Course Code: CE 455
Course Title: Traffic Engineering and Management

Lecture 10: Freight movement

Course Teacher: Saurav Barua (SB)

Assistant Professor, Dept. Of Civil Engineering, DIU

Contact No: 01715334075

Email: saurav.ce@diu.edu.bd

Outline

- Overview of freight transport,
- Freight system, relationship with supply chain,
- Benefits and drawbacks of road, sea, air and rail freights.
- Economic factors of transportation,
- Traffic department responsibilities, participants in transportation decision.
- Suppliers of transportation service
- Components and significance of freight transport,
- Means of transport on the road
- Challenges of proper use of Chittagong seaport

What do we mean by *Freight Transportation*

- The safe and efficient movement of goods and products that society uses on a daily basis
- Something we often take for granted. We expect
  - to have our store shelves fully stocked
  - to be able to order almost anything online and have it delivered days later
  - to have our garbage taken away regularly
- Freight transportation can also be described as:
  - Goods movement
  - City logistics

Freight System

- Users: those who are moving goods or facilitating the movement of goods
  - Shippers
  - Carriers
- Infrastructure: physical structures which goods move on/in
  - Roads/Rails
  - Terminals
  - Vehicles (trucks, trains, planes, ships)
- Managers: entities which operate and manage infrastructure
  - DOTs
  - Terminal operators


Supply Chain Community
1
2
3
4
5
6
SHOP
Raw Material Supply
Manufacturer
Distributors
Wholesalers
Retailers
End User


Supply Chain
[sə-'plī 'chān]
A network between a company and its suppliers to produce and distribute a specific product to the final buyer; it includes different activities, people, entities, information, and resources.
Investopedia

Road Freight

Road freight is a popular choice for transporting for all manner of goods across the globe. It's particularly suited to situations where products are being transported across borders and for final-mile delivery to customers' doors.

FREIGHT TYPES IN COMPARISON

Speed	● ● ● ○	● ○ ○ ○	● ● ○ ○	● ● ● ●
Transport volume	■ ■ ○ ○	■ ■ ■ ■	■ ■ ■ ○	■ ○ ○ ○
Price	€ € ○ ○	€ ○ ○ ○	€ € € ○	€ € € €

What are the benefits of road freight

- There are fewer restrictions on road freight compared to air or sea freight.
- Trucks are easier to track than ships or planes – GPS can let you know where they are at all times
- It's one of the most financially economical modes of transport
- It's highly accessible. Every country in the world has a road network. That can't be said for sea or rail networks
- It's easy to organise specialist transportation based on your products. Road freight can accommodate hazardous materials, perishable goods and just about anything else
- Door-to-door transport is possible when correctly planned
- It's easy to adjust routes and timings if necessary
- Uncomplicated packing, shipping and offloading process

What are the drawbacks of road freight

- Road freight can take longer than transportation by air or sea and can also be unpredictable due to unforeseen weather or road closures
- It's not suitable for trans-global transportation
- It's easier for criminals to target trucks compared to other transport modes
- Size and weight limits apply
- Issues with seasonality can make roads unsafe
- Higher risk of accidents and breakdowns when compared to alternative modes of transport
- It's slower than other modes of transport

Sea Freight

Sea freight accounts for the vast majority of the world's trade. More than 90% of all goods are transported by ships.

What are the benefits of sea freight

- It's the best way to transport large and heavy goods. Cargo ships can carry thousands of tons, making them perfect for oversized or bulk products
- It's cheaper than air transportation. And also more environmentally friendly
- Minimal handling is required
- Slow-moving vessels mean goods are less likely to be damaged
- Shipping is rarely impacted by weather conditions
- It has the highest carrying capacity of all freight options
- Sea freight the largest carrying capacity

What are the drawbacks of sea freight

- Not always the most financially economical choice
- Can be inaccessible depending on origin or end destination
- Long transit times make it unsuitable for expedited deliveries
- Any reputable freight forwarder should provide access to a global shipping network with a range of services including FCL and LCL shipments.

