



REPORT

Green Corridors in Developing Countries

Scouting for Opportunities



Foreword

Why focus on green corridors in developing countries? This question goes to the heart of both the challenges and the opportunities facing the decarbonization of the global maritime sector.

Global challenges require global solutions. The transition to green shipping must be global in scope and equitable in its implementation, leaving no country behind. Many developing countries possess great potential for producing renewable energy and green fuels for the shipping sector, which in turn can create economic and social benefits. At the same time, developing countries face specific challenges, including limited access to financing, technological barriers, and capacity building needs, as recognized in the 2023 IMO GHG Strategy. Strong partnerships, knowledge sharing and international collaboration can help address these challenges and support realizing the potential.

In an initiative to enhance an inclusive green transition in shipping, Denmark entered into a partnership with the Fonden Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping as part of the Green Shipping Challenge at COP28 with the presence of the Danish Prime Minister, Mette Frederiksen. The initiative aimed at exploring the potential for establishing green shipping corridors in a number of developing countries. By aligning the entire value chain behind a concrete showcasing of green shipping, green corridors can enable progress while building confidence and momentum for broader transformation across the energy and shipping sectors. This may in turn lead to green jobs in the energy sector, at ports and as seafarers on dual-fuel vessels. The learnings from the partnership you are sitting with in your hands.

The initiative is part of Denmark's broader commitment to an inclusive green shipping transition. The Danish Maritime Authority engages in Strategic Sector Cooperation with maritime authorities in various developing and middle-income countries. Denmark also contributes to IMO programmes targeting capacity building and technical cooperation to strengthen developing countries' opportunities to engage in the green transition of shipping. The latter includes assistance to developing maritime National Action Plans through the IMO GreenVoyage2050. By feeding into and creating synergies with these other efforts, the work on green corridors has provided value outside of its own realm.

Global efforts to achieve a just and equitable transition to net-zero GHG emissions from international shipping are essential to succeed. This report and the work that it builds on is a testament of that.

Happy reading.

Jakob Haugaard
Director at Danish Maritime Authority

April 2026

The findings in this paper are supported by interviews with stakeholders related to the projects described in this report:



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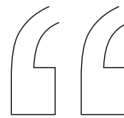
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Working with the green shipping corridor team from the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping was an opportunity for the maritime administration to coordinate with different stakeholders from the fuel sector, the cargo sector, ports, and various agencies. This collaboration helped in ensuring that Ghana has a consolidated front as a nation towards enabling green shipping activities through the concept of green shipping corridors."

Numbu Issahaque Sumabe, Ghana Maritime Authority

Following the formal initiation of green corridors with Clydebank Declaration in 2021 (COP26), all of the first green corridor projects were related to the Global North. In Autumn 2023, the Danish Ministry of Foreign Affairs and the Danish Maritime Authority partnered with the Fonden Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZS) to assess how the green corridor concept, could enable collaborative discussions and plans for decarbonization in developing countries. In advance of this collaboration, the Center had developed a thorough methodology and had carried out several green corridor projects, amongst others in Chile. This paper builds on the collaboration, which conducted green corridor pre-feasibility studies in Fiji, Ghana, Namibia, Panama and the Philippines. The findings from this work is supported by stakeholder interviews from the relevant countries.

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1 Introduction

The maritime industry is the backbone of global trade, moving over 80% of all goods traded worldwide¹. At the same time, it accounts for about 3% of all global greenhouse gas emissions².

To contribute to its share in achieving global climate goals, the shipping industry must decarbonise and replace fossil-based fuels with Zero and Near-Zero emission (ZNZ) fuels such as e-methanol, e-ammonia, biofuels and the use of renewable electricity for propulsion. In this paper green corridors are presented as a central lever to scaling the adoption of the use of such ZNZ fuels. This potential was recognized at COP26 in Glasgow, where 22 governments signed the Clydebank Declaration, declaring their commitment to support and incentivize the establishment of green corridors³.

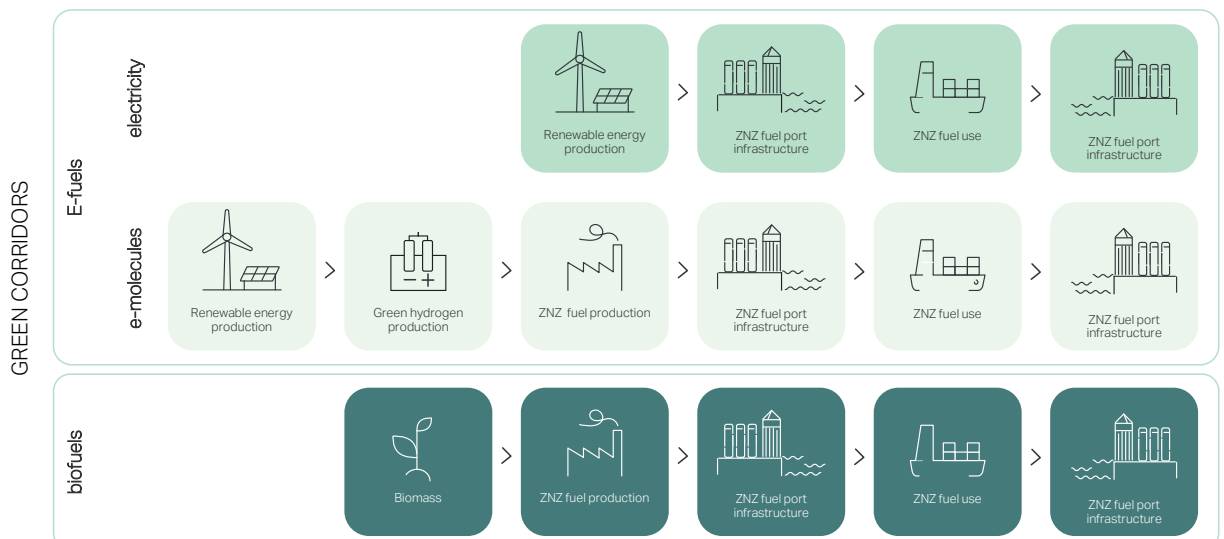
To strengthen the development of green corridors in developing countries, the Danish Ministry of Foreign Affairs, the Danish Maritime Authority and the Fonden Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS) decided to carry out green corridor pre-feasibility studies in Fiji, Ghana, Namibia, Panama and the Philippines.

The purpose of this paper is to share the knowledge gained through this joint effort with the aim of demonstrating that green corridors offer benefits for developing countries that go beyond decarbonization of the maritime industry.

What is a green corridor?

A green corridor is a defined commercial route where vessels operate on ZNZ fuels or electrified propulsion, supported by a full ecosystem of renewable energy production, fuel supply chains, and port infrastructure (Figure 1). Corridors can take many shapes: point-to-point connections between major commercial ports, networks of commercial routes, or single point applications, such as fishing fleets⁴. A green corridor project includes all activities along the ZNZ fuel production value chain including ports and vessel operation. The purpose of developing a green corridor is to test and demonstrate ZNZ fuel technologies, operating models, and partnerships within a manageable local scope before scaling solutions globally and use the gained insights to inform regulation and national policies.

Figure 1: Key activities within a green corridor





Benefits beyond decarbonization

Through the execution of the five green corridor pre-feasibility studies, MMMCZCS has seen that the initiatives have the potential to bring benefits to engaging countries beyond solely maritime decarbonization.

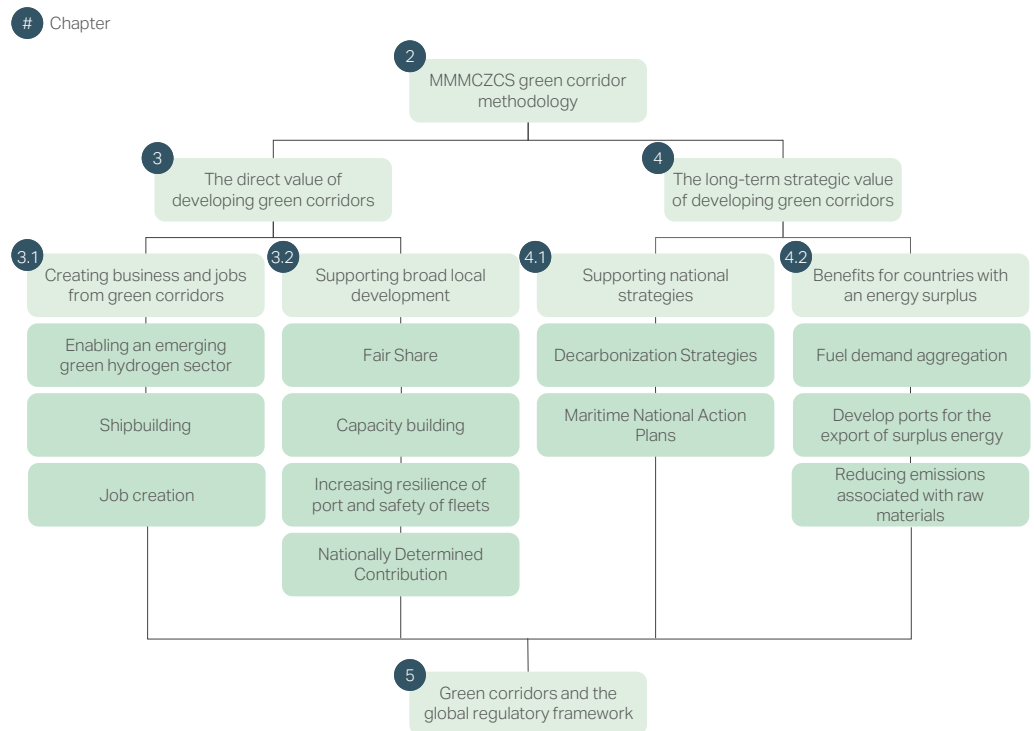
When carried out correctly, pre-feasibility studies can provide an opportunity to plan for the stimulation of emerging and existing industries and the jobs which growth in those industries will generate. The studies also bring benefits to local communities through active and planned capacity building as well as the future tangible benefits of establishing a green corridor. Chapter 3 elaborates on such benefits and provides concrete case examples.

Furthermore, pre-feasibility studies have been seen to assist the development of long-term strategies beyond the immediate scope of a green corridor. Study outputs have contributed to the development of both Maritime National Action Plans and input for Green Hydrogen Strategies. Readers can refer to Chapter 4 for further insights into such benefits.

