Routes-based action plan: a toolkit

Exploring applications for the Asia Pacific context

IMO INTERNATIONAL MARITIME ORGANIZATION

MPA SINGAPORE

GREENVOYAGE 2050

Norwegian Ministry of Climate and Environment

NEXT GEN Towards Green and Efficient Navigation

This material is prepared by The Lloyd's Register Maritime Decarbonisation Hub

The Lloyd's Register Maritime Decarbonisation Hub (LR MDH) is a joint initiative between Lloyd's Register Group and Lloyd's Register Foundation. Our mission is to accelerate the sustainable decarbonisation of the maritime industry, by enabling the delivery and operation of safe, technically feasible and commercially viable zero-emission vessels by 2030 and beyond. We bring 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.

LR MDH was the winner of the IMO-Singapore NextGEN Connect Challenge in April 2023 for their proposal on "Development of a Routes-based Action Plan Methodology based on Silk Alliance". The LR Maritime Decarbonisation Hub serves as the facilitator and secretariat of the Silk Alliance 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 has applied its in-house First Mover Framework (FMF) methodology to this multi-year programme for the Silk Alliance.

Please contact:

Ahila Karan
ahila.karan@lr.org

Dr Charlie McKinlay
charlie.mckinlay@lr.org

Dr Carlo Raucci
carlo.raucci@lr.org

Background

The potential for shipping routes and maritime hubs actions to reduce shipping's Greenhouse Gas (GHG) emissions and support maritime decarbonization was examined during the NextGEN-GreenVoyage2050 workshop held in Singapore on 5 to 6 October 2023.

The workshop was organised by the International Maritime Organization (IMO), the Maritime and Port Authority of Singapore and the Ministry of Climate and Environment of Norway. In line with the objectives in the 2023 IMO GHG Strategy, the aim was to raise awareness on actions to reduce GHG emissions from ships and foster cooperation along shipping routes with stakeholders across the whole value chain to aggregate demand and support energy transition.

Forty participants representing ports and National Administrations across Asia from Brunei Darussalam, Cambodia, China, Malaysia, the Philippines, Thailand, Timor-Leste, and Vietnam participated in the two-day workshop. The Singapore-IMO Third Country Training Programme (TCTP) and the GreenVoyage2050 Project supported the participation of several countries.

A route-based action plan methodology presented at the workshop was developed by the Lloyd's Register Maritime Decarbonisation Hub (LR MDH). LR MDH was the winner of the IMO-Singapore NextGEN Connect Challenge in April 2023 for their proposal on "Development of a Route-Based Action Plan Methodology based on Silk Alliance".

The workshop simulated the process steps of the routes-based action plan methodology with several group activities and exercises. This provided a chance to gather feedback to help refine the methodology and address the limitations of the methodology in its application in the wider Asia-Pacific context. **Additional engagements with stakeholders from the Pacific are envisaged to further refine the methodology.** It was also an opportunity to reflect the unique challenges and opportunities faced by these regional stakeholders. This report describes the methodology developed by LR MDH and summarises the discussions and feedback from workshop participants.

The workshop was delivered by:

LR Maritime Decarbonisation Hub


Ahila Karan


Dr Carlo Raucci


Dr Charlie McKinlay


Natassa Kouvertari

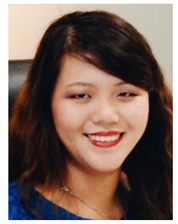

Charles Haskell

IMO


Astrid Dispert


Minglee Hoe

Singapore MPA


Minerva Lim

Norway


Sveinung Oftedal

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Executive Summary

The International Maritime Organization (IMO) set stricter targets for shipping's GHG emissions reaching net-zero by or close to 2050, committed to ensuring the uptake of zero-carbon fuels by 2030, and signalled its support for a just and equitable transition as part of the IMO's Revised GHG strategy.

This report presents a routes-based action plan methodology that is designed to kickstart the uptake of clean maritime fuels, and supports the inclusion of developing countries, Least Developed Countries (LDCs) and Small Island Developing States (SIDS).

The starting point to develop the routes-based action plan is the First Mover Framework (FMF) methodology that was created by the Lloyds Register Maritime Decarbonisation Hub, to develop an approach for first movers to deploy clean fuels in specific locations e.g. along a route/s or in a cluster. The First Mover Framework was already deployed for a first mover initiative in the Asia Pacific region – called the Silk Alliance.

By building on the experiences of the Silk Alliance a routes-based action plan was developed as shown in Figure 1.

Figure 1
Routes-based action plan

The routes-based action plan was shared during a **2-day workshop with stakeholders across Asia,** and the workshop simulated the process steps with several group activities and exercises. This provided a chance to gather feedback to help refine the methodology and address the limitations of the methodology in its application in the wider Asia Pacific context. It was also an opportunity to reflect the unique challenges and opportunities faced by these regional stakeholders. **Additional engagements with stakeholders from the Pacific are envisaged to further refine the methodology.**

The findings in this report also draw on the stakeholders' feedback collected during this workshop, and also reinforces how the inclusion of developing countries, Least Developing Countries (LDCs) and Small Island Developing States (SIDS) can be best supported.

Workshop identifies need for a regional approach

The discussions during the workshop highlighted specific needs:

- Routes-based action plans need to consider a wider range of routes and actors that connect large demand aggregation locations with remote and smaller demand locations, as well as to facilitate the connections to existing or new fuel production sites. To ensure the inclusion of LDCs, SIDS and developing countries, it will require the engagement of a broader stakeholder community across the region to **establish regional energy clusters – both as demand centres and energy producing hubs.**

- The pace of development varies across the Asia Pacific region, with some ports and governments already engaged in first-mover initiatives involving routes-based action plans and energy development projects. Therefore, **coordination across regional governments and knowledge pooling across existing regional first movers will be critical** in establishing regional hubs that can support the inclusion of LDCs and SIDS.

- Furthermore, a **top-down approach steered by National Governments in support of routes-based action plans is useful,** particularly giving confidence to ports to make investment decisions for infrastructure to support the uptake of alternative fuels and will encourage these initiatives to be prioritised at the project level. Specifically, **coordination across governments in the Asia Pacific region has the potential to create a more level playing field and create economies of scale for alternative fuel production,** to help the region overcome challenges created by more mature regulatory and incentive structures that are already being offered elsewhere across other regions.

Driving success with routes-based action plans across Asia Pacific

In order to drive success with routes-based action plans across the wider Asia Pacific region, several factors are considered of critical importance.

- **Coordination and collaboration among stakeholders** is key to the consensus-building and full supply chain engagement aspects of the routes-based action plans methodology, particularly when it comes to co-developing the *Implementation Plan* presenting actions and milestones for each stakeholder. It is also important that key decision makers, such as vessel owners and operators, fuel suppliers and investors in these projects are involved as early as the Inception and Definitions & Scope stage so that there is sufficient support from the outset. Ports can also play a further convening role to facilitate these collaborative environments.

- **Capacity building and specialised support** will be a major requirement to execute the data-driven aspects of the routes-based action plan methodology as part of completing the Assessment and Business Case development steps of the process. Many countries in the Asia-Pacific region need support in developing the technical expertise and institutional capacity to implement routes-based action plans. This support may come from other regional first movers or maritime experts driving this forward. Feasibility assessments and preparatory work will require funding and support to execute particularly where resources are limited.

- **Increased access to the investment community** is needed to build a credible Business Case, which is the final stage of the process. Projects partners need a clear understanding of what investors are looking for to construct robust proposals and understand the tools and mechanisms available to bridge the cost gap of these projects. These relationships can be developed by regional workshops and roundtables that increase engagements with the shipping, fuel supply and finance communities.

Recommended actions to drive creation of regional hubs

- **Regional governments** need to work together to support a strategy focused on creating a regional hub, and this will include understanding the demands from the different countries across the region, which will be key to building investment cases for energy infrastructure for the region at scale.

- **Public-private partnerships** can be effective in mobilising resources and expertise needed to establish regional clusters and implement routes-based action plans. Bringing the industry and governments together will be key during the integral risk sharing discussions to unlock investments in these projects.

- **Governments and fuel suppliers** need to assess prospective energy producing locations in the Asia Pacific region, that are inclusive of new energy producing ports and locations in the region and have potential to bring wider economic and social benefits to local communities that can include LDCs, SIDS and developing countries.

- **Development Banks and regional funds** need to prioritise working with prospective regional energy producing locations and regional hubs and lead on efforts to tailor those financing mechanisms that can help unlock investments at scale and increase access to financing routes-based action plans that are inclusive of LDCs and SIDS.

Introduction

The 2023 IMO GHG Strategy explicitly foresees supporting global availability and uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources, including:

- First movers incentives to develop and take up new technologies;
- Consideration and analysis of measures to both encourage port developments and activities globally to facilitate reduction of GHG emissions from shipping;
- Provision of ship and shoreside/onshore power supply from renewable sources, and infrastructure to support supply of zero or near-zero GHG emission fuels and/or energy sources; and
- Further optimization of the logistic chain and its planning, including ports.

The 2023 Strategy specifically recognizes that the decarbonization of shipping should be possible for all IMO Member States and may create new opportunities also for developing countries, including especially Small Island Developing States (SIDS) and least developed countries (LDCs), to take part in the value chain of the production and distribution of zero and near-zero GHG emission technologies, fuels and/or energy sources for international shipping.

A two-day workshop was organised from 5-6 October 2023 by the International Maritime Organization (IMO), the Maritime Port Authority of Singapore (MPA) and the Lloyd's Register Maritime Decarbonisation Hub (LR MDH). In line with the 2023 IMO GHG Strategy, the objective was to raise awareness on actions to reduce GHG emissions from ships and foster cooperation along shipping routes with stakeholders across the whole value chain to aggregate demand and support energy transition.

Forty participants representing ports and National Administrations responsible for policy development, participated in the two-day workshop from Brunei Darussalam, Cambodia, China, Malaysia, the Philippines, Thailand, Timor-Leste, and Vietnam. The Singapore-IMO Third Country Training Programme (TCTP) and IMO-GreenVoyage2050 supported the participation of several countries.

A routes-based action plan methodology presented at the workshop was developed by LR MDH. This was based on the First Mover Framework (FMF) methodology[1] designed to kickstart the uptake of clean maritime fuels and was further refined using the experiences gained through the methodology's application as part of the Silk Alliance initiative[2]. Workshop participants learned about the key steps of the methodology as described in this report and provided valuable input through activity-based exercises. This was the first training session with plans to repeat this to raise awareness among other stakeholders and test the application of the methodology across other regions, routes, ports and fleets.

