



GLOBAL
MARITIME
FORUM

ANNUAL PROGRESS REPORT ON GREEN SHIPPING CORRIDORS

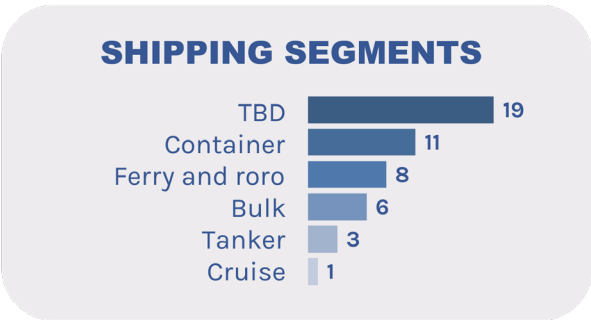
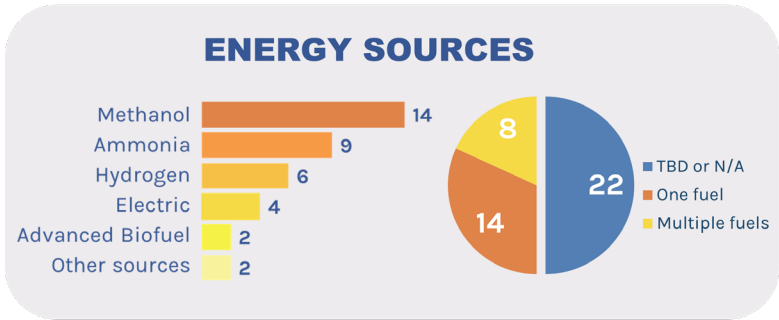
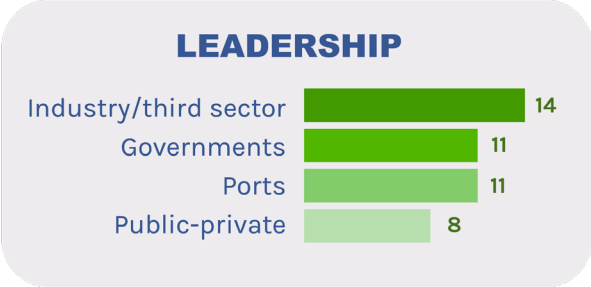
2023



Executive summary

Green shipping corridors – defined as specific trade routes where the feasibility of zero-emission shipping is catalysed by public and private action – are at a crucial point in their early development.

The second edition¹ of the **Annual Progress Report on Green Shipping Corridors** provides a checkpoint for a movement that, in just over a year, has grown in both numbers and maturity.



¹ The first edition of the report can be found [here](#)

This edition reveals a doubling in the number of initiatives and a significant increase in the number of stakeholders involved. It also registers a notable increase in the level of maturity of these initiatives, with multiple corridors clearing a progress stage, deciding on their priority fuels and setting targets for operation. Beyond the numbers, ample evidence points to green corridors triggering pre-investment activity.





12+ corridors
cleared a progress stage



15 corridors
set operation targets
between **2024-2030**



6 corridors
aim for scaled pre-2030
deployment

The other side of this maturation is a new set of challenges identified this year. As the corridors move closer to implementation and into the commercial space, new problems emerge that are aggravated by pre-existing issues. Despite significant progress in determining fuel pathways, many corridors have still not made key fuel decisions. The complexity of governing corridors as cross-sectoral, multi-stakeholder initiatives continues to slow down progress within multiple categories. On the commercial front, gaps in understanding suitable business arrangements to enable deployment have been revealed. On the policy front, the need for implementation support requires an increase in government resources and capacity.

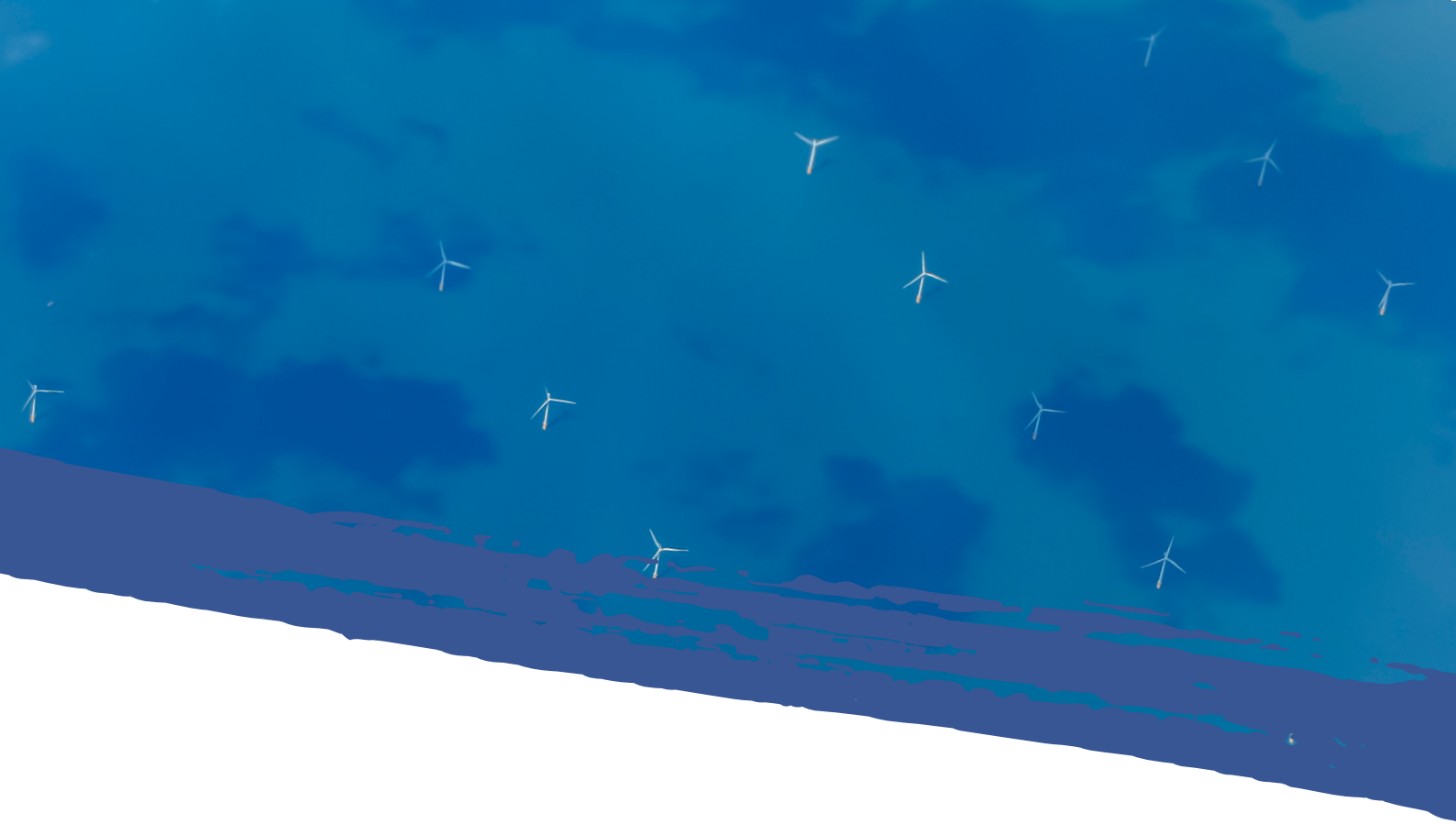


With these challenges in mind and with sights set on 2024, we conclude that:

1. **Decisiveness on fuel pathways** separates successful and stalling initiatives. Given the trade-offs involved in determining the fuel pathway, the choice of whether to adopt a mono- or a multi-fuel approach must be a result of careful consideration.
2. Green corridors need to explore, trial, and adopt **innovative commercial, business, and financial arrangements** across the three challenge areas of chartering, vessel ownership, and fuel offtakes. The knowledge sector can support the corridors by providing a toolbox of potential mechanisms and considerations.
3. Governments' focus should gradually move towards supporting implementation, with first dialogues and decisions regarding potential design of measures taken in 2024. **Governments can trigger a race to the top among green corridors** and explore multiple policy pathways to increase the effectiveness and cost-efficiency of their support.
4. **Appropriate governance structures can accelerate progress.** Focus should be placed on stakeholder alignment, multilevel participation, and nurturing a sense of co-creation and co-ownership.
5. Green corridors should **strive to contribute to an equitable global regime and maximise their co-benefits.** Knowledge sharing is a central mechanism to achieve that, while additional strategies include leveraging ports' positions within local communities and contributing to the development of training programmes and requirements for future fuels and vessels.

If green corridors are to hit their targets and fulfil their function, 2024 must be a breakthrough year in which front-running initiatives begin to execute their plans and others are primed to quickly follow. Success hinges on accelerated effort within the corridors, swift introduction of fit-for-purpose measures by the governments and a willingness of the broader shipping ecosystem to get behind the frontrunners.





