

Port Planning Challenges and Innovative Solutions to Boost Port Throughput

A Beira Perspective



1998



Cornelder
de Moçambique S.A.



1998

- Start of Operations under Cornelder de Moçambique.
- Great location, a lot of potential but with limitations and little use by the hinterland.
- Access Channel with a draft of -3m.
- 301 employees in the company of which only 10 Women.
- Few computers, no centralized systems.
- 1 Reach stacker. 3 x 40t Forklifts.
- Mozambique Customs with manual systems.
- The dwell time of containers and cargo was measured in weeks/months, not days.
- 700 TEU / Vessels with a capacity of 15,000t



Now



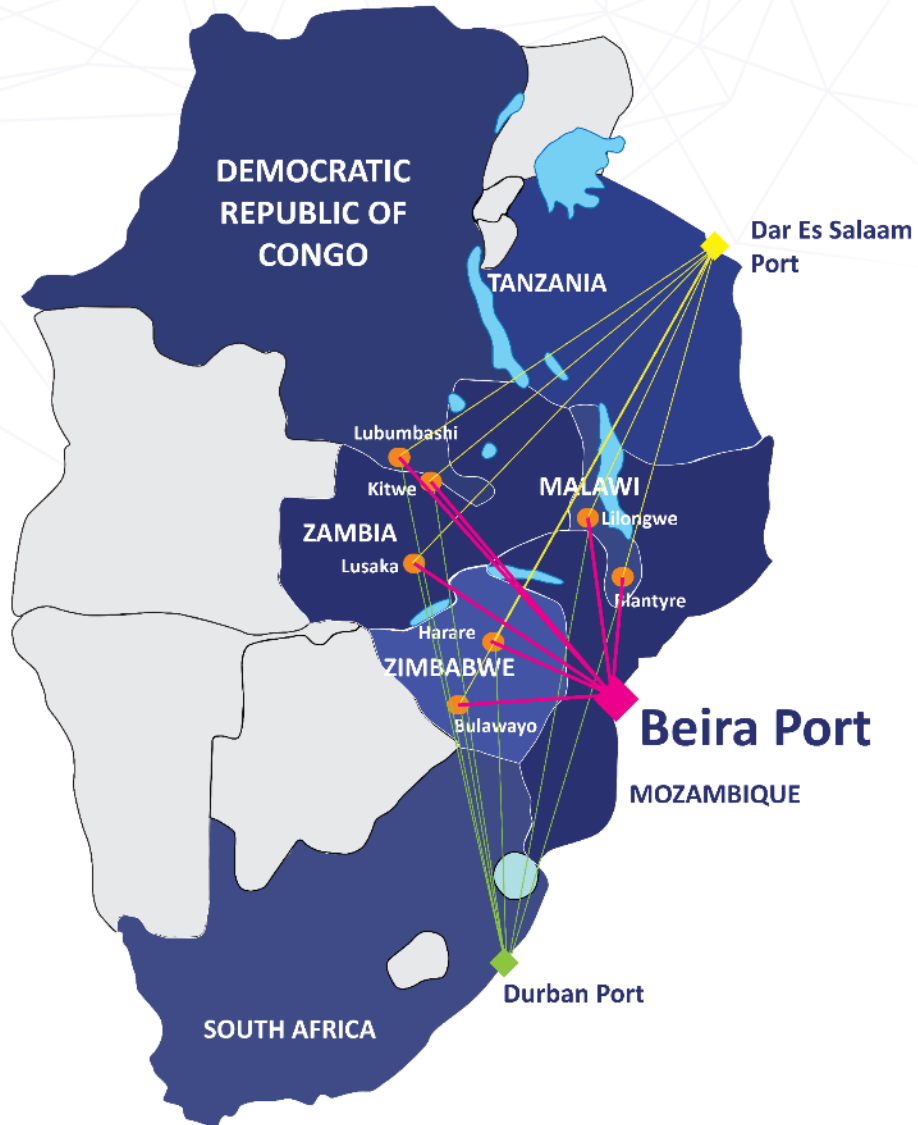
Cornelder
de Moçambique S.A.



