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Charting the path forward: Recommendations for catalyzing zero-emission maritime fuel adoption in British Columbia

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This project was conducted under the mentorship of C40 staff. The opinions and recommendations in this report and any errors are those of the author and do not necessarily reflect the views of C40 or the University of British Columbia.

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EXECUTIVE SUMMARY

To achieve widespread adoption of zero-emission maritime fuels, extensive changes are needed in maritime and its extended value chains, including infrastructure for fuel production, storage, transport, bunkering, and combustion. Effective coordination among fuel suppliers, ports, terminal operators, fuel users, cities, governments, financiers, communities, and other stakeholders is essential.

The commonly-discussed zero-emission maritime fuel types have their distinct production pathways, feedstocks, and more frequent bunkering needs compared to conventional fossil maritime fuels. Such distinction will induce changes in what roles countries and regions play in the maritime industry, both internationally and domestically.

While challenges exist in the maritime industry's transition to zero-emission fuels, there are also opportunities for developing a clean and competitive local cluster with green jobs in British Columbia (BC), Canada.

This report showcases global initiatives ranging from a cargo owners alliance, regional demand and supply collaboratives, to a double-auction financial mechanism for ramping up the production and/or adoption of zero-emission fuels. It then explores what forms of collaboration would effectively create a clear demand signal for zero-emission maritime fuels in BC. This research is informed by a global jurisdictional scan, document review, and interviews with global and BC's stakeholders in the maritime industry.

The recommendations in this report outline potential roles for BC in the transition to zero-emission maritime fuels, including its positions as a consumer, producer, and bunkering hub. Further recommendations are made to address how these roles align with BC's position in the Pacific Northwest region. Actions for various stakeholder groups are suggested for short, medium and long terms.

Which chapters would be most relevant to you?

If you are a **policy maker** crafting priority actions for accelerating the zero-emission maritime fuel transition,

- [The Applying a BC Lens Chapter](#)
- [The Recommendations Chapter](#)

If you are a **BC-based fuel producer** or **fuel offtaker** who is hoping to address the chicken-or-egg problem,

- [The Recommendations Chapter – BC as a Consumer](#)
- [The Recommendations Chapter – BC as a Producer](#)

If you are from **civil society or industry** wanting to understand different collaborative models and explore how integrators like you can facilitate this transition,

- [The Collaborative Models chapter](#) and its [Case Studies](#).
- [The Recommendations Chapter](#)

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Readers' Guide



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& publications



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1. INTRODUCTION

BC's Maritime Industry – Economic and Environmental Stakes

BC's maritime industry ensures supplies of our daily necessities, facilitates the export of Canadian goods, maintains our competitiveness in global trades, creates jobs, and supports the development of various industries both domestically and globally.

The economic prosperity from these maritime activities comes at a cost. Shipping is powered mostly by fossil fuels, with the industry accounting for 2–3% of global CO₂ emissions. Other air pollutants from the burning of marine bunker fuels also contribute to environmental and public health problems such as smog, acid rain, asthma, and premature death.¹

International and national authorities have committed to decarbonize the maritime industry. Canada's 2030 Emissions Reduction Plan outlines how the country can achieve a 40-45% reduction in GHG emissions below 2005 levels by 2030, with a commitment to align carbon intensity requirements for domestic vessels with international standards.² The International Maritime Organisation (IMO) rolled out the 2023 IMO GHG Strategy,³ which envisages:

- A 5% to 10% uptake of zero or near-zero GHG emission technologies, fuels and/or energy sources in international shipping by 2030.
- A reduction in the total annual GHG emissions from international shipping by 20-30% by 2030, 70-80% by 2040 (compared to 2008), and achieving net-zero emission by 2050.

Statistics of the Port of Vancouver

#1 in Canada in terms of total cargo, container and automobile volumes.⁴

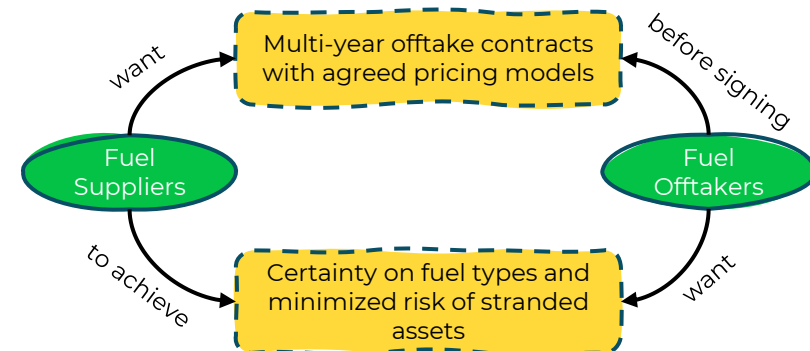
Port-related activities contribute **40% of the GDP** and **27% of jobs** within the Lower Mainland region.⁵

Generates **\$2.23 billion** in total economic output in each cruise season

Chicken-or-Egg Problem

The large-scale adoption of zero-emission maritime fuels requires significant transformation across the maritime and extended value chains, as well as coordination among stakeholders. Currently, less than 5% of the fuel production projects worldwide have passed the final investment decision (FID) stage that could deliver zero-emission fuels to the market.⁶ Among various hurdles, the misalignment between fuel suppliers' and offtakers' needs and expectations creates a classic chicken-or-egg problem.

Figure 1. Chicken-or-egg problem faced by zero-emission fuel producers and offtakers



Shipping segments such as bulk carriers, container lines, cruises, and ferries, and the companies within each segment, each have potential fuel offtakers considering various fuel options, leaving fuel suppliers unsure of whom to engage with and complicating the chicken-or-egg dilemma.



The '[Fuelling the Future of Shipping: Key Barriers to Scaling Zero-Emission Fuel Supply](#)' insight report by World Economic Forum (WEF) in collaboration with Boston Consulting Group.

'[New Energy Markets in West Coast Shipping](#)' by Oceans North Conservation Society, Vancouver Maritime Centre for Climate (VMCC), C40 and Arup

Decarbonizing the Global and BC's Maritime Industry

In today's global maritime fuel supply chain, BC exports crude oil to the world, and its ports do not carry out significant bunkering for ocean-going vessels. The emergence of zero-emission maritime fuels, which require more frequent bunkering, will induce changes in what roles countries and regions play. The landscape of opportunities for BC will shift along with the global fuel transition. While challenges exist in the maritime industry's net-zero transition, there are also opportunities for developing a clean and competitive local cluster, with associated green jobs.

This report aims to shed light on the questions below by first introducing stakeholder groups along the value chain for zero-emission maritime fuels, and then exploring different collaboration models to progress demand aggregation, eventually adoption of zero-emission fuels via five case studies. These are followed by an assessment of BC's current landscape, and eventually a set of recommendations for short, medium, and long terms actions for various stakeholder groups to enhance scalability of zero-emission maritime fuels in BC.

Questions addressed in this report:

What models of collaboration would be effective in creating a clear demand signal for zero-emission maritime fuels in BC?

Who should be involved in these collaborations?

What qualifications should an integrator of these collaborations possess to serve BC's needs?

What information gaps need to be addressed moving forward?

How can BC remain competitive in the global zero-emission transition, particularly within the maritime industry?

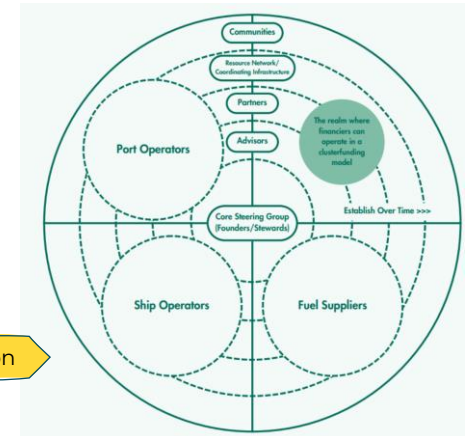
2. COLLABORATIVE MODELS

A Glimpse of the Value Chain

To pinpoint areas for collaboration, we first need to get a clearer picture of the value chain for zero-emission maritime fuels. This includes identifying the key players, their roles within the value chain, and how they interact with each other.

The Agile Decarbonisation Cluster model, co-developed by Connected Placed Catapult and Thetius, acknowledges the varying readiness for change among stakeholder groups and therefore emphasizes the importance of maintaining agility. It extends beyond the maritime industry on the belief that collaboration with other sectors can help reduce the commercial risks associated with decarbonization.

Extracted from a private report titled 'Ripple Effects - an analysis of the funding landscape for maritime technology in the United Kingdom' courtesy of Mark Wray, Ecosystem Director for Maritime & Ports at the Connected Places Catapult in the UK.



Click image to access the enlarged version

'Canadian Green Shipping Corridors Preliminary Assessment' (p.12) by Oceans North and Arup outlines major stakeholder groups involved in the production, supply and consumption of low- and zero-emission maritime fuels at several Canadian ports.

