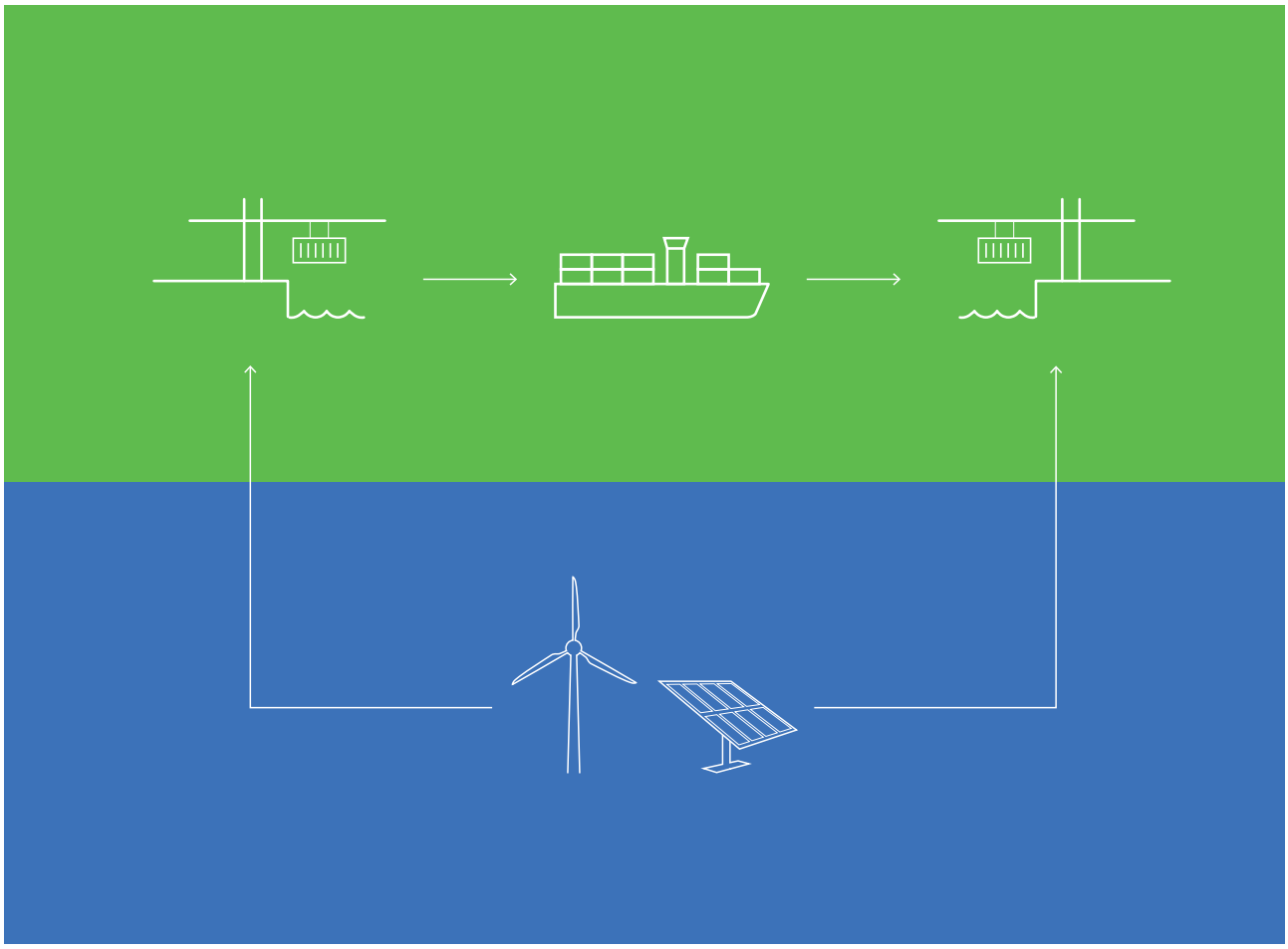
Nordic Roadmap

Future Fuels for Shipping

INSIGHT ON GREEN SHIPPING CORRIDORS

From policy ambitions to realization



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1 Introduction

To decarbonize shipping, the industry will need to rapidly develop ships using zero-emission fuels, as well as the needed infrastructure to operate these ships. This is a great challenge, and to achieve this, a wide range of policies and regulations, alongside research and development activities, have been initiated across the globe.

One such policy initiative is the Clydebank Declaration – where more than 20 countries have committed to develop at least six green shipping corridors between two (or more) ports by 2025 and "many more" by 2030 (chapter 2). Such green shipping corridors could become key enablers to accelerate the uptake of zero-emission fuels, and already several plans to develop such corridors have been announced.

In this paper, we explain the fundamentals of how green corridors can effectively contribute to the uptake of zero-emission fuels, and thus the decarbonization of shipping (chapter 3). We also provide an overview of ongoing green corridor initiatives – and show that although the green corridor label is new – several examples of the green corridor concept have already been implemented (chapter 4).

Finally, we draw on lessons learned from many years of experience working with stakeholders to establish green corridors in Norway and beyond – several of which have been realized – to provide practical guidance for how to realize new green shipping corridors (chapter 5 and 6).

In short, we hope to contribute to accelerate developments, moving from policy ambitions and announcements to real-world realization of green shipping corridors.

2 What is a green shipping corridor?

There exist several definitions[1] of green shipping corridors. In this chapter, we look at the Clydebank Declaration, which defines green shipping corridors simply as "zero-emission maritime routes between two (or more) ports"[2].