Air Freight

Air freight is the go-to choice for speedy delivery. It's accessible all over the world and a convenient method to move smaller shipments long distances. Given that most major cities have an airport, air freight also lets businesses ship to specific areas or regions.

What are the benefits of air freight:

- Speed is the biggest benefit of air freight. It's rare for flights to suffer more than a few hours delay and air freight allows for a much more direct route than road, sea or rail
- The fixed schedule of air freight makes them a reliable choice
- Security is much higher with air freight than other modes of transport, packages often receive the most rigorous protection measures
- The reduced risk of air freight tends to mean lower insurance premiums

What are the drawbacks of air freight:

- Air freight is one of the most expensive transport methods owing to high fuel costs and additional expenses like security checks
- The nature of air freight means there are restrictions on what can be transported. Size, weight and product types are all restricted.
- It can be risky, given that any crash can result in the complete loss of goods.

Rail Freight

Trains are a vital part of logistics routes across the globe, particularly in Europe and North America, where rail networks are comprehensive. In North America, for instance, rail freight accounts for about 15% of all freight journeys. It's the ideal choice for organisations that require fast, scheduled and reliable freight in areas of the world where rail networks are strong.

What are the benefits of rail freight

- Trains offer more carrying capacity than road freight
- Less chance of delays owing to fixed schedules and the nature of rail journeys
- Low environmental impact compared to any other mode of transport. It emits over three-quarters fewer emissions than road freight
- A cost-effective solution for long journeys
- Particularly good for inter-country transportation

What are the drawbacks of rail freight

- Can be slower than other forms of transport
- A lack of accessibility means rail freight isn't suitable in all locations
- No door-to-door service owing to pre-defined routes
- Usually requires additional transportation at the end of the journey

Relationship to Supply Chains

- The freight transportation system is a component of supply chains
- Enterprises versus systems
- Individual actions versus aggregate actions
- Enterprise costs versus social costs

Modes

Ways in which freight can move

- Air
- Surface/Land
  - Rail
  - Road
  - Pipeline
- Water

Land Use and Infrastructure Management Strategies

Long-Haul/Regional/Drayage

- If possible, separate from residential and commercial land uses
- If possible, separate from traffic from pedestrian and bicycle modes

Urban pick-up and delivery

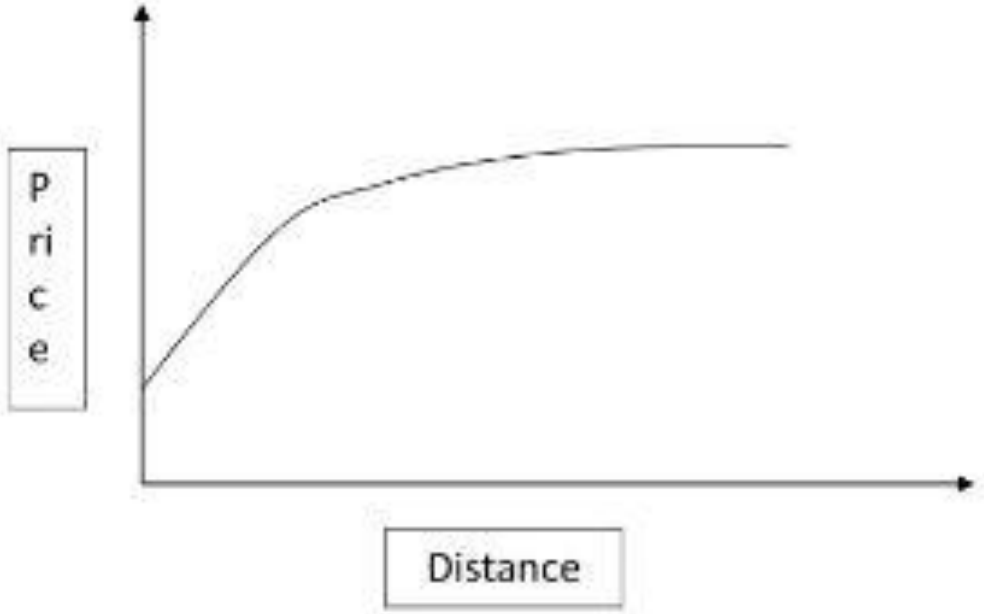
- Can't separate from non-industrial land uses and transportation
- Must address conflicts with pedestrian and bicycle activity
- Must address shared roadway uses