This report summarises the key steps of the routes-based action plan methodology as well as the key takeaways derived from the input and feedback received from the participants.

1 LR_First_movers_in_shipping_s_decarbonisation_A_framework_for_getting_-1.pdf (thesilkalliance.com)
2 The Silk Alliance - Green Corridor Cluster Initiative

Overview of the methodology

The methodology is broken down into 5 stages, each with the aim of building consensus at each stage among the project partners that are critical to the decision-making process, inclusive of partners across the full value chain. In each stage, there are key outputs and deliverables that guide partners through the collective decision-making process.

This report lays out the routes-based action plan methodology that is designed to help the partners agree on an implementation plan that is focused on the uptake of clean fuels and position themselves to make the necessary investment decisions to execute these initiatives.

The Inception stage is about creating a community that is ready to engage in collective decision making – from here, the process of consensus building begins. Thereafter, the process takes the partners through a series of joint activities that help narrow down the decisions, until the group can collectively decide on a final way forward with a formalised implementation plan in hand.

Developing a Routes-Based Action Plan

1 Inception

- Identifying **routes and ports**
- **Stakeholder** mapping
- Creating a **community**
- **Trends** and perspectives

2 Definitions & setting scope

- Prioritisation of **focus areas**
- Create **key questions** for scenario analysis
- Build **scenarios**

3 Assessment

- Creating a **demand signal**
- **Planning** maritime ecosystems
- **Understanding** fuel supply systems and **deployment**

4 Implementation planning

- **Review** scenarios
- Address key questions
- Narrow focus
- **Implementation plan**
- Stakeholder engagement

5 Business case

- **Financial assessment**
- Assess bridging options & financing sources
- **Refinement of scenarios** and assessments

Building consensus throughout the process at each of the stages

A community created that is ready to make collective decisions for a joint purpose and learn through the process together.

Reaching alignment among the partners on the direction of this initiative and how best to focus efforts going forwards.

This may already include agreement on the fuel selection and/or routes and ports involved.

Agreement among partners on the analytical outputs and scenarios that would help to address the group's key questions and steer focus for the group.

An agreed plan is created, steered by the assessments and alignment among the partners, to show how and when each stakeholder would in practice contribute and lead this forward through to project execution.

Clarity achieved on how project can be financed in line with the implementation plan timelines, by bringing in partners that can ensure financing mechanisms and funding will be in place.

Consensus on the mutually agreed strategy and financing at this stage sets groundwork to move onto the execution phase.

STEP 1

Inception

At the start, the initiators of the routes-based action plan methodology will need to decide where to begin and gain clarity on which stakeholders should be brought together to kickstart this collaborative effort.

What are Routes-based Action Plans?

Routes-based action plans can cover various routes and clusters that are not limited to single port-to-port routes. Clusters could have the potential to drive a greater demand signal in certain cases, while some routes may involve multiple port calls along the way (Figure 2 illustrates a wide range of options that can be applied to both a domestic and international shipping context including the routes required to develop the fuel supply).

As an example, for routes-based action plans that focus on developing energy hubs (see Figure 2), there could be a range of roles to consider:

- ports where e-fuels are locally produced and also provide bunkering services
- exporter ports where e-fuels are produced locally, but exported to other locations
- importer ports where e-fuels are imported, but bunkering services are provided

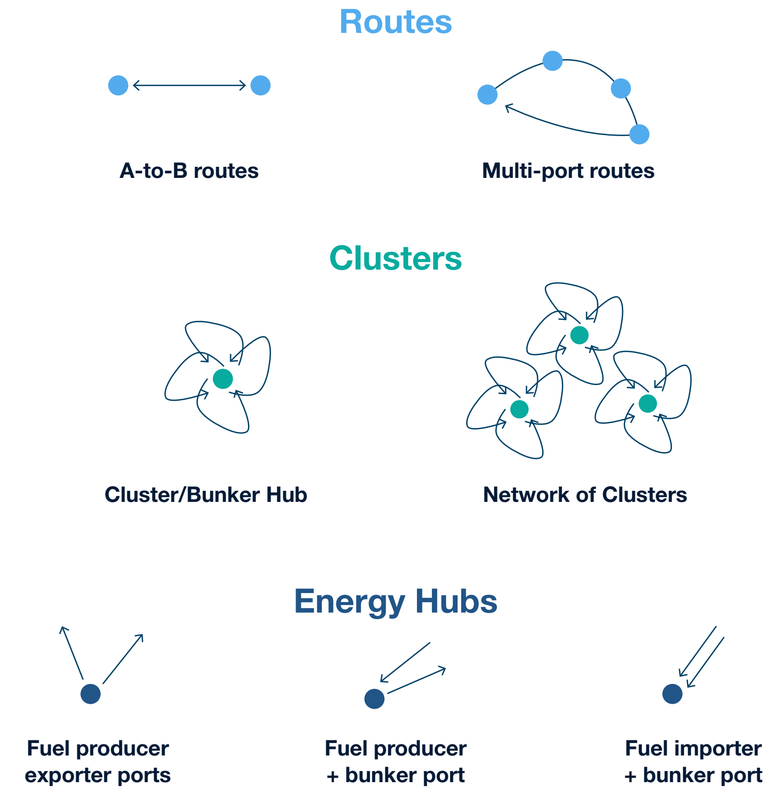


Figure 2
Illustration of several types of routes and clusters

Identifying routes & ports

There are separate ways to understand how to prioritise the routes and ports that could potentially be involved in this type of initiative. One way is to use the tool for inclusive transition that assess the potential of ports based on a range of factors, including:

- Potential to deliver a surplus of renewable energy near ports
- Land suitability
- Shipping traffic at the port and in the surrounding sea area
- Potential improvement in air quality
- Potential improvement to local economies

The identification of candidate ports based on these criteria is presented in a recent case study[3] that starts with ports across the Asia-Pacific.

Further analysis is then required to assess the suitability of candidate route(s) and port(s). Some possible selection questions that could help to identify candidate routes and ports are:

1. **Does a fleet typically operate certain routes or within a specific region or area?** A strong and stable demand signal is necessary to justify the investment in fuel supply and bunkering infrastructure at a specific location. A regional fleet is more likely to operate within a certain range and has more chances to bunker at the same location, and potentially more likely to bunker at a proposed location.

2. **Is there a stable demand signal from the fleets?** The nature of the routes (e.g. shuttle routes and defined service lines) are also factors contributing to the certainty around fuel demand for specific routes and areas.

3. **Can this quickly scale up and make a greater impact?** If the selection can demonstrate the potential to expand and scale up to include other routes and fleets over time, this could support the business case for the initial selection. Given the high upfront investment costs, the potential to drive multiplier and spillover effects and reduce emissions at scale could be impactful and attractive to investors and funders of these projects.

4. **Do fleets and ports demonstrate first mover characteristics?** Examples may include shipping segments with a higher willingness to pay from end consumers, or ports and governments steered by financiers, shareholders or domestic targets that drive and support actions that promote the uptake of alternative fuels.

3 LR-MDH, EDF and Arup, The Potential of Ports in Developing Sustainable First Movers Initiatives, A Tool for an Inclusive Transition, 2023

Stakeholder mapping

It is unlikely that all stakeholders will be represented from the outset across international shipping, shipbuilding, financing, and energy and fuel supply chains. It is important to bring in the partners that are critical to the investment and strategic decision-making process as early as possible. The initiators may find that there are stronger relationships with certain stakeholders than others, however as relationships strengthen through the process, the network of engaged collaborators can be expanded.

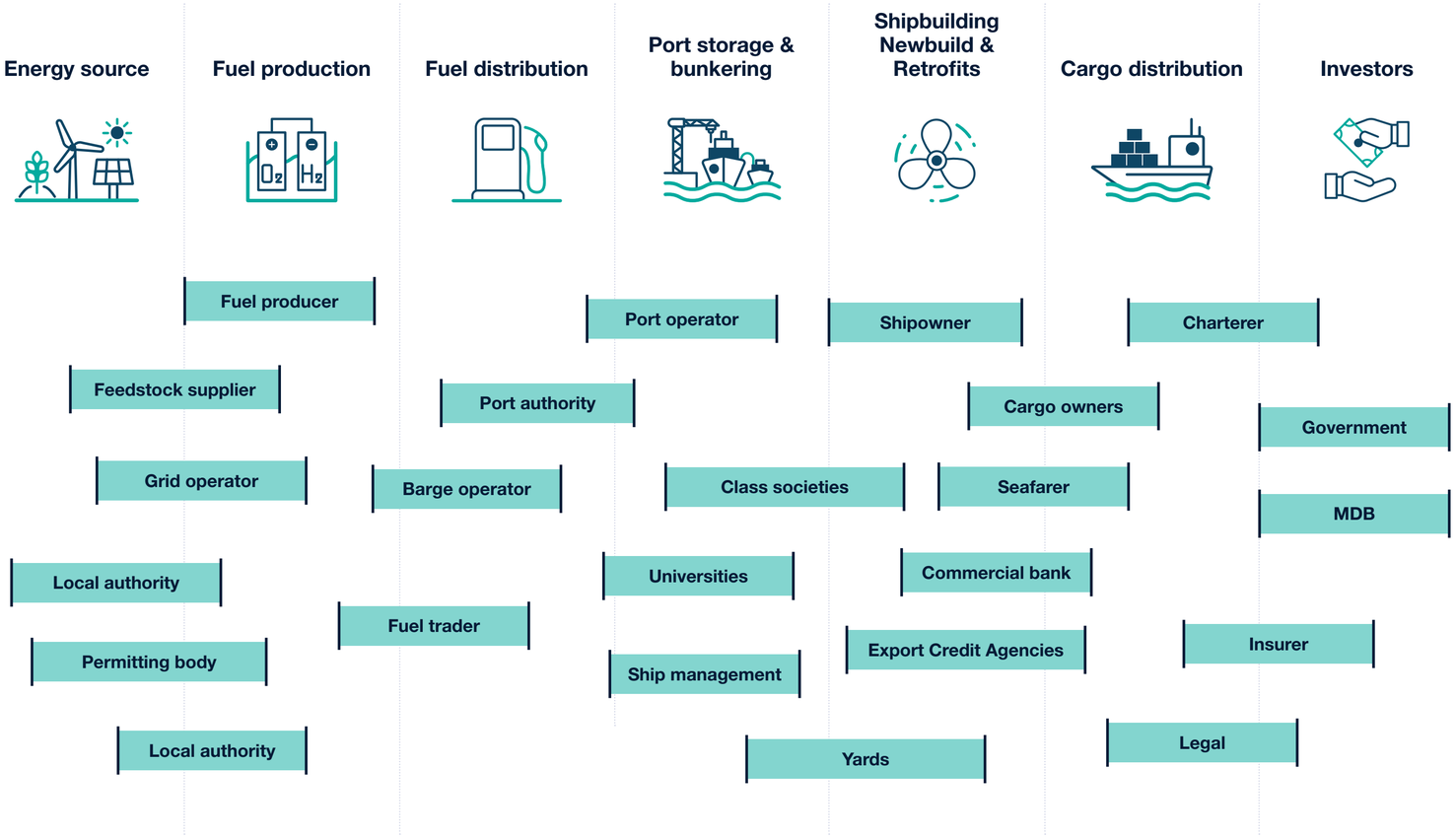


Figure 3
Stakeholder mapping across full value chain

1

Inception

- Identifying **routes and ports**
- **Stakeholder** mapping
- Creating a **community**
- **Trends** and perspectives

Trends & perspectives

Part of the community-building process involves sharing perspectives and understanding of the different challenges faced by each of the partners and identifying the collective opportunities. These challenges and opportunities may vary depending on geographies and profiles of the different partners involved in the initiative. These early engagements can be supported by interactive workshops and roundtables to bring different stakeholders together that may not otherwise have collaborated in the past.