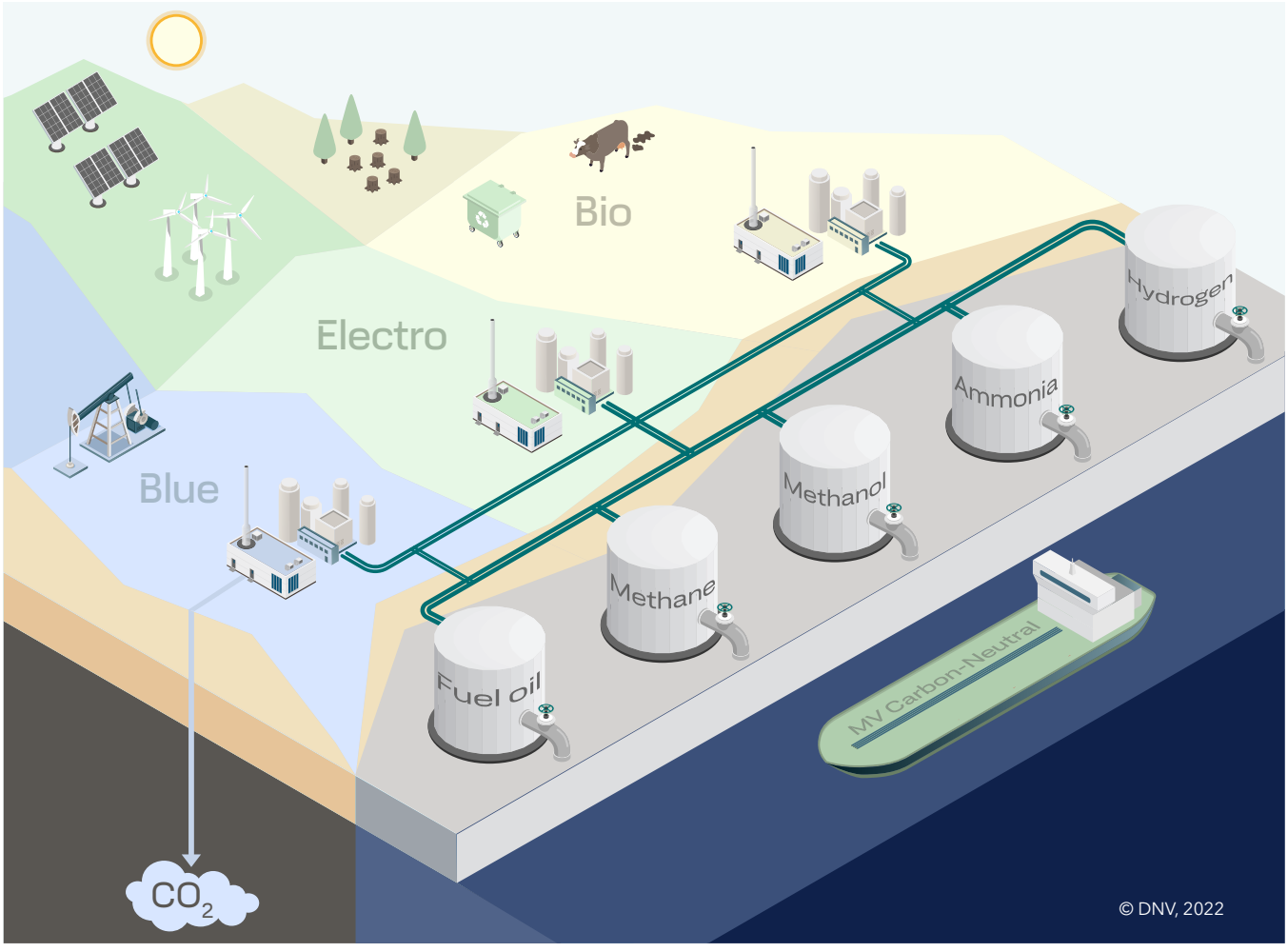

Figure 1: *The future carbon-neutral energy supply chain. Categorization of carbon-neutral "fuel family" types, based on primary energy source; Biofuels (from sustainable biomass sources), electrofuels (from renewable electricity, and nitrogen or non-fossil carbon), and 'blue' fuels (from reformed natural gas with CCS)[5].*

The signatories of the Clydebank Declaration pledges to develop a number of such corridors, signifying a strong political will to help accelerate the decarbonization of shipping through this concept.

The declaration states that fully decarbonized fuels or propulsion technologies should not lead to additional greenhouse gas (GHG) emissions to the global system through their lifecycle. We stick to the terminology used by the Clydebank Declaration, and use the term *zero-emission* in this paper with the understanding that this means any carbon-neutral[3] fuel that can be used in a green shipping corridor, such as carbon-neutral methanol, methane, diesel, ammonia and hydrogen (see Figure 1), as well as battery-electric propulsion.

For clarity, the Clydebank Declaration recognizes that not all vessels transiting a green shipping corridor would be required to be zero-emission vessels, or to participate in the corridor partnerships.

The interpretation of a shipping corridor in this context, is a specific route between two or more ports. A green shipping corridor is a port-to-port route where the use of zero-emission fuels is realized by assigned zero-emission ships **at an earlier stage** than what would be required by only regulations and already established incentives.

A simplified sketch of the green shipping corridor value chain is shown in Figure 2. The system involves a large number of actors such as cargo owners and charterers, ports, ship owners and operators, energy suppliers, financial institutions, authorities, and others that need to cooperate in a green shipping corridor ecosystem. It is important to note that the Clydebank Declaration only covers the port-to-port element of the logistic value chain.

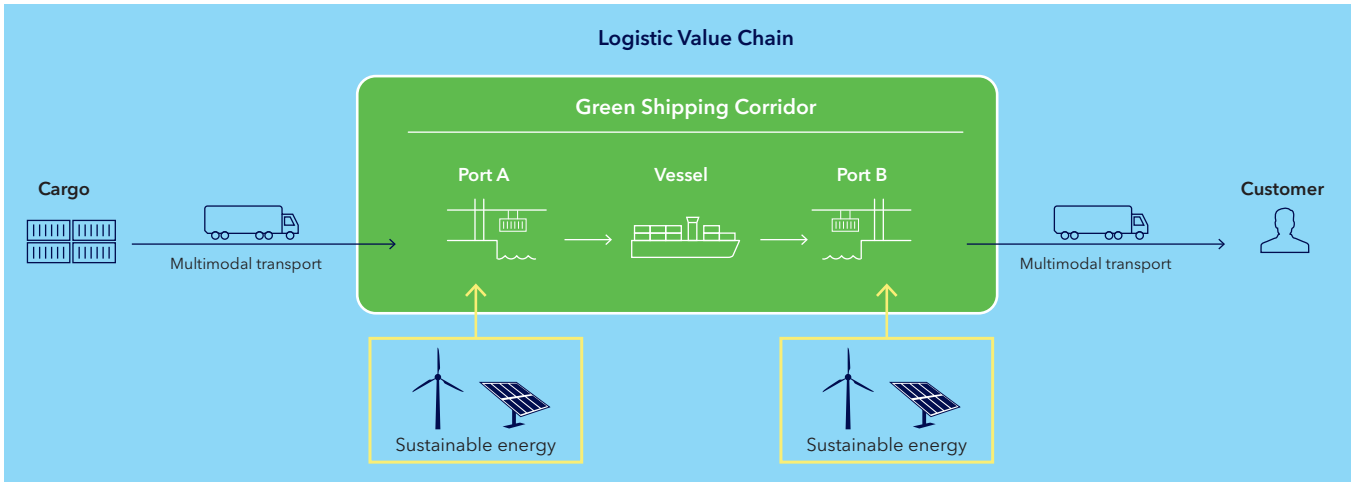

Figure 2: *Illustration of a simplified logistic value chain (blue box), highlighting a green shipping corridor from port-to-port (green box). Supply of sustainable energy is a prerequisite for green shipping corridors (Source: DNV, 2022).*

3 Why green shipping corridors?

To achieve the 2030 GHG targets set by the International Maritime Organization (IMO)[4] and be able to accelerate further to reach the 2050 targets, some 5% of fuel[5] for the world fleet will have to be carbon neutral by 2030." Rapid scaling of this fuel uptake is needed, and, in this endeavor, green shipping corridors can play an important role.

