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Navigating the Energy Transition: Strategic Implications for Shipping and Ports

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Presented by

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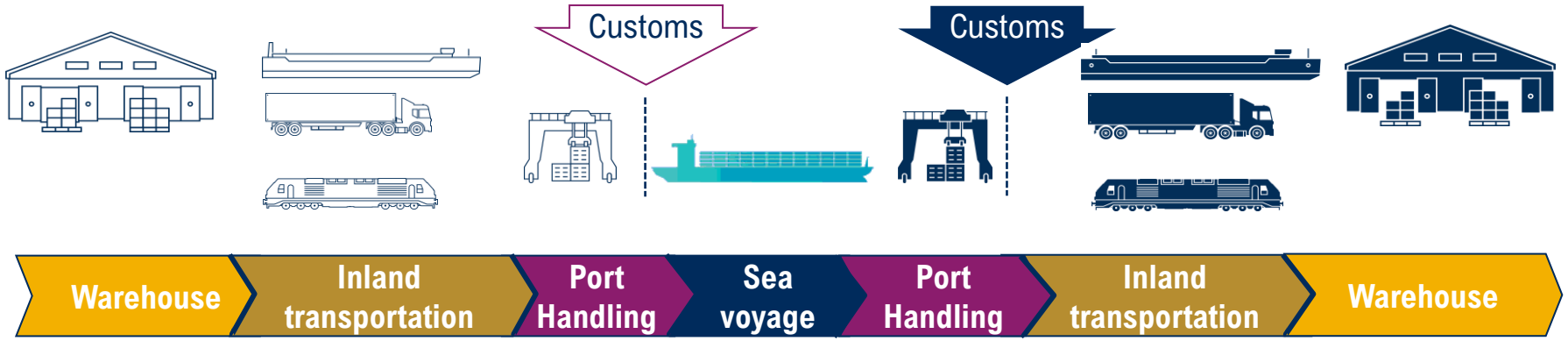
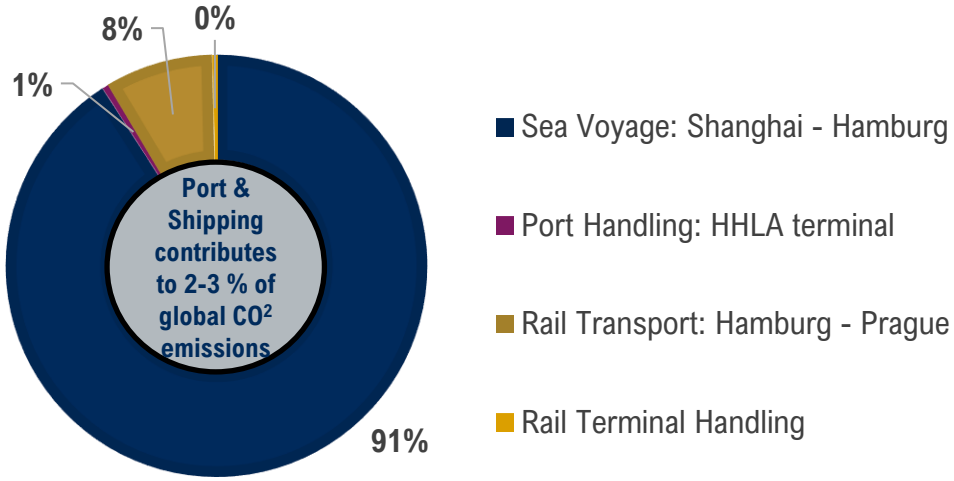
Cargo supply chain illustration

In a door-to-door cargo move, the sea leg contributes to 90% share of the total Green House Gas (GHG) emissions. Reducing emissions from ships is therefore critical.



Relative importance of GHG emissions from a typical container supply chain



Source: Fourth IMO GHG study 2020, Hamburg Terminal

What is driving the GHG emission reduction of shipping?

It is not only regulations but also various other factors which are driving the reduction in vessel emissions.