Terminais of the Port of Beira



A Growing Region

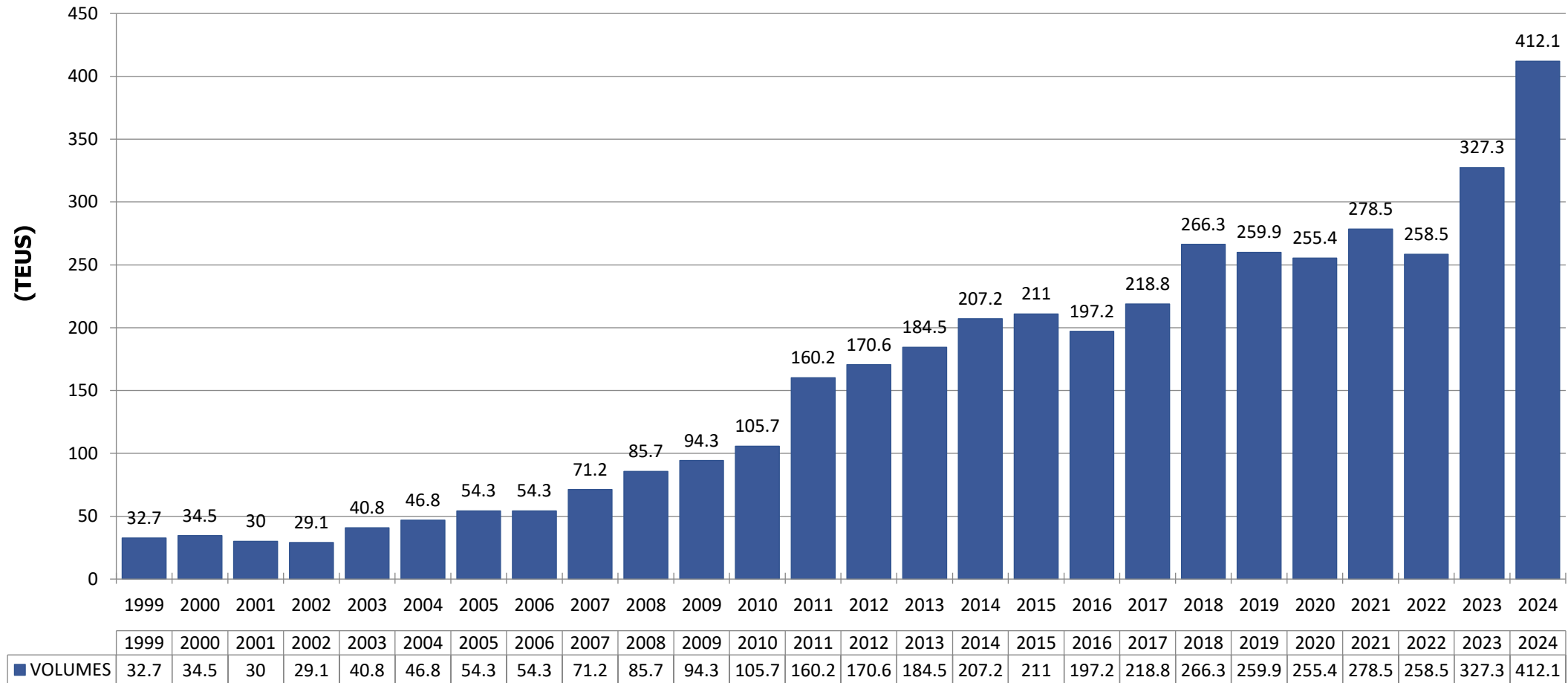


- 1998 DRC Copper production <100.000 Mtons
- 2024 DRC Copper production ~3.3 million Mtons
- 1998 Zambia Fertiliser Import 96.900 Mtons
- 2024 Zambia Fertilizer Import >500.000 Mtons
- 2008 - Zimbabwe Tobacco 48.000 Mtons
- 2024-2025 over 300.000 Mtons
- Chrome Ore export banned in 2011 now over more than 1.5 millions tone is being exported out of Zimbabwe
- Before 2023 Zimbabwe only had one lithium mine, in 2025 it is now the Worlds 4th largest producer with volumes exceeding 1 million Mtons.