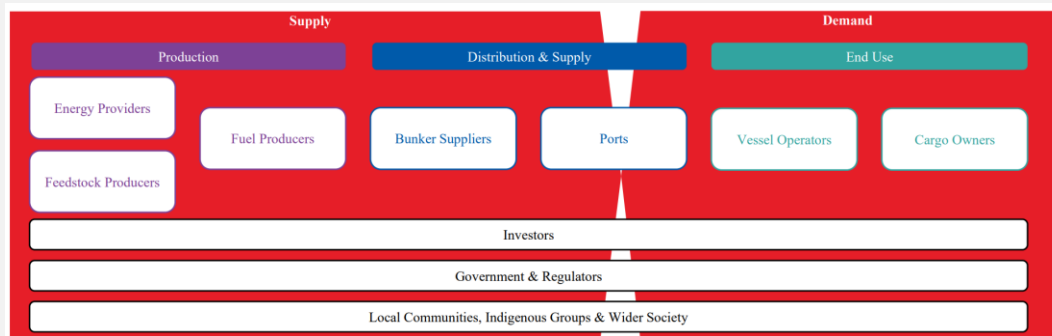


Figure 5 – Key stakeholder groups involved in production, supply and use of low and zero carbon marine fuels

WEF's '[Fuelling the Future of Shipping: Key Barriers to Scaling Zero-Emission Fuel Supply](#)' (p.18) labels stakeholder groups into supply, demand and ecosystem enablers, essential for kickstarting the first few zero-emission maritime fuel projects. This illustration emphasizes the role of an integrator to coordinate these groups within the ecosystem.



Harmony at the harbour: The connected nature of maritime logistics and city networks

Port electrification

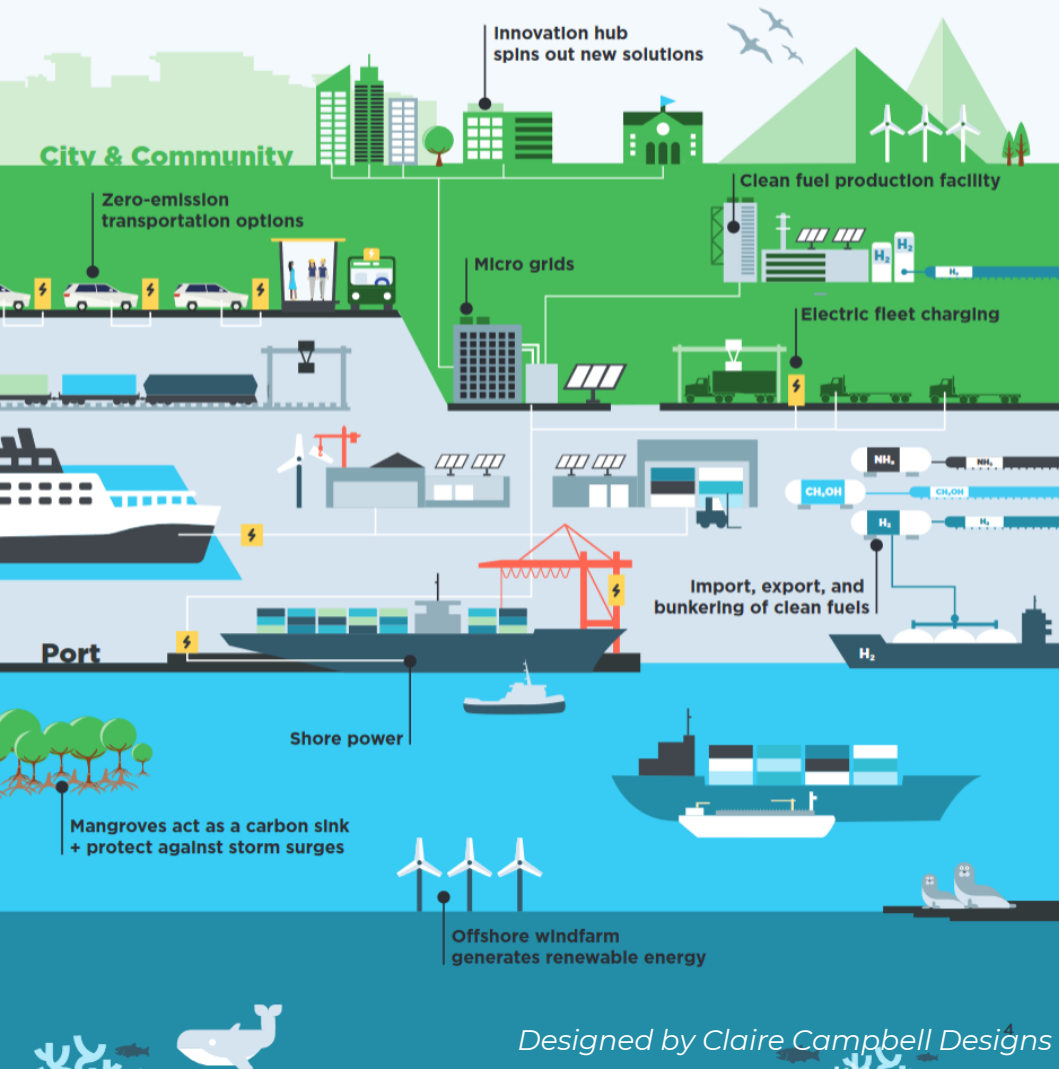
Creates opportunities for zero-emission mobility for people and goods

Clean fuel adoption

Leads to opportunities for clean energy production and export

Green ports strategies

Spurs clean innovation, nature-based climate solutions and delivers good, green jobs



Role of Cities

Cities are home to ports and carry the potential of creating synergies between maritime and urban climate action. Decarbonizing ports and shipping could create sustainable value for cities, including improved air quality and citizens' health, green job creation, and staying globally competitive.



A policy brief by C40, as its name suggests, sheds light on [‘Why port cities should include ports and shipping in climate action plans’](#)

Role of Ports

Ports act as the nexus of transportation by being connected to maritime shipping, rail, and trucking activities. They could serve as energy hubs for bunkering, fuel import and export. Their central role in both transportation and energy systems positions them uniquely to convene stakeholder groups and accelerate climate action.



[‘Oceans of Opportunity: Supplying Green Methanol and Ammonia at Ports’](#) by the Global Maritime Forum and RMI identifies four archetypes of ports based on their common opportunities, challenges, and actions required to develop green methanol or ammonia bunkering.

[‘The potential of ports in developing Sustainable First Mover Initiative’](#) by the Lloyd’s Register Maritime Decarbonisation Hub and the Environmental Defense Fund, in collaboration with Arup, introduce an identification tool to assess a port’s potential to produce and/or bunker electrofuels in an inclusive way to the port communities.



Source of the illustration: [‘Greening Ports; Empowering Local Communities’](#) which outlines actions and Insights from C40’s Green Ports Forum first workshop in Singapore in 2023.

