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CERTIFIED IN LOGISTICS,
TRANSPORTATION AND DISTRIBUTION

MODULE 8: TRANSPORTATION

APICS

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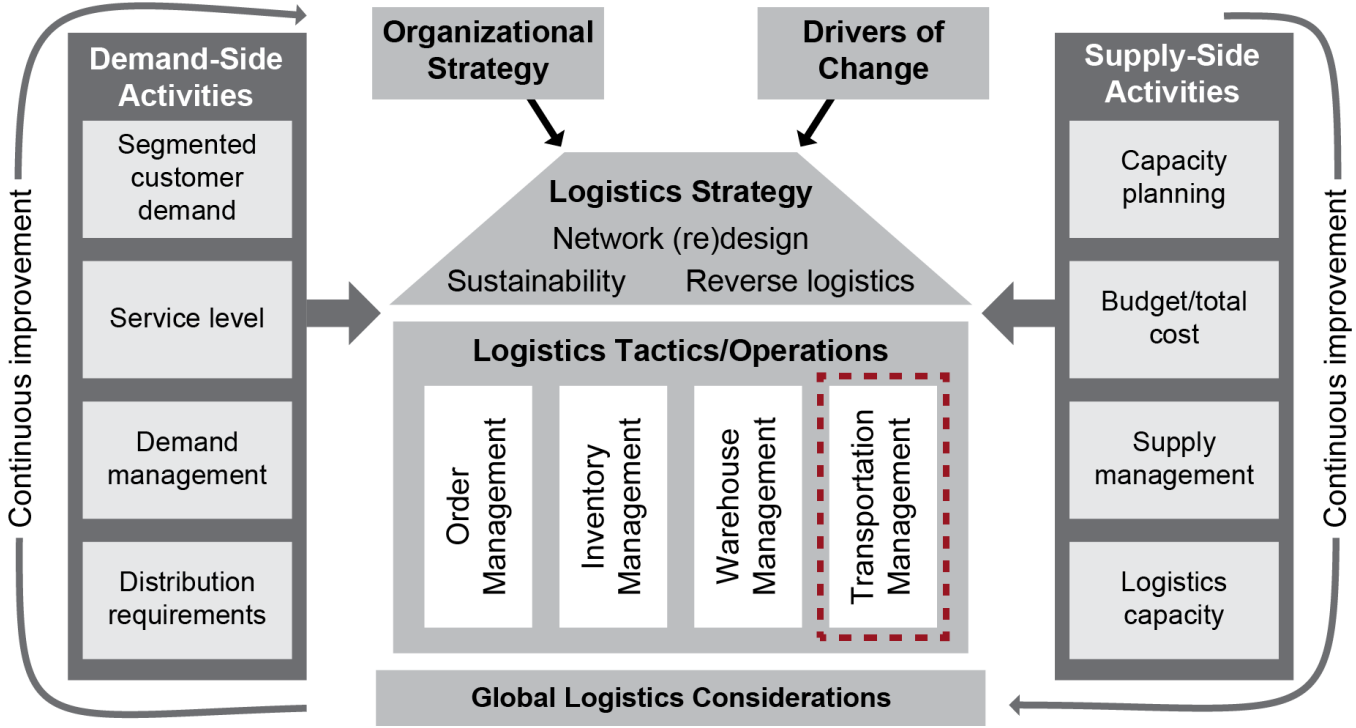
Module 8 Overview



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TRANSPORTATION AND DISTRIBUTION

MODULE 8, SECTION A: TRANSPORTATION FUNDAMENTALS

APICS

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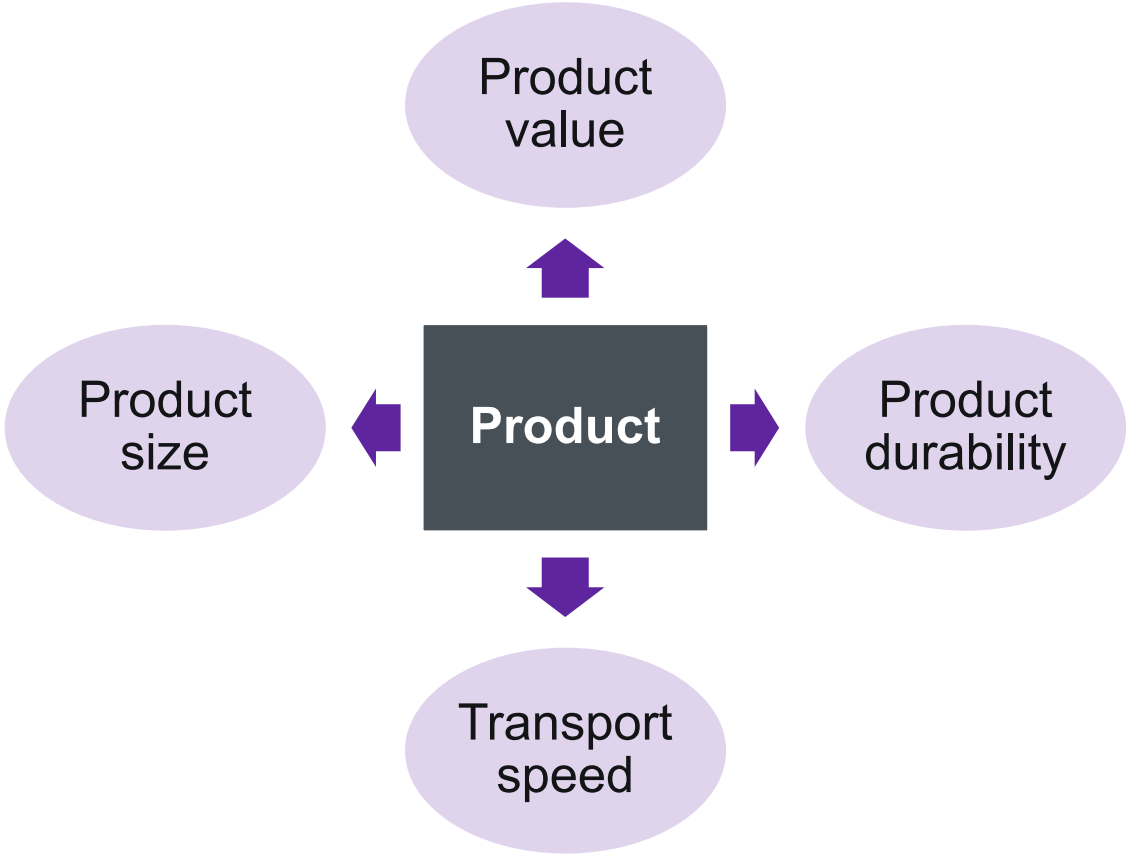
Transportation Mode Selection

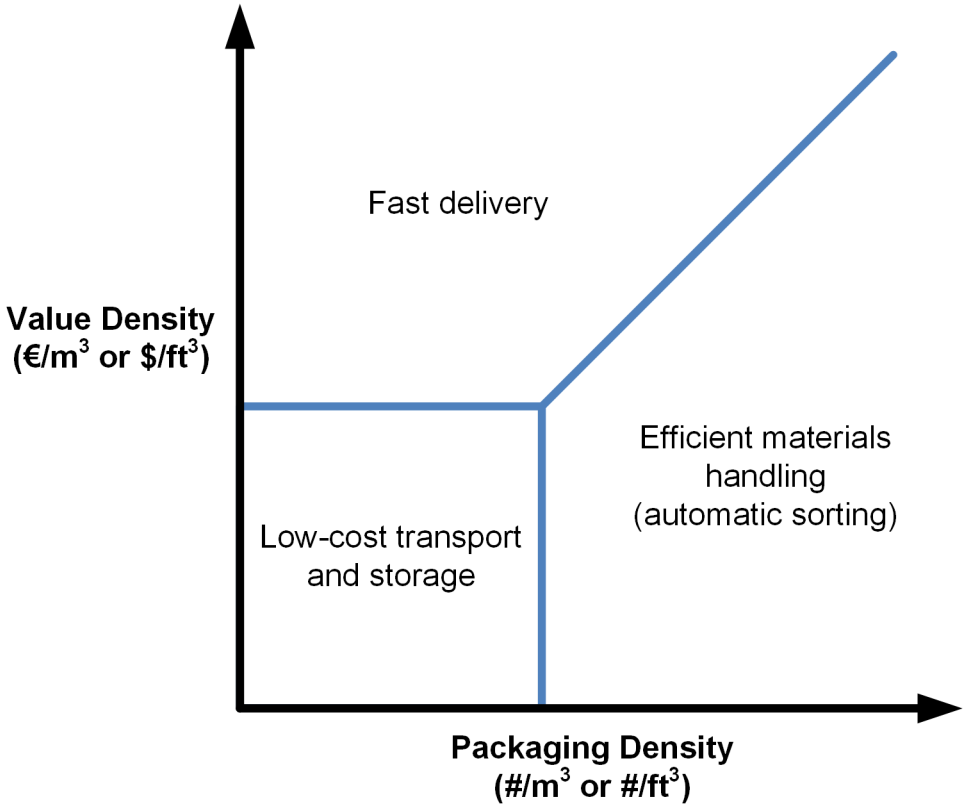
Criteria

- Product
- Accessibility
- Transit time
- Reliability
- Security



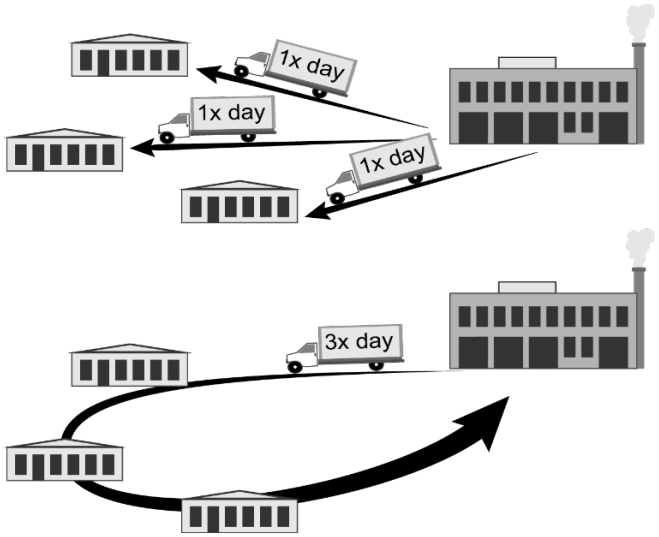
Value Density vs. Packaging Density

- Lower value products need lower cost transport
- Speed is a component of cost.

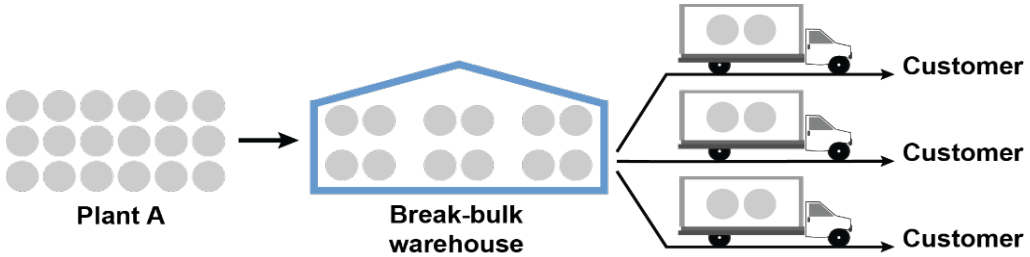


Terminals

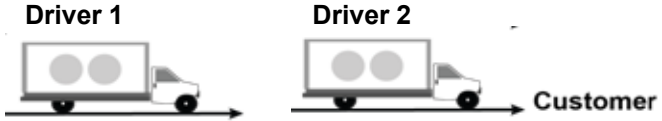
Milk run



Break-bulk



Relay



Vehicle Costing

Reasons for efficient costing systems:

- Need to know vehicle details and fleet performance to control operations
- Need to know in enough time to make necessary changes

Gather information:

- Human resources—vehicle drivers
- Machinery—vehicles
- Materials—associated materials (tires, fuel, etc.)
- Money—costs of resources
- Minutes—resource use/purpose(s)

Overhead Costs

Indirect costs not related directly to a vehicle

Main types:

- Fleet overhead
  - Costs of reserve equipment and labor required to run vehicle fleet
- Business overhead
  - Administrative and transportation department expenditures unrelated to specific vehicle

Private Trucking

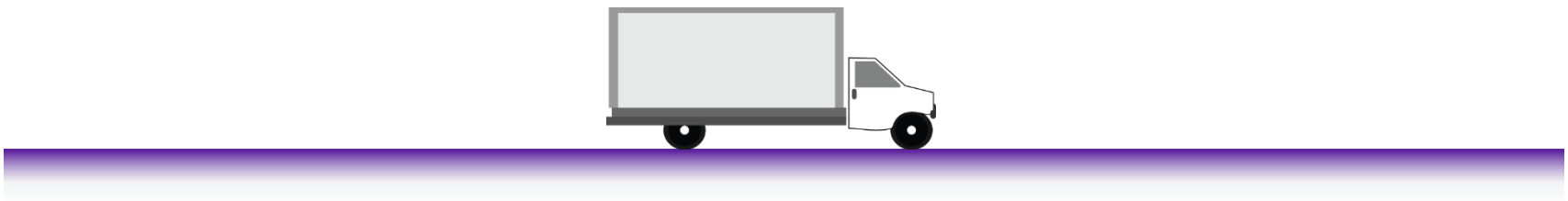
Pros

- Better service
- Guaranteed capacity
- Schedule flexibility/convenience
- Design fleet for specific needs
- Less transportation cost and inventory
- Vehicle depreciation
- Security

Cons

- Higher capital expenses
- Ongoing maintenance
- Scheduling/routing
- Increased liability
- Labor unions

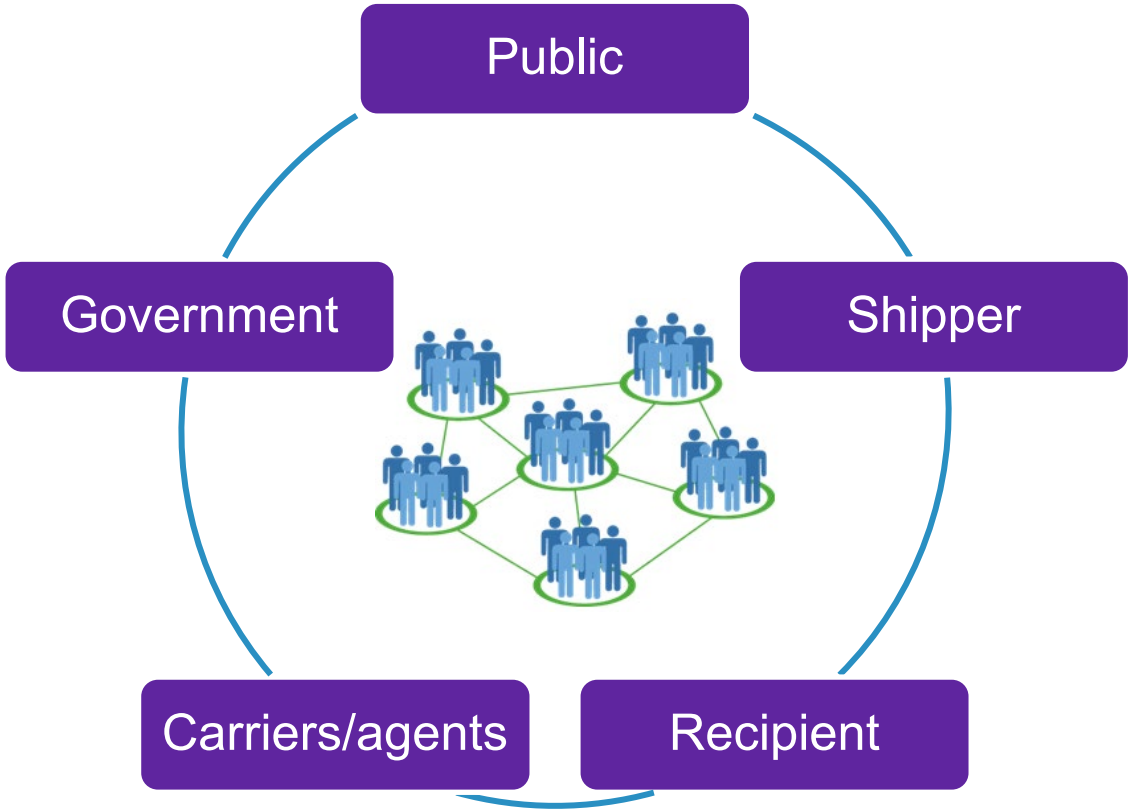
Outsourcing Transportation



- No capital cost of starting and maintaining private fleet
- Reduces or eliminates risks
  - Accident liability
  - Regulations compliance
  - Unions

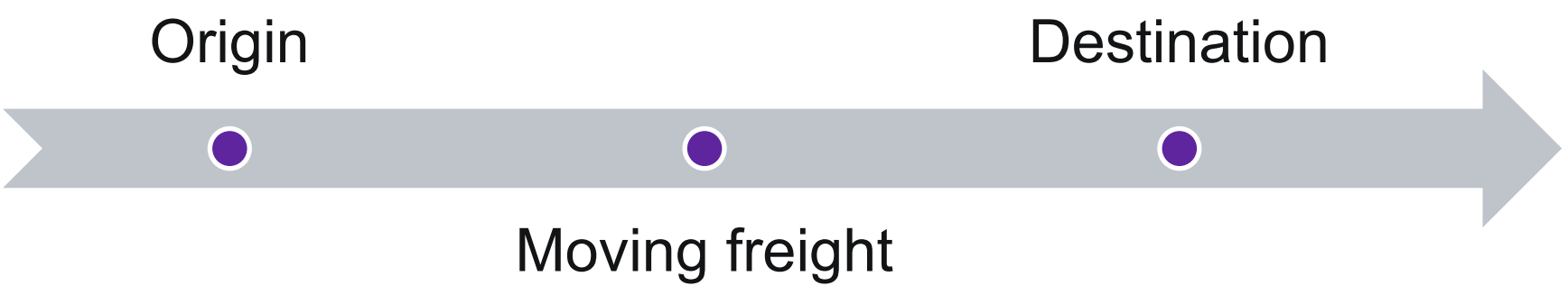
Transportation Stakeholders

- Understand complexity of transportation environment
- Review roles and their perspectives



Load Transport

Purpose: Get goods to destination while minimizing expenses and environment impact



Components of Load Transport

Freight services	▪ Moving goods between locations
Terminal services	▪ Consolidating smaller shipments to optimize transportation costs and break-bulk
Loading/ unloading	▪ Responsibility varies as dictated by service contract
Value-added services	▪ Electronic shipment tracking, label imaging, delivery confirmation, temperature control
Documentation	▪ Required for domestic and international
Diversion/ reconsignment	▪ Diversion is the delay of receipt/reroute shipment before arrival. Reconsignment is done after arrival at original destination.