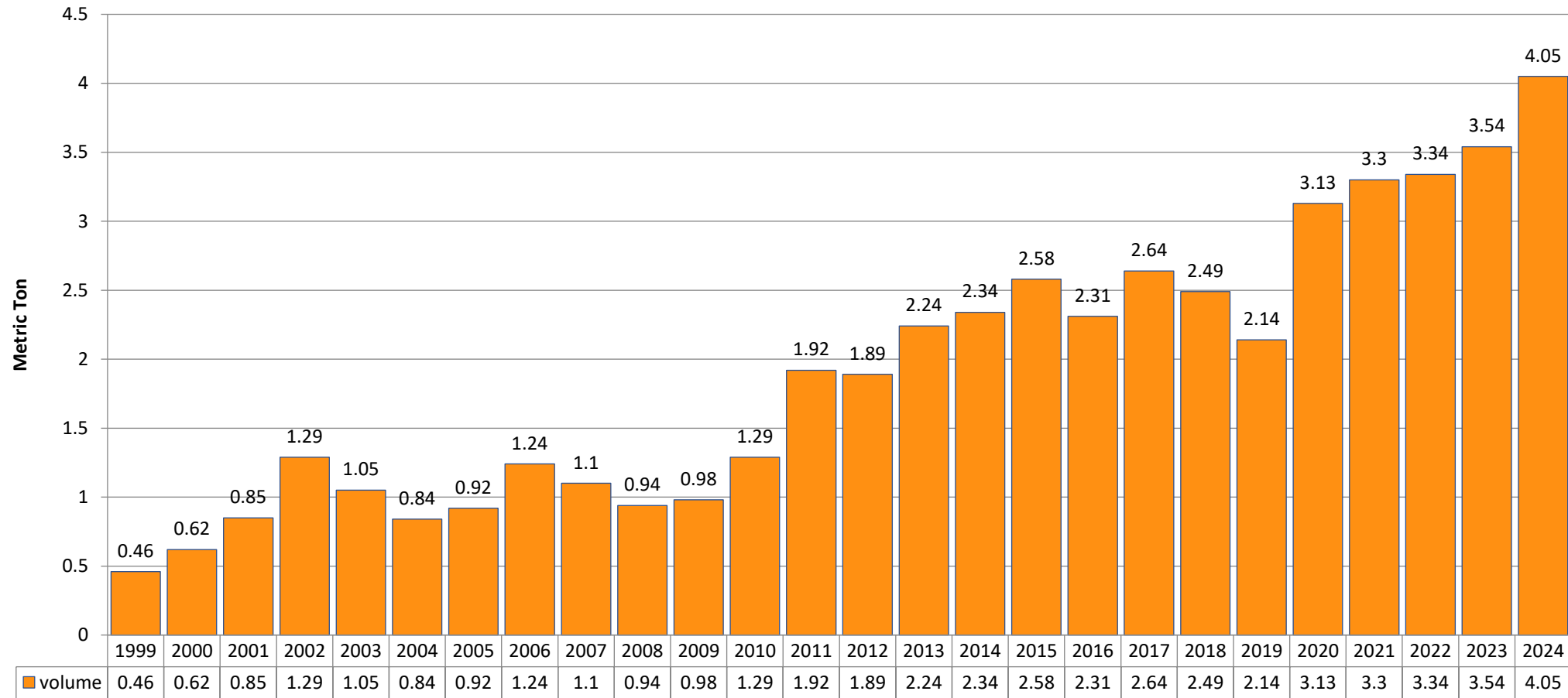
Then & Now

Containers Handled 1999-2024 (TEU)



Then & Now

General Cargo Handled 1999-2024 (Million tons)



Port Planning Challenges in Southern Africa

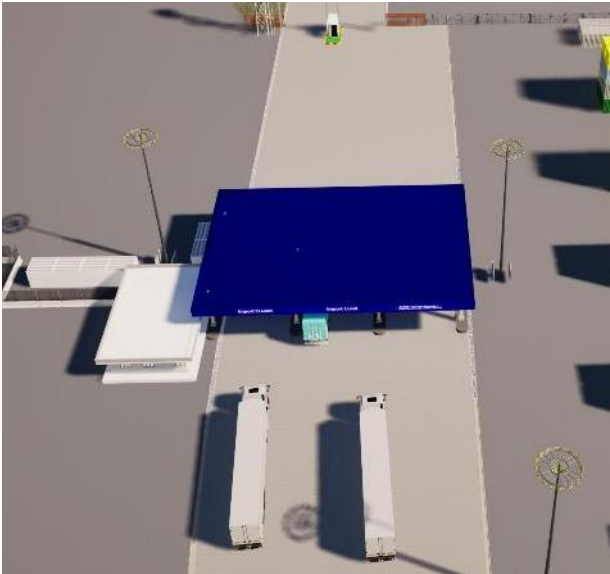
Port Planning and implementation of solutions is hard everywhere, but our region has some additional challenges.

- 🌐 Unstable and unpredictable markets.
- 🌐 Regulatory changes and logistical bottlenecks impacting Ports.
- 🌐 EU/USA/Asian systems and paradigms not always suitable to local context.



Regulatory change challenges: CT Exit Gate

Target Capacity: 700.000TEU per year
Initial design: Traditional 4 lane, 2 stage (customs + terminal).

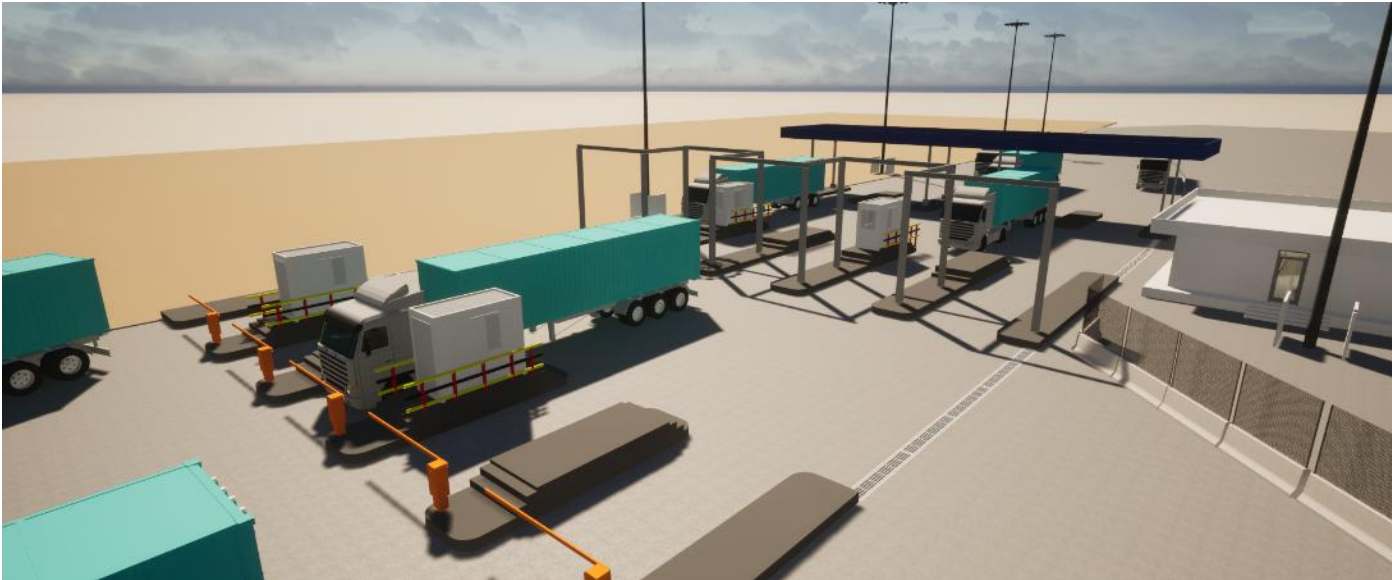


Before E-Sealing		
Time per truck	120	seconds
Max Capacity per lane	30	trucks/h
Truck Lanes	4	
Max Capacity per hour	120	trucks/h
Effective Capacity Factor	60%	
Practical capacity per day	1,728	trucks/d
Peak season factor	20%	
Practical capacity per year	504,576	Truck moves

With E-sealing and old design		
Time per truck	360	seconds
Max Capacity per lane	10	trucks/h
Truck Lanes	4	
Max Capacity per hour	40	trucks/h
Effective Capacity Factor	50%	
Practical capacity per day	480	trucks/d
Peak season factor	20%	
Practical capacity per year	140,160	Truck moves

Case Study: Container Exit Gate

First revised design: 5 lanes, 3 stage (terminal + customs + e-seal), OCR Portals.