Additional Factors

- Perishability and value
- Schedule negotiations with shippers/receivers
- Industry schedule constraints
- Absolute shipment size
- Hazardous materials

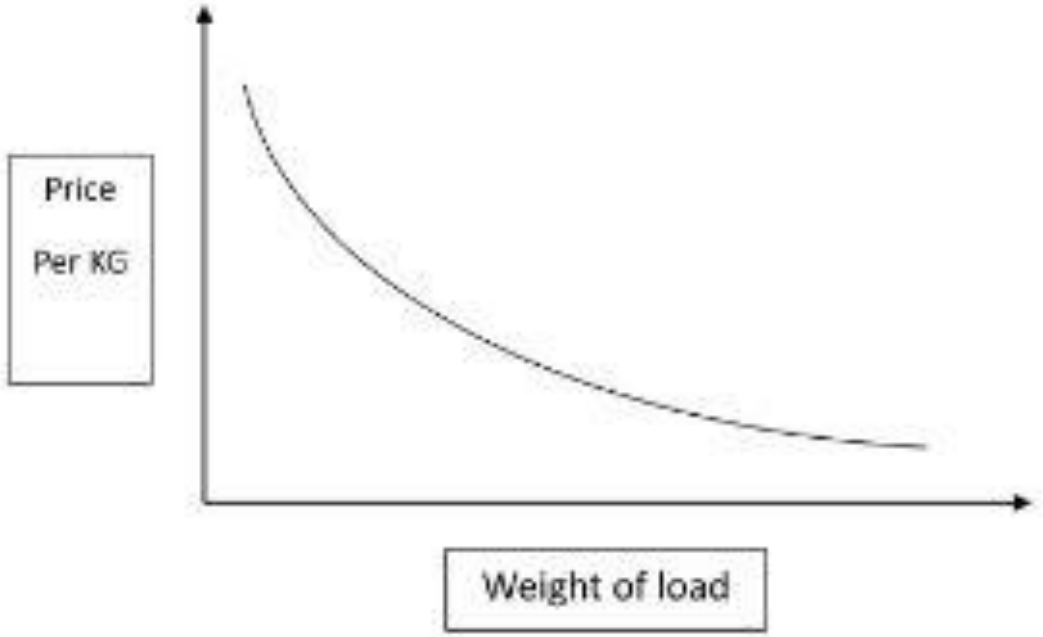
Economic factors of transportation.

- Transportation economics is influenced by seven factors- distance, volume, density, stowability, handling, liability and markets.
- Distance: it directly contributes to variable cost, such as labor, fuel and maintenance. (cost curve does not start at origin & it tapers – *tapering principle*). Intercity vs intracity/urban miles characterized by frequent stops & additional loading/unloading.



Economic factors of transportation.

Volume: logistical scale of economies exists for most movements. (Fixed costs spread over additional volume)



Economic factors of transportation.

Stowability: it refers to product dimensions and how it affects vehicles space utilization. Odd shapes and sizes, excessive weight or length do not stow well and typically waste space. (stowability & density similarity). Nesting in case large numbers of cans.

Handling: special handling equipment is required for loading/unloading from vehicle. (taped, boxed or palletized).

Liability: includes six product characteristics that primarily affect risk of damage and the resulting incidence in claims. They are susceptibility to damage, property damage to freight, perishability, susceptibility to theft, susceptibility to spontaneous combustion or explosion & value per pound.

Market factors: Such as lane volume and balance, influence transportation cost. Transport lane refers to movements between origin and destination points. (backhaul-deadhead). Ideal balanced haul.

Traffic Department Responsibilities

Rate Negotiation: they are responsible for obtaining the lowest possible rate consistent with the service requirements. (rail, air, motor, pipeline, parcel etc). lowest transportation cost may not be lowest cost of logistics.