Figure 2 illustrates how these topics are interlinked and outlines the structure of this report. Benefits from green corridors are not achieved in a linear way, nor are they achieved in the same order from country to country or from project to project. The report is therefore written in a way that allows the reader to select chapters of interest.

For a more detailed description of learnings from MMMCZCS's full green corridor portfolio, readers are recommended to read MMMCZCS's paper on *Insights from maturing a global portfolio of green shipping corridors*⁵.

Figure 2: Graphic representation of the table of content, illustrating how the individual benefits group together



2 MMMCZCS green corridor methodology

Developing a green corridor requires collaboration and knowledge sharing between public and private actors across the full value chain in order to identify the most beneficial constellation of fuel, ports, vessel type, cargo and supporting regulation. It is therefore not a simple task that can be done by policymakers or commercial actors in isolation.

MMMCZCS has developed a stringent, data driven methodology that fosters such collaboration and identifies the most suitable green corridor through structured analysis, drawing on the transparent use of publicly available data in the first pre-feasibility phase⁶, substantiated through data from commercial stakeholders in the following feasibility phase⁷ (Figure 3). Although the focus of this report is on the opportunities arising from the pre-feasibility phase (as outlined in Chapter 1), it is considered relevant to describe the green corridor maturation including the feasibility phase here for completeness and reference.

A pre-feasibility study is conducted by a consortium of public stakeholders and is based on publicly available data. The consortium engages in structured data analysis of national renewable energy potentials, central trade routes and ports, most used vessel types, opportunities for creating a just transition and existing or upcoming regulation. Based on this data and an overlay of strategic selection criteria defined by the consortium, a longlist of potential corridors is created (1st suite of corridors). The longlist is further narrowed down at a Consortium Incubation Workshop in which public and private stakeholders commit to maturing a feasibility study of a specific corridor.

Feasibility studies for specific corridors are conducted by a consortium of commercial companies which bring deep insight from experts within the value chain. This study will identify the incremental cost gap for using ZNZ fuels and provide a clear understanding of the amount of public and private funding required to close it (see total cost of green corridors in Figure 4). The identified feasibility studies are independent projects and may differ in starting point and duration (see Figure 3).

Using a structured, data driven methodology is central for a clear and transparent decision-making process. It aligns all involved stakeholders around a vision for the future of the national shipping industry, creates a shared understanding of why a corridor is selected and provides a solid basis for communicating this choice to the public. This strengthens public support, increases credibility and improves the prospects to secure funding, stakeholder engagement and business development, thus building the foundation for collaboration.

Figure 3: The MMMCZCS green corridor methodology

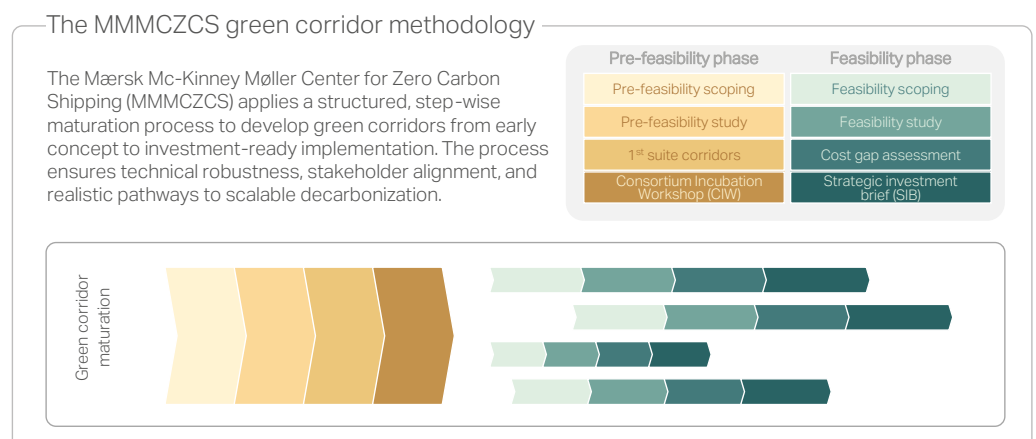
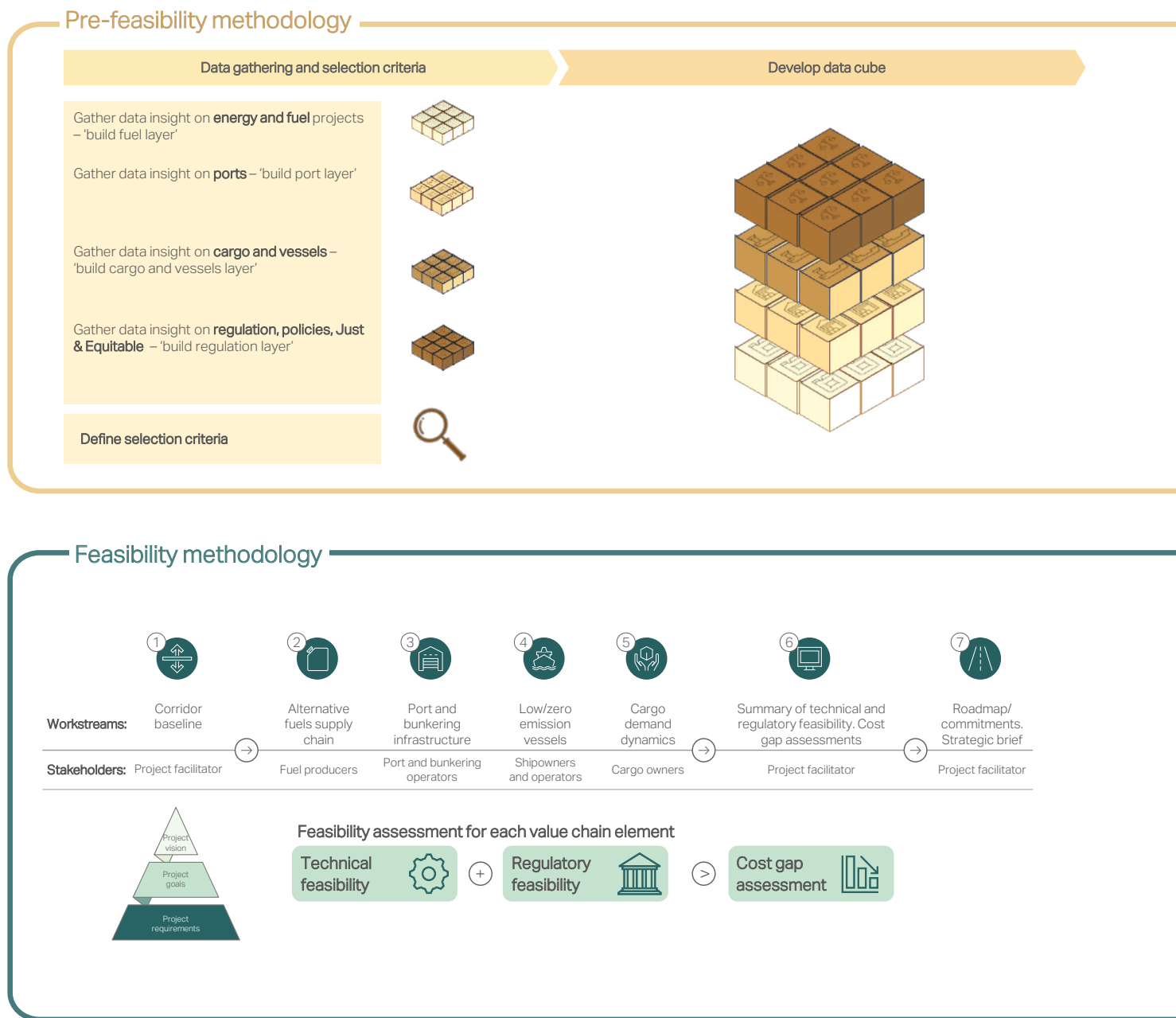
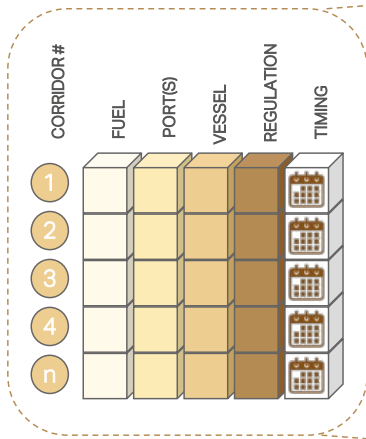


Figure 4: The MMMCZCS methodology for green corridor pre-feasibility and feasibility studies



Generate 1st suite corridors

Final corridor selection

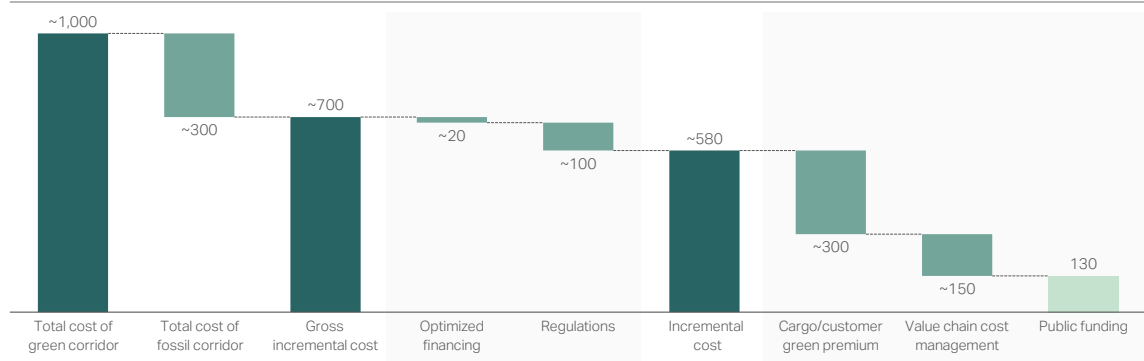


Example from Chile:

Loc.	ID	Short description
Dom.	1	Chilean Powerplant Ammonia
Dom.	2	Chilean Mining Explosives Ammonia
Dom.	3	Austral Ferries
Dom.	4	Austral Cruise
Int.	5	CuS Corridor
Int.	6	Copper to Asia Corridor
Int.	7	Green Copper Europe
Int.	8	Car Import from Japan
Int.	9	Agri/Aqua Culture Corridor
Int.	10	ContainEurope
Int.	11	CircumSouthAmericas
Int.	12	Ammonia Exp Japan
Int.	13	Ammonia Exp Rotterdam
Int.	14	Ammonia Exp Los Angeles
Int.	15	Ammonia Exp Singapore
Dom.	16	Austral Fish/Aqua
Dom.	17	Tug/service
Dom/Int	18	H ₂ SO ₄ Carrier for mining

