

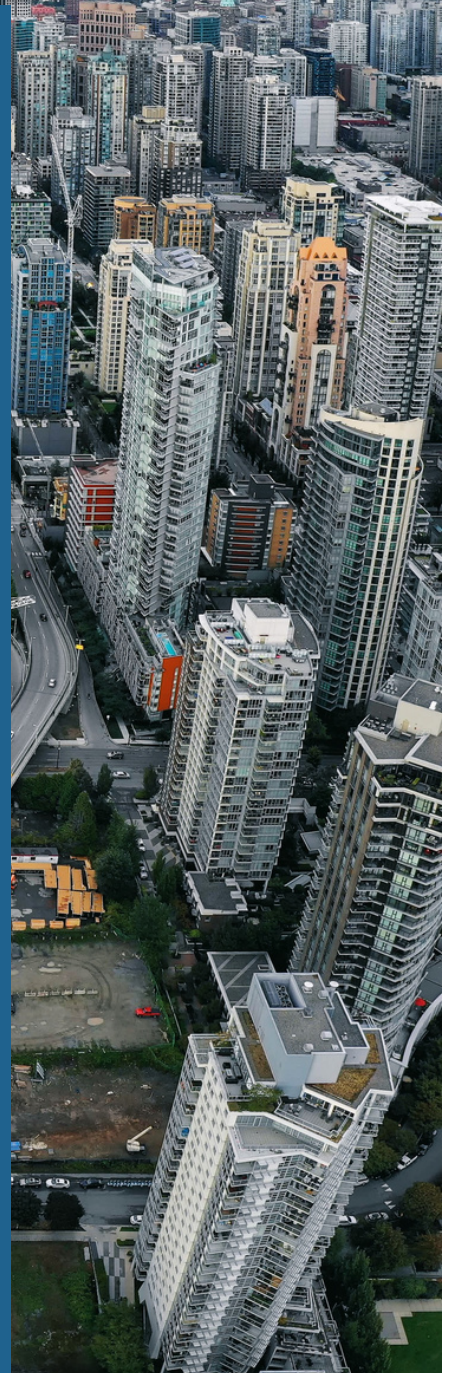


VANCOUVER MARITIME
CENTRE FOR CLIMATE

Green Shipping Strategy



2020-2021





Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

This project was undertaken with the financial support of the Government of Canada through the federal Department of Environment and Climate Change.

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Foreword

The Vancouver Maritime Centre for Climate (VMCC) Green Shipping Strategy sets an ambitious purpose and vision to support the BC maritime industry in reducing greenhouse gas (GHG) and criteria air contaminants (CAC) emissions in line with federal and provincial targets. This collective decarbonization strategy provides a strategy for an optimal road map for emission reductions.



"Addressing decarbonization head on provides a unique opportunity to be a first mover when it comes to climate change. It puts the maritime and shipping transport sector in British Columbia ahead of the curve, giving them a competitive edge as global leaders in reducing the global carbon footprint."

- Elisabeth Charmley, Executive Director, VMCC

The VMCC Green Shipping Strategy is the first of its kind in Canada, developed in response to increasing pressure for the British Columbia (BC) marine and shipping transport industry to decarbonize.

With the ambitious direction set by the Canadian Federal and Provincial BC governments this past year, the release of this strategy is in line with the rising external pressure for industry to drastically reduce emissions. Its focus is to provide clear insight into what key indicators of success look like along the path to decarbonization.

The VMCC Green Shipping Strategy is a first step to guide and coordinate the efforts of the maritime and shipping transport sector in the province of BC to reduce their carbon footprint, and get to zero faster.



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Executive Summary



In anticipation of an increasing demand on the maritime and shipping industry to decarbonize, the VMCC developed the Green Shipping Strategy (GSS) which outlines necessary goals and Implementation Pathways as key indicators of success in collectively guiding the British Columbia maritime and shipping transport sector to reduce GHG and CAC emissions in line with federal and provincial legislation and commitments.

The emissions reductions goals identified as pertinent for industry to achieve are as follows:

- Domestic Shipping Emission Reduction: Elimination of GHG and CAC emissions by 2050 in line with intermediate federal or provincial targets (40% below 2007 levels by 2030, 60% by 2040).¹
- Deep-Sea Shipping Emission Reduction Goal: Decrease deep-sea shipping GHG and CAC emissions in BC waters more rapidly than international frameworks (as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008).²

These strategic goals illustrate what fulfilling provincial and federal targets looks like, and the Implementation Pathways outline how these goals can be reached.