Net Zero target of individual countries	• Paris Agreement
Regulations from multilateral institutions/countries	• Push from the IMO, EU ETS and the UK ETS (started from 1st July 2026) to reduce emissions from vessels.
Charterers	• Charterers are also exerting pressure on shipowners by the adoption of the Sea Cargo Charter, Zero Emission Buyers Alliance
Financial institutions	• Adoption of the 'Poseidon Principles' by 75% of ship financiers.
Marine insurers	• By adoption of 'Poseidon Principles for Marine Insurance', there is an increasing push from marine insurers to reduce emissions from vessels
End customers	• This requires the declaration of the emissions from vessels as the end customers want to know the emissions from products.
Incentivising decarbonisation by government/ports	• Discount on port disbursements, giving grants for pilot projects.
Shipowners' internal ESG targets	• Net Zero target of the shipping companies. Increase in competitiveness for low-emission vessels vs high-emission vessels. Eg Cosco, MSC, CMA CGM, ONE, Carnival etc have net zero target by 20250.

Emission reduction measures from vessels in deep sea

Various measures can be undertaken by vessels to reduce emissions while sailing in deep seas

Alternate fuels	• Stricter regulations are accelerating the use of alternative fuels such as IMO 2023 GHG strategy and FuelEU Maritime. • Options include ammonia, biofuels, batteries, hydrogen, LNG, LPG, methanol and nuclear.
Propulsion improvement devices (PIDs)	• PIDs are the measures to improve the propulsion efficiency of a ship by making modifications to the propeller/rudder, or in front of or behind the propeller/rudder. • Examples include propeller ducts, nozzles, boss cap fins, CPP, rudder bulbs and gate rudders
Energy saving devices (ESDs)	• Energy saving devices help in reducing fuel consumption, which eventually results in emission reduction by reducing resistance, energy optimisation and reducing waste energy. • Certain technologies under ESDs are air lubrication systems, engine optimisation, waste heat recovery systems, hull modifications, etc.
Wind assisted propulsion system (WAPS)	• It is a technology that harnesses the power from the wind to aid the vessel's propulsion by using aerodynamic forces. It has several sail systems such as rigid or soft wing sails, Flettner rotors and ventilated foils, or kites. • It is also rewarded under the FuelEU Maritime regulation.
Others	• There are others measures that can also be carried out, such as energy-efficient lighting systems, cargo handling optimisations, auxiliary systems optimisation, solar panels, etc.

Source: Drewry

Alternative fuels

Three main alternative fuels are broadly considered for deep sea shipping in new engine designs – LNG, Methanol and Ammonia. It is not known whether any particular fuel will become dominant in the future, as it depends on various factors. The energy transition is expected to be from 'grey' fuels to 'bio or blue' fuels and thereafter to 'green or e-fuels'.

Grey fuels
- Fuels produce carbon emissions that are not captured.

Blue fuels
- Produce carbon emissions that are captured using the carbon capture, utilisation and storage (CCUS) process.

Bio fuels
- Fuels derived from sustainable biomass.

Green or e-fuels
- Use renewable sources for energy requirements and minimum GHG is emitted during the production process.

Alternative fuel

Ammonia
- There are concerns about the safety of the engine room crew due to its very high toxicity.
- Highly corrosive

Methanol/Ethanol
- Toxic if inhaled in a certain proportion
- Low flash point

LNG
- In case of a spillage, LNG undergoes a Risk of Rapid Phase Transition (RPT), leading to vapour formation, which needs special handling precautions.
- Highly flammable

Hydrogen
- Highly flammable
- Prone to leakage as the molecule is extremely small