Product Storage

Transport mode

- Common to store products in trailers, containers, etc.
- Usually only for short time, as cost is high

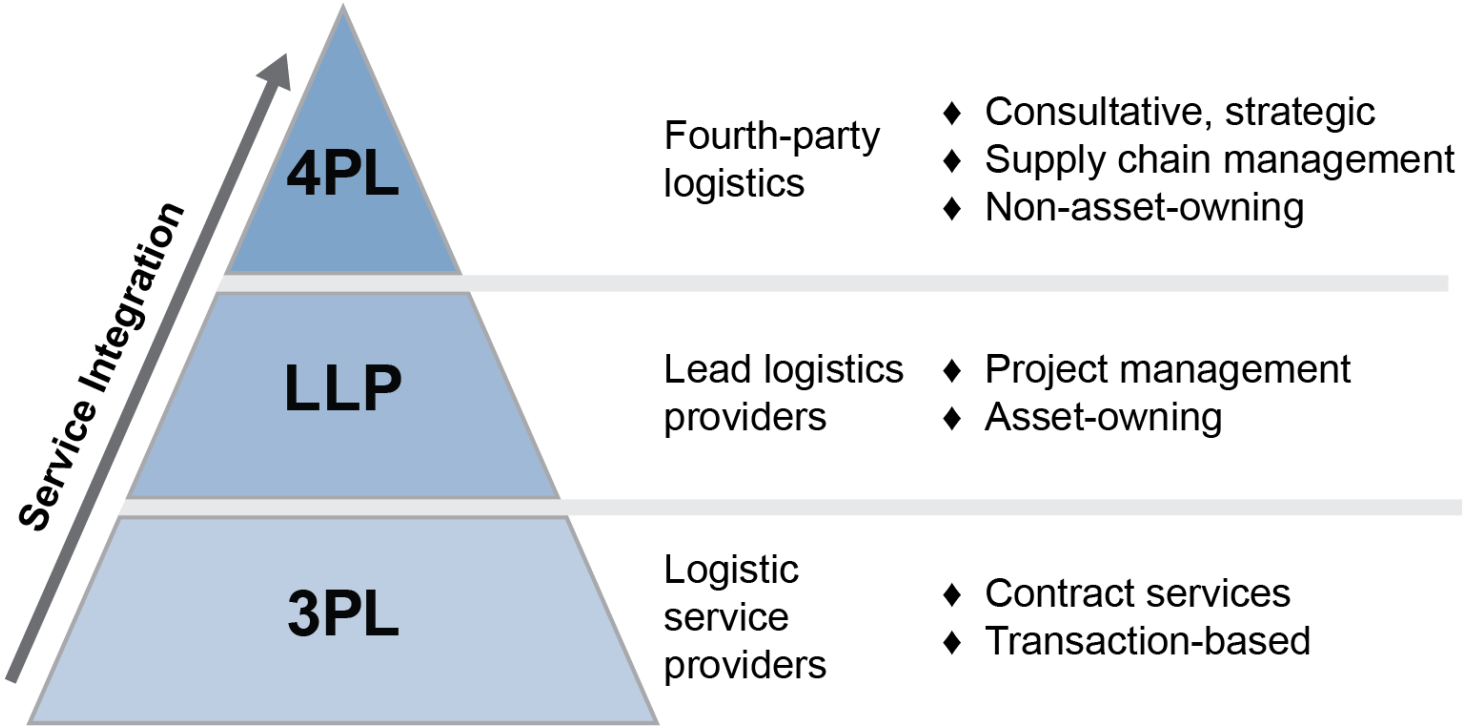
In-transit storage

- Often used when there is a space shortage at receiver's warehouse

Integrated Service Providers (ISPs)

- Sufficient support with existing assets?
- Can flex services up or down based on market?
- History of saving money for clients (e.g., asset utilization)?
- Current capacity?

Service Provider Structure



International Freight Forwarder (IFF) Functions

- Advising on L/C acceptance
- Booking international carriers
- Export declarations
- Air waybills, bills of lading, ASNs, etc.
- Importing country consular documents
- Cargo insurance
- General consultant on exporting

Broker Roles in Transportation

Freight broker

- Finds carriers but doesn't take possession (unlike forwarder)
- Negotiates terms and administers documentation

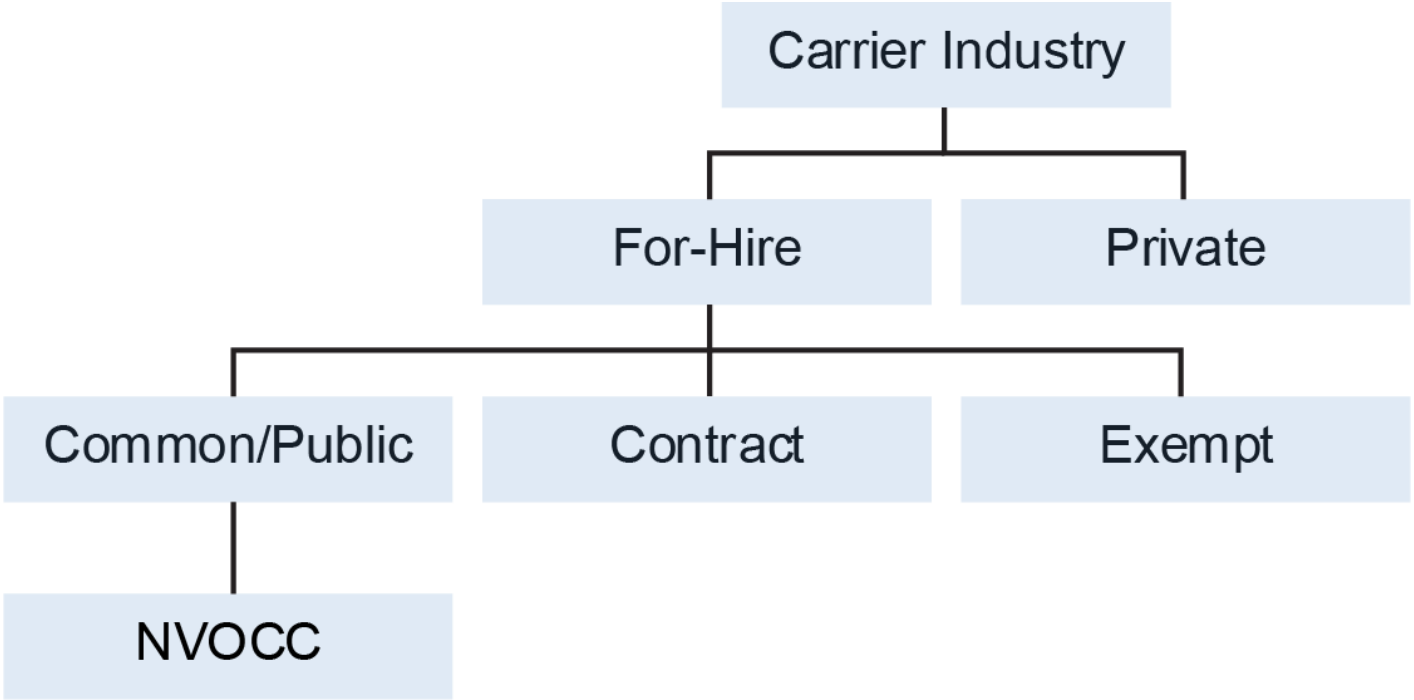
Customs broker

- Manages international shipping documents
- Tracks and moves shipments through proper channels

Other Transport Intermediaries

- Export management company (EMC)
- Export trading company (ETC)
- Shipping associations
- Shipper’s agents
- Export packing companies

Carrier Types



Mode Evaluation

- Speed
- Completeness
- Dependability
- Capability
- Frequency
- Cost

Modes for Moving Goods

Fixed costs

- Costs that do not change with the volume of goods transported.
  - Land
  - Facilities
  - Equipment

Variable costs

- Costs that fluctuate with the volume moved.
  - Fuel
  - Maintenance
  - Wages
  - Border-crossing fees

Industry Cost Overview

Mode	Fixed Costs	Variable Costs
Road	Low ↓	High ↑
Rail	High ↑	Low ↓
Air	Low ↓	High ↑
Water	Low ↓	High ↑
Pipeline	High ↑	Low ↓
Intermodal	Varies	Varies
Parcel, courier, express	Low ↓	High ↑

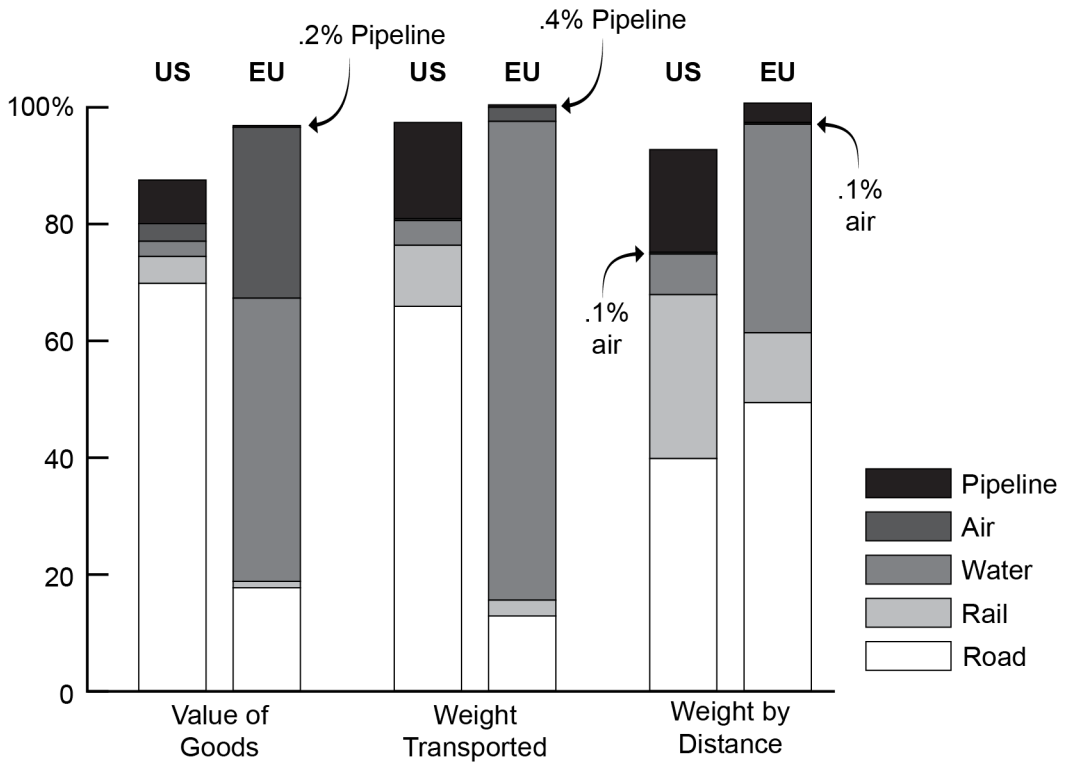
Transportation Infrastructure

kkm = thousands of km *mkm = millions of km*	Australia	China	France	India	Nigeria	United States
Airports with paved runways	349	510	294	253	40	5,054
Roadways (total)	0.874 mkm	5.2 mkm	1.053 mkm	6.372 mkm	0.195 mkm	6.587 mkm
Railways—high speed	—	40 kkm	—	—	—	—
Railways—broad gauge	2.7 kkm	—	—	64 kkm	—	—
Railways—standard gauge	18 kkm	104 kkm	27.9 kkm	—	0.29 kkm	293.6 kkm
Railways—narrow gauge	12 kkm	—	—	1.6 kkm	3.5 kkm	—
Waterways	2 kkm	27.7 kkm	8.5 kkm	14.5 kkm	8.6 kkm	41 kkm
Pipelines (oil)	3.6 kkm	30.4 kkm	2.9 kkm	10.4 kkm	4.4 kkm	240.7 kkm
Major seaports	12	8	6	7	3	9

Source: *The World Factbook*, www.cia.gov, accessed 2023 (dates for specific data vary).

Freight Shipments by Mode

- US versus EU comparisons



Source: U.S. Department of Transportation, Bureau of Transportation Statistics, “2019 Pocket Guide to Transportation”; European Union Commission, “Statistical Pocketbook 2017, EU Transport in Figures”

Characteristics of Transportation Modes

Characteristics	Road	Rail	Water	Air	Pipeline
Capability	Minimal limitations	Minimal limitations	Few limits	Limited	Very limited
Cost	Moderate/high	Low	Low	Very high	Very low
Capacity	Moderate	High	Seasonal	Very low	Very high
Speed of delivery	Fast	Moderate	Slow	Very fast	Slow
Accessibility/ flexibility	Very high	High	Low	Moderate	Very low/low
Environmental efficiency/efficacy	Low	Very high	Low	Moderate	Moderate
Damage	High (LTL only)	Very high	High	Very low	Low
Reliability	High	Low	Low	High	Very high
Intermodal capability	Very high	Very high	Very high	High	Low
Courier delivery	Very high	Low	Low	Very high	Very low

Source: Adapted from David F. Ross, *Distribution Planning and Control—Managing in the Era of Supply Chain Management*, third edition, and John J. Coyle, et al., *Managing Supply Chains: A Logistics Approach*, ninth edition