Case Studies

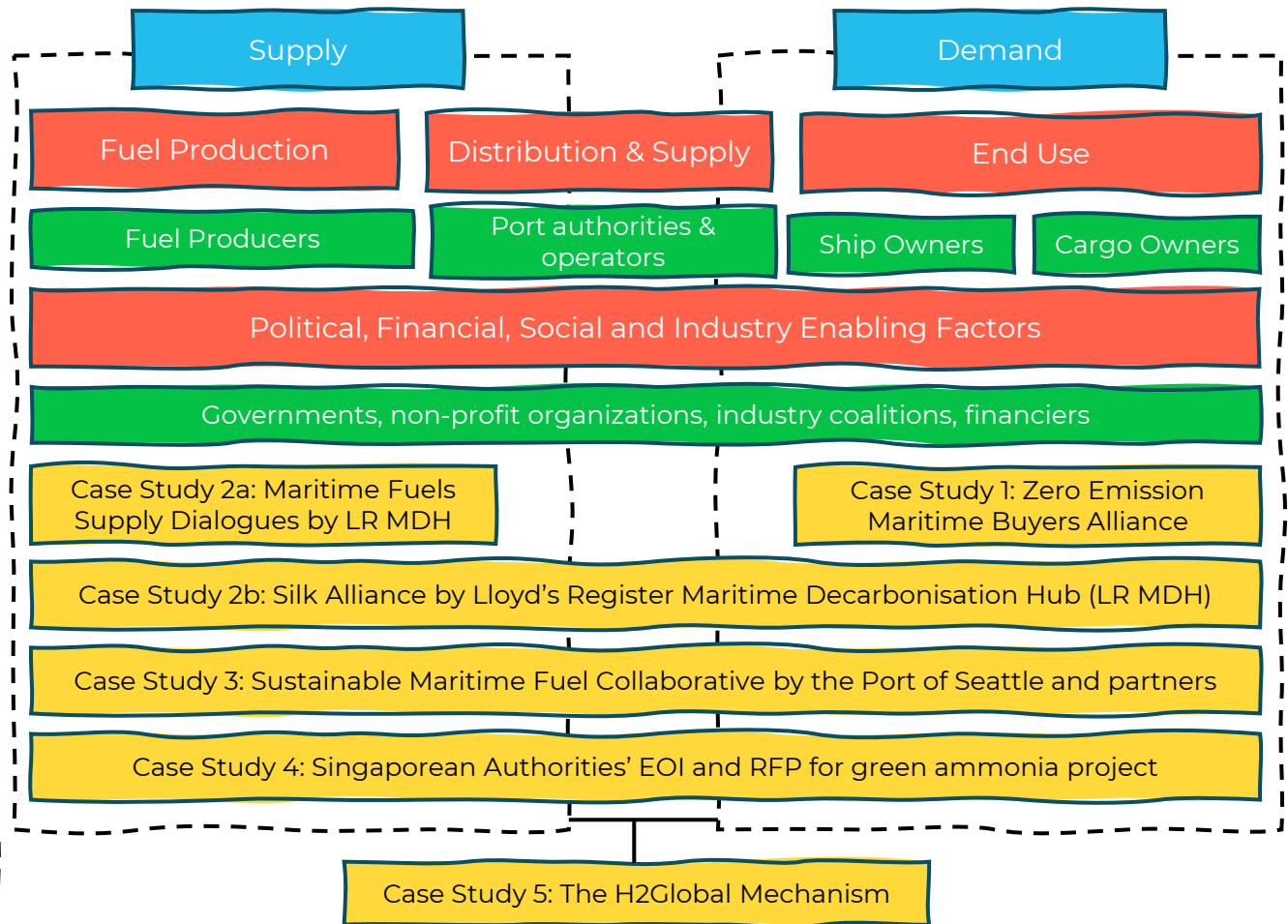
There is no widely accepted 'best' or 'correct' way for effective market transformation for fuels. Diverse strategies are emerging globally across the value chain to accelerate fuel development and adoption. On the demand side, various approaches to aggregate demand for zero-emission fuels have been initiated. Some interviewees praised this adaptive and evolving landscape:

“ Right now, it’s more organic, with projects arising from different ports and regions. It is important that these are developed in different ways so that we can explore different ways of aggregating demand, what works and what does not work.

Interviewee

Six of these global initiatives were explored in detail through five case studies. Each case study examined the origins, motives, stakeholders, structures, current stages, and impact to date of these initiatives. We identified different focus points in each case study to reflect on how BC might integrate or learn from these models.

Figure 2. Focus area of the five case studies and their stakeholder groups along the value chain of zero-emission maritime fuels



Case Study 1: Zero Emission Maritime Buyers Alliance

What is ZEMBA?

Zero Emission Maritime Buyers Alliance (ZEMBA) is a first-of-its-kind buyers' group within the maritime sector that creates a collective demand signal from cargo owners to accelerate commercial deployment of zero-emission shipping solutions.⁷ ZEMBA is an initiative of Cargo Owners for Zero Emission Vessels (coZEV) and facilitated by the Aspen Institute Energy & Environment Program (the Aspen Institute).

In April 2024, it was announced that ZEMBA completed its inaugural collective tender for zero-emission shipping solutions. Over a dozen major cargo owners (including Amazon, Patagonia, Tchibo, and Nike) committed to purchase the environmental attributes associated with over 1 billion twenty-foot equivalent container unit-miles of zero-emission shipping on a route from Singapore to Rotterdam, Netherlands in 2025-2026.⁸ Designing of the second tender is now underway.

Question for further consideration:

- How can sustainability-minded cargo owners based in BC push for zero-emission maritime shipping and reinforce ZEMBA's work?

What skills and knowledge are crucial for running a cargo owner alliance?

Selena Elmer at the Aspen Institute, which serves as the Secretariat for ZEMBA, shared several essential and some unforeseen skills for the success of ZEMBA. For drafting documents such as the membership agreement, tenders, and the winning bid contract, ZEMBA engaged a large law firm with the expertise in antitrust compliance, non-profit governance, confidentiality, procurement law, and corporate governance. Among others, internal and external capacities have also been built for advancing market commitments, voluntary carbon market frameworks, and technical knowledge regarding maritime fuels.

What are the roles of cities and ports for ZEMBA?

Cities and ports also have their roles to reinforce ZEMBA's mission, both directly and indirectly. When the first ZEMBA tender was launched, the Port of Rotterdam announced that they would offer port fee reduction specifically for carriers that offered fuels that met ZEMBA's criteria.⁹

Focus of this case study

- Demand aggregation by cargo owners
- Skills and roles for integrators
- Roles of cities and ports

Selena suggested that municipalities and ports could support ZEMBA's work by advancing clean fuel bunkering infrastructure, doing so in a way that attracts carriers to bunker at these ports, and developing safety protocols associated with these new fuels.

Operating containerships on low- or zero-emission fuels would incur significant operating expenditure for the first mover liners. ZEMBA is designed to help kickstart the market by convening cargo owners who are willing to pay extra for zero-emission shipping services, or a 'green premium.' Even so, it will not be a forever solution to large scale adoption of zero-emission shipping solutions:

“**Ambitious policies are still critical to level the playing field and close the cost gaps between fossil fuels and zero-emission fuels in the long term.**”

Selena Elmer
Assistant Director for Ocean & Climate,
Aspen Institute Energy & Environment Program

Case Study 2: Silk Alliance & Maritime Fuels Supply Dialogues by the Lloyd's Register Maritime Decarbonisation Hub

What is the Silk Alliance?

The Lloyd's Register Maritime Decarbonisation Hub (LR MDH or 'the Hub') is a non-profit organization funded by the Lloyd's Register Foundation and provides valuable information, insights, and knowledge on the transition towards a decarbonized world fleet.¹⁰

In May 2022, LR MDH officially formed the Silk Alliance, a multi-stakeholder partnership exploring the technological, economic, and regulatory feasibility of zero emissions shipping in a fleet that predominantly bunkers in Singapore and operates across the Indian and Pacific Oceans. The Hub developed the concept of a Green Corridor Cluster to emphasize the Silk Alliance's focus on a cluster of ships operating within a specific region.

How is the Silk Alliance structured?

With a diverse membership base, the Silk Alliance is structured with three interlinked workstreams - (1) fleet and fuel demand, (2) fuel supply, and (3) finance. Ahila Karan, Senior Lead on Green Initiatives at LR MDH, credited LR's close connections with industry players as a classification society for the Hub's smooth engagement with members.

“

Finding a partner that could be the glue or the access point to the industry was important for us.

”

Ahila Karan
Senior Lead on Green Initiatives, Lloyd's Register Maritime Decarbonisation Hub

To develop an implementation plan¹¹ for the Green Corridor Cluster, the Hub hosted one-to-one meetings with members to discuss their thoughts on key milestones. As the central repository for that feedback, the Hub then identified and presented the areas of consensus and disagreements at group meetings for further discussions.

Patience is a key for integrators like the Hub, as Ahila shared that the constant feedback loop took the Hub about four months before publishing the Silk Alliance's implementation plan.

Question for further consideration:

- How can stakeholders in BC's maritime industry get together to design an implementation plan for scaling up the supply and demand for zero-emission maritime fuels in BC?

Focus of this case study

- Regional demand & supply aggregation
- Collaborative design
- Skills and roles for integrators

A complementary supply-side regional collaborative

Regarding aggregating the supply and demand for zero-emission fuels, the Hub established the Maritime Fuel Supply Dialogues in April 2024.¹²

“

We identified the opportunity to focus on fuel supply development for shipping at a regional level that could support multiple corridors in the region, including the Silk Alliance.’

”

Through public/private dialogues and collaboration amongst energy and transport sectors across Asia Pacific and Africa, the Maritime Fuel Supply Dialogues aims to aggregate demand across maritime hubs, Green Shipping Corridors and different sectors, and make a business case to stimulate supply.

This initiative focuses on national and regional policy levers and financing mechanisms, as well as identifying potential regional synergies to unlock investments in maritime fuel supply infrastructure.¹³

Case Study 3: Sustainable Maritime Fuels Collaborative in Washington State

Just across the border from BC, a regional collaboration is enabling stakeholders to accelerate the production and use of sustainable maritime fuels and technologies.

Founded by Washington Maritime Blue, Port of Seattle, Consortium for Hydrogen and Renewable E-Fuels (CHARGE) and Northwest Seaport Alliance (NWSA), the Maritime Sustainable Fuels Collaborative aims to engage stakeholders from the supply and demand sides to strategize the production, supply and use of sustainable maritime fuels in Washington State.

The Port of Seattle and founding partners made a public request for USD250,000 in state funding to support the development of the Collaborative.¹⁴ The funding is for contracting with a non-profit entity representing the maritime industry, foundational planning, and organizational capacity building.[#] The non-profit entity is expected to engage various stakeholder groups and publish a strategic framework regarding the production, supply and use of sustainable maritime fuels and deployment of low and zero-emissions vessel technologies in the State.