Illustrative values based on real example from MMZCS work

Stylized breakdown of total cost of green corridors
USDm



2.1 The strategic value of selection criteria

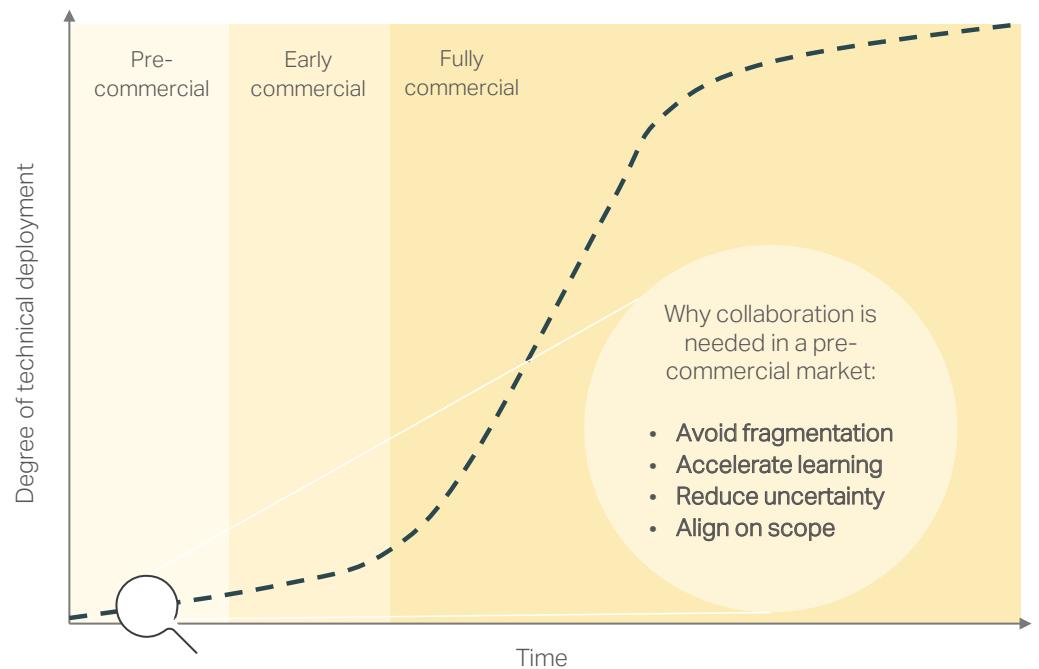
A central step in the pre-feasibility study for green corridors is the establishment of selection criteria (Figure 4). There are two ways in which the consortium can generate selection criteria: One way is driven by strategic interest, such as deliberately reflecting national strategic priorities, while the other is based on more generic terms such as timing, emissions, and fuel types. When selection criteria are designed to reflect national capabilities and long-term priorities they become a tool for directing attention and investment towards areas where a corridor can deliver additional economic value beyond emissions reduction.

Across the five pre-feasibility studies underpinning this report, strategic selection criteria have been central to ensuring the corridor’s contribution to both decarbonization and strategic objectives. This report provides more detail on how these criteria were applied in practice. Chapter 3.1.1 outlines how Namibia applied selection criteria to identify corridors that help build emerging markets. Chapter 3.1.2 describes how the Philippines used them to reinforce the country’s shipbuilding industry. Finally, Chapter 3.2.4 explains how Ghana utilized selection criteria to support its Nationally Determined Contribution.

2.2 The value of collaboration and coordination

Collaboration in the pre-commercial phase of any technology transition, visualized in Figure 5, is essential for reducing uncertainty and building a shared understanding amongst stakeholders throughout the value chain.

Figure 5: The value of collaboration for pre-commercial technologies



The decarbonization of the maritime industry and the production of ZNZ fuels is currently in such a pre-commercial phase. Commercializing these fuels is a complex task requiring alignment across regulators, governments, port state authorities and the private sector.

Green corridors initiatives can be seen as breaking this task down into actionable parts, yet even their maturation requires consideration of; various ZNZ fuel pathways, their respective storage and bunkering infrastructure, vessel readiness for the deployment of these fuels, technical and regulatory challenges, engagement with relevant public authorities, and commitment from the private sector who will ultimately have to take investment decisions. While green corridor initiatives allow stakeholder engagement to be concentrated geographically, the level of engagement required is still vast. Bringing these stakeholders together requires a structured approach with tangible tasks to align activities along the entire value chain.

Green corridor pre-feasibility studies offer such a starting point for coordination of the many actors involved in enabling these initiatives. Stakeholders align on a common vision, scope, and goals, reducing the risk of misinterpretation or strategic divergence. Work is organized into modular value chain workstreams, supporting parallel progress while maintaining overall coordination and collaboration. The methodology provides standardized templates and data frameworks enabling the pooling of publicly available data and insights, and expectations about costs, risks, standards, and transition pathways. This creates a unified analytical basis and enables consistent comparisons of potential corridors for maturation.

The process also facilitates the transparent evaluation and joint prioritization of potential green corridors through structured analysis and democratic shortlisting. The pre-feasibility stage creates a collaboration space where stakeholders can test ideas, exchange insights, and address challenges without the pressure of immediate commercial commitments. An example of this collaboration space is the Consortium Incubation Workshop conducted at the end of each pre-feasibility phase as illustrated in Figure 3. These Consortium Incubation Workshops bring together all relevant stakeholders to collaboratively discuss findings and select the most suitable corridors to progress into a feasibility study. This strengthens collective ownership, builds trust, and reduces uncertainty for subsequent projects. Ultimately, the structured methodology aligns the entire ecosystem, enhances confidence, and prepares the foundation for coordinated, large scale implementation.

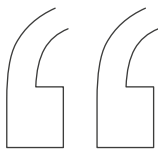


Figure 6: The importance of collaboration highlighted during stakeholder interviews

The [pre-feasibility] study involved organisations from the whole value chain from the public and private sector. This was emphasized in the consortium incubation workshop. It strengthened our coordination efforts towards tackling emissions within the maritime industry."

Numbu Isaahaque Sumabe, Ghana Maritime Authority

The collaboration between academia and industry works well particularly in research and training as such activities facilitate deeper analyses of challenges in Global South towards the green transition."

Professor Maximo Q. Mejia, President, World Maritime University

For other ports undergoing similar transformations, the most important advice would be to adopt a phased and collaborative approach. Infrastructure development should be guided by realistic demand projections, while maintaining flexibility to adapt to evolving market conditions. Strategic partnerships with experienced international ports can also provide invaluable technical support and knowledge transfer."

Elzevir Gelderbloem, Namibian Ports Authority (Namport)

"The study also aligns with the broader EU efforts for a green transition in the Philippines. It bridges Danish and EU partners interests, a positive instrument to have in the arsenal."

Franz-Michael Skjold Mellbin, Ambassador of Denmark in the Philippines



3 The direct value of developing green corridors

3.1 Creating business and jobs from green corridors

Pre-feasibility studies for green corridors have proven to be more than just instruments for stakeholders to galvanise around maritime decarbonisation. Throughout their deployment strategic use of the selection criteria has also served to platform country specific industrial opportunities that the transition to ZNZ fuels presents. These opportunities are highlighted in the following subchapters.

3.1.1 Enabling an emerging green hydrogen sector

While the green hydrogen market is currently nascent, shipping represents an industry which could drive demand and subsequent investment. A paper co-authored by the World Bank group describes the 1st pillar of green hydrogen market growth as creating an, “Enabling environment” discussing how, “national hydrogen strategies, instruments and mechanisms, regulations and standards, and strong private sector ecosystems contribute to robust enabling environments”.⁸

Green corridor pre-feasibility studies assist in establishing such environments through engagement with government agencies and a structured way to identify a country’s potential, planned and existing ZNZ fuel capabilities. Importantly, the studies give the private sector an opportunity to assess outputs during the Consortium Incubation Workshop and indicate to which specific corridors they would be willing to invest resources in maturing with other parts of the value chain.

In the Namibia pre-feasibility study, as well as an earlier Chile pre-feasibility study, ammonia export corridors had been flagged as part of the selection criteria, and in both cases, corridors garnered sufficient commitment from private sector stakeholders across the value chain to be matured into feasibility studies.

3.1.2 Shipbuilding

A green corridor requires vessels capable of running on ZNZ fuels or electric propulsion, creating direct demand for new or retrofitted ZNZ vessels. Countries with existing shipbuilding capacity can meet this demand domestically rather than through imports. Domestic vessel building supports local innovation, deepens technical expertise, and therefore strengthens the industry’s long-term competitiveness.

The Philippines identified this economic opportunity through the intentional use of selection criteria applied during the green corridor pre-feasibility study. The methodology enabled stakeholders to focus on national strengths, in this case shipbuilding, and to prioritize the corridor options that could reinforce this sector.



“The green corridor pre-feasibility study helped us to put shipbuilding back on the policy table. The Philippines needs 250 new domestic vessels – this presents a real industrial potential for local production.”

Franz-Michael Skjold Mellbin, Ambassador of Denmark in the Philippines, 2026



As the fourth-largest shipbuilding nation in 2022⁹, the Philippines have strong local capabilities to build upon. Producing ZNZ vessels in domestic shipyards would not only allow the country to supply its own passenger transport vessels but also support the long-term resilience of its export-oriented shipbuilding sector by expanding technical skills, creating employment, and positioning local industry to serve future global demand for ZNZ vessels.

Furthermore, as the largest seafarer nation in the world¹⁰, having 'the future vessels' in their own waters will continue to allow the training of the seafarers to take place domestically as new technologies emerge. This example demonstrates how green corridors can contribute not only to national decarbonization targets, but also to actively strengthening local industries.

3.1.3 Job creation

The establishment of a green corridor requires significant CAPEX investment and OPEX for developing and operating renewable energy plants, ZNZ fuel, and port infrastructure. The International Monetary Fund estimates that such public infrastructure spending can create 5–30 direct jobs per US\$1 million invested in developing countries, spanning both short-term construction roles and longer-term operational positions¹¹. Numbers vary greatly depending on the complexity of projects and need for imported elements, such as electrolyzer stacks, synthesis elements and ZNZ vessels.

