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INVESTMENT & TECHNICAL CONCEPT

MEDITERRANEAN DEEP-WATER GRAIN HUB

Grain hub concept for a Mediterranean deep-water port

Initial concept · Location and selected project identifiers removed

10 Mt/year · 2 Mt storage · CAPEX USD 340–430 M
base case, onshore scope excluding quay works, harbour works and external infrastructure

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1. Initial data

This concept for a dedicated grain import-transit terminal (hub) at a Mediterranean deep-water port is intended to support an initial discussion of the investment case, a rational process layout of the terminal, the equipment set, the required land area, and the indicative cost range of the project's onshore part — excluding marine works (quay construction and dredging) and external infrastructure.

Item	Input
Location	Deep-water port, Mediterranean Sea
Purpose	Grain import, storage, distribution across the domestic market, transit to regional export markets, sea and inland-waterway shipment
Annual throughput	10 Mt/year
Cargo mix	Wheat 90%; corn, barley 10%
Design vessels	Panamax, 60–80 kt lots; vessels up to 80,000–100,000 DWT
Transit vessels	Barges from 500 t, coaster vessels, Handy / Handymax up to 30,000 DWT
Vessel discharge rate	At least 25,000 t/day; recommended design throughput 40,000–50,000 t/day
Vessel loading rate	At least 15,000 t/day
Storage	2 Mt simultaneous storage (in stages)
Shipment	Trucks, railway wagons, sea/coastal vessels, bagging into sacks and big bags
Quay/harbour	Excluded from cost; required parameters only

Required quay-front parameters

Parameter	Recommended value
Quay-front length	650–700 m
Number of berths	2 berths with parallel-operation capability
Depth alongside	Minimum 15 m; preferably 16–17 m with an operational allowance
Vessel class	Panamax for import; Handy / Handymax / coasters / barges for transit
Operating area	Sufficient load-bearing capacity for loading/discharging equipment

The port is officially positioned as a deep-water port, with new berths under construction and a prospective depth of up to 22 m.

2. Concept Summary

The project is proposed to be developed as the Mediterranean Deep-Water Grain Hub — a large import-and-distribution grain complex of national and regional significance. The hub's primary function is to accept Panamax-class grain import vessels, store the grain, distribute it across the domestic market, and onward dispatch by sea or land to regional export markets.

Concept element	Solution
Process model	Continuous mechanical ship discharge + covered conveyors + silos / flat-storage warehouses
Primary discharge	2 mechanical ship unloaders, Portalink-type / bucket-chain
Backup and flexibility	1 mobile harbour crane with a large-volume grain grab and hopper
Vessel loading	1 ship loader
Storage	Up to 2 Mt: steel silos + flat-storage warehouses
Site area	Stage 1: 25–40 ha; full development 60–90 ha; up to 100 ha with extended reserve and a larger flat-storage share
Onshore CAPEX, excluding marine works and external infrastructure	Stage 1: 3–5 Mt/year: USD 180–280 M; full development to 10 Mt/year and 2 Mt storage: base case USD 340–430 M; conservative scenario: up to USD 506 M

The CAPEX range assumes that the quay, dredging, breakwaters and external transport and utility networks are financed by the port/state and are not included in the terminal cost.

3. Terminal Process Flow (import and shipment)

3.1. Main import flow

- Panamax vessel → continuous mechanical ship unloader → covered belt conveyor → distribution tower → silos / flat-storage warehouses.
- Grain is then routed to truck and railway wagons loading stations, sea (river) shipment, bagging or long-term storage.

3.2. Shipment by sea / inland waterways and transit

- Silos / warehouses → conveyor line → ship loader → vessels (barges, coasters and Handy-size)
- The ship loader loading rate is 200 to 1,000 t/h for small vessels and precise hold topping-off.
- Projected loading rate — 15,000 t/day.

3.3. Landside shipment

Truck loading station

- 12–24 truck loading lines with loading hoppers at full development.
- 4–8 truck weighbridges, automated entry/exit control, sampling and lab integration.
- Truck parking area for 200–400 trucks depending on the operating regime and port constraints.

Railway loading station (subject to a railway connection)

- internal yard, 1–2 wagon-loading fronts of 8–16 wagons each, loading hoppers, wagon weighbridges, sampling, formation of unit-train consignments.
- The availability or prospect of a direct freight-rail connection to the specific site requires confirmation from the port authority and the national railway operator.

