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Mini MBA Humanitarian Logistics and Supply Chain: supplying fast, well and fairly

Course handout · Week 5 : Transport: modes, costs, contracts and tracking

A programme of exactly 3 months (12 weeks, 144 hours) to lead a humanitarian supply chain: mapping and landed cost, demand forecasting and safety stocks, procurement and competitive bidding, Incoterms and contracts, transport, warehouses and inventories, fleet and fuel, customs and exemptions, prepositioning and distributions, health products and the cold chain, performance, costs and the environment, constrained contexts and data protection. Corrected numerical exercises, three monthly exams with case studies, and a verifiable diploma from the Humanitarian Academy.

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Week 5 : Transport: modes, costs, contracts and tracking

Objectives

- Choose a transport mode (sea, air, road, rail, river) according to lead time, cost, capacity and risk.
- Calculate transport costs (per tonne, per tonne-kilometre, volumetric weight) and plan rotations.
- Contract transporters and track shipments through to proof of delivery.

Choosing the mode

Each mode has its own profile:

Mode	Relative cost	Speed	Typical use
Sea	Very low	Slow (weeks)	Large volumes, non-urgent items, containers
Air	Very high (often 5 to 15 times sea freight)	Fast (days)	Emergencies, medicines, cold chain, landlocked areas
Road	Medium	Variable	Regional, national, last mile
Rail and river	Low	Slow	Large volumes on existing corridors

The decision takes account of the **cost of delay**: an air freight of 40,000 USD that avoids two weeks of stock-out of essential medicines may be justified; the same freight for office supplies never is. Multimodal transport (sea then road, or air then helicopter) is the norm in crises.

Units and basic calculations

Essential notions:

- **Metric tonne** (t) = 1,000 kg; **cubic metre** (m^3) for volume.
- **Container**: 20-foot (about 33 m^3 usable, payload often limited to 20 to 25 t depending on the roads) or 40-foot (about 67 m^3).
- **Air volumetric weight**: volume in cm^3 / 6,000 (in kg). The higher of actual weight and volumetric weight is charged.
- **Tonne-kilometre** (t·km): one tonne carried over one kilometre; the basis for comparing road costs.

Air example. 50 packages of 60 × 40 × 40 cm, 12 kg each. Volume per package: 96,000 cm^3; volumetric weight: 96,000 / 6,000 = 16 kg. Chargeable weight: 16 kg per package (higher than

12 kg), i.e. 800 kg for the shipment. At 4.50 USD/kg: 3,600 USD, versus 2,700 USD on the actual weight of 600 kg. Light, bulky items (blankets, mosquito nets) are expensive by air.

Road example. 300 t over 450 km at 0.12 USD per t·km: 300 × 450 × 0.12 = 16,200 USD, i.e. 54 USD per tonne.

Planning rotations

For road transport with own trucks or trucks hired by the day, the number of **rotations** (round trips) and trucks needed is calculated.

Example. 600 t must be moved in 3 weeks (18 working days) to a warehouse 220 km away. Trucks with a 15 t payload. Average speed on this road: 30 km/h, loading and unloading 4 hours per rotation, 10-hour working day in daylight (no night driving for security reasons).

- Duration of a rotation: 440 km / 30 km/h ≈ 14.7 h of driving + 4 h = 18.7 h, i.e. 2 working days.
- Rotations per truck over 18 days: 9, i.e. 9 × 15 = 135 t per truck.
- Trucks needed: 600 / 135 ≈ 4.4, so **5 trucks** (with a margin for breakdowns, 6 in practice).

The assumptions (speed, loading time, waiting days at checkpoints) must come from the field, not from a map: a 220 km road can take one day in the dry season and three in the rainy season.

Transport contracts and documents

Most often, **transporters** and **freight forwarders** selected through competitive bidding and bound by framework agreements (rates per tonne and per route, lead times, responsibilities) are used.

Essential documents:

- **Bill of lading** (B/L) for sea freight: a negotiable transport document and document of title; the goods are released to the holder of the original bill of lading.
- **Air waybill** (AWB) for air freight.
- **Waybill** (consignment note, CMR internationally) for road: quantities loaded, signed at departure and on arrival.
- **Packing list**, invoice, certificate of origin, health documents depending on the items.

Clauses of the transport contract: liability in the event of loss or damage (often limited by international conventions, hence the value of insurance), lead times, penalties, prohibition of subcontracting without agreement, security rules (no weapons on board, no passengers), and carriage of goods in compliance with humanitarian law.

