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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE

REGULAR MEETING

Wednesday, March 3, 2021
9:00 a.m.
28th Floor Boardroom, 4730 Kingsway, Burnaby, British Columbia

A G E N D A[1]

1. ADOPTION OF THE AGENDA

1.1 March 3, 2021 Regular Meeting Agenda
That the Climate Action Committee adopt the agenda for its regular meeting scheduled for March 3, 2021 as circulated.

2. ADOPTION OF THE MINUTES

2.1 February 12, 2021 Regular Meeting Minutes
That the Climate Action Committee adopt the minutes of its regular meeting held February 12, 2021 as circulated.

3. DELEGATIONS

4. INVITED PRESENTATIONS

5. REPORTS FROM COMMITTEE OR STAFF

5.1 Draft *Clean Air Plan*
That the MVRD Board authorize staff to proceed with engagement on the draft *Clean Air Plan*, based on the report dated February 10, 2021, titled "Draft *Clean Air Plan*".

5.2 Draft *Climate 2050 Buildings Roadmap*
That the MVRD Board authorize staff to proceed with engagement on the draft *Climate 2050 Buildings Roadmap*, as presented in the report dated February 10, 2021, titled "Draft *Climate 2050 Buildings Roadmap*".

5.3 Manager's Report
That the Climate Action Committee receive for information the report dated February 16, 2021, titled "Manager's Report".

[1] *Note: Recommendation is shown under each item, where applicable.*

6. INFORMATION ITEMS

6.1 Correspondence re Application GVA1197 to Increase Allowable Annual Emissions by an Industrial Operator from Jenny Kwan, Member of Parliament, Vancouver East, to Sav Dhaliwal, Chair, Metro Vancouver Regional District.

6.2 Correspondence re Application GVA1197 to Increase Allowable Annual Emissions by an Industrial Operator from Sav Dhaliwal, Chair, Metro Vancouver Regional District to Jenny Kwan, Member of Parliament, Vancouver East.

7. OTHER BUSINESS

8. BUSINESS ARISING FROM DELEGATIONS

9. RESOLUTION TO CLOSE MEETING

Note: The Committee must state by resolution the basis under section 90 of the Community Charter on which the meeting is being closed. If a member wishes to add an item, the basis must be included below.

10. ADJOURNMENT/CONCLUSION

That the Climate Action Committee adjourn/conclude its regular meeting of March 3, 2021.

Membership:

Carr, Adriane (C) - Vancouver
Dhaliwal, Sav (VC) - Burnaby
Arnason, Petrina - Langley Township
Baird, Ken - Tsawwassen First Nation
Dupont, Laura - Port Coquitlam
Hocking, David - Bowen Island
Kruger, Dylan - Delta
McCutcheon, Jen - Electoral Area A
McIlroy, Jessica - North Vancouver City
McLaughlin, Ron - Lions Bay
Patton, Allison - Surrey
Royer, Zoe - Port Moody
Steves, Harold - Richmond
Yousef, Ahmed - Maple Ridge

METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE

Minutes of the Regular Meeting of the Metro Vancouver Regional District (MVRD) Climate Action Committee held at 1:00 p.m. on Friday, February 12, 2021 in the 28th Floor Boardroom, 4730 Kingsway, Burnaby, British Columbia.

MEMBERS PRESENT:
Chair, Councillor Adriane Carr, Vancouver
Vice Chair, Councillor Sav Dhaliwal*, Burnaby
Councillor Petrina Arnason*, Langley Township
Chief Ken Baird*, Tsawwassen (arrived at 1:15 p.m.)
Councillor Laura Dupont*, Port Coquitlam
Councillor David Hocking*, Bowen Island
Councillor Dylan Kruger*, Delta
Director Jen McCutcheon*, Electoral Area A
Councillor Jessica McIlroy*, North Vancouver City
Mayor Ron McLaughlin*, Lions Bay
Councillor Allison Patton*, Surrey
Councillor Zoe Royer*, Port Moody
Councillor Harold Steves*, Richmond
Councillor Ahmed Yousef*, Maple Ridge (arrived at 2:15 p.m.)

MEMBERS ABSENT:
None.

STAFF PRESENT:
Roger Quan, Director, Air Quality and Climate Change, Parks and Environment
Lauren Cichon, Legislative Services Coordinator, Board and Information Services

1. ADOPTION OF THE AGENDA

1.1 February 12, 2021 Regular Meeting Agenda

It was MOVED and SECONDED
That the Climate Action Committee:
a) amend the agenda for its regular meeting scheduled for February 12, 2021 by withdrawing Item 4.1 Invited Presentation Alex Boston, Executive Director, Renewable Cities; and
b) adopt the agenda as amended.

CARRIED

*denotes electronic meeting participation as authorized by Section 3.6.2 of the *Procedure Bylaw*

2. ADOPTION OF THE MINUTES

2.1 January 15, 2021 Regular Meeting Minutes

It was MOVED and SECONDED
That the Climate Action Committee adopt the minutes of its regular meeting held January 15, 2021 as circulated.

CARRIED

3. DELEGATIONS

No items presented.

4. INVITED PRESENTATIONS

4.1 Alex Boston, Executive Director, Renewable Cities

Pursuant to Item 1.1 of the agenda, this item was withdrawn.

5. REPORTS FROM COMMITTEE OR STAFF

5.1 *Climate 2050* Discussion Paper on Energy

Report dated January 20, 2021, from Nicole Chan, Project Engineer, Parks and Environment Department, providing the Committee with information about the *Climate 2050* Discussion Paper on Energy to support development of the *Climate 2050* Roadmaps.

1:15 p.m. Chief Baird arrived at the meeting.

Members were provided a presentation regarding the *Climate 2050* Discussion Paper on Energy highlighting the energy roadmap development process, proposed long-term goal for energy, proposed ideas to reduce emissions, and next steps.

Presentation material titled "Energy Discussion Paper" is retained with the February 12, 2021 Climate Action Committee agenda.

It was MOVED and SECONDED
That the Climate Action Committee receive for information the report dated January 20, 2021, titled "*Climate 2050* Discussion Paper on Energy".

CARRIED

5.2 Assessment of the Fossil Fuel Non-Proliferation Treaty Initiative

Report dated January 20, 2021, from Nicole Chan, Project Engineer, and Conor Reynolds, Division Manager, Air Quality and Climate Change Policy, Parks and Environment Department, providing the Committee with an assessment of the Fossil Fuel Non-Proliferation Treaty Initiative, and recommending a course of action for Metro Vancouver.

It was MOVED and SECONDED

That the MVRD Board:

a) endorse the call for a Fossil Fuel Non-Proliferation Treaty as presented in the report dated January 20, 2021, titled "Assessment of the Fossil Fuel Non-Proliferation Treaty Initiative"; and

b) send letters urging the Canadian and BC governments to support the global initiative for a Fossil Fuel Non-Proliferation Treaty.

CARRIED

5.3 2021 Regional District Sustainability Innovation Fund Applications

Report dated January 26, 2021, from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment Department, presenting ten projects recommended for Sustainability Innovation Funding for the Committee and the MVRD Board's consideration.

2:15 p.m. Councillor Yousef arrived at the meeting.

It was MOVED and SECONDED

That the MVRD Board approve the allocation from the Regional District Sustainability Innovation Fund for the following projects:

a) Assessment of Carbon Capture Technology in the Metro Vancouver Region: $200,000 over two years starting in 2021;

b) Lights, Camera, Climate Action: $200,000 over two years starting in 2021;

c) Sharing Data for Zero Emission Buildings (SDZEB): $200,000 over two years starting in 2021;

d) Responding to the Climate Emergency: Enhanced Stakeholder Engagement: $200,000 over two years starting in 2021;

e) Social and Community Data Land Use Model: $60,000 in 2021;

f) Regional Land Use Assessment: $200,000 over two years starting in 2021;

g) Housing Retrofit Evolution – Pembina Institute Reframed Initiative: $200,000 over two years starting in 2021;

h) Managing Capacity and Reducing Emissions: Real-time Parking Availability in Regional Parks: $300,000 over three years starting in 2021;

i) Natural Asset Management in Regional Parks: $160,000 over two years starting in 2021; and,

j) Promoting Peatland Recovery in Areas Affected by Wildfire in Burns Bog Ecological Conservancy Area: $199,000 over two years starting in 2021.

CARRIED

Discussion ensued on the Regional District sustainability fund applications, and for staff to review the criteria set out in the *Regional District Sustainability Innovation Fund Policy*.

It was MOVED and SECONDED
That the Climate Action Committee direct staff to review the *Regional District Sustainability Innovation Fund Policy*, and report back with proposed amendments for the MVRD Board's consideration.

CARRIED

5.4 2021 Water Sustainability Innovation Fund Applications

Report dated January 26, 2021, from Lucas Pitts, Director, Policy, Planning and Analysis, Water Services Department, presenting five projects recommended for Sustainability Innovation Funding for the Committee and the GVWD Board's consideration.

Members were provided a presentation regarding the 2021 Sustainability Innovation Fund Applications highlighting funding overview, and the Regional District and Water District Sustainability Innovation Fund applications.

Presentation material titled "2021 Sustainability Innovation Fund Applications" is retained with the February 12, 2021 Climate Action Committee agenda.

It was MOVED and SECONDED
That the GVWD Board approve the allocation from the Water Sustainability Innovation Fund for the following projects:

a) Building Information Modeling (BIM): Transforming Utilities Information Management: $800,000 over two years starting in 2021;
b) Microplastics Study in Source Waters and Water Treatment: $150,000 over two years starting in 2022;
c) Next Generation Snowpack Monitoring, Phase 2: $400,000 over two years starting in 2021;
d) Visual Documentation of Key Water Services Infrastructure: $700,000 over two years starting in 2022; and,
e) Industrial, Commercial & Institutional Sector Migration – Impact on Water Services: $150,000 over two years starting in 2021.

CARRIED

5.5 Hydrothermal Processing Demonstration Facility – Additional Sustainability Innovation Fund Funding Request

Report dated February 1, 2021, from Paul Kadota, Collaborative Innovations Manager, Liquid Waste Services Department, updating the Committee on the Hydrothermal Processing Demonstration Project cost estimate revised in 2020, and seeking GVS&DD Board approval for additional allocation of Sustainability Innovation Funds from reserves.

Members were provided a presentation regarding the Hydrothermal Processing Demonstration Facility highlighting conversion to transportation fuels, background and new information, anaerobic digestion versus hydrothermal processing, and implications.

Presentation material titled "Hydrothermal Processing Demonstration Facility" is retained with the February 12, 2021 Climate Action Committee agenda.

It was MOVED and SECONDED
That the GVS&DD Board approve additional funding of $6.13 million from the Liquid Waste Sustainability Innovation Fund for the Hydrothermal Processing Biofuel Demonstration Facility.

CARRIED

5.6 Endorsement of Host Society for the Howe Sound Ocean Watch Action Committee

Report dated January 22, 2021 from Marcin Pachcinski, Division Manager, Electoral Area and Environment, Regional Planning and Housing Services Department, providing the Committee and MVRD Board with the opportunity to consider endorsing the Howe Sound Biosphere Region Initiative Society as the host society for the Ocean Watch Action Committee.

It was MOVED and SECONDED
That the MVRD Board endorse the Howe Sound Biosphere Region Initiative Society as the host society for the Ocean Watch Action Committee**.**

CARRIED

5.7 Manager's Report

Report dated January 22, 2021, from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment Department, updating the Committee on the following:

- Climate Action Committee 2021 Work Plan
- Item 4.1 Invited Presentation Alex Boston, Executive Director, Renewable Cities, will be presented at a future Climate Action meeting
- Township of Langley Climate Action Strategy
- CleanBC electrification initiatives
- *Clean Air Plan* and *Climate 2050* engagement update
- consultation events on potential expansion of the *Non-Road Diesel Engine Emission Regulation* were conducted
- proposed amendments to *Air Quality Permit and Regulatory Fees*
- Fraser Valley Regional District Air Quality Service Agreement.

It was MOVED and SECONDED
That the Climate Action Committee receive for information the report dated January 22, 2021, titled "Manager's Report".

CARRIED

6. INFORMATION ITEMS

6.1 Correspondence re: Ride Hailing, from Office of the Minister, Ministry of Transportation and Infrastructure, to MVRD Board Chair Sav Dhaliwal, dated January 22, 2021.

7. OTHER BUSINESS

No items presented.

8. BUSINESS ARISING FROM DELEGATIONS

No items presented.

9. RESOLUTION TO CLOSE MEETING

No items presented.

10. ADJOURNMENT/CONCLUSION

It was MOVED and SECONDED

That the Climate Action Committee conclude its regular meeting of February 12, 2021.

CARRIED

(Time: 3:50 p.m.)

_____ _____

Lauren Cichon, Adriane Carr, Chair
Legislative Services Coordinator

43742229 FINAL

To: Climate Action Committee

From: John Lindner, Air Quality Planner
Derek Jennejohn, Lead Senior Engineer
Parks and Environment Department

Date: February 10, 2021 Meeting Date: March 3, 2021

Subject: **Draft *Clean Air Plan***

RECOMMENDATION

That the MVRD Board authorize staff to proceed with engagement on the draft *Clean Air Plan*, based on the report dated February 10, 2021, titled "Draft *Clean Air Plan*".

EXECUTIVE SUMMARY

This report presents the draft *Clean Air Plan*, Metro Vancouver's plan to reduce greenhouse gas emissions and improve air quality in our region over the next 10 years. The draft Plan was developed based on feedback received in 2019 and 2020, as well as recent modelling work. The draft Plan presents actions to reduce air contaminant emissions (including health-harming air contaminants and greenhouse gases) from transportation, buildings and industry, and will support engagement and development of the final *Clean Air Plan*. The draft Plan also outlines a process to introduce equity considerations. The *Clean Air Plan* will support *Climate 2050's* vision of a carbon neutral region by identifying the initial actions needed to meet the region's 2030 greenhouse gas target.

PURPOSE

To seek MVRD Board authorization to proceed with engagement on the draft *Clean Air Plan*.

BACKGROUND

Metro Vancouver adopted its first regional air quality management plan in 1994, with subsequent plans adopted in 2005 and 2011. These management plans have guided continuous improvement in regional air quality, addressing both common air contaminants and greenhouse gases.

Development of the current *Clean Air Plan*, coincides with development of the *Climate 2050 Roadmaps*. At the October 4, 2019 meeting of the MVRD Board, the following motion was passed:

> *That the MVRD Board, based on the report dated August 27, 2019, titled "Integrated Public Engagement Process for the Metro Vancouver Clean Air Plan and Climate 2050":*
> *a) approve the scope of the proposed Clean Air Plan as presented in the Clean Air Plan Backgrounder;*
> *b) authorize staff to proceed with the engagement process on the Clean Air Plan; and*
> *c) direct staff to integrate the Clean Air Plan engagement process with the Climate 2050 engagement process.*

This report responds to Board direction by presenting a draft *Clean Air Plan*, developed with input from the engagement process. Staff are seeking authorization from the MVRD Board to proceed with engagement on the draft *Clean Air Plan*, with an aim to finalize the plan by the end of 2021.

DRAFT *CLEAN AIR PLAN*

The draft *Clean Air Plan* (Attachment 1) contains actions that will reduce air contaminant emissions and impacts, including greenhouse gases, in our region over the next 10 years, and in doing so will build the foundation to support the 30-year goal of a carbon neutral region by 2050. These actions will also improve air quality in the region, protecting human health and the environment, and are harmonized with multiple issue areas in *Climate 2050*. The draft *Clean Air Plan* focuses on actions that Metro Vancouver has the authority to implement. The Plan also identifies actions for implementation by other orders of government, so collaboration and coordination will be essential to achieving the Plan's regional air quality and greenhouse gas (GHG) targets.

The draft *Clean Air Plan* is structured around the following elements:

- **Vision:** Metro Vancouver is a carbon neutral region where residents experience healthy, clean and clear air.
- **Regional 2030 targets**:
  - Reduce regional GHG emissions by 45% from 2010 levels (aligned with *Climate 2050*);
  - Ambient air quality in the region meets or is better than health-based ambient air quality objectives and standards set by Metro Vancouver, and the BC and Canadian governments;
  - Increase the amount of time that visual air quality is classified as excellent.
- Ten **guiding principles** to guide decisions around strategies and actions.
- **Goals**, **targets**, **strategies** and **actions** for six issue areas: Transportation; Buildings; Industry; Agriculture; Health; and Measure, Monitor and Regulate.

Prior to proceeding with engagement, the draft *Clean Air Plan* will be formatted to match the look and feel of other documents intended for a public and stakeholder audience.

Key Strategies and Actions in the Draft *Clean Air Plan*

The key strategies and actions to help achieve the vision and targets of the *Clean Air Plan* include:

- **Transportation:**
  - Accelerating the transition to zero emission passenger and commercial vehicles with more stringent sales targets and emission requirements, along with more incentives for new and used zero emission vehicles, and associated charging and refueling infrastructure;
  - Reducing driving in the region by increasing funding for public transit and active transportation networks, as well as supporting development of mobility pricing and updating local parking strategies;
  - Reducing marine, rail and aviation emissions through long-term provincial and federal emission reduction strategies;
- **Buildings:**
  - Accelerating the transition to zero emission buildings with GHG requirements for existing large and small buildings, supported by building code changes, incentives and outreach;
  - Making wood heating cleaner through regulation and incentives;
- **Industry:**
  - Reducing emissions from industrial facilities with more stringent emission requirements, incentives and sector-specific regulations;
  - Reducing non-road emissions with more stringent emission requirements and incentives;
  - Reducing business emissions with regional guidance on low carbon procurement; and

- **Increasing the supply of clean, renewable fuels** for hard to decarbonize sectors such as freight and industry.

The goals, targets, strategies and actions in the draft *Clean Air Plan* incorporate feedback received from the public, stakeholders and other governments, which was summarized in a report to the Climate Action Committee at its November 13, 2020 meeting. That feedback was received in response to the discussion papers on buildings, industry, transportation, and agriculture that were presented to the Climate Action Committee and MVRD Board in 2019 and 2020.

The draft *Clean Air Plan* also outlines a process to introduce equity into air quality and climate action planning, by developing an approach that includes enhanced community input, equity evaluation tools, and health impact assessments. Staff will carry out additional work with partners to conduct an equity review of the draft Plan, and the proposed approach, before presenting the final *Clean Air Plan* for Board approval.

Feedback provided by the Committee on the attached draft *Clean Air Plan* will be incorporated into the draft Plan prior to initiating engagement.

Potential Emission Impacts of the Draft *Clean Air Plan*
Implementation of the actions in the draft *Clean Air Plan* is critical to achieving regional emission reduction targets. Initial modelling of the draft *Clean Air Plan* estimated the potential impacts of actions on regional emissions, supported by the initial carbon neutral modelling presented to the Climate Action Committee on November 13, 2020.

With respect to emissions of health-harming air contaminants, regional air quality is generally good, with the emphasis on continuous improvement and maintaining compliance with the applicable ambient air quality standards. The modelling indicates that if all the actions in the draft Plan are implemented, regional emissions of common air contaminants could be reduced by over 7,000 tonnes, with potential health benefits of up to $1 billion.

From a GHG perspective, the modelling indicates that if all the actions in the draft Plan are implemented, regional GHGs could be reduced by approximately 2 million tonnes by 2030, or 15% below 2010 levels. While significant, these potential emission reductions do not achieve the 2030 target to reduce regional GHG emissions by 45% from 2010 levels. With this in mind, 2030 GHG targets have been established for each issue area, which go beyond the initial modelling results such that the cumulative benefit aligns with the 45% target, while accounting for the technological readiness and economic considerations of different sectors. Staff will continue to work with residents, businesses and governments to identify additional solutions, and additional climate actions will be identified as the *Climate 2050 Roadmaps* are developed and implemented.

Relationship Between *Clean Air Plan* and *Climate 2050*
The *Clean Air Plan* will be Metro Vancouver's fourth air quality and greenhouse gas management plan, building on the 2011 *Integrated Air Quality and Greenhouse Gas Management Plan.* The *Clean Air Plan* supports *Climate 2050's* vision of a carbon neutral region by identifying the initial actions needed to support the region's 2030 greenhouse gas target. The greenhouse gas actions in the draft

Clean Air Plan will also be included in the relevant *Climate 2050 Roadmaps*, such as the draft *Buildings Roadmap*, which is the subject of a separate report in the Committee's March 2021 agenda package.

ENGAGEMENT PROCESS

Metro Vancouver is committed to engaging with the public, stakeholders and other governments, including First Nations, and incorporating their feedback into the *Clean Air Plan*.

The proposed engagement process will be conducted in accordance with the Metro Vancouver Board Policy on Public Engagement and builds on the work completed to date to develop the draft *Clean Air Plan*. The engagement plan (Attachment 2) is designed to reach a broad audience to discuss the purpose and benefits of the *Clean Air Plan*. Engagement will also seek feedback from specific sectors and organizations, which could include support, concerns about implementation or impacts, and ideas for innovation and collaboration.

Due to public health regulations, engagement events are expected to be virtual and online, and staff are planning creative and engaging materials to encourage feedback. Feedback will be reported to the Committee, highlighting how it informed the final *Clean Air Plan*. Staff intend to bring the final *Clean Air Plan* forward for adoption later in 2021, following completion of the engagement period and incorporation of the feedback received.

ALTERNATIVES

1) That the MVRD Board authorize staff to proceed with engagement on the draft *Clean Air Plan*, based on the report dated February 10, 2021, titled "Draft *Clean Air Plan*".

2) That the MVRD Board receive for information the report dated February 10, 2021, titled "Draft *Clean Air Plan*", and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

Under Alternative 1, the resources required to develop and engage on the draft *Clean Air Plan* have been approved in program budgets for 2021, including staff time and consulting expenditures. Continued integration of engagement activities for the *Clean Air Plan* with the *Climate 2050 Roadmaps* is intended to make the best use of resources available, as well as minimize time commitments for interested parties providing feedback.

CONCLUSION

Metro Vancouver is developing a *Clean Air Plan* to identify actions to reduce emissions of air contaminants, including greenhouse gases, in our region over the next 10 years. The *Clean Air Plan* supports *Climate 2050* by identifying the actions to meet the region's 2030 greenhouse gas target. The draft *Clean Air Plan* outlines major strategies and actions in sectors such as transportation, buildings and industry. These strategies and actions would significantly reduce emissions and impacts in the region, and support the transition to a carbon neutral region.

If authorized by the Board, Metro Vancouver intends to seek feedback from the public, stakeholders and other governments, including First Nations, to support the final development of the *Clean Air Plan*. Staff recommend Alternative 1, that the Board direct staff to proceed with engagement on the draft *Clean Air Plan*.

Attachments *(44092301)*

1. Draft *Clean Air Plan*, dated March 2021 *(44041459)*
2. Engagement Plan for the Metro Vancouver *Clean Air Plan* *(43857026)*

43696213

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Your feedback is valued.

The draft *Clean Air Plan* was prepared in winter 2020/2021, and introduced for public and stakeholder comment during the COVID-19 pandemic. Metro Vancouver assesses work plans on a case by case basis to determine if adjustments are required due to the COVID-19 pandemic response, including how engagement is conducted. For air quality and climate change programs and initiatives, this means continuing with work plans that protect human health and the environment, and adjusting how we approach engagement.

Goals and targets in Metro Vancouver's climate-related plans are science-based and remain a priority. The interim target of a 45% reduction in greenhouse gas emissions below 2010 levels by 2030 has a time horizon of less than ten years. Pursuing a carbon neutral region by 2050 requires taking bold action now. Across the globe, the pandemic response has provided a glimpse of what is possible and what we can achieve with coordinated efforts and common goals.

Public feedback is valued and project teams continue to seek input, create online feedback opportunities, and ensure feedback is reflected as policy development moves forward. Documents, feedback forms, and direct email links to the project team are all posted to the Metro Vancouver website, www.metrovancouver.org, search "Clean Air Plan".

Executive Summary

The *Clean Air Plan* is Metro Vancouver's air quality and greenhouse gas management plan. Actions in the Plan will reduce air contaminant emissions and impacts, including greenhouse gases, over the next 10 years, and in doing so support the 30-year goal of a carbon neutral region by 2050. This management plan also helps improve air quality for the region, to protect human health and the environment.

The *Clean Air Plan* focuses on actions that Metro Vancouver has the authority to implement, and also identifies actions for implementation by others. The Plan targets air contaminants that have the potential to harm human health, together with greenhouse gases, as many sources in the region emit both types of air contaminants. The *Clean Air Plan* is developed with input from across the region, and will be implemented through to 2030. Metro Vancouver's website includes more information.

Challenge

Air quality impacts from health-harming air contaminants such as fine particulate matter and nitrogen dioxide, have significant health costs, and the most impact on our youngest, oldest and residents with underlying health conditions. Climate change, while less evident day-to-day, is already impacting our health and our environment, and those impacts will become more evident in coming years. Climate change and air quality impacts can harm some neighbourhoods, households and individuals more than others.

Metro Vancouver, together with its member jurisdictions, has been taking action on air quality and climate change for more than twenty years. **But governments, businesses and residents need to do more to reduce our contributions to climate change and improve our regional air quality, both of which will protect human health and the environment.**

Vision

Metro Vancouver is a carbon neutral region where residents experience healthy, clean and clear air.

Regional 2030 Targets

1. Reduce regional greenhouse gas emissions by 45% from 2010 levels.
2. Ambient air quality in the region meets or is better than health-based ambient air quality objectives and standards set by Metro Vancouver, the BC Government and Government of Canada.
3. Increase the amount of time that visual air quality is classified as excellent.

If all the actions in this *Clean Air Plan* are implemented, the region will see further air quality improvements, and accelerate progress towards our long-term goal of a carbon neutral region by 2050.

Guiding Principles

The Guiding Principles describe the fundamental values that guided development of the Plan.

1. Ambitious
2. Evidence-based
3. Equitable
4. Inclusive & Collaborative
5. Preventative
6. Continuous Improvement
7. Prioritize Co-benefits
8. Dynamic
9. Transparent
10. Comprehensive & Integrated

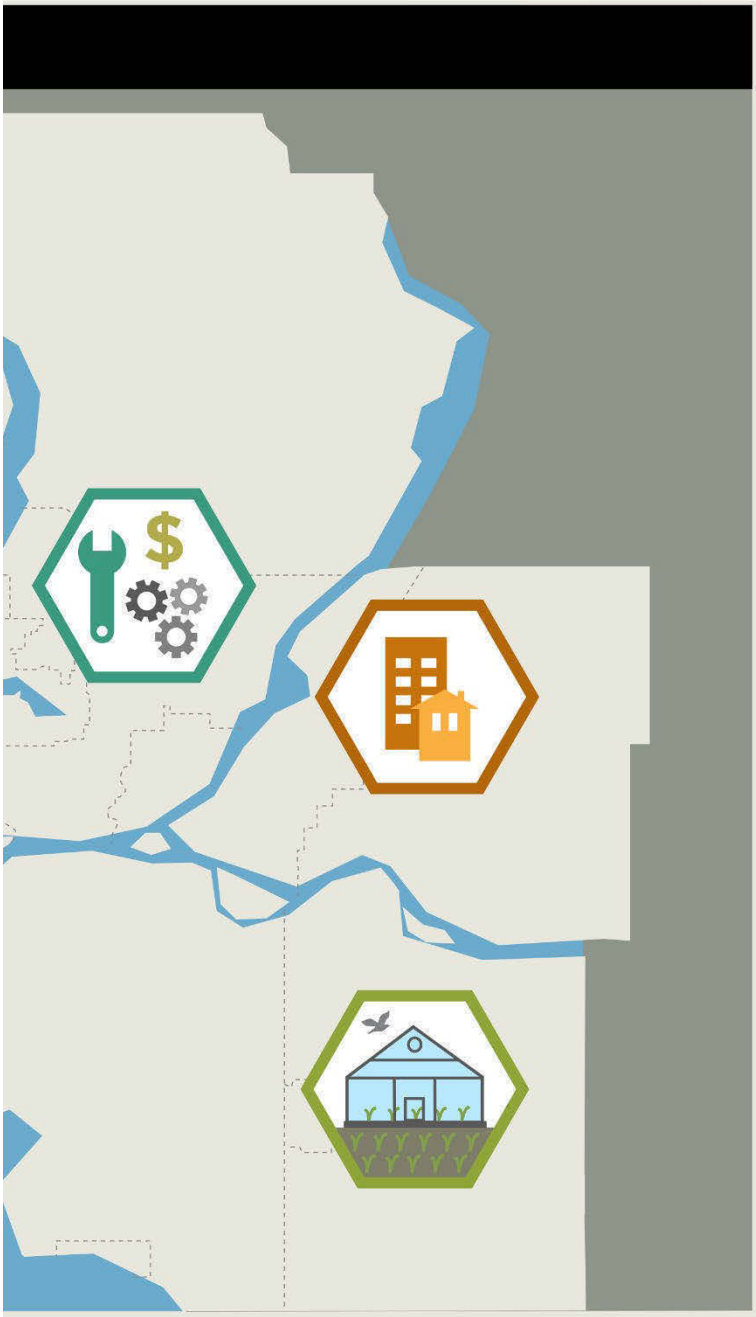
Summary of Actions

Equity

Metro Vancouver will develop a strategic approach to assessing equity in air quality and climate change programs. This will include community input, health impact assessments and other equity evaluation tools so that all residents benefit from air quality and climate change programs.

Transportation

The transition to zero emission passenger and commercial vehicles will be supported by sales targets, improved emission standards, more renewable fuels and a charging and refueling strategy. Personal transportation choices will be supported by increased funding for transit and active transportation and improved parking policies. Longer-term clean fuel strategies and engine technologies will reduce rail, marine and aviation emissions.



Industry & Business

Industry will benefit from cleaner fuels and better emissions controls, supported by stronger emissions standards and regional collaboration. Replacement of older non-road equipment models will be accelerated with more stringent regulations as well as incentives.

Buildings

New and existing buildings will meet more stringent greenhouse gas standards and offer reporting on energy use and emissions. More households can benefit from retrofit programs by enhancing financial tools. Residential wood burning rules will reduce health impacts from fine particulate matter.

Agriculture

Agricultural equipment and greenhouses will reduce emissions through improved energy efficiency and shifting to renewable energy. Air quality impacts from burning vegetative waste will be reduced through alternative practices.

Issue Area 2030 Targets

Transportation Targets

- Passenger vehicles:
  - 65% reduction in greenhouse gas emissions, from 2010 levels
- Commercial vehicles, rail locomotives, marine vessels and aircraft:
  - 35% reduction in greenhouse gas emissions, from 2010 levels
- Passenger and commercial vehicles, rail locomotives, marine vessels and aircraft:
  - 25% reduction in diesel particulate matter emissions, from 2020 levels
  - 40% reduction in nitrogen oxides emissions, from 2020 levels

Buildings Targets

- All buildings:
  - 35% reduction in greenhouse gas emissions from buildings, from 2010 levels
  - 35% reduction in fine particulate matter emissions from buildings, from 2020 levels
  - 15% reduction in nitrogen oxides emissions from buildings, from 2020 levels
- New buildings:
  - All new buildings are zero emissions in their operations
  - All new buildings produce 40% less embodied emissions from construction

Industry Targets

- Industrial facilities
  - 35% reduction in greenhouse gas emissions, from 2010 levels
  - 10% reduction in fine particulate matter emissions, from 2020 levels
  - 10% reduction in nitrogen oxides emissions, from 2020 levels
- Non-road
  - 35% reduction in greenhouse gas emissions, from 2010 levels
  - 50% reduction in diesel particulate matter emissions, from 2020 levels

Agriculture Targets

- 35% reduction in greenhouse gas emissions, from 2010 levels
- 10% reduction in fine particulate matter, from 2020 levels

Measure, Monitor and Regulate Target

- 98% reliability of ambient air quality monitoring network

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Metro Vancouver

Underlined words are key concepts defined in the Glossary on Page 62.

