metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

# METRO VANCOUVER REGIONAL DISTRICT
# CLIMATE ACTION COMMITTEE

**REGULAR MEETING**

**Friday, November 5, 2021**
**1:00 p.m.**
**28th Floor Boardroom, 4515 Central Boulevard, Burnaby, British Columbia**

## A G E N D A[1]

**1. ADOPTION OF THE AGENDA**

**1.1 November 5, 2021 Regular Meeting Agenda**
That the Climate Action Committee adopt the agenda for its regular meeting scheduled for November 5, 2021 as circulated.

**2. ADOPTION OF THE MINUTES**

**2.1 October 15, 2021 Regular Meeting Minutes** *pg. 5*
That the Climate Action Committee adopt the minutes of its regular meeting held October 15, 2021 as circulated.

**3. DELEGATIONS**

**4. INVITED PRESENTATIONS**

**4.1 Roberto Pecora, Director, Zero Emissions Building Exchange (ZEBx)** *pg. 10*
Subject: An Introduction to ZEBx and its Evolving Mission

**5. REPORTS FROM COMMITTEE OR STAFF**

**5.1 Metro Vancouver's *Climate 2050 Buildings Roadmap*** *pg. 11*
That the MVRD Board:
a) endorse the *Climate 2050 Buildings Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Buildings Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the buildings sector;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Buildings Roadmap*; and

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

c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

**5.2 Metro Vancouver's *Climate 2050 Transportation Roadmap*** *pg. 72*

That the MVRD Board:

a) endorse the *Climate 2050 Transportation Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Transportation Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the transportation sector;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Transportation Roadmap*; and
c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

**5.3 Draft *Climate 2050 Agriculture Roadmap*** *pg. 140*

That the MVRD Board authorize staff to proceed with engagement on the draft *Climate 2050 Agriculture Roadmap*, as presented in the report dated October 13, 2021, titled "Draft *Climate 2050 Agriculture Roadmap*".

**5.4 Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2016 to 2020)** *pg. 187*

That the Climate Action Committee receive for information the report dated October 13, 2021, titled "Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2016 to 2020)".

**5.5 MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021** *pg. 235*

That the MVRD Board:

a) give first, second and third reading to *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021*; and
b) pass and finally adopt *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021*.

**5.6 MVRD Ticket Information Utilization Amending Bylaw No. 1333, 2021** *pg. 245*

That the MVRD Board:

a) give first, second and third reading to *Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021*; and
b) pass and finally adopt *Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021*.

**5.7 Air Quality Advisories During the Summer of 2021** *pg. 256*

That the Climate Action Committee receive for information the report dated October 13, 2021, titled "Air Quality Advisories During the Summer of 2021".

**5.8 Board Appointment of Enforcement Officers** *pg. 261*

That the MVRD Board:

a) pursuant to the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008* and the *Environmental Management Act*:
   i. appoint Metro Vancouver employees Matt Brinkworth and Toby Gritten as officers; and
   ii. rescind the appointments of Rick Laird, Robert Kemp and Corey Pinder as officers; and

b) pursuant to section 28 of the *Offence Act*:
   i. appoint Metro Vancouver employees Matt Brinkworth and Toby Gritten for the purpose of serving summons under section 28 of the *Offence Act* for alleged violations under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*; and
   ii. rescind the appointments for the purpose of serving summons of Rick Laird, Robert Kemp and Corey Pinder.

**5.9 Manager's Report** *pg. 263*

That the Climate Action Committee receive for information the report dated October 26, 2021, titled "Manager's Report".

## 6. INFORMATION ITEMS

**6.1 Media Release from Environment and Climate Change Canada, October 25, 2021 re UK COP26 Presidency releases Climate Finance Delivery Plan, led by German State Secretary Flasbarth and Canada's Minister Wilkinson ahead of COP26** *pg. 274*

## 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 November 5, 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 1:05 p.m. on Friday, October 15, 2021 in the 28th Floor Boardroom Room, 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
Councillor David Hocking*, Bowen Island
Councillor Laura Dupont*, Port Coquitlam
Councillor Dylan Kruger*, Delta
Councillor Jessica McIlroy*, North Vancouver City
Mayor Ron McLaughlin*, Lions Bay
Councillor Allison Patton*, Surrey
Councillor Harold Steves*, Richmond
Councillor Ahmed Yousef*, Maple Ridge

**MEMBERS ABSENT:**
Director Jen McCutcheon, Electoral Area A
Councillor Zoe Royer, Port Moody

**STAFF PRESENT:**
Roger Quan, Director, Air Quality and Climate Change, Parks and Environment
Natalia Melnikov, Legislative Services Coordinator, Board and Information Services

## 1. ADOPTION OF THE AGENDA

### 1.1 October 15, 2021 Regular Meeting Agenda

**It was MOVED and SECONDED**
That the Climate Action Committee:
a) amend the agenda for its regular meeting scheduled for October 15, 2021 by adding:
   i. Item 3.2 Late Delegation – Ken Carrusca, Cement Association of Canada, Stephanie Voysey, Lafarge, and Eileen Jang, Lehigh;
   ii. Item 3.3 Late Delegation – Jennifer Ahluwalia, Matt McAra, Jeffrey Styles, GFL Environmental Inc.; 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 September 10, 2021 Regular Meeting Minutes

**It was MOVED and SECONDED**
That the Climate Action Committee adopt the minutes of its regular meeting held September 10, 2021 as circulated.

**CARRIED**

## 3. DELEGATIONS

### 3.1 Lia Cairone, Deputy Director, C40 Cities Climate Leadership Group, Inc.

Lia Cairone, C40 Cities Climate Leadership Group, Inc. spoke to the Climate Action Committee on the Cities Race to Zero initiative, the official partner for the global Race to Zero campaign run by High-Level Champions and COP26 Presidency, and invited the Metro Vancouver Regional District and member jurisdictions to join the initiative.

Presentation material titled "Cities Race to Zero" is retained with the October 15, 2021 Climate Action Committee agenda.

**It was MOVED and SECONDED**
That the MVRD Board:

a) apply to join the *Race to Zero* initiative ahead of the 2021 Conference of the Parties (COP26) on behalf of Metro Vancouver; and
b) forward the executive summary and presentation material from the October 15, 2021 delegation to the Climate Action Committee from Lia Cairone, C40 Cities Climate Leadership Group, to member jurisdictions for their consideration in also joining the Race to Zero initiative.

**CARRIED**

### 3.2 Ken Carrusca, Cement Association of Canada, Stephanie Voysey, Lafarge, and Eileen Jang, Lehigh

Ken Carrusca, Cement Association of Canada, spoke to members regarding the proposed MVRD Air Quality Management Fees Regulation Bylaw No. 1330, 2021, highlighting the potential repercussions of the proposed Bylaw on the domestic manufacturing industry.

Presentation material titled "Cement Association of Canada Presentation at Metro Vancouver Climate Action Committee" is retained with the October 15, 2021 Climate Action Committee agenda.

### 3.3 Jennifer Ahluwalia, Matt McAra, Jeffrey Styles, GFL Environmental Inc.

Matt McAra, GFL Environmental Inc. spoke to members regarding the proposed MVRD Air Quality Management Fees Regulation Bylaw No. 1330, 2021,

highlighting the benefits of organic composting facilities and measures taken to control odour.

## 4. INVITED PRESENTATIONS

No items presented.

## 5. REPORTS FROM COMMITTEE OR STAFF

### 5.1 2022 – 2026 Financial Plan Overview

Dean Rear, General Manager of Financial Services/Chief Financial Officer, provided a verbal update on the 2022 – 2026 Financial Plan, highlighting the projected operating and capital budgets.

Presentation titled "2022 – 2026 Financial Plan Overview" is retained with the October 15, 2021 Climate Action Committee agenda.

### 5.2 2022 – 2026 Financial Plan – Air Quality

Report dated October 8, 2021 from Neal Carley, General Manager, Parks and Environment, and Roger Quan, Director, Air Quality and Climate Change, presenting the Climate Action Committee with the 2022 - 2026 Financial Plan for Air Quality for the Committee's consideration.

Members commented on the household impact of the budget increase and the rationale of using reserves versus borrowing practices.

Presentation material titled "2022 – 2026 Financial Plan – Metro Vancouver Regional District – Air Quality" is retained with the October 15, 2021 Climate Action Committee agenda.

**It was MOVED and SECONDED**

That the Climate Action Committee endorse the 2022 - 2026 Financial Plan for Air Quality as presented in the report dated October 8, 2021, titled "2022 - 2026 Financial Plan – Air Quality", and forward it to the Metro Vancouver Board Budget Workshop on October 20, 2021 for consideration.

**CARRIED**

### 5.3 MVRD Air Quality Management Fees Regulation Bylaw No. 1330, 2021

Report dated September 23, 2021 from Ray Robb, Director, Environmental Regulation and Enforcement, and Derek Jennejohn, Lead Senior Engineer, Parks and Environment Department, seeking MVRD Board adoption of *Metro Vancouver Regional District Air Quality Management Fees Regulation Bylaw No. 1330, 2021* (Bylaw 1330), concerning updated air quality permit and regulatory fees in Metro Vancouver.

Discussion ensued regarding the proposed fees and the potential impact on businesses.

Presentation material titled "Proposed *Air Quality Management Fees Bylaw 1330, 2021*" is retained with the October 15, 2021 Climate Action Committee agenda.

**Main Motion**
**It was MOVED and SECONDED**
That the MVRD Board:
a) give first, second and third reading to *Metro Vancouver Regional District Air Quality Management Fees Regulation Bylaw No. 1330, 2021*; and
b) pass and finally adopt *Metro Vancouver Regional District Air Quality Management Fees Regulation Bylaw No. 1330, 2021*.

**Referral Motion**
**It was MOVED and SECONDED**
That the Climate Action Committee refer back to staff the aforementioned motion for additional information.

**DEFEATED**

**Question on the Main Motion**
Question was then called on the Main Motion and it was

**CARRIED**
Councillor Yousef voted in the negative.

**5.4 MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021**
Report dated October 5, 2021 from Ray Robb, Director, Environment Regulation and Enforcement, and Cindy Onyejekwe, Senior Policy Analyst, Parks and Environment Department, seeking MVRD Board adoption of the *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021*, to regulate all non-road diesel engine tiers and promote further emission reductions.

Presentation material titled "MVRD Non-Road Diesel Engine Emissions Regulation Bylaw 1329, 2021" is retained with the October 15, 2021 Climate Action Committee agenda.

**It was MOVED and SECONDED**
That the MVRD Board:
a) give first, second and third reading to *Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021*; and
b) pass and finally adopt *Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021*.

**CARRIED**

**5.5 Manager's Report**
Report dated October 4, 2021 from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment, providing the Climate Action Committee with an update on current and on-going initiatives and programs.

**It was MOVED and SECONDED**
That the Climate Action Committee receive for information the report dated October 4, 2021, titled "Manager's Report".

**CARRIED**

## 6. INFORMATION ITEMS

### 6.1 Correspondence dated September 22, 2021 addressed to Metro Vancouver from Mayor Hurley, City of Burnaby, re: Gas to Electric Powered Equipment

### 6.2 Correspondence dated July 23, 2021 addressed to Board Chair Dhaliwal, Metro Vancouver from Mayor Brodie, City of Richmond, re: Help Cities Lead Initiative

## 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
That the Climate Action Committee conclude its regular meeting of October 15, 2021.

**CARRIED**

(Time: 4:51 p.m.)

_____ _____

Natalia Melnikov,
Legislative Services Coordinator

Adriane Carr, Chair

48439049 FINAL

## An Introduction to ZEBx and its Evolving Mission

ZEBx was first conceived in the City of Vancouver's 2016 Zero Emissions Building Plan. The City's ZEB Plan included the creation of a Centre of Excellence with a "mission to facilitate the compilation and dissemination of the knowledge and skills required to design, permit, build and operate zero emission buildings in BC." Since its launch in 2018, ZEBx, the first emission-focused Centre of Excellence in Canada, has firmly embedded itself in both the building industry and governmental organizations to act as a critical hub for building decarbonization.

ZEBx's capacity-building initiatives include the 2019 Brussels tour for local developers, local building tours, the monthly Decarb Lunch series, the six-part CleanBC Net-Zero Energy-Ready Challenge series, the six-part Deep Emissions Retrofit Dialogue series, technology demonstrations and publishing a multitude of resources. It aims to not only build capacity for zero-emission buildings, but also a sense of community and an enthusiasm and confidence that zero-emission buildings can be built cost effectively today. ZEBx also works behind the scenes, representing the decarbonization agenda at a variety of Energy Step Code Council and subcommittee meetings, industry workshops, consultation sessions and many other influential forums closed to the public. Ultimately, its aim has always been to enable governments to enact the required legislation and regulations which reduce the building sector's impact on global warming.

Although initially focused on operational emissions from new buildings in Vancouver, ZEBx's reach has expanded to well beyond Metro Vancouver and its focus continues to evolve and adjust to the shifting priorities within the green building community, in particular local and provincial governments. A recent addition to its programming is Building to Electrification, or B2E. This new, branded program area specifically targets the most effective path for decarbonization of new and existing buildings in BC: electrification of systems and appliances which use natural gas. Launched in September 2021, B2E has attracted significant attention throughout the Province and beyond as a result of its unique focus. Unlike ZEBx, it is a member-based organization with an influential Leadership Council which strives to represent a diverse cross-section of industry and governments as it provides guidance and support for the program. Primarily funded by BC Hydro, B2E will undoubtedly benefit BC Hydro's recently released five-year electrification plan.

As the regulations fall into place to reduce the operational emissions of new buildings throughout BC, ZEBx's focus has grown to include embodied emissions, as well as emissions-focused retrofits of existing buildings. Both of these are mentioned in MVRD's Clean Air Plan and Climate 2050 Roadmap for Buildings, indicating a very strong alignment with MVRD's future priorities for buildings. This alignment makes ZEBx a strong, potential enabler for MVRD's 2030 and 2050 GHG reduction targets for buildings. It is one of the main reasons why MVRD is collaborating with ZEBx for a Sustainability Innovation Fund application centred on incentivizing and building the local industry's capacity for deep emissions retrofits of existing buildings. Similar programs already exist in New York City (NYC Accelerator) and Toronto (TAF).

ZEBx's leadership and value have grown within the building industry to a point where it would be an ideal addition to Metro Vancouver's Low Carbon Cities Canada Centre, currently called the Zero Emission Innovation Centre (ZEIC). ZEIC will have an initial endowment from the federal government of approximately $20M and will focus on decarbonizing the building and transportation sectors in BC. It is being set up by the SFU Centre for Dialogue's Renewable Cities team, the current host organization for ZEBx. ZEIC has recently hired an Executive Director and its Board of Directors and ED are currently in discussions with ZEBx regarding integration with the centre.

To: Climate Action Committee

From: Erik Blair, Regional Planner II
Parks and Environment Department

Date: October 8, 2021 Meeting Date: November 5, 2021

Subject: **Metro Vancouver's *Climate 2050 Buildings Roadmap***

**RECOMMENDATION**

That the MVRD Board:

a) endorse the *Climate 2050 Buildings Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Buildings Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the buildings sector;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Buildings Roadmap*; and
c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

**EXECUTIVE SUMMARY**

The *Buildings Roadmap* is one in a series of ten *Climate 2050* Roadmaps that presents a robust pathway to have a resilient and sustainably powered regional building stock by 2050. Buildings in Metro Vancouver currently contribute about 25% of the region's overall greenhouse gas emissions. The *Buildings Roadmap* complements the recently adopted Clean Air Plan and the buildings-related actions contained therein to meet the region's 2030 greenhouse gas and air quality targets. The *Roadmap* identifies 12 big moves, and includes 7 strategies and 38 actions to reduce emissions, and ensure the region's building stock will be resilient to a changing climate. A draft of the *Buildings Roadmap* was presented to the Climate Action Committee and Board in March 2021. Staff have since completed engagement through a number of avenues, and have included a summary of key feedback that has been considered in finalizing the *Buildings Roadmap*. This report seeks endorsement of the *Climate 2050 Buildings Roadmap* by the MVRD Board.

**PURPOSE**

This report presents the *Climate 2050 Buildings Roadmap*, seeking endorsement by the MVRD Board.

**BACKGROUND**

Following the MVRD Board adoption of the *Climate 2050 Strategic Framework* in September 2018, staff were authorized in October 2019 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. A discussion paper on the *Climate 2050 Buildings Roadmap* was received by the Climate Action Committee at its September 20, 2019 meeting, followed by a draft Buildings Roadmap at the March 3, 2021 meeting. With the completion of engagement on the draft, staff have now finalized the *Climate 2050 Buildings Roadmap*, and are seeking endorsement by the Board.

## 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 (GHGs) 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*, as well as forthcoming updates to the regional growth strategy, and management plans such as liquid waste, solid waste, drinking water and regional parks. For actions that are within the jurisdiction or responsibility of others, Metro Vancouver can play a supporting and convening role, working closely with other orders of government, First Nations, and member jurisdictions, along with other key stakeholders, to advance implementation.

## METRO VANCOUVER'S *CLIMATE 2050 BUILDINGS ROADMAP*

The *Climate 2050 Buildings Roadmap* (Attachment 1) is Metro Vancouver's pathway to ambitious and necessary change in our built environment. The Roadmap sets the goals that "all buildings are zero emissions from heating and cooling by 2050" and that "residents are protected by buildings that are resilient to high temperatures, harmful air quality, severe storms and flooding by 2050."

### Potential Greenhouse Gas Reductions

The *Climate 2050 Buildings Roadmap* establishes a target of reducing GHG emissions from buildings 35% below 2010 levels by 2030, and achieving carbon neutral by 2050. Modelling, as previously presented to the Committee, estimates that actions in the Roadmap could reduce building-related GHGs by approximately 1.4 million tonnes by 2030 and over 3.5 million tonnes by 2050 (2010 buildings emissions were approximately 4.5 million tonnes). This represents a significant reduction of GHG emissions in the region, but still falls short of meeting the 2030 and 2050 science-based buildings targets adopted by the Metro Vancouver Board, which reflect the level of GHG reduction needed to limit global warming to 1.5 degrees Celsius. Achieving these targets presents a significant challenge as well as opportunities for the region's residents and buildings industry.

Metro Vancouver and its partners will continue to explore opportunities to further accelerate emission reductions during the detailed planning and implementation of the actions. It is expected that actions in the *Buildings Roadmap* and other Roadmaps may need to be updated in the future, in response to major changes in science, technology, policy and progress towards the targets. In order to ensure that there is alignment with Roadmaps that are under development, staff will also revisit any previously developed Roadmaps once all ten have been completed to reflect any necessary changes. The Committee will be provided with regular updates on the Roadmaps. For any significant changes that may need to be incorporated (such as enhanced or additional action items), staff will come back to Committee with the update to the respective Roadmap.

### Implementation of the *Buildings Roadmap*

The actions in the *Climate 2050 Buildings Roadmap* will be implemented through Metro Vancouver's regulatory and planning authority, delivery of regional services, and its role as convener of and advocate for issues of regional significance. The Roadmap considers equity in all actions, and

identifies opportunities to reduce disproportionate impacts. The Roadmap also identifies actions for implementation by other governments and organizations. Metro Vancouver's resources available for implementation will be focused on the priority "Big Moves". Progress on achieving the goals and targets will be measured against recommended key performance indicators, and reported publically.

**Big Moves in the *Buildings Roadmap***

The *Climate 2050 Buildings Roadmap* identifies the following 12 Big Moves, which are foundational actions needed to achieve the goals and targets of the *Climate 2050 Buildings Roadmap*:

1. Greenhouse gas performance requirements for existing large buildings
2. Greenhouse gas performance requirements for existing homes and townhomes
3. New buildings are highly efficient and electric
4. Require greenhouse gas reductions during renovations
5. Building electrification mandate for BC Hydro
6. Expand incentives for low carbon upgrades
7. Online decision support tools for low carbon upgrades in buildings
8. Emission requirements for district energy systems
9. Incorporate embodied emissions into the BC Building Code
10. Apply leading water efficiency standards to buildings
11. Require cooling measures in new buildings and major retrofits
12. Apply leading standards for ventilation and filtration in new buildings

**Relationship between the *Buildings Roadmap* and *Clean Air Plan***

The *Clean Air Plan*, approved by the MVRD Board on September 24, 2021, 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 GHG emissions from 2010 levels by 2030. All GHG reduction actions in the *Climate 2050 Buildings Roadmap* reflect actions that were adopted in the *Clean Air Plan*. The *Buildings Roadmap* includes additional actions for adaptation, also referred to as climate resiliency that are not found in the *Clean Air Plan*.

**CONSIDERING FEEDBACK AND UPDATING THE *CLIMATE 2050 BUILDINGS ROADMAP***

In 2021, staff conducted public webinars and stakeholder workshops in coordination with the *Clean Air Plan* engagement process on emission reduction actions as they related to key GHG emitting sectors, including the buildings sector. Staff have incorporated feedback on the buildings-specific actions, and they are in alignment with the actions in the *Clean Air Plan*. Staff offered additional workshops and opportunities for feedback focused on the adaptation actions as these do not appear in the *Clean Air Plan*. The full draft roadmap was publically available on the Metro Vancouver website from June to September 2021, and the opportunity to provide feedback promoted through social media platforms. The key revisions to the draft roadmap include:

- Some actions were elevated to become Big Moves to highlight more clearly the actions with the highest impact.
- Some actions were modified to identify additional partners for implementation.
- Some actions were modified to clarify the focus on new vs. existing buildings, or both.

Based on feedback received, some additional revisions to the draft *Buildings Roadmap* include:

- Additional context on the role of the *Clean Air Plan* and its relationship to the greenhouse gas mitigation strategies and actions in the *Buildings Roadmap*.
- Additional context on the linkage between the *Buildings Roadmap* and the forthcoming *Nature and Ecosystems Roadmap*, including nature-based solutions.
- One new action "provide education on retrofit options that can increase resilience to heatwaves and wildfires" (included in Strategy 6).

Attachment 2 provides more detail on how feedback was considered in finalizing the *Climate 2050 Buildings Roadmap.*

**ALTERNATIVES**

1. That the MVRD Board:
   a) endorse the *Climate 2050 Buildings Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Buildings Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the buildings sector;
   b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Buildings Roadmap*; and
   c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

2. That the MVRD Board:
   a) endorse the *Climate 2050 Buildings Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Buildings Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the buildings sector, with amendments proposed by the Climate Action Committee;
   b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Buildings Roadmap*; and
   c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

3. That the MVRD Board receive for information the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Buildings Roadmap*" and provide alternate direction to staff.

**FINANCIAL IMPLICATIONS**

The resources required to develop and engage on the *Climate 2050 Buildings Roadmap* were approved under the 2020 and 2021 budgets. Continued alignment of implementation activities and deliverables for the *Climate 2050 Buildings Roadmap* with the *Clean Air Plan* is intended to make the best use of resources available. As such, resource and cost implications will be brought back to the Committee and Board in coordination with the *Clean Air Plan* budgeting and work planning processes. The 2022 and subsequent annual budgets and five-year work plans will reflect the resource needs to begin implementation of actions in the *Clean Air Plan* and *Climate 2050 Buildings Roadmap*, as well as implementation of climate resiliency actions included in the *Climate 2050 Buildings Roadmap*.

## CONCLUSION

Metro Vancouver's *Climate 2050 Buildings Roadmap* sets an ambitious path towards zero emissions and resilient buildings in the region by 2050. The *Buildings Roadmap* has been updated based upon feedback received in 2021. To achieve the 2030 and 2050 targets, Metro Vancouver and its partners need to start on the actions in the Buildings Roadmap as soon as possible, using the full extent of each agency's authority, while continuing to explore opportunities to further accelerate emission reductions and improve the resiliency of all buildings. Staff recommend Alternative 1, to endorse the *Climate 2050 Buildings Roadmap*.

**Attachments** *(48848146)*

1. *Climate 2050 Buildings Roadmap*
2. Feedback considered in finalizing the *Climate 2050 Buildings Roadmap*

**Reference**

1. Feedback Considered in Finalizing the Clean Air Plan

48479869

CLIMATE **2050 Roadmap**

# Buildings

## A Pathway to Zero Emissions and Resilient Buildings

October 2021

FRONT COVER: BROCK COMMONS, UNIVERSITY OF BRITISH COLUMBIA.
PHOTO COURTESY OF WWW.NATURALLYWOOD.COM

Metrotower III, 4515 Central Boulevard, Burnaby, BC, V5H 0C6
www.metrovancouver.org

October 2021

The goals and targets at the heart of Metro Vancouver's climate-related plans are based on science. Reaching them is a top priority for the organization and the region. We must take bold action now to become a carbon neutral region by 2050, while recognizing that changes to our climate are already occurring, and that climate resilience must be a central consideration for the development of the region. The *Climate 2050 Transportation Roadmap* was prepared in 2020/2021 and introduced for stakeholder comment during the COVID-19 pandemic. 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 in a time of crisis.

# Metro Vancouver

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 2.6 million people. Essential services include drinking water, sewage treatment, and solid waste disposal, along with regional services like regional parks, housing, land use planning and air quality management 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, 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.


REGIONAL MANAGEMENT PLANS/STRATEGIES

## Metro Vancouver's Roles and Responsibilities for Climate Action

The three broad roles outlined in Metro Vancouver's mission each demonstrate responsibilities related to climate change. More specifically, under the *Environmental Management Act*, Metro Vancouver has the delegated authority to provide the service of air pollution control and air quality management and may, by bylaw, prohibit, regulate and otherwise control and prevent the discharge of air contaminants, including greenhouse gases. Through the regional growth strategy, Metro Vancouver, with its members, plans for compact, complete communities that are foundational to enabling a carbon neutral, resilient region. As part of delivering its core services, Metro Vancouver also generates and uses clean, renewable energy from its facilities and is working to ensure core regional services and infrastructure are prepared for and resilient to climate change.

In its role as a regional forum, Metro Vancouver builds and facilitates collaborative processes which engage the public and build partnerships to address significant regional issues like climate change. As part of this role, Metro Vancouver coordinates with and advocates on behalf of its member jurisdictions to other governments and partners on greenhouse gas management and climate change adaptation initiatives. Metro Vancouver will be looking to other governments and regional partners to lead the implementation of a number of key actions in the *Climate 2050 Roadmaps*, highlighting the importance of ongoing collaboration with others.

# 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 and cool our homes and buildings, produce hot water, and for some household appliances.

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.

VIEW FROM NORTH BURNABY

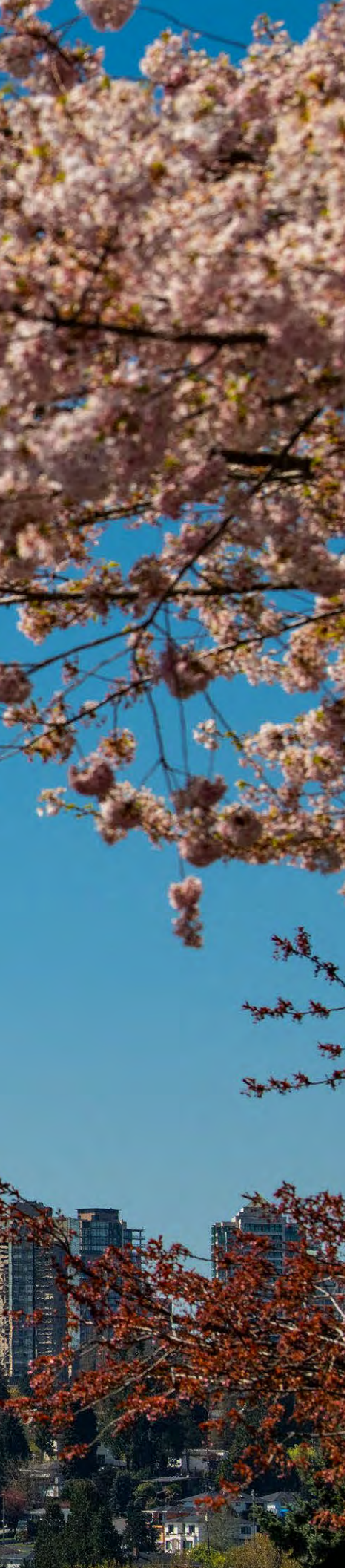
THE SEVEN STRATEGIES ARE:

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 and resilient 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.


BURNABY METROTOWN



# Contents



Click to return to Table of Contents

# 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.

# Climate 2050 Buildings Roadmap

## A pathway to zero emissions, resilient buildings in Metro Vancouver

# 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.

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.

### 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.

# Goals

Metro Vancouver's *Climate 2050 Strategic Framework* has set the following regional vision to guide the region's response to climate change::

- Metro Vancouver is a carbon neutral region by 2050
- Infrastructure, ecosystems, and communities are resilient to the impacts of climate change

It also sets an interim target of 45% reduction in greenhouse gas emissions from 2010 levels, by 2030.

Achieving this vision means setting 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 a carbon neutral, resilient region.

Metro Vancouver has set these goals for 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.

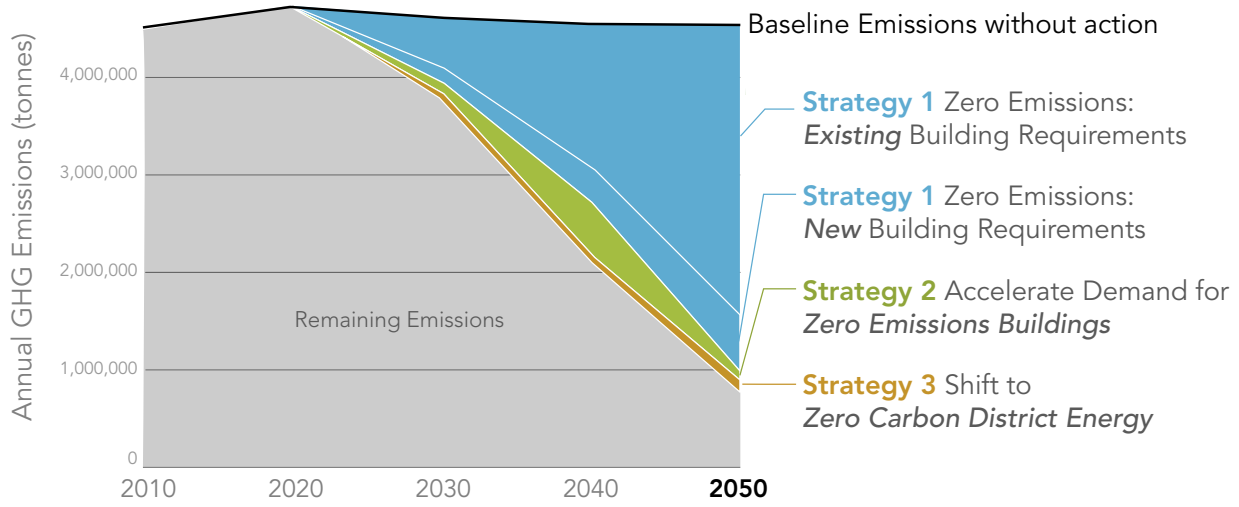
By 2050:

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.

GETTING TO CARBON NEUTRAL BUILDINGS: Impact of key strategies




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.

HOWE SOUND TRAIL LOOKOUT, WEST VANCOUVER

## 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.

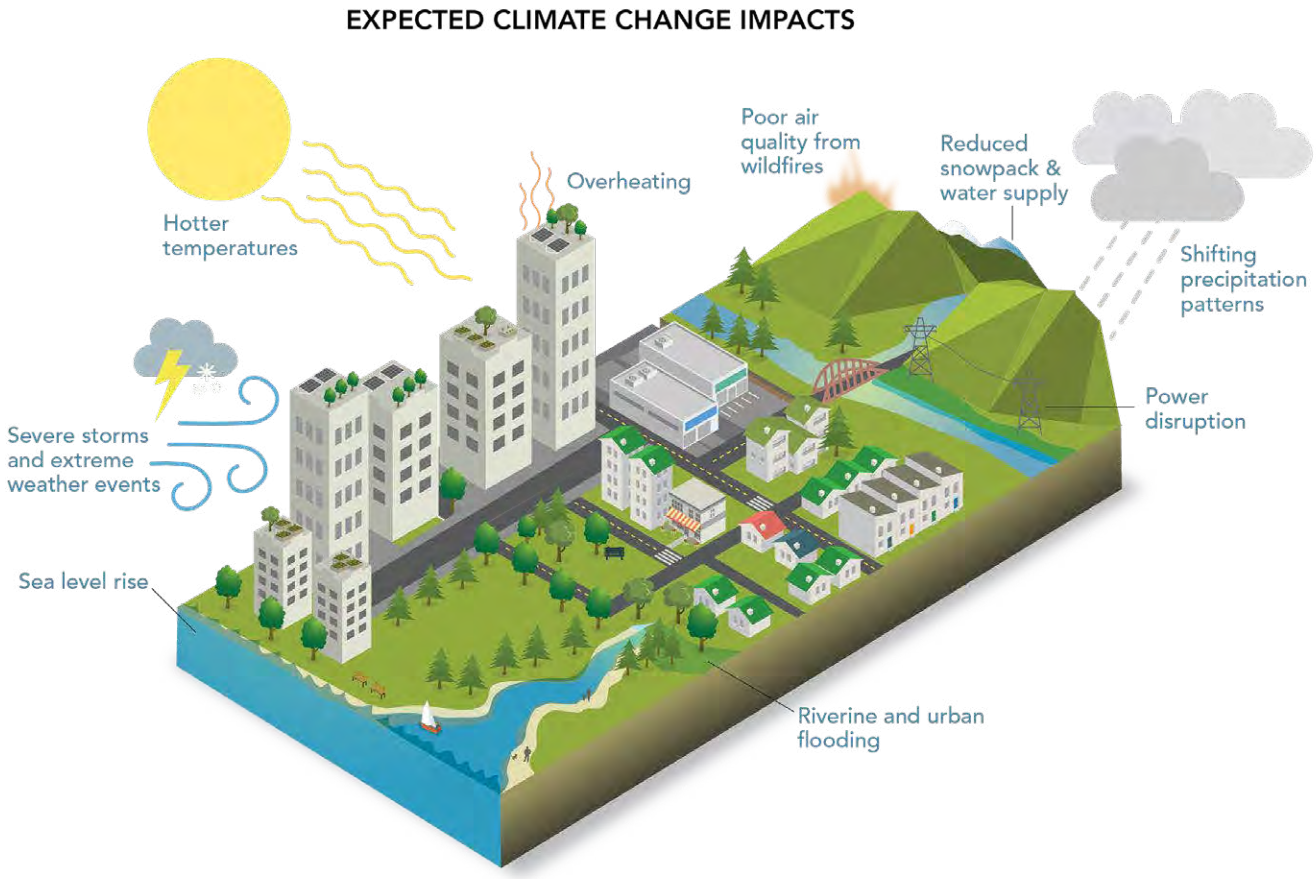
The Climate 2050 Buildings Roadmap and the *Clean Air Plan* will work together to reach a common goal of accelerating our path to a carbon neutral region. As a result, the plans share some strategies and actions. Here's what you will find similar and different in each of these plans:

### CONNECTING THE *BUILDINGS ROADMAP* AND THE *CLEAN AIR PLAN*

| *Clean Air Plan* | *Buildings Roadmap* |
|---|---|
| • Greenhouse gas reduction goals, strategies and actions.<br>• Air quality goals, strategies and actions.<br>• Goals, strategies and actions for other sectors such as transportation, industry, and agriculture. | • Greenhouse gas reduction goals, strategies and actions.<br>• Resilient building strategies.<br>• Challenges, opportunities and benefits of transitioning our buildings to become zero emissions and resilient. |

# 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.



**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

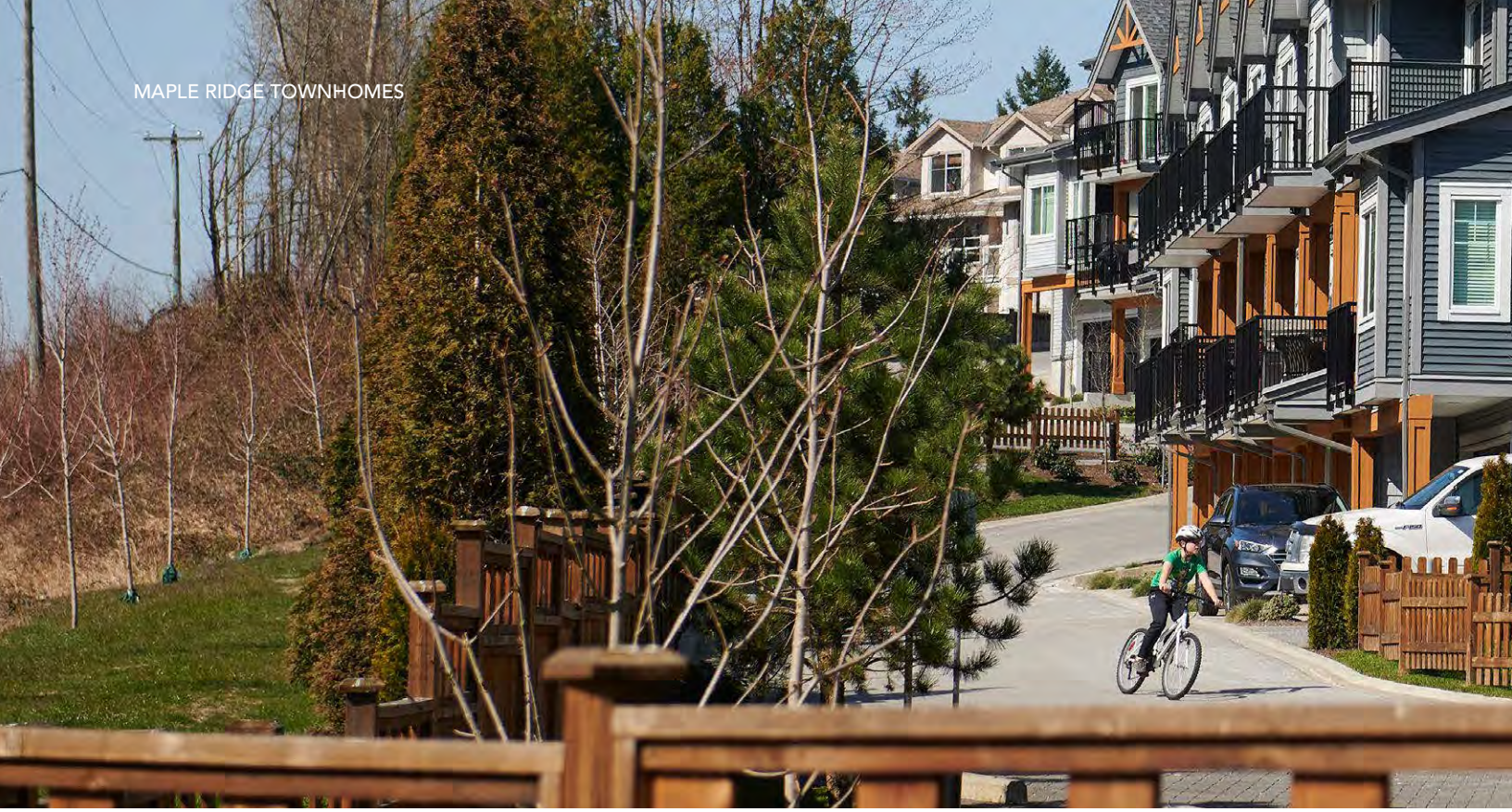
**Overheating** in buildings where cooling solutions do not exist or are inadequate. This poses particular risk to vulnerable populations and those without the means to cope. Reducing this risk requires a thoughtful combination of passive and mechanical cooling measures.

