SILK ALLIANCE

The Silk Alliance: A progress report

Prepared by the Lloyd's Register Maritime Decarbonisation Hub
on behalf of the Silk Alliance members

About the Lloyd's Register (LR) Maritime Decarbonisation Hub

The LR Maritime Decarbonisation Hub serves as the facilitator and secretariat of the Silk Alliance Green Corridor Cluster initiative, which was officially launched in May 2022. From the project inception and creation of the Silk Alliance in 2021, the LR Maritime Decarbonisation Hub have applied its in-house First Mover Framework (FMF) methodology to this multi-year programme for the Silk Alliance.

The LR Maritime Decarbonisation Hub is a joint initiative between Lloyd's Register Group and Lloyd's Register Foundation.

Our Mission: We remove barriers to accelerate the safe and sustainable maritime energy transition though evidence and partnerships across the ecosystem

For more information, go to www.maritimedecarbonisationhub.org.

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SILK ALLIANCE

The journey so far

The Silk Alliance members held a full-member workshop in Singapore in early October 2023 and this note summarises the progress made so far and the next steps.

The Silk Alliance is a Green Corridor Cluster focused on a fleet that predominantly bunkers in Singapore and operates across the Indian and Pacific Oceans comprising stakeholders from across the full value chain including international shipping, shipbuilding, financing and marine fuel supply chains, while also bringing together representatives from both the public and private sector.

The Alliance was officially formed in May 2022 and has -since then- adopted the First Mover Framework (FMF) approach. The First Mover Framework brought together the members to discuss emerging trends and share different perspectives about the initiative. It also helped to identify a 'baseline fleet' stemming from the members' existing fleet based on the likelihood for these vessels to perform bunkering operations in Singapore. The next step was about identifying the key questions and agreeing on focus areas.

A scenario analysis of the different fuel transition strategies to narrow down the fuels of interest even further was conducted as part of this initiative. The above have all culminated in the development of an Implementation Plan along with the addition of new members representing the government and fuel production space.

The October meeting follows up from a previous meeting held in April 2023 when the members finalised the Silk Alliance's Implementation Plan (Figure 2). The Plan represents the shared vision of the members on where this Green Corridor Cluster initiative should focus and how the industry could achieve the milestones set therein until 2030.

Key milestones were outlined to be completed as immediate steps, corresponding to three workstreams:

- **fleet and fuel demand**
- **fuel supply**
- **finance**

Figure 1
Summary of the key milestones taken by the Silk Alliance to date

For more information about the Silk Alliance Green Corridor Cluster and its members, please visit our website

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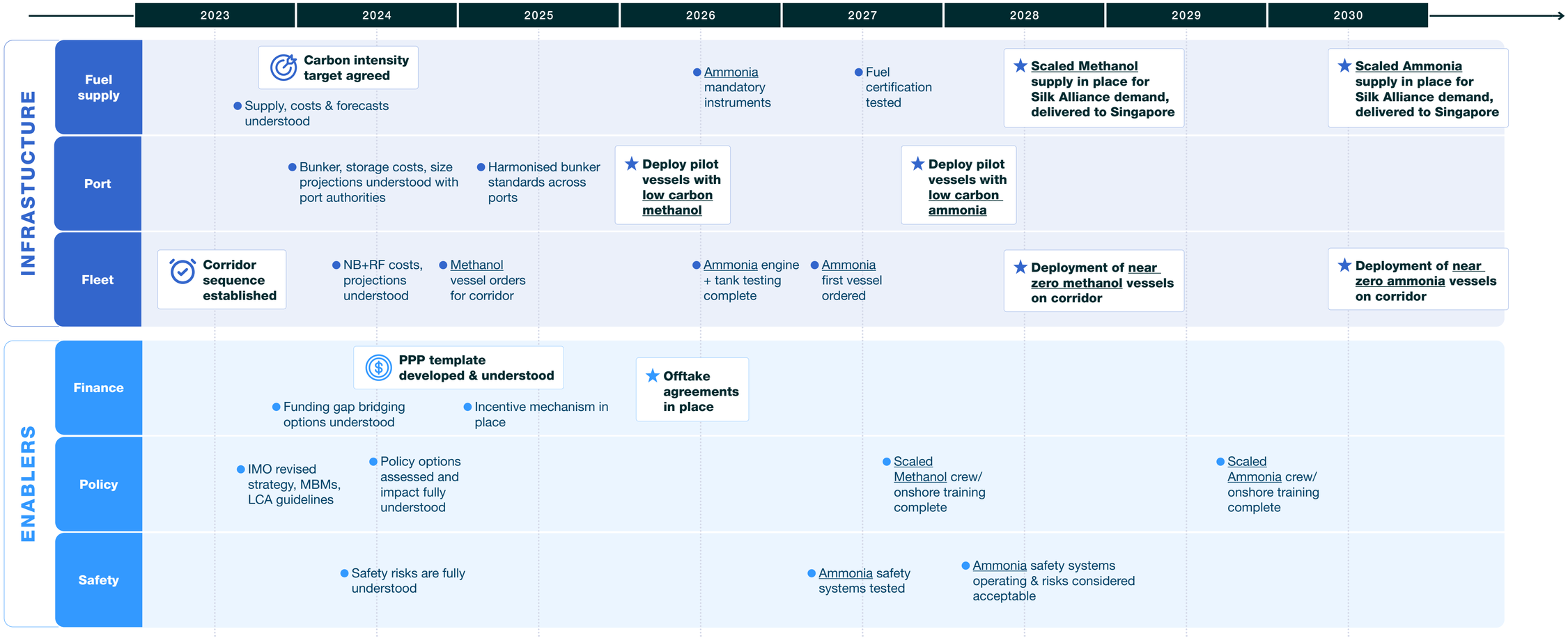
Implementation plan for the Silk Alliance Green Corridor Cluster