Metro Vancouver is a federation of 21 municipalities, one Electoral Area and one Treaty First Nation, working collaboratively in planning and providing vital utility and local government services to 2.7 million people. Core services include drinking water, sewage treatment, and solid waste management, along with regional services like regional parks, affordable housing, regional land use planning and air quality and climate action that help keep the region one of the most livable in the world.

Mission

Metro Vancouver's mission is framed around three broad roles.

1. Serve as a Regional Federation

Serve as the main political forum for discussion of significant community issues at the regional level, and facilitate the collaboration of members in delivering the services best provided at the regional level.

2. Deliver Core Services

Provide regional utility services related to drinking water, liquid waste and solid waste to members. Provide regional services, including parks and affordable housing, directly to residents and act as the local government for Electoral Area A.

3. Plan for the Region

Carry out planning and regulatory responsibilities related to the three utility services as well as air quality and climate action, regional planning, regional parks, Electoral Area A, affordable housing, labour relations, regional economic prosperity, and regional emergency management.

Building a Resilient Region

Building the resilience of the region is at the heart of Metro Vancouver's work. Each of Metro Vancouver's regional plans and strategies adopts a vision, guiding principles, goals, strategies, actions and key performance measures that will support a more resilient, low carbon and equitable future. Metro Vancouver's interconnected plans and strategies are guided by the *Board Strategic Plan*, which provides strategic direction for each of Metro Vancouver's legislated areas of responsibility, and the Long-Term Financial Plan, which projects total expenditures for capital projects and operations that sustain important regional services and infrastructure. Together these documents outline Metro Vancouver's policy commitments and specific contributions to achieving a resilient region.

Plan Context

Challenges and Opportunities

The air we breathe is mostly nitrogen and oxygen, and also contains air contaminants, some of which are damaging. Higher levels of air contaminants degrade air quality and cause climate change, with associated impacts on human health and the environment. The air contaminants with the most impact in the Metro Vancouver region are described below.

- Health-harming air contaminants damage air quality, harming human health and the environment. Some impact visual air quality, and others have odorous characteristics. Health-harming air contaminants include fine particulate matter, diesel particulate matter, ground-level ozone, nitrogen dioxide, sulphur dioxide and volatile organic compounds.
- Greenhouse gases trap heat and are the cause of climate change. Greenhouse gases include carbon dioxide, methane, nitrous oxide, halocarbons (e.g., refrigerants), black carbon and ground-level ozone.

Air Quality: Residents in the region generally experience good air quality today, due to air quality management efforts by Metro Vancouver and others in recent decades. Air quality monitoring by Metro Vancouver shows that most health-harming air contaminant levels have been improving, even while the region's population has grown.

Greenhouse Gases: Climate change projections for the region for 2050 include longer, hotter and drier summers, warmer and wetter fall and winter seasons with decreased snowpack, and more extreme weather events. Greenhouse gas emissions have both local and global impacts and we all have a shared responsibility to take local climate action.

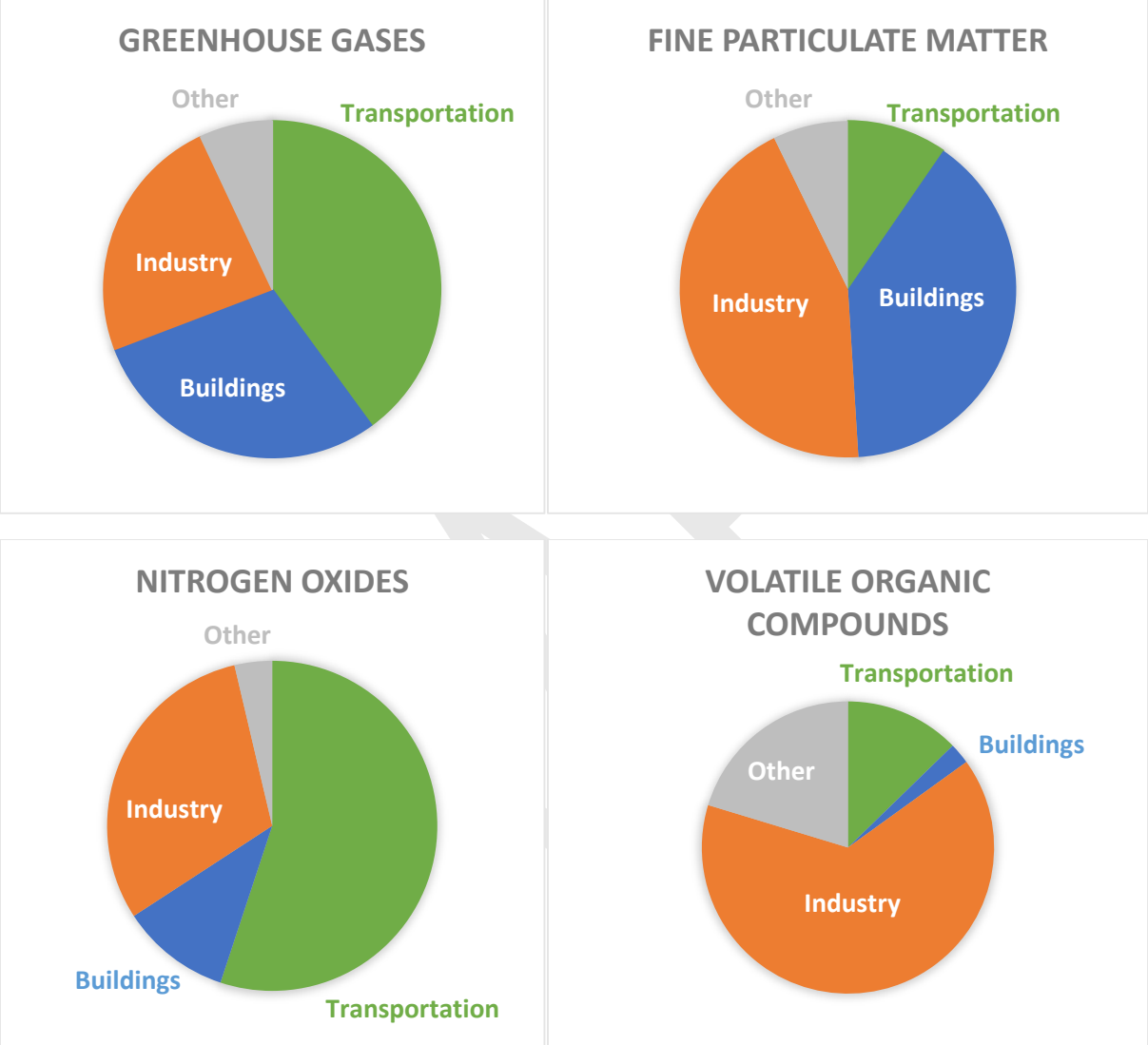
CALL OUT BOX

How degraded air quality and climate change can harm residents in Metro Vancouver

Higher levels of health-harming air contaminants can cause heart and lung disease and cancer, and increases the risk of hospitalization, asthma and bronchitis. Children, the elderly, people who are active outdoors, and those with pre-existing health conditions are at higher risk from air quality impacts. Health researchers have demonstrated that there are no known safe levels for some health-harming air contaminants, including fine particulate matter, ground-level ozone and nitrogen dioxide. Health Canada estimates that at least 1,600 British Columbians die prematurely every year due to those three contaminants and many more live with the associated health effects.

As the climate changes, wildfires are expected to become more intense and more frequent, impacting residents with harmful smoke. Sea level rise, increased storm surge and more extreme rainfall all increase the risk of flooding in Metro Vancouver communities, which can hurt residents, their homes and businesses. More extreme heat can cause heat stress in vulnerable populations. Some households are better able to prepare for and protect themselves from climate change and air quality impacts.

Regional Emission Sources: Emissions in the Metro Vancouver region are primarily from burning fossil fuels such as gasoline, diesel, natural gas and coal, as well as burning renewable fuels such as wood. The major sources of regional emissions are transportation, buildings and industry, as shown in the graphics below, with smaller contributions from agriculture, waste management and other sources.



Metro Vancouver, together with its member jurisdictions, has been taking action on air quality and climate change for decades. **But governments, businesses and residents need to do more to reduce our contributions to climate change, improve our regional air quality, and protect human health and the environment.**

The *Clean Air Plan* is Metro Vancouver's fourth regional air quality and greenhouse gas management plan. The Plan is developed with input from across the region, and will be implemented through to 2030.

Roles and Responsibilities

Metro Vancouver is responsible for managing and regulating air contaminants in the region under authority delegated by the BC Government in the *Environmental Management Act*. Metro Vancouver's

management program includes developing plans, strategies and regulations; promoting compliance with permits and regulations; monitoring air quality; and delivering awareness and incentive programs (see Issue Area 6 for more details).

Metro Vancouver also coordinates with other governments and regional partners on air quality and greenhouse gas management. Coordination will be essential to achieving the draft Plan's regional air quality and greenhouse gas targets because some key actions will be led by other governments. The roles and responsibilities of Metro Vancouver's key partners are described below.

- The **Government of Canada** sets emission standards for on-road vehicles, non-road equipment, rail locomotives, home heating appliances, fuels, and some industrial sources. The Government of Canada coordinates the national Air Quality Management System to improve air quality in Canada, and regulates federal undertakings such as ports and airports.
- The **BC Government** sets emission standards for fuels and other emission sources, and manages air quality in BC for areas outside of Metro Vancouver, including adjacent regional districts.
- **First Nations** in the Metro Vancouver region provide services to their communities and a number of First Nations in the region have adopted sustainability and/or land-use plans. Tsawwassen First Nation is a Metro Vancouver member jurisdiction and has similar authority and powers as other member jurisdictions with respect to climate change.
- **Member jurisdictions** (i.e., local municipalities) are responsible for land-use policy and enforcing building codes. Many member jurisdictions have adopted climate action and environmental plans, and are implementing actions to reduce emissions within their jurisdictions.
- **TransLink** plans, finances and operates public transit in the region, and shares responsibility for the major road and regional cycling networks with municipalities and the BC Government. The Government of Canada and BC Government also fund transit and transportation projects.
- The **Vancouver Fraser Port Authority** oversees federal port lands in the region. It protects the environment, considers local communities and safely facilitates Canada's trade objectives.
- The **Fraser Valley Regional District** shares the Canadian Lower Fraser Valley airshed with Metro Vancouver. The Fraser Valley Regional District has air quality planning authority and operates air quality programs.
- **Health authorities** provide research and information on the health impacts of air contaminants to support air quality management.
- **Energy utilities** such as BC Hydro and FortisBC supply energy for residents and businesses, as well as provide incentives to owners to reduce emissions and energy consumption.

Relationship of *Clean Air Plan* to other Metro Vancouver Roles and Strategic Plans

The *Clean Air Plan* supports the vision of *Climate 2050*, Metro Vancouver's strategy to transition the region to a low carbon and resilient future, increasing the health, well-being and prosperity of Metro Vancouver residents. The *Clean Air Plan* identifies the initial actions needed to meet the region's 2030 greenhouse gas target – a 45% reduction in regional greenhouse gas emissions from 2010 levels. Achieving the 45% target sets the foundation for moving the region towards the *Climate 2050* goal of a carbon neutral region by 2050. A series of *Climate 2050 Roadmaps* describe the current opportunities and best approaches to reach climate targets for the region.

CALL OUT BOX

Land-use and growth management supports emission reductions

Metro Vancouver, in partnership with its member jurisdictions, manages regional land-use and growth through the *Regional Growth Strategy* (*Metro Vancouver 2040: Shaping our Future*). The Strategy outlines a vision for a compact region with a network of complete communities well connected by public transit, and protected agricultural and natural areas. Strong regional land-use policies are foundational to achieving the targets in the *Clean Air Plan*. Compact, complete communities promote walking, cycling and public transit, which reduce driving emissions. They also support higher density communities that reduce emissions from buildings. Containing urban growth protects agricultural, rural, conservation and recreation lands, allowing natural areas to absorb and store carbon dioxide. The Strategy also establishes greenhouse gas targets for the region.

The *Clean Air Plan* also supports and is supported by actions by other Metro Vancouver services. The table below outlines the links between the *Clean Air Plan* and actions and plans under other Metro Vancouver services.

METRO VANCOUVER SERVICE	LINKS WITH AIR QUALITY AND GREENHOUSE GAS MANAGEMENT
Regional Planning	- See "Land use and growth management supports emission reductions" info box.
Water Services	- Contamination of water resources is minimized by reducing air contaminant emissions. - Natural areas in the watersheds help sequester carbon. - Management of natural areas and a wildfire suppression program reduce wildfire risks, which would impact air quality.
Housing	- The *Metro Vancouver Housing 10-Year Plan* sets targets to reduce energy consumption by 25% for major rehabilitation and new construction, and reduce greenhouse gas emissions in the housing portfolio by 45% by 2030 through electrification.
Regional Parks	- Regional greenways help reduce traffic emissions. - Natural areas in regional parks help sequester carbon. - Park land acquisition protects green spaces and bolsters carbon sequestration. - Management of natural areas and a wildfire suppression program reduce wildfire risks, which would impact air quality.
Liquid Waste Services	- Pursuing opportunities to create low carbon energy from liquid waste streams and residuals, to help displace fossil fuel use. - Biosolids used for land reclamation and restoration help sequester carbon in soil. - Odour control systems reduce odours from the sewer system and wastewater treatment plants. - Increasing energy efficiency and switching to clean, renewable energy both reduce emissions.

Solid Waste Services	- Diversion and circular economy processes minimize the generation of solid waste, which reduces emissions of greenhouse gases and other air contaminants. - Landfill gas management reduces emissions of methane, a powerful greenhouse gas. - Pursuing opportunities to create low carbon energy from solid waste streams, to help displace fossil use.

Clean Air Plan

The *Clean Air Plan* is Metro Vancouver's fourth regional air quality and greenhouse gas management plan. Actions in the Plan will reduce air contaminant emissions and impacts, including greenhouse gases, in our region over the next 10 years, and in doing so support the 30-year goal of a carbon neutral region by 2050. These actions will improve air quality in the region, protecting human health and the environment.

Vision

Metro Vancouver is a carbon neutral region where residents experience healthy, clean and clear air.

Regional 2030 Targets

The regional 2030 targets are quantitative measures that help to describe when we have achieved the vision.

1. Reduce regional greenhouse gas emissions by 45% from 2010 levels.
2. Ambient air quality in the region meets or is better than health-based ambient air quality objectives and standards set by Metro Vancouver, the BC Government and Government of Canada.
3. Increase the amount of time that visual air quality is classified as excellent.

CALL OUT BOX

Visual air quality

Visual air quality is how clear the air looks to the average observer. Visual air quality is another way of tracking air quality. In general, the more air contaminants there are in the air, the hazier the view. Improving air quality generally improves visual air quality.

Guiding Principles

The *Clean Air Plan* was written considering the following Guiding Principles, which describe the fundamental values that guided development of the Plan. These principles will also guide implementation of the actions in the Plan. The Guiding Principles were adapted from the United Nations Habitat principles for local climate action.

1. **Ambitious** – Demonstrate global and local leadership in tackling local climate change and air quality challenges.
2. **Evidence-based** – Inform decision-making with the most current science and local conditions, and understand and consider traditional knowledge.
3. **Equitable** – Consider equity in all actions to address climate change and air quality. This includes sharing the costs and benefits, considering affordability and a responsibility to future generations.
4. **Inclusive & Collaborative** – Involve all voices in planning and implementation.
5. **Preventative** – Prioritize actions that minimize air contaminant emissions through design or efficiency approaches, rather than remedial efforts such as emission controls.

6. **Continuous Improvement** – Continually reduce emissions and air quality impacts.
7. **Prioritize Co-benefits**: Prioritize actions that both improve air quality and reduce greenhouse gas emissions, while considering trade-offs and minimizing negative or unintended consequences.
8. **Dynamic** – Support innovation, leverage new information and explore emerging opportunities.
9. **Transparent** – Follow an open decision-making process, and set goals and targets that can be measured, reported, verified, and evaluated.
10. **Comprehensive & Integrated** – Implement air quality and climate change actions across all sectors and communities, integrating and aligning efforts with other governments.

Equity

Metro Vancouver's air quality and greenhouse gas management program has historically focused on the sources with the largest impacts in the region as a whole. These impacts are strongly linked to the amount and harm potential of air contaminants emitted by key sources. However, management programs have expanded beyond a regional focus to a community level, recognizing that climate change and degraded air quality impact some neighbourhoods, households and individuals more than others.

Equity is the promotion of fairness, justice and the removal of structural barriers that may cause or aggravate disparities experienced by different groups of people. The *Clean Air Plan* was developed based on an "equity" guiding principle, which is a commitment that Metro Vancouver will consider equity in actions to address climate change and air quality, and will work to reduce disproportionate impacts. **Actions that reduce emissions must also support an equitable distribution of benefits and avoid an inequitable distribution of costs.**

Integrating equity into Metro Vancouver's air quality and climate change programs is a work in progress. The *Clean Air Plan* includes six actions to support that work, recognizing that more will be needed in the future.

These actions will help Metro Vancouver further understand the impacts and benefits of air quality and climate change actions on all communities. The actions can clarify where inequities in air quality exist in the region, consider how equity can be better integrated into actions, and develop tools to address gaps.

Equity Actions

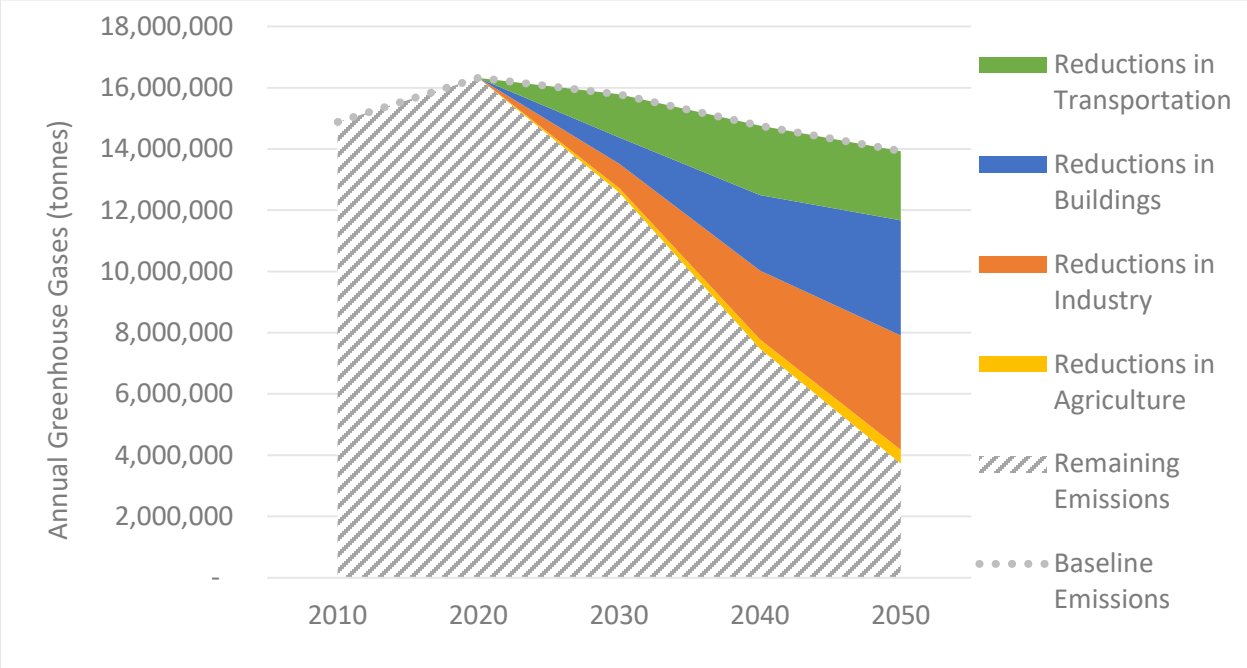
1. **Long-Term Approach for Equity.** Develop a long-term approach to evaluate and address equity in the design and implementation of air quality and greenhouse gas management programs, policies and regulations. The results of any equity analysis, both positive and negative, would be communicated to the public, including any disproportionate burdens that may be experienced by specific groups.
2. **Equity Community Input Process.** Work with community partners to develop a community input process to review equity impacts in the design and implementation of programs, policies and regulations.
3. **Air Quality Inequities Tool.** Work with health authorities and community partners to develop a publicly accessible tool to highlight and track existing inequities experienced in air quality impacts across the region (e.g., due to underlying health conditions, or proximity to large

emission sources or major roads). The tool could support similar work on disproportionate climate impacts in the region.

4. **Equity Metrics and Targets.** Develop metrics and targets to measure progress on equity in the region as it relates to air quality and greenhouse gas management.
5. **Share Equity Best Practices with Other Organizations.** Work with health authorities, member jurisdictions, BC Government and other regional partners to integrate equity best practices into the design and implementation of air quality and greenhouse gas policies, programs and regulations across the region.
6. **Equity-Building Air Quality Pilot.** Work with health authorities and community partners to develop and pilot at least one air quality project focused on equity-building.

Potential Impacts of *Clean Air Plan*

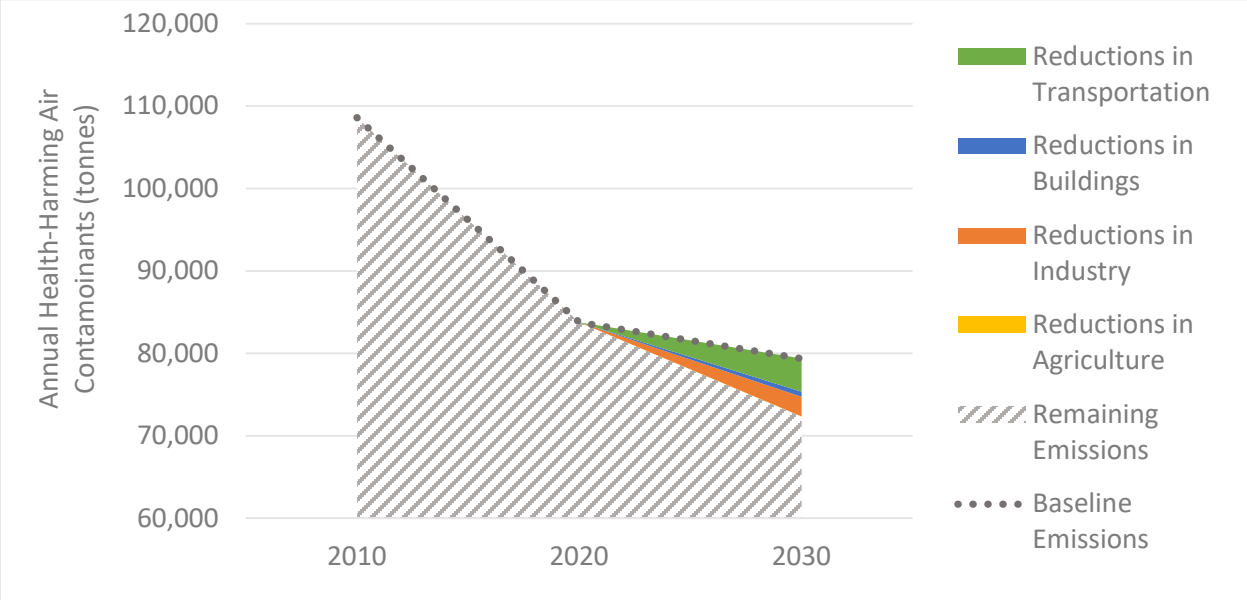
The actions in the *Clean Air Plan* were modelled to estimate their impact on regional emissions. This modelling suggests that with bold actions by all governments and broad adoption by the public and local businesses, emissions in the Metro Vancouver region can be significantly reduced over the next 30 years. The graph below shows the potential reduction in greenhouse gas emissions by 2050 by implementing an aggressive and achievable suite of actions, starting with the actions outlined in the *Clean Air Plan*.



Metro Vancouver's initial modelling of the actions in the *Clean Air Plan* indicates that if all the actions in the Plan were implemented, regional greenhouse gas emissions could be reduced by approximately 2 million tonnes by 2030, or 15% below the 2010 regional total. Starting implementation on the actions in the *Clean Air Plan* is critical to achieve these emission reductions.

These potential emission reductions are significant but do not achieve the 2030 target to reduce regional greenhouse gas emissions by 45% from 2010 levels. The 2030 greenhouse gas targets

established for each issue area align with the 45% target while accounting for the technological readiness and economic considerations of different sectors. Metro Vancouver will continue to work with residents, businesses and governments to accelerate these actions even further. Additional climate actions to help transition the region to carbon neutrality will be identified in the *Climate 2050 Roadmaps*.



The suite of actions in the *Clean Air Plan* are also expected to lead to significant improvements in regional air quality and public health. The above graph shows the impact of the Plan on the combined emissions of key health-harming air contaminants: fine particulate matter, nitrogen oxides, sulphur oxides and volatile organic compounds. Between 2020 and 2030, the actions could reduce regional emissions of fine particulate matter by 200 tonnes, nitrogen oxides by 3,800 tonnes, and volatile organic compounds by 3,000 tonnes. The impact of these emission reductions are described in the call out box below.

CALL OUT BOX

Assessing Health Benefits of Air Quality Actions in the *Clean Air Plan*

Assigning a value to these improvements depends on a variety of factors (e.g., health impacts of different air contaminants, costs of medical treatments, lost productivity, cost of pain and suffering). Using data from Health Canada, Metro Vancouver assessed that the potential health benefits from the *Clean Air Plan* between 2020 and 2030 could be up to $1 billion.

Structure and Implementation

The *Clean Air Plan* focuses on actions that Metro Vancouver can implement under our delegated authority. The Plan also identifies where other governments need to take action to help achieve our regional vision and 2030 targets.

Actions in the *Clean Air Plan* include guidance, incentives, awareness and outreach programs, standards, policies, programs and regulations. Most of the greenhouse gas actions in the *Clean Air Plan* are also included in the relevant *Climate 2050 Roadmaps*. Actions related to natural carbon sequestration and climate adaptation (i.e., climate resiliency) are identified in the relevant *Climate 2050 Roadmaps* and are not included in the *Clean Air Plan*.

The *Clean Air Plan* is organized around six issue areas:

1. Transportation;
2. Buildings;
3. Industry;
4. Agriculture;
5. Health; and
6. Measure, Monitor and Regulate.

CALL OUT BOX

Transitioning to Clean, Renewable Energy

Achieving our 2030 air quality and greenhouse gas targets will require a region-wide transition from fossil fuels to clean, renewable energy. Clean, renewable energy is low or zero emission energy that is replenished over days or years. In British Columbia, electricity is produced primarily from hydro power, a clean, renewable source of energy that produces significantly less emissions than fossil fuels. Therefore, electrification is the primary pathway to cleaner air and lower greenhouse gas emissions. Other renewable fuels will also be needed, particularly for sectors that are more expensive or complicated to electrify. However, most renewable fuels (e.g., wood, renewable natural gas) still produce health-harming air contaminants, which harm air quality, human health and the environment. The *Climate 2050 Energy Roadmap* describes the actions needed to transition to a carbon neutral and resilient region, powered by clean, renewable energy.

Metro Vancouver will work to implement the strategies and actions in the *Clean Air Plan*, reflecting them in annual work plans and budgets. Strategies and actions will be implemented following the Guiding Principles on Page 15. Progress on achieving the *Clean Air Plan* goals and targets will be publicized in annual reports, such as the Caring for the Air report.

Many actions in the *Clean Air Plan* may require a public engagement process prior to implementation, including new air emission regulations or significant changes to existing air emission regulations. Implementation of actions could also consider cost implications. Metro Vancouver values public feedback and will continue to seek feedback from the full range of voices and communities in the region. Feedback will be reflected in the design and implementation of actions.

DIAGRAM - UNDER DEVELOPMENT

Diagram will describe goals, targets, strategies, actions and other elements in the *Clean Air Plan*.

- **Long-term Goal(s)** frame the bright green future we want in the region around 2050, for each issue area.
- **Target(s)** help measure progress toward the long-term goals of the issue areas. Emission targets account for potential impacts of the issue area strategies, as well as emission impacts due to previously implemented policies.
- **Lead Agency(ies):** Agency(ies) with the largest role(s) in completing the action. The lead agency(ies) could be Metro Vancouver, others or a combination.
- **Potential Impacts of Strategy in 2030:** The largest potential emission reductions due to all actions in the strategy, relative to the expected baseline emissions in 2030. Greenhouse gases include carbon dioxide, methane and nitrous oxide. Health-harming air contaminants include the sum of fine particulate matter, nitrogen oxides, sulphur oxides and volatile organic compounds. The potential impacts reflect the emissions modelling described on Page 17.
- **Major Regional Action(s)** are foundational to achieving the strategy, and will generally lead to the most significant emission reductions.
- **Supporting Regional Action(s)** are critical to achieving the major regional actions.
- **Corporate Regional Action(s)** are leadership actions that Metro Vancouver will implement to support the major regional actions.
- **Potential Impacts of Action:**

  / The action **does/does not** have the potential to reduce greenhouse gas emissions.

  
  / The action **does/does not** have the potential to improve regional air quality.

  
  / The action **does/does not** have the potential to improve regional visual air quality.

- **Start Year(s):** Year when development of the action would be initiated by the Lead Agency(ies).

Issue Area 1: Transportation

The transportation system serves and shapes our region's communities and economy. Roads, rail lines, shipping lanes, flight paths, transit networks, and bike paths link us with our destinations, but burning fuels to travel these routes can worsen air quality and contribute to climate change. As the region grows and changes, we need a transportation system that will keep us connected and goods moving while also reducing emissions.

CALL OUT BOX
Transportation generates about half of regional emissions. Within transportation, passenger vehicles are the primary contributors of greenhouse gases and volatile organic compounds, while marine vessels, medium and heavy duty vehicles, and rail locomotives are most responsible for harmful emissions from diesel use, including fine particulate matter.

The strategies to reduce emissions of these air contaminants align with best practices around the world. They include cleaner fuels and engines; more compact, complete communities; shifting to lower emission modes of transportation (e.g., cycling, walking, transit, high-speed rail); and electrification. More background on climate change and transportation is included in the *Climate 2050 Transportation Roadmap*.

Long-term Goals

1. All personal travel within the region is made by active transportation or using zero emission technologies powered by clean, renewable energy.
2. All medium and heavy duty trucks, and rail locomotives operating within the region use zero emission technologies powered by clean, renewable energy.
3. All aircraft and marine vessels operating in the region use low emission and zero carbon technologies powered by clean, renewable energy.