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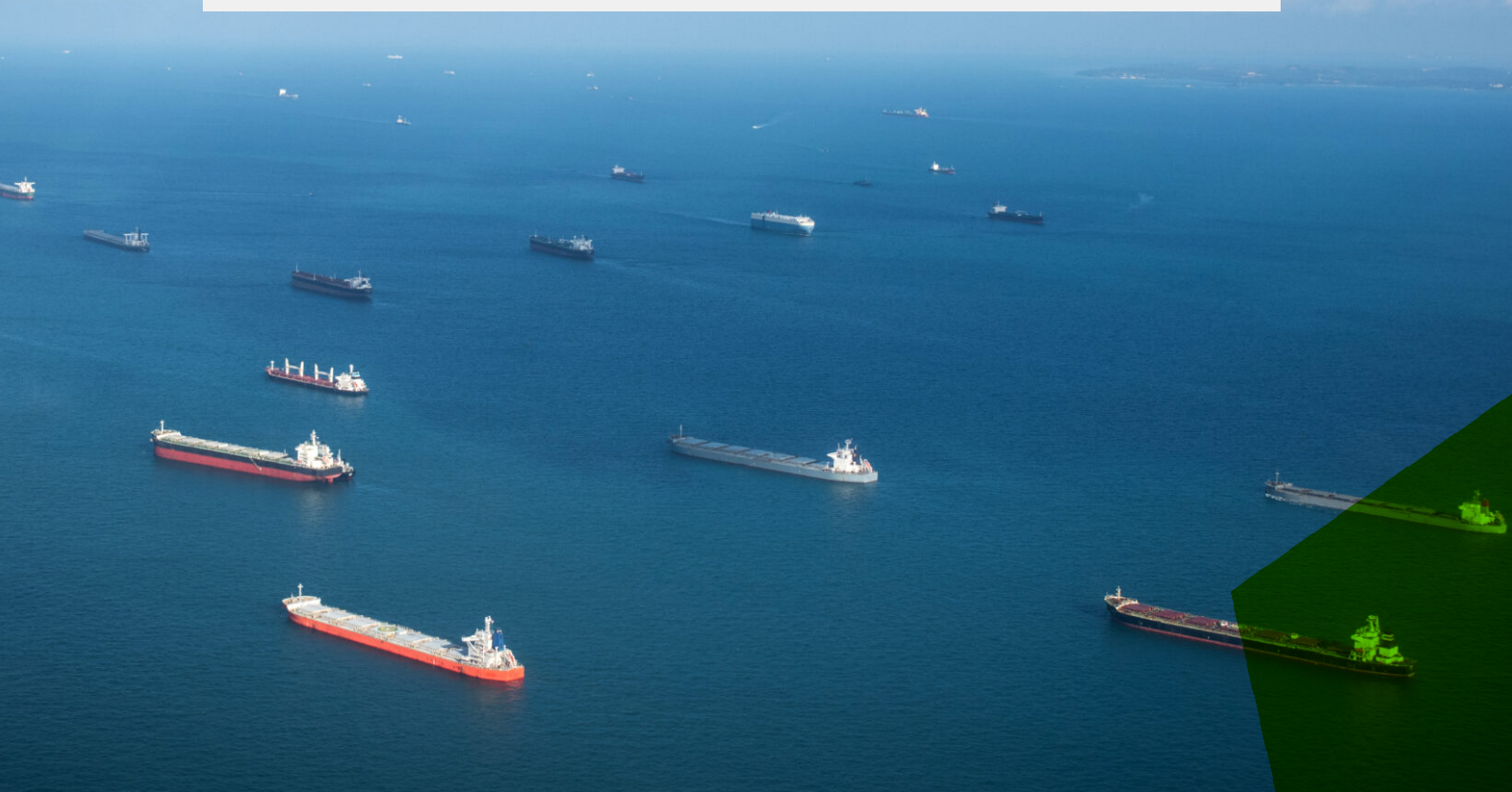
This report has been produced by the Global Maritime Forum on behalf of the Getting to Zero Coalition. The views expressed are the authors' alone.

Acknowledgements

The Global Maritime Forum would like to thank the representatives of green shipping corridor initiatives and Clydebank Declaration signatories for their support in the preparation of this report.

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Introduction

Why do green corridors matter?

The creation of green corridors – defined as specific trade routes where the feasibility of zero-emission shipping is catalysed by public and private action – offers the opportunity to accelerate shipping's transition to zero emissions.

Decarbonising shipping is difficult, but some trade routes offer relative advantages, either because they are near potentially attractive fuel supply hubs, have comparatively simple operational profiles, or are likely to have favourable economics. The idea behind establishing green corridors is to identify and leverage these advantageous routes for accelerated action.

Policymakers can target these routes to create an enabling ecosystem of fit-for-purpose regulatory measures, financial incentives, and safety regulations. At the same time, the shipping industry may develop corridor-specific arrangements, such as joint ventures, demand aggregation structures, and emissions reduction credits and tracking mechanisms that lower the threshold for action throughout the value chain.

While green corridors are focused enough to make decarbonisation manageable, they are also large enough to be impactful. They offer scope for participation from all value chain actors needed to scale zero-emission shipping, including fuel producers, shipowners and operators, cargo owners, and regulatory authorities. They could provide offtake certainty to fuel suppliers, supporting essential investments in zero-emission fuel production and bunkering infrastructure.

The importance of green shipping corridors as a tool in the sector's decarbonisation toolkit has been reinforced by the International Maritime Organisation's 2023 Greenhouse Gas Strategy. The updated strategy, agreed in July, sets ambitious targets for the reduction of emissions from the sector, including 70-80% reductions by 2040 and full decarbonisation "by or around" 2050. The strategy further identifies a milestone of 5-10% adoption of zero- or near-zero-emission fuels by 2030.

To reach these targets, zero-emission shipping technologies, standards, infrastructure, and business models must all be mature by the end of this decade. Corridors are ideal candidates for supporting this maturation at the scale and pace needed.

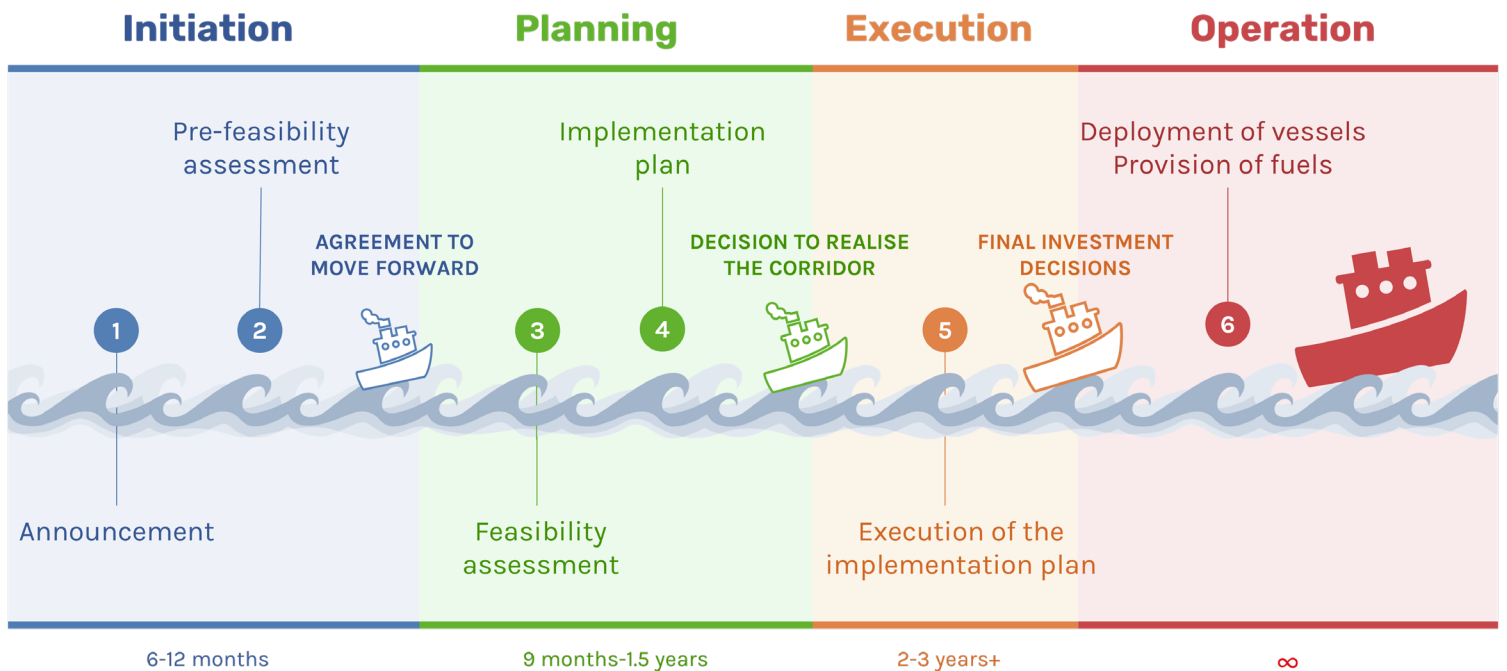
“The 2023 IMO Strategy [...] has attracted more players and generated even greater commitment from partners to invest in assets and create an enabling ecosystem for shipping lines planning to bunker zero- and near-zero-emission fuels on the corridor.”