In this information gathering process, it is also important to be aware of the emerging trends in the industry, so that everyone has a mutual understanding of the risks and opportunities that are faced. For example, monitoring the progress around the 'readiness' of the fuels will be key, particularly in understanding the driving forces behind these emerging trends. For instance, one tool is the Zero Carbon Fuel Monitor,[4] which reports readiness ratings for a range of fuels across all stages of the value chain against three distinct pillars:

1. **Technology Readiness (TRL)**
2. **Investment Readiness (IRL)**
3. **Community Readiness (CRL)**

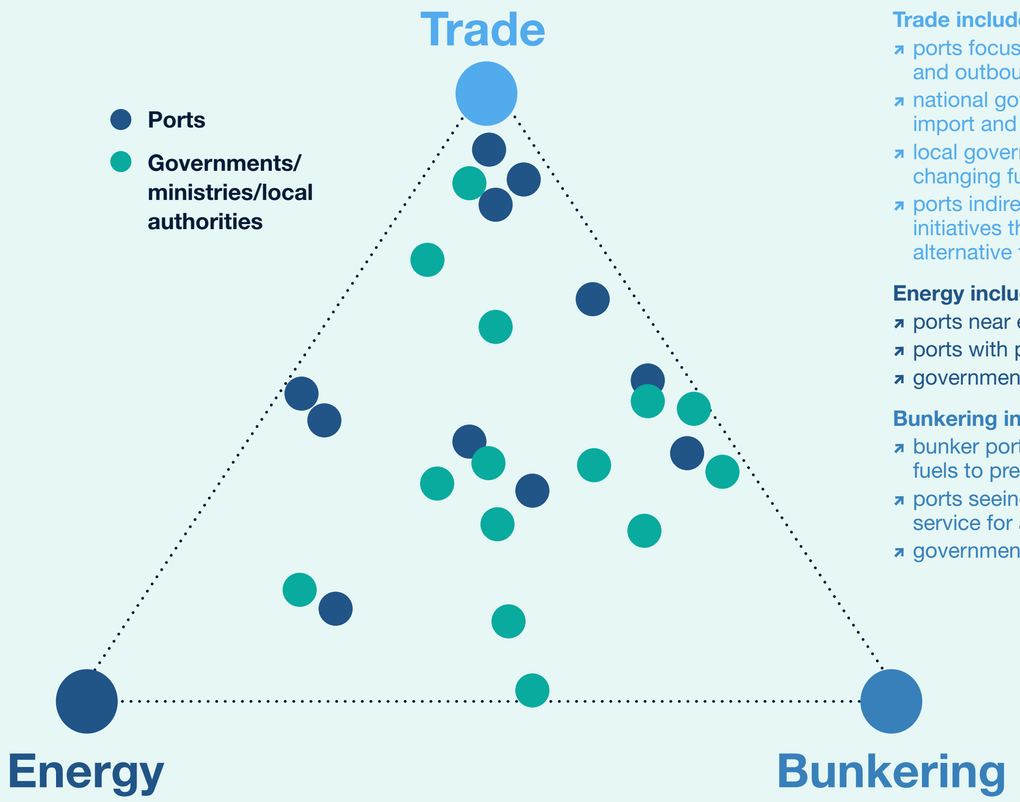
This first Inception stage is designed to create a community that can build on the various stakeholders' experiences and their different perspectives.

Figure 3
Workshop convening stakeholders across Asia

4 https://www.lr.org/en/expertise/maritime-energy-transition/maritime-decarbonisation-hub/zcfm/

Workshop Feedback
Stakeholder mapping across Asia

The focus of routes-based action plans is not restrictive to a narrow definition, as there is a wide range of routes and cluster options, and neither are stakeholders restricted to the roles that they could take on. The opportunities across the value chain can vary depending on the stakeholder. Feedback collected from participants across Asia demonstrated how differently the opportunities were perceived depending on the location and resources available to each stakeholder – see Figure 4.



Trade includes:
- ports focused on preparing for business as usual inbound and outbound port traffic shifting to alternative fuels
- national government levels interest to promote country's import and export trade targets
- local governments keen to prepare port communities with changing fuel demands
- ports indirectly impacted by neighbouring first mover initiatives that bring inbound vessels operating on alternative fuels

Energy includes:
- ports near existing and potential energy hubs
- ports with potential to produce energy within the facility
- governments promoting an energy and fuel export strategy

Bunkering includes:
- bunker ports preparing for future demands for alternative fuels to preserve market share
- ports seeing a new opportunity to provide a bunkering service for alternative fuels
- governments promoting itself as a strategic bunkering hub

Figure 4
Ports and governments from across Asia mapped themselves against different potential roles and opportunities

Perspectives from Stakeholders:

- The spread of responses across the three dimensions in Figure 4 suggests there is no one-size-fits-all strategy, the opportunity is seen differently depending on the individual port/country's maritime and energy strategy.
- Six port and government entities clustered between 'trade' and 'bunkering' discussed a continued reliance on fuel imports to support local bunkering activities. For some locations, the security of supply for alternative fuels may be an additional hurdle, with some participants calling for increased government-to-government coordination to deliver on future fuel security.
- Several positioned themselves centrally across all three dimensions, implying that localised fuel production is a strong option. This assessment tended to be port specific with driving factors being the high renewable energy potential and the proximity to existing industrial fuel production sites.
- It was acknowledged that in many cases domestic strategy would prioritise fuel security for other domestic sectors over supply for shipping. Many ports await government-level communication on the strategy, emphasizing the need for initiating these conversations for full realisation of this opportunity.

Key Takeaways:

- Some ports saw little potential for the development of bunkering and energy systems, but still recognised the need for preparatory work to accommodate vessels using alternative fuels due to the anticipated pace of change. Capacity building is particularly crucial in resource-limited developing nations. Other domestic targets and competing concerns at the national level may pull ports in various directions, hence additional support is needed to execute routes-based action plans.
- While coordination among ports is essential, the competitive landscape hinders effective interaction. Smaller ports often feel dependent on larger ones for training and knowledge sharing. Leadership is seen in some ports, but the full benefits of collaboration are not universally understood, requiring demonstrated incentives for support networks to be effective.
- Ports in remote locations face challenges relying on larger ports for higher-priced fuel imports in a higher-cost, zero-emission shipping environment. Alternatively, fostering independence in remote locations can occur through the creation of local island clusters with tailored energy systems meeting their specific needs.

Building on existing relationships to start a collaborative initiative is one way of getting the efforts off the ground, whilst also building on the relationships of existing networks. During the two-day workshop, participants conducted stakeholder mapping and shared feedback on the status of existing relationships across the value chain. Results from the mapping exercise are shown in Figure 5.

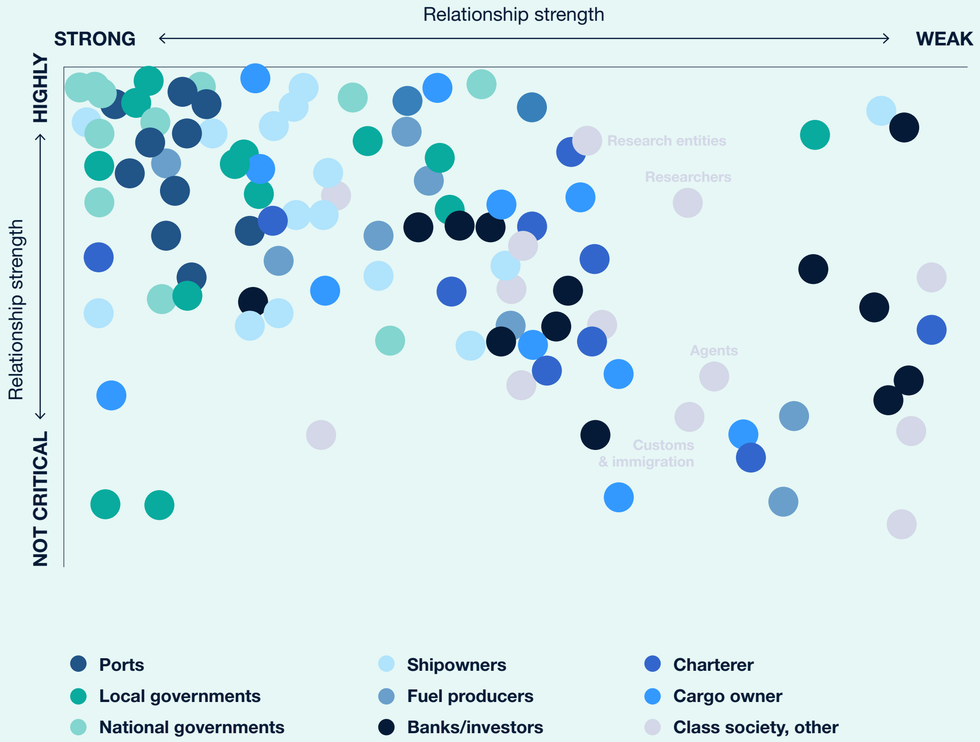


Figure 5
Matrix of relationships with cross industry stakeholders and the relevance of stakeholders to investment decisions from the perspectives of Ports and Governments across Asia

Feedback from port and maritime ministries included:

- The interconnectedness of local governments and port authorities was considered strong in many instances, already at a satisfactory level to initiative conversations about routes-based action plans. Likewise, were the relationships with shipowners as port customers.
- Noted by regional first movers, the involvement of the port authority was a major step and acted as a signal of confidence for everyone within their initiatives and throughout the consensus-building process.
- The limited relationship with downstream stakeholders was a common theme, particularly across cargo owners and charterers, where shipowners would also be looking for a demand signal. From a port and government perspective, there was limited access to these groups to make a material impact, so other forces would need to connect this missing link.
- Banks and investors were not always seen as most relevant in the initial strategy development of port planning, and so the relationships historically developed with banks were limited and would need to be further developed if any deliberation over how the initiative would be financed would need to be resolved.
- While fuel producers would be critical for those ports and governments deploying an energy-focused strategy, the relationships today were viewed as relatively weak for most ports and governments interviewed, including those already part of early-stage initiatives. One way of accessing the right partners is looking out for public announcements on first mover initiatives and approaching the specific partners already involved.