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CERTIFIED IN LOGISTICS,
TRANSPORTATION AND DISTRIBUTION

MODULE 8, SECTION B:
ROAD TRANSPORTATION

APICS

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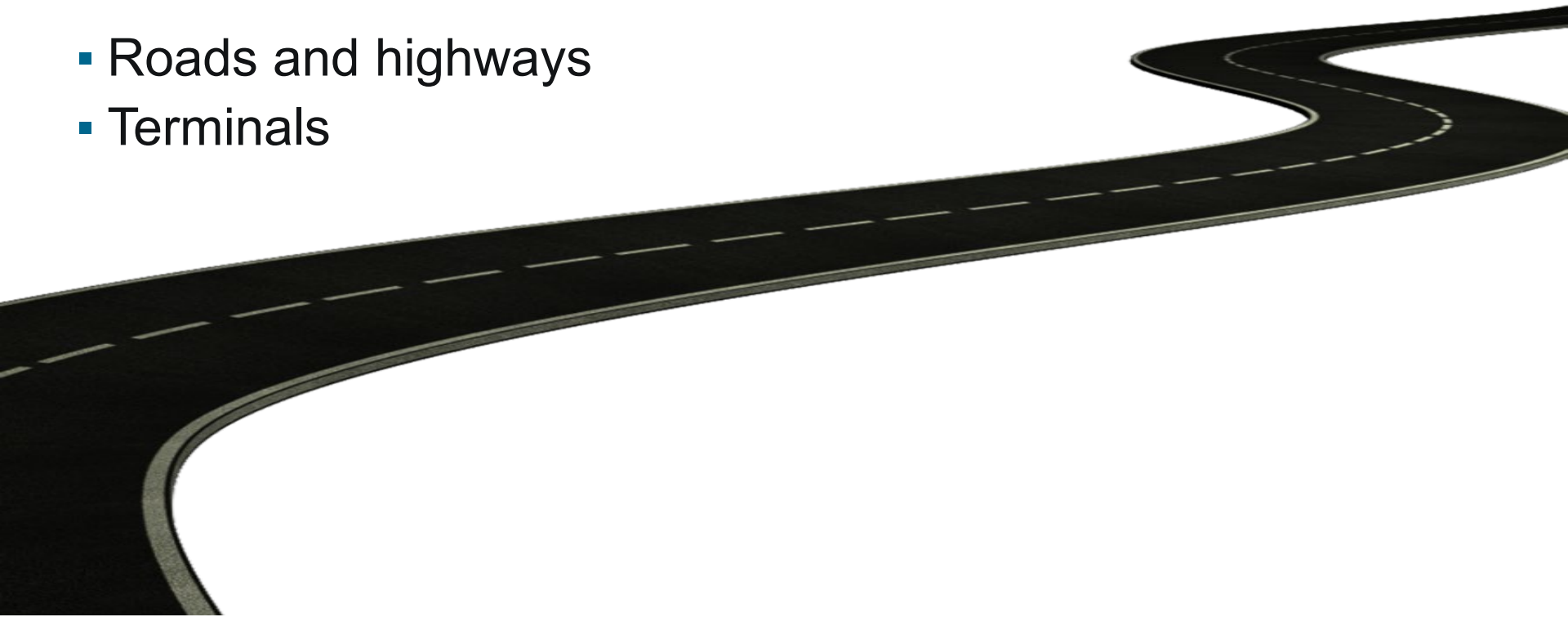
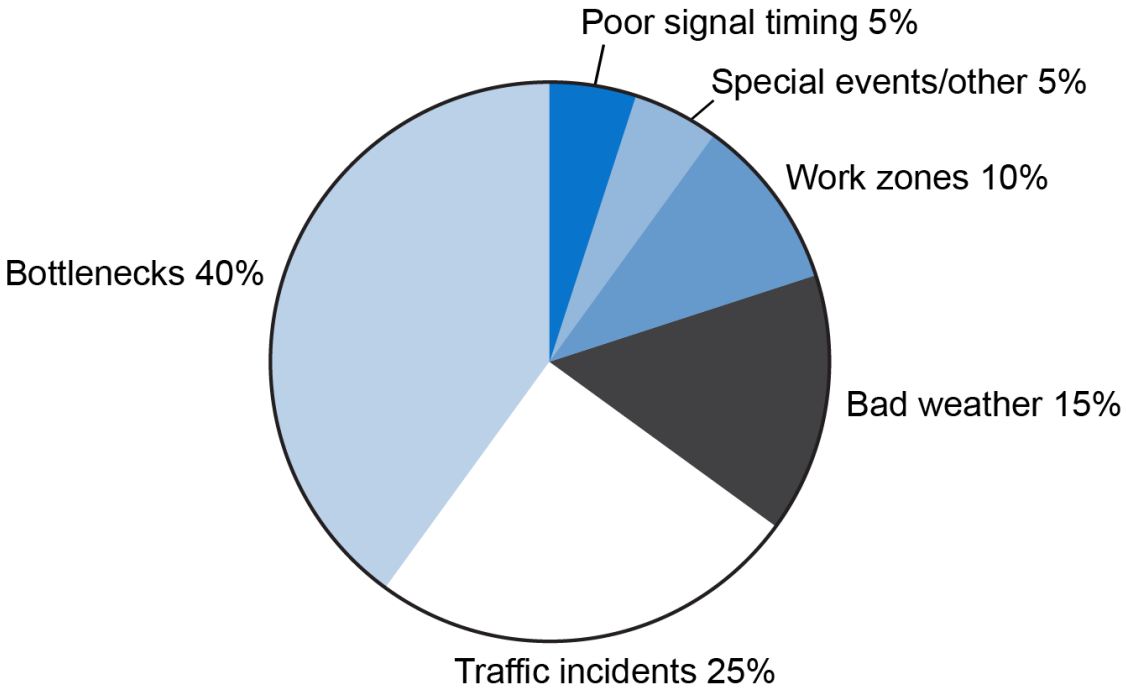
Road Transport Infrastructure

- Roads and highways
- Terminals



Sources of Road Congestion

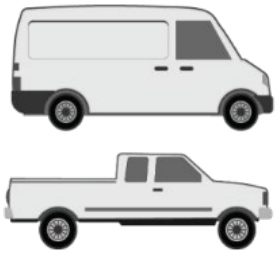


Source: “Traffic Congestion and Reliability: Linking Solutions to Problems,” U.S. Department of Transportation, Federal Highway Administration Office of Operations

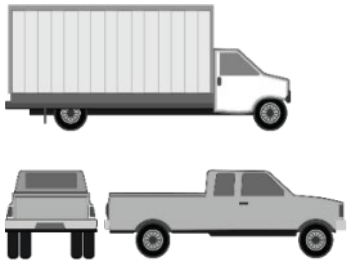
Topic 2: Road Vehicle and Trailer Types

Single Units

Motorcycles



Pickups, panels, vans



2-axle trucks

3-axle trucks

4+-axle trucks

Tractor-Trailer Combinations

Single trailer (3 or 4)

Single trailer (5+)

Single trailer (6+)

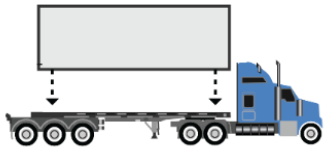
Multi-trailer (5 or fewer)

Multi-trailer (6)

Multi-trailer (7+)

Auto carrier

Gooseneck trailer



Skeletal trailer

Freight Rate

Established price for transport, based on distance, weight, measure, equipment type, package, commodity, etc.

- Rate often refers to the price per hundredweight
- Products grouped into uniform classifications based on similar
  - Density
  - Handling requirements
  - Stowability
  - Value characteristics
  - Liability

Freight Classifications

LTL — **Less-than-truckload**

Shipment will not use entire cargo capacity.

TL — **Truckload**

Shipment uses full cargo capacity.

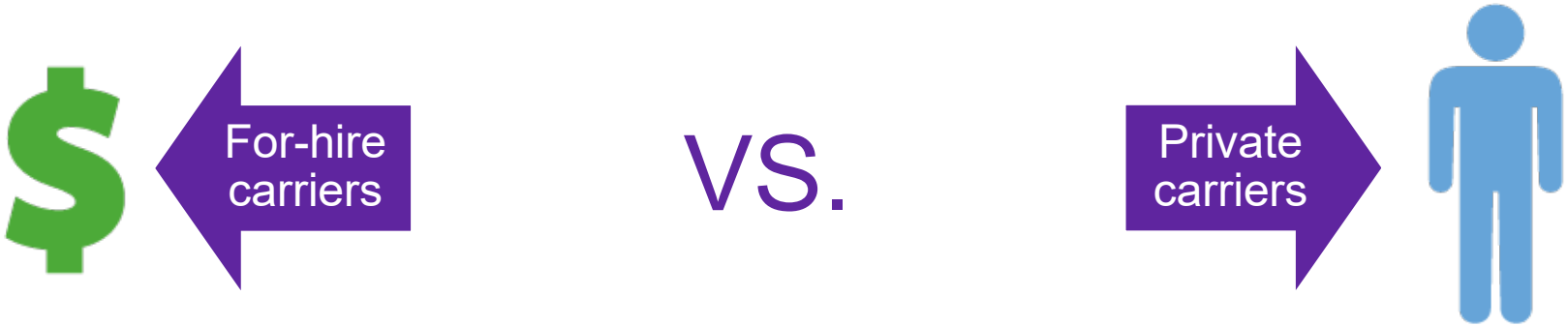
Cartage — **Local, short haul, and delivery**

Move pallets in short hauls from origin to destination.

Small parcel — **Specialized carriers**

Multiple shipments on single vehicle.

Competition

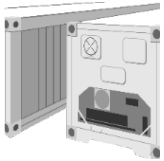


- Fiercest competition between trucking providers
- Why?
  - Low initial investment
  - Few regulatory requirements
  - Selective discounting practices

Types of Services

Local	Multi-stop	In-bond	Line haul
▪ Local pickup—when a company uses intermodal transport ▪ Local delivery—from warehouse/carrier to final destination	▪ Serves more than one customer ▪ May be multiple stops along route	▪ Origin in one country to destination in another	▪ Drive between home terminal and reshipment terminal

Operating and Service Characteristics

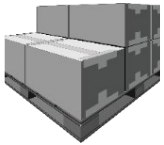


Capability

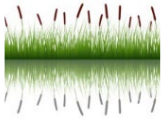
Accessibility

Cost structure

Flexibility



Capacity

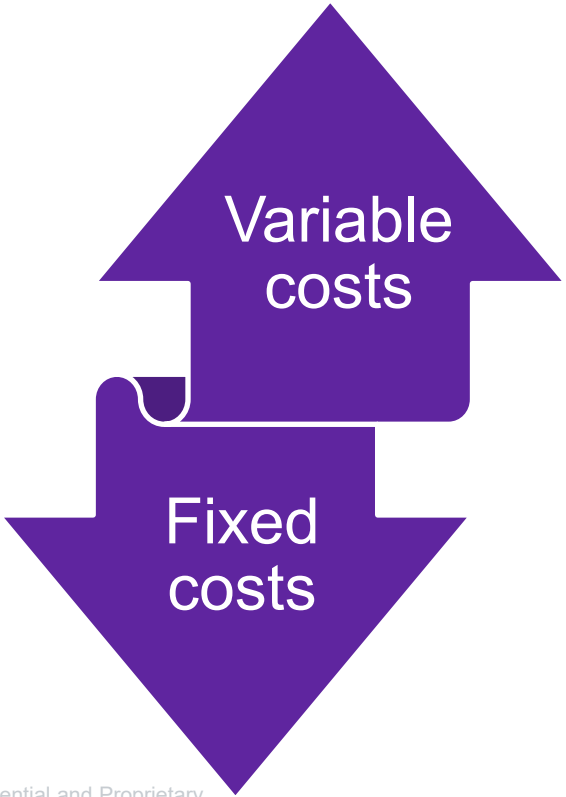


Environmental

Speed

Safety

Cost Structure: Road



70–90%

10–30%

Operating Ratio

$$\text{Operating Ratio} = \frac{\text{Operating Expenses}}{\text{Operating Revenue}} \times 100$$

Operating expenses:

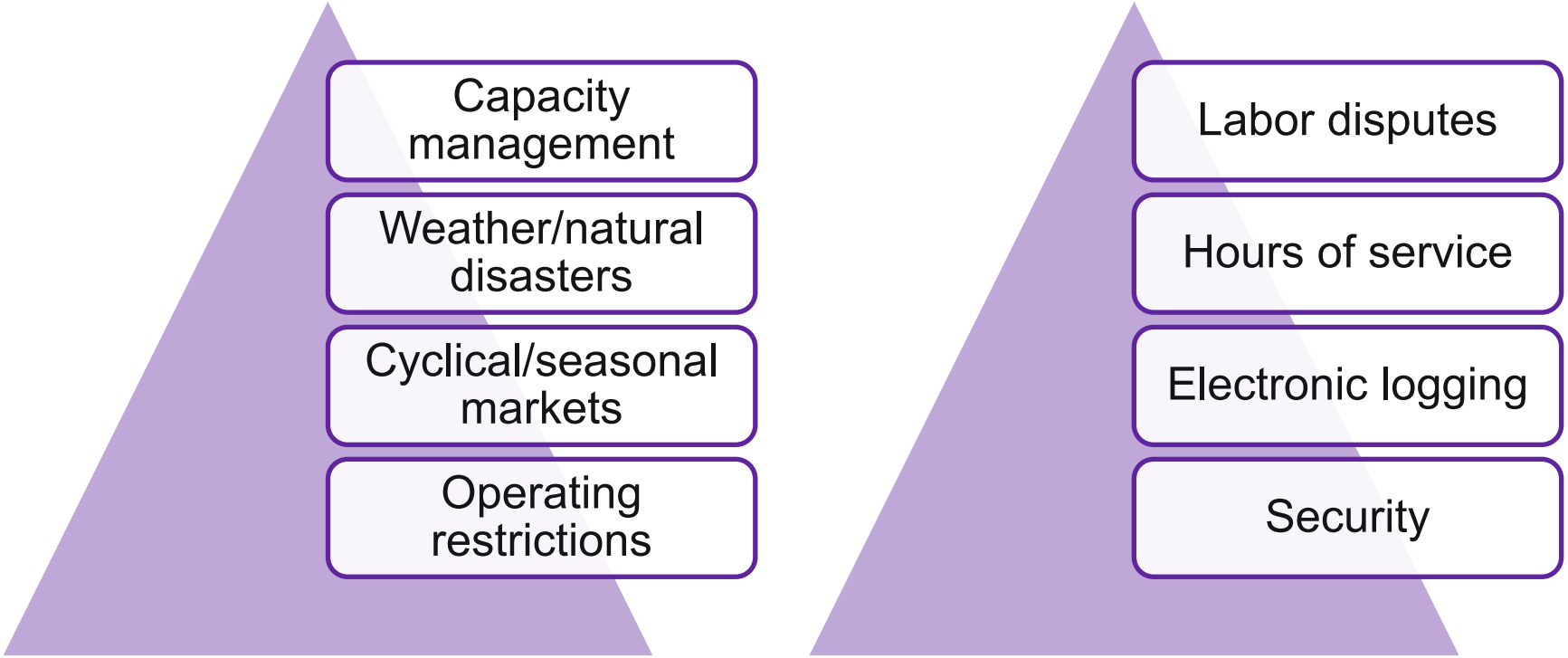
- Fuel
- Truck and trailer lease or purchase payments
- Vehicle repair and maintenance
- Truck insurance premiums
- Permits and special licenses
- Tolls
- Driver wages and benefits

Environmental Efficiency/Efficacy

Use of trucks contributes to environmental stress:

- Air pollution
- Noise

Issues and Challenges



Capacity Management Issues

Truck driver shortage

- Age demographics
- Pay rates
- Driving records
- Licenses and exams
- Working conditions and schedules

Chassis supply

- Providing chassis
- “Roadability Rule”
- Chassis maintenance
- Chassis shortages

Hours of Service—EU

- Daily limits:
  - Total minimum rest of 12 hours
    - First rest at least 3 hours of uninterrupted rest, any time
    - Second rest at least 9 hours of uninterrupted rest
  - Maximum 9 hours after 11 consecutive hours off, except 2x week maximum 10 hours driving
  - 45-minute break after 4.5 hours (30 minutes, 15 minutes OK)
- Weekly limits:
  - Maximum total drive time 56 hours; 90 hours per fortnight
  - 45 continuous hours off duty (every 2nd week can be just 24 hours) after 6 days of work

Hours of Service—U.S.

U.S. Regulation	Description
11-hour driving limit	Maximum 11 hours after 10 consecutive hours off
14-hour limit	Maximum 14 consecutive hours after 10+ consecutive hours off
Rest breaks	30-minute rest period at least every 8 hours
Weekly hour limits	• No driving after 60/70 hours on duty in 7/8 consecutive days • Restart 7/8 consecutive day period after taking 34+ consecutive hours off
Sleeper berth provision	Minimum 8 hours in sleeper berth plus 2 separate hours in berth and/or off duty

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MODULE 8, SECTION C:
RAIL TRANSPORTATION

APICS

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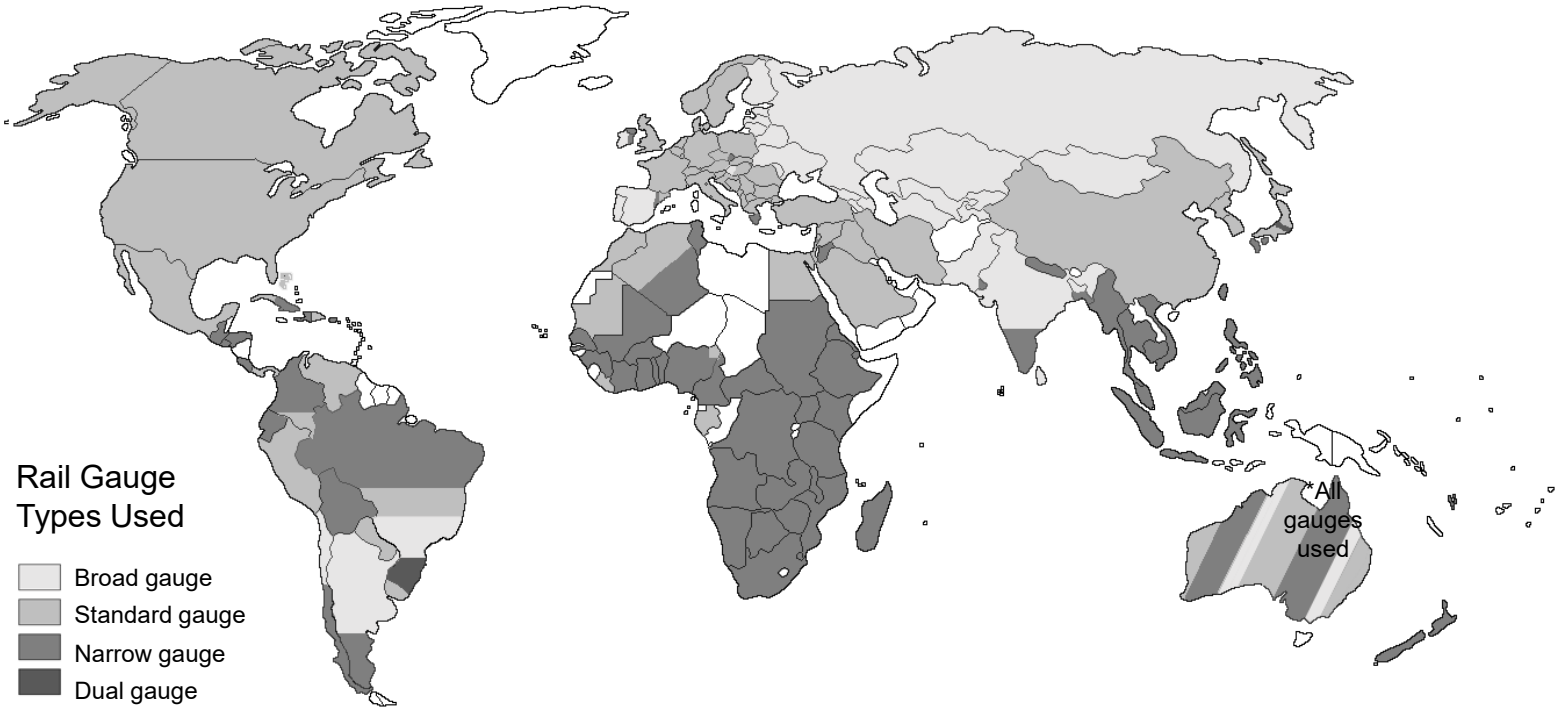
Rail Gauge around the World



Source: Data derived from *The World Factbook* 2013-14, Central Intelligence Agency (www.cia.gov).