Rotterdam-Singapore Green and Digital Shipping Corridor representative

What does it take to develop a corridor?

Green corridors are, by their nature, complex, multi-year initiatives by first-mover companies and governments to explore, assess and, ultimately, establish initial pockets of zero-emission shipping this decade.

While there is variation in the approaches taken by existing corridor initiatives, a common process for green corridor development has begun to crystallise. Like other major industrial projects, it consists of several discrete stages. These stages do not necessarily have to be tackled consecutively. However, they do represent bases that must be covered to narrow the field of possibilities down into a tangible action proposition.



Initiation

Initiatives at this stage: **23** | Completed the stage: **21** | Average duration: **6-12 months**

The first step in exploring a potential green corridor revolves around determining the “what” and “where” of the corridor.

This stage commences with the formation of a **core stakeholder group**, linked by a common interest in exploring a green corridor in a given geography.

The first tasks facing this group are to agree on foundational governance, align on a shared vision, and devise a work plan for the collaboration. This provides a platform to determine the specific shipping route of focus. Where there is a high pre-existing level of alignment or an emphasis on rapid action, this decision may be based on a bottom-up initiative. Where the possibilities for action are broader or there is an emphasis on establishing an evidence base for decisions, dedicated **pre-feasibility assessments** have been undertaken. Regardless, the decision should be grounded in a balance between the impact a specific corridor could achieve and its expected feasibility.

The phase ends with either an **agreement to move forward** with a deeper exploration of the chosen corridor or a decision to conclude the collaboration and refocus efforts on other opportunities.

Planning

Initiatives at this stage: **17** | Completed the stage: **4** | Average duration: **9 months-1.5 years**

Where the initiation stage determines the “what” and “where” of the corridor, the planning stage is concerned with the “how” and “when”.

The main activity in this phase is co-developing an **implementation plan** for the chosen corridor, including a fuel focus (if not already decided during the initiation stage), common implementation targets, and the shared actions needed to achieve them on the route.

Feasibility assessments – examining the technological, regulatory, and commercial requirements to establish the corridor – are used to support the process. This includes strategic discussions between the stakeholder groups, wider value chain, and policymakers. The aim of policy engagement is to communicate the value of the corridor, outline areas of policy support, and identify potential policy measures to aid implementation.

The planning phase ends with a positive **decision to realise the corridor** by some or all of the stakeholder group, and a shift from primarily pre-commercial to commercial forms of collaboration. A decision may also be made to refocus efforts on other opportunities.

Execution

Initiatives at this stage: **0-2** | Expected duration: **2-3 years+**

The execution stage marks the beginning of tangible action to realise the corridor. In this stage, the various technical, regulatory, and commercial steps to enable the operation of zero-emission ships on the corridor are taken.

Execution represents the frontier of existing corridor efforts, and it is likely that different approaches will emerge based on the specific barriers and actions to be tackled. The phase ends once **business case approvals are obtained, contracts and offtakes are signed, and the required permits are in place.**

While no initiatives have fully entered this stage, several have begun elements of execution in parallel with planning – for example, by initiating new pilots, technical studies, regulatory, or commercial actions. This is likely to streamline the timeline for operation, which will include time for development and accommodate the one-to-three-year lead times for the construction of vessels, bunkering infrastructure, and fuel production.

Operation

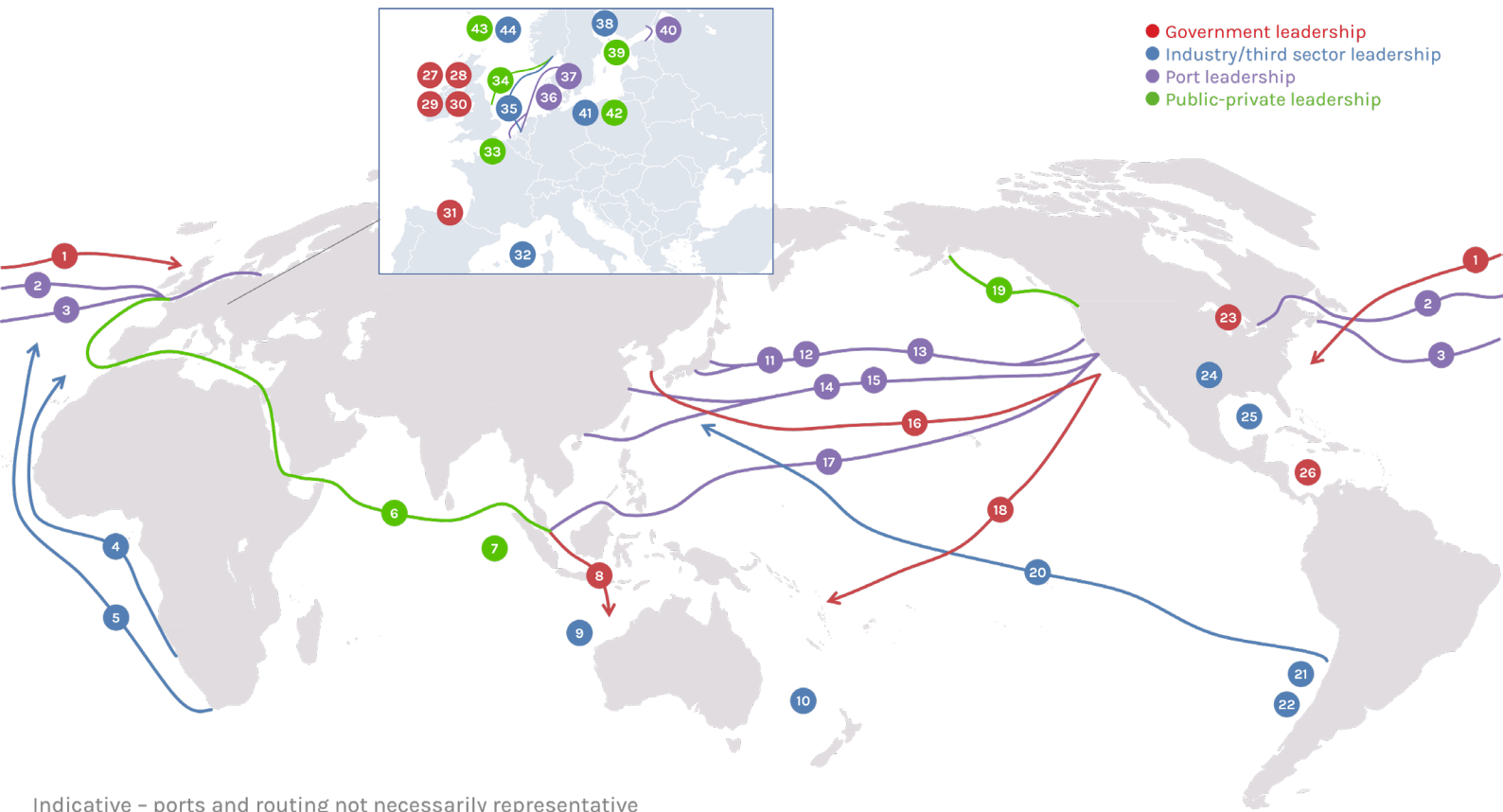
In the operation phase, the first **zero-emission vessels hit the water**, supported by the relevant infrastructure, standards, and contracts. From there, deployment is expected to scale.

This phase does not have an end, as such. But a sign of success is that corridors eventually make themselves obsolete, with what was once a green corridor simply becoming one zero-emission shipping route among a growing global network. As a part of this process, bespoke arrangements such as joint ventures, demand pools, and targeted policy support may be phased out in favour of more conventional arm's length commercial arrangements and standardised regulatory regimes.

Further guidance

- **Approaches:** The 2023 edition of DNV's [‘Maritime Forecast to 2050’](#) and Lloyd's Register's [‘First Movers Framework’](#) outline recommended approaches to corridor development, with similar milestones to the above.
- **Advice and lessons learned:** Experiences and recommendations for how best to navigate the different stages of corridor development can be found in [‘Green Corridors: Definitions and approaches’](#) and [‘The Silk Alliance: Experience and Initial Lessons from a Green Corridor Cluster’](#).
- **Tools:** With support from the Global Maritime Forum, UMAS has developed a [Green Corridor Prioritisation Tool](#), aimed at supporting governments in identifying promising green corridor routes. The Maersk McKinney Møller Center for Zero Carbon Shipping, Green Hydrogen Catapult, and McKinsey & Co have also created “blueprints” to assist in the design of pre-feasibility and feasibility assessments.

