declared by the consignor before the goods have been taken in charge by the multimodal transport operator and inserted in the multimodal transport document, the multimodal transport operator shall in no event be or become liable for any loss or damage to the goods in an amount exceeding the equivalent of 666.67 SDR per package or unit or 2.00 SDR per kilogram of gross weight of the goods lost or damaged, whichever is the higher.

Content

- **MTO liability**

  Loss of damage

  - If the multimodal transport does not, according to the contract, include carriage of goods by sea or by inland waterways, the liability of the multimodal transport operator shall be limited to an amount not exceeding 8.33 SDR per kilogram of gross weight of the goods lost or damaged. FIATA apply US-COGSA limitation of liability shall not exceed US$ 500 per package or, in the case of goods not shipped in packages, per customary freight unit. (Paramount clauses)

  Delay in delivery FIATA

  FIATA An amount not exceeding the equivalent of twice the freight under the multimodal contract

  Localized damage

  When the loss of or damage to the goods occurred during one particular stage of the multimodal transport, in respect of which an applicable international convention or mandatory law would have provided another limit of liability if a separate contract of carriage had been made for that particular stage of transport, then the limit of the multimodal transport operator's liability for such loss or damage shall be determined by reference to the provisions of such convention or mandatory law.

  Assessment of compensation for loss and damage

  1. Assessment of compensation for loss of or damage to the goods shall be made by reference to the value of such goods at the place and time they are delivered to the consignee or at the place and time when, **in accordance with the multimodal transport contract**, they should have been so delivered.

  2. The value of the goods shall be determined according to the current commodity exchange price or, if there is no such price, according to the current market price, or if there is no commodity exchange price or current market price, by reference to the normal value of goods of the same kind and quality

Content

- MTO liability

  Loss of right to limit liability

  The Carrier is not entitled to the benefit of the limitation of liability if it is proved that the loss, damage or delay in delivery resulted from a personal act or **omission of the Carrier done with the intent to cause such loss**, damage or delay, or recklessly and with knowledge that such loss, damage or delay would probably result.

  FIATA MT document

  Freight and Charge:

  • **Cash and not to be return in any event**

  • Currency at Carrier's option and highest exchange rate • Demurrage on equipment is for Merchant account if it is not due to a fault or neglect of the Carrier.

  • Cost of deviation or delay or any other increase of costs of whatever nature caused by War, Warlike operation, epidemics, strikes, government directions or force majeure.

  Inspection of the carriers

  The Merchant warrants the correctness of the declaration of contents, insurance, weight, measurements or value of the goods but the Carrier has the liberty to have the contents inspected and the weight, measurements or value verified**. If on such inspection it is found that the declaration is not correct** it is agreed that a sum equal either to **five times the difference** between the correct figure and the freight charged, or to double the correct freight less the freight charged, whichever sum is the smaller, shall be payable as liquidated damages to the Carrier for his inspection costs and losses of freight on other goods, notwithstanding any other sum having been stated on this BL as freight payable

  Freight collect responsibility

  Despite the acceptance by the Carrier of instructions to collect freight, charges or other expenses from any other person in respect of the transport under this BL, the Merchant shall remain responsible for such monies on receipt of evidence of demand and the absence of payment for whatever reason.

Content

- MTO liability

  FIATA MT document

  General average

  The Merchant shall indemnify the Carrier in respect of any claims of a General Average nature which may be made on him and shall provide such security as may be required by the Carrier in this connection.

  Applicable laws

  UNCTAD/ICC Rules - FIATA

  - These rules shall only take effect to the extent that they are not contrary to the mandatory provisions of international conventions or national law applicable to MT contract.

    Actions against the Carrier may be instituted only in the place where the Carrier has his place of business as stated on the reverse of this BL and shall be decided according to the law of the country in which that place of business is situated.

