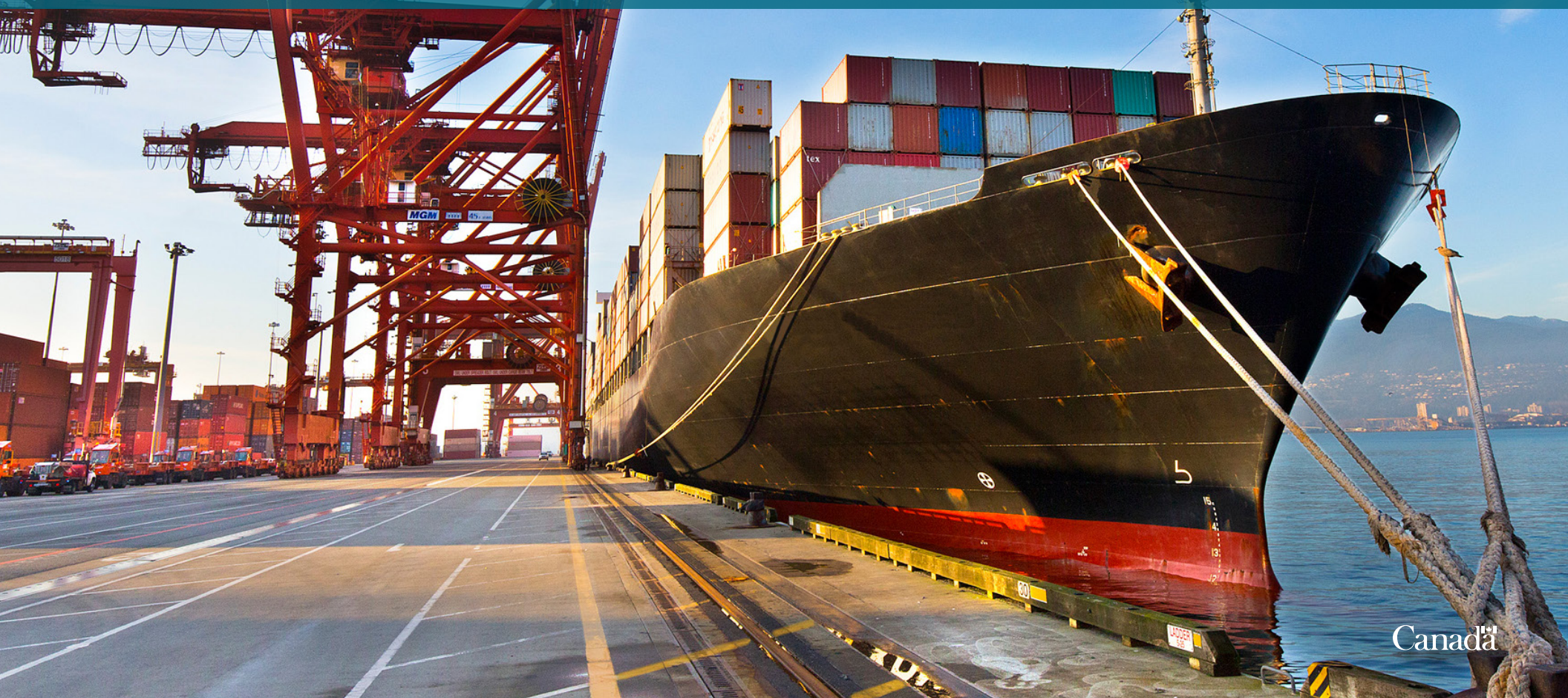
PORT of vancouver | Vancouver Fraser Port Authority

December 20, 2024

Climate and Air Quality Action Plan for the Port of Vancouver



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Executive summary

Addressing climate change and improving air quality are challenges for the future of the maritime industry. Recognizing the importance of these issues, the Vancouver Fraser Port Authority developed this Climate and Air Quality Action Plan in collaboration with industry stakeholders, government, non-profit organizations, as well as First Nations, to provide a roadmap for reducing greenhouse gas and air pollutant emissions from the Port of Vancouver.

This plan outlines key steps needed from organizations within and connected to the Port of Vancouver to reduce air emissions through 2030, presents a vision for continued action to 2050, and highlights specific actions for the port authority. Successful implementation of this plan will require collaborative action with stakeholders and First Nations to ensure effective progress in reducing air emissions, while maintaining the competitiveness of the Port of Vancouver.

The table below summarizes the actions needed by the port authority to support reduced emissions at the Port of Vancouver. This action plan is intended to be a living document, to ensure it remains relevant, actionable, and aligned with the latest scientific research and policy developments. A comprehensive review and update will be conducted by 2030.

Summary of port authority actions

Energy efficiency and load management	1. Implement a decision-making framework to reduce the intensity of emissions that contribute to climate change and affect air quality from port authority-led optimization and capacity development projects
Technology innovation and adoption	2. Participate in the investigation of opportunities to increase the use of existing shore power infrastructure by ocean-going vessels 3. Administer an electric container trucking pilot program 4. Provide technical expertise and administrative support to enable projects by port businesses and customers that reduce air emissions 5. Assess potential opportunities through commercial agreements to support the energy transition while considering investment risks
Infrastructure planning and development	6. Conduct a port-wide alternative energy infrastructure supply/demand assessment with a focus on high impact activities 7. Facilitate the development of priority alternative energy infrastructure, including the expansion of shore power for container and cruise where feasible
Safety planning	8. Publish practices and procedures for vessels operating on market-ready alternative marine fuels in the Port of Vancouver 9. Develop and enhance alternative fuel bunkering protocols and evolve the bunker supplier accreditation program for the Port of Vancouver
Value-chain collaboration	10. Participate in a forum for port businesses with non-road equipment to share knowledge and explore opportunities to leverage collective purchasing power, reduce costs, and accelerate the adoption of alternative energy sources 11. Engage in collaborative efforts to share knowledge on decarbonization and safety in ports and shipping 12. Collaborate with interested parties to facilitate, coordinate, and implement green corridors 13. Support port businesses, marine carriers and supply chain partners to explore potential market-based opportunities to provide low and zero emission corridor options
Enabling policy, programs and funding	14. Evolve port authority emission reduction programs 15. Engage with government agencies to advocate for policies, regulations, and funding that support piloting and adoption of alternative energy, technology and supporting infrastructure

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1. Introduction

1.1. Port of Vancouver

The Port of Vancouver is Canada's largest port by tonnes of cargo, playing a significant role in the nation's economic prosperity. It is home to 29 major marine terminals that handle over 140 million tonnes of cargo, valued at over $300 billion annually. As the most diversified cargo-handling port in North America, the Port of Vancouver moves goods and people across five different business sectors: container, automobiles, breakbulk, dry and liquid bulk, and cruise. Goods arrive and depart by sea on ships owned and operated by global shipping companies, supported by tugboats, shipyards, shipping agents, and freight forwarders. Terminal operators transfer goods between land and water, while trucks and rail move goods to and from terminals on land.