Green corridors map



Indicative - ports and routing not necessarily representative

- | | | |
|--|---|-----------------------------------|
| 1. US-UK Taskforce | 16. Republic of Korea-United States | 31. Green Corridors Spain |
| 2. Antwerp-Montreal | 17. LA/Long Beach-Singapore | 32. La Méditerranéenne |
| 3. Halifax-Hamburg | 18. US-Fiji-Pacific Blue Shipping Partnership | 33. Dover-Calais/Dunkirk Ferry |
| 4. Namibia-EU | 19. Pacific Northwest to Alaska | 34. H2 powered North Sea crossing |
| 5. South Africa - Europe Iron Ore | 20. Chile Cu-Concentrate | 35. Oslo-Rotterdam |
| 6. Rotterdam-Singapore | 21. Chile Piscocultura | 36. Gothenburg - Rotterdam |
| 7. The Silk Alliance | 22. Chile sulfuric acid | 37. Gothenburg - North Sea Port |
| 8. Singapore-Australia | 23. Canada-US Great Lakes- St Lawrence | 38. Åland RoPAX |
| 9. Western Australia-North Asia Iron Ore | 24. US Green Bulk | 39. Decatrip |
| 10. Australia-New Zealand | 25. Gulf of Mexico | 40. FIN-EST |
| 11. Oakland-Yokohama | 26. US and Panama | 41. European GC Network |
| 12. LA-Nagoya | 27. UK-Belgium | 42. Nordic Roadmap |
| 13. LA-Yokohama | 28. UK-Norway | 43. Clean Tyne |
| 14. LA-Guangzhou | 29. UK-Netherlands | 44. GREENBOX |
| 15. LA-Long Beach-Shanghai | 30. UK-Denmark | |

Overview of initiatives

The number of announced initiatives more than doubled this year, a development driven by both an acceleration in governmental efforts to establish green corridors, and new industry- and port-led efforts. Shipping companies, ports and the civic sector (non-governmental nonprofit organisations) represent over half of the 171 stakeholders involved in green corridors.



171 STAKEHOLDERS

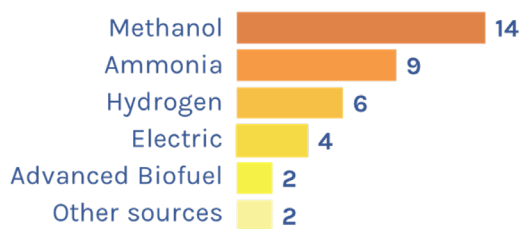
VESSEL OWNER/OPERATOR
KNOWLEDGE, THIRD SECTOR
PORT AUTHORITY REGULATOR
FUEL PRODUCER CARGO OWNER OTHER
CLASSIFICATION SOCIETY FINANCIAL INSTITUTION

LEADERSHIP

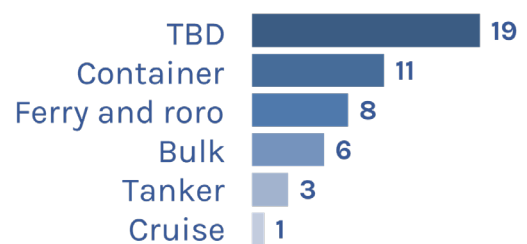


The container segment is the most prominent in the green corridor space, with limited but increasing activity in the bulk segment, and very little activity in the cruise and tanker segments. Methanol and ammonia have solidified their position as the most popular fuel choices (more on fuel pathway progress can be found in the next section).

MOST CONSIDERED ENERGY SOURCES

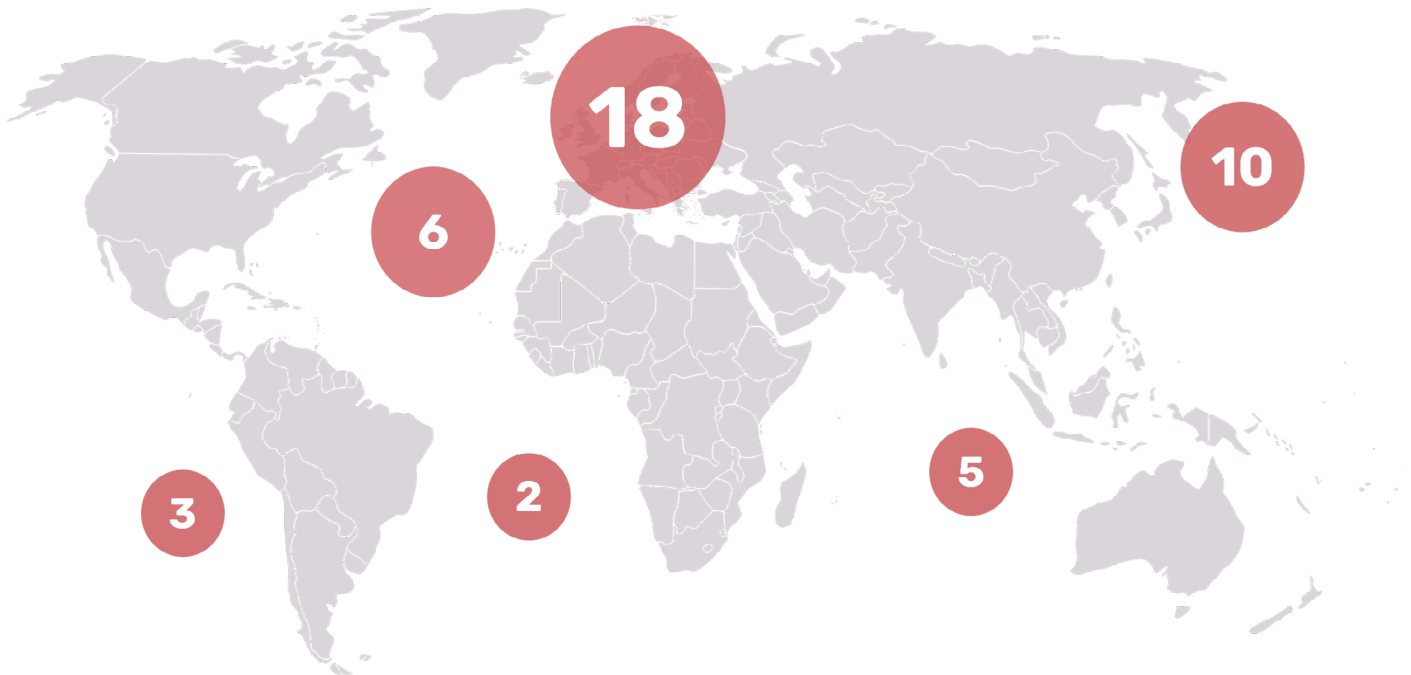


SHIPPING SEGMENTS



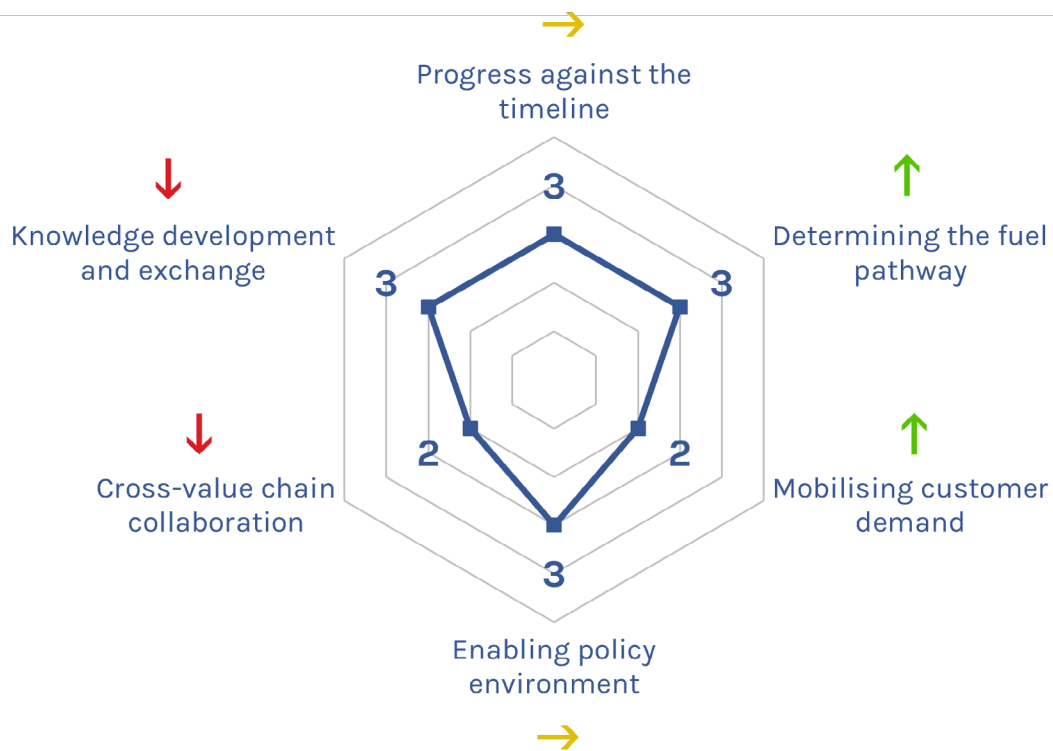
The South Pacific and South Atlantic regions witnessed an increase in activity, with new initiatives emerging in both South America and Africa. The numbers remain low, however. Asia has significantly increased its representation, with several transpacific initiatives announced this year, while the number of short-sea corridors in Europe doubled.