The following Implementation Pathways were identified as key indicators of success to reaching the goals;

1. End-to-End Low-Carbon Intensity Alternative or Renewable Fuel Solutions
2. End-to-End Electric Power (Marine Electrification)
3. Port Operations & Infrastructure
4. Vessel Energy Efficiency
5. Emissions Abatement

The pathways proposed above are predominant emissions reduction pathways in line with focus areas of major regional and global trends.

To realize the Implementation Pathways, four action areas have been identified as pertinent to success,

1. Research & Development
2. Pilot Projects & Commercialization (Operation Flagship)
3. Policy & Regulation
4. Finance & Funding

The urgency of the provincially and federally legislated emissions reduction targets means that efforts should be focused on the mobilization, commercialization, and implementation of existing and emerging clean technologies and alternative fuels. In the longer term, however, current low-emissions solutions are not sufficient to support operational requirements and reach emissions reduction targets. As such, research and development of the next generation of technology solutions and alternative fuels may be necessary.

The Imperative



In December 2015, international negotiations were held in Paris at COP21 through the United Nations Framework Convention on Climate Change to prevent the worst effects of climate change. The resulting Paris Agreement was adopted on December 12, 2015 with the goal of limiting the global average temperature increase well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C. Under this new agreement, each country must determine, plan, and regularly report on the contributions they undertake to mitigate climate change. At COP26 in Glasgow, Canada committed to reduce its GHG's by 40–45 percent from 2005 levels by 2030.

Within the past few years, emissions reductions commitments have been made at multiple levels. The City of Vancouver through its Climate Emergency Action Plan, the Province of BC through its CleanBC plan, and the Government of Canada through its newly announced Emission Reduction Plan, and finally, in 2020 the Port of Vancouver renewed the Northwest Ports Clean Air Strategy. All have created a sense of urgency to address the climate crisis in the near term.

The Province of BC is committed through legislation to reductions of 40% by 2030, 60% by 2040, 80% by 2050 (compared to 2007 levels).¹ The province has also established a reduction target specific to the transportation sector of reducing emissions by 27–32% by 2030 compared to a 2007 baseline.¹

The GHG emissions from heavy freight transport is a substantial, and land and air based Canadian transport industry stakeholders are now subject to government regulation and are incentivized as such to achieve GHG emissions reductions. However, one set of stakeholders currently not subject to stringent regulation is the maritime sector.

As a result, in 2020, the BC marine and shipping transport industry came together to form the Vancouver Maritime Centre for Climate (VMCC), a not-for-profit industry-led organization dedicated to accelerating the transition to a net-zero maritime shipping industry in the province of BC. This work is achieved through cross sector innovation, collaboration and eco-system building governed by the Implementation Pathways outlined in this Green Shipping Strategy (GSS) and actioned through VMCC's Industry Working Groups, technology & commercialization program, Operation Flagship, and regionally, nationally, and internationally based industry partnerships.

The following strategy was developed with funding from Environment and Climate Change Canada (ECCC) to guide and coordinate the efforts of the maritime and shipping transport industry in the province of BC as they work towards meeting provincial and federal emissions reductions targets. It contains the emission reduction goals identified as necessary for industry to achieve provincial and federal targets, five key Implementation Pathways identified by industry as indicators of success in achieving these goals, as well as operational activities to realize the developmental pathways.

The strategy is a living document, revised annually to reflect the needs of industry as they work towards the emissions reductions targets.

Green Shipping Strategy



Purpose

Support the maritime and shipping transport industry in addressing the climate imperative in the province of British Columbia, in line with federal and provincial legislation and commitments.

Mission

Provide a clear path to the desired future state.

Ocean Trade
Passing
through BC
60%^{1,2}

The strategy contains information and guidance on how to achieve the purpose and realize the mission. To do this, three key elements inform the strategy:

- **Goals** are used to define distinct and quantifiable objectives which if achieved, represent a significant contribution to achieving the purpose and the mission.
- **Pathways** are used to define intermediate targets and milestones which give direction to short and mid-term activities.
- **Action Areas** are the tools to achieve the goals. Action areas will include all the intended activities and areas of work. Preferably, short- and mid-term activities will be defined within individual action areas, to achieve intermediate targets on a particular pathway.