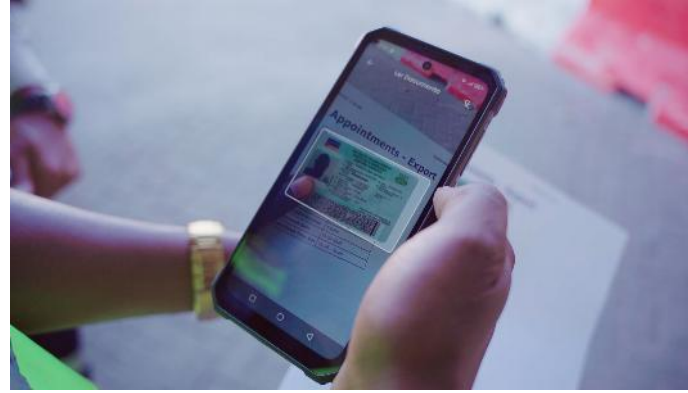


Practical insights: After seeing the e-sealing working for a period, we realized that the design would not be practical.

Regular delays between customs system and e-seal emission would make on most days the gate block up in spite of in theory 2 trucks able to seal per lane simultaneously.

Solution: C-gate GOS

Flexible but secure handheld Gate Operating system developed in Beira



Fixed drive through OCR portals for damage registration and pre-check

Handheld Applications for Truck & Driver Validation, Seal scans, linked to appointment system.

Mobile printers for receipts

Flexible deployment, extremely scalable

C-gate GOS – Permits flexible gate design



Terminal Gate out Transactions can be done 200m away from customs/scanning. Multiple trucks standing parallel or in queue processed simultaneously.

E-sealing done in a buffer parking area.

OCR Portals only act as a high-speed exit gate security scan.

If e-sealing/customs processes change in future, we

Yard Capacity Expansion



For 700.000TEU with expected avg dwell times, we need extra yard capacity:

- 5 hectares of new pavement
- Adding RTG operations to supplement the reach stackers.



Planning Challenges: dwell time fluctuations

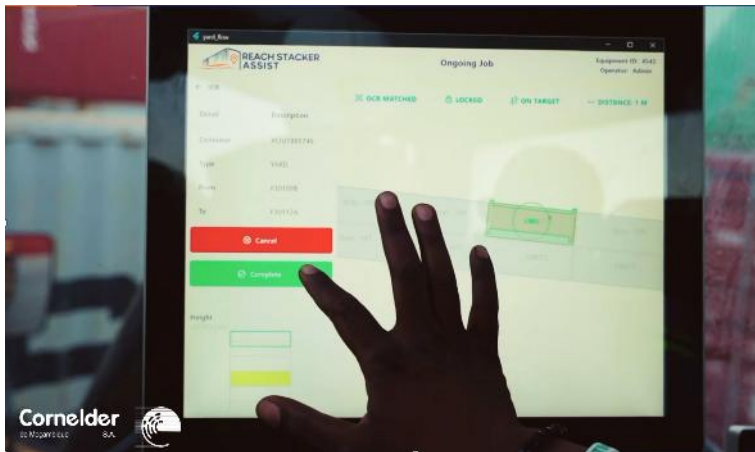


Average dwell times have trended downwards, but upheavals can lead to big temporary swings.

- Cyclones/weather closures
- Regional Logistical interruptions
- Global supply chain interruptions

Emergency Surge / Improvisation capacity is essential, but difficult to reconcile with yard automation and rigid systems.

Solution: Terminal Flow



- Automation to enhance human performance.
- Rigid controls without losing flexibility.
- Guides operators with centimetre accuracy to the container slots.
- Ability to create virtual yards in unpainted or even unpaved areas in a matter of hours in case of emergencies.
- OCR verification for each move done.
- Guiding tractors and handlers on the most efficient routes.





Expansion quay capacity



Post Panamax Ship with 295m regularly calling Beira.



- 🌐 Tender for 2 new STS cranes in final stage
- 🌐 Quay suitable for 19-row wide STS cranes.
- 🌐 Capable of operating on vessels up to 10,000TEU





Security is always key

- 355 CCTV cameras in key areas identified for security and operational control:
 - Access to landside, warehouses, quays, open storage areas
- Electronic security record of all cargo, drivers and trucks crossed between multiple systems.
- Fully ISPS compliant.



Port Digitalisation

To sustains the growth, African Ports need innovative digital solutions to be implemented to enhance documentation process, terminal productivity and vessel operations. These innovations need to complement human efforts so that Port’s remain the key employment drivers that they are in African communities.