**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.



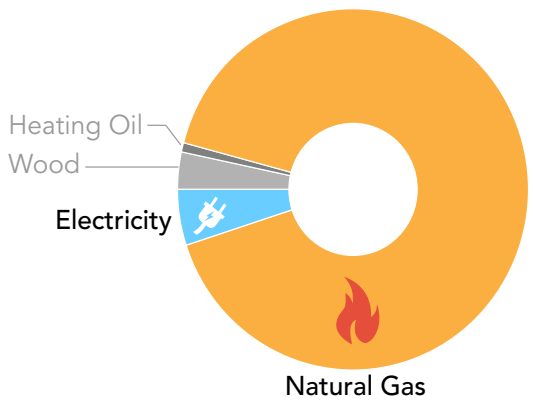
MAPLE RIDGE TOWNHOMES

# Emissions from Buildings in Metro Vancouver

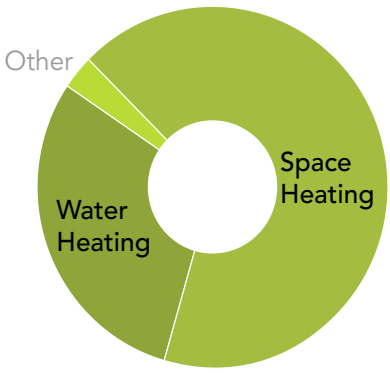
There are nearly 500,000 buildings throughout Metro Vancouver that collectively have more than 185 million square meters (2 billion square feet) of floor space.

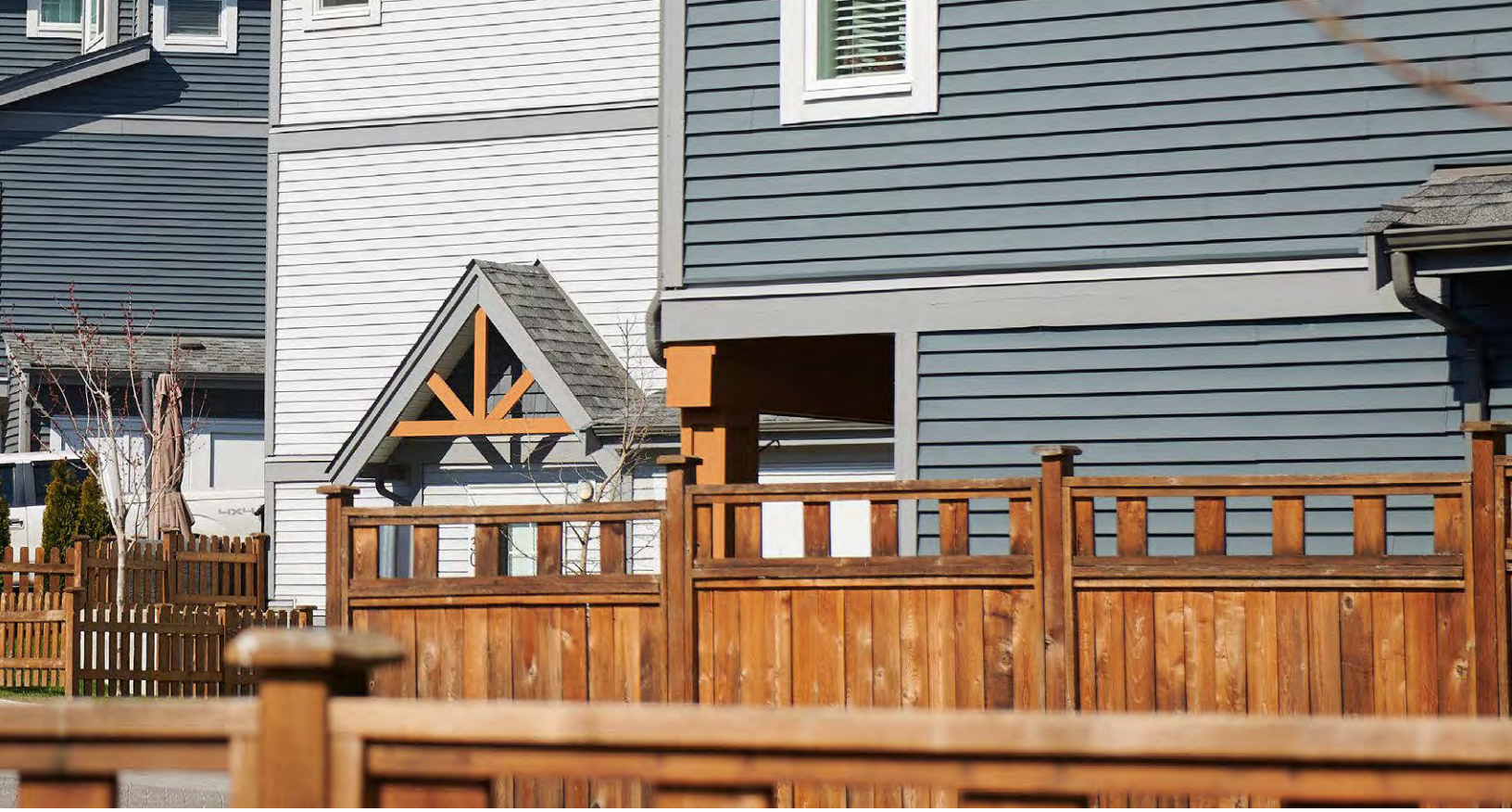
Together, these buildings are the second largest source of greenhouse gas emissions in Metro Vancouver after transportation, emitting over 4 million tonnes per year, which is approximately 25% of the region's total annual emissions. Even with programs and incentives in place, greenhouse gas emissions 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.

GHG EMISSIONS BY FUEL SOURCE




GHG EMISSIONS BY END USE





Natural Gas produces **16x** more Greenhouse Gases than Electricity


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.

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.

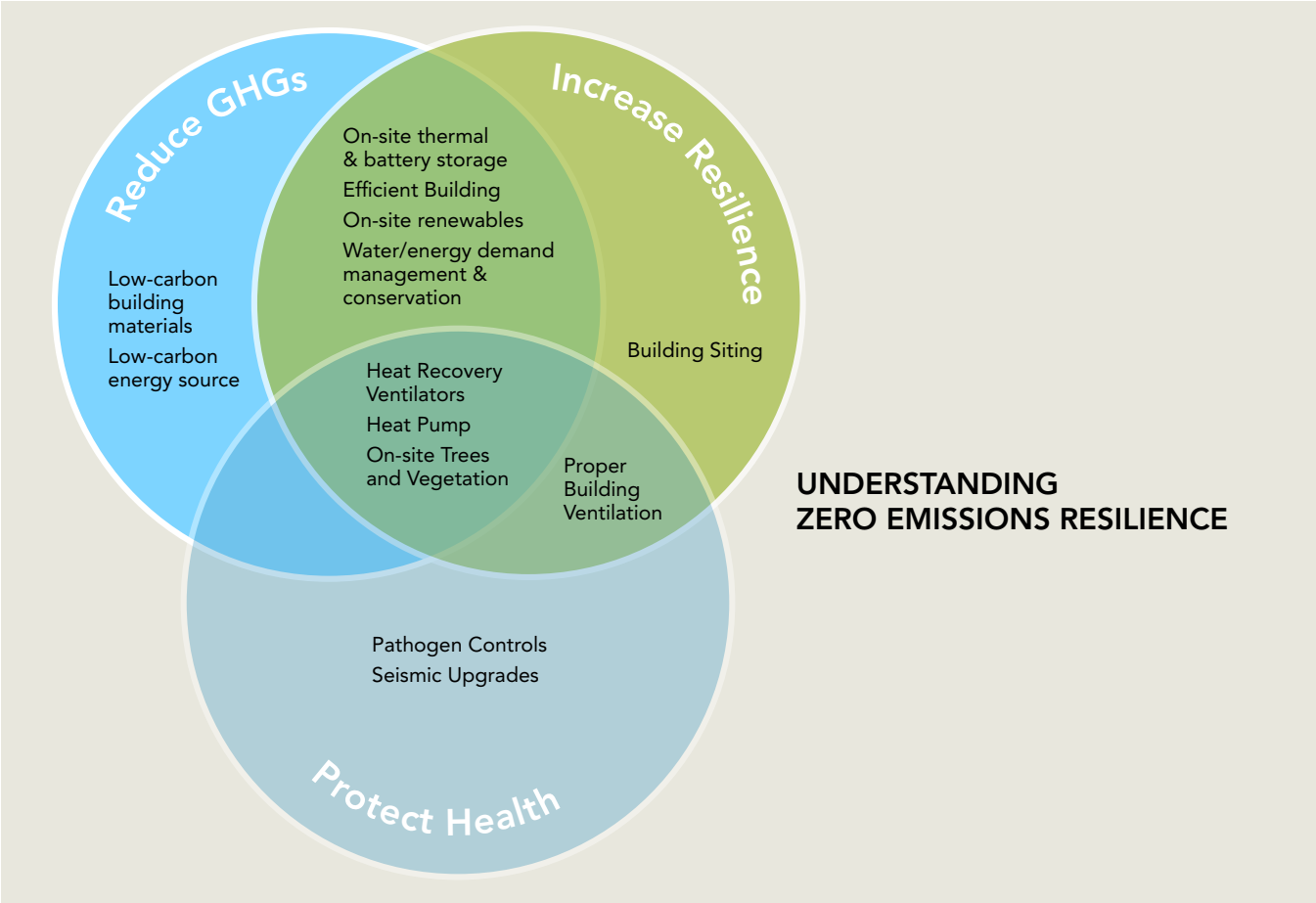
Looking to 2050, this Roadmap seeks to achieve a zero emissions and resilient building stock. By applying these desired outcomes simultaneously at the building and site level, we can identify ways to reduce emissions and vulnerability to climate change impacts at the same time.

### 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.




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.

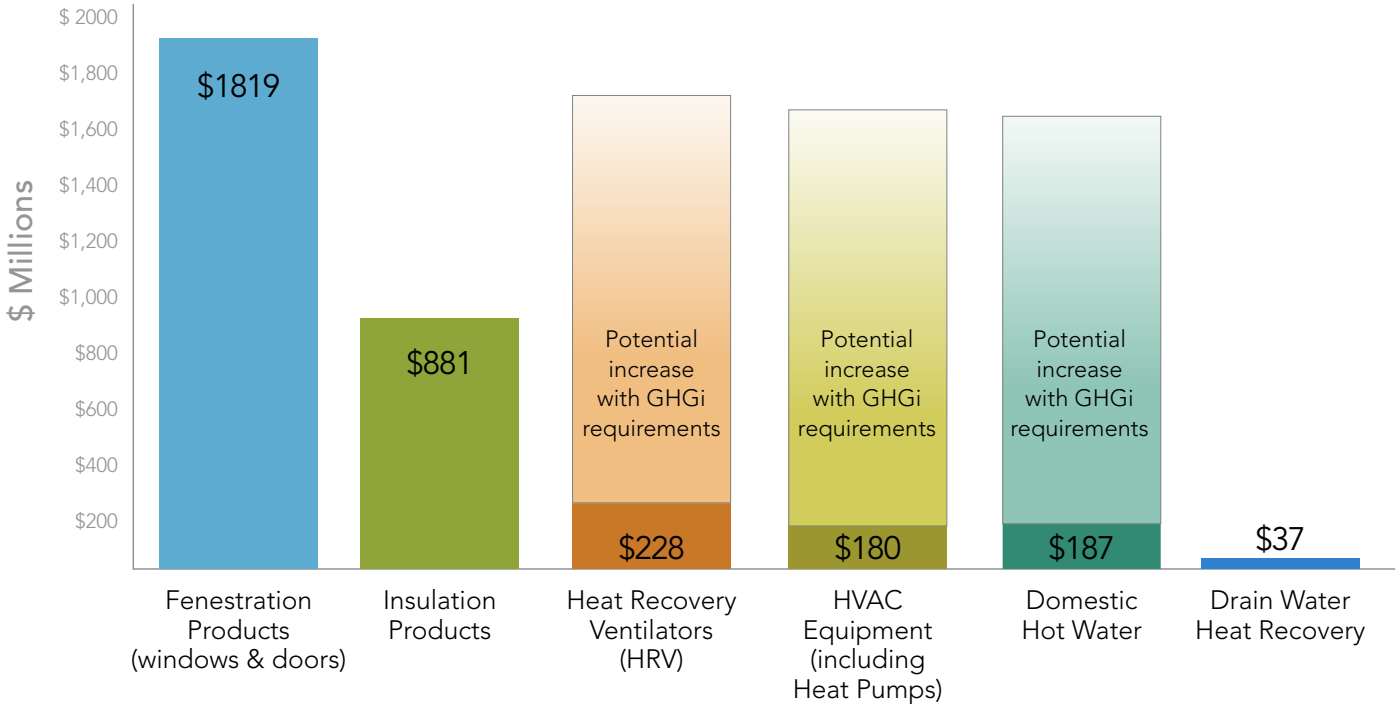
Applying a zero emissions resilience lens offers benefits, including:

- Identifying strategies that achieve emissions reductions and increased resiliency simultaneously (e.g., heat pumps can both reduce emissions and provide mechanical cooling; trees can sequester carbon, support on-site storm water management, and provide shading to buildings);
- 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.

## $3.3B MARKET FOR GREEN BUILDING MATERIALS

Demand forecast, new construction, Metro Vancouver 2019-2032 (cumulative)




## 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.

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

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. 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. 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. Metro Vancouver will develop a strategic approach to assessing equity in the Climate 2050 *Buildings Roadmap*. This will include community input, health impact assessments and other equity evaluation tools so that all residents benefit from these changes.

# Healthy Buildings

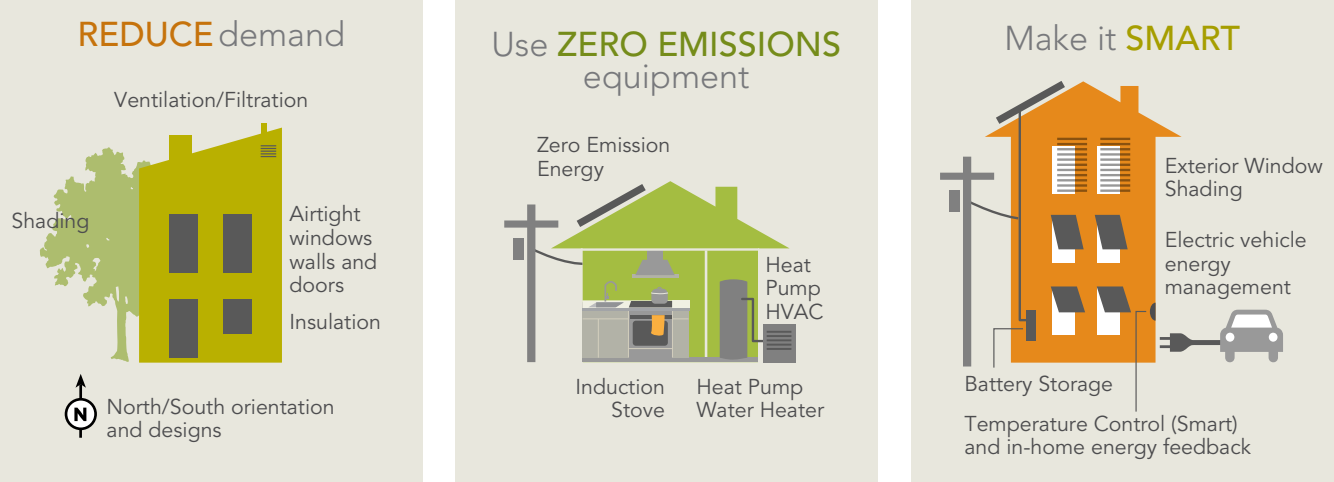
Health must be considered alongside emissions reductions and resiliency. Many of the ways that we make our buildings zero emissions and resilient are also the ways we make them healthier. Health outcomes will be a driving force behind how we craft our response.

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. Measures at the building site, such as shade from trees and green or white roofs can also reduce the amount of energy needed to cool a building, and may even provide some insulation in colder months.

### 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.

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 many of 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.

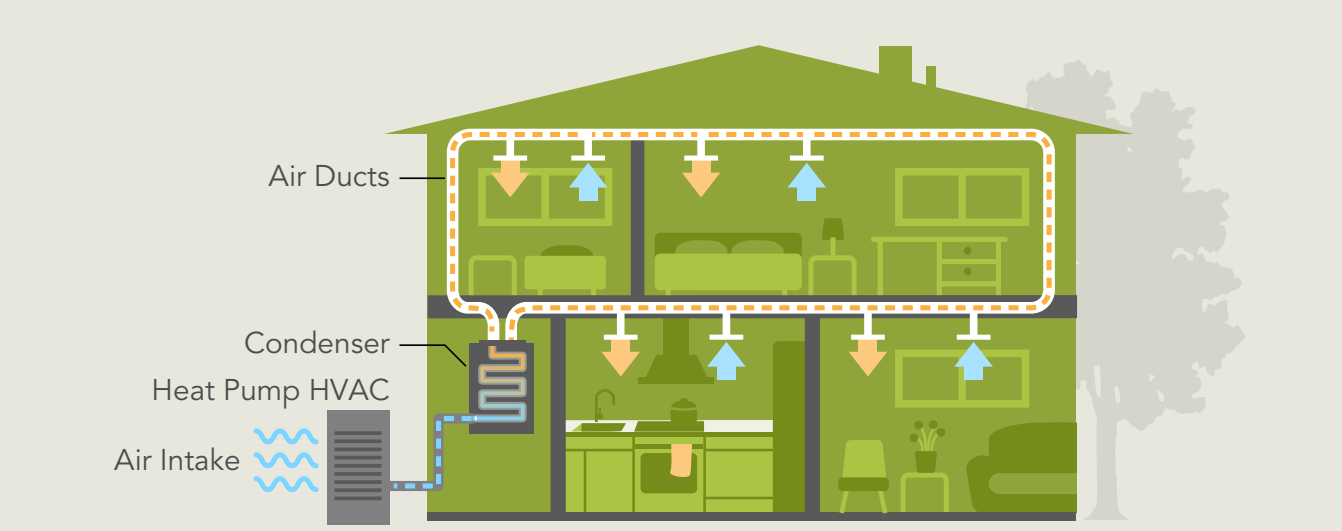
Similarly, appliances and water heaters equipped with demand response technologies could provide BC Hydro with an opportunity to encourage the use of this equipment during off peak periods and to help ensure services such as space heating and cooling are prioritized during periods of unusually high demand.

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.

BC HYDRO ELECTRICITY

# 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°C (in other words, they are 300-500% efficient). Low temperature heat pumps operate very well below 0°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.

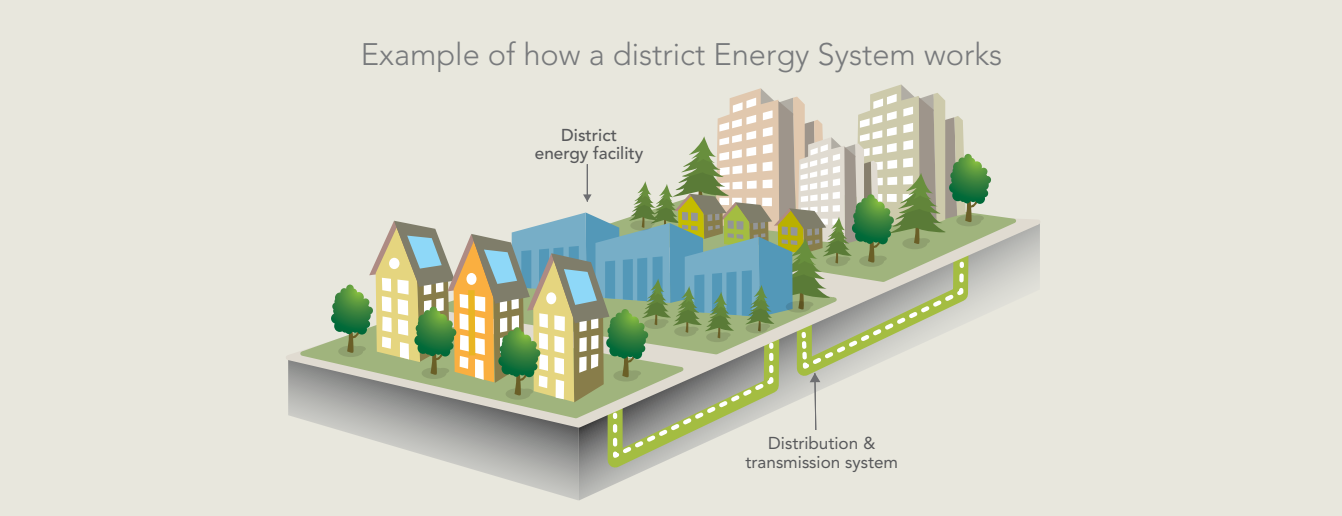
In addition to being zero emissions, heat pumps provide air conditioning in the summer. This makes these buildings more resilient to the longer, hotter, drier summers that are predicted for the Metro Vancouver region as a result of climate change.

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.

### 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

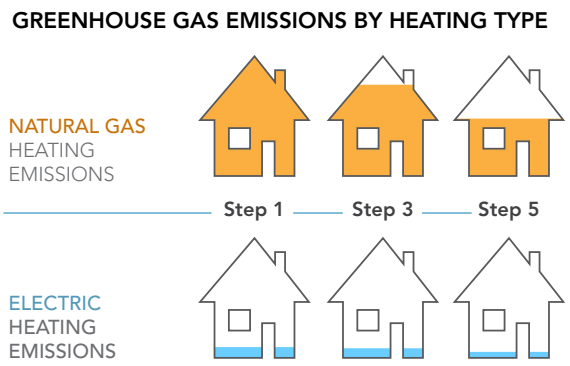
Metro Vancouver is home to at least 18 different District Energy Systems. A District Energy System is a utility that provides heating services to buildings within a concentrated geographic area (e.g., university campus, hospital, downtown core, high-density neighbourhood). Pipes carry hot water or steam 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:

- **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.

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.

## 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.

### 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, a viable path to reduce greenhouse gas emissions 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. 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

## 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.

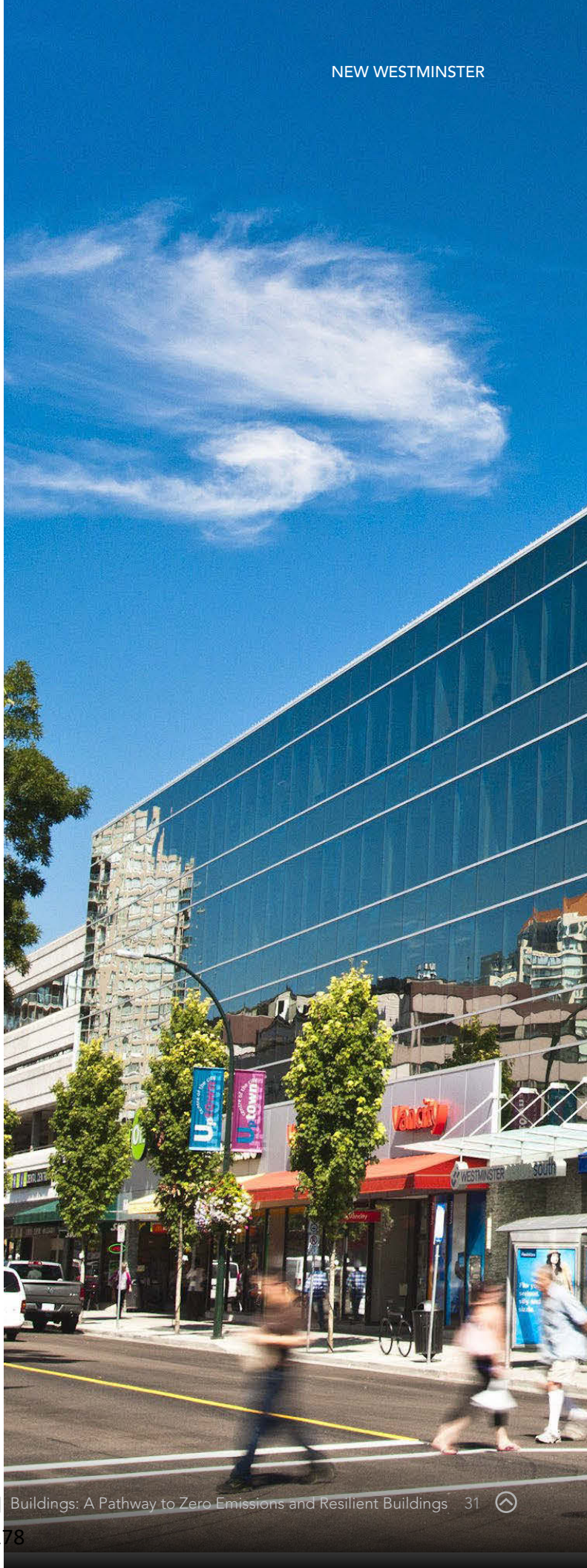
**Energy Roadmap** – availability of clean, renewable energy for use by buildings between now and 2050.

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

**Nature and Ecosystems Roadmap** – the importance of natural systems to reducing emissions from buildings, and increasing the resiliency of the built environment.

## Linkage to Metro Vancouver's *Clean Air Plan*

Zero Emissions Buildings Strategies 1-4 (and all the associated actions) appear in both the *Buildings Roadmap* and the *Clean Air Plan*. These two plans are working together to achieve a carbon neutral region. Linking these strategies and actions in both plans ensures a clear action plan for Metro Vancouver and its partners.

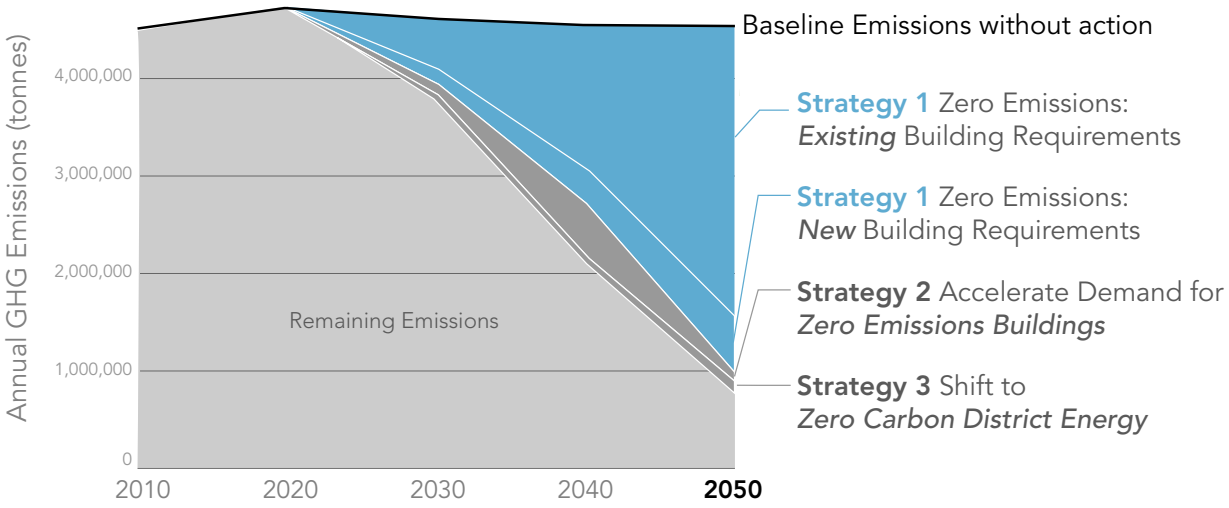


# Zero Emissions Buildings Strategies

## 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 BC 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 IMPACT OF STRATEGY 1 ON GHG EMISSIONS




| STRATEGY 1 | Potential Impacts of Strategy | Key Partners |
|---|---|---|
| | Reduce annual greenhouse gases by up to **650,000** tonnes in 2030<br>Reduce annual greenhouse gases by up to **3.5 million** tonnes in 2050 | • Federal Government<br>• BC Government<br>• Member jurisdictions<br>• 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). Public sector organizations could play a leadership role by establishing zero emission targets for their own existing buildings earlier.

### 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 could be developed with member jurisdictions, and would also help with achieving Metro Vancouver's ambient air quality objectives.

### 1.3 New Buildings are 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 (i.e., electric heating and cooling) by 2030. These requirements should allow local governments to voluntarily establish zero emission targets earlier. These requirements would apply to new homes, townhomes, commercial buildings, and large residential buildings. Public sector organizations should play a leadership role by establishing zero emission targets for their own new buildings in advance of provincial requirements.

### 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 Building Electrification Mandate for BC Hydro.

BIG Move

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. A clear mandate could also support the development of electricity rates for residents who wish to switch to electricity.

### 1.6 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. This should include outreach and training with real estate agents, property assessors, insurance providers and other related professions. Such labels would provide information to accelerate low carbon updates for buildings.

### 1.7 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.

### 1.8 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. 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.

### 1.9 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 safely reduce refrigerant leaks and ensure effective refrigerant management in heating and cooling systems in buildings.

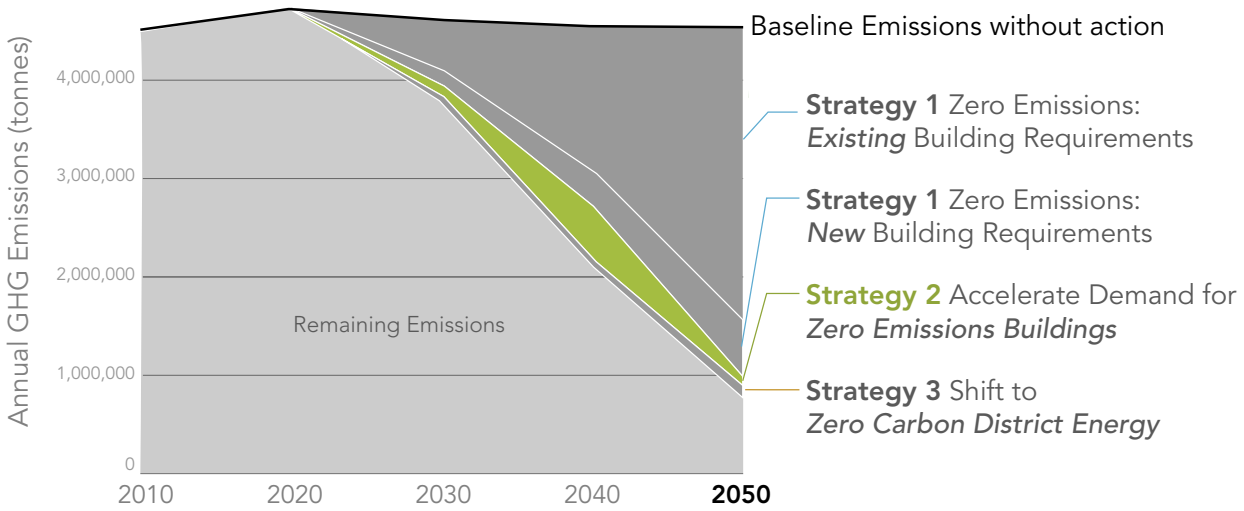
### 1.10 Accurately Value Zero Emission and Resilient Buildings.

Replace with "Work with the BC Government and the Government of Canada to establish guidelines for the valuation of low and zero emission, and resilient buildings. This would support lenders, appraisers and insurers in providing competitive products for low and zero emission, and resilient buildings, such as "Green Mortgages" and "Green Loans".

## STRATEGY 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 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 IMPACT OF STRATEGY 2 ON GHG EMISSIONS




**STRATEGY 2**

| Potential Impacts of Strategy | Key Partners |
|---|---|
| Reduce annual greenhouse gases by up to **110,000** tonnes by 2030<br>Reduce annual greenhouse gases by up to **90,000*** tonnes by 2050<br><br>*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<br>• BC Government<br>• Member jurisdictions<br>• BC Hydro |

CONSTRUCTION IN WHITE ROCK

### 2.1 Expand Low Carbon Upgrade Incentives.

BIG Move

Advocate to the BC Government and the Government of Canada to increase funding for fuel-switching and energy efficiency incentives, to the scale required to transition to zero emission buildings in the region and the province. The funding (e.g., incentives, tax credits) should support more building electrification solutions for older homes and buildings, and should complement financing tools under Action 2.5. 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

### 2.2 Online Decision Support Tools for Low Carbon Upgrades in Buildings.

BIG Move

Work with the BC Government, the Government of Canada and member jurisdictions to develop innovative online decision support tools to help significantly increase public awareness of low carbon solutions. These tools would help home and building owners choose these solutions by simplifying the planning, financing and execution of low carbon upgrades in buildings. These tools would be supported by energy advisor services under Action 2.3

### 2.3 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.

### 2.4 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 (e.g., supply constraints for zero emission building equipment) and create opportunities to accelerate the transition to zero emission homes and 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).

### 2.5 Energy Advisor Services for Homes and Large Buildings.

Work with the BC Government and the buildings industry to enhance energy advisor services for home and building owners energy advisor services for home and 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.

### 2.6 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 how health is improved by reducing emissions of indoor aircontaminants; the benefits of using qualified installers; permitting requirements for heating, cooling and ventilation systems; and the consumer protections provided by municipal permits.

### 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, for both new builds and retrofits of existing buildings.

### 2.9 Share Lessons from Transitioning Metro Vancouver Corporate Buildings to Zero Emissions.

**Corporate** LEADERSHIP

Develop and promote 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.

