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

Complete manual

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 1 : The humanitarian supply chain: actors, flows and costs

Objectives

- Describe the stages and flows (physical, information, financial) of a humanitarian supply chain.
- Place the role of logistics in the cost and success of a response, and identify its main actors and coordination mechanisms.
- Map a real supply chain and spot its bottlenecks and risks.

Why logistics decides the response

Logistics and procurement often account for **60 to 80% of the expenditure** of a humanitarian operation, counting the goods purchased, transport, storage and the staff who manage them. A distribution that arrives three weeks late, a broken cold chain or expired stock have direct consequences for the people being assisted.

The **supply chain** goes beyond logistics in the strict sense. It covers the whole: identification of the need, planning, procurement, international and local transport, customs clearance, storage, distribution to the beneficiary, and feedback. It links three flows:

- **Physical flow**: goods, from the supplier to the beneficiary, sometimes in the opposite direction (returns, disposals).
- **Information flow**: needs, orders, stock levels, shipment tracking, proof of delivery.
- **Financial flow**: budgets, commitments, payments, transport and storage costs.

> A supply chain is never faster than its slowest link: often customs clearance, internal approval or the last mile, rarely international transport.

The stages of the supply chain

A typical humanitarian supply chain follows seven stages:

- **1. Need**: assessment, technical specifications, quantities (with the programme team).
- **2. Planning**: supply plan, schedule, budget, choice of buying locally, regionally or internationally.
- **3. Procurement**: competitive bidding, contract, quality control.
- **4. Transport**: international (sea, air, road), then national and local.
- **5. Customs clearance**: documents, exemptions, inspections.
- **6. Storage**: main warehouse, field warehouses, stock management.
- **7. Distribution**: last mile, handover to beneficiaries, proof of delivery and post-distribution monitoring.

The **total lead time** is calculated by adding up the stages in series. **Example:** specifications 1 week, international tender 5 weeks, production 4 weeks, sea freight 5 weeks, customs clearance 2 weeks, inland transport 1 week, distribution 1 week = **19 weeks**. A regional purchase by road can bring this lead time down to 8 or 10 weeks, often at a higher unit cost but with lower transport and storage costs.

Actors and coordination

The humanitarian supply chain involves many actors:

- **Operational organisations**: NGOs, United Nations agencies, the Red Cross and Red Crescent Movement, each with its own procedures.
- **The Logistics Cluster**, led by WFP: coordination, information (access maps, status of roads and airports), common services (transport, shared storage) where gaps exist.
- **Common services**: UNHAS (United Nations Humanitarian Air Service), the UN Humanitarian Response Depots (UNHRD), shared storage platforms.
- **Government**: customs, the disaster management authority, line ministries, port authorities.
- **Private sector**: suppliers, freight forwarders, transporters, banks, mobile network operators.

Common services are an option, not an obligation: their cost and reliability are compared with those of the market. They are valuable when the market does not work (air access, insecure areas) and for pooling information.

The full logistics cost

The purchase price of an item does not tell you its true cost. The **landed cost** adds everything needed to bring it to the point of use:

- purchase price and packaging;
- international transport and insurance;
- duties and taxes (if not exempted), customs clearance and freight forwarder fees;
- inland transport, handling, storage;
- losses, damage and expiry;
- the cost of time: delay to an activity, cost of the capital tied up in stock.

Example. Plastic sheeting: international offer at 9 USD per piece, freight and insurance 2.40 USD, customs clearance 0.60 USD, inland transport 1.20 USD, storage and handling 0.30 USD, losses 2%: landed cost = (9 + 2.40 + 0.60 + 1.20 + 0.30) / 0.98 ≈ 13.78 USD. Regional offer at 11.50 USD with road transport 1.10 USD, customs clearance 0.40, inland 0.80, storage 0.30, losses 1%: (11.50 + 1.10 + 0.40 + 0.80 + 0.30) / 0.99 ≈ 14.24 USD. The international offer is 0.46 USD cheaper per piece, but arrives 9 weeks later: if the rainy season starts in 8 weeks, the regional offer is the only useful one.

Emergency, recovery, development

The supply chain does not have the same priorities in every phase:

Phase	Priority	Typical practices
Acute emergency	Speed, availability	Prepositioned stocks, air freight, emergency procedures, local purchases without a lengthy tender
Protracted crisis	Cost, reliability	Framework agreements, road or sea transport, demand planning, stable warehouses
Recovery	Local markets, sustainability	Local procurement, cash transfers, strengthening of local suppliers

A common mistake is to keep emergency practices (air freight, direct purchases) long after the acute phase: costs soar and controls weaken. Another is the reverse: applying heavy procedures on the first day of a disaster. Emergency procedures must be planned in advance, time-limited and documented.

Mapping your supply chain

Supply chain mapping is the logistics manager's first tool. It shows, on one page: suppliers, entry points (ports, airports, borders), warehouses, transport corridors and distribution points, with the lead time, capacity, cost and risk of each link.

Reading example. Port A → main warehouse (2 days, 600 t/week) → field warehouse (5 days in the dry season, 12 in the rainy season, 150 t/week) → distribution points (1 day). Need: 220 t per week in the rainy season. The bottleneck is the main warehouse → field corridor: 150 t/week is not enough. Options: preposition before the rainy season (220 − 150 = 70 t shortfall per week, i.e. 70 × 16 = 1,120 t for 16 weeks of rain), hire additional suitable trucks, or use another mode (barges, occasional airlifts).

> Mapping means asking "where is the bottleneck?" before it blocks the response.

Exercise: choosing a source of supply

Situation. You must supply 20,000 hygiene kits before the start of the rainy season, in 10 weeks. Two options: 1) international supplier: 14 USD per kit, sea freight and insurance 3 USD, customs clearance 0.50 USD, inland transport 1.50 USD, losses 2%, total lead time 16 weeks; 2) regional supplier: 17 USD per kit, road transport 1.20 USD, customs clearance 0.30 USD, inland transport 1 USD, losses 1%, lead time 7 weeks. The budget provides 21 USD per landed kit.

Tasks. 1) Calculate the landed cost of each option. 2) Total cost for 20,000 kits and variance against budget. 3) Recommendation.

Answer. 1) International: (14 + 3 + 0.50 + 1.50) / 0.98 = 19 / 0.98 ≈ 19.39 USD. Regional: (17 + 1.20 + 0.30 + 1) / 0.99 = 19.50 / 0.99 ≈ 19.70 USD. 2) International: 20,000 × 19.39 ≈ 387,800 USD (saving of about 32,200 USD on a budget of 420,000); regional: 20,000 × 19.70 ≈ 394,000 USD (saving of about 26,000 USD). 3) The international option is about 6,200 USD cheaper but arrives 6 weeks after the start of the rains: it does not meet the need. Recommendation: regional purchase, documenting the justification (lead time) in the procurement file; consider an international framework agreement to replenish the contingency stock before the next season.

Key takeaways

- Logistics and procurement often account for 60 to 80% of an operation's expenditure.
- Three flows to manage together: physical, information, financial.
- Total lead time = sum of the stages in series; the bottleneck is rarely international transport.
- Compare offers on landed cost, including losses and lead time, never on purchase price alone.
- Map the supply chain to find the bottleneck before it blocks the response.

Quiz

1. Specifications 1 week, tender 4, production 3, freight 6, customs clearance 2, inland transport 1. The total lead time is:
   A. 6 weeks
   B. 17 weeks
   C. 12 weeks
   D. 15 weeks

2. Item at 10 USD, landing costs 3 USD, losses 5%. The landed cost is approximately:
   A. 13.00 USD
   B. 12.35 USD
   C. 13.68 USD
   D. 13.65 USD

3. The Logistics Cluster is led by:
   A. UNICEF
   B. UNHCR
   C. OCHA
   D. WFP

4. Corridor capacity 150 t/week, need 200 t/week for 12 weeks. Quantity to preposition:
   A. 600 t
   B. 2,400 t
   C. 50 t
   D. 1,800 t

5. Keeping air freight six months after the acute phase is generally:
   A. A good practice for speed
   B. A source of excessive costs to be corrected
   C. Mandatory
   D. Without effect

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

Week 2 : Forecasting demand and planning supply

Objectives

- Turn a programme plan into quantified needs (quantities, schedule) and a procurement plan.
- Calculate a safety stock, a reorder point and an order quantity, and monitor a pipeline.
- Organise joint planning between programmes, logistics and finance to avoid stock-outs and overstocks.

From programme to quantified need

Planning starts with a simple question: **what, how much, where, when**. It requires close dialogue with programmes, who know the beneficiaries, and with finance, who know the budget.

Methods for estimating needs:

- **By population**: number of people × standard. Example: 12,000 people, 15 litres of water per person per day (Sphere minimum standard), i.e. 180 m³ per day.
- **By past consumption**: average stock issues over recent months, corrected for stock-outs (a stock-out lowers apparent consumption).
- **By service**: number of consultations × prescription rate. Example: 3,000 consultations per month, 30% receive an antimalarial: 900 treatments per month.

The **procurement plan** lists, for each item: specifications, quantity, date required, procurement method, estimated lead time, launch date, budget and budget line. The launch date is calculated backwards: date required − total lead time.

Average consumption and forecasting

For an item with regular consumption, the **average monthly consumption** (AMC) over 3 to 6 months is used, corrected for:

- **stock-out days**: corrected AMC = observed consumption × days in the month / days with stock available;
- **planned changes**: new area, influx of displaced people, campaign, season.

Example. A health centre consumed 600, 640 and 450 sachets of ORS over three 30-day months; the third month had 10 stock-out days. Corrected consumption for the third month: 450 × 30 / 20 = 675. Corrected AMC = (600 + 640 + 675) / 3 ≈ 638. If a diarrhoea outbreak is expected with a 50% increase, the forecast for the season is 957 per month.

For seasonal items or items linked to a sudden-onset crisis, the forecast relies on **scenarios** (most likely, reasonable worst case) rather than on history.

Safety stock and reorder point

Safety stock protects against two uncertainties: demand higher than expected and a delivery lead time longer than expected. A simple method, widely used in the sector:

Safety stock = AMC × safety margin (in months). The margin depends on variability: often 1 to 3 months in difficult contexts.

Reorder point = AMC × replenishment lead time (in months) + safety stock. When available stock reaches this level, the order is placed.

Maximum stock = reorder point + AMC × interval between orders.

Example. AMC 1,000 units, replenishment lead time 3 months, safety stock 2 months, review every 2 months. Safety stock = 2,000. Reorder point = 3,000 + 2,000 = 5,000. Maximum stock = 5,000 + 2,000 = 7,000. If available stock is 4,600 and 1,500 units are already on order, the quantity to order to return to the maximum is: 7,000 − 4,600 − 1,500 = 900 units.

> Always count stock on order (the pipeline): forgetting it means ordering twice.

The pipeline and pipeline breaks

A programme's **pipeline** (especially for food assistance or nutrition) tracks, month by month, needs, stocks, expected arrivals and funding. It makes it possible to anticipate a **pipeline break** several months in advance.