Infrastructure investments can also catalyze large indirect employment effects. For example, the green methanol project in Pernambuco, Brazil, expects around 250 direct jobs and more than 15,000 indirect jobs to be created across its renewable energy, biogenic CO₂, hydrogen, port, and transport value chains¹².

Importantly, planning green corridors offers countries an opportunity to not only quantify, but also guide job creation. Early planning phases allow governments to, for example, prioritize employment pathways for women, who remain underrepresented in many energy and maritime roles, and to design reskilling programs for workers currently dependent on fossil fuel industries. By linking green corridor development with inclusive workforce strategies, countries can strengthen social resilience during the energy transition and ensure that new value chains contribute to broader development goals. As an inspiration, the IMOGENDER Network (under the IMO) is a network which aims to create a more inclusive environment by supporting the advancement and empowerment of women in maritime professions¹³.



3.2 Supporting broad local development

Green corridors can also act as catalysts for development beyond their immediate maritime decarbonization scope. They can enable local industries to get access to renewable energy and green molecules, build capacities in project development, and increase health and safety conditions in ports and neighboring communities. Moreover, domestic green corridors can contribute to national emission reduction targets and reduce local air and environmental pollution. The following section elaborates on these benefits and provides examples of how they can be realized in practice.

3.2.1 Fair Share

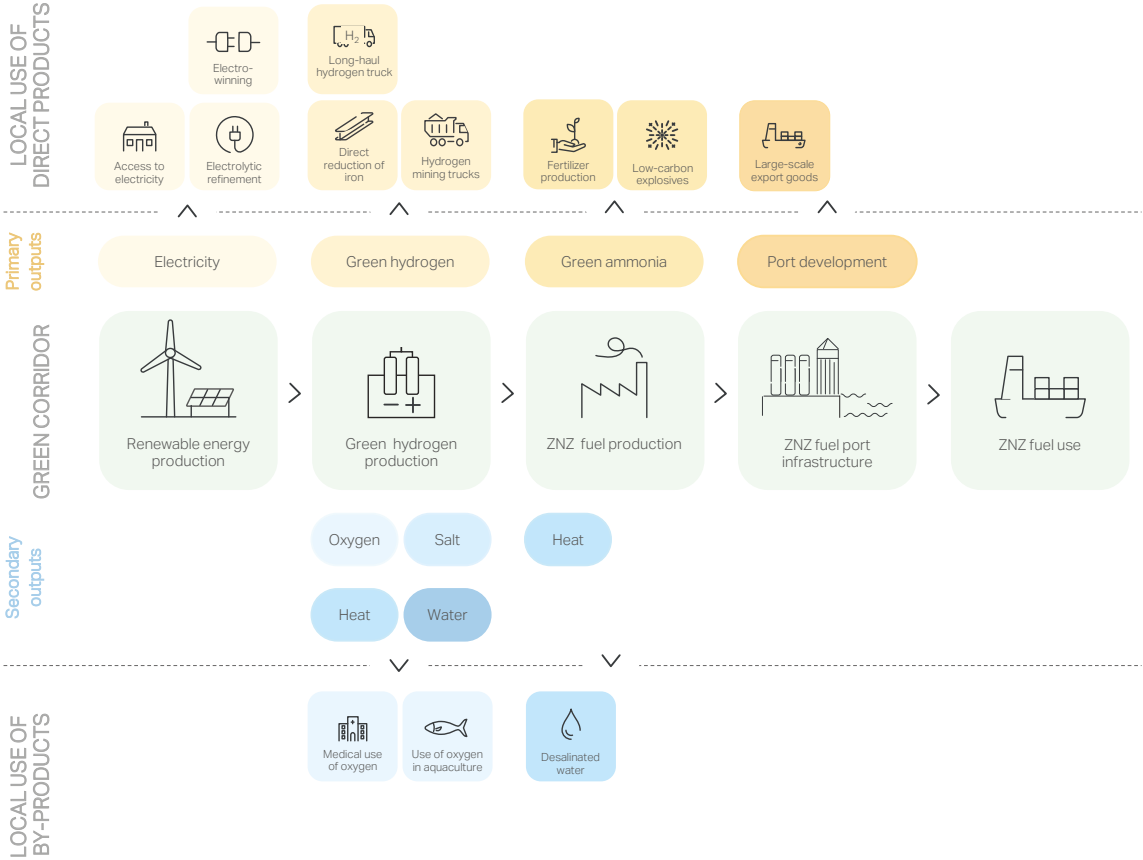
“Fair Share”¹⁴ refers to the share of renewable energy and green molecules that the producing region retains for domestic value generation. It is important that local communities receive a meaningful, engineered portion of the products created within the green corridor, not only an incidental spillover. A corridor project will require a defined flow of electrons and molecules for fuel use and/or commodity export and any excess production available for local use represents retained value. The appropriate share will differ by project and context, but a ‘fair share framework’ requires that the questions be asked explicitly and reflected in project designs from the outset.

Local value can be derived from *primary outputs* produced within the green corridor’s value chain and from associated *secondary outputs* of that value chain, illustrated in Figure 7. Direct products include renewable electricity, green hydrogen, ZNZ fuels such as green ammonia, and port infrastructure developments. Shares of these products can be retained for local projects, for example the use of renewable electricity in households, green hydrogen for long-haul hydrogen trucks and industrial processes, green ammonia for production of low-carbon explosives, or using expanded port infrastructure for the export and import of other goods.

Examples of *secondary outputs* could be heat and oxygen from large-scale electrolyzers or salt from producing desalinated water for electrolysis. While most secondary outputs are of little use to the green corridor, they can be of additional value to the host region. The heat, often low-to-medium-grade, can be recovered for applications such as district heating, desalination, or supporting aquaculture operations. Similarly, the oxygen produced in significant volumes, if captured and stored, can serve multiple use-cases including raw material smelting, wastewater treatment, medical use, and enhancing water quality for fish farming.

Figure 7 illustrates local projects which could benefit from value streams from the land-based part of a green corridor related to e-fuel.

Figure 7: Example of integration of local projects into a green corridor, outputs and products are examples and non-exhaustive



Combining production for maritime use and export with production for local value creation in a single facility unlocks economies of scale for local projects with small volumes. Cost per unit is reduced as project size increases, thus the host community accesses cheaper energy than a standalone facility would provide, while the corridor benefits from lower production costs. Unlocking these cost reductions requires deliberate choices about scale, financing, and governance. The following figures (8 and 9) illustrate this effect through two examples: Hydrogen production for a small fleet of local hydrogen trucks and a pilot project for low-carbon explosive production based on green molecules.

Figure 8: Economies of scale for hydrogen truck fair share project

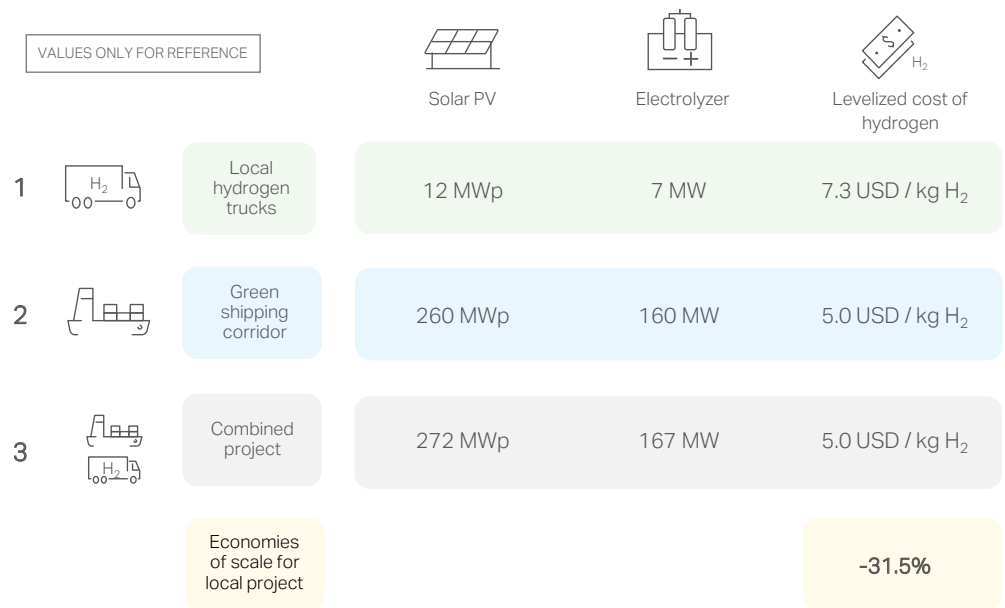
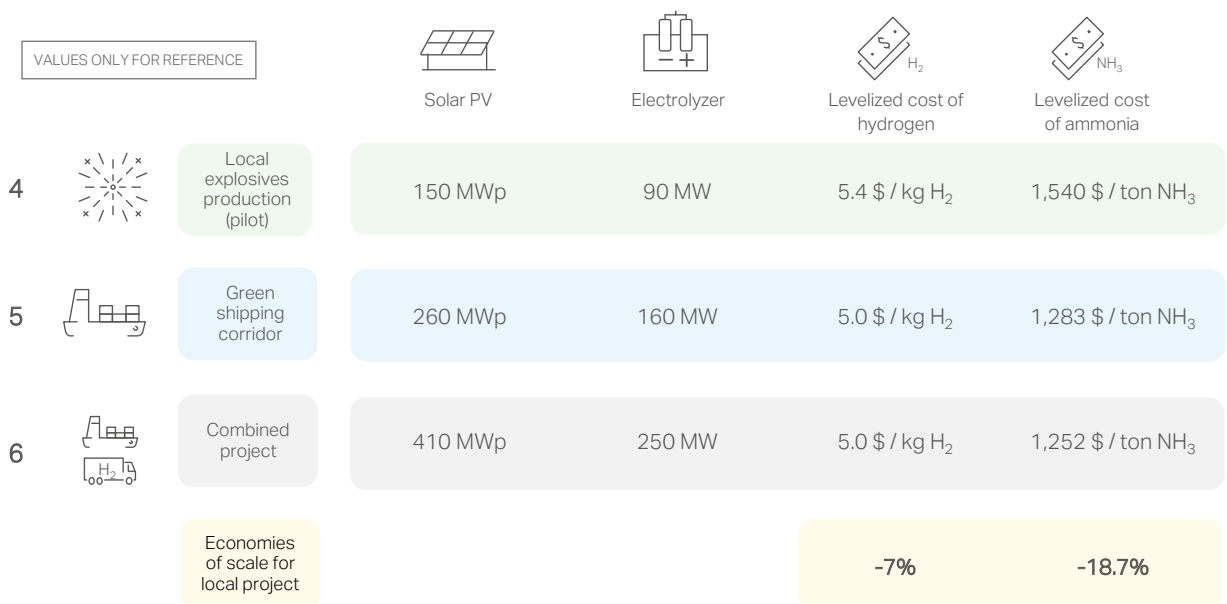