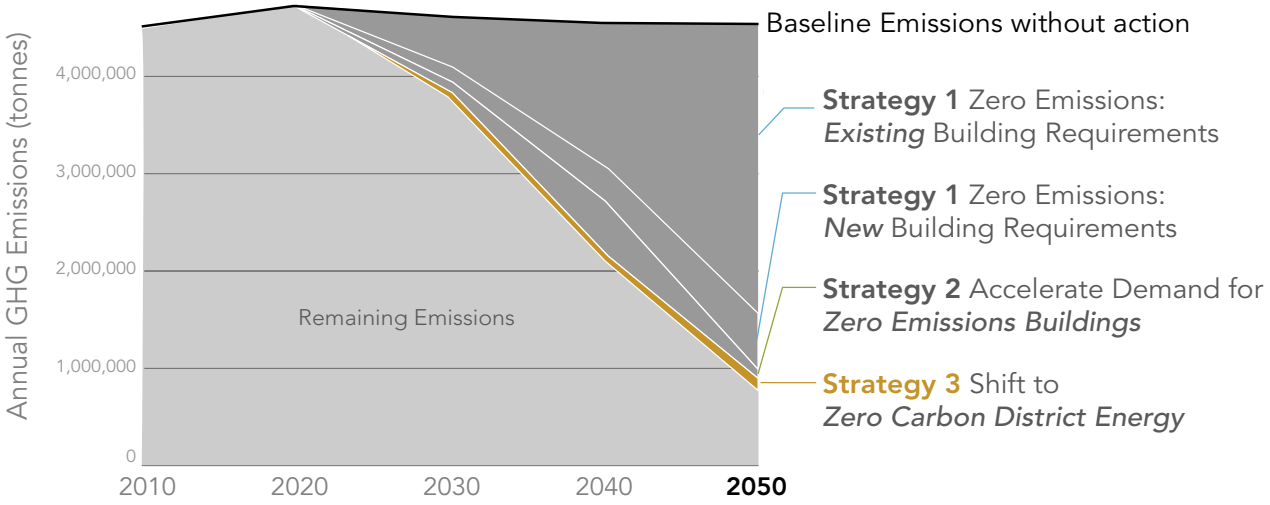
**Corporate** LEADERSHIP

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. Metro Vancouver is currently exploring opportunities to provide clean, renewable energy to district energy systems.

### POTENTIAL IMPACT OF STRATEGY 3 ON GHG EMISSIONS




| STRATEGY 3 | Potential Impacts of Strategy | Key Partners |
|---|---|---|
| | Reduce annual greenhouse gases by up to **80,000** tonnes by 2030<br>Reduce annual greenhouse gases by up to **110,000** tonnes by 2050 | • Member jurisdictions<br>• 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. These requirements should align with Action 1.1 on large buildings.

### 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 other member jurisdictions.

## 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.

| STRATEGY 4 | Potential Impacts of Strategy | Key Partners |
|---|---|---|
| | To be developed as Strategy is implemented | • Member jurisdictions<br>• BC Government<br>• Construction/ Renovation industry |

### 4.1 Incorporate Embodied Emissions into the BC Building Code.

BIG Move

Advocate to the BC Government that future BC Building Code and Retrofit Code updates should 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.

### 4.2 Use Building Materials with Low Embodied Emissions.

Work with the BC Government and member jurisdictions to update or create policies (e.g., procurement, design guidelines, zoning) to prioritize the use of building materials with low embodied emissions, including BC forest products. This should include development and maintenance of widely-supported standard calculations for the life cycle emissions of common building products.

### 4.3 New Public Buildings Set Embodied Emission Reduction Targets.

Advocate to public sector organizations in the region to establish embodied emission reduction targets for new construction projects, ahead of BC Building Code and Retrofit Code changes.

#### 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, 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 2.4).

### 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 4.2.

# 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 (e.g., non-food green roof irrigation, toilets, make-up water for boiling and cooling systems), working towards a One Water approach. Metro Vancouver will support member jurisdictions to identify barriers and solutions for the application of these standards new and existing buildings.

### 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 public, building 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. This work should be integrated with the industry training and education work in action 2.8, 6.6, and 7.2.

**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.

## 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. Nature-based solutions are central to low carbon resiliency, including using green roofs that can dissipate heat and planting deciduous trees that can shade buildings in the summer, and let light through in the winter.

### 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.

### 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 or other building site green spaces that could be feasibly improved 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.

#### 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 (e.g., window covers, tree canopy) 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.

## STRATEGY 6 continued

### 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.

### 6.6 Provide Education on Retrofit Options that can Increase Resilience to Heatwaves and Wildfires

Work with member municipalities, BC Government and other regional partners to communicate to the public and industry the retrofit solutions that reduce the risks associated with severe heat and wildfire events.This work should be integrated with training and education work in actions 2.8, 5.3 and 7.2.

## 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.

### 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 the public and 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. 5.3, and 6.6.

SEA WALL IN VANCOUVER

# Setting the Path Ahead

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 |
|---|---|---|---|
| **STRATEGY 1** Signal the Transition to Zero Emission Buildings Through Requirements and Standards | New Buildings Efficient and Electric | GHG Performance Requirements for Existing Large Buildings | High Perform. Heating and Cooling Equip. |
| | Building Electrification Mandate for BC Hydro | GHG Performance Requirements for Existing Houses & Townhomes | |
| | Energy Labels for Homes and Buildings | Require Greenhouse Gas Reductions During Renovations | |
| | Manage Indoor Air Quality in Building Codes | | |
| | Significantly Reduce Refrigerant Leaks in Building Equipment | | |
| | | Accurately Value Zero Emissions and Resilient Buildings | |
| **STRATEGY 2** Accelerate Demand for Zero Emissions Buidlings through Reearch, Education & Funding | Expand Incentives for Low Carbon Upgrades | | |
| | Online Decision Support Tools for Low Carbon Upgrades in Buildings | | |
| | New Financing Tools for Low Carbon Upgrades | | |
| | Building Decarbonization Coalition | | |
| | Energy Advisor Services for Homes and Large Buildings | | |
| | 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 | | |
| **STRATEGY 3** Shift to ZeroCarbon District EnergySystems | Low Carbon District Energy Policies | Emissions Requirements for District Energy Systems | |
| **STRATEGY 4** Accelerate the Transition to Lower Embodied Emissions in Buildings | New Public Buildings Set Embodied Emission Reduction Targets | Incorporate Embodied Emissions into BC Building Code | |
| | Use Building Materials with Low Embodied Emissions | | |
| | Regional Working Group to Reduce Embodied Emissions in Buildings | | |
| | Strengthen Metro Vancouver's Corporate Sustainable Design Requirements | | |
| **STRATEGY 5** Water Conservation & Non-Potable Water Reuse | Broaden Applications of Non-Potable Water Use in Buildings | Apply Leading Water Efficiency Standards to Buildings | |
| | Support Capacity Building of Non-Potable Water use Applications on Building Sites | | |
| **STRATEGY 6** Design & Retrofit Solutions for Heatwave and Wildfire Resiliency | Expand the Network of Public Buildings that can serve as Cool, Clean Air Centres | Require Cooling Measures in New Buildings and Major Retrofits | |
| | Understand Climate Risk and Resilience for Public Buildings Across the Region | Apply Leading Standards for Ventilation and Filtration in New Buildings | |
| | Integrate Resiliency into Low Carbon Upgrade Solutions | | |
| | Provide Education on Retrofit Options that can Increase Resilience to Heatwaves and Wildfires | | |
| **STRATEGY 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. Additional work is underway to understand what key performance indicators and data effectively measure progress towards regional resilience (noted in the table below as "TBD").

| 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<br>Technical Safety BC<br>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<br>Home Energy Scores | No |
| | Number of incentives (number of incentives and total dollar value). | CleanBC,<br>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 | Utilities, Home Performance Stakeholder Council (HPSC) | Yes |
| | Number and sector distribution of Building Electrification Coalition members | Coalition | Yes |
| | Number of products, efficiency ratings and purchase cost | Shelf/industry survey | Yes |
| | Net present value of newly installed high-efficiency electric systems in buildings | Various | No |

| ROADMAP ELEMENT | KEY PERFORMANCE INDICATOR | DATA SOURCE | DATA IS CURRENTLY COLLECTED |
|---|---|---|---|
| Demand for Zero Emissions Buildings (cont.) | 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 | $tCO_2e$ attributed to district energy systems | Metro Vancouver District Energy Reporting Data | Yes |
| Lower Embodied Emissions | TBD | TBD | TBD |
| Water Conservation & Reuse | TBD | TBD | TBD |
| Heatwave & Wildfire Resilience | Numbers of high-efficiency electric equipment sold in BC | HRAI & CIPH shipment data<br>Technical Safety BC<br>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 |
| | 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 | TBD |

# 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 (NOx)** 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).

SUNSET, WEST VANCOUVER


metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

## ATTACHMENT 2

**Additional Feedback Considered in Updating the *Climate 2050 Buildings Roadmap***

***Note:*** *Feedback considered for the greenhouse gas reduction related actions found in the Climate 2050 Buildings Roadmap are referenced in the Clean Air Plan feedback. A copy of the feedback can be found in the MVRD September 24th Board Agenda Package: Clean Air Plan (Section E3.1, Attachment 2)*

| ***Climate 2050 Buildings Roadmap*** **Section/Topic** | **Feedback** | **Metro Vancouver Feedback Response** |
|---|---|---|
| **The Challenge** | | |
| Goals | The Roadmap includes goals for 2030, but the rest of the Roadmap consistently emphasizes the 2050 targets and 30-year time horizon. | Call out box added to clarify the relationship between the *Clean Air Plan*, as the 10-year air quality and greenhouse gas management plan, and *Climate 2050 Buildings Roadmap* as the overarching regional buildings climate strategy. |
| Buildings Goals | Cooling retrofits for the rental stock are particularly challenging and could lead to renovation issues if not carefully planned. | Metro Vancouver recognizes that retrofits to improve low carbon resilience in rental buildings pose unique challenges to both building owners and tenants. The implementation of many actions in the *Climate 2050 Buildings Roadmap* must consider how to reduce or eliminate "renovations" and exacerbating the housing crisis while pursuing our 2030 and 2050 Goals. |
| **The Journey to Carbon Neutral, Resilient Buildings** | | |
| Linkages to Other *Climate 2050* Roadmaps | Clarity needed on the relationship between the *Clean Air Plan* and *Climate 2050 Roadmaps*. | Call out box added to clarify the overlap in actions between the *Clean Air Plan* and *Climate 2050 Buildings Roadmap*. |
| **Resilient Buildings Strategies** | | |
| **Strategy 5: Support water conservation and non-potable water reuse to increase resilience to shifting precipitation patterns** | | |
| Strategy 5 "Support water conservation and non-potable water reuse to increase resilience to shifting precipitation patterns" | Strategy 5 should note the potential negative impacts that non-potable water systems may have on potable supply. | Consideration of the viability of non-potable water systems in different building types is noted in the description of Strategy 5. This could be considered as part of the implementation of this Strategy. |
| Strategy 5 "Support water conservation and non-potable water reuse to increase resilience to shifting precipitation patterns" | Work to ensure codes and water treatment standards enable non-potable solutions without a lot of redundant infrastructure. | Proposed changes to codes and standards will be considered as part of the implementation of this Strategy. |
| Strategy 5, Action 5.2 "Broaden Application of Non-Potable Water Use in Buildings" | Need solutions to retrofit existing buildings. These buildings are challenged to make business cases for non-potable water, and often have electrical supply pinch points. | The wording of this action was changed to clarify the need for solutions in new and existing buildings. |

| | | |
|---|---|---|
| Strategy 5, Action 5.2 "Broaden Application of Non-Potable Water Use in Buildings" | Will need to work with Health Authorities and Ministry of Health on non-potable water use recommendations to ensure we do not increase risk of pathogens such as legionella, e-coli etc. Vancouver Coastal Health and City of Vancouver have worked closely on this but there are opportunities for further work and collaboration. | Action 5.2 includes advocacy to "member jurisdictions and other agencies" which could include health authorities and provincial or federal ministries. |
| Strategy 5, Action 5.3 "Support Capacity Buildings of Non-Potable Water Use Applications on Buildings Sites" | Consider an action to undertake education and public engagement for Strategy 5, similar to action 7.2. | The wording in action 5.3 was changed to clarify that educational resources could be considered for the general public in addition to the identified audiences. |
| **Strategy 6: Support the uptake of building design and retrofit solutions to reduce the impact of heatwaves and wildfires** | | |
| Strategy 6 “Support the uptake of building design and retrofit solutions to reduce the impact of heatwaves and wildfires” | Awareness building on heatwaves and wildfires could be a specific action in Strategy 6. | New action 6.6 (Provide Education on Retrofit Options that can Increase Resilience to Heatwaves and Wildfires) was added to reflect this feedback. |
| Strategy 6 “Support the uptake of building design and retrofit solutions to reduce the impact of heatwaves and wildfires” | More support / education needed about FireSmart practices | This could be considered as part of implementation of new Action 6.6 "Provide Education on Retrofit Options that can Increase Resiliency to Heatwaves and Wildfires". |
| Strategy 6, Action 6.1 "Require Cooling Measures in New Buildings and Major Retrofits" | Energy efficiency requirements for cooling will be needed. | This will be considered as part of the implementation of this action. Additionally, Action 1.7 identifies that Metro Vancouver will advocate for the rated energy performance of cooling and heating equipment to meet or exceed 100% efficiency, in addition to using low carbon refrigerants. |
| Strategy 6, Action 6.1 "Require Cooling Measures in New Buildings and Major Retrofits" | Concerned that adding cooling requirements will increase operational costs for building owners. | Metro Vancouver recognizes that cooling would be a new service for most buildings in the region and would have associated costs. Demand for cooling may be driven by comfort, health or safety concerns of building occupants and owners. The Province of BC develops and administers the BC Building Code including any new cooling requirements. Metro Vancouver understands that any proposed changes to the BC Building Code for new or existing buildings will be assessed against multiple outcomes including cost to building owners and tenants, health, safety, accessibility and greenhouse gas emissions reductions, and would include public engagement. |

| | | |
|---|---|---|
| Strategy 6, Action 6.2 "Require Cooling Measures in New Buildings and Major Retrofits" and 6.6 "Integrate Resiliency into Low Carbon Upgrade Solutions" | There is a need to incentivize planning for electrifying heating, cooling and EV charging. | Incentives will be considered as part of the implementation of these actions along with actions in Strategy 1 and 2 related to requirements to reduce carbon emissions in buildings, and the development of planning tools for home and building owners. |
| Strategy 6, Action 6.3 "Expand the Network of Public Buildings that can serve as Cool, Clean Air Centres" | Support municipalities with resources to incorporate resilience measures in new/retrofitted community facilities (e.g. resilience hubs/cooling centres) | As part of the implementation of Action 6.3, Metro Vancouver will work with member municipalities and other partners to identify research, best practices and funding that can improve the low carbon resilience of community facilities and provide cool air refuge. |
| Strategy 6, Action 6.3 "Expand the Network of Public Buildings that can serve as Cool, Clean Air Centres" | What is the interaction between using public sector buildings as cooling centres and implementing cooling across all buildings - is there a tradeoff to provide homeowners or building owners longer timelines to implement cooling at the building level if public cooling centres are available? | Cooling in both public buildings and all other occupied buildings will likely be needed. The costs, benefits and timing of adding cooling to existing buildings will be considered in the implementation of Actions 6.1 and 6.3 |
| Strategy 6, Action 6.3 "Expand the Network of Public Buildings that can serve as Cool, Clean Air Centres" | Consider how publicly accessible clean/cool air centres could address overnight excess heat and accessibility barriers for vulnerable populations. | These issues will be considered as part of implementation of this action. |
| Strategy 6, Action 6.4 "Understand Climate Risk and Resilience for Public Buildings Across the Region" | Baseline metric of how to understand level of resiliency of buildings for different archetypes (e.g. SFD, multi family, commercial) | Development of resiliency metrics will be considered as part of the implementation of the resiliency actions in the *Climate 2050 Buildings Roadmap*. |
| **Strategy 7: Encourage the uptake of design and retrofit solutions that increase resilience to severe storms and flooding in buildings** | | |
| Strategy 7, Action 7.2 “Provide Education on Retrofit Options that can Increase Resilience to Severe Storms and Flooding” | Clarify that educational resources could be considered for the general public in addition to the identified audiences. | The wording in action 7.2 was changed to clarify that educational resources could be considered for the general public in addition to the identified audiences. |
| **General Roadmap Feedback** | | |
| General Feedback | People at highest risk for heat and smoke health impacts may be more likely to live in older rental buildings. We must address these older rental buildings. | Equity is a key focus of the *Climate 2050 Buildings Roadmap* and will be central to the development of policies and programs during implementation. |

| | | |
|---|---|---|
| General Feedback | There are no actions regarding First Nations / Indigenous needs | The *Climate 2050 Buildings Roadmap* proposes policies that may include many partners, including First Nations governments, communities and businesses. |
| General Feedback | Comments queried the extent of the engagement, including specifically if Metro Vancouver has considered First Nations in the Buildings Roadmap, and how outreach will include a broader audience as we move into implementation. | The engagement to develop the *Climate 2050 Buildings Roadmap* focused on audiences most likely to contribute to the technical discussions, be impacted by the actions, and play a key role in implementation. The project team shared progress and received feedback from some First Nations on buildings and other climate related topics. As we move to implementation, outreach will broaden to seek a supportive constituency on the rationale and opportunities to reduce emissions and be prepared for climate impacts. |
| General Feedback | Policies should consider standards that integrate non-climate resilience objectives (e.g. seismic considerations). | Metro Vancouver is taking a "Zero Emissions Resiliency" approach to the buildings sector, which brings together multiple objectives including emissions reductions, climate adaptation, improved health, equity and others. Metro Vancouver will continue to work with many partners to balance these objectives and seek opportunities that optimize positive outcomes. |
| General Feedback | The Roadmap should include an action for nature-based solutions that provide resiliency outcomes such as cooling and water conservation. | The wording of key sections in the roadmap ("Zero Emissions, Resilient Buildings", "The Journey to Zero Emissions, Resilient Buildings"), including actions 5.2 and 6.3 was changed to include examples of nature-based solutions at the building and building site level. |
| General Feedback | Consider a strategy to connect this roadmap with other roadmaps | There are many linkages between buildings and other issue areas. The "Journey to Zero Emissions, Resilient Buildings" section of the Buildings Roadmap includes a description of some of these linkages to other *Climate 2050 Roadmaps*. |

To: Climate Action Committee

From: Morgan Braglewicz, Air Quality Planner
Parks and Environment Department

Date: October 8, 2021 Meeting Date: November 5, 2021

Subject: **Metro Vancouver's *Climate 2050 Transportation Roadmap***

**RECOMMENDATION**

That the MVRD Board:

a) endorse the *Climate 2050 Transportation Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Transportation Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the transportation sector;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Transportation Roadmap*; and
c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

**EXECUTIVE SUMMARY**

The *Transportation Roadmap* is one in a series of ten *Climate 2050 Roadmaps* that will guide the transition to a carbon neutral and resilient region by 2050. Transportation is the largest source of regional greenhouse gas emissions, currently contributing over 40% of the region's overall GHGs. The *Transportation Roadmap* complements the recently adopted Clean Air Plan and the transportation-related actions contained therein to meet the region's 2030 greenhouse gas and air quality targets. The *Roadmap* identifies 13 big moves and includes 6 strategies and 52 actions to significantly accelerate the reduction of emissions and ensure that the regional transportation system is resilient to a changing climate by 2050. A draft *Climate 2050 Transportation Roadmap* was presented to the Climate Action Committee and Board in April 2021. Staff have since completed engagement through a number of avenues, and have included feedback highlights in this report that have been considered in finalizing the *Climate 2050 Transportation Roadmap*. This report seeks endorsement of the *Climate 2050 Transportation Roadmap* by the MVRD Board.

**PURPOSE**

This report presents the *Climate 2050 Transportation Roadmap*, seeking endorsement by the MVRD Board.

**BACKGROUND**

Following the MVRD Board adoption of the *Climate 2050 Strategic Framework* in September 2018, staff were authorized in October 2019 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. A discussion paper on the *Climate 2050 Transportation Roadmap* was received by the Climate Action Committee at its October 2019 meeting, followed by a draft Transportation Roadmap at the April 16,

2021 meeting. With the completion of engagement on the draft, staff have now finalized the *Climate 2050 Transportation Roadmap*, and are seeking endorsement by the Board.

**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 (GHGs) 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*, as well as forthcoming updates to the regional growth strategy and management plans such as liquid waste, solid waste, drinking water and regional parks. For actions that are within the jurisdiction or responsibility of others, Metro Vancouver can play a supporting and convening role, working closely with other orders of government, First Nations, and member jurisdictions, along with other key stakeholders, to advance implementation.

**METRO VANCOUVER'S *CLIMATE 2050 TRANSPORTATION ROADMAP***

The *Climate 2050 Transportation Roadmap* (Attachment 1) is Metro Vancouver's pathway to ambitious and necessary change in our transportation system over the next 30 years. The Roadmap sets the goals that regional transportation is carbon neutral by 2050, with personal transportation being zero emission. It also sets a goal for regional transportation to be resilient to climate impacts by 2050.

**Potential Greenhouse Gas Reductions**

The *Climate 2050 Transportation Roadmap* establishes greenhouse gas emissions reductions targets for each transportation subsector. The target for personal transportation is a 65% reduction by 2030, with all others modes – medium and heavy duty vehicles, marine, rail, and aviation – reducing emissions by 35% by 2030. The 2050 target for personal transportation is zero emissions. For medium and heavy duty vehicles and rail, it is a 100% reduction in greenhouse gas emissions, achieved through zero emissions technologies and renewable, low carbon fuels. Marine and aviation target a 75% reduction in emissions by 2050.

Modelling estimates that actions in the Roadmap could reduce all transportation-related GHG emissions by approximately 1.8 million tonnes by 2030 relative to 2010 and 5.2 million tonnes by 2050. This represents a reduction of approximately 30% by 2030 from 2010 and almost 90% by 2050. While this is a significant reduction of GHG emissions in the region, it still falls short of meeting the 2030 and 2050 science-based transportation targets adopted by the Metro Vancouver Board, which reflect the level of GHG reduction needed to limit global warming to 1.5 degrees Celsius. Achieving these targets presents a significant challenge as well as opportunities for the region.

Metro Vancouver and its partners will continue to explore opportunities to further accelerate emission reductions during the detailed planning and implementation of the actions. It is expected that actions in the *Transportation Roadmap* and other Roadmaps may need to be updated in the

future, in response to major changes in science, technology, policy and progress towards the targets. In order to ensure that there is alignment with Roadmaps that are under development, staff will also revisit any previously developed Roadmaps once all ten have been completed to reflect any necessary changes. The Committee will be provided with regular updates on the Roadmaps. For any significant changes that may need to be incorporated (such as enhanced or additional action items), staff will come back to Committee with the update to the respective Roadmap.

**Implementation of the *Climate 2050 Transportation Roadmap***

The actions in the *Climate 2050 Transportation Roadmap* will be implemented through Metro Vancouver's regulatory and planning authority, delivery of regional services, and its role as convener of and advocate for issues of regional significance. The Roadmap also identifies actions for implementation by other governments and organizations. Metro Vancouver's resources available for implementation will be focused on the priority "Big Moves". Progress on achieving the goals and targets will be measured against recommended key performance indicators, and reported publically.

**Big Moves in the *Climate 2050 Transportation Roadmap***

The *Climate 2050 Transportation Roadmap* identifies 13 Big Moves, which are foundational actions needed to achieve the goals and targets identified in the Roadmap:

1. Enhance and improve regional transit
2. Use pricing to reduce driving and emissions
3. Expand active transportation networks
4. Accelerate sales targets for new electric passenger vehicles
5. Develop regional emission requirements for passenger vehicles
6. Make electric vehicles more affordable
7. Regulate existing medium and heavy trucks
8. Require zero emission sales targets for new medium and heavy trucks
9. More Stringent Low Carbon Fuel Standards
10. Accelerate emission reductions from marine vessels
11. Support Regional Emergency Management Planning
12. Minimize Risk Exposure for New Transportation Infrastructure
13. Create Flexible Transportation Networks

**Relationship between the *Transportation Roadmap* and *Clean Air Plan***

The *Clean Air Plan*, approved by the MVRD Board on September 24, 2021, 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. All GHG reduction actions in the *Climate 2050 Transportation Roadmap* reflect actions that were adopted in the *Clean Air Plan*. The Roadmap also includes additional actions for climate adaptation (referred to as climate resiliency) that are not found in the *Clean Air Plan*.

**CONSIDERING FEEDBACK AND UPDATING THE *CLIMATE 2050 TRANSPORTATION ROADMAP***

In 2021, staff conducted public webinars and stakeholder workshops in coordination with the *Clean Air Plan* engagement process on emission reduction actions as they related to key GHG emitting sectors, including transportation. Staff have incorporated feedback on the transportation-specific

actions, and they are in alignment with the actions in the *Clean Air Plan*. Staff offered additional workshops and opportunities for feedback focused on the adaptation actions as these do not appear in the *Clean Air Plan*. The full draft roadmap was publically available on the Metro Vancouver website from June to September 2021, and the opportunity to provide feedback promoted through social media platforms. The key revisions to the draft roadmap include:

- The Big Moves in the *Roadmap* have been updated to align with the Big Moves identified in the *Clean Air Plan* to more clearly highlight the most important and high impact actions.
- Strategy 2 (reducing driving) was switched with Strategy 1 (accelerating vehicle electrification) for greater emphasis on the hierarchy of actions to reflect an "efficiency first" approach, given the multiple co-benefits of active transportation and transit.
- Three new actions were created to address gaps identified during the engagement process.
- Many existing actions were modified to reflect alignment with other organizations and initiatives, identify additional implementation partners, enhance clarity, and broaden or refine the actions' scope.

Based on feedback received, some additional revisions made to the context sections and climate resilience sections of the draft *Climate 2050 Transportation Roadmap* include:

- Additional context on the role of the *Clean Air Plan* and its relationship to the greenhouse gas mitigation strategies and actions in *Climate 2050 Transportation Roadmap*.
- Additional context on linkages between transportation infrastructure and other resilience priorities, and the other *Climate 2050 Roadmaps* that will address these.
- Two new actions under Strategy 6, Develop Climate Resilient Transportation Networks:
    - An action identifying the importance of developing complete, compact communities to build low carbon resilience.
    - An action to consider possible synergies between and co-location of transportation networks with infrastructure designed to address resilience priorities such as storm water management, flooding, and seismic risk.

Attachment 2 provides more detail on how feedback was considered in finalizing the *Climate 2050 Transportation Roadmap.*

**ALTERNATIVES**

1. That the MVRD Board:
    a) endorse the *Climate 2050 Transportation Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Transportation Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the transportation sector;
    b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Transportation Roadmap*; and
    c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

2. That the MVRD Board:
   a) endorse the *Climate 2050 Transportation Roadmap* as attached to the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Transportation Roadmap*" as the initial Roadmap towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the transportation sector, with amendments proposed by the Climate Action Committee;
   b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Transportation Roadmap*; and
   c) direct staff to update the Roadmap, as needed, in response to changes in science, technology and policy.

3. That the MVRD Board receive for information the report dated October 8, 2021, titled "Metro Vancouver's *Climate 2050 Transportation Roadmap*" and provide alternate direction to staff.

**FINANCIAL IMPLICATIONS**

The resources required to develop and engage on the *Climate 2050 Transportation Roadmap* were approved under the 2020 and 2021 budgets. Continued alignment of implementation activities and deliverables for the *Climate 2050 Transportation Roadmap* with the *Clean Air Plan* is intended to make the best use of resources available. As such, resource and cost implications will be brought back to the Committee and Board in coordination with the *Clean Air Plan* budgeting and work planning processes. The 2022 annual budget will reflect the initial resource needs to begin implementation of actions in the *Clean Air Plan* and *Climate 2050 Transportation Roadmap*, as well as implementation of climate resiliency actions included in the *Climate 2050 Transportation Roadmap*.

**CONCLUSION**

Metro Vancouver's *Climate 2050 Transportation Roadmap* sets an ambitious pathway to a carbon neutral and resilient transportation system by 2050. The Roadmap has been updated based on feedback received in 2021. To achieve 2030 and 2050 targets, Metro Vancouver and its partners need to start on the actions in the Roadmap as soon as possible, using the full extent of each agency's authority, while continuing to explore opportunities to further accelerate emission reductions. Staff recommend Alternative 1, to endorse the *Climate 2050 Transportation Roadmap*.

**Attachments** *(48847284)*

1. *Climate 2050 Transportation Roadmap*
2. Additional feedback considered in finalizing the *Climate 2050 Transportation Roadmap*

**Reference**

1. Feedback Considered in Finalizing the Clean Air Plan

47390813

CLIMATE **2050 Roadmap**

# Transportation

## A pathway to carbon neutral transportation in Metro Vancouver

November 2021

FRONT COVER: GOLDEN EARS BRIDGE

Metrotower III, 4515 Central Boulevard, Burnaby, BC, V5H 0C6
www.metrovancouver.org

November 2021

The goals and targets at the heart of Metro Vancouver's climate-related plans are based on science. Reaching them is a top priority for the organization and the region. We must take bold action now to become a carbon neutral region by 2050, while recognizing that changes to our climate are already occurring, and that climate resilience must be a central consideration for the development of the region. The *Climate 2050 Transportation Roadmap* was prepared in 2020/2021 and introduced for stakeholder comment during the COVID-19 pandemic. 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 in a time of crisis.

# Metro Vancouver

**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.

## 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, 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.


REGIONAL MANAGEMENT PLANS/STRATEGIES

## Metro Vancouver's Roles and Responsibilities for Climate Action

The three broad roles outlined in Metro Vancouver's mission each demonstrate responsibilities related to climate change. More specifically, under the *Environmental Management Act*, Metro Vancouver has the delegated authority to provide the service of air pollution control and air quality management and may, by bylaw, prohibit, regulate and otherwise control and prevent the discharge of air contaminants, including greenhouse gases. Through the regional growth strategy, Metro Vancouver, with its members, plans for compact, complete communities that are foundational to enabling a carbon neutral, resilient region. As part of delivering its core services, Metro Vancouver also generates and uses clean, renewable energy from its facilities and is working to ensure core regional services and infrastructure are prepared for and resilient to climate change.

In its role as a regional forum, Metro Vancouver builds and facilitates collaborative processes which engage the public and build partnerships to address significant regional issues like climate change. As part of this role, Metro Vancouver coordinates with and advocates on behalf of its member jurisdictions to other governments and partners on greenhouse gas management and climate change adaptation initiatives. Metro Vancouver will be looking to other governments and regional partners to lead the implementation of a number of key actions in the *Climate 2050 Roadmaps*, highlighting the importance of ongoing collaboration with others.

# The Roadmap at a Glance

We rely on our regional transportation system every day to work, study, play, and access important services. This system also ensures that goods move efficiently and reliably through our region. However, transportation is the largest source of greenhouse gas emissions in our region as a result of the fossil fuels used to power cars, trucks, trains, boats, and aircraft.

Although it is currently the largest source of regional greenhouse gas emissions, transportation is one of the best opportunities to start reducing emissions, particularly for personal transportation. The region is well positioned to continue with intentional land use planning that supports walking, cycling, transit, and other shared mobility modes. Electric vehicles are widely available and ready to be used on a regional scale.

As personal transportation transitions to being zero emission, medium and heavy trucks, marine vessels, aviation, and rail will become the largest sources of transportation greenhouse gas emissions in the region. Accelerating ongoing actions that support rapid development and scale-up of zero emission and low carbon options for these sectors, as well as new innovations in technology, will ensure that the transportation sector as a whole can transition to carbon neutrality by 2050.

Even as we reduce emissions from transportation, it is critical that we develop a transportation network that is resilient to the impacts of a changing climate. Some impacts from climate change are locked in, and will create vulnerabilities in our existing system. We must protect existing networks and infrastructure, and develop a resilient transportation system moving forward to ensure that regional transportation continues to be safe, reliable, and comfortable.

The *Transportation Roadmap* lays out 52 actions for reducing emissions and increasing resiliency, organized under the following six strategic areas:

1. Reduce Driving through Active Transportation and Public Transit
2. Accelerate the Transition of the Passenger Vehicle Fleet to Electric Vehicles
3. Reduce Heavy Truck Emissions and Support Early Adoption of Zero Emission Heavy Trucks
4. Reduce Marine, Rail, and Aviation Emissions
5. Protect Existing Transportation Networks from Future Climate Impacts
6. Develop Climate Resilient Transportation Networks

Although there is much work to be done, there are some important actions that need to be started soon in order to make a major difference in accelerating the region's drive to carbon neutral and resilient transportation. It is critical that the actions to reduce emissions identified in this *Roadmap* are implemented rapidly to set this transition in motion as soon as possible. Taking early action to reduce emissions can also help improve air quality, support health and well-being through exercise, and enhance low carbon resilience sooner rather than later.

We are not alone in this challenge. The actions in this *Roadmap* demonstrate the importance of working collectively to reach climate objectives, and will complement other plans guiding regional transportation. Working closely with TransLink, the BC government, member jurisdictions, and other key partners will be critical to effectively implement the actions in this *Roadmap*. Together, we can create a carbon neutral and resilient regional transportation system.

CHARGING STATION, BURNABY

# Contents



Click to return to Table of Contents

# Visioning Carbon Neutral Transportation in 2050

In 2050, everyday movement of people around the region in cars and trucks has transitioned from being the largest source of greenhouse gas emissions in the region to being completely emissions free. More Metro Vancouver residents live in walkable urban centres, can comfortably walk, roll or bike for many of their day-to-day trips, and access convenient, reliable public transit to key destinations. Cars, trucks, and SUVs are powered by electricity and are zero emission, creating almost no air pollution and less noise. The regional transportation system integrates different modes and vehicle charging networks, creating a diverse range of clean, affordable transportation options for residents.

Local goods movement and transit produce no greenhouse gas emissions, with almost all vehicles powered by electricity or hydrogen. Large trucks, trains, marine vessels, and aircraft moving goods and people in and out of the region use low or zero emission engines and fuels. The Metro Vancouver region is a leader in the use of innovative technologies for trains, marine vessels, and aircraft, and is a hub for low emission goods movement. Transportation networks are located and designed to be resilient to the impacts of a changing climate, ensuring safe and reliable transportation of people and goods in the region.

# Climate 2050 Transportation Roadmap

## A pathway to carbon neutral transportation in Metro Vancouver

# The Challenge

Transportation is the largest source of emissions in the region, but also has great potential to drastically reduce those emissions in the next 30 years. Reducing emissions from this sector is critical in order to reach climate targets for both 2030 and 2050. The majority of transportation emissions in our region come from fossil fuels used to power cars and trucks. Once a car or truck is purchased, it usually stays on the road for at least 10 years; most vehicles bought today will be in use in 2030. Trains, marine vessels, and aircraft also produce greenhouse gas emissions. The larger engines used in these modes of transportation pose an even greater challenge, as they are designed to last even longer and are very costly to replace.

Making it comfortable and easy to get around the region by walking, cycling, or using transit, and transitioning to zero emission engines and biofuels as soon as possible is critical in order for transportation to go from being the largest source of emissions to one of the smallest.

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 to avoid passing 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.

### What is a Carbon Neutral Region?

A carbon neutral region means that we have achieved the deepest greenhouse gas emission 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.

# Goals

Metro Vancouver's *Climate 2050 Strategic Framework* has set the following regional vision to guide the region's response to climate change:

- Metro Vancouver is a carbon neutral region by 2050
- Infrastructure, ecosystems, and communities are resilient to the impacts of climate change

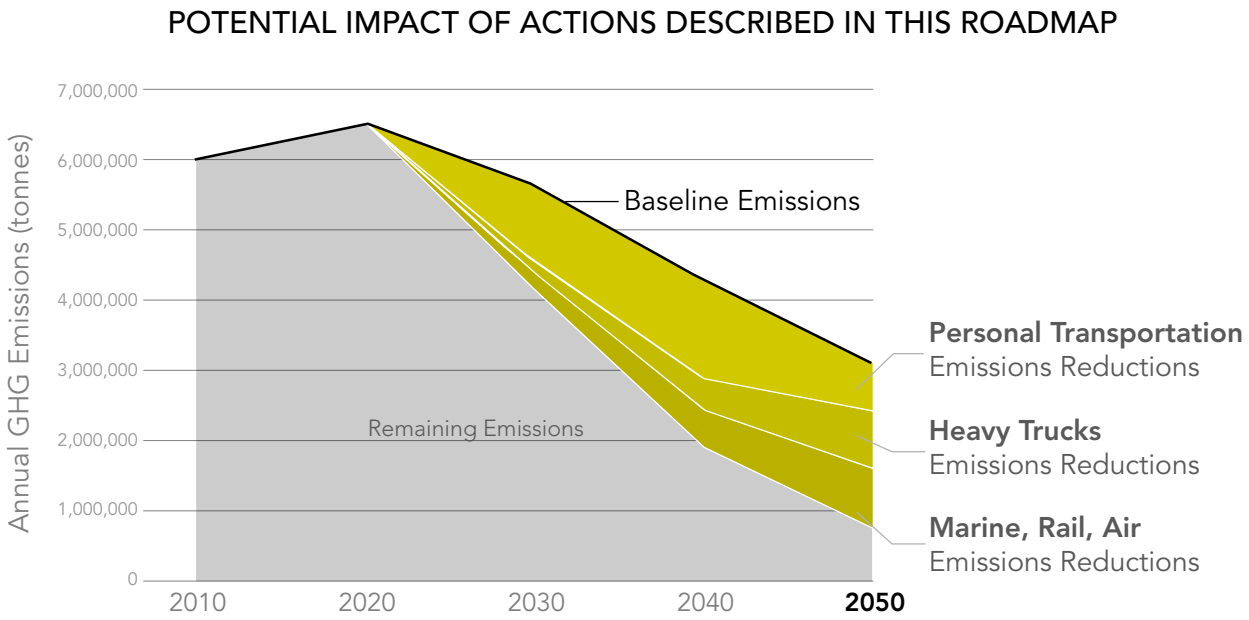
It also sets an interim target of 45% reduction in greenhouse gas emissions from 2010 levels, by 2030.