Content

- MTO **insurance and claim**
  - AFAMT – Insurance is one of elements for registration of MTO Registered MTO shall have an insurance policy, **a coverage from a protection and indemnity club**, or an alternative of a financial character to cover payment of obligations for loss, damage or delay in delivery of goods under multimodal transport contracts, as well as contractual risks. The Coverage of Insurance Policy has not been fixed in AFAMT and it leaves to the national laws of ASEAN Member States.
  - Do not indicate exact coverage amount Vietnam:
    - Have a liability insurance policy for multimodal transport operator or an equivalent guarantee. Thailand:

    1. NVO-MTO – acts as Individual Principal 2 Million Baht

    2. NVO-MTO – acts as Principal & Agent 3 Million Baht 3. NVO-MTO – acts as Principal & Agent under Group Liability Insurance 5 Million Baht

Coverage under policy South East Asia

- 1.Cargo Liability/Bill of Lading Liability Cover loss, damage, delay in delivery under issuance of FIATA Bill of Lading and acting as Agent for Overseas MTO **including packing, international road transport and or storage that related to export**
- 2.**Errors&Omissions** Cover the delay in performing duty and failure so performed according to the contract, mis-declaration in documents, any failure transport performance under the contract or bill of lading.
- 3.**Third Party Liability** Cover injury, death, loss in properties of the third party during the operation of insured.
- 4.**Customs Liability Cover** fine, penalties of Customs, seize of the cargoes by competent authorities caused by unintentional act of insured provided for export / import in Thailand TRANSPORTATION SPECIALIST LEGAL LIABILITY INSURANCE

Transportation Specialist legal liability incurance

Coverage option I (Maritime Transport)	Coverage option II (All mode)	Coverage option III (All mode)
Insured Services : Operations – Customs broker, Freight forwarder, Consolidator, MTO, NVOCC Excluded Cargoes – Bulk, Flexitank, project cargo, tank Excluded Transportation by Air Freight	Insured Services : Operations – Customs broker, Freight forwarder, Consolidator, MTO, NVOCC and NAOCC Excluded Cargoes – Bulk, Flexitank, project cargo, tank Including Transportation by Air Freight	Insured Services : Operations – Customs broker, Freight forwarder, Consolidator, MTO, NVOCC and NAOCC Excluded Cargoes – Bulk, Flexitank, project cargo, tank Including Transportation by Air Freight Issuance a HB/L, Agent B/L as per Principle

Limitation of liability example

- 1.Cargo Liability/Bill of Lading Liability 10 Million Baht per event and annual aggregation
- 2.Errors&Omissions 2.5 Million Baht per event and annual aggregation
- 3.Third Party Liability 10 Million Baht per event and annual aggregation
- 4.Customs Liability 2.5 Million Baht per event and annual aggregation Maximum limitation per member 20 Million Baht

Option 1 example

- **Option I Export**
- Issue FIATA BL for export **by Sea Transport to destination**.
- Cross Boarder Transport by road vehicle using Truck waybill with FIATA back clauses excepts Local Transport (pure trucking) Import
- Insured's Principals BL as Agent
- Import by international road transport connected to sea transport under FIATA Bill of Lading
- Non-cover import by road transport between neighboring country (only two countries as non documents are issued)
- Not cover Pure Trucking locally
- Not cover Stand Along Customs Clearance

Option 2

- **Option II Export**
  - Issue FIATA BL **for export by Sea Transport to destination**.
  - Cross Boarder Transport by road vehicle using Truck waybill with FIATA back clauses excepts Local Transport (pure trucking)
  - House Air waybill for export under MTO Act. Import
  - Insured's Principals BL as Agent - Not cover import by road transport between neighboring country (only two countries as non documents are issued)
  - Not cover Pure Trucking locally
  - Not cover Stand Along Customs Clearance - Insured's Principal AWB under MTO Ac

Option 3

- Export
  - **Issue FIATA BL for export by Sea Transport to destination**
  - Cross Boarder Transport by road vehicle using Truck waybill with FIATA back clauses excepts Local Transport (pure trucking)
  - House Air waybill for export under MTO Act.
  - House BL / Agent BL for export under MTO Act.
- **Import**
  - **Insured's Principals BL as Agent**
  - Non-cover import by road transport between neighboring country (only two countries as non documents are issued)
  - Not cover import by road transport between neighboring country (only two countries as non documents are issued)
  - Not cover Pure Trucking locally
  - Import by Agent AWB Air under MTO act. - Cover Stand Alone Custom Clearance

Claim of claimant

- Unless notice of loss of or damage to the goods, specifying the **general nature of such loss or damage, is given in writing by the consignee** to the multimodal transport operator when the goods were handed over to the consignee, such handing-over is prima facie evidence of the delivery by the multimodal transport operator of the goods as described in the multimodal transport document.
- Where the loss or damage is not apparent, the same prima facie effect shall apply if notice in writing is not given within six consecutive days after the day when the goods were handed over to the consignee.