[#]The early-phase collaborative is supported by the Climate Commitment Act, which is contingent on the ballot in November.

Focus of this case study

- Roles of integrators
- Government support



A legislative report titled '[Green Electrolytic Hydrogen and Renewable Fuels: Recommendations for Deployment in Washington](#)' was released by the Washington State Department of Commerce to shed light on the modelled demand for green hydrogen, and opportunities and challenges to advancing green electrolytic hydrogen and hydrogen-derived fuels within the state.

RMI's '[Advancing Zero-Emission Fuels in Washington's Shipping Sector: Roadmap to 2050](#)' shared insights into feasible pathways for catalyzing deployment of zero-emission shipping fuels by 2030, and fully decarbonizing shipping fuel for ocean going vessels at Washington ports by 2050. The roadmap is informed by a feasibility study of several low-carbon fuels based on their respective emissions reductions, delivered cost, scalability, and technological readiness.

Questions for further consideration:

- Can this series of actions at the Sustainable Maritime Fuel Collaborative be referenced by BC to convene stakeholder groups in the maritime industry and deliver a strategic framework, or even an implementation plan?
- Would it be more effective to form a cross-border Pacific Northwest collaborative to amplify regional impact?
- Who should be involved in cross-border collaboration for accelerating the development of zero-emission maritime fuels?

Case Study 4: Singapore's EOI and RFP for Green Ammonia and Methanol Solutions

Focus of this case study

- Government support
- Regional and cross-sector demand aggregation

Developing local green ammonia solutions

When asked about effective ways to aggregate demand for zero-emission fuels within a region, several interviewees mentioned the Government of Singapore's exemplary efforts to develop local green ammonia solutions and low- or zero-emission fuel bunkering projects.

In December 2022, the Energy Market Authority (EMA) and the Maritime & Port Authority of Singapore (MPA) announced an expression of interest (EOI) to develop an end-to-end low or zero-emission ammonia power generation and bunkering solution in Jurong Island, Singapore. As a concrete reinforcement to Singapore's National Hydrogen Strategy, the EOI recognizes the potential of low- or zero-carbon hydrogen to decarbonize multiple sectors, such as the power, energy, chemicals, maritime and aviation sectors.¹⁵

Following the EOI and an initial round of closed Request for Proposal (RFP) in October 2023, two consortia were shortlisted by EMA and MPA in July 2024 for the next round of evaluation.¹⁶ The end-to-end solution to be developed in Jurong Island will consist of electricity generation from imported low- or zero-carbon ammonia, and ammonia bunkering facilities.

Keeping multi-fuel future on radar

The world's largest bunkering hub is keeping a multi-fuel future on its radar. In December 2023, MPA also issued an EOI to receive proposals for the supply of methanol as a marine bunker fuel in the Port of Singapore.¹⁷ It received a total of 50 submissions from over 60 regional and international companies, consisting of energy companies, fuel suppliers, traders, bunker operators, and storage companies.¹⁸ In aggregate, the submissions have the potential to supply over one million tonnes per annum of low-carbon methanol by 2030.¹⁹

Questions for further consideration:

- What are the existing and potential demand for zero-emission fuel in BC's sectors, e.g., power generation, maritime, heavy industry, and trucking within 20 years?
- How can we coordinate the demand aggregation from multiple industries for zero-emission fuels?

Focus of this case study

- Government support
- Financial mechanism for offtake agreements

Case Study 5: The H2Global Mechanism

How does the double-auction mechanism work?

The discrepancy between fuel producers' and potential offtakers' expectations regarding fuel volume, timeframe, and pricing makes it challenging to finalize offtake agreements. The H2Global mechanism is pioneering a double-auction mechanism to address the challenges faced by both fuel producers and offtakers, ultimately to accelerate the creation of a renewable hydrogen market.

Hintco, the implementing entity of the H2Global instrument, is expected to ink long-term hydrogen purchase agreements with fuel producers via a competition-based procurement process, then sell the fuel products to offtakers who want short-term offtake agreements through auctions.^{20, 21} The price difference is offset by public funding - the Federal Ministry for Economic Affairs and Climate Action of the German Government is the first adopter of the H2Global instrument - but Hintco is open for funding from other states.²²

Figure 3. Flowchart of the H2Global Mechanism²⁰



Hydrogen trade partnership between Canada and Germany

A Memorandum of Understanding (MOU) was signed between the governments of Canada and Germany to establish a Bilateral Window for commercial transactions between Atlantic Canada's hydrogen producers and Germany's industrial manufacturing and energy distribution sectors.²³ The federal Canadian government will commit a funding of up to \$300 million, which will be allocated via the H2Global mechanism to support clean hydrogen trade with Germany.²⁴ The exact production pathway(s) of hydrogen, whether it is green, blue, or otherwise, is yet to be specified publicly by Canadian suppliers.

“**The H2Global instrument ticks several boxes - long-term secure contracts backed by a government for fuel producers, and subsidies and smaller-scale supply for end users.**”

Joe Boyland
Project Manager, Global Maritime Forum



The webinar titled '[H2Global pilot auction results explained](#)' in which the CEO of Hintco GmbH and co-creator of H2Global shared the results of the first H2Global pilot auction.

Questions for further consideration:

- How can the West Coast of Canada, specifically BC, leverage the H2Global mechanism to tackle the chicken-or-egg problem we are facing?
- What financial mechanisms are in place for incentivizing the zero-emission fuel transition for the maritime industry?

3. APPLYING A BC LENS

We presented local stakeholders in BC with an overview of these case studies, and the insights and lessons learned during our interviews. We invited local leaders to then share their perspectives, with a focus on BC and to answer the questions:

What forms of collaboration would effectively create a clear demand signal for zero-emission maritime fuels in BC?

What are the considerations when selecting which collaboration models to adopt?

The BC context in a nutshell:

- Mixed perspectives on the role of BC in the global maritime fuel supply chain
- The need to include maritime industry in fuel transition policymaking
- How to create a favourable investment environment in relation to the US
- Engaging first-mover shipping segments and clusters
- Ensuring sufficient supply of renewable electricity
- Aggregating fuel demand across sectors
- Opportunities within the Pacific Northwest

Mixed Perspectives on the Roles of BC in the Global maritime fuel Supply Chain

On BC's potential and realistic position in the zero-emission maritime fuel transition, and future role in international trading of these fuels, mixed perspectives from the local interviewees were observed:

“

Vancouver might be a fast follower rather than a first mover with respect to zero-emission fuels, considering it is not a major bunkering or production hub.

”

“

Washington State's recent legislative report²⁵ indicates that its own supply of green hydrogen will not meet expected demand in the short term, meaning that BC has the potential to export green hydrogen within the Pacific Northwest region.

”

“

Some hydrogen projects in BC are working with companies in countries in Asia-Pacific, which are ready to pay for hydrogen faster than the current local demand in BC would.

”

“

Canada currently does not have the ability to create infrastructure quickly enough to be a global exporter of green hydrogen.

”

Call to action

Further studies to attest these mixed perspectives, identify roles that different BC stakeholders could play in domestic and international transition to zero-emission maritime fuels, and have BC government take up the corresponding political leadership.

Securing Maritime Industry's Seat in Fuel Transition Policymaking

While ambitious progress of hydrogen projects is observed in sectors such as trucking, notably, neither the federal nor the provincial hydrogen strategies extensively address the application of green hydrogen and hydrogen-derived fuels in the maritime industry in Canada or BC, respectively.



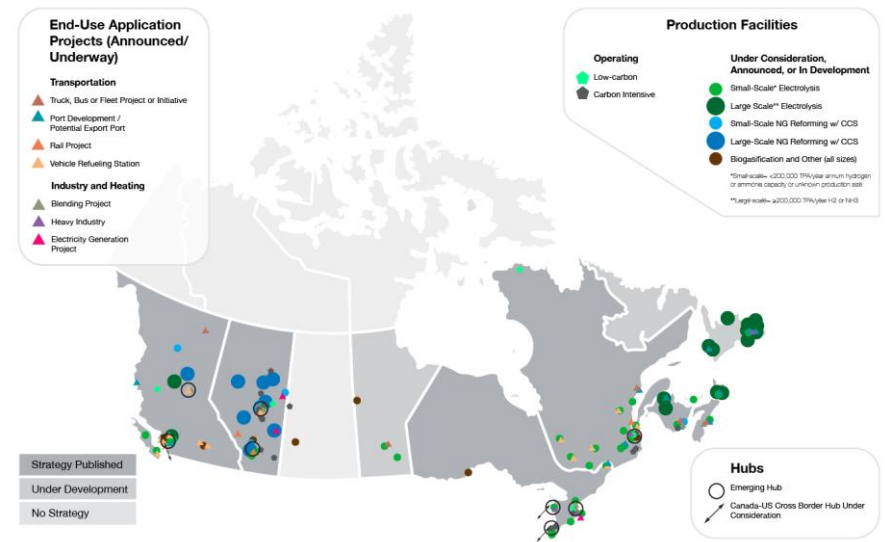
BC's Low Carbon Fuel Standard, brought up by several interviewees as one existing policy for low-carbon fuel transition, is not covering the maritime sector at the moment.