Achieving this vision means setting 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 a carbon neutral, resilient region.

Metro Vancouver has set these goals for transportation in this region, out to 2030 and 2050.

| Goals | Targets |
|---|---|
| All personal travel within the region is made by active transportation or using zero emission technologies powered by clean, renewable energy. | By 2030:<br>• 65% reduction in greenhouse gas emissions, from 2010 levels<br>By 2050:<br>• 100% reduction in greenhouse gas emissions<br>• All passenger vehicles on the road are zero emission, powered by clean, renewable electricity or hydrogen |
| All medium and heavy duty trucks and rail locomotives operating within the region use zero emission technologies powered by clean, renewable energy. | By 2030:<br>• 35% reduction in greenhouse gas emissions, from 2010 levels<br>By 2050:<br>• 100% reduction in greenhouse gas emissions<br>• All medium duty trucks are zero emission, powered by clean, renewable electricity or hydrogen<br>• All heavy duty trucks and rail locomotives use either zero emission technologies or biofuels |
| All aircraft and marine vessels operating in the region use low emission and zero carbon technologies powered by clean, renewable energy. | By 2030:<br>• 35% reduction in greenhouse gas emissions, from 2010 levels<br>By 2050:<br>• 75% reduction in greenhouse gas emissions, from 2010 levels |
| The regional transportation system is safe, reliable, and resilient to the current and future impacts of climate change. | By 2030:<br>• All major transportation infrastructure projects are located outside of areas with known, unmitigated climate hazards<br>By 2050:<br>• All transportation networks and infrastructure are protected from current and future impacts of climate hazards |

The graph below compares a baseline scenario – the pathway we are on now – with the possible impacts of the actions described in this *Roadmap*.




Reaching these ambitious goals will require extensive collaboration with key partners. Many of the actions identified in this *Roadmap* will be led by other governments (e.g., national, provincial, local, First Nations), TransLink, 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 climate plan called *A Healthy Environment and a Healthy Economy*, Metro Vancouver's member jurisdictions, community and corporate climate plans, TransLink, utilities, First Nations, and, increasingly, industry associations.

## 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. Transportation generates about half of diesel particulate matter, over half of nitrogen oxides, and roughly a third of sulphur oxides produced by all sectors in the region.

Actions in this Roadmap and the *Clean Air Plan* will help reduce all of these emissions to protect human health. The *Climate 2050 Transportation Roadmap* and the *Clean Air Plan* will work together to reach a common goal of accelerating our path to a carbon neutral region. As a result, the plans share some strategies and actions. Here's what you will find similar and different in each of these plans:

### CONNECTING THE *TRANSPORTATION ROADMAP* AND THE *CLEAN AIR PLAN*

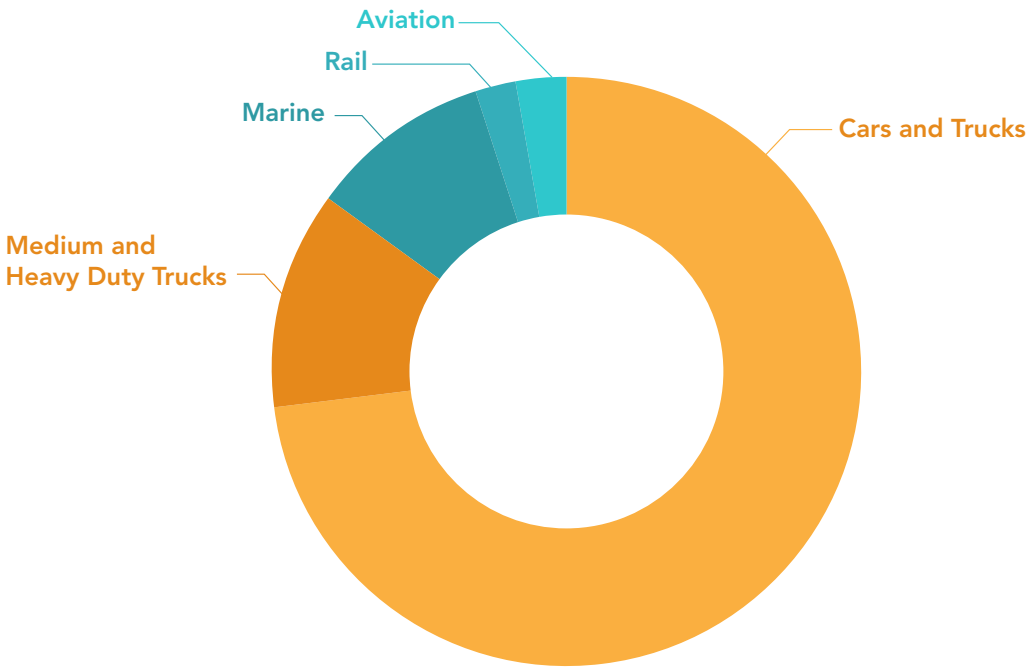
| *Clean Air Plan* | *Transportation Roadmap* |
|---|---|
| • Greenhouse gas reduction goals, strategies and actions.<br>• Air quality goals, strategies and actions.<br>• Goals, strategies and actions for other sectors such as buildings, industry, and non-road equipment. | • Greenhouse gas reduction goals, strategies and actions.<br>• Resilient transportation strategies.<br>• Challenges, opportunities and benefits of transitioning our transportation system to become carbon neutral and resilient. |

# Emissions from Transportation in Metro Vancouver

The movement of people and goods – whether by car, truck, train, aircraft or boat – is the largest source of greenhouse gas emissions in Metro Vancouver, accounting for over 40% of total annual regional greenhouse gas emissions. The 1.5 million passenger cars and trucks, including SUVs, registered in the region make up most of those emissions, accounting for almost 75% of transportation emissions. 40,000 medium and heavy duty trucks registered in the region (plus the trucks registered elsewhere that travel in and out of the region) generate over 10% of regional transportation emissions.

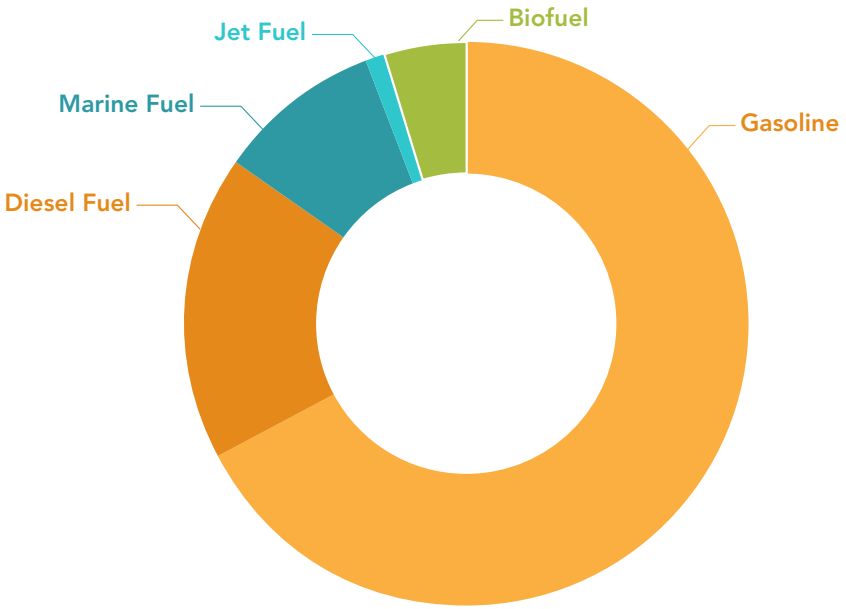
Around 150 million tonnes of cargo are handled at port terminals in the region every year, supporting the regional economy. This cargo movement is the main driver of marine vessel emissions in the region, though passenger ferries, cruise ships, harbour vessels, and pleasure craft are also sources of emissions. Together, marine transportation causes about 10% of transportation emissions. Trains used for goods movement accounts for most rail emissions in the region. Along with a small amount of passenger rail travel, this contributes about 2% of transportation emissions. Airports in the region handle 25 million passengers per year, which generate about 3% of regional transportation emissions. While aviation and marine emissions account for a relatively small amount of local greenhouse gas emissions, they are a significant source of emissions globally.

BREAKDOWN OF METRO VANCOUVER TRANSPORTATION GREENHOUSE GAS EMISSIONS



Virtually all of the energy used to power transportation is fossil fuel based, the majority of which is gasoline and diesel used in cars and trucks. A small amount of natural gas is used as a fuel for compressed natural gas vehicles, such as transit buses. Marine vessels and aircraft use specialized fossil fuels. Most of the trains in the region use diesel, though the SkyTrain network runs on electricity. In recent years, the advent of electric vehicles and biofuels have introduced the use of some zero emission vehicles and low carbon biofuels, but these still account for a very small proportion of overall energy use in transportation.

BREAKDOWN OF BREAKDOWN OF TRANSPORTATION ENERGY USE



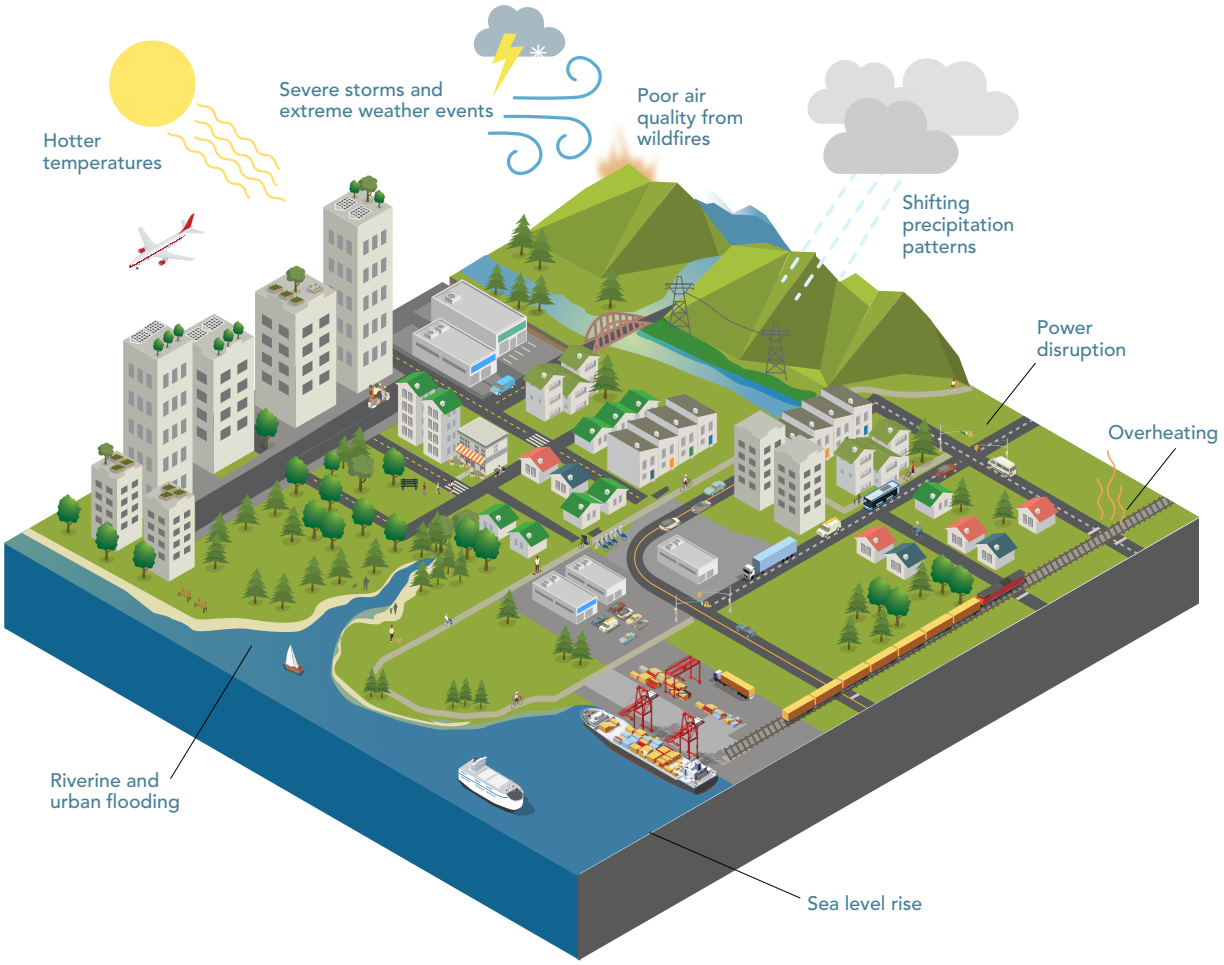

Compressed natural gas not shown as it accounts for less 1% of total energy use. Electricity is not shown; currently, electricity use for transportation is estimated to be small relative to other fuel types.

In addition to creating direct greenhouse gas emissions through fossil fuel use, the transportation sector is connected to emissions embodied in materials used for vehicles and other transportation equipment, upstream energy production, and construction and maintenance of roads, rail lines, and other parts of the transportation system. These emissions are not the subject of this *Roadmap*, but have considerable overlap with related sectors such as industry, waste, and energy production.

# Climate Change Impacts on Transportation

We rely on our transportation system to reliably and comfortably get around the region and beyond, and for the supply of goods that we use every day. Ensuring that the transportation system is resilient to the impacts of a changing climate is essential. Transportation networks function smoothly due to infrastructure including roads, bridges, rail lines, transit, bike lanes, sidewalks, ports, ferry terminals, and airports. Most of this infrastructure lasts for decades, but has not always been designed to accommodate the anticipated impacts of climate change.

**EXPECTED CLIMATE CHANGE IMPACTS**




### Transportation and Regional Resilience

While the resilience sections of this *Roadmap* focus on adapting transportation to impacts of climate change, transportation infrastructure itself can exacerbate climate change impacts. For instance, asphalt and concrete in roads and sidewalks often displaces natural ground cover, and these impervious surfaces can worsen the impacts of extreme heat and floods. Solutions to these issues will be addressed in their respective *Roadmap* issue areas, such as infrastructure, land use and growth management, and nature and ecosystems.

## Metro Vancouver Climate Change Projections

While reducing regional greenhouse gas emissions will contribute to the global effort against climate change, some impacts from a changing climate are locked in and are likely to occur even with drastic emission reductions. There are already a number of projected changes to local climate conditions in Metro Vancouver:

**Warmer temperatures:** with increasing daytime and nighttime temperatures, there will be more hot summer days and fewer winter days with frost or ice.

**Longer summer dry spells:** summer rainfall will decline by nearly 20%, with increased likelihood of extended drought periods.

**Wetter fall and winters:** although on average the total annual rainfall is expected to increase by just 5%, there will be a large increase in rainfall during fall and winter.

**More extreme precipitation events:** more rain will fall during the wettest days of the year and the frequency of extreme rainfall events will increase.

**Decreased snowpack:** the deep spring snowpack in the mountainous watersheds is expected to decrease by over 50% compared to present day.

**Sea level rise:** in addition to these weather-related changes predicted in our region, warming global temperature is projected to bring at least 1 metre of sea level rise by 2100, which will impact coastal areas in the region.

FRESHET

KING TIDES, WEST VANCOUVER

## Climate Change Impacts on Regional Transportation

Existing and new transportation infrastructure will need to adapt to increasing impacts from:

- **Riverine and urban flooding** caused by periods of heavy rainfall during extreme weather events such as storms, or as a result of major spring freshets (snow melts) linked to changing snowpack. This can lead to localized flooding, power failures, landslides, and disruptions to the transportation system.
- **Sea level rise**, which will impact coastal areas in our region, threatening low elevation parts of the transportation network with flooding. Sea level rise can also magnify the impact posed by other hazardous conditions in coastal areas such as subsidence (land sinking), king tides and storm surges, and heavy winds and precipitation caused by storms.
- **Heatwaves, wildfires, and droughts** caused by warmer temperatures and changing precipitation patterns can impact the safety and comfort of walking, cycling, and taking transit. Major wildfire events could also disrupt inter-regional travel.

These impacts could have consequences to this region's transportation networks in numerous ways, such as:

- **Provincial highways and municipal arterial roads** around the Fraser River and Burrard Inlet may be susceptible to flooding that could disrupt emergency services, delay goods movement, and isolate residents and workers. Wildfires and landslides pose additional threats by affecting transportation access in and out of the region.

DROUGHT CONDITIONS WITH WILDFIRE SMOKE, LIONS GATE BRIDGE

- **Public transit** across the region could be impacted by flooding through disruptions to services and infrastructure for SkyTrain, West Coast Express, SeaBus terminals, and roads used by transit buses which would prevent residents and workers from travelling for work, school, recreation, and access to other services.
- **The Vancouver International Airport** is located at sea level so its runways, terminal grounds, and access roads are vulnerable to flooding and sea level rise. Flooding could also impact smaller regional airports such as Boundary Bay Airport, Pitt Meadows Airport and Delta Heritage Air Park.
- **Truck routes and rail lines** servicing the Vancouver Fraser Port Authority and industrial lands in the region could be damaged or disrupted by flooding, sea level rise, storm surges and heat waves, which could have cascading effects for supply chains.
- **BC Ferries terminals** could be susceptible to sea level rise, flooding, and increased delays from high winds, impacting passenger transportation as well as goods movement.
- **Bike lanes and regional greenways** could be prone to flooding if they are located near natural areas or along the Fraser River. Additionally, hotter temperatures and degraded air quality from wildfire activity may result in dangerous conditions for walking, rolling, and cycling.

# Zero Emission, Low Carbon Transportation

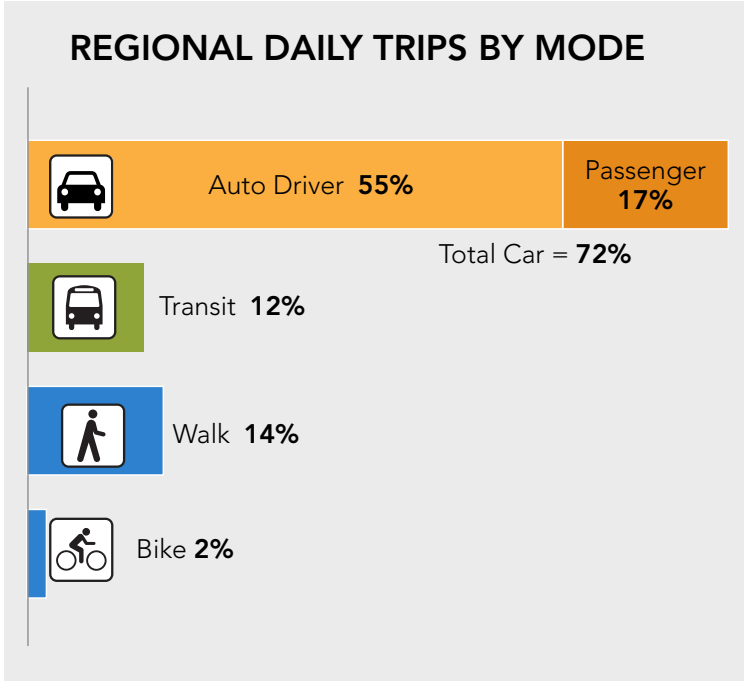
Emissions from transportation are caused by engines using fossil fuels, such as gasoline and diesel. The two key pathways to reducing emissions in transportation are to shift trips to active transportation, transit, and more energy efficient vehicles, reducing the use of fossil fuels, and to increase the use of zero emission vehicles and biofuels. Reducing the amount of driving in cars and trucks is a first step towards reducing transportation emissions, but achieving significant emission reductions in transportation will also mean switching from fossils fuels to clean, renewable energy that is zero emission or low carbon and replenished over days or years. Some modes of transportation, like cars, SUVs, and small trucks, are rapidly developing electric options. Other types of vehicles, such as heavy trucks used for goods movement, are more technologically challenging to electrify, and may rely more on the use of hydrogen or biofuels to reduce greenhouse gas emissions. Trains, ships, and aircraft are large, complex pieces of equipment that move between regions and countries, and face some unique challenges.

## Reducing Driving

Over 70% of all trips in the region are made by car, and most of those are made by cars with a single occupant, the driver. However, there are many ways residents and visitors can make their daily trips: walking, rolling, cycling, taking transit, and driving with or without other passengers. These different modes have different impacts on greenhouse gas emissions. When people walk or cycle to their destination, they do not produce any emissions. On transit, one bus or train replaces several individual car trips. Carpooling also reduces the number of cars on the roads. New technologies and services like electric bicycles, car sharing, and ride hailing help reduce the need for people to drive or own their own car. These are all ways to reduce emissions by driving less. Driving less also means using less energy in cars, freeing up clean, renewable energy for use in other modes of transportation or sectors.

NEW WESTMINSTER

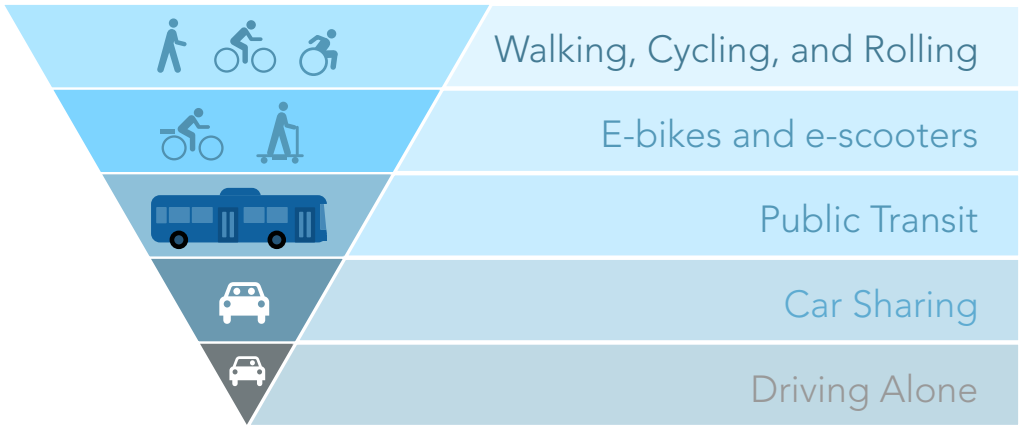
Many of the modes which produce little to no greenhouse gas emissions also have significant co-benefits. People who walk, roll, cycle, and and ride transit enjoy lower transportation costs and improved health and well-being. Reduced driving can lessen road congestion. Having multiple ways to get to and from key destinations also helps create a system that is more resilient to climate impacts.




## Land Use

By shaping our neighbourhoods and communities with effective urban design, land use, zoning, and allocation of road space, we can create complete, compact communities that make walking, rolling and cycling well connected and comfortable for most short trips, and result in more efficient trips by car. Complete communities also support a frequent and efficient transit network that connects key destinations with comfortable, reliable service. This facilitates a multi-modal system where transit, active modes, car sharing, and other transportation options are efficiently integrated for convenient trips. However, even as the region continues to build towards well-connected, compact communities served by transit, many trips will be taken by vehicles. In order to eliminate greenhouse gas emissions from personal transportation, we need to find ways to make our vehicles zero emissions.

**BETTER TRANSPORTATION CHOICES**



### Working Together to Reduce Regional Transportation Emissions

Strong regional land use policies are foundational to achieving the targets in the *Climate 2050 Transportation Roadmap*. There are several organizations that manage regional land use and transportation planning:

**Metro Vancouver**, in partnership with its member jurisdictions, manages regional land use and growth through the *Regional Growth Strategy*, which is being updated to extend to 2050 (*Metro 2050*). The *Strategy* outlines a vision for a compact region with a network of complete communities well connected by public transit.

**TransLink** is responsible for regional transportation planning, managing regional road networks, and delivering transit services. TransLink is currently developing *Transport 2050*, the region's long range regional transportation strategy, which will guide investment and planning decisions for the regional transportation system over the next 30 years. Together, *Metro 2050* and *Transport 2050* will shape how we live and move.

The **BC Government** is responsible for major transportation infrastructure such as highways, provides funding for capital projects, and sets policy to meet provincial environmental and economic objectives.

The *Transportation Roadmap* links together land use, transportation planning, and emissions reducing technologies to identify a pathway to reaching a carbon neutral and resilient transportation sector. This includes actions by other organizations that affect the regional transportation system.

## Zero Emission Transportation Options

Electricity is a well-known zero emission source of energy that we already encounter every day. In British Columbia, almost all of the electricity that we use is generated from hydropower, making electricity a form of clean, renewable energy. When electricity is used as a source of energy to power vehicles in Metro Vancouver, there are no emissions from the tailpipe. Electric vehicles have become an increasingly familiar sight on the road, and are the best known type of zero emission vehicles. TransLink's fleet of transit vehicles also makes use of electric trolleys with overhead wires, and they have committed to transitioning to a 100% renewably powered fleet by 2050 through the *Low Carbon Fleet Strategy.*

British Columbia has world-leading legislation in place (the *BC Zero-Emission Vehicles Act*) that requires that more new cars and small trucks sold in British Columbia are zero emission, reaching 100% of new vehicle sales by 2040. However, because most vehicles stay on the road for at least 10 years after they are purchased, it will take a long time for gasoline and diesel powered vehicles purchased over the next two decades to reach the end of their lifecycle and be replaced with new zero emission vehicles. Additionally, these sales targets allow for the use of plug-in hybrid vehicles. As these vehicles use gasoline or diesel as a fuel in addition to electricity, they are not truly zero emission, but can be a low emission alternative to conventional fossil fuel-powered vehicles.

While electric vehicles are an important technology to reduce emissions from transportation, not all modes of transportation are ready to move to fully electric technologies. Electrifying some types of medium and heavy duty trucks is more challenging due to the heavier loads they carry, specialized operating needs, long driving ranges, and lack of rapid electrical charging in dispersed, remote destinations outside of the region. Electric options for ferries and small aircraft are available, but still very much under development. Larger marine vessels and aircraft are difficult to electrify due to the long distances they travel and specific operating demands, and no fully electric options are available for the largest and most complex of these. Electric rail locomotives are used widely in other parts of the world, such as Europe. However, transitioning inter-provincial railways to these zero emission fuels is costly and requires coordination at the provincial and national level.

Hydrogen can also be a zero emission fuel. Hydrogen technologies are emerging for all transportation modes, and could play an important role in helping some modes that are challenging to electrify transition to zero emission technologies. While hydrogen engines generally produce zero tailpipe greenhouse gas emissions, hydrogen can be produced using carbon intensive means that affect its overall carbon footprint. When produced using clean, renewable energy, hydrogen can be a zero emission and low carbon transportation fuel.

### Hydrogen: A Zero Emission Fuel?

There are several different means of production for hydrogen that determine how emission intensive it is:

- **Grey hydrogen** is produced using natural gas, creating significant greenhouse emissions and a reliance on fossil fuels.
- **Blue hydrogen** is also produced using natural gas, but the emissions created during production are captured and stored.
- **Green hydrogen** is produced using electricity, and can be a zero emission and zero carbon fuel if the electricity used is generated from clean, renewable sources.

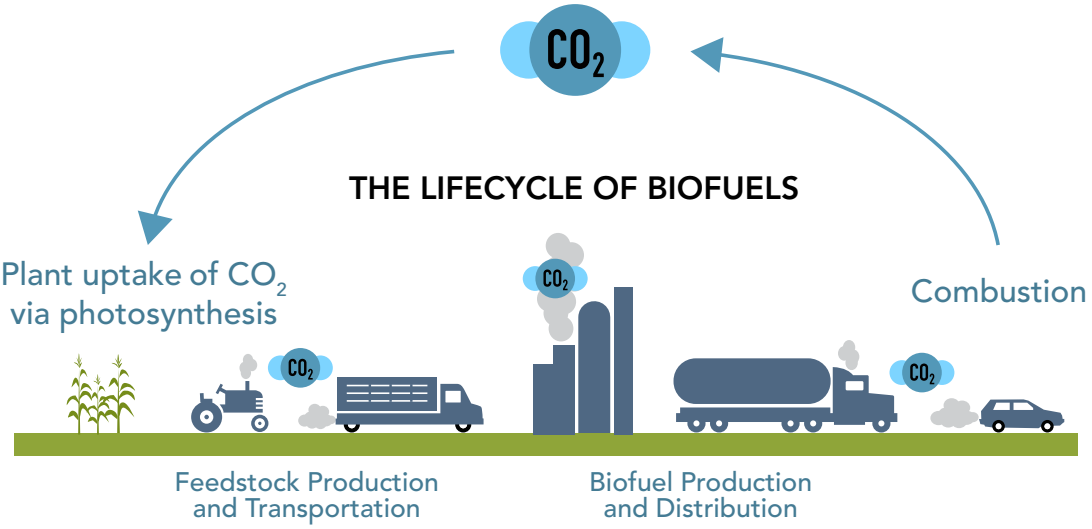
In the transportation sector, hydrogen can be used to power vehicles, marine vessels, trains, and more as fuel for **hydrogen fuel cells or specially designed internal combustion engines.** These technologies release water vapor from the tailpipe, and don't produce direct greenhouse gas emissions. However, hydrogen combustion engines may produce some nitrogen oxides, a health-harming air contaminant.

# Strategic Use of Low Carbon Biofuels

In addition to zero emission sources of energy such as electricity and hydrogen, there are a number of fuels that have a low carbon footprint and are produced from organic matter derived from biomass such as plants. These biofuels are renewable and can be a low carbon source of energy. To use some of these fuels, specialized engines may be required, whereas others can be used directly in regular gasoline and diesel combustion engines. While not as visible as electric cars on the road, this is another example of a climate solution we already encounter every day. As a result of the *BC Low Carbon Fuel Standard* and federal requirements, a small proportion of biofuels are blended into the regular gasoline and diesel that we use in British Columbia.

Though biofuels can be low carbon alternatives to gasoline and diesel, they still produce tailpipe greenhouse gas emissions as well as air contaminants that can have negative impacts for public health and the environment. Feedstocks must be carefully managed to ensure that greenhouse gas emissions are balanced with carbon uptake in order for biofuels to be truly low carbon. Additionally, there are a number of ways in which biofuels generate greenhouse gas emissions throughout their lifecycle, from the use of fossil fuel-based fertilizer in feedstock growth to distribution. Some biofuels and renewable gas are produced in the region, including production at a number of Metro Vancouver facilities. However, biofuels produced outside of the region will be needed to meet demand. While biofuels are currently available and used in limited quantities, widespread use could have consequences for the way that we use agricultural land, forests, and other ecosystems. A lifecycle view of the carbon emissions from biofuels is needed to ensure that they are a low carbon alternative to fossil fuels and do not have unintended ecological impacts.

If used strategically, biofuels have the potential to displace the use of fossil fuels in large and specialized trucks, rail locomotives, aircraft, and marine vessels that are difficult to electrify, especially in the short term while new zero emission technologies are developed. Biofuels can also lower the carbon footprint associated with hybrid technologies that are not solely powered by electricity.



### Low Carbon Transportation Biofuels

Low carbon diesel fuels include biodiesel and renewable diesel:

- **Biodiesel** is made from vegetable oils (such as canola) and waste animal fats. It can be blended in fossil diesel in amounts up to 20% and used in conventional diesel engines. When used in higher amounts, a specialized engine is required.
- **Renewable diesel** is also made from vegetable oils and animal fats, but is produced using a different process that makes the end fuel identical to fossil diesel. Because there is no chemical difference from fossil diesel, renewable diesel can be used directly in conventional diesel engines in amounts up to 100% without requiring engine modifications.

**Ethanol** is the most common renewable alternative to gasoline. Made from plants such as corn or sugar cane, it can be blended in regular gasoline in amounts up to 10% before a different engine is required. Flex fuel vehicles that can accommodate gasoline blends with up to 85% ethanol have become increasingly common in North America.

**Renewable natural gas** is produced from decomposing waste, and can be used in compressed natural gas vehicles and other equipment as a renewable, low carbon alternative to fossil natural gas.

There are specialized types of renewable fuels for aircraft and marine vessels, such as **sustainable aviation fuel**.

## Low Carbon Aircraft, Trains, and Ships

All modes of transportation move in and out of the region some of the time, but aircraft, trains, and ships almost exclusively travel in and out of the region.They often travel long distances that cross provincial and international borders. Marine and air movement between countries is governed by international organizations such as the International Maritime Organization and the International Civil Aviation Organization. Policies and standards adopted by these organizations, action taken by other countries, and actions by the federal government are key determinants of whether and how these sectors will reduce greenhouse gas emissions. Rail transport faces similar challenges, as rail lines coming into and out of the region are subject to federal regulations and, when they cross the American border, the United States' regulations. National and international cooperation is essential to find ways to reduce emissions in these sectors.

## Working Across Borders to Reduce Emissions

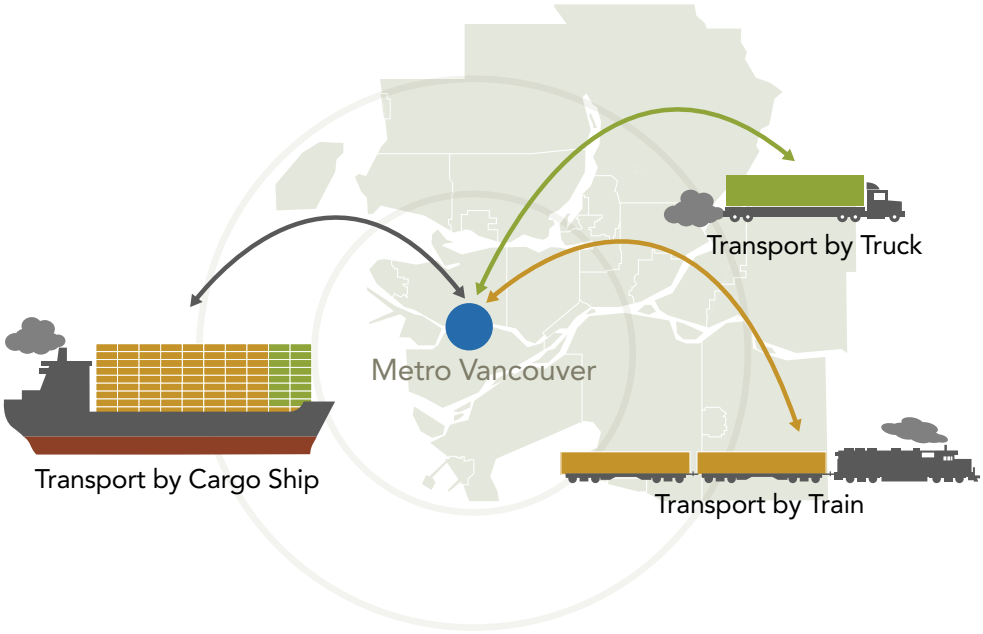
The **International Maritime Organization (IMO)** is a United Nations agency with responsibility for the prevention of marine and atmospheric pollution by ships, as well as their safety and security. It has committed to a target of reducing total annual greenhouse gas emissions from international shipping by at least 50% by 2050 (compared to 2008). The Federal Government is responsible for adopting, implementing, and enforcing IMO requirements within Canada.

The **Northwest Ports Clean Air Strategy (NWPCAS)** is a shared strategy for reducing air contaminants and greenhouse gases from the Port of Vancouver and ports in the state of Washington. Participating ports have committed to implementing port-specific plans to implement the NWPCAS vision of reaching net zero emissions by 2050.

The **International Civil Aviation Organization (ICAO)** is a United Nations agency that facilitates regulatory alignment between 193 member nations. It has adopted the aspirational goals of carbon neutral growth for the international aviation sector from 2020 onwards, as well as 2% annual fuel efficiency improvement from 2021 to 2050. Member nations are responsible for developing their own regulatory approaches to reaching these goals.

**Canadian National Rail** and **Canadian Pacific Rail** are the two major freight railways in Canada, both of which operate in the Metro Vancouver region. They are subject to legislation and regulation by the federal government. While Transport Canada has regulations in place to manage air contaminants from rail, there is no federal strategy in place to significantly reduce greenhouse gas emissions from rail. Some rail lines in the region also cross the American border, creating a need for international alignment.

The Metro Vancouver region is also a key hub for goods movement and air travel in Canada and the Pacific Northwest through Canada's largest port, The Port of Vancouver (operated by the Vancouver Fraser Port Authority), as well as Canada's second busiest airport, the Vancouver International Airport. The region can leverage this position and accelerate change in these sectors by creating opportunities that support the use of zero emission technologies and biofuels. Developing supply chains for biofuels, offering access to infrastructure for zero emission engines and biofuels, using zero emission technologies for smaller vessels and shorter in-region trips, and establishing requirements for trains, planes, and ships that service the region are important components of a larger national and international approach to reducing emissions in these sectors. Actions taken in the region can help reduce aviation and marine emissions well beyond Metro Vancouver's borders.