	The world's fully deployed container terminal operating system. In 2023, an automatic refrigerated monitoring solution will be implemented.
	CDMS is an in-house developed online customer portal that allows customers to do all administrative procedures online, increasing efficiency. Version 2.0 currently in the pilot phase.
	AI-driven applications on handheld devices and scanning portals to process container arrivals and departures safely and efficiently, increasing gate capacity and security.
	Fully retrofitted General Cargo Terminal operating system currently in service that controls gates, truck movements, weighing and warehouse operations and allows customers to make truck reservations online.



GC Terminal: diversity of commodities and packaging

Fertilizer

Cereals

Bulk Minerals

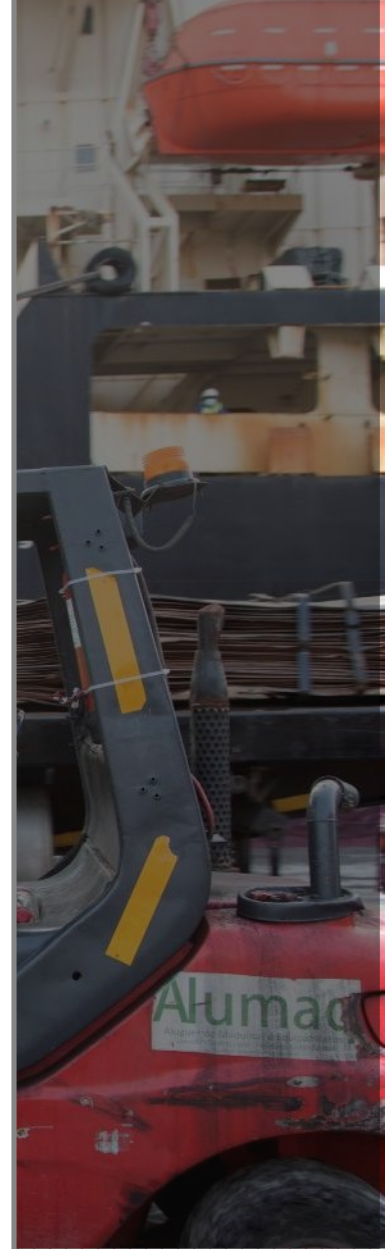
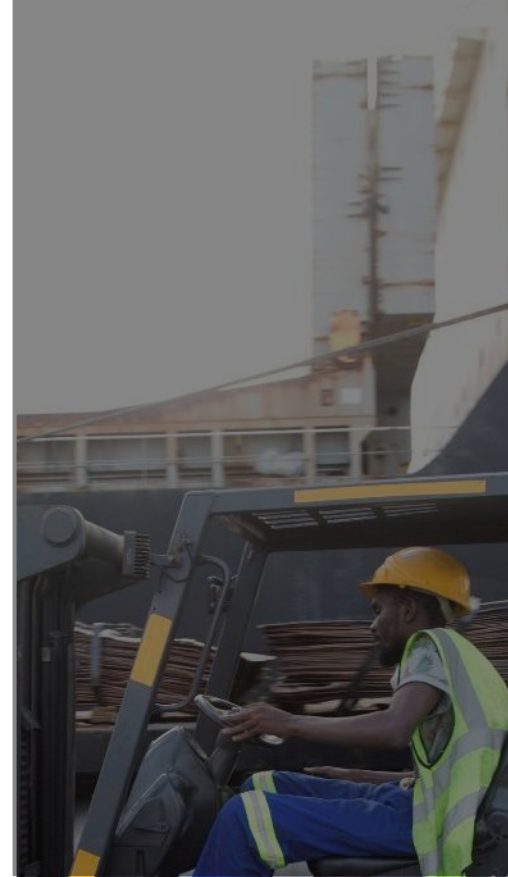
Granite

Sulphur

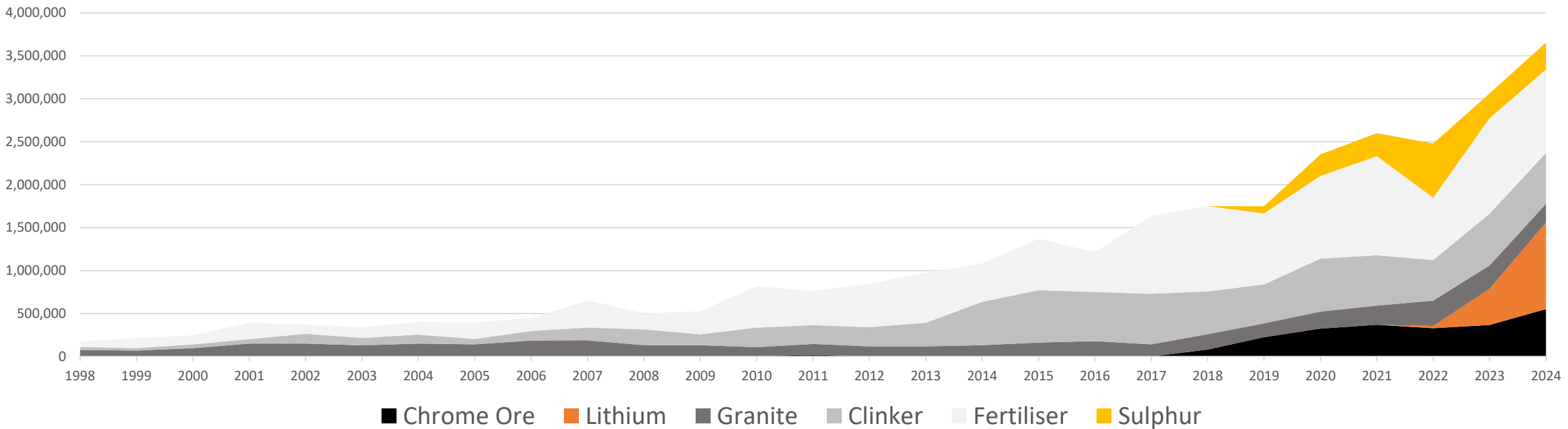
Clinker

Project Cargo

Equipment



GC Terminal: Volume drivers



Volume drivers of today were marginal or non-existent cargoes when we started.