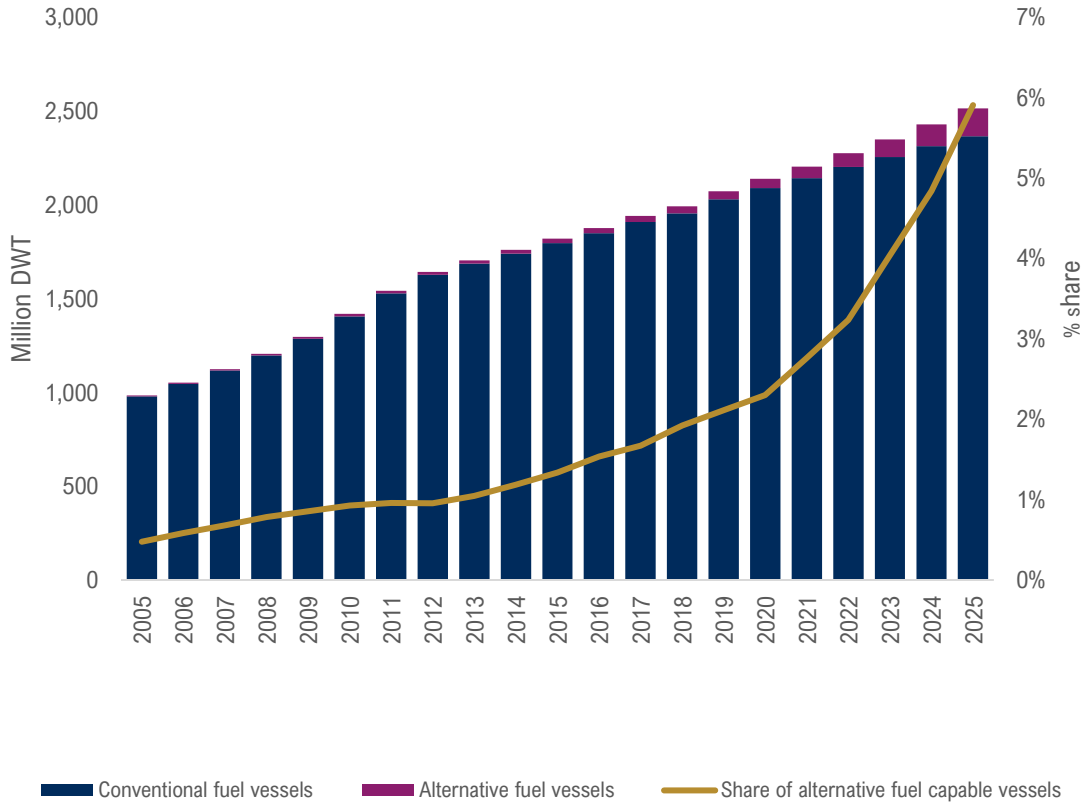
Due to the space requirement for the tank, hydrogen is not suitable for deep-sea vessels