1.2. Vancouver Fraser Port Authority

The Vancouver Fraser Port Authority is the federal agency responsible for the shared stewardship of the lands and waters of the Port of Vancouver. Like all Canada Port Authorities, we are accountable to the federal Minister of Transport, and operate pursuant to the *Canada Marine Act* with a mandate to enable Canada's trade through the Port of Vancouver, while protecting the environment and considering local communities.

The **port authority's jurisdiction** includes 16,000 hectares of water, more than 1,500 hectares of land, and hundreds of kilometres of shoreline. It borders 16 municipalities and intersects the asserted and established territories and treaty lands of more than 35 Coast Salish First Nations.[1]

[1] For more information about the port authority's jurisdiction, see Our land use plan.

2. This plan

2.1. Purpose of this plan

The port authority developed this plan in collaboration with stakeholders and First Nations to provide a roadmap for reducing air emissions from the Port of Vancouver. The plan identifies key steps to reduce air emissions from port operations and focuses on how the port authority can provide support between now and 2030, while considering continued action out to 2050.

Reducing port-related emissions that contribute to climate change and affect air quality:

- Supports the Government of Canada's domestic and international greenhouse gas reduction commitments
- Is guided by Canada's Air Quality Management System, and,
- Is in alignment with the *Northwest Ports Clean Air Strategy*, developed in partnership with the port authorities of Seattle, Tacoma, and the Northwest Seaport Alliance

> The Northwest Ports Clean Air Strategy includes a vision to *"phase out emissions from seaport-related activities by 2050, supporting cleaner air for our local communities and fulfilling our shared responsibility to help limit global temperature rise to 1.5°C".*

Minimizing contributions to climate change is a growing global issue. Climate change brings increased risk and severity of extreme weather and events, biodiversity loss, ocean acidification, sea-level rise, and impacts on human health, livelihoods, food security and economic prosperity.

Reducing air pollutant emissions mitigates local and regional impacts on human health and the economy. Many pollutants are linked to negative effects on human health. The economic impacts of air pollution include lost workdays, reduced productivity, increased healthcare costs, and nuisance cleaning costs.

The plan outlines what is needed to reduce air emissions from the Port of Vancouver and how the port authority can best support those reductions. Strong collaboration and concerted action with stakeholders and First Nations will be critical. As the landlord and steward of port lands and waters, we have a vital role in this effort. Although we do not directly own or operate the vessels, equipment, or vehicles involved in trade, we lead, participate, and influence actions throughout the Port of Vancouver within the scope of our mandate.

Implementing the Climate and Air Quality Action Plan is essential not only to reduce air emissions, but also to ensure the Port of Vancouver remains competitive in a rapidly changing global environment.

2.2. Developing the plan

The port authority developed this plan with input from stakeholders, including terminal operators and other port businesses, marine carriers, supply chain partners, government, energy providers, non-profit organizations, and academia, as well as First Nations (Figure 1). The port authority hosted a series of interactive workshops, technical working sessions, direct meetings, and a survey to collect valuable insights on air emission reduction opportunities. This input was used to inform how the port authority can best support air emission reduction efforts.[2]

[2] See Climate and Air Quality Action Plan Engagement Summary (September 27, 2024)

Figure 1. Plan development involved input from numerous stakeholders and First Nations.

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3. Port of Vancouver emissions

This plan addresses air emissions associated with the transportation of goods to and from the Port of Vancouver within the regional airshed (see Figure 2), as quantified in the **2020 Port of Vancouver Emissions Inventory**.