Month	Opening stock	Arrivals	Needs	Closing stock
January	900 t	500 t	700 t	700 t
February	700 t	0	700 t	0
March	0	400 t	700 t	−300 t
April	0	0	700 t	−700 t

The break appears in March (300 t missing), then becomes total in April. With a procurement lead time of 4 months, the decision had to be taken in November. Options in January: borrow from another programme or from a national stock (with documented repayment), faster local or regional purchases, temporary reduction of the ration (a programme decision, communicated to beneficiaries), or prioritisation of the most vulnerable groups.

Integrated planning

Stock-outs and overstocks rarely come from a calculation error. They come from a **lack of coordination**: the programme changes area without informing logistics, finance has not released the budget, the tender is waiting for a signature.

Good practices:

- **Monthly planning meeting** of programmes, logistics and finance: needs for the next three months, status of procurement, budget committed.
- **Procurement plan validated at the start** of each grant, aligned with the budget and the workplan.
- **Shared indicators**: procurement lead times, stock-out rate, months of stock available per item.
- **Specification freeze**: a change of specification after the tender is launched often costs weeks.

Months of stock available = available stock / AMC. A 9-month stock for an item with a 2-month lead time is an overstock: tied-up capital, risk of expiry and storage cost.

Joint procurement, framework agreements and prepositioning

Three levers reduce lead times and costs when demand is recurrent:

- **Framework agreement** (long-term agreement): a supplier selected through competitive bidding commits to prices and lead times for 1 to 3 years; orders are placed as needs arise without re-tendering. Procurement lead time reduced by several weeks.
- **Joint procurement** between projects or between organisations: higher volumes, better prices, but heavier coordination.
- **Prepositioning**: contingency stocks close to at-risk areas before the cyclone or rainy season.

Calculating the benefit of a framework agreement. Without an agreement, 6 purchases per year, each with a 5-week tender and 2,000 USD in administrative cost. With an agreement, one 8-week tender every 2 years (5,000 USD) and an order lead time of one week. Annual administrative cost: 12,000 USD versus 2,500 USD; lead time per order: 5 weeks shorter. The safety stock required also falls, since the replenishment lead time is shorter.

Exercise: avoiding a stock-out of therapeutic food

Situation. Nutrition programme: 1,200 children admitted per month, each consumes on average 1.5 cartons of ready-to-use therapeutic food over their treatment. Available stock: 2,400 cartons; on order: 1,800 cartons expected in 2 months. Replenishment lead time: 3 months. Policy: 2-month safety stock, monthly review.

Tasks. 1) AMC. 2) Safety stock, reorder point and maximum stock. 3) Should you order, and how much? 4) When will stock run out without a new order?

Answer. 1) AMC = 1,200 × 1.5 = 1,800 cartons. 2) Safety stock = 3,600; reorder point = 1,800 × 3 + 3,600 = 9,000; maximum stock = 9,000 + 1,800 × 1 = 10,800. 3) Available stock + on order = 4,200, well below the reorder point: order 10,800 − 4,200 = 6,600 cartons immediately. 4) The stock of 2,400 covers 1.33 months; the 1,800 cartons arrive in month 2: at the end of month 1, 600 remain; during month 2, 1,200 cartons are missing before the arrival if it takes place at the end of the month. The stock-out is imminent: in parallel, request a loan from a partner or from the nutrition cluster's stock, and expedited delivery of the order in progress.

Key takeaways

- Plan: what, how much, where, when; launch date = date required − total lead time.
- Correct consumption for stock-out days before calculating the AMC.
- Reorder point = AMC × lead time + safety stock; always deduct stock on order.
- The monthly pipeline reveals a break in time to act; the decision is taken one procurement lead time in advance.
- Framework agreements and prepositioning reduce lead times, costs and safety stocks.

Quiz

1. Observed consumption 400 over a 30-day month with 6 stock-out days. Corrected consumption:
   A. 400
   B. 480
   C. 500
   D. 320

2. AMC 500, lead time 2 months, safety stock 1 month. The reorder point is:
   A. 1,500
   B. 1,000
   C. 500
   D. 2,000

3. Maximum stock 3,000, available stock 1,200, on order 800. Quantity to order:
   A. 1,800
   B. 1,000
   C. 2,200
   D. 3,000

4. Available stock 4,500, AMC 500. The number of months of stock is:
   A. 4.5
   B. 5
   C. 0.11
   D. 9

5. 12,000 people at 15 litres per person per day represent:
   A. 18 m^3 per day
   B. 1,800 m^3 per day
   C. 180 m^3 per day
   D. 12 m^3 per day

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

Week 3 : Buying right: procurement principles, thresholds and procedures

Objectives

- Apply the principles of humanitarian procurement: transparency, competition, best value for money, ethics and accountability.
- Choose the right procedure according to value, urgency and market, and build a complete procurement file.
- Write specifications and evaluation criteria that allow a fair and defensible decision.

The principles

Humanitarian procurement spends the money of donors and contributors on behalf of the people being assisted. It rests on principles shared by most organisations:

- **Best value for money**: not necessarily the lowest price, but the best combination of quality, lead time, total cost and sustainability.
- **Competition** that is effective and proportionate to the value.
- **Transparency and fairness**: the same information and the same rules for all suppliers.
- **Segregation of duties**: the person who requests is not the person who chooses alone, nor the person who receives alone.
- **No conflict of interest**: written declaration by the members of the procurement committee.
- **Ethics and compliance**: no sanctioned suppliers, no child labour, compliance with donor rules.
- **Traceability**: every decision is documented in a file that an auditor can understand on their own.

Thresholds and procedures

Each organisation sets **thresholds** that determine the procedure. A common scale (amounts vary between organisations and donors, who sometimes impose stricter thresholds):

Estimated value	Procedure	Indicative timeframe
Less than 1,000 USD	Direct purchase, one quotation or a simple comparison	1 to 3 days
1,000 to 10,000 USD	Request for quotation: at least 3 written quotations	1 to 2 weeks
10,000 to 100,000 USD	Restricted or national tender, evaluation committee	3 to 6 weeks
More than 100,000 USD	Open tender (national or international), committee, often headquarters approval	6 to 12 weeks

The threshold applies to the **total value of the need**, not to each order: 5 orders of 9,000 USD for the same need make up a purchase of 45,000 USD (splitting is prohibited).

Controlled exceptions: **single source** (sole supplier justified on technical grounds), **emergency procedures** triggered by management for a limited period, purchases through an existing **framework agreement**. Each exception is justified in writing and approved at the right level.

The procurement file

The procurement file follows the purchase from start to finish. Minimum content:

- **Signed purchase request**, with specifications, quantities, budget line and project code.
- **Budget check** by finance.
- **Competition documents**: request for quotation or tender dossier, list of suppliers consulted, proof of dispatch or publication.
- **Offers received**, including those rejected, and the bid opening record.
- **Comparative table and evaluation report**, signed by the committee, with the declarations of no conflict of interest.
- **Checks** on the selected supplier: sanctions lists, legal registration.
- **Purchase order or contract**, signed according to the delegation of authority table.
- **Delivery note and goods received note** (quantity and quality), invoice, proof of payment.

> An incomplete file is the most frequent cause of costs declared ineligible in an audit, even when the purchase was honest.

Writing specifications

Good **specifications** describe the need in a precise, measurable and neutral way:

- **Functional**: what the item must do (filter 20 litres per day, withstand 3 rainy seasons).

- **Technical**: dimensions, materials, standards (for example the standard specification catalogues of the major organisations, ISO standards, the WHO essential medicines lists).
- **Packaging and marking**: weight per package, palletisation, labelling in the local language.
- **Delivery**: place, date, Incoterm, documents.

Common pitfalls: naming a brand (which excludes competition; add "or equivalent"), specifications that are too vague (offers impossible to compare), or too strict without reason (only one possible supplier). Specifications are drawn up with the programme team and, for technical items, with a specialist (health, water, shelter).

Criteria and evaluation grid

Criteria are set **before** offers are received and announced to suppliers. Two methods:

- **Lowest-priced compliant offer**: administrative and technical compliance is checked (yes or no), then the lowest price among compliant offers is selected. Simple, suited to standard items.
- **Weighted scoring**: technical and financial criteria with weights. Suited to services, works and complex items.

Weighted scoring example (technical 60%, price 40%). Financial score = lowest price / price of the offer × 40.

Supplier	Technical score /60	Price	Price score /40	Total
A	52	80,000	40.0	92.0
B	58	90,000	35.6	93.6
C	40	70,000	(eliminated: technical score below the minimum of 42)	–

C is the cheapest but is eliminated by the announced technical threshold; the lowest price among the retained offers is therefore 80,000. B wins narrowly thanks to its technical quality. A committee cannot change the criteria or weights after the offers have been opened.

Ethics, conflicts of interest and suppliers

Procurement is the area with the highest fraud risk. The basic rules:

- Every committee member declares in writing that they have no link with the suppliers; if there is a link, they withdraw.
- No gift, meal or benefit is accepted from a supplier, even after the award.
- Offers are received in sealed envelopes or in a secure electronic mailbox and opened in a session, in front of at least two people.
- Unsuccessful suppliers may ask for the reasons; a complaints mechanism is provided.

- Suppliers are screened against sanctions lists (United Nations, donors) and internal exclusion lists.

A good **supplier roster** (a qualified database, with performance evaluations after each contract) speeds up procurement and reduces risk. Local procurement, when the quality is there, also supports the local economy and localisation.

Exercise: a purchase of construction materials

Situation. The shelter programme requests roofing sheets, timber and nails for 500 shelters, estimated at 95,000 USD, as a single need. The logistician proposes issuing 10 purchase orders of 9,500 USD to move quickly with simple quotations. Three offers received after a national tender (announced criteria: technical 50%, price 50%, technical minimum 35/50): X: technical 45, price 92,000; Y: technical 38, price 84,000; Z: technical 30, price 78,000.

Tasks. 1) Is the logistician's proposal acceptable? 2) Calculate the scores and designate the supplier. 3) Which documents must be in the file?

Answer. 1) No: it is splitting a single need of 95,000 USD, which falls under a tender; the expenditure would become ineligible. If the urgency is real, management can trigger a documented emergency procedure. 2) Z is eliminated (30 < 35). Lowest price between X and Y: 84,000. X: 45 + 84,000 / 92,000 × 50 = 45 + 45.65 = 90.65. Y: 38 + 50 = 88. X is selected. 3) Purchase request, budget check, tender dossier and proof of publication, bid opening record, the three offers, conflict of interest declarations, signed evaluation report, sanctions check, contract, goods receipt, invoice and payment.

Key takeaways

- Best value for money does not mean lowest price.
- The threshold applies to the total need: splitting is prohibited.
- Every exception (single source, emergency) is justified in writing and approved at the right level.
- Criteria and weights are set and announced before offers are received.
- A complete procurement file protects the organisation, even when the purchase is honest.