Global Rail Network

A collection of unlinked national rail systems with the following types of rail lines:

- Penetration lines
- Regional networks
- Transcontinental lines

Types of Freight

Food ingredients	Livestock	Farm products	Construction materials
Nonmetallic materials	Mined goods	Chemicals	Transportation equipment
	Break-bulk goods	Bulk goods	

Types of Railcars

Boxcar

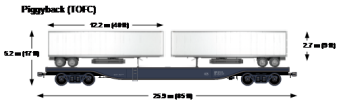
Hopper car

Flatcar

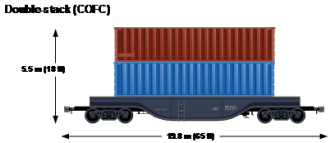
Tank car

Refrigerated car

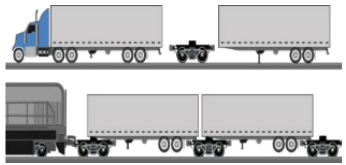
Gondola car



Piggyback



Double-stack



RoadRailer®

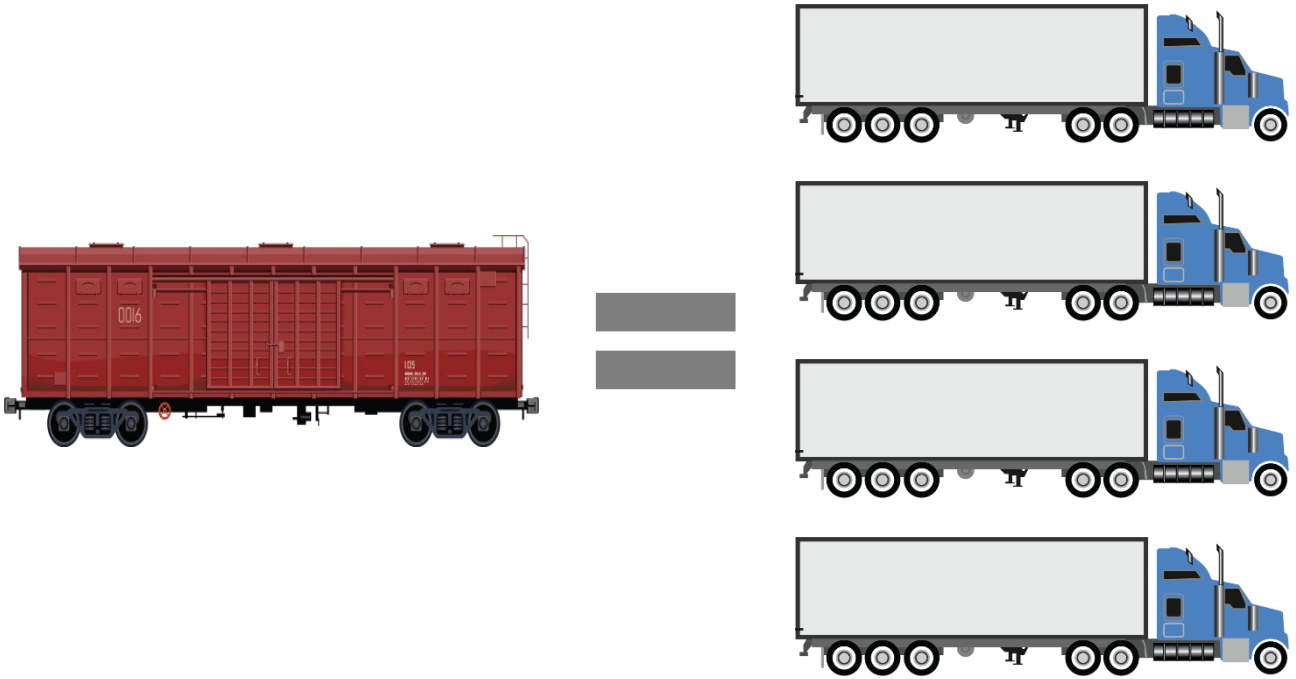
Rail Infrastructure Investment

- Brazil: ~28,000 kilometers (17,400 miles) of track
- China: ~100,000 kilometers (62,000 miles) of track
- Russia: ~85,000 kilometers (52,000 miles) of track
- Germany: ~42,000 kilometers (26,000 miles) of track
- U.S.: ~260,000 kilometers (160,000 miles) of track

Rail Cost Structures

Variable costs	Semi-variable costs	Fixed costs
▪ Labor ▪ Fuel ▪ Power	▪ Maintain rights of way ▪ Terminal structures ▪ Equipment	▪ Property taxes ▪ Building maintenance ▪ Equipment maintenance

Rail Transport Capacity



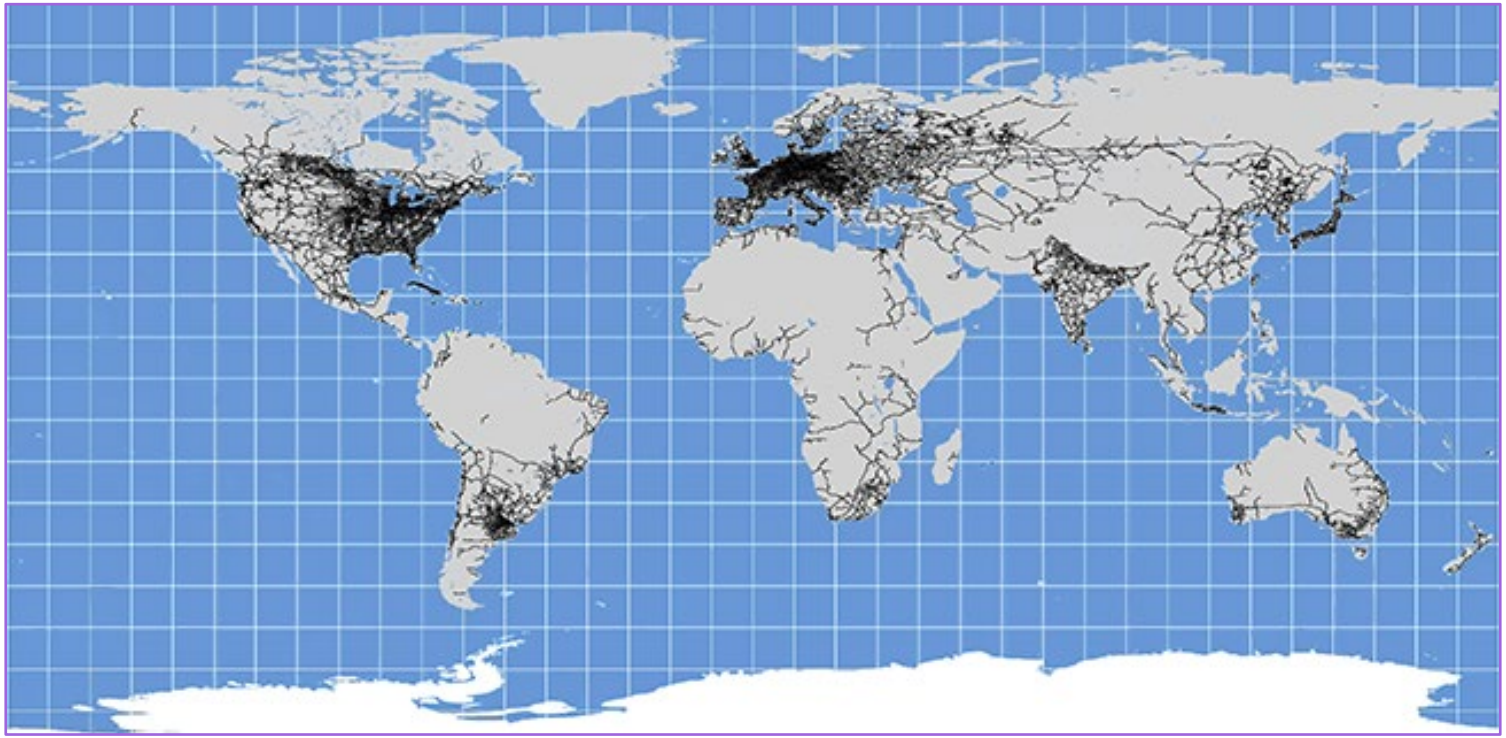
Environmental Efficiency/Efficacy

- 3.5 times more energy-efficient than trucks
- Requires far less fuel; far fewer carbon emissions
- Avoids highway congestion
- Far more environmentally friendly mode than road

Issues and Challenges—Rail

- Schedule flexibility
- Rigid operations
- Lead time
- Interconnectivity
- Challenges outside of North America
- Derailment and vibration tests

Interconnectivity



Source: © European Union, Joint Research Centre (http://forobs.jrc.ec.europa.eu/products/gam/sources.php).

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MODULE 8, SECTION D:
AIR TRANSPORT

APICS

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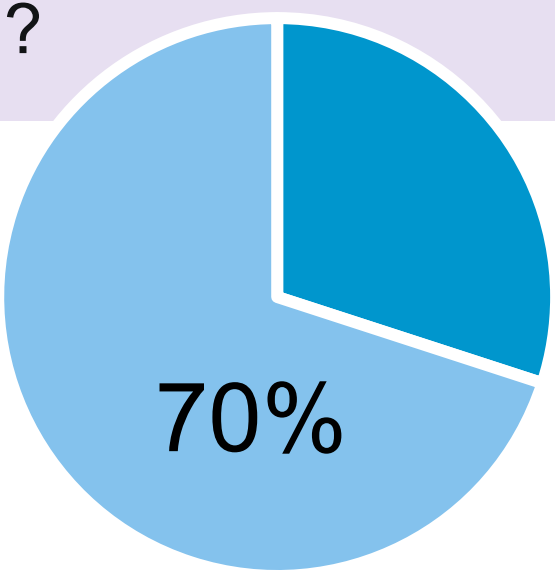
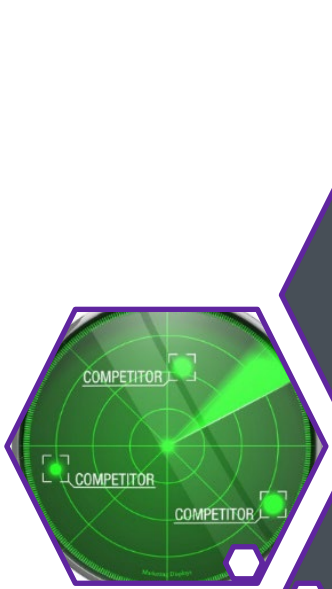
Air Transport Inefficiencies

What amount of transit time for air cargo is spent on the ground?



Air Transport Infrastructure Considerations



Runway length

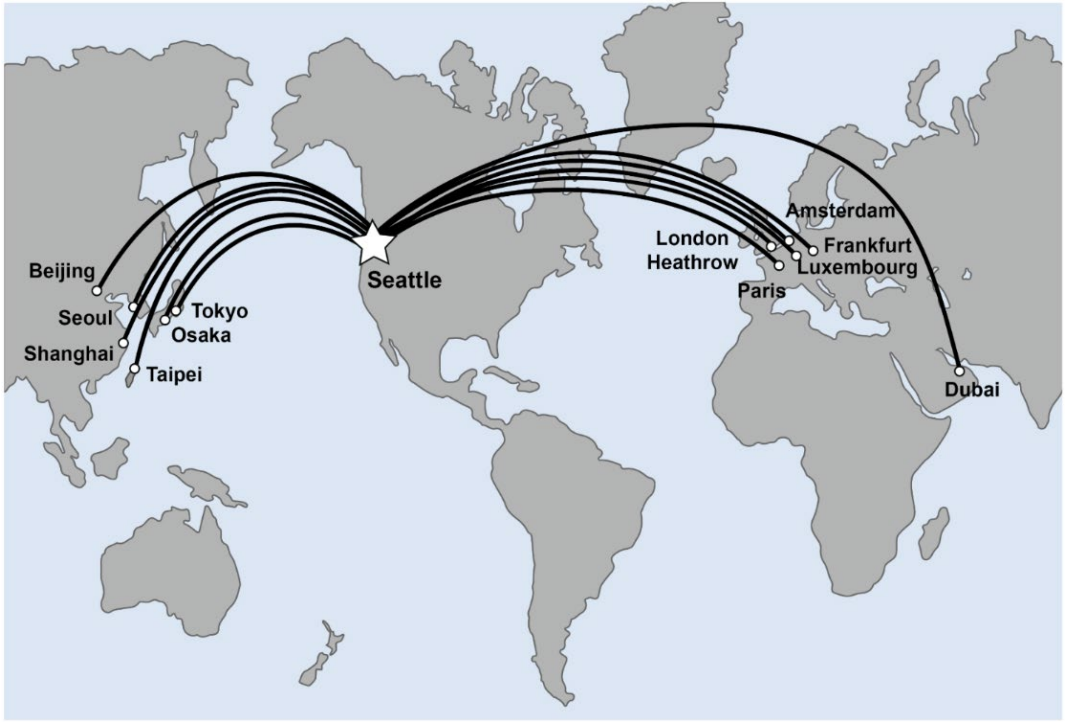
Landing fees

Weather

Terminal facilities

Ramp access

Hub-and-Spoke Model



Types of Carriers

Combination carriers

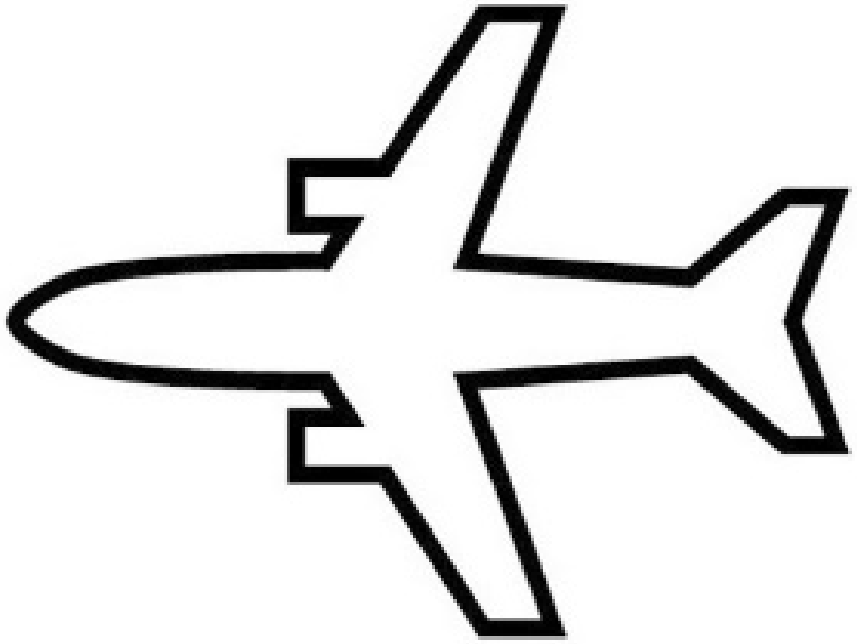
- Freight and passengers
- Freight on main deck and in hold
- Freight can be bumped to accommodate passenger luggage

Air cargo carriers

- Focus on letters, envelopes, packages, and freight
- Integrated carriers provide door-to-door service
- Nonintegrated carriers provide air-only services

Aircraft Body Types

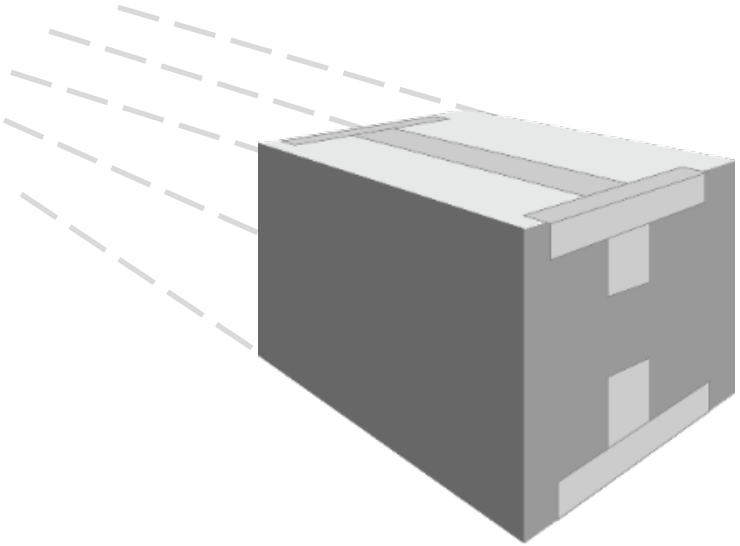
- Narrow
- Wide
- Cargo
- Combination



Unit Load Devices (ULDs)

Market Structure

- Air transport is used for freight if…
  - The market is unpredictable.
  - Demand exceeds local supply.
  - Demand is infrequent.
  - Freight is seasonal.
- Main benefit is delivery speed.