Arbitration

- FIATA The Carrier shall, unless otherwise expressly agreed, **be discharged of all liability under these conditions unless suit is brought within 9 months after the delivery of the goods**, or the date when the goods should have been delivered, or the date when in accordance with clause 6.4. (90 days) failure to deliver the goods would give the consignee the right to treat the goods as lost.

Proceedings

- FIATA
  - Actions against the Carrier may be instituted only in the place where the Carrier has his **place of business** as stated on the reverse of this BL and shall be decided according to the law of the country in which that place of business is situated.
- UNCTAC/ICC Rules:

  These Rules shall only take effect to the extent that they are not contrary to the mandatory provisions of international conventions or national law applicable to the multimodal transport contract.

Filing the claim

- It is depended on process of insurance company for MTO to file the claim against them.
- In normal practice, **once MTO receives the claim, he should**:

  a) Checking what, when, where and how the event happened.

  b) By who makes such event happening

  c) Collecting information and consider whether he should pass the claim to insurance company

  d) Determine his obligation if he shall be the party who has to responsible for such claim. In many cases, the event may happen on “Shipper’s load weight and counted” Inherent or latent defect in the goods MTO could response claimant by issuing reject claim letter.

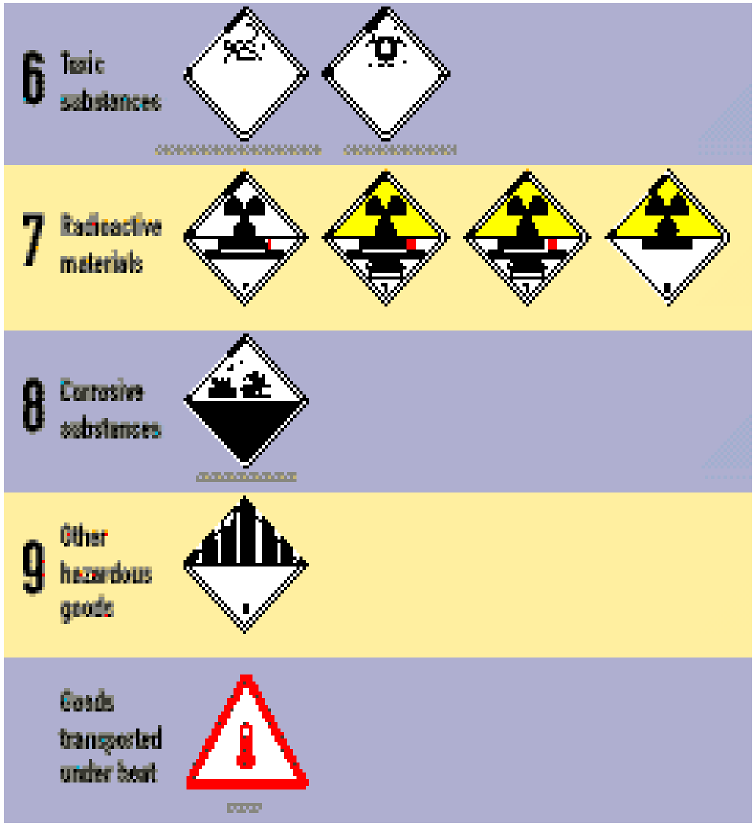
  e) Apparently, MTO should take responsibility, then pass the claim to insurance company.

