

Best practices and lessons learnt from port expansion projects in Asia

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Introduction

- Global trade perspective
- Environmental considerations
- Port planning
- Green port
- Port engineering



Global trade perspective

- Maritime transport plays a major role in facilitating global trade (80% by volume is carried by sea)
- Efficient and competitive ports help to drive the economic development of countries
- Inefficient ports limit the volume of trade and/or have a negative impact on the total cost of moving goods
- Efficient ports can contribute to development of the hinterland by attracting industry and investment



Global trade perspective

Ports play an essential role in the overall logistics chain

- Efficient port operations
- the main nodal point in the transport chain
- concentrate a high quantity of freight throughput at a single location.
- provide a seamless nodal link in the overall transport chain.

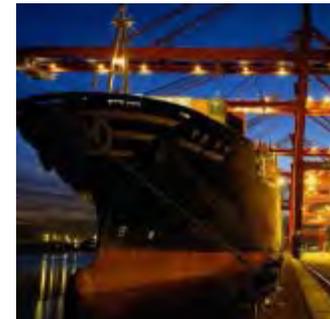


Global trade perspective

3 main types of goods transported by sea are dry bulk, oil, and containerized cargo.

- Dry bulk (iron ore, grain, coal, bauxite/alumina, etc.) 38%
- Oil trade 36%
- Containerized cargo 15%.

These trades are carried by more than 20,000 merchant ships to various ports around the world



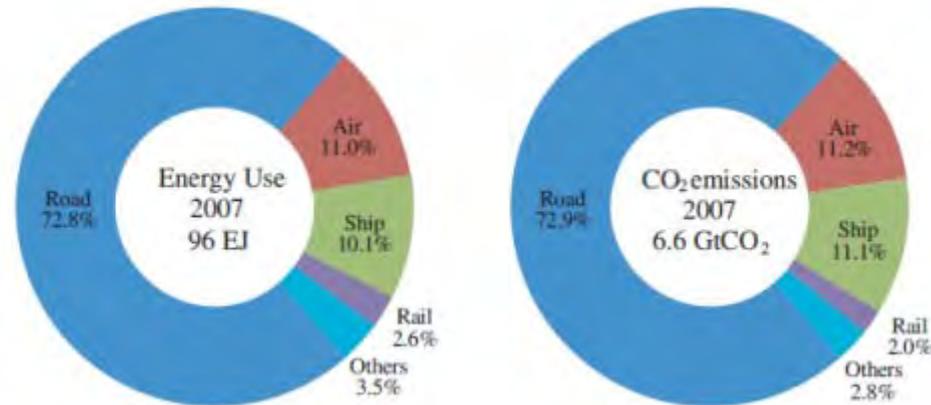
Environmental considerations

- Becoming increasingly important in the selection of modal transport systems
- Push to protect the environment and the quality of air to shift transport from the roads to rail and water transport to reduce carbon emissions



Environmental considerations

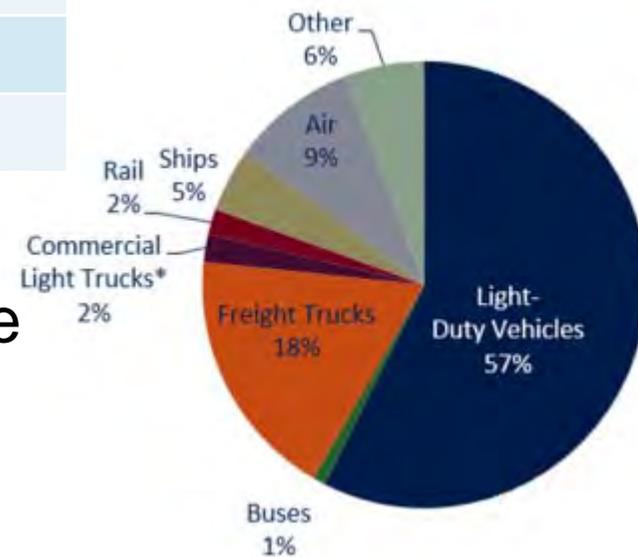
- The global transport sector is responsible for 28% of total global energy demand.
- 95% of transport energy comes from oil-based fuels
- Transportation weighs heavily on climate, energy security, and environmental considerations
- CO₂ output