All the milestones outlined in this implementation plan represent milestones that need to be delivered, led by a combination of actions from the Members and from wider industry efforts, to support the ultimate implementation of this Green Corridor Cluster. This is a live implementation plan that the Members will continue to detail further and refine as the initiative progresses.

Figure 2
Silk Alliance Implementation Plan

SILK ALLIANCE

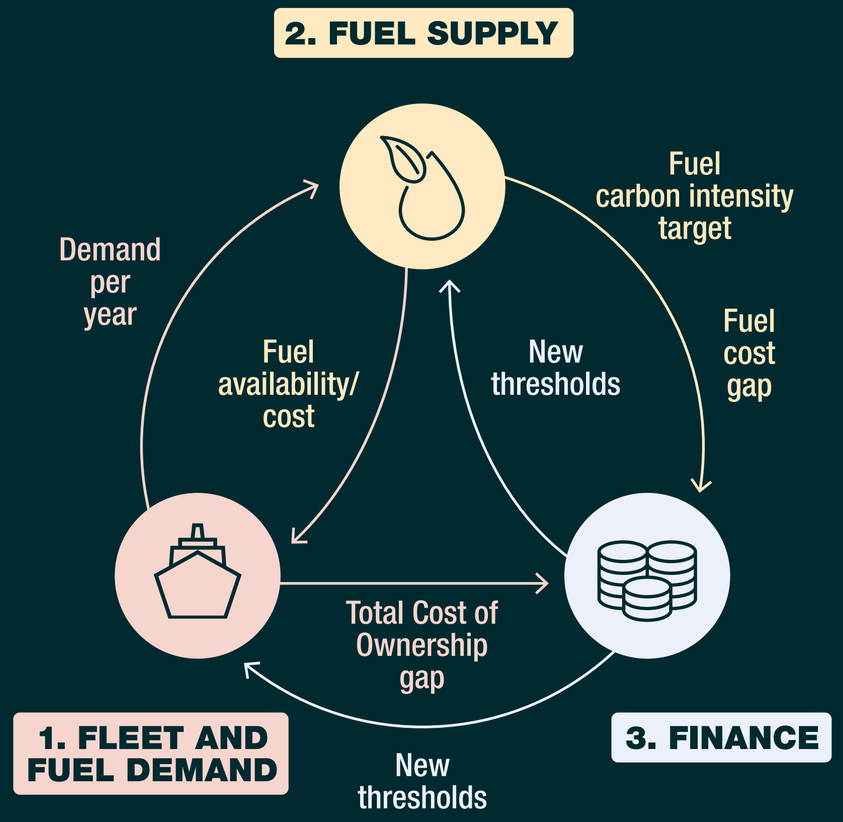
Overview of the three workstreams

Three interlinked workstreams were initiated to facilitate the implementation of this Green Corridor Cluster. There is significant interaction among the workstreams as the tasks performed in each of them can assist the progress made on the others. Figure 3 illustrates an example of such interactions. To begin with, the workstream on fleet and fuel demand focused on estimating the aggregated demand for the Silk Alliance fleet based on the endorsement of the Implementation Plan. This is in turn linked to the fuel supply workstream with an overall objective to secure consensus on fuel carbon intensity levels and fuel cost gap estimations. Both workstreams fed into the third workstream on Finance, which aims to identify the scale of the cost gap as well as the mechanisms that could bridge this cost gap across both the fleet and fuel supply.