GEOGRAPHIES



Overview of progress

Initiatives have gained significantly more clarity on the **fuel pathway** since the first edition of the Progress Report. More favourable conditions for **mobilising customer demand** have also been created. There is more ample evidence of active **government engagement**, though significant barriers to meaningful policy intervention have begun to surface. While progress has been made on **advancing the initiatives against the timeline**, recent developments at the IMO and EU levels may have narrowed the window for the corridors to meaningfully contribute to shipping's energy transition. Within **knowledge development and exchange**, issues with data sharing within the initiatives are starting to surface. This links to challenges on the governance front, which impeded both **cross-value chain collaboration** and overall progress this year.



Progress against the timeline



12+ corridors
cleared a progress stage



15 corridors
set operation targets



6 corridors
aim for scaled pre-2030 deployment

There is a growing level of maturity in the 22 corridor initiatives recorded in the previous edition of the report, with over half having progressed to a new development stage over the past year. While a few of the remaining ten initiatives appear to have stalled, most report that this does not reflect a lack of progress but rather the time- and resource-intensiveness of their current activities.

Continued momentum in initiating green corridor efforts was observed, with 23 new initiatives announced this year. These initiatives remain in the early stages of development, creating a long tail of corridor initiatives in the short term, but also a pipeline of future projects with the potential to contribute significantly in the medium-term.

Initiation

Announcement and initial partnerships

Pre-feasibility assessment

Route-specific feasibility assessment

Planning

Implementation plan

Execution

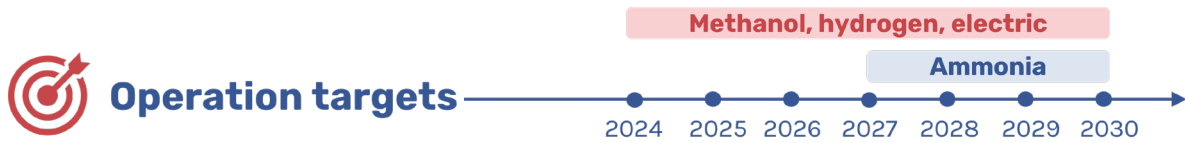
Final investment decisions

Operation

Deployment of vessels
Provision of fuel



The increased level of maturity among the initiatives has yielded a clearer sense of timelines for action. Fifteen corridors have now set operational targets - specifying when the corridor should be “online” with operational zero-emission vessels and infrastructure - virtually all of which were announced this year. They have shared a focus on action this decade, targeting initial operation between 2024 and 2030.



Relevant initiatives are planning to introduce methanol, hydrogen, or electric vessels from 2024-2030 and ammonia vessels from 2027-2030, reflecting the varying readiness levels of these solutions. As well as timeframes for initial operation, several initiatives have announced their intention to scale the corridor, kickstarting a full-scale fleet transition; this includes at least six initiatives that are actively seeking to achieve scaled deployment before 2030. This is a promising sign in terms of green corridors' contribution to the 5% fuel goal by 2030.

For the first time, implementation plans have also been released, outlining the critical pathway to reach initiative targets and the required actions identified throughout the value chain. Three initiatives have completed plans this year, with at least three more in advanced stages of development.

Finally, there are early indications that **corridors are helping drive investment and action:**

- NYK Bulk & Project Carriers (NBP), Oshima, and Sumitomo have announced a collaboration to design Handymax bulk carriers, part of fleet of up to 15 ammonia-powered vessels “dedicated to the transport of copper products that NBP would operate from Chile to the Far East.” This is connected to one of the corridors under the ongoing Chilean Green Corridors Network project and follows a collaboration agreement between Codelco, a Chilean state-owned copper producer, and NBP to decarbonise maritime transport of copper products.
- Multiple actions are being undertaken in connection with the exploration of the Western Australia-East Asia iron ore corridor. For example, Yara Clean Ammonia and the Pilbara Ports Authority have completed a study on the feasibility of clean ammonia bunkering in the Pilbara.
- DFDS is working on the design and approvals for an ammonia-powered roll-on/roll-off (ro-ro) vessel, intended for operation on the Gothenburg-North Sea Port green corridor.
- CMA has acquired freight and passenger company La Méditerranéenne with an ambition of using its lines to create green corridors in the Mediterranean Sea.



There is also evidence of progress in **establishing zero-emission fuels supply chains** in areas relevant to corridors. For example:

- Ground has been broken at the Port of Gothenburg on 50 kilotonnes of e-methanol production, which will be online from 2025.
- The Singaporean Energy Market Authority is seeking proposals to develop 0.1 megatonnes of ammonia for bunkering purposes by 2027.
- The World Bank is completing a feasibility study on the potential for green ammonia production in the Saldanha Bay region of South Africa, which is under exploration for an iron ore green shipping corridor within the Getting to Zero Coalition.

Many corridor ports are working to increase their readiness for zero-emission bunkering. For example, Singapore, Rotterdam, and Gothenburg have all completed ship-to-ship methanol bunkering trials, while Singapore, the Pilbara, Rotterdam, Antwerp, Houston, and Korean ports are undertaking safety and feasibility assessments for ammonia bunkering. In addition, some ports have begun harmonising bunkering standards through corridors.

Progress this year puts the movement largely on track, but the need to keep focus remains. If the corridors are to hit their targets, 2024 must be a breakthrough year, in which frontrunning initiatives begin execution, with others ready to follow quickly behind. The full shipping ecosystem needs to get behind frontrunners and adopt best practices to streamline development.

Gothenburg-North Sea Port spearheads execution

The ro-ro corridor between Port of Gothenburg in Sweden and North Sea Port in Belgium builds on a green shipping-related collaboration between the two ports and the shipowner DFDS, signed in October 2022.

The partners have undertaken a vessel conversion project and developed the required regulatory enablers for retrofitting an existing vessel on the route to methanol. However, due to the prohibitive cost gap between green methanol and conventional fuel, the project is currently on hold. In the meantime, the partners have shifted their focus to an ammonia newbuilding project, which is the preferred long-term fuel choice for DFDS. There, too, the partners run into the cost gap challenge, stating that the project may not materialise unless the states provide significant additional capital expenditure for the vessel and enough fuel can be secured at a reasonable cost.

Notwithstanding the obstacles, the work continues. The key to the progress to date has been to leverage the ongoing but independent efforts by the three partners. Coming together within the context of a corridor has provided a framework for aligning solutions, building an understanding of the costs of zero-emission shipping, and exchanging knowledge.



Photo: Port of Gothenburg



Rotterdam-Singapore Green & Digital Shipping Corridor adopts a “building block” approach to decarbonise the trade lane

The Singapore-Rotterdam Green and Digital Shipping Corridor unites more than 20 partners from across the shipping industry’s value chain in an effort led by two of the biggest bunkering hubs in the world. The corridor is established on one of the busiest trade routes in the world, and features participation from all major container lines active on that route.

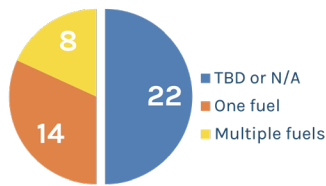
The initiative has adopted a “building-block” approach to decarbonise the trade lane by bringing together value chain stakeholders, identifying zero and near-zero fuel pathways, and building an enabling ecosystem for deployment. This includes developing and harmonising emerging methanol and ammonia bunkering standards in the Ports of Rotterdam and Singapore, exploring reduced port dues for zero and near-zero-emission vessels, and undertaking joint pilots and demonstrations. One example of the latter is the recent bunkering of the green methanol-powered vessel *Laura Maersk* in both ports. The hope is to help create confidence by showing tangible progress and improve the case for support from governments and first movers among cargo owners.



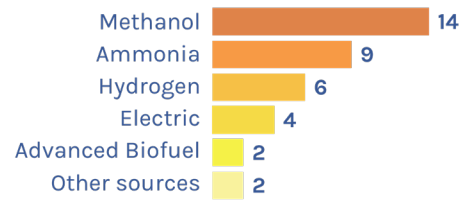
Photo: Rotterdam-Singapore Green & Digital Shipping Corridor

Determining the fuel pathway

22 corridors
with specified fuel focus
(+16 since 1st ed.)



Most considered energy sources



As a result of the progress in planning and the move to bring ongoing demonstrations into the context of green corridors, a number of new decisions have been made on fuel pathways. Only six initiatives had specified a fuel focus last year, compared to 22 this year. This is an encouraging sign as fuel decisions represent an important milestone in developing a green corridor. Green corridors' potential lies in their ability to simplify complex choices and forge a pathway through uncertainty, and the increasing clarity on fuel pathways suggests that corridors are fulfilling this potential.

The portfolio of initiatives spans all major zero-emission energy sources. Methanol and ammonia are emerging as leading solutions, seemingly reflecting the sentiment in the sector, where these two fuels are viewed as the primary scalable options for medium and large vessels.