This leaves plenty of room for both levels of governments to enhance their policy toolkits with a unified and strategic approach that incorporates the urgent need to decarbonize maritime supply chains as part of the whole economy.

Call to action

- The federal and provincial governments should enhance their policy toolkits by incorporating the urgent need to decarbonize maritime supply chains as part of the whole economy.
- The provincial government should ensure BC stays competitive with the US investment landscape and facilitate local zero-emission fuel production projects to reach final investment decision (FID).

Figure 4. Summary map: Hydrogen developments in Canada since 2020 – Production, end-use, hubs and strategies²⁶



Creating a Favourable Investment Environment

Local stakeholders shared about financial mechanisms and support available within Canada and BC for low- or zero-emission projects, including: the \$15 billion Canada Growth Fund created by the federal Ministry of Finance²⁷; its carbon policy contracts for difference²⁸; and funding from the B.C. Centre for Innovation and Clean Energy (CICE) for BC-made clean energy solutions.

With the significant funding from the Inflation Reduction Act and Bipartisan Infrastructure Law, the US creates a large gravitation pull on clean development projects and capital towards itself. Several interviewees highlighted the need for BC to stay competitive with the US investment landscape and facilitate zero-emission fuel production projects to reach final investment decision (FID) within the province.

First-mover Shipping Segments and Clusters to Kickstart Zero-Emission Fuel Transition

Despite the complexities and nuances within the industry, the transition to zero-emission maritime fuels must start somewhere. Some interviewees highlighted **Green Shipping Corridors (GSCs), cruises, and ferries** as actors that have the potential to kickstart and lead the broader maritime fuel transition in BC.

The North Pacific Green Corridor Consortium and the Pacific Northwest to Alaska Green Corridor are two GSCs making progress in which BC's ports are involved.

The more predictable port call schedules and higher bunkering demand in BC make cruises and ferries more suitable for early adoption compared to shipping segments involved in international trade, such as containerhips and dry bulk carriers.

“ **Realistically, cruises and ferries do have significant and reliable bunkering demand for a finite number of vessels, ... because the cruise ships operate throughout the summer and need to bunker pretty much every time they come to Vancouver or Seattle. Given the dynamic of not being a major international bunkering hub, this could be a logical place for people to be focusing on locally.** ”

Robin Silvester
Former CEO, Vancouver Fraser Port Authority

	The North Pacific Green Corridor Consortium ²⁹	The Pacific Northwest to Alaska Green Corridor ³⁰
Shipping segment	Dry bulk	Cruise
Trade routes	Between Canada, Japan, and South Korea	Between Washington, BC, and Alaska
Partners	<ul style="list-style-type: none"> • Bulk commodity producers • Marine vessel owners and operators • Railway and intermodal transportation provider • Terminal operator • Port authorities 	<ul style="list-style-type: none"> • Cruise owners and operators • Municipality and city governments • Port and harbour authorities • Industry and not-for-profit organizations
Progress to date based on public information	The consortium was announced in April 2024 and is expected to have more updates at a later stage.	A feasibility study is underway to explore the potential for four green methanol ships in the corridor alongside other technical considerations. ³¹

Call to action

A coordinated industry collaboration should identify the existing and potential first movers of the fuel transition in BC, facilitate their delivery of first mover actions, and foster knowledge sharing with other industry players to learn from and kickstart their own transition.

Ensuring Sufficient Renewable Electricity regardless of the Multi-fuel Uncertainty

Some local stakeholders suggested that increasing renewable electricity capacity could be a practical and low-risk step for BC to take, given the uncertainty surrounding future maritime fuel choices. Interviewees referenced the recent Call for Power³² by BC Hydro as a 'no regret' move for BC to acquire cost-effective renewable electricity resources.

Plans to boost renewable electricity capacity, or future Calls for Power, should be informed by projections of electricity demand by present and emerging zero-emission fuel production projects in BC.

Energy should be allocated in a coordinated manner across several industry sectors, considering:

- the intermittency issue of renewable energy sources;
- the fluctuating demands of various energy consumers, and
- the critical role ports and shipping play in the region's economy and supply chain.

Cross-Sector Fuel Demand Aggregation

Some interviewees mentioned the opportunity for industry sectors to aggregate demand and sign joint offtake agreements for zero-emission fuels, which would provide more certainty to fuel producers and enhance the bankability of their projects.

“**Different from fossil fuels that the maritime shipping sector is currently consuming, consumption of these zero-emission fuel options will involve competition with other industries. On the flip of a coin, it can be considered as a chance for the maritime industry to aggregate demand with other industries to sign offtake agreements.**”

Interviewee

“**Globally the bigger ammonia projects are looking for three offtakers, ideally across different sectors, and covering the majority of the production.**”

Joe Boyland
Project Manager, Global Maritime Forum

As of the time of writing, the author is not aware of cross-industry collaboration or demand aggregation involving the maritime industry in BC.

Call to action

- BC Hydro's plans to increase renewable electricity capacity, or future Calls for Power, should be informed by projections of electricity demand by present and emerging zero-emission fuel production projects in BC.
- The provincial government should explore the potential of aggregating the demand for zero-emission maritime fuels with other ambitious industries to ink joint offtake agreements.

Opportunities within the Pacific Northwest

Several interviewees mentioned cross-border collaboration in the Pacific Northwest (PNW) for zero-emission maritime fuels, based on two premises: (1) climate change transcends borders, (2) long-standing collaborations in PNW, such as the Northwest Ports Clean Air Strategy, which can serve as precedents.

A cross-border hydrogen analysis project was announced in July 2024 by the Pacific NorthWest Economic Region (PNWER), the BC Ministry of Energy, Mines and Low Carbon Innovation's Clean Energy Major Projects Office (CEMPO), and the Washington State Department of Commerce.³³ The study aims to identify cross-border linkages and opportunities for collaboration between BC and Washington State to develop the hydrogen economy, along with associated infrastructure and investment opportunities.

The author and C40 project mentor attended a roundtable discussion about the potential to scale the regional hydrogen industry at the 33rd PNWER Annual Summit. Some key observations were:

- Some attendees echoed views expressed by interviewees in this study, specifically on the lack of a clear demand signal for zero-emission fuels in the market.
- Some stressed the importance of active engagement with Indigenous communities both in Canada and the US
- The maritime industry received less attention compared to other sectors, such as trucking, even though green hydrogen could be a feedstock for producing green ammonia and methanol as future maritime fuels (refer to APPENDIX I: REPORT METHODOLOGY for details about different fuels' production pathways).



['Advancing Zero-Emission Fuels in Washington's Shipping Sector: Roadmap to 2050'](#)

by RMI highlights feasible strategies for accelerating the adoption of zero-emission shipping fuels by 2030, and completely decarbonizing fuel for ocean-going vessels at Washington ports by 2050. Some of the key findings and policy recommendations include:

- High production costs of e-fuels in Washington indicate that substantial demand should be met by out-of-state imports.
- Significant increases in renewable capacity deployment and transmissions in the PNW region are necessary for local electrolytic production to meet Washington's fuel demand.
- Certain approval timeline for zero-emission fuels to generate credits should be sped up in Washington's Clean Fuel Standard.
- Incentive(s) should be in place to close the final cost gap between fossil and zero-emission maritime fuels, possibly in the form a tax credit for fuel offtakers, a sales and use tax incentive, or a contract-for-difference mechanism.
- Port transition planning and implementation should be facilitated by enhancing permitting and regulatory processes for new infrastructure, investing in workforce training and upskilling, and leveraging federal funding to offset the associated initial costs.

Call to action

The provincial government, and BC's maritime industry itself, should leverage the current collaboration platforms within the PNW region and look for ways to accelerate the production, logistics, and adoption of zero-emission fuels in a cost-effective, inclusive, and collaborative manner.

4. RECOMMENDATIONS

The interviews with local stakeholders demonstrate that:

- The transition to a zero-emission maritime industry requires a **multi-faceted and multi-stakeholder approach** with interventions spanning the entire value chain.
- Significant **information gaps** need to be addressed to make informed decisions and devise effective strategies to accelerate BC's maritime sector's transition to zero-emission fuels.
- The role of an **integrator** is crucial for:
 - Steering the direction and progress of collaborations
 - Resolving disagreements and facilitating consensus among stakeholder groups
 - Creating a mechanism to address anti-trust issues and facilitating the sharing and aggregation of sensitive or competitive data,

Although international trade falls under the federal jurisdiction of Transport Canada, the provincial government, specifically the Ministries whose mandates pertain to developing a net-zero economy, must also urgently support the transition to zero-emission maritime fuels.