Quiz

1. Financial score = lowest price / price × 40. Lowest price 60,000; offer at 75,000. Score:
   A. 40
   B. 32
   C. 30
   D. 48

2. A need of 48,000 USD is placed as 6 orders of 8,000 USD with simple quotations. This is:
   A. A framework agreement
   B. An emergency procedure
   C. Prohibited splitting
   D. A good practice

3. A specification states "brand X only" without justification. The problem is:
   A. It excludes competition; add "or equivalent" or justify a single source
   B. None
   C. It is too vague
   D. It is illegal in every country

4. After the offers are opened, the committee wants to change the price weighting from 40% to 60%. This is:
   A. Allowed if the whole committee agrees
   B. Allowed for emergency purchases
   C. Mandatory if the price is high
   D. Prohibited: criteria are set before offers are received

5. A committee member is the cousin of a bidder. They must:
   A. Vote in favour of their cousin
   B. Declare the link and withdraw from the evaluation
   C. Say nothing
   D. Chair the committee

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

Week 4 : Supplier contracts, Incoterms, total cost and quality control

Objectives

- Choose the appropriate Incoterm and draw the consequences for costs, risks and documents.
- Compare offers on total cost of ownership and negotiate protective contractual clauses (penalties, guarantees, payment).
- Organise quality control and supplier performance evaluation.

Incoterms

Incoterms (rules of the International Chamber of Commerce, 2020 version) set, for a sale, the point at which the **risks** pass from the seller to the buyer and who pays which **costs**. They govern neither the transfer of ownership nor payment.

- **EXW** (Ex Works): the buyer takes on everything from the factory, including loading and export. Maximum risk for the buyer.
- **FCA** (Free Carrier): the seller hands over the goods, cleared for export, to the carrier designated by the buyer.
- **FOB** (Free On Board, sea): risks are transferred when the goods are on board the vessel at the port of loading.
- **CFR / CIF** (sea): the seller pays the freight to the port of destination (and minimum insurance for CIF), but the risk passes to the buyer as soon as the goods are loaded at the port of departure.
- **CPT / CIP** (all modes): equivalents of CFR/CIF for all modes; CIP requires extended insurance cover.
- **DAP** (Delivered At Place): the seller delivers to the agreed place, not cleared for import.
- **DDP** (Delivered Duty Paid): the seller takes on everything, including customs clearance and import duties. Often impossible or unsuitable when the organisation benefits from exemptions, because it is the seller who imports.

> A common trap: under CIF, the seller pays the freight, but if the ship sinks, it is the buyer who bears the loss and claims from the insurer. Always check the level of cover.

Comparing on total cost

Two offers with different Incoterms cannot be compared on the displayed price. Each offer is brought back to the same point (the **landed cost** at the warehouse), and for equipment the **total cost of ownership** (TCO) is calculated: purchase + transport + installation + energy + maintenance + spare parts + negative residual value.

Generator example over 5 years:

Item	Generator A	Generator B
Landed price	12,000	18,000
Consumption	4 l/h	3 l/h
Fuel (8 h/day, 300 days/year, 1.20 USD/l, 5 years)	57,600	43,200
Maintenance over 5 years	9,000	6,000
Total cost	78,600	67,200

B, 50% more expensive to buy, costs 11,400 USD less over 5 years. Fuel for A: 4 × 8 × 300 × 5 × 1.20 = 57,600. The committee may select B if the announced criteria included total cost; otherwise, the next tender must include them.

Key contractual clauses

A purchase order or a contract protects the organisation through a few essential clauses:

- **Subject, quantities, specifications** (in an annex), Incoterm and place of delivery.
- **Delivery lead time** and **liquidated damages for late delivery**: for example 0.5% of the value per day of delay, capped at 10%.
- **Payment terms**: on delivery and after compliant receipt; avoid advances, or cap them (20 to 30%) with a bank guarantee.
- Technical **warranty** (12 months for equipment) and a **performance guarantee** for large contracts (often 5 to 10%).
- **Inspection and acceptance**: right to inspect before shipment; rejection of non-compliant items at the supplier's expense.
- **Ethical clauses**: anti-corruption, sanctions, child labour, sexual exploitation and abuse, right of audit.
- **Termination**, force majeure and dispute resolution.

Penalty calculation. Contract of 60,000 USD, delivered 12 days late, penalty 0.5% per day, cap 10%. Penalty = 60,000 × 0.5% × 12 = 3,600 USD (6%, below the cap of 6,000 USD). With 25 days of delay: 7,500 USD calculated, reduced to the cap of 6,000 USD.

Quality control

Quality control takes place at three points:

- **Before shipment**: inspection at the supplier's premises by the organisation or an inspection company, for large volumes, medicines and critical items.
- **On receipt**: counting, visual inspection, sampling according to a plan (for example 1 package in 20), checking of expiry dates and batches.
- **In use**: feedback from teams and beneficiaries (post-distribution monitoring).

Goods received note. It records the quantities received, missing, damaged and non-compliant. It is signed by the storekeeper and a witness, never by the requester alone. A receipt "with reservations" is noted on the carrier's delivery note, otherwise a claim becomes very difficult.

For **medicines and health products**, specific rules apply: prequalified suppliers (for example by WHO or recognised humanitarian procurement centres), good distribution practices, control of dates and storage conditions. Buying a medicine on an uncontrolled local market exposes you to the risk of falsified products.

Evaluating and managing suppliers

Each major supplier is evaluated after each contract, on a simple grid:

- **Lead time**: share of deliveries on time and complete (OTIF, on time in full).
- **Quality**: non-compliance rate on receipt.
- **Price**: stability and competitiveness.
- **Service**: responsiveness, correct documents, handling of claims.
- **Compliance**: ethics, adherence to the contract.

OTIF example. 40 deliveries over the year: 34 on time, of which 31 complete; 6 late. OTIF = 31 / 40 = 77.5%. A target of 90% is not met: meeting with the supplier, improvement plan, and search for alternative suppliers.

Managing the relationship also means **paying on time**: an organisation that pays at 90 days loses the best local suppliers or pays a higher price.

Local procurement and markets

Buying locally reduces lead times and supports the economy, but requires a **market analysis**:

- Can the market supply the quantities without driving up prices for the population?
- Is the quality consistent?
- Do suppliers have the financial capacity to accept payment on delivery?

Price effect example. A local market usually sells 50 t of beans per month. An organisation wants to buy 40 t at once. That is 80% of the monthly supply: high risk of price increases for households that receive no assistance. Options: spread the purchase over several months, combine local and regional procurement, or use cash transfers if the market can respond gradually.

Market analyses (for example MSMA-type tools or WFP price monitoring) help decide between in-kind assistance, local procurement and cash transfers.

Exercise: two offers, two Incoterms

Situation. Purchase of 2,000 rolls of plastic sheeting. Offer 1: 28 USD per roll EXW (factory abroad); costs borne by the buyer: loading and export 0.80 USD, sea freight 4.20 USD, insurance 0.30 USD, customs clearance and port charges 1.20 USD, transport to the warehouse 1.50 USD. Offer 2: 36 USD per roll DAP warehouse (not cleared); customs clearance borne by the buyer 1.20 USD. Lead time: offer 1 = 12 weeks; offer 2 = 7 weeks. Penalties provided: 0.5% per day, cap 10%.

Tasks. 1) Landed cost per roll for each offer. 2) Total difference. 3) If offer 2 is delivered 15 days late, what penalty? 4) Which offer, under what conditions?

Answer. 1) Offer 1: 28 + 0.80 + 4.20 + 0.30 + 1.20 + 1.50 = 36 USD; offer 2: 36 + 1.20 = 37.20 USD. 2) Difference: 1.20 × 2,000 = 2,400 USD in favour of offer 1. 3) Value of offer 2: 72,000 USD; penalty 0.5% × 15 × 72,000 = 5,400 USD (7.5%, below the cap of 7,200 USD). 4) If the need falls within less than 12 weeks, offer 2 wins despite the 2,400 USD extra cost (3.3%); under EXW, the organisation also bears all the risks from the factory and must organise the export, which requires a reliable freight forwarder. If the lead time is not critical, offer 1, with a freight forwarder and proper insurance.

Key takeaways

- Incoterms govern risks and costs, not ownership or payment.
- Under CIF and CFR, the risk passes to the buyer as soon as the goods are loaded at the port of departure.
- Compare on landed cost and, for equipment, on total cost of ownership.
- Capped penalties, payment after compliant receipt, guarantees and ethical clauses protect the organisation.
- Buying locally requires a market analysis so as not to drive up prices.

Quiz

1. Under the CIF Incoterm, when does the risk pass to the buyer?
   A. On arrival at the port of destination
   B. At the buyer's warehouse
   C. On loading on board at the port of departure
   D. At the factory

2. Contract 40,000 USD, 8 days late, penalty 0.5% per day, cap 10%. Penalty:
   A. 1,600 USD
   B. 4,000 USD
   C. 160 USD
   D. 3,200 USD

3. 50 deliveries, of which 42 on time and 38 on time and complete. The OTIF is:
   A. 84%
   B. 92%
   C. 76%
   D. 50%

4. A generator consumes 2 l/h, 10 h/day, 300 days per year, fuel 1.50 USD/l. Annual fuel cost:
   A. 6,000 USD
   B. 4,500 USD
   C. 3,000 USD
   D. 9,000 USD

5. Why is the DDP Incoterm often unsuitable for an exempt NGO?
   A. It is too expensive
   B. It is the seller who imports, and the NGO's exemption does not apply
   C. It is prohibited by donors
   D. It does not exist for sea freight

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

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** (m³) for volume.
- **Container**: 20-foot (about 33 m³ usable, payload often limited to 20 to 25 t depending on the roads) or 40-foot (about 67 m³).
- **Air volumetric weight**: volume in cm³ / 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 cm³; 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

Week 6 : Warehouses and stock management: capacity, turnover, inventories and losses

Objectives

- Size and organise a humanitarian warehouse (floor area, height, aisles, security, hygiene).
- Run reliable stock management: stock cards, FEFO, inventories, reconciliations and indicators.
- Analyse losses and inventory discrepancies, and decide on actions (investigation, write-off, destruction).

Sizing a warehouse

The **floor area required** is calculated from the maximum volume to be stored, the permitted stacking height and a coefficient for aisles and work areas.

Method. Net storage area = volume / usable stacking height. Gross area = net area / utilisation rate (often 60 to 70%, the rest for aisles, receiving, dispatch, quarantine and the office).

Example. Maximum stock: 800 t of food in bags. Density: about 1.4 m³ per tonne for bagged cereals, i.e. 1,120 m³. Safe stacking height: 2 m (pallets on the floor, without racking). Net area = 1,120 / 2 = 560 m². With 65% utilisation: 560 / 0.65 ≈ 862 m², i.e. a warehouse of about 900 m², or two mobile storage units of 10 × 32 m (320 m² each), which on their own would not be enough.