As the work progresses and interaction within these workstreams increases, members of the Alliance will discuss ways forward. with the final objective to meet the milestones in the Implementation Plan.

The following sections delve into each workstream and the work done to date.

Figure 3
Graphical representation of the links between the three workstreams



WORKSTREAM 1

Fleet transition and fuel demand

The main objective of this workstream was to estimate the aggregated demand for the Silk Alliance up to 2030 and beyond, given the agreement on the Implementation Plan and the fuels of focus.

To achieve this, the baseline fleet was updated to include new members' vessels. Key details of the baseline fleet are shown below:

359 vessels

6 shipowners

Current Energy Consumption:

0.126 EJ

Current Annual Fuel Consumption:

2.9m tonnes (HFO equivalent)

Well-to-Wake (WtW) Emissions:

10.14m tonnes of CO_2e

Thereafter, a model was developed to project the number of replacements (newbuildings replacing retiring vessels), expansions (new vessels to meet increasing transport demand), and retrofits. This analysis was conducted separately for each shipowner within the Silk Alliance and preliminary results were presented in one-to-one meetings. These shipowner-specific results were then refined based on detailed feedback from each owner to further improve the validity of the results.

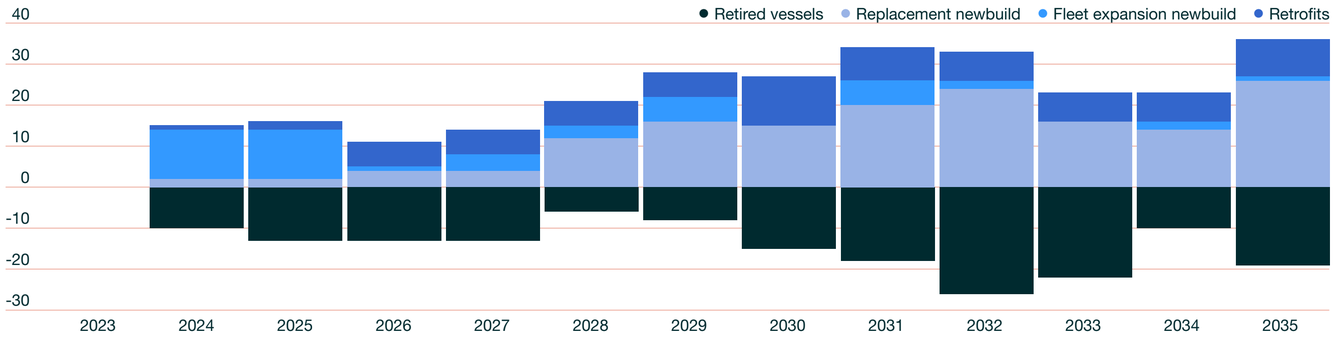
The final stage was then to aggregate the results from these 6 separate analyses to establish the sequence of the baseline fleet. Key results are visualised in Figure 4, and results indicate that by 2030 the Silk Alliance basefleet will contain **137 ships** operating on alternative fuels comprising of:

For the replacements and retrofits, it was possible to identify the routes and the potential roundtrips of these vessels as well as their potential succession.

Figure 4

Projected evolution of the Silk Alliance basefleet to 2030.

Negative columns (shown in black) represent vessels being removed from the fleet due to retirement.