4. Main Equipment

Equipment	Quantity / parameters	Role
Mechanical ship unloaders	2 units; 1,000–1,500 t/h each	Primary discharge of import vessels
Ship loader	1 unit; 200–1,000 t/h	Shipment of barges / coasters / Handy
Mobile harbour crane	1 unit; LHM 550/600 class or equivalent	Backup, cargo shifting, maintenance operations
Grain grab	1–2 units; 40 m³	Used with the mobile crane
Hopper with dust-control system	1 unit; 700–1,200 t/h	Backup grab discharge with aspiration
Covered conveyors	2 independent main lines	Transfer from quay to storage area
Bucket elevators, towers, transfer towers	According to design	Routing to silos, warehouses and loading stations
Truck loading station	12–24 lines	Distribution across the domestic market
Railway loading station	1–2 fronts / 8–16 wagons each	Large domestic consignments
Bagging facilities	500–2,000 t/day	Sacks, big bags, palletizing

Projected capacity

Flow	Recommended capacity	Comment
Vessel discharge	40,000–50,000 t/day	Above the minimum 25,000 t/day for stable 10 Mt/year operation
Vessel loading	15,000+ t/day	One ship loader
Truck loading station	1,000–2,000 t/h total	Depends on the number of lines and truck parking arrangement
Railway loading station	1,000–2,000 t/h	After confirmation of the connection and wagon scheme
Bagging	500–2,000 t/day	Additional commercial flexibility

5. Storage and Warehousing Architecture

Storage capacity of up to 2 Mt is envisaged under a combined model: steel silos for operational and medium-term storage plus flat-storage warehouses for long-term grain storage.

Storage block	Full-development capacity	Purpose
Buffer silos at the quay front	50,000–100,000 t	Smoothing vessel discharge and routing flows
Operational steel silos	400,000–600,000 t	Fast turnover, lots, quality, road / rail / sea shipments
Long-term steel silos	600,000–800,000 t	Long-term storage with temperature control and aeration
Flat-storage warehouses	600,000–900,000 t	Long-term storage with temperature control and aeration
Bagged-product warehouse	As required	Sacks, big bags, pallets
Total	**Up to 2,000,000 t**	**Full prospective capacity**

Recommended base storage option

Type	Capacity	CAPEX guide	Cost
Steel silos	1,200,000 t	USD 40–70/t installed	USD 48–80 M
Flat-storage warehouses	800,000 t	USD 20–50/t	USD 16–40 M
Additional mechanization, aeration, integration	As designed	Reserve	USD 14–30 M
Total storage	**2,000,000 t**		**USD 80–150 M**

6. Site Land Area

A realistic range for full development is 60–90 ha, with possible expansion to 100 ha given a significant flat-storage share and a land reserve. For Stage 1, plan for 25–40 ha depending on warehouse layout, transport scheme and the readiness of port-side infrastructure.

Zone	Stage 1	Full development
Quay operating zone	3–5 ha	4–6 ha
Conveyor corridors, towers	2–4 ha	4–6 ha
Silo park	8–15 ha	20–35 ha
Flat-storage warehouses	5–10 ha	15–25 ha
Truck loading station, weighbridges, staging	4–6 ha	6–10 ha
Railway loading station, internal yard	3–6 ha	6–12 ha
Bagging, lab, workshops, admin	2–4 ha	4–6 ha
Roads, utilities, fire breaks, reserve	5–8 ha	10–18 ha
Total	**25–40 ha**	**60–90 ha**

7. Automation, Environment and Safety

The terminal is run by an integrated system controlling conveyors, ship unloaders, towers, gates and grain routing, with a warehouse management system tracking lots, owners, quality, storage locations and operations. Quantity and quality are managed through hopper scales, automatic samplers at vessel discharge, truck and rail wagon loading stations, and a laboratory covering quality parameters, while thermometry and aeration maintain grain condition in silos and warehouses.

Environmental and safety systems are built in as a baseline condition for sustainable operation: dust aspiration and filtration at transfer points, hoppers, towers and bagging, combined with grain-dust explosion protection, fire-water lines and pump stations, and lightning protection.

8. Implementation Stages

Stage	Throughput	Storage	Main scope
Lean start	3 Mt/year	200–300 kt	1 mechanical unloader, 1 mobile harbour crane + hopper, 1 ship loader, basic conveyors, truck loading station, rail provisions
Stage 1 base	3–5 Mt/year	500–700 kt	2 mechanical unloaders, mobile harbour crane + hopper, ship loader, silos + flat-storage warehouses, truck loading station, basic rail loading station, bagging
Stage 2	Up to 7 Mt/year	1.0–1.3 Mt	Expansion of silos, warehouses, rail fronts, truck loading station and automation
Full development	Up to 10 Mt/year	Up to 2 Mt	2 unloaders, 1 mobile crane, 1 ship loader, 2 independent lines, full truck / rail / sea shipment

The staged development lowers the entry barrier for the investor and avoids overloading Stage 1 with excess infrastructure. The task of the first stage is to confirm the cargo flow, refine the logistics, and then expand the terminal into a regional-scale hub.

