Ambition into action

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The shipping industry's collective commitment to deliver on zero-emission by 2050 was palpable at the Glasgow UN Climate Change Conference of the Parties (COP26) last November. The sector enjoyed a higher profile than at previous COPs, and commitments were signed that placed intention ahead of regulation. Among these was the Clydebank Declaration on Green Corridors. It currently involves 22 countries and allows getting such large-scale demonstrators tested and into service in a controlled, risk-managed-and-mitigated manner.

The initiative put forth by the Clydebank Declaration focuses on major port hubs and specific trade routes, gathering the relevant supply chain actors under one banner. It points to scalable and commercially viable solutions, supports the green transition policy-wise, and encourages targeted public and private investment. The initiative also enables a fuller understanding of where the first land-based new fuel production infrastructure might have the biggest initial impact. The Green Corridors are, without question, essential to encouraging first-mover activity.

Navigating the opportunities and risks

The creation of Green Corridors is tied to another crucial area where pioneers require a helping hand to convert their ambition into action, namely in navigating the opportunities and risks associated with the many transition scenarios out there. That is why we have established the Lloyd's Register (LR) Maritime Decarbonisation Hub.

In December 2021, the Hub launched 'First movers in Shipping's Decarbonisation – a framework for getting started,' an approach that enables a detailed comparison of different fuel transition pathways regardless of vessel type or trade lane. It, among others, focuses on comparing different fuel options and what the evolution of a specific fleet means for the regional supply chain.

It also entails raising critical questions, ranging from "What are the material costs needed by all stakeholders to meet these changes?" and "Are there any synergies across the supply chain once a path is selected?" to "What do we need to keep monitoring to continue improving our strategy?"

Framing the work

The Maritime Decarbonisation Hub framework evaluates the entire supply chain, from fuel production to onboard use, and can be applied to any fleet, revealing the implications of each transition strategy and offering insights to support future fleet investment decisions.

We can pinpoint a common solution by identifying the breakdown of different costs for the supply and fleet sides for a specific fleet and location. This way, we encourage stakeholders to think about what works for them holistically, helping kickstart a scalable transition for other fleets and locations.

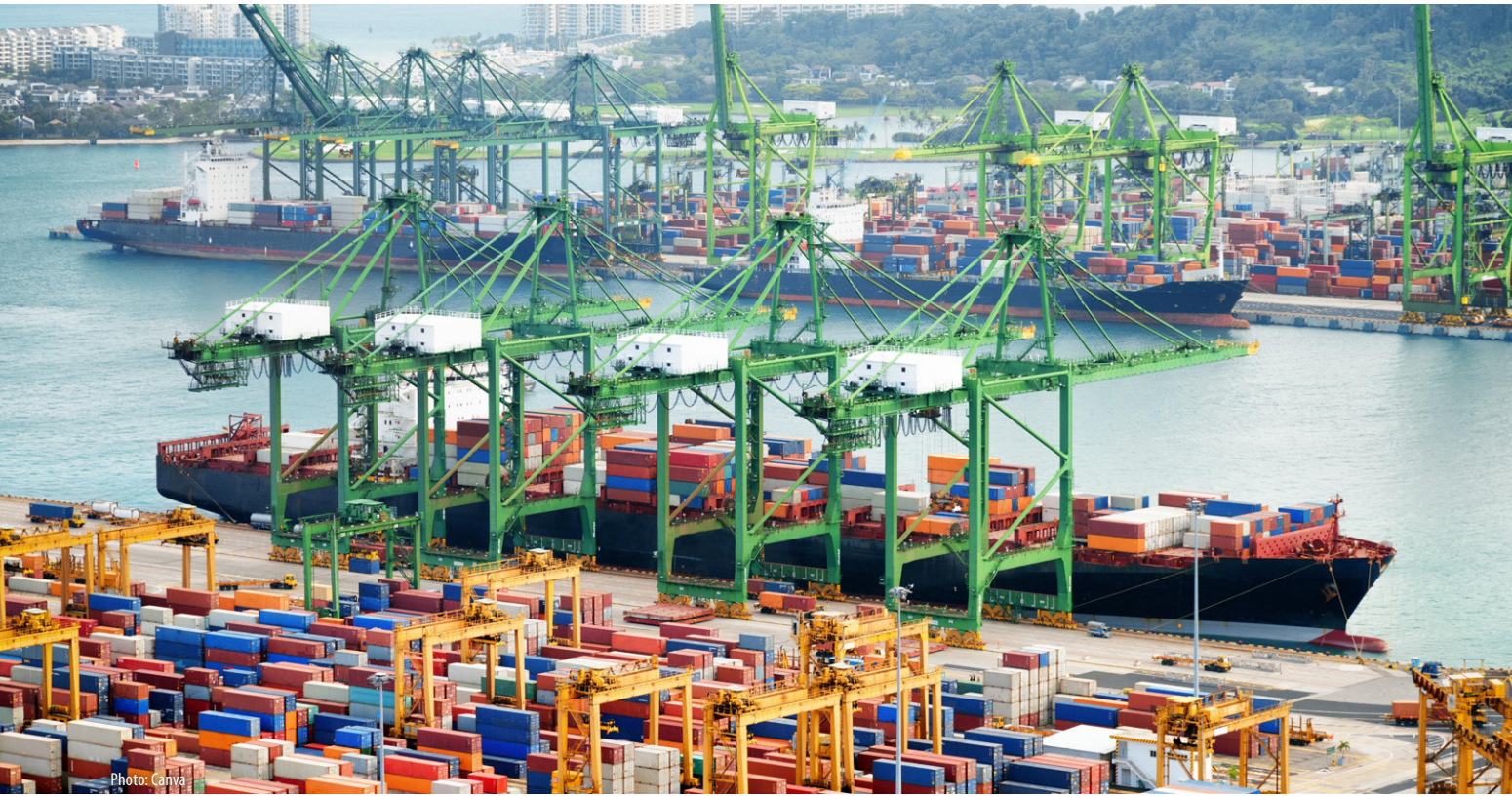
Until now, research has either focused on a specific ship and fuel or been too high level and generic to have real relevance for shipping companies. LR's new framework can help the industry move from analysing the entire global shipping fleet to focusing on plausible real cases for large demonstration projects worldwide. By doing this, we can help reduce uncertainty and risk by providing an understanding of the transition pathways open to stakeholders in those particular demonstrations. This approach can also inform a strong business case for a potential coalition that will support the chosen route ahead.