Figure 2. Port emission inventory boundary

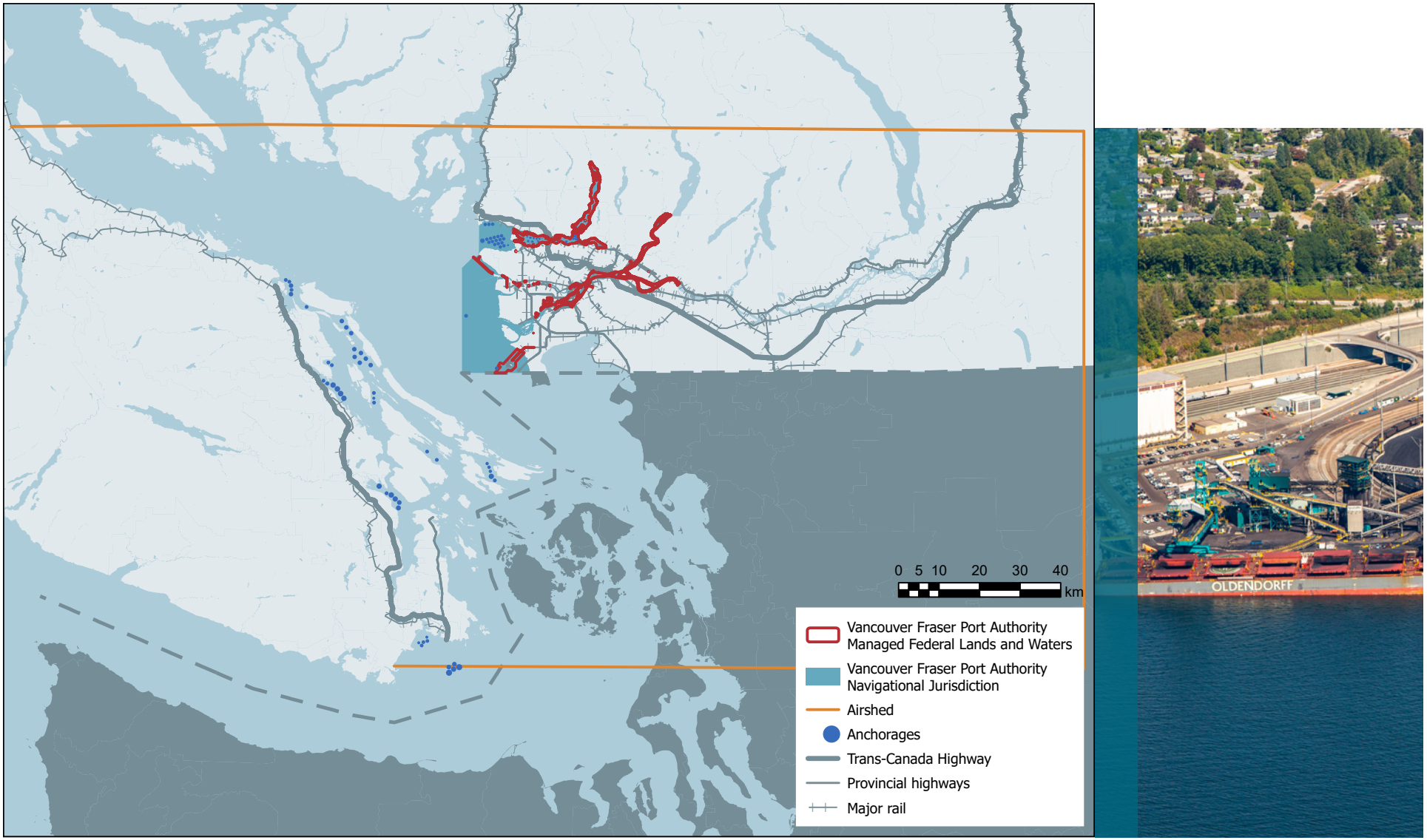
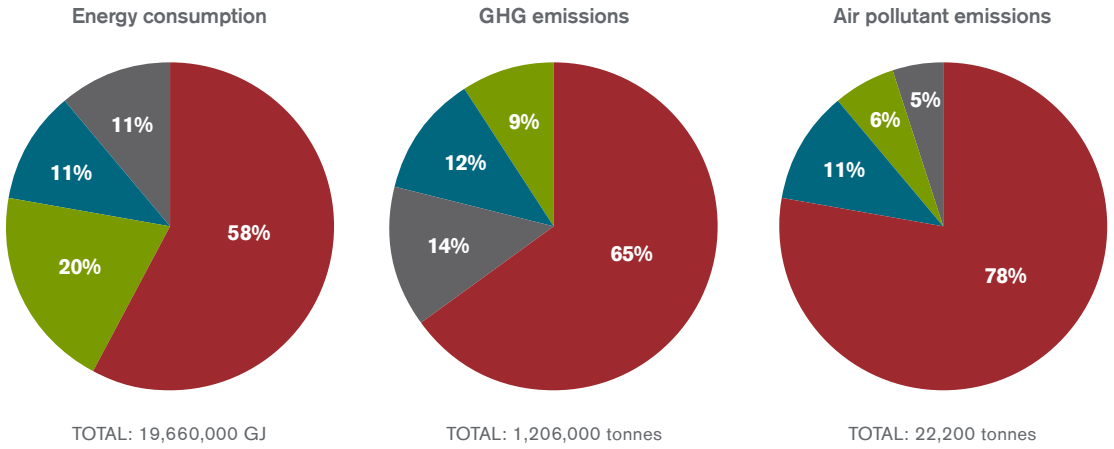


Figure 3. Energy consumption, GHG emissions and air pollutants at the Port of Vancouver, 2020



In 2020, activities at the Port of Vancouver consumed a total of 18 million gigajoules of energy and produced 1.12 million tonnes of greenhouse gas (GHG) emissions and 19,820 tonnes of air pollutants. The primary sources of port air emissions are marine (ocean-going vessels and harbour vessels), rail (locomotives), on-road vehicles, non-road equipment, and administrative operations (buildings and lighting) as outlined in Figure 3 and Table 1.

Marine On-road Rail Port businesses

Table 1. Key factors driving emissions in each activity area

Ocean-going vessels

Over 2,700 ocean-going vessels call the Port of Vancouver every year. These include bulk, general cargo, container, cruise, roll-on roll-off, and tanker vessels.

Harbour vessels

Harbour vessels, such as tugboats, play a critical role in escorting tankers, positioning vessels at terminals, towing barges and logs, domestic trade, and conducting dredging operations to maintain navigational channels.

Locomotives

Three Class 1 railways and one charter railway serve the port, transporting goods to and from inland locations. This category includes both line-haul and switcher locomotives, owned by rail companies or port businesses.

On-road vehicles

This category includes on-road vehicles used in port-related activities, ranging from owner-operator vehicles to those owned or operated by large companies and port businesses. Vehicles include drayage trucks, heavy-duty trucks, light-duty fleet vehicles, taxis, and buses.

Non-road equipment

Nearly 1,800 pieces of non-road equipment, including cranes, loaders, stackers, yard trucks, aerial lifts, welders, and compressors, operate within the port.

Administrative operations

More than 50 terminals and other businesses responsible for moving goods through the port maintain administrative and operations buildings. Energy consumption for heating, cooling, and powering electrical equipment in these buildings contributes to air emissions.

4. Taking action

4.1. The energy transition

Reducing emissions that contribute to climate change and affect air quality relies on improving efficiency and transitioning to alternative energy sources, including electricity and alternative fuels. While some of these alternative energy sources are more mature and ready for implementation, others are still in development or not yet proven in a port environment. Though low-emission energy sources, such as biofuels, may not achieve zero emissions–particularly with respect to air pollutants –they can serve as valuable interim solutions to significantly reduce GHG emissions compared to conventional gasoline or diesel while other lower- and zero-emission energy sources mature.

Figure 4 highlights key aspects of reducing air emissions. Each alternative energy source presents unique opportunities, limitations, and impacts. Successful implementation will require coordination across stakeholders and First Nations, along with pilot projects, technology and infrastructure development, standardization, and phased scaling–supported by safety measures, partnerships, policies, programs, and funding.