- Participants commented on how maritime and energy sectors were addressed in individual silos at a public policy level. One way of bridging these relationships would be through more collaboration across sectors at a national policy level by leveraging industry contacts to make introductions with initiatives that are already underway.

- On the side of fuel producers, the complexity around fuel selection was a challenge, and so there was perhaps reticence around early engagement at this stage. Narrowing focus on the fuel selection is one way of staggering this early engagement with fuel producers, along with the need for clear understanding around the potential fuel strategies.

- National government direction plays a significant role in driving local decisions at the port level, but participants noted that in some instances the autonomy to make decisions in the opposite direction was somewhat restricted. Coordination in some instances was largely top-down. This varied depending on the governance structure in the country in question.

Key conclusions from workshop activities

Overall, there were two major conclusions from these discussions. Firstly, the ports highlighted the need for support and guidance from a top-down approach, as well as from other regional ‘first mover’ ports already engaged in initiatives. However, the benefits of creating this regional community will need to be demonstrated to incentivise this level of support from other ports and governments to overcome the challenges raised by this competitive landscape.

Secondly, for ports to support and facilitate these collaborative initiatives and community-driven approach, there is still a large hurdle for ports in the way of establishing relationships with all the different stakeholders. While relationships with their current client base – shipowners and terminal operators – are strong, the new community of fuel producers, investors and downstream actors remains unchartered territory. Leveraging existing relationships is one way of gaining access to these new stakeholders but so is finding ways of collaboration with existing first mover projects that already have these wide-ranging stakeholder networks set up and ready to go live.

STEP 2

Definitions & setting the scope

After the inception phase, a community is formed and is now ready to make collective decisions. At this point, the group understands each other's perspectives, along with the latest trends in technology, investments, and the communities' readiness levels. Although the group is aligned on a general purpose, they are now tasked with identifying the fundamental elements, key questions, and focus areas. Analysis can support the collective decision-making process, this must occur during the second step, which aims at defining and setting the scope.

Prioritisation of focus areas

After identifying the challenges and opportunities, it is important to prioritise the focus areas to determine what is essential for the group to progress in co-creating. Different techniques of consensus-building can be used, including discussions around the materiality of the factors relative to the general purpose.

Create key questions

From the focus areas, it is essential to define the exact questions that need to be addressed. For example, fuel selection may be an area of focus that leads to a series of critical questions:

- Which fleet fuel transition strategies are the most plausible?
- How is the decarbonisation goal achieved through fleet turnover?
- What is the fuel mix projection and emissions trajectory?
- How must fuel production scale meet the demand?
- What are the potential fuel production routes?
- What are the production routes and their projected costs?
- What are the key cost drivers and how do they differ among transition strategies?

Build scenarios

Partners need to determine the type of analysis that can provide support in answering these questions. Often this is addressed through a scenario-based analysis, where the process of defining the scenarios becomes crucial. One method to define scenarios is to plot the key factors in a grid of uncertainty level versus impacts. The factors are clustered to create contrasting outcomes or scenarios.

For example, this method was applied to the Silk Alliance, and several scenarios were defined based on three main factors: goal alignment with expected policy; speed of innovation and transformative changes; expected dominant fuel. Several fuel transition strategies were assessed by assuming a range of diverse assumptions for those factors. The discussion of the results supported the partner's decision regarding fuel selection.

Workshop Feedback
Prioritisation of the challenges and opportunities

During the workshop, the participants were asked to simulate this stage by first providing their views on the most important challenges and opportunities, thereafter agreeing on the top areas of focus. These are summarised in Table 1.

Challenges

Fuel availability uncertainty
Rising fuel costs may lead to more efficient ships, therefore the total market size would reduce over time
High investments required
Uncertainty around raw materials to produce biofuels
Insufficient research in the field of alternative fuels
Need to catch-up with technology advancement
May lack technical expertise required
First movers on fleet side aggregate in Europe rather than in Asia Pacific given favourable regional regulatory incentives elsewhere.
Competitive mindset among some ports both nationally and internationally
Energy hubs outcompeted by projects from developed countries that may better compete on price. Need a way of levelling the playing field for other Asia-Pacific countries
Who should own the infrastructure and assets?
Lack of capacity at ports to manage these initiatives

Opportunities

Market capture and first mover advantage in new market for green fuels
Diversify consumer base for fuel suppliers entering marine space as a new end consumer market
Ensuring sustainability and longer-term profits for company
Potential for synergies through cross sector collaborations

Table 1
Challenges and Opportunities from the workshop's participants

The discussion of the challenges and opportunities led to the identification of the top priority areas, which were ranked based on votes. The top three priority areas are as follows:

1. Identifying fuel suppliers and supply locations
2. Establishing national roadmaps
3. Identifying critical investors and financing institutions.

Other priority areas were:

- Creation of long-term port bunkering plans
- Preparation of safety and training development plans
- Securing demand/market of end consumers
- Demonstration of the wider employment opportunities for community
- Fuel selection
- Technology options selection
- Assessment of costs for different options and strategies
- Increase of R&D efforts
- Improvement of access to R&D funding
- Identification of support mechanisms specific to LDCs and SIDS
- Government-to-Government engagement to support shipping development
- Build a credible business case
- Development of supporting port and local policies

The participants drew two main conclusions. Firstly, it was emphasised that National Governments must be involved to establish roadmaps and incentives. This will enable new initiatives to flourish. For example, their involvement was seen as an essential tool to overcome challenges created by other regions in the world offering more attractive regional regulatory incentives. It would help to level the playing field for Asia-Pacific developing and emerging countries compared to developed countries with more advanced regulatory frameworks and existing incentive structures.

Secondly, there is a lack of clarity on how fuel supply infrastructure can be developed in the Asia-Pacific region. It was recognised that partners may lack the capacity to manage these initiatives and that there is a great economic challenge. Therefore, this needs to be addressed by collective action bringing together fuel producers, fuel users, and investors.

Both conclusions highlight the need for increased international collaborations among governments and key actors to increase confidence and understanding in the actions needed to address the challenges.

STEP 3

Assessment stage

The assessment stage involves quantitative analysis to address partners' key questions, integrating fleet and fuel supply through scenario-based analysis. Outputs include cost and emission projections on both sides of the value chain. Creating a demand signal is crucial for collective stakeholder action.

Creating a Demand Signal

Once the routes and ports have been established, this stage involves identifying an in-scope baseline fleet. These are the vessels that can feasibly operate by bunkering at the port(s) within the initiative and therefore are well placed to be the first movers for the project.

The process for identifying the baseline fleet starts with the global fleet and is then filtered down. The method may vary depending on the type of the initiative. For example, a one-port cluster's typical approach may be to set minimum thresholds for key metrics such as:

- Number of port calls for that specific port;
- Regionality defined by the percentage of time each vessel spends within a defined region;
- Thresholds for the longest round trip (serving as further filters).

Conversely, a different iterative approach may be more effective for an A-to-B route. For example:

- Identifying all vessels that called at Port A during a given time frame;
- Filtering by all vessels that also called at Port B;
- Optional further filtering such as a furthest distance deviated from route, or increasing the minimum number of port calls for A and/or B.

An additional factor to consider is the demand stability, meaning examining whether the vessels tend to operate along set routes or adopt a 'tramp trading' approach.

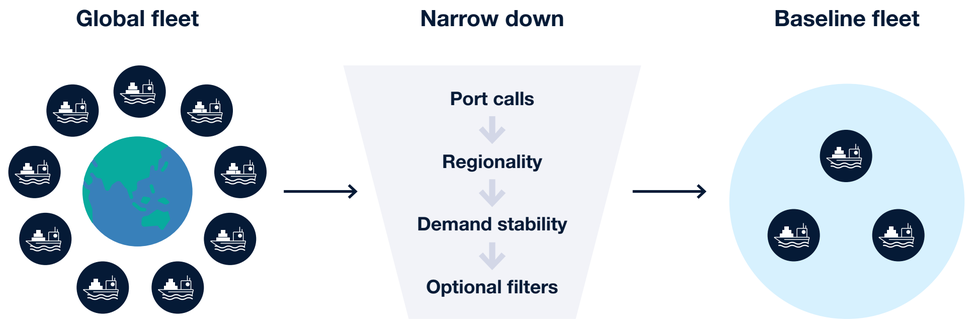


Figure 6
Methodology for the identification of the baseline fleet

3

Assessment

- Creating a **demand signal**
- **Planning** maritime ecosystems
- **Understanding** fuel supply systems and **deployment**

After establishing the baseline fleet, data analysis can show key details, such as annual fuel consumption and current emissions. The next steps would engage with key stakeholder, examples include:

- Governments: can shipping demand be aggregated across other sectors? How could shipping support a national decarbonisation strategy?
- Shipowners: are there plans for regular vessel operators and older vessels ready for retirement?
- Fuel suppliers: are there national infrastructure projects in the pipeline and regional export locations?
- Port authority: is there a case for bunkering site and storage capabilities shoreside?

Sequencing

Sequencing involves understanding the start of the baseline fleet transition to zero emission shipping and how it scales. Ships powered by alternative fuels can be separated into three categories:

- Newbuild ships replacing retiring vessels;
- Newbuild ships that are expansions to the fleet;
- Retrofits (existing ships with replaced energy systems).