Figure 9: Economies of scale for a pilot scale low-carbon explosives fair share project



3.2.2 Capacity building

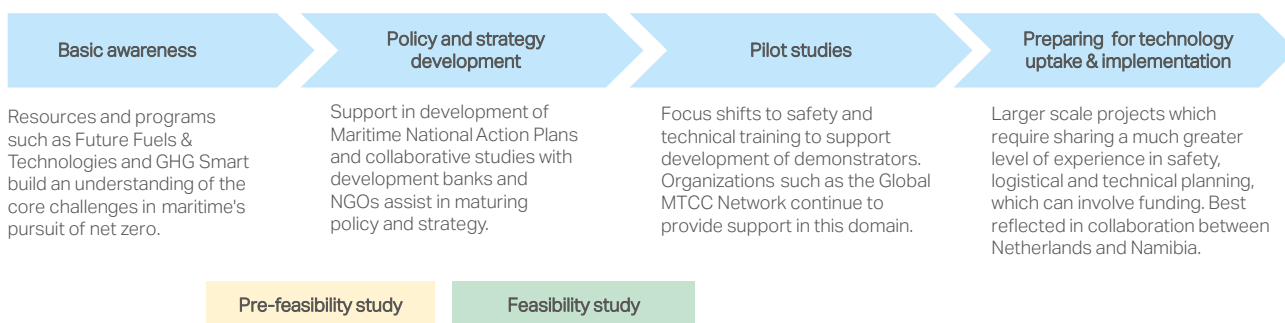
The United Nations defines capacity building as, "The process of developing and strengthening the skills, instincts, abilities, processes and resources that organizations and communities need to survive, adapt, and thrive in a fast-changing world."¹⁵ For countries looking to produce the ZNZ fuels required for the maritime industry to reach its goal of Net Zero around 2050, this means building capabilities across the entire ZNZ fuel value chain.

Ultimately, port workers and seafarers must be able to handle the new fuels safely, producers need the expertise to generate green molecules, and countries must expand renewable energy production to meet future demand. For countries yet, or only beginning, to embark on this transition, time and resources are required to understand the challenges of maritime decarbonization and build strategies to overcome them. Building this capacity comes at a cost however, and without global collaboration through the sharing of knowledge and skills, some countries risk being left with an insurmountable challenge.

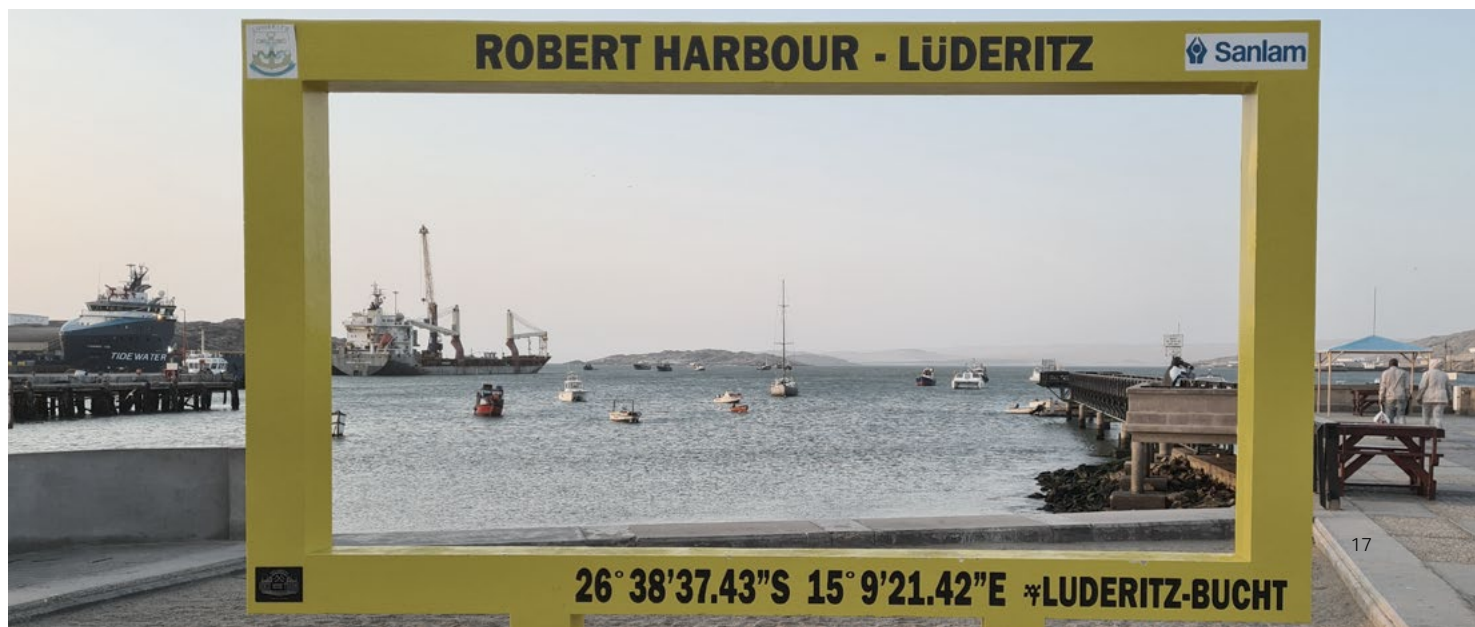
Broadly speaking, countries will build capacity in the pursuit of maritime decarbonization progressively. There are multiple organizations including MMMCZCS, various divisions of the IMO and several governments who continue to provide resources and support to develop this capacity. This progression in capacity building is visualized in Figure 10.

Figure 10: Progression of capacity building

Capacity building progress



Note: Future Fuels & Technology¹⁶, GHG Smart¹⁷ and the Global MTCC Network¹⁸ are all IMO initiatives. The collaboration between the Netherlands and Namibia refers to the Port of Rotterdam and Namibian Port Authority (Namport), which is mentioned in the following section.



Green corridors can help developing countries identify these capability needs. By bringing together stakeholders from energy, ports, shipping, cargo, and regulatory institutions, the pre-feasibility process creates a platform for coordinated assessment. Through structured collaborative effort, stakeholders obtain a shared understanding of where critical skills already exist, and which capabilities need to be strengthened to support future corridor development. This has led to creating significant awareness in government agencies for opportunities arising from green corridors, with outputs from pre-feasibility studies being used in the National Action Plans (Ghana) and Green Hydrogen Action Plan (Chile).

The collaboration between the Port of Lüderitz and the Port of Rotterdam provides another example of how capacity building can be conducted. The green corridor between the Port of Lüderitz and Port of Rotterdam (originating from the Namibia pre-feasibility study and later moved into a specific green corridor in feasibility) builds upon a pre-existing collaboration between Namibia and Netherlands which was formalized in 2023 with the signing of an MoU. The shared goal is to develop a cooperation for green hydrogen related infrastructure¹⁹. This collaboration puts the human element to the forefront e.g. with port-management training in the safe handling of ZNZ fuels. Port of Lüderitz therefore benefits from the Port of Rotterdam's 30 years of experience in handling ammonia as a commodity, while the Port of Rotterdam benefits from an early engagement with an emerging ZNZ molecule producer.



"Collaborations with leading global ports such as the Port of Rotterdam provide access to technical expertise, operational best practices, and strategic insight into the development of modern port infrastructure and energy logistics. Through these partnerships, Namport is able to accelerate its institutional capacity development, particularly in areas such as the energy transition planning, and the development of green shipping corridors."

Elzevir Gelderbloem, Executive: Port Engineering, Namibian Ports Authority (Namport), 2026



"Using ammonia as a fuel comes with significant safety challenges. At the Port of Rotterdam, it took between 3-5 years of preparation before we could carry out the first in-port bunkering pilot, which successfully took place in April 2025, the first of its kind worldwide. While many of our colleagues in other countries are highly skilled in the traditional port disciplines, ammonia bunkering marks a new learning curve for every port. That's why capacity-building programs are crucial to ensure the safe development of infrastructure and operations of new fuels like ammonia in every country."

Martijn Coopman, Program Manager Port of Rotterdam, 2026



3.2.3 Increasing resilience of ports and safety of fleets

In a future where the maritime industry decarbonizes, investment in infrastructure for ZNZ fuels today provides resilience for tomorrow. As international climate action advances, the relative competitiveness of fossil fuels may decline while demand for ZNZ fuels grows. In this scenario, ports that invest early in ZNZ fuel infrastructure (see Chapter 4.2.2) are well positioned to facilitate bunkering demands for ZNZ fuels while reducing their dependence on the decreasing demand for fossil fuels.

Some countries have identified outdated domestic fleets as a safety concern, and investment in new vessels can serve to mitigate this risk. This opportunity was identified in the pre-feasibility study for green corridors in the Philippines, where an investment in new-built electric ferries for domestic transport held particular value due to the increased safety for passengers and crew.

Moreover, the transition from fossil fueled vessels to electric or ZNZ fuel consuming vessels reduces environmental impact on local communities and helps to protect the ecosystems along domestic waterways. Replacing diesel ferries with electric ferries, for example, reduces air pollution, noise and fuel leaks into domestic waterways²⁰. This consideration has been central in the pre-feasibility study for green corridors in Ghana, where several corridors along the Volta Lake have been highlighted, to contribute to protecting this ecological zone²¹.

3.2.4 Nationally Determined Contribution

When green corridors are put into operation, they reduce CO₂ emissions by shifting maritime activity to low carbon energy. For domestic segments such as inland shipping, national ferries, bunkering vessels, and port maneuvering vessels, these emission reductions can be accounted for in a country's Nationally Determined Contributions (NDCs) and support national decarbonization plans/targets.

For many developing countries, this ability to generate measurable NDC impact makes green corridors a strategic tool. The corridors allow countries to advance their climate targets while directing investment into sectors which also deliver wider development benefits.