Source: Drewry

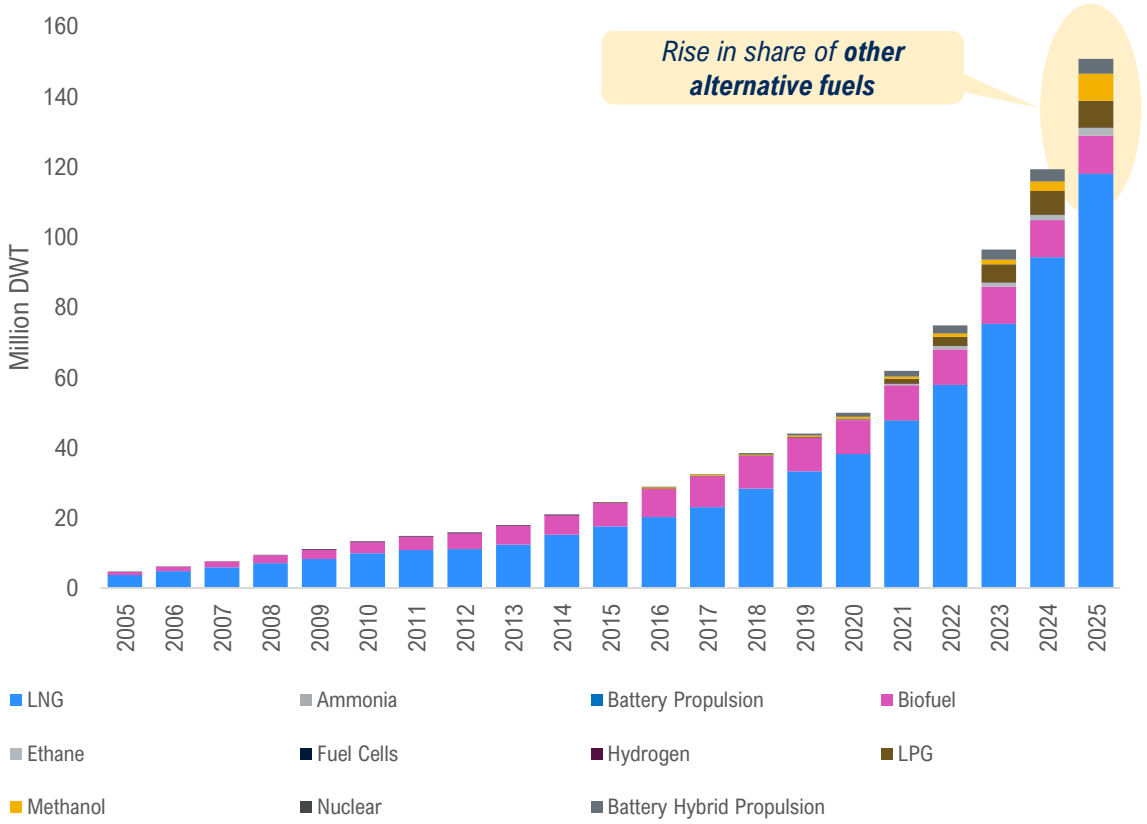
Alternative Fuels Fleet- Timeline

The alternative fuel capable fleet has reached 148 million DWT in 2025 (5.9%) out of 2,515 million DWT. Even though LNG-capable fleet amounts to 79% of the alternative fuels fleet, it only accounts for 4.7% of the total fleet. As energy transition intensifies, an increasing number of vessels will need to be retrofitted. Engine makers have started providing retrofit options for the existing vessels in order to keep them compliant with the environmental regulations.

Alternative fuel capable vessels in fleet (in terms of DWT)



Alternative fuel capable fleet (in terms of DWT)- Split by fuel

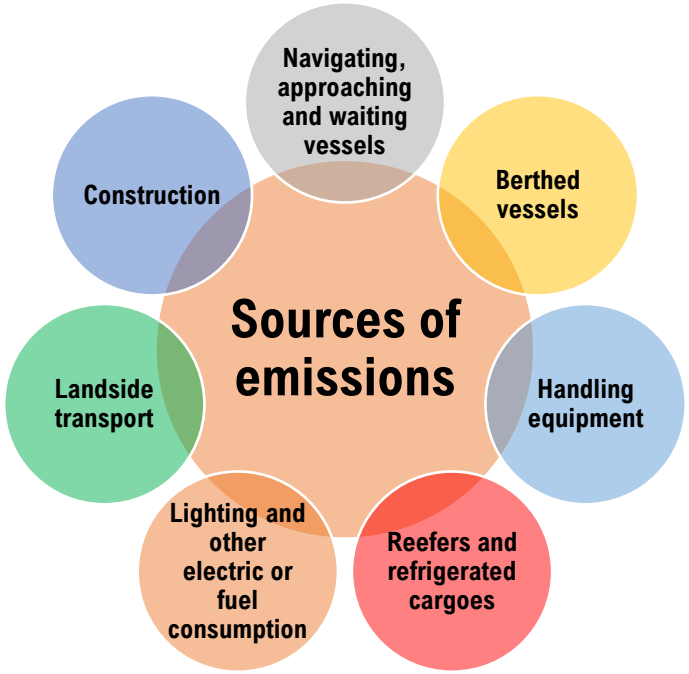


Source: Clarksons, Drewry

Emission reduction measures in ports

Ports play an important role in reducing the overall GHG emissions. Green tugboats, OPS, electric cranes, LED lighting are some of the popular solutions

Types of emissions in ports



During the ship-port interface, there are many sources of emissions such as vessels, port and various processes/machinery involved in the operation. Necessary abatement measures will be required to reduce emissions during the ship-port interface.