2030 Targets

- Passenger vehicles:
  - 65% reduction in greenhouse gas emissions, from 2010 levels
- Commercial vehicles, rail locomotives, marine vessels and aircraft:
  - 35% reduction in greenhouse gas emissions, from 2010 levels
- Passenger and commercial vehicles, rail locomotives, marine vessels and aircraft:
  - 25% reduction in diesel particulate matter emissions, from 2020 levels
  - 40% reduction in nitrogen oxides emissions, from 2020 levels

Strategies and Actions

Strategy 1.1 Accelerate Transition of the Passenger Vehicle Fleet to Electric Vehicles.

The 1.5 million passenger vehicles registered in the region are our largest source of greenhouse gases, contributing almost a third of emissions. Electrifying passenger vehicles is the fastest way to significantly reduce these emissions. The BC *Zero Emission Vehicles Act* provides a pathway to 100% electric vehicle sales by 2040, but this timeline should be accelerated to get more electric vehicles on the road faster.

Electrifying passenger vehicles will also improve regional air quality, though work is needed to ensure that electric vehicles and charging infrastructure are reasonably accessible to everyone, including lower income households.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **710,000** tonnes Reduce annual health-harming air contaminants by up to **1,400** tonnes	- Member jurisdictions - BC Government - BC Hydro

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
1.1.1 Accelerate Sales Targets for New Electric Vehicles. Advocate to the BC Government to accelerate the sales targets in the *Zero Emission Vehicles Act* to reach 100% zero emission vehicle sales by 2030 (instead of current 2040 target). The BC Government should also modify the *Act* to prioritize 100% electric vehicles.	BC Government		2022 – 2023
1.1.2 Develop Regional Emission Requirements for Passenger Vehicles. Develop regulatory emission requirements for existing passenger vehicles, to be implemented by the BC Government or Metro Vancouver. Requirements could include low or zero emission zones, or a vehicle emissions levy with rebates for replacing older vehicles. Requirements would target both health-harming air contaminants and greenhouse gases. Any regulatory program must consider equity and be coordinated with member jurisdictions. Any program could also support actions focused on reducing total driving distances, including Action 1.2.3 on regional mobility pricing.	BC Government, Metro Vancouver		2023 – 2024
1.1.3 Make Electric Vehicles More Affordable. Advocate to BC Government, Government of Canada and other regional partners to continue providing funding (e.g., incentives, loans and tax credits) for the purchase of new and used electric vehicles. Funding should be available for personal and business purchases and should prioritize groups who generally cannot afford these vehicles without funding programs, such as low and middle income residents.	BC Government, Government of Canada		2022 – 2023

SUPPORTING REGIONAL ACTIONS			
1.1.4 Regional Electric Vehicle Charging Strategy. Develop a long-term regional strategy for electric vehicle charging infrastructure, coordinating with member jurisdictions, energy utilities, TransLink, and other regional partners. A strategy would identify where additional publicly accessible electric vehicle chargers are needed to ensure equitable access, as well as provide guidance on user fees, design and siting. The strategy should align with similar actions for medium and heavy duty trucks, and non-road equipment (Actions 1.3.6 and 3.2.4).	Metro Vancouver		2022 – 2023
1.1.5 Make New Passenger Vehicles Cleaner. Advocate to the Government of Canada to adopt more stringent fuel economy and emission standards for new passenger vehicles. New emission standards should consider more than just tailpipe emissions, such as particulate matter emissions from brake and tire wear.	Government of Canada		2024 – 2025
1.1.6 Expand Electric Vehicle Charging in Buildings. Work with member jurisdictions, BC Government, BC Hydro and Government of Canada to expand access to electric vehicle charging in buildings. This should include adoption of provincial "Right-to-Charge" legislation as well as code requirements that new or substantially renovated buildings are wired for electric vehicle chargers. Expanding access should also include increased support and funding (e.g., incentives, loans, tax credits) for electric vehicle charging in existing buildings. Funding should prioritize groups who generally would not have access to chargers, such as residents living in rental buildings, strata buildings, non-market housing or secondary suites.	BC Government, member jurisdictions		2022 – 2023
1.1.7 Electric Vehicle Outreach Programs. Enhance existing and deliver new public outreach programs about the benefits of electric vehicles and how to install electric vehicle chargers at workplaces and multi-family buildings, working with member jurisdictions and other regional partners.	Metro Vancouver		Ongoing
1.1.8 Electrification Targets for Ride-Hailing Services. Advocate to BC Government to establish vehicle electrification targets for ride-hailing and taxi fleets.	BC Government		2024 – 2025

1.1.9 Eliminate Tampering with Vehicle Emission Controls. Work with BC Government and Government of Canada to reduce the air quality impacts from tampering with emission control systems in passenger vehicles, and medium and heavy duty trucks. This could include banning the sale or import of tampering devices, and improved enforcement of tampering in vehicles and by automotive repair shops.	BC Government, Government of Canada, Metro Vancouver		2022 – 2023
1.1.10 Reduce Vehicle Idling Emissions. Advocate to member jurisdictions to adopt Metro Vancouver's model anti-idling bylaw, enforce existing anti-idling requirements and educate residents about the human health and environmental impacts of idling.	Member jurisdictions		2025 – 2026
SUPPORTING CORPORATE ACTIONS			
1.1.11 Transition the Corporate Fleet to Zero Emissions. Transition Metro Vancouver's corporate on-road fleet to zero carbon emission between 2035 and 2040, and zero emission by 2050. The transition would include both passenger and medium and heavy duty vehicles (see Action 4.2.7 for related action on corporate non-road fleet).	Metro Vancouver		Ongoing

Strategy 1.2 Reduce Driving through Active Transportation and Public Transit.

Transportation emissions at the community scale are driven by where people live, work, study and play. The Metro Vancouver *Regional Growth Strategy* (see Info Box on Page 13) and the TransLink *Regional Transportation Strategy* both outline policies to help create communities that are complete, compact, and transit oriented. When people live closer to where they work, study and play, more trips can happen by active transportation (e.g., walking, cycling) and public transit. Public transit can effectively move people medium and long distances, while active transportation is better for short and medium distances. Reducing the amount of driving in the region will significantly contribute to achieving the regional 2030 air quality and greenhouse gas targets. (Active transportation in particular has important co-benefits such as improved health.) However, helping residents and businesses to drive less is a long-term transition, so significant funding is needed to expand public transit and active transportation options. Regional mobility pricing can also help reduce emissions.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **280,000** tonnes Reduce annual health-harming air contaminants by up to **400** tonnes	- Member jurisdictions - TransLink - BC Government - Government of Canada

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
1.2.1 More Stable Funding for Regional Transit. Advocate to BC Government and Government of Canada to expand stable funding for the regional transit system to cover both operations and capital investments.	BC Government, Government of Canada		2022 – 2023
1.2.2 Enhance and Improve Regional Transit. Advocate to TransLink to increase public transit in the region. TransLink should increase transit frequency in key areas, transition to using clean, renewable energy, and implement other related air quality and climate actions outlined in the *Regional Transportation Strategy*. Regional emission reductions should be prioritized in transit expansion and service decisions, while ensuring that all residents have access to transportation options in a connected region.	TransLink		Ongoing
1.2.3 Support Mobility Pricing. Work with BC Government, TransLink and member jurisdictions to support development of mobility pricing. Any mobility pricing program for the region should prioritize reducing total driving distances and emissions, promoting fairness and equity, and should align with any low or zero emission zones in the region (see Actions 2.1.2 and 2.3.1).	BC Government		Ongoing
1.2.4 More Stable Infrastructure Funding for Regional Active Transportation Networks. Advocate to BC Government and Government of Canada to expand stable funding for comprehensive regional and local active transportation networks. The networks should be well-connected, comfortable for most, and integrated with public transit. Network expansion should prioritize under-served areas to ensure all residents have access to active transportation options in a connected region. Network elements should include walking and cycling paths, regional greenways, separated bike lanes, and end-of-trip facilities suitable for all bike and mobility types, including charging for electric mobility devices.	BC Government, Government of Canada		2022 – 2023

SUPPORTING REGIONAL ACTIONS			
1.2.5 Regional Parking Strategy to Reduce Driving. Develop a Regional Parking Strategy to prioritize active transportation and other low emission transportation options, coordinating with member jurisdictions and TransLink. The strategy could include replacing building parking minimums with maximums, establishing parking minimums for bicycles, implementing dynamic parking pricing and reducing free parking spaces. The strategy could also support uptake of electric and car-share vehicles by establishing electric vehicle charging requirements for parkades, and enhancing preferential parking rates and spaces for electric and car-share vehicles.	Metro Vancouver, member jurisdictions		2023 – 2024
1.2.6 Support Residents and Businesses in Active Transportation. Advocate to the BC Government and Government of Canada to provide incentives (including tax credits) to residents and businesses to support active transportation, including for buying, renting or sharing all bike and mobility types. Incentive availability should prioritize groups who generally cannot access these transportation options, such as low-income residents.	BC Government, Government of Canada		2022 – 2023
1.2.7 Communicate the Benefits of Walking, Cycling and Public Transit. Support outreach campaigns led by TransLink, member jurisdictions and health authorities that show the benefits of walking, cycling (including electric bikes) and public transit, including the associated improvements to regional air quality and greenhouse gas emissions.	TransLink, member jurisdictions		Ongoing
1.2.8 Implement Trip Reduction Programs. Advocate to BC Government to require large employers and major trip generators (e.g., shopping malls) to implement trip reduction programs. Such programs could require large employers and other major trip generators to measure staff or customer driving habits and take action to reduce driving. These programs should consider availability of lower emission alternatives and opportunities for remote and flexible work options.	BC Government		2024 – 2025
1.2.9 Support the Use of Bike- and Car-Sharing Services. Develop a regional strategy to support the increased use of bike- and car-sharing services, coordinating with member jurisdictions, TransLink and other regional partners. These services have been shown to reduce total driving distances among users.	Metro Vancouver		2024 – 2025

SUPPORTING CORPORATE ACTIONS			
1.2.10 Support Low Emissions Commuting by Staff. Develop and implement a Metro Vancouver corporate commuting strategy to reduce driving emissions. The strategy would encourage more commuting by active transportation, public transit and car-pooling. The strategy could also review parking policies, explore distributed and remote work options where operationally feasible, and recommend additional electric vehicle chargers at work sites.	Metro Vancouver		2022 – 2023

Strategy 1.3 Reduce Heavy Truck Emissions and Support Early Adoption of Zero Emission Heavy Trucks.

As our economy grows, goods movement in the region will continue to grow. The 40,000 medium and heavy duty trucks registered in the region (plus the trucks that travel in and out of the region) generate 5% of regional greenhouse gas emissions and 10% of regional diesel particulate matter. Federal emission standards ensure new trucks are cleaner, and provincial clean fuel standards have reduced the carbon intensity of diesel, the main fuel used by medium and heavy duty trucks. Programs that target high emitting medium and heavy duty trucks will help achieve the 2030 transportation targets for diesel particulate matter and nitrogen oxides. Sales targets, incentives and a regional refueling strategy will accelerate the long-term transition to zero emission medium and heavy duty trucks, reducing greenhouse gases and improving regional and local air quality.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **170,000** tonnes Reduce annual health-harming air contaminants by up to **200** tonnes	- BC Government - Vancouver Fraser Port Authority - Member jurisdictions - Trucking industry

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
1.3.1 Regulate Existing Medium and Heavy Trucks. Develop regulatory requirements for existing medium and heavy duty trucks, to be implemented by the BC Government or Metro Vancouver. Regulatory approaches to reduce emissions could include an inspection and maintenance program that requires repairs on higher emitting trucks, registration requirements targeting older vehicles, a regional smoking vehicle hotline, and low or zero emission zones (aligned with Action 1.1.1). Requirements should be developed in coordination with member jurisdictions, Vancouver Fraser Port Authority and other regional partners. Requirements would align with TransLink's transition to clean, renewable energy in Action 1.2.2. Requirements would initially target health-harming air contaminants but should eventually include greenhouse gas emissions.	Metro Vancouver, BC Government, member jurisdictions		2022 – 2023
1.3.2 Require Zero Emission Sales Targets for New Medium and Heavy Trucks. Advocate to BC Government to set mandatory zero emission vehicle sales targets for new medium and heavy duty trucks. For medium duty trucks, the zero emission sales target should reach 100% by 2050. For heavy duty trucks, the zero emission sales target should reach 100% before 2060.	BC Government		2023 – 2024
1.3.3 More Stringent Low Carbon Fuel Standards. Advocate to the BC Government to increase the stringency of the BC *Low Carbon Fuel Standard* to reduce the carbon intensity of transportation fuels. Advocate to the Government of Canada to adopt a *Clean Fuel Standard* that includes stringent carbon intensity targets for all transportation fuels.	BC Government, Government of Canada		2025 – 2026
1.3.4 Make Low and Zero Emission Heavy Trucks More Affordable. Advocate to BC Government, Government of Canada and other regional partners to enhance incentives (including loans, tax credits) for the purchase of low and zero emission medium and heavy duty trucks. Any funding program should consider whether incentives should be targeted to groups less able to afford low and zero emission medium and heavy duty trucks.	BC Government, Government of Canada		2023 – 2024

SUPPORTING REGIONAL ACTIONS			
1.3.5 Regulate Fuel Economy and Emissions for Medium and Heavy Trucks. Advocate to the Government of Canada to adopt more stringent fuel economy and emission standards for medium and heavy duty trucks. Cleaner trucks will improve regional air quality in the short term and support the long term transition to zero emission vehicles.	Government of Canada		2023 – 2024
1.3.6 Zero Carbon Refueling Strategy for Medium and Heavy Trucks. Develop a long-term regional zero carbon refueling strategy for medium and heavy duty trucks, coordinating with member jurisdictions, energy utilities, Vancouver Fraser Port Authority, TransLink and other regional partners. The strategy would identify where refueling stations are needed for different fuels including electricity, hydrogen, renewable diesel and others. The strategy could identify pilot projects and should also consider opportunities to leverage public investment in electric bus charging infrastructure for commercial vehicle use. This strategy should align with similar strategies for passenger vehicles and non-road equipment (Actions 1.1.3 and 3.2.4).	Metro Vancouver		2025 – 2026
1.3.7 Funding for Zero Carbon Refueling Infrastructure for Medium and Heavy Trucks. Advocate to the BC Government, Government of Canada and energy utilities to increase funding (e.g., incentives, loans, tax credits) for zero carbon refueling infrastructure for medium and heavy duty trucks. This infrastructure would support early adoption of low and zero emission medium and heavy trucks, prior to wider commercialization.	BC Government, Government of Canada		2025 – 2026
1.3.8 Large Fleets to Adopt "ZEV-First" Procurement. Develop and support implementation of "ZEV-first" fleet procurement policies, coordinating with member jurisdictions and large fleet operators in the region, to transition fleets to zero emission vehicles by the late 2040s. The policies would be supported by regularly updated information on the availability of zero emission passenger vehicles and medium and heavy duty trucks. The policies could also include guidance on right-sizing fleets, and potential regional coordination of purchases of zero emission vehicles for fleets.	Metro Vancouver		2025 – 2026

1.3.9 Efficient Goods Movement to Reduce Emissions. Work with member jurisdictions, large fleet operators, Vancouver Fraser Port Authority and other regional partners to support fleets in reducing emissions. This could include enhancing sustainable fleet management programs (currently funded by BC Government and Government of Canada) to improve fleet logistics, regional coordination of HOV lane use for zero emission heavy duty trucks, shifting deliveries to off-peak hours, small urban consolidation centres ("microHubs"), and cargo bike delivery pilot projects.	Metro Vancouver, BC Government, Vancouver Fraser Port Authority		2023 – 2024
1.3.10 Support Innovation in Zero Emission Technology for Medium and Heavy Trucks. Advocate to industry, academic institutions and other governments to accelerate innovation in low and zero emission technologies for medium and heavy duty trucks, including supporting pilot projects.	BC Government, Government of Canada		2022 – 2023
1.3.11 Use Business Licences to Support Emission Reductions. Work with member jurisdictions to explore whether business licences can be used to accelerate adoption of low and zero emission medium and heavy duty trucks.	Member jurisdictions		2025 – 2026

Strategy 1.4 Reduce Marine and Rail Emissions

Around 150 million tonnes of cargo are handled at port terminals in the region every year, supporting the regional economy. This cargo movement is the main driver of marine vessel and rail locomotive emissions in the region, causing 5% of greenhouse gas and 40% of diesel particulate matter emissions. (Passenger ferries and rail are also a source of emissions.) The Vancouver Fraser Port Authority is working to reduce greenhouse gas and health-harming air contaminant emissions associated with shipping in the region. Achieving significant emission reductions in the marine and rail sectors is challenging; progress will depend on efforts by the Government of Canada and the BC Government to develop and implement strategies to advance cleaner fuels and engine technologies. For marine emissions, the Government of Canada also needs to advocate to international organizations such as the International Maritime Organization to accelerate the implementation of more stringent standards.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **240,000** tonnes Reduce annual health-harming air contaminants by up to **2,000** tonnes	- Vancouver Fraser Port Authority - Government of Canada - BC Government

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
1.4.1 Accelerate Emission Reductions from Marine Vessels. Advocate to the Government of Canada and BC Government to develop and implement a long-term strategy to accelerate emission reductions from ocean-going marine vessels, harbour vessels and passenger ferries in the region. In the short term, the strategy should prioritize cleaner engines, more renewable fuels and more shore power, particularly for vessels operating in areas that are most impacted by marine emissions. In the long term, the strategy should establish more stringent greenhouse gas emission targets, standards and regulations, to achieve a carbon neutral marine sector by 2050. The strategy should also consider efficiency improvements and the design and supportive funding for regional refueling infrastructure for zero carbon marine vessels.	Government of Canada, BC Government		2023 – 2024
1.4.2 Accelerate Emission Reductions from Rail Locomotives. Advocate to the Government of Canada and BC Government to develop and implement a long-term strategy to accelerate emission reductions from rail locomotives in the region. In the short term, the strategy should prioritize cleaner locomotives, particularly those operating near neighbourhoods most exposed to rail emissions, as well as fugitive emissions from rail cars. In the long term, the strategy should establish more stringent greenhouse gas emission targets, standards and regulations for line-haul and switch locomotives, to achieve a carbon neutral rail sector by 2050. The strategy should also consider efficiency improvements and the design and supportive funding for regional refueling infrastructure for zero carbon locomotives.	Government of Canada, BC Government		2023 – 2024
1.4.3 Support Emissions Reduction Actions at Vancouver Fraser Port Authority. Advocate to the Vancouver Fraser Port Authority to enhance actions that reduce greenhouse gas emissions and minimize air quality impacts on neighbourhoods most exposed to marine and port-related emissions. Actions under the *Northwest Ports Clean Air Strategy* should include expanding emission incentive programs for marine vessels and harbour tugs, tightening emission requirements for the Port's Truck Licensing System, considering of short-sea shipping, and expanding shore power capacity at container and cruise terminals.	Vancouver Fraser Port Authority		Ongoing

SUPPORTING REGIONAL ACTIONS			
1.4.4 Support Innovation in Low and Zero Emissions Marine and Rail Technologies. Advocate to BC Government and Government of Canada to help accelerate innovation in low and zero emission technologies for marine vessels, harbour tugs, passenger ferries and rail locomotives, including supporting pilot projects. Emerging engine technologies include hybrid, battery-electric and hydrogen fuel cells. This should include coordination with Vancouver Fraser Port Authority, BC Ferries, rail companies, governments and other regional partners.	BC Government, Government of Canada		2023 – 2024

Strategy 1.5 Reduce Aviation Emissions.

Airports in the region handle 25 million passengers per year; these aircraft generate 2% of regional greenhouse gas emissions and under 10% of regional emissions of sulphur oxides. International standards have improved fuel economy from aircraft and the Vancouver International Airport Authority is aggressively electrifying airport operations. While electrification of small aircraft is progressing, achieving significant emission reductions for large aircraft is challenging. In the short term, increasing the availability of sustainable aviation fuel (i.e., renewable jet fuel) will reduce greenhouse gases from aviation. In the long term, the Government of Canada needs to develop a national strategy to transition to a carbon neutral aviation sector. This likely would include advocacy to international organizations such as the International Civil Aviation Organization.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **10,000** tonnes Reduce annual health-harming air contaminants by up to **20** tonnes	- Government of Canada - Vancouver International Airport Authority - Airlines

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
1.5.1 Carbon Neutral Aviation Sector. Advocate to Government of Canada to develop and implement a long-term strategy to accelerate greenhouse gas emission reductions from the aviation sector. The strategy should include more stringent fuel economy and emission standards for aircraft, to achieve a carbon neutral aviation sector by 2050. The strategy should also increase the availability of sustainable aviation fuel, and could include mandatory carbon offsets or carbon taxes for air travel.	Government of Canada		2023 – 2024
1.5.2 Develop Local Sources of Sustainable Aviation Fuel. Support airlines at Vancouver International Airport and other regional partners in increasing local availability of sustainable aviation fuel.	Airlines, Vancouver International Airport Authority		2022 – 2023
SUPPORTING REGIONAL ACTIONS			
1.5.3 Technologies for Zero Emission Aircraft. Advocate to Government of Canada and BC Government to support development of zero emission aircraft, including electrification of small aircraft.	Government of Canada, BC Government		2023 – 2024
1.5.4 Stringent Fuel Sulphur Requirements. Advocate to Government of Canada to adopt more stringent sulphur content requirements for aviation fuel. Fuels with lower sulphur would reduce emissions of sulphur oxides.	Government of Canada		2025 – 2026
SUPPORTING CORPORATE ACTIONS			
1.5.5 Support Low Carbon Corporate Business Travel. Update and adapt corporate business travel policies to reduce emissions, including air travel considerations, corporate carbon offsets, and remote attendance.	Metro Vancouver		2022 – 2023

Issue Area 2: Buildings

Buildings provide spaces for shelter, comfort, productivity and recreation—this is where we spend most of our time. Yet, heating and cooling our homes, businesses, schools, hospitals, and every other building in the region emits greenhouse gases and health-harming air contaminants.

CALL OUT BOX

Building emissions

The nearly 500,000 buildings in the region generate approximately 25% of regional greenhouse gas emissions, primarily from natural gas heating. Buildings also generate more than 35% of regional fine particulate matter emissions, primarily from wood burning in homes. Emissions are higher from buildings with less insulation and older windows or equipment.

Buildings can last a long time—50 years or more—so how we design, build and retrofit them in the next ten years will determine their emissions for decades. Improving building energy efficiency and heating buildings mostly with electricity are the most effective ways to reduce emissions from buildings. Better insulated and sealed buildings are also more comfortable, healthier, quieter, and protect better against wildfire smoke and heat waves. Multi-family buildings (e.g., townhomes, apartments) need less energy per occupant to heat and cool, so the *Regional Growth Strategy*'s policies on more compact communities will also reduce emissions. More background on climate change and buildings is included in the *Climate 2050 Buildings Roadmap*.

Long-term Goal

1. All buildings are zero emissions from heating and cooling.

2030 Targets

- All buildings:
    - 35% reduction in greenhouse gas emissions, from 2010 levels
    - 35% reduction in fine particulate matter emissions, from 2020 levels
    - 15% reduction in nitrogen oxides emissions, from 2020 levels
- New buildings:
    - All new buildings are zero emissions in their operations
    - All new buildings produce 40% less embodied emissions from construction

CALL OUT BOX

Low Carbon Upgrades for Buildings

Also known as "deep carbon retrofits", low carbon upgrades for buildings include upgrading building insulation and windows, sealing out drafts and switching to electric heating and cooling. These upgrades can significantly reduce energy consumption and emissions.

Strategies and Actions

Strategy 2.1 Signal the Transition to Zero Emission Buildings through Requirements and Standards.

Natural gas use in buildings contributes approximately 25% of greenhouse gas and approximately 10% of nitrogen oxides emissions in the region. The BC *Energy Step Code* and upcoming Retrofit Code will improve the energy performance of new and renovated buildings, and both should require that most heating and cooling uses electricity. Emission requirements for existing homes and large buildings will also help achieve the 2030 buildings targets for reducing greenhouse gases and nitrogen oxides. Equipment efficiency standards and the climate impacts of refrigerants must also be addressed, along with a clear mandate for BC Hydro to support electrification of buildings.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **650,000** tonnes Reduce annual health-harming air contaminants by up to **500** tonnes	- BC Government - Member jurisdictions - BC Hydro - Government of Canada

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
2.1.1 Greenhouse Gas Performance Requirements for Existing Large Buildings. Develop regulatory requirements for existing large buildings to meet greenhouse gas emission performance targets, which would reach zero carbon emissions before 2050. Requirements would apply to all existing large commercial and large residential buildings, and would include energy consumption benchmarking, reporting and performance requirements, in coordination with BC Government regulatory requirements. Any regulation should also require that emissions from large buildings would not lead to local air quality that exceeds Metro Vancouver's ambient air quality objectives, when also considering background levels. The requirements should align with Strategy 2.4 on district energy systems and could be developed with member jurisdictions.	Metro Vancouver		Ongoing

2.1.2 Greenhouse Gas Performance Requirements for Existing Houses and Townhomes. Develop regulatory requirements for existing homes and townhomes to meet greenhouse gas emission performance targets, which would reach zero carbon emissions before 2050, in coordination with BC Government regulatory requirements. These requirements could be developed with member jurisdictions, and would also help with achieving Metro Vancouver's ambient air quality objectives.	Metro Vancouver		2022 – 2023
2.1.3 New Buildings are Highly Efficient and Electric. Work with the BC Government to establish greenhouse gas performance requirements for new buildings, through the BC *Energy Step Code* or other legislation, reaching zero emissions (i.e., electric heating and cooling) by 2030. These requirements should allow local governments to voluntarily adopt zero emission targets earlier. These requirements would apply to new homes, townhomes, and large commercial and large residential buildings.	BC Government		Ongoing
2.1.4 Require Greenhouse Gas Reductions during Renovations. Advocate to the BC Government to establish the BC Retrofit Code with increasingly stringent greenhouse gas performance requirements for buildings undergoing significant renovations.	BC Government		Ongoing
SUPPORTING REGIONAL ACTIONS			
2.1.5 Energy Labels for Homes and Buildings. Work with the BC Government to require every building and home in the region to obtain an energy and greenhouse gas emissions label. The label must be disclosed publicly when a property is constructed or listed for sale, rental or lease. Such labels would provide information to accelerate low carbon updates for buildings.	BC Government		Ongoing
2.1.6 High Performance Heating and Cooling Equipment Standards. Advocate to the Government of Canada and BC Government to establish energy efficiency standards for new and imported heating and cooling equipment. The standards should require a rated energy performance of 100% or more, and greenhouse gas requirements for refrigerants, both by 2030. The standards would help buildings conserve energy while reducing emissions.	Government of Canada, BC Government		2022 – 2023

2.1.7 Locate Exhausts to Minimize Local Air Quality Impacts. Work with member jurisdictions, the BC Government and health authorities to establish more stringent exhaust requirements for building boilers and heaters, and restaurants. This would include updating municipal development and building permits, and the BC Building Code so that exhausts are located to minimize impacts on local air quality and human health.	Member jurisdictions, BC Government		2023 – 2024
2.1.8 Significantly Reduce Refrigerant Leaks in Building Equipment. Advocate to the BC Government to improve compliance with the requirements of the BC *Ozone Depleting Substances and other Halocarbons Regulation.* This is expected to involve enhanced outreach to help reduce refrigerant leaks and ensure effective refrigerant management in heating and cooling systems in buildings.	BC Government		2022 – 2023
2.1.9 Value Zero Emission and Resilient Buildings in Lending Practices. Work with the BC Government and Government of Canada to establish guidelines for the valuation of low and zero emission, and resilient buildings. This would support lenders to provide competitive "Green Mortgages" and "Green Loans" for low and zero emission, and resilient buildings.	BC Government, Government of Canada		2022 – 2023
2.1.10 Building Electrification Mandate for BC Hydro. Advocate to the BC Government to direct BC Hydro and the BC Utilities Commission to promote and accelerate building electrification and to reduce emissions from buildings.	BC Government		2022 – 2023

Strategy 2.2 Accelerate Demand for Zero Emission Buildings through Incentives, Education and Research.

Many technologies, like heat pumps and heat recovery systems, exist today to electrify most buildings that currently use natural gas for heating. Current technical support programs and incentives help home and building owners adopt these technologies, as well as improve the energy performance of homes and buildings. A regional Building Decarbonization Coalition will help significantly expand existing programs so more home and building owners can reduce their buildings emissions. These programs must work directly with community partners to identify how to involve more communities in the region so everyone can benefit from zero emission buildings. These approaches will help achieve the 2030 buildings targets for reducing emissions of greenhouse gases and nitrogen oxides.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **110,000** tonnes Reduce annual health-harming air contaminants by up to **100** tonnes	- Member jurisdictions - BC Government - Construction industry - Government of Canada

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
2.2.1 Expand Incentives for Low Carbon Upgrades. Advocate to the BC Government and Government of Canada to continue providing fuel-switching and energy efficiency incentives (including tax credits). The incentives should be expanded to support more building electrification solutions for older homes and buildings, and should complement financing tools under Action 2.2.2. Specific incentives should also support rental and non-market housing building owners to conduct low carbon upgrades while avoiding increased evictions or significant cost increases for renters.	BC Government, Government of Canada		2022 – 2023
2.2.2 New Financing Tools for Low Carbon Upgrades. Work with the BC Government, Government of Canada, member jurisdictions, energy utilities and other partners to develop strategic financing tools for home and building owners to accelerate low carbon upgrades in buildings. These tools allow owners to spread the cost of upgrades over a longer period, making them more affordable. Examples include Property Assessed Clean Energy (PACE) financing, on-bill financing and other related mechanisms. The tools should be available for homes, townhomes, and large commercial and large residential buildings, and would complement incentives under Action 2.2.1.	BC Government, Government of Canada		2022 – 2023
2.2.3 Building Decarbonization Coalition. Work with governments, energy utilities, construction industry, academic institutions, non-governmental organizations and other regional partners to develop a Building Decarbonization Coalition. The Coalition would collaborate to address major barriers and create opportunities to accelerate the transition to zero emission homes and large buildings. The Coalition would also align with the regional working group focused on reducing embodied emissions in new and existing buildings (see Action 2.5.4).	Metro Vancouver		2022 – 2023

SUPPORTING REGIONAL ACTIONS			
2.2.4 Online Decision Support Tools for Low Carbon Upgrades in Buildings. Work with the BC Government, Government of Canada and member jurisdictions to develop simple online tools that help home and large building owners choose low carbon solutions. Online support tools will be supported by energy advisor services under Action 2.2.5.	Metro Vancouver		Ongoing
2.2.5 Energy Advisor Services for Homes and Large Buildings. Work with the BC Government to enhance energy advisor services for home and large building owners. The expansion would help simplify the customer journey for home and building owners considering retrofits, so they can more easily access technical support and financial incentives under Action 2.2.4.	BC Government		Ongoing
2.2.6 Make Electricity Upgrades Faster and Cheaper. Advocate to BC Hydro to work with member jurisdictions, trade associations and other regional partners to streamline electricity service upgrades, to reduce costs and installation timelines.	BC Hydro		2022 – 2023
2.2.7 Increase Public Awareness of the Benefits of Zero Emission Buildings. Work with member jurisdictions, the BC Government, health authorities, and other partners to deliver awareness and educational programs that encourage home and building owners to choose zero emission building solutions. These programs would highlight how health is improved by reducing emissions of indoor air contaminants; the benefits of using qualified installers; permitting requirements for heating, cooling and ventilation systems; and the consumer protections provided by municipal permits.	Metro Vancouver		2022 – 2023
2.2.8 Training and Education in Zero Emission Buildings. Work with industry stakeholders and other governments to ensure industry training and certification meets the growing market demand for zero emission building design, technology, installation and operation.	Construction Industry		2022 – 2023
SUPPORTING CORPORATE ACTIONS			
2.2.9 Share Lessons from Transitioning Metro Vancouver Corporate Buildings to Zero Emissions. Develop and promote case studies about low carbon upgrades completed in Metro Vancouver corporate buildings, including Metro Vancouver Housing buildings, to show the benefits and feasibility of electric and resilient buildings.	Metro Vancouver		2023 – 2024

2.2.10 Test New Zero Emission Building Technologies. Test new zero emission building technologies in Metro Vancouver corporate buildings, including Metro Vancouver Housing buildings. These pilot projects would include the installation, use and monitoring of building technologies that are not yet widely used in the region.	Metro Vancouver		2022 – 2023

Strategy 2.3 Make Wood Heating Systems Cleaner.