Ferries and local airlines move passengers between Metro Vancouver and neighbouring regions. Some of these, such as BC Ferries and Harbour Air, have introduced the use of innovative zero emission technologies. BC Ferries operates a number of battery-equipped ships on shorter routes. The ships are designed for full electric operation, but are fitted with hybrid technology that bridges the gap until shore charging infrastructure becomes available. Harbour Air has demonstrated the world's first fully electric commercial aircraft in a short test flight, and is advancing this technology for use in full length commercial flights in the future.

In addition to reducing greenhouse gas emissions from air, marine, and rail sources, it is critical that key transportation corridors and facilities such as ports, airports, and rail lines are resilient to the impacts of future climate hazards to minimize disruptions to goods movement, supply chains, and personal travel. Ships and aircraft used for goods movement, as well as ferries and rail lines used for passenger travel, must be adapted to a changing climate to ensure that connections to neighbouring regions and islands are reliable and safe.

## Social Equity

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. We must ensure no one is left behind in the transition to a carbon neutral and resilient region. Metro Vancouver's efforts to move towards zero emission and low carbon transportation 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 transportation related climate policies must consider whether inequity is created or magnified, and address these inequities to ensure a just transition. 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. Metro Vancouver will develop a strategic approach to assessing equity in assessing equity in the *Climate 2050 Transportation Roadmap*. This will include community input, health impact assessments and other equity evaluation tools so that all residents benefit from these changes.

# Barriers and Opportunities

The transportation sector presents an important opportunity to reduce regional greenhouse gas emissions in the next ten years and beyond, leading early emission reduction efforts in the region. Many member jurisdictions and the BC government are global leaders in taking action to reduce transportation emissions, and have put in to place a number of policies that provide a strong foundation. However, additional action is needed to leverage this opportunity to its full potential.

### Reduce Driving through Compact Communities

Underpinning shifts in the technologies and fuels we use to move people and goods will be the continued development of a compact region. Existing compact communities along transit networks and around transit hubs bring people closer to the places they wish to go and facilitate some of the highest public transit ridership levels in North America. However, the population of Metro Vancouver is expected to grow from 2.7 million to 3.8 million, an increase of over 40%, from 2020 to 2050. It is critical that regional growth is concentrated in compact, transit serviced areas to minimize growth in car use and driving distances. Ensuring that more people live in compact communities that are well-connected to work, school, services, and amenities will enable a more affordable, resilient, and efficient transition to zero emission day-to-day trips.

### Accelerating Uptake of Low and Zero Emission On Road Transportation Options

A number of the technology solutions and strategies to reduce emissions from on road transportation are already familiar to us. Electric vehicles and biofuels are already in use, and electric and hydrogen vehicle technologies are rapidly continuing to develop. Switching to lower emission modes for both personal transportation and goods movement is supported through existing and emerging regional transportation plans. However, this transition needs to happen faster

in order to meet regional climate targets. Actions such as the establishment of low emission zones can accelerate local uptake of low and zero emission transportation options including transit, active transportation, and zero emission vehicles. Reducing emissions from on road transportation sooner rather than later will also benefit the region by improving air quality, enhancing the resilience of transportation networks, and creating comfortable, affordable transportation options.

### Rapid Uptake of Electric Vehicles

Electric vehicle and charging technologies have advanced substantially in recent years. Costs continue to decline, driving ranges are getting longer, and charging is getting faster. More makes and models will soon be available for larger vehicles. However, there are still barriers to rapidly increasing the amount of electric vehicles on the road:

- **Lack of affordable used electric vehicles.** Electric vehicles for personal use are widely available, inexpensive to charge, and declining in up front cost, but they still cost more than their fossil fuel counterparts and there is not yet an affordable used market for them. This creates inequities for lower income groups, and slows down the uptake of electric vehicles.
- **Diverse vehicle models are needed.** A greater variety of different electric vehicle models, such as SUVs, vans, and pickup trucks, are needed to meet diverse needs. Electric options are under development and will be available in coming years, but are not yet widely available for purchase.
- **Access to charging in large buildings can be challenging.** It can be expensive and complicated to access and install charging in large commercial and residential buildings like condos, townhomes, and multi-unit rentals. Better access to charging in these types of buildings is needed to support widespread electric vehicle uptake.
- **Infrastructure to support electric vehicle charging is needed.** As more people start using electric vehicles, new public fast charging stations and networks will be needed to support longer trips. A modernized electricity grid that integrates smart grid technologies can also help to support vehicle charging as electricity demand changes as a result of widespread electric vehicle use.
- **Accelerating electric vehicle uptake.** While the *BC Zero-Emission Vehicles Act* mandates sales targets for new electric vehicles, every new gasoline or diesel car sold in 2021 is likely to remain on the road until at least 2030. Additionally, market demand in the Metro Vancouver region has already exceeded regulated sales targets for early years. Finding ways to further accelerate electric vehicle uptake beyond the Provincial minimums to get more electric vehicles on the road earlier is a critical pathway to drastically reduce greenhouse gas emissions over the next ten years and beyond.

### Reducing Emissions from Medium and Heavy Duty Trucks

Medium and heavy duty trucks used commercially will be slower and more difficult to transition to zero emission technologies than smaller vehicles used for personal transportation. It is unlikely that all of these vehicles will be ready to transition to zero emission technologies by 2050, creating a need for low carbon alternatives to bridge that gap. There are a number of barriers to wider adoption of zero emission and low carbon commercial vehicles:

- **Availability of zero emission vehicles is limited**. While there are several electric and hydrogen models developed for medium and heavy duty trucks, very few are in use and they are not yet widely available in British Columbia. The market for these vehicles must be expanded to make it possible to purchase zero emission vehicles in large quantities for a variety of commercial purposes.

- **Existing technologies have high up front costs**. The up front cost of zero emission vehicles is considerably higher than their conventional fossil fuel counterparts. As the market develops and production scales up, these costs are likely to follow trends in passenger vehicles and drop quickly. However, action is needed to accelerate market demand. Financial support will be needed to facilitate this transition.
- **Biofuel supply and availability is not yet developed**. Though some biofuels are already in use in gasoline and diesel used in the Metro Vancouver region, a significant ramp up of supply, production, and distribution of these fuels is needed before they can be deployed on a wider scale. As these supply chains develop, carbon intensity requirements are needed to ensure that biofuels have a lifecycle climate benefit.
- **Recharging and refueling infrastructure requires a multi-jurisdiction approach.** Recharging and refueling options for zero emission and low carbon vehicles will be more difficult to access for commercial vehicles that travel in and out of the region to far or remote destinations where access to fast electric charging, hydrogen refueling, and biofuels may not develop at the same pace as regional infrastructure.

## Zero Emission and Low Carbon Technologies for Marine Vessels, Rail Locomotives, and Aircraft

As on-road vehicles transition to zero emission technologies and biofuels, marine vessels, rail locomotives, and aircraft will become the largest remaining sources of regional transportation greenhouse gas emissions. Additionally, as our economy grows, goods movement within and through the region will continue to grow, compounding the need to reduce emissions from marine and rail while maintaining a competitive local economy. However, reducing emissions from these sources is challenging for a number of reasons:

- **Innovative zero emission and low carbon technologies are still under development.** While there are some electric and hydrogen options developed for rail locomotives and small ferries, zero emission options for aircraft, harbour tugs, and large marine vessels are virtually non-existent. Rapid innovation in these modes is needed to develop and scale up production of viable zero emission technologies, especially as many of these engines last for decades and will still be in use in 2050.
- **Global demand for biofuels requires complex supply chains and large quantities of feedstocks.** Widespread use of biofuels for global marine and air movement will require huge amounts of these fuels and a high degree of coordination at production and refueling facilities around the world. A better understanding of global supply and production constraints is needed to effectively build a role for biofuels in sectors with significant international connections.
- **National and international cooperation is needed to effectively reduce emissions.** Cooperating with research institutions, industry partners, international agencies such as the IMO and ICAO, and other governments – locally, provincially, federally and internationally – will be key to developing new technologies and building reliable refueling and recharging networks. A shared vision for emission reductions is needed to ensure these sectors are on a pathway to carbon neutrality.

# The Journey to Carbon Neutral, Resilient Transportation

## Linkages to Other Climate 2050 Roadmaps

There are many linkages between transportation and other *Climate 2050* issue areas. Some of the related issue areas for transportation include:

**Land use and growth management** – policies that support more compact, complete communities influence the form and location of the transportation network, how people move and how goods are transported;

**Infrastructure** – the regional transportation network includes infrastructure such as roads, rail lines, bridges, and bike paths;

**Energy** – availability of clean, renewable energy to power regional transportation;

**Human health and well-being** – active transportation modes improve public health;

**Buildings** – home and workplace charging for electric vehicles will become more common, and;

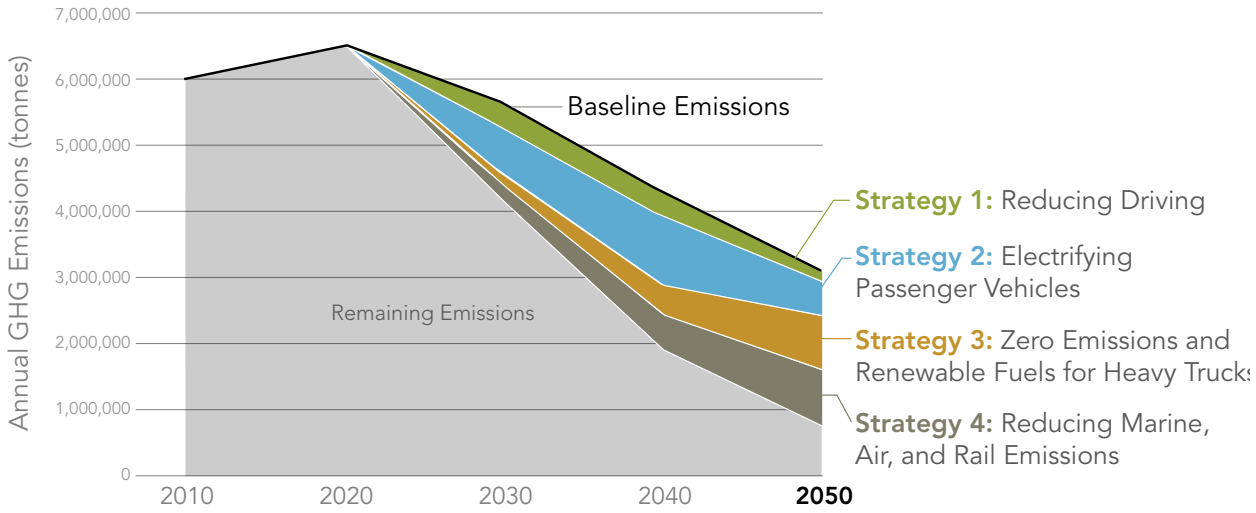
**Industry** – delivery of goods and provision of services impact the amount and types of transportation that take place in the region. Non-road vehicles and equipment may be impacted by policies applied to on-road transportation.

### Linkage to Metro Vancouver's *Clean Air Plan*

Strategies 1-4 (and all the associated actions) appear in both the *Transportation Roadmap* and the *Clean Air Plan*. These two plans are working together to achieve a carbon neutral region. Linking these strategies and actions in both plans ensures a clear action plan for Metro Vancouver and its partners.

SKY TRAIN, SURREY

POTENTIAL IMPACTS OF THE STRATEGIES AND ACTIONS DESCRIBED IN THE ROADMAP




## STRATEGY 1: Reduce Driving through Active Transportation and Public Transit

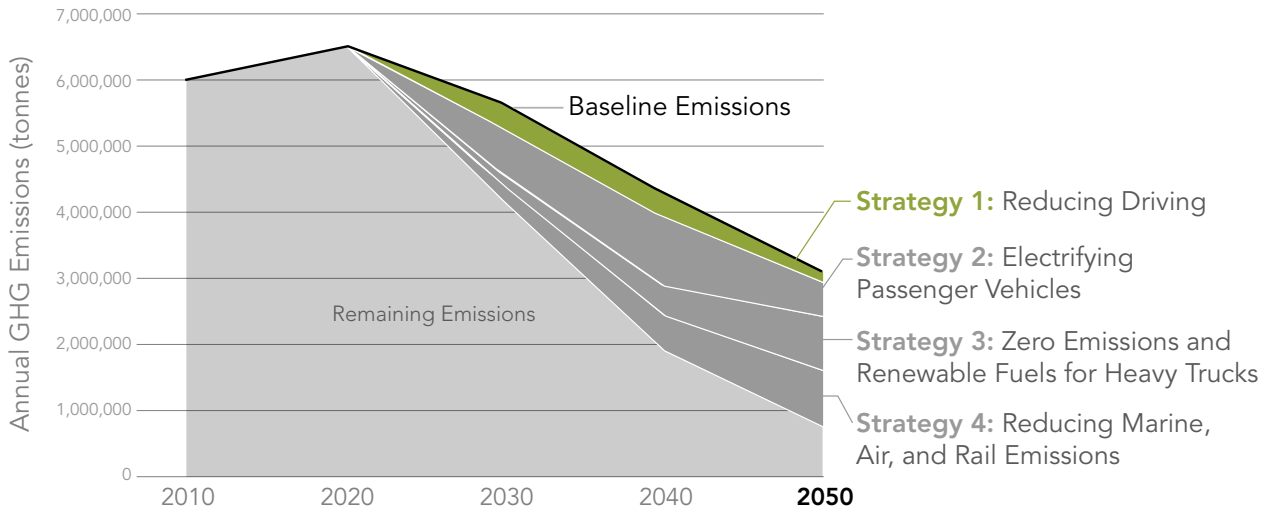
Transportation emissions at the community scale are driven by where people live, work, study and play. The Metro Vancouver *Regional Growth Strategy* and the *Regional Transportation Strategy* both outline policies to help create communities that are complete, compact, and transit oriented. When people live closer to where they work, study and play, more trips can be made by walking, rolling and cycling and on public transit. Emerging technologies and services such as electric mobility devices and and car sharing can also support a wider range of transportation options.

Reducing the amount of driving in the region contributes to many different goals, such as improving air quality and health impacts and managing traffic congestion as regional population grows. 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, and significant funding is needed to expand public transit and active transportation options.

| STRATEGY 1 | Potential Impacts of Strategy | Key Partners |
|---|---|---|
| | Reduce annual greenhouse gases by up to **280,000** tonnes by 2030<br>Reduce annual greenhouse gases by up to **170,000** tonnes by 2050 | • Member jurisdictions<br>• TransLink<br>• BC Government<br>• Government of Canada |


RAPID BUS, MAPLE RIDGE

## POTENTIAL IMPACT OF STRATEGY 1 ON GHG EMISSIONS




### 1.1 Enhance and Improve Regional Transit.

BIG Move

Advocate to TransLink to increase public transit in the region, significantly shifting trips from passenger vehicles to transit. 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.

### 1.2 Use Pricing to Reduce Driving and Emissions.

BIG Move

Work with the BC Government, TransLink, member jurisdictions and other regional partners to develop and implement a policy that puts a price on driving in the region, to help reduce emissions. The program could include mobility pricing, transportation pricing, usage-based insurance, fuel taxes, etc. Any program should prioritize fairness and equity and be supported by transit expansion (Action 1.1). Any program should align with any low or zero emission zones in the region (see Actions 2.2 and 3.1).

### 1.3 Expand Active Transportation Networks.

BIG Move

Advocate to member jurisdictions to expand regional and local active transportation networks so it's the most convenient choice for most shorter trips. 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 such as electric bikes, electric scooters, etc.

### 1.4 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.

### 1.5 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, including investments to transition to zero emission technologies.

### 1.6 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.

### 1.7 Support Residents and Businesses in Active Transportation.

Advocate to the BC Government and Government of Canada to provide provide funding (e.g. incentives, tax credits) to residents and businesses to support active transportation, including for buying, renting or sharing all bike and mobility types. Funding availability should prioritize groups who generally cannot access these transportation options, such as low-income residents and households.

### 1.8 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.

### 1.9 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.

### 1.10 Regional Bike- and Car-Sharing Strategy

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.

### 1.11 Support Low Emissions Commuting by Staff.

**Corporate** LEADERSHIP

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.

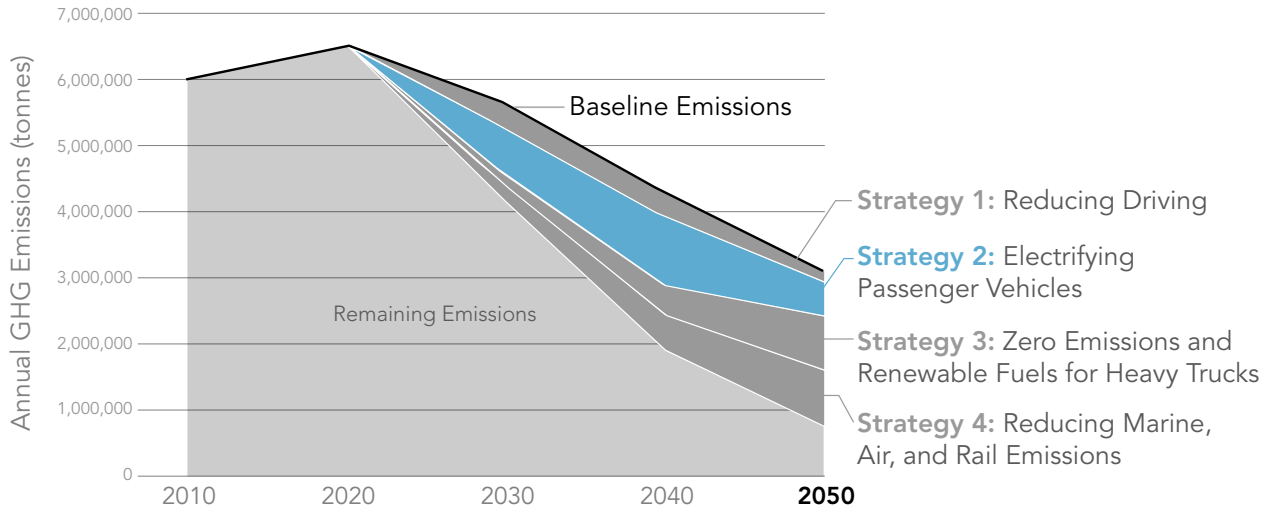

BUS STOP, SURREY

## STRATEGY 2: Accelerate the 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 all regional emissions. Electrifying passenger vehicles is a critical way to significantly reduce these emissions, though work is needed to ensure that electric vehicles and charging infrastructure are reasonably accessible to everyone, including lower income households. The *BC Zero-Emission Vehicles Act* provides a pathway to 100% zero emission vehicle sales by 2040, but this timeline should be accelerated to get more electric vehicles on the road faster.

| STRATEGY 2 | Potential Impacts of Strategy | Key Partners |
|---|---|---|
| | Reduce annual greenhouse gases by up to **710,000** tonnes by 2030<br>Reduce annual greenhouse gases by up to **520,000** tonnes by 2050 | • Member jurisdictions<br>• BC Government<br>• BC Hydro |

POTENTIAL IMPACT OF STRATEGY 2 ON GHG EMISSIONS



### 2.1 Accelerate Sales Targets for New Electric Passenger Vehicles.

BIG Move

Advocate to the BC Government to accelerate the sales targets in the *BC 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. Advocate to Government of Canada to establish sales targets for zero emission passenger vehicles, reaching 100% by 2030 (instead of the current 2035 target).

### 2.2 Develop Regional Emission Requirements for Passenger Vehicles.

BIG Move

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 emission levy with rebates for replacing older vehicles. 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 on pricing driving.

### 2.3 Make Electric Vehicles More Affordable.

BIG Move

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 households.

### 2.4 Regional Electric Vehicle Charging Strategy.

Develop a long-term regional strategy for electric vehicle charging infrastructure, coordinating with member jurisdictions, energy utilities, TransLink, industry, 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 (Action 3.7).

### 2.5 Make New Passenger Vehicles Cleaner.

Advocate to the Government of Canada to adopt more stringent fuel economy and emission standards for new passenger vehicles, prioritizing greenhouse gas reductions.

### 2.6 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.

CHARGING STATION, PORT MOODY

### 2.7 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.

### 2.8 Electrification Targets for Ride-Hailing Services.

Advocate to BC Government to establish vehicle electrification targets for ride-hailing and taxi fleets.

### 2.9 Transition the Corporate Fleet to Zero Emissions.

**Corporate** LEADERSHIP

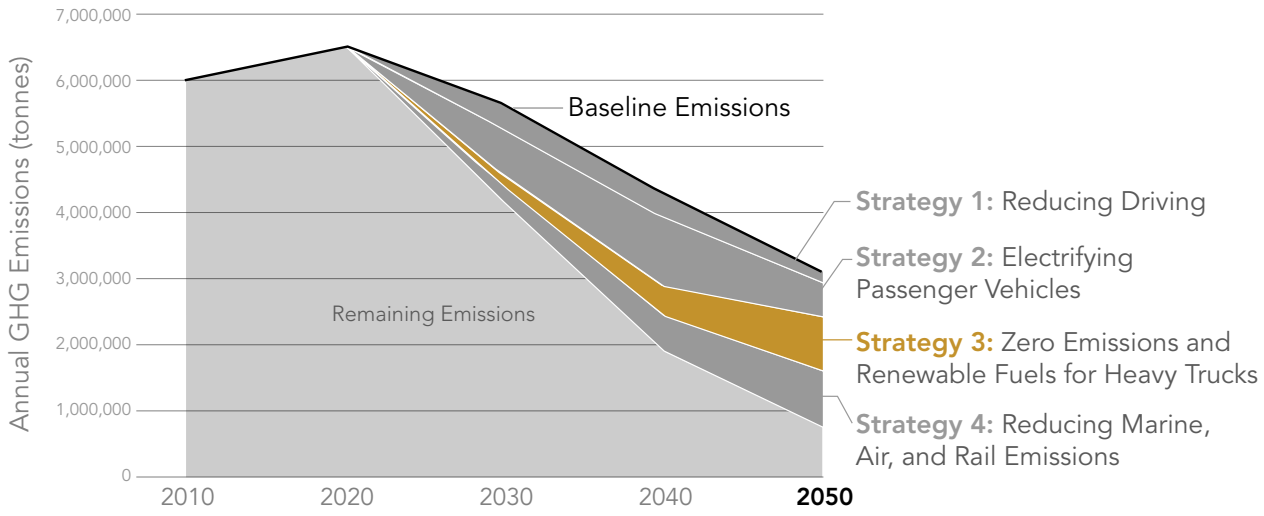
Transition Metro Vancouver's corporate on-road fleet to zero carbon emission between 2035 and 2040, and zero emission by 2050. The transition would include both passenger and medium and heavy duty vehicles.

## STRATEGY 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. Federal emission standards ensure new trucks use fuel more efficiently, and provincial clean fuel standards have reduced the carbon intensity of diesel, the primary fuel for medium and heavy duty trucks. 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 while supporting a competitive local economy. Other medium and heavy duty vehicles used in the region, such as transit vehicles, must also shift towards zero emission technologies and low carbon fuels.

| STRATEGY 3 | Potential Impacts of Strategy | Key Partners |
|---|---|---|
| | Reduce annual greenhouse gases by up to **170,000** tonnes by 2030<br><br>Reduce annual greenhouse gases by up to **810,000** tonnes by 2050 | • BC Government<br>• TransLink<br>• Trucking industry<br>• Vancouver Fraser Port Authority<br>• Member jurisdictions |

POTENTIAL IMPACT OF STRATEGY 3 ON GHG EMISSIONS



### 3.1 Regulate Existing Medium and Heavy Trucks.

BIG Move

Develop regulatory requirements for existing medium and heavy duty trucks, 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, and low or zero emission zones (aligned with Action 2.2). Requirements should be developed in coordination with member jurisdictions, Vancouver Fraser Port Authority, TransLink and other regional Requirements would align with TransLink's transition to clean, renewable energy in Action 1.1.

### 3.2 Require Zero Emission Sales Targets for New Medium and Heavy Trucks.

BIG Move

Advocate to the 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.

### 3.3 More Stringent Low Carbon Fuel Standards.

BIG Move

Advocate to the BC Government to further increase the stringency of the BC *Low Carbon Fuel Standard* to reduce the carbon intensity of transportation fuels, primarily through increasing use of renewable diesel and ethanol. Advocate to the Government of Canada to adopt a *Clean Fuel Standard,* to include more stringent carbon intensity targets for all transportation fuels (see Actions 4.1, 4.2, 4.5 and 4.6).

### 3.4 Long-term Emissions Strategy for Medium and Heavy Trucks.

Work with the BC Government and partners to develop a long-term province-wide emissions strategy for medium and heavy duty vehicles. The strategy should identify a phased timeline to implement a suite of policies and programs (including the other actions under Strategy 3) that would accelerate fleet turnover to cleaner vehicles while preparing for the longer term transition to zero emission vehicles. The strategy should target both greenhouse gas emissions and health harming air contaminants, while providing a level-playing field and minimizing stranded assets.

### 3.5 Make Low and Zero Emission Medium and Heavy Trucks More Affordable.

Advocate to BC Government, Government of Canada and other regional partners to enhance enhance funding (e.g. incentives, loans, tax credits, joint financing) for the purchase of low and zero emission medium and heavy duty trucks. Any funding program should consider whether funds should be targeted to groups less able to afford low and zero emission medium and heavy duty trucks.

### 3.6 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, prioritizing greenhouse gas reductions. Cleaner trucks will improve regional air quality in the short term and support the long term transition to zero emission vehicles.

### 3.7 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, fuels industry, 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

ROBERTS BANK, DELTA

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 (Action 2.4).

### 3.8 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.

### 3.9 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 emissions medium and heavy duty trucks and zero emission passenger vehicles. The policies could also include guidance on right-sizing fleets, calculating total lifetime costs of zero emission vehicles, and potential regional coordination of purchases of zero emission vehicles for fleets (i.e. bulk buy).

### 3.10 Reduce Delivery Emissions.

Work with member jurisdictions, delivery industry, and other regional partners to implement programs to reduce delivery emissions. Programs should prioritize transitioning delivery fleets to zero emissions (aligned with Actions 3.7 to 3.9) and could also include off-peak deliveries, small urban consolidation centres ("microHubs"), and cargo bike deliveries. This should include exploring the emissions impact of growing online deliveries, along with any potential solutions.

### 3.11 Reduce Refuse Trucks Emissions.

Work with member jurisdictions and other regional partners to accelerate the transition to zero emission refuse trucks. Opportunities could include contracting, procurement, charging infrastructure, and regional coordination of purchases (i.e., bulk buy).

### 3.12 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.

### 3.13 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.

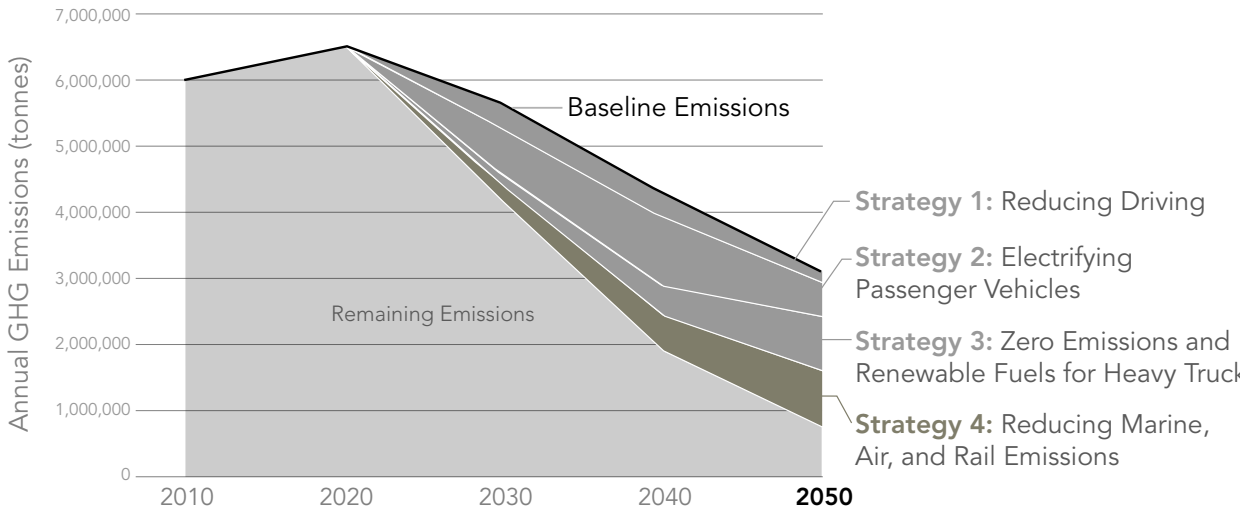
## STRATEGY **4:** Reduce Marine, Rail, and Aviation Emissions

Marine, rail, and aviation are significant sources of greenhouse gas emissions globally. While they account for a relatively small amount of regional greenhouse gas emissions, regional rail lines, ports, and airports are important hubs in larger networks that must decarbonize to meet global climate targets. Achieving significant emission reductions in the marine and rail sectors depend on efforts by the Government of Canada and the BC Government to develop and implement strategies to advance cleaner fuels and engine technologies. The Government of Canada also needs to advocate to international organizations such as the International Maritime Organization to accelerate the implementation of more stringent emission standards. Locally, the Vancouver Fraser Port Authority is working to reduce greenhouse gas and health-harming air contaminant emissions associated with shipping in the region.

International standards have improved fuel economy from aircraft and the Vancouver International Airport Authority is 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 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.

| STRATEGY 4 | Potential Impacts of Strategy | Key Partners |
|---|---|---|
| | Reduce annual greenhouse gases by up to **250,000** tonnes by 2030<br>Reduce annual greenhouse gases by up to **860,000** tonnes by 2050 | • Vancouver Fraser Port Authority<br>• Government of Canada<br>• BC Government<br>• Airlines<br>• Vancouver International Airport Authority<br>• BC Ferries |

## POTENTIAL IMPACT OF STRATEGY 4 ON GHG EMISSIONS




### 4.1 Accelerate Emission Reductions from Marine Vessels.

BIG Move

Advocate to the Government of Canada and BC Government to develop and implement implement long-term strategies to accelerate emission reductions from ocean-going marine vessels, harbour vessels and passenger ferries in the region. Different strategies may be needed for domestic versus international vessels. 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 strategies should also consider efficiency improvements and the design and supportive funding for regional refueling infrastructure for zero carbon marine vessels.

### 4.2 Accelerate Emission Reductions from Rail Locomotives.

Advocate to the Government of Canada and BC Government to continue development and implementation of long-term strategies to accelerate emission reductions from rail locomotives in the region. Different strategies may be needed for local versus long-haul locomotives. In the short term, the strategies should prioritize cleaner locomotives, particularly those operating near neighbourhoods most impacted by rail emissions, as well as fugitive emissions from rail cars. In the long term, the strategies should establish more stringent greenhouse gas emission targets, standards and regulations for line-haul, switch, and local locomotives, to achieve a carbon neutral rail sector by 2050. The strategies should also consider efficiency improvements and the design and supportive funding for regional refueling infrastructure for zero carbon locomotives.


BURRARD INLET PORT LANDS

### 4.3 Support Emission Reduction Actions at Vancouver Fraser Port Authority.

Work with the Vancouver Fraser Port Authority to implement actions that reduce port-related greenhouse gas emissions and minimize air quality impacts on port-adjacent neighbourhoods. Areas of collaboration include phasing out older higher emitting equipment, increasing the availability of renewable fuels, developing infrastructure for zero emission equipment (e.g., shore power), and accelerating the adoption of zero emission solutions. Other opportunities include pilot or demonstration projects, and short-sea shipping.

### 4.4 Support Innovation in Low and Zero Emission 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.

### 4.5 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.

### 4.6 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.

### 4.7 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.

### 4.8 Support Low Carbon Corporate Business Travel

**Corporate** LEADERSHIP

Update and adapt corporate business travel policies to reduce emissions, including air travel considerations, corporate carbon offsets, and remote attendance.

# Resilient Transportation Strategies

## STRATEGY 5: Protect Existing Transportation Networks from Future Climate Impacts

While reducing regional emissions will contribute to the global effort against climate change, some impacts from a changing climate are locked in and are likely to occur even with drastic emission reductions. Rising sea levels, increased frequency and severity of riverine flooding, and more frequent and intense heatwaves, wildfires, and droughts are already recognized as potential climate hazards that are likely to impact regional transportation networks within the next 100 years. Many critical transportation networks and infrastructure will remain standing for decades, but have not been designed to withstand impacts from changing climate hazards. Identifying current and future climate impacts and protecting existing transportation infrastructure from the hazards posed by these impacts is essential in order to maintain a resilient transportation system that is adapted to a changing climate.

### 5.1 Support Regional Emergency Management Planning.

BIG Move

Work with member jurisdictions, TransLink, neighbouring regions, the Vancouver Fraser Port Authority, and through convening groups such as the Integrated Partnership for Regional Emergency Management (IPREM) to collaborate on data sharing and policy development, and consider critical regional infrastructure interdependencies that could result in cascading effects in the event of regional climate disruption.

### 5.2 Protect Road Networks.

Work with the BC government and member jurisdictions to ensure that critical road networks, including infrastructure such as tunnels and bridges, are protected from future climate impacts (such as flooding and sea level rise) through projects such as dikes and drainage systems that mitigate potential climate impacts in known risk areas.

### 5.3 Protect Key Transportation Hubs.

Advocate to the Vancouver Fraser Port Authority, Vancouver International Airport Authority, and Federal government to protect key transportation hubs in low-lying coastal areas from hazards such as sea level rise and riverine flooding.

### 5.4 Adapt Active Transportation and Transit Networks.

Work with member jurisdictions and TransLink to make sidewalks, bike paths, regional greenways, and transit networks comfortable and safe to use even when impacted by climate hazards such as flooding, hotter temperatures, degraded air quality due to wildfires, and heavy precipitation.

### 5.5 Prepare for Regional Disruption.

Advocate to TransLink, Vancouver Fraser Port Authority, BC Ferries, and local airports to develop and maintain climate change adaptation plans that establish "safe-to-fail protocols" in the event of severe climate shocks that cause regional and inter-regional disruption, as well as post-event intervention and review procedures.

## STRATEGY 6: Develop Climate Resilient Transportation Networks

In addition to protecting critical transportation infrastructure and networks, steps must be taken to proactively build a more resilient transportation system. Defining and assessing future climate risk must look beyond past trends in order to successfully create a transportation network that is resilient to future climate conditions. Climate change adaptation needs to be considered during the location, construction, maintenance, and operation of transportation infrastructure to avoid creating vulnerabilities that make adaptation more difficult and expensive in the future. Long range transportation planning must include hazard, risk, and vulnerability assessments to ensure that all new infrastructure is located in areas without known, unmitigated hazard risks. Land use and development can be coordinated with transportation networks to create robust regional transit, walking, and cycling options that provide a multitude of ways to get to and from key destinations, enhancing low carbon resilience.

### 6.1 Minimize Risk Exposure for New Transportation Infrastructure.

BIG Move

Work with the BC government, member jurisdictions, and TransLink to ensure that new transportation infrastructure is located outside of areas with known, unmitigated hazards, such as flooding and sea level rise.

### 6.2 Create Flexible Transportation Networks.

BIG Move

Work with member municipalities and TransLink to develop flexible transportation systems through low-cost, low-emission travel options such as active transportation and transit options that minimize reliance on vulnerable transportation networks, and create multiple travel options in the event of a disruption.

### 6.3 Reduce Reliance on Transportation Networks.

Work with member jurisdictions to develop complete, compact communities that support transportation demand management measures, reduce the need for long trips, and limit expansion of road space.

### 6.4 Build Climate Resilient Transportation Infrastructure.

Advocate to the BC government and Federal governments to strengthen climate change resilience design requirements for new transportation infrastructure projects.

### 6.5 Identify Regional Climate Hazards, Risks, and Vulnerabilities Impacting Transportation Networks.

Work with the BC government, member jurisdictions, TransLink, Vancouver Fraser Port Authority, BC Ferries, and local airports to collect data for baseline, trend, and monitoring purposes, and integrate forward-looking hazard, risk and vulnerability analysis into long-range transportation planning.

### 6.6 Integrate Resilient Infrastructure in to Transportation Networks.

Work with member jurisdictions, TransLink and the BC Government to consider possible synergies between and co-location of transportation networks with infrastructure designed to address resilience priorities such as storm water management, flooding, and seismic risk.

BIKING IN VANCOUVER

# Setting the Path Ahead

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

Transportation is one of the best opportunities for significant early reductions of greenhouse gases in the region, particularly for personal transportation. The region is well positioned to continue with intentional land use planning that supports walking, rolling, cycling, transit, and other shared mobility modes. Electric vehicles are readily available and ready to be deployed on a large scale. It's critical that the actions identified in this *Roadmap* to support faster uptake of electric vehicles are implemented without delay to set this transition in motion as soon as possible. Taking early action to reduce emissions can also help improve air quality, support health and well-being through exercise, and enhance low carbon resilience sooner rather than later. Taking action to improve the resilience of regional transportation networks should also begin right away to adapt to changing climate conditions.