Environmental considerations

Energy efficiency of transport modes (PIANC)

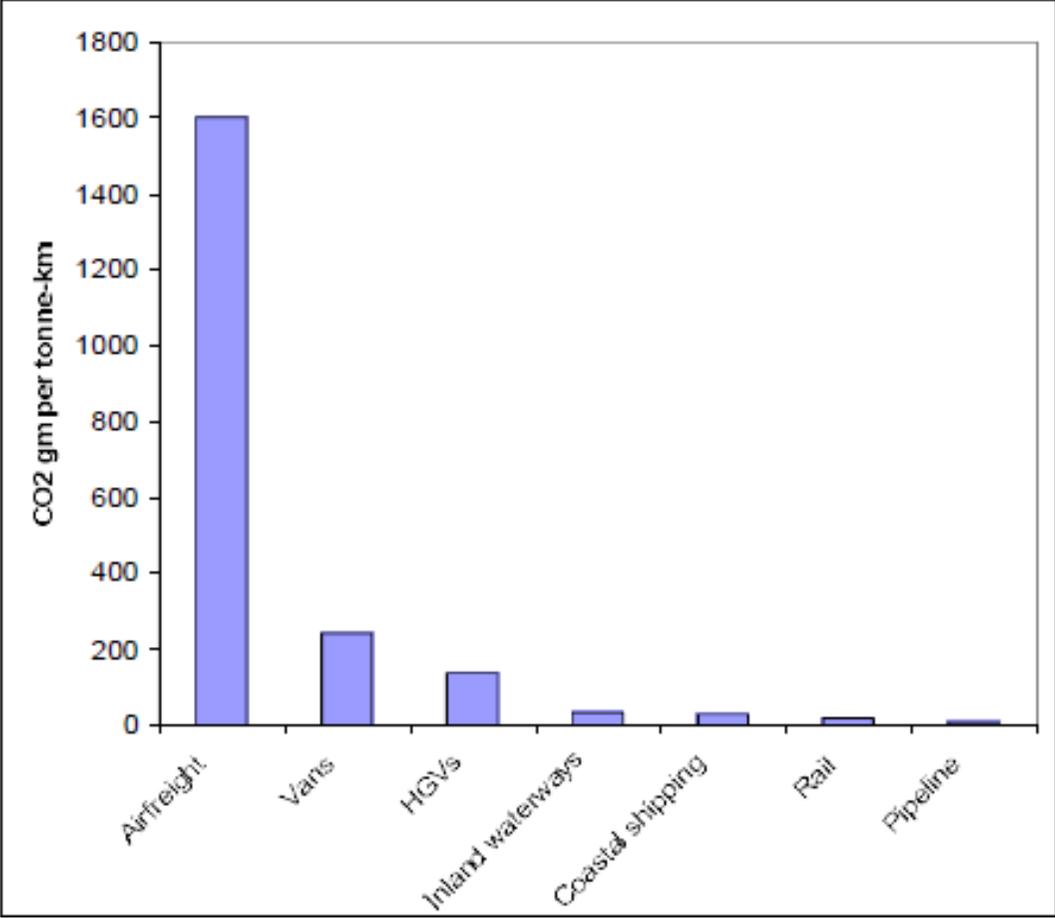
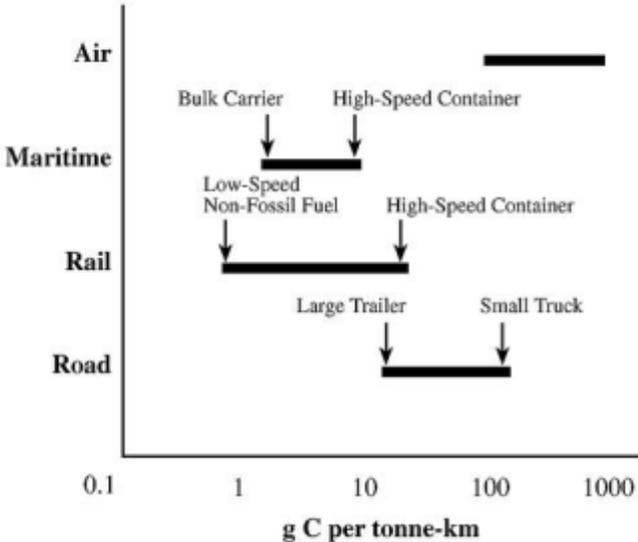
| Mean of Transport | Energy Consumption kJ/t-m |
|--------------------------|---------------------------|
| 11,000 TEU containership | 79 |
| Rail | 410 |
| Road – articulated HGV | 2,400 |
| Air cargo | 6,900 |