A Growing but ever changing region

Mineral Market Volatility

Southern Africa is dominated by mineral extraction and trade.

- These extractive sectors dominate Africa and are subject to
 - International market price volatility,
 - Domestic policy changes,
 - Beneficiation oriented drives,
 - Export quotas & Bans,
 - Finite Resources
 - Naturally non-renewable

A Growing Region - Mineral Market Volatility

Chrome

- Zimbabwe Bans from 2011 to 2015
- Increases Smelting capacity, which can reduce export volume by 75 % as concentrates are smelted in ferrochrome,
- Alluvial Chrome Deposits are dwindling in Zimbabwe's North Dyke,

Lithium

- Lithium sulphate production can potentially result in 80% reduction in export cargo volume vs concentrates.

Cobalt

- As we speak DRC has extended a total cobalt export ban by three months due to price volatility,

Granite

- Beneficiation drive in Zimbabwe has seen exporters struggle with raw export permits.
- Cutting & Polishing Plants will drastically reduce overall export volumes.

Zimbabwe to ban export of lithium concentrates from 2027

By Reuters

June 10, 2025 6:53 PM GMT+2 · Updated June 10, 2025



AFRICA 1 MIN READ

DRC extends cobalt export ban by three months

DRC has extended its temporary suspension of cobalt exports by an additional three months, citing oversupply in the global market.

Share



A Growing Region - Industrialization

Industrialization reduces import dependency

Good for the economy, but difficult to plan for in Ports!

Fertilizer

- Fertilizer Factories under construction in Zambia and Tanzania and plans in Mozambique.

Clinker

- Clinker Production Line under Construction in central Mozambique

Sulphur

- New plants in DRC for direct production of Sulphuric Acid.

Minerals

- Local benefaction of granite and lithium concentrates

Kamoa-Kakula copper complex in DRC to install MECS sulphuric acid plant

Posted on 10 Jan 2024



Zambia's UCF to start up 300,000/year urea unit in Dec: report

[Grey Ammonia](#) [Fertiliser](#)

16 Apr 2025

United Capital Fertilisers' second fertiliser plant, a 300,000 mt/year urea unit, is set to begin operations in December...

Shipment preferences in constant flux

Bulk vs Break Bulk

Bagging in Port vs Bagging Outside

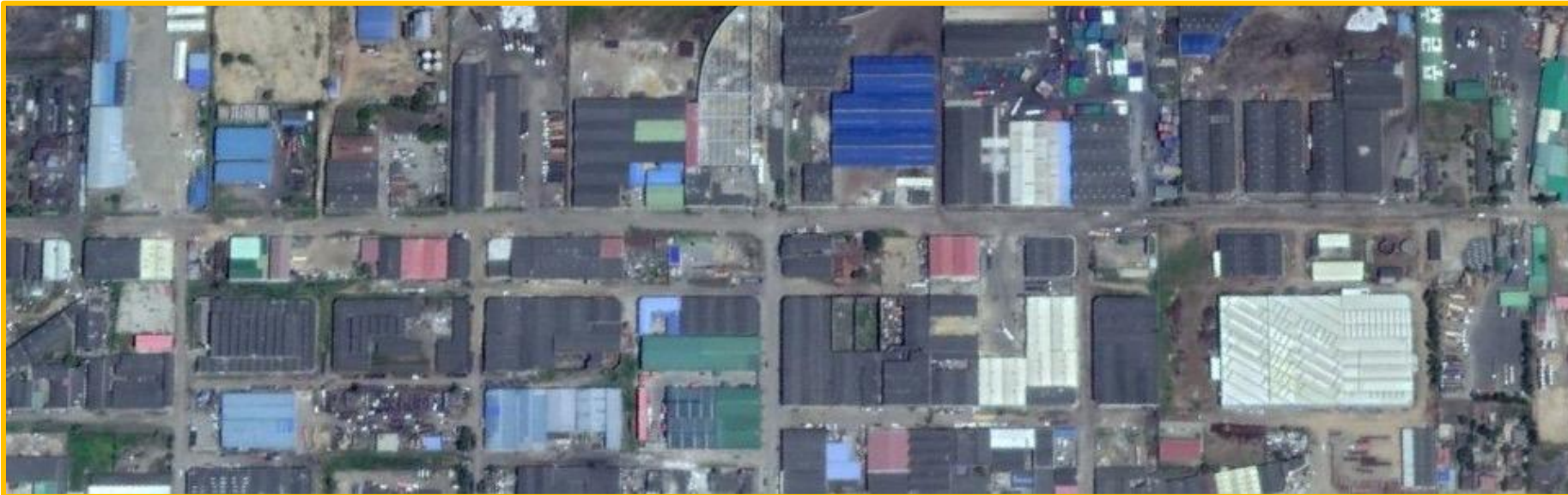
Break Bulk vs Containers

In constant Change due to regional logistics and global supply changes
Massive difference in infrastructure and equipment requirements



Beira Corridor – More than just a Port

- Various Dry Ports / Bonded Warehouses have been built around Beira
- They provide long term storage facilities.
- They can provide value added services such as blending.
- A Good Port needs a Good Ecosystem around it.