Criteria for choosing a building: year-round truck access, stable and dry floor, watertight roof, ventilation, security (fence, guarding, lighting), no flood risk, distance from conflict areas, and written agreement from the owner (lease).

Organising space and security

Basic rules of a humanitarian warehouse:

- **Pallets** under all goods, at least 50 cm from the walls, with aisles for inspection and pest control.
- **Separate zones**: receiving, storage, order picking, dispatch, quarantine (damaged items or items awaiting inspection), hazardous products (fuel, chlorine), temperature-controlled products.
- **One location per item and per batch**, with a label or a stack card.
- **Hygiene and pests**: regular cleaning, traps, fumigation of food according to procedures by trained personnel.
- **Fire safety**: suitable extinguishers, no smoking, fuel stored separately.
- **Access control**: a single entrance, entry log, keys managed by two people.

> The "two-person" rule: no stock receipt or issue without a document signed by the storekeeper and a second person (driver, requester or supervisor).

Stock documents

The system, on paper or computerised, relies on documents that are reconciled with one another:

- **Goods received note** (with the waybill and the receiving report).
- **Goods issue note** or delivery note, based on an approved request.
- **Stock card** per item (bin card): receipts, issues, balance, at each movement, placed on the stack.
- **Ledger or database** kept by someone other than the storekeeper.
- **Transfer notes** between warehouses.

The physical balance, the stock card balance and the ledger balance must be identical. An unexplained discrepancy is a warning sign: a recording error, an unrecorded movement, or theft.

Issuing methods: **FIFO** (first in, first out) for items without an expiry date; **FEFO** (first expired, first out) for all perishable items: food, medicines, therapeutic foods. Under FEFO, a batch received later but expiring sooner is issued first.

Inventories and discrepancies

A distinction is made between the **full physical inventory** (all items, at least once a year and at each project closure or change of storekeeper) and the **cycle count** (a few items each week, prioritising high-value or at-risk items).

The inventory is carried out by a team that includes a person from outside the store, without first showing the theoretical balance to the counters ("blind" counting).

Discrepancy example. Ledger: 1,250 blankets. Count: 1,180. Discrepancy: −70, i.e. 5.6%. Checks: issue notes not entered (2 are found, for 40 blankets), data entry errors (none), transfers in progress (none). Residual discrepancy: 30 blankets (2.4%) to be explained through an investigation, above the organisation's tolerance threshold (for example 0.5% for non-food items). Follow-up: written report, investigation, then write-off approved at the right level; if theft is suspected, reporting in accordance with the anti-fraud policy.

Stock indicators

A few indicators are enough to manage a warehouse:

- **Stock turnover** = annual issues / average stock. A turnover of 2 means that the average stock corresponds to 6 months of issues.
- **Months of stock** = stock / average monthly consumption.
- **Stock-out rate** = number of days an item is unavailable / days in the period.

- **Stock accuracy** = item lines with no discrepancy at inventory / lines counted.
- **Losses and expiries** in value and as a percentage of issues.
- **Occupancy rate** of the warehouse.
- **Dormant stock**: items with no movement for more than 6 months.

Example. Annual issues 3,600 t; average stock 900 t. Turnover = 4; average stock = 3 months of issues. For food with a 12-month shelf life, this is acceptable. For a stock of health items with a 6-month shelf life, 3 months of average stock leaves little margin: monitor dates under FEFO.

Damaged and expired items, and disposal

Unfit items follow a strict procedure:

- Immediate **quarantine**, labelled "do not distribute".
- **Assessment** by a committee (logistics, programme, and for food or medicines, a specialist or a health authority).
- **Decision**: repair, repackaging, alternative use (for example food unfit for human consumption used as animal feed, only after analysis and in accordance with the rules), or destruction.
- **Destruction** documented in an official report, with witnesses, photos and, where necessary, the presence of the authorities, in compliance with environmental standards (controlled incineration of medicines, for example).
- **Informing the donor** when the items were funded by it, according to the contract.

Losses due to poor management (unsuitable storage, no FEFO) may be declared ineligible by the donor. Losses due to documented force majeure (flooding, looting) are generally accepted if they are reported promptly.

Exercise: diagnosing a district warehouse

Situation. Warehouse with 600 m² of floor area, stacking at 2 m, target utilisation rate 65%. At peak it must store 700 t of food (1.4 m³ per tonne). Annual inventory: 42 item lines counted, 36 with no discrepancy. Annual food issues: 2,100 t; average stock: 700 t. 3.5 t of flour have expired: the issue notes show that batches received later were distributed first. The ledger is kept by the storekeeper himself.

Tasks. 1) Is the warehouse large enough? 2) Stock accuracy and turnover. 3) Probable cause of the expiry and consequence. 4) Three measures.

Answer. 1) Volume 700 × 1.4 = 980 m³; net area 490 m²; gross area 490 / 0.65 ≈ 754 m²: about 150 m² are missing at peak (solution: mobile storage unit or additional warehouse, or staggering deliveries). 2) Accuracy = 36 / 42 ≈ 86%; turnover = 2,100 / 700 = 3, i.e. 4 months of average stock. 3) FEFO (and probably FIFO) not applied; the loss is likely to be judged ineligible because it is due to poor management. 4) Apply and monitor FEFO (stack cards with dates, issues validated by a supervisor); separate ledger keeping (assistant or finance) from physical custody; monthly cycle counts of perishable items with a report to the logistics manager.

Key takeaways

- Gross area = volume / stacking height / utilisation rate (60 to 70%).
- Pallets, separate zones, quarantine, access control and the two-person rule.
- FEFO for everything that expires; physical stock, stock card and ledger must match.
- Blind inventory with an outside person; any discrepancy above tolerance is explained and approved.
- Turnover = annual issues / average stock; monitor dormant stock and expiries.

Quiz

1. Volume to store 600 m³, stacking 2 m, utilisation 60%. Gross area required:
   A. 300 m²
   B. 360 m²
   C. 500 m²
   D. 1,000 m²

2. Annual issues 1,200 t, average stock 400 t. The turnover is:
   A. 3
   B. 0.33
   C. 4
   D. 800
3. Batch A received in January, expires in December; batch B received in March, expires in August. Under FEFO, the first to be issued is:
   A. Batch A
   B. Batch B
   C. Both in equal shares
   D. The heaviest
4. Ledger 2,000 units, count 1,960. The discrepancy is:
   A. −4%
   B. −0.2%
   C. +2%
   D. −2%
5. Why count "blind" during an inventory?
   A. To go faster
   B. So that the counters are not influenced by the theoretical balance
   C. Because the lighting is poor
   D. To avoid filling in forms

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

Week 7 : Managing a fleet: costs, fuel, maintenance and road safety

Objectives

- Calculate the full cost of a vehicle per kilometre and compare purchase, rental and pooling.
- Put fleet controls in place: logbooks, consumption, preventive maintenance, fuel management.
- Reduce road risk, the leading cause of death and serious injury among humanitarian staff in many contexts.

The full cost of a vehicle

A vehicle costs far more than its purchase price. The **cost per kilometre** combines:

- **Fixed costs**: depreciation (price − residual value, over the period of use), insurance, registration, driver's salary, equipment (radio, GPS tracking).
- **Variable costs**: fuel, tyres, maintenance and repairs.

Example. Off-road 4x4 bought for 55,000 USD, resold for 15,000 USD after 5 years, 30,000 km per year. Depreciation: 40,000 / 5 = 8,000 USD per year. Insurance and taxes: 2,000. Driver: 7,200. Equipment and tracking: 600. Fixed costs: 17,800 USD per year, i.e. 0.59 USD/km. Fuel: 14 l/100 km × 30,000 km = 4,200 l × 1.40 USD = 5,880 USD. Tyres and maintenance: 4,500 USD. Variable costs: 10,380 USD, i.e. 0.35 USD/km. **Full cost: 28,180 USD per year, about 0.94 USD/km.**

At only 15,000 km per year, fixed costs remain almost the same and the cost per kilometre climbs to more than 1.50 USD: an underused vehicle is very expensive.

Buying, renting or pooling

Three options:

- **Purchase**: worthwhile for a long (3 years or more) and intensive need, in a country where suitable vehicles are rarely available for rent. Beware of donor rules on vehicle purchases (often subject to prior approval, with origin rules) and on their disposal at the end of the project.
- **Rental** (with or without driver): flexible, no capital tied up, suited to short or variable needs; more expensive per kilometre in the long term, and the quality and safety of the vehicles must be checked.
- **Pooling and internal hire**: a pool of vehicles shared between projects, charged per kilometre or per day to each project according to the logbooks. This makes it possible to charge costs fairly to donors.

Comparison. Rental: 2,400 USD per month with driver, fuel extra. The vehicle bought above costs, excluding fuel, (28,180 − 5,880) / 12 ≈ 1,858 USD per month. Over 3 years or more, purchase is cheaper if use is heavy; on a 10-month project, rental avoids the purchase, the disposal and the customs formalities.

Logbooks and consumption

The **logbook** is the basic document: for each trip, date, driver, start and end mileage, destination, purpose, passengers, project charged, and fuel refills. It is checked every week by the fleet manager.

Consumption is calculated for each vehicle: litres consumed / kilometres travelled × 100. It is compared with the model's standard and with the previous month.

Control example. Vehicle 1: 2,800 km, 420 l, i.e. 15 l/100 km (standard 13 to 15). Vehicle 2: 2,100 km, 410 l, i.e. 19.5 l/100 km (same model, same area). A 30% difference: possible causes, to be checked before drawing any conclusion: a fault (injectors, filters, under-inflated tyres), trips over difficult terrain, a faulty odometer, or fuel theft. An excess of 4.5 l/100 km over 2,100 km represents about 95 litres per month.

> A logbook filled in at the end of the month, in a single hand and with the same pen, is not a logbook: it is a warning sign.

Fuel management

Fuel is one of the budget lines most exposed to fraud. Essential controls:

- **Supply** through a framework agreement with a filling station, with numbered fuel vouchers or fuel cards assigned to each vehicle.
- **Own storage** (drums or tank) only if necessary: receipts and issues register, meter, two keys, weekly inventory by dipping.
- **Monthly reconciliation**: filling station invoices, signed vouchers, logbooks and consumption per vehicle.
- **Generators**: hour meter and consumption per hour, reconciled in the same way.

Drum stock example. Opening stock 3,000 l; receipts 8,000 l; recorded issues 9,400 l; final dip reading 1,350 l. Theoretical stock = 3,000 + 8,000 − 9,400 = 1,600 l. Discrepancy = −250 l, i.e. 2.7% of issues: above a tolerance for evaporation and handling of about 0.5%, an investigation is needed.

Maintenance and life cycle

Preventive maintenance follows a mileage-based schedule (for example an oil change every 5,000 km in severe conditions) and a weekly check by the driver (tyres, brakes, fluid levels, lights, safety equipment). It costs far less than breakdowns on the road, which immobilise a team and can put it in danger.