As personal transportation transitions to zero emissions, medium and heavy trucks, marine vessels, aviation, and rail will become the largest sources of transportation greenhouse gas emissions in the region. Action that supports rapid development and scale-up of zero emission and low carbon options for these sectors is needed to ensure that the transportation sector as a whole can transition to carbon neutrality by 2050.

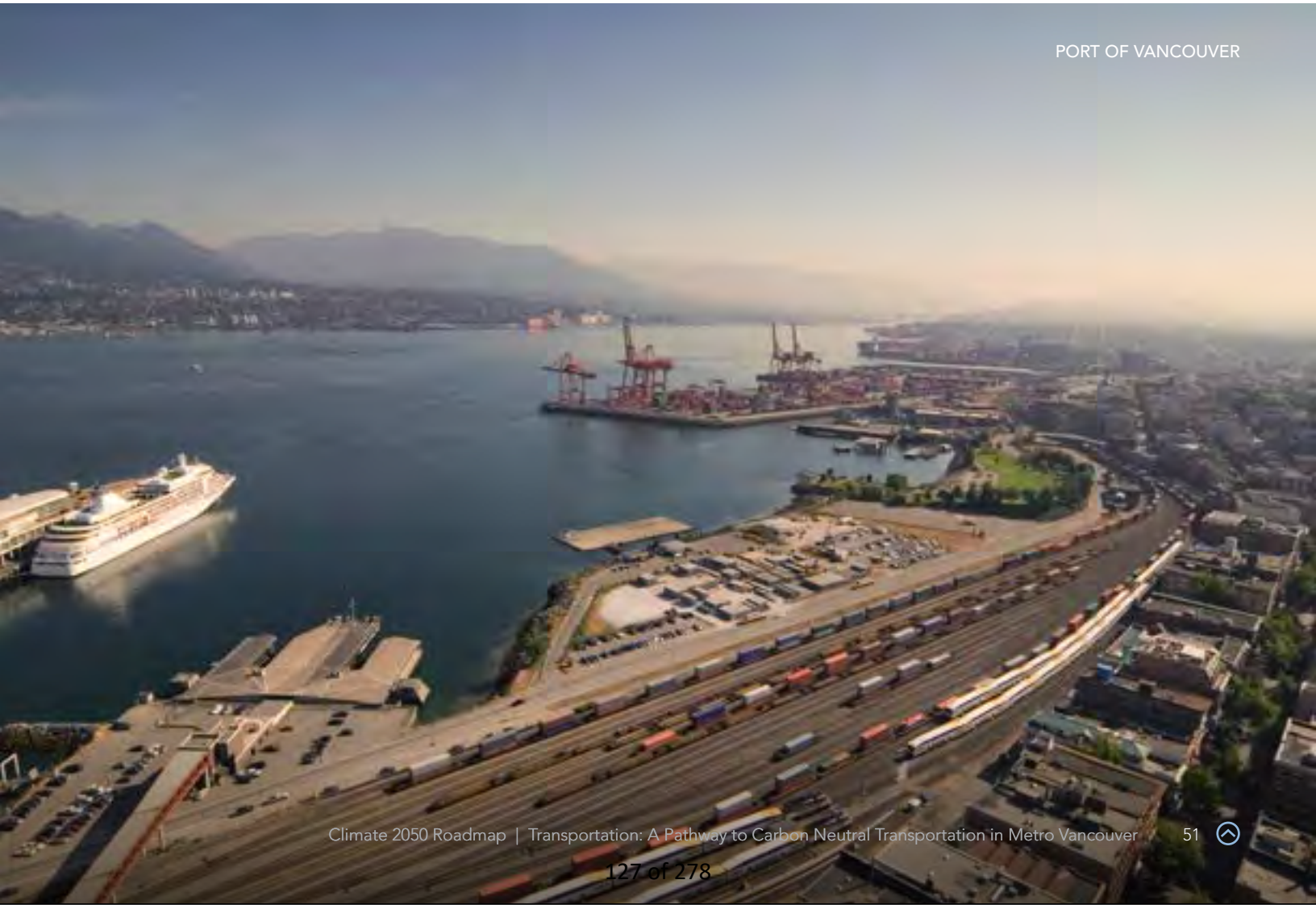
The timeline below includes all of the actions included in this *Roadmap*. Although there is much work to be done, there are some critical actions that, if started over the next two years, will make a major difference to accelerating the region's drive to zero emission and resilient transportation.

## CLIMATE 2050 TRANSPORTATION ROADMAP ACTION TIMELINE

| STRATEGY | 2021-2023 | 2024-2029 | 2030-BEYOND |
|---|---|---|---|
| **STRATEGY 1**<br>Reduce Driving through Active Transportation and Public Transit | Enhance and Improve Regional Transit | | |
| | Use Pricing to Reduce Driving and Emissions | | |
| | Expand Active Transportation Networks | | |
| | More Stable Infrastructure Funding for Regional Active Transportation Networks | | |
| | More Stable Funding for Regional Transit | | |
| | Regional Parking Strategy to Reduce Driving | | |
| | Support Residents and Businesses in Active Transportation | | |
| | Communicate the Benefits of Walking, Cycling and Public Transit | | |
| | | Implement Trip Reduction Programs | |
| | | Regional Bike- and Car-Sharing Strategy | |
| | Support Low Emissions Commuting by Staff | | |
| **STRATEGY 2**<br>Accelerate Transition of Passenger Vehicle Fleet to Electric Vehicles | Accelerate Sales Targets for New Electric Passenger Vehicles | | |
| | Develop Regional Emission Requirements for Passenger Vehicles | | |
| | Make Electric Vehicles More Affordable | | |
| | Regional Electric Vehicle Charging Strategy | | |
| | | Make New Passenger Vehicles Cleaner | |
| | Expand Electric Vehicle Charging in Buildings | | |
| | Electric Vehicle Outreach Programs | | |
| | | Electrification Targets for Ride-Hailing Services | |
| | Transition the Corporate Fleet to Zero Emissions | | |
| **STRATEGY 3**<br>Reduce Heavy Truck Emissions and Support Early Adoption of Zero Emission Heavy Trucks | Regulate Existing Medium and Heavy Trucks | | |
| | Require Zero Emissions Sales Targets for New Medium and Heavy Trucks | | |
| | | More Stringent Low Carbon Fuel Standards | |
| | Long-term Emissions Strategy for Medium and Heavy Trucks | | |
| | Make Low and Zero Emission Medium and Heavy Trucks More Affordable | | |
| | Regulate Fuel Economy and Emissions for Medium and Heavy Trucks | | |
| | | Zero Carbon Refueling Strategy for Medium and Heavy Trucks | |
| | | Funding for Zero Carbon Refueling Infrastructure for Medium and Heavy Trucks | |
| | Large Fleets to Adopt "ZEV-First" Procurement | | |
| | Reduce Delivery Emissions | | |
| | Reduce Refuse Trucks Emissions | | |
| | Support Innovation in Zero Emission Technology for Medium and Heavy Trucks | | |
| | | Use Businesses Licenses to Support Emission Reductions | |
| **STRATEGY 4**<br>Reduce Marine, Rail, and Aviation Emissions | Accelerate Emission Reductions from Marine Vessels | | |
| | Accelerate Emission Reductions from Rail Locomotives | | |
| | Support Emissions Reduction Actions at Vancouver Fraser Port Authority | | |
| | Support Innovation in Low and Zero Emissions Marine and Rail Technologies | | |
| | Carbon Neutral Aviation Sector | | |
| | Develop Local Sources of Sustainable Aviation Fuel | | |
| | Technologies for Zero Emission Aircraft | | |
| | Support Low Carbon Corporate Business Travel | | |

## CLIMATE 2050 TRANSPORTATION ROADMAP ACTION TIMELINE CONTINUED

| STRATEGY | 2021-2023 | 2024-2029 | 2030-BEYOND |
|---|---|---|---|
| **STRATEGY 5** Protect Existing Transportation Networks from Future Climate Impacts | Support Regional Emergency Management Planning | | |
| | Protect Road Networks | | |
| | Protect Key Transportation Hubs | | |
| | Adapt Active Transportation and Transit Networks | | |
| | | Prepare for Regional Disruption | |
| **STRATEGY 6** Develop Climate Resilient Transportation Networks | Minimize Risk Exposure for New Transportation Infrastructure | | |
| | Create Flexible Transportation Networks | | |
| | Reduce Reliance on Transportation Networks | | |
| | Build Climate Resilient Transportation Infrastructure | | |
| | Identify Regional Climate Hazards, Risks, and Vulnerabilities Impacting Transportation Networks | | |
| | Integrate Resilient Infrastructure in to Transportation Networks | | |



PORT OF VANCOUVER

# 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, to some extent, on the availability of this information from other organizations. Because the *Transportation 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 carbon neutral future. While much of the data needed to measure progress in on-road transportation is already collected, there are significant data gaps for rail, marine, and air transportation. Additional work is underway to understand what key performance indicators and data effectively measure progress towards regional resilience (noted in the table below as "TBD").

| ROADMAP ELEMENT | KEY PERFORMANCE INDICATOR | DATA SOURCE | DATA IS CURRENTLY COLLECTED |
|---|---|---|---|
| **Reduce Driving through Active Transportation and Public Transit** | Mode share by trip (number of trips, % of total trips) | TransLink<br>Statistics Canada<br>Municipalities | Yes |
| | Kilometers travelled by mode type: walking, cycling, transit, single occupant vehicle, multiple occupant vehicle (Person kilometers travelled, PKM) | TransLink<br>Municipalities | Yes |
| | Kilometers of bike lanes, paths, and greenways | Metro Vancouver<br>Municipalities | Yes |
| | Proportion of household and employment growth concentrated in urban centres and frequent transit development areas (FTDAs) (% of households, % of jobs in urban centres and FTDAs) | Metro Vancouver | Yes |
| | Kilometers of road and road space area | Metro Vancouver<br>Municipalities<br>BC Government | Yes |

| ROADMAP ELEMENT | KEY PERFORMANCE INDICATOR | DATA SOURCE | DATA IS CURRENTLY COLLECTED |
|---|---|---|---|
| **Accelerate Transition of the Passenger Vehicle Fleet to Electric Vehicles** | Proportion of new vehicles sales that are electric, hybrid, hydrogen (number of new vehicle sales, % of total sales) | BC Government<br>ICBC<br>Market research firms<br>Vehicle manufacturers | Yes |
| | Regional vehicle registration by engine type: internal combustion, electric, hybrid, hydrogen (number of new vehicle registrations, % of total registrations) | ICBC | Yes |
| | Kilometers travelled by vehicle model year, vehicle size, engine type (vehicle kilometers travelled, VKT) | ICBC<br>TransLink<br>Metro Vancouver | Partial |
| | Fuel use by type: fossil diesel, fossil gas, biofuels, electricity, hydrogen (Gigajoules, GJ) | Metro Vancouver<br>BC Hydro<br>BC Government | Partial |
| | Regional vehicle fleet make up by engine type: internal combustion, electric, hybrid, hydrogen (number of vehicles, % of total regional vehicle stock) | ICBC<br>Metro Vancouver<br>TransLink | Yes |
| | Number of electric vehicle chargers | Municipalities<br>BC Government<br>Charging service providers | Yes |
| **Reduce Heavy Truck Emissions and Support Early Adoption of Zero Emission Heavy Trucks** | New vehicle sales by engine type: internal combustion, electric, hybrid, hydrogen, compressed natural gas (number of new vehicle sales, % of total sales) | Vehicle manufacturers<br>ICBC<br>Market research firms<br>Industry associations | Yes |
| | Regional vehicle registration by engine type (number of new vehicle registrations, % of total registrations) | ICBC | Yes |
| | Kilometers travelled by vehicle model year, vehicle class, engine type (VKT) | TransLink<br>Metro Vancouver<br>ICBC | Partial |
| | Fuel use by type: fossil diesel, fossil gas, compressed natural gas, renewable natural gas, biofuels, electricity, hydrogen (Gigajoules, GJ) | Metro Vancouver<br>TransLink<br>BC Hydro<br>BC Government<br>Market research firms<br>Industry associations | Partial |

| ROADMAP ELEMENT | KEY PERFORMANCE INDICATOR | DATA SOURCE | DATA IS CURRENTLY COLLECTED |
|---|---|---|---|
| **Reduce Marine, Rail, and Aviation Emissions** | Marine vessels with access to shore power by vessel type: cruise, container, tanker, ferry, other (number of shore power terminals, % of marine vessels with access to shore power) | Vancouver Fraser Port Authority<br>BC Ferries and other ferry operators | Yes |
| | Kilometers travelled by marine vessels using zero or low emission fuels (kilometers, % of total kilometers travelled) | Vancouver Fraser Port Authority<br>International Maritime Organization<br>Metro Vancouver<br>Transport Canada<br>BC Ferries<br>BC Government | No |
| | Marine vessel fuel use by type: fossil fuels, liquefied natural gas, renewable natural gas, biofuels, electricity, hydrogen (GJ) | Vancouver Fraser Port Authority<br>International Maritime Organization<br>Transport Canada<br>BC Ferries<br>Metro Vancouver<br>BC Hydro | No |
| | Kilometers travelled by rail locomotives using zero or low emission fuels (kilometers, % of total kilometers travelled) | Canadian National Rail<br>Canadian Pacific Rail<br>TransLink<br>Other rail companies<br>Metro Vancouver<br>Transport Canada | No |
| | Locomotive and switch operations fuel use by type: fossil fuels, biofuels, electricity, hydrogen (GJ) | Canadian National Rail<br>Canadian Pacific Rail<br>TransLink<br>Other rail companies<br>Metro Vancouver<br>Vancouver Fraser Port Authority<br>Transport Canada | No |
| | Kilometers travelled by aircraft using zero or low emission fuels (kilometers, % of total kilometers travelled) | Transport Canada<br>Regional airports<br>Airlines | No |
| | Aircraft fuel use by type: fossil fuels, biofuels, electricity, hydrogen(GJ) | Transport Canada<br>Regional airports<br>Airlines | No |
| **Protect Existing Transportation Networks from Future Climate Impacts** | TBD | TBD | TBC |
| **Develop Climate Resilient Transportation Networks** | TBD | TBD | TBC |

# 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.

**Biofuels** are renewable transportation fuels that have a low carbon footprint and are produced from organic matter derived from biomass such as plants.

**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 emission reductions possible across all economic sectors, with any remaining emissions 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.

**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.

**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.

**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 (sometimes referred to as "climate change mitigation") is critical to avoiding catastrophic climate change.

**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.

**Large fleet operators** are organizations that purchase, operate, and maintain a significant amount of vehicles for public sector or commercial use.

**Low carbon fuels** produce direct greenhouse gas emissions, but have no net greenhouse gas emissions when the fuel lifecycle is taken in to account.

**Low emission technologies** produce some greenhouse gas emissions or air contaminants, but significantly less than conventional fossil fuel counterparts. This may include high efficiency vehicles or plug in hybrid technologies.

**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 used for commercial purposes, but also includes buses and refuse trucks.

**Mobility pricing** refers to fees for transportation services. Some types of mobility pricing (e.g., decongestion charging, low emission zones) are used to manage demand for roads and reduce emissions.

**Passenger vehicles** include motorcycles, cars, SUVs, minivans and light trucks. Buses are included as part of medium and heavy duty trucks.

**"Right-to-charge"** legislation provides residents of multi-unit residential buildings with the right to install and use a charging station for their electric vehicle.

**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.

**"Safe-to-fail"** protocols anticipate possible system failures so that they can be contained and minimized.

**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.

**Zero emission** means no greenhouse gases or other air contaminants are generated at the point of use, 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.


metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

**Additional Feedback Considered in Updating the *Climate 2050 Transportation Roadmap***

***Note:*** *Feedback considered for the greenhouse gas reduction related actions found in the Climate 2050 Transportation Roadmap are referenced in the Clean Air Plan feedback. A copy of the feedback can be found in the MVRD September 24th Board Agenda Package: Clean Air Plan (Section E3.1, Attachment 2)*

| ***Climate 2050 Transportation Roadmap* Section/Topic** | **Feedback** | **Metro Vancouver Feedback Response** |
|---|---|---|
| **The Challenge** | | |
| Goals | The Roadmap includes goals for 2030, but the rest of the Roadmap consistently emphasizes the 2050 targets and 30-year time horizon. | Call out box added to clarify the relationship between the *Clean Air Plan*, as Metro Vancouver's 10-year air quality and greenhouse gas management plan, and the *Transportation Roadmap* as the overarching regional transportation climate strategy. |
| Climate Change Impacts on Transportation | In addition to experiencing the impacts of climate change, transportation infrastructure itself can exacerbate climate impacts. | Call out box added to note this interrelationship and connect to other relevant Roadmaps. |
| **The Journey to Carbon Neutral, Resilient Transportation** | | |
| Linkages to Other *Climate 2050* Roadmaps | Clarity needed on the relationship between the *Clean Air Plan* and *Climate 2050 Roadmaps*. | Call out box added to clarify the overlap in actions between the *Clean Air Plan* and Roadmap. |
| **Resilient Transportation Strategies** | | |
| **Strategy 5: Protect Existing Transportation Networks from Future Climate Impacts** | | |
| Strategy 5 "Protect Existing Transportation Networks from Future Climate Impacts" | This strategy may be interpreted to mean that all existing transportation should be protected. | Language clarified to convey that critical infrastructure and networks should be protected. |
| Strategy 5 "Protect Existing Transportation Networks from Future Climate Impacts" | Some infrastructure or assets may become stranded; retreat should be considered as a possible response. | Metro Vancouver will be considering these issues in other Roadmaps (e.g. Land Use and Growth Management, Infrastructure). |
| Strategy 5, Action 5.1 "Support Regional Emergency Management Planning" | The Vancouver Fraser Port Authority is involved in regional emergency management planning. | Vancouver Fraser Port Authority identified as a partner for this action. |
| Strategy 5, Action 5.2 "Protect Road Networks" | Water crossings via bridges and tunnels are key risk areas and should be considered as part of this action. | Tunnel and bridges explicitly noted in this action. |
| Strategy 5, Action 5.4 "Adapt Active Transportation and Transit Networks" | Networks may also be impacted by flooding. | Flooding identified as a hazard in this action. |

| | | |
|---|---|---|
| Strategy 5, Action 5.4 “Adapt Active Transportation and Transit Networks” | Equitable access to modes such as walking, cycling, and transit is essential. | Equity will be central to the development of policies and programs during implementation. |
| Strategy 5, Action 5.5 “Prepare for Regional Disruption” | Highway corridors in and out of the region are limited and several pass through one area. | Inter-regional disruption specifically identified in this action. |
| **Strategy 6: Develop Climate Resilient Transportation Networks** | | |
| Strategy 6 “Develop Climate Resilient Transportation Networks” | The two strategies of protecting existing infrastructure and networks and creating new, resilient transportation networks may be interpreted as incompatible. | Additional wording added to clarify that the Roadmap proposes both strategies are needed to address climate resilience. |
| Strategy 6 “Develop Climate Resilient Transportation Networks” | As electric vehicles become more widely used, electric infrastructure used for charging vehicles will become an important part of transportation infrastructure; hazards impacting electrical infrastructure should be considered as part of the transportation system. | Climate resilience considerations for the electricity grid will be considered in the Energy Roadmap, including increased used of electricity as a transportation fuel. |
| Strategy 6 “Develop Climate Resilient Transportation Networks” | Developing complete, compact communities is foundational for low carbon resilience as it minimizes reliance on transportation networks to access work, services, and other amenities. | New action (Reduce Reliance on Transportation Networks) added to reflect this feedback. |
| Strategy 6 “Develop Climate Resilient Transportation Networks” | Other types of infrastructure related to climate resilience may be effectively integrated with transportation infrastructure, e.g. storm water management. Seismic resilience may also have synergies with climate resilience. | New action (Integrate Resilient Infrastructure in to Transportation Networks) added to reflect this feedback. |
| Strategy 6, Action 6.2 “Create Flexible Transportation Networks” | Both alternate routes and modes should be considered to maximize flexibility. | Wording adjusted to specify that both routes and modes should be considered in this action. |
| Strategy 6, Action 6.2 “Create Flexible Transportation Networks” | Building redundancy in to transportation systems can avoid significant costs in the event of disruptions to the transportation network; | Consideration of costs will be central to the development of policies and programs during implementation. |

| | | |
|---|---|---|
| | quantifying these avoided costs can highlight the value of this approach. | |
| **Setting the Path Ahead** | | |
| Measuring our Progress | Metrics are needed to track progress and establish more specific targets. Need leading (are we getting where we need to be?) and lagging (how have we been doing?) key performance indicators. | The targets and key performance indicators will be used to measure progress as the Roadmap is implemented. |
| Measuring our Progress | As electric vehicle use increases, understanding the amount of chargers in use will be important. | "Number of electric vehicle chargers" added as a potential key performance indicator. |
| Measuring our Progress | In addition to tracking kilometers of bike lanes, monitoring road space is an important metric to understand transportation infrastructure. | "Kilometers of road and road space area" added as a potential key performance indicator. |
| **General Roadmap Feedback** | | |
| General Feedback | There are no actions regarding First Nations / Indigenous needs. | The Roadmap proposes policies that may include many partners, including First Nations governments, communities and businesses. |
| General Feedback | Comments queried the extent of the engagement, including specifically if Metro Vancouver has considered First Nations in the Roadmap, and how outreach will include a broader audience as we move into implementation. | The engagement to develop the Roadmap focused on audiences most likely to contribute to the technical discussions, be impacted by the actions, and play a key role in implementation. The project team shared progress and received feedback from some First Nations on transportation and other climate related topics. As Metro Vancouver moves in to implementation, outreach will broaden to seek a supportive constituency on the rationale and opportunities to reduce emissions and be prepared for climate impacts. |
| General Feedback | Consideration of embodied emissions and use of low carbon materials is needed to understand the true footprint of various transportation options and technologies. | Metro Vancouver is exploring an approach to assessing embodied emissions that takes in to account upstream emissions and emissions embedded in materials. |

To: Climate Action Committee

From: Carla Stewart, Senior Planner, Regional Planning and Housing Department
Jason Emmert, Program Manager, Climate Policy, Parks and Environment Department

Date: October 13, 2021 Meeting Date: November 5, 2021

Subject: **Draft *Climate 2050 Agriculture Roadmap***

**RECOMMENDATION**

That the MVRD Board authorize staff to proceed with engagement on the draft *Climate 2050 Agriculture Roadmap*, as presented in the report dated October 13, 2021, titled "Draft *Climate 2050 Agriculture Roadmap*".

**EXECUTIVE SUMMARY**

This report presents the draft *Climate 2050 Agriculture Roadmap*, the next 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 *Climate 2050 Agriculture Roadmap* lays out strategies and actions that will accelerate the transition to a net-zero agriculture sector by 2050 and that support agriculture becoming resilient to the ever-changing effects of climate change that have a direct impact on the health and longevity of farming in this region. Action items in the *Agriculture Roadmap*, include protecting agricultural land and expanding the use of ecosystem services and regenerative agriculture within farming, to support creating an overall adaptive and resilient food system.

Like the other *Climate 2050 roadmaps*, the *Agriculture Roadmap* is intended to be dynamic, and over time, more work will be necessary to identify and undertake additional research and actions to reach our 2030 and 2050 climate targets. To assess resilience of the agriculture industry, further work and research is needed to establish measurable outcomes to quantify and qualify the impact of resiliency and adaptation actions in the *Climate 2050 Agriculture Roadmap*. The draft will inform on-going engagement with the agriculture sector, Metro Vancouver's Agricultural Advisory Committee and with member jurisdictions, with the intent of bringing an updated *Climate 2050 Agriculture Roadmap* for endorsement by the MVRD Board in 2022.

**PURPOSE**

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

**BACKGROUND**

In September 2018, the MVRD Board adopted the *Climate 2050 Strategic Framework* and directed staff to initiate the development process of the *Climate 2050 Roadmaps*. The Board subsequently 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. The Climate Action Committee received a report on the *Climate 2050* Discussion Paper on Agriculture at its May 2020 meeting.

This report presents the draft *Climate 2050 Agriculture Roadmap* (attached), and provides information on how it will be the subject of engagement activities planned with the agriculture community, the public, stakeholders and other governments, including First Nations, on greenhouse gas (GHG) emission reductions from, and climate resiliency for, regional agriculture.

**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. *Climate 2050* is being implemented 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*, as well as forthcoming updates to the Regional Growth Strategy (*Metro 2050*).

**DRAFT CLIMATE 2050 AGRICULTURE ROADMAP**

The *Climate 2050 Agriculture Roadmap* presents a robust plan for this region to have a carbon neutral and resilient agricultural industry by 2050. In laying out the pathway, the *Agricultural Roadmap* identifies the following issues:

- **challenges** to reaching net-zero emissions and a resilient agricultural sector, including targets for GHG emission reductions and goals and measurable outcomes that illustrate effective adaptation by 2050;
- **key sources** of GHG emissions and the expected impacts to farming operations as a direct result of a changing climate;
- **barriers and opportunities** to reduce emissions and increase resiliency that shape the strategies and actions in the Roadmap; and
- **benefits** of net zero agricultural operations and the communal benefits achieved from farms that support and use ecosystem services near or on their property.

The draft *Climate 2050 Agriculture Roadmap* lays out 26 actions for reducing emissions and increasing resiliency, organized under the following four strategic areas:

1. Protect Agricultural Land
2. Support Farmers and Climate Action Leaders
3. Support Long-Term Farm Health and Resiliency
4. Leverage Economic Opportunities, Innovation and Leadership

The *Climate 2050 Agriculture Roadmap* proposes an implementation timeline to encourage swift early action on key GHG issues and on obtaining additional data and research to further understand the path to resiliency. Given the timelines and ambitious targets and goals, staff have continued to work with all levels of government and other partners, including the agriculture industry, to take action while planning and developing the *Climate 2050 Agriculture Roadmap*.

The goals, strategies and actions in the draft *Climate 2050 Agriculture Roadmap* incorporate public and stakeholder feedback, previously summarized in a report on engagement for the *Clean Air Plan* and the *Climate 2050 Agriculture Discussion Paper* received by the Climate Action Committee on November 13, 2020. Additional GHG reduction actions not accounted for in the *Clean Air Plan* but

included in the *Climate 2050 Agriculture Roadmap* involve examining the use of soil to sequester and store carbon. Additional research and data collection is required for this action item to thoroughly understand how it may contribute to a carbon neutral agriculture industry by 2050.

**Potential Impact on Greenhouse Gas Emissions**
Initial modelling of carbon neutral scenarios, including key actions for agriculture, were presented to the Committee in November 2020. The overall 2030 agriculture target was initially set at a 35% GHG reduction below the 2010 regional total but reaching this target is dependent on additional policy creation and new technologies being developed. Additional review and modelling will be required to fully determine what GHG emission reductions are possible for the agricultural sector as a whole.

Each of the *Climate 2050* roadmaps, including the *Climate 2050 Agriculture Roadmap*, is intended to serve as a "living, breathing" document that charts the path to achieving 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 measures and indicators. In coming years, staff will continue to work with the agricultural sector, residents, businesses and governments to amplify these actions and add new ones to accelerate the transition to resilient, carbon neutral agriculture.

**Relationship between the *Climate 2050 Agriculture Roadmap*, *Clean Air Plan* and *Metro 2050***
Approved on September 24, 2021 by the MVRD Board, the *Clean Air Plan* is 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 *Metro 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. The 2030 greenhouse gas reduction target in the *Climate 2050 Agriculture Roadmap* initiated from the *Clean Air Plan*.

In addition to incorporating actions from the *Clean Air Plan*, there are important connections between the *Climate 2050 Agriculture Roadmap* and *Metro 2050*, which is currently in the comment and review phase. Metro Vancouver, in partnership with its member jurisdictions, will manage regional land use and agricultural land protection through *Metro 2050*. The *Climate 2050 Agriculture Roadmap* will outline the actions necessary to achieve regional carbon neutrality and *Metro 2050* will shape the future of how we move and live. Together, these strategies will ensure that agricultural land protection, regional growth, food security and climate strategies are mutually supportive.

**ENGAGEMENT PROCESS**
Metro Vancouver is committed to engaging with the agricultural community, the public, stakeholders and other governments, including First Nations, that could be impacted by the *Climate 2050 Agriculture Roadmap,* and will incorporate feedback into the final document. 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 *Agriculture Roadmap*. Most of the GHG reduction actions in the *Climate 2050 Agriculture Roadmap* originated from the *Clean Air Plan* and were brought forward through the *Clean Air Plan* engagement and adoption processes.

Engagement for the roadmaps has been designed to reach a broad audience to convey the importance of zero emissions, low carbon and resilient agriculture. Engagement for the *Climate 2050 Agriculture Roadmap* will also require connecting to the local agricultural community including farmers and agricultural producers through the Metro Vancouver Agricultural Advisory Committee; the Ministry of Agriculture, Food and Fisheries; the Agricultural Land Commission; agri-tech focused businesses; and educational institutions and non-government organizations involved in agricultural-focused research. Feedback sought from these specific sectors and organizations might include: support or 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 a finalized *Climate 2050 Agriculture Roadmap*, which will be presented to the Committee and Board for consideration in 2022.

**ALTERNATIVES**

1) That the MVRD Board authorize staff to proceed with engagement on the draft *Climate 2050 Agriculture Roadmap*, as presented in the report dated October 13, 2021, titled "Draft *Climate 2050 Agriculture Roadmap*".

2) That the MVRD Board receive for information, the report dated October 13, 2021, titled "Draft *Climate 2050 Agriculture 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* from the Sustainability Innovation Fund has been approved by the MVRD Board and will be used to support engagement activities on the development and implementation of the *Climate 2050 Roadmaps*. Continued alignment of engagement activities and deliverables for the *Climate 2050 Roadmaps*, with the implementation of the *Clean Air Plan* and development of other management plans, 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 *Climate 2050 Agriculture Roadmap* lays out strategies and actions to transition regional agriculture to be resilient and adaptive to climate change and to reach carbon neutrality by 2050. If authorized by the Board, Metro Vancouver intends to seek feedback on the draft roadmap from the farming community, the public, stakeholders and other governments.

Staff recommend Alternative 1: for the Board to authorize staff to proceed with public engagement on the draft *Climate 2050 Agriculture Roadmap*. Engagement is intended to provide sufficient opportunity to interested parties to learn about the draft strategies and actions in the *Agriculture Roadmap* and provide feedback. Feedback from engagement will inform the development of a final *Agriculture Roadmap* for Committee and Board consideration, planned for 2022.

**Attachment**

*Climate 2050 Agriculture Roadmap*, draft dated October 13, 2021

47393125

# AGRICULTURE ROADMAP

Metro Vancouver acknowledges that the region's residents live, work and learn on the shared territories of many Indigenous peoples, including 10 local First Nations: Katzie, Kwantlen, Kwikwetlem, Matsqui, Musqueam, Qayqayt, Semiahmoo, Squamish, Tsawwassen, and Tsleil-Waututh.

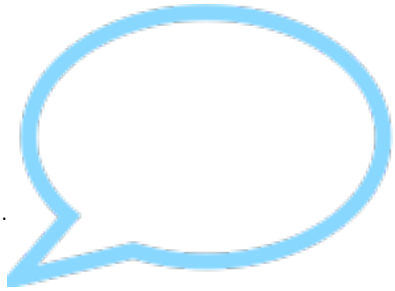
Metro Vancouver respects the diverse and distinct histories, languages, and cultures of First Nations, Métis, and Inuit, which collectively enrich our lives and the region.

FRONT COVER: FARMING IN METRO VANCOUVER

4515 Central Boulevard, Burnaby, BC, V5H 0C6
www.metrovancouver.org

October 13, 2021

## Your Input is Valued.



### We heard you loud and clear.

This Roadmap was drafted in Summer/Fall 2021 based on feedback received from the farming community as well as a broad range of individuals, organizations and stakeholder groups between Spring 2020 and Spring 2021. Engagement was centred around the Metro Vancouver *Agriculture Discussion Paper* to support *Climate 2050*, introduced for public and stakeholder comment in Spring 2020.

Public feedback is valued and project teams will continue to seek input on this draft Roadmap through the Fall/Winter 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 Agriculture 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.

# Metro Vancouver

**Metro Vancouver** is a federation of 21 municipalities, one Electoral Area and one Treaty First Nation that collaboratively plan for and deliver 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.

## Mission

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

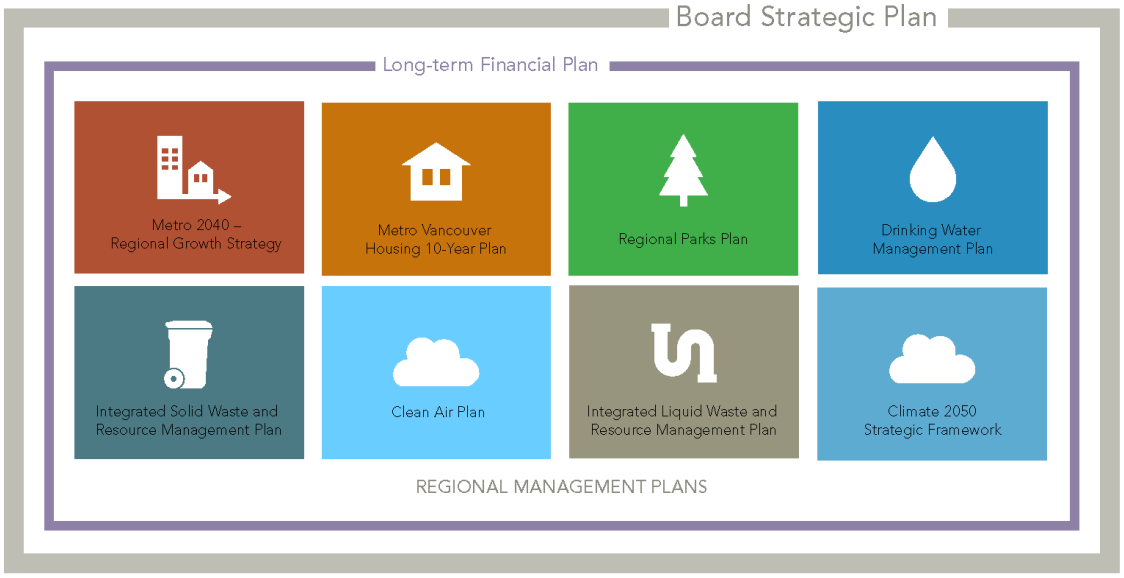
1. **Serve as a Regional Federation**
Serve as the main political forum for discussion of significant community issues at the regional level, and facilitate the collaboration of members in delivering the services best provided at the regional level.

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, 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.




**Metro Vancouver's Roles and Responsibilities for Climate Action**

The three broad roles outlined in Metro Vancouver's mission, each demonstrate responsibilities related to climate change**.** More specifically, under the *Environmental Management Act*, Metro Vancouver has the delegated authority to provide the service of air pollution control and air quality management and may, by bylaw, prohibit, regulate and otherwise control and prevent the discharge of air contaminants, including greenhouse gas emissions. Through the regional growth strategy, Metro Vancouver, with its members, plans for compact, complete communities that are foundational to enabling a carbon neutral, resilient region. As part of delivering its core services, Metro Vancouver also generates and uses clean, renewable energy from its facilities and is working to ensure core regional services and infrastructure are prepared for and resilient to climate change.

In its role as a regional forum, Metro Vancouver builds and facilitates collaborative processes which engage the public and build partnerships to address significant regional issues like climate change. As part of this role, Metro Vancouver coordinates with and advocates on behalf of its member jurisdictions to other governments and regional partners on greenhouse gas management and climate change adaptation initiatives. We will be looking to many other regional partners to lead the implementation of key actions in the *Climate 2050 Roadmaps,* highlighting the importance of ongoing collaboration with other governments and partners.

## The Roadmap at a Glance

Humans rely on agriculture to provide healthy, delicious food.  Agriculture relies on healthy ecosystems, balanced soils and predictable growing conditions to produce crops for our enjoyment and consumption. Increasingly however, agricultural producers have been facing difficult challenges in managing their operations due to the effects of climate change and have been identified as also needing to adjust their business practices to reduce their contribution to that changing climate.

Like many industries, agriculture will be affected by higher temperatures, shifting precipitation patterns, severe weather events and sea level rise. In response to these complicated and challenging climate change impacts, this Roadmap focuses on supporting new technologies, using renewable energy sources, supporting and conserving ecosystem services and healthy soils relied upon by farms, and using adaptation as a method to support a resilient agricultural community that will survive, thrive and help to reduce the effects of climate change.

The *Climate 2050 Agricultural Roadmap* is about taking the necessary steps to ensure the agricultural sector is supported in the journey to resiliency and ensuring the long-term production of the food humans rely on. This Roadmap lays out four key strategies and 26 actions that will reduce the region's greenhouse gas emissions and create a strong, adaptive agricultural community in Metro Vancouver by 2050.