4.2. Roadmap

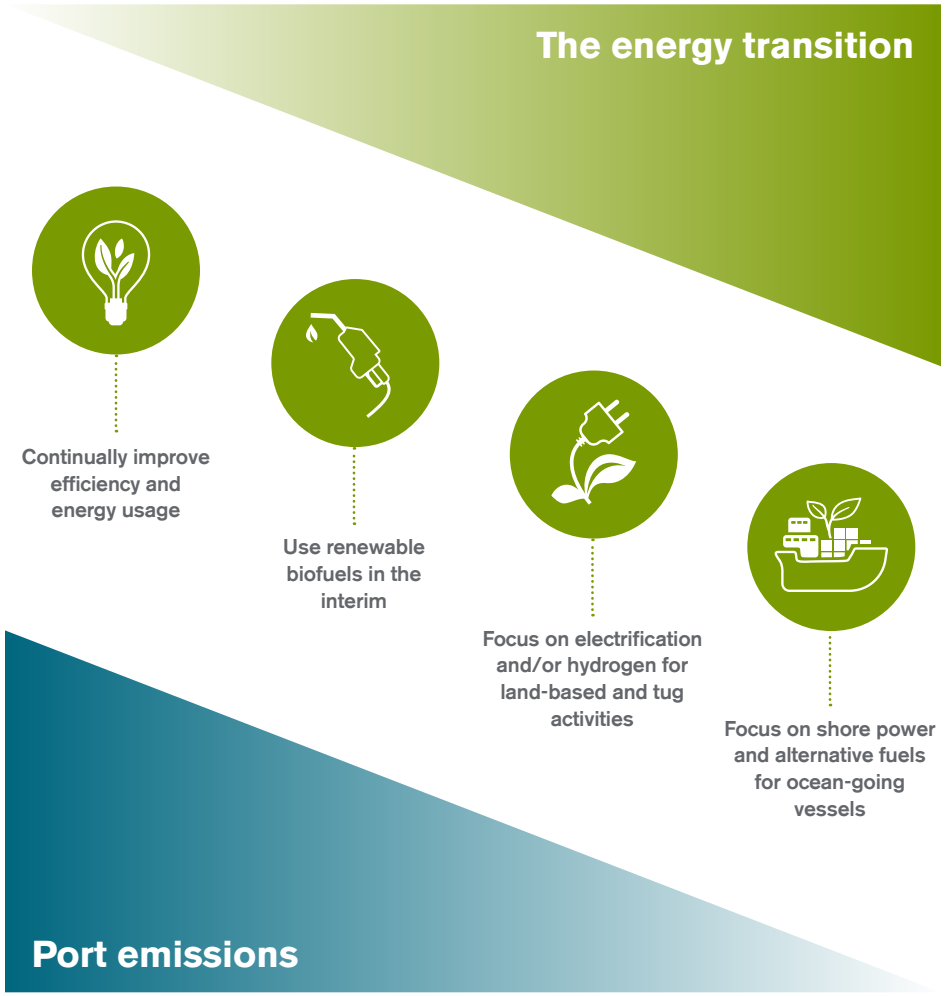
Phasing out emissions that contribute to climate change and affect air quality is a long-term effort that requires close collaboration for success. Key areas of focus include:

- **Energy efficiency and load management**
- **Technology innovation and adoption**
- **Infrastructure planning and development**
- **Safety planning**
- **Value chain collaboration**
- **Enabling policy, programs and funding**

Emission reduction efforts are consistently progressing within each of these areas. Momentum is building and is visible through significant initiatives already underway.

The following sections of this plan describe progress made to date in the Port of Vancouver, and identify both clear opportunities in the near-term and significant challenges that remain to be addressed to further advance air emission reductions. We identify key steps needed from organizations across and connected to the Port of Vancouver and list specific roles for the port authority.

Figure 4. The energy transition



[3] Biofuels, such as biodiesel, derived from biomass generally emit fewer pollutants when burned than fossil fuel equivalents. The production of biomass theoretically removes carbon dioxide (CO2) from the atmosphere in amounts equivalent to what is emitted during combustion. However, burning biomass still emits other pollutants, including particulate matter (PM), nitrogen oxides (NOx), sulfur oxides (SOx), and carbon monoxide (CO).

4.3. Energy efficiency and load management

Enhancing energy efficiency and load management is a highly cost-effective and essential component of optimizing supply chain operations while reducing air emissions and other impacts from both conventional fuel and alternative energy sources. Once alternative energy sources are broadly adopted, these measures will continue to add value by helping to ensure a sufficient supply of energy and reducing costs for operators.

Progress to date: Stakeholders and port authority

- Maritime and logistics companies are implementing **fuel-saving technologies** such as wind-assist on ocean-going vessels, variable speed generators on rubber tire gantry cranes, and multi-genset engines in locomotives to improve energy efficiency.
- The shipping industry is adapting to **evolving efficiency standards** set by the International Maritime Organization (IMO), including the Energy Efficiency Existing Ship Index (EEXI), Energy Efficiency Design Index (EEDI), and Carbon Intensity Indicator (CII).
- The port authority's **Connect+ Initiative** includes supply chain optimization projects, such as the Active Vessel Traffic Management (AVTM) Program, which has the potential to reduce emissions per vessel call.
- Individual maritime and logistics companies are **optimizing their operations** by refining routes, terminal layouts, scheduling, and retrofitting fleets–particularly within the domestic fleet–to reduce energy consumption and increase efficiency.

Opportunities

- **Digital monitoring and simulation tools** can identify efficiency improvements, such as route and speed optimization, without risking real-world throughput, allowing for detailed assessments of energy-saving opportunities.
- **Port call optimization**, including improvements in communication and planning between vessels, terminals, rail, and on-road transport can reduce energy usage without sacrificing throughput.
- The adoption of **short-sea shipping** routes could offer substantial energy savings.

Challenges

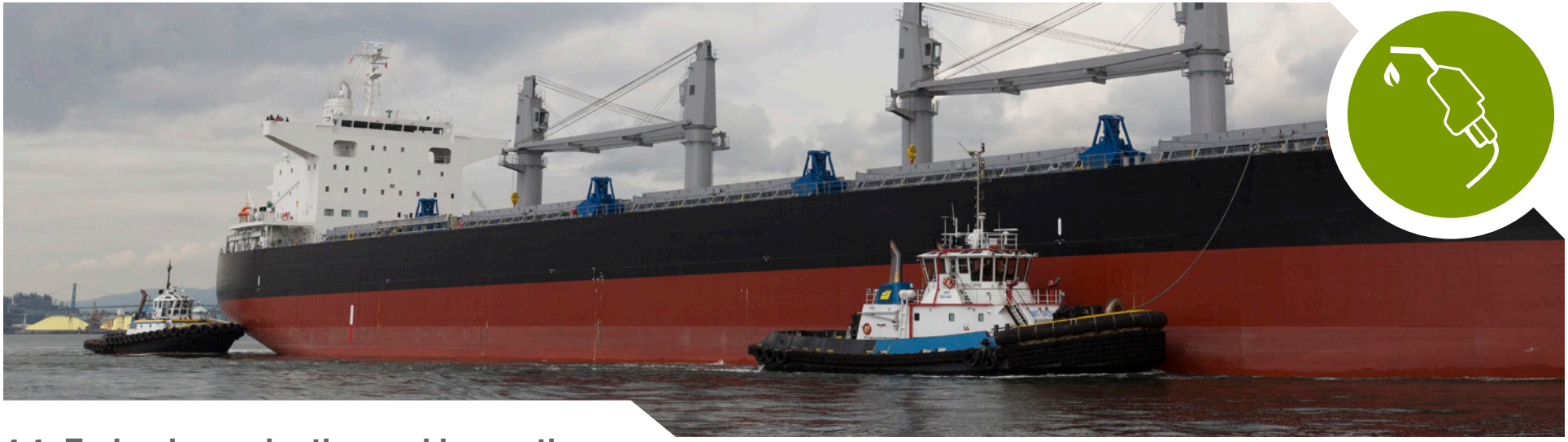
- The **long operational lifespan of equipment** can limit the ability to quickly adopt new technologies, creating a delay in achieving optimal efficiency improvements.
- Short-sea shipping may require **the construction of new berths and infrastructure**, representing a significant investment that could delay efficiency gains.