This strategy is subject to periodic review. During any revisions, there will be a robust process of member and stakeholder engagement to establish broad 'buy-in' from the full industry.

Emission Reduction Goals



This strategy makes a distinction between domestic and deep-sea maritime activities in BC:

The context, stakeholders, and regulatory pressures for these two scopes are different, as are the pathways available for emissions reduction. Therefore, separate emissions reduction goals have been set for each scope area.



Domestic Shipping

Consists of the local captive fleet, ports, and supporting infrastructure, based in BC waters.

Elimination of GHG and CAC emissions by 2050, in line with intermediate federal or provincial targets (40% below 2007 levels by 2030, 60% by 2040).³

This goal aligns with federal and provincial emission reduction ambitions, as well as the NWPCAS target to phase out emissions by 2050. In the medium term, BC's transportation sector GHG reduction targets would imply targeting a reduction of between 27% and 32% in GHG emissions from 2007 levels by 2030.³



Deep-Sea Shipping

Consists of vessels transiting through local waters for trading purposes, but not based in BC.

Decrease deep-sea shipping GHG and CAC emissions in BC waters more rapidly than international frameworks (as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008).⁴

This goal implies deep-sea GHG emissions will peak as soon as possible, with a >40% reduction in carbon intensity by 2030, and ultimately a greater than 50% reduction from 2008 levels by 2050 (with a 70% reduction in intensity) to exceed the IMO GHG strategy.⁴



Implementation Pathways

While establishing strategic goals illustrates what fulfilling the purpose and mission looks like, the role of the Implementation Pathways in the strategy is to outline how those goals will be reached and are key indicators of success in achieving the goals.

END-TO-END LOW CARBON INTENSITY ALTERNATIVE OR RENEWABLE FUEL SOLUTIONS

#1

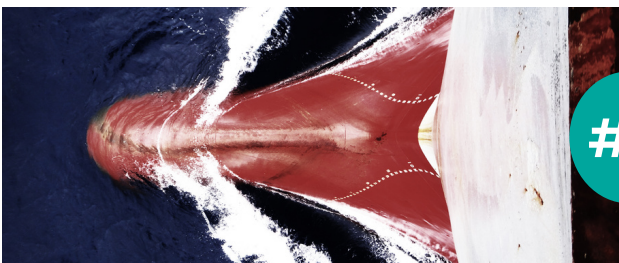
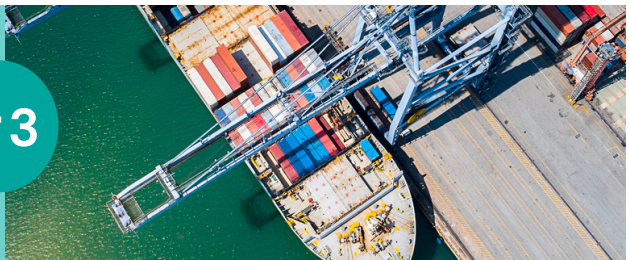


#2

END-TO-END ELECTRIC POWER (MARINE ELECTRIFICATION)

PORT OPERATIONS & INFRASTRUCTURE

#3



#4

VESSEL ENERGY EFFICIENCY

EMISSIONS ABATEMENT

#5



#1



END-TO-END LOW CARBON INTENSITY ALTERNATIVE OR RENEWABLE FUEL SOLUTIONS

Vessel owners are looking for solutions which offer lower carbon intensity or renewable fuels. The overall solution should address:

- a. Provision of a new engine or engine retrofit (if needed).
- b. Supply of fuel within Salish Sea operations (either onboard, bunkering, or jetty).
- c. An analysis demonstrating the fuel availability for the next 30 years.

Routes to implementation include:

- Sustainable fuel supply
- Alternative fuel port and bunkering infrastructure
- Shipboard machinery
- Competence development & operational practices

Key Performance Indicators of Success:

- Short-term
 - Demonstration projects of low-carbon fuel technologies
- Mid-Term
 - Uptake of low-carbon or carbon-neutral fuel bunker volumes available in BC
 - demonstration projects of carbon-neutral fuels
- Long-term
 - Elimination of conventional fuels in the domestic fleet
 - Deep-sea ships bunkering carbon-neutral fuels

#2

END-TO-END ELECTRIC POWER (MARINE ELECTRIFICATION)

Vessel owners are looking for end-to-end solutions which could provide either a full or partial electrification of their operations. The solution proposed will allow the vessel to operate on electric power for:

1. Departures and arrivals/landings (minimum) or full propulsion (desired).
2. All systems required for navigation, automation, etc. covering all on-board activities.
3. Time-sensitive recharge at each end of the travel with a standard design connection.