Emission reduction measures in ports

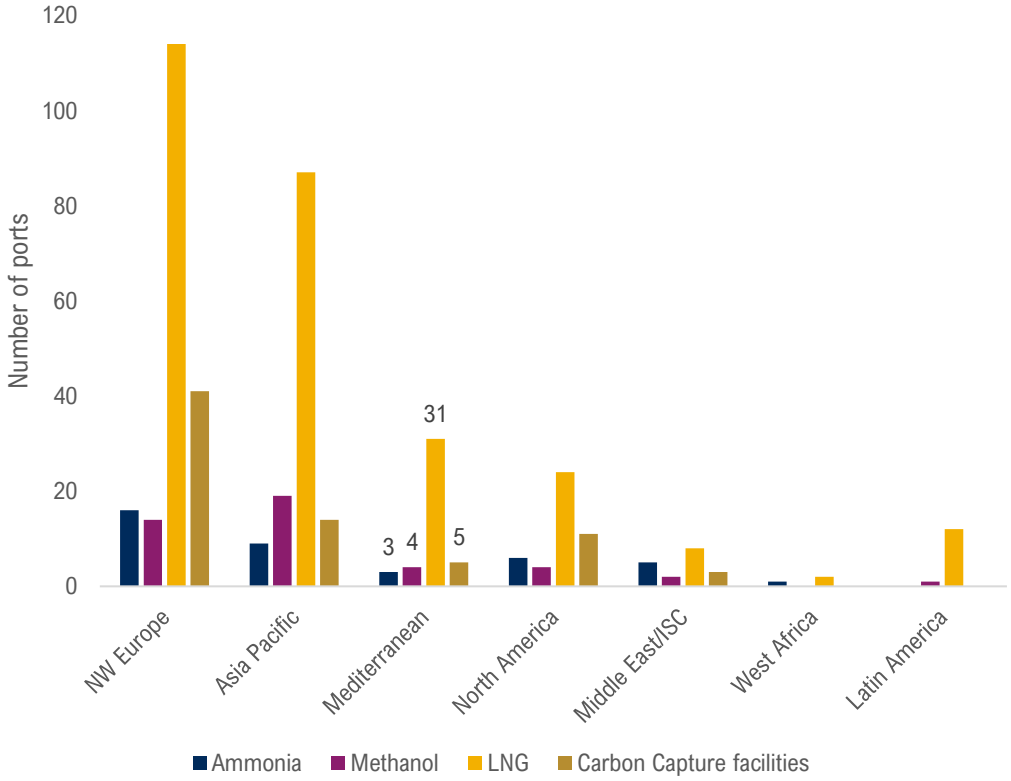
Emission reduction from tugboats	• Tugboats involved in assisting vessels to berth usually have powerful engines; therefore, their contribution to GHG emissions should be considered. In many ports, tugboats are connected to onshore power while they are berthed and await the next job.
Onshore power (OPS)	• OPS significantly reduces GHG emissions from vessels, since auxiliary engines are no longer required to run on vessels while it is at berth.
Cargo operations-related emission reduction by port	• In recent years, considerable progress has been made in improving the performance of fossil fuel-driven equipment, as well as developing alternative power sources for cargo operation-related machinery in ports.
LED lighting at port	• Lighting is the third-largest energy consumer (12%) in a container terminal and also a major consumer in other types of terminals. The development of lighting technologies such as LED has made it possible to replace energy guzzlers like halogen lamps in ports, improving energy efficiency and reducing the carbon footprint.
Others	• Some examples of other measures including, green fuel in trucks, allowing vessel's main engine immobilisation, etc.