Residential indoor wood burning is responsible for more than 25% of fine particulate matter emissions in the region – more than any other single source. Since heating generally occurs in the fall and winter, wood smoke can contribute even more to fine particulate matter levels in the air that residents breathe during those times of the year. In more densely populated areas, the smoke from a single chimney can impact many more neighbours, compared to rural areas. Metro Vancouver's *Residential Indoor Wood Burning Emission Regulation* requires that, by 2025, most residents in urban areas may only burn wood in an appliance that meets performance standards to ensure fine particulate matter emissions are low. Enhancing wood stove exchange and education programs will help achieve the 2030 buildings target for fine particulate matter.

Potential Impacts of Strategy in 2030	*Key Partners*
No greenhouse gas reductions are expected Reduce annual health-harming air contaminants by up to **20** tonnes	- Member jurisdictions - BC Government

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
2.3.1 Enhance Wood Stove Exchange Program. Advocate to the BC Government, Government of Canada, energy utilities and other regional partners to increase funding for wood stove exchange incentives, aligned with the Metro Vancouver's residential indoor wood burning regulation. Larger incentives should be available for low income households that use wood stoves as a primary heating source, and for households switching to electric heating.	BC Government, Government of Canada		2023 – 2024
SUPPORTING REGIONAL ACTIONS			
2.3.2 Enhance Wood Burning Education. Enhance existing awareness and educational programs about how to reduce emissions from residential indoor wood burning.	Metro Vancouver		2023 – 2024

2.3.3 All Wood Stoves are Certified. Advocate to BC Government and Government of Canada to require that new wood burning stoves and devices imported into BC, as well as existing stoves and devices sold in BC, are certified by the Canadian Standards Association or the US Environmental Protection Agency. This should include enforcement mechanisms to limit sales of uncertified devices through private sales.	BC Government		2024 – 2025

Strategy 2.4 Shift to Zero Carbon District Energy Systems.

District energy systems provide heating and cooling to a network of residential and commercial buildings more efficiently, and generally with lower emissions than individual building heating and cooling systems. There are currently 18 district energy systems in the region, running on natural gas, recovered heat and biomass, and more systems are under development. Developing a long-term emissions pathway to transition district energy systems to clean, renewable energy will help achieve the 2030 buildings targets for greenhouse gases, nitrogen oxides and fine particulate matter. Metro Vancouver is currently exploring opportunities to provide clean, renewable energy to these systems; more information is available in the *Climate 2050 Roadmaps*.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **80,000** tonnes Reduce annual health-harming air contaminants by up to **20** tonnes	- Member jurisdictions - Energy utilities

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
2.4.1 Emission Requirements for District Energy Systems. Develop a regulatory pathway to achieve zero carbon district energy systems by 2050, working with member jurisdictions, BC Government and energy utilities. Any regulation should also require that emissions from district energy systems would not lead to local air quality that exceeds Metro Vancouver's ambient air quality objectives, when also considering background levels. These requirements should align with Action 2.1.1 on large buildings.	Metro Vancouver		2023 – 2024

SUPPORTING REGIONAL ACTIONS			
2.4.2 Low Carbon District Energy Policies. Work with member jurisdictions with district energy systems to assess the feasibility of using sewer heat and biogas generation from Metro Vancouver and other member municipalities.	Metro Vancouver		2023 – 2024

Strategy 2.5 Accelerate the Transition to Lower Embodied Emissions in Buildings.

Embodied emissions are the greenhouse gas emissions associated with resource extraction, manufacturing and distribution of products. Using construction materials with lower embodied emissions will reduce global emissions of greenhouse gases. Local governments in the region are establishing requirements for embodied emissions of construction materials. Convening a regional embodied emissions working group, and setting embodied emissions requirements in the building code and for new public buildings, will help accelerate the transition to lower embodied emissions in buildings.

Potential Impacts of Strategy in 2030	*Key Partners*
Greenhouse gas impacts to be developed during implementation No regional air quality impacts are expected	- Member jurisdictions - BC Government - Construction/renovation industry

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
2.5.1 Incorporate Embodied Emissions into the BC Building Code. Advocate to BC Government that future BC Building and Retrofit Code updates would include stringent embodied emissions performance targets for new construction and retrofits, and would incentivize the use of materials with low embodied emissions through consideration of cost and material availability.	BC Government		2023 – 2024
2.5.2 Use Building Materials with Low Embodied Emissions. Advocate to BC Government and member jurisdictions to create procurement policies that prioritize the use of building materials with low embodied emissions, including BC forest products.	BC Government, member jurisdictions		2022 – 2023

SUPPORTING REGIONAL ACTIONS			
2.5.3 Set Embodied Emission Targets for New Public Buildings. Advocate to public sector organizations in the region to establish embodied emission reduction targets for new construction projects, ahead of BC Building and Retrofit Code changes.	Member jurisdictions		2023 – 2024
2.5.4 Regional Working Group to Reduce Embodied Emissions in Buildings. Work with member jurisdictions, the BC Government, construction industry and other regional partners to develop a regional working group focused on reducing the embodied emissions in new construction and building retrofits. The working group should support accelerated policy development, establish a regional baseline for embodied emissions, and would also align with the Building Decarbonization Coalition (see Action 2.2.3).	Metro Vancouver		2022 – 2023
SUPPORTING CORPORATE ACTIONS			
2.5.5 Strengthen Metro Vancouver's Corporate Sustainable Design Requirements. Update Metro Vancouver's *Sustainable Infrastructure and Buildings Policy* to include increasingly stringent embodied emission requirements and greenhouse gas performance limits. These requirements should align with the corporate low carbon procurement policies in Action 3.3.4.	Metro Vancouver		2023 – 2024

Issue Area 3: Industry and Business

The region's diverse industrial facilities and businesses contribute to our local economy, providing jobs to residents and products to supply chains and consumers. For this Issue Area, "Industry and Business" includes industrial facilities, non-road equipment, building construction and demolition, and small and medium businesses.

CALL OUT BOX
Regional industrial and business operations generate 25% of greenhouse gases and 65% of volatile organic compounds. Industrial facilities generate 15% of regional fine particulate matter and non-road equipment generates over 40% of regional diesel particulate matter. These emissions come from burning fuel, chemical and other manufacturing processes, product off-gassing, wind-blown particulate matter, and fugitive leaks from process equipment and piping. Some industrial and business activities create odorous air contaminants.

Industrial facilities and businesses are innovating to support clean technology solutions. Opportunities to reduce emissions from industry and business include transitioning to clean, renewable energy; adopting more low and zero emission technologies; replacing older non-road equipment; and supporting low and zero emission solutions for small and medium businesses. More background on climate change, and industry and business is included in the *Climate 2050 Industry Roadmap*.

Long-term Goals

1. The industrial and business sector is carbon neutral.
2. All industrial and business operations minimize air contaminant emissions using lowest achievable emission technologies.

2030 Targets

- Industrial facilities
    - 35% reduction in greenhouse gas emissions, from 2010 levels
    - 10% reduction in fine particulate matter emissions, from 2020 levels
    - 10% reduction in nitrogen oxides emissions, from 2020 levels
- Non-road
    - 35% reduction in greenhouse gas emissions, from 2010 levels
    - 50% reduction in diesel particulate matter emissions, from 2020 levels

Strategies and Actions

Strategy 3.1 Accelerate Emission Reductions from Industrial Facilities.

Over 1,000 industrial facilities and related commercial operations operate under Metro Vancouver permits and regulations, which have historically focused on emissions of health-harming air contaminants. These operations make cement, concrete, and forest products, refine petroleum, distribute gasoline, paint vehicles and more. There are significant technical challenges to decarbonizing some large industrial facilities, particularly the high heat requirements needed for some manufacturing processes. Integrating greenhouse gas requirements into Metro Vancouver's permits and regulations, along with cleaner fuels and more stringent emission requirements, will help achieve the 2030 emission targets for industrial facilities.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **520,000** tonnes Reduce annual health-harming air contaminants by up to **2,100** tonnes	- BC Government - Government of Canada - Industrial facilities

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
3.1.1 More Stringent Greenhouse Gas Requirements for Large Industrial Emitters. Advocate to the BC Government to implement more stringent requirements for BC-based industrial facilities with significant greenhouse gas emissions. This could include increases to or expansion of the carbon tax, as well as mandatory carbon offsets. Requirements would be supported by incentives under Action 3.1.3.	BC Government		2022 – 2023
3.1.2 Integrate Greenhouse Gases into Emission Regulations and Permits. Develop and implement processes to integrate greenhouse gas reduction requirements into new emission regulations, amendments of existing emission regulations, new permits, and permit amendments. Integration would consider greenhouse gas regulations implemented by the BC Government, as well as the benefits and tradeoffs of reducing greenhouse gases versus improving regional air quality. Integration could include greenhouse gas emission limits and fees, and could require permitted industrial facilities to evaluate opportunities to transition to clean, renewable energy, better utilize waste heat, or to phase out the use of some fossil fuels.	Metro Vancouver		2022 – 2023

3.1.3 Industrial Emission Reduction Incentives. Advocate to the BC Government and Government of Canada to enhance or develop incentives for industrial facilities to reduce emissions of greenhouse gases and other air contaminants. Incentives could include rebates on carbon tax or energy efficiency upgrades, as well as tax credits. Incentives should be based on emission reductions that meet or exceed relevant industrial emission benchmarks.	BC Government, Government of Canada		2022 – 2023
3.1.4 Implement Renewable Gas Content Requirements. Advocate to the BC Government to establish content requirements for renewable gas, in line with targets in the provincial *CleanBC* plan. Renewable gas includes renewable natural gas, which has a lower carbon intensity than natural gas from fossil fuels.	BC Government		Ongoing
3.1.5 Develop Sector-Specific Regulations. Develop and update sector-specific regulations to accelerate emission reductions from specific industrial, commercial or business sectors. Sectors targeted would be based on air quality and climate change impacts, emission reduction potential, emerging issues and other factors.	Metro Vancouver		Ongoing
SUPPORTING REGIONAL ACTIONS			
3.1.6 Provincial and Federal Industrial Emission Standards. Advocate to the Government of Canada and the BC Government to continue developing stringent emission standards for industrial facilities to help improve air quality. Industrial sectors could include chemicals, petroleum refining, pipelines, shipping of bulk goods, and wood products.	Government of Canada, BC Government		2023 – 2024
3.1.7 Carbon Tariffs. Advocate to the Government of Canada and the BC Government to establish carbon tariffs or carbon border tax adjustments for imported industrial, manufactured and agricultural goods. This will help industrial facilities and businesses in the region to compete fairly against imported goods with higher carbon content.	Government of Canada, BC Government		2022 – 2023
3.1.8 Regional Industrial Emissions Working Group. Work with the BC Government, local First Nations, regional industry, business associations, academic institutions, port terminals and other partners to explore the opportunities for establishing a regional industrial emissions working group. If established, the working group would collectively identify the best opportunities to both minimize air quality impacts from industrial facilities and reduce industrial greenhouse gas emissions. The working group could help accelerate emission control innovation at industrial facilities, including supporting pilot projects.	Metro Vancouver		2022 – 2023

3.1.9 Improve Volatile Organic Compound Content Limits. Advocate to Government of Canada to implement more stringent volatile organic compound content limits for architectural and automotive paints, household products, industrial chemical products and other products that release significant amounts of volatile organic compounds.	Government of Canada		Ongoing
3.1.10 Reduce Air Quality Impacts from Odorous Air Contaminants. Continue to develop and implement a regional odour management framework, including measures to prevent, collect, control and disperse odorous air contaminants from industries and businesses. Odorous air contaminants are made up of many different compounds, some of which are immediately harmful to human health. This could include development of an emission regulation for organics processing facilities, which can be a source of odorous air contaminants.	Metro Vancouver		Ongoing
3.1.11 Phase out High Global Warming Refrigerants. Advocate to the Government of Canada to accelerate the phase out of halocarbons that have a high global warming potential, including refrigerants and blowing agents. This would support Action 2.1.8 on enhancing compliance with existing halocarbon regulations.	Government of Canada		2024 – 2025
3.1.12 Improved Emission Controls at Petroleum Storage and Loading Facilities. Advocate to the Government of Canada and the BC Government to explore the opportunities to reduce volatile organic compound emissions at federally and provincially regulated land- and marine-based facilities for storing and distributing petroleum products.	Government of Canada, BC Government		2025 – 2026

Strategy 3.2 Reduce Non-Road Emissions and Support Early Adoption of Zero Emission Non-Road Equipment.

Almost 850,000 non-road equipment units are used in the region, primarily for construction and commercial operations, cargo-handling, and lawn and garden maintenance. They are a regional source of harmful diesel particulate matter, nitrogen oxides and greenhouse gases. Metro Vancouver's *Non-Road Diesel Engine Emission Regulation* (and the Vancouver Fraser Port Authority's related program) are helping to manage emissions from older, higher-emitting non-road diesel engines. More stringent emission requirements for new and existing non-road engines will help achieve the 2030 non-road targets for greenhouse gases and diesel particulate matter. The BC Government and Government of Canada should support development and commercialization of zero emission non-road engines, which would reduce air contaminant emissions over the long term.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **220,000** tonnes Reduce annual health-harming air contaminants by up to **200** tonnes	- BC Government - Government of Canada - Vancouver Fraser Port Authority

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
3.2.1 Tighten Metro Vancouver's Emission Regulation for Non-Road Diesel Engines. Update Metro Vancouver's emission regulation for non-road diesel engines with more stringent requirements that could cover additional air contaminants, equipment types, fuels and engine sizes. These updates should incentivize the early adoption of zero emission non-road equipment. Any updates should be coordinated with Vancouver Fraser Port Authority to align requirements as much as possible.	Metro Vancouver		Ongoing
3.2.2 Emission Standards for New Non-Road Equipment. Advocate to the Government of Canada to adopt more stringent fuel economy and emission standards for new non-road equipment. Cleaner non-road equipment standards will improve regional and local air quality and increase the availability of low and zero emission non-road equipment.	Government of Canada		2022 – 2023
3.2.3 Funding for Cleaner Non-Road Equipment. Advocate to the BC Government and Government of Canada to enhance funding (e.g., incentives, loans, tax credits) to replace or retrofit existing non-road equipment, to reduce emissions of health-harming air contaminants and greenhouse gases. Higher incentives should be available for zero emission equipment. (Action 4.1.5 advocates for funding for cleaner agricultural non-road equipment.)	BC Government, Government of Canada		2022 – 2023

SUPPORTING REGIONAL ACTIONS			
3.2.4 Identify Infrastructure Needs for Zero Emission Non-Road Equipment. Work with member jurisdictions, energy utilities, Vancouver Fraser Port Authority and other regional partners to identify the regional infrastructure needs to support a long-term transition of zero emission non-road equipment. This would consider the refueling and charging needs for different types of non-road equipment, and should align with similar actions for passenger vehicles and medium and heavy duty trucks (Actions 1.1.3 and 1.3.6).	Energy utilities, Metro Vancouver, member jurisdictions		2025 – 2026
3.2.5 Encourage Cleaner Non-Road Equipment for Construction. Advocate to member jurisdictions to encourage the use of low or zero emission non-road equipment for construction. For example, builders and developers using cleaner non-road equipment could receive development benefits such as lower building permit fees.	Member jurisdictions		2023 – 2024
3.2.6 Awareness Program on Zero Emission Non-Road Equipment. Work with member jurisdictions and other regional partners to develop and implement an awareness and outreach program for residents and businesses about the benefits of zero emission non-road equipment. The program would include regularly updated information on the availability of zero emission equipment, and could include guidance on "right-sizing" equipment.	Metro Vancouver, member jurisdictions		2023 – 2024
SUPPORTING CORPORATE ACTIONS			
3.2.7 Transition Corporate Non-Road Fleet to Zero Emissions. Transition Metro Vancouver's corporate non-road fleet to zero carbon emissions by 2040, and zero emissions by 2050. (Action 2.1.11 covers Metro Vancouver's corporate on-road fleet.)	Metro Vancouver		Ongoing

Strategy 3.3 Reduce Emissions through Procurement and from Small and Medium Businesses.

Businesses in the region have been helping to improve regional air quality, as well as reduce their greenhouse gas emissions. Additional technical support and guidance will help businesses adopt cleaner operating practices. Developing regional guidance on buying low carbon products will help reduce the embodied greenhouse gas emissions of goods and services. These steps will help achieve the 2030 regional targets to improve air quality and reduce greenhouse gas emissions. Key partners for this strategy include member jurisdictions, local businesses, the Government of Canada and the BC Government.

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
3.3.1 Regional Low Carbon Procurement. Work with member jurisdictions and other regional partners to develop and implement regional guidance on procurement to prioritize low carbon products, equipment and services for construction and other projects. The guidance could outline best practices, available certifications, calculation methods, greenhouse gas targets and emission disclosure requirements. The guidance should align with Strategy 2.5 on reducing embodied emissions in buildings, as well as Action 3.3.4.	Metro Vancouver, member jurisdictions		2023 – 2024
SUPPORTING REGIONAL ACTIONS			
3.3.2 Air Quality Best Management Practices for Businesses and Organizations. Develop and promote a best practices guide for small and medium businesses and similar organizations about how they can help improve regional air quality. The guide would fill gaps identified in coordination with local businesses and other regional partners. The guide would also reflect practices identified in Metro Vancouver's corporate guidance (Action 3.3.5).	Metro Vancouver		2025 – 2026
3.3.3 Integrate Climate Considerations into Standard Business Practices. Advocate to the Government of Canada and the BC Government to integrate climate considerations into financial reporting and other standard business practices. Integration could include public disclosure of business carbon footprints and climate-related risks, as well as changes to legislation or accounting standards. These practices would push businesses and industrial facilities to prioritize management of climate risks in operations and practices.	Government of Canada, BC Government		2023 – 2024
SUPPORTING CORPORATE ACTIONS			
3.3.4 Low Carbon Corporate Procurement. Adopt low carbon procurement guidance as a Metro Vancouver corporate standard, in alignment with Action 3.3.1. This would show how procurement can support low carbon (and resilient) buildings, infrastructure and services. This action aligns with Action 2.5.5 on updates to Metro Vancouver's Sustainable Infrastructure and Buildings Policy.	Metro Vancouver		2022 – 2023

3.3.5 Corporate Opportunities to Reduce Emissions of Health-harming Air Contaminants. Explore and develop Metro Vancouver guidance to reduce corporate impacts on regional air quality. The guidance could identify practices that reduce emissions health-harming air contaminants from activities such as construction, demolition, solvent use, painting and surface coating, road asphalt and more.	Metro Vancouver		2025 – 2026

Strategy 3.4 Explore Opportunities for Technological Carbon Capture

Long term modelling of regional greenhouse gas emissions indicates that climate actions focusing only on reducing emissions are likely insufficient for the Metro Vancouver region to reach carbon neutrality by 2050. Additional removal of carbon dioxide from the atmosphere is expected to be necessary, to avoid the worst impacts of climate change. While natural carbon sequestration can be increased in the region, its potential impact is expected to be limited. (This is described in more detail in the *Climate 2050 Nature & Ecosystems Roadmap.*) As such, technological carbon capture will be needed. Initial research on the opportunities for these technologies in the region will support the 2030 greenhouse gas target for industrial facilities.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **50,000** tonnes No regional air quality impacts are expected	- BC Government - Industrial facilities - Academic Institutions

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
3.4.1 Carbon Capture in Metro Vancouver Region. Explore the potential opportunities for carbon capture technologies in the region, including pilot projects and uses of captured carbon dioxide.	Metro Vancouver		Ongoing
SUPPORTING REGIONAL ACTIONS			
3.4.2 Develop Carbon Capture Standards. Advocate to the BC Government to develop technical standards for carbon capture technologies.	BC Government		2023 – 2024

Issue Area 4: Agriculture

Agriculture contributes to the regional economy and provides fresh, healthy food for local consumption and export. Protecting agricultural land supports regional food security and provides ecosystem services, which are public benefits that include flood management, carbon sequestration and wildlife habitat. Agricultural activities also generate emissions of greenhouse gases and other air contaminants.

CALL OUT BOX
Agricultural activities generate 4% of regional greenhouse gas emissions, primarily from heaters and boilers in greenhouses, agricultural equipment, and livestock. Some agricultural activities cause emissions of ammonia, fine particulate matter and volatile organic compounds, which impact regional air quality, visual air quality, and human health. The main sources of these emissions are poultry and cattle manure, ammonia fertilizers, fuel combustion, open-air burning, wind erosion of soils, and fugitive dust.

Odours can come from normal farm practices such as manure application. Some agricultural practices generate odorous air contaminants, which are generally more challenging to manage than nuisance odours.

Additional information on climate change and agriculture is outlined in the *Climate 2050 Agriculture Roadmap*, including opportunities on climate adaptation and enhancing carbon sequestration on agricultural lands.

Long-term Goals

1. The agricultural sector is carbon neutral and maximizes carbon sequestration.
2. The agricultural sector minimizes air contaminant emissions continues using best available management practices and technologies, and clean, renewable energy.

2030 Targets

- 35% reduction in greenhouse gas emissions, from 2010 levels
- 10% reduction in fine particulate matter, from 2020 levels

Strategy 4.1 Reduce Emissions from Agriculture Sector.

The BC Government and Government of Canada support emission reductions in agriculture through Environmental Farm Plans and Beneficial Management Practices. Improving energy efficiency in greenhouses and switching to clean, renewable energy for greenhouses and agricultural equipment will help achieve the 2030 agriculture emission targets for greenhouse gases and fine particulate matter. Alternatives to burning agricultural vegetative waste and enhanced beneficial management practices will help achieve 2030 targets for greenhouse gases and fine particulate matter. Increasing the production of renewable natural gas through anaerobic digestion of agricultural and other waste will help to displace natural gas from fossil fuels in sectors where zero emission solutions are more challenging.

Potential Impacts of Strategy in 2030	*Key Partners*
Reduce annual greenhouse gases by up to **150,000** tonnes Reduce annual health-harming air contaminants by up to **50** tonnes	- BC Government - Agriculture community - Member jurisdictions

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
4.1.1 Reduce Emissions from Greenhouses. Work with the BC Government, BC Agricultural Council, BC Greenhouse Growers Association and member jurisdictions to explore opportunities to reduce emissions from greenhouses. Opportunities could include improving energy performance and transitioning to using more clean, renewable energy.	BC Government, Metro Vancouver, member jurisdictions		2024 – 2025
4.1.2 Reduce Open-Air Burning. Work with the agricultural producers to reduce barriers to adopting alternatives to open-air burning of agricultural vegetative waste. These alternatives would complement open-air burning regulatory requirements.	Metro Vancouver		Ongoing
SUPPORTING REGIONAL ACTIONS			
4.1.3 Outreach Program on Reducing Agricultural Emissions. Develop and implement an awareness and outreach program on reducing agricultural emissions. The program would be developed with the agricultural community, member jurisdictions and BC Government, and would supplement existing agricultural outreach and support programs.	Metro Vancouver, member jurisdictions		2025 – 2026
4.1.4 Enhance Funding for Environmental Farm Plans. Advocate to the Government of Canada and BC Government to enhance the funding for developing and implementing Environmental Farm Plans. This program helps agricultural operations reduce emissions of particulate matter, ammonia, nitrous oxide, methane and odorous air contaminants. This should include continued development and promotion of beneficial management practices, as well as providing incentives and technical guidance to farms to support adoption of low emission practices and technologies.	Government of Canada, BC Government		2023 – 2024

4.1.5 Incentives for Farmers to Transition to Lower Emission Equipment. Advocate to the BC Government and Government of Canada to enhance or develop incentives (or tax credits) for cleaner agricultural equipment. This would help accelerate the transition to lower emission equipment (e.g., a harvester with better emission controls) or encourage the installation of improved emission controls on existing equipment (e.g., diesel particulate filters). Higher incentives should be available for zero emission equipment to increase their adoption. (Action 3.2.3 advocates for incentives for cleaner non-road equipment for non-agricultural uses.)	BC Government, Government of Canada		2023 – 2024
4.1.6 Pilot Study with Zero Emission Agricultural Equipment. Work with the BC Government and the agricultural sector to develop a pilot study for zero emission agriculture equipment such as an electric tractor. The study could identify the long-term pathways for wider adoption of zero emission agricultural equipment, including infrastructure requirements.	BC Government, Metro Vancouver		2026 – 2027
4.1.7 Regulatory Requirements for Cannabis Industry. Develop an emission regulation to reduce air quality impacts from the cannabis industry. Regulatory requirements would be based on air quality impacts, emission reduction potential, and other factors.	Metro Vancouver		Ongoing
4.1.8 Streamline Emission Requirements for Anaerobic Digestion Facilities. Develop an emission regulation for anaerobic digestion of manure, other agricultural waste and commercial food waste. The regulation would maintain equivalent protections for regional air quality and human health as the existing permit process, and would provide a simpler path to regulatory compliance.	Metro Vancouver		2023 – 2024
4.1.9 Expand Anaerobic Digestion of Agricultural Waste. Advocate to the BC Government, Government of Canada, energy utilities and member jurisdictions to expand development of anaerobic digestion facilities to process manure, other agricultural waste and commercial food waste. This could include financial incentives (and tax credits) and removal of barriers in existing regulations. Any expansion should avoid the loss of agricultural land in the Metro Vancouver region.	BC Government		2022 – 2023
4.1.10 Encourage Local Agriculture. Advocate to member jurisdictions and other regional partners to continue encouraging more local food production, prioritizing agricultural practices that reduce emissions or help sequester carbon.	Member jurisdictions		Ongoing

Issue Area 5: Health

Emissions are the air contaminants that emission sources release into the air; they are most concentrated near the source and are dispersed over time and distance. Exposure refers to the air contaminants that residents breathe where they live, study, play and work. Managing exposure to health-harming air contaminants reduces their impacts on residents and communities in the Metro Vancouver region.

CALL OUT BOX

Indoor air quality

Metro Vancouver will continue to work with the BC Government, health authorities and member jurisdictions to improve indoor air quality. Health authorities are responsible for managing indoor air quality. Areas of concern include the impact of airtight buildings, infiltration of air contaminants from outdoors, and the impact of indoor sources such as gas stoves, wood burning, and consumer products.

Long-term Goal

1. Residents in the region do not experience disproportionate impacts from air quality and climate change.

2030 Targets

- Under development

Strategies and Actions

Strategy 5.1 Reduce Residents' Exposure to Harmful Air Contaminants.

Managing exposure to health-harming air contaminants reduces their impacts on residents and communities in the Metro Vancouver region. Integrating health impact assessments and protecting indoor air quality can reduce the amount of air contaminants residents breathe from medium and heavy duty trucks, wildfires and other sources. The key partners for this strategy include health authorities, member jurisdictions and the BC Government.

Actions to be Completed by 2030	Lead Agency(ies)	Potential Impacts of Actions	Start Year(s)
MAJOR REGIONAL ACTIONS			
5.1.1 Integrate Health Impact Assessments into Major Projects. Work with member jurisdictions, health authorities, BC Government and Government of Canada to integrate health impact assessments into review processes for major transportation, development and industrial projects. Integration would be supported by guidance on how to reduce residents' exposure to harmful air contaminants, such as from medium and heavy trucks. Guidance could include recommendations for urban form and land use, infrastructure and ventilation design, and siting of emission sources.	Member jurisdictions, health authorities		2024 – 2026
5.1.2 Protect Against Wildfire Smoke Impacts. Work with health authorities, member jurisdictions and other regional partners to further protect against smoke from wildfires. Protections could include actions to prevent wildfires, more "clean air" shelters in public buildings (e.g., community centres, libraries), resources to help residents use home air filters, and providing high quality information to the public during advisories.	Metro Vancouver, health authorities		2022 – 2026
5.1.3 Strengthen Relationships with First Nations on Air Quality Issues. Work to strengthen relationships with local First Nations to improve understanding of air quality concerns in First Nations communities in the region (e.g., transportation and industrial emissions), along with potential solutions.	Metro Vancouver		Ongoing
SUPPORTING REGIONAL ACTIONS			
5.1.4 Health and Air Quality Awareness. Work with health authorities and other health partners to develop awareness and outreach activities to inform residents and businesses about the links between air quality and personal and public health, including impacts on vulnerable populations. Outreach should ensure information reaches the populations who are most vulnerable to air quality impacts.	Health authorities, Metro Vancouver		2022 – 2023
5.1.5 Enhance Social Support Programs to Consider Air Quality Impacts. Advocate to the BC Government and Government of Canada to enhance social support programs to consider air quality impacts. Enhancements should support residents that are at higher risk from exposure to air contaminants, such as through poor building ventilation and heating systems.	BC Government, Government of Canada		2022 – 2024

Issue Area 6: Measure, Monitor and Regulate

Metro Vancouver drives continuous improvement in air quality and greenhouse gas management through a fair, efficient and effective management program. Measuring emissions and monitoring ambient air quality provide the foundation for Metro Vancouver's air quality and greenhouse gas management program. Metro Vancouver authorizes emissions through permits and regulations, and promotes compliance through various mechanisms. Public communication ensures that residents and businesses are aware of and understand air quality and climate change issues. Metro Vancouver adapts its methods as needed to respond to technological advances, changing regulatory regimes and emerging issues.

This issue area outlines how Metro Vancouver currently operates as an air quality and greenhouse gas authority, as well as identifying future directions. The actions associated with measurement, monitoring and regulation cut across Issue Areas 1 to 5; many of the actions in those issue areas will require measurement or tracking on an individual issue area basis.

Long-term Goals

1. Metro Vancouver implements world-leading and innovative air quality and greenhouse gas management services and solutions.
2. Metro Vancouver residents have a high awareness and accurate understanding of climate change and air quality issues, and can identify opportunities to take action through behaviour change, purchasing decisions and citizen advocacy.

2030 Targets

- 98% reliability of ambient air quality monitoring network

Strategy 6.1 Implement Leading Management Practices to Continually Improve Air Quality and Greenhouse Gas Emissions.

Emerging and innovative technologies such as low cost sensors, big data and machine learning are creating opportunities to extend the reach of our existing monitoring network, and improve management of local impacts. Continuing to improve management practices and processes could streamline emission authorizations and reviews for regulated entities. Enhancing communications with the public will help achieve the public awareness goal.