Research: lookout for information that improves carrier service or obtain lower freight. 1) Carrier integration, 2) carrier evaluation, and 3) transportation integration services.

Carrier integration: it refers to the practice of combining new carrier products and services into logistics operation. Long term trends and service capabilities.

Carrier evaluation: carrier selection – choice of cost, transit time, reliability, capability, accessibility and security.

Traffic Department Responsibilities

Rate Negotiation: they are responsible for obtaining the lowest possible rate consistent with the service requirements. (rail, air, motor, pipeline, parcel etc). lowest transportation cost may not be lowest cost of logistics.

Research: lookout for information that improves carrier service or obtain lower freight. 1) Carrier integration, 2) carrier evaluation, and 3) transportation integration services.

Carrier integration: it refers to the practice of combining new carrier products and services into logistics operation. Long term trends and service capabilities.

Carrier evaluation: carrier selection – choice of cost, transit time, reliability, capability, accessibility and security.

Traffic Department Responsibilities

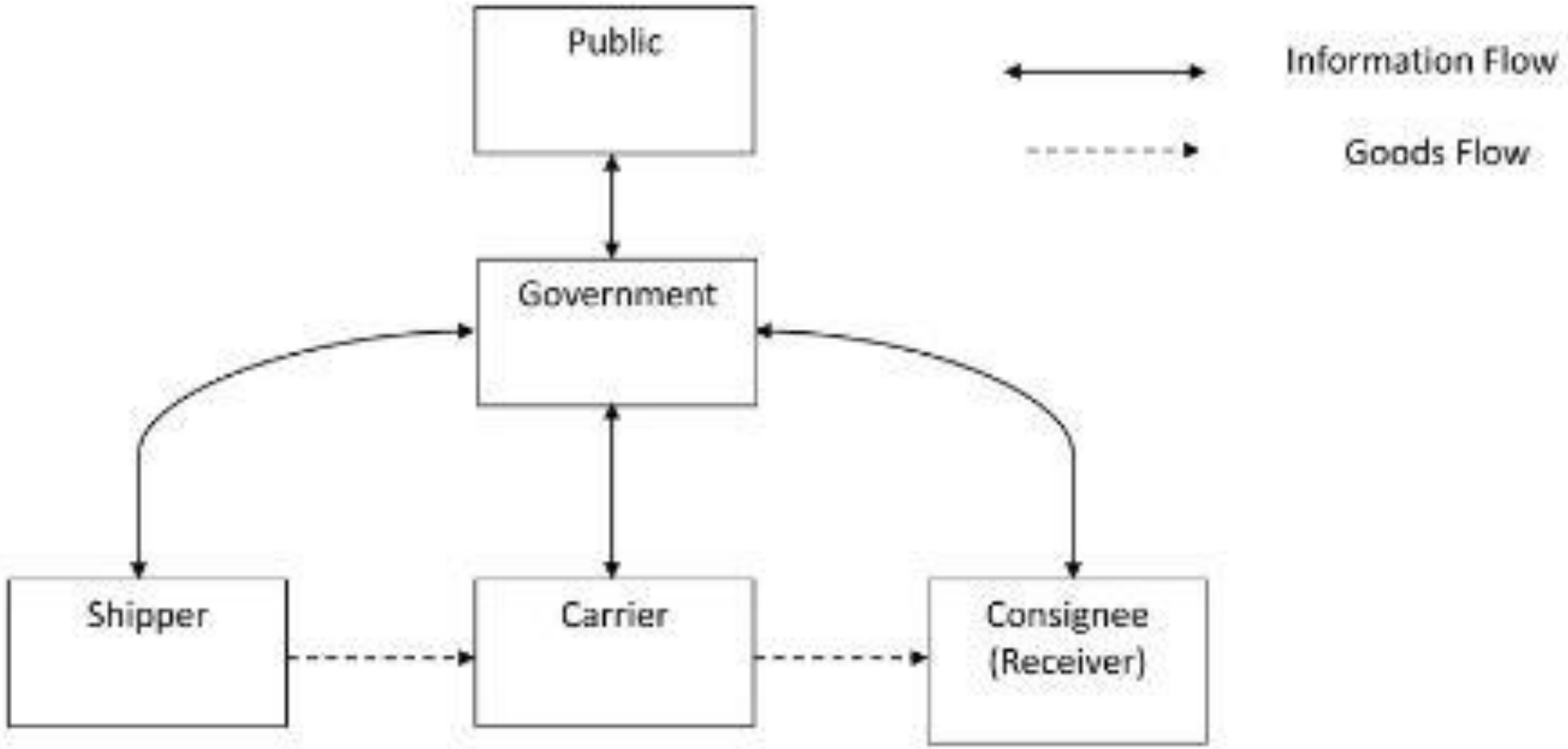
Carrier Evaluation Process: 2 step process- first - grading a relative importance from the shippers perspective. Second – rating carrier performance for each measure.