[Appendix II](#) outlines some BC ministries and the specific aspects of their mandates that indicate the relevance of this report to them.


This chapter builds on insights from the previous chapters and recommends actions for the short, medium and long terms.

Each set of recommendations corresponds to the potential role that BC could play in the domestic and global transition to zero-emission maritime fuels, namely:

- Consumer
- Producer
- Bunkering hub
- Importer
- Exporter

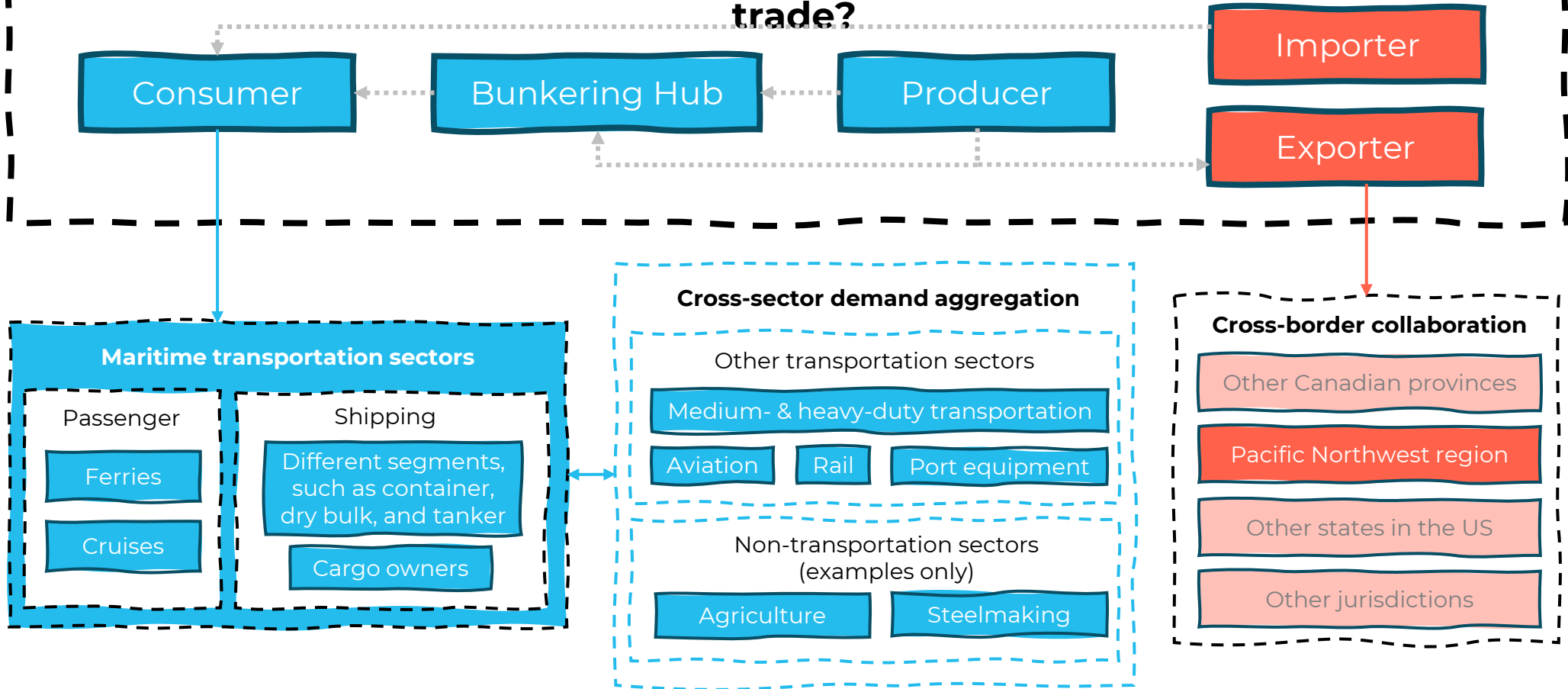
The stakeholder groups that are suggested to execute the recommendations are specified, and relevant sections in this reports are included for readers' reference.

The final section discusses the significance of integrators in the suggested collaborative, with the skillsets identified by the interviewees to be crucial.

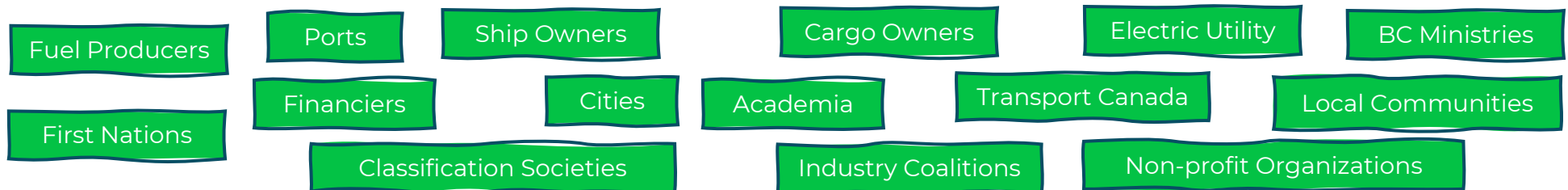


Turn to next page for a graphic overview of the recommendations

What could be the roles of BC in zero-emission maritime fuel adoption & trade?



What are some actions for these stakeholder groups in short, medium, and long terms?



BC as Consumer: Stimulate and aggregate demand for zero-emission maritime fuels at regional and cross-sectoral dimensions to offer risk diversification and demand certainty to fuel producers and their financiers.

Short term

A collaborative should be established to convene **BC's maritime stakeholders** and specifically address the adoption of zero-emission maritime fuels.

BC Government should contract an organization to facilitate such collaborative with several working groups, including but not limited to:

- A Fuel Offtaker working group that consists of **ship owners** with relatively stable bunkering demand in BC (e.g., **cruiases, ferries**) and regional first movers (e.g., **participants of the two GSCs**).
- A Cargo Owner working group that gathers **BC-based cargo owners** with substantial inbound and outbound cargo volumes to support and join ZEMBA's future tenders to reinforce buyers' demand signal for zero-emission shipping solutions.

[Case Study 1 & Case Study 3](#)
First-mover Shipping Segments and Clusters to Kickstart Zero-Emission Fuel Transition

Medium term

The collaborative and its members should demonstrate clearer demand signal for zero-emission maritime by:

- Mapping out regional zero-emission fuel demand projections by **academia, classification societies, non-profits, industry strategic alliances, and ship owners** themselves to facilitate knowledge exchange.
- Providing technical assistance to any **ship owners in the Fuel Offtaker working group** that have yet to conduct fuel demand analysis, which should cover:
 - Fuel types under consideration.
 - Desired volumes over timeframes.
 - Logistic plans for fuel delivery.
 - Willingness-to-pay for zero-emission fuels.
 - Requirements of environmental attributes.

The Fuel Offtaker working group should be expanded to include potential **fuel offtakers from other shipping segments e.g., containers, bulk, tanker**, with learnings from the pilot engagement.

[Case Study 2](#)

BC's policy makers should further incorporate the maritime sector into existing policy instruments for zero-emission fuel transition and hydrogen strategies, such as the [Low Carbon Fuel Standard](#).

[Securing Maritime Industry's Seat in Fuel Transition Policymaking](#)

Long term

The collaborative's members should identify points of intersections between the value chain of their preferred zero-emission maritime fuel(s) and those of **other transportation and non-transportation sectors**, to explore room of amplifying demand volumes.

Relevant BC Ministries should facilitate these dialogues, such as by hosting cross-sector economic roundtables, accordingly.

[Cross-Sector Fuel Demand Aggregation](#)

Relevant BC Ministries should support the release of requests for proposals (RFPs) **to international, domestic and regional zero-emission fuel suppliers**, informed by the technical analysis results, to send regional cross-sector demand signal for zero-emission fuels.

[Case Study 4](#)

Legend

Actions

Stakeholders involved

Relevant Content in this Report

BC as Bunkering Hub: Explore the feasibility of BC ports transforming into bunkering hubs for zero-emission maritime fuels.

Short term

Medium term

Long term

Relevant BC Ministries, cities and port authorities should ensure inclusive stakeholder consultation with the **local communities and First Nations** for all analyses that explore the construction of new bunkering facilities and modification of existing facilities at ports and the hinterlands for zero-emission maritime fuel transition.

The collaborative mentioned in the previous page should establish a Fuel Bunkering working group that:

- Convenes **academic researchers, classification societies, non-profit maritime organizations, Port of Vancouver, Port of Prince Rupert, relevant BC Ministries, and Green Shipping Corridor partners** that have jointly or separately been working on feasibility studies on developing zero-emission fuel bunkering hubs in BC ports.
- Creates knowledge exchange and mobilization between various studies.