Up to date information on any of the actions or directions in this strategy are available on Metro Vancouver's website (www.metrovancouver.org, search "air quality and climate change").

CURRENT ACTIONS	FUTURE DIRECTIONS
6.1.1 Air Quality and Greenhouse Gas Management. Work with member jurisdictions, health authorities, BC Government and other partners on air quality, visual air quality and	• Explore the adoption of service establishment bylaws to support regional climate change programs.

greenhouse gas management. Approaches include strategic planning, guidance, tools, dispersion modelling guidelines, public reporting, industrial proposal reviews, etc.	• Pursue legislative changes enable non-regulatory approaches to support emission reductions from businesses. • Explore and implement innovative technologies and approaches to improve air quality and greenhouse gas management, such as machine learning. • Explore the benefits of adopting regional carbon budgets to guide climate planning. • Continue to update *Climate 2050 Roadmaps* in response to changing science, technology, public opinion and partnership opportunities.
6.1.2 Ozone Management. Implement targeted actions under existing *Regional Ground Level Ozone Strategy* to minimize ozone impacts in the Lower Fraser Valley, working with regional partners.	• Update *Regional Ground-Level Ozone Strategy* and continue to implement targeted actions to reduce impacts of ozone on regional air quality.
6.1.3 Odour Management. Implement existing regional odour management framework. Framework addresses key sources of odorous air contaminants, odour monitoring, complaint management and public outreach.	• Continue development of sector-specific regulations that address air contaminants, including odorous air contaminants. • Develop odour monitoring capacity within the region.
6.1.4 Visual Air Quality Management. Implement existing visual air quality management program for the Lower Fraser Valley, working with regional partners.	• Continue to develop and implement policies and programs to improve visual air quality in the Lower Fraser Valley.
6.1.5 Complaint Management. Review and respond to air quality complaints. Responding can include communication with the alleged source, site visits, air quality monitoring and compliance or enforcement action.	• Streamline complaint response process to identify and resolve new air quality issues.
6.1.6 Emissions Inventories and Related Data Sets. Track and forecast regional emissions of air contaminants, including greenhouse gases, to measure performance, track progress towards goals and targets, and guide policy and regulatory development. The primary inventory is the Lower Fraser Valley regional emissions inventory developed every 5 years; specialized approaches include inventories of hazardous air pollutants, and additional tracking of greenhouse gases.	• Track regional greenhouse gas emissions on annual basis. • Develop a consumption-based emissions inventory for greenhouse gases. • Improve understanding of emissions from refrigerants and halocarbons, natural volatile organic compounds, large sources of fugitive particulate matter, and natural gas leakage, automated vehicles. • Continue to work with member jurisdictions and others regional partners on developing, aligning, and sharing regional data sets.
6.1.7 Air Quality Monitoring. Measure levels of key air contaminants and visual air quality across the region, working with regional partners. Monitoring includes fixed and temporary sites, as	• Enhance monitoring network with low cost and portable sensors, near-road and community monitoring, and carbon dioxide monitoring.

well as specialized monitoring studies**.** Review monitoring network every 5-10 years to respond to regional changes, emerging issues and help protect human health and the environment.	• Measure the changing climate and the impacts to air quality, including visual air quality. • Develop and implement a user-friendly open data portal, so the public and researchers can more easily access and use data collected by Metro Vancouver. • Explore options to improve rapid monitoring capabilities during air quality emergencies.
6.1.8 Ambient Air Quality Objectives. Develop and update ambient air quality objectives, establishing acceptable thresholds for concentrations of air contaminants. Concentrations are compared to objectives to determine achievement of the objectives.	• Develop new and updated objectives based on current health research and best practices. • Explore expected impact of *Clean Air Plan* actions on achievement of ambient air quality objectives.
6.1.9 Air Quality Advisories. Develop and issue air quality advisories and bulletins to inform the public during periods of degraded air quality, working with regional partners	• Continue to work with regional partners on managing air quality advisories and bulletins, and enhancing public awareness.
6.1.10 Bylaw and Regulation Development. Develop and amend bylaws and emission regulations to protect human health and the environment. Regulatory development uses best available evidence and includes engagement with the public, stakeholders and other governments.	• Continue to develop and implement tools to assess costs and benefits for new or significantly modified emission regulations. • Introduce expanded regulatory requirements for greenhouse gas emissions (Action 3.1.2).
6.1.11 Regulatory Authorizations and Compliance. Authorize emissions through regulations and air permits. Promote compliance with regulatory requirements through inspections, report reviews and, where necessary, issuing notices of violation, tickets or orders. Identify opportunities in permits and regulations to reduce emissions and impacts, and work to address emerging air quality issues through existing regulatory tools.	• Develop a framework for issuing administrative penalties.
6.1.12 Public Communication. Communicate with the public, stakeholders and other governments about local and regional air quality and climate change issues, and provide resources to support emission reductions. Some current approaches include the annual Caring for the Air report, Air Quality Health Index, annual Air Quality Monitoring Reports, www.AirMap.ca, www.CleanAirBC.ca, public opinion research, and others.	• Improve online air quality and climate change communication tools. • Develop and promote a climate literacy online learning tool to support citizen advocacy and personal choices. • Develop metrics to track public awareness of air quality and climate change issues.
6.1.13 Environmental Assessments. Provide technical feedback and mitigation	• Advocate that environmental assessments improve consideration of upstream and

recommendations to environmental and impact assessments for major projects conducted under provincial and federal regulations, and through inter-agency referrals.	downstream emissions, and recognize Metro Vancouver's recommended conditions.
6.1.14 Specialized Studies. Conduct specialized studies on emerging areas of concern in local and regional air quality and climate change, such as air quality near major roads and regional climate projections.	• Improve understanding of the impacts and interactions between air contaminants and the region's natural environment (working with researchers).

Glossary

Active transportation includes self-powered modes of transportation such as walking, biking, skateboarding, in-line skating/rollerblading, jogging and running, wheel chairing, snowshoeing and cross-country skiing.

Air contaminants means any substance that is emitted into the air and that (a) injures or is capable of injuring the health or safety of a person; (b) injures or is capable of injuring property or any life form; (c) interferes or is capable of interfering with visibility; (d) interferes or is capable of interfering with the normal conduct of business; (e) causes or is capable of causing material physical discomfort to a person; or (f) damages or is capable of damaging the environment.

Ambient air quality objectives and standards are health-based targets which define the acceptable outdoor concentration of key air contaminants. Metro Vancouver, the BC Government and Government of Canada adopt objectives and standards that become more stringent over time, to drive continuous improvement in air quality.

Anaerobic digestion breaks down waste products in the absence of oxygen to create biogas, which can be converted into renewable natural gas.

Carbon dioxide (CO_2) is the primary driver of climate change, and is produced mainly by burning fossil fuels.

Carbon neutral region means that the region generates no net greenhouse gas emissions. This is achieved through the deepest greenhouse gas emission reductions possible across all economic sectors, and any remaining emissions are balanced out by the carbon dioxide that the plants, trees, and soil of the region remove from the atmosphere, or potentially through technological means.

Carbon sequestration is the removal of carbon dioxide from the air and the long-term storage of carbon to mitigate climate change.

Clean, renewable energy is low or zero emission energy that is replenished over days or years. In Metro Vancouver, clean, renewable energy is primarily electricity from renewable sources such as hydro or solar.

Climate change adaptation means anticipating, planning for and responding to the adverse effects of climate change and taking appropriate action to prevent or minimize the damage it can cause, or taking advantage of opportunities that may arise. It has been shown that well planned, early adaptation action saves money and lives later.

Diesel particulate matter is a form of fine particulate matter from diesel engines that is classified as carcinogenic.

District energy systems provide heating and cooling to a network of residential and commercial buildings more efficiently, and generally with lower emissions than individual building heating and cooling systems.

Embodied emissions are greenhouse gas emissions associated with the construction of goods and products, including the raw materials and the transport of the good or product to where it is sold.

Equity is the promotion of fairness, justice and the removal of structural barriers that may cause or aggravate disparities experienced by different groups of people.

Fine particulate matter ($PM_{2.5}$) is made up of tiny solid or liquid particles that float in the air and can penetrate deep into the lungs and even into the bloodstream. Fine particulate matter can damage people's health by aggravating existing lung and heart diseases, increasing the risk of cancer and reducing life expectancy.

Greenhouse gases are air contaminants that trap heat and are the cause of climate change. Greenhouse gases include carbon dioxide, methane, nitrous oxide, halocarbons, black carbon and ozone. Limiting or preventing greenhouse gas emissions and removing these gases from the atmosphere is critical to avoiding catastrophic climate change (sometimes referred to as "climate change mitigation").

Ground-level ozone (O_3) can have harmful impacts on everyone, especially children, the elderly, and people with lung and heart conditions. It is primarily formed when nitrogen oxides and volatile organic compounds react in the air on hot and sunny days.

Health-harming air contaminants are air contaminants that can harm public health and reduce residents' quality of life and life expectancy by causing heart and lung diseases, cancer, asthma, and other impacts. Health-harming air contaminants include fine and coarse particulate matter, diesel particulate matter, ground-level ozone, nitrogen dioxide, sulphur dioxide, volatile organic compounds and ammonia.

Low carbon building upgrades include upgrading building insulation and windows, sealing out drafts and switching to electric heating and cooling. These upgrades can significantly reduce energy consumption and emissions.

Marine vessels include ocean-going marine vessels (e.g., container, bulk, tanker, fishing, cruise and other specialty vessels), harbour vessels and passenger ferries.

Medium and heavy duty trucks are mostly freight vehicles such as long-haul trucks and cube vans, but can also include buses and refuse trucks.

Methane (CH_4) is a short-lived greenhouse gas and is 25 times more effective than carbon dioxide at trapping heat in the atmosphere.

Mobility pricing refers to how we pay to get around. Some types of mobility pricing (e.g., decongestion charging, low emission zones) are used to manage demand for roads and reduce emissions.

Nitrogen dioxide (NO_2) can damage people's health by aggravating existing lung diseases like asthma and bronchitis and reducing immunity to lung infections. It is formed during high-temperature fuel combustion.

Nitrogen oxides (NO_X) are a group of gases, which includes nitrogen dioxide, that are produced during high-temperature fuel combustion, and can contribute to the formation of ground-level ozone and fine particulate matter.

Nitrous oxide (N_2O) is a long-lived greenhouse gas, and is about 300 times more effective than carbon dioxide at trapping heat in the atmosphere.

Non-road equipment is any machine with an internal combustion engine that is not used or intended for transportation on public roads. Examples include stationary or mobile equipment such as loaders, cranes, generators, tractors and lawn mowers.

Renewable natural gas is a renewable form of natural gas with a low carbon intensity. Sources of renewable natural gas include landfill gas and organic waste.

Right-sizing fleets means aligning the type and number of fleet vehicles to the true needs of the fleet. Right-sizing fleets reduces costs and emissions.

Sulphur dioxide (SO_2) is emitted during the combustion of sulphur-containing fuels. Exposure to high levels of sulphur dioxide can damage people's health by aggravating asthma and increasing respiratory symptoms.

Sulphur oxides (SO_X) are a group of gases, which includes sulphur dioxide, that are emitted during the combustion of sulphur-containing fuels. They can also react with other substances in the air to form particulate matter.

Visual air quality is how clear the air looks to the average observer. Metro Vancouver and its partners measure visual air quality on a scale from "very poor" to "excellent" at five sites in the Lower Fraser Valley.

Volatile organic compounds (VOC) are compounds that readily become vapours or gases; they are emitted during fuel combustion and from many consumer, commercial and industrial products. They have direct and indirect impacts on human health and contribute to the formation of ground-level ozone.

Zero carbon or **zero carbon emissions** are emissions that generate no net greenhouse gas emissions at the point of use. A zero carbon fuel source either produces no greenhouse gas emissions or any greenhouse gas emissions produced are offset by renewable energy (either generated on-site or purchased).

Zero emission means no greenhouse gases or other air contaminants are generated at the point of use. Zero emission includes zero carbon (see above) and also eliminates emissions of health-harming air contaminants (e.g., fine particulate matter and nitrogen oxides).

Zero emission vehicles (ZEVs) release no air contaminants from their tailpipes. Electric vehicles are the most common type of zero emission vehicle; others include hydrogen fuel cell vehicles.

ZEV-first is a procurement policy where priority is given to purchasing zero emission vehicles, if they are available.

Metro Vancouver is a federation of 21 municipalities, one Electoral Area and one Treaty First Nation that collaboratively plans for and delivers regional-scale services. Its core services are drinking water, wastewater treatment and solid waste management. Metro Vancouver also regulates air quality, plans for urban growth, manages a regional parks system and provides affordable housing. The regional district is governed by a Board of Directors of elected officials from each local authority.

Member jurisdictions of Metro Vancouver include:

- Village of Anmore
- Village of Belcarra
- Bowen Island Municipality
- City of Burnaby
- City of Coquitlam
- City of Delta
- Electoral Area A
- City of Langley
- Township of Langley
- Village of Lions Bay
- City of Maple Ridge
- City of New Westminster
- City of North Vancouver
- District of North Vancouver
- City of Pitt Meadows
- City of Port Coquitlam
- City of Port Moody
- City of Richmond
- City of Surrey
- Tsawwassen First Nation
- City of Vancouver
- District of West Vancouver
- City of White Rock

Attachment 2 to the Report 'Draft *Clean Air Plan*' dated Feb 10, 2021

Engagement Plan for the Draft *Clean Air Plan*

Introduction

Metro Vancouver is committed to engaging with the public, stakeholders and other governments, including First Nations, and incorporating their feedback into the *Clean Air Plan*.

The proposed engagement process will be conducted in accordance with the Metro Vancouver Board Policy on Public Engagement and builds on the work completed to date to develop the draft *Clean Air Plan*. The engagement plan is designed to reach a broad audience to discuss the purpose and benefits of the *Clean Air Plan*. Engagement will also seek feedback from specific sectors and organizations, which could include support, concerns about implementation or impacts, and ideas for innovation and collaboration.

Due to public health regulations, engagement activities will be conducted using virtual and online means, and staff are planning creative and engaging materials to encourage feedback. Feedback will be reported to the Committee, highlighting how it informed the final *Clean Air Plan*.

Engagement Objectives

- Share information with the public on the purpose and benefits of the *Clean Air Plan*.
- Provide meaningful opportunities for the public to provide feedback.
- Have meaningful conversations with specific sectors and organizations (e.g., those impacted by the proposed actions, responsible for implementation, aligned sectors, experience with equity assessment) about their support, specific concerns or impacts and thoughts on collaboration and implementation

Outcomes

- A broad audience is aware of their opportunity to provide input into the draft *Clean Air Plan*, and the purpose and benefits are highlighted.
- Specific sectors and organizations are aware, have the opportunity to speak with staff, and are requested to provide feedback.
- Feedback is received, recorded, and where required, staff have responded.
- Feedback is considered in revising the draft *Clean Air Plan*, and the feedback and any revisions are highlighted to the Board when presenting the final *Clean Air Plan* for adoption.

Audience and Anticipated Feedback

Audience categories (with examples)	**Anticipated feedback**
Other governments, including: • First Nations • Member jurisdictions • Provincial agencies • Federal agencies • Neighbouring regional districts	• Aware of the *Clean Air Plan* purpose and benefits • Support, concerns or impacts such as: ○ Support the *Clean Air Plan* in general

	○ Support or concern for specific actions • Identify aligned initiatives • Input on further alignment, implementation or collaboration • Any other feedback will be considered
Specific sectors and organizations as represented in the *Clean Air Plan* database. The list below includes categories and a few <u>examples</u> of the 500+ database: • Agencies/ organizations with a role in implementation: ○ BC Hydro ○ TransLink ○ Vancouver Fraser Port Authority • Sector-specific audiences for the buildings, industry, transportation and agriculture issue areas: ○ Building Owners and Managers Association ○ TransLink ○ FortisBC • Industry and business associations: ○ LandlordBC ○ Cement Association of Canada ○ Business Council of BC ○ Building Officials' Association of BC ○ Engineers and Geoscientists BC • Vancouver Coastal, Fraser and First Nations health authorities and other health partners • Metro Vancouver advisory committees ○ Agriculture Advisory Committee ○ Lower Fraser Valley Air Quality Coordinating Committee • Municipal advisory committees ○ Municipal agricultural advisory committees ○ Municipal environmental advisory committees • Individuals with expertise and influence ○ In-region academics ○ NGOs (e.g., Resilient Cities, Canadian Centre for Policy Alternatives, David Suzuki Foundation, Fraser Basin Council)	• Aware of the *Clean Air Plan* purpose and benefits • Support, concerns or impacts such as: ○ Support the *Clean Air Plan* in general ○ Support or concern for specific actions (e.g., investments, fees, policies, and expectations) ○ Comments on alignment or misalignment with other initiatives • Input on implementation, collaboration or innovation • Any other feedback will be considered
Public as reached through: • Interest in previous engagement • Increase reach through existing communications channels such as newsletters, social media promotion, and paid advertising • Request to members to amplify to residents	• Aware of the *Clean Air Plan* purpose and benefits • High level comments and feedback ○ Support the *Clean Air Plan* in general ○ Concerns about the *Clean Air Plan* in general

	○ Comments on specific actions • Any other feedback will be considered
Youth • Might include students, teachers, student leaders and early career • Introduce the *Clean Air Plan* and call for feedback at upcoming Youth4Action events • Reach youth through preferred social media platforms and existing corporate youth social media channels	• Aware of the *Clean Air Plan* purpose and benefits • High level comments and feedback ◦ Support the *Clean Air Plan* in general ◦ Concerns about the *Clean Air Plan* in general ◦ Comments on specific actions • Any other feedback will be considered
Other areas such as equity, resilience and prosperity will also be considered as the *Clean Air Plan* continues to develop.	• Comments on draft specific or related content • Suggestions for Metro Vancouver to consider as these areas are further integrated into the Air Quality and Climate Change program • Potential for collaboration • Any other feedback will be considered

Tactics and Timing

Tactic	Timing
Inform audiences that the draft *Clean Air Plan* is published, purpose and benefits, and options for providing comments. • Publish an engaging web resource to house: ○ Draft *Clean Air Plan* ○ Plain language summary of the draft Plan ○ Highlight purpose and benefits ○ Highlight major actions ○ <5 minute engaging introductory video ○ Options for providing comment • Correspondence to stakeholder audience to include: ○ Link to web resource ○ Link to introductory video ○ Invitation to join a public or sector specific virtual forum ○ Invitation for a meeting with staff ○ Request and options for providing feedback ○ Specific mail out to agricultural audience based on previous engagement • Promote information to broader audience via: ○ Social media ○ Newsletters ○ Request member outreach to residents ○ Paid advertising (radio, online community papers)	First week of April

Answer questions and clarify information
• Host four webinars to walk through the draft *Clean Air Plan* and answer any questions
  ○ 1 public, focus on purpose and benefits
  ○ 1 industry focused
  ○ 1 buildings focused
  ○ 1 transportation focused
• Offer to meet (virtually) with
  ○ other governments
  ○ specific sectors and organizations
  ○ other relevant audiences
• Respond to email queries to project email and moderate social media
	Virtual forums – last week of April / first week May
	
	Virtual meetings – schedule as requested
	
	Respond to queries and moderate social media – ongoing

Ensure specific sectors and organizations are aware, have the opportunity to speak with staff, and are requested to provide feedback • Phone or email direct offers to have a virtual meeting and conversation with audiences the project team deems essential to hear from (e.g. implementation, collaboration, alignment, higher impact etc.)	Late April through mid-May
Compile feedback • Collect and review feedback • Create a table that can be filtered for theme and audience	Start late May through early June
Analyze/ incorporate into draft *Clean Air Plan*	Early June
Final *Clean Air Plan* to MVRD Board • Include summary of engagement and feedback and how feedback was applied	July

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Erik Blair, Air Quality Planner
Jason Emmert, Senior Planner
Parks and Environment Department

Date: February 10, 2021 Meeting Date: March 3, 2021

Subject: **Draft *Climate 2050 Buildings Roadmap***

RECOMMENDATION

That the MVRD Board authorize staff to proceed with engagement on the draft *Climate 2050 Buildings Roadmap*, as presented in the report dated February 10, 2021, titled "Draft *Climate 2050 Buildings Roadmap*".

EXECUTIVE SUMMARY

This report presents the draft *Climate 2050 Buildings Roadmap,* the first in a series of ten *Climate 2050 Roadmaps* that will guide our region's policies and collective actions to transition to a carbon neutral, resilient region by 2050. The draft *Buildings Roadmap* lays out strategies and actions that will accelerate the transition to a zero emissions and resilient building stock by 2050. Preliminary modelling results estimate that completing these aggressive but achievable actions will have a significant impact on greenhouse gas emissions, but over time, more work will need to be done to identify and undertake additional actions in order to reach our 2030 and 2050 climate targets. Future work will include establishing methods and key data sources to quantify the impact of the resiliency actions in the *Buildings Roadmap*. The draft will inform further engagement, with the intention to bring an updated *Buildings Roadmap* for endorsement by the MVRD Board in Fall 2021.

PURPOSE

To seek MVRD Board authorization to proceed with engagement on the draft *Climate 2050 Buildings Roadmap*.

BACKGROUND

On September 28, 2018, the MVRD Board adopted the *Climate 2050 Strategic Framework* and directed staff to begin the development process of the *Climate 2050 Roadmaps*. On October 4, 2019, the MVRD Board authorized staff to begin an integrated engagement process for *Climate 2050* and the *Clean Air Plan*, using a series of issue area discussion papers related to the roadmaps. This report responds to the above direction, and provides information on activities planned through the end of 2021. On January 15, 2021, the Climate Action Committee endorsed its 2021 work plan that directed staff to present the *Buildings Roadmap* for Board approval.

This report presents the draft *Climate 2050 Buildings Roadmap* (Attached), which will be the subject of engagement activities with the public, stakeholders and other governments, including First Nations, on greenhouse gas reduction and climate resiliency in the regional building stock.

CLIMATE 2050 STRATEGIC FRAMEWORK

Climate 2050 is an overarching long-term strategy that will guide our region's policies and collective actions to transition to a carbon neutral and resilient region over the next 30 years. Metro Vancouver is implementing *Climate 2050* through ten issue area Roadmaps, which will describe long-term goals, targets, strategies and actions to reduce regional greenhouse gases and ensure that this region is resilient to climate change impacts. Implementation of the Roadmaps will be driven by Metro Vancouver's management plans and other policies, including the *Clean Air Plan* (Report 5.1 in this agenda) as well as forthcoming updates to the regional growth strategy, liquid waste management plan and solid waste management plan.

CLIMATE 2050 BUILDINGS ROADMAP

The *Climate 2050 Buildings Roadmap* presents a robust plan for this region to have a zero emissions and resilient building stock by 2050. In laying out the pathway, the *Buildings Roadmap* discusses the following issues:

- **challenges** to reaching zero emissions and resilient buildings, including goals and targets for greenhouse gas emissions reductions and climate resiliency for new and existing buildings by 2030 and 2050;
- **key sources** of greenhouse gas emissions from buildings and the expected impacts to buildings and occupants from a changing climate;
- **barriers** and **opportunities** to reduce emissions and increase resiliency that shape the strategies and actions in the Roadmap; and,
- **benefits** of zero emissions heating/cooling and taking an integrated approach to zero emissions and resilient buildings.

The *Buildings Roadmap* lays out 37 actions for reducing emissions and increasing resiliency, organized under the following 7 strategic areas:

1. Signal the Transition to Zero Emission Buildings through Requirements and Standards
2. Accelerate Demand for Zero Emission Buildings through Research, Education and Incentives
3. Shift to Zero Carbon District Energy Systems
4. Accelerate the Transition to Lower Embodied Emissions in Buildings
5. Support water conservation and non-potable water reuse to increase resilience to shifting precipitation patterns
6. Support the uptake of building design and retrofit solutions to reduce the impact of heatwaves and wildfires
7. Encourage the uptake of design and retrofit solutions that increase resilience to severe storms and flooding in buildings

The *Buildings Roadmap* proposes an implementation timeline to encourage swift early action on key issues. Given the short timelines and ambitious targets, staff have continued to work with all levels of government and other partners to take action while planning and developing the *Buildings Roadmap*.

The goals, strategies and actions in the draft *Buildings Roadmap* incorporate public and stakeholder feedback, previously summarized in a report on engagement for the Clean Air Plan and Climate 2050 roadmaps received by the Climate Action Committee on November 13, 2020.

Staff are currently working to further integrate equity considerations into the *Buildings Roadmap*. Staff intend to carry out additional work with partners to conduct an equity review before presenting the *Buildings Roadmap* for Board endorsement.

Prior to proceeding with engagement, the draft *Climate 2050 Buildings Roadmap* will be formatted to match the look and feel of other *Climate 2050* documents.

Potential impact on greenhouse gas emissions
Initial modelling of key actions in the draft *Buildings Roadmap*, as described in the staff presentation on *"Carbon Neutral Modelling to Support Clean Air Plan/Climate 2050"* received by the Climate Action Committee on November 13, 2020, indicates that greenhouse gas emissions from the building sector could be reduced by 10% below the 2010 regional total by 2030, and 80% by 2050. These potential emission reductions reflect aggressive but achievable actions, but do not alone achieve the 2030 or 2050 targets to reduce regional greenhouse gas emissions from this sector.

As discussed in the *Climate 2050 Strategic Framework*, all roadmaps, including the *Buildings Roadmap* are intended to serve as "living, breathing" documents that chart the path to achievement of the region's climate action goals and targets. It is expected that the strategic areas and actions will be updated dynamically, responding to changes in policy, technology, science, opportunities and innovations, and performance measurement and indicators. In the coming years, staff will continue to work with residents, businesses and governments to further accelerate these actions. Additional actions to accelerate the transition to resilient, zero emission buildings will be identified.

Relationship between the *Buildings Roadmap* and *Clean Air Plan*
The *Clean Air Plan* will be Metro Vancouver's air quality and greenhouse gas management plan, building on the 2011 *Integrated Air Quality and Greenhouse Gas Management Plan.* The *Clean Air Plan* supports *Climate 2050's* vision of a carbon neutral region by identifying the initial actions needed to meet the region's 2030 greenhouse gas target – a 45% reduction in greenhouse gas emissions from 2010 levels by 2030. Greenhouse gas reduction actions in the *Buildings Roadmap* will also be included in the *Clean Air Plan*, which is the subject of Report 5.1 in the March 2021 Climate Action Committee agenda package.

ENGAGEMENT PROCESS
Metro Vancouver is committed to engaging with the public, stakeholders and other governments, including First Nations, that could be impacted by the *Climate 2050 Buildings Roadmap*, and will incorporate feedback into the final roadmap.

The engagement will be conducted in accordance with the Board Policy on Public Engagement and will build on the work completed to date to develop the draft *Buildings Roadmap*. Many of the GHG reduction actions in the *Buildings Roadmap* parallel the *Clean Air Plan* and will be brought forward through the *Clean Air Plan* engagement and adoption processes. The resiliency content in the roadmap is planned to be brought forward for public input in fall 2021, along with the resiliency actions in the upcoming draft *Industry* and *Transportation Roadmaps*.

The engagement is designed to reach a broad audience with the purpose and benefits of zero emissions and resilient buildings, and also to seek out feedback from specific sectors and organizations, where this feedback might include for example; support, concerns about implementation or impacts, and ideas for innovation and collaboration. Due to public health regulations, engagement is expected to be conducted through virtual means, and staff are planning creative and engaging materials to encourage feedback. This feedback will be reported to the Committee, highlighting how it informed the updated draft *Buildings Roadmap*s.

ALTERNATIVES

1) That the MVRD Board authorize staff to proceed with engagement on the draft *Climate 2050 Buildings Roadmap*, as presented in the report dated February 10, 2021, titled "Draft *Climate 2050 Buildings Roadmap*".

2) That the MVRD Board receive for information the report dated February 10, 2021, titled "Draft *Climate 2050 Buildings Roadmap*", and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

Under Alternative 1, the overall resources required to develop and engage on *Climate 2050 Roadmaps* have been approved in program budgets for 2021, including staff time and consulting expenditures. Funding for enhanced engagement on *Climate 2050* has been requested from the Sustainability Innovation Fund, and at time of writing, awaits MVRD Board approval. Continued alignment of engagement activities and deliverables for the *Climate 2050 Roadmaps* with the development of the *Clean Air Plan* is intended to make the best use of resources available, as well as minimize time commitments for interested parties providing feedback.

CONCLUSION

Metro Vancouver's draft *Buildings Roadmap* lays out strategies and actions to transition to a zero emissions and resilient building stock by 2050.

If endorsed by the Board, Metro Vancouver intends to seek feedback on the draft *Buildings Roadmap* from the public, stakeholders and other governments, including First Nations. This engagement will be undertaken in coordination with engagement on the draft *Clean Air Plan*.

Staff recommend Alternative 1, for the Board to endorse the draft *Climate 2050 Buildings Roadmap* for the purposes of public engagement, and authorize staff to proceed with the public engagement process. Engagement is intended to provide sufficient opportunity to interested parties to learn about the draft strategies and actions in the *Buildings Roadmap* and provide feedback. Feedback from engagement will inform the development of a final *Buildings Roadmap* for Committee and Board consideration, scheduled for the fourth quarter of 2021.

Attachment

Climate 2050 Buildings Roadmap, draft dated February 10, 2021 *(44037101)*

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Brock Commons, University of British Columbia. Photo courtesy of www.naturallywood.com

Climate 2050 Roadmap

Buildings

A Pathway to Zero Emissions and Resilient Buildings

March 2021

Metro Vancouver is a federation of 21 municipalities, one Electoral Area and one Treaty First Nation that collaboratively plans for and delivers regional-scale services. Its core services are drinking water, wastewater treatment and solid waste management. Metro Vancouver also regulates air quality, plans for urban growth, manages a regional parks system and provides affordable housing. The regional district is governed by a Board of Directors of elected officials from each local authority.

Metro Vancouver's Member Municipalities and Population

We heard you loud and clear.

This Roadmap was drafted in the winter of 2020-21, based on feedback received from a broad range of individuals, organizations and stakeholder groups between 2019 and 2020. Engagement was centred around the Metro Vancouver *Buildings Discussion Paper* to support *Climate 2050*, introduced for public and stakeholder comment in late 2019, just as BC began its response to the COVID-19 pandemic.

Public feedback is valued and project teams will continue to seek input on this draft Roadmap through the spring and summer of 2021. We will create online feedback opportunities, and will continue to ensure feedback is reflected as we move forward with implementing these actions. Documents, feedback forms, and direct email links to the project team are all posted to the Metro Vancouver website, metrovancouver.org, search "Climate 2050 Buildings Roadmap".

COVID-19 has had an impact on our traditional engagement methods. Metro Vancouver assesses work plans on a case by case basis to determine if the COVID-19 pandemic response requires an adjustment to any work plans, including engagement components. For climate change programs and initiatives, this means continuing with work plans that protect human health and the environment, but adjusting how we approach engagement.

Goals and targets in Metro Vancouver's climate-related plans are science-based and remain a priority. The interim target of a 45% reduction in greenhouse gas emissions below 2010 levels by 2030 has a time horizon of less than ten years. Pursuing a carbon neutral region by 2050 requires taking bold action now. Across the globe, the pandemic response has had an unexpected benefit of significant environmental improvements in terms of greenhouse gas emissions. This provides a glimpse of what is possible and what we can achieve with coordinated efforts and common goals in a time of crisis.