Replacement takes place according to age and mileage (often 5 years or 150,000 to 200,000 km on difficult terrain), or when the cost of repairs exceeds a threshold. **Disposal** at the end of the vehicle's life or of the project follows the donor's rules: transfer to another project, to a partner, auction or donation, with an official report and, if the vehicle was imported duty-free, payment or regularisation of the duties.

GPS tracking helps with security (location in the event of an incident) and control (unauthorised trips), but must respect the staff data protection policy and be explained to drivers.

Road safety

In many contexts, road accidents are a major cause of death and serious injury among humanitarian staff, often more so than violence. The measures that reduce the risk the most:

- **Seat belts** mandatory for everyone, in every seat, without exception.
- Internal **speed limits** (for example 80 km/h on the road, 40 in built-up areas), monitored through GPS tracking.
- **No night driving** outside towns, except for approved emergencies.
- **Drivers** recruited through a practical test, trained (defensive driving, first aid), with rest periods (no more than 8 to 10 hours of driving per day).
- **Zero alcohol** and no phone use at the wheel.
- **Equipped vehicles**: first aid kit, fire extinguisher, means of communication, spare wheel, warning triangle.
- **Incident analysis**: every accident or near miss is reported and analysed, without a blame culture, to correct the causes.

Exercise: a fleet that costs too much

Situation. A field office manages 8 purchased vehicles. Four travel 32,000 km per year; four only 9,000 km. Fixed costs per vehicle: 16,000 USD per year. Variable cost: 0.35 USD/km. A rental agency offers vehicles with drivers at 2,300 USD per month, fuel extra (fuel accounts for 0.20 USD/km of the variable cost). The logbooks of one vehicle show 21 l/100 km against 14 l/100 km for the other vehicles of the same model.

Tasks. 1) Cost per km of the two groups. 2) Should the 4 underused vehicles be kept? 3) What should be done about the vehicle at 21 l/100 km?

Answer. 1) Heavily used group: 16,000 / 32,000 + 0.35 = 0.85 USD/km. Underused group: 16,000 / 9,000 + 0.35 ≈ 1.78 + 0.35 = 2.13 USD/km. 2) Annual cost of an underused vehicle: 16,000 + 9,000 × 0.35 = 19,150 USD. Rental at 2,300 × 12 = 27,600 USD + fuel 9,000 × 0.20 = 1,800 USD = 29,400 USD: renting for the whole year is more expensive. But the 4 vehicles together only cover 36,000 km, barely more than the work of one well-used vehicle: pool them (a single pool with trip planning), dispose of 2 or 3 vehicles in accordance with donor rules and rent occasionally for peaks. 3) First check the mechanical condition and the odometer, compare the trips; if nothing explains it, reconcile fuel vouchers, logbook and GPS, and if there is suspicion, report in accordance with the anti-fraud policy without confronting the driver.

Key takeaways

- Cost per km = annual fixed costs / km + variable costs per km; an underused vehicle is very expensive.
- Pool the fleet and charge each project per kilometre, based on the logbooks.
- Consumption per vehicle every month: a difference of more than 20% is explained before drawing conclusions.
- Fuel: numbered vouchers or cards, monthly reconciliations, dipping of stocks.
- Seat belts, speed, no night driving, driver rest, zero alcohol: road safety saves lives.

Quiz

1. Fixed costs 18,000 USD per year, 24,000 km, variable cost 0.30 USD/km. Cost per km:
   A. 0.75 USD
   B. 1.05 USD
   C. 0.30 USD
   D. 1.25 USD

2. 1,600 km travelled with 272 litres. The consumption is:
   A. 14 l/100 km
   B. 15 l/100 km
   C. 17 l/100 km
   D. 16 l/100 km

3. Opening stock 2,000 l, receipts 5,000 l, issues 6,200 l, dip reading 700 l. The discrepancy is:
   A. −100 l
   B. +100 l
   C. −800 l
   D. 0

4. Purchase 50,000 USD, residual value 10,000 USD after 4 years. Annual depreciation:
   A. 12,500 USD
   B. 8,000 USD
   C. 15,000 USD
   D. 10,000 USD

5. Which measure most directly reduces the severity of road accidents?
   A. GPS tracking
   B. Mandatory seat belts in every seat
   C. A logo on the vehicle
   D. Filling up every day

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

Week 8 : Importing: customs, exemptions, documents and lead times

Objectives

- Understand the customs clearance procedure and the documents required for a humanitarian import.
- Calculate theoretical duties and taxes and defend an exemption on the basis of the host country agreement and national legislation.
- Reduce customs clearance lead times and costs, and anticipate items subject to special regimes.

The customs clearance procedure

On entering a country, all goods must be **declared** to customs, which check their nature, value, origin and tax regime. Typical steps:

- **Before arrival**: preparation of documents, request for an exemption or import authorisation, pre-declaration if the system allows it.
- **On arrival**: submission of the declaration by a customs broker (licensed clearing agent), with the documents.
- **Inspection**: documentary, and sometimes physical (green, orange or red channel depending on the risk analysis).
- **Assessment and payment** of duties and taxes, or application of the exemption.
- **Release**: authorisation to remove the goods; payment of port and storage charges.

Storage at the port becomes chargeable after a free period of a few days, and the **demurrage** charged by the shipping line for a container not returned adds up quickly: for example 75 USD per day per container after 10 free days.

The documents

A complete import file generally includes:

- **Commercial invoice** (or pro forma invoice for donations, marked "no commercial value" with a value declared for customs).
- Detailed **packing list**.
- **Transport document**: bill of lading, air waybill or road waybill.
- **Certificate of origin**, sometimes required for preferential regimes or donor rules.
- **Specific certificates**: sanitary and phytosanitary (food, seeds), authorisation from the medicines regulatory authority, fumigation certificate (wooden pallets treated in accordance with the ISPM 15 standard), licences for telecommunications equipment.
- **Exemption letter or decision** and the organisation's registration document.

> Half of customs clearance delays come from inconsistencies between documents: quantities, weights, descriptions or values that differ between the invoice, the packing list and the bill of lading. Check before shipment, not on arrival.

Duties, taxes and customs value

The **customs value** is most often the CIF value (cost of the goods + insurance + freight to the border). Customs duties apply to this value; import VAT generally applies to the customs value plus duties.

Example. Goods 80,000 USD, freight 9,000, insurance 1,000: CIF value 90,000 USD. Customs duties 20%: 18,000. Miscellaneous fees 2% of the CIF value: 1,800. VAT base: 90,000 + 18,000 + 1,800 = 109,800; VAT 18%: 19,764. Total duties and taxes: 18,000 + 1,800 + 19,764 = **39,564 USD**, i.e. 44% of the CIF value. A well-prepared exemption therefore represents a considerable saving, and the absence of an exemption must be provided for in the budget.

Most donors consider recoverable or avoidable duties and taxes to be **ineligible**: if the organisation could have obtained an exemption and did not request it, the cost remains its own.

Exemptions and legal frameworks

Exemptions rest on several possible legal bases:

- **Host country agreements** or establishment agreements signed between the organisation and the government.
- **International conventions**: privileges and immunities of the United Nations; the revised Kyoto Convention (specific annex J5 on relief consignments); the Tampere Convention for emergency telecommunications equipment.
- **National laws** on NGOs, disasters or customs codes.
- The **IDRL Guidelines** (international disaster response law) of the International Federation, which encourage States to facilitate the entry of relief.

Useful practices: obtain and keep registration documents up to date; know which ministries sign (often the ministry responsible for NGOs, then finance); anticipate lead times (2 to 6 weeks per request in many countries); request the exemption before shipment; keep a register of items imported duty-free, because their subsequent **disposal** (sale of a vehicle, for example) triggers payment of the duties.

Special regimes and items

Some items require specific attention:

- **Medicines and medical devices**: authorisation from the national regulatory authority, list of authorised medicines, minimum remaining shelf life (often 12 months or two thirds of the shelf life).
- **Food**: health certificates, compliance analysis, rules on GMOs in some countries.

- **Telecommunications**: radios, satellite phones, drones: import and usage licences.
- **Dual-use goods** or goods subject to export controls (certain electronic equipment, chemicals such as chlorine in large quantities, bulletproof vests): export licences from the country of origin and import licences from the country of destination.
- **Vehicles**: temporary or permanent import, number plates, conditions for resale.

Temporary admission makes it possible to import duty-free equipment that will be re-exported (for example an emergency team's equipment), against a guarantee or a re-export undertaking.

Reducing lead times and costs

Proven levers:

- A **qualified clearing agent** selected through competitive bidding, with a framework agreement specifying its fees and prohibiting any unofficial payment.
- **Document checks** before shipment (checklist per country).
- **Planning**: submit exemption requests for an entire procurement plan rather than case by case.
- **Coordination**: in emergencies, the Logistics Cluster and the disaster management authorities often set up fast-track procedures or one-stop shops.
- **Monitoring of storage and demurrage costs**, with an alert before the free days run out.

Example of the cost of a delay. 6 containers held 18 days beyond the free period. Storage: 40 USD per container per day; demurrage: 75 USD per container per day. Cost: 6 × 18 × (40 + 75) = 12,420 USD, generally ineligible if they result from a documentation error.

> "Facilitation payments" requested by an official to speed up a file are corruption: they are prohibited, even when small, even when presented as customary.

Exercise: a shipment of medical equipment

Situation. Sea shipment of medical equipment and medicines: value of goods 150,000 USD, freight 12,000, insurance 1,500. Duties 10%, fees 1.5% of the CIF value, VAT 18% on (CIF + duties + fees). An exemption is possible but takes 4 weeks; the ship arrives in 3 weeks. 4 containers; free period of 7 days; storage 40 USD and demurrage 75 USD per container per day. Some of the medicines have a remaining shelf life of 9 months whereas the authority requires 12 months.

Tasks. 1) Duties and taxes without an exemption. 2) Cost of waiting for an exemption that runs 10 days beyond the free period. 3) What should be done about the medicines with 9 months? 4) Recommendation.

Answer. 1) CIF = 163,500. Duties 16,350; fees 2,452.50; VAT base 182,302.50; VAT 32,814.45. Total ≈ 51,617 USD. 2) Arrival in week 3, exemption in week 4: 7 days of waiting, within the free period; but if the exemption takes 2 more weeks, 10 days beyond the free period cost 4 × 10 × 115 = 4,600 USD, far less than 51,617 USD in duties. 3) They will probably be refused: request a waiver from the authority before shipment, or have the supplier replace these batches, with the 12-month requirement stated in the order. 4) Submit the exemption request immediately; inform the clearing agent and the shipping line; do not pay the duties to "save time", as they would be ineligible; resolve the expiry date problem before loading.

Key takeaways

- Customs value = CIF value; VAT is often calculated on CIF + duties + fees.
- Documents consistent with one another, checked before shipment: the leading cause of delay is inconsistency.
- Request the exemption before shipment; avoidable duties = ineligible costs.
- Medicines, food, telecommunications, dual-use goods: special regimes to anticipate.
- Storage and demurrage add up quickly; any "facilitation" payment is prohibited.