SILK ALLIANCE

WORKSTREAM 1

Fleet transition and fuel demand

Actions completed:

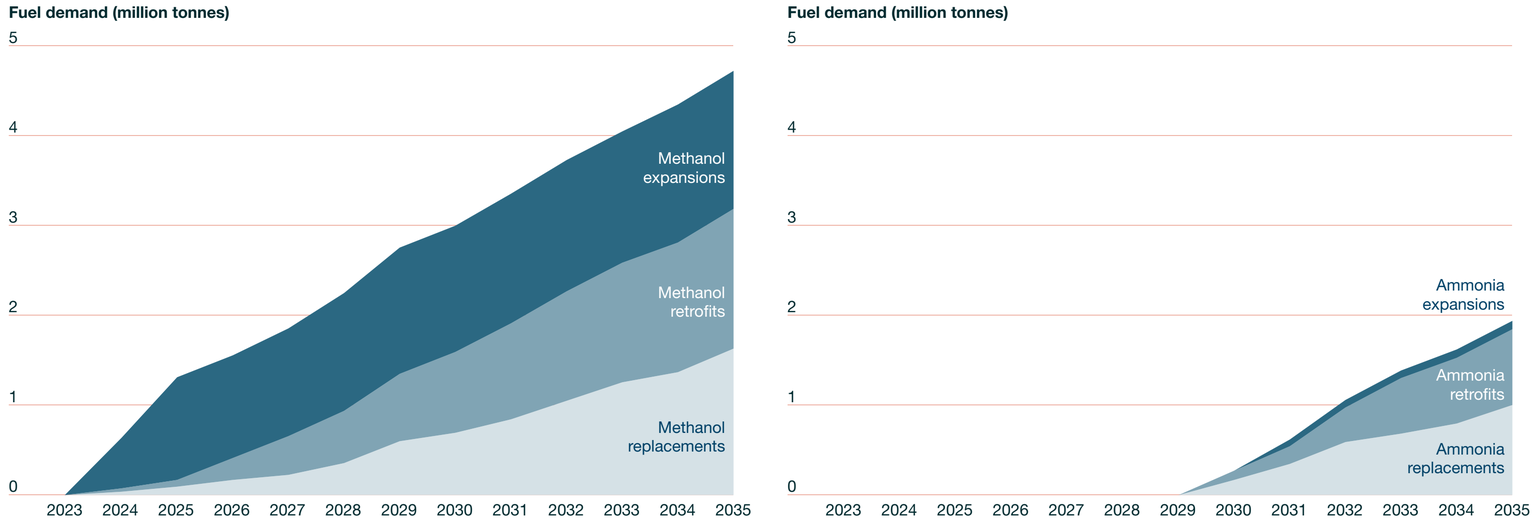
- **Sequence of the corridor has been established**
- **Indicative aggregated demand has been projected**

First estimates of the emissions have been calculated and discussed, however, the group agreed that this is largely dependent on the carbon intensity of the fuels, which is part of Workstream 2

Based on Figure 5, the energy mix of the baseline fleet over time was forecasted. Each newbuild or retrofitted vessel was initially designated as utilising methanol or ammonia in accordance with the Implementation Plan, and in certain instances adjusted based on feedback. Assumptions accounted that 100% of the energy demand for these ships was delivered by alternative fuels without blending and with the additional requirement of MDO pilot fuel to facilitate combustion (5% for methanol, 10% for ammonia). This is a key caveat as, in practice, many of the ships ordered for the formative years will be dual-fuel vessels and will most likely operate primarily on fossil fuels until a methanol supply chain has been established. Therefore, the resulting fuel demand projections, shown in Figure 5, represent the upper bound of the potential demand.

These projections can henceforth demonstrate a strong demand signal for the fuel suppliers within the Alliance.

Figure 5
Projected growth of alternative fuel demand for the Silk Alliance baseline fleet to 2035



WORKSTREAM 2

Fuel supply

The first objective of this workstream was to learn about the different types of production pathways, their carbon intensities and their cost drivers, as well as the risks involved in fuel supply investments and potential supporting actions.

This objective was met by delivering three webinars led by the representatives of the fuel supply area, namely Yara Clean Ammonia and the Methanol Institute.