4- multimodal transport of hazardous goods

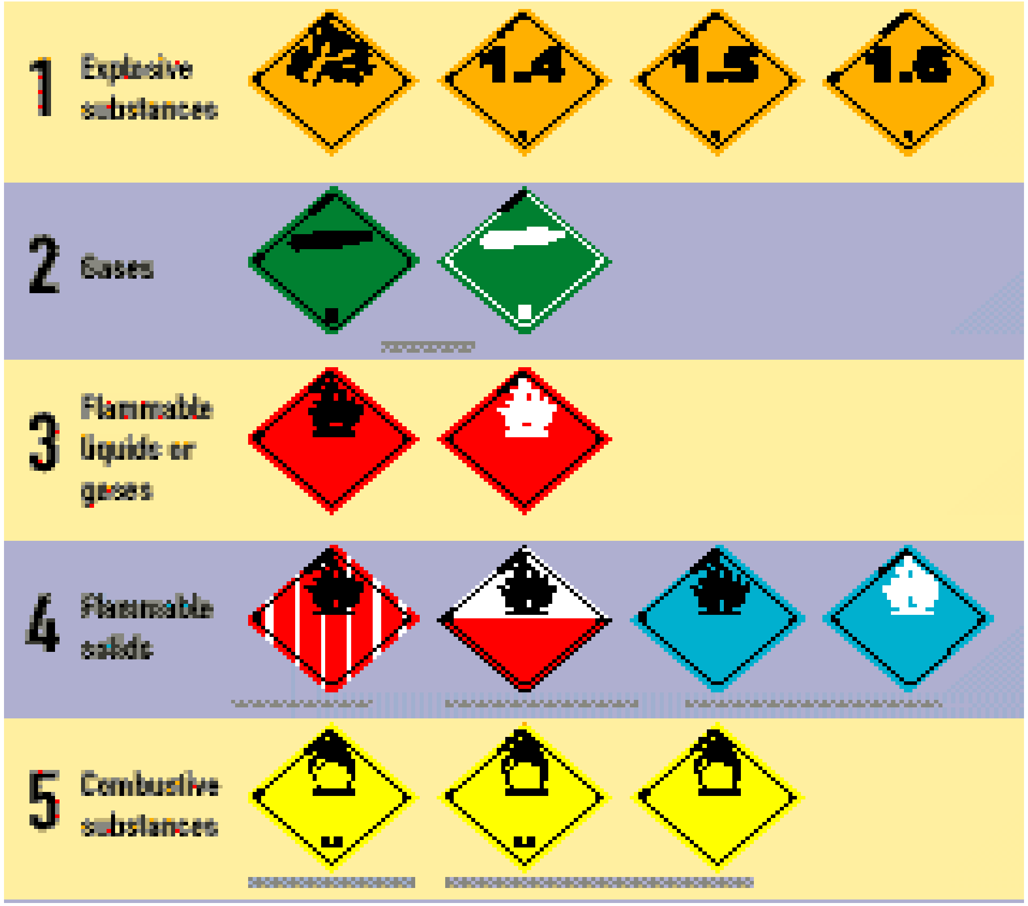
- UN packaging
  - Dangerous substances
  - Risk of accidents
  - Legislation and regulation
  - Association of america railroad

  www.aar.org
- Performance packagings for the transportation of dangerous goods
- Permits of equivalent level of safety
- **Depending on transport modes**

Carriage of dangerous goods



Carriage of dangerous goods



5- Political issue

- CMI and multimodal transport
- Multimodal contracts reality
- Containerization
- Carriage by air
- Electronic commerce environment
- Multimodal COGSA
- Door to door scope – performing carrier
- Error in navigation defence