Air Freight Transport

- Perishable goods available all year
- Critical equipment available on short notice
- Humanitarian aid delivered quickly and effectively

- Aircraft dimensions limit cargo size and weight
- Air safety and security limit types of cargo
- Air cargo has high unit cost

Operational Efficiency

$$\text{Load Factor} = \frac{\text{Cargo Volume}}{\text{Cargo Space}}$$

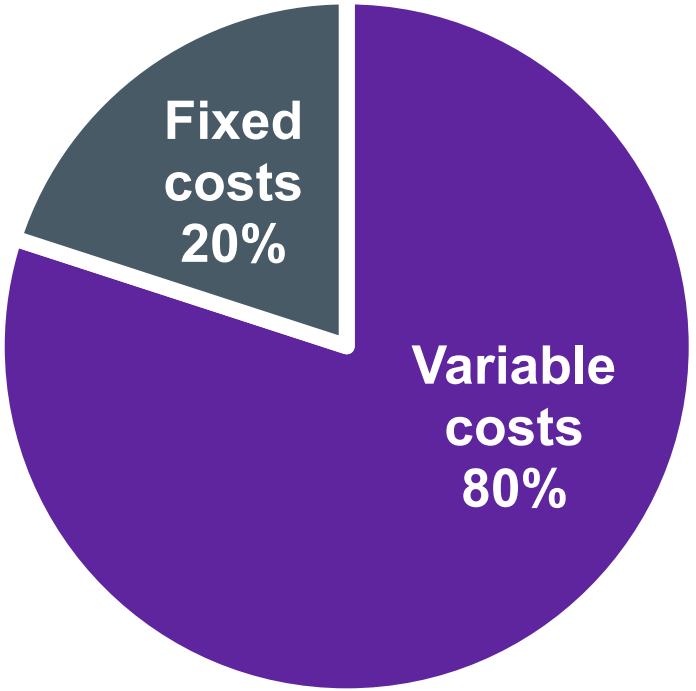
An operating efficiency metric that measures the percentage of a plane's capacity that is used.

Competition

Best balance between required transit time and planned transportation costs

Air Transport Cost Structure

Competitive pricing requires airlines to cut costs and operate efficiently.

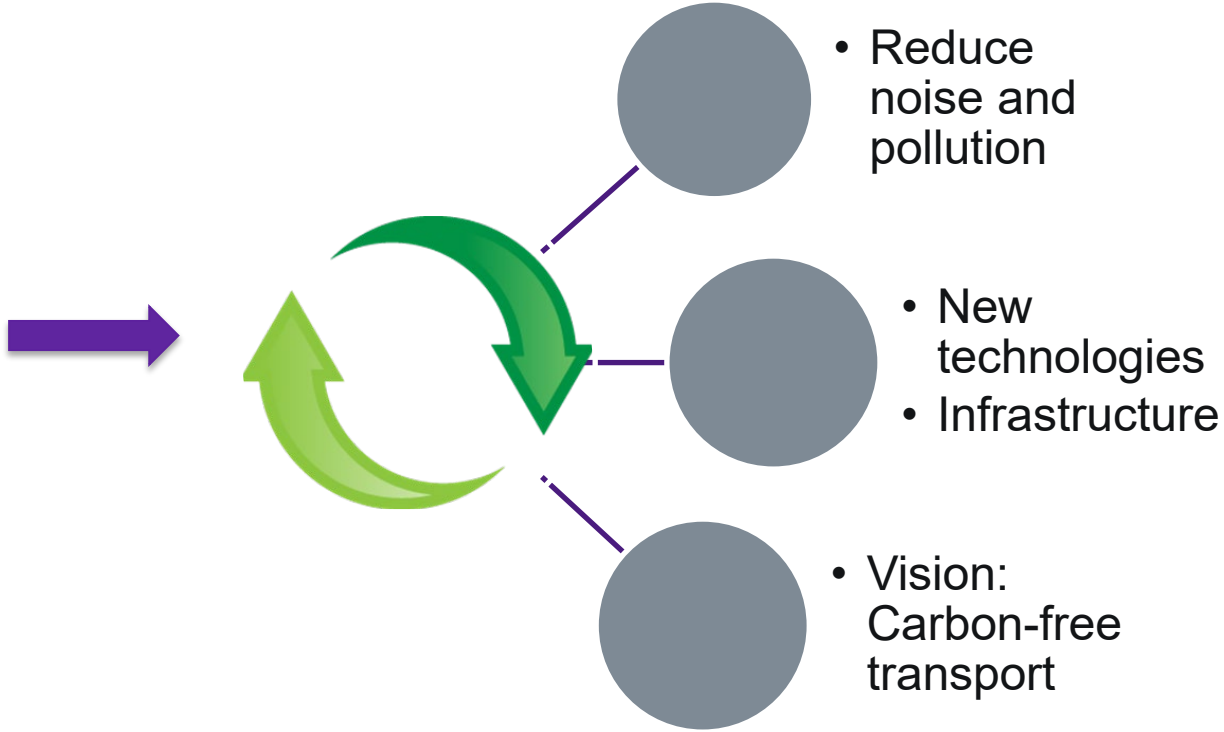


Air Cargo Capacity

- With passenger aircraft, cargo is of secondary importance.
- Capacity measured in lanes.
- Less packaging.
- Items do not need to be shipped in containers (but ULDs can combine many items).

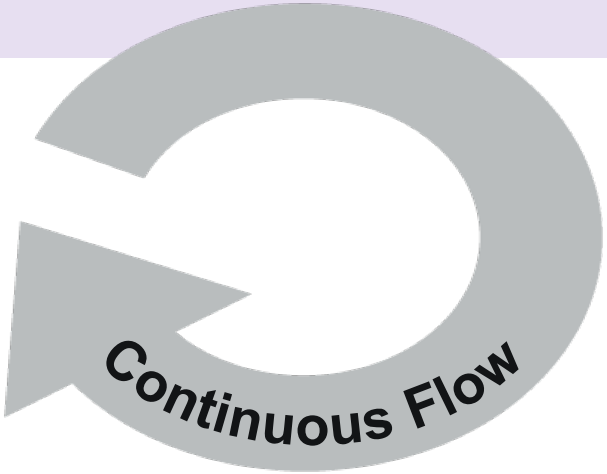
Environmental Efficiency/Efficacy

- IATA and ICAO promote environmental protection.
- ICAO group: Committee on Aviation Environmental Protection

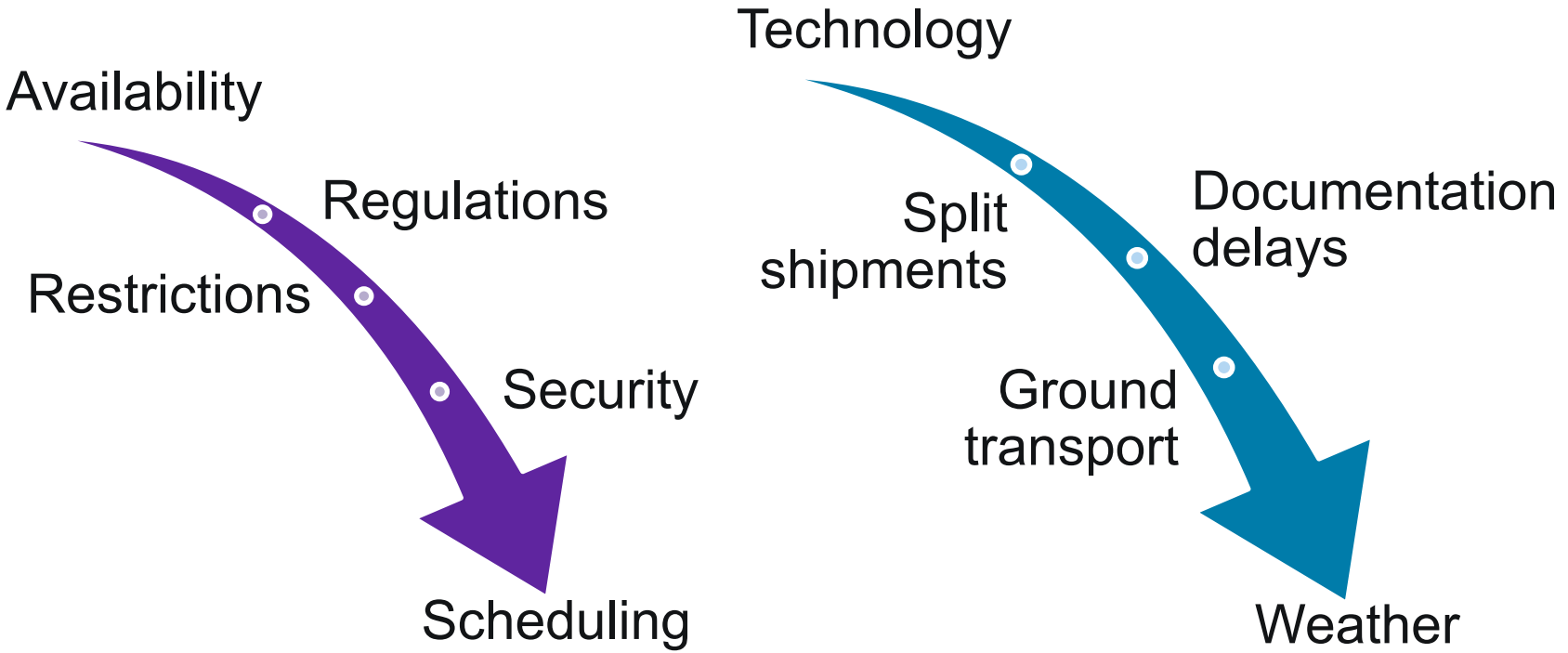


Biggest Issue

Ensuring the continuous flow of air traffic, including increased or decreased amount of passengers and cargo



Issues and Challenges



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TRANSPORTATION AND DISTRIBUTION

MODULE 8, SECTION E: OCEAN AND INLAND WATERWAY TRANSPORTATION

APICS

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Water Transport Infrastructure

Inland ports

- Terminals for internal waterways located on canals, rivers, and intercoastal waterways

Seaports

- 1 to 20 terminals on coastline for import and export from one country to another

Water depth

- Channels leading to port and at wharf must be deep and unobstructed
- Dredged regularly and, on occasion, deepened for larger ships

Water Freight Classifications

TEUs

20-foot equivalent units (6 meters)

- ISO 668 and ISO 1496; 20′ x 8′ x 8′

FEUs

40-foot equivalent units (12 meters)

- Double length of TEU

LCL

Less-than-container load

- Less than cubic volume or weight capacity; shipped with other LCL cargo

FCL

Full-container load

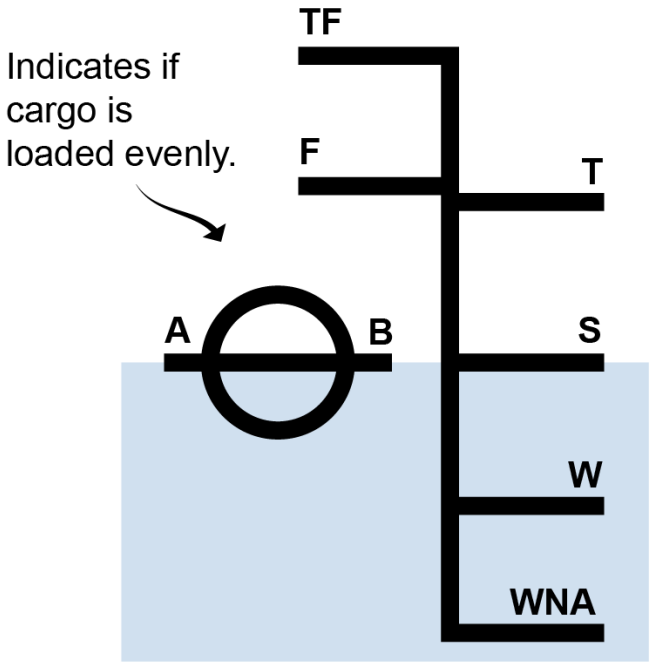
- Close to volume or weight limits; only one shipper's order

Bulk freight

Loose, large mass and volume

- Uses capacity with high efficiency but risk of theft, contamination, and spillage

Weights and Measures



- Water transport charges based on weight (tonnage)
- Deadweight (dwt): Maximum weight ship can carry
- Draft: Depth at which a ship sits in the water
- Plimsoll line: Marking on hull used when loading

Types of Carriers

Liner carriers	▪ Roll-on, roll-off (RORO) ▪ Bulk carriers ▪ Containerships
Charter carriers	▪ Voyage charter ▪ Time charter ▪ Bareboat or demise charter
Tankers	Double-walled for environmental protection
Private carriers	Used to lower costs or increase control
Common carriers: VOCC and NVOCC	Provide service on a container basis
Lakers and barges	▪ Lakers are the ships traveling the Great Lakes. ▪ Barges are either self-propelled, pushed or pulled.

Water Vessel Types

Other types of ships

- Mother and feeder vessels
  - Pairs that work together
  - Mother (10,000 to 15,000 TEUs): Only major ports
  - Feeders (300 to 500 TEUs): Short distances
- General cargo ships
  - Bring own handling equipment

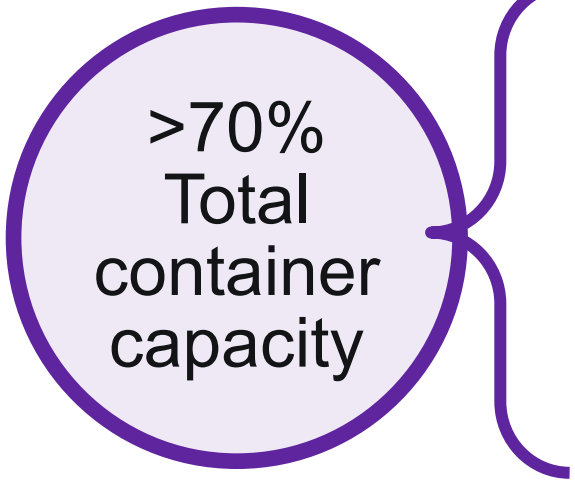
Shipping vessels by size

- Handysize
- Capesize
- Very large crude carrier (VLCC)
- Ultra-large crude carrier (ULCC)
- Offshore vessel (OSV)
- Platform supply vessel (PSV)

Market Structure: Major Trends

- Carriers building larger vessels
- Larger vessel sizes pressuring carriers to form alliances to take advantage of economies of scale

Carrier Alliances



Major carrier alliances

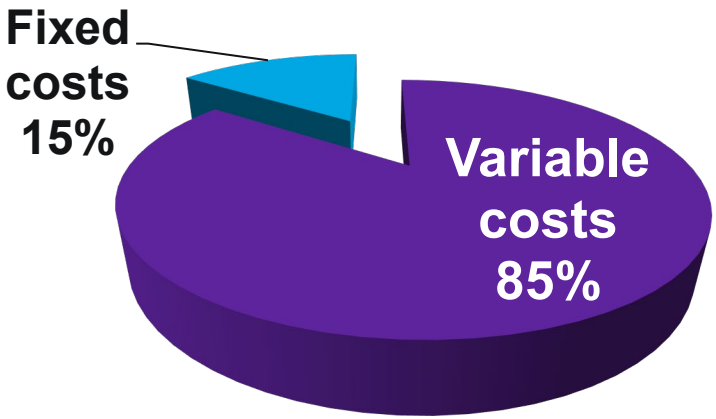
- 2M: Maersk Line, MSC, and a vessel-sharing agreement with HMM (29.5%)
- THE: Hapag-Lloyd, KLINE, MOL, NYK Line, Yang Ming (16%)
- Ocean Alliance: CMA CGM, COSCO, Evergreen, OOCL (26%)

Capability

- Unlike any other transport mode, water transport can move heavy-weight cargo from continent to continent.
- Heavy-weight, low-value cargo
- Specialized cargo
- Cargo that maintains value on long trip

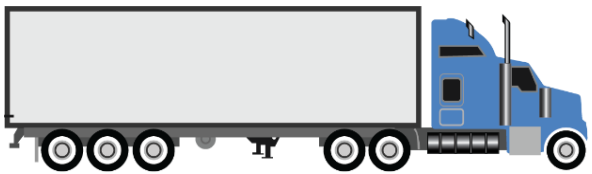
Cost Structure

Majority of variable expenses are line-operating costs, operating rents, labor, and maintenance.