[Case Study 2](#)

The **Fuel Bunkering working group** might take reference from existing publications on port archetypes and conduct technical analyses that investigate:

- The demand for bunkering zero-emission fuels and the fuel types, by working with members of the **Fuel Offtaker working group**.
- Whether fuel supply can be secured domestically or from other countries at a competitive price.
- What infrastructure would be needed for the bunkering the preferred fuel type(s) accordingly.
- The costs and benefits for constructing the corresponding bunkering facilities, including engaging financiers such as the Canada Infrastructure Bank.
- The implications **on other transportation systems connected to ports, such as rails, trucking, and cargo-handling activities within the ports**.

[Case Study 2](#) [Mixed Perspectives on Roles of BC in the Global maritime fuel Supply Chain](#)

Relevant BC Ministries should take into account the bunkering demand, informed by previous analyses, in the release of requests for proposals (RFPs) to **international, domestic and regional zero-emission fuel suppliers** to amplify the regional demand signal for zero-emission fuels and ensure sufficient supply will be available for the maritime sector.

[Case Study 4](#) [Securing Maritime Industry's Seat in Fuel Transition Policymaking](#)

Legend

Actions

Stakeholders involved

Relevant Content in this Report

BC as Producer: Create a favourable and competitive environment for BC-based zero-emission fuel projects to reach final investment decisions and add clarity to domestic consumption and/or export of BC-produced fuels.

Short term

The Clean Energy and Major Projects Office (CEMPO) and relevant offices of BC Ministries should:

- Channel the network of **regional zero-emission fuel producers** and maintain a repository of all fuel production projects in BC.
- Connect fuel suppliers with **fuel offtakers** from the collaborative via industry conferences and roundtable discussions to create clarity on BC's demand for zero-emission maritime fuels.

[Case Study 2](#)

Medium term

Relevant BC Ministries should investigate, either by itself or by contracting a consultant:

- Electricity requirements by existing and emerging zero-emission fuel production projects in BC, then share the insights with **electric utility e.g., BC Hydro**.
- **Regional fuel producers'** and **financiers'** gaps and pricing expectations to reach offtake agreements.
- Financial mechanisms that could not only de-risk investments for producers and financiers, but also create a competitive investment environment related to that in the US and other jurisdictions.

[Ensuring Sufficient Renewable Electricity to Navigate the Multi-fuel Uncertainty](#)
[Creating a Favourable Investment Environment](#)

Under the guidance of **the federal and provincial governments, the fuel supplier network** should explore its potential to export fuels and leverage existing levers for trading low- or zero-emission fuels internationally.

[Case Study 2](#) & [Case Study 5](#)

Long term

BC's electric utility, BC Hydro, should factor in the expected energy demand from zero-emission fuel production projects as it tries to generate and secure clean power for BC's future energy demand, possibly via additional Calls for Power.

[Ensuring Sufficient Renewable Electricity to Navigate the Multi-fuel Uncertainty](#)

When more information regarding local and international fuel offtakers' demand volumes, fuel producers' supply volumes, and their respective pricing expectations are available from previous technical studies, **relevant BC Ministries** should look into the potential of double-auction mechanism and other financial mechanisms that could facilitate the inking of zero-emission fuel offtake agreements between **BC's fuel producers** and **local and/or international offtakers**.

[Case Study 5](#)

Legend

Actions

Stakeholders involved

Relevant Content in this Report

BC as PNW Member: Leverage the Pacific Northwest network to accelerate offtake of zero-emission maritime fuels across the Canada-US border.

Short term

The **maritime collaborative** should maintain close connections with collaboratives across the border in the PNW, for example, **the Sustainable Maritime Fuel Collaborative in Washington State**, for knowledge exchange and exploring room for collaboration.

[Case Study 3](#)

Relevant BC Ministries should ensure there is sufficient representation from the maritime industry and the **surrounding local communities** in PNW's wider discussions and coalitions about the net-zero fuel transition.

For example, this could be done by inviting the **maritime collaborative** and its members, as well as other maritime stakeholders to join the cross-border hydrogen industry analysis by **Pacific NorthWest Economic Region (PNWER), CEMPO, and the Washington State Department of Commerce.**

[Opportunities within the PNW](#)

Medium to long term

Relevant BC Ministries, the Clean Energy and Major Projects Office, and/or an organization that they contract, should foster joint analyses within the PNW that:

- Grapple with the potential demand and supply for zero-emission maritime fuels in the PNW.
- Investigate the production capacity of zero-emission fuels and their feedstocks in BC and other parts of the PNW.
- Explore the costs and benefits of exporting fuels across the border.
- Identify funding opportunities and financial mechanisms for exporting zero-emission fuels domestically and across the border.

[Opportunities within the PNW](#)

Legend

Actions

Stakeholders involved

Relevant Content in this Report

Collaborative Leadership for BC's Maritime Sector

From the recommendations in the previous pages, a maritime industry collaborative is suggested to have several working groups, respectively focusing on fuel offtakers, cargo owners, fuel bunkering, and engagement within the Pacific Northwest region.

For the recommendations to proceed, one of the first steps would be to identify an organization or alliance that has the capacity and capability to deliver an integrator role.

Across the five case studies and other initiatives, integrators are typically government agencies, academic institutions, industry associations or not-for-profit organizations with a specific sectoral focus. We asked interviewees about the essential skills and traits required for those convening the sector.

Soft Skills & Traits	Hard Skills & Areas of expertise
System-thinking that covers the wider transportation and energy nexus	Hydrogen and maritime fuel-related technical knowledge
Enormous amount of patience	Carbon accounting
Anchored regional interest	Knowledge of advance market commitments
Strong connections with the industry and senior executives	Antitrust compliance and confidentiality
Someone the industry will be comfortable talking to	Corporate governance



The [Vancouver Maritime Centre for Climate \(VMCC\)](#) is an industry-led non-profit dedicated to accelerating the transition to a zero-emission shipping industry in British Columbia.

With members including the Ministry of Transportation and Infrastructure, BC Ferries, port authorities, terminal operators, fuel suppliers, engineering companies, classification societies, industry associations and non-profit organizations, VMCC houses a great industry network with diverse technical skillsets and anchored regional interest in BC and Vancouver. The Centre consists of five working groups:

- Research & Development
- Policy & Regulation
- Pilot Programs & Commercialization
- Green Financing
- VMCC

VMCC has been hosting the GreenShip Conference since 2022, focusing exclusively on maritime shipping and transportation decarbonization.

It also connects industry stakeholders with technology innovators, funds and promotes technology commercialization via initiatives like the Operation Flagship.

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APPENDIX I: REPORT METHODOLOGY

Scope of Work

This study addressed the question of 'How' (e.g., how can BC find out its suitable zero-emission fuel options?) rather than "What" (e.g., what is the fuel option suitable for BC?). The following questions are addressed by other previous studies and were outside the scope of work for this project.

- What are the advantages and disadvantages of zero-emission maritime fuel options?
- Which zero-emission maritime fuel options should BC go for?
- How much might be the aggregated demand volume for these options?

Definition of net-zero GHG emissions maritime fuels

In this report, net-zero GHG emissions maritime fuels (or "zero-emission maritime fuels") refer to fuels that could achieve net-zero GHG well-to-wake emissions. Well-to-wake refers to a fuel's lifecycle encompassing these stages:

- Feedstock and/or energy production
- Production
- Distribution, storage, and bunkering
- Onboard storage and use.

Achieving net-zero GHG well-to-wake emissions would mean that no additional GHGs are emitted throughout the lifecycle of a fuel. The production pathways and sources of feedstocks for a fuel could significantly affect the GHG intensities of potential zero-emission fuel options.

Hydrogen has the potential to be both a zero-emission maritime fuel, as well as a feedstock for other maritime fuels, such as ammonia and methanol. It also plays a central role in the decarbonization pathways of many transportation and non-transportation sectors, such as medium and heavy-duty transportation, electricity generation, heavy industry, and the agricultural sector which has increasing demand for green ammonia produced from green hydrogen, as a fertilizer.

For this report, green hydrogen, green methanol, and green ammonia are considered as zero-emission maritime fuels, while other fuel types may also account for the fuel mix in a net-zero scenario.

Regarding the Adoption of Liquefied Natural Gas (LNG)

This study does not cover interventions or policies related to LNG, mainly for two reasons:

1. This study focuses on nascent zero-emission maritime fuels that require transformative industry collaboration and interventions to overcome barriers and achieve scalability. Meanwhile, LNG is already deployed in Canada and BC as a marine shipping fuel with companies, such as BC Ferries and Seaspan which commission and operate LNG-powered or LNG-compatible ferries and vessels.
2. On a well-to-wake basis, studies have suggested that LNG as a maritime fuel does not pave the way for a Paris Agreement-aligned future i.e., net-zero GHG emissions by 2050.