Sno	Evaluation Factor	Relative Importance	Carrier Performance	Carrier Rating
1	Cost	1	1	1
2	Transit time	3	2	6
3	Reliability	1	2	2
4	Capability	2	2	4
5	Accessebility	2	2	4
6	Security	2	3	6
				23

Transporting services integration: search of alternative ways in which transportation can be effectively utilized to reduce the overall logistical systems cost.

Participants in transportation decisions

Participants in transportation decisions:



Participants in transportation decisions

Shippers and Consignees: They have common objective of moving goods from origin to destination within prescribed time at the lowest cost. Services include specified pickup & delivery time, predictable transit times, zero loss and damage, and timely exchange of information and invoicing.

Carriers: they desire to maximize revenue and minimize costs. They desire flexibility in pickup and delivery times to consolidate into economic moves.

Govt: stable and efficient commercial economy requires the carriers offer competitive services. Involvement may be regulation, promotion or ownership.

Public: They are concerned with accessibility, expense, and effectiveness as well as environmental and safety standards. Public generates ultimate demand. Pollution and accidents reduction.

Suppliers of transportation services

Suppliers of transportation services:

Single Mode Operators: The basic carrier type that offers service utilizing only one transport mode. This focus allows a carrier to become highly speciliased, competent and efficient. Eg Airline; Series of single mode –costly

Specialised carriers – opportunities exists for companies offering small shipment or package services.

(regular or premium)

Basic Package Service-package delivery services within commercial zones of metropolitan area, others offer on an interstate or intrastate services. United Parcel Services(UPS), Overnite Express

Suppliers of transportation services

Example of Integrated parcel carrier services.

Freight services: Next-day air; Second-day air; Ground Saver; World wide document service.

Value-added service: Electronic tracking; Advanced label imaging system (barcode); Delivery confirmation service; on call air pickup etc.

Premium Package services – Fed Ex, DHL, Emery Worldwide, Bluedart use of dedicated cargo aircraft/vehicles. This appealed to commercial business because they fill a need for rapid delivery in emergency situations.

Means of Transport on the Roads

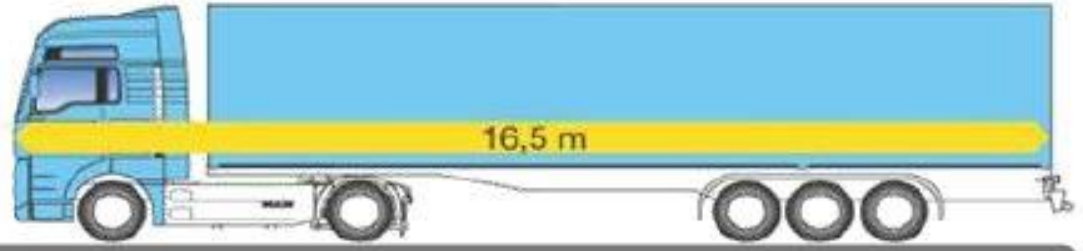
Focus on Goods Vehicles

light goods vehicles	medium-weight goods vehicles	heavy goods vehicles
range of application: e.g. distribution of parcels, courier services, craft sector, private furniture transport	**range of application:** e.g. construction site supply, waste collection, craft sector, distribution of general cargo	**range of application:** e.g. connection of large hubs, heavy or long goods