5% of global transportation energy use

Environmental considerations

CO₂ output



Environmental considerations

Vessels Generate a Large Fraction of Total Port Pollution



Environmental considerations

Yard equipment also contributes



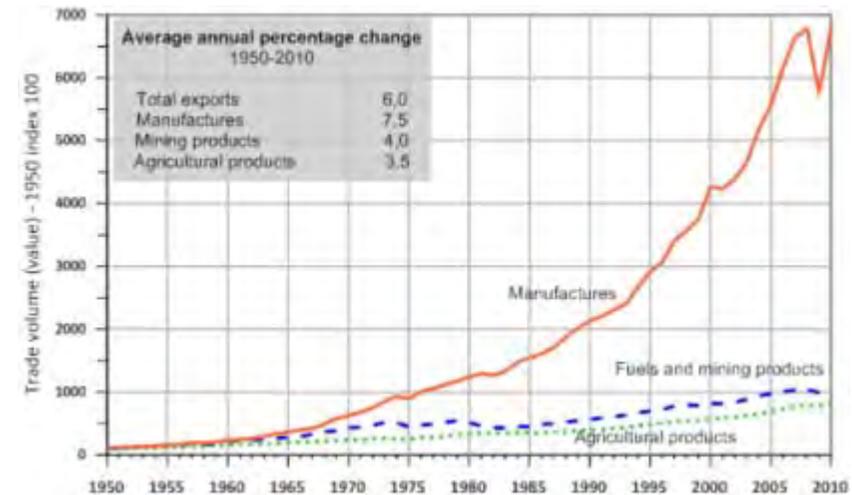
Environmental considerations

Future increase in economic activity and international trade

- International marine emissions are estimated to increase by at least 50 percent over 2007 levels by 2050