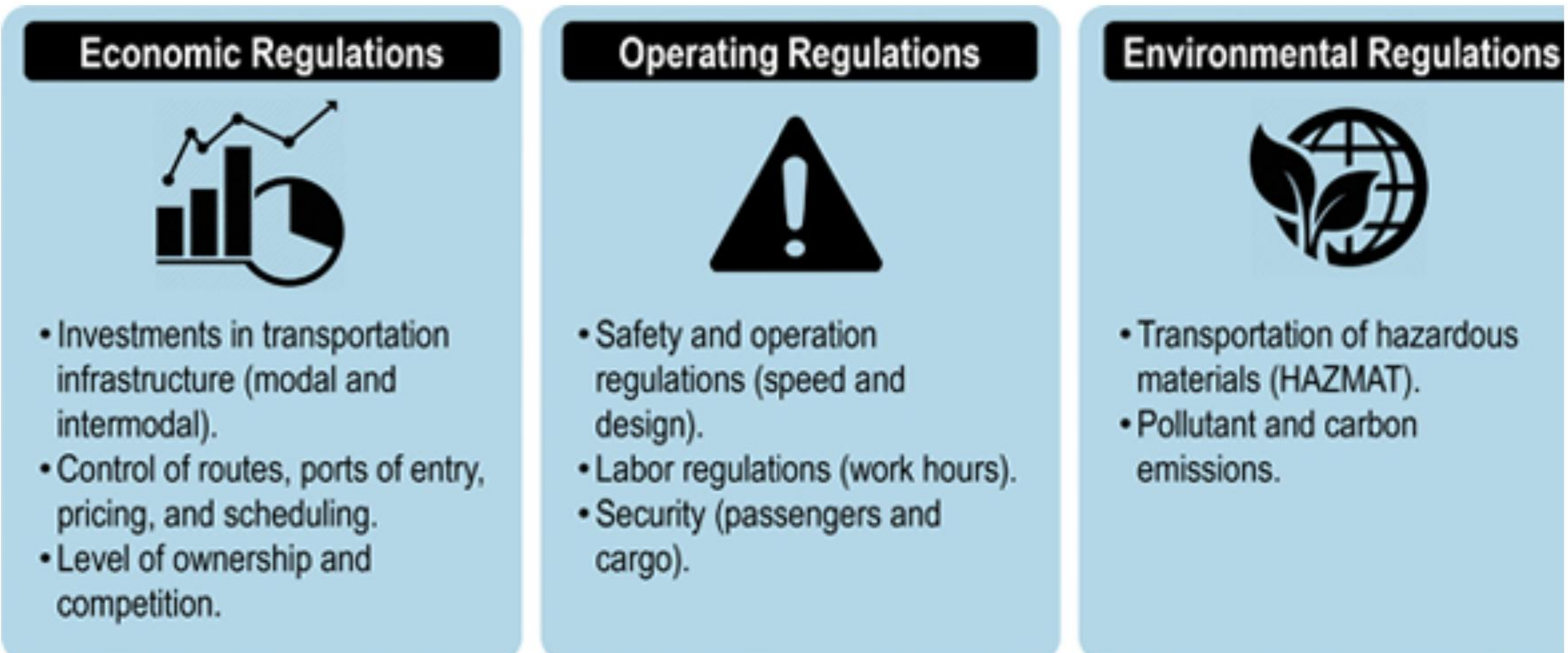
Shipowner and cargo insurance

package definition - Container

Singapore conference then Rotterdam

- Door to door
- Inland segments
- Liability network basis
- Conflict of laws
- Electronic commerce implications
- A per kilo basis

Transport policy



Transport security

integrity of

- cargo
- Route
- information systems (IT security) managing the transport chain.

set of procedures that can be implemented to

- maintain the integrity of cargo, namely inspections
- the security of facilities and personnel
- the data and the supporting cybersecurity measures

Issues and customs

- **Reduced risk of disruptions** of trade in response to security threats.
- Improved security against theft and diversion of cargo, with reductions in direct losses (cargo and sometimes the vehicle) and indirect costs (e.g. higher insurance premiums).
- **Improved security against illegal transport** of freight such counterfeits, narcotics and weapons, and of persons.
- Improved **reliance of the information systems** supporting the complex transactions generated by transport activities.
- Reduced **risk of evasion of duties and taxes**
- Increased confidence in the international trading system by current and potential shippers of goods.
- Improved screening process (cost and time) and simplified procedures.

- Security-based measures could increase total costs between 1% and 3%

Issues

- emphasis on freight transport security is gradually shifting into a more comprehensive but complex approach
- **An Automated Identity System (AIS**) is required for all vessels between 300 and 50,000 dwt
  - vessels to have a permanently marked and visible identity number, and there must be a record maintained of its flag, port of registry, and address of the registered owner.