The Roadmap at a Glance

Buildings are where we spend most of our lives. They provide us shelter, places to play, create, congregate, and so much more. They are also contributing to climate change. One quarter of all greenhouse gas emissions in the region comes from burning natural gas to heat our homes and buildings.

Buildings also last a long time. Decisions that we made a century ago about design and construction are affecting our greenhouse gas emission levels today. Similarly, the decisions we make today will determine the amount of emissions they create well beyond 2050.

The Climate 2050 Buildings Roadmap is about ambitious and necessary change in our buildings. It lays out seven key strategies and 37 actions that will reduce our greenhouse gas emissions and increase the resiliency of our new and existing buildings, in pursuit of a carbon neutral and resilient building stock by 2050.

The seven Strategies are:

1. Signal the Transition to Zero Emission Buildings through Requirements and Standards
2. Accelerate Demand for Zero Emission Buildings through Research, Education and Incentives
3. Shift to Zero Carbon District Energy Systems
4. Accelerate the Transition to Lower Embodied Emissions in Buildings
5. Support water conservation and non-potable water reuse to increase resilience to shifting precipitation patterns
6. Support the uptake of building design and retrofit solutions to reduce the impact of heatwaves and wildfires
7. Encourage the uptake of design and retrofit solutions that increase resilience to severe storms and flooding in buildings

To achieve a carbon neutral building stock in this region, we are going to have to make some difficult decisions and investments today, or risk passing them on to our children and grandchildren at higher cost and consequence.

We are not alone in this challenge. All over the world, cities are starting to make big decisions that will transition buildings to be more efficient, and to use clean and renewable energy. Here in our region, zero emissions buildings are possible today. Many of Metro Vancouver's member municipalities have committed to ambitious targets and bold leadership to respond to the global climate crisis. This plan responds to the challenge to come together, think big, and act now.

Table of Contents

Climate 2050 Buildings Roadmap

A pathway to zero emissions, resilient buildings in Metro Vancouver

Visioning Zero Emissions and Resilient Buildings in 2050

Our vision is that in 2050, Metro Vancouver residents live in resilient, healthy, zero emissions buildings across the region. Many buildings use so little energy that most of it can be generated on site, and some buildings even send unused energy back to the grid. Cities each retain their unique cultural, geographic and economic qualities, but are similarly compact in their development, with accessible and thriving local services. Buildings are healthy, comfortable and smart – allowing building occupants to easily control and automate equipment and appliances.

In response to climate change, flood protection, increased shading, air filtration and cooling have become a standard in nearly every building, and all public buildings are places for anyone seeking clean and cool air. Our region is known globally as a leader in zero emission and resilient buildings, and we are supported by a thriving circular economy and highly trained green buildings workforce.

The Challenge

This Roadmap is about ambitious and necessary change in our built environment. It presents a robust plan for this region to have a clean and sustainably powered building stock by 2050.

Buildings contribute approximately 25% of the greenhouse gas emissions in the region, mostly through burning natural gas for space and water heating. Buildings also last a long time – decisions that we made 100 years ago about the design, construction and retrofit of buildings are affecting our greenhouse gas emission levels today. Similarly, the decisions we make today will determine the amount of emissions they create well beyond 2050.

Call out Box: What is a Carbon Neutral Region?
A carbon neutral region means that we have achieved the deepest greenhouse gas emissions reductions possible across all economic sectors, and any emissions left are balanced out by the carbon dioxide removed from the atmosphere by the plants, trees, and soil in the region, as well as by potential carbon capture technologies that are under development.

A carbon neutral region is the best option for future generations to maintain a good quality of life, beyond 2050. We have to make some difficult decisions and investments today or pass them on to our children and grandchildren at higher cost and consequence. Metro Vancouver and many of its member municipalities have committed to ambitious targets and bold leadership to respond to the climate crisis. This plan responds to the global challenge to come together, think big, and act now.

Goals

Metro Vancouver's *Climate 2050 Strategic Framework* has set the following targets to respond to climate change:

- Infrastructure, ecosystems, and communities are resilient to the impacts of climate change
- Target a 45% reduction in emissions from 2010 levels, by 2030
- Carbon neutral region by 2050

Meeting these goals means setting similar goals in each of the Climate 2050 Roadmaps, in order to ensure that each sector in the region plays as strong a role as possible in getting to carbon neutral.

Metro Vancouver has set the following goals for all buildings in this region, out to 2030 and 2050.

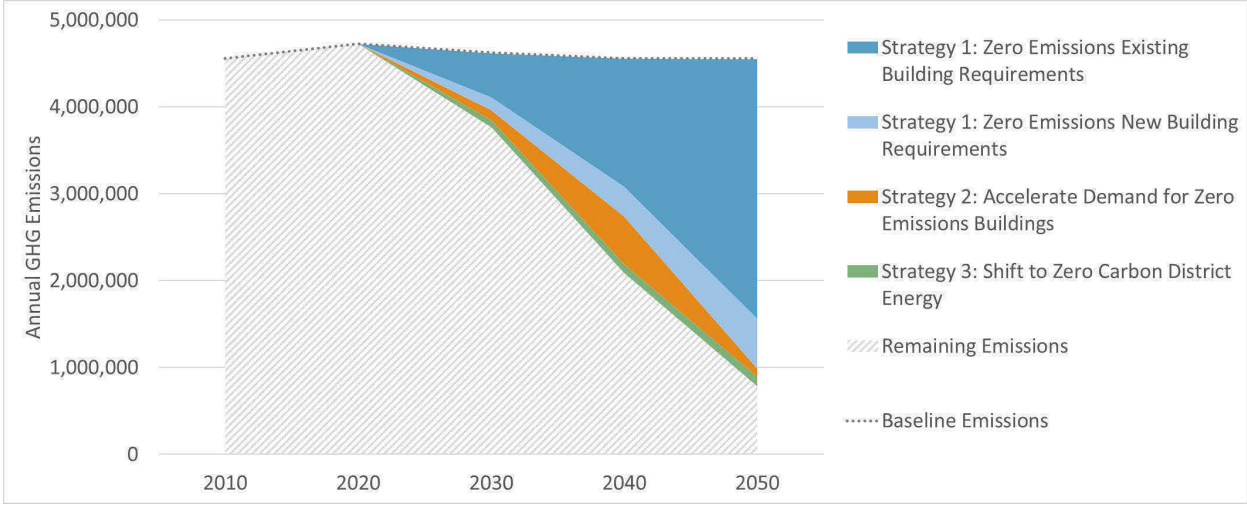
Goal – Zero Emissions Buildings
All buildings are zero emissions from heating and cooling by 2050.
Targets
By 2030:
- A 35% reduction in greenhouse gas emissions from buildings, relative to 2010 levels.
- All new buildings are zero emissions in their operations.
- All new buildings produce 40% less embodied emissions from construction.

By 2050:
- All buildings are zero emissions in their operation, deriving all energy needs from 100% clean and renewable sources.
- All new buildings are carbon neutral in their embodied emissions from construction.

Goal – Resilient Buildings
Residents are protected by buildings that are resilient to high temperatures, harmful air quality, severe storms and flooding by 2050.
Targets
By 2030:
- All new buildings utilize world-leading water conservation methods.
- Metro Vancouver's most vulnerable residents in the region have access to buildings with cooling and clean air during extreme heat and wildfire events.
- All new buildings include cooling and air filtration adequate to protect against extreme heat and harmful outdoor air quality events.
- All new buildings are constructed to be resilient to riverine, coastal and urban flooding, and extreme storms.

By 2050:
- All Metro Vancouver's residents have access to buildings that:
    - protect against extreme heat and harmful outdoor air quality events,
    - are resilient to riverine, coastal and urban flooding, and extreme storms, and
    - utilize world-leading water conservation methods.

The diagram below shows key strategies in this Roadmap that will significantly reduce GHGs and how, collectively, they will close the gap on a carbon neutral building stock.



Many of the actions identified in this Roadmap will need to be led by other levels of government (e.g., national, provincial, and local) and industry. Metro Vancouver has a long history of working with all levels of government towards common goals. Fortunately, many of the organizations needed to make this transition are already actively working toward similar goals, including: the Provincial Government and its CleanBC Plan; the Federal Government's recently strengthened climate plan called *A Healthy Environment and a Healthy Economy*; Metro Vancouver's member organization's own community and corporate climate plans; utilities; and, increasingly, industry associations.

Call out Box: The Connection between Climate and Air Quality

The *Clean Air Plan* is Metro Vancouver's air quality and greenhouse gas management plan. Actions in the Plan will reduce air contaminant emissions and impacts, including greenhouse gases, in our region over the next 10 years, and in doing so support the interim target of a 45% reduction in greenhouse gas emissions by 2030, and establish the foundation for the 30-year goal of a carbon neutral region by 2050. This management plan also addresses air quality targets for the region.

Residents in the region generally experience good air quality. However, health researchers have demonstrated that there are no known safe levels for some air contaminants that are harmful to human health. Through burning fuels for heating and hot water, buildings generate 9% of all nitrogen oxides emissions in the region and 25% of fine particulate matter emissions, both of which are health-harming air contaminants.

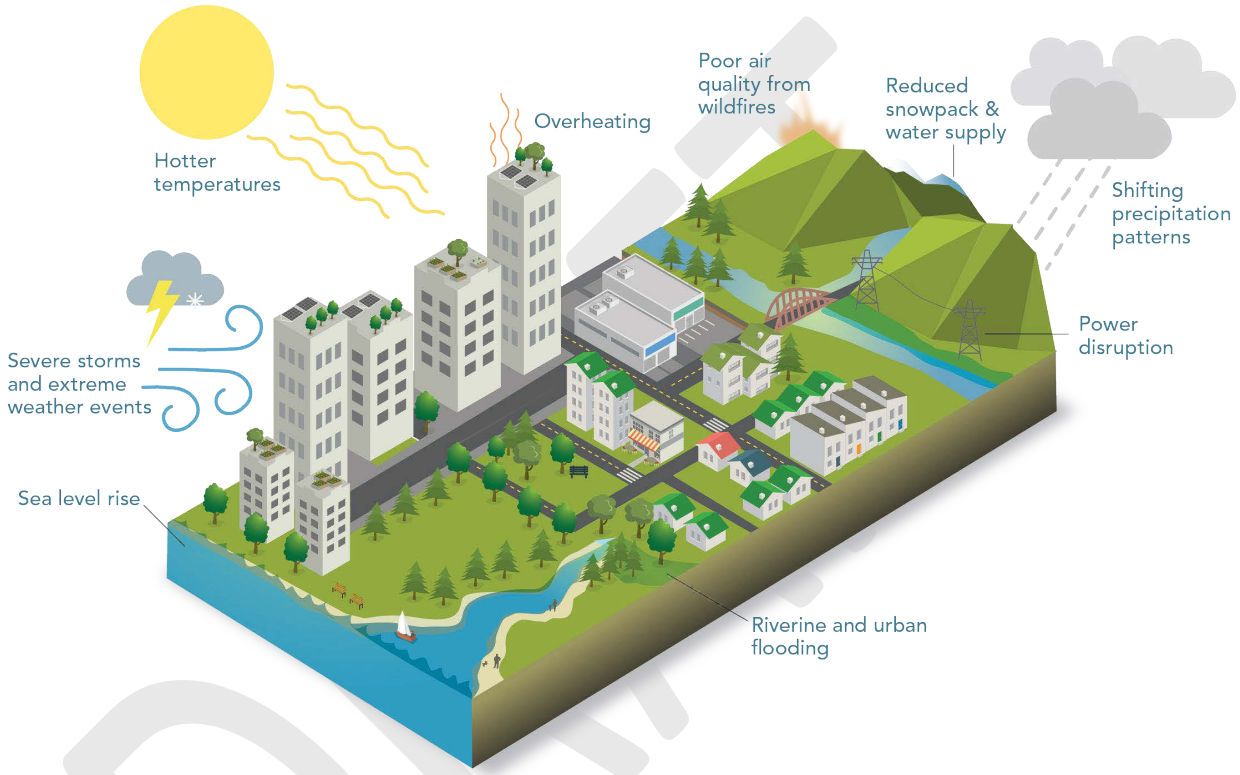
Actions in this Roadmap and the *Clean Air Plan* will help reduce all of these emissions to protect human health.

Climate Impacts on Buildings

Climate change, while less evident day-to-day, is already impacting our health and our environment, and those impacts will become more evident in coming years. We spend most of our time in buildings and the impacts of a changing climate will also change how well our buildings work for us – the need for cooling

in extreme heat, air filtration during wildfire smoke events, and water conservation and flood protection for droughts and severe storms. These impacts can harm some neighbourhoods, households and individuals more than others, and solutions must consider that some are better able to prepare for and protect themselves from climate change. Metro Vancouver's goal is that zero emission and resilient buildings be standard practice by 2050, both for new construction and major retrofits.

EXPECTED CLIMATE CHANGE IMPACTS



Based on climate projections to the 2050s we can expect the following changes and impacts:

Climate Changes

- **Hotter temperatures** overall, with higher daytime and nighttime temperatures, and more hot summer days. This will lead to increased frequency and severity of heatwaves, wildfires and droughts.
- **Shifting precipitation patterns**, including more rainfall in every season except the summer, and less precipitation falling as snow.
- **Severe storms and extreme weather events**, including high winds and heavy rainfall.
- **Sea level rise**, with 0.5 metres expected by 2050, which will impact coastal communities in our region. While sea level rise is an important aspect of climate change with significant regional impacts, it is not directly addressed in this report because it is being addressed through other Metro Vancouver initiatives.

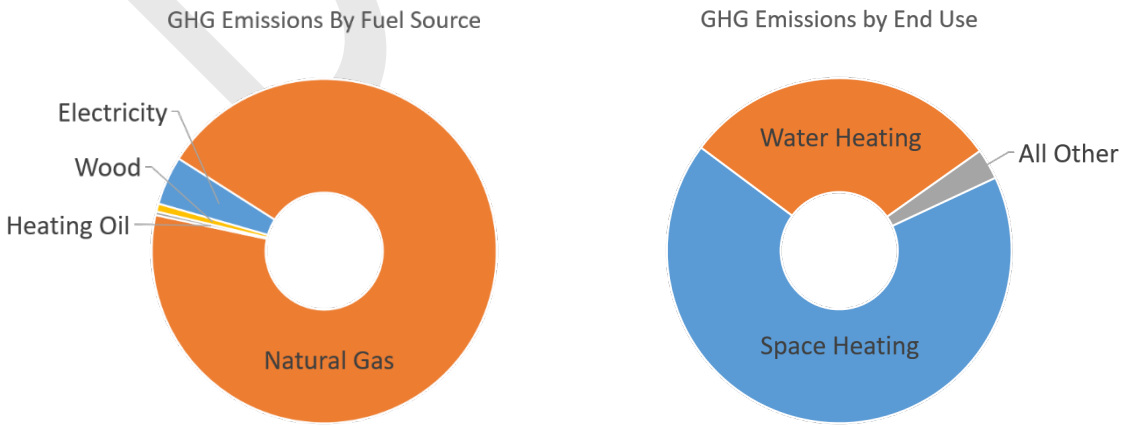
Impacts Felt

- **Overheating** in buildings where cooling solutions do not exist or are inadequate. This poses particular risk to vulnerable populations and those without the means to cope. Reducing this risk requires a thoughtful combination of passive and mechanical cooling measures.
- **Dangerous indoor air quality** from wildfire smoke events, which can compound with existing sources of contamination (e.g., ground-level ozone, pollution from traffic and industry). Reducing this risk requires thoughtful ventilation and filtration design, and minimizing sources of pollutants wherever possible.
- **Reduced water supply as a result of** reduced snowpack and hotter, drier summers strain drinking water supplies during times of year when demand is the greatest. Reducing this risk requires policies and measures to manage demand, support water conservation and facilitate non-potable water reuse.
- **Riverine and urban flooding** from periods of extreme rainfall, which can cause immediate and long-term damage to buildings. This can be addressed through site selection, structural design decisions, strategic location of key mechanical systems, and careful materials selection.
- **Power disruption** due to overloaded grids from increased demand from cooling, and from shock events including flooding and storms. This can be addressed through demand management and the installation of low-carbon backup power solutions.

Emissions from Buildings in Metro Vancouver

There are nearly 500,000 buildings throughout Metro Vancouver that collectively have more than 185 million square meters (2 billion square feet) of floor space.

Together, these buildings are the second largest source of greenhouse gas emissions in Metro Vancouver after transportation, emitting over 4 million tonnes per year, which is approximately 25% of the region's total annual emissions. Even with programs and incentives in place, greenhouse gas emissions from buildings have actually risen 10% since 2010 in Metro Vancouver. This increase is due in large part to the widespread and continued use of natural gas to heat space and water in many of our new and existing buildings. The graphic below shows that in our region, over 90% of the greenhouse gas emissions from buildings come from burning natural gas while close to 3% comes from out-of-region electricity generation, and on the right, that space and water heating are responsible for nearly all of the natural gas use in buildings.



Electricity is also commonly used in certain building types for space and water heating. Hydro-produced electricity also produces some GHGs, but one unit of natural gas produces at least 16 times more GHGs than one unit of electricity, as shown below.

BC Hydro Electricity
3 kg of GHGs/GJ

Natural Gas
50 kg of GHGs/GJ

Given the above information, it is clear that to achieve our target of zero emissions buildings, we need to shift away from the use of natural gas in favour of clean and renewable energy for space and water heating in existing buildings.

For new construction, zero emissions space and water heating systems are available for nearly every type of home and building. It is also much more straightforward to design a new building to be zero emissions than it is to retrofit an existing one. New construction needs to move swiftly towards zero emissions space and water heating systems – for example, high-efficiency electric heat pumps. This will avoid yet more costly retrofits to get to zero emissions.

For existing buildings, technologies are also widely available to electrify most buildings that use natural gas for space and water heating. The transition for existing buildings will be more gradual primarily because space and water heating equipment is only replaced every 10 to 20 years, and even less frequently for large commercial, residential, and public sector buildings. This equipment lifetime makes it critical to ensure the right equipment goes in at the next opportunity.

Zero Emissions, Resilient Buildings

Zero emissions resilience involves considering and balancing, wherever possible, the three necessary sides of climate change action:

1) **Reducing** greenhouse gas emissions that are accelerating climate change,
2) **Increasing resilience** and our ability to recover by preparing for, and responding to the effects of climate change that we cannot avoid, and
3) **Protecting the health** of the occupants of buildings.

A "zero emissions and resilient building" is a building that emits no greenhouse gas emissions and better withstands the negative effects of a changing climate, ensuring occupant comfort and health are maintained.

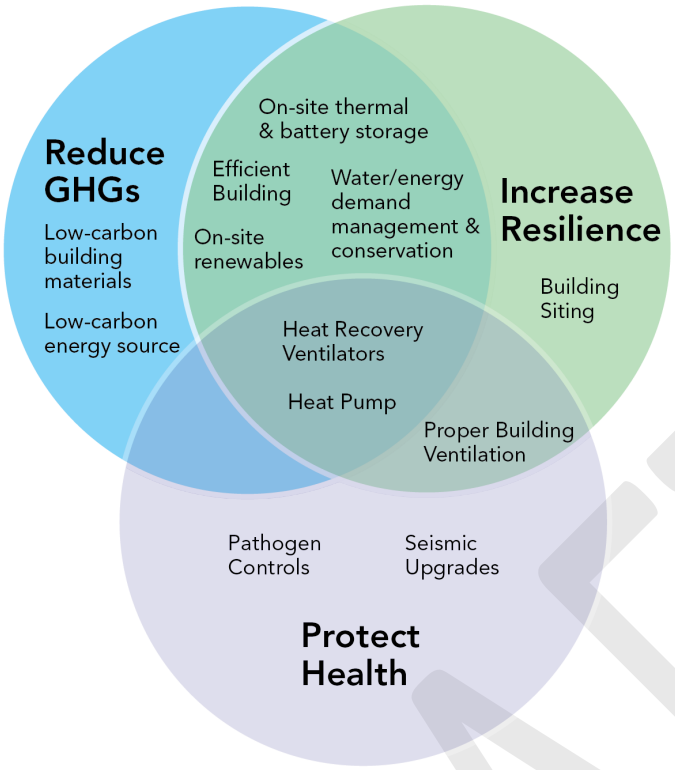
Looking to 2050, this Roadmap seeks to achieve a zero emissions and resilient building stock. By applying these desired outcomes simultaneously at the building and site level, we can identify ways to reduce emissions and vulnerability to climate change impacts at the same time.

Call out Box: What is the difference between "Zero Carbon", "Zero Emissions" and "Embodied Emissions"?

"Zero Carbon" or "Zero Carbon Emissions" refers to no greenhouse gas emissions at the point of use. A zero carbon fuel source either produces no greenhouse gas emissions, or any greenhouse gas emissions produced are offset by renewable energy (either generated onsite or purchased).

"Zero Emissions" means no greenhouse gases or other air contaminants are generated at the point of use. Zero emission includes zero carbon (see above) and also eliminates emissions of health-harming air contaminants (e.g., fine particulate matter and nitrogen oxides).

"Embodied Emissions" are greenhouse gas emissions associated with the construction of goods and products, including the raw materials and the transport of the good or product to where it is sold. Metro Vancouver is working to understand how embodied emissions – emissions from the construction and creation of materials for buildings – can be tracked to ensure we are reducing emissions beyond those created in our region.



UNDERSTANDING "ZERO EMISSIONS RESILIENCE"

The diagram above shows a number of different strategies for addressing greenhouse gas reductions and resilience. All of these strategies work together to provide both a carbon reduction and resilience benefit. The figure also shows which of these strategies contribute to direct health benefits for building occupants.

Applying a zero emissions resilience lens offers benefits, including:

- Identifying strategies that achieve emissions reductions and increased resiliency simultaneously (e.g., heat pumps can both reduce emissions and provide a source of mechanical cooling that improves thermal comfort for occupants, particularly during heatwaves);
- Avoiding conflicting strategies (e.g., adding backup diesel generators to a building can enhance resilience, but will also increase greenhouse gas emissions and contribute to poor air quality);
- Prioritizing building strategies that lead to zero emissions resilience aligns climate action goals with public health and safety objectives.

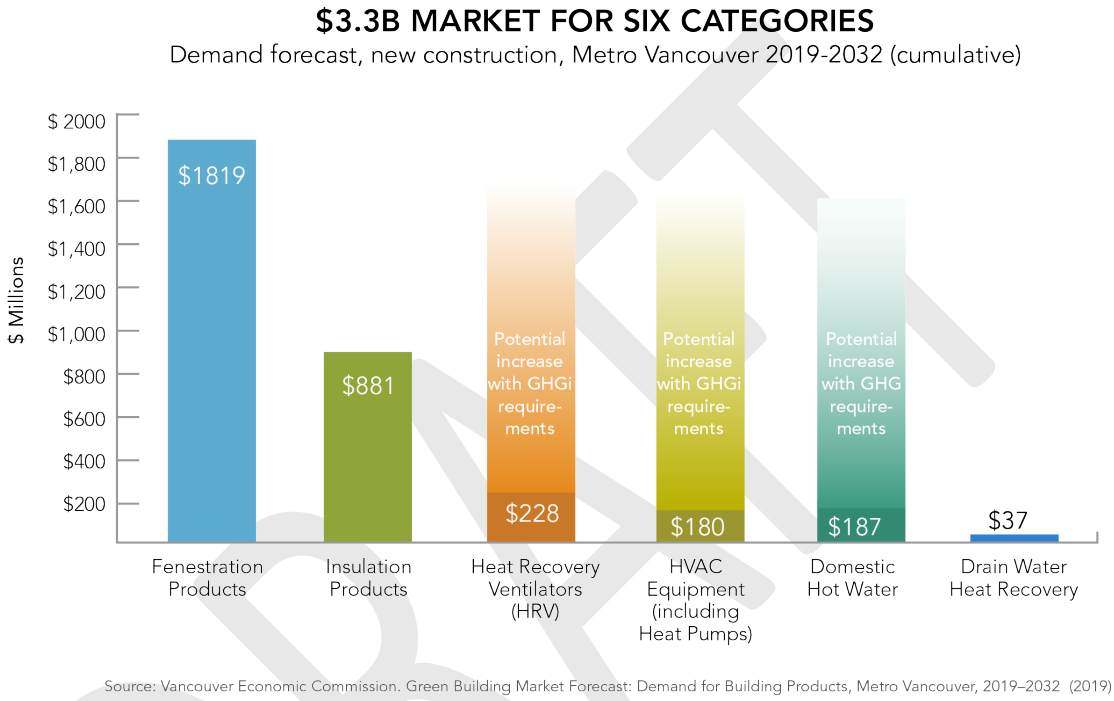
Many opportunities to achieve a building stock that is both zero emissions and resilient exist today and all organizations should seek these multiple benefits.

Economic Benefits of Zero Emissions Buildings

Recent studies show the broader economic benefit of improving building efficiency and reducing greenhouse gas emissions:

- The proposed BC Retrofit Code, which will require energy saving retrofits during renovations, is estimated to lead to the creation of more than 4,400 direct jobs and nearly 6,000 indirect jobs between 2019 and 2039 and contribute over $8.3 billion to the province's GDP. See the "Barriers and Opportunities to get to Zero Emissions Buildings" section to learn more about the BC Retrofit Code.

- The Vancouver Economic Commission estimates that the BC Energy Step Code could help unlock a $3.3 billion market for high-performance windows, insulation, and equipment in Metro Vancouver by 2032, as shown in in the chart below. High-efficiency mechanical equipment alone could support 770 local jobs on an annual basis from 2019-2032 and increase further if stricter greenhouse gas emissions requirements are put in place.
- Building electrification across the entire State of California is estimated to lead to an average of 64,200 to 104,000 new jobs annually by 2045 after accounting for losses in the natural gas sector.



Source: Vancouver Economic Commission. Green Building Market Forecast: Demand for Building Products, Metro Vancouver, 2019–2032 (2019)

Economic benefits of accelerating building decarbonization must consider economic inequities. These might be costs, or access to training, employment, investment and innovation or others. Over time, factors such as increased supply, improved industry knowledge and capacity, and technology improvements should support equitable benefits.

Social Equity

In some cases, shifting towards zero emissions and resilient buildings may cost some more than others, and we must ensure no one is left behind in this transition. Metro Vancouver will continue to incorporate the voices and needs of a full range of communities to ensure that fairness and equity are of the highest priority. Organizations responsible for building-related climate policies must consider whether inequity is created or magnified, and address these inequities to ensure a just transition.

Metro Vancouver will develop a strategic approach to assessing equity in our climate action. This will include community input, health impact assessments and other equity evaluation tools so that all residents benefit from these changes.

Healthy Buildings

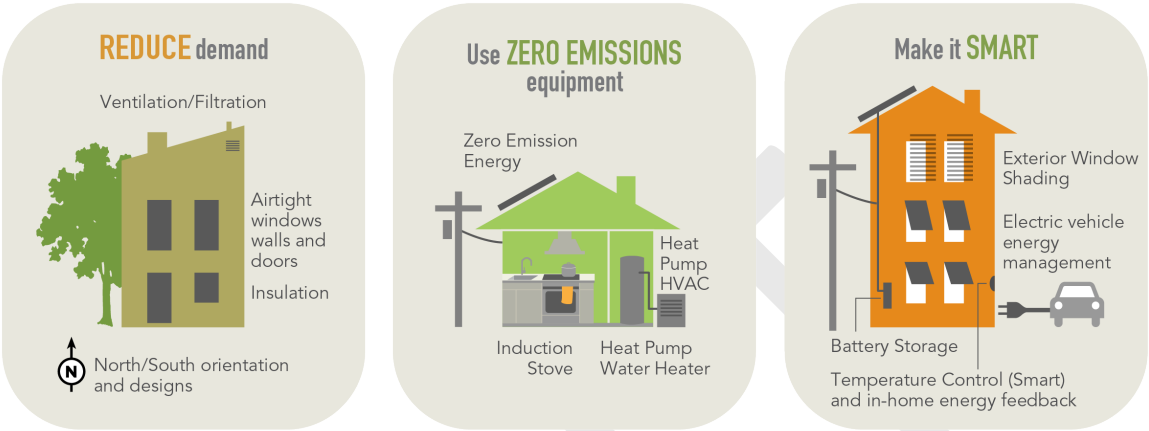
Health must be considered alongside emissions reductions and resiliency. Many of the ways that we make our buildings zero emissions and resilient are also the ways we make them healthier. Health outcomes will be a driving force behind how we craft our response.

We spend the majority of our lives indoors, so the quality of our buildings plays an ever greater role in our health and wellness. Fortunately, high-performance buildings can have a positive effect on the full spectrum of wellness, including our physical, mental, emotional and social health, including the following:

- **Thermal comfort:** Prolonged thermal discomfort can negatively impact physical health (e.g., overheating, heatstroke) and mental health for occupants. Ensuring that buildings remain comfortable in our warming climate requires analysis of future climate projections, and incorporation of passive and active cooling systems that meet future needs.
- **Air quality:** Indoor air quality plays a major role in health and wellbeing. Outdoor air pollution from wildfire smoke, traffic and other sources can enter buildings that have leaky envelopes. In new construction and retrofits, this can be limited by prioritizing an airtight envelope and ensuring that adequate ventilation and filtration systems are in place that promote energy efficiency as well as a healthy and safe indoor environment.
- **Acoustic comfort:** Better designed, insulated, and airtight buildings can reduce sound. Exposure to sounds such as traffic and mechanical systems can disrupt concentration and productivity, and has been linked to sleep disturbance and hypertension.

Taking a Whole Building Approach

Taking a whole building approach to achieving zero emissions and resilient buildings means looking for opportunities to reduce how much energy a building needs to operate, and how to improve its overall resiliency to a changing climate. This is in addition to using clean and renewable energy sources.



1. **Reduce Energy Demand**
   One of the first steps to pursuing zero emissions and resilient buildings is to look for opportunities to reduce how much energy the building needs for heating and cooling. Measures that improve the envelope (or shell) of the building to keep hot or cold air inside, such as weather sealing, improved insulation and windows, and heat recovery systems, will have a direct reduction in energy demand. Since electricity is more expensive than natural gas in BC, keeping the heat inside the building will make the switch to zero emissions electric heat pumps a better economic choice.

2. **Use Zero Emissions Energy**
   With total energy demand reduced, the next important step is to select a heating system that uses low carbon or zero emissions energy. Although renewable fuel sources already exist (e.g., electricity and renewable gas), high-efficiency, all-electric buildings have a number of advantages. A building that uses BC's clean and renewable electricity for its space and water heating ensures long-term and deep greenhouse gas emissions reductions.

   For buildings that will be harder to electrify, the same technologies used today for natural gas space and water heating can continue to be used over the next few years because renewable gas can be used to power this equipment without any modifications. It should therefore be considered as a transitional fuel on the path to achieving a zero emissions electric home or building.

   Metro Vancouver is considering what role clean, renewable sources of energy will play in the region's transition to carbon neutral within the *Climate 2050 Energy Roadmap*.