Most initiatives are picking a single fuel. Many bulk corridors are focused on ammonia, ferry corridors are mostly working towards methanol, and small vessels are looking at hydrogen or electricity. Container corridors, however, show a markedly different strategy. They tend to opt for a multi-fuel approach, either announcing two or more fuel focuses or taking a "fuel agnostic" posture, where all solutions meeting a specified emissions reduction threshold are considered. This is likely driven by factors such as the existing multi-fuel nature of container shipping (having been a major adopter of first liquified natural gas and now methanol) and a push to begin the sector-wide fuel switch as soon as possible. This may also reflect the idiosyncrasies of the port leadership, prevalent in container corridors. Given ports' status as providers of bunkering services, initiatives driven by ports are often inclined to pursue multiple fuel pathways in order to be able to cover emerging demand.

Data shows an openness towards transitional use of bio or blue versions of fuels on the way to green. Time-limited use of bio and blue fuels supports the rollout of bunkering and vessels and reflects a hedge strategy against fuel supply constraints. However, to unlock the value of green corridors as leaders of deep decarbonisation and to support the most scalable long-term options, green fuel pathways must be prominent in the movement before 2030.

At this stage, there is no evidence of zero-emission fuel being explicitly secured for use on corridors. However, this is symptomatic of shipping in general, with very few offtake contracts signed within the sector, and extends to the broader hydrogen economy, where less than 10% of clean hydrogen projects have identified potential buyers. To secure the sector's access to sufficient volumes of zero-emission fuels, progress within this area, including demand aggregation within and across corridors, must accelerate in 2024.

Western Australia-East Asia iron ore corridor features clear alignment on ammonia

Under the auspices of the Getting to Zero Coalition, more than 15 stakeholders from across the shipping, mining, and energy value chains are advancing a green corridor for the trade of iron ore from the Pilbara region in Western Australia to Northeastern Asia. The initiative is focused on the potential to decarbonise the trade specifically with clean ammonia.

The corridor was initiated based on the potential for first-mover clean-ammonia-powered shipping. The pre-feasibility study for the route suggested that ammonia is best positioned to power the corridor, based on Australia's leading position in hydrogen development (mostly in the form of ammonia production), the potential for political support given the industrial priorities of the Australian government, and momentum in the shipping value chain with multiple actors relevant to the corridor having announced plans for its use and/or ongoing projects.

Together with another advanced corridor initiative, the Silk Alliance, the Western Australia-East Asia corridor has placed an active focus on scale and demand aggregation. The corridor's grounding in the fuel opportunity (and the focus this has created) is, in part, credited for its speed of development.



Mobilising customer demand

Participation of cargo owners in green corridors remains low, with only five initiatives featuring cargo owners and a total of eight cargo owners represented. However, alternative modes of cargo owners' engagement and ways to activate their willingness to pay for zero-emission shipping services have begun to crystallize.



8 cargo owners involved across 5 initiatives

sectors represented:

mining and steel
chemicals

Direct cargo owner participation in green corridors is limited to bulk corridors. There, companies representing major players in the mining sector (BHP, Rio Tinto, Fortescue Metals Group, Anglo-American, and Codelco), and even their customers (Tata Steel and Volvo), are taking the lead. Initiatives with the direct involvement of cargo owners often single it out as a catalyst of progress.

In the ro-ro segment, which shares some of the characteristics of bulk in terms of the number of cargo owners per vessel, cargo owners are not yet officially involved, though there is evidence of ongoing dialogue with cargo owners. In the initiatives focusing on the container segment, characterised by its more disaggregated nature of trade, current discussions point at a preference towards mobilising customer demand indirectly through demand aggregation platforms for zero-emission shipping services and emerging book and claim solutions (on the cargo side).

Cargo owners' proactivity triggers action among key actors on the corridors

Among the most significant developments in the periphery of green corridors is the announcement of a joint procurement initiative by the Zero Emissions Buyers Alliance (ZEMBA). The first auction round intends to procure 600,000 TEUs* of zero-emission shipping services over a three-year period, with delivery in 2025. This has triggered a response among actors on the corridors, such as the **Singapore-Rotterdam Green and Digital Corridor**. To support this initiative, Port of Rotterdam announced a port dues reduction for container vessels bunkering alternative fuels** on its premises as part of ZEMBA. The other corridor co-lead, Maritime Port Authority of Singapore, has previously announced substantial reductions on port dues, ship registration fees and annual tonnage tax for vessels that adopt energy-efficient, zero and near-zero emission solutions.

ZEMBA's inaugural request for proposals is geography-neutral, and the zero-emission shipping services procured will be deployed wherever it is most economically viable to do so. However, for future rounds, ZEMBA is open to exploring opportunities to innovate on this model, including potentially through geography-specific demand aggregation, ideally in support of high-ambition green shipping corridors, expansion to other segments beyond the container market, and issuance of fuel-specific tenders to accelerate scaling and deployment of promising early-stage zero-emission fuels and technologies.

* Twenty-foot equivalent unit

** Fuels with at least 90% emission reduction

Despite the low level of direct participation from cargo owners, the underlying assumption shared by some of the corridors is that the additional costs associated with zero-emission shipping will be passed to the consumers. While this is relatively unproblematic in situations where a level playing field is established through global or regional policy measures, the feasibility of implementing such an approach in the context of first-mover initiatives, and on specific routes, remains to be explored.

“Though we have had good dialogue with cargo owners active on the route, our understanding is that, so far, it will be difficult for them to pass the costs to their end consumers. No matter how much we cash in from other parts, there remains a price gap that initially must be bridged with state support.”

Gothenburg-North Sea Port Green Corridor representative

Enabling policy environment

Many governments have provided meaningful support to corridors at their early development stages. In fact, evidence suggests that proactive behaviour on the part of governments has often been central to progress. While all leadership models show signs of progress, public-private initiatives seem to advance particularly quickly, fast-tracked by funding opportunities and pre-defined timelines.

To date, 18 governments are directly involved in the initiatives, with 19 initiatives featuring either public or public-private leadership. This year has seen an increase in the number of bilateral agreements to establish green corridors between countries (+9 since the 1st edition). This development is largely driven by the United Kingdom and the United States, which both now manage a sizeable portfolio of prospective green corridor routes. Additional efforts were made on the funding front, with R&D support provided by several countries, including the United Kingdom, Finland, Denmark, Sweden, and Norway. In parallel, countries continue their efforts coordinating and convening relevant stakeholders.

While the early-stage support provided to date is commendable, there is evidence of a growing disconnect between the expectations of governments from more mature initiatives and the capacity of the governments to deliver on these expectations. As the initiatives dive into figuring out the business case, the fuel cost gap surfaces as the main policy area where governments may have to intervene. Five of the most advanced non-government-led corridors have either started engaging in dialogue with policymakers or are outlining it as a priority for the upcoming year. For most, the focus is on operational expenses support, where cost gap modelling serves as a basis for formulating the policy ask.

“Greater public funding support is needed to de-risk the deployment of novel fuel technology and infrastructure for private investors beyond the development stage.”

Dan Smith, Project Manager at ACUA Ocean, First Hydrogen-Powered North Sea Crossing

Governments universally acknowledge the fuel cost gap challenge but point at a number of barriers to action. These include fiscal limitations, misalignment across different governmental departments, and a perceived lack of mandate, incentives, and, in some cases, experience, to support international shipping. Most governments continue to rely on international and regional regulations to address the fuel cost gap for international ships, and therefore focus their efforts on domestic shipping, supporting fuel production and port infrastructure, and promoting action at the IMO level, citing the potential of these measures to spill over to green corridors.

Chilean Green Corridors Network empowered by strong governmental presence

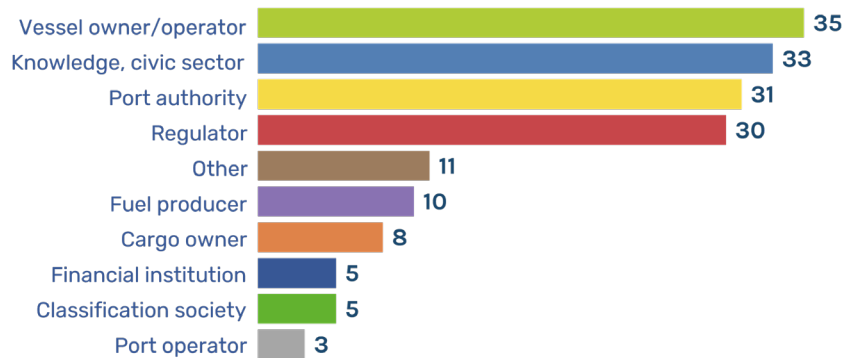
The Chilean Green Corridors Network, led by the Maersk Mc-Kinney Møller Center for Zero Carbon Shipping, was initiated as a collaboration with the Chilean government, and aims to assess the green corridor potential in and out of Chile. The network has generated a diverse portfolio of domestic and international corridors, such as a copper ore corridor between Chile and Japan/ South Korea and a sulfuric acid corridor.

Throughout its development, the project has seen significant involvement and interest from the government of Chile. Three different ministries were involved at the pre-feasibility stage, marking a good example of intragovernmental collaboration. The involvement continued beyond the early stages, with the government becoming an official participant in the feasibility study, shadowing the work and providing regular interface for interactions with senior decision-makers. The government has expressed an openness to consider policy interventions while stressing the importance of providing concrete numbers and evidence of local value added. In response, the corridor has made cost gap modelling a central activity.