Capacity

50 trucks



OR

15 railcars

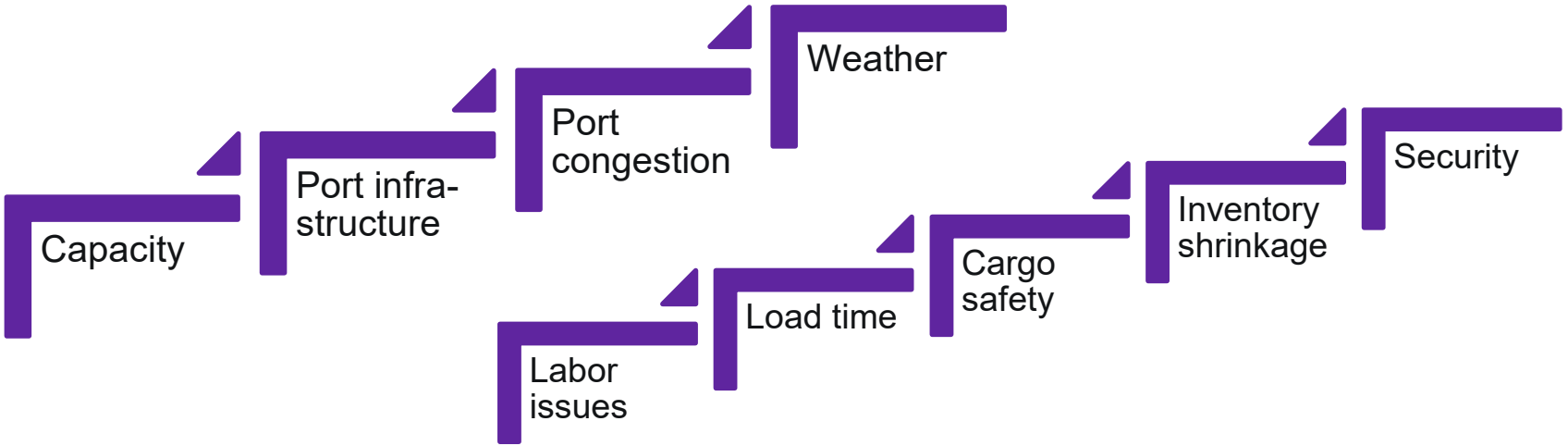
= 1 small barge

Port Facilities

- Unloading and handling facilities?
- Sufficient room for carrier?
- Warehouse space for temporary storage?
- Intermodal transport and labor available?
- When will detention/demurrage begin?

Issues and Challenges

Weather, inaccessibility, speed may add costs to shipper.



Load Time

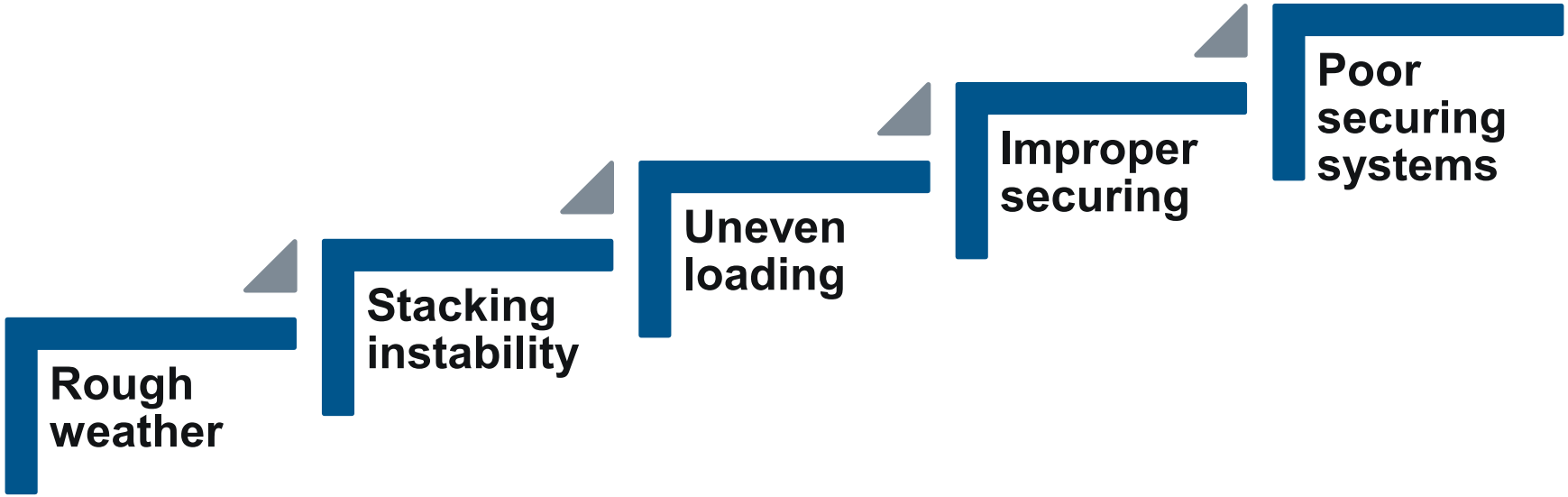
Ship stability

- Cellular structure restricts loading
- Containers stowed in middle

Rehandled cargo

- Organization of yard containers can prevent
- Goal: Minimize rehandling

Inventory Shrinkage



Security

Port security

- Volume of traffic creates concerns
- Cargo safety at port and at sea

Piracy

- Ransom
- Cargo theft
- Terrorism

War risk surcharge

- Enter or be near a war zone
- Insurance policy

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TRANSPORTATION AND DISTRIBUTION

MODULE 8, SECTION F: INTERMODAL AND OTHER TRANSPORTATION MODES

APICS

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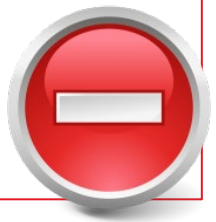
Intermodal Configurations

- Ocean-truck: Products competitive across international markets due to low cost, fast transit from port.
- Air-truck: Combination expedites transportation of in-demand commodities (fashion, electronics).
- On-dock rail: Rail often first loaded/unloaded at dockside for expedited handoff.

Container Shipping

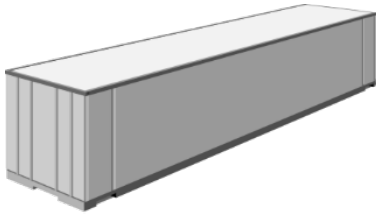
- Small, non-bulk products store conveniently and safely
- Secure and physically protected
- Far less inventory handling
- Storage outdoors

- Transport cost of empty containers more than new container cost
- Container size: Smaller than standard motor trailer
- Closed containers: Smuggling easier
- Susceptible to loss, especially at sea



Container Types

General-purpose



High-cube

Flatrack

Open-top

Tank

Temperature-controlled

Types of Intermodal Carriers

- Air-road (birdyback)
- Rail-road (piggyback)
  - COFC
  - TOFC
  - RoadRailer®
  - Swapbody
  - Caisse mobile
  - Skeletal trailer
  - Extendable trailer
- Water-road (fishyback)
  - LOLO
  - RORO
- Rail-water (trainship)

Market Structure and Sales Strategy

Competition

- Less competition between modes after intermodal.
- Competition now on multimodal and intermodal option selections.

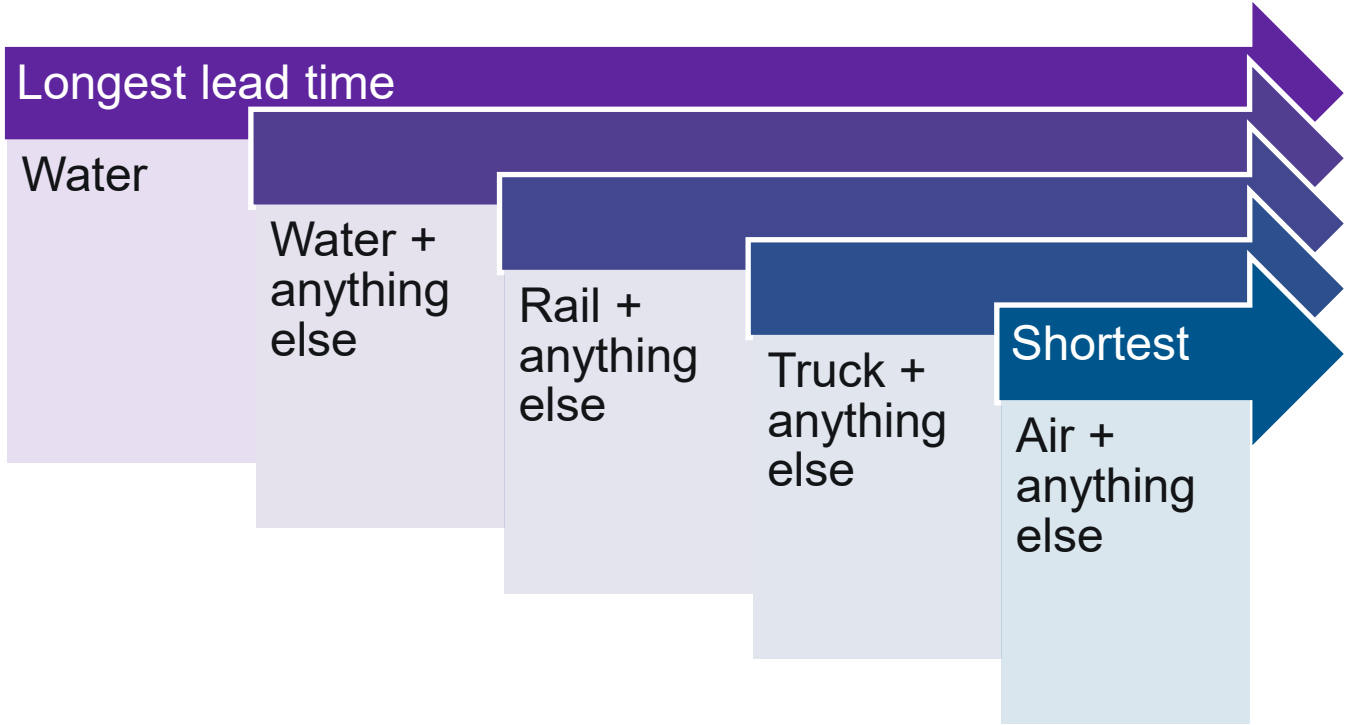
Multimodal capabilities

- Use most efficient combinations that make sense for customers .
- Carriers base decision on:
  - Capacity.
  - Route.
  - Cost efficiency.
  - Delivery deadlines.

Operating/Service Characteristics

- Capability
  - Mini land bridge
  - Micro land bridge
  - Single tariff
- Cost structure
  - Best qualities per mode
  - Lower door-to-door rate
  - Lost cargo liability differs
- Capacity (by mode)
- Speed (need for)
- Accessibility/flexibility: high
- Environmental
  - Interchange points
  - International intermodal terminals
- Safety
  - Intermodal terminals

Speed



Safety

Intermodal transport is safer than ever.

- Technology and engineering: much safer cargo-loading practices
- Transportation management systems (TMS)
  - Cargo visibility
  - Shippers anticipate areas of concern
  - Revise routes, carriers, or schedules

Issues and Challenges

Visibility

- More carriers
- Some use old technology
- TMS: rerouting

International freight forwarders

- Shipment visibility
- L/C consulting
- Booking space/scheduling
- Export declaration
- Ocean bills/Consular documents
- Insurance
- Punctual payment/documents
- New markets, regulations, etc.

Filling the Need

Fills common carrier and small package shipping gap

Parcel

- Transportation specialists
- Accept packages up to a certain weight

Courier

- Local
- Pick up and deliver important documents and packages

Express

- Guarantee delivery by a predetermined date

Market Structure and Sales Strategy

- Demand for parcel, courier, and express services has grown.
- Due to e-commerce and consumer demand.

Regional Courier Services

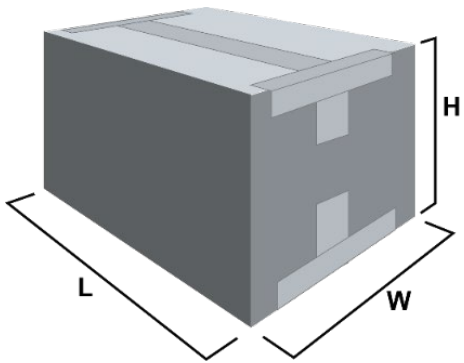
- Focus on deliveries that are local to as much as 1,000 miles (1,609 kilometers)
- Services designed to supplement those of major carriers
- Offer degree of “personalized service”

Operating and Service Characteristics

Capability	• Driven by general public's purchases
Cost structure	• Market-based pricing • Most carriers publish transport services and prices.
Capacity	• Dictated by commodities being shipped
Speed	• Carriers guarantee overnight or same-day delivery.
Accessibility/ flexibility	• Internet makes carriers available around the clock. • Door-to-door service: easy for consumers
Environmental efficiency/efficacy	• Recyclable and less packaging when possible
Safety	• Safety procedures, company rules, and preventive measures help carriers avoid most safety challenges.

Parcel Measurement

Measure to determine if exceeds maximum limits



Step 1

Determine the length (1 x length).

- Measure longest side of package, rounding up.

Step 2

Determine the girth (2 x width + 2 x height).

- Measure width, rounding up. Multiply by 2.
- Measure height, rounding. Multiply by 2.
- Add the two values. This is the girth.

Step 3

Add the length and the girth.

- This is the package measurement.

Issues and Challenges

- Speed
- Packaging
- Limited international competition
- Pricing
- Payments/cash

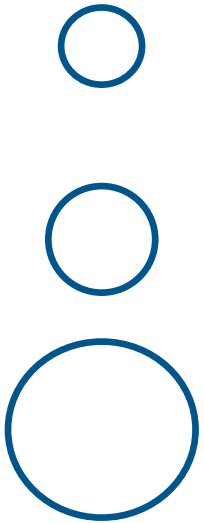
Types of Carriers

Deliver liquid cargo for further refining or to customers

Move crude oil/liquid cargo from producers to pipelines

Source: © Luca Galuzzi, www.galuzzi.it. Used with permission.

Pipeline Diameters



Gathering lines: Less than 6 inches (152 millimeters)

Trunk lines: Most commonly 8–10 inches (203–254 millimeters)

Refined product lines: 8–42 inches (203–1,067 millimeters)

Distribution pipelines: 0.5–6 inches (12–152 millimeters)

Pipeline Market Structure and Sales Strategy

- Dominated by small number of very large carriers.
- High start-up costs limit participants.
- Market is oligopolistic.
- Minimal competition in industry.
- Other modes support pipeline rather than compete.

Operating/Service Characteristics

Capability	Limited: Must be liquid, liquefiable, or gaseous
Cost structure	Low unit costs: High fixed costs, carrying capacity
Capacity	Two-thirds of all tonne-kilometers hauled: oil, oil products
Speed	Slowest form of transport; needs additional inventory to account for in-transit cargo
Accessibility/ flexibility	Inflexible: Only near product they move and only serve product for which they were built
Environmental efficiency/efficacy	Energy-efficient, few leaks/ruptures, unaffected by weather, construction locations may have controversy
Safety	Safest mode, highly automated, operates on 24/7 basis

Issues and Challenges

- Government regulations: Many government agencies oversee pipeline industry.
- Political issues: Use law of eminent domain, pipeline use in sensitive ecosystems.
- Cross-country boundaries: Needs collaboration.
- Safety concerns: Enviable records for safety, but industry must be vigilant.