While more than 200 zero-emission demonstration projects for the maritime industry exists across the globe[6], the uptake of zero-emission fuels in the world fleet is still very low[5].

Shipowners have always gravitated towards solutions that are cheaper, more reliable, more efficient and needing less space onboard. The challenge for decarbonization of shipping is that zero-emission fuels are typically more expensive, less mature, less efficient and require more space onboard. They also pose new safety challenges and introduce significant supply-side problems.

The reason green shipping corridors can become key enablers to accelerate the uptake of zero-emission fuels, is that they allow for the multitude of barriers hindering the global uptake of zero-emission fuels (such as risk, costs and supply) to be addressed and resolved on a **manageable scale**. With an initial focus on a selected green corridor, the technical, practical, organizational, legal, political, and financial barriers can be identified and overcome by engaging and involving the relevant stakeholders linked to a specific corridor, rather than tackling the issues on a currently unmanageable global scale.

An early identifier of global supply challenges
Succeeding with a set of green corridors may be an important direct contribution to the decarbonization of shipping– especially if the corridor is heavily trafficked and CO_2-intensive. However, **the most important outcome** of realizing green corridors will be indirect – through allowing for learning on critical issues, which can be generalized and applied on a regional and global scale leading to scaling though a multitude of mechanisms generally described as diffusion (see Figure 3).

The concept of scaling via diffusion[7] can help explain the global proliferation of LNG-powered vessels[8]: It started with initial routes or ports by building on the national interests of one country, expanding into developments in a wider region, followed by other regions, before finally scaling to a global arena with intercontinental routes. Thus, there was a gradual process to overcome barriers, including developing fuel supply, demand, and bunkering facilities, procedures for the handling, transport, and usage of new marine fuels, the need to de-risk the choices of first movers, including financial incentives such as the NOx-fund[9], and technology cost reductions through learning. Battery electric propulsion started on a similar journey, pioneered by Ampere in 2015, followed by the Norwegian ferry sector.

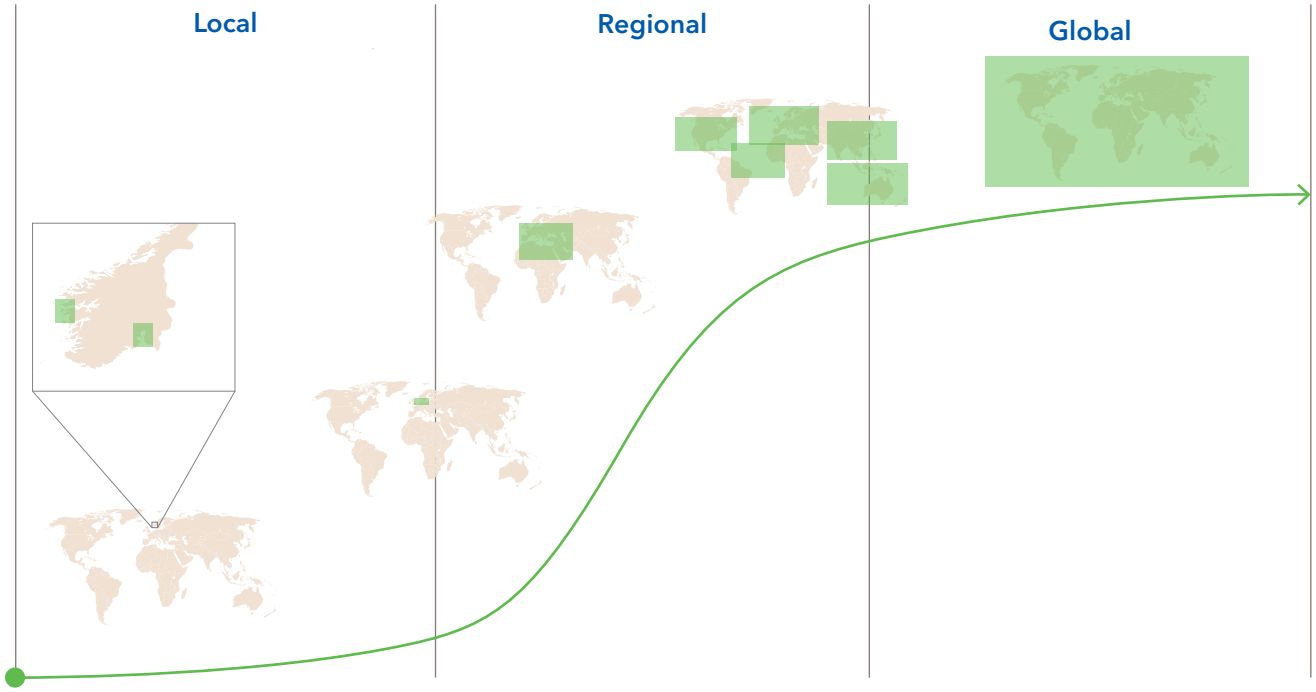

Figure 3: *Illustration of a green corridor initiating diffusion to other countries and potentially globally. Scaling via diffusion will start with initial routes or ports by building on the national interests of one country, expanding into developments in wider region, followed by other regions, before finally scaling to a global arena with intercontinental routes. In the map, two existing corridors are indicated, Lavik-Oppedal and Moss-Horten in Norway (source: DNV 2022).*

While these examples illustrate the principle of scaling through diffusion and gradual development, the key issue is that for zero-emission fuels **the pace needs to increase**. It took 20 years for LNG to become a global fuel with 323 ships in operation (excluding LNG carriers)[5,10]. For electric ships it has taken 7 years to reach 60-70 battery electric ferries[11,12,13] in Norway and they are not a global phenomenon yet. We need to significantly accelerate the availability of zero-emission fuels and drastically decrease the timeline for development to reach the 2030 targets, as well as the 2050 targets set by IMO.

In this perspective, we expect green corridors to work as an effective tool to significantly accelerate the rate of diffusion for zero-emission fuels. Every green corridor being realized, will potentially contribute to crucial development steps along several different axes. Examples include increased fuel production and infrastructure development, increase in technology maturity levels and cost reductions, accelerated development of rules and regulations, new supporting policies, growing market demand for green shipping services, request for green contracts, and many more.