The Agricultural Roadmap lays out 26 actions for reducing emissions and increasing resiliency, organized under the following 4 strategic areas:

Strategy 1: Protect Agricultural Land
Strategy 2: Support Farmers as Climate Action Leaders
Strategy 3: Support Long-Term Farm Health and Resiliency
Strategy 4: Leverage Economic Opportunities, Innovation and Leadership

To achieve a carbon neutral agricultural community in this region, we are going to have to support farmers - financially and through information sharing - to transition their operations to using new sustainable technologies (e.g., solar power) and to incorporating regenerative agriculture and nature-based solutions into their daily operations. Farmers should not be left to manage this transition on their own, and the food available to this region, both today and well into the future, relies on making these adjustments as a collective whole, with each stakeholder playing a vital and unique part:

- → For Farmers – it means using climate smart, ecological and regenerative agriculture and investing in new available technologies to take advantage of digital systems and processes;
- → For Industry – it means funding new research and embracing digital innovations or information sharing to create new low-carbon options (e.g., electric farm equipment);
- → For Consumers – it means increasing their awareness (e.g., the connection between agriculture and our resilience to climate change), adjusting their personal choices (e.g., eating more local food and reducing food waste), and becoming stronger advocates (e.g., supporting structural and regulatory change that protects agricultural land and the longevity of farming in the region); and
- → For Government – it means establishing policies, creating programs and providing financial assistance to bring all these elements together to support the changes needed in the agricultural sector in order for it to become fully adaptive and resilient to the climate challenges ahead.

# Contents

# Visioning Net-Zero Carbon, Resilient Agriculture in 2050

In 2050….agriculture is a key contributor to a low-carbon future having embraced clean and renewable energy sources, switched to regenerative farming practices, and transitioned farm land for both carbon capture and local food production.

Agriculture continues to significantly contribute to the Metro Vancouver regional economy, provides fresh, healthy food for local use and export markets, and operates in a sustainable and resilient capacity. Agricultural land is protected for future farming needs, and it helps to manage floods, captures carbon and provides habitat for pollinators and other wildlife while also benefitting from these ecosystem services.

Agricultural production practices have evolved and continue to adapt to the vulnerabilities of climate change. Farmers are able to pivot operations to manage changes in temperature and rainfall and are able to adjust farming practices and adapt to extreme weather events by using technological innovations and by taking advantage of new or expanded capacity and financial support systems. The agricultural community has seen noticeable improvement and maintenance of soil health and overall has increased and expanded its agricultural viability ensuring a long-term succession of farming and sustainable local food production for future generations.

PLACEHOLDER FOR IMAGE

# Climate 2050 Agriculture Roadmap

A pathway to net-zero carbon, resilient Agriculture in Metro Vancouver

## The Challenge

Agriculture in the Metro Vancouver Region contributes to the regional economy and provides fresh, healthy food for residents, visitors, businesses and export markets. In addition, agricultural land provides an aesthetic landscape, and other public benefits called ecosystem services, including wildlife habitat, carbon sequestration, water infiltration and flood management. At the same time, agricultural activities cause greenhouse gas and common air contaminant emissions. These come from livestock production, farm equipment, excess fertilizer applications, burning of organic residues, and the heating of greenhouses with natural gas and other fuels.

Compared to the biggest contributors of greenhouse gas emissions in the region, agriculture contributes approximately 4% to the total mostly from three main sources: 1. carbon dioxide produced from fuel combustion to heat greenhouses and to run farm equipment; 2. methane from livestock and manure storage; and 3. nitrous oxide from fertilizer and manure soil treatments. While the agricultural community is not a large contributor overall, all sectors will need to lower their emissions contributions in order for Metro Vancouver to hit carbon neutrality by 2050.

Agricultural activity is also vulnerable to the impacts of climate change. Farmers are dealing with changes in temperature and rainfall, and extreme weather events, all of which affect local food production. To increase our resilience, we need to support farming practices that improve soil health, strengthen agricultural viability and sustain local food production for future generations.

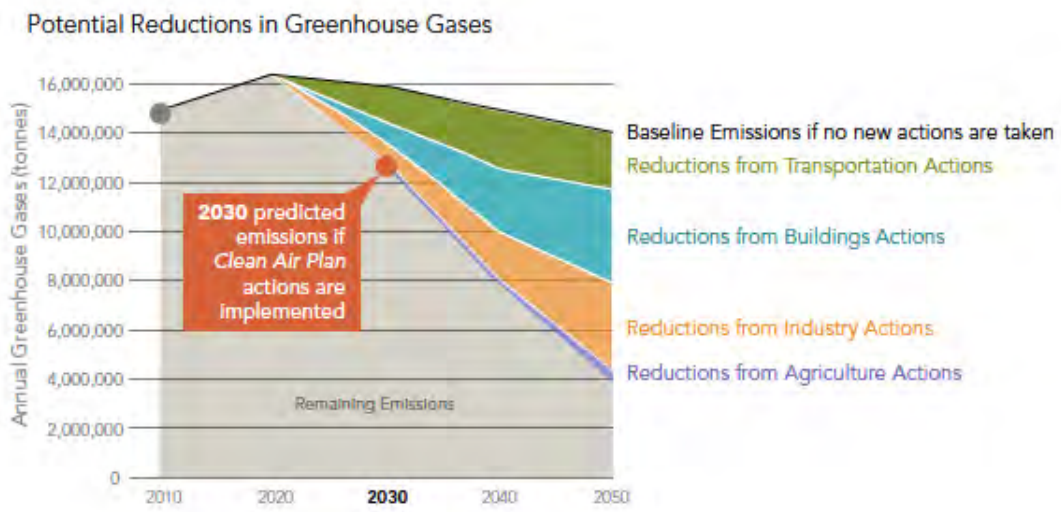
We are creating a roadmap to help us reach a low-carbon, resilient future while also improving air quality. By 2050, we can make agriculture carbon neutral and power it with clean, renewable energy. Farmers can use regenerative farm practices to capture carbon and build the soil for long-term productivity. And we can protect and invest in agricultural land to enable food production and provide secure tenure to farmers, and sustain the agricultural community over the long term.

*Call Out Box: What is a Carbon Neutral Region?*
*A carbon neutral 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 in the region remove from the atmosphere, or potentially through technological means.*

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 onto our children and grandchildren at higher costs and consequences. 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

| GOALS | TARGETS AND MEASURABLE OUTCOMES |
|---|---|
| **GOAL:** The agricultural sector is carbon neutral and maximizes carbon sequestration. | **TARGET**: 35% reduction in greenhouse gas emissions, relative to 2010 levels. |
| **GOAL:** All agricultural operations minimize greenhouse gas emissions using best available management practices and technologies, and are powered by clean, renewable energy. | |
| **GOALS:** The Agriculture community consistently applies its knowledge of the benefits of ecosystem services to support the resiliency of local farming operations. | **MEASURABLE OUTCOMES:** To Be Determined: measurable climate-resilient outcomes are currently unknown for the agricultural community. Additional review and consultation will be required to determine what outcomes are attainable and available to measure on how well the region's agricultural producers are adapting to climate change impacts. |
| **GOAL:** Metro Vancouver complete food system is adaptable and resilient. | |
| **GOAL:** Long-term investment in the Agriculture community is coordinated and successful. | |

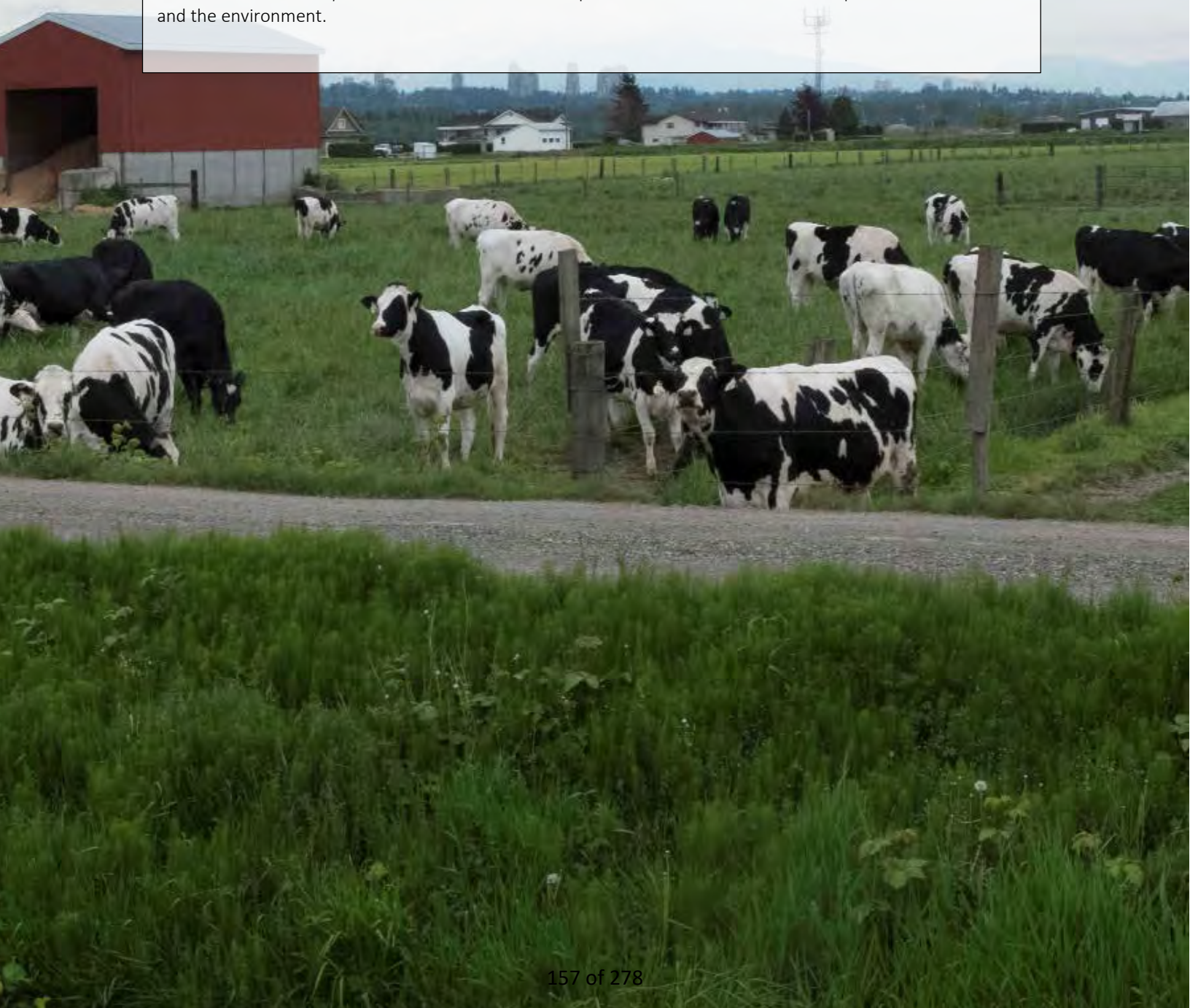


## The Connection Between Climate and Air Quality

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 2030 target of reducing regional greenhouse gas emissions by 45% compared to 2010 levels, and establish the foundation for the 30-year commitment of a carbon neutral region by 2050. This management plan also addresses air quality targets for the region.

Agricultural activities including fuel combustion in greenhouses and farm equipment, manure management, livestock and fertilizer use, generate both greenhouse gases and air contaminants with direct health impacts, such as fine particulate matter, ammonia and nitrogen oxides. Residents in the region generally experience good air quality; however, health researchers have demonstrated that there are no known safe levels for some health-harming air contaminants.

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

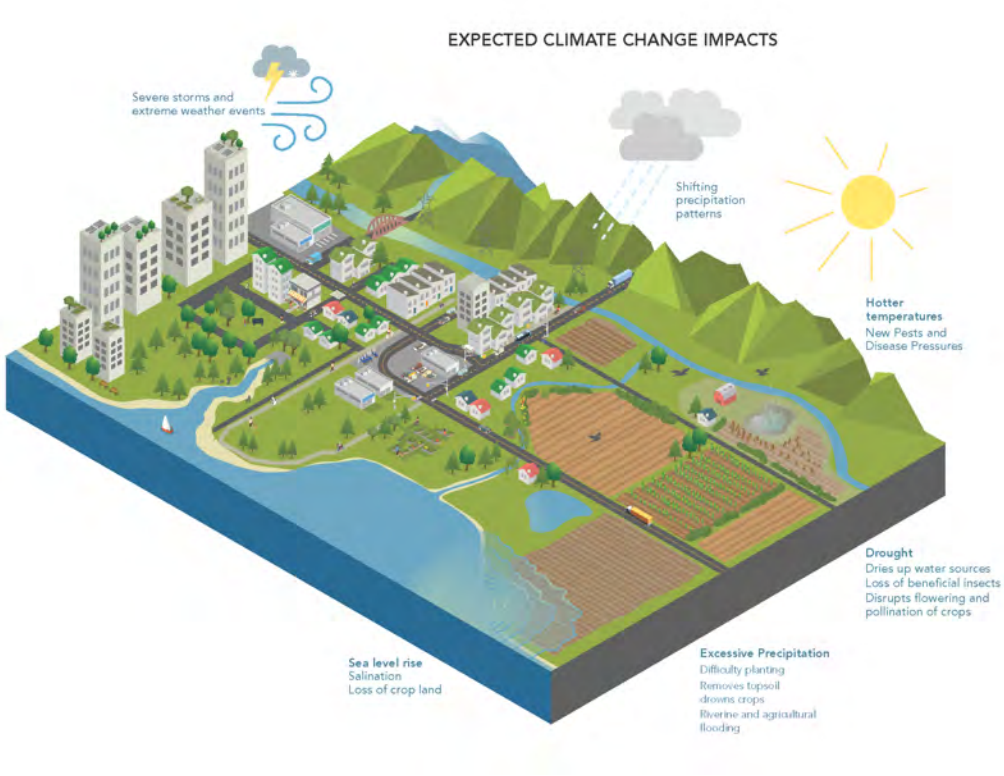


# Climate Impacts on Agriculture

The agricultural sector is one of the most vulnerable sectors to the impacts of climate change. Farmers will continue to deal with changes in temperature and rainfall, shifting pests and diseases, and extreme weather events that significantly affect local food production. These impacts are not unique to the region, and have been and will continue to affect those agricultural areas in other parts of the world that supply food to this region. Climate change will lead to an overall increase in temperature, which may benefit agriculture by expanding the growing season, enabling a wider variety of crops that can be produced locally; however, there is also uncertainty and significant climate risks to agriculture such as the increased frequency and severity of extreme weather events - droughts, heat waves, heavy rainfall and flooding.

Extreme conditions will have immediate impacts on food production in the Metro Vancouver area as well as other parts of North America and internationally that supply food in this region.

Adverse impacts on agricultural crops are expected from higher temperatures, increased frequency and/or severity of droughts and storm, severe precipitation events, and salinization of soil and groundwater due to sea-level rise. The potential impacts to agriculture will increase costs of crop and livestock production and reduce economic viability.




PLACEHOLDER GRAPHIC

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

## Climate Changes

Higher 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 m 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

Adjustments in temperature disrupt expected seasonal temperature changes affecting fisheries, livestock and crop mortality and the increase in the prevalence of new parasites and diseases. A longer growing season does lead to earlier harvests, a greater range of crop suitability and a decrease in heating costs for greenhouses in cooler months; however, warmer temperatures lead to an increase in demand for water for irrigation during the growing season and exacerbates pest and disease problems that are controlled by cooler temperatures.

Variations in temperature increase the variability in growing conditions which can impact crop quality, pollination and the life-cycle of pests and disease. These changes create challenges in aligning production with processing schedules. Hotter summers and heat waves also decrease productivity and crop quality and increase crop losses. Heat stress may require more heat-tolerant plants which may not currently be in use and may increase stress on limited water resources placing additional demands for irrigation. Energy use increases for the cooling and ventilation of greenhouses, crop storage and livestock.

Changes in precipitation increases the demand for supplementary irrigation that could put pressure on local water supplies and on adjacent ecosystems and riparian areas. Unreliable rainfall during the growing season increases irrigation requirements that didn't previously exist and waterlogged soils lead to delayed planting, soil compaction and nutrient leaching. Crop damage, crop loss, livestock relocation and soil erosion are all additional challenges agricultural producers are faced with due to the experienced changes in precipitation experienced within this region.

Riverine and field flooding from periods of extreme rainfall and increased runoff from adjacent urban development reduces ground permeability and causes long-term inundation of water into agricultural lands. This water intrusion reduces and limits land-use potential and causes root rot damage to year-round crop varieties.

More incidences of coastal flooding from higher tides and more severe storm surges causes immediate and long-term damage to agricultural land and operations including increased salinization of soils from brackish water, increased coastal erosion, loss of livestock and crops, reduced fish passage and a decrease in water quality used for irrigation and ecosystems. Coastal flooding also places additional pressures on ensuring flood prevention mechanisms, such as dykes, spillways and pumps, are all adequately maintained.

Food loss from climate change impacts affects the availability and pricing of local food producers, as well as international food markets, to produce enough food for human consumption. Local food systems impacted by climate change also experience disruptions to regional infrastructure, supply and delivery lines, a skilled agricultural labour force, and trade markets. This may lead to food price increases, food shortages of some agricultural products, distribution disruptions and an overall increase in food insecurity for an area.

## Emissions from Agriculture in Metro Vancouver

Metro Vancouver's 2015 regional emissions inventory estimates that agricultural activities generate 4% of total greenhouse gas emissions in the region. The major sources of agriculture-related greenhouse gas emissions in this region are: carbon dioxide from fuel combustion in greenhouses and farm equipment; methane from livestock and manure storage; and nitrous oxide from fertilized and manured soils.

Agriculture emits 10% of the total greenhouse gases in Canada, with similar estimates for agriculture globally. This figure only measures emissions from agriculture production (including for food and non-food products) and does not reflect the full spectrum agricultural system emissions caused by upstream fertilizer and farm equipment manufacturing nor downstream from food transportation, refrigeration, processing and food waste disposal.

Opportunities to reduce greenhouse gas emissions from agriculture in Metro Vancouver include using cleaner, more renewable fuels, reducing energy demands and improving the energy efficiency of greenhouses, improving fertilizer and manure management, and altering livestock diets. Agriculture can also contribute to carbon sequestration by maintaining existing natural vegetation and woodlots, planting trees and hedgerows, and using regenerative farm practices that add carbon to soil. Protecting agricultural land for farming also prevents land conversion and development that generally emit more greenhouse gases.

# Net-Zero Emissions, Resilient Agriculture

Reaching net-zero emissions and resilience in the agriculture sector involves considering and balancing, wherever possible, necessary elements of climate change action:

- Reducing Greenhouse Gas Emissions that accelerate climate change.
- Increasing resilience and the agriculture sector's ability to prepare, respond and recover from the effects of climate change that cannot be avoided.

A "net-zero emissions and resilient" agricultural sector is one that emits almost no greenhouse gas emissions and is able to withstand the negative effects of a changing climate, ensuring farm yield and business livelihoods are maintained. Looking to 2050, the *Roadmap* seeks to support the continued transition of agriculture toward a net-zero emissions future where renwable energy systems, innovative farm practices, and grazing and crop techniques support a sustainable and thriving future. By aiming for all of these desired outcomes simultaneously, we can identify ways to reduce emissions and vulnerability to climate change impacts at the same time.

In order for meaningful change to take place within the agriculture community, it is helpful to examine how it is connected to the three pillars of sustainability: economic, environmental and socio-cultural. These three pillars can also be used to structure and support necessary solutions and actions for change.

1. ECONOMIC - agricultural operations are businesses that need to make profits in order to survive and continue to function; these businesses can be difficult to adjust and may rely on expensive innovations and new technologies that still need to be developed in other sectors. For example, farmers cannot stop using diesel tractors until alternative fuel source (e.g., electric) tractors have been developed and commercialized. When appropriate funding, incentives and technologies are offered to the agricultural sector, farmers can begin to implement these new innovations while still maintaining a profitable business.

**What is the difference between "Zero Carbon", "Zero Emissions", "Net-Zero" and "Carbon Neutral" and what is "Carbon Sequestration"?**

"Zero Carbon" also known as Zero Carbon Emissions, is reached when no greenhouse gas emissions exist at the point of use. A zero carbon fuel source either produces no greenhouse gas emissions, or the greenhouse gas emissions that are produced are offset by renewable energy (either generated onsite or purchased).

"Zero Emissions" are reached when no greenhouse gases or other air contaminants are generated at the point of use. Zero emissions include zero carbon and the elimination of or non-existence of health-harming air contaminants (e.g., fine particulate matter and nitrogen oxides).

"Net-Zero" is reached when there is a balance between the whole amount of greenhouse gases that are released into the atmosphere and the amount that is taken out.

"Carbon Neutral" is reached when a company achieves a balance between the carbon dioxide it releases into the atmosphere and the amount it takes out.

"Carbon Sequestration" is a process of capturing and storing atmospheric carbon dioxide. In the agricultural context, carbon sequestration includes carbon storage in soils in conjunction with sound land management practices, and is one component in creating a resilient agricultural sector.

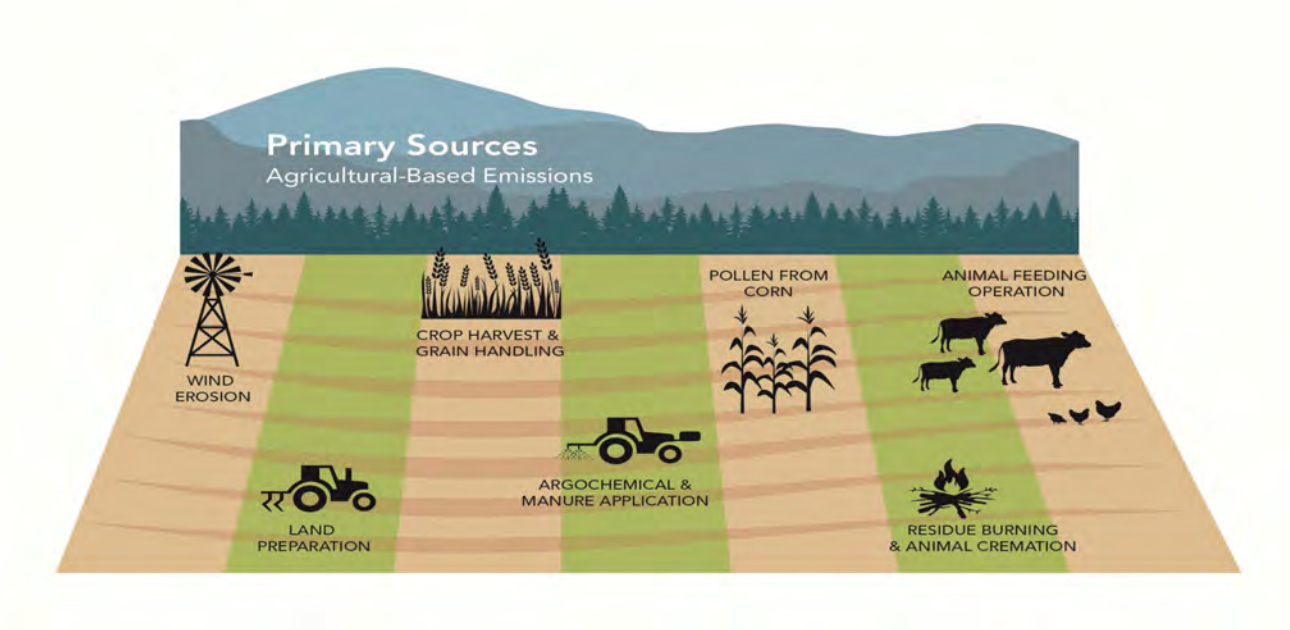
2. ENVIRONMENTAL - farming relies on and is affected by the environment. Affecting change, including using new fertilizer types and application methods, incorporating new irrigation systems and adjusting soil quality to increase carbon sequestration are all adjustments to farming practices that may take multiple growing seasons to determine if they were successful or not. Using nature-based solutions to solve problems is likely the best case scenario; however, outcomes are hard to determine in the short term.

3. SOCIO-CULTURAL - many farms are family-run businesses with generational ties to farming practices and many farms operate within a region where most residents have limited experience with the challenges and realities of running a farm. While these can both be challenging to overcome as farming is faced with the necessity to adjust its practices, generational knowledge and the desire for residents to have a closer connection to their food can also be used as positives for change.

## Lowering Emissions Through Renewable Energy and New Technology

Agricultural operations emit air contaminants that can impact human health and the environment. These contaminants are sourced from a variety of farming practices including: the use of poultry and cattle manure; by-products from heating greenhouses; feed types provided to livestock; fertilizer application; and pesticide application.

Each of these contributors to air contaminants can be mitigated and addressed using a combination of renewable energy sources, new technologies, new management practices, and new input application methods.




### 1. Renewable Energy Sources

Renewable energy sources such as biogas and wind and solar have been around for decades and, when applied as alternative energy sources, their use helps to significantly reduce greenhouse gas emissions. Trucks, tractors and other non-road equipment, as well as greenhouses and agricultural buildings, all represent opportunities for the agricultural sector to transition to the use of clean, renewable energy sources. Most agricultural vehicles and equipment are extremely expensive (each range from $15,000 - $700,000 when purchased new) and are built to be durable and used for decades. Farmers need help to turn these vehicles over and take them out of production and they need technologies to advance making the option to purchase, for example an electric tractor with the same operating costs and life span as the current diesel version, actually possible.

### 2. New Technologies

New technologies across all industries are being invented, tested and applied to mainstream uses on a regular basis. Within the agricultural sector, new energy sources such as renewable natural gas (RNG) hydrogen energy, and re-using captured carbon dioxide are all options that have potential to transform farming operations into carbon neutral producers. Greenhouses have the most to gain from these new technologies; however, more research is required to fully understand how fuel is used and released and how different technologies and fuel types can be applied to existing buildings and production systems. These new technologies can be used in conjunction with improving the energy efficiency of greenhouses (for example, making them more air tight and improving thermal performance) to increase the overall sustainability of the agriculture sector. Businesses involved in the Agritech Grant Program in British Columbia are providing insight into how farming can evolve.

### 3. New Management Practices

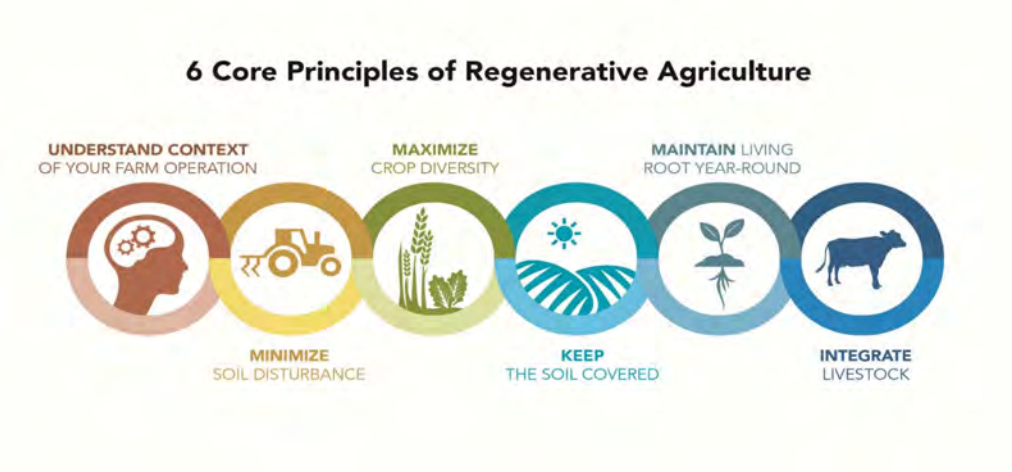
Adjusting production management practices at the farm level is an area where the agricultural community has more individual control. Enhancing grazing practices and optimizing grass and forage quality has shown to reduce methane emissions from cattle and retaining, expanding and adding freshwater wetlands and riparian zones directly onto farms can increase a farm's resiliency, and using regenerative agricultural practices within production fields can increase the ability for soils to store carbon, thereby releasing less carbon emissions into the atmosphere. Additional data collection in this area is vital to understanding the degree to which the agricultural community can, contribute to a reduction in greenhouse gas emissions in the region, and determine how these management practices can contribute to the long-term resiliency of agricultural producers.

### 4. New Input Application Methods

In farming, field crops use nutrients, or inputs, (e.g., potassium, phosphorous and nitrogen) to grow. These nutrients are replaced back into the soil for each growing cycle through the use of mineral fertilizers. As these fertilizers are applied to crops, ammonia and greenhouse gas emissions, such as nitrous oxide, are released into the atmosphere. A convenient and standardized approach to fertilizer use involves an even application across entire fields regardless of plant need. Research has been conducted that shows that slow-release fertilizers and precision applications (for example, using field mapping to determine which specific parts of the crop need the fertilizer) can reduce emissions produced from using this input.

## Understanding and Benefitting from Ecosystem Services

The agriculture sector within Metro Vancouver, British Columbia, Canada and across the globe is at a turning point of needing to adapt to the increasingly extreme effects of climate change. Every season, floods, rainfall events, heat waves, and droughts last longer or are more severe. Crop losses are more extensive, pest management is more difficult, and production costs are more expensive. Through all of this, farmers are relied upon to continue to produce the same quality and higher quantities of food even while it becomes harder and more challenging to do so. In order to continue to fill this economic and social need, farms must become as healthy and resilient as possible. This is achieved by understanding and benefitting from the ecosystem services provided by nature and working with those systems to ensure the long-term viability of agricultural producers.




### 1. Support Regenerative Agriculture

The agricultural sector is affected by and relies upon the natural environment. As the negative effects of climate change continue to increase and take their toll on farming operations, the natural environment increasingly is being identified as something farmers can turn to, not only to help them adjust to the changing conditions, but to also work to actually counteract climate change. Regenerative agriculture focuses on building high-quality soil, increasing biodiversity, and retaining rainwater with a focus on working in sync with nature. Land management practices such as agroecology and agroforestry are increasingly being applied by farmers globally and show promising signs of success.

### 2. Support and Expand Ecosystem Services

Regenerative agriculture and maximizing ecosystem services on farmland will help farmers manage against the uncertainty of the timing, extent and frequency of extreme weather conditions. Programs such as Farmland Advantage, work directly with farmers, helping to not only conserve critical riparian streams and habitats but making farms more resilient to climate concerns. Farmland Advantage targets high risk and high opportunity (e.g., where support by a farmer already exists) areas throughout British Columbia and focuses on providing assessments and working collaboratively with farmers. Identifying the best ways to enhance ecosystem services on farmland largely depends on understanding the regional specialization and differences in landscapes, for example, rain, wind and sun microclimates, ocean and riverine environments, species at risk locations, soil composition, etc. One way to identify these differences is to conduct natural asset mapping, an evaluative process that compiles an inventory of a community's existing natural assets (e.g., aquifers, forests and wetlands), within Metro Vancouver's agricultural areas, to determine how these areas can currently work to collectively create a resilient agricultural sector.

### 3. Payment and Programs for Ecosystem Services

In order for the agricultural sector to be resilient in the wake of a significantly changing climate, adaptation will need to take place at the farm level. This requires that individual farmers take their land out of production; and although this results in the farmer losing the ability to expand their business, these set-aside areas also provide benefits to the farmer in the form of ecosystem services that provide habitat for pollinators and well as natural

flood and erosion control. In order to make establishing set-asides financially viable for the farming community, they need appropriate compensation, directly or indirectly, for these set-asides. Delta Farmland and Wildlife Trust and Farmland Advantage provide programs that specifically support ecosystem services in farmland in Metro Vancouver but there are other indirect tools (e.g., land acquisition programs) that can be used to share the burden throughout the entire population of Metro Vancouver as all residents, businesses and visitors benefit from supporting measures that help farmers maintain a sustainable business and that help farms adapt and increase their resiliency.

Other programs and policies that have been used throughout British Columbia and Canada to support the expansion of ecosystem services in agricultural areas include: Land Acquisition Fund Property Levy (Capital Regional District); Natural Asset Reserve Fund (Edmonton); reverse auctions (Ducks Unlimited); Species at Risk Farm Incentive Program (Ontario); Land Stewardship and Habitat Restoration Program (Ontario); Natural Area Protection Tax Exemption Program (Vancouver Island); Riparian Tax Credit (Manitoba); Stewardship Portal (Ontario). Funding sources for the lower mainland would need to be examined and reviewed to determine the most appropriate and effective option for supporting ecosystem services within Metro Vancouver's agricultural areas.

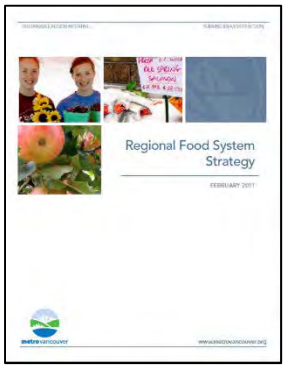
### 4. Focus on Soil Health

Good soil health is the backbone to a sustainable, resilient farm operation. Healthy soils help with water retention and infiltration, help reduce the effects of drought and the need to use fertilizers, help improve soil nutrients and can help roots grow deeper and sustain cover crops which helps sequester carbon and reduce carbon dioxide release into the atmosphere.  Beneficial Management Practices (BMP) for maintaining soil health, as used in regenerative agriculture, include reducing or eliminating tillage, reducing and minimizing soil disturbance and keeping plants growing year-round through the use of cover crops during the off-season. Work and research is currently on-going in Metro Vancouver to determine the benefits of healthy soils, which is imperative to help farmers understand how they can adjust their business practices to get the inherent benefit of the soil they depend on so much.

# Developing Adaptable and Resilient Food Systems

The Metro Vancouver region is one of the most important food producing areas in British Columbia. The system that supports food production in the Lower Mainland is comprised of a myriad of players engaged in farming, processing, transporting, distributing, celebrating and food waste recovery. These players function as individual units yet are simultaneously part of a larger natural, social, economic and political system that is incredibly complex, layered and multi-jurisdictional. Food systems that are sustainable and able to adapt to changing climate, economic and societal conditions must be energy efficient, protect ecosystems as part of their operations, build and bind a local community, and provide for sustained and attainable economic development opportunities.

In the context of this Roadmap, sustainable food systems are not just about providing local, healthy food, they are about ensuring the resiliency of the farm system in the context of significant major driving forces such as development pressures, climate change impacts, greenhouse gas emissions reductions, increasing transportation costs, pandemics and global health crises, and droughts, floods and an increased incidence of severe weather events to name a few. A transition to a sustainable, adaptable and resilient food system will require a multitude of interventions, decisions and changes in business and consumer practices both at the community and individual level.





### 1. Update Food System Strategy

A key step in examining the resiliency of Metro Vancouver's food system is to update the existing Regional Food System Strategy. This would allow for a separate process to answer tough questions about sustainability, adaptability and resiliency solely from the perspective of food. New experiences such as a global pandemic and exacerbated experiences such as extended heat waves and droughts can be examined cohesively with other issues such as vulnerabilities in the food chain, Indigenous access to traditional foods, inefficiencies in the transportation system, expansion of agricultural waste reduction; and Agritech and the role of technology and innovation.

### 2. Plan for Systemic Agricultural Changes

Large portions of the most productive agricultural land occupy low-lying, reclaimed coastal regions are susceptible to coastal flooding and are at risk from increased soil salinization and widespread farmland inundation and crop losses. A significant amount of work has already been done examining how communities are going to manage sea level rise and increased coastal flooding but there has not been a singular, regional examination of what that means specifically to the agricultural community, how it can be addressed and what systemic changes are needed in order to ensure the long-term viability of the region's farms. Focusing on cover crops, improving soil structure, switching to salt-tolerant crops are all elements that need to be examined in more detail and applied under a regional scale.

## REGIONAL FOOD SYSTEM STRATEGY

In 2011, the Metro Vancouver Board endorsed the Regional Food System Strategy to create a collaborative approach to a sustainable, resilient and healthy food system. Since that time, the region has experienced a significant amount of urban growth, has seen increased and unprecedented pressure for agricultural lands to accommodate non-farm uses, has experienced increased food insecurity among vulnerable populations and among new demographic sectors as a result of a global pandemic, has experienced increasing changes to climate such as heat waves and droughts and has not addressed gaps in the previous Strategy including managing for hazards such as floods and earthquakes and engaging with the Indigenous community to help them expand access to traditional food sources.