W-02

Worksheet (1)

1:2500

- Multi Purpose Quays
- Multi Purpose Storage facilities
- Multi Purpose Handling Equipment
- Combining port and port community facilities

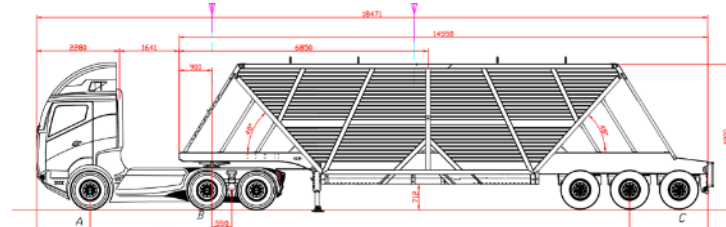
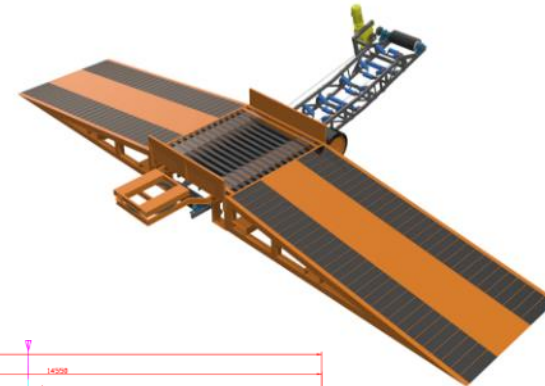
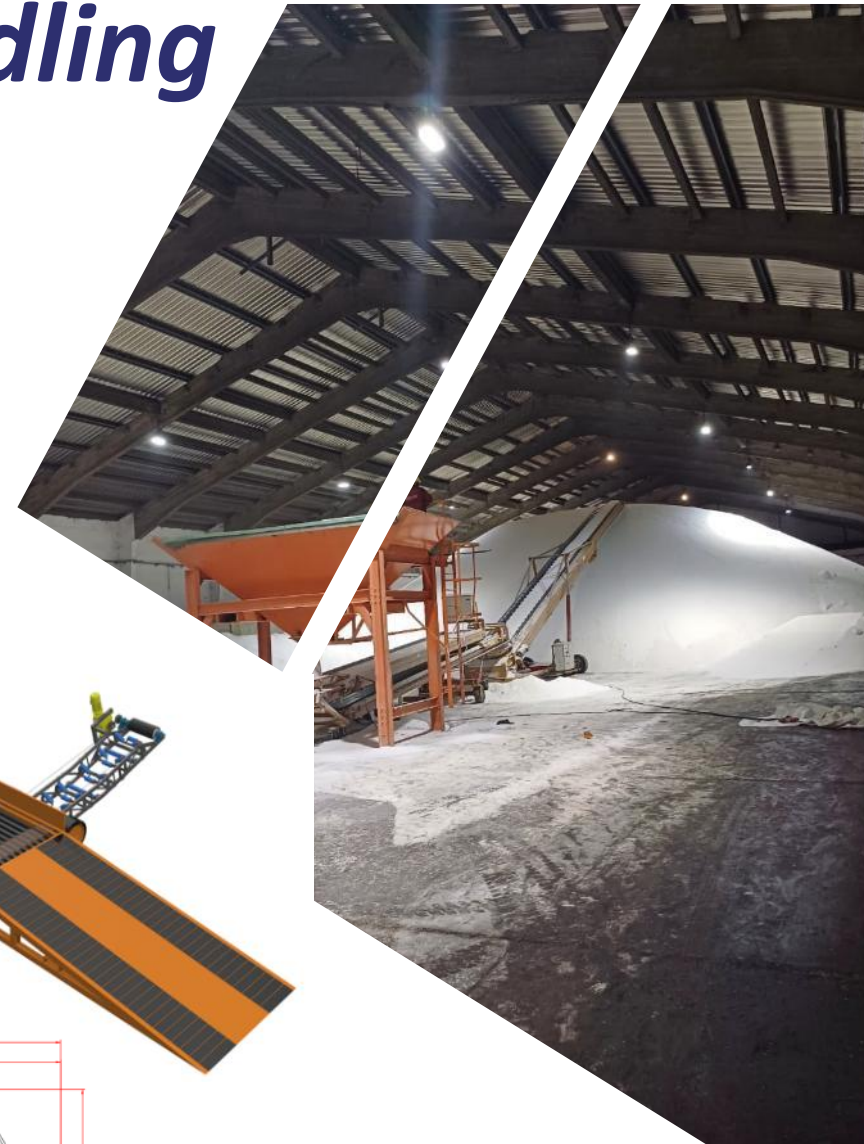


Fertilizer & Sulphur Storage/Handling

80,000 tons of Sulphur/fertilizer storage capacity in multiple warehouses, using innovative and highly productive equipment speeding up the unloading of ships from 4,000 tons per day to 8,000 tons per day.

Combining Port Facilities and combining unloading to the fertilizer terminal with unloading onto trucks that transport fertilizer to the main facilities around the port.

Part of the equipment was developed by our internal team, are purchased internationally.