Ghana is an example of a country exploring how emissions reductions from decarbonizing domestic maritime activities can be incorporated into its NDCs. The country is specifically assessing the inclusion of green corridors on the Volta Lake, along with other domestic shipping segments to combine climate action in line with the Paris Agreement with economic development.



"The pre-feasibility assessment highlighted the potential of a green corridor on the Volta Lake. We are now examining how domestic emission reductions from this initiative may be incorporated in future updates of our Nationally Determined Contributions."

Numbu Issahaque Sumabe, Senior Maritime Officer, Ghana Maritime Authority, 2026

4 The long-term strategic value of developing green corridors

4.1 Supporting national strategies

The pre-feasibility studies for green corridors provide an analytical foundation supporting the development of wider maritime and decarbonization strategies. It fosters collaboration between the relevant public bodies such as ministries, agencies and private stakeholders, creating a shared vision of the opportunities connected with the decarbonization of the maritime industry. Conducting such studies can therefore build a collaborative foundation for further strategy development, such as Decarbonization Strategies and Maritime National Action Plans (MNAP).

4.1.1 Decarbonization Strategies

Countries that have completed pre-feasibility studies for green corridors based on the MMMCZCS methodology have used the results to mature green corridor concepts while also informing national policy processes. Studies can help governments identify barriers to ZNZ fuel adoption, strengthen cooperation between ministries and the private sector and highlight the economic potential of emerging industries linked to renewable energy and ZNZ fuels.

In some cases, the analytical work has contributed directly to the shaping of national strategies, investment frameworks or legislative proposals. An example is Chile, where the pre-feasibility and feasibility studies supported stakeholder coordination, informed the country's Green Hydrogen Action Plan²² and contributed to the design of fiscal incentives currently under discussion in congress (Spring 2026). These studies also helped clarify cost gaps and thereby funding instrument design, as well as infrastructure needs, thereby supporting Chile's broader ambition to position itself as a competitive producer of green hydrogen and ZNZ fuels from its derivatives.



4.1.2 Maritime National Action Plans

The IMO Strategy on the reduction of GHG emissions from vessels²³ encourages member states to develop MNAP translating global decarbonization guidelines into national context. Preparing such a plan requires coordinated input from a variety of stakeholders in the maritime ecosystem to define a shared vision and outline the actions needed to achieve it. This process is often lengthy, requiring broad political stakeholder buy in. An essential foundation of such processes are solid analytical insights provided by a structured, transparent and data-driven approach, and establishing a collaborative platform.

In Ghana, conducting the pre-feasibility study for green corridors provided stakeholders with a foundation to develop the second step of the MNAP. The study brought together stakeholders who had not previously worked in a coordinated manner and generated a shared understanding of Ghana's maritime sector, its opportunities and its constraints.

Additionally, the data gathered through the Ghana green corridor pre-feasibility study provided the Ghana Maritime Authority with data on the most beneficial decarbonization pathways for the country as well as an early identification of the practical steps required to pursue them. The content of the pre-feasibility analysis could therefore directly inform key chapters of the MNAP as shown in Figure 11, which allowed Ghana to develop their MNAP within a shorter timeframe and with greater stakeholder engagement.

How pre-feasibility studies fit into the overall timeline of developing Maritime National Action Plans can be seen in Figure 12.



"The pre-feasibility study helped us take the first step towards developing a Maritime National Action Plan. We are now ready to conduct feasibility studies for green shipping corridors which will directly feed into our Maritime National Action Plan."

Numbu Issahaque Sumabe, Senior Maritime Officer, Ghana Maritime Authority, 2026

Figure 11: Transferrable contents from green corridor pre-feasibility studies to Maritime National Action Plan chapters

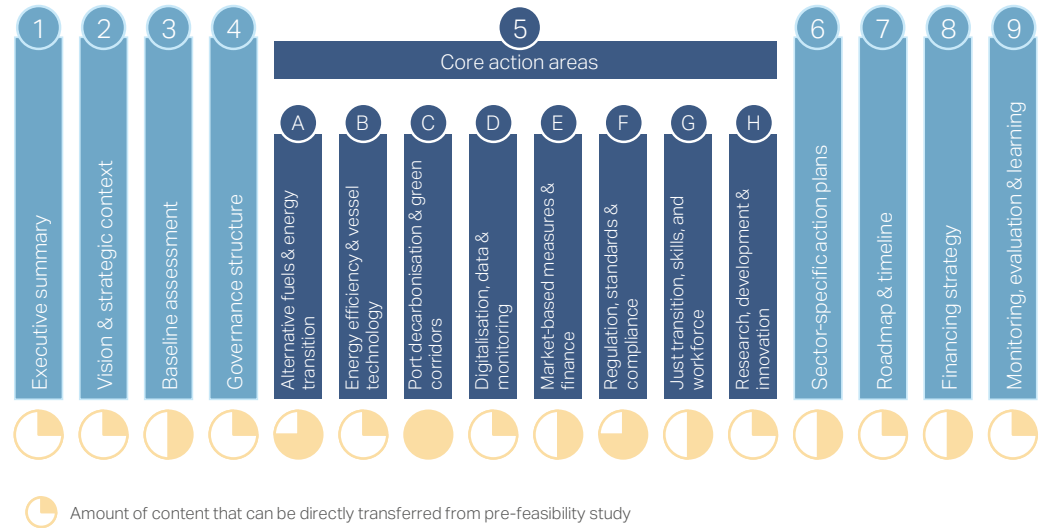
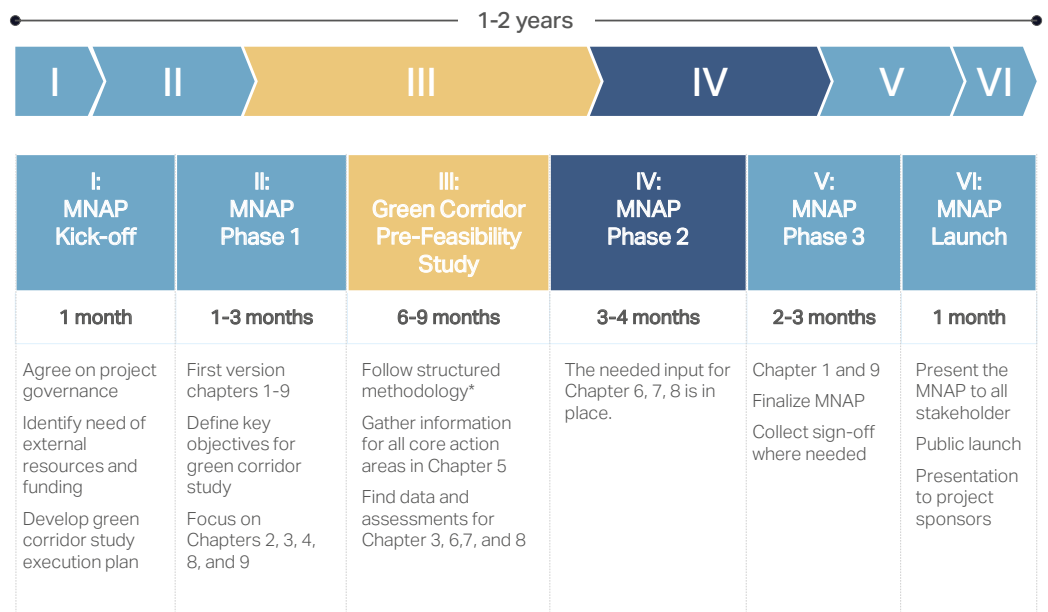


Figure 12: Typical timeline for developing a Maritime National Action Plan (MNAP). A green corridor pre-feasibility study will ideally be located 3-6 months into the MNAP process



* As for example MMMCZCS



4.2 Benefits for countries with an energy surplus

The key cost driver of decarbonization and green molecule production is the cost of renewable electricity. The decarbonization of the global shipping industry therefore depends on the access to abundant, long-standing, exportable and competitively priced renewable energy. With the current technological options for batteries, larger vessels will not be electrified before 2050. Vessels sailing on deep sea routes therefore require ZNZ fuels for their 2050 decarbonization path. Where production of these fuels is based on electricity, they will most likely be produced in countries with vast renewable energy resources, abundant land areas, and an outlook to long-term export opportunities that do not compromise the country's own national climate targets requiring the same green molecules.

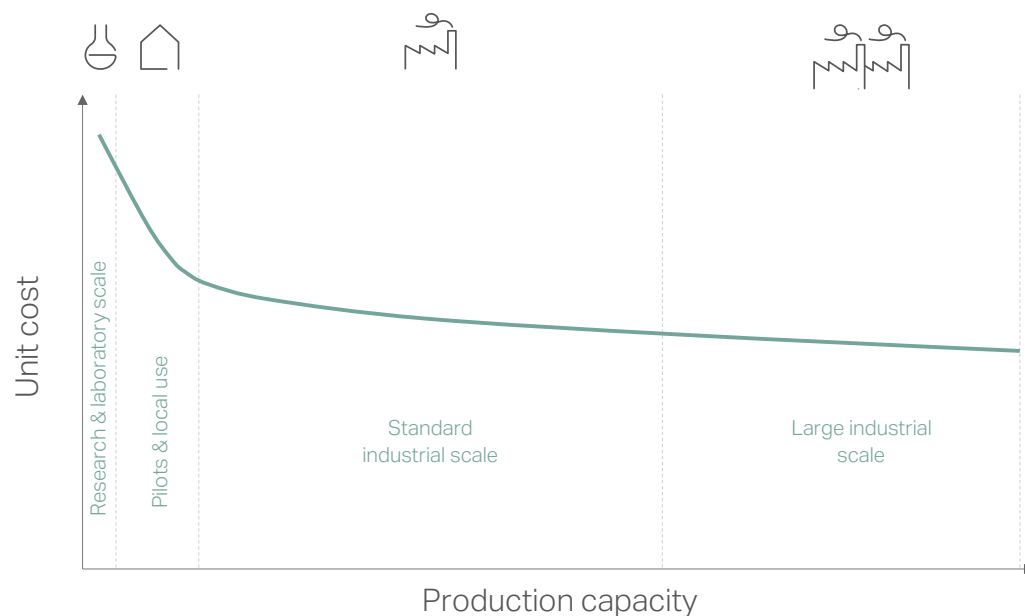
Many developing countries are well positioned to meet these conditions. The Global South is home to some of the world's richest solar and wind resources, with Africa possessing 60% of the global solar resources²⁴, and Latin America and the Caribbean being home to some of the world's most favorable conditions and potential for wind and solar power production²⁵. The establishment of green corridors offers an opportunity for the Global South to utilize these renewable energy potentials and take the first step towards becoming a green molecule exporter both to the Global North and the international shipping industry, currently calling their ports.