9. Preliminary CAPEX Estimate

The estimate is preliminary. It excludes quay construction, dredging, breakwaters, land purchase or lease, external rail connection, external utility networks, taxes, financing and customs charges. Prices are indicative at the investment-concept level and should be refined against geological conditions, the utility-connection scheme, site logistics and suppliers' quotations.

The CAPEX figures should be treated as preliminary order-of-magnitude estimates, not as a contractor quotation or a binding project budget.

9.1. Cost of storage facilities: market benchmarks

Storage type	Indicative cost	Comment
Steel silos	USD 25–45/t of storage	Base cost of silo capacity; large terminals gain economies of scale
Steel silos, installed	USD 40–70/t	With foundations, aeration, thermometry and basic integration
Concrete silos	USD 70–120/t	More expensive, heavier, higher foundation requirements
Flat-storage warehouses	USD 20–50/t	Suitable for the strategic reserve and large wheat lots

For this grain hub, the preferred storage architecture is based on steel silos as the primary storage architecture, adding flat-storage warehouses for long-term storage of large lots.

9.2. Full development: 10 Mt/year, storage up to 2 Mt

No.	Item	Estimate, USD M	Comment
1	2 mechanical ship unloaders	16–28	Primary vessel discharge
2	1 ship loader	5–10	200–1,000 t/h
3	Mobile harbour crane	5–7	Backup and ancillary operations
4	Grain grab + hopper with dust-control system	2–3	Backup grab discharge
5	Quay and main conveyors	25–45	Excluding quay construction
6	Internal conveyors, towers, elevators	30–55	Routing to warehouses and shipment
7	Storage, 2 Mt	80–150	Steel silos + flat-storage warehouses
8	Truck loading station	5–8	Lines, weighbridges, staging
9	Railway loading station	7–12	Excluding external connection
10	Bagging	2–4	Sacks, big bags
11	Laboratory, sampling, quality system	2–3	Vessel, trucks, railway
12	Aspiration, fire-protection systems	10–20	Dust, environment, safety
13	Electrical, substations, cabling	15–20	Terminal internal power supply
14	Process control system	5–10	Flow and lot management
15	Foundations, roads, paving, drainage	30–40	Depends on soils and degree of site preparation
16	Buildings, workshops, spares, mobile equipment	5–7	Operational infrastructure
17	Engineering, EPCM, contingency	49–85	EPCM + contingency; 20% of direct costs
	Total	**293–506**	**CAPEX total**

A scenario range of USD 293–506 M is recommended.

Scenario	Onshore CAPEX, excl. quay
Lean / optimized	USD 293–340 M
Base case	USD 340–430 M
Conservative case	USD 430–506 M

9.3. Stage 1

Scenario	Throughput	Storage	CAPEX excl. quay
Lean start	About 3 Mt/year	200,000–300,000 t	USD 120–180 M
Stage 1 base	3–5 Mt/year	500,000–700,000 t	USD 180–280 M
Conservative variant	3–5 Mt/year	500,000–700,000 t + reinforced infrastructure	USD 250–350 M

10. Limitations and Matters Outside the Scope of This Document

This concept is preliminary and of an investment-and-technology nature, limited to the process scheme, equipment set, required land area and the CAPEX range of the terminal's onshore part. The matters listed below — critical to the project's feasibility and economics — fall outside the scope of this document and are to be addressed at the pre-feasibility / feasibility, marine engineering and financial-modelling stages:

- **Market rationale and competition** — target market share, sources of cargo flow and positioning relative to existing regional grain gateways.
- **Anchor demand and commercial model** — counterparties, contract form (concession / BOT, tolling, take-or-pay) and secured guaranteed volume.
- **Full (all-in) project cost** — quay, dredging, breakwaters, land purchase or lease, external rail connection and utility networks, financing, taxes and customs charges, as well as the estimate accuracy class and contingency.
- **Landside shipment** — confirmation of the rail connection (a critical factor for reaching full capacity) and the capacity of shipment by trucks.
- **Transit and re-export** — treated as an optional upside scenario and not included in the base case.

11. Conclusion

The grain hub project, with a throughput of 10 Mt/year and 2 Mt of storage, is technically feasible provided that sufficient land is allocated, a deep-water quay front and harbour are created, and stable land-side logistics are arranged. The model is a dedicated grain hub with mechanical discharge, covered conveyors, steel silos and flat-storage warehouses, and a mobile harbour crane as backup and ancillary equipment.

The base-case CAPEX for the onshore part of the terminal at full development, excluding the quay, dredging and external infrastructure, is within USD 340–430 M (base case), with a technical range of USD 293–506 M.

Stage 1, with a throughput of 3–5 Mt/year and 500–700 kt of storage, is estimated at USD 180–280 M, while the minimum lean option at 3 Mt/year is within USD 120–180 M range.

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