Projecting the uptake of each of these transition types can estimate the fuel demand uptake for the baseline fleet. Several factors drive this, so it is important to engage the relevant stakeholders to determine the appropriate sequencing. Factors include the age of the ship, the operating range, and owner's strategies. An example of the evolution of a fleet is shown in Figure 7.

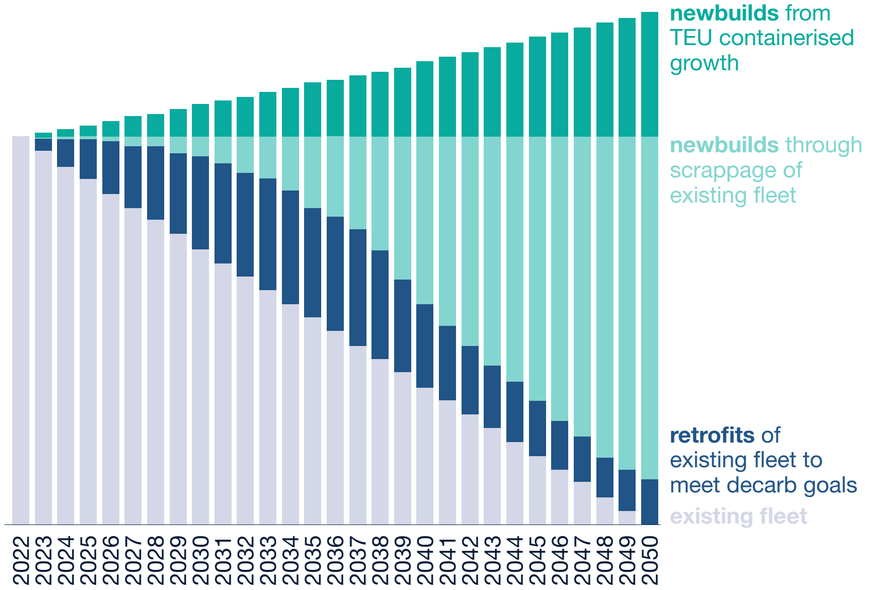


Figure 7
Example of the energy demand transition for a fleet over time.

Fuel supply development

A fundamental decision for any routes-based action plan is the selection of fuel, fuels, or other energy systems to be included in the initiative. Key decision-making analyses include:

- Selection of fuel transition strategies to compare;
- Identification of potential fuel production routes and cost breakdowns;
- Assessing the feasibility and constraints of production routes;
- Running fleet and fuel costs for each scenario.

The final decision for fuel(s) suitability will be dependent on several factors. It is important to recognise that the fuel costs will be a function of numerous variables, including fuel carbon intensity and scale of production. And these costs may also change over time as shown in Figure 8.

Some strategies may consider a transition fuel. This may not be the long-term leading fuel for the initiative (due to higher carbon intensities or limited resources), but may be easier to implement in the short term (due to lower production costs or fewer technical challenges). Examples of transition pathways are shown in Table 2.

Following the determination of the fuel strategies that the partners would wish to consider, collaborations with fuel producers and other key stakeholders create opportunities for further analysis to help narrow down the fuel selection. This will require an assessment of the costs of the shortlisted fuels based on specific carbon intensity targets. Using this analysis, the project partners will have the necessary information to decide and agree on how to proceed regarding the fuel strategy.

Transition Fuel	Final leading fuel
Bio-methanol	e-methanol
Bio-ammonia	e-ammonia
Liquefied bio-methane	Liquefied synthetic methane
Blue hydrogen	e-hydrogen

Table 2
Examples of fuel transition strategies

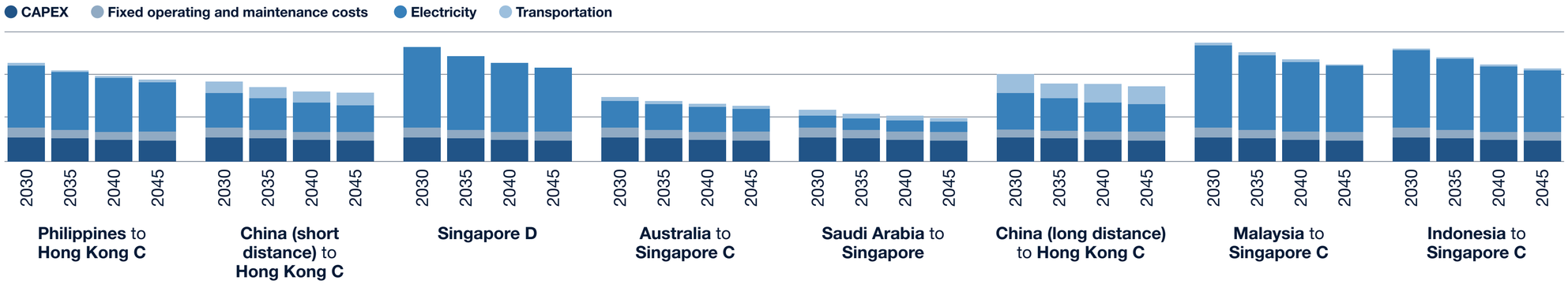


Figure 8
Example of fuel production cost analysis in different locations[5]

5 LR_First_movers_in_shipping_s_decarbonisation_A_framework_for_getting_-1.pdf (thesilkalliance.com)

3

Assessment

- Creating a **demand signal**
- **Planning** maritime ecosystems
- **Understanding** fuel supply systems and **deployment**

Workshop Feedback
Assessing opportunities across the Asia-Pacific region

The workshop participants discussed a case study showing an assessment between two ports in Asia. They then identified the type of analysis that could be used to inform the decision-making at this stage.

Case Study: JPNT to Singapore

The case study focuses on a hypothetical routes-based action plan between Jawaharlal Nehru Port Trust (JNPT) in India and Singapore (A-to-B routes).

Route analysis based on AIS vessel tracking data showed:

- **2,377 vessels** calling at JNPT and passing traffic during 2022;
- **1,489 vessels** also calling at Singapore (as well as 1,635 other ports that year);
- Fleet narrowed down to **336 vessels** by removing one-off JNPT port calls (now referred to as the "baseline fleet").

The established baseline fleet had an annual fuel consumption of 3.38 million tonnes of HFO (Heavy Fuel Oil) equivalent to 13 million tonnes of CO2e emissions (carbon dioxide equivalent). The baseline fleet breakdown is shown in Figure 9.

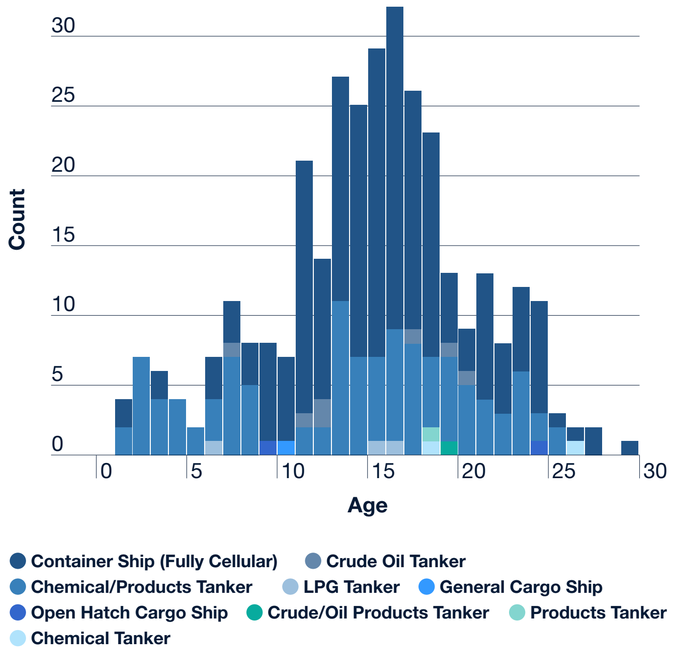


Figure 9
Breakdown of baseline fleet by age and ship type for the JNPT-Singapore corridor case study.

Applying a routes-based sequencing approach as portrayed in Figure 10 is one way of projecting a potential evolution of the fleet. Normally methods to define the sequence should be based on the ships' characteristics such as age, vessel operating efficiencies, or current emissions.

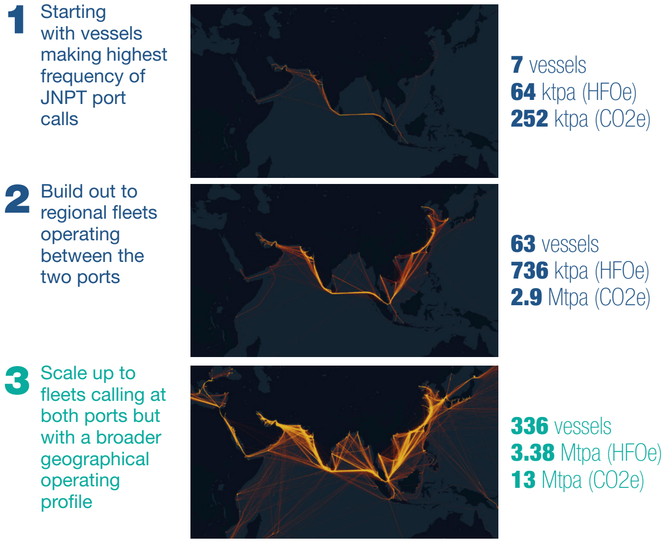


Figure 10
Evolution of JNPT-Singapore case study: fleet transition, routes covered, energy demand and emission reductions
Source: LR Maritime Decarbonisation Hub

Further Analysis

During the workshop, the participants identified several themes that could be included as means to alleviate the areas of uncertainty. These include:

Market Dynamics

Understanding the dynamics of the ZE fuel market, including the assessment of fuel options, feasibility of adopting mono-fuel or multi-fuel strategies, and the impact of pricing fluctuations.

Collaboration with fuel supply stakeholders is essential for credible insights.

Assessment of the confidence levels around the results and sensitivity analysis to ensure the robustness of the conclusions and decisions being made based on the modelling approach.

Technology and Economic Considerations

Addressing uncertainties related to the availability of ZE technology, facility locations, and distribution requirements.

Preparing for potential supply chain delays and developing fallback strategies.

Financial modelling is necessary to determine the scale of investment for ZE fuel infrastructure and assess economic benefits, such as job creation and improved air quality.

Regulatory and Safety Measures

Recognising the need to adapt existing port laws and regulations to accommodate alternative fuels.