Green ports

- Cold ironing
- Electric RTGs, ASCs
- Alternative power generation
- Cranes



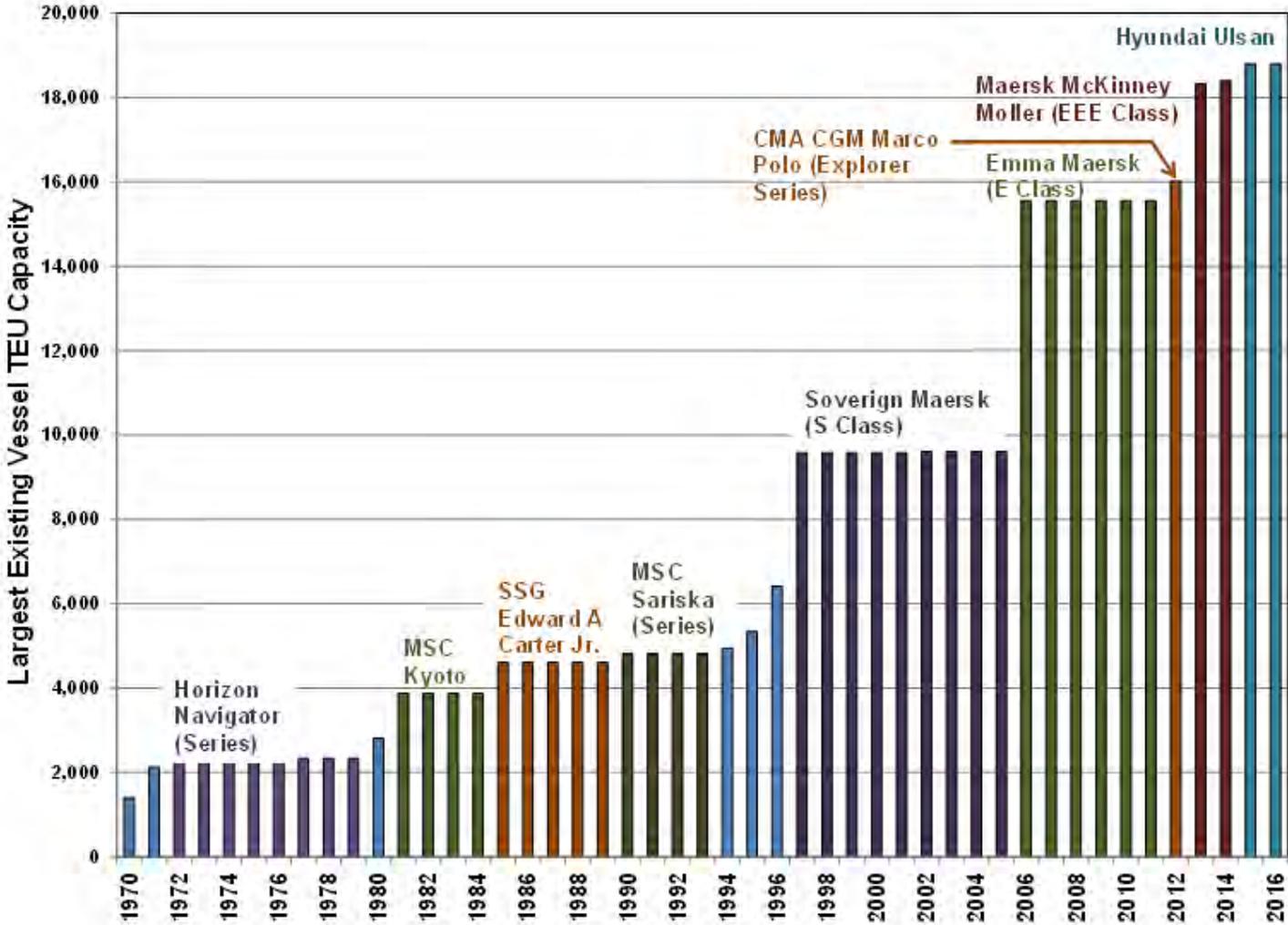
Port Planning

A port masterplan should aim to:

- Develop the port in accordance with international and national legislation and guidelines
- Integrate economic, engineering, environmental and safety considerations in the overall plan
- Promote the orderly long-term development and growth of the port by establishing functional areas for port facilities and operations
- Allow the port to respond to changing technology, cargo trends, regulations and legislation and port competition