Naturally, green corridors alone will not decarbonize shipping. There is a need for regulations in order to signal that beyond the initial piloting there will be a demand for zero-emission shipping. Beyond initiatives like the Clydebank Declaration, several maritime regulation proposals aim to increase the use of zero-emission fuels, e.g. through setting well-to-wake GHG intensity requirements. An EU proposal[14] to this end may be finally adopted later in 2022 or 2023 and take effect from 2025, while a similar IMO proposal will take further time to finalize and may enter into force after 2026[5]. Another significant policy option under discussion is to introduce a price on GHG emissions. There are also other policies under development from both EU and IMO, as explained in DNV's Maritime Forecast[5] Chapter 2, that will impact the uptake of zero-emission fuels.

4 What is the status on green shipping corridors?

Green shipping corridors do already exist. As recently stated by the Norwegian newspaper Adresseavisen; “Ferry and HSLC operator Norled, was the first to establish a short version of Green Corridors when they started operating the battery-powered ferry Ampere in February 2015. The ferry is still trafficking Lavik-Oppedal in Sognefjorden, charging the batteries at each stop.”

Digitalization is an important aspect of designing, operating, optimising, and standardizing green shipping corridors. In a digital green shipping corridor or network, better integration and communication between ships, shore offices and ports will enable standardization, improved planning, scheduling and logistics, improved information integrity and transparency, further increasing fleet utilization and performance, and deliver energy and cost savings[34, 35, 36]

After this, 60-70 more battery ferries have started operating along the Norwegian coast, and more than 20 are confirmed to be in operation within a few years.

The Norwegian ferry network's early uptake of zero-emission energy is a success not only because of zero emission requirements set by the Norwegian Road Administration and the county administrations in their public tenders for ferry routes, based on requests from the Parliament. It was also highly dependent on forward-looking and risk-accepting ship operators and technology suppliers, as well as substantial funding of CAPEX on ferries and charging infrastructure from the NOx fund[9] and ENOVA[15]. Also, early cross-sectoral collaboration and understanding of opportunities and barriers was an important success criterion for the establishment of zero-emission ferry routes in Norway[16].

Each of these ferry connections is an example of a green shipping corridor. In common, they illustrate that the public sector can play an important role in the enabling and phase-in period for uptake of new low-emission technologies in shipping[17]. Fully electric ferries and passenger ships have since then started to operate on routes also in other parts of the world.

Cargo owners establishing green shipping corridors
There are also examples of commercial cargo owners establishing green shipping corridors. ASKO, a grocery supplier, drives a project between Horten and Moss in Norway, where two autonomous electric vessels transport cargo across Oslofjorden[18]. Yara Birkeland is another similar project, where an electric and autonomous-ready container vessel sails from Porsgrunn to Brevik[19], initiated by fertilizer producer Yara. HeidelbergCement and agricultural cooperative Felleskjøpet AGRI have established a joint effort requesting a zero-emission cargo ship. The companies are applauded for using their role as cargo owners to initiate the development of several different zero-emission solutions for larger ships with longer sailing distances[20].

The examples of ASKO, Yara and HeidelbergCement/Felleskjøpet show the extra effort, high costs and time demanding processes a cargo owner must overcome today to realize a green shipping corridor, even with public financial support. All three project examples have started as pilot studies in the Green Shipping Programme[46], which is managed and facilitated by DNV, highlighting **collaboration across sectors as a key element for realization** (see also chapter 5.2).

Announcements of international green shipping corridors
A handful of international green shipping corridors have been announced via various press releases and are in the early planning phase. This includes the route from Port of Los Angeles to Shanghai in China (January 2022)[21], the European Green Corridors Network (March 2022)[22], the Chilean Green Corridors Network (April 2022)[23] and the Iron Ore Green Corridor between Australia and East Asia[24]. The three latter corridors have no given route specified.

The UK Shore R&D programme also announced a British green corridor (May 2022)[25], while the International Transport Forum has investigated green corridors from the port of Hamburg (June 2021)[26]. The European green corridors network is formed by port authorities of Gdynia, Hamburg, Rønne, Rotterdam, and Tallinn in Northern Europe and the Baltic Sea[27]. RMC, Viking Line, Åbo Akademi and Kempower have also announced a carbon-neutral sea route between Stockholm and Turku funded by Business Finland (September 2022)[28].

As a part of the European Green Corridors Network, Göteborg and Rotterdam recently signed a Memorandum of Understanding (MoU) to develop a green shipping corridor between the two ports[29]. The port of Rotterdam has also signed a MoU with the port of Singapore, as the port authorities of the two largest bunker ports in the world, claiming to establish world's longest green corridor for shipping[30], with the first sustainable vessels sailing on the route by 2027.

The cruise industry has established initiatives for decarbonization, and several ports and cruise companies support the world's first cruise-led 'green corridor'[31]. This initiative involves "the first mover commitment" by ports ranging from Seattle and Vancouver to Juneau, Alaska[32].

Under COP27, as part of the US and Norway led Green Shipping Challenge[33], several further green corridor initiatives were announced. Undoubtedly, more green shipping corridors will be announced in the coming months and years.

5 How to move forward with green shipping corridors?

The Clydebank Declaration clearly demonstrates the political ambitions to establish green corridors – and the many announced initiatives and plans similarly demonstrates the eagerness of industry actors to follow up on these ambitions. However, it remains a great challenge to move from plans and ambitions to the realization of green shipping corridors. In order to do so, we must understand the barriers we face – and identify solutions to overcome them.

From a global perspective, the uptake of zero-emission fuels faces several barriers and challenges. Among them is low energy density and capital-intensive installations, both onboard and onshore, with differing grades of technical maturity. Onshore, there is a lack of production capacity and infrastructure for zero-emission fuels, in addition to challenges linked to feedstock availability. Also – the cost of zero-emission fuels is prohibitively high, which is also linked to the high energy input compared to output in the production process of many zero emission fuels. The introduction of new marine fuels also brings new safety challenges originating from the physical properties of each fuel (e.g., the toxicity of methanol and ammonia, and the extreme flammability of hydrogen). In general, there is a lack of demand for green transport and uncertainties related to future fuel prices and the availability of zero-emission fuels.

In the perspective of a single green corridor, many of the same barriers present from a global perspective persist. For many of these, the barrier level will depend on corridor-specific attributes, including the sailing distance and energy demand of the corridor (fuel feasibility); the number of ports and their location and surroundings (safety zones, supply of fuel, etc.); the number of jurisdictions involved and their willingness and ability to support development (regulations, supporting policies, etc.); the type of ships operating on the corridor (fuel feasibility, regularity, etc.); the nature of the traffic on the corridor (e.g. liner shipping vs. tram shipping), and the composition and maturity of the actor ecosystem (private and public).