Cross-value chain collaboration

171
STAKEHOLDERS
 (+61 since 1st ed.)



With a doubling of the number of corridors, there has been a concomitant increase in the number of actors involved. The 171 stakeholders participating in green corridor development cover the whole maritime value chain, but involvement continues to be heaviest among the traditional shipping actors, such as shipowners/operators, ports, and maritime regulators. Green corridors feature participation from eight of the world’s ten largest container shipping lines, three of the five largest cruise lines, four of the ten largest bulk shipping companies, and nine of the top 20 global bunkering hubs.

Engagement from the rest of the value chain is significantly lower, with cargo owners, fuel producers and the financial sector underrepresented.

Just seven initiatives feature the participation of fuel producers. Fuel producer involvement is so far mostly grounded in fuel production opportunities, and bunker suppliers are not yet represented. Close engagement with the fuel supply chain is crucial for corridor planning; it allows for transparent dialogue about availability, costs, and barriers to fuel production and supply, as well as alignment of emission reduction and certification expectations with charterers and cargo owners. At the same time, some initiatives stress the need to think carefully about the timing, nature, and extent of involvement of fuel producers.

Only three initiatives feature membership from financial institutions. Due to their novelty, securing financing for early zero-emission vessels will require more analysis, data sharing, and dialogue between financiers and shipowners than for conventional vessels. Early involvement of the financial sector in green corridors may help speed up zero-emission ship finance deals, through familiarising the sector with the initiative’s scope and approach to risk, while also benefiting from the financiers’ market knowledge.

Finally, governance has become an increasingly significant challenge. Building consensus on specific technologies, levels of ambition, and actions among diverse sets of stakeholders has proven complex and time-consuming. In parallel, maintaining consistent communication and undertaking detailed analytical work have also demanded significant resources.

“The nature of voluntary multistakeholder partnerships introduces challenges to progressing towards implementation. The rate of progress that can be made among large groups is slow, particularly where partner organizations only commit limited resources. Reaching alignment on specific levels of ambition, goals and timelines is also challenging”

Anonymous green corridor representative

The Silk Alliance opts for alignment

The Silk Alliance represents a green corridor cluster in the Indian and the Pacific Oceans, led by Lloyd’s Register Maritime Decarbonisation Hub. The initiative has garnered 18 members from across the maritime, energy, finance, and public sectors. The corridor was among the first in developing an implementation plan, aiming at pre-2030 scaled ammonia and methanol vessel deployment.

The initiative cites several best practices that enabled them to establish firm consensus and commitment:

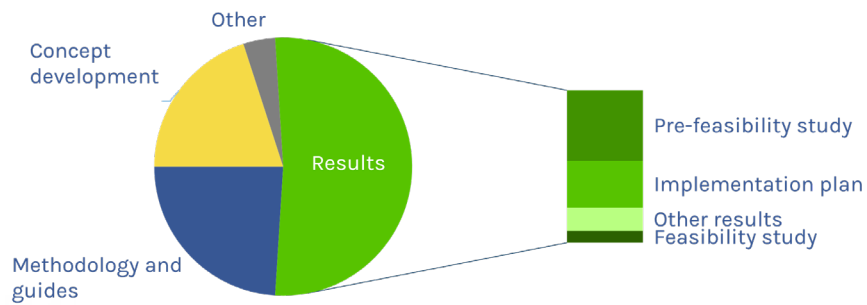
1. Clearly defining the vision and pathway from the start. Sharing the vision was a pre-condition for membership; this was viewed as essential for having a focused and constructive engagement.
2. Taking the time required to ensure consistency of communication and co-creation. Consensus and ownership, rather than top-down decision-making, was seen as a key enabler of meaningful action.
3. Introducing different modes of engagement. Depending on the question being tackled and the decision to be made, bilateral, group, or taskforce engagement were deemed more appropriate.
4. Narrowing the fuel scope down to a manageable level, while keeping long-term scalability and potential spill-over to the wider industry in mind.



Photo: The Silk Alliance

Knowledge development and exchange

25
publications



The global green corridor movement continues to generate learnings that have the potential to accelerate the transition of the sector. Compared to last year, where many publications focused on concept development and methodology, this year's focus² is on sharing tangible outcomes. Two new themes have also emerged: national policy and co-benefits of green corridors. However, gaps in knowledge remain. For example, while ample guidance is now available for pre-commercial stages, commercial arrangements for green corridors remain underexplored.

In terms of knowledge exchange between and beyond the initiatives, significant progress has been made, with evidence of knowledge generated within green corridors spilling over to the rest of the sector. The need for harmonising performance and other data across corridors is starting to emerge, though it remains unclear which actor can take the lead.

Nordic Roadmap adds to the global knowledge base

Initiated by the Nordic Council of Ministers, the Nordic Roadmap aims to address key barriers to zero-emission shipping in the region. As part of this effort, several promising intra-Nordic routes were identified. The project has established two green shipping corridor pilots and is working on an additional one. It is coordinated by DNV with support and involvement from all Nordic countries.

One of the workstreams within the initiative looks at the safety implications of using methanol, ammonia, and hydrogen as maritime fuels and the regulatory developments needed to support their uptake. The knowledge generated by that workstream was used to inform draft interim guidelines for the safety of ammonia-powered ships. The initiative then worked with the Nordic countries to submit this guidance to the IMO in May 2023, marking a good example of channelling learnings in an impactful way.

In addition to sharing knowledge, the initiative encourages other green corridors and governments to build on insights from previous experiences. In designing its scope, the initiative incorporated learnings generated within the Green Shipping Programme (GSP). This resulted in the early involvement of cargo owners and a high degree of fuel specificity in the pilots, both identified as key success factors within GSP.

² Library of green corridor publications can be found at Mission Innovation's [Green Shipping Corridor Hub](#)

The Silk Alliance bets on transparency

The Silk Alliance has a strong focus on transparency and has opted to publicly and systematically share experiences, progress, and lessons learned. As part of the efforts, the initiative launched a website to disseminate insights on the ongoing progress. Such high levels of transparency have multiple benefits both for the initiative and the sector's transition. Among other advantages, it attracts attention to the initiative and facilitates stakeholder interactions. So far, the initiative has skilfully navigated the tricky balance between transparency and confidentiality.

Civic sector organisations are emerging as important conduits for best practices and inter-corridor knowledge sharing, as well as facilitators and advisers in corridor development. Just five actors representing these stakeholder groups cover well over half of all the existing publications.

Knowledge exchange within the initiatives is an area of growing concern, particularly for corridors that involve competitors. To some extent, this is a result of the inherent trade-off between sharing knowledge and realising the first mover competitive advantage. However, even in instances where information is not commercially sensitive, lack of industry experience with transparency seems to drive a reluctance to share data. This reinforces the importance of trust-building within the existing initiatives.

Recommendations

and next steps

The other side of the significant progress made between the first and the second edition of this report has been the unearthing of a new set of challenges. As the corridors move closer to implementation, new problems emerge, for example in the areas of policy and commercialisation, while pre-existing issues resurface in new ways, such as those related to fuels and governance. This section provides decision support to address these challenges.

Decisiveness on fuel pathways separates successful and stalling initiatives

Despite significant progress, many important fuel decisions have yet to be made. The two emergent fuel strategies- multi- and mono-fuel - have their distinct advantages and disadvantages, and the choice to adopt one or the other should be based on a careful examination of the context and a thorough consideration of the trade-offs.

	PROS	CONS
MONO-FUEL	<ul style="list-style-type: none">+ More manageable in development and operation; likely to move faster+ May aggregate higher levels of demand for each fuel and achieve cost advantages+ May be easier to design a specific and clear policy ask	<ul style="list-style-type: none">- May preclude the involvement of important stakeholders- May increase immediate technology and operational risk- Policy advocacy may be harder due to policymakers' preference for technology neutrality
MULTI-FUEL	<ul style="list-style-type: none">+ May enable earlier impact, depending on the combination of zero-emission fuel pathways+ May help hedge immediate technology and operational risk+ Policy ask is in line with policymakers' preference for technology neutrality	<ul style="list-style-type: none">- Resource intensive- May fragment first-mover fuel demand- Policy ask may be more complex- Unlikely to be best way to hedge technology and operational risks at fleet level- Likely to be impractical on many smaller routes

In the initiation phase, considering multiple fuel options is beneficial in many contexts. By the planning and implementation stages, however, a monofuel strategy offers comparatively more advantages in most contexts, supporting more targeted efforts, reduced complexity, and a stronger business case.

The following best practices offer guidance for how to approach fuel decisions at early stages of green corridor development.



1. While diversity may be positive at the portfolio level, individual initiatives should **strive for specificity** on a fuel pathway (before the planning stage). Such choices align with green shipping corridors' core value proposition – not as the solutions for the entirety of shipping's decarbonisation, but as specific initiatives to test and mature high-potential zero-emission value chains.
2. **Take a considered approach to the fuel strategy.** Regardless of the strategy chosen, these choices should be made and communicated actively to maximise alignment and momentum.
3. **Empower the future buyers and users of the fuel.** Future fuel buyers and users should have an influence over the fuel focus of the initiative. This is especially important in port-led initiatives, where the needs of those who will make the largest commercial decisions related to fuels need to be considered alongside port-centric activities and port-to-port collaboration.
4. **Give fuel availability and cost due consideration during the fuel choice process,** rather than allowing it to be an afterthought.