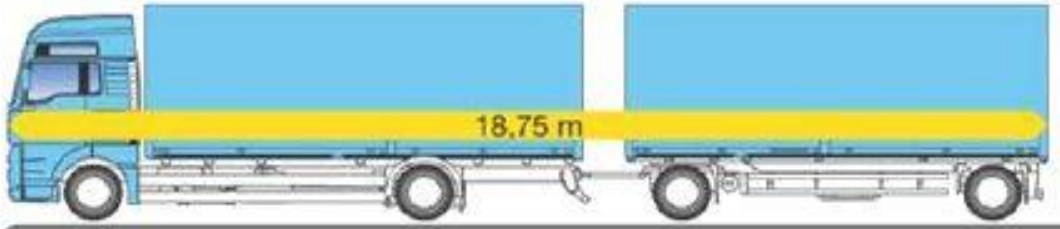
Goods Vehicles

Frequent Truck Types in Daily Use

Facts:
total length: 16.5 m
cargo hold: 90 m3 *(= space for 34 Euro pallets)*
cargo area: 13.62 / 2.45 / 2.70 m (l/w/h)



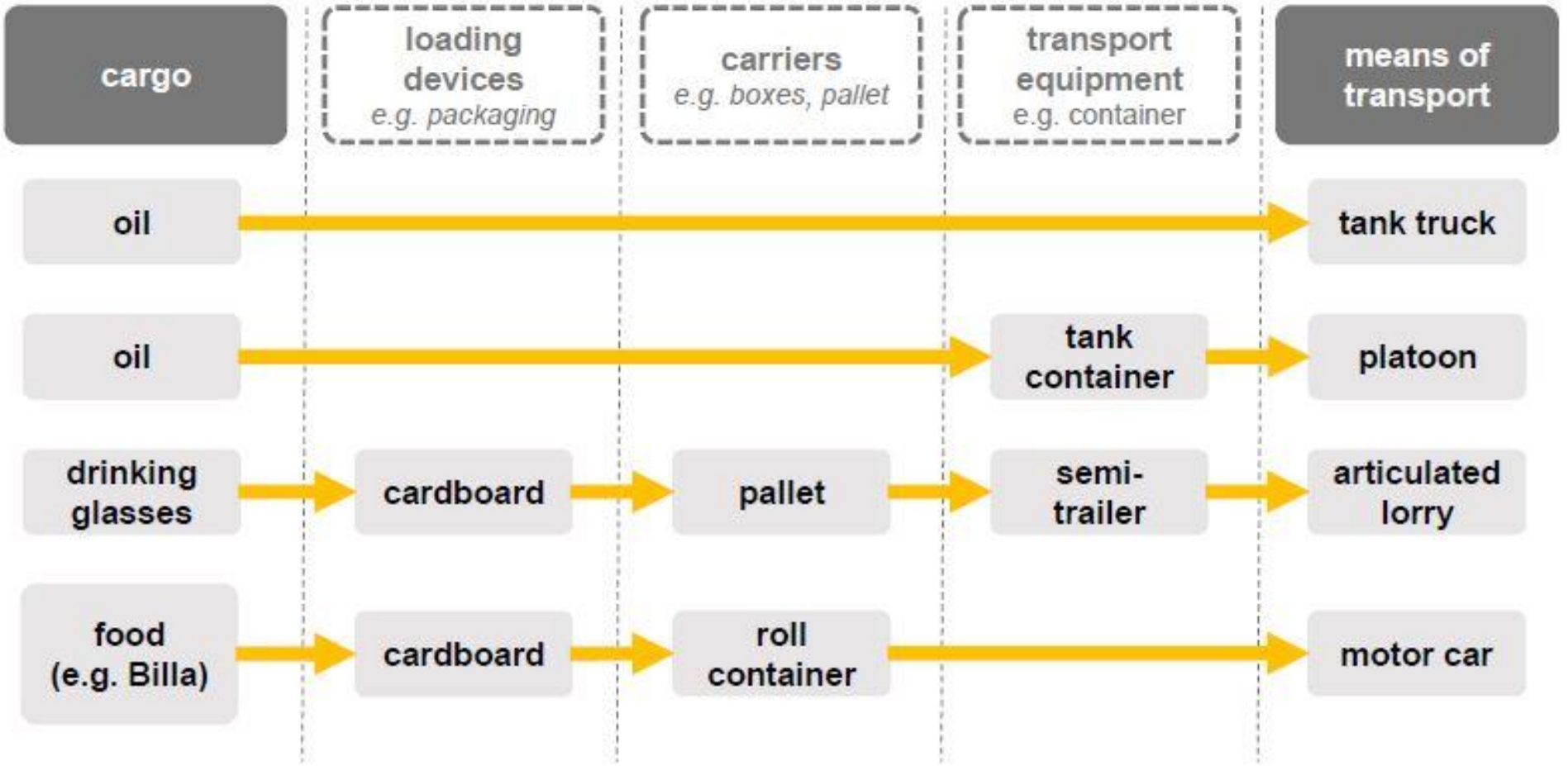
articulated lorry
(tractor + trailer/semitrailer)