Hybrid solutions with existing engines and fuel sources are welcome.

Routes to implementation include:

- Clean Energy Supply
- Onshore power infrastructure
- Energy storage and shipboard electrification

END-TO-END ELECTRIC POWER (MARINE ELECTRIFICATION) CONT'D



Key Performance Indicators of Success:

- Short-term
 - Demonstration projects of alternative fuel technologies
- Mid-term
 - Deep-sea port calls utilising onshore power
- Long-term
 - Domestic fleet using electric propulsion

#3

PORT BASED INFRASTRUCTURE & OPERATIONAL EFFICIENCIES

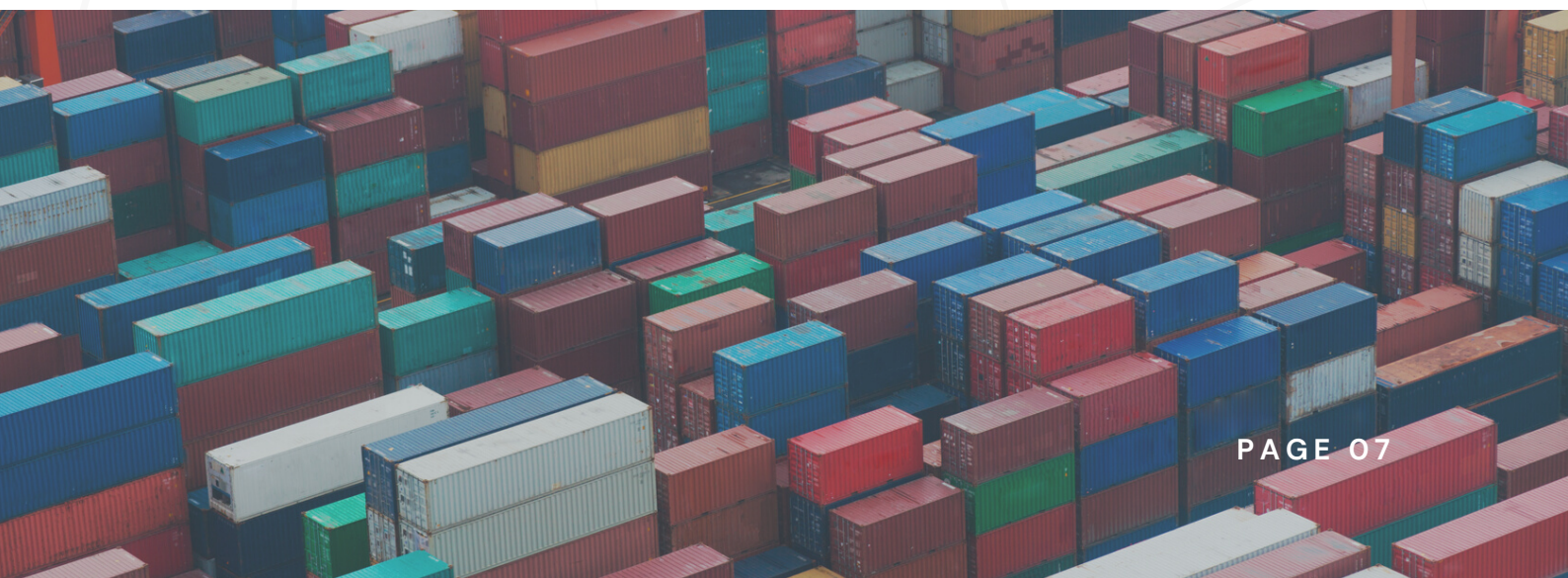
Port and terminal operators are looking for the delivery of optimization of energy use and improved energy efficiency with respect to anchorage of vessels at ports within or serving the Salish Sea. Examples include optimization of vessel replenishment and dispatching within the port and provision of an alternate source of power while anchored. Solutions addressing a multi-port outcome are encouraged.