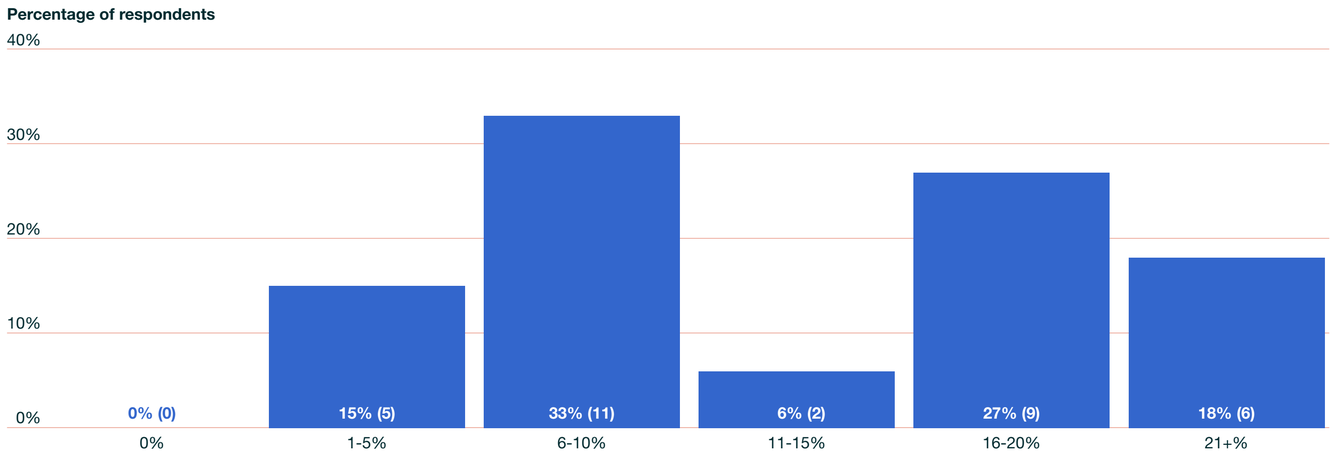
During the workshop, the members had the chance to discuss the key points that emerged during the webinars including:

- The time dependency of fuel production costs
- The different processes impacting fuel carbon intensity
- The need for a transition period in adopting 100% greener fuel options
- The flexibility to shift from traditional fuels (grey) to greener options (green and blue) using blending or hybrid systems
- Consideration of the existing infrastructure and adaptability for greener fuels
- Sizing of facilities and impact on production levels and costs
- The challenge of addressing the gap and creating a viable business case for greener fuels
- The importance of aligning the supply chain elements for efficient production and distribution
- The need to balance risks across the supply chain.

The members discussed a ‘tolerable’ range for fuel carbon intensity of the fuels to be used within the Silk Alliance initiative. A poll taken during the webinars indicated that many of the members foresee a potential target as carbon intensity fuel with 6% to 10% lifecycle emissions compared to the fossil fuel benchmark in Figure 6. After the discussion during the workshop, there was a general consensus to explore two cases: one case with fuel having a carbon intensity of 20% GHG lifecycle emissions compared to the fossil fuel benchmark and another case with carbon intensity of 10%.

Given these tentatively agreed targets in terms of fuel carbon intensity, the group intends to carry out further analysis to better understand potential production and distribution costs for different fuel pathways routes.

Figure 6
Results from the polls during the webinars



WORKSTREAM 3

Finance

Building on the fleet and fuel supply analysis, the finance workstream focused on identifying the scale of the cost gap for the Silk Alliance and the mechanisms that could bridge the cost gap for this Green Corridor Cluster. The cost gap is considered across the full value chain by factoring the higher costs on both the fleet and fuel supply side relative to a business-as-usual case, as illustrated in Figure 7.

The Silk Alliance Finance Taskforce, comprising members and external stakeholders, reviewed and discussed the viability and the opportunities for a range of different cost gap-bridging options as part of an initial high-level screening exercise (Figure 8).

Figure 7

Illustration of relative cost difference for the fleet and fuel supply for green corridor initiatives to estimate cost gap.