Source: Drewry

Port decarbonisation efforts

Northwest Europe leads port-led energy transition efforts, supported by strong regulatory drivers (EU ETS & FuelEU Maritime), with a preference for ammonia and growing investments in carbon capture, while LNG remains the dominant fuel globally. Ports in the Mediterranean region lags despite being within the influence of the same drivers. Asia-Pacific shows a clearer inclination towards methanol when compare to Ammonia.

Ports with interest in Alternative fuel facilities



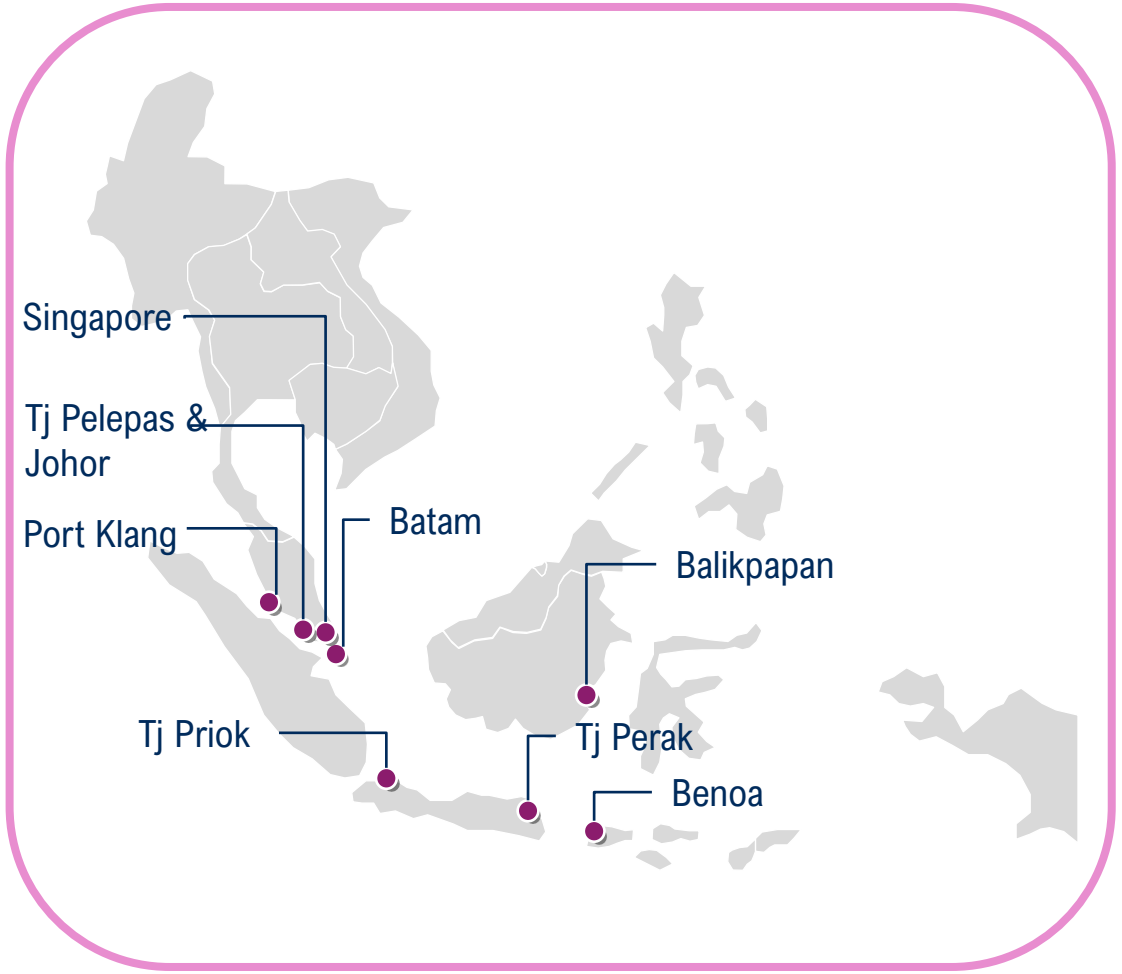
Note: The chart shows all ports with Active, Planned and under construction facilities combined, depicting the interest of the ports towards providing such facilities.