Port Planning

Trend in largest vessel sizes



Port planning

Planning and design for latest generation vessels

Maximum container vessel sizes (2010) - UNCTAD

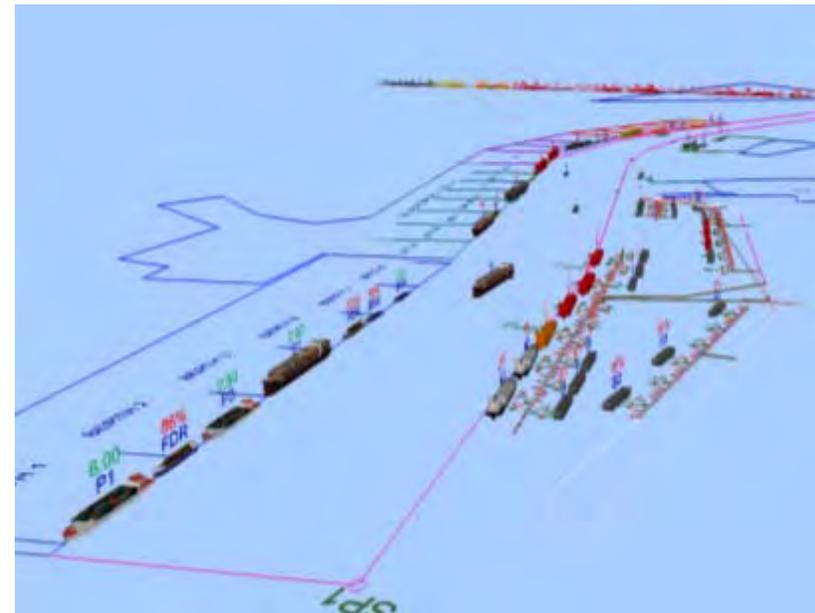
| 2010 | Developed economies | Economies in transition | Developing countries | LDC's | Total |
|-------------------------------|---------------------|-------------------------|----------------------|--------------|--------------|
| Africa | | | 4,494 | 2,125 | 3,185 |
| Asia | 9,650 | 1,022 | 7,578 | 1,669 | 6,690 |
| Europe | 6,962 | 3,447 | | | 6,413 |
| Latin America & the Caribbean | 2,556 | | 3,417 | 2,127 | 3,359 |
| North America | 5,289 | | | | 5,289 |
| Oceania | 4,606 | | 1,810 | 1,224 | 2,065 |
| Total | 6,672 | 3,043 | 4,736 | 1,959 | 4,590 |

Vessel sizes in general depend on trade volumes which tend to be higher in developed countries.

Port Planning

Channel Simulation

- Capacity and performance analysis
 - Demurrage calculations
 - Berth utilisation and delays
 - Total throughput
 - Multi-user impacts
- Infrastructure/resource changes
 - Berth additions, equipment rates
 - Channel dredging & siltation
 - Tugs and Pilots
 - Additional Trades
- Effects of environmental conditions
 - Tidal and wind/wave constraints