Tracking and proof of delivery

Shipment tracking links each shipment to the order, the project and the planned distribution. A simple table is often enough: shipment number, items, quantities, departure date, expected date, actual date, discrepancies, status.

The **proof of delivery** is the waybill signed and stamped by the consignee, with the quantities received and any reservations. Discrepancies (losses in transit) are handled as follows:

- Normal losses tolerated by the contract (for example 0.2% for bulk grain); beyond that, deducted from the transporter's invoice.
- Damage or theft: written reservations on delivery, report, claim to the transporter or the insurer.

Example. 30 t of flour loaded; 29.6 t received. Loss 0.4 t, i.e. 1.33%. Contractual tolerance 0.5% (0.15 t). Loss chargeable to the transporter: 0.25 t at 600 USD/t = 150 USD deducted from its invoice, with the annotated waybill as evidence.

Transport in difficult contexts

In insecure or hard-to-reach areas, transport requires particular preparation:

- **Access analysis**: roads, bridges, seasons, checkpoints, armed actors; access maps shared by the Logistics Cluster and OCHA.
- **Convoys**: useful in some contexts, but the use of armed escorts is a last resort, governed by the inter-agency guidelines on armed escorts and decided at the highest level.
- **Humanitarian notification** (deconfliction) of movements to the parties to the conflict, according to the mechanisms in place.
- **Air assets**: UNHAS for passengers and light cargo, helicopters, airdrops as an absolute last resort (costly and risky).
- **Local transporters**: often the only ones with access; check their independence from the parties to the conflict and never accept illegitimate payments or "taxes" at roadblocks.

> Paying an armed roadblock to pass, even a small amount, may constitute financing of an armed actor and violate donor rules and counter-terrorism laws: the rule must be clear to every driver.

Exercise: moving goods before the rainy season

Situation. 900 t of food must reach a district warehouse 180 km away before the rainy season, within 20 working days. Hired trucks with a 20 t payload, average speed 30 km/h, 4 hours of loading and unloading per rotation, 10-hour days, no night driving. Hire rate: 350 USD per truck per day. Alternative: transporter at 0.10 USD per t·km (one way charged). Tolerated loss: 0.3%.

Tasks. 1) Duration of a rotation and rotations per truck over 20 days. 2) Number of hired trucks needed and cost. 3) Cost of the transporter. 4) For a delivery of 20 t with 19.8 t received, what loss should be charged to the transporter?

Answer. 1) 360 km / 30 = 12 h + 4 h = 16 h, i.e. 2 working days; 10 rotations per truck, i.e. 200 t. 2) 900 / 200 = 4.5, so 5 trucks (6 with a margin); 5 × 20 days × 350 = 35,000 USD (42,000 with 6 trucks). 3) 900 × 180 × 0.10 = 16,200 USD. The transporter is clearly cheaper; hiring is only justified if no reliable transporter exists. 4) Loss 0.2 t = 1%; tolerance 0.3% of 20 t = 0.06 t; chargeable loss 0.14 t, deducted at the price of the goods.

Key takeaways

- The choice of mode takes account of the cost of delay, not only the price of transport.
- Air: chargeable weight = max(actual weight, volume in cm³ / 6,000).
- Road cost = tonnes × kilometres × rate per t·km; rotations calculated with real field times.
- The signed waybill is the proof of delivery; reservations are written on receipt.
- Never pay at roadblocks; armed escorts only as a last resort, in line with the guidelines.

Quiz

1. A package of 50 × 50 × 48 cm weighs 15 kg. Its air chargeable weight is:
   A. 15 kg
   B. 20 kg
   C. 120 kg
   D. 12 kg

2. 200 t over 300 km at 0.15 USD per t·km costs:
   A. 9,000 USD
   B. 4,500 USD
   C. 90,000 USD
   D. 6,000 USD

3. Loss tolerance 0.5%, loaded 40 t, received 39.6 t. Loss chargeable to the transporter:
   A. 0.4 t
   B. 0 t
   C. 0.2 t
   D. 0.6 t

4. The sea freight document that serves as a negotiable document of title is:
   A. The waybill
   B. The packing list
   C. The air waybill
   D. The bill of lading

5. A driver asks for permission to pay 20 USD at an armed roadblock. The answer:
   A. Accept, it is a small amount
   B. Refuse: this payment is prohibited and must be reported
   C. Pay and record it as miscellaneous expenses
   D. Pay in kind

Quiz answers : 1. B · 2. A · 3. C · 4. D · 5. B