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Logistics centres and facility location: network design and the centre of gravity method

Logistics centres vs free zones and OSBs, Türkiye's 12 rail logistics centres, network design, location criteria and a centre of gravity example.

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SHORT ANSWER

A logistics centre is an area where independent companies and bodies dealing with freight transport, such as forwarders, carriers and customs, are grouped together with support services and at least one terminal (UNECE). A free zone is a customs and tax status and an OSB is an industrial planning model; a logistics centre does not confer any customs status by itself. Türkiye has 12 logistics centres on its national rail network (TCDD 2023, Ministry of Trade May 2026). Designing a warehouse network means balancing delivery speed against inventory and facility cost: pooling stock in one hub cuts safety stock, while more warehouses shorten delivery times. Location decisions weigh proximity to market, transport access, labour, land and incentives together; the centre of gravity method is a starting point that shows which area makes sense for transport.

Logistics centres, freight villages, free zones and OSBs

These four terms often appear in the same sentence, but they answer different questions. A logistics centre describes a **function**: a place where freight is gathered, transferred and distributed. A free zone is a **customs and tax status**. An organised industrial zone (OSB in Turkish) is an **industrial planning** model. A customs warehouse is a **facility** status for goods held under customs supervision.

Logistics centre (freight village). The combined transport terminology of the United Nations Economic Commission for Europe (UNECE) defines the logistics centre and the freight village under a single entry. In that definition, a logistics centre is a geographical grouping of independent companies and bodies dealing with freight transport, such as forwarders, carriers, shippers and customs, together with support services such as storage, maintenance and repair. The one indispensable condition is that it includes **at least one terminal**. In Türkiye the two expressions are often used for the same facilities; TCDD's official reports say "lojistik merkez" (logistics centre).

The academic literature also draws distinctions within this broad heading. *The Geography of Transport Systems* (Rodrigue, 6th edition, 2024) classifies logistics zones as follows:

- **Logistics park:** A planned zone combining distribution centres and light manufacturing. It may be served by road only.
- **Freight village:** The part of a logistics zone that clusters support services such as offices, fuel stations, hotels and restaurants.
- **Inland port or dry port:** An intermodal terminal, usually rail-served, with distribution activities clustered around it. The source considers this the most advanced form of logistics zone. For an inland container terminal away from the port, see the glossary entry ICD.
- **Port-centric and airport-centric zones:** Zones located right next to a gateway port or airport.

	Logistics centre / freight village	Free zone	Organised industrial zone (OSB)	Customs warehouse
What it describes	An area where freight is gathered, transferred and distributed	A zone with a separate customs and tax status	A production zone where industry is located in a planned way	A facility where goods wait under customs supervision
Legal basis	No dedicated law in Türkiye. A draft regulation by the Ministry of Transport and Infrastructure and the Ministry of Trade exists (see below)	Free Zones Law No. 3218	Organised Industrial Zones Law No. 4562	Customs Law No. 4458, customs warehousing procedure
Customs status	None by itself. Customs operations inside require a separate customs warehouse or temporary storage authorisation	Treated as outside the Turkish customs territory for customs procedures	None. A facility in the zone may hold its own customs warehouse authorisation	Goods wait under customs supervision with duties suspended
Number in Türkiye	12 logistics centres on the national rail network (Ministry of Trade, May 2026)	19 free zones under the Ministry of Trade (Ministry website, last checked November 2026)	416 OSBs, 12 of them with a rail connection (Ministry of Trade, May 2026)	Authorised facility by facility
More in the guide	This page	Free zones	This page	Customs warehouse types

When does an OSB matter for logistics? The purpose of Law No. 4562 is to set the rules for establishing, building and operating OSBs; its definition stresses locating industry in suitable areas and preventing unplanned industrialisation. Its relevance to logistics is that the factories inside make it a large source of freight. According to the Ministry of Trade's May 2026 report *Dış Ticaret Lojistiği* (Foreign Trade Logistics), there are 240 rail-connected freight generation and transfer centres, including ports, piers, OSBs and factories, and only 12 of the 416 OSBs are connected to the railway.

The draft regulation. The draft "Regulation on Logistics Centres" prepared by the Ministry of Transport and Infrastructure and the Ministry of Trade defines a logistics centre as one with effective links to different transport modes, where different businesses carry out transport, logistics and distribution activities together. According to the draft text published on the Ministry's website, a logistics centre must cover at least 500,000 m^2, have access to at least two transport modes and be at least 50 km by road from the nearest logistics centre. The minister also announced these criteria publicly in December 2023. As of November 2026 we could not confirm that the regulation has been published in the Official Gazette, so read these criteria as a draft, not as rules in force.