Green corridors—and the knowledge sector—need to explore innovative commercial arrangements

With frontrunning initiatives moving towards execution, and several fast followers hot on their heels, commercial arrangements and other aspects related to the “software” of the corridors come to the limelight. At advanced progress stages, business-as-usual structures and relationships are unlikely to suffice, and business model, commercial, and financial innovation are likely to be required.

“Companies need to step out of business-as-usual thinking, embrace a collaborative approach to time-limited risk sharing across the value chain, and adopt new operational models. We need bold bets on the future; absorbing some of the risks and costs now will help companies better position themselves for what’s to come.”

Johan Byskov, Program Manager at Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping, Chilean Green Corridors Network

Challenges for operationalisation of zero-emission shipping include aggregating demand for zero-emission freight and fuel, distributing the increased costs across the value chain, and bolstering the bankability of zero-emission assets. Emerging practices among the most advanced corridors offer a glimpse into potential commercial innovation opportunities within these challenge areas.

COMMERCIAL CHALLENGE AREA	COMMERCIAL INNOVATION OPPORTUNITIES
<p>CHARTERING/ CARGO</p>	<ul style="list-style-type: none"> » Aggregation and forward procurement of zero-emission freight services by cargo owners, e.g. through initiatives like ZEMBA » Employing cargo logistics optimisation and portfolios of smaller-scale contracts of affreightment to lower the threshold for commitment by charterers » Aligning Incoterms with willingness to pay
<p>VESSEL OWNERSHIP</p>	<ul style="list-style-type: none"> » Joint ventures between shipowners, charterers, and potentially cargo owners to share risks and rewards » Funds and leasing arrangements that leverage the creditworthiness of larger partners and public sector actors to accelerate deployment
<p>FUEL OFFTAKE</p>	<ul style="list-style-type: none"> » Joint fuel offtakes with land-based sectors and/or joint fuel procurement within shipping » Trading companies and governments kickstarting and widening fuel availability by serving as third-party fuel demand aggregators/buyers » Direct investment in fuel production or offtake structuring to stimulate the availability and secure access to fuels



While some of these arrangements represent significant deviations from the way shipping currently operates, they are also relatively common both in the broader innovation space and in shipping-specific contexts. For example, the sector's long history of establishing joint ventures represents an opportunity to learn from previous experiences. Other arrangements, while being novel, may grow in significance and even become the new normal over the coming years. For example, an upcoming shift from spot bunkering to fuel supply contracts was highlighted by the European Commission. Corridors offer companies an opportunity to gain early experience with structuring these arrangements.

Governments can trigger a race to the top among green corridors

Lengthy policy processes mean that decisions on the measures to support implementation must be taken relatively soon. Many options for government action exist that can contribute to closing the cost gap, such as economic support, competition exemptions, targeted climate regimes, government involvement in demand aggregation, and combinations thereof.

Regardless of the chosen portfolio of measures, both the research on driving early technological transitions and preliminary calculations on the corridors indicate that direct economic support may be required. However, uncertainties remain regarding the incentives for governments to contribute, the mandate to act on international shipping, the availability of funding, and the design of support. Given the large number of initiatives, governments will likely have to increase their capacity to support implementation on priority corridors.

With these challenges in mind, the following policy principles may be used to guide governments in providing effective but cost-efficient economic support:

1. Policy support **does not have to be corridor-specific**. Governments can initiate a race to the top among corridors through broader schemes, with several initiatives competing for funding.
2. Governments may **build on existing support schemes**, such as industrial decarbonisation policies for hard-to-abate sectors, shipping-specific policies and hydrogen policies.
3. **Technology specificity is key** to a successful policy intervention. General decarbonisation policy that encompasses several emission-reduction solutions is likely to be much less effective at incentivising green corridors than targeted support for zero-emission value chains.
4. **Balancing demand- and supply-side support** is central to ensuring the successful uptake of fuels within shipping. This can be done by introducing separate demand-side measures or encouraging shipping-specific uses in supply-side support.
5. **Gradually phasing out the support** with the rollout of the IMO mid-term measures increases the cost-efficiency of support.

6. **Splitting the support between the countries** collaborating on the corridor in line with their profiles and incentives is a good practice but requires coordination between the countries.
7. To **increase the political and fiscal feasibility**, consider aligning support with other strategic priorities within the country, introducing a local climate regime to fund the scheme, or redirecting funding from the existing fuel production-based schemes to shipping use.
8. Supporting green corridors requires **building the institutional capacity** within governments, fostering cross-ministerial dialogue across different parts of the government, and increasing the status of maritime as an integral part of several production systems.
9. In cases where economic support cannot be justified, **alternative policy measures** should be considered, such as direct fuel demand aggregation by governments.

Appropriate governance structures can accelerate progress

The complexity of governing corridors as cross-sectoral, multi-stakeholder initiatives continues to slow down progress within multiple areas.

Good corridor governance can be thought of as the ability to piece individual stakeholder activities together into a whole that is greater than the sum of its parts. In the initiation stage, these activities will define the corridor opportunity. In the planning stage, they generate the implementation plan. In execution, they are the practical actions needed to operationalise the route. The task for the initiatives is to find an effective way to do so that responds to their individual circumstances.

"Effective governance in green shipping corridors thrives on collaboration, where stakeholders seamlessly co-create pathways for the demand and supply of clean maritime fuels. Managing interests and reaching consensus becomes an art. However, by engaging with and learning from each other, stakeholders can find alignment, create a competitive advantage, and generate more value for society"

Dr Carlo Raucci, Programme Lead at the LR Maritime Decarbonisation Hub, The Silk Alliance

This is an area where learning by doing is key, as it is unlikely that there will be many one-size-fits-all solutions. Nonetheless, some best practices are emerging.

1. Have a **clear understanding of the purpose of the corridor** and of what you are trying to achieve from the start. Participation in the initiative should be predicated on sharing this vision; this is generally more important than breadth of representation.
2. **Build a core of critical stakeholders**, including vessel owners/operators, before announcing the corridor initiative to ensure a foundation for genuine action is in place.
3. Set target dates for the operation of zero-emission vessels that **focus on the period before 2030**. Such targets will be more valuable if they are outputs of planning, rather than pre-defined KPIs.
4. **Spend the time required for consistency of communication and co-creation**, to build consensus and commitment. Regular, open workshops between partners and participatory/stakeholder-led planning are among best practices.
5. While some actions and decisions require a whole green corridor initiative, many do not. To help manage complexity without sacrificing impact, corridors can **consider a multi-level governance approach**. This could include a strategic level, in which required actions are defined and advocacy takes place, and a working level made up of smaller groups that advance specific pieces of research and/or actions.
6. While standardised templates can provide a useful starting point for action, both **the scope and governance of the initiative should be tailored to the circumstances** and allowed to evolve as the initiative advances.
7. Discussions are needed to **identify whether there are neutral data brokers and frameworks** that can be leveraged to enable a freer exchange of information within and between the corridors.

Green corridors should strive to maximise co-benefits to contribute to an equitable global regime

Delivering a just and equitable transition is a complex and multifaceted challenge, and green corridors represent only one of the many potential mechanisms involved. Some aspects of a just transition are more effectively handled outside of green corridors, but several practices may help ensure that green corridors don't perpetuate existing inequalities and are instead part of the collective solution.

BROADER JUST TRANSITION CHALLENGE	GREEN CORRIDORS' POTENTIAL CONTRIBUTION
<p>How to build a bridge between the fragmented and localised early-stage transition and an equitable global regime?</p>	<p>Corridors are important generators of knowledge that can be replicated in multiple contexts. This won't happen automatically, and requires increased transparency among the initiatives, adequate platforms for knowledge exchange, and the existence of a diverse portfolio of initiatives, including high-feasibility corridors that are easier to replicate.</p>
<p>How to maximise positive impacts of decarbonisation on local communities and minimise potential negative effects?</p>	<p>Corridors should leverage ports' positions as core members of local communities, well placed to act as safeguards of local impact. Explore synergies with landside infrastructure buildout and the local economy.</p>
<p>How to avoid the negative impacts of decarbonisation on global workforce?</p>	<p>Corridors are well placed to become testing grounds, piloting education and training programmes for future fuels. They also have the potential to contribute tangible insights to developers of these programmes.</p>
<p>How to ensure equal access to finance for the transition?</p>	<p>Corridors between the Global North and South could provide a mandate and framework to support investment in zero-emission shipping in the South, serving as an additional channel for climate finance. This could take the form of bilateral funding for shared corridor assets, and commercial arrangements designed to leverage the greater creditworthiness and access to capital of Northern companies, among other things.</p>

GETTING
TO ZERO
COALITION



GLOBAL
MARITIME
FORUM