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MODULE 8, SECTION G: TRANSPORTATION MANAGEMENT

APICS

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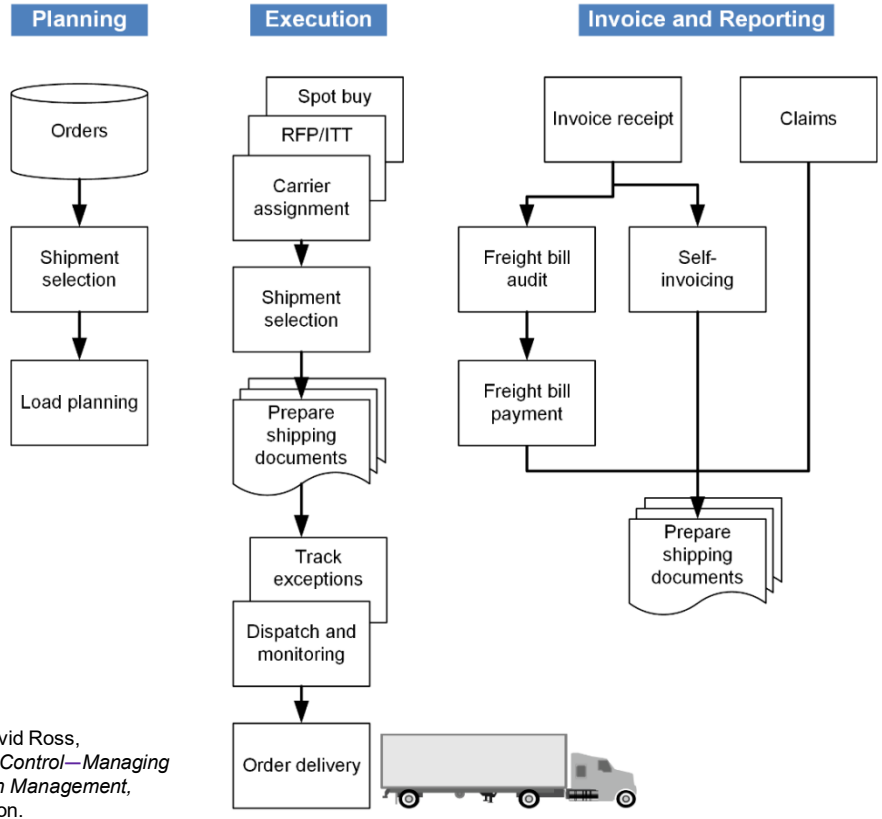
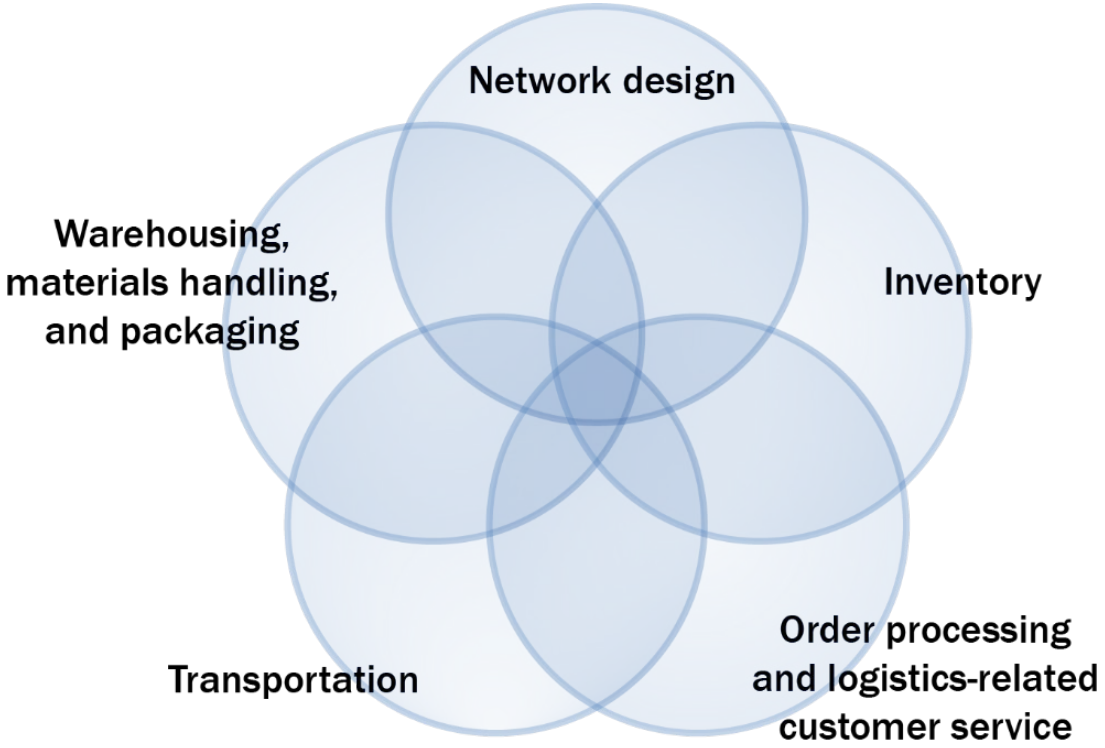
Transportation Management Tasks

Planning, scheduling, budgeting of transportation assets, services, and related systems



Source: Adapted from David Ross, *Distribution Planning and Control—Managing in the Era of Supply Chain Management,* 2015. Used with permission.

Grouping Logistics Components



Transportation Design Tradeoffs

Capability/ Mode	Road	Rail	Air	Water	Pipeline
Accessibility	Advantage	Disadvantage	Disadvantage	Disadvantage	Disadvantage
Transit time	Advantage	Disadvantage	Advantage	Disadvantage	Disadvantage
Reliability	Advantage	Disadvantage	Advantage	Disadvantage	Advantage
Product safety	Advantage	Disadvantage	Advantage	Disadvantage	Advantage

Labeling

- Weight
- Consignee's name
- Name of company
- Shipment number
- Number of units (e.g., 1 of 3)

Special Considerations

- Temperature
- Bulk shipments
- Hazardous materials
- Perishables
- Live animals
- Classified/government material
- Prohibited goods
- Pharmaceuticals
- High-value goods
- Household goods
- Personal effects

Selection of Transport Mode

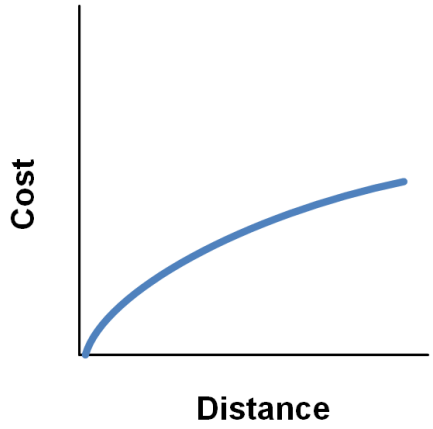
External considerations	Customer considerations	Product considerations
▪ Country infrastructure ▪ Trade barriers ▪ Export controls, licenses ▪ Law and taxation ▪ Economic ▪ Culture/political ▪ Climate ▪ Regional/geographic	▪ Service level requirements ▪ Delivery point constraints ▪ Credit rating ▪ Terms of sale and order size preference ▪ Customer importance ▪ Product knowledge	▪ Volume-to-weight ratio ▪ Value-to-weight ratio ▪ Substitutability ▪ Package dimensions ▪ Special characteristics

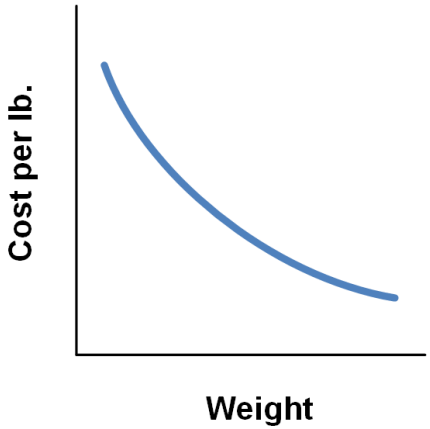
Modal Capabilities

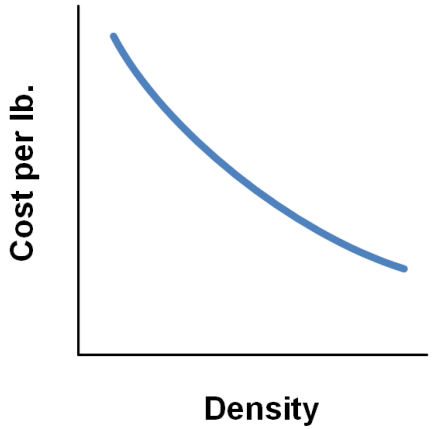
Mode	Strengths	Weaknesses	Product Characteristics	Cost
Road	▪ Accessible and versatile ▪ Fast ▪ Customer service	Limited capacity	▪ High value ▪ Finished goods ▪ Low volume	High
Rail	▪ High capacity	▪ Accessibility ▪ Service levels ▪ Damage rates	▪ Low value ▪ Raw materials ▪ High volume	Low
Air	▪ Speed ▪ Load protection ▪ Flexibility ▪ International capabilities	▪ Accessibility ▪ Limited capacity	▪ High value ▪ Finished goods ▪ Low volume ▪ Time-sensitive	High
Water	▪ High capacity ▪ International capabilities	▪ Slow ▪ Accessibility	▪ Low value ▪ Raw materials or bulk commodities ▪ Containerized finished goods	Low
Pipeline	▪ In-transit storage ▪ Load protection ▪ Efficiency	▪ Slow ▪ Limited network	▪ Low value ▪ Liquid commodities ▪ Not time-sensitive	Low

Transportation Economics

Cost per unit of weight decreases as load size increases







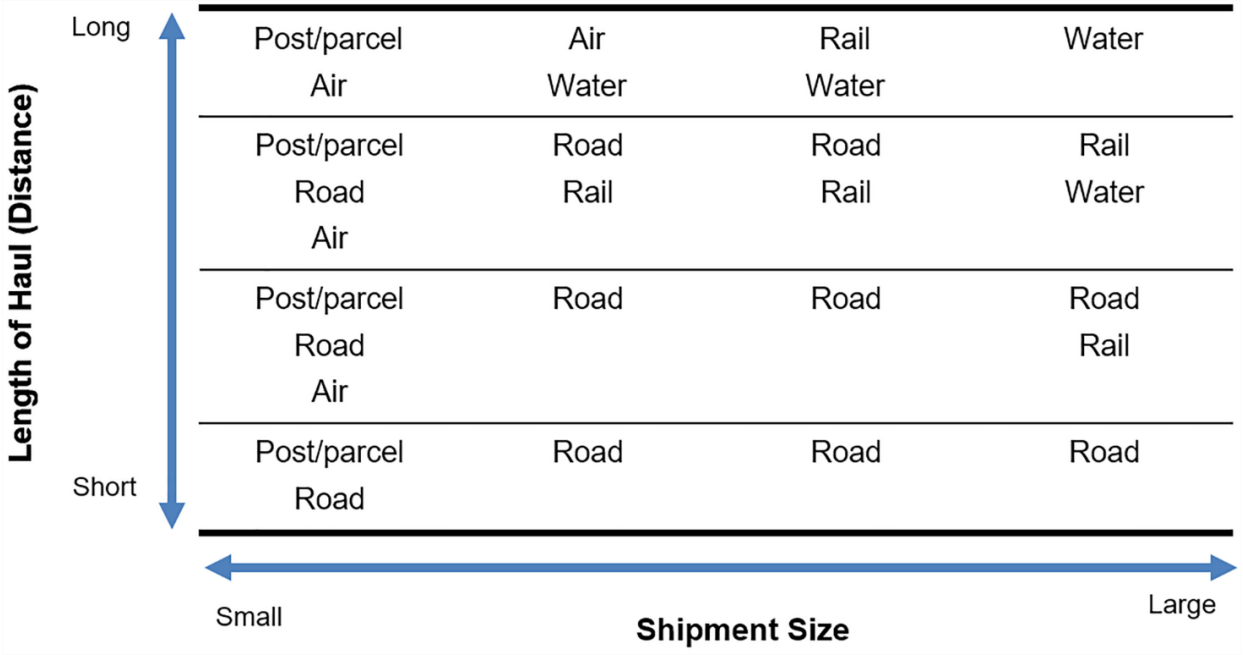
Source: Paul A. Myerson, *Supply Chain and Logistics Management Made Easy*. Used with permission.

Line-Haul Services

- Reconsignment
- Diversion
- Pooling
- Stopping in transit
- Transit privilege
- Pickup and delivery
- Terminal handling

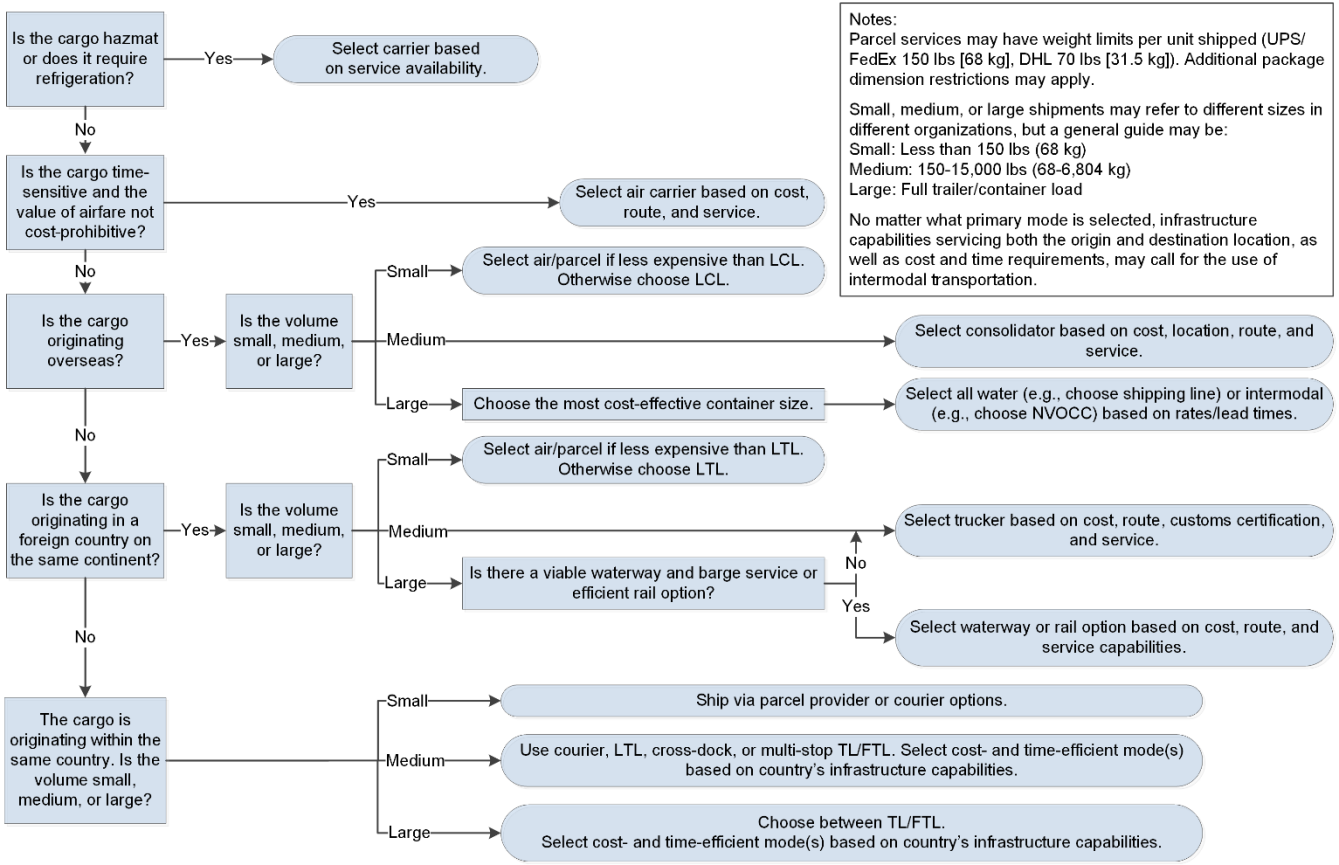
Selection Matrix

- Consider freight volume or load size and delivery distance
- Cost is secondary to distance (schedule)



Source: Adapted from Alan Rushton, Phil Croucher, and Peter Baker, *The Handbook of Logistics and Distribution Management: Understanding the Supply Chain,* 2014.

Topic 1: Transportation Management, Network Design, and Mode Selection



Route Planning and Scheduling

Transit time

Transit time and on-time performance.

Proper scheduling, routing, and sequencing of stops.

Location risk

Risky locations, poorly equipped ports, and congested border crossings.

Any of these can delay shipment.

Maximized equipment

Maximized equipment capacity via minimized tolls, port costs, and route surcharges.

Equipment efficiency ensures space used to capacity.

Safety

Product and employee safety.

Sea/land routes examined for areas known for hijacking or product theft.

Business Intelligence (BI) Tools

Data available through BI tools:

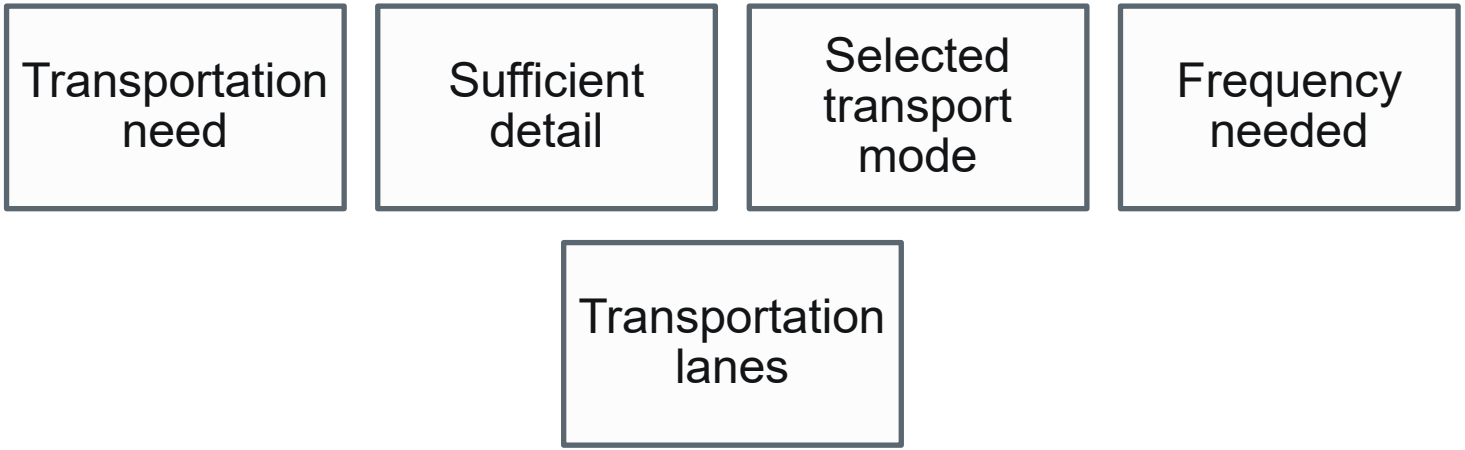
- Distance requirements
- Vehicle details
  (e.g., age; vehicle weight; type of body, axle, engine)
- Tonnes carried
- Idle time
- Maintenance details
- Fuel used
- Delivery details

Overall Provider Selection Process

1. Clarify requirements and scope.
2. Identify type of provider needed.
3. Locate and research potential providers.
4. Prepare RFP/ITT or equivalent.
5. Evaluate and compare responses.
6. Select a contractor and negotiate.
7. Finalize contract and terms and conditions; sign.