Energy efficiency and load management: steps needed by 2030

- **Ship efficiency and carbon intensity:** Ensure that all ships operating at the port meet or exceed standards set by the IMO for efficiency and carbon intensity.
- **Port call optimization:** Improve vessel scheduling and reduce turnaround times by optimizing port calls, using real-time data integration to enhance coordination among vessels, terminals, rail, and on-road operators.
- **Energy management programs:** Support electrification, load management, and load displacement, as well as efficiency improvements for terminal operators and other port businesses through targeted energy management programs.
- **Investments in efficiency:** Develop business cases to support investment in proven fuel-saving methods such as aerodynamic and tire upgrades for on-road vehicles, use of long-combination vehicles, high gross vehicle weight rating (GVWR) vehicles, short-sea shipping, technologies to reduce or eliminate idling and start-stop operation for on-road vehicles, non-road equipment, and locomotives, and energy regeneration under braking (particularly for short-haul rail).
- **Terminal layout optimization:** Review and optimize operational processes at container terminals, including layouts, equipment placement, and infrastructure, to maximize efficiency.
- **Digital twins for predictive simulations:** Use digital twin technology in container terminals to simulate operational activities and predict maintenance needs, enhancing operational efficiency.
- **Policies and training:** Develop best practices, implement policies, and provide operator training for efficiency improvement, ensuring personnel can optimize energy use.

Port authority actions

1. Implement a decision-making framework to reduce the intensity of emissions that contribute to climate change and affect air quality from port authority-led port optimization and capacity development projects



4.4. Technology adoption and innovation

Alternative energy sources remain underdeveloped for full-scale deployment, but innovation and technological improvements are closing this gap. Stakeholders and First Nations have the opportunity to continue to support these developments to enable meaningful air emission reductions on a commercial scale.

Progress to date: Stakeholders and port authority

- Terminal operators are actively **tracking air emissions**, committing to zero-emission transitions and enacting implementation plans.
- The maritime industry's **adoption of biofuels and mixed fuels** in harbour vessels, rail, non-road, and on-road applications has led to carbon emission reductions with minimal engine modifications.
- Terminal operators are replacing diesel equipment in select port activities, such as small to medium forklifts and yard trucks, with **hydrogen fuel cell and electric equipment**.
- Original Equipment Manufacturers (OEMs) are piloting **alternative energy heavy duty trucks**, particularly container trucks, using battery electric, fuel cell, renewable natural gas (RNG), and hydrogen combustion in port applications.
- Rail operators in northern BC and Alberta are evaluating **alternatives for rail** such as hybrid diesel-battery electric, hydrogen fuel cell, battery-powered, and 100% renewable-fueled locomotives.
- Shipping lines are utilizing **wind technology and batteries** to improve vessel fuel efficiency.
- Three Port of Vancouver terminals have **shore power** infrastructure. Since 2009, over 1,000 vessels have connected to the electrical grid and shut down their engines while at berth.
- Shipping lines are operating **methanol-fueled ships** along the West Coast of North America, signaling early success in alternative fuel adoption for marine vessels, and they are investing in research and design for additional **future fuels like ammonia**.
- Tug companies at the port have introduced **electric, dual-fuel methanol, and liquified natural gas-fueled escort tugs**.

Opportunities

- **Low-energy consumption equipment can transition** to battery electric with conventional charging strategies.
- Some **port applications can utilize low-density fuels**, like hydrogen, effectively (e.g., rubber-tired gantry cranes, long-haul trucks, or rail locomotives).
- **Modular systems** can address use cases of various sizes in a cost-effective way (e.g., existing diesel trucks can add a module to use hydrogen fuel).

Challenges

- **Lower energy density** of alternative fuels requires more space and weight, leading to costly adjustments (e.g., vessel design, cargo capacity, or fueling frequency).
- Large and expensive batteries for **high-consumption applications** may complicate business cases until technology advances.
- Experimentation opportunities for new technologies are limited due to **high reliability and throughput demands** (e.g., locomotives).

Technology adoption and innovation: steps needed by 2030

- **Operational understanding:** Develop comprehensive understanding of the operational challenges and opportunities for each alternative energy source and technology.
- **Continued pilot projects:** Advance ongoing testing of various alternative energy technology.
- **Business case development:** Build strong business cases for adopting alternative energy technology.
- **Methanol and hydrogen initiatives:** Continue to deploy methanol-fueled vessels and further testing of hydrogen- and ammonia-fueled vessels by developing strategies that promote technology adoption and identify infrastructure needed to support the integration of these technologies at the port.
- **Interim measures:** Develop air emission-reduction strategies for scenarios where complete phase out is not immediately feasible.
- **Charging technology evaluation:** Assess the suitability of various charging technologies (e.g., induction, robotic arm, DC fast charging).