By focusing on individual green corridors, mitigation of the practical-, organizational-, legal-, political-, and financial barriers as well as technical issues can be overcome by placing the initial focus on tailormade commercial cases. In all cases, the barriers need to be identified and resolved by the various stakeholder, defining necessary actions for realizing the green shipping corridor. This requires timely identification of key stakeholders and barriers, and the subsequent establishment of common commitment, understanding, solutions, and agreements through collaboration and risk sharing

While it is beyond the scope of this paper to present a comprehensive overview of barriers, we identify two key barriers which - based on years of experience and knowledge from working with establishing green corridors in Norway - we expect will be decisive in most corridors. These key barriers are the **fuel cost gap** and the **need for coordinated action among stakeholders.** In the following we elaborate on these, and the solutions we see to overcome them.

5.1 Closing the cost gap

A fully decarbonized corridor can be achieved by several fuel technology pathways, impacting overall cost picture differently. For any zero-emission fuel, a key barrier to realizing initial green corridors towards 2025 is the **competitiveness gap** that exists between fossil fuels and zero-emission fuels. The maritime fuel costs make up 20-35% of annual total cost of ownership[37]. The price of zero-emission fuels can be more than 3 times the price of conventional fuels in 2030, as shown in Figure 4. Such increase in marine fuel prices will have significant impact on the short-term economic performance and could possibly increase the total cost of ownership (TOC) with 40-100% depending on ship type and fuel choice[37].

Actions to close the cost gap

Critical for the realization of green shipping corridors will be to find ways to share risks and close the significant cost gap (indicated in Figure 5). EU's proposal to include shipping into its ETS and IMO's work on market-based instruments, are policy measures already underway for decreasing the cost gap. However, this is not expected to be sufficient to create price parity with conventional fuel within this decade, as illustrated in Figure 5. For example, the current EU ETS allowance price of 80 USD/tonne CO_2[39] is equivalent to about 6 USD/GJ additional cost of fossil VLSFO. Therefore, other cost- and risk-sharing mechanisms such as procurement policies, green financing, and Contracts for Difference (CfD)[40] will be required to support the first movers developing green shipping corridors.

A recent study carried by Oxford University has analyzed the feasibility of applying CfD as a policy instrument to the decarbonization of shipping, which has previous shown success in driving down the costs of renewable technologies in the electricity sector in the UK. Three types of CfD mechanisms[40 i]) for international shipping was investigated, and "fuel only CfD"[40 ii]) was the preferred option based on interviews with almost forty stakeholders from the shipping industry.

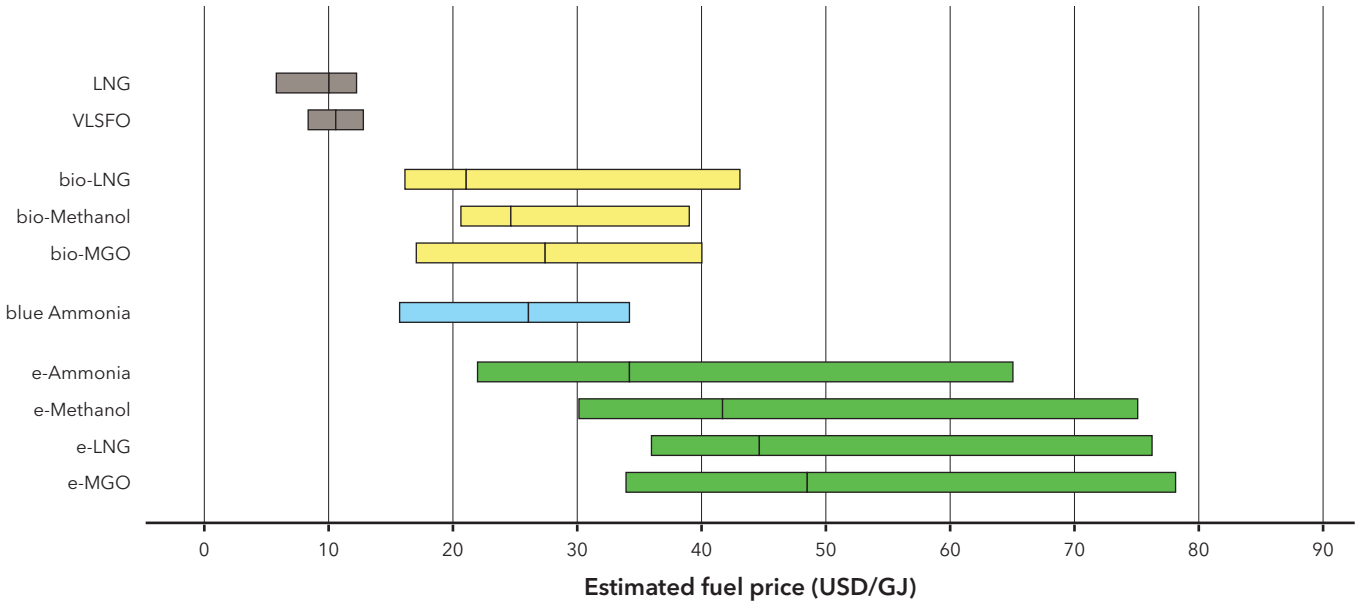

Figure 4: *Estimated fuel price range in 2030 for selected bio-, blue - and electrofuels, based on DNV Fuel Price Mapper[38].*

Figure 5 illustrates how a CfD can close the fuel price gap between zero emission fuels and fossil fuels in the short term, until the emerging fuels becomes competitive[40]. On longer term the price gap can be driven down by technology learnings and scaling effects, as well as regulations increasing the GHG emissions prices and other incentives. However, some intermediate measure such as a CfD is needed in a transitional period to realize green corridors. In Figure 5 we focus on the fuel price gap, however, we recognize that there might be other CfD programmes accounting for additional cost elements. Such programmes should also be explored to close the cost gap.

The key question is how to design the financial support of CfD programmes, where various fuel types and green shipping corridor designs will require customized packages of public-private support. Learnings from the NOx fund[9] perspectives (even if today focusing on CAPEX financial support), could be used as a basis for CfD designs, with purpose of reinvesting payment from the shipping industry into an accelerated uptake of zero-emission fuels.