Routes to implementation include:

- Harbour operations & scheduling
- Zero-emissions port operations
- Port as decarbonization hub

Key Performance Indicators of Success:

- Short-term
 - Zero-emissions harbour and port demonstration projects
- Mid-Term
 - Emissions reduction from cargo handling and port operations
 - Incentives for low emission and low carbon intensity deep-sea port calls
- Long-term
 - Phasing out of emissions from port operations



#4



VESSEL ENERGY EFFICIENCY

Vessel owners are looking for solutions that optimize the performance of existing or new build vessels that are not able to fully convert to zero carbon or low carbon intensity fuels. Areas to be addressed are machinery and equipment, hull form design and propulsion devices, vessel operational efficiency and digitalization.

Routes to implementation include:

- Hydrodynamic optimization
- Hull form & propulsion
- Machinery & equipment
- Vessel operational efficiency and digitalization

Key Performance Indicators of Success:

- Short-term
 - Demonstration projects of energy saving technologies
- Mid-Term
 - Energy saving in domestic fleet
 - Domestic new builds with high energy efficient designs
- Long-term
 - Average carbon intensity of deep-sea port calls < X (target TBD)



#5

EMISSIONS ABATEMENT

Both ocean going and land based marine operators are looking to participate and implement solutions that allow the capture of GHG and CAC emissions.

Routes to implementation include:

- Treatment and capture of GHG and CAC emissions.

Key Performance Indicators of Success:

- Short-term
 - Demonstration projects of of abatement technologies
- Mid-Term
 - Uptake of alternative fuels in the domestic fleet
 - Volume of bunker supply for specific alternative fuels
- Long-term
 - Elimination of convention fuels in the domestic fleet.

Action Areas



The Implementation Pathways along with the suggested targets and milestones, define what the desired outcomes are in the short- to mid-term, however, to realize the Implementation Pathways, four action areas have been identified as pertinent to success.



Research & Development



Pilot Projects & Commercialization



Policy & Regulation



Finance & Funding



Research & Development



RESEARCH & DEVELOPMENT EFFORTS SHOULD FOCUS ON THE VALIDATION AND DEMONSTRATION OF EARLY-STAGE TECHNOLOGY, FUEL AND DESIGN SOLUTIONS, IN ADDITION TO RESEARCH.

#1 – Technology solutions

Technology solutions include novel machinery or energy saving devices for installation onboard. Priority is given to technologies with the potential to address emissions reduction targets while also maintaining operational efficiency.

Examples of possible research areas:

- Next generation battery and fuel cell, charging, and technologies for hybrid and electric propulsion
- Digitalized solutions for operational efficiency including just-in-time arrival technologies
- Shipboard carbon capture and storage solutions
- Advanced and lightweight materials
- Shipboard renewable power & wind propulsion technologies

#2 – Alternative Fuels

In the medium- and long-term, shipping faces a diversity in the fuel mix unprecedented since the turn of the twentieth century. Research and development efforts should focus on enabling 'end-to-end' fuel solutions for the BC maritime industry by addressing technical barriers to the establishment of local supply chains.

Examples of possible research areas:

- Production and supply of alternative fuels in BC (including synthetic or bio-fuels and hydrogen-based solutions)
- Bunkering & storage solutions for alternative fuels
- Transportation alternatives for moving larger volumes of alternative fuels
- Options to increase energy density, such as liquefaction or liquid hydrogen carriers
- Systems based or holistic approaches for enabling utilization of alternative fuels in increasing shore side and vessel applications

#3 – Design Solutions

Incorporating novel technology solutions and alternative fuels will require innovations in vessel design, in addition to incremental efficiency improvement in hydrodynamic and mechanical design.

Examples of possible research areas:

- Vessel concepts demonstrating feasibility of novel technologies
- Alternative fuel ready concepts (including dual-fuel and fuel-flexible designs)
- Designs optimized for new operating and logistics models and increased through-lifecycle utilization



Pilot Projects & Commercialization



THE KEYSTONE TO ACHIEVING THE PURPOSE AND MISSION OF THE STRATEGY WILL BE THE FACILITATION OF PILOT PROGRAMS AND COMMERCIALIZATION OF EMISSIONS REDUCTION SOLUTIONS. THE PRINCIPAL MECHANISM FOR THIS IS RUN BY THE VMCC TECHNOLOGY AND COMMERCIALIZATION PROGRAM, OPERATION FLAGSHIP.