4.2.1 Fuel demand aggregation

Despite having abundant renewable resources, some countries may question their competitiveness in the long term compared to countries which have similar access to renewable energy but greater financial and industrial capacity. These other countries can therefore build at larger scale and would be expected to be able to produce green molecules at a lower unit cost.

However, ongoing work in the scaling effects of green molecule production suggests that the inflection point, at which economies of scale diminish, happens at a smaller capacity compared to conventional fossil fuel production. This implies that, notwithstanding other technical differences and synergies, countries capable of rapidly aggregating demand and capital do not automatically produce molecules at much lower cost than developing countries with more modest initial production capacity as illustrated in Figure 13. It is important to note however that competitiveness is not determined solely by scale, but also by factors such as project design, financing structures and integration into wider value chains.

Figure 13: Illustration of change in levelized cost of e-fuels at increasing scale of production



4.2.2 Develop ports for the export of surplus energy

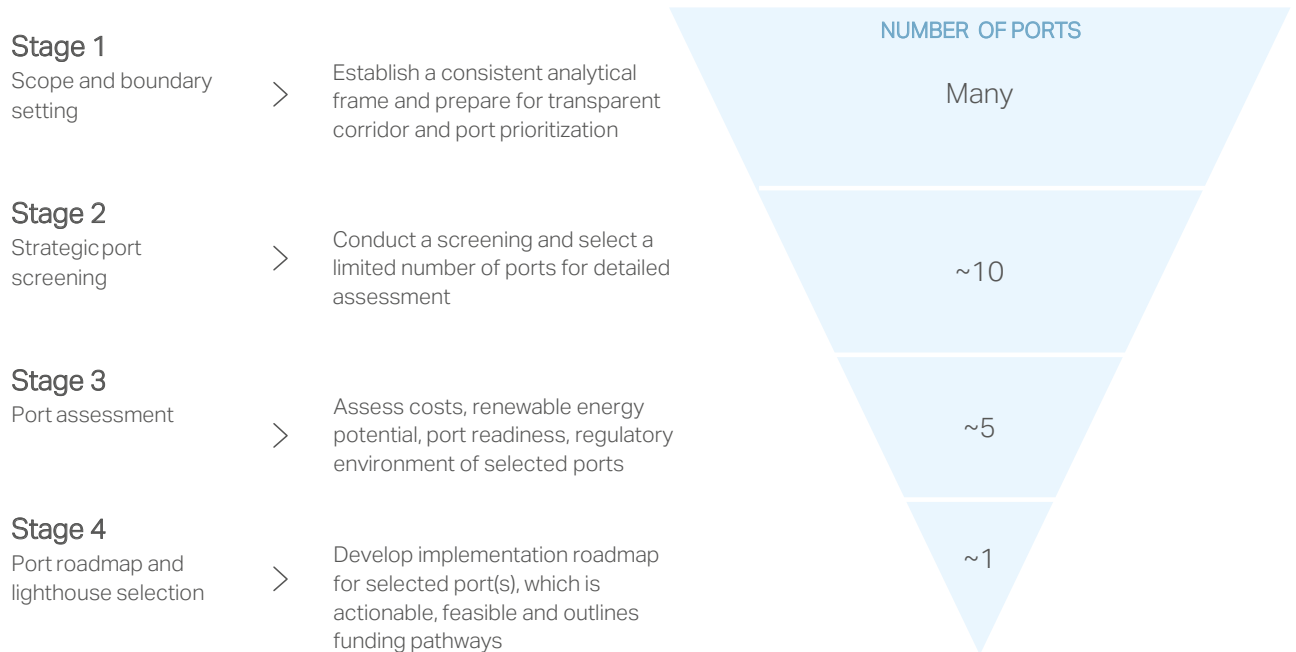
A central decision in the strategic path to becoming a green molecule exporter is the selection of the port(s) which will serve as the gateway for green molecules.

Energy ports must be equipped to handle increasing operational and strategic complexity, serving as both bunkering location, aggregation for industrial demand and export hub. Handling green molecules differs from handling conventional marine fuels in terms of energy density, safety characteristics and therefore infrastructure requirements.

Given these high demands on future energy ports, developing countries can benefit from conducting a structured, data-driven and transparent assessment to identify which of their ports are best suited for this role. The process for such an assessment is illustrated in Figure 14. This structured process combines strategic screening with a multi-criteria analysis which assists countries in narrowing a wide range of potential ports down to a small set of candidates with the strongest long-term potential.

A green corridor pre-feasibility study, which assesses the maturity of different ports, the relevance of their specific trade routes to the national economy, and highlights current and future bunkering potential for ZNZ fuels, can build the foundation (stage 1 in Figure 14) of such a Port Hub Assessment. As a result, pre-feasibility studies carried out in pursuit of establishing a green corridor do more than prepare a single commercial route. They also lay the groundwork for a broader strategic selection process that can help countries position themselves as competitive net exporters of green molecules over the long term.

Figure 14: The Port Hub Assessment²⁶



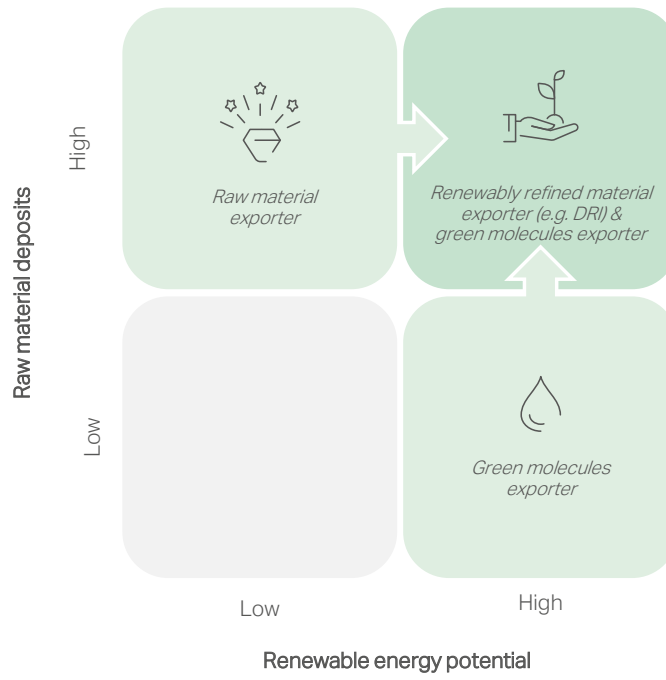
4.2.3 Reducing emissions associated with raw materials

Two thirds of developing countries make more than 60% of their GDP from exports from the commodity market, including energy, mining and agricultural raw materials²⁷. These industries are large CO₂ emitters. As an example, the production of raw material from mining produces 4-7% of the global GHG emissions²⁸, of which the largest amount is ascribed to Scope 3 emissions²⁹. These Scope 3 emissions include, amongst others, refinement and transportation. As countries strive to meet the pledges of the Paris Agreement, more focus will be placed on purchasing commodities with lower total embedded emissions.

For developing countries possessing raw material deposits and strong renewable energy potential, there are good options for reducing embedded emissions of their exports, by utilizing the production of renewable electricity and green molecules for lower-carbon refinement of raw-materials³⁰. In this way, refining raw materials domestically can create additional value in terms of jobs and investment, while also producing an export commodity with higher intrinsic value. An example of how this can be realized is found in Namibia, where direct reduced iron (DRI) is produced using green hydrogen at the Hylron Oshivela plant. The plant is powered entirely by renewable energy and a large electrolyzer system that generates hydrogen as the reductant³¹. Green hydrogen replaces coal or natural gas in the reduction process, allowing iron ore to be converted to DRI while emitting only water. This makes Namibia home to Africa's first zero-emission iron production facility, and positions Namibia in the upper right quadrant in Figure 15. The local refinement comes with sustainability synergies and trade-offs and should be evaluated on a case-by-case basis.

Green corridors can act as another, yet smaller, contributor to emission reduction, allowing the refined materials to be transported in a low-carbon manner, thus reducing embedded emissions further. This positions the countries in the upper right corner in Figure 15 to enter emerging markets for raw materials with lower embedded emissions and strengthens the long term resilience of their export sectors in line with global decarbonization goals.

Figure 15: Export pathways for countries with raw materials and green molecules



5 Green corridors and the global regulatory framework

The previous sections have shown that green corridors can create significant opportunities for developing countries as well for other countries with similar characteristics, unlocking benefits within the corridor's value chain itself and supporting broader strategic economic objectives over time.

There is currently a cost disparity between fossil fuels and ZNZ fuels because the externalities of fossil fuels are not priced but generally covered by society³². This cost disparity is the main challenge to fuel projects. A clear regulatory direction which includes CO₂-equivalent (CO₂e) pricing can both derisk and reduce delay in investments and avoid regional fragmentation. Green corridors and wider maritime decarbonization will not scale without such a global regulatory framework. As first moving pre-commercial projects, green corridors face an even larger cost gap, and national, regional or global funding support remains essential to enable early deployment.

Conducting studies for green corridors can help developing countries to understand the specific cost gaps, identify capacity needs and unite stakeholders around a common strategic vision. This enables developing countries to identify the scale and type of global regulation required and supports data-driven advocacy work. In the period before regulation, green corridors can, as all other strategically driven pre-commercial activities, only be materialized through public funding, subsidies or other enabling mechanisms.

5.1 Revenue distribution mechanism

A global regulation imposing CO₂e pricing may close the cost gap between fossil and ZNZ fuels, but it would also raise the cost of shipping. In this scenario, where an increase in shipping costs is experienced globally, there is risk that developing countries are disproportionately impacted. Some such countries are key actors in global shipping and will be central to future production of ZNZ fuels. Any global regulation that is established must consider mechanisms for fair revenue distribution as one way of enabling a just and equitable transition. Redirecting a share of money paid through CO₂e pricing towards developing countries can unlock the investment needed for green corridors and ensure they can play their full role in the green transition.



"A global revenue-distribution mechanism is a central lever to mitigate the disproportionate impacts of maritime decarbonisation on developing countries. When establishing global regulation for revenue distribution, considerations should be given to supporting a just and equitable transition."

Maria Ogbugo, Director of Programmes of the African Future Policies Hub

1

Investment needs: Redistributed revenue could serve as catalytic funding to unlock capital for critical green port and energy infrastructure in developing countries.