Rail logistics centres in Türkiye

According to TCDD's *Railway Sector Report 2023*, 12 logistics centres have been opened. The Ministry of Trade's May 2026 report also states that there are 12 logistics centres on the national rail network. The two official sources agree on the number; the names are taken from the TCDD report:

Province	Logistics centre
Samsun	Gelemen
Kocaeli (İzmit)	Köseköy
Uşak	Uşak
İstanbul	Halkalı
Eskişehir	Hasanbey
Balıkesir	Gökköy
Denizli	Kaklık
Kahramanmaraş	Türkoğlu

Province	Logistics centre
Erzurum	Palandöken
Mersin	Yenice
Konya	Kayacık
Kars	Kars

The same report states that construction and design work is under way on 11 more logistics centres. As of 2023, the centres under construction included Sivas and Kayseri (Boğazköprü), while centres such as Bilecik (Bozüyük), Mardin and Habur were at the study, design and planning stage. The report also notes that the Transport and Logistics Master Plan aims to raise the number of logistics centres from 12 to 26.

The list changes over time. Check the latest publications of TCDD and the Ministry of Transport and Infrastructure for newly opened centres (last checked: November 2026). How rail is combined with road and sea is covered in **Intermodal and combined transport**.

Network design: one hub or many warehouses?

Network design answers three questions: how many warehouses, where, and which customer is served from which warehouse? At its core the decision balances **speed** for the customer against **cost** for the company.

	Centralised network (a few large warehouses)	Decentralised network (many regional warehouses)
Delivery time	Longer for distant customers	Closer to the customer, shorter
Total inventory	Lower; demand fluctuations offset each other in a single pool	Higher; each warehouse holds its own safety stock
Facility cost	Few leases, teams and systems	A separate lease, team and system for each warehouse
Transport	Inbound freight is consolidated; the outbound leg to the customer is long	Replenishment between warehouses increases; the last delivery leg is shorter
Typically suits	High-value products with volatile demand that do not need fast delivery	Products that need fast delivery, or bulky and low-value products

The last row is a generalisation, not a rule. The decision should rest on a total cost calculation using your own product and customer data.

Why does centralising reduce inventory? Maister's 1976 "square root law" states that total inventory in a system is proportional to the square root of the number of locations where a product is stocked. Eppen's (1979) model sets out the conditions: if demand at the locations is independent and identically distributed, pooling stock in one location cuts the safety stock needed by the square root of the number of locations. The more demand at the locations moves together, the smaller the benefit; with perfect correlation it disappears.

Example (figures are illustrative): Four regional warehouses each hold 100 units of safety stock for the same service level, 400 units in total. Assuming independent, equal demand, a single hub needs about $100 \times \sqrt{4} = 200$ units. How safety stock is calculated is covered in Warehousing and inventory management.

Adding warehouses brings diminishing returns. In Rodrigue's model for the United States, increasing the number of distribution centres from 3 to 10 cuts average lead time from 1.29 days to 1.04 days, and after six centres each additional one adds little. In your own network, each new warehouse may save less time than the one before, but each brings its own lease, staff and safety stock cost.

The effect of transport mode on inventory cost (inventory in transit) is covered in Choosing a transport mode, and resilience against disruptions in the network in Supply chain basics.

Facility location criteria

The location of a warehouse or logistics facility locks in a cost structure for years. The criteria that stand out in Rodrigue's work on logistics zones and in open-access operations management textbooks are:

Criterion	What to look at	Watch out for
Proximity to market	Where customers and demand are concentrated; expected delivery times	Logistics zones in regions with a thin local market carry more risk
Transport access	Distance to motorway junctions, rail terminals, ports and airports	Import-oriented freight favours corridors towards consumption markets; export-oriented freight favours proximity to the port
Labour	Availability of warehouse staff and drivers in the area; wage levels	Rodrigue often sees labour as the most important criterion; as automation grows, so does the need for skilled staff
Land	Size, zoning, price, room for expansion	Logistics facilities use large areas; suitably zoned land at a reasonable price is decisive
Infrastructure	Power, water, road access, large users nearby	A large tenant or manufacturer attracts other logistics firms around it
Status and incentives	Free zone, OSB, customs warehouse authorisation, investment incentives	Conditions change; check current legislation before deciding

Incentives. In Türkiye the current basis for investment incentives is Presidential Decision No. 9903 on State Aid in Investments, published in the Official Gazette on 30 May 2025. The Decision explicitly lists licensed warehousing investments among priority investments (Art. 9). Which support other logistics investments receive depends on the investment subject, the region and the annexes to the Decision; check the current text before committing. Tax exemptions in free zones are covered in the free zones section of HS codes and customs procedures in Türkiye.