Port authority actions

2. Participate in the investigation of opportunities to increase use of existing shore power infrastructure by ocean going vessels
3. Administer an electric container trucking program
4. Provide technical expertise and administrative support to enable projects by port businesses and customers that reduce air emissions
5. Assess potential opportunities through commercial agreements to support the energy transition, while considering investment risks

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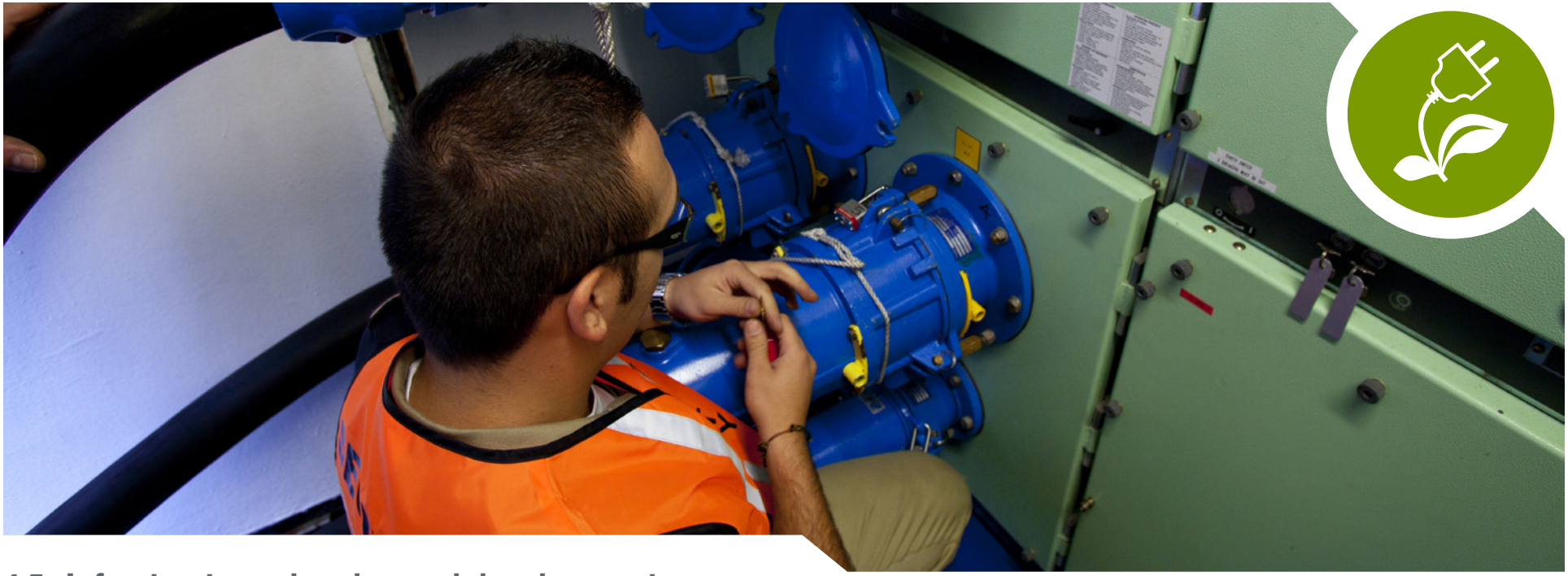

4.5. Infrastructure planning and development

Expanding the use of alternative energy sources will require planning, as well as modifying existing infrastructure and installing new infrastructure, to deliver alternative energy sources to the port and distribute them to end users. This may include expanding electrical power transmission systems and charging infrastructure, as well as fuel storage, bunkering, and other supply facilities for alternative fuels.

Progress to date: Stakeholders and port authority

- Terminal operators are identifying energy management opportunities and **developing electrification roadmaps** for implementation in the near future.
- The port authority and BC Hydro are working together under a Memorandum of Understanding (MOU) to facilitate the development of **electrical infrastructure that supports energy demands** for port operations.
- The **Railway Association of Canada has committed** to exploring the feasibility of using 10-20% low-carbon fuels in the sector by 2030, with a target of net-zero GHG emissions for the Canadian rail industry.

Opportunities

- Coordination of **forecast electrical capacity requirements** is supported through the port authority and BC Hydro MOU.
- Plans are underway to **increase the availability of hydrogen** in the Metro Vancouver region.
- Continued **expansion of shore power** installations will allow for more connections.
- The relatively **centralized nature of the port** allows minimal infrastructure to serve a large percentage of end users.
- Fossil fuel **infrastructure may be retrofitted** to support alternative fuel distribution and bunkering.

Challenges

- Increased electrification of high-consumption equipment may necessitate **extensive service infrastructure**, potentially exceeding realistic limits at specific locations.
- High costs and limited availability currently constrain supply of alternative fuels.
- New delivery and storage infrastructure for alternative fuels will be needed, but **space is limited**.
- The lack of a single best option for all applications complicates economies of scale, necessitating **multiple energy sources** based on specific application needs.

Infrastructure planning and development: steps needed by 2030

- **Energy planning:** Identify future alternative energy demands at each terminal and for other port businesses, and incorporate findings into port-wide energy master planning. Include technical and financial feasibility assessments to evaluate potential alternative energy sources, required quantities, storage solutions, and delivery infrastructure needed for the transition to alternative energy.
- **Infrastructure installation:** Install sufficient electrical and fueling infrastructure at each terminal and for other port businesses in accordance with energy plans and as new energy sources are adopted.
- **Regional plans:** Develop regional plans to support charging and alternative fuel infrastructure outside port lands.
- **Cost-sharing strategies:** Identify cost-sharing strategies for significant infrastructure investments.
- **Alternative fuel supply:** Determine and address infrastructure needs for biofuels, methanol, and hydrogen blends for the specific activities not transitioning to electric (e.g., coastal and barging tugs).
- **Bunkering preparedness:** Prepare the Port of Vancouver to become a port of call for alternative fuel bunkering (e.g., methanol).
- **Off-shore power feasibility:** Assess the feasibility of providing off-shore power infrastructure for vessels at anchor, taking into account both moorage capacity and energy supply requirements.
- **Renewable energy generation:** Investigate the potential for renewable energy infrastructure within the port to generate electricity (e.g., via solar and wind).

Port authority actions

6. Conduct a port-wide alternative energy infrastructure supply/demand assessment
7. Facilitate the development of priority alternative energy infrastructure including the expansion of shore power for container and cruise where feasible

4.6. Safety planning

The introduction of alternative energy sources at the port requires establishing or revising procedures, standards, and best practices to ensure operator and community safety. In some cases, these safety protocols may need to be developed from scratch or tailored specifically for the first time. In general, safety protocols and best practices are shared across ports around the world to ensure consistency and to limit the risk of incompatibilities between safety requirements.

Progress to date: Stakeholders and port authority

- Maritime companies continue to make **safety a top priority** across all port operations.
- The port authority has contributed to developing **safety protocols and operational guidelines** to ensure safe handling and transfer of liquefied natural gas (LNG), and has accredited an LNG bunker provider.
- Terminal operators are using a **highly automated shore power system** managed through a Human-Machine Interface (HMI).