Statement of Work (SOW) for Carrier Selection

Detailed and specific document that describes the required work in terms of scope



Insourcing vs. Outsourcing for Logistics Services

Differentiate on…

- Customer service?
- Cost control?
- Integration?
- Data?
- Flexibility?

External Providers (Asset-Based/Non-Asset Based)

Service Category	Asset Dedication	Speed of Delivery	Size of Consignment	Contractual Basis
Express	Shared	Same/next day	Small parcel-size	Transaction
Groupage	Shared	Slower than express/several days	Larger than express/pallet-size plus	Transaction
General haulage	Shared (but could be contract)	Slower than express/48 hours plus	Any size	Transaction or Contract
Multi-user	Shared	Slower than dedicated/ next day or longer	As required	Contract
Dedicated	Dedicated	As required	As required	Contract

Requests for Information (RFI)

- Preliminary planning step before RFP
- Information from providers about their capabilities
- Used to build short list of contractors
  - Adequate abilities
  - Interest

Key Sections of an RFP/ITT

- Statement of requirement
- Statement of purpose
- Background information
- Scope of work
- Performance standards
- Delivery schedule
- Contract terms and conditions
- Payments, incentives and penalties

RFP/ITT Evaluation and Alternative Methods

Evaluation criteria

- Transit time average and reliability
- Equipment availability and capacity
- Geographic coverage
- Product protection
- Rates

Online shipper auctions

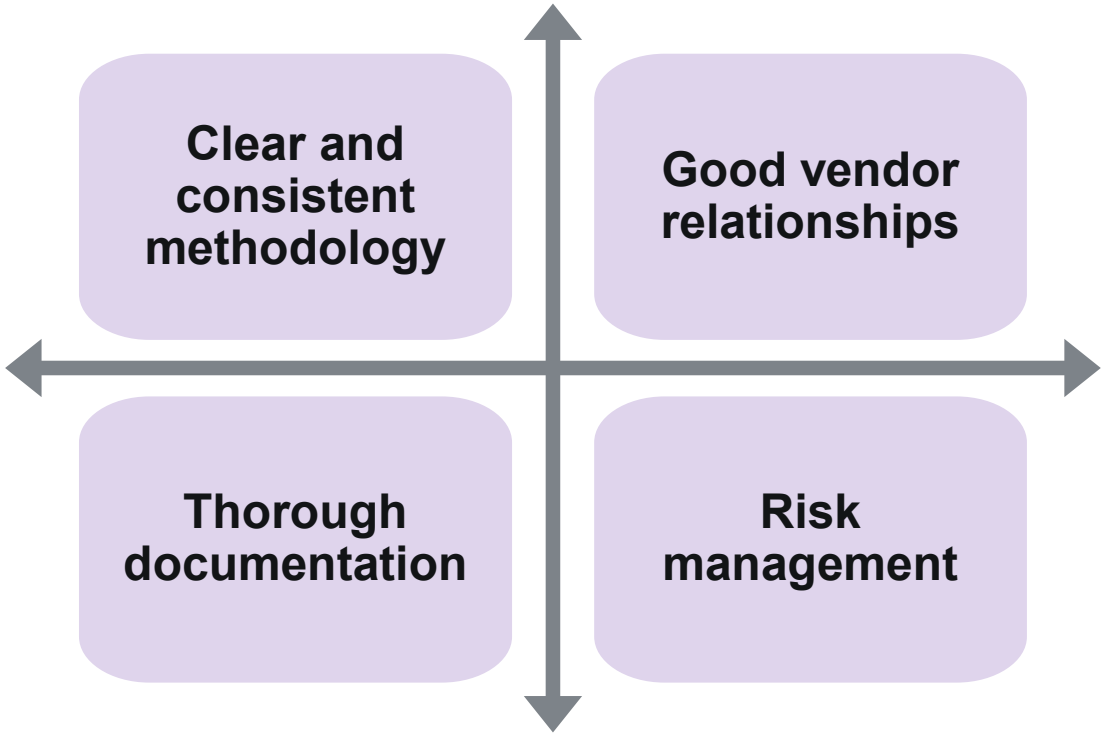
- Buyers bid on services
  - Cost-effective deal
  - Publish shipment requirements
  - Time to submit bids
- Shippers fill excess capacity

Contracts

Contracts

- Oral or written
- Single purchase
- Delivery of products over defined period

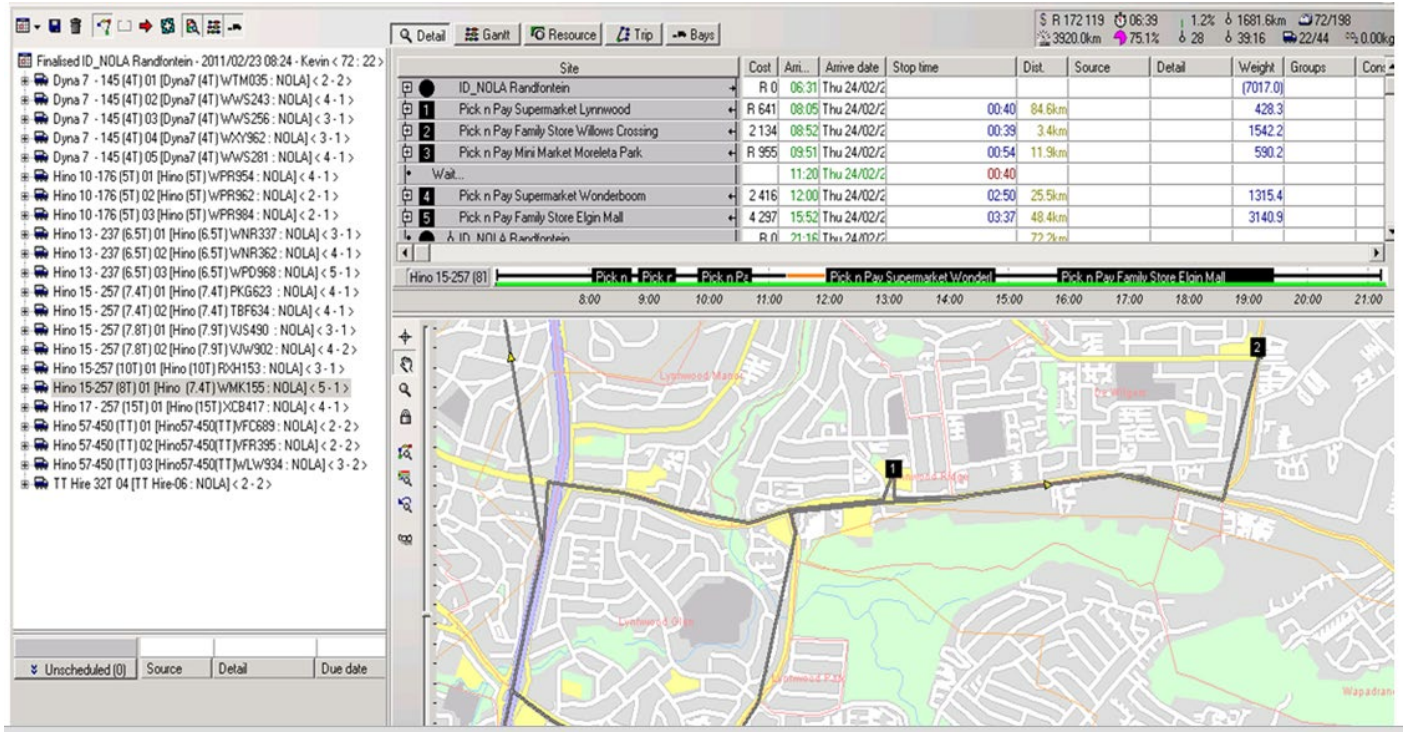
Contracting Best Practices



Transportation Management Systems (TMS)

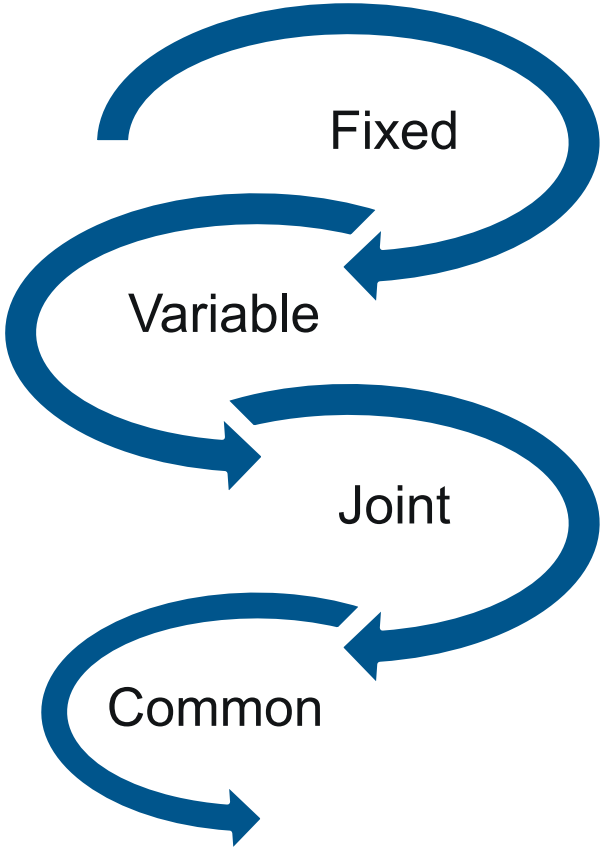
- Optimizing fleet: planning and executing across entire shipping system
- Routing and rating
- Executing shipment across multiple modes
- Tracking and tracing loads
- Freight settlement
- Hybrid planning, execution, evaluation capabilities
- Reduce freight costs by 6 to 10%

Automated Route Planning



Types of Costs

Understand these costs before pricing.



Assigning a Rate Tariff

Rates Per Mode

Road

- LTL/TL
- Per-truckload
- Discount

Rail

- Multiple-car
- Unit-train

Air

- Density
- Deferred delivery

Water

- Container basis
- Additional charges for international shipping

Pipeline

- Per-barrel basis
- Point-to-point

Other Rate Structures

- Contract
- Distance
- Corporate volume

- Deficit weight
- Dead freight
- Weight break

Pricing Drivers

- Distance
- Weight
- Density
- Stowability
- Handling
- Liability
- Market

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CERTIFIED IN LOGISTICS,
TRANSPORTATION AND DISTRIBUTION

MODULE 8, SECTION H:
TRANSPORTATION ADMINISTRATION

APICS

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Bills of Lading

- Master bill of lading (MBL)
- House bill of lading (HBL)

Date: STANDARD TRUCKLOADBILL OF LADING Page 1 of _____

SHIP FROM
Name:
Address:
City/State/Zip:

SHIP TO
Name:
Address:
City/State/Zip:

SPECIAL INSTRUCTIONS::

Bill of Lading Number:_____
CARRIER NAME: _____
Trailer number:
Seal number(s):

THIRD PARTY FREIGHT CHARGES BILL TO:
Name:
Address:
City/State/Zip:

CUSTOMER ORDER INFORMATION

Customer Order No.	No. Packages	Weight	Pallet/Slip Y (circle) N		Additional Shipper Info
GRAND TOTAL					

CARRIER INFORMATION

HANDLING UNIT		PACKAGE					LTL Only	
Qty	Type	Qty	Type	Weight	H.M. (X)	COMMODITY DESCRIPTION	NMFC #	Class

Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property as follows: "The agreed or declared value of the property is specifically stated by the shipper to be not exceeding _____ per _____.

COD Amount: $_____
Fee Terms:
Collect: ☐ Prepaid: ☐ Customer check acceptable: ☐

NOTE Liability Limitation for loss or damage in this shipment may be applicable. See 49 U.S.C. - 14706(c)(1)(A) and (B).

Received, subject to individually determined rates or contracts that have been agreed upon in writing between the carrier and shipper, if applicable, otherwise to the rates, classifications, and rules that have been established by the carrier and are available to the shipper, on request, and to all applicable state and federal regulations.

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

_____Shipper Signature

SHIPPER SIGNATURE / DATE
This is to certify that the above named materials are properly classified, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the DOT.

Trailer Loaded:
☐ By Shipper
☐ By Driver

Freight Counted:
☐ By Shipper
☐ By Driver/pallets said to contain
☐ By Driver/Pieces

CARRIER SIGNATURE / PICKUP DATE
Carrier acknowledges receipt of packages and required placards. Carrier certifies emergency response information was made available and/or carrier has the DOT emergency response guidebook or equivalent documentation in the vehicle. Property described above is received in good order, except as noted.

Freight Claims

A request for financial reimbursement for loss or damage

Time to submit

Filing process

Making and Receiving Shipments

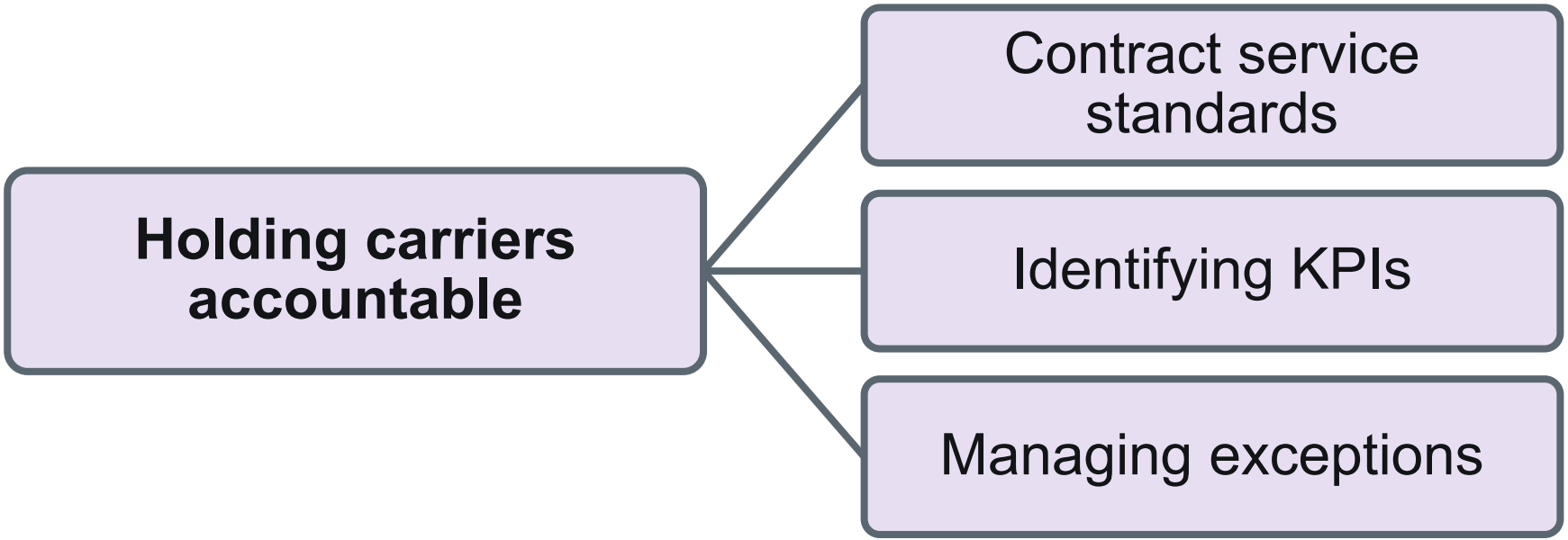
Tracking	Expediting	Tracing
▪ Current location of shipment	▪ Getting to destination quicker	▪ Shipment believed lost ▪ Shipper must initiate ▪ Carrier's responsibility to provide information

Consolidating

Goal: Reduce costs

- Reactive
  - Market area
  - Scheduled delivery area
  - Pooled delivery
- Proactive
  - Preorder planning
  - Multivendor consolidation

Exception Management



Routing, Billing and Demurrage

Routing

- Making best decision about how shipment will move.
- Routing guides help make best choice.
- Bottlenecks can occur from improper routing.

Billing

- Manage cost through accurate and timely billing and invoicing.

Demurrage/ Detention

- To control costs, it is important to minimize demurrage or dwelling penalties.
- Detention is same concept as demurrage.

Transportation Cost Analysis

Considerations:

- Freight
- Economic
- Market
- Security
- Regulation requirements

Economic Regulations by Mode in U.S.

Mode	Regulation
Road	▪ Carriers must provide tariffs to shippers on request. ▪ Undercharge/overcharge claims must be filed within 180 days. ▪ Antitrust immunity for collective rate making.
Rail	▪ Regulated by ICCTA. ▪ STB (in U.S.) has jurisdiction over rates, classifications, rules, practices, and routes.
Air	Rates are not controlled.
Water	Rates are not controlled.
Pipeline	Regulated by the Federal Energy Regulatory Commission.

Freight Settlement

Compares freight order invoice as received to expected invoice and authorizes payment if documents consistent

- Responsibility of traffic department
- Ensures accuracy of invoice
- Can be completed in house or by external provider
  - In-house settlement: if higher settlement discrepancy risk
  - External provider used when expert is needed