Fund from the EU ETS, e.g., from the proposed Ocean Fund[43], could be reinvested through CfDs and be an inspiration for other regions and IMO[41]. Possible EU CfD schemes on long-distance international routes, as well as some regional routes, can be administered and funded by both the EU and member states. For international routes, CfDs could be administered and funded at the country level with a partnership formed between two or more counties, or potentially by the ports.

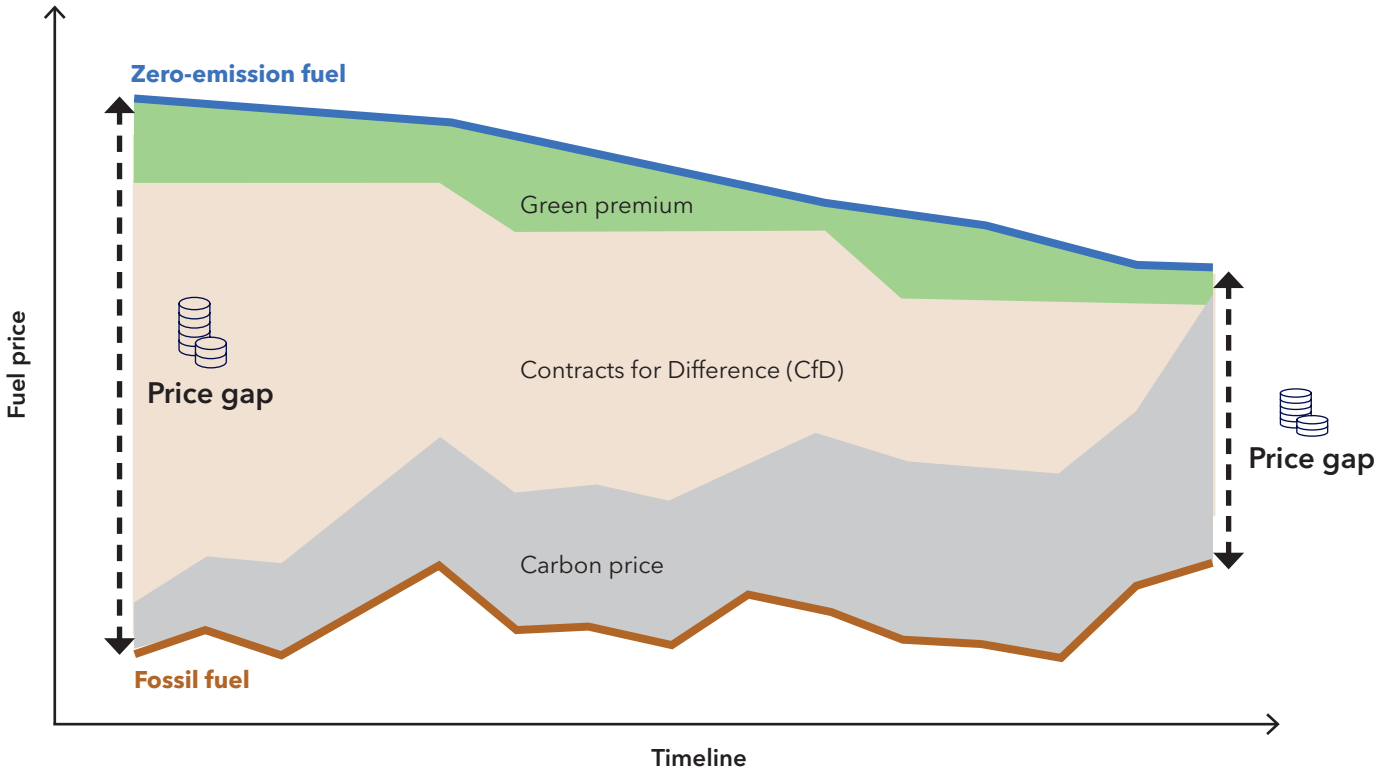

Figure 5: *Indication on how to close the price gap between zero-emission (carbon-neutral) and fossil fuel (inspired by Getting to Zero Coalition, May 2022[41]). Without carbon price and CfD, the whole price gap will be green premium[42].*

5.2 Enabling coordinated action between stakeholders

Stakeholders in a green shipping corridor ecosystem need a business case – a "reason" to participate. Hence, understanding the business case for each actor, and establish a good cross-sectoral team built on trust, is paramount for realization.

The stakeholders required for successfully establishing green shipping corridors include ports and fuel suppliers, ship owners, cargo owners, national governments, financial institutions and industry associations. Their perspectives will differ, and for any potential green corridor, the following key issues are among those which will likely have to be addressed:

- **Port perspective** – What is the market outlook, and the business case for supplying new fuels on my docks? Will my investment in infrastructure be profitable? Is the safety zone sufficient? What regulatory barriers are there? What policy incentives?
- **Fuel supplier perspective** – What is the market outlook, and the business case for producing and distributing new fuels? What is the feedstock availability? Can this corridor support the needed investments? Does the corridor provide a stepstone to a wider market?
- **Regulator perspective** – How can this corridor be implemented safely, onshore and onboard? Can financial support be justified? How can we be sufficiently predictable in our regulation of this new field?
- **Cargo owner perspective** – What will be the unit cost for transporting my cargo? What is my risk exposure? Does paying for green transportation make sense in my overall strategy?
- **Finance perspective** – What is the Return on investments in green fuels or green ships or new infrastructure? What is my risk exposure?
- **Shipowner perspective** – What is the technical and economic feasibility of the potential fuels and technologies to be applied? Can my investment in this be justified?

Importantly, these issues are interconnected – and resolving them in a green shipping corridor requires the whole value chain to act, jointly and concurrently, as the individual stakeholders will not be able to resolve these issues on their own. This is illustrated in Figure 6, which shows the stakeholders in a green corridor as bulbs on an electric series circuit. In such a system, breaking the circuit at any point, will cut the current through all components, and the lights go out for all the bulbs. In the green corridor value chain - if one of the stakeholders fail to overcome their barriers and produce a sound business-case, the business cases for all the stakeholders will fail, and the green shipping corridor will not be established.