3. **Make It Smart**
   In BC, electrifying our buildings will likely increase the amount of electricity needed during peak heating periods and place additional pressure on provincial and local electricity grids. Some of this pressure can be alleviated by taking advantage of smart grid features and other in-home

technologies that automate some building systems to use less energy. For example, electric storage batteries located in buildings could be charged by on-site renewables or via the electricity grid during periods of low demand. This stored energy could then be used during times of high demand, making better use of the energy capacity that BC already has in place. Buildings with on-site energy storage and low energy demand will also be better equipped to withstand any short-term power losses that could result from major storm events.

Similarly, appliances and water heaters equipped with demand response technologies could provide BC Hydro with an opportunity to encourage the use of this equipment during off peak periods and to help ensure services such as space heating and cooling are prioritized during periods of unusually high demand.

Given the high cost of upgrading provincial and local electricity grids, measures such as these can go a long way to maintaining competitive electricity rates and overall resiliency while a market-wide shift to zero emissions buildings takes place.

Zero Emissions Heating and Cooling

In most cases, installing high-efficiency electric heating and cooling equipment will be the quickest, most economical, and most permanent way to achieve a zero emissions building. Of the various categories of high-efficiency electric technologies already available, heat pumps carry the most promise for achieving significant emissions reductions in homes and buildings.

How do Heat Pumps Work?

Electric heat pumps provide both heating during the winter and cooling during the summer with the help of the air outside your home. A heat pump operates similarly to your refrigerator or air conditioner. In the winter, a heat pump extracts heat from the outside air (or ground, depending on the type) and brings it into your home. In the summer, it pulls heat from inside your home and moves it outside, effectively cooling the indoor space. By using refrigerants to help move the heat, heat pumps are by far the most energy efficient technology available for space heating and cooling and hot water heating. For every unit of energy it takes to run, a heat pump typically provides three to five units of heating or cooling, at temperatures above 0^{o}C (in other words, they are 300-500% efficient). Low temperature heat pumps operate very well below 0^{o}C, but efficiency gains get closer to conventional electric heating as temperatures drop. In contrast, an electric baseboard heater converts each unit of electrical energy into a single unit of heat energy (100% efficient), and a high performance natural gas furnace provides slightly less than a single unit of heat energy (about 95% efficient).

This very high efficiency means that electric heat pumps are not only a zero emissions solution for buildings, they also operate using less electricity while providing both heating and cooling to homes and other buildings.

In addition to being zero emissions, heat pumps provide air conditioning in the summer. This makes these buildings more resilient to the longer, hotter, drier summers that are predicted for the Metro Vancouver region as a result of climate change.

Heat pumps also help to filter indoor air, a feature that is especially important during wildfire smoke events that are becoming increasingly common during the summer months. During a wildfire smoke event it is also important that buildings remain cool and comfortable with the windows closed, because of the need to minimize the amount of unfiltered outdoor air that enters the building. Maintaining a comfortable indoor air temperature is easily achieved with a heat pump. Although a conventional air conditioning unit

could provide similar services, it is often more straightforward and economical to have a single system that can do both the heating and cooling for a building.

Call out Box: Managing Refrigerants to Reduce Greenhouse Gas Emissions

As heat pumps become more widely used in BC, it will be important to work with other government and industry partners to ensure that the refrigerants used in this equipment do not create unintended environmental harm. Many of the refrigerants permitted today have very high "global warming potential" – or GHG emissions equivalent. Releasing a single kilogram of these gases into the atmosphere can equal the impact of hundreds or thousands of kilograms of carbon dioxide, the most common greenhouse gas.

Fortunately, international efforts are underway to reduce the global warming potential of refrigerants, and the Government of Canada requires industry to participate in refrigerant management stewardship, but more needs to be done to further reduce releases of refrigerants from existing equipment In the meantime, more and more models of heat pumps with low global warming potential refrigerants are becoming available.

District Energy Systems

Metro Vancouver is home to at least 18 different District Energy Systems. A District Energy System is a utility that provides heating services to buildings within a concentrated geographic area (e.g., university campus, hospital, downtown core, high-density neighbourhood). Pipes carry hot water or steam from a centralized heating plant to the system's connected building network. Different renewable and non-renewable fuel sources are used by district energy systems, but the most common fuel used is natural gas. In order to achieve zero emissions for buildings connected to district energy system, all new and existing systems will need to convert to clean and renewable sources of energy such as electricity and waste heat, heat from data centres, air conditioning, and Metro Vancouver's sewer pipes. Once converted, all of the buildings connected to the district energy system will minimize their own emissions and will benefit from the emissions reductions at the plant. These systems present unique opportunities to decarbonize clusters of buildings throughout the region.

Barriers and Opportunities

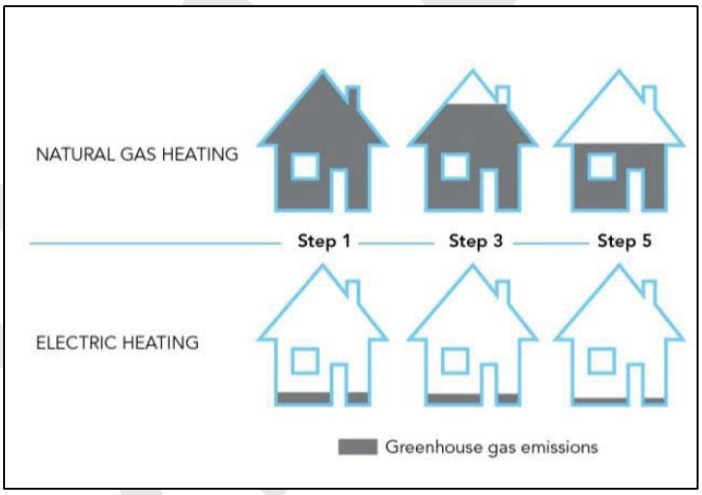
New Construction

For new construction, most of the technologies to make new residential and commercial buildings zero emissions are already commercially available. Modern, high-efficiency building techniques and technologies also mean far less energy is needed to meet a building's space and water heating needs than in the past. Many of the region's local governments have adopted the BC Energy Step Code and have signaled their intention to continue to increase energy performance requirements, but challenges remain in the new buildings sector, including the following:

ENERGY STEPCODE
BUILDING BEYOND THE STANDARD

The BC Energy Step Code allows local governments to set increasingly stringent energy efficiency requirements for new construction, leading to net-zero energy ready buildings by 2032. There is a big opportunity for the Step Code to include GHG limits in new buildings.

- **The Energy Step Code does not include GHG emission limits**. Local governments are not currently permitted to include GHG emissions limits that would restrict the use of fossil fuels in new buildings. As a result, many of the high-efficiency new homes built in the region are being built with natural gas heating systems that will emit higher levels of GHG emissions for the foreseeable future. As shown in the image below, even at Step 1, the lowest step, electric heating results in a more than 90% reduction in GHGs compared to natural gas heating, due to BC's clean, renewable hydroelectricity. The BC Government has signaled an intent to regulate the GHG performance of new buildings. Ensuring this happens is a critical step towards zero emissions buildings.



- **Embodied emissions aren't being measured.** Embodied emissions are currently a blind spot for the building industry. The greenhouse gas emissions generated from the production and installation of building materials can have a significant impact on the overall emissions of the building. Government and the building industry needs to better understand the impact that building material choice has on the embodied emissions of a building and work to reduce it.
- **Building knowledge and capacity in skilled trades.** As bold policies are introduced for zero emission buildings, the real pace of change will be set by the people who build them. Knowledge building and training through schools and trade associations will help to ensure that everyone working in the sector has the skills they need to confidently make every new building zero emissions.

Existing Buildings

Although many of the solutions needed to convert existing buildings to zero emissions are readily available, the transition will be more gradual and challenging for existing buildings. Some of the main reasons for this are listed below:

- **Existing heating equipment is only replaced every 10 to 20 years.** One of the Building Roadmap's biggest logistical challenges is that the transition will require most existing natural gas space and/or water heating systems to be replaced with high-efficiency electric heat pumps. Most of these systems only get replaced once every 10 to 15 years for water heaters and 15 to 20 years for furnaces. Requiring these systems to be replaced more rapidly than this would place a financial burden on many building owners.

- **No limits on greenhouse gas emissions from buildings.** New buildings are constructed to the requirements in the Building Code, which locks in the greenhouse gas emissions and energy use of the building until it undergoes a major renovation. Other than the City of Vancouver, there are virtually no regulatory requirements in BC to encourage building owners to take action to reduce the greenhouse gas emissions in their building at the point of renovation.

Call out Box: BC Retrofit Code. As of 2021, the BC Government is considering a code for alterations to existing buildings that would include energy efficiency, earthquake safety, and occupant health and safety, to be introduced in 2024. This code would follow and harmonize with the introduction of a Government of Canada model code for retrofits in 2022. Existing buildings are a much larger source of greenhouse gas emissions than new buildings. Placing greenhouse gas limits on retrofits is a game-changing opportunity to transition to zero emissions buildings.

- **Complexity and cost impede decision-making.** For many home and building owners, the steps needed to reduce the greenhouse gas emissions from their building can be time consuming and overwhelming, and can dissuade them from switching to clean, renewable energy. These issues are compounded for older buildings where additional steps may need to be taken to improve their overall efficiency (such as improved insulation, air leak sealing, high-efficiency windows, heat recovery, or converting a steam heating system to a lower temperature one) before an electric heat pump can be effectively used.

- **Availability of clean, renewable energy.** Electrification is a key decarbonization strategy for buildings to meet emission reduction targets, and provides co-benefits such as reduced emissions, improved air quality, cooling in homes and increased energy efficiency. Electricity in BC is currently abundant, but as more buildings electrify, there may be capacity constraints for electrical supply that need to be resolved. For some existing heating systems that are harder to electrify quickly, such as district energy and high-temperature water or steam boilers, the most straightforward path to reduce greenhouse gas emissions, at least in the next few years, will be to use renewable natural gas. The main challenge will be to ensure that there is a sufficient supply of cost-competitive renewable natural gas if it is to be used as a strategy to decarbonize large portions of the building sector. The provincial CleanBC Plan has set a goal for renewable gas to make up 15% of the province's natural gas supply by 2030. It currently makes up less than 0.5% of FortisBC's total gas supply. A provincial study estimates that the short-term potential in the

province is less than 2% of the natural gas currently consumed in BC. Given the scale of the challenge to decarbonize buildings, every available clean, renewable form of energy will play an important role.

- **Costs of retrofitting to zero emissions.** Similar to the new construction sector, many zero emissions solutions are available for most building types, but the cost of providing these solutions can be considerably higher when compared to simply replacing one fossil fuel system with another. Costs can be higher in a building with high heating demand, which is often older buildings. Affordability is exacerbated in rented or leased spaces. In these cases, a key cost reduction measure is to retrofit the building to reduce heating demand before replacing the heating systems. For many buildings in the region, incentives to support both the capital cost of retrofits as well as the ongoing energy costs will need to be explored.

Low Awareness of the Benefits of Constructing and Renovating to Zero Emissions Standards

Across new and existing buildings, there is a low level of awareness about the benefits of electrification and other low and zero emissions building options. For example, most people are not aware that natural gas is responsible for almost all of the greenhouse gas emissions that come from buildings. Nor are they aware of the climate, health and resiliency benefits associated with high-efficiency electric heat pumps. Often the zero emissions and resiliency solutions for any new or existing building are hidden inside and behind the walls. A huge opportunity exists to amplify the benefits and success stories of zero emissions buildings.

Each of the barriers that have been raised here are addressed within the strategies and actions in the next section of this Roadmap.

The Journey to Zero Emissions, Resilient Buildings

Call out Box: Linkages to other Climate 2050 Roadmaps.
There are many linkages between buildings and other issue areas. You can find additional information on some topics in the following:

Waste Roadmap – additional consideration of embodied emissions, building materials as part of the circular economy, and final disposal of building materials.

Land-use and Growth Management Roadmap – ideas that shape the form and location of buildings in the region, which influences their emissions and resilience.

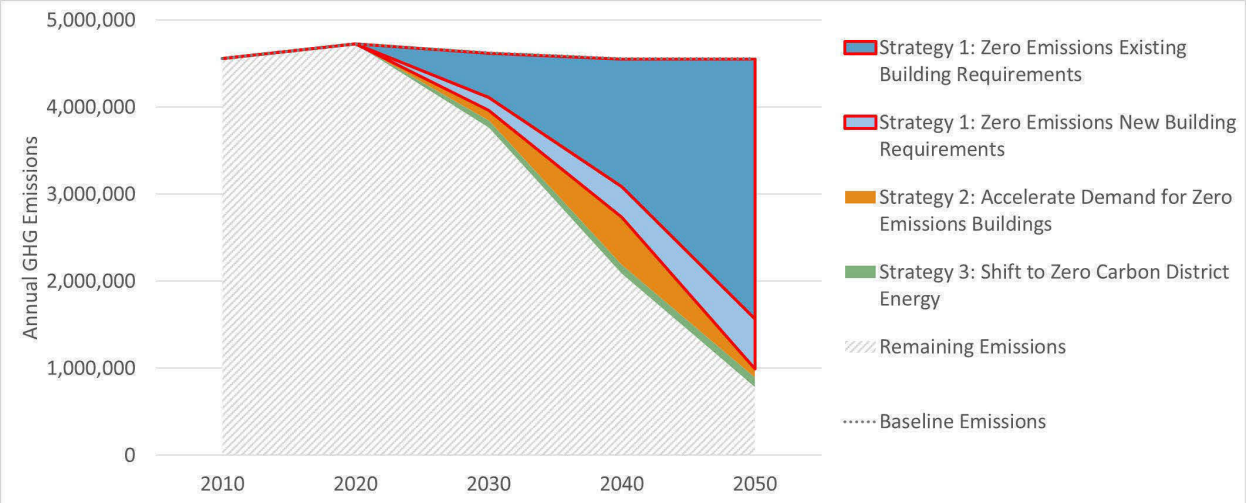
Energy Roadmap – availability of clean, renewable energy for use by buildings between now and 2050.

Industry Roadmap – emissions produced in the construction and demolition of buildings.

Zero Emissions Buildings Strategies

Strategy 1: Signal the Transition to Zero Emission Buildings through Requirements and Standards.

Space and water heating using natural gas contributes about 25% of the greenhouse gas emissions in the region. To meet our targets we must send clear and early signals about future requirements for buildings. The BC Energy Step Code and upcoming Retrofit Code will improve the energy performance of new and renovated buildings, and both should require that most heating and cooling uses clean, renewable electricity. Equipment efficiency standards and the climate impacts of refrigerants must also be addressed, along with a clear mandate for BC Hydro to support electrification of buildings, will accelerate the transition to zero emissions buildings.



Potential Impacts of Strategy	*Key Partners*
Reduce annual greenhouse gases by up to 650,000 tonnes in 2030 Reduce annual greenhouse gases by up to 3.5 million tonnes in 2050	- Federal Government - BC Government - Member jurisdictions - BC Hydro

1.1 **Greenhouse Gas Performance Requirements for Existing Large Buildings. (BIG MOVE)**
Develop regulatory requirements for existing large buildings to meet greenhouse gas emission performance targets, which would reach zero carbon emissions before 2050. Requirements would apply to all existing large commercial and large residential buildings, and would include energy consumption benchmarking, reporting and performance requirements in coordination with BC Government regulatory requirements. These requirements would help to achieve Metro Vancouver's air quality objectives and align with emissions requirements for district energy systems. (see Strategy 2.4).

1.2 **Greenhouse Gas Performance Requirements for Existing Houses and Townhomes. (BIG MOVE)**
Develop regulatory requirements for existing homes and townhomes to meet greenhouse gas emission performance targets, which would reach zero carbon emissions before 2050 in coordination with BC Government regulatory requirements. These requirements would help to achieve Metro Vancouver's air quality objectives.

1.3 **New Buildings Highly Efficient and Electric. (BIG MOVE)**
Work with the BC Government to establish greenhouse gas performance requirements for new buildings, through the BC Energy Step Code or other legislation, reaching zero emissions by 2030. These requirements should allow local governments to voluntarily adopt zero emissions targets earlier. These requirements would apply to new homes, townhomes, and large commercial and residential buildings.

1.4 **Require Greenhouse Gas Reductions During Renovations. (BIG MOVE)**
Advocate to the BC Government to establish the BC Retrofit Code with increasingly stringent greenhouse gas performance requirements for buildings undergoing significant renovations.

1.5 **Energy Labels for Homes and Buildings.**
Work with the BC Government to develop requirements that every building and home in the Metro Vancouver region obtain an energy and greenhouse gas emissions label, and to require public disclosure of that label when a property is constructed or listed for sale, rental or lease. These labels provide information to accelerate the uptake of low carbon upgrades.

1.6 **Manage Indoor Air Quality in Building Codes.**
Work with the BC Government, health authorities and member jurisdictions to ensure that indoor air quality impacts of air tight buildings are safely managed in future updates to building codes.

1.7 **High Performance Heating and Cooling Equipment Import and Sale Standards.**
Advocate to the Government of Canada and the BC Government to establish energy efficiency standards for new and imported heating and cooling equipment that has a rated energy performance of 100% or more and minimum greenhouse gas requirements for refrigerants, by 2030. This would ensure that buildings are conserving energy while reducing emissions.

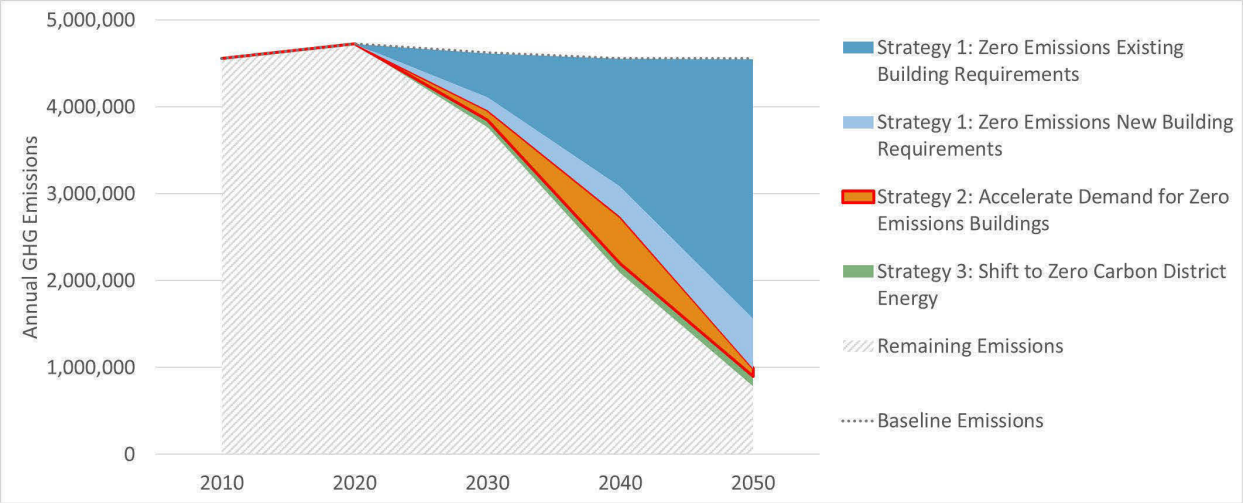
1.8 **Significantly Reduce Refrigerant Leaks in Building Equipment.**
Advocate to the BC Government to enhance compliance with the requirements of the *BC Ozone Depleting Substances and other Halocarbons Regulation*. This would likely involve enhanced outreach to help reduce refrigerant leaks and ensure effective refrigerant management in heating and cooling systems in buildings.

1.9 **Value Zero Emissions and Resilient Buildings in Lending Practices.**
Work with the BC Government and Government of Canada to establish guidelines for the valuation of low and zero emissions, resilient buildings. This would support lenders to provide competitive "Green Mortgages" and "Green Loans" for low carbon and resilient properties.

1.10 **Building Electrification Mandate for BC Hydro.**
Advocate to the BC Government to direct BC Hydro and the BC Utilities Commission to promote and accelerate building electrification and to reduce emissions.

Strategy 2: Accelerate Demand for Zero Emission Buildings through Research, Education and Incentives.

Many technologies, like heat pumps and heat recovery systems, exist today to electrify most buildings that currently use natural gas for heating. Current technical support programs and incentives help home and building owners to adopt these technologies, as well as to improve the energy performance of buildings. A regional Building Decarbonization Coalition will help significantly expand existing programs so more home and building owners can reduce their building emissions. These programs must work directly with community partners to identify the best ways to involve all communities in the region so everyone can benefit from zero emission buildings. Increased technical support and expanded incentives will underpin greenhouse gas requirements by supporting home and building owners to make informed decisions and reduce their emissions.



Potential Impacts of Strategy	*Key Partners*
Reduce annual greenhouse gases by up to 110,000 tonnes by 2030 Reduce annual greenhouse gases by up to 90,000* tonnes by 2050 **annual reductions in 2050 are lower because the effectiveness of Strategy 2 peaks around 2040 (up to 540,000 tonnes) as shown in the graph above.*	- Federal Government - BC Government - Member jurisdictions - BC Hydro

2.1 **Building Decarbonization Coalition. (BIG MOVE)**

Work with governments, energy utilities, construction industry, academia, non-governmental organizations and other regional partners to develop a Building Decarbonization Coalition. The Coalition would collaborate to address major barriers and create opportunities to accelerate the transition to zero emission homes and large buildings. The Coalition would also align its work with the regional working group focused on reducing embodied emissions in new and existing buildings (see Action 4.4).

2.2 **Online Decision Support Tools for Low Carbon Upgrades. (BIG MOVE)**

Work with the BC Government, Government of Canada and member jurisdictions to develop simple online tools that help home and large building owners choose low carbon solutions. Online support tools will be supported by energy advisor services (see action 2.3).

2.3 **Energy Advisor Services for Homes and Large Buildings. (BIG MOVE)**
Work with the BC Government to expand energy advisor services for homes and large building owners. The expansion would help simplify the customer journey for home and building owners considering retrofits, so they can more easily access technical support and financial incentives.

2.4 **Expand Low Carbon Upgrade Incentives.**
Advocate to the BC Government and Government of Canada to continue providing fuel-switching and energy efficiency incentives (including tax credits). The incentives should be expanded to support more whole building electrification solutions for older homes and buildings, including reducing the operating costs of fuel switching. Specific incentives should support rental and non-market housing building owners to conduct low carbon upgrades while avoiding increased evictions or significant cost increases for renters.

2.5 **New Financing Tools for Low Carbon Upgrades.**
Work with member jurisdictions, BC Government, Government of Canada, energy utilities and other partners to develop strategic financing tools for home and building owners to accelerate low carbon building upgrades. These tools allow owners to spread the cost of a retrofit over a longer period, making the retrofits more affordable. Examples include Property Assessed Clean Energy (PACE) financing, on-bill financing and other related mechanisms. The tools should be available for homes, townhomes, and large commercial and residential buildings.

2.6 **Make Electricity Upgrades Faster and Cheaper.**
Advocate to BC Hydro to work with member jurisdictions, trade associations and other regional partners to streamline electricity service upgrades, to reduce costs and installation timelines.

2.7 **Increase Public Awareness of the Benefits of Zero Emissions and Resilient Buildings.**
Work with member jurisdictions, the BC Government, health authorities, and other partners to deliver awareness and educational programs that encourage home and building owners to choose zero emissions and resilient buildings solutions. These programs would highlight the health improvements achieved by reducing emissions of indoor air contaminants, the benefits of using qualified installers, permitting requirements for HVAC systems, and the consumer protections provided by municipal permitting processes.

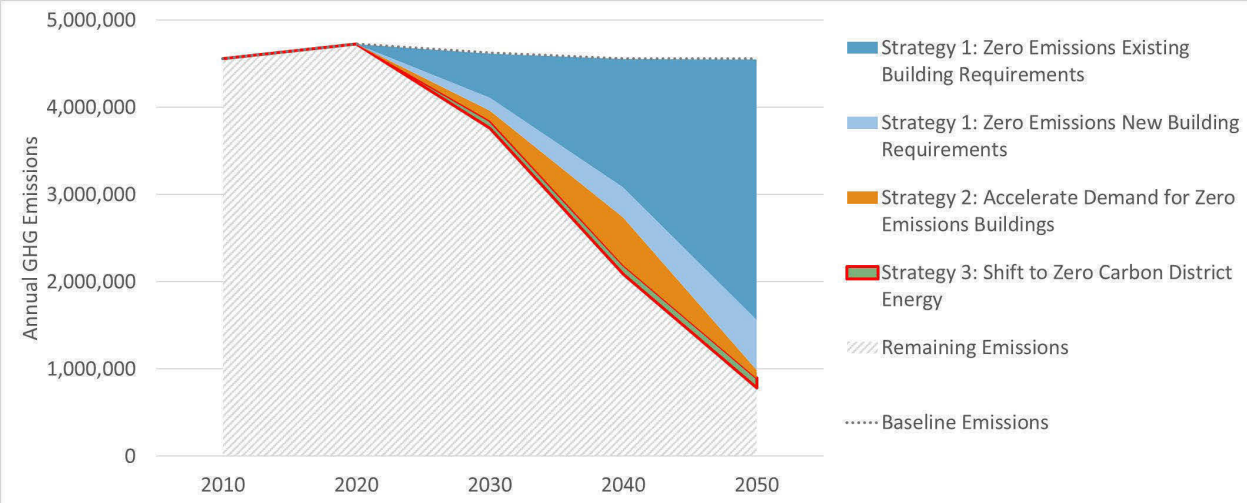
2.8 **Training and Education in Zero Emissions and Resilient Buildings.**
Work with industry stakeholders and other governments to ensure industry training and certification meets the growing market demand for zero emissions and resilient building design, technology, installation and operation.

2.9 **Share Lessons from Transitioning Metro Vancouver Corporate Buildings to Zero Emissions. (CORPORATE LEADERSHIP)**
Publish case studies about low carbon upgrades completed at Metro Vancouver corporate buildings, including Metro Vancouver Housing buildings, to show the benefits and feasibility of electric and resilient buildings.

2.10 **Test New Zero Emission Building Technologies. (CORPORATE LEADERSHIP)**
Test new zero emission building technologies in Metro Vancouver corporate buildings, including Metro Vancouver Housing buildings. These pilot projects would include the installation, use and monitoring of building technologies that are not yet widely used in the region.

Strategy 3: Shift to Zero Carbon District Energy Systems.

District energy systems provide heating and cooling to a network of residential and commercial buildings more efficiently and generally with lower greenhouse gas emissions than individual building heating and cooling systems. There are currently 18 district energy systems in the region, running on natural gas, recovered heat and biomass, and more systems are under development. Developing a long-term emissions pathway to transition district energy systems to clean, renewable energy will set a path for entire district energy neighbourhoods to become zero emissions in the future.



Potential Impacts of Strategy	*Key Partners*
Reduce annual greenhouse gases by up to 80,000 tonnes by 2030 Reduce annual greenhouse gases by up to 110,000 tonnes by 2050	- Member jurisdictions - Energy utilities

3.1 **Emissions Requirements for District Energy Systems. (BIG MOVE)**
Develop a regulatory pathway to achieve zero carbon district energy systems by 2050, working with member jurisdictions, BC Government and energy utilities. Regulatory design will also support Metro Vancouver's air quality objectives.

3.2 **Low Carbon District Energy Policies.**
Work with member jurisdictions with district energy systems to assess the feasibility of using sewer heat and biogas generation from Metro Vancouver and its member municipalities.

Strategy 4 Accelerate the Transition to Lower Embodied Emissions in Buildings.

Embodied emissions are the greenhouse gas emissions associated with resource extraction, manufacturing and distribution of buildings products. Using construction materials with lower embodied emissions will reduce global emissions of greenhouse gases. Local governments in the region are establishing requirements for embodied emissions of construction materials. Establishing a regional

embodied emissions working group, and setting requirements in the building code and for new public buildings, will help accelerate the transition to lower embodied emissions in buildings.

Potential Impacts of Strategy	*Key Partners*
To be developed as Strategy is implemented	- Member jurisdictions - BC Government - Construction/Renovation industry

4.1 **Incorporate Embodied Emissions into the BC Building Code. (BIG MOVE)**
Advocate to the BC Government for future BC Building and Retrofit Code updates to develop low embodied emissions performance targets for new construction and retrofits, as well as incentivize the use of materials with low embodied emissions through consideration of cost and material availability.

4.2 **New Public Buildings Set Embodied Emission Reduction Targets.**
Advocate to public sector organizations across the region to establish embodied emission reduction targets into new construction projects ahead of provincial Code changes.

4.3 **Use Building Materials with Low Embodied Emissions.**
Advocate to the BC Government and member jurisdictions to create procurement policies that prioritize the use of building materials with low embodied emissions, including BC forest products.

Callout Box: Buildings and the circular economy
The construction, retrofit and demolition of buildings creates a lot of unnecessary emissions and waste. In our current "take-make-dispose" economy, demolition material is too damaged to use in new construction. New approaches such as thinking of buildings as "material banks" could help the region transition to a circular economy that keeps building materials circulating at their highest potential value. Through circular design and circular business models we can decrease embodied emissions while increasing economic activity for deconstruction. A small building deconstruction economy is already starting in Metro Vancouver – by setting embodied emissions targets in buildings we can support further growth of the circular economy for the built environment in our region.

4.4 **Regional Working Group to Reduce Embodied Emissions in Buildings.**
Work with member jurisdictions, BC Government, industry and other regional partners to develop a regional working group focused on reducing the embodied emissions in new construction and building retrofits. The working group would support accelerated policy development, establish a regional baseline for embodied emissions, and would also align with the Building Decarbonization Coalition (see Action 2.1).

4.5 **Strengthen Metro Vancouver's Corporate Sustainable Design Requirements. (CORPORATE LEADERSHIP)**
Update Metro Vancouver's Sustainable Infrastructure and Buildings Policy to include increasingly stringent embodied emissions requirements and greenhouse gas performance limits. These requirements should align with the corporate low carbon procurement policies in Action 4.3.

Resilient Buildings Strategies

Strategy 5: Support water conservation and non-potable water reuse to increase resilience to shifting precipitation patterns

As summers become hotter and drier in the future and water supply is impacted, the region will look to buildings to play a role in better water conservation practices. On-site non-potable water systems have a great deal of potential to reduce demand for potable water in Metro Vancouver. To make these systems more viable, however, there is a need to improve industry understanding on how to appropriately install and maintain them. Guides and resources aimed at key industry and stakeholder groups will support the training that will be required for successful implementation.

5.1 **Apply Leading Water Efficiency Standards to Buildings. (BIG MOVE)**
Advocate for updates to the BC Building and Plumbing Code to require the highest efficiency standards for water use in buildings. Ongoing updates to strengthen standards for water efficiency in buildings should reflect the continuous improvement in technologies and practices for construction and plumbing.

5.2 **Broaden Applications of Non-Potable Water Use in Buildings.**
Advocate to member jurisdictions and other agencies for the development of standardized on-site non-potable water use, working towards a One Water approach. Metro Vancouver will support member jurisdictions to identify barriers and solutions for the application of these standards across building types.

Callout Box: A One Water Approach is where water and wastewater utilities shift away from the traditionally separated silos of drinking water, waste water and storm water, towards an integrated systems approach. This is based on the fundamental concept that all water systems are interconnected and opportunities exist to leverage the interconnections of our water resources.