C40's '[Zero-Emission Fuels 101](#)' webinar offers an overview of major zero-emission maritime fuel types.

The '[Canadian Green Shipping Corridors Preliminary Assessment](#)' report by Oceans North and Arup also outlines the feedstock and production pathways of zero-emission maritime fuel types, as well as the technical details on LNG and its lifecycle GHG emission profile

Methods

This project was divided into two parts:

1. A global jurisdictional scan of initiatives catalyzing the adoption of zero-emission fuels at commercial scale.
2. An exploratory analysis in the context of British Columbia.

Specifically, the global jurisdictional scan covered Initiatives that:

- were established with the primary objective of accelerating the production and/or adoption of low- or zero-emission fuels in one or multiple sector(s) at commercial scale, and
- emphasize multi-stakeholder engagement instead of bilateral offtake agreements between fuel suppliers and offtakers.

A total of 13 semi-structured interviews were conducted with maritime industry professionals from public, private, and non-governmental organizations. A list of interviewees can be found in [Acknowledgements](#).

	Global jurisdictional scan	BC exploratory analysis
Purposes	<ul style="list-style-type: none"> • To understand the current global landscape of low- or zero-emission fuel initiatives from the maritime and other sectors such as aviation and trucking. • To identify some representatives of low- or zero-emission fuel initiatives at various points of the maritime value chain, and investigate their rationales, structures, challenges, and enablers. 	<ul style="list-style-type: none"> • To evaluate the applicability of global initiatives' designs to BC's maritime industry. • To outline the actionable next steps for key stakeholder groups to catalyze BC's transition to zero-emission maritime fuel adoption.
Research methods	<ul style="list-style-type: none"> • Review of industry and government publications, which are mostly cited in this report. • Desktop research of global initiatives. • Semi-structured interviews 	
Number of interviews	Seven	Six
Interview focus	<ul style="list-style-type: none"> • The considerations made when designing and operating the discussed global initiatives. • Levers for demand aggregation for zero-emission maritime fuels. • Traits and skills for integrators of the discussed initiatives. 	<ul style="list-style-type: none"> • Current efforts, resource availability, and challenges of BC's adoption of zero-emission maritime fuels. • Roles of BC in the global adoption of zero-emission maritime fuels.

Limitations

- Due to the tight project timeline, this study did not address the perspectives of some key stakeholder via interviews. They include but are not limited to fuel offtakers from various shipping segments (e.g., barges, cruise lines and ferry operators), electric utility BC Hydro, zero-emission fuel producers, and most of the BC Ministries mentioned in [Appendix II - Excerpts of Relevant BC Ministries and Mandates](#).
- The author approached this study with an external perspective, influenced by her international student status, geographical base in Vancouver, and past ESG working experience in a container shipping line. While the author endeavoured to address this complex issue as comprehensively as possible, there is room for improvement to align the recommendations with BC's political, geographical, social, environmental, and economic circumstances.

APPENDIX II: EXCERPTS OF BC MINISTRIES' MANDATES

Excerpts of Mandate Letters	Excerpts of the Latest Service Plan
<p data-bbox="99 406 902 440">Ministry of Energy, Mines and Low Carbon Innovation^{34, 35}</p> <ul data-bbox="99 457 1088 768" style="list-style-type: none"> • Drive delivery of your ministry's CleanBC Roadmap to 2030 policies and programs on time and on target to help ensure we meet our legislated GHG goals. • Develop and implement a climate-aligned energy framework for B.C. with an overall goal of maximizing our province's production of clean energy to use at home and for export. • Review and identify opportunities to transition fossil fuel subsidies to the clean tech and clean energy sectors. 	<p data-bbox="1111 457 2140 529">Goal 1: An innovative, low carbon energy portfolio that advances CleanBC economic opportunities across all sectors.</p> <p data-bbox="1111 580 2113 652">Objective 1.1: Accelerate efforts to decarbonize B.C.'s energy sectors and usage to support the provincial CleanBC plan.</p> <p data-bbox="1111 703 1324 734">Key Strategies:</p> <ul data-bbox="1111 741 2190 970" style="list-style-type: none"> • Continue to implement the BC Hydrogen Strategy through the BC Hydrogen Office to support the decarbonization of B.C.'s economy and energy systems. • Develop and implement a climate-aligned energy framework for B.C. with an overall goal of maximizing our province's production of clean energy to use at home and for export.
<p data-bbox="99 982 916 1016">Ministry of Environment and Climate Change Strategy^{36, 37}</p> <ul data-bbox="99 1033 1088 1417" style="list-style-type: none"> • Lead our government's implementation of the CleanBC Roadmap to 2030, on time and on target, including legislating an additional target to reach net-zero province-wide by 2050 while continuing to take action to meet B.C.'s 2030, 2040 and 2050 legislated reduction targets. • Ensure new industries fit within the CleanBC Plan, and that they deliver on the CleanBC Roadmap to 2030 commitment that requires new large industrial facilities to submit plans demonstrating how they align with B.C.'s legislated and sectoral targets and how they will achieve net zero emissions by 2050. 	<p data-bbox="1111 1033 1632 1064">Goal 2: A sustainable, clean economy</p> <p data-bbox="1111 1115 2140 1262">Objective 2.1: Implement the CleanBC Roadmap to 2030 to provide a pathway for B.C. to prosper economically while significantly reducing our greenhouse gas pollution to meet our legislated emissions reduction targets.</p>

Excerpts of Mandate Letters	Excerpts of the Latest Service Plan
Ministry of Transportation and Infrastructure ^{38, 39}	
<p>In collaboration with the Minister of Energy, Mines and Low Carbon Innovation, complete the Clean Transportation Action Plan to support shifts to sustainable modes of travel, advance modern transportation systems, and help meet our ambitious greenhouse gas targets for the transportation sector.</p>	<p>Goal 2: British Columbia has a clean, accessible and sustainable transportation network.</p> <p>Objective 2.1: Reduce greenhouse gas emissions across the transportation sector.</p> <p>Key Strategies:</p> <ul style="list-style-type: none"> • Complete development and implement the Clean Transportation Action Plan to reduce greenhouse gas emissions across the transportation network. • Support and pursue innovative policies, programs and projects that support mode shift and reduce emissions.
Ministry of Finance ^{40, 41}	
<ul style="list-style-type: none"> • With support from the Minister of Environment and Climate Change Strategy, chart a path that aligns with the federal carbon price, including measures to support families, small businesses, and industry in BC to make the transition to a clean economy while ensuring no one gets left behind. • Work with the Minister of Jobs, Economic Development and Innovation to advance and support business innovation, exports, and transition across the province. 	<p>Goal 3: B.C. is an inclusive and equitable place to live</p> <p>Objective 3.2: Social, environmental and economic values are reflected in British Columbia's programs, policies and capital projects.</p> <p>Key Strategies:</p> <ul style="list-style-type: none"> • Work with government and crown partners to ensure capital projects consider the following policy objectives: child care space creation, mass timber construction, greenhouse gas emission reduction, climate resilience and work opportunities for apprentices and members of under-represented groups.

Excerpts of Mandate Letters	Excerpts of the Latest Service Plan
Ministry of Jobs, Economic Development and Innovation ^{42, 43}	
<ul style="list-style-type: none"> • Make B.C. a global destination for investment in clean industries by leveraging federal investments, taking steps to attract more new companies, and supporting B.C.-based clean business start-ups. • With support from the Minister of State for Trade, launch and implement the Trade Diversification Strategy that will diversify our trading partners to hedge against global uncertainty and position B.C. businesses on the global stage. 	<p>Goal 1: Capitalize on our strengths, including low-carbon and Environmental, Social and Governance advantages, to build a brand that attracts investment, accelerates exports, and supports business growth in British Columbia</p> <p>Objective 1.1: Assist B.C. businesses to compete globally, taking advantage of trade opportunities in existing and new markets, and attract investment to create resiliency</p> <p>Key Strategies:</p> <ul style="list-style-type: none"> • Develop a clean industrial strategy to catalyze investments in B.C. and improve economic competitiveness, taking important steps to position the province as the place for accelerated clean energy development. • Ensure businesses that are not yet export-ready are supported to become exporters through a modernized and expanded Export Navigator Program • Leverage federal investment dollars by co- investing in projects of strategic importance to B.C. and Canada. <p>Goal 2: Accelerate the innovation economy to catalyze future opportunities in core and emerging sectors to support ongoing economic development in British Columbia</p> <p>Objective 2.2: Grow sectors of emerging opportunity, including agritech, life sciences, manufacturing, maritime industries, and transformative technologies such as artificial intelligence and quantum computing, and position them as drivers of good jobs, revenues, and solutions to food security and climate change</p> <p>Key Strategies:</p> <ul style="list-style-type: none"> • Implement the B.C. Maritime Industries Strategy to support sustainable and innovative industrial marine activities in B.C.