Pilot and commercialization activities separately address three segments of the BC maritime industry:

- Local captive fleet operating within BC
- Ports, terminals and supporting infrastructure in BC
- Deep sea shipping transiting through BC waters for trade.

Demonstration projects are supported where:

- They clearly align with a pathway target or demonstrate emissions reduction solutions within the BC maritime industry.
- Assist in commercializing solutions and help providers to scale their offering to the industry's need.

In order for projects of this nature to be successful, they must be championed on a broader national and global scale, supported with additional partnerships to make implementation successful and ultimately furnished with funding and resource assistance. This will enable projects to broaden to include scaling and commercialization of proven solutions.

Commercialization is supported through:

- Working to add maritime opportunities to the network of entrepreneurial support available in Canada and BC
- Connecting with existing programs that provide support for entrepreneurship such as start-up incubation, acceleration, mentorship, coworking and meeting spaces.
- Exploring the initiation of new incubators and accelerators with an explicit maritime focus
- Pursuing opportunities for export development for proven BC based solutions
- Linking with policy, regulatory and finance action areas to enable scaling of solutions

Operation Flagship

Operation Flagship is at the core of the VMCC's operation and is firmly aligned with the mission to position BC as a global industry leader in addressing the climate imperative within the maritime industry.

The primary purpose of Operation Flagship is to help the maritime industry reduce GHGs by launching various pilot projects in the region. This is achieved by working on behalf of program partners to source innovative and sustainable solutions suited to their operating profile to help them meeting their environmental targets, specifically in regard to GHG emissions in line with provincial and federal legislation targets.



Policy & Regulation



THE DEVELOPMENT OF INDUSTRY-LED POLICY AND REGULATIONS IS KEY TO HELPING ACCELERATE THE COMMERCIAL DEVELOPMENT AND DEPLOYMENT OF LOW TO ZERO-CARBON VESSELS AND ASSOCIATED INFRASTRUCTURE. THE PARTICIPATION OF GOVERNMENT, REGULATORY AGENCIES AND CLASSIFICATION SOCIETIES FOR REMOVING BARRIERS TO THE IMPLEMENTATION OF CLEAN TECHNOLOGIES IS KEY TO MAKING THIS A SUCCESS.

It is suggested that the above mentioned align and drive the development funding and regulatory structures for emission reduction nationally and internationally across all jurisdictions. Examples of potential areas for alignment include;

#1 – Strategic policy alignment

Six key areas for strategic alignment are identified,

- Key stakeholder strategies (such as the Northwest Ports Clean Air Strategy)
- National and provincial strategies for measuring emissions reductions
- National Blue Economy strategy (such as Fisheries and Oceans Canada)
- Common framework for national decarbonization funding across public agencies, R&D entities, community organizations and private industries.
- Engagement with the Pacific Coast Collaborative to raise the priority of maritime issues and initiatives.
- Promotion of decarbonization strategy with major international trade partners.

#2 – Public Sector Spending

Direct public sector spending will play a powerful and important role in seeding and promoting maritime decarbonization, specifically for funding of programs, projects, and cluster operations. Recommended areas for directed funding;

- Creation of new and expansion of existing maritime decarbonization funding programs.
- Operational and project specific funding to regional maritime cluster organizations.
- Mandating emissions reduction in grant selection criteria.
- Green Procurement Policies for Government owned vessels and shoreside infrastructure.
- Application of market-based measures e.g. provincial carbon taxes or port authority incentives/levies to incentivize decarbonization (and as possible source of innovation funding).

Note: Market-based measures (especially if applied to deep sea shipping) would have the potential to impact BC's competitiveness and therefore should be approached in collaboration with regional stakeholders such as the NWPCAS or the Pacific Coast Collaborative Home – Pacific Coast Collaborative.



#3 – Regulatory and Operational Frameworks

As the maritime industry is heavily regulated, decarbonization can be impeded (or at least be perceived to be impeded) by regulatory barriers, particularly for novel technical solutions. To address this, national authorities and international institutions, alongside industry are recommended to work together to create a favourable regulatory environment for technologies being targeted for commercialization, as well as sharing of operational good practices for promoting and assisting the uptake of technology within the industry.