- Each port must undertake a security assessment
  - assessment of its assets and facilities and an assessment of the effects of damages that might be caused
  - The port must then evaluate the risks and identify its weaknesses in features such as physical security, communication systems, and utilities.

- All cargoes destined for the United States must receive customs clearance before the departure of the ship

- **I.S.P.S.** International ship and port security
- **T.S.A.** Transportation Security Administration

Transport resilience to

- **Transportation supply**
  - Ensuring that transportation modes, routes, terminals, and information systems can satisfy national security needs
- **Transportation readiness**
  - Maintaining the readiness of transportation to face time-sensitive national security needs.
- **Transportation vulnerability**
  - Reducing the vulnerability of transportation modes, terminals, and users to intentional harm, accidents, or disruption from natural events.
- **Illegal use of transportation**
  - Reducing the trade of restricted or illegal goods (e.g. drugs, endangered species), and illegal immigration.

To anticipate

- Extreme weather events
- Geophysical events
- Climate change
- Conflicts, terrorism and piracy
- Economic and political shocks
- Cybersecurity
- Sanitary threats
  - Risk assessment
  - Preparedness (warehousing …)
  - Mitigation
  - Response
  - Recovery

Together

Risk Management

A large consignment of luxury cars is being shipped from Hamburg, Germany, to Dubai, UAE. The shipment is at risk of piracy, theft, and damage.