Quiz

1. Goods 50,000 USD, freight 4,000, insurance 1,000. The CIF value is:
   A. 50,000 USD
   B. 54,000 USD
   C. 55,000 USD
   D. 51,000 USD

2. CIF 100,000, duties 10%, VAT 18% on CIF + duties. Total duties and taxes:
   A. 29,800 USD
   B. 28,000 USD
   C. 19,800 USD
   D. 18,000 USD

3. 3 containers held 12 days beyond the free period, at 100 USD per container per day in total. Cost:
   A. 1,200 USD
   B. 3,600 USD
   C. 300 USD
   D. 36,000 USD

4. The ISPM 15 standard concerns:
   A. Medicines
   B. Radios
   C. Vehicles
   D. The treatment of wooden packaging and pallets

5. An official offers to speed up a file for a "customary" 50 USD. You:
   A. Pay, it is the custom
   B. Pay and record it as clearing agent fees
   C. Refuse and report it: it is corruption
   D. Negotiate it down to 25 USD

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

Week 9 : Preparedness, prepositioning and last-mile distributions

Objectives

- Size a contingency stock and choose where to preposition it, weighing cost against speed.
- Organise a safe, dignified and accountable in-kind distribution, from calculating quantities to proof of handover.
- Choose between in-kind assistance, vouchers and cash transfers, and draw the logistical consequences.

Logistics preparedness

Preparedness means doing, before the crisis, everything that would slow down the response afterwards:

- **Framework agreements** signed with suppliers, transporters, freight forwarders, warehouses.
- **Country logistics assessment**: ports, airports, roads, storage capacity, suppliers, customs (the Logistics Cluster publishes Logistics Capacity Assessments by country).
- **Contingency stocks** for the first days.
- **Emergency procedures** approved in advance (raised thresholds, temporary delegations).
- **Rosters** of trained staff who can be mobilised.
- Regular **simulation exercises**.

Several studies on prepositioning and preparedness have shown that investing before a crisis saves days and reduces response costs, in particular by avoiding air freight. The argument must nevertheless be quantified for each context.

Sizing a contingency stock

A contingency stock is sized on the basis of a **planning scenario**: number of people affected, share the organisation will cover, items and the period to be covered before normal supplies arrive.

Example. Scenario: a flood affecting 30,000 households; the organisation commits to covering 20% for the first 4 weeks, until regional purchases arrive. Kits per household: 1 hygiene kit, 1 kitchen kit, 2 tarpaulins, 2 mosquito nets. Households covered: 6,000. Stock: 6,000 hygiene kits, 6,000 kitchen kits, 12,000 tarpaulins, 12,000 mosquito nets.

Cost of the stock. Value: 6,000 × (18 + 25) + 12,000 × (12 + 4) = 258,000 + 192,000 = 450,000 USD. Annual holding cost (storage, insurance, rotation, losses, capital) often estimated at 15 to 25% of the value: at 20%, 90,000 USD per year. This cost is justified if the stock makes it possible to avoid air freight or to gain the critical days.

Items with a limited shelf life (food, medicines, chlorine) must be **rotated**: integrated into regular programmes before they expire, and replaced.

Where to preposition?

Three levels of stock are combined:

- **Global or regional**: humanitarian response depots (for example the UNHRD network), regional warehouses of the major organisations. Economies of scale, but lead time and cost of transport to the country.
- **National**: a warehouse in the capital or near the port. A good compromise.
- **Local**: small stocks in at-risk areas. Very fast, but costly, exposed to looting and humidity.

Trade-off example. Option A: regional stock, emergency air transport (5 days, 2.80 USD/kg). Option B: national stock, road transport (3 days, 0.25 USD/kg), additional holding cost of 30,000 USD per year. For a 200 t response: A costs 200,000 × 2.80 = 560,000 USD in freight; B costs 200,000 × 0.25 = 50,000 USD. If such a response occurs at least once every 10 years, B is already more economical (510,000 USD saved versus 300,000 in holding costs over 10 years), and faster.

Organising an in-kind distribution

A successful distribution is prepared with the programme team and the community:

- A verified **beneficiary list**, distribution cards or tokens, without duplicates.
- **Calculation of quantities** per site, with a small margin (for example 2 to 3%) for errors and vulnerable cases identified on the day.
- **Choice of site**: accessible, safe, shade and water, separate queues, access for older people and people with disabilities, reasonable distance from home.
- **Organisation**: waiting, verification, handover and exit areas; female and male staff; display of entitlements (what each person should receive).
- **Accountability**: complaints committee, telephone line, explicit prohibition on demanding anything in exchange (sexual exploitation and abuse).
- **Documentation**: distribution list signed or thumb-printed, reconciliation of quantities issued, distributed and returned.

Site throughput. One handover point serves about 1 household per minute. 2,400 households in a 6-hour day require 2,400 / 360 ≈ 7 handover points. It is better to spread over two days or two sites than to make people wait for long hours in the sun.

Reconciling and monitoring after the distribution

After each distribution, logistics and programme **reconcile**: quantities issued from the warehouse = quantities distributed + quantities returned + justified losses.

Example. Issued: 2,500 kits. Signed list: 2,410 households. Returned to the warehouse: 70 kits. Discrepancy: 2,500 − 2,410 − 70 = 20 kits unaccounted for (0.8%). Above a low

tolerance, investigation: counting error, kits handed over without a signature, diversion.

Post-distribution monitoring (PDM) checks with a sample of households: did they receive the right quantity? are the items suitable? did they sell them (a sign of a poorly identified need)? were they subjected to pressure? Its results improve subsequent distributions.

> A distribution without reconciliation or monitoring does not prove that the aid arrived; it only proves that it left the warehouse.

In kind, vouchers or cash transfers?

The choice of **modality** changes the whole supply chain:

Modality	Conditions	Logistical consequences
In kind	Failing markets, specific items (medicines, shelter), acute emergency	Full supply chain: procurement, transport, storage, distribution
Vouchers	Functioning markets but a need to restrict items or guarantee quality	Contracts with traders, price and quality control, payment of traders
Cash transfers	Functioning markets, safe access to money, acceptance	Contracts with financial service providers, price monitoring, management of beneficiary data

Logistics remains essential in cash transfers: **market supply chain analysis** (can traders restock?), contracts with payment providers, and sometimes support to traders. The cost-transfer ratio (delivery costs / amount transferred) of a cash programme is often well below that of in-kind assistance, but the comparison must include all costs and the effect on markets.

Exercise: preparing for a cyclone season

Situation. Scenario: 40,000 households affected; your organisation covers 15% for 3 weeks. Per household: 1 shelter kit (30 USD, 15 kg), 1 hygiene kit (20 USD, 8 kg). Options: regional stock, air shipment at 3 USD/kg; or national stock, road transport at 0.30 USD/kg, with a holding cost of 20% per year of the stock value. Distribution planned at one main site, over 2 days of 6 hours.

Tasks. 1) Quantities and value of the stock. 2) Transport cost under each option. 3) Annual holding cost of the national stock and the number of years "covered" by the transport saving from a single response. 4) Handover points needed.

Answer. 1) 40,000 × 15% = 6,000 households; 6,000 shelter kits and 6,000 hygiene kits; value 6,000 × 50 = 300,000 USD; weight 6,000 × 23 = 138,000 kg. 2) Air: 138,000 × 3 = 414,000 USD; road: 138,000 × 0.30 = 41,400 USD. Saving: 372,600 USD. 3) Holding: 20% × 300,000 = 60,000 USD per year; a single response that avoids air freight covers 372,600 / 60,000 ≈ 6.2 years of holding. In an area hit on average every 2 to 3 years, the national stock is clearly justified (and faster). 4) 6,000 households over 2 × 360 minutes = 720 minutes; at 1 household per minute per point, 6,000 / 720 ≈ 8.3 are needed, so 9 handover points (or 3 days with 6 points).

Key takeaways

- Prepare before the crisis: framework agreements, assessments, stocks, emergency procedures, staff, simulations.
- Contingency stock = scenario × share covered × items × period until normal supplies arrive.
- Holding cost often 15 to 25% of the value per year, to be compared with the air freight avoided and the days gained.
- Distribution: verified list, safe and accessible site, accountability, documentation, reconciliation.
- The modality (in kind, vouchers, cash transfers) changes the whole supply chain; analyse the markets.

Quiz

1. 10,000 households affected, 25% coverage, 2 tarpaulins per household. Tarpaulins to stock:
   A. 2,500
   B. 5,000
   C. 10,000
   D. 20,000

2. Stock of 200,000 USD, holding cost 20% per year. Annual cost:
   A. 4,000 USD
   B. 20,000 USD
   C. 40,000 USD
   D. 200,000 USD

3. 1,800 households to serve in 5 hours, 1 household per minute per point. Handover points:
   A. 6
   B. 5
   C. 4
   D. 9

4. Issued 1,000 kits; signed list 960; returned 30. Kits unaccounted for:
   A. 40
   B. 30
   C. 0
   D. 10

5. Households are reselling the items received on a large scale. This mainly indicates:
   A. Fraud by households
   B. A poorly identified need or an unsuitable modality
   C. Markets working well
   D. A transport error

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

Week 10 : Health logistics: medicines, cold chain and quality assurance

Objectives

- Apply the supply rules for health products: essential lists, qualified suppliers, expiry, batch traceability.
- Size and monitor a cold chain for vaccines and temperature-sensitive products.
- Manage the risks specific to health products: falsified products, batch recalls, waste and controlled substances.

The basic rules for health products

Health products (medicines, medical devices, laboratory reagents, vaccines) are subject to stricter rules than other items, because a mistake can kill:

- **Reference lists**: the national essential medicines list, the WHO model list, national treatment protocols. A medicine not authorised in the country is not imported without a waiver.
- **Qualified suppliers**: WHO prequalification for certain products, recognised humanitarian procurement centres, manufacturers that comply with good manufacturing practices. Purchases on the uncontrolled local market are the exception, with reinforced controls.
- **Standard kits**: for example the Interagency Emergency Health Kits (IEHK), designed for 10,000 people for 3 months, useful at the start of a crisis but to be replaced afterwards by orders adapted to actual consumption.
- **Batch traceability**: every receipt and issue records the batch number and the expiry date, so that a batch can be withdrawn in the event of a recall.

Quantifying health needs

Two main methods:

- **Consumption method**: based on the AMC corrected for stock-outs (see week 2). Reliable if the data are good and prescribing is rational.
- **Morbidity method**: number of expected cases × standard treatment. Useful at start-up or when consumption data are distorted.

Morbidity example. Population 50,000; malaria incidence during the season: 8% per month; 60% of cases seek care; 70% of cases are adults. Adult treatment: 24 tablets; child (according to weight, average used): 12 tablets. Cases treated per month: 50,000 × 8% × 60% = 2,400. Tablets: 2,400 × (0.7 × 24 + 0.3 × 12) = 2,400 × (16.8 + 3.6) = 2,400 × 20.4 = 48,960 tablets per month. Over a 4-month season, plus a 2-month safety stock: 6 × 48,960 = 293,760 tablets.