5.3 **Support Capacity Building of Non-Potable Water Use Applications on Building Sites.**
Work with member jurisdictions, the BC Government, industry and other regional partners to develop educational resources for the buildings industry and trades that increase the capacity to install and maintain on-site non-potable systems, which have a high potential to reduce demand for potable water in Metro Vancouver.

Strategy 6: Support the uptake of building design and retrofit solutions to reduce the impact of heatwaves and wildfires

Metro Vancouver has already experienced the challenges of heatwaves and extended periods of poor air quality from wildfires, and this is expected to increase in the future. These events carry with them a host of health and safety risks (e.g., overheating, and aggravating existing respiratory diseases), especially for populations with pre-existing health conditions and limited access to resources. To reduce the impact that heat and wildfire smoke has on our residents, we need a network of publicly accessible buildings that can provide cool, clean indoor air, where people can seek shelter. At the same time, our new and existing buildings will need to meet higher standards for cooling, airtightness and filtration.

6.1 **Require Cooling Measures in New Buildings and Major Retrofits. (BIG MOVE)**
Advocate to BC Government to require cooling measures in new construction and significant retrofits to meet current and future cooling demands.

Call out Box: Cooler Buildings for a Hotter Future
As the climate warms, enhanced cooling will be necessary to ensure thermal comfort for building occupants. Starting with passive design is key to simultaneously reducing cooling demand and energy costs, through strategies such as orientation, solar shading and high-performance glazing. After maximizing passive measures, mechanical systems such as heat pumps can help to meet additional cooling needs. These measures should be applied in combination at new construction projects and major retrofits, with designs that account for both present and future conditions.

6.2 **Apply Leading Standards for Ventilation and Filtration in New Buildings. (BIG MOVE)**
Advocate to the BC Government to establish increasingly stringent code requirements for ventilation and filtration systems in new construction. These requirements will reduce the impacts of poor indoor air quality, including wildfire smoke events.

6.3 **Expand the Network of Public Buildings that can serve as Cool, Clean Air Centres.**
Work with regional partners to conduct public outreach about buildings that our most vulnerable residents can rely on for cool and clean air during extreme heat events and periods of poor air quality, and identify facilities that could be feasibly upgraded to serve this function.

6.4 **Understand Climate Risk and Resilience for Public Buildings Across the Region.**
Work with member jurisdictions, health authorities and other regional partners to conduct a regional vulnerability assessment for public buildings in Metro Vancouver to understand where risks are the highest and where adaptive capacity already exists.

6.5 **Integrate Resiliency into Low Carbon Upgrade Solutions.**
Work with member municipalities, BC Government and other regional partners to integrate resiliency solutions for existing buildings into the support services proposed in Strategy 2.

Strategy 7: Encourage the uptake of design and retrofit solutions that increase resilience to severe storms and flooding in buildings

As our climate changes, severe storms with heavy precipitation and high winds will occur more frequently and with greater magnitude. It will be important to ensure that new buildings are designed to withstand the impact of these shock events, and to reduce damage and avoid financial burden. Metro Vancouver and its partners can serve as key actors in developing and disseminating information on these options to industry and other stakeholders.

Call out box: Different kinds of flooding in the region. Metro Vancouver is expected to see increased flooding in the future. There are three types of flooding that can impact buildings in our region:

Coastal flooding happens when strong winds push ocean waves beyond the natural tidal area. Low lying areas can be particularly vulnerable to coastal flooding.
Riverine flooding happens when water levels run over the natural or artificial banks of a stream or river, such as the Fraser.
Urban flooding happens when severe precipitation overwhelms the drainage system of a city or town and causes water to collect in the streets, causing damage to buildings and infrastructure.

7.1 **Update Climate Projections to Future-Proof Buildings.**
Work with the BC Government to update planning and design tools for building design, based on future climate modeling, to ensure buildings are capable of withstanding anticipated climate conditions, including heavy precipitation, flooding and increased wind speeds.

7.2 **Provide Education on Retrofit Options that can Increase Resilience to Severe Storms and Flooding.** Work with member municipalities, BC Government and other regional partners to communicate to industry the retrofit solutions that reduce the risks associated with severe storms and flooding. This work should be integrated with the industry training and education work in action 2.8.

Setting the Path Ahead

Call out Box: The "Setting the Path Ahead" section will eventually be found on Metro Vancouver's Climate 2050 webpages under "Buildings", and will serve as a companion to the Buildings Roadmap. This will allow Metro Vancouver to track progress towards targets, and add and adjust strategies and actions in response to performance measurement.

Zero emissions, efficient buildings are better for the environment and better for the people who work, live and play in them. There is strong potential and a critical need to achieve significant greenhouse gas emissions reductions in Metro Vancouver's building sector over the next three decades. The first place to start is to ensure that all new buildings constructed are zero emissions.

By expediently addressing new construction, all levels of government, utilities, and industry can then focus on the longer-term task of decarbonizing the region's existing building stock. Achieving this will require careful coordination between key stakeholders, and increased market awareness about the opportunities and benefits of efficient buildings powered by clean and renewable energy. Support for training and

knowledge sharing will make it easier for building owners and building professionals to make this shift, backed by effective regulations to ensure that all buildings eventually participate.

The timeline below includes all of the actions included in this Roadmap. Although there is much work to be done, there are a few critical actions that, if started over the next two years, will make a major difference to accelerating the region's drive to zero emission and resilient buildings.

Climate 2050 Buildings Roadmap Action Timeline

Strategy	2021-2023	2024-2029	2030-Beyond
1. Signal the Transition to Zero Emission Buildings Through Requirements and Standards		GHG Performance Requirements for Existing Large Buildings	
		GHG Performance Requirements for Existing Houses & Townhomes	
	New Buildings Efficient and Electric		
		Require Greenhouse Gas Reductions During Renovations	
	Energy Labels for Homes and Buildings		
	Manage Indoor Air Quality in Building Codes		
			High Perform. Heating and Cooling Equip.
	Significantly Reduce Refrigerant Leaks in Building Equipment		
		Value Zero Emissions and Resilient Buildings in Lending Practices	
	Building Electrification Mandate for BC Hydro		
2. Accelerate Demand for Zero Emissions Buidlings through Reearch, Education & Funding	Building Decarbonization Coalition		
	Online Decision Support Tools for Low Carbon Upgrades		
	Energy Advisor Services for Homes and Large Buildings		
	Expand Low Carbon Upgrade Incentives		
	New Financing Tools for Low Carbon Upgrades		
	Make Electricity Upgrades Faster and Cheaper		
	Increase Public Awareness of the Benefits of Zero Emissions and Resilient Buildings		
	Training and Education in Zero Emissions and Resilient Buildings		
	Share Lessons from Transitioning Metro Vancouver Corporate Buildings to Zero Emissions		
	Test New Zero Emission Building Technologies		
3. Shift to Zero Carbon District Energy Systems		Emissions Requirements for District Energy Systems	
	Low Carbon District Energy Policies		
4. Accelerate the Transition to Lower Embodied Emissions in Buildings		Incorporate Embodied Emissions into BC Building Code	
	New Public Buildings Set Embodied Emission Reduction Targets		
	Use Building Materials with Low Embodied Emissions		
	Regional Working Group to Reduce Embodied Emissions in Buildings		
	Strengthen Metro Vancouver's Corporate Sustainable Design Requirements		
5. Water Conservation & Non-Potable Water Reuse		Apply Leading Water Efficiency Standards to Buildings	
	Broaden Applications of Non-Potable Water Use in Buildings		
	Support Capacity Building of Non-Potable Water use Applications on Building Sites		
6. Design & Retrofit Solutions for Heatwave and Wildfire Resiliency		Require Cooling Measures in New Buildings and Major Retrofits	
		Apply Leading Standards for Ventilation and Filtration in New Buildings	
	Expand the Network of Public Buildings that can serve as Cool, Clean Air Centres		
	Understand Climate Risk and Resilience for Public Buildings Across the Region		
	Integrate Resiliency into Low Carbon Upgrade Solutions		
7. Design & Retrofit Solutions for Storm and Flooding Resiliency	Update Climate Projections to Future-Proof Buildings		
	Provide Education on Retrofit Options that can Increase Resilience to Severe Storms and Flooding		

Measuring our Progress

The table below lists examples of some of the performance indicators that could be used to help Metro Vancouver measure regional progress towards meeting the targets set out for this purpose. The performance indicators used will depend on the availability of this information from other organizations. Because the Buildings Roadmap is calling for actions from many different partners and stakeholders, data sharing will be foundational to understanding the pace of progress towards our common goals, and will help governments to continue to shape equitable and cost-effective pathways to a zero emissions future.

Roadmap Element	Key Performance Indicator	Data Source	Data is Currently Collected
Regional GHG impact	tCO_2e attributed to the building sector	Regional GHG inventory	Yes
	tCO_2e attributed to the building sector	Aggregated utility data for building energy sales	Yes
Zero Emissions Buildings Standards	Number of municipalities adopting minimum GHG performance requirements (medium term)	BC Government	No
	Number of retrofit code permits with energy/climate measures	Local Governments	No
Demand for Zero Emissions Buildings	Numbers of high-efficiency electric equipment sold in BC	HRAI & CIPH shipment data Technical Safety BC Municipal mechanical system permits	No
	New buildings with low-carbon energy systems	Local Government building permits	Yes
	Distribution of building level GHG intensity scores (medium term KPI)	Building Energy Benchmarking Home Energy Scores	No
	Number of incentives (number of incentives and total dollar value).	CleanBC, Utilities	Yes
	Number of self-reported heat pump systems and fuel switches	Residential End Use Survey & Commercial End Use Survey (medium term KPI)	Yes
	Number of installed heat pump systems	Local government and Technical Safety BC Installation Permits	Yes
	Number of builders and retrofit trades companies operating in BC	North American Industry Classification Systems (NAICS) company registry	Yes
	Number of CleanBC Program Registered Contractors in different regions of BC	BC Government	Yes
	Number and sector distribution of Building Electrification Coalition members	Coalition	No
	Number of products, efficiency ratings and purchase cost	Shelf/industry survey	No
	Net present value of newly installed high-efficiency electric systems in buildings	Various	No
	Number of new products – year over year	Shelf/industry survey	No
	Number and types of products going through certification process	Canadian Standards Association (CSA)	No
Zero Carbon District Energy Systems	tCO2e attributed to district energy systems	Metro Vancouver District Energy Reporting Data	Yes
Lower Embodied Emissions	TBD	TBD	TBC
Water Conservation & Reuse	TBD	TBD	TBC
Heatwave & Wildfire Resilience	Numbers of high-efficiency electric equipment sold in BC	HRAI & CIPH shipment data Technical Safety BC Municipal mechanical system permits	No
	Number of new buildings with low-carbon energy systems	Local Government building permits	Yes
	Percentage of buildings self-reporting heat pump systems and fuel switches	Residential End Use Survey & Commercial End Use Survey (medium term KPI)	Yes

Roadmap Element	Key Performance Indicator	Data Source	Data is Currently Collected
	Percentage of buildings self-reporting mechanical air filtration systems	Residential End Use Survey & Commercial End Use Survey (medium term KPI)	No
	Number of installed heat pump systems	Local government and Technical Safety BC Installation Permits	Yes
Storm and Flooding Resilience	TBD	TBD	TBC

Feedback and Engagement Process

This Roadmap was generated with input from many organizations, including other orders of government, and residents across the region. The project team is continuously assessing that input, and many of the recommendations are reflected in the structure and content of this Roadmap.

This Roadmap reflects current policies and the best ideas, approaches and technologies available. As with all climate planning, it must be viewed as an iterative, *dynamic* path forward. The goals remain clear, and new policies, ideas, approaches and technologies must be anticipated and reflected in the Roadmap.

The project team continues to be open to feedback, at any time, in this Buildings Roadmap and any other aspect of the climate action initiatives led or coordinated through Metro Vancouver. Send any comments direct to the Project Team through Climate2050@metrovancouver.org or phone 604-432-6200.

Glossary

Carbon dioxide (CO_2) is the primary driver of climate change, and is produced primarily by burning fossil fuels.

Carbon neutral region means that the region generates no net greenhouse gas emissions. This is achieved through the deepest greenhouse gas emissions reductions possible across all economic sectors, and any remaining emissions are balanced out by the carbon dioxide that the plants, trees, and soil of the region remove from the atmosphere, or potentially through technological means

Carbon sequestration is the removal of carbon dioxide from the air and the long-term storage of carbon to mitigate climate change.

Clean, renewable energy is low or zero emission energy that is replenished over days or years. In Metro Vancouver, clean, renewable energy is primarily electricity from renewable sources such as hydro or solar.

Climate resilience describes the capacity of ecosystems, infrastructure, economies, and communities to absorb the impacts of climate change while maintaining essential services and functions needed to support health and well-being. In some cases, climate resilience involves changing services and functions so they are more sustainable.

Common air contaminants are air contaminants that can harm public health and reduce residents' quality of life and life expectancy by causing heart and lung diseases, cancer, asthma, and other impacts. Some air contaminants have odorous characteristics. Common air contaminants include fine and coarse particulate matter, ground-level ozone, nitrogen dioxide, sulphur dioxide, and ammonia.

Embodied emissions are greenhouse gas emissions associated with the construction of goods and products, including the raw materials and the transport of the good or product to where it is sold.

Equity is the promotion of fairness, justice and the removal of structural barriers that may cause or aggravate disparities experienced by different groups of people.

Fine particulate matter ($PM_{2.5}$) is made up of tiny solid or liquid particles that float in the air and can penetrate deep into the lungs and even into the bloodstream. Fine particulate matter can damage people's health by aggravating existing lung and heart diseases, increasing the risk of cancer and reducing life expectancy.

Global Warming Potential refers to the ability of a greenhouse gas to trap heat into the atmosphere over a specific period of time (usually 100 years). In other words, how many kilograms of carbon dioxide released into the atmosphere would it take to equal a single kilogram of the refrigerant gas, if released. Some of the most common refrigerants used in heat pumps today can have GWPs that exceed 750 (e.g., R410a, R407c and R134a).

Greenhouse gases are air contaminants that trap heat and are the cause of climate change. Greenhouse gases include carbon dioxide and nitrous oxide as well as short-lived climate forcers such as methane, halocarbons, black carbon and ozone. Limiting or preventing greenhouse gas emissions and removing these gases from the atmosphere is critical to avoiding catastrophic climate change (sometimes referred to as "climate change mitigation").

Low carbon building upgrades include upgrading building insulation and windows, sealing out drafts and switching to electric heating and cooling. These upgrades can significantly reduce energy consumption and emissions.

Nitrogen oxides (NO_X) are a group of gases, which includes nitrogen dioxide, that are produced during high-temperature fuel combustion, and can contribute to the formation of ground-level ozone and fine particulate matter.

Renewable natural gas is a renewable form of natural gas with a low carbon intensity. Sources of renewable natural gas include landfill gas and organic waste.

Vulnerability is the degree to which ecosystems, economies, infrastructure and communities are susceptible to, or unable to cope with, the adverse effects of climate change. Vulnerability varies based on exposure, sensitivity and adaptive capacity. Geographic location, socio-economic conditions, and other factors can impact susceptibility to harm and adaptive capacity.

Vulnerability assessments identify areas or populations most likely to be impacted by projected changes in climate and build an understanding of why these areas are vulnerable, including the interaction between climate change, non-climatic stressors and cumulative impacts. Assessments evaluate the effectiveness of previous coping strategies and target potential adaptation measures.

Zero carbon or **zero carbon emissions** are emissions that generate no net greenhouse gas emissions at the point of use. A zero carbon fuel source either produces no greenhouse gas emissions or any greenhouse gas emissions produced are offset by renewable energy (either generated on-site or purchased).

Zero emission means no greenhouse gas or other air contaminants are generated at the point of use. Zero emission includes zero carbon (see above), and also eliminates emissions of health-harming air contaminants (e.g., fine particulate matter and nitrogen oxides).

To: Climate Action Committee

From: Roger Quan, Director, Air Quality and Climate Change
Parks and Environment Department

Date: February 16, 2021 Meeting Date: March 3, 2021

Subject: **Manager's Report**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated February 16, 2021, titled "Manager's Report".

CLIMATE ACTION COMMITTEE 2021 WORK PLAN

The attachment to this report sets out the Committee's Work Plan for 2021. The status of work program elements is indicated as pending, in progress, or complete. The listing is updated as needed to include new issues that arise, items requested by the Committee, and changes to the schedule.

CLIMATE ACTION HIGHLIGHTS AROUND THE REGION

Metro Vancouver Region LC3: Zero Emissions Innovation Centre (ZEIC)

Simon Fraser University's Renewable Cities (SFU RC) Program is embarking on engagement activities with key stakeholders as part of the establishment of the new Low Carbon Cities Canada (LC3) Centre for the Metro Vancouver region. Seeded by a $21.7 million federal endowment, this Centre, using the working name of Metro Vancouver Zero Emissions Innovation Centre (ZEIC), will be one of seven LC3s with a mandate to accelerate urban climate solutions through research, capacity building, policy reform and financial innovation. It will support a wide range of actions by different agencies, including local governments, to reduce greenhouse gas emissions in line with adopted targets.

The Project Team that SFU RC has assembled to establish this organization over the course of 2021 are top strategists with experience in nonprofit start-up, impact investment, governance and community climate action. The Project Team includes:

- Alex Boston, Executive Director, Renewable Cities, and Fellow, SFU's Morris J. Wosk Centre for Dialogue;
- Brad Doff, Project Manager, Renewable Cities;
- Cheeying Ho, Executive Director, WCS Engagement + Planning;
- Don Lidstone, Managing Partner, Lidstone & Company; and
- Brian Smith, Chief Executive Officer, Rhiza Capital.

Over 20 key stakeholder interviews have been conducted to date, which have garnered input regarding the new centre, including priority program areas, current assets and gaps in advancing carbon reduction in the region, and impact investment priorities.

Key next steps are as follows:

- engagement of key stakeholders including municipal staff, though workshops and additional interviews in March to inform the organization and its programmatic and investment priorities of the ZEIC (note: elected officials may also be engaged through the Climate Caucus);
- establish a governing body with appointments of elected officials representing Metro Vancouver and City of Vancouver, as well as members at large; and
- hire an executive director (early summer 2021).

Staff will bring regular updates to the Climate Action Committee on progress toward establishing the ZEIC. The SFU RC team intend to continue engaging with Climate Action Committee members through 2021 during the process to establish the ZEIC and develop its strategic priorities, and will introduce the governing body Chair and Executive Director when they have been recruited.

Update on Utility Long Term Resource Plans

BC Hydro Long Term Resource Plan – BC Hydro is preparing a Long Term Resource Plan that will include an estimate of the expected demand for energy and a description of the facilities that the public utility would construct or extend in response. Originally asked to submit the plan before February 28, 2021, BC Hydro has requested an extension and is now expecting to submit its plan to the BC Utilities Commission (BCUC) by no later than December 31, 2021.

FortisBC Long Term Resource Plan – FortisBC will be filing their long-term resource plan in 2022. Metro Vancouver staff are participating in an Advisory Group formed by FortisBC Energy Inc. to provide input into their long term resource planning process.

Creative Energy Long Term Resource Plan – on January 13, 2021, Creative Energy filed a long-term resource plan with the BCUC, which outlines the planning context for future energy sources for Creative Energy to serve its core steam system in downtown Vancouver and Northeast False Creek system in the next 10 years.

ENGAGEMENT UPDATE

Clean Air Plan* and *Climate 2050

Staff have developed the draft *Clean Air Plan*, and an associated engagement plan, which are being presented to the Climate Action Committee in item 5.1 of this agenda.

A public climate webinar series began in late January, and runs each Tuesday until March 9. Six webinars are offering interested members of the public the opportunity learn about climate actions already underway, ask questions and hear about next steps. Topics included carbon neutral modelling, energy, agriculture, infrastructure, and nature and ecosystems, and the final webinar will be on the draft *Clean Air Plan*.

Proposed Amendments to Air Quality Permit and Regulatory Fees

Engagement is underway for potential amendments to the *Greater Vancouver Regional District Air Quality Management Fees Regulation Bylaw No. 1083, 2008* (Bylaw 1083). Following a public opinion survey late last year, staff are hosting three public webinars throughout February and early March. The first two webinars cover all potential Bylaw amendments and the final webinar will be focused on odorous air contaminants and the Measured Discharge Program.

Materials prepared by staff to support engagement include a questionnaire and a summary of the proposed amendments. Feedback on the proposals is being sought from businesses that are currently permitted or regulated and other interested stakeholders. All of the materials, including the discussion paper, are now available on the project website.

Managing Emissions from Cannabis Production and Processing Facilities

Following the public webinar and meetings with federal and provincial government staff in January, Metro Vancouver staff met with several cannabis producers in February. The purpose of these activities was to reach a common understanding of key issues, better align with Provincial initiatives, and explore industry-based solutions to managing emissions from cannabis production facilities. An additional public webinar was also hosted in February. These engagement activities have been well-attended by residents, government staff and representatives of the cannabis sector.

Staff will continue to meet regularly with the Ministry of Environment and Climate Change Strategy and the Ministry of Agriculture, Food and Fisheries to discuss alignment of potential policies and initiatives.

RESIDENTIAL WOOD BURNING BYLAW OUTREACH UPDATE

In the Manager's Report to the Climate Action Committee on October 16, 2020, staff reported on planned outreach to inform Metro Vancouver residents about the requirements of MVRD Residential Indoor Wood Burning Emission Regulation Bylaw No. 1303, 2020. Since December 2020, social media posts have directed residents to the Metro Vancouver webpage (Reference 1), which provides information about each phase of the bylaw. At the October 2020 meeting staff also previewed a video that provides an overview of the bylaw requirements (Reference 2).

A second video has recently been created to provide detailed information about best burning practices. Bylaw 1303 defines the best burning practices that must be used by anybody using a wood burning appliance in the region. The best burning practices video is now available on Metro Vancouver's web site (Reference 3) and is intended to be shared with residents through Metro Vancouver's social media channels.

Attachment

Climate Action Committee 2021 Work Plan

References

1. http://www.metrovancouver.org/services/air-quality/action/residential-wood-burning/Pages/default.aspx
2. http://www.metrovancouver.org/media-room/video-gallery/air-quality-and-climate-change/459154087
3. http://www.metrovancouver.org/media-room/video-gallery/air-quality-and-climate-change/500646425

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Climate Action Committee 2021 Work Plan
Report Date: February 16, 2021

Priorities

1st Quarter	**Status**
Climate Action Committee 2021 work plan and priorities	Complete
Climate 2050 – FCM Low Carbon Cities Canada initiative	In progress
Climate 2050 – carbon neutral modelling	In progress
Climate 2050 – electric vehicle programs review and recommendations	In progress
Air quality – monitoring network review and upgrades	In progress
Sustainability Innovation Fund (SIF) – 2021 proposals	Complete
2nd Quarter	
Climate 2050 – draft Roadmaps: Buildings, Industry, Transportation	In progress
Climate 2050 – Energy Roadmap discussion paper	In progress
Air quality – draft Clean Air Plan	In progress
Air quality – second phase of consultation on open air burning emission regulation	Pending
10th annual Caring for the Air report	In progress
SIF – status report on previously approved liquid waste projects	Pending
3rd Quarter	
Climate 2050 – draft roadmaps: Agriculture, Nature and Ecosystems	Pending
Climate 2050 – Land Use and Growth Management Roadmap discussion paper	Pending
Climate 2050 – Metro Vancouver's climate actions and carbon neutral progress	Pending
Climate 2050 – initiate consultation on proposed buildings regulatory initiative	Pending
Air quality – amendments to air quality permit and regulatory fees	In progress
Air quality – amendments to non-road diesel engine emission regulation	In progress
Air quality – update on regulatory initiative for cannabis processing	Pending
SIF – status report on previously approved regional district projects	Pending
SIF – status report on previously approved water projects	Pending
Ecological Health Framework – annual report	Pending
4th Quarter	
Climate 2050 – annual report and progress tracking	Pending
Climate 2050 – Human Health and Well-being Roadmap discussion paper	Pending
Climate 2050 – final roadmaps: Buildings, Industry, Transportation	Pending
Climate 2050 – managing Metro Vancouver's corporate GHG emissions and energy	Pending
Air quality – Clean Air Plan for Board approval	Pending
Air quality - initiate process to update boilers and process heaters regulation	Pending
Annual budget and 5 year financial plan	Pending

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February 11, 2021

Sav Dhaliwal, Chair
Metro Vancouver Regional District
Via email: sav.dhaliwal@burnaby.ca

Dear Mr. Dhaliwal,

Open Letter re: Application GVA1197 to Increase Allowable Annual Emissions by an Industrial Operator

I am writing you to bring to your attention concerns that some constituents of Vancouver East have raised about Air Quality Notification of Permit Application number GVA1197, an Application by West Coast Reduction Ltd to Amend Permit number GVA0141.

People residing in the north corridor of Vancouver East within a several kilometer radius of the West Coast Reduction facility have had longstanding concerns about odors and emissions emanating from the facility. The distance that this odor carries can vary somewhat depending on wind and weather conditions, but as constituents have said, on a clear warm day it can sometimes drift as far west as the Strathcona neighbourhood or east to Penticton or Slocan Streets – enough to have an impact on the quality of life on thousands of people in this densely populated urban area.

In past local residents have worked together to try and seek stricter rules on the allowable odors and emissions emanating from the facility. Regrettably an 2010 appeal led by several local residents to the BC Environmental Appeal Board was unsuccessful (viewable at http://www.eab.gov.bc.ca/ema/2010EMAList.htm).

Now, constituents have alerted me to the fact that West Coast Reduction Ltd has applied for an extension of their operating permit until 2031 – a fifteen-year extension.

One of the concerns they raise in this is that the permit amendment application also requests a sizeable lift in allowable annual Emissions levels: from the current total emissions allowable from combined sources of 102.234 tonnes/year, to 126.257 tonnes/year. This is a substantial increase and residents are deeply alarmed that this could have a very negative impact on air quality in the surrounding residential area.

I would echo their concerns. The notice of application, available at http://www.metrovancouver.org/services/permits-regulations-enforcement/permitting-notices/air-quality-notification/west-coast-reduction-ltd/gva1197, breaks down the requested mass of material to be discharged, emitted or stored by tonnes per year:

"Contaminant	**Current Permit Emissions**	**New Permit Requested Emissions**
Ammonia	1.692	2.165
Nitrogen Oxides (NOx)	52.782	67.534
Sulphur Oxides (SOx)	1.082	1.384
Volatile Organic Compounds (VOC)	2.901	3.712
Total Particulate Matter	42.555	49.899
Methane	1.222	1.563
Total	**102.234**	**126.257"**

The application to increase ammonia, methane and volatile compounds emitted could certainly have an impact on the odor issues that affect people's quality of life. Beyond odor issues, though, the application to increase all emission types raises questions about potential health and safety impacts on people living in the surrounding area. This neighbourhood is home to many lower-income people; there are a number of subsidized housing units in the area, including a number of Indigenous housing buildings, and many lower-end-of-market rental units. There are several elementary schools and childcare facilities nearby as well. The increase of respiratory and cardiovascular irritants and/or potentially carcinogenic emissions allowable raises serious questions about how those who live and work close to the facility may be impacted; these issues are not addressed within the application documents.

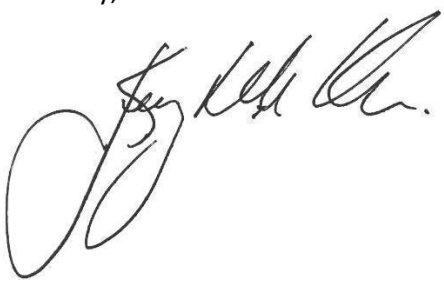
This application also raises questions about how the operations would add to overall greenhouse gas emissions if approved. I am mindful that climate science is clear that emissions must be reduced significantly & quickly if we are to mitigate the likelihood of irreversible climate change, and methane gas is a serious contributor to climate change. Likewise, the application documents make no reference to the potential climate impacts if this application is approved, nor does it explain how it would meet the goals of the Metro Vancouver Integrated Air Quality & Greenhouse Gas Management Plan.

Finally, I note the concern raised by constituents that the request to increase total combined annual emissions is not reflected in the permit amendment notice summary page (at this link: http://www.metrovancouver.org/services/permits-regulations-enforcement/permitting-notices/air-quality-notification/west-coast-reduction-ltd/gva1197).

Given the seriousness of these concerns I would ask if you would please respond directly to my constituents to address these concerns. I have attached their emails to me for your reference and so that you may correspond with them directly.

I thank you in advance for your consideration of these matters and for your efforts in addressing these concerns.

Sincerely,



Jenny Kwan
MP for Vancouver East

CC:
Melanie Mark, MLA, Vancouver-Mount Pleasant
Niki Sharma, MLA, Vancouver-Hastings
Kennedy Stewart, Mayor, City of Vancouver
Christine Boyle, Councillor, City of Vancouver
Adriane Carr, Councillor, City of Vancouver
Lisa Dominato, Councillor, City of Vancouver
Melissa de Genova, Councillor, City of Vancouver
Colleen Hardwick, Councillor, City of Vancouver
Michael Wiebe, Councillor, City of Vancouver

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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

Office of the Chair
Tel. 604 432-6215 Fax 604 451-6614

February 24, 2021

File: AQ-10-01-1197

Jenny Kwan
Member of Parliament, Vancouver East
House of Commons
Room 930, Confederation Building
Ottawa, ON K1A 0A6
VIA EMAIL: Jenny.Kwan@parl.gc.ca

Constituency Office
2572 East Hastings Street
Vancouver, BC V5K 1Z3

Dear Ms. Kwan: Jenny,

Open Letter re: Application GVA1197 to Increase Allowable Annual Emissions by an Industrial Operator

Thank you for your letter dated February 11, 2021 that expressed concern regarding the permit application submitted by West Coast Reduction Ltd. It is my understanding that you have also discussed this matter with Director Adrian Carr, Chair of the Metro Vancouver Climate Action Committee, on February 17, 2021. I wish to inform you that I have forwarded your letter onto the District Director and his team for consideration in their decision making process.

Furthermore, I encourage any member of the public concerned with the permit amendment application submitted by West Coast Reduction Ltd. to submit their comments and concerns through our website at: http://www.metrovancouver.org/services/permits-regulations-enforcement/permitting-notices/air-quality-notification/west-coast-reduction-ltd/gva1197.

While the minimum timeframe for comments is 30 days, in this case ending on March 4, 2021, the District Director will consider input from concerned parties up to the time of the permitting decision. Again, I encourage any concerned party to submit comments as soon as possible to ensure that their concerns are received and considered before a decision is reached after March 4, 2021.

Yours sincerely,

Sav Dhaliwal
Chair, Metro Vancouver Board

SD/NC

43925604

cc: Melanie Mark, MLA, Vancouver-Mount Pleasant
Niki Sharma, MLA, Vancouver-Hastings
Kennedy Stewart, Mayor, City of Vancouver
Christine Boyle, Councillor, City of Vancouver
Adriane Carr, Councillor, City of Vancouver
Lisa Dominato, Councillor, City of Vancouver
Melissa de Genova, Councillor, City of Vancouver
Colleen Hardwick, Councillor, City of Vancouver
Michael Wiebe, Councillor, City of Vancouver
Neal Carley, General Manager, Parks and Environment, Metro Vancouver

43925604