Bulk Minerals Terminal: Flexible storage & Handling

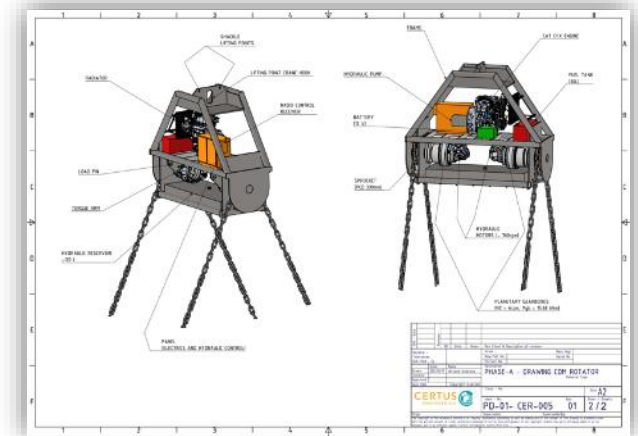


- 🌐 Construction completed in 2024
- 🌐 4ha
- 🌐 Storage capacity 150,000t
- 🌐 Doubling capacity by 2027



Flexible Equipment

- Mobile Cranes.
- Containerized Bulk loading system.
- Chromium discharge equipment.

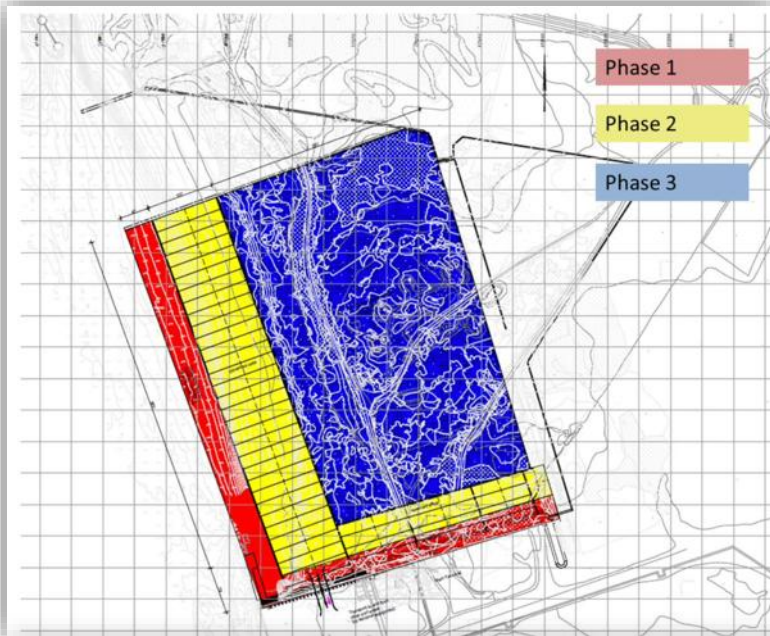


New General Cargo Terminal Entry and Exit

The smooth entry and exit of trucks is a crucial aspect for improving the Port's capacity.

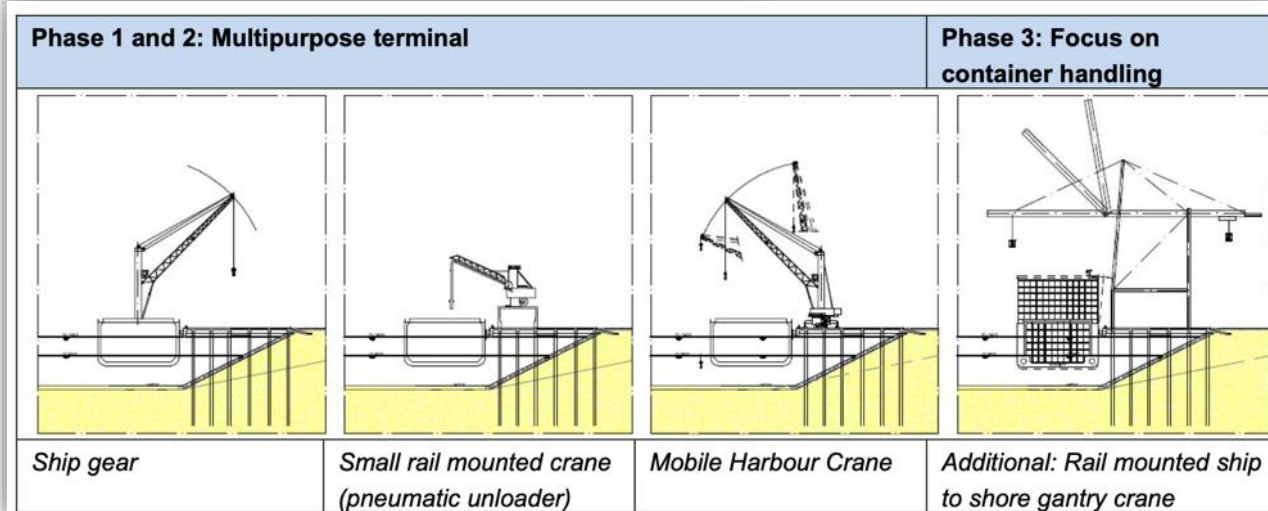


Quay Expansion: Q11



After the completion of the current expansion plans, further expansion will continue the multi purpose philosophy:

- 700m Multi-purpose quay capable of accommodating STS gantries;
- Royal Haskoning DHV quay design already done;
- 30Ha of Terminal Area;



OBRIGADO