- Ports in Northwest Europe are leading in actively supporting the energy transition across the maritime sector.
- Regulatory frameworks such as EU ETS and FuelEU Maritime are strengthening the commercial case for ports to invest in decarbonisation infrastructure.
- Despite being within the influence of these regulations, the Mediterranean region remains comparatively behind in enabling similar levels of support. It is mainly focussed on LNG.
- Northwest European ports show a stronger preference for ammonia, while Asia-Pacific ports demonstrate a clearer inclination towards methanol.
- LNG continues to dominate port fuel strategies globally, driven by industry familiarity and renewed market support.
- A growing number of ports (particularly in Northwest Europe) are investing in infrastructure to support carbon capture technologies.

Source: Drewry, Clarksons

Alternative fuel bunkering – some of the ASEAN ports

ASEAN ports are developing alternative fuel bunkering at different speeds, with Singapore leading LNG, methanol and ammonia initiatives, Malaysia expanding LNG and methanol capabilities, and Indonesia introducing B40 biofuel bunkering across key ports. Together, these developments are positioning the region as an emerging low-carbon marine fuel hub.



Malaysia

- Port of Tj Pelepas (PTP) conducted a pilot project on methanol bunkering in 2024. Since then, methanol-powered container vessels operated by Maersk have been calling at PTP on scheduled routes.
- Sarawak Petchem (opened in 2025) and Petronas produce methanol and plan to supply the methanol for bunkering.
- LNG has been established since 2020 and is available for major ports: Port Klang, Johor, and Tj Pelepas.
- Port Klang has established a Biofuel B24 bunkering pilot project in 2024. The status of higher biofuel blends, including B30, is still unclear.

Singapore

- Singapore is establishing several green shipping corridors with various Countries, for example: Rotterdam NL, Australia, Japan, Shandong China, Tianjin China, India, Los Angeles USA.
- Singapore has established LNG bunkering for a decade, followed by methanol years ago. Now the country is preparing for the ammonia bunkering pilot project.

Indonesia

- In January 2025, Indonesia established the biofuel, B40, bunkering facility across five port locations: Tj Priok (Jakarta), Tj Perak (Surabaya), Batam, Benoa, and Balikpapan.
- The main B40 bunkering provider is Pertamina.
- Indonesia Govt mandated all tugboats operating in Indonesian waters to use B40. Now B50 is planned as pilot project.
- Pertamina subsidiaries have started using B40 for their sea-going vessels. However, the application for the private sector vessel remains unclear.

Source: Drewry, Getting to Zero Coalition, Global Maritime Forum, Indonesia ESDM, various websites and news

Uptake for the ports

Energy transition will reshape port competitiveness

- Emissions at port are driven mainly by vessels, heavy equipment and landside transport → increasing regulatory pressure
- Ports will become energy hubs, requiring integration of electricity and alternative fuels
- Early movers in decarbonisation (e.g. green fuels) will gain a competitive advantage along key trade routes

Adoption challenges remain significant

- High CAPEX for OPS, electrification and alternative fuel infrastructure
- Misalignment of incentives (port vs terminal vs shipping lines) and legacy concession agreements
- Regulatory and power supply constraints, including access to reliable and green electricity
- Limited vessel readiness and uncertain uptake of green fuels

Strategic implications and recommended actions

- Prioritise phased investments: start with high-impact measures (electrified equipment, LED lighting, etc)
- Align stakeholders via revised concession frameworks and incentives for cleaner operations
- Position port within green shipping corridors to secure fuel demand and partnerships
- Develop long-term roadmap for multi-fuel bunkering (e.g., LNG, methanol, ammonia) + renewable energy integration

Thank you

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