Opportunities

- Many alternative fuels, such as hydrogen and methanol, are **already in use in other sectors and regions**. This provides a valuable body of expertise that can be leveraged to inform the creation of safety standards specific to port operations.
- Safety **learnings from ongoing pilot projects** will be critical in refining and developing Port of Vancouver-specific safety requirements prior to the full-scale rollout of new equipment and energy sources.

Challenges

- Reliance on alternative energy sources–each with distinct hazards–will require the development, implementation, and enforcement of **multiple new safety procedures**.
- Many existing safety regulations, particularly those concerning harbour vessels and equipment, were **not designed with alternative energy sources in mind**. Updating these regulations will require substantial collaborative efforts.
- The diverse range of alternative fuels will introduce **complexities in emergency response planning**, requiring specialized training and resources.

Safety planning: steps needed by 2030

- **Safety standards development:** Develop comprehensive safety standards for the use of alternative fuels, including hydrogen, methanol, and battery systems.
- **Operational practices and training:** Develop and incorporate new safety standards into all port operations, ensuring that operators are trained on the safe handling, maintenance, and operation of alternative energy technologies and fuels.
- **Collaborative safety planning:** Collaborate closely with relevant training providers to develop safety plans that are practical and responsive to real-world conditions, especially during the initial rollout of new technologies and fuels.
- **Regulatory compliance:** Ensure adherence to regulatory requirements regarding the use of new technologies and fuels to minimize risks.
- **Continuous safety improvement:** Establish a feedback loop from pilot projects and early adoption phases for the ongoing evaluation and adaptation of safety standards and operational practices.

Port authority actions

8. Publish practices and procedures for vessels operating on market-ready alternative marine fuels in the Port of Vancouver
9. Develop and enhance alternative fuel bunkering protocols and evolve bunker supplier accreditation program for the Port of Vancouver

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4.7. Value chain collaboration

The transition to alternative energy sources will rely heavily on the actions of stakeholders both within the port and beyond. Engaging stakeholders and First Nations early in the process is needed to ensure cohesive planning, prevent duplication of efforts, and accelerate air emission reductions at the port.

Progress to date: Stakeholders and port authority

- The port authority, in collaboration with other ports and cruise lines, is undertaking a feasibility study for the **Pacific Northwest to Alaska Green Corridor** for cruise, and has supported the formation of a Canadian non-profit consortium to develop the North Pacific Green Corridor for bulk.
- The port authority hosts **regular meetings with port business environmental managers** to share information, exchange knowledge, and support collaboration on environmental efforts.

Opportunities

- **Expansion of green corridors** will accelerate the adoption of alternative energy sources and bolster cross-border collaboration.
- Collaborations such as the **International Association of Ports and Harbours** help to understand and address key issues including alternative marine fuels, green corridors and shore power

Challenges

- **Competitive dynamics** may inhibit data sharing and collaborative learning among companies, limiting collective progress.
- The reliance on **multiple alternative energy sources** will require diverse solutions, which may complicate coordination between stakeholders.
- Determining **responsibility for funding the energy transition** remains a key challenge.

Value chain collaboration: steps needed by 2030

- **Collaboration across the port:** Strengthen partnerships between port businesses, customers, supply chain partners, and fuel providers to coordinate efforts and share technical insights on, for example, supply/demand assessments, and infrastructure development.
- **Lessons from pilot projects:** Communicate technical requirements and lessons learned from pilot projects, including both successes and unintended consequences, with port businesses, customers, supply chain partners, OEMs, and fuel providers to inform further development.
- **Innovative charging solutions competition:** Incentivize competition to develop innovative concepts for managing multiple charging scenarios that align with the unique operational parameters of the port.
- **Support early adoption:** Recognize and mitigate the risks faced by industry pioneers through early-adopter support programs, fostering confidence and accelerating the uptake of new technologies.
- **Green corridor collaborations:** Strengthen strategic partnerships around green corridors for both marine and land activities.
- **Buyers' groups for alternative fuels:** Convene stakeholders to assess the availability and reliability of alternative fuel supplies, while leveraging marketplace mechanisms, such as first mover subsidies and large commercial agreements, to enhance access to alternative energy sources and technology for early adopters.
- **Standardization of biofuel practices:** Collaborate with biofuel producers to develop standardized practices that facilitate more accurate air emissions estimates and improve transparency across the supply chain.
- **Routine reporting:** Establish routine reports on the availability, pricing, GHG lifecycle emissions, and air quality impacts of alternative fuels and suppliers.

Port authority actions

10. Participate in a forum for port businesses with non-road equipment to share knowledge and explore opportunities to leverage collective purchasing power, reduce costs, and accelerate the adoption of alternative energy sources
11. Engage in collaborative efforts to share knowledge on decarbonization and safety in ports and shipping
12. Collaborate with interested parties to facilitate, coordinate, and implement green corridors
13. Support port businesses, marine carriers and supply chain partners to explore potential market-based opportunities to provide low and zero emission corridor options

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4.8. Enabling policy, programs, and funding

Until alternative energy sources approach cost and convenience parity with conventional fuels, additional motivation and support will be necessary to encourage users in adoption. This may come in the form of policies that set mandatory requirements, programs that reduce barriers, or funding opportunities that alleviate the financial burdens.

Progress to date: Stakeholders and port authority

- The port authority's **Non-Road Diesel Emissions program** incentivizes newer, lower-emission equipment by offering financial rewards for retiring or reducing the use of older, higher emission diesel equipment.
- The Province of British Columbia financially supports the use of low- and zero-emission alternatives in transportation including, as of 2024, ships, trucks, and port equipment through its **Low Carbon Fuel Standard**.
- The port authority's **EcoAction and Blue Circle Award Programs** reward vessels for reducing their environmental impact—such as using lower emission fuels, technologies, or shore power—by offering reduced harbor fees.
- The Province of British Columbia has **proposed legislation to phase out the sale of diesel trucks** to align with requirements in California, accelerating the transition to zero-emission heavy-duty vehicles.
- The **British Columbia Truckers Association Clean Carrier Program** provides a roadmap for carriers and shippers to reduce their air emissions and adopt more sustainable practices.

Opportunities

- **Further updates to policies and regulations** can ensure that alternative energy sources and equipment become more cost-competitive with conventional options.
- There are **opportunities to expand funding** for studies, pilot projects, and the adoption of alternative energy source equipment and infrastructure at ports and throughout the supporting supply chain.