How do you combine the criteria? A common method is to compare candidate sites with weighted scoring against these criteria. A step-by-step application of the same method to supplier selection is in Purchasing and supplier selection; for location only the criteria change. The simplest way to put a number on transport cost is the centre of gravity method below.

Centre of gravity method: a worked example

The centre of gravity method finds the approximate location of a single warehouse that will serve several markets. Each market is given a coordinate (x, y), and the volume shipped to that market (Q) is used as its weight:

$$x^* = \Sigma(x_i \cdot Q_i) / \Sigma Q_i \cdot y^* = \Sigma(y_i \cdot Q_i) / \Sigma Q_i$$

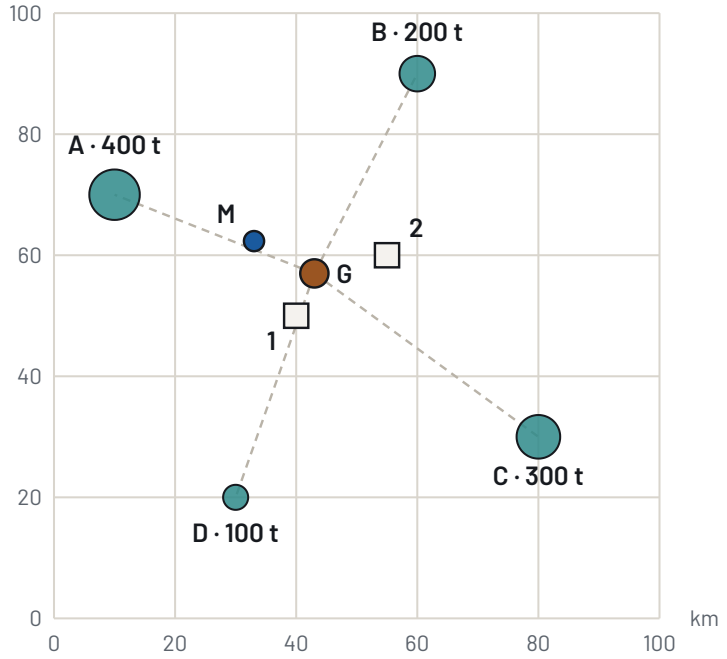
Some textbooks also include the transport rate in the weight (volume × rate). If all markets are served at the same rate, the two versions give the same result.

Example (all figures are illustrative and do not represent a real city or company). A distributor serves four markets placed on a 100 × 100 km map:

Market	x (km)	y (km)	Monthly volume Q (tonnes)	x · Q	y · Q
A	10	70	400	4,000	28,000
B	60	90	200	12,000	18,000
C	80	30	300	24,000	9,000
D	30	20	100	3,000	2,000
Total			**1,000**	**43,000**	**57,000**

x* = 43,000 / 1,000 = **43** km, y* = 57,000 / 1,000 = **57** km. The centre of gravity is G (43, 57). Straight-line distances from this point to the markets, and monthly tonne-km:

Market	Distance to G (km)	Tonne-km (Q × distance)
A	35.47	14,187.3
B	37.12	7,424.3
C	45.80	13,741.2
D	39.22	3,921.7
Total		**39,274.5**



Centre of gravity with the example data. Circle size is proportional to monthly volume. G: centre of gravity (43, 57). M: the point that minimises total tonne-km (about 33, 62). 1 and 2: candidate warehouse sites. Dashed lines show straight-line distance.

The result is a starting point, not a final answer. It needs correcting for three reasons:

1. **The shortest total distance may lie elsewhere.** Mathematically, the centre of gravity minimises the sum of weighted *squared* distances, not total tonne-km. The point that minimises tonne-km is found by an iterative calculation (the Weiszfeld method). In this example that point M comes out at about (33.0, 62.3), with a total of 38,787.5 tonne-km. The total at G is about 1.3% higher. Textbooks also present the centre of gravity as an approximation.
2. **Distances are straight-line.** Real road distances are longer, and they do not stretch by the same ratio in every direction. Do the final comparison with real route distances.
3. **The point may not fall on available land.** G may be in the middle of a field, a residential area or land that cannot be developed. That is why the calculation is used to compare real candidate sites.