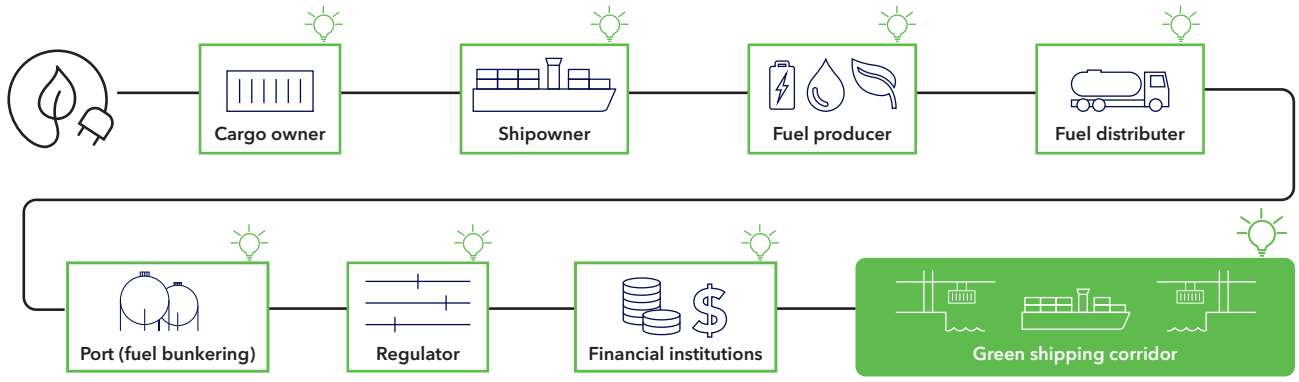

Figure 6: *Simplified illustration of interconnections between selected stakeholders in a green shipping corridor ecosystem. Similarly, to a series circuit are all stakeholders connected end-to-end, forming a single path for current flow. Breaking the circuit at any point, will thus cut the current through all components, and we will not obtain a green shipping corridor.*

Collaboration as a measure to coordinate actions
The core of the green shipping corridor concept is establishing the required level of understanding and upfront agreement among the stakeholders for a specific transport system, such that the cost and risk level associated with using zero-emission fuels becomes acceptable. Simply put, **the actors need to find agreement on several "what happens if…" scenarios**. A key success factor for this to happen is collaboration between the involved stakeholders.

Innovative ways of collaboration to establish green business cases have been pioneered by Green Shipping Programme in Norway – a public-private partnership program – with stakeholders from the whole shipping value chain. Partnering companies collaborate on concrete manageable topics, identifying barriers, and together try to solve them (see chapter 6). Based on experience in this program, we here point at four important pillars for effective cross-sectoral collaboration:

i. **Involvement** – involve and engage all stakeholders in the green shipping corridor ecosystem and decisions makers high up in the organizations – close to where the investment decisions are made, including CEO and board level.

ii. **Sharing knowledge and experience** – a multidisciplinary focus, building common understanding and knowledge of the specific transport system, identifying and resolving barriers for future business cases.

iii. **Transparency and openness** – building trust between the green shipping corridor stakeholders – barriers often appear between the stakeholders.

iv. **Coordinator** – need for a dedicated and independent person/organization ensuring proper collaboration, keep track on the development and help on solving challenges.

We recognize that there will be no recipe that fits all, as there will be local variations and differences, therefore, the pillars presented above must be tailormade and adapted to each specific case. We believe that these four pillars for collaboration is important for maturing technology and stakeholders and accelerate the uptake of zero-emission fuels.

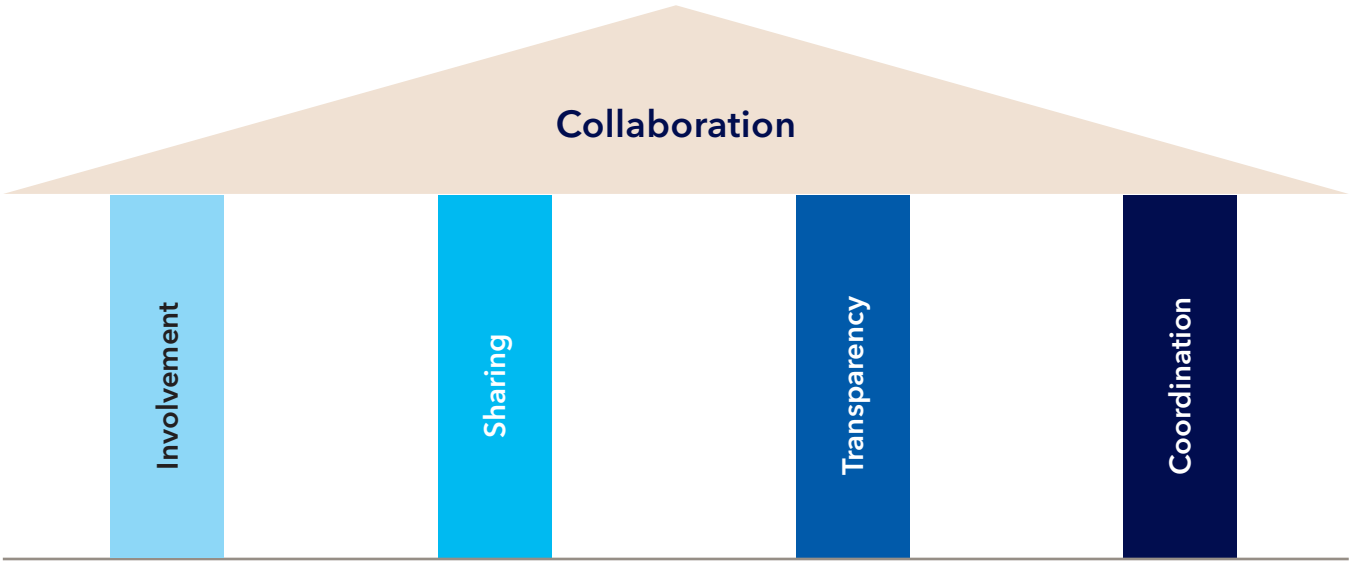

Figure 7: *Four pillars for effective collaboration.*

6 Projects facilitating collaboration in the nordic

In this chapter, we present the Nordic Roadmap and the Green Shipping Programme – two important examples of innovative collaboration projects to be aware of for accelerating a green fuel transition.

Green shipping corridors requires the whole value chain to act, and cross-value chain collaboration is stated as a key building block[44]. In the zero-emission project mapping performed by the Getting to Zero Coalition[6], almost all projects involved multiple stakeholders but only 20 percent of the 203 mapped projects involved at least four value chain categories. The mapping study states that there is a lack of projects involving the demand side of the industry (e.g., customer, cargo owner, charterer). The mapping shows that it seems to be a need for strengthen the involvement of all relevant stakeholders, such as the Nordic Roadmap and the Green Shipping Programme.

The Nordic Roadmap project

The Nordic Roadmap[45] is striving for the introduction of sustainable zero-emission fuels. The project is funded by the Nordic Council of Ministers with strong regional support from all the Nordic countries. The Nordic Roadmap project is centered around the establishment of a Nordic Cooperation platform to facilitate knowledge sharing, alongside the launch of pilot projects and studies that will build experience in new fuels, to establish "green corridors" and the enabling infrastructure.