Questions

1. Identify the main risks associated with this shipment.

2. Develop a risk assessment plan, detailing the likelihood and impact of each risk.

3. Propose risk mitigation strategies for each identified risk.

4. Evaluate the effectiveness of insurance options for this shipment.

Physical internet and Multimodal transport

http://www.etp-logistics.eu/alice/en/news___events/video/

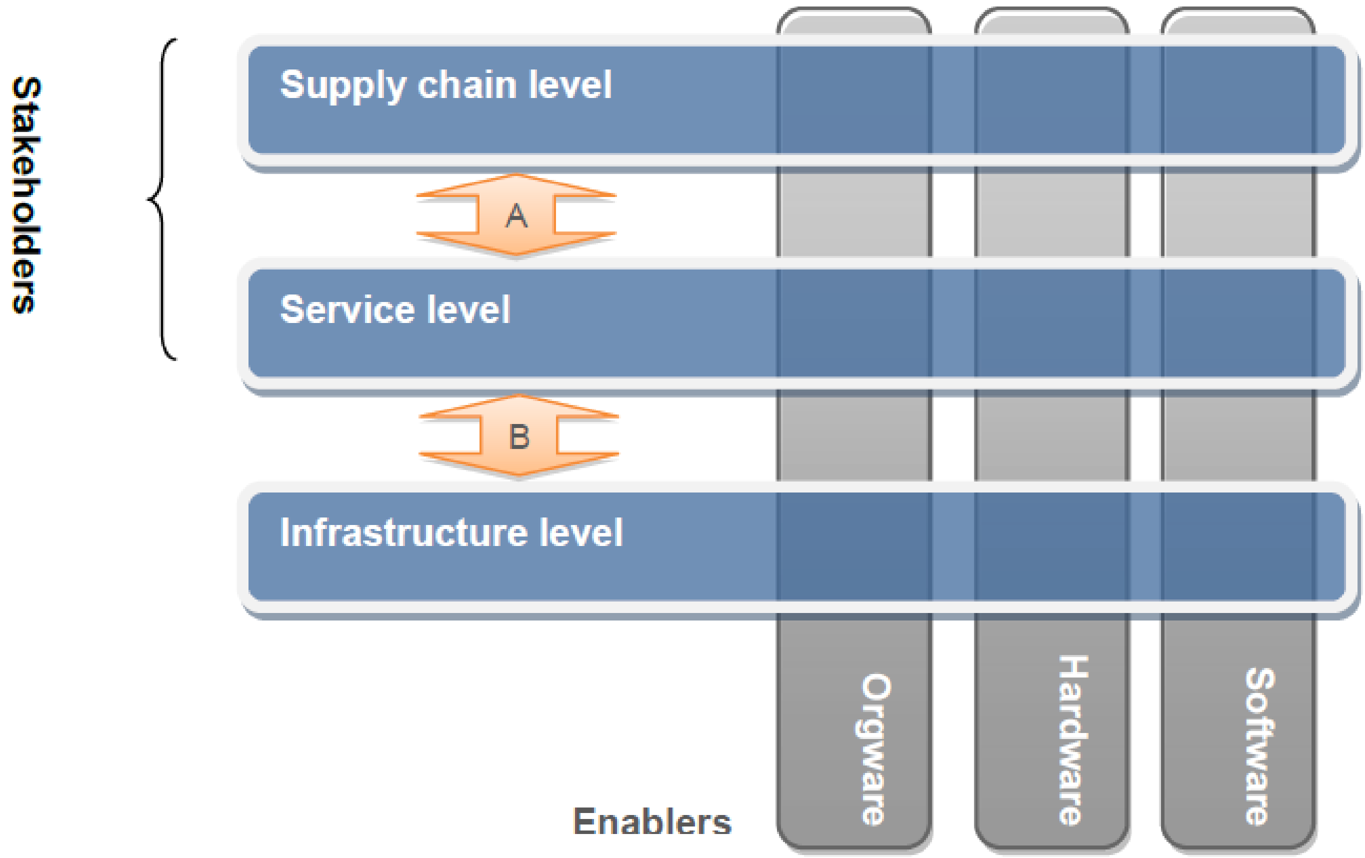
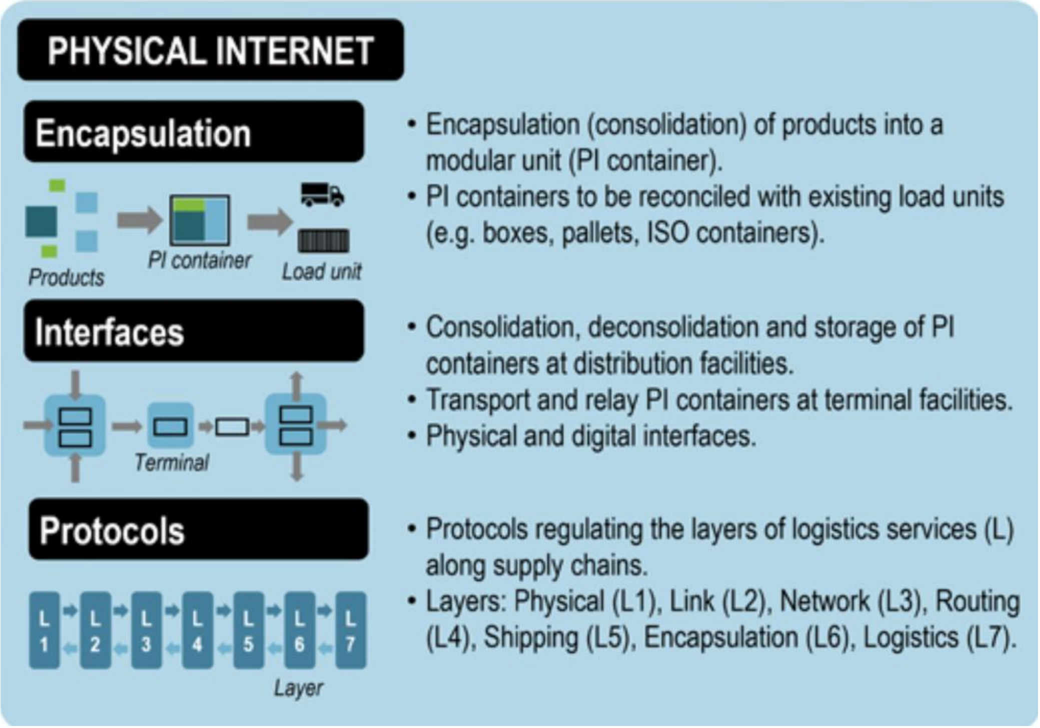


Figure S-1: Stakeholders levels and enablers

Physical internet



Discussion

Your views, Global transport outlooks