Exploring the feasibility of port incentive schemes to encourage ZE fuel adoption and considering the credibility of such strategies based on case studies.

Addressing safety concerns, including training requirements, safety investments, and the costs of implementing safety measures. Preparation for evolving safety standards and the establishment of clear and comprehensive safety guidelines for ZE fuel handling and storage.

Policy Framework

Highlighting the importance of a National Action Plan or policy framework to guide the transition to ZE fuels.

Modelling the implications of regulations and policies to understand their impact on port operations.

Infrastructure and Skilled Personnel

Acknowledging the uncertainty surrounding infrastructure requirements and the availability of skilled personnel.

Learning from the experiences of other ports that have taken first-mover initiatives to address these concerns effectively.

Looking at where there are more job opportunities and development for the surrounding areas.

The participants agreed that the assessment stage is the most challenging part of the process, with the exact scoping being dependent on several factors. However, they also agreed on an integrated approach that combines both fleet and fuel supply analysis. Some participants found the analysis to be complex, which highlighted the importance of having an independent entity to assist with the assessment. This additional support will also need to be funded.

Given the nature of the workshop, with participants simulating the co-creation process, it was difficult to identify a specific type of assessment. Instead, it was easier to identify further areas of analysis that need to be considered when defining scenarios and interpreting results.

STEP 4

Implementation planning

After the Assessment stage, the partners need to set specific objectives and define the vision. This takes the initiative from a conceptual stage and transforms it into an action-orientated programme, to understand how this translates into concrete actions and next steps. This is achieved by creating an implementation plan, which is a key milestone in the process.

The implementation plan is a draft plan of activities and milestones that provide direction to cross-industry stakeholders. It should be an evolving document that is shared among the stakeholders and is continuously updated as the work progresses and the landscape changes. It effectively represents the shared vision of the collective group. The plan is used to set priorities and initiate focused working groups around activities that can unlock investment as well as identify missing stakeholders to start planning those complementary engagements.

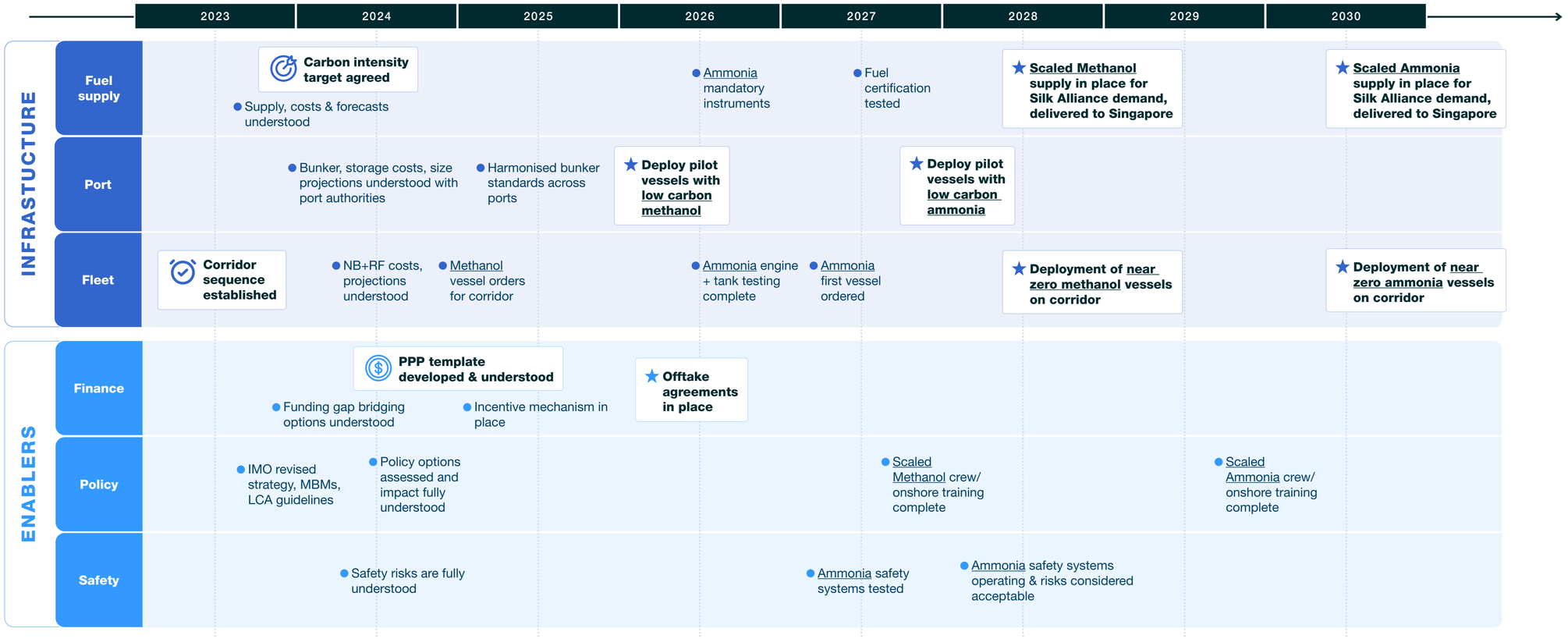
The structure can be split in diverse ways but should capture the key milestones and activities for different stakeholders across the full value chain, whilst considering the time allocation for these interdependent activities. In the example of the regional Silk Alliance initiative, the implementation plan is divided into infrastructure (fuel supply, port, and fleet) categories and enabler (finance, policy, and safety) categories – see Figure 11 *(page 27)*. The mapping of activities along the timeline is particularly helpful in visualising what can feasibly be achieved within the agreed timeframes and goals.

There are several interdependencies between the milestones and actions need to be completed prior to others, so the timeline mapping serves an organisation purpose.

Also, some milestones may require a set of activities and tasks to be amplified, so the implementation plans can be further detailed as the working groups in the initiative begin to tackle each of the milestones.

The creation of the implementation plan requires at least the following activities:

- gathering information around timings from a wide range of stakeholders;
- consolidation of all the feedback and information provided;
- refinement and endorsement from the partners to proceed on the timelines and actions laid out as part of the plan.



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 11
Example of an implementation plan for a regional first mover initiative – the Silk Alliance Green Corridor Cluster[6] published by the members of the initiative in October 2023.

6 Workstreams – The Silk Alliance

4

Implementation planning

- **Review** scenarios
- Address key questions
- Narrow focus
- **Implementation plan**
- Stakeholder engagement

Workshop Feedback
Identifying key milestones and actions for implementation plans

During the workshop, participants were asked to simulate this stage by taking the perspectives of ports that want to invest in future fuels infrastructure. Participants were asked to highlight a range of key milestones and actions that would be considered during the implementation planning stage.

Several milestones and actions were discussed in groups and were summarised in Table 3.

During the discussion, it was emphasised that a detailed feasibility study (which includes technical, economic, and environmental aspects) is crucial to fully understand the impact of infrastructure development and scaling operations. These feasibility studies will be in addition to the efforts the IMO is also making as part of its regulatory discussions at the level of the Marine Environment Protection Committee (MEPC) to ensure comprehensive impact assessments on States from proposed measures are undertaken that will support maritime decarbonisation efforts in accordance with the procedure for impact assessments agreed by MEPC. The necessary supporting activities also require a considerable amount of time to be finalised, such as applying for permissions and developing a master plan with local authorities. Therefore, it is essential to identify and establish the relevant timelines for the infrastructure development well in advance of the implementation planning phase.

Actions for INFRASTRUCTURE:	Additional support:
Feasibility studies, including technical, economic, and environmental studies to understand impacts of infrastructure development and scaling operations	Port planning specialists
Preparations for future climate risks	Local experts
Permitting applications	Existing training programmes
Training of port personnel	Global regulatory support including maritime education and training to be developed to include competencies for safe handling of hydrogen, methanol, and ammonia as fuels (revision of the STCW convention)
Port master plan development/ finalisation	Board agreement from port authorities
Procurement: bidding, construction, follow-up monitoring and testing, launching	Project developers and construction teams

Actions for ENABLERS:	Additional support:
Engage relevant stakeholders	Leaning on other ports that have experience in instances where there is a lack of internal capacity and experience
Develop funding case/proposal	Consulting other regional first movers and leveraging existing initiatives that are already underway to avoid doubling efforts and to save resources
Hold governments and public sector roundtables to understand support mechanisms and benefits of initiatives to taxpayers	Shipowners (customers) and fuel suppliers across the value chain signalling clear intent from all the partners
Develop communication strategy to bring local communities and governments at various levels.	Banks, investors, development banks offering solutions to creating a bankable business case
Draft regulations	Learning from other public sectors ministries (e.g. energy) that can offer guidance through the experiences with renewable energy development.
Review regulatory landscape	
Conduct regulatory landscape gap analysis	
Undertake legal due diligence	
IMO's efforts for comprehensive impact assessment on states to evaluate proposed measures	

Table 3
Milestones and Actions from the workshop's participants

STEP 5

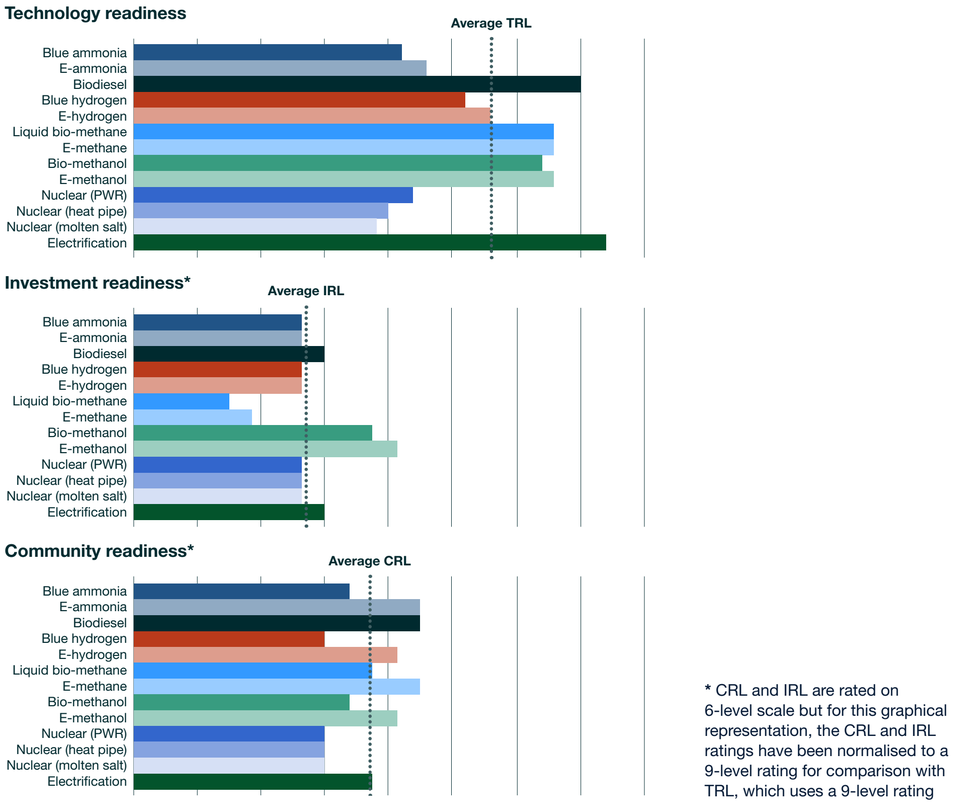
Business case

Business case development is key to understanding the commercial viability of projects as well as the level of required additional support make these initiatives viable – commonly referenced as the ‘viability gap’ or the ‘cost gap.’