Linked to the Nordic roadmap project is the Nordic pilot project for the establishment of zero-emission routes/green shipping corridors. The project will identify relevant and interested actors that can enter partnerships for specific projects for decarbonization of the identified routes.

For more information, visit:
https://futurefuelsnordic.com/

The Green Shipping Programme

The Green Shipping Programme (GSP)[46] is a public-private partnership with the vision to develop and strengthen Norway's goal of establishing the world's most efficient and environmentally friendly shipping and is currently counting more than 100 partners. The partners cover all parts of the maritime ecosystem – from yards, shipowners, technology providers, to cargo owners, service providers, finance institutions, and public entities including ministries, the Norwegian Maritime Administration, and public funding agencies. Through studies and pilot projects facilitated by DNV, Green Shipping Programme is helping the industry to identify and develop zero- and low-emission solutions that rapidly can be put into practice. To date, 44 pilots have been initiated, and 15 have been realised. Figure 8 illustrates the ongoing Green Shipping Programme pilot projects related to green shipping corridors.

For more information, visit:
https://greenshippingprogramme.com/

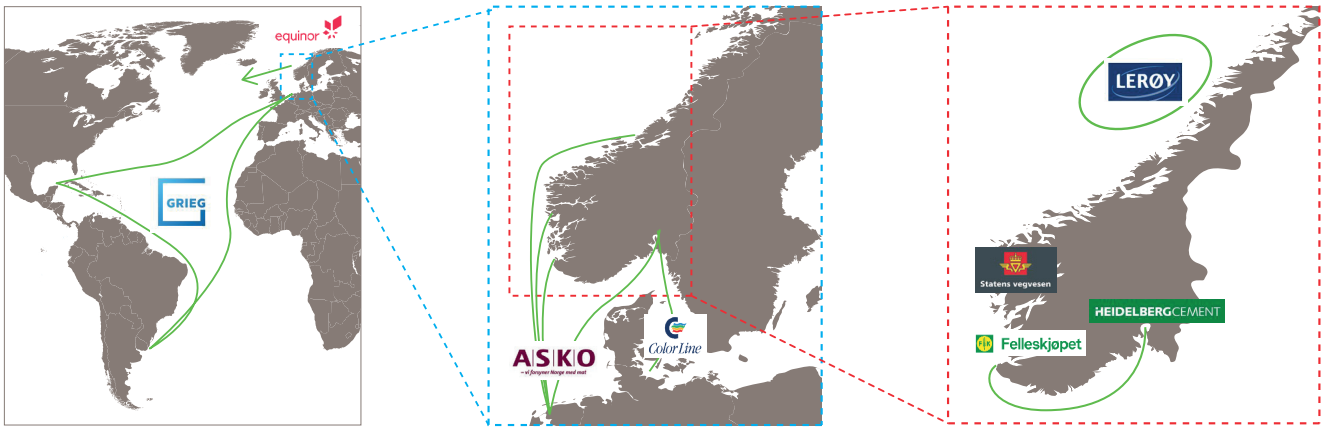

Figure 8: *Illustration of the ongoing Green Shipping Programme pilot projects related to green shipping corridors.*

7 Summing up

This paper explains the fundamentals of green shipping corridors as key enablers to decarbonize shipping and how they can be established in practical terms. Key takeaways can be summarized as follow:

- The uptake of zero-emission fuels in shipping is still very low and faces several barriers, including high costs, low technical maturity, lack of fuel supply and bunkering availability.
- A green shipping corridor is a port-to-port route where the use of zero-emission fuels is realized by assigned zero-emission ships at an earlier stage than what would be required by only regulations and already established incentives. Green shipping corridors already exist, and many more are announced to come in various regions.
- The reason green shipping corridors can become key enablers to accelerate the uptake of zero-emission fuels, is that they allow for the multitude of barriers hindering the global uptake of zero-emission fuels to be addressed and resolved on a manageable scale.
- The most important outcome of realizing green corridors will be indirect – through allowing for learning on critical issues, which can be generalized and applied on a regional and global scale leading to scaling though a multitude of mechanisms generally described as diffusion.
- In order to move from policy ambitions to realization of green shipping corridors, stakeholders participating in a green shipping corridor ecosystem need a business case – a "reason" to participate.
- The barriers related to the green corridor business case for the different stakeholders is interconnected. If one of the stakeholders fail to overcome their barriers and produce a sound business-case, the business cases for all the stakeholders will fail, and the green shipping corridor will not be established.
- The core of the green shipping corridor concept, as we sees it, is establishing the required level of understanding and agreement among the stakeholders for a specific transport system, such that the cost and risk level associated with using zero-emission fuels becomes acceptable. This will require innovative ways of collaboration.
- The Nordic Roadmap and the Green Shipping Programme are two examples of innovative collaboration projects to be aware of for accelerating a green fuel transition.

1 Green Corridors: Definitions and Approaches. A Discussion paper from the Global Maritime Forum (2022), Discussion-paper_Green-Corridors-Definitions-and-Approaches.pdf (globalmaritimeforum.org).

Other various definitions of green shipping corridors:

i) In *The Next Wave: Green Corridors - A Special report for the Getting to Zero Coalition (2021)* green corridors are referred to as "specific trade routes between major port hubs where zero-emission solutions have been demonstrated and are supported" and more specific "a shipping route between two major port hubs (including intermediary stopovers) on which the technological, economic, and regulatory feasibility of zero-emissions ships is accelerated by public and private action." The-Next-Wave-Green-Corridors.pdf (globalmaritimeforum.org)

ii) The U.S. Government have published a framework on green shipping corridors and refers to them as "maritime routes that showcase low- and zero-emission lifecycle fuels and technologies with the ambition to achieve zero greenhouse gas emissions across all aspects of the corridor in support of sector-wide decarbonization no later than 2050." Green Shipping Corridors Framework - United States Department of State

iii) The Economic and Social Commission for Asia and the Pacific (ESCAP) refers to green shipping corridor as "facilitating early and rapid adoption of fuels and technologies that, on a lifecycle basis, deliver low and zero emission across the maritime sector, placing the sector on a path to full decarbonization." https://www.unescap.org/sites/default/d8files/event-documents/10_ESCAP_SYK_GreenShippingCorridors.pdf

iv) The American Bureau of Shipping (ABS) defines green shipping corridors as "the geographical connection between two locations (could be specific maritime routes or it could be multiple ports between two regions) and the enabling environment that helps reduce emissions."
Green Shipping Corridors: Leveraging Synergies (eagle.org)

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Nordic Roadmap

Future Fuels for Shipping

For more information:
https://futurefuelsnordic.com/