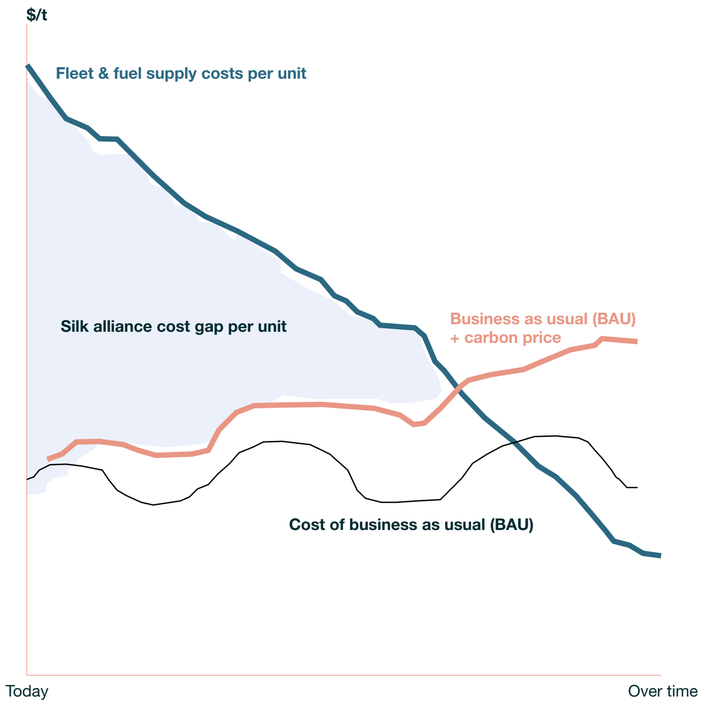
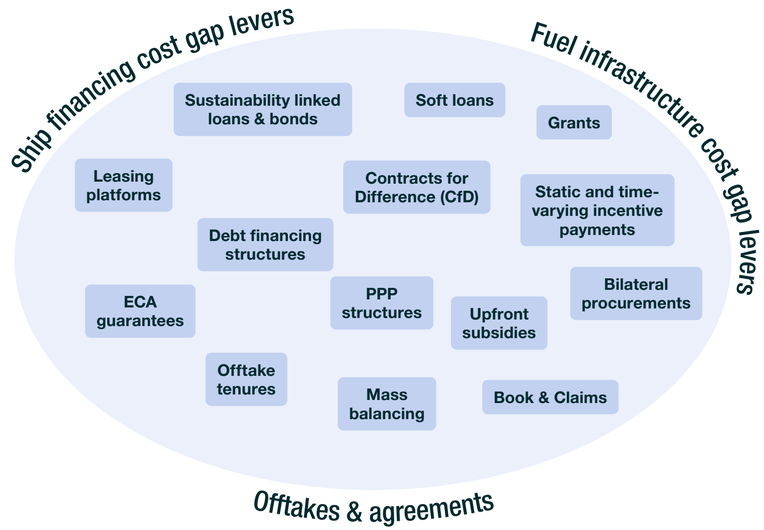


Figure 8

Financing mechanism & bridging options discussed during early consultations with Silk Alliance Finance Taskforce

Finance Taskforce discussions covered a broad range of topics to better understand how financing mechanisms can bridge the cost gap for green corridor initiatives



SILK ALLIANCE

WORKSTREAM 3

Finance

Critical engagements

- Members discussed the need for engagement with the energy-producing countries in Asia as a high priority to help focus on location-specific business case development, but also to get more clarity on which types of financing mechanisms would see the most credible public sector support.
- Members voiced that the demand signal from end consumers and cargo owners in the Indian & Pacific Ocean region was fragmented, so the focus on demand aggregators further up the value chain, such as bunker suppliers and freight forwarders, would instead provide a more consolidated regional downstream demand signal.

Fuel infrastructure cost gap

- The Finance Taskforce was asked to review several options including the viability and implementation of (1) an upfront capex subsidy (2) both a static and time-varying incentive payment scheme and (3) Contracts for Difference (CfD) mechanisms.
- These early consultations with the task force have provided direction on the key questions to address during the modelling of these bridging options, plus which key stakeholders would be crucial to delivering these strategies.

Ship finance cost gap levers

- Members created an asset-based cashflow model to understand the extent to which ship financing levers could help minimize the cost gap.
- The Alliance chose to assess the potential role of a leasing platform for a green corridor initiative, compared with traditional lending facilities, as both debt and equity financing are equally crucial factors to consider in better understanding how a business case could be developed and explore where opportunities for more vertically integrated business models could emerge for green corridors.
- Other considerations for the model scenarios would include (but are not limited to) the tenure period of loans, the decision to invest in new builds or retrofits, and additional government-backed guarantees. The workstream will look at the financing requirements needed for the given scale and timeline as per the Implementation Plan.

Next steps

- Going forward, the finance workstream will develop the cost gap analysis further, building on the preliminary cashflow modelling assessments developed by the members.
- The Silk Alliance members will look to other key partnerships to further discuss asset ownership, public sector engagements, and cross-sector demand aggregations -- the latter, driven to strengthen the scale and diversification of the Silk Alliance’s aggregated demand signal in support of the Alliance’s business case development.

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