Challenges

- **The high reliability and throughput demands** of port operations reduce opportunities for experimentation, limiting the ability to test new technologies at scale.
- New battery-electric vehicles (BEVs) are currently **rated for lower tonnage** than what is allowed on Canadian roadways, limiting their application until manufacturers address this gap.
- **Smaller owner-operators** often lack the resources to invest in dedicated charging infrastructure or other alternative energy solutions, slowing widespread adoption

Enabling policy, programs and funding: steps needed by 2030

- **Policy and regulatory updates for cost parity:** Update policies and regulations to support the transition to alternative fuels and technologies by addressing cost disparities during the transition period, including considerations for fuel, technology, land, and infrastructure.
- **Expand funding opportunities:** Develop and expand funding opportunities for studies, pilot programs, and the adoption of alternative energy source technologies and infrastructure, making it easier for operators to transition.
- **Accelerate stepping-stone fuels and technologies:** Establish or support programs to accelerate the adoption of interim fuels and technologies that reduce air emissions in the short term, while paving the way for long-term solutions.
- **Increased incentives for air emissions reduction:** Enhance incentives and establish stricter requirements for air emissions reduction, rewarding early adopters and encouraging further investment.
- **Soft mandates for air emissions strategies:** Implement a soft mandate to adopt air emissions reduction strategies, especially those that are minimally disruptive to port operations.

Port authority actions

14. Evolve port authority emission reduction programs
15. Engage with government agencies to advocate for policies, regulations, and funding that support pilot and adoption alternative energy, technology and supporting infrastructure

4.9. Anticipated future actions

This plan outlines key steps to reduce air emissions from port-related activities through 2030. However, to effectively phase out emissions contributing to climate change and affecting air quality, sustained efforts will be necessary through 2050. In addition to continuing many of the actions already outlined, further air emissions reduction potential can be achieved by expanding existing initiatives and initiating new collaborative actions among stakeholders, First Nations and the port authority, such as:

Energy efficiency and load management

- Increase the use of long-haul, high gross weight, and long-combination trucks
- Procure land to support optimal and efficient terminal layout
- Specialize fleet in response to any increase in demand for short-sea shipping or other applications
- Deploy advanced tools to monitor, regulate, and optimize energy and electricity consumption in terminal buildings, and retrofit with electric heat pumps
- Where applicable, automate fuel-efficient procedures to ensure consistent application across all operators and contexts

Technology adoption and innovation

- Implement proven alternative energy source equipment in full-scale operations
- Test, source, produce, store, and bunker alternative fuels for vessels
- Assess the role of carbon capture technologies and natural carbon sinks for the Port of Vancouver
- Shift from pilot testing to the turnover of all equipment at time of replacement
- Run pilot projects for larger, hard-to-transition heavy-duty equipment
- Address lingering concerns with alternative energy trucks after minimum viable products are commercialized
- Explore options for retrofitting tugs with alternative energy propulsion technologies

Infrastructure planning and development

- Advance regional energy master planning to phase out air emissions
- Expand shore power capacity
- Expand charging and fueling infrastructure in and around the port, ahead of anticipated demand increase
- Expand on-site and near-site alternative energy production and/or storage
- Shift from infrastructure planning to capacity expansion and installation
- Retrofit obsolete fossil fuel infrastructure to support emerging fuels
- Advocate for expanded production of low- and zero-emission fuels and the transition away from interim fuels

Safety planning

- Form data-sharing groups to improve transparency around safety incidents and allow carriers to proactively address the root causes of incidents
- Further improve safety protocols and training for the handling of alternative fuels and equipment as they are adopted
- Deploy new passive, active, and autonomous safety systems as they mature

Value chain collaboration

- Establish fuel supplier standards to ensure transparency and accountability for upstream GHG emissions
- Expand participation in decarbonization knowledge-sharing groups, incorporating lessons from other industries
- Phase out marine diesel engine operations while in port or at anchor
- Phase out the purchase of interim fuels
- Institute increasingly strict restrictions on conventional fuels as the adoption of alternatives accelerates

Enabling policy, programs, funding

- Secure early adopter funding and incentives, evolve policies, programs, and funding to ensure alternative energy sources are competitive with fossil fuels
- Expand green corridors to include rail, terminals, trucks, and short-sea shipping
- Raise efficiency requirements for newly constructed vessels and equipment

5. Reporting

The port authority is committed to regularly reporting on progress toward its 15 actions identified in this Climate and Air Quality Action Plan, and to continuing to engage with stakeholders and First Nations to understand opportunities, challenges and ongoing progress to reduce port-related air emissions.

Climate and Air Quality Action Plan reporting will include:

- **Biennial progress updates:** We will provide biennial updates on port authority actions included in this plan. These updates will highlight any adjustments–such as adding, removing, or altering actions–based on lessons learned or emerging opportunities. This will also highlight collaborations and initiatives that contribute to emission reductions across the port, as available and relevant.
- **Emissions inventory:** We publish a port-wide emission inventory every five years covering both greenhouse gas emissions and air pollutants. The inventory compares current and historical emissions and explains significant changes in the emissions profile, and will be used to inform progress reporting.
- **Continuous engagement and review:** We will continue to engage with stakeholders and First Nations to inform updates to the plan, both to help assess its effectiveness and identify new actions.

This action plan is intended to be a living document, to ensure it remains relevant, actionable, and aligned with the latest scientific research and policy developments. A comprehensive review and update will be conducted by 2030.

6. Conclusion

Climate change and air quality are key global, regional, and local issues. This Climate and Air Quality Action Plan has been developed in collaboration with stakeholders, including terminal operators and other port businesses, marine carriers, supply chain partners, government, energy providers, non-profit organizations, and academia, as well as First Nations to provide a roadmap for reducing air emissions from the Port of Vancouver. The plan identifies key steps to reduce emissions from port operations and outlines the port authority's role between now and 2030, while considering continued action through 2050.

The plan will be reviewed and updated regularly to track progress and maintain relevance.

Proactively addressing climate and air quality supports the port's continued competitiveness in a low- and zero-emission future. It equips us to adapt to evolving energy sources, market demands, regulatory requirements, and community expectations, ensuring the ongoing success of the Port of Vancouver.

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Acknowledgements

We extend our sincere thanks to all who provided input into the development of <?xml version="1.0" encoding="UTF-8"?><svg id="Layer_1" xmlns="http://www.w3.org/2000/svg" viewBox="0 0 90 90"><defs><style>.cls-1{fill:#fff;}.cls-2{fill:#9e2a2f;}</style></defs><rect class="cls-2" x="0" y="0" width="90" height="90" rx="45" ry="45"/><path class="cls-1" d="M70.36,32.41s.18.07.26.