- Industry-led development of class and statutory rules for new technologies or for addressing specific technical barriers to their uptake
- Good practice guidelines for implementation of emissions reducing measures
- Competence standards and mariner training programs for novel solutions

#4 – Emissions Monitoring and Reporting

A key component to measuring progress towards the goals of the strategy will be emissions monitoring and reporting. While deep-sea shipping now has established monitoring and reporting processes in place, these do not apply to all vessels and smaller and domestic craft may require alternative means. Therefore, provincial and national policy on the following should be developed in partnership with industry;

- Maritime GHG inventories
- Reporting and monitoring of maritime fuel consumption and emissions for domestic vessels not addressed by international schemes.



Finance & Funding



MARITIME DECARBONIZATION WILL REQUIRE IMPROVED ACCESS TO PUBLIC AND PRIVATE FUNDING OPPORTUNITIES FOR A DIVERSE AND VARIED FINANCING APPROACH. ACCESS TO CAPITAL IS KEY TO SUCCESSFUL DEMONSTRATION AND COMMERCIALIZATION OF MARITIME DECARBONIZATION TECHNOLOGIES.

While there is a particular need for early-stage funding in the development of maritime technologies, venture capital is often either uninterested in or unfamiliar with the maritime sector and is also averse to the complexity and development timeline of maritime technology. Government funding and initiatives can provide a vital bridge to sustain early phase development, as can pooling resources amongst interested parties and leveraging development in other industries which are more traditional investment destinations.

These challenges can be overcome by identifying potential sources of capital, profiling and building awareness amongst potential investors, and facilitating the connection between a funding source and a member or solution provider. As the work matures and grows, it is necessary to extend the reach of this work to seek out international sources of financing to BC.

In the interim, it is recommended to support activities in this area through;

- Development of a Flagship fund which can be used to directly fund pilot and demonstration projects or provide early-stage capital, through:
 - Grant applications for federal or provincial funding under programs such as VMCC's Operation Flagship.
 - Industry contributions to pool resources for specific demonstration programs.
 - Direct contribution by foundations or private finance such as venture capital.
- Connecting industry members and solution providers with outside sources of capital by for example:
 - Connection with direct investment investors seeking decarbonization investment opportunities
 - Support in identifying and pursuing green financing opportunities e.g. green/blue bonds
 - Support in submitting grant applications for federal or provincial funding for pilot projects and solutions, including potentially acting as a grant administrator.
- An additional area of action may be to directly support interested investors in identifying green infrastructure opportunities in BC that will accelerate progress towards the goals.

Next Steps

Addressing climate change is not just about looking back, but looking forward. The VMCC Green Shipping Strategy is designed to highlight areas of action for industry to help guide and coordinate efforts. To amplify and accelerate efforts it's important to connect with others and join the VMCC.

1

Become a Member

Join a coalition of likeminded organizations who are committed to tackling climate change through the VMCC.

2

Get Connected

Participate in VMCC programs, work groups and networking opportunities to educate, accelerate and reduce emissions.

3

Stay Informed

Participate in VMCC webinars, events and work groups to foster informed decision making and equal opportunity for green advancement within your organization.



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About the VMCC



The Vancouver Maritime Centre for Climate is an industry led initiative dedicated to accelerating the transition to a zero emissions shipping industry in British Columbia.

We recognize that maritime operators are currently facing large regulatory hurdles, both compulsory and voluntary, to reduce emissions with no clear path forward on how to meet these objectives. We believe that bringing industry together helps facilitate the mobilization and implementation of green technologies that maritime and shipping transport operators get to zero emissions faster.

The VMCC is founded on six key pillars;

- To **act as a hub for resources**, support and education to provide a menu of practical green solutions which enable industry to meet or exceed either compulsory or voluntary emissions targets.
- To **act as a convening point** for both the local and transient ships passing through our waters by maintaining a membership and network of regional and international industry stakeholders.
- To **ensure information is disseminated** to all branches of industry to help promote informed decision making and equal opportunity for green advancement within the local maritime community.
- To **facilitate commercialization and pilot testing**, with mandatory reporting of emissions savings results and cost benefits, to support both industry and regulatory bodies with decision-making.
- To **advocate and support** for faster adoption of solutions that are available.
- To **facilitate communications** between the corners of our industry, and to and from government, regulatory and classification societies to help remove barriers faced by implementation of green technologies.

Interested in knowing more? Our contact information is below.

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LET'S DO MORE-

LET'S DO BETTER-

TOGETHER.