The two methods cross-check each other: a large difference signals a problem (irrational prescribing, leakage, under-use of services).

The cold chain

Vaccines and many biological products must be kept between **+2 °C and +8 °C**; some must be frozen. A break can render them ineffective with no visible sign.

Equipment: cold rooms, prequalified refrigerators and freezers (WHO PQS catalogue), solar direct-drive refrigerators, cold boxes and vaccine carriers with conditioned ice packs, temperature loggers.

Sizing. Net storage volume = number of doses × volume per dose (cm^3) × period factor (maximum stock). **Example:** measles campaign, 60,000 children, expected wastage rate 15%, 10-dose vials. Doses required = 60,000 / 0.85 ≈ 70,590, rounded to 70,600, i.e. 7,060 vials. Volume per packed dose: 2.6 cm^3 (to be checked on the product sheet). Volume: 70,600 × 2.6 ≈ 183,600 cm^3 ≈ 184 litres net, to which the diluent is added (often stored at room temperature but refrigerated before use).

Monitoring. Temperature reading twice a day, electronic loggers with alarms, vaccine vial monitors (indicators that change colour after cumulative exposure to heat). Any temperature excursion is documented and assessed according to the manufacturer's instructions before the product is used.

Wastage rate and vaccine efficiency

The vaccine **wastage rate** combines opened vials not fully used, expired products and cold chain breaks.

Wastage factor = 1 / (1 − wastage rate). With a wastage rate of 20%, the factor is 1.25: to vaccinate 1,000 children, 1,250 doses are needed.

Example. 1,000 vials of 10 doses distributed; 6,400 children vaccinated. Doses used: 10,000; wastage rate = (10,000 − 6,400) / 10,000 = 36%. For a 10-dose multi-dose vial in sessions with few children, part of this wastage is unavoidable; the multi-dose vial policy (keeping certain opened vials for up to 28 days under conditions) and the organisation of sessions reduce it. The rate must be compared with the national programme's target.

Falsified products, recalls and waste

Falsified or substandard products. They circulate widely in countries with weak regulatory capacity. Signs: different packaging, spelling mistakes, abnormally low prices, inconsistent batch numbers. Course of action: quarantine, report to the national authority and to the WHO Global Surveillance and Monitoring System, no distribution.

Batch recalls. Thanks to traceability, it is possible to identify within a few hours where the units of the batch concerned are: warehouses, health centres, patients if necessary.

Controlled substances. Narcotics and psychotropics (morphine, for example) require specific import authorisations, double-lock storage and a special register.

Waste. Expired medicines, sharps waste, infectious waste: segregation at source, safety boxes, appropriate incineration or an approved disposal channel, destruction report. Burning medicines in the open air is dangerous and often illegal.

Quality assurance and good distribution practices

Good distribution practices cover the entire journey of a health product:

- a clean, dry, ventilated warehouse, with temperature and humidity readings (often below 25 °C for ordinary medicines, according to the labelling);
- strict FEFO, quarantine and rejected product zones;
- transport that protects against heat, humidity and theft;
- trained staff, with a pharmacist or qualified person who validates receipts;
- written procedures and self-inspections.

Performance indicators of a health supply chain: availability of tracer products (for example 15 essential medicines monitored in each centre), stock-out days, expiry rate, inventory discrepancies, replenishment time for health centres.

> Tracer product availability = number of tracer products in stock on the day of the visit / number of tracer products monitored. A centre at 9 out of 15 (60%) cannot provide proper care.

Exercise: preparing a vaccination campaign

Situation. Measles vaccination campaign: 45,000 children targeted, expected wastage rate 10%, 10-dose vials, 2.6 cm³ per dose. Refrigerators available at the district store: 3 units of 60 litres net each. During the campaign, a logger shows that one refrigerator rose to 12 °C for 5 hours during a power cut. After the campaign: 5,000 vials distributed, 41,800 children vaccinated.

Tasks. 1) Doses and vials required. 2) Net volume and adequacy of capacity. 3) Course of action after the temperature excursion. 4) Actual wastage rate.

Answer. 1) Wastage factor 1 / 0.9 ≈ 1.11; doses 45,000 / 0.9 = 50,000; 5,000 vials. 2) 50,000 × 2.6 = 130,000 cm³ = 130 litres; capacity 180 litres: sufficient if the vaccines arrive in one go and the space for ice packs and other products is taken into account. 3) Place the vials concerned in quarantine in the cold, read the vaccine vial monitors, apply the excursion assessment procedure according to the manufacturer's and national programme's instructions, document, and use only the vials declared usable; correct the cause (backup power supply). 4) Doses distributed: 50,000; wastage rate = (50,000 − 41,800) / 50,000 = 16.4%, above the 10% expected: analyse session size and the management of opened vials.

Key takeaways

- Health products: essential lists, qualified suppliers, batch traceability, strict FEFO.
- Quantify by consumption and by morbidity, and compare the two.
- Cold chain: +2 to +8 °C, continuous monitoring, every excursion assessed before use.
- Wastage factor = 1 / (1 − wastage rate); doses = target × wastage factor.
- Falsified products, recalls, controlled substances and waste: written, documented procedures.

Quiz

1. With a wastage rate of 20%, the wastage factor is:
   A. 1.2
   B. 0.8
   C. 1.25
   D. 1.5

2. 12,000 children, wastage rate 25%. Doses required:
   A. 15,000
   B. 16,000
   C. 12,000
   D. 9,000

3. Storage range for most vaccines:
   A. +2 to +8 °C
   B. −20 to −10 °C
   C. +15 to +25 °C
   D. 0 to +2 °C

4. Population 20,000, incidence 5% per month, 50% seek care. Cases treated per month:
   A. 1,000
   B. 10,000
   C. 200
   D. 500

5. A centre has 12 tracer products in stock out of 15 monitored. Availability is:
   A. 12%
   B. 80%
   C. 75%
   D. 120%

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

Week 11 : Measuring performance, controlling costs and reducing the environmental footprint

Objectives

- Build a logistics dashboard with indicators that are defined, measurable and useful for decision-making.
- Analyse logistics costs (cost per tonne delivered, share of the budget, hidden costs) and identify real savings.
- Integrate the environment into the supply chain: packaging, energy, transport, waste, and measure the carbon footprint.

Key indicators

A useful logistics dashboard fits on one page and covers each link:

Area	Indicator	Calculation
Procurement	Procurement lead time	Days between the approved request and the purchase order
Procurement	Share of purchases under framework agreements	Value under framework agreements / total value
Suppliers	OTIF	Deliveries on time and in full / deliveries
Transport	Cost per tonne delivered	Transport costs / tonnes delivered
Stocks	Accuracy, turnover, stock-outs	See week 6
Fleet	Availability rate	Days available / days in the period
Distribution	Completion rate	Quantities distributed / quantities planned

Each indicator has a **written definition**, a source, a frequency, a person responsible and a target. Without a definition, figures that do not measure the same thing are compared: does "procurement lead time" start at the request, at approval or at the budget check?

Reading procurement lead time

The average procurement lead time often hides very uneven stages. It is broken down:

Example. Average lead time of 38 days for purchases of 10,000 to 100,000 USD: incomplete request sent back to the programme (6 days), budget check (4), preparation of the file (5), publication and receipt of offers (14), evaluation (3), approval by headquarters (6). The "market" part (14 days) cannot be compressed; the others (24 days) are down to the organisation itself.

Targeted actions: purchase request template with mandatory specifications (−5 days), budget check within 48 hours (−2), delegation of approval to the country up to 100,000 USD (−5). Target lead time: 26 days.

The **median** is often more telling than the average: a few purchases blocked for months push up the average without representing the usual situation.

Logistics costs

Logistics costs include transport, storage, handling, customs clearance, the fleet, logistics staff and losses. They are related to a useful unit:

- **Cost per tonne delivered** (for food and bulk items);
- **Logistics cost as a percentage of the value delivered** (LTSH rate, landside transport, storage and handling, for food assistance);
- **Cost per household served**.

Example. 4,200 t delivered in the year; transport 336,000 USD; storage and handling 126,000; customs clearance 42,000; logistics staff 180,000; losses 21,000. Total 705,000 USD, i.e. 167.9 USD per tonne. If the value of the food is 2,520,000 USD (600 USD/t), logistics costs represent 28% of the value.

This figure is neither good nor bad in itself: it is compared over time, between areas, and with other options (local procurement, cash transfers). A landlocked area will always have a higher cost per tonne.

False economies

Some "savings" prove expensive later:

- Choosing the cheapest transporter without checking its reliability: losses, delays, stock-outs.
- Reducing safety stocks below a reasonable level: stock-outs and emergency purchases at high prices.
- Cutting preventive maintenance: breakdowns, vehicles off the road, accidents.
- Buying lower-quality items: replacements, dissatisfaction, resale by beneficiaries.
- Under-sizing the logistics team: incomplete files and ineligible costs at audit.

Worked example. Poor-quality tarpaulins at 8 USD instead of 12 USD, for 10,000 pieces: apparent saving of 40,000 USD. If 40% have to be replaced after the first rainy season (4,000 × 12 USD + 1.50 USD for transport and distribution = 54,000 USD), the operation costs 14,000 USD more, not counting the families poorly sheltered for weeks.

The environmental footprint

Humanitarian action has a significant environmental footprint: air transport, diesel generators, plastic packaging, waste. The **Climate and Environment Charter for Humanitarian Organizations** (2021), signed by many organisations, commits them to measuring and reducing this footprint.

Logistics levers:

- **Transport**: prefer sea and road to air when the lead time allows (air often emits 50 times more CO_2 per tonne-kilometre than sea); optimise truck loading.
- **Energy**: solar power for offices, warehouses and cold chains; properly sized generators.
- **Packaging**: reduce plastic, favour reusable or recyclable packaging, ask suppliers for lighter packaging.
- **Waste**: management plans, take-back of packaging, appropriate disposal channels.
- **Procurement**: environmental criteria in specifications and evaluation.

Simple emissions calculation. Indicative factors: air about 0.6 kg CO_2 per t·km, road about 0.1, sea about 0.012. 50 t over 6,000 km: air 50 × 6,000 × 0.6 = 180,000 kg (180 t of CO_2); sea 50 × 6,000 × 0.012 = 3,600 kg (3.6 t). The exact factors depend on the sources used; the order of magnitude is enough to decide.

Continuous improvement

A dashboard is only useful if it leads to decisions. A simple cycle:

- **Measure** every month with the same definitions.
- **Analyse** variances against targets and their causes (cause-and-effect diagram, "five whys").
- **Decide** on specific actions, with a person responsible and a date.
- **Check** the following month that the indicator is moving.

"Five whys" example. Chlorine stock-out at water points. Why? The district stock was empty. Why? The order was placed late. Why? The reorder point was not reached in the system because issues were not entered. Why? The storekeeper enters data at the end of the month. Why? No daily access to the tool. Action: data entry at least weekly, offline access, supervisor check. The root cause was not procurement but information.