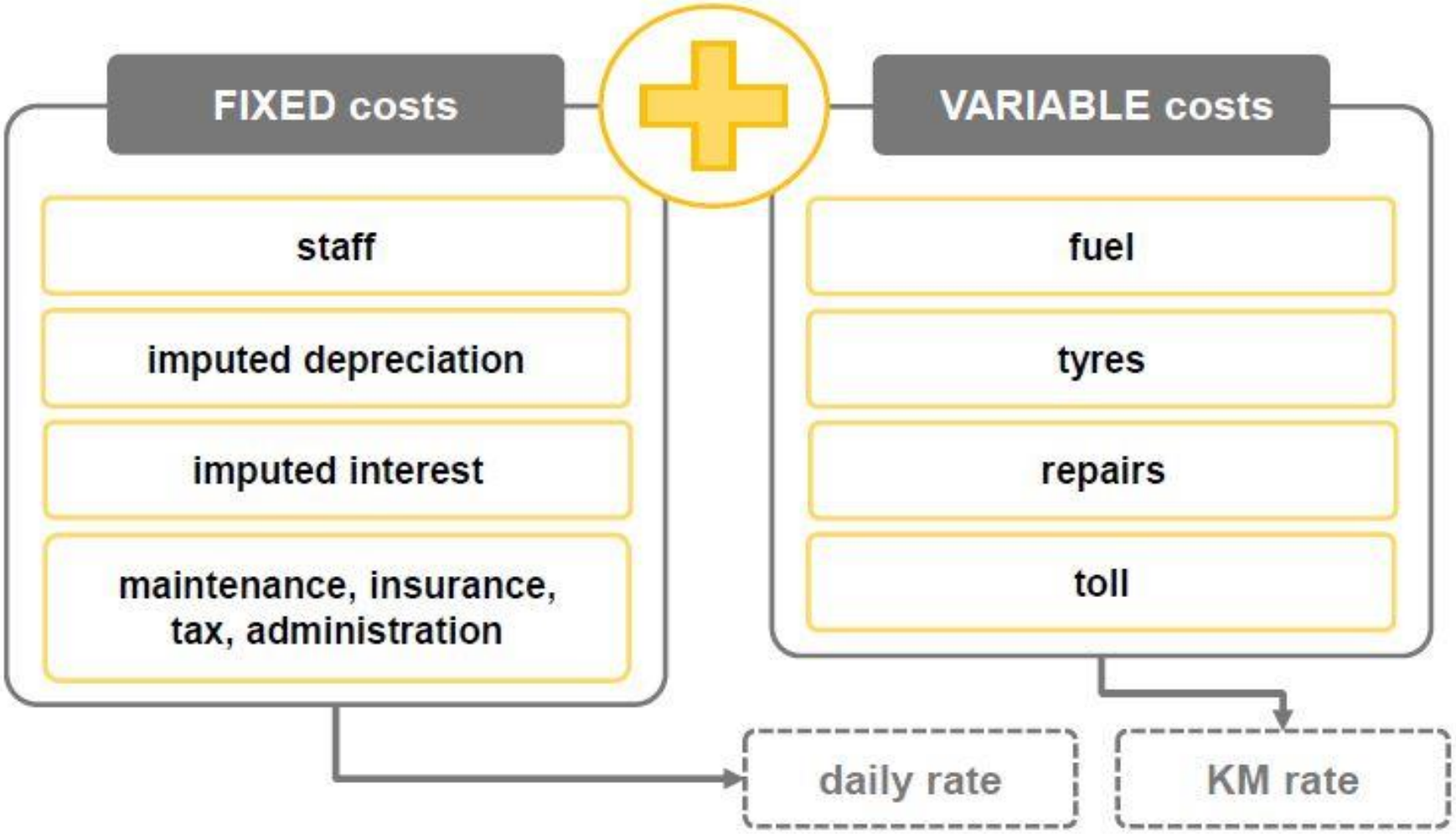
Facts:
total length: 18.75 m
cargo hold: ~ 94 m3 *(= space for 36 Euro pallets)*
cargo floor (2x): 7.35 / 2.45 / 2.65 m (l/w/h)