Comparing candidate sites. The example has two realistic candidates: Site 1 (40, 50) near a motorway junction, and Site 2 (55, 60) where rental warehouse space is available. With the same calculation:

Point	Coordinates	Monthly tonne-km	Difference from M
M (shortest total distance)	≈ (33.0, 62.3)	38,787.5	–
G (centre of gravity)	(43, 57)	39,274.5	+1.3%

Point	Coordinates	Monthly tonne-km	Difference from M
Site 1	(40, 50)	39,945.2	+3.0%
Site 2	(55, 60)	40,954.2	+5.6%

Site 2 adds about 1,009 tonne-km of transport per month compared with Site 1. Multiply that difference by your own cost per tonne-km and set it against the differences in rent, labour and access between the two sites. Transport cost favours Site 1, but a rent difference or the labour situation in the area can reverse the decision. The method does not replace those criteria; it puts a number on the transport line.

Where to go next in the guide

- Storage types, customs warehouses and inventory calculations: **Warehousing and inventory management**
- The customs and tax side of free zones: HS codes and customs procedures in Türkiye (free zones section)
- Combining rail with other modes: **Intermodal and combined transport**
- Mode choice and inventory in transit: **Choosing a transport mode**
- The overall structure of the supply chain: **Supply chain basics**
- Terminal and yard processes in the port: **How cargo moves through a port**
- Logistics costs and performance indicators: Pricing and decision models

Which courses cover this topic?

Two headings on the course map correspond to this page: "Network design and facility location" and "Logistics centres and freight villages". Network design appears as a dedicated course mainly in master's and certificate programmes, while logistics centres appear as a dedicated course in bachelor's programmes in Türkiye. Some examples from the map:

- Atatürk University — International Trade and Logistics (bachelor's) — Logistics Centres (IUT201)
- Anadolu University, Open Education Faculty — Logistics (associate degree) — Principles of Logistics (LOJ101U), as part of a course
- Kastamonu University — International Trade and Logistics (bachelor's) — Urban Logistics (AİS056), as part of a course
- Zaragoza Logistics Center (MIT-Zaragoza) — ZLOG master's — Supply Chain Network Design and Logistics Facilities & Operations
- University of Antwerp — Master of Maritime and Logistics Management — Transport and Location (2121TEWTEL)
- National University of Singapore — MSc Supply Chain Management — Facility Layout and Location (IE5108)
- MIT CTL / MITx — MicroMasters in Supply Chain Management (open course) — Supply Chain Design (CTL.SC2x)
- CILT International — International Diploma in Logistics and Transport (Level 5) — Supply Chain Network Planning (PD17)

Test yourself

1. A company has moved its warehouse into a logistics centre. Can it now hold imported goods there without paying duties? *(Answer: Being in a logistics centre does not achieve that by itself. For goods to wait under customs supervision, the facility needs a customs warehouse or temporary storage authorisation. If a separate status for customs procedures is wanted, a free zone is a different option.)*
2. Six regional warehouses each hold 50 units of safety stock. If demand is independent and equal in size, about how much safety stock does a single hub need for the same service level? *(Answer: $50 \times \sqrt{6} \approx 122$ units, about 59% less than the 300 units in the decentralised network.)*

3. There are two markets: P1 at (0, 0) with 300 tonnes and P2 at (100, 0) with 100 tonnes. What is the x coordinate of the centre of gravity? *(Answer: (0 × 300 + 100 × 100) / 400 = 25 km.)*
4. The centre of gravity calculation points to a lakeshore. Was the calculation wasted? *(Answer: No. It shows which area makes sense in terms of transport cost. Real candidate plots are chosen around that point, recalculated with real road distances, and compared together with land, labour, access and incentive criteria.)*

Frequently asked questions

Is a logistics centre the same as a freight village?

UNECE's combined transport terminology defines the two terms under one entry, and in Türkiye they are often used for the same facilities. Academic sources may distinguish the freight village as the part of a logistics zone that clusters support services such as offices, fuel stations, hotels and restaurants.

Is a warehouse in a logistics centre a customs warehouse?

Not by itself. A logistics centre describes a function and confers no customs status. For goods to wait with duties suspended, the facility needs a customs warehouse or temporary storage authorisation from the Ministry of Trade.

How many rail logistics centres does Türkiye have?

According to TCDD's Railway Sector Report 2023, 12 logistics centres have been opened; the Ministry of Trade's May 2026 report also states that there are 12 logistics centres on the national rail network. The same TCDD report said construction and design work was under way on 11 more.

Does the centre of gravity method give the best warehouse location?

No, it gives a good starting point. It uses straight-line distances and minimises the sum of weighted squared distances rather than total tonne-km. The point may also not fall on suitable land. Real candidate sites are chosen around it and compared using real road distances.

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