For zero-emission shipping, the additional costs for investing in the fleet and fuel supply infrastructure are estimated to be higher than in the ‘business as usual’ scenario (using conventional fossil fuels). A case study estimated that alternative fuel costs can represent between 71-82% of cumulative fleet total costs for a range of methanol, ammonia and hydrogen fuel transition strategies that were assessed[7].

The investment challenge is to find ways of bridging the higher capital and operating costs for zero emission shipping across the value chain while demonstrating to investors the bankability of projects, such as expected returns and lowering the risk profile of these projects.

Despite considerable progress around the technology readiness for zero emission shipping fuels, investments in fleet and landside infrastructure remain low (Figure 17). Collaborative engagement between the public and private sectors and the investment community will be vital to bridging the commercial viability gaps to make these projects a reality.



* CRL and IRL are rated on 6-level scale but for this graphical representation, the CRL and IRL ratings have been normalised to a 9-level rating for comparison with TRL, which uses a 9-level rating

Figure 12
Zero Carbon Fuel Monitor illustrates technology, community, and investment ‘readiness’ levels across range of alterantive fuels averaged across all stages of the value chain

7 First Mover Framework, http://mission-innovation.net/wp-content/uploads/2022/09/LR_First_movers_in_shipping_s_decarbonisation_A_framework_for_getting_.pdf

5

Business case

- **Financial assessment**
- Assess bridging options & financing sources
- **Refinement of scenarios** and assessments

Part of this process will involve:

- Financial assessments – visibility over costs and revenues of the project are needed to assess commercial viability and estimate the scale of the cost gap.
- Bridging options & financing sources assessment – project partners need to understand what type of support is available and to what extent it can be deployed in support of the initiative – see Figure 18 for examples. This will also involve understanding where capital can be accessed and initiating those discussions with the relevant stakeholders.
- Scenarios & assessments refinement – as part of stakeholder engagement, all the assessments conducted through the process are key materials. Where bridging options would not fully address the viability gaps, conversations around risk sharing are required. Project partners need to find common ground, whether this would involve reaching a compromise on margins or making other contributions to help bring together a viable investment case. For some public sector funders, the wider benefits to society and local communities (e.g. jobs creation) have positive indirect impacts that may support a funding case.

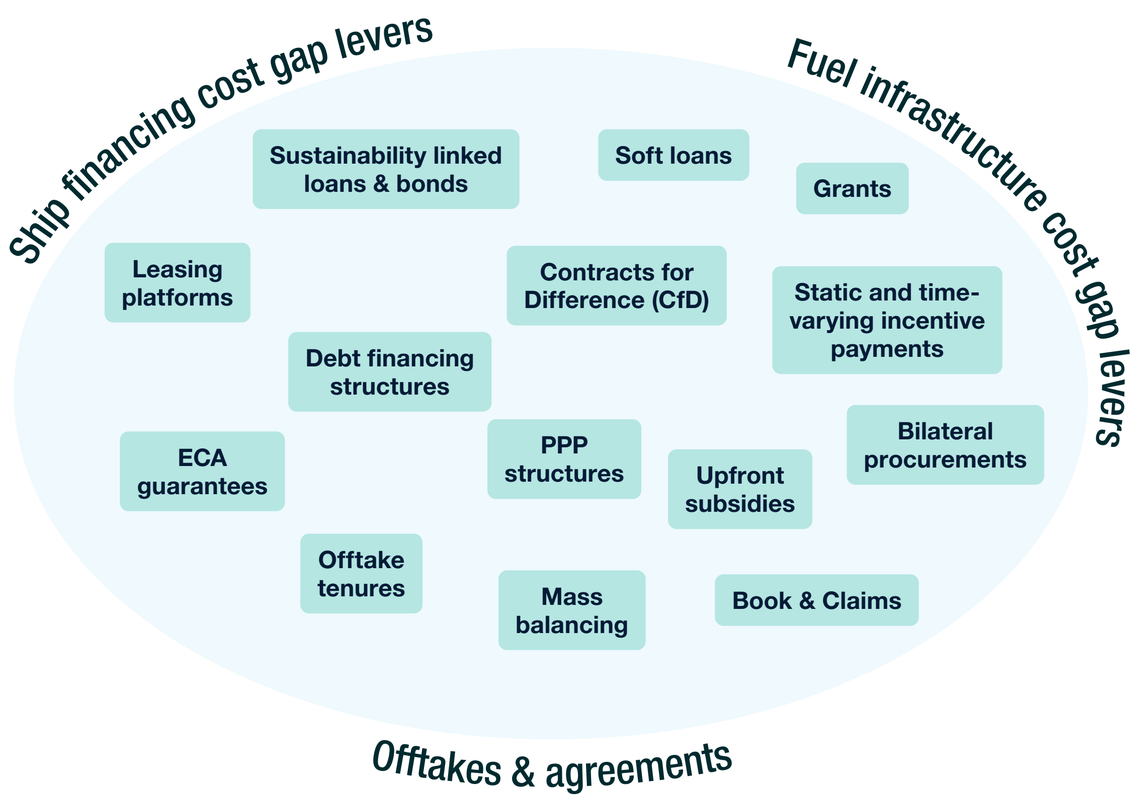


Figure 13
Financing mechanism & bridging options discussed during early consultations as part of the Silk Alliance Green Corridor Cluster Initiative, which is a public and private collaborative initiative that is focused on a fleet operating across the Indian & Pacific Oceans

Workshop Feedback
Challenges & opportunities around building a business case

The workshop involved bringing together the shipping and other maritime stakeholders with the investment communities operating in the Asia Pacific region. It has been a chance to share knowledge between these two sets of communities and address the shipping industry feedback about the limited engagement with the investment communities (Figure 14 illustrates the weaker relationships typically held with banks and investors compared with other stakeholder groups).

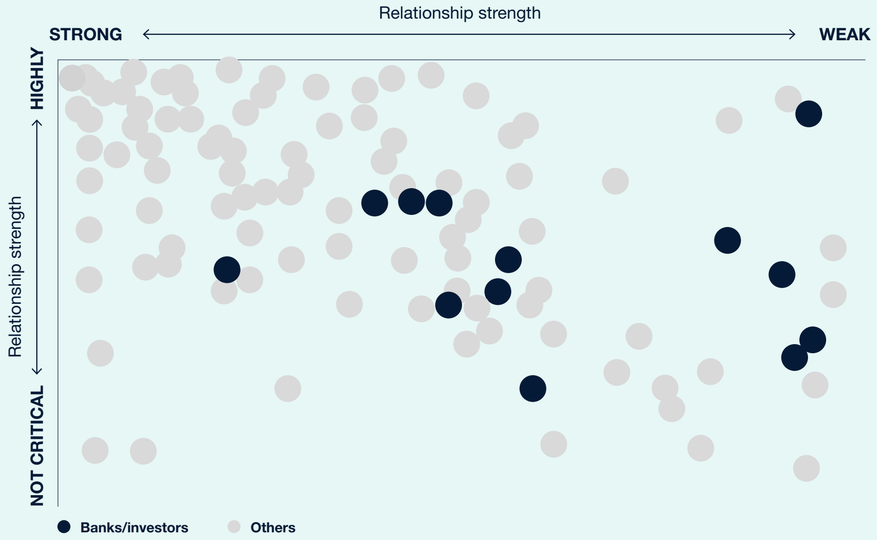


Figure 14
Matrix of relationships with cross industry stakeholders and the relevance of stakeholders to investment decisions from the perspectives of Ports and Governments across Asia – highlighting relationships with banks and investors.

INITIATORS

- At a local level, some ports and local governments noted a lack of capacity that would be dedicated to creating routes-based action plans, so would require investments in both capacity building and personnel. An alternative would involve leaning on other regional first movers that are equipped to lead these collaborations. However, many also observed that first movers would require incentivisation to support other regional players, so the benefits of assisting a regional network must be demonstrated.

- Lack of engagement with investment community needs to be addressed through more sessions and roundtables (like these workshops) to build relationships and better understand how the industry can access the necessary capital for these projects. Development banks may not see many bankable maritime decarbonisation projects emerging to date. However, development banks need to actively engage and make the first move to help create bankable projects centred around routes-based action plans. This will ensure that the financial mechanisms are in place and that innovative financial solvers are developed to create viable financeable projects.

- Ports creating a plan to invest in landside infrastructure are also looking for clear intent from the rest of the value chain to ensure adoption of the same strategy. Coordination across financing activities will be important.

- Ports are integral to drive continuity and provide a signal, but the general view was that the key decision makers were shipowners and fuel suppliers. However, it was noted that ports offered the environment to facilitate the space for these collaborations. The ports recognised their role as enablers of these projects, but key decision-making was still seen to reside with other partners.

DECISION MAKING

- In many cases, investment decisions at the port level are based on a hierarchy of needs. Lower income countries typically prioritise other more immediate services with more limited resources and reduced access to capital for higher risk projects. For these to be prioritised, many ports and local authorities that are typically reliant on subsidies are awaiting more top-down pressure.

- Many ports and governments noted how decision-making at the government level was made in silos, potentially stifling the coordinated actions required for routes-based action plans across the value chain. For decisions on domestic energy hubs and fuel imports, there is typically more onus on National Governments and Ministers of Energy to drive the final decisions forward. While for port-focused strategies maritime-focused departments would drive the agenda. A more synchronised strategy across all these government departments will help to ensure that energy-related strategies are inclusive of shipping and moreover address a strategy around routes-based action plans.