Exercise: a dashboard that raises the alarm

Situation. Quarter: 120 supplier deliveries, of which 96 on time and 84 on time and in full. Transport: 1,500 t delivered for 198,000 USD (previous quarter: 1,400 t for 168,000 USD). Fleet: 10 vehicles, 90 days, 120 vehicle-days off the road. Distribution: 21,600 kits distributed out of 24,000 planned. 30 t of freight were sent by air over 4,000 km because of a procurement delay, instead of by road (factors: air 0.6, road 0.1 kg CO_2 per t·km).

Tasks. 1) OTIF, cost per tonne and its trend, fleet availability, completion rate. 2) Additional emissions due to air freight. 3) Three priorities for action.

Answer. 1) OTIF = 84 / 120 = 70%. Cost per tonne: 132 USD versus 120 USD (+10%). Availability: (900 − 120) / 900 ≈ 86.7%. Completion: 21,600 / 24,000 = 90%. 2) Air 30 × 4,000 × 0.6 = 72,000 kg; road 30 × 4,000 × 0.1 = 12,000 kg; an additional 60 t of CO_2, not counting the extra financial cost. 3) Suppliers: performance review with the late suppliers, framework agreements with penalties (OTIF at 70%); procurement: reduce the internal delays that forced the use of air freight; fleet: preventive maintenance and analysis of vehicle downtime; transport: analyse the 10% increase in the cost per tonne (fuel, new areas, empty return trips).

Key takeaways

- Each indicator: written definition, source, frequency, person responsible, target.
- Break down procurement lead time: the internal part is often the largest and the easiest to reduce.
- Cost per tonne and the share of logistics costs are compared over time and between options.
- Beware of false economies: quality, reliability and maintenance cost less than their absence.
- Air emits dozens of times more than sea per t·km: planning also means protecting the climate.

Quiz

1. 80 deliveries, of which 60 on time and in full. The OTIF is:
   A. 60%
   B. 80%
   C. 75%
   D. 133%

2. 2,000 t delivered for a logistics cost of 300,000 USD. Cost per tonne:
   A. 150 USD
   B. 600 USD
   C. 1,500 USD
   D. 6.67 USD

3. 8 vehicles over 30 days, 24 vehicle-days off the road. Availability:
   A. 70%
   B. 75%
   C. 80%
   D. 90%

4. 20 t over 5,000 km by air at 0.6 kg CO_2 per t·km emit:
   A. 6 t of CO_2
   B. 60 t of CO_2
   C. 600 t of CO_2
   D. 0.6 t of CO_2

5. Why use the median procurement lead time rather than the average?
   A. It is always lower
   B. It is not distorted by a few purchases blocked for a very long time
   C. Donors require it
   D. It is easier to calculate

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

Week 12 : Leading the supply chain: constrained contexts, digital tools, organisation and final project

Objectives

- Adapt the supply chain to constrained contexts: conflicts, sanctions, limited access, remote management.
- Choose and deploy suitable digital tools (stock management, procurement tracking, distribution data) while protecting data.
- Organise an organisation's supply chain function and complete the final project: a full supply plan for a response.

Supply chains in conflict and sanctions contexts

In armed conflicts, the supply chain must respect humanitarian principles and the law:

- **Neutrality and independence**: suppliers and transporters vetted to ensure they are not linked to the parties to the conflict; no payments to armed groups.
- **Sanctions**: systematic screening of suppliers, transporters and partners against sanctions lists (United Nations Security Council, European Union, United States and others depending on the funding). Humanitarian exemptions exist (for example Security Council resolution 2664, adopted in 2022), but they have limits and do not remove the need for due diligence.
- **Dual-use goods**: fertilisers, chemicals, communications equipment: licences and end-use monitoring.
- **Risk of diversion**: control of distributions, reconciliations, post-distribution monitoring, complaints mechanisms.

A diversion of aid to the benefit of a party to the conflict can lead to the suspension of funding for the whole organisation: logistics is on the front line in preventing and detecting it.

Remote management

When international or even national staff cannot access an area, the supply chain is managed **remotely**, often with local partners or service providers. Adapted controls:

- **Third-party monitoring**: independent companies or organisations that visit warehouses and distributions.
- **Digital evidence**: time-stamped and geolocated photos, electronic signature records, GPS tracking of trucks.
- **Calls to beneficiaries** on a sample, by an independent call centre.
- **Reinforced reconciliations** and lower tolerance thresholds.
- **Measured risk transfer**: do not transfer to partners security risks they cannot manage, and fund their security costs.

Call verification example. 3,000 households served; a sample of 300 called; 255 reached, of whom 240 confirm full receipt, 9 partial receipt and 6 non-receipt. Confirmation rate = 240 / 255 ≈ 94%. The 15 problem cases (5.9%) are passed on to the complaints mechanism and verified; extrapolated to 3,000 households, this represents about 176 households potentially poorly served.

Digital tools

Digital tools improve reliability and speed if they are **suited to the context** (connectivity, skills, cost):

- **Stock and warehouse management**: from a structured spreadsheet to specialised software; several tools have been developed for the humanitarian sector, some open-source and free.
- **Procurement tracking**: dashboard of requests, lead times and statuses, linked to finance.
- **ERP** integrating procurement, stocks, fleet and finance, for organisations of a certain size.
- **Distribution data**: beneficiary registration, distribution by card, QR code or biometrics, automatic reconciliation.
- **Vehicle and shipment tracking**.

Data protection. Beneficiary data (identity, location, biometrics) are sensitive: in a conflict, a beneficiary list can put people in danger. Principles: data minimisation (collect only what is necessary), informed consent, security (encryption, access rights), limited retention period, extreme caution with biometrics, and an impact assessment before any new system.

Organising the supply chain function

An effective supply chain function rests on:

- **A clear structure**: a country supply chain manager, with procurement, warehouse, fleet and transport managers; base logisticians in the field; a functional link with headquarters for standards and international procurement.
- **Written procedures** and an up-to-date manual, adapted to the context, with templates (purchase request, purchase order, stock cards, logbooks).
- Appropriate **delegations** of authority: too centralised, they slow everything down; too broad, they weaken control.
- **Skills**: continuous training, professional certifications for the sector, career paths for national staff.
- **A partnership with programmes and finance**: planning meetings, shared indicators, logistics present from the design of projects and budgets.

> Logistics that is consulted only after a project has been signed inherits unrealistic budgets and impossible lead times. Its place is at the table from the concept note onwards.

Coordination and common services

No organisation can do everything alone in a major crisis. Logistics coordination provides:

- **Shared information**: status of roads, ports and airports, capacities, customs procedures, transport prices.
- **Common services** when the market fails: road, air (UNHAS) and river transport, shared storage, fuel, emergency telecommunications (Emergency Telecommunications Cluster).
- **Collective advocacy** for access, exemptions and customs facilitation.
- **Joint procurement** and sharing of framework agreements between organisations.

Using a common service does not relieve an organisation of its obligations: it remains responsible for its goods, its documents and its accountability to beneficiaries and donors.

Final project: supply plan for a response

The final project of the Mini MBA Logistics and Supply Chain consists of writing, for a real crisis (using public data) or a fictional but realistic one, a **complete supply plan** of 6 to 10 pages:

- **1. Context and scenario**: target population, needs, phase, access and security constraints.
- **2. Supply chain mapping**: entry points, warehouses, corridors, lead times, capacities, bottlenecks.
- **3. Quantified needs**: items, specifications, quantities, schedule, safety stock and reorder point.
- **4. Procurement strategy**: local, regional or international, procedures, framework agreements, compared landed cost.
- **5. Transport, customs and storage**: modes, rotations, documents, exemptions, warehouse sizing.
- **6. Distribution and accountability**: sites, throughput, reconciliation, post-distribution monitoring, data protection.
- **7. Logistics budget and indicators**: cost per tonne or per household, dashboard, environmental footprint.
- **8. Risks and controls**: fraud, diversion, sanctions, road safety, contingency plan.

Evaluation criteria: accuracy of calculations, consistency between the parts, realism of lead times and costs, compliance with the rules (procurement, customs, sanctions), quality of accountability and clarity. The project is part of the third month's exam.

Exercise: taking over a supply chain in difficulty

Situation. You take over as head of supply chain for an operation in a conflict zone. Findings: median procurement lead time 52 days; supplier OTIF 64%; 2 of 5 warehouses without an inventory for 9 months; a local transporter belongs to the brother of a commander of an armed group; beneficiary lists are shared via unencrypted messaging; call verification: 88% confirmation on a sample of 250 households reached; logistics is not invited to project design meetings.

Task. Rank the problems by severity and propose a 30-, 60- and 90-day plan.

Answer. Severity: 1) the transporter linked to an armed group (risk of financing a party to the conflict, possible breach of sanctions and donor rules); 2) unprotected beneficiary lists (risk to people's safety); 3) the 88% confirmation rate (12% problems, i.e. about 30 households out of 250: risk of diversion); 4) the warehouses without an inventory; 5) lead times and OTIF; 6) the absence of logistics from project design. Plan. 30 days: suspend the transporter and screen the other service providers against sanctions lists, inform management and, depending on the contracts, donors; stop the unencrypted sharing, secure the lists, inform the teams; full inventories in the 2 warehouses with an outside team; investigation of the unconfirmed cases. 60 days: new transport tender with enhanced due diligence; breakdown of procurement lead time and revised delegations; supplier performance review. 90 days: monthly dashboard; logistics involvement in all concept notes; data protection procedures and training.

Key takeaways

- Conflicts and sanctions: screen all service providers, no payments to the parties, due diligence despite humanitarian exemptions.
- Remote management: third-party monitoring, digital evidence, calls to beneficiaries, reinforced reconciliations.
- Beneficiary data: minimise, secure, limit retention, caution with biometrics.
- Logistics must be at the table from the design of projects and budgets.
- Common services help, but each organisation remains responsible for its goods and its accountability.

Quiz

1. Sample of 400 households reached, 368 confirm full receipt. Confirmation rate:
   A. 92%
   B. 8%
   C. 86%
   D. 96%

2. A transporter belongs to a relative of an armed commander. The first action:
   A. Negotiate a better rate
   B. Suspend its use and apply enhanced due diligence
   C. Ignore it if the transporter is reliable
   D. Ask for a sworn statement

3. The principle of data minimisation means:
   A. Storing the data on a small disk
   B. Deleting all data
   C. Collecting only the data necessary for the purpose
   D. Sharing the data with fewer donors

4. In a conflict, using a common transport service:
   A. Transfers all responsibility to the common service
   B. Is prohibited
   C. Removes the need for reconciliations
   D. Does not relieve the organisation of its obligations regarding its goods and its accountability

5. Why should logistics take part in project design?
   A. To reduce the budget
   B. So that budgets, lead times and feasibility are realistic from the outset
   C. To choose the beneficiaries
   D. Because donors always require it

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