articulated train
(swap bodies)

Loading and Transport Units in Road Traffic



Calculation in Road Transport



Challenges for the proper use of Chittagong seaport

- Despite the increase in ship arrivals during the peak season (April-October), the inadequacy of the jetty was a major obstacle to the activities of the Chittagong port. To solve this problem, the port authorities have recommended completion of construction of PCT, Matarbari Port and Bay Terminal and necessary renovation of old jetties.
- lack of adequate cargo and container handling equipment collection. In this regard, the collection of handling equipment has continued in line with the increase in cargo and container handling.

Challenges for the proper use of Chittagong seaport

- The port authorities have continued to increase the yard and space in phases to store the increased quantity of these containers. But the container storage yard could not be extended in time as the construction of physical infrastructure was time consuming. As a result, there is sometimes a shortage of container storage space. To solve this problem, it is necessary to build adequate yard or space for storage of containers in a timely manner and to complete the construction of delivery yard for Chittagong port in the Bay Terminal area.

Challenges for the proper use of Chittagong seaport

- The activities of the port are going on in the thirty three year old tariff. Since the introduction of tariffs in 1986, no other tariff charges have been changed in 2008 except for eight items. As a result, even though the cost of capital items of the port has increased, it has not been adjusted with the tariff, so it has been fixed in one place. As a result, there may be a revenue shortfall for the port authorities in the future.

Challenges for the proper use of Chittagong seaport

- Delays and procedural complexities in the auction activities of actionable containers and vehicles, lack of auto integration of customs port with Chittagong port with Asaikuda World, insufficient depth of channels and berths, dependence of ship operation on tidal low tide, Handling of stones, heavy project goods etc. inside the jetty, hindrance to increase rear facilities, old-fashioned TO&E still in operation, environmental unit not fully operational, lack of tags, port access road for Chittagong port being two lanes And the scarcity of connecting roads for the unloading of cargo and containers from the port.

Challenges for the proper use of Chittagong seaport

- Moreover, the rent inside the port is also relatively low. For this reason, importers feel comfortable keeping their goods inside the port. This is also increasing the space crisis and traffic congestion in the jetty area. The port authorities have recommended raising the tariff rate to solve the problem.
- The Chittagong Port Authority has also identified the delivery of goods by opening FCL containers inside the port as a problem. According to the report, about 80 per cent of FCL import containers are unloaded inside the port or in the yard. Due to this, handling activities were disrupted due to increase in the number of trucks, covered vans and driver-helpers in the jetty area. Moreover, it is also a risk to the security of the port. It also affects the productivity of the port.