Lessons already learned

Our first study analysed three transition pathways – for methanol, ammonia, and hydrogen – and applied each potential fuel to the container ship feeder fleet operating regionally between Singapore, Hong Kong, and other nearby Asian economies. The set comprised 222 ships, totalling around 360k TEU capacity, with an annual fuel consumption estimated at 1.4mt of fuel oil equivalent and 4.7mt of CO_2 emitted per year.

We chose that particular region because it is a regular trading route that generates an aggregate demand to specific ports, so much so that fuel providers are more confident to make investment commitments to serve this market. And we wanted to pick an ecosystem or green corridor that can be scalable to other ships serving this port network/region, so the supply chain could, in theory, start the transition here and scale it out. Below is what we found out.

First, different transitions might be suitable for this specific fleet – based on either methanol, ammonia, or hydrogen, which can, in turn, be produced from natural gas, renewable electricity, or in some instances, also sustainable biomass.


Photo: Canva

Second, similar emission reduction trajectories have different implications for the fuel supply infrastructure. The fleet transitions based on methanol, ammonia, or hydrogen can all meet similar emission reductions; however, this result is achieved using different infrastructures and at varying implications.

Third, the sector must balance early results with strategic planning. The analysis shows a trade-off between early efforts to decarbonise the fleet, which allows for a smoother transition, versus the long-term planning approach, which attempts to find the solution with the lowest overall cost. This balance must be found while providing a growing fuel supply through different feedstock routes without major price fluctuations.

Fourth, both retrofits and newbuilds will be required to meet net-zero by mid-century. In all transition pathways, approximately 26% (by the number of ships up to 2050) of the transition is achieved through retrofitting. It means that replacing vessels near the end of their lives with newbuilds powered by zero-carbon fuels is no longer sufficient to meet the net-zero 2050 target. Instead, younger ships in operation today need to be retrofitted to accelerate the uptake of zero-carbon fuels.

Fifth, fleet costs vary per transition pathway. The total fleet costs up to 2050 are lowest for ammonia ($44.5b), followed by methanol ($51.5b) and then hydrogen ($69.4b) – compared to the fossil fuel baseline of $42.3b (incl. carbon cost).

Sixth, voyage expenses dominate the fleet's total costs, representing between 71% and 82% of the cumulative fleet total costs depending on the transition. Therefore, improving vessel energy efficiency and voyage optimisation becomes increasingly instrumental in reducing the cost of decarbonisation.

Seventh, the fleet fuel transition leads to a specific fuel supply. The production location delivering the cheapest fuel production option typically also benefits from being the location with the lowest feedstock prices, except when the cost of transporting that fuel to the fleet becomes too large (e.g., for the hydrogen transition scenario).

Finally, co-location of fuels produced with natural gas and fuels produced with renewable electricity could deliver further cost reductions. Saudi Arabia and Australia are likely production locations because of the relative lower feedstock prices. There can be key economic advantages in plant co-location, such as de-risking investments and building long-term security of supply capability and associated costs.

Unearth and accelerate

This first step was an exercise to show what the framework can do, i.e., to find a system-based solution that brings the supply and fleet sides together. By focusing on a particular Green Corridor, the framework can highlight issues in advance, helping to identify what we think might work best for a specific fleet and, importantly, reach a common solution that holds good for the majority of stakeholders. The framework can be applied to different fleet types, geographies, and transition strategies outside of the three fuels explored in the report. As we advance, we want to develop the framework further and test it on a real case.

Building on this fuel agnostic framework, the LR Maritime Decarbonisation Hub aims to steer cross-industry alliances that can unearth and accelerate resilient energy transitions, enabling the carry out of Green Corridor projects this decade. ■

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Launched in 2020, the Lloyd's Register Maritime Decarbonisation Hub is a joint initiative between Lloyd's Register Group and Foundation. It brings together thought leaders and subject matter experts with the skills, knowledge and capability to help the maritime industry design, develop and commercialise the pathways to future fuels required for decarbonisation.
Click **www.lr.org/en/marine-shipping/maritime-decarbonisation-hub** to learn more.