2

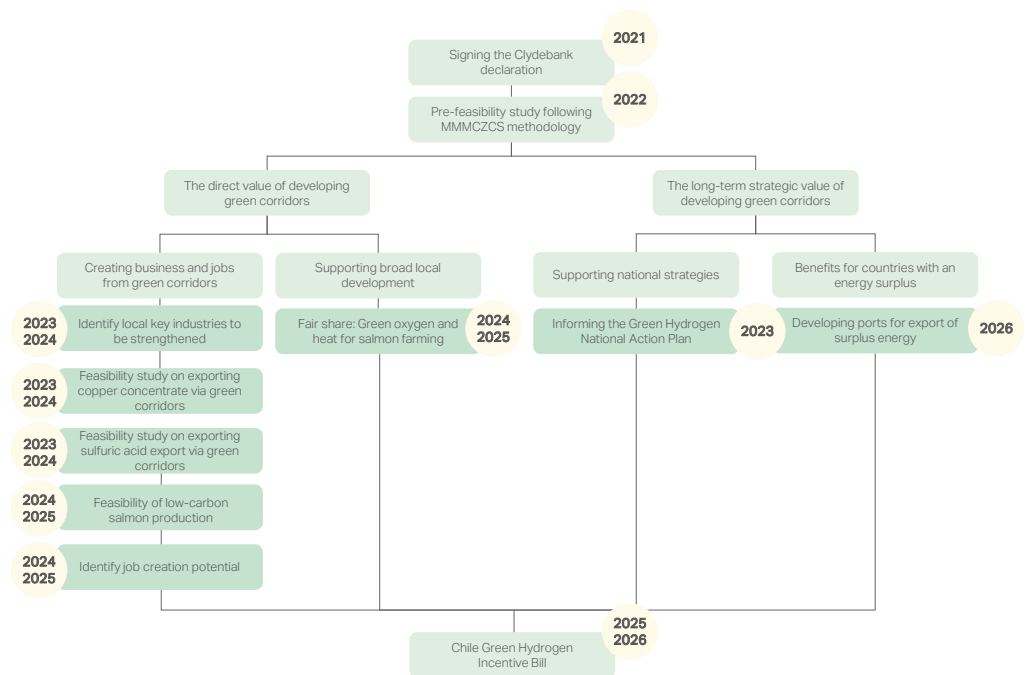
Fleet renewal: Ship finance for the acquisition of new green fleet to operate short-sea shipping along green corridors in Africa in support of the continent's ambitions of boosting intra-regional trade under the African Continental Free Trade Area (AfCFTA).



6 From Glasgow to green hydrogen

For countries considering green corridor development, Chile provides a clear example of strategic use of green corridors. From conducting a pre-feasibility study succeeded by several feasibility studies, developing national industrial strategies to support opportunities identified through this work, to building institutional capacity to implement them.

Figure 16: Chile's use of green corridors in their national decarbonization strategy



Chile signed the Clydebank Declaration in 2021, signaling commitment to develop zero-emission maritime routes, while being conscious of the need for incentives and support³³. This signature placed the topic on the national policy agenda and was followed in 2022 by a pre-feasibility study on possible green corridors conducted with the MMMCZCS³⁴. The study identified eighteen possible corridors and established a shared evidence base among government institutions, ports, cargo owners, and fuel and technology suppliers. It further clarified potential opportunities and highlighted key barriers such as fuel cost gaps, infrastructure readiness, and regulatory needs.

On this basis, Chile moved into targeted green corridor feasibility studies between 2023 and 2025^{30F}. The corridors selected for feasibility assessments were chosen for their strategic relevance to sectors central to Chile's economy. Specifically, they examined how copper and salmon export could be decarbonized and strengthened through green corridors. The studies confirmed technical and regulatory feasibility, quantified emissions reduction potential, identified feasible technology pathways, and outlined where economic gaps remained³⁵. In addition, the studies outlined the job creation that could be realized through establishing individual corridors. They also pointed to specific locations in northern Chile with strong potential for NZV fuel production due to renewable energy resources, existing industrial facilities, and port access, and were in 2023 included into the Green Hydrogen National Action Plan³⁶.

This analytical work directly informed several policy processes. First, in 2023, a formal Memorandum of Understanding between the Ministry of Energy and the MMCZCS was signed, enabling public-private-research collaboration to directly inform policy formulation. Insights from the feasibility studies afterwards contributed to the Green Hydrogen Fiscal Incentives Bill³⁷, and were incorporated into the Maritime Energy Transition Roadmap 2050, which is now being developed as a national framework for maritime decarbonization, infrastructure planning, regulation, and financing.

In combination, these steps show how green corridor development can evolve into a coherent national approach that links maritime decarbonization with export competitiveness and industrial development. In the green corridor work related to the salmon industry, it was assessed how side streams (as discussed in Figure 7) could be monetized, leading to novel use of low carbon oxygen.

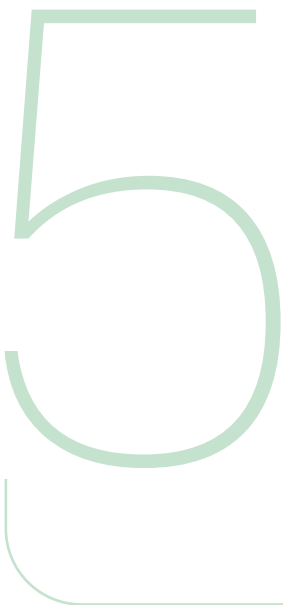


7 Summary

The Danish Ministry of Foreign Affairs and Danish Maritime Authority partnered with the Fonden Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS) in 2023 to conduct green corridor pre-feasibility studies in Fiji, Ghana, Namibia, Panama and the Philippines. Green corridors are understood here as commercial routes on which vessels operate on ZNZ fuels with appropriate energy and port infrastructure in place. The work in these countries, together with insights from similar engagements, shows that green corridor projects can support maritime decarbonization while creating economic and social benefits for developing countries.

The green corridor studies assist countries in identifying suitable corridors, strengthening local industries, assessing the employment effect, building institutional capacity, and investigating how the corridors may contribute to Nationally Determined Contributions. The findings also show how corridor development can inform broader maritime and energy strategies. Countries with strong renewable resources can use these insights from corridor work to advance their potential as producers, users and exporters of ZNZ fuels, and to guide their strategic port development.

For countries where these opportunities may be relevant, a pre-feasibility study following the MMMCZCS methodology can provide a structured and evidence-based starting point. In addition, it provides a collaborative framework, to inform national strategies and plans. The graphic below presents five recommended steps for initiating such a process.



steps to start developing a green corridor:

- 1 Familiarization with the MMMCZCS methodology:** Understand what the pre-feasibility study entails and what resources it takes to follow it. More information can be found [here](#).
- 2 Get buy-in:** Mobilize relevant ministries, commercial actors, and international partners to ensure broad support.
- 3 Understand resource gap:** Identify internal capacities available to conduct the pre-feasibility study, as well as additional monetary and human resources required.
- 4 Identify funding pathways:** If external funding is required, explore funding potentials from institutions such as the IMO, the EU Global Gateway program or via international partnerships (philanthropic or through embassies)
- 5 Engage an independent facilitator:** Independent facilitators, such as non-profit organizations or consultancies can help to create collaboration between stakeholders and guide the process of applying the methodology.

For more information on the MMMCZCS's work with green corridors please refer to the MMMCZCS's publication on *Insights from maturing a global portfolio of green shipping corridors*³⁸.

For more insight into methodologies and tools readers are recommended to visit www.zero-carbonshipping.com/green-corridors.





Pictures in the Report

Page	Description	Location	Region	Country	Source
1	Beach view	Aptera Beach	Crete	Greece	Johan Svendsen
2	Rudder	Everllence Office	Copenhagen	Denmark	Johan Svendsen
6	Copper smelter	Chuquicamata Copper Mine	Calama	Chile	Johan Svendsen
9/10	Waves	Tilvilde	Northern Zealand	Denmark	Johan Svendsen
12	RoRo & RoPAX	Port of Batangas	Luzon	Philippines	Johan Svendsen
13	Green H ₂ Plant	Cleanergy Solutions Namibia	Walvis Bay	Namibia	Johan Svendsen
14	H ₂ powered boat	Pier Zou-no-hana	Yokohama	Japan	Johan Svendsen
15	Green H ₂ Plant	Cleanergy Solutions Namibia	Walvis Bay	Namibia	Johan Svendsen
17	Port view	Port of Luderitz	Luderitz	Namibia	Johan Svendsen
19	Volta Queen	Akosombo Harbour	Lake Volta	Ghana	Johan Svendsen
20	H ₂ tank	Cleanenergy Solutions Namibia	Walvis Bay	Namibia	Johan Svendsen
23	Salt tower	Cero Dominador	Calma	Chile	Johan Svendsen
26	Copper cathodes	Port of Antofagasta	Antofagasta	Chile	Johan Svendsen
29	Puerto Chacabuco	Aisén Fjord	Aisén	Chile	Johan Svendsen
31	Puerto Chacabuco	Aisén Fjord	Aisén	Chile	Johan Svendsen
32	Boat on lake	Lake Taal	Luzon	Philippines	Johan Svendsen
33	Ship-to-Shore Crane	Manzanillo International Terminal	Colon	Panama	Johan Svendsen
34	Port Authority Building	Akosombo Harbour	Lake Volta	Ghana	Johan Svendsen
36	Little Mermaid	Copenhagen Central	Copenhagen	Denmark	Johan Svendsen



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About the MMMCZCS

The Fonden Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS) is a not-for-profit, independent research and development center looking to accelerate the transition towards a net-zero future for the maritime industry. We drive and facilitate the development and implementation of new technologies; build confidence in new concepts and mature viable strategic ways to drive the required systemic and regulatory change.

As we set the course for a sustainable transition, the Center consistently assesses, informs and guides the industry transition journey and is recognized as a change leader, trusted adviser and leading knowledge hub for maritime decarbonization. The Center has leveraged this role in its work on green corridors projects by guiding governments and industry players. Based on these learnings, the Center has developed methodologies that provide guidance on how to perform the initial pre-feasibility assessment of potential green corridors. The framework is based on learnings from existing corridor projects, and this tool provides a structured approach to collecting the necessary data and making the right analyses.



Mærsk Mc-Kinney Møller Center
for Zero Carbon Shipping