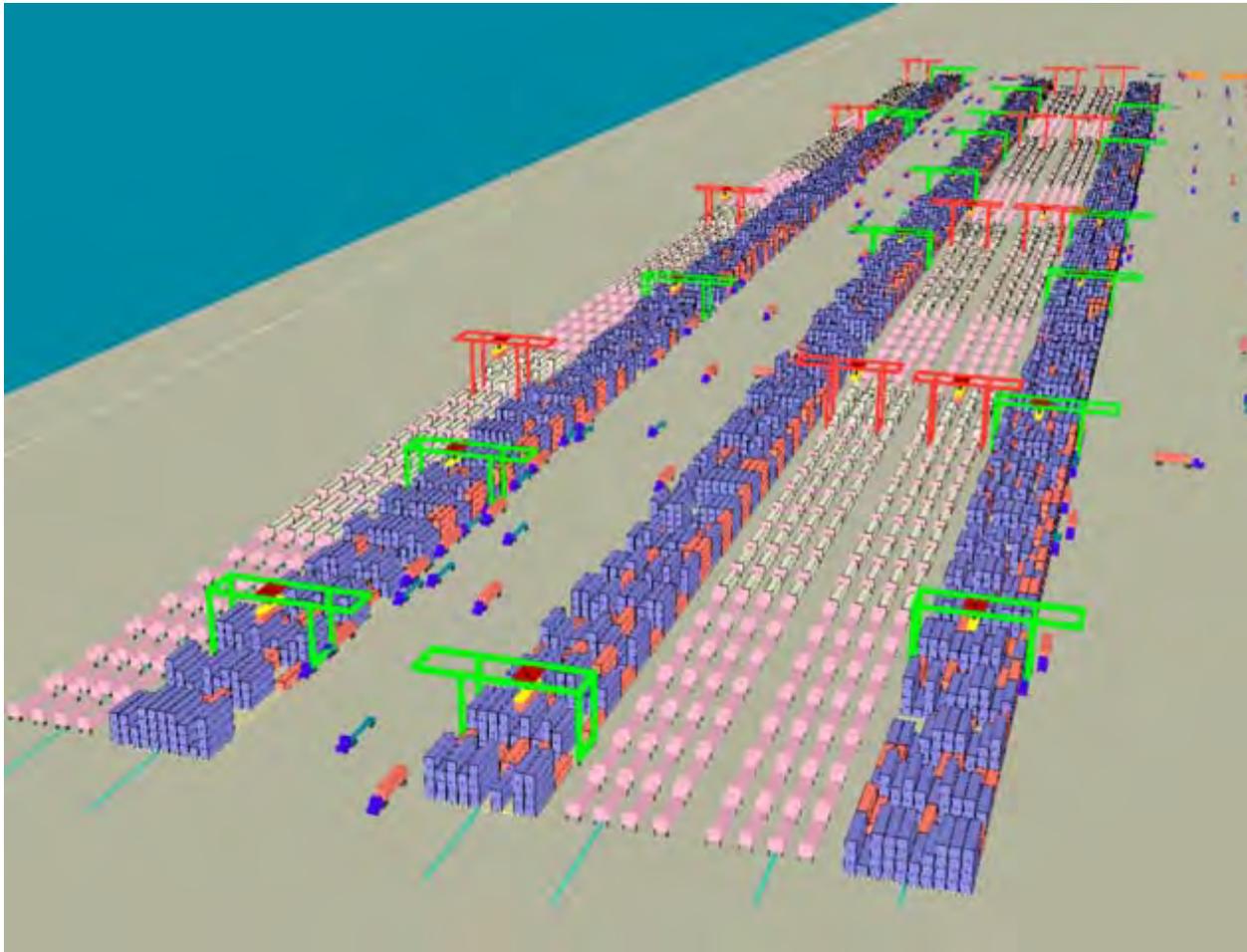
Port Planning

Bridge simulator



Port Planning

Terminal simulation

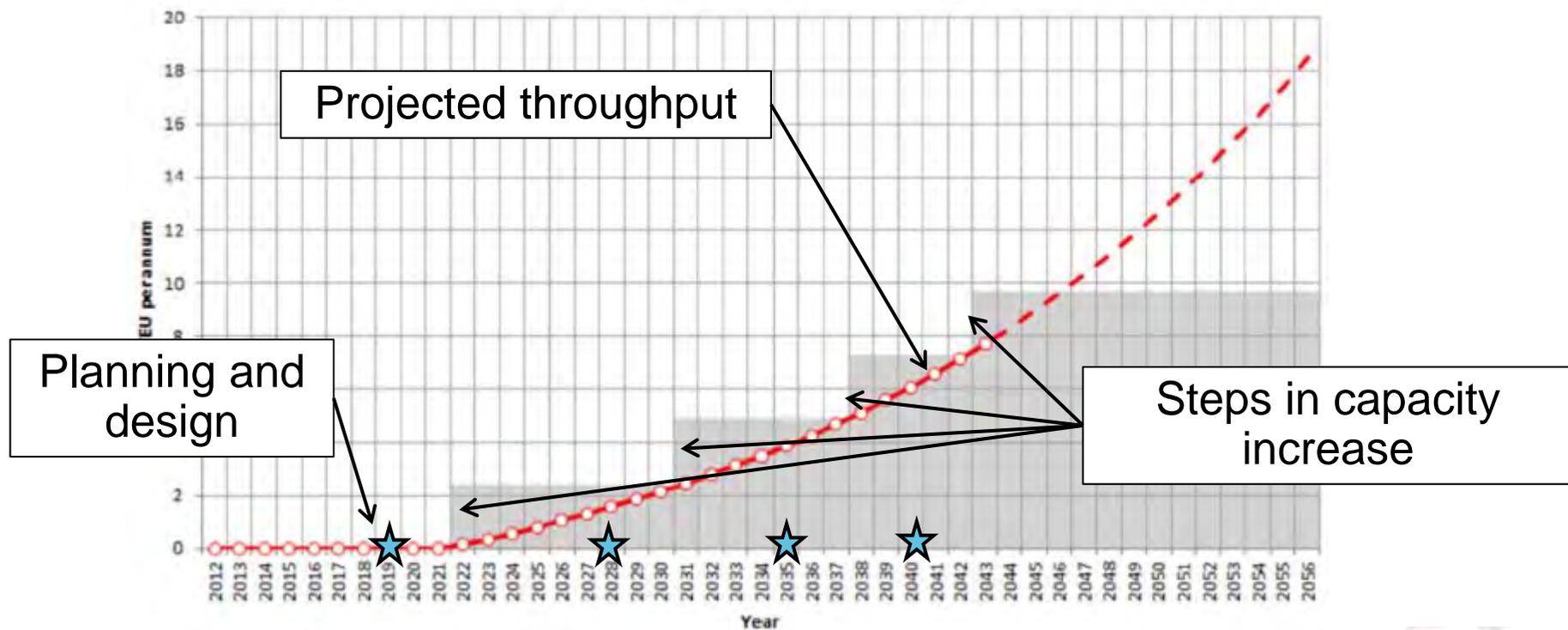


Port Planning

Make best use of existing infrastructure

- sweat v re-build

Plan design and build the infrastructure in advance of the need



Port Planning

Challenges

- Cargo volume has grown rapidly, often exceeding port capacity
- Increased vessel size with some port facilities no longer able to serve larger vessels, reducing the effective capacity
- Handling equipment is no longer appropriate for current handling requirements.
- Yards cannot grow at the same pace as vessel productivity due to landside constraints
- Inland transport connections are congested
- Need to consult community / stakeholders

Green Port Aspects

Electric RTGs



Green Port Aspects

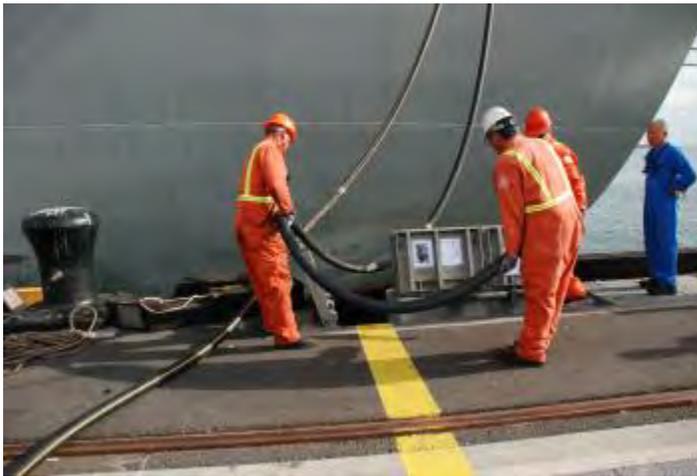
Electric RMGs



Green Port Aspects

Cold ironing

- Wharf receptacles @ 60m
- Forward of crane rail
- Modify utility trench
- Modify deck



Green Port Aspects

Alternative power



Green Port Aspects

Rail Vs Road



Port Engineering

Sweat assets v new/re-build

Ensure design

- suit client's needs
- local construction industry and supply lines

Design life of assets

- 30yr, 50yr, 100yr. Tied to nature of lease

Port Engineering

Sea level rise

Cost estimates – Good in-country knowledge

Green ports - Cold ironing, electric RTGs, ASCs, alternative power generation (solar, wind), cranes

Use of rail for inland transport

Project delivery

Summary

- Importance of ports to the transport chain
- Environmental concerns
- Port planning
- Ships getting bigger – impact on waterway, dredging and quay structure
- Involve stakeholders
- Green Port considerations



Thank You

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