- Focus on Paris Alignment commitments is gaining traction, with initiatives such as the Finance Ministers for Climate Action[8] looking to bring climate-focused policies at the heart of national policy; making and budgeting decisions along with commitments from the investor community and multilateral development banks to Paris Alignment[9]. With the mainstreaming of climate focused policies across the public and finance sectors, routes-based action plans could increasingly present interesting opportunities as Paris-aligned investment projects.

- There is still limited clarity on what is considered a Paris-Aligned investment strategy, and what investors are willing to accept in terms of the carbon intensity of fuels.

- There is a lack of clarity over the level and type of public sector support that will be provided to shipping and maritime to help bridge the cost gap for these initiatives for early movers. Increased engagement with governments will be needed to make this signal of intent clear to the industry and to private sector investors.

- To see public sector support for unlocking these investment cases, the case presented to governments should be evaluated in terms of the wider and indirect benefits of investments in these routes-based action plans. This goes beyond the direct cost of subsidisation and direct burden on the government budgets. For instance, benefits to local communities that could be accounted for include: air quality and future reductions in health costs; jobs creation and new market developments; other wider economic benefits.

8 https://www.financeministersforclimate.org/
9 https://www.adb.org/news/mdbs-agree-principles-aligning-financial-flows-paris-agreement-goals#:~:text=ADB%20will%20achieve%20full%20alignment,100%25%20by%201%20July%202025.

DRIVING A REGIONAL CROSS-SECTOR APPROACH

- One path for routes-based action plans success is for these strategies to be closely tied with wider national demands. For example, ensuring power generation demands are met and high fuel import costs are addressed particularly during this global inflationary period. A cross sector energy strategy could be more realistic for lower income and remote countries, particularly where vessel traffic alone is insufficient to drive a compelling demand signal.

- The business case is strengthened by a stable fuel demand signal, so aggregating demand across different sectors (power generation, industry, road transportation, etc) along with shipping's fuel demand is a way of driving synergies where routes-based action plans can also support a national-level investment case.

- Regional energy hubs could also create a greater demand signal by serving the energy consumption requirements for multiple countries and port clusters, which would require critical coordination across multiple regional governments.

The discussions concluded that more work is needed to drive a two-way discussion between the investment communities and the shipping value chain stakeholders looking closely at routes-based action plans. There needs to be more visibility over what investors and financiers require to help these initiatives develop credible business cases. Similarly, development banks and governments need to see routes-based action plan proposals from shipping and energy industries work towards solutions that can help bridge the cost gap, as these projects are unlikely to get off the ground at this stage without the public sector support.

Secondly, the hierarchy of the investment needs at the local level often seemingly places shipping sector demands as a lower priority, with many still being unaware of the potential for cross-sector synergies or even regional synergies that can be created with shipping demand for business proposals. More awareness and cross-sector financial modelling and analysis is needed to fully understand these potential economies of scale and collective opportunities.

5

Business case

- **Financial assessment**
- Assess bridging options & financing sources
- **Refinement of scenarios** and assessments

Key actions and Recommendations

This report outlines a routes-based action plan methodology with a 5-step process to support maritime decarbonisation efforts, and this is designed to help narrow down options and steer decision-making among the diverse group of stakeholders.

This routes-based action plan methodology is:

1. **Data-driven:** decision making supported by quantitative assessments and scenarios-based analysis to provide evidence tailored to the group of stakeholders

2. **Consensus-driven:** evidence is discussed, and stakeholders provide inputs and refinements and agree on co-creation

3. **Full supply chain-driven:** stakeholders making decisions represent both the shipping supply chain and the marine fuels supply chain – both public and private entities

Developing a Routes-Based Action Plan

1 Inception

- Identifying **routes and ports**
- **Stakeholder** mapping
- Creating a **community**
- **Trends** and perspectives

2 Definitions & setting scope

- Prioritisation of **focus areas**
- Create **key questions** for scenario analysis
- Build **scenarios**

3 Assessment

- Creating a **demand signal**
- **Planning** maritime ecosystems
- **Understanding** fuel supply systems and **deployment**

4 Implementation planning

- **Review** scenarios
- Address key questions
- Narrow focus
- **Implementation plan**
- Stakeholder engagement

5 Business case

- **Financial assessment**
- Assess bridging options & financing sources
- **Refinement of scenarios** and assessments

Building consensus throughout the process at each of the stages

A community created that is ready to make collective decisions for a joint purpose and learn through the process together.

Reaching alignment among the partners on the direction of this initiative and how best to focus efforts going forwards.

This may already include agreement on the fuel selection and/or routes and ports involved.

Agreement among partners on the analytical outputs and scenarios that would help to address the group's key questions and steer focus for the group.

An agreed plan is created, steered by the assessments and alignment among the partners, to show how and when each stakeholder would in practice contribute and lead this forward through to project execution.

Clarity achieved on how project can be financed in line with the implementation plan timelines, by bringing in partners that can ensure financing mechanisms and funding will be in place.

Consensus on the mutually agreed strategy and financing at this stage sets groundwork to move onto the execution phase.

Actions to drive an inclusive transition

A workshop convening stakeholders from across Asia discussed the methodology and how to support the inclusion of Developing Countries, Least Developing Countries (LDCs) and Small Island Developing States (SIDS) in the wider Asia-Pacific context.

Critical factors to consider that were highlighted during the workshop included:

CAPACITY BUILDING

Capacity building, particularly for lower income countries, is lacking and needs to be bolstered, particularly to support partners to execute all the analytical assessments and to build a credible business case. This may come through leadership from other regional first movers or maritime experts driving this forward. Feasibility assessments and preparatory work will require funding and support for execution purposes particularly where resources are limited.

CRITICAL STAKEHOLDERS

Consensus building is critical in the process, with key decision makers identified as vessel owners and operators, fuel suppliers and investors in these projects. Meanwhile, ports and other stakeholders are seen to play a more anchoring role in these initiatives to facilitate an environment for these collaborations. There was consensus that capturing a strong and stable demand signal from stakeholders downstream (e.g. cargo owners) will be difficult across the Asia-Pacific region given the fragmentation of these markets and the lack of regulatory incentives.

CROSS SECTOR COORDINATION

Cross sector collaboration is lacking at a local and port level in the region to the extent that a routes-based action plan would require. Internal government dialogue is necessary to bring the shipping agenda in terms with the domestic energy strategy where potential synergies for these initiatives could be realised. However, the internal bureaucracy and silos within policy-making departments may be a delaying factor. Incentives are needed to get government-wide alignment, which could be achieved through a national decarbonisation strategy (e.g. National Action Plans that are inclusive of shipping).

TOP-DOWN APPROACH

Success of a routes-based action plan is driven by the engagement of National Authorities and governments able to signal the direction of policy making and regulations and offer financing and incentive mechanisms to help bridge the cost gap for zero-emission shipping. Many regional ports are currently steered by various conflicting priorities and other short-term targets so there is a need for clear top-down signals to focus efforts and ensure alignment among partners in these initiatives. The value created and the indirect benefits of the routes-based action plans need to be clearly demonstrated to these governments.

LEVELLING THE PLAYING FIELD FOR THE GLOBAL SOUTH

The involvement of local and National Governments within the region is seen as an essential tool to overcome the challenges created by there being more advanced regional regulatory incentives created elsewhere in the world (e.g. regulations set by the European Union) as well as levelling the playing field for the Asia-Pacific developing and emerging countries compared to developed countries.

CONNECTING REMOTE NATIONS

Remote locations that rely on fuel imports at an inflated price are already limited by the direction of major regional ports and exporter countries in the region. To generate new opportunities and energy independence for LDCs and SIDS, local or regional clusters among ports or through the creation of regional Green Energy Hubs that also support the demands of LDCs and SIDS could be potential strategies. For instance, a regional “hub” or “cluster” concept would work to aggregate demands from shipping and other domestic energy uses among these remote locations to create a strong and sufficient demand signal to create the necessary regional energy and fuel supply infrastructure.

FINANCING ROUTES-BASED ACTION PLANS

Firstly, there is a knowledge gap around financial solutions considered to study the cost gap. Secondly, many of the proposed solutions do not yet touch upon the way these solutions can address the lack of access to capital for many of the lower income stakeholders in the region. While ports and governments could engage with development banks for financial support and guidance, many remain unsure about how to confidently present a case and what the financial solvers should be. Therefore, guidance and leadership by the multilateral banks will be needed to bring LDCs and SIDS into these discussions and to raise confidence levels for these regional stakeholders to employ such strategies. Finally, for the development of business cases, more work is needed to better understand how local asset ownership can feed profits back into the communities and foster new market and growth opportunities.

SAFE AND SUSTAINABLE TRANSITION

Safety remains a key concern for the port side communities with exposure to the handling and incidents surrounding the use of new alternative fuels being put forward by the shipping industry. Ensuring the communities are brought through the journey with safety assurances and checks and a collective understanding and support, particularly from the most vulnerable communities, will be vital throughout the process.

Recommendations for routes-based action plans across the Asia Pacific region

A regional hubs approach is needed

Routes-based action plans needs to consider a wider range of routes and actors that connect large demand aggregation locations with remote and smaller demand locations, as well as to facilitate the connections to existing or new fuel production sites. To ensure the inclusion of LDCs, SIDS and developing countries, it will require the engagement of a broader stakeholder community across the region to establish regional energy clusters – both as demand centres and as energy producing hubs.

Coordination across regional governments and knowledge pooling across existing regional first movers will be critical

to establishing regional hubs that can support the inclusion of LDCs and SIDS. The pace of development varies across the Asia Pacific region, with some ports and governments already engaged in first-mover initiatives involving routes-based action plans and energy development projects.

A top-down approach steered by National Governments in support of routes-based action plans is necessary,

particularly giving confidence to ports to make investment decisions for infrastructure to support the uptake of alternative fuels and will encourage these initiatives to be prioritised at the project level. Specifically, **coordination across governments in the Asia Pacific region has the potential to create a more level playing field,** to help the region overcome challenges created by more mature regulatory and incentive structures are already being offered elsewhere across other regions, particularly across the Global North.

Regional governments, public-private partnerships across the fleet and fuel supply and financial institutions

will need to play an instrumental role in enabling and accelerating the development and implementation of regional hubs and routes-based action plans.

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