In order for these issues to be explored from a purely food-centric perspective, they will be included in a review of Metro Vancouver's Regional Food System Strategy separate from this Roadmap. Of particular note, the following items should also be explored from a food system point of view:

i. examine the Milan Urban Food Policy Pact to determine what regional monitoring frameworks can be implemented to evaluate gaps in policy and resource mobilization and reveal overall food system improvements;
ii. examine the entire food system chain from a regional level to determine where emissions can be reduced and what efficiencies can be achieved;
iii. examine the Food and Agriculture Organization of the UN to determine what sustainability indicators can be applied regionally to Metro Vancouver;
iv. identify partnerships with industry, for example, Cleanfarms.ca, to determine ways to reduce packaging waste in the agriculture and food industries;
v. work with the Indigenous Advisory Council on Agriculture and Food, as well as other Indigenous partners, to identify opportunities to strengthen Indigenous food systems and increase Indigenous participation in the agriculture and food sectors;
vi. establish partnerships and programs to support and increase information sharing with farmers about the sustainability challenges faced by the agricultural sector;
vii. establish partnerships and programs to support and increase information sharing with the consumer about how food is produced, sustainability challenges faced by the food sector, and the benefits of supporting local farmers;
viii. examine how the local agriculture community can diversify including: new, more resilient crop species; appropriate locations for crops based on soil type and hazard vulnerabilities (e.g., coastal flooding); and new adaptive agricultural management and production models;
ix. gain a complete and comprehensive understanding of a farmer's realities regarding regulations, jurisdictional requirements, food safety needs, access to labour, profit margins, machine and equipment purchasing and maintenance costs and how that relates to the price of food to the local consumer; intended to bridge the gap between the realities of the farming community and expectations of the consumer;
x. establish inter-municipal learning opportunities for staff, administration and council to learn from each other and understand how municipal interests and activities intersect with food systems planning and decision-making;
xi. determine the content for a toolkit to be used by new or young farmers interested in starting a farm operation within Metro Vancouver, including step-by-step instructions to follow, Beneficial Management Practices to follow, and financial sources to seek;
xii. address the tension that exists between food safety (health protection) and food security (health promotion) activities.

# Enable Long-Term Investment in Agriculture

Agricultural producers understand and largely support the need to adapt and adjust their processes to remain viable as an sector; however, they have experienced gaps in the knowledge, financial support, policy structure or understanding of what these adjustments should be, how to go about making them happen on their farms, and how they can be applied to their business practices.



### 1. Support Champions and Provide Strong Leadership

In order for the agricultural sector to make the necessary adjustment to manage for climate change and keep their farming operations running and viable, long-term investment in agriculture and farming operations is necessary at all levels and through multiple streams: financial, support services, leadership, innovation, education, policy and regulation. While climate adaptation requires changes to individual behaviour as well as business practices, these changes are often unsuccessful without the necessary champions and leaders (e.g., BC Climate and Agricultural Initiative).

### 2. Ensure Policy, Regulatory and Financial Support

In order for the agricultural sector to remain viable and to continue to adapt to changing climate conditions, all levels of government in Canada will need to ensure there are adequate policies and regulations established to support innovation and create opportunities for businesses to be flexible to adjust to changing international, national, local and sector needs. Regulators will also need to show leadership in understanding and supporting that conventional farming models will likely not be applicable in the future and that alternative models with new and multiple objectives should be pursued. Tax reform, incentive programs, learning opportunities, research funding, and an overall recognition and understanding of the importance of supporting the agricultural sector as it adjusts and adapts to the new climate realities will go a long way. Coupled with the policy and regulatory support needed by the agricultural sector is the financial support farmers need to make this transition. Financial support doesn't just have to show up through complicated adjustments to tax structures or finding ways to reduce the impact of the high cost of land in the Metro Vancouver region, it can also take place through offering programs that provide specialized agricultural advisement to primary producers, supporting extension services that help understand supply chain, packaging, food safety, human resources, and marketing and distribution commitments.

### 3. Create Opportunities to Increase Self-Sufficiencies

Many farmers rely on others to provide them information on how they can adjust their operational practices to become more resilient. Production improvements are often suggested to farmers, for example, to incorporate new growing practices, add new building technologies, or participate in educational opportunities that may require expensive testing to implement (e.g., soil for carbon sequestration), may not be readily available (e.g., solar powered equipment) or that may be offered during the most productive part of a farmer's day. Part of the leadership gap that exists in the agricultural sector is the lack of resources that could help farmers increase their existing self-sufficiencies by relying less on outside sources to determine if a new farming method is successful or not. Programs such as COMET (US Department of Agriculture) allow farmers to use an online evaluation tool to determine a generalized estimate of the greenhouse gas impacts of a conservation or adaptive principle implemented by the farming operation. Tools like these provide more knowledge and information to the farmer to make better decisions and allow for more adaptive and innovations on their own farms. Online programs like AgPal (Government of Canada) allow farmers and agri-businesses to find relevant resources and information (for example, funding and grants, licensing and regulations, business practices, science, environment and sustainability) in an easy to access platform that they can use at a time that is suitable to them. Expanding and supporting these types of

resources go a long way in increasing a farmer's ability to be self-sufficient and able to adjust and pivot to outside changes and pressures.

### 4. Integrate the Use of Technological Solutions

While the agricultural sector is making great strides in using regenerative agricultural practices and ecosystem services to create sustainable farming operations, technology is also playing a vital part in helping farmers adjust to climate change and increase their overall operational resiliency. Supporting technology to optimize fertilizer application, generate renewable energy from agricultural residues, and assist with pest, water and soil management are great examples of how farming is benefiting from high-tech innovations. Continuing to innovation and technology, as well as Provincial programs such as Agritech (supports agriculture and food and seafood processing) will help the agriculture sector in Metro Vancouver, and throughout the province, remain competitive, diverse, resilient and adaptive.

# Barriers and Opportunities

Most barriers are also chances for opportunities....

### International Pressures

| Barrier | Opportunity |
|---|---|
| Farm businesses are expected to accommodate all climate-related policy and regulatory changes while working with global commodity prices and also competing with cheaper imports. | Climate change is experienced locally but it is being experienced globally and throughout the world people are experimenting and researching solutions that may be applicable in a local setting; solutions can be shared. |

### Sea-level Rise and Extreme Weather Events

| Barrier | Opportunity |
|---|---|
| Salt water intrusion is an on-going issue and drainage problems and flooding pose great risks; the extreme land shortage in the Lower Mainland doesn't provide opportunities to 'move' farmland to somewhere else. | Pushing the sector and all levels of government to collaboratively develop solutions by developing salt-resistant crops and by supporting crop diversification within the region thereby establishing a more resilient agricultural sector. |
| Lack of knowledge and understanding by the consumer on how extreme weather events, for example an on-going heat wave, affect their own food security. Crop damages due to extended droughts and high temperatures not only affect crop production, they affect a farmer's livelihood, decrease the amount of food available for consumption and increase food costs. | Communication with surrounding urban communities is an opportunity to connect them with their local food and strengthen the urban population's understanding of agriculture and how their personal decisions and choices toward managing climate change can be connected to the cost of the food they consume. |
| Ongoing insufficient access to water for irrigation for agricultural purposes. | Determine how using practices such as regenerative agriculture can directly impact the amount of water needed by the agricultural sector to reduce the effects of climate change; test and implement alternative water storage and recycling methods and strategies to overall increase the resiliency of the farming community within Metro Vancouver. |

### Local Decision Making

| Barrier | Opportunity |
|---|---|
| Financial costs from the effects of climate change hinder the agricultural sector's ability to produce food. | Adjust policies, regulations, and financial structures to shift toward supporting the agricultural sector in becoming more resilient and finding ways to best adapt to the climate challenges ahead. |
| Urban development impacts and the effects of climate change have not been factored into managing and protecting local agricultural land and managing and dealing with water shortages. | Local governments can apply local solutions to ensuring the resiliency of the agricultural resiliency; not all of their decisions are reliant on other levels of government to approve. |
| The agricultural community is marginalized and produce food for consumers who do not understand the challenges and risks that go into local farming. | Communication with surrounding urban communities is an opportunity to connect them with their local food and strengthen the urban population's understanding of agriculture and how their personal decisions and choices toward managing climate change can be connected to the cost of the food they consume. |
| Lack of access to irrigation for agricultural purposes including: water licences that are over prescribed; | Determine how using practices such as regenerative agriculture can directly impact the amount of water |

| | |
|---|---|
| water taken without a licence; marginal ground water quality; and difficulty accessing ground water sources. | needed by the agricultural sector to reduce the effects of climate change; test and implement alternative water storage and recycling methods and strategies to overall increase the resiliency of the farming community within Metro Vancouver. |
| Standing in the way of farmers to fully integrate adaptability and sustainability into their farm operations includes no capacity to do so and the processes, applications and permitting being too onerous, costly and time consuming. | Support and expand programs such as Farmland Advantage that directly provide support services to assess a farmer's land, determine remediation needs (if any), follow-up with additional inspections and provide payment for ecosystem services. |
| There are more non-farm landowners in ALR than farmers in Metro Vancouver making it difficult to comprehensively use agricultural land to manage for climate change; high absentee landlords in the ALR make it difficult to access underused agricultural land; agricultural land is held idle by non-farm land owners while at the same time there are operators who cannot find land to use for farming purposes. | Adjust policies, regulations and financial structures to make non-farm uses that do not support agricultural operations harder to support for the long-term and that make it less financially viable to use agricultural land for uses other than agriculture. |
| Metro Vancouver farmland is very desirable for estate and non-farm use development and activities that generate higher financial gains compared to food production and agricultural uses, makes it difficult to comprehensively use agricultural land to manage for climate change. | Adjust policies, regulations and financial structures to make non-farm uses that do not support agricultural operations harder to support for the long-term and that make it less financially viable to use agricultural land for uses other than agriculture. |
| Ongoing tension and pressure from industrial sector to expand into and convert agricultural land to ease regional industrial land shortages. | Adjust policies to re-affirm using Agricultural land for agricultural purposes; specifically examine how agriculture and ag-industrial uses can co-benefit and co-exist within a region that experiences pressures for both use types. |

### Ongoing Research and Support

| Barrier | Opportunity |
|---|---|
| Switching to high-value crops may be challenged by exposure to pests, soil salinization etc. | The integrated pest management approach inherent in regenerative agriculture provides an opportunity to address increased pest exposure; research and technology can determine ways to adapt crops and farmland to better manage sea water inundation and the increased salinization of soil as a result. |

## Journey to Net-Zero Emissions, Resilient 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.

**Linkage to Other Issue Areas**

There are several linkages between agriculture and other issue areas and Metro Vancouver is exploring which linkages must be considered when developing policies and actions. This *Roadmap* primarily addresses agriculture within our region and impacts and actions related to climate change or air contaminants. Some of the related issue areas for agriculture are:

Land Use and Growth Management – Containing urban growth protects agricultural land for farming. Agriculture is vulnerable to impacts from adjacent land uses and new housing developments and transportation infrastructure.

Human Health and Well-Being – Fresh local and imported food, especially fruits and vegetables, support healthy communities; food choices affect health as well as emissions and agriculture viability.

Transportation – Transporting imported and exported foods and food distribution within the region, are sources of emissions.

Waste – Food loss and food waste increase air contaminant emissions, including greenhouse gases.

Industry and Energy - Production of renewable natural gas from agricultural organic residues has the potential to supply energy to the agriculture sector as well as other industries thereby reducing greenhouse gas emissions from manure and from industrial energy use.

Nature and Ecosystems – Protecting, restoring and connecting natural areas, and enhancing ecosystem services on agricultural land support a climate resilient agriculture sector. The significant connection the *Nature and Ecosystems Roadmap* has to the agricultural sector is explored in more detail below.

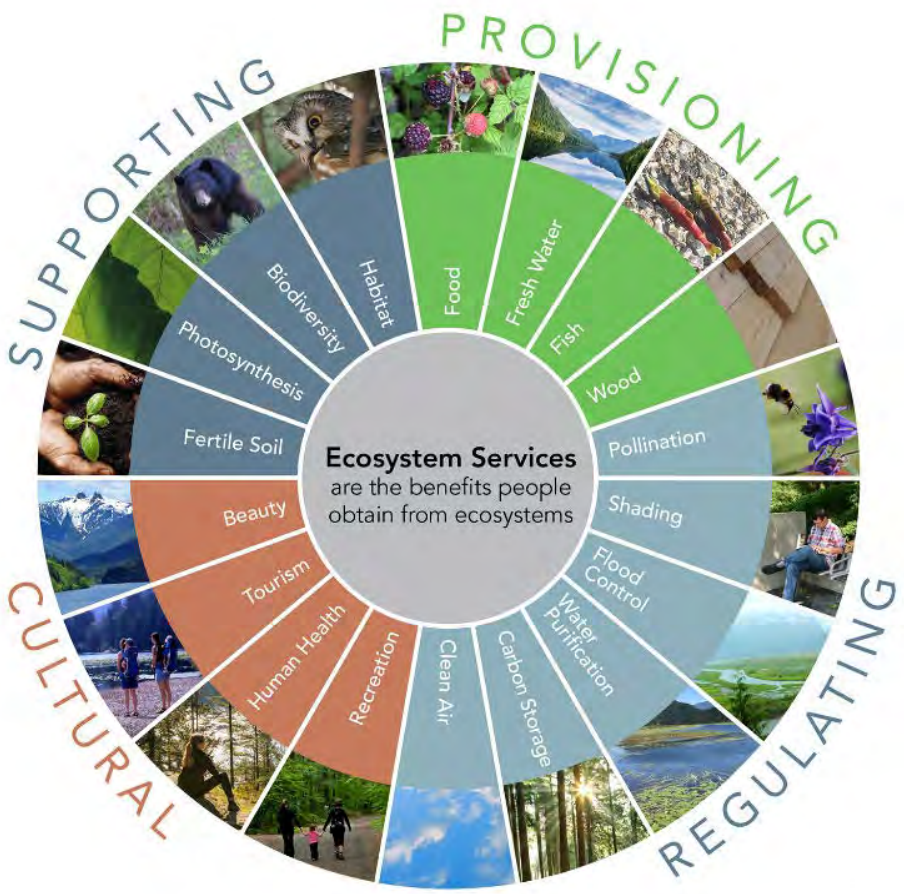
As these other Roadmaps are developed, they will be made available on the Metro Vancouver website.

## CLIMATE 2050 NATURE AND ECOSYSTEMS - ROADMAP CONNECTION TO AGRICULTURE

While there are several linkages between the *Agriculture Roadmap* and the other issue areas of *Climate 2050*, more than any of the others, the *Nature and Ecosystems Roadmap* is the most inter-connected and related to the *Agriculture Roadmap*.

The *Nature and Ecosystems Roadmap* and *Agricultural Roadmap* largely connect through the co-benefits each provides the other:

→ NATURAL SPACES provide agricultural lands pollinator habitat, flood and erosion control and natural pest management; and
→ AGRICULTURAL LANDS provide the opportunity for wildlife and bird habitat, natural asset management, connections and linkages to Metro Vancouver's Green Infrastructure Network, regional park space and habitat for sensitive ecosystems and species at risk.




Source: Metro Vancouver Regional Planning 2018

# Strategies and Actions

## ROLES AND RESPONSIBILITIES

Under authority delegated by the BC Government in the *Environmental Management Act*, Metro Vancouver is responsible for managing and regulating air quality and greenhouse gases in the region, including air contaminants from agricultural sources. Metro Vancouver is also responsible for developing, implementing and stewarding *Metro Vancouver 2040: Shaping our Future* (*Metro 2040*), the regional growth strategy, and for preparing an update to that strategy, *Metro 2050* (draft). Both *Metro 2040 and Metro 2050* contain Metro Vancouver's greenhouse gas reduction targets and include strategies to protect agricultural land and promote agricultural viability through policies such as the Urban Containment Boundary.

While Metro Vancouver plays a pivotal role in advancing climate strategies and actions for the agricultural community in response to climate change issues, air quality management and climate action require close coordination among all governments, as well as private businesses, utilities, institutions and residents. The government and agency organizations that fill key roles in reducing agricultural emissions and helping increase resiliency of Metro Vancouver's agricultural community are outlined below:

| ENTITY | ROLE |
|---|---|
| BC Ministry of Agriculture, Food and Fisheries (AFF) | Supports the production, marketing, processing and merchandising of agricultural products, provides guidance for agricultural operations and secures agricultural production through the mandate of the Agricultural Land Commission. |
| Agricultural Land Commission (ALC) | Preserves agricultural land, encourages farming in British Columbia and encourages local governments to enable and accommodate farm use of agricultural land. |
| BC Ministry of Environment and Climate Change Strategy (MOECCS) | Responsible for the protection, management and conservation of BC's water, land and air and living resources and leads climate action through various policies, legislation, regulation and programs. |
| Government of Canada | Establishes standards for agricultural operations and agricultural equipment as well as supports agricultural research. |
| Member Jurisdictions | Have authority over local land use decisions and support agriculture through zoning, environmental policies and engaging with residents. Some member jurisdictions can manage agriculture through Farm Bylaws approved by the BC Ministry of Agriculture. |
| Energy Utilities | Provide rebates, infrastructure and energy for agricultural operations as well as access to market for energy sources such as renewable natural gas (RNG) (e.g., BC Hydro, FortisBC) |
| Farm Industry Review Board | An independent administrative tribunal that is responsible for hearing complaints from person aggrieved by odour, noise, dust or other disturbances arising from agriculture and may also study and report on farm practices. |
| Industry Associations | Support agricultural producers with the latest information on technologies, policies and regulations. |
| Academic Institutions | Conduct research and provide education and training as well as advocate and inform others about ways to transition to a low-carbon and resilient future. |
| Non-Profits | |
| Other Organizations | |
| Local Residents | Make food choices that can support agriculture by buying local food. |

## STRATEGY 1: Protect Agricultural Land

Above all else, farming cannot take place, food cannot be produced, and ecosystem services cannot be gained if farmland does not exist. Agricultural land in Metro Vancouver is increasingly threatened from non-farm land uses. Currently, there are more non-farm landowners in the Agricultural Land Reserve (ALR) than there are farm owners which is a significant barrier to not only turning unused or non-productive land into operating farms and to ensuring the ALR is cohesively used to protect farming operations from climate change, but it is also a substantial barrier that prevents new or young farmers from gaining access to land to farm, whether it be through leasing or purchasing. This imbalance in land ownership and use of the ALR represents lost economic development opportunity for the region and places strains on the local food system when the demand for local food is constrained by the availability of land for farming. The agricultural sector stimulates links with restaurants, retail, food manufacturing and tourism making its protection a regional priority.

### 1.1 Continue to Protect Agricultural Land From the Impacts of Land Development

Advocate to member jurisdictions to use the powers provided to them through the *Local Government Act* and *Agricultural Land Commission Act* and Regulations to: 1. adopt policies, regulations and Development Permit Guidelines requiring agricultural impact assessments for development taking place adjacent to the ALR; and 2. limit the extend of urban development and commercial uses that seek to extend utility services into the ALR.

### 1.2 Provide Secure Tenure for Farmers.

METRO 2040

Work with member jurisdictions to protect the supply of agricultural land and promote agricultural viability with emphasis on food production by actively monitoring the status of agricultural land, including the amount of actively farmed land and other indicators to be able to promote agricultural viability and food production. Metro Vancouver will continue to work with its Agricultural Advisory Committee to protect the region's agricultural land base and will continue to work with the Agricultural Land Commission to protect and optimize the use of agricultural land in order to preserve farmland capability well into the future.

### 1.3 Enable Long-term Investment in Agricultural Lands.

Metro Vancouver will update its Regional Food System Strategy to determine appropriate, effective and measurable actions that will enable investment in agricultural lands for the long-term, including how to support local food production that will contribute to food security and regional resilience.

### 1.4 Encourage Adjustment of Agricultural Practices to Ensure Long-Term Local Food Sources.

BIG MOVE

Work with the BC Government, Government of Canada, industry and other regional partners to determine the changing conditions for farming in the region and what farming practices can be adjusted to ensure food production can successfully continue here well into the future. This should include examining irrigation infrastructure and water use, adjustments to farming techniques to account for climate change and incorporating regenerative agriculture and nature-based solutions into farming daily practices.

### 1.5 Increase Entry and Reduce Barriers to Local Farming.

Advocate to the BC Government for changes to the tax structure for agricultural properties to reduce incentives for non-farm use development in the ALR. Work with member jurisdictions to support existing land matching initiatives or to create their own programs (e.g., municipal-owned agricultural land trust provided for long-term leasing for incubator farms) that would help eliminate the barriers to local farming experienced by young or new farmers.

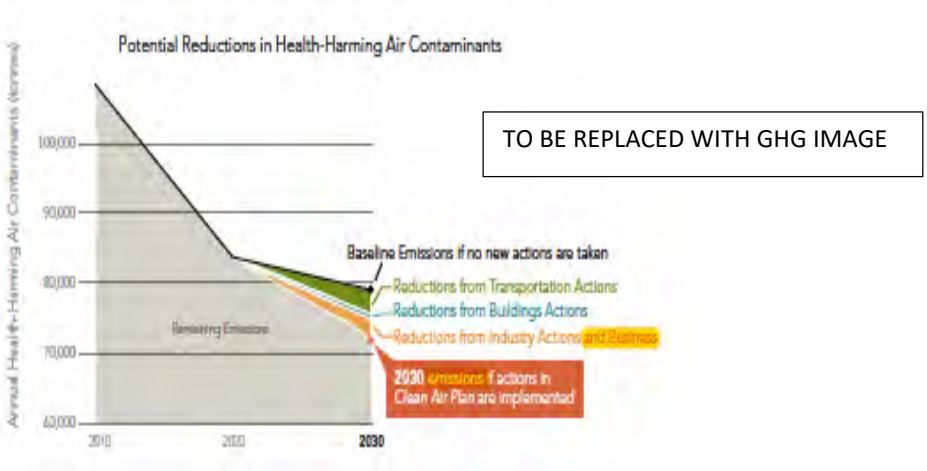
### 1.6 Protect Agricultural Land for Ecosystem Services

BIG MOVE

Metro Vancouver will examine the use of ecosystem services as a benefit to the regional agricultural sector including what programs are most beneficial to farmers financially and what methods are most effective in securing land for ecosystem services and for ensuring the long-term health and resiliency of farming operations.

## STRATEGY 2: Support Farmers as Climate Action Leaders

Agricultural activities generate 4% of regional greenhouse gas emissions, primarily from heaters and boilers in greenhouses, agricultural equipment, and livestock. Improving energy efficiency and switching to clean, renewable energy for greenhouses and agricultural equipment and using enhanced Beneficial Management Practices (BMP) will help achieve 2030 agriculture emission targets for greenhouses gases. 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.




The agricultural sector has demonstrated its leadership in continually looking at ways to adjust production methods to reduce costs and increase efficiencies and has demonstrated its willingness to continue to innovate and make adjustments in order to remain competitive and viable and be a positive, contributing factor to a healthy future. Supporting farmers and the agricultural sector in continuing this tradition of leadership is an essential step in leading to a net-zero greenhouse gas emissions future.

| Potential Impacts of Strategy 2 | Key Partners |
|---|---|
| Reduce annual greenhouse gases by up to 100,000 tonnes<br>Reduce annual health-harming air contaminants by up to 50 tonnes | Government of Canada<br>BC Government<br>Agriculture Community<br>Member Jurisdictions |

### 2.1 Reduce Emissions from Greenhouses

BIG MOVE

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 cleaner, renewable energy, while considering the need for supplemental carbon dioxide in greenhouses to support plant growth. This can be supported by preparing passive design standards specific to greenhouse operations and providing an on-line decision support tool for how to best upgrade greenhouses. Metro Vancouver will update the regional emissions inventory with data specific to greenhouses to increase the understanding of their level of greenhouse gas emissions and will work with industry to determine how much carbon dioxide is used for their processes.

### 2.2 Improve Soil Health to Help Address Carbon Emissions

BIG MOVE

Work with the BC Government, member jurisdictions, industry and other regional partners to expand the knowledge and understanding the role of soil health in ensuring long-term agricultural viability and resilience against climate change and as a local source able to reduce carbon emissions within the Lower Mainland.

Examine ways to financially support expansion of data collection in soil carbon measuring and establish actionable programs specific to soil carbon storage and sequestration.

### 2.3 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 agriculture community, member jurisdictions and BC Government, and would supplement existing agricultural outreach and support programs. The program would include examining all sources of agricultural emissions to determine how agricultural practices could be adjusted (for example, adjusting cattle feed to reduce methane, using field mapping to apply fertilizer more efficiently, and using crops and soil on farms to capture and sequester carbon) to not only reduce agricultural emissions, but include farmers in an effort to reverse the effects of climate change in the region.

### 2.4 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 nitrous oxide, methane and other air contaminants. This should include continued development and promotional Beneficial Management Practices (BMP), as well as providing reliable incentives and technical guidance to farms to support adoption of low emission practices and technologies.

### 2.5 Incentives for Farmers to Transition to Lower Emission Equipment

Advocate to the BC Government and Government of Canada to enhance or develop funding supports for cleaner agricultural equipment (e.g., incentives, tax credits, loans, etc.). 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 if old equipment is scrapped and for zero emission equipment to increase their adoption.

### 2.6 Pilot Study with Zero Emission Agricultural Equipment

Work with the BC Government, industry, and the agriculture community 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 charging and related infrastructure, and could focus on emerging alternative fuels such as hydrogen.

### 2.7 Streamline Emission Requirements for Anaerobic Digestion Facilities

Develop an emission regulation for anaerobic digestion of manure, other agricultural waste and commercial food waste. The updated 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.

### 2.8 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.

### 2.9 Encourage Local Agriculture

Metro Vancouver will update the Regional Food System Strategy and will continue to advocate to member jurisdictions and other regional partners to address regional food security issue, to encourage more local food production, and to prioritize agricultural practices that reduce emissions or help maintain or sequester carbon.

## STRATEGY 3: Support Long-Term Farm Health and Resiliency

Farmers and agricultural operations have adapted and evolved over time accommodating changes in economics, consumers, weather, technology, transportation, and markets. Resiliency and adaptation are not new concepts and have been requirements for the long-term success of the agricultural sector in general for centuries. While facing adversity is not a new concept, the degree to which farmers need to adapt to continue to succeed in the face of a rapidly changing climate is.

Farmers and their businesses will not be able to continue to withstand the effects of climate change, feed present and future populations or provide ecosystem services to adjacent urban areas without adjusting their practices to ensure the health of their farm is a top priority. These adjustments will need to incorporate and connect to the ecosystem, natural biological applications and regenerative techniques more than ever before. This involves first understanding a farm's specific vulnerabilities and then second, pursuing actions so that they can directly benefit from the ecosystem services (e.g., soil nutrient and organic matter, habitat for wildlife, food for pollinators, carbon sequestration and flood management) provided by their agricultural land.

### 3.1 Expand the Use of Regenerative Agriculture

BIG MOVE

Work with the BC Government to normalize regenerative agricultural practices for farming operations within the lower mainland by offering additional extension services, financial support and information sharing opportunities. Metro Vancouver will examine the feasibility of establishing a regional network for farmers (for example, Texas' Soil for Water Network) that provides access to peer-to-peer knowledge sharing from research, pilot projects and operational adjustments to increase the support for local farmers to increase their resiliency to climate change.

### 3.2 Support and Expand Ecosystem Services

BIG MOVE

Work with the BC Government, member jurisdictions, the farming community and other regional partners such as Farmland Advantage to determine how much agricultural land is available and appropriate to be used for ecosystem services, how individual farms can benefit from the restoration and protection of these lands (including riparian areas) on their farms, and how farmers and land owners can be compensated for keeping these lands set aside for ecosystem services. Metro Vancouver will provide regionally-appropriate guidance on the valuation methodologies, tools and decision-making frameworks needed to identify, preserve, restore, and, where necessary, expand natural ecosystems on agricultural land and will examine the benefits of connecting these areas within a regional Green Infrastructure Network, as a way to increase agriculture's role in contributing to a resilient region, both on and off the farm.

### 3.3 Support Innovations in Agricultural Operations

BIG MOVE

Work with the BC Government, Federal Government, industry and regional partners to expand digital and high-tech agricultural systems to improve production operations that will increase the resiliency and longevity of agricultural operations, including GPS-guided machinery, sensor and data-driven analytics, quantification platforms and technology hubs, precision farming, drone monitoring and data collection, and using cognitive systems to help address labour shortages.

### 3.4 Ensure Long-term, Reliable Access to Water

BIG MOVE

Work with the BC Government to provide viable and tangible solutions to ensuring water resources needed by the farming community are provided in a sustainable, consistent and reliable manner including: exploring innovative sources and new technologies for water re-use (e.g., municipal waste water, sea water, brackish water, meat and dairy processing wastewater, and agricultural drainage water) and water conservation (e.g., applying mulches to field crops); and developing a new reservoir or storage systems that takes advantage of rainfall collection when it is abundant to be used during periods of low or no rainfall during the growing season. Metro Vancouver will update the agricultural water demand model to incorporate current climate conditions, crop irrigation systems and soil information data to contribute to the discussion of water availability for the agricultural community and will develop a toolkit on how a circular water economy can be supported within the Metro Vancouver farming community.

## STRATEGY 4: Leverage Economic Opportunities, Innovation and Leadership

Agriculture requires long-term investment, financial support and leadership from all levels of government (federal, provincial, regional and local), from private industry (transportation, finance, support services, logistics, retail, and research), and from society (consumers, education, non-profits, places of worship). Farming is the corner stone to the agricultural sector providing healthy food to every individual and as every human being needs to eat, every human being should be invested in ensuring the longevity and resilience of farming.

### 4.1 Prioritize Agriculture Via Strategic Action

BIG MOVE

Metro Vancouver will illustrate leadership in the importance of prioritizing agriculture within the region by committing to provincial, federal or international programs that establish bench-line policies, measurable targets and achievable actions. Metro Vancouver will also encourage member jurisdiction engagement and participation in the programs aimed at the municipal level, for example, the Mexico City Pact and Milan Food Policy Pact, as they can help communities commit to addressing the effects of climate change on agriculture and provide reporting frameworks by which to monitor the effectiveness of policies and the progress of actions.

### 4.2 Continue Long-term Financial Investment in the Agricultural Sector

Work with the Federal and BC Governments to support the agricultural sector through direct and indirect financial investment that: provide incentive programs to help farmers adjust their operations to become more sustainable; expand funding sources for long-term, consistent and reliable funding to agricultural producers to pay for agricultural land to be used for ecosystem services and advance the resiliency of farming operations in the lower mainland; and designate resources for testing practices and technology to help farmers effectively use soil as a means to store carbon for a greater societal benefit.

### 4.3 Increase Access to Information for Local Farmers and Agricultural Producers

BIG MOVE

Work with member jurisdictions and the BC Government to provide information to the farming community in formats that are compatible with the specific needs of farmers, including providing on-field workshops, supporting Farmer-to-Farmer information sharing, and providing existing and new educational materials, guidelines, regulations and toolkits in different languages and as audio books to expand outreach and ease of accessing information.

### 4.4 Reduce Confusion with Provincial Legislative Overlaps

Prepare a joint and coordinated toolkit that brings together all legislation applicable to agriculture and farming from the Ministry of Agricultural, Food and Fisheries, Agricultural Land Commission, Ministry of Environment and Ministry of Municipal Affairs to collectively address legislation that can be contradictory (e.g., riparian protection within the Agricultural Land Reserve) to make it transparent, clear and concise about the expectation from farmers for managing these areas on their farms.

### 4.5 Support Long-term Local Food Production

Metro Vancouver will update the Regional Food System Strategy to ensure food-specific challenges, gaps and opportunities are identified for the region to specifically include climate change issues and will include examining impacts and considerations specific to food production vulnerability and longevity within the region.

### 4.6 Bridge the Gap Between the Agriculture Community and the Consumer

Metro Vancouver will develop engaging and approachable educational campaigns aimed toward the public about agriculture and how it is affected by climate change, what costs and processes go into producing food (e.g., the farm to food cost spectrum), what actions farmers are taking to adapt to significant regional climate issues and how consumers can be a positive contributor to agricultural resiliency through their actions and decision making. These campaigns will specifically work to bridge the gap between the public and the realities of what climate change is, helping to increase understanding and awareness of it broadly and as it relates specifically to food costs and availability.

### 4.7 Help Farmers Build Capacity to Adapt to Climate Change

BIG MOVE

Work with the BC Government, member jurisdictions, industry and other regional partners to increase the agricultural community's capacity to integrate climate change considerations into their ongoing business decisions and operations. This will include a wide spectrum of support mechanisms, including: encouraging and aiding farm-level preparation of emergency plans; working at the farm level to help producers implement water back-up plans or determine appropriate methods to recycle or store water; increasing producer access to programs, tools, practices, equipment and finances to help them self-monitor and manage soil (e.g., US Department of Agriculture on-line COMET carbon sequestration evaluation tool); and help prepare farm-level business continuation plans for prolonged extreme weather events and disruptions to water and energy supplies.

## Setting the Path Ahead

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

The timeline below includes all of the actions included in this Roadmap. There is much work to be done; however, there are some 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 agriculture.

### CLIMATE 2050 AGRICULTURE ROADMAP ACTION TIMELINE

| STRATEGY | 2021-2024 | 2025-2029 | 2030-BEYOND |
|---|---|---|---|
| STRATEGY 1<br>Protect Agricultural Land | Continue to Protect Agricultural Land From the Impacts of Land Development<br>Provide Secure Tenure for Farmers<br>Enable Long-term Investment in Agricultural Lands<br>Encourage Adjustment of Agricultural Practices to Ensure Long-Term Local Food Sources<br>Increase Entry Into and Reduce Barriers to Local Farming<br>Protect Agricultural Land for Ecosystem Services | | |
| STRATEGY 2<br>Support farms as leaders in Climate Change mitigation. | Support Improving Soil Health to Help Reduce Carbon Emissions<br>Enhance Funding for Environmental Farm Plans<br>Provide Incentives for Farmers to Transition to Lower Emission Equipment<br>Streamline Emission Requirements for Anaerobic Digestion Facilities<br>Expand Anaerobic Digestion of Agricultural Waste<br>Encourage Local Agriculture | Reduce Emissions from Greenhouse Gases<br>Pilot Study with Zero Emission Agricultural Equipment and Heating Sources | |
| STRATEGY 3<br>Support Long-Term Farm Health and Resiliency | Expand the Use of Regenerative Agriculture<br>Support and Expand Ecosystem Services<br>Support Innovations in Agricultural Operations | Ensure Long-term, Reliable Access to Water | |
| STRATEGY 4<br>Enable Long-Term Investment in Agriculture | Prioritize the Agriculture Sector Via Strategic Action<br>Increase Access to Information for Local Farmers and Agricultural Producers<br>Support Long-term Local Food Production | Continue Long-term Financial Investment in the Agricultural Sector<br>Reduce Confusion with Provincial Legislative Overlaps<br>Bridge the Gap Between the Agriculture Community and the Consumer<br>Help Farmers Build Capacity to Adapt to Climate Change | |

## 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 Agriculture Roadmap is calling for actions from many different partners and stakeholders, and because, in some instances, it is suggesting using technology that either does not currently exist or that is not readily available at a consumer level, data availability may be limited until technologies advance and industry markets further advance toward full operational sustainability. Additionally, data sharing from partner organizations will be foundational to understanding the pace of progress toward s our common goals and will help governments to continue to shape equitable and cost-effective pathways to a zero emission and resilient future.

| ROADMAP ELEMENT | KEY PERFORMANCE INDICATOR | DATA SOURCE | DATA IS CURRENTLY COLLECTED |
|---|---|---|---|
| Resilient Agriculture | % ALR used for long-term set aside ecosystem services | ALUI | no |
| Protected Agricultural Land | % ALR actively farmed | ALUI | yes |
| Regional GHG Impact | The agricultural sector is carbon neutral by 2050. | various | yes |
| Regional GHG Impact | % greenhouse gas emissions from greenhouses | various | yes |
| | The agricultural sector produces clean, renewable energy to meet all its production needs by 2050. | various | yes |
| | The agricultural sector provides clean, renewable energy to other energy users by 2050. | various | no |

# Feedback and Engagement Process

This Roadmap was generated with input from many organizations, including other levels 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 at time of writing. 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 Agricultural 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

**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.

**Adaptive capacity** means the ability of ecosystems, economies, infrastructure and communities to adjust to climate change (including climate variability and extremes) by moderating potential damages, taking advantage of potential opportunities, or coping with consequences.

**Agroecology** applies ecological principles to agriculture ensuring a regenerative use of natural resources and ecosystem services while addressing the need for food sovereignty. While the practices can be wide-ranging, agroecology is characterized by diversifying farms and farming landscapes, replacing chemical inputs with organic materials and processes, optimizing biodiversity and stimulating interactions between different species.

**Agroforestry** is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land-management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence.

**Air contaminants** are any substances emitted into the air that do or could a) harm public health (including material physical discomfort) and property, b) damage the environment, including the climate, c) impede normal business operations, or d) impair visual air quality.

**Carbon dioxide** ($CO_2$) is the primary driver of climate change, and is produced primarily by burning fossil fuels. In agriculture, carbon dioxide is primarily generated by fuel combustion by greenhouses and agricultural equipment. Carbon dioxide is also released from farm fields during soil cultivation as organic materials undergo biological decomposition. Plants, trees and soils can sequester carbon in stable organic matter.

**Carbon neutral region** is a region that has achieved the deepest greenhouse gas emissions reductions possible across all economic sectors, and removes or captures sufficient carbon dioxide to balance any remaining regional greenhouse gas emissions.

**Carbon sequestration** is the removal of carbon dioxide from the air and the long-term storage of carbon to mitigate climate change. Carbon enriched soils are healthier, have better resilience to extreme weather, better water permeability, microbial diversity, higher yields and reduced input requirements.

**Carbon sinks** are natural systems that absorb more carbon dioxide than they release. The main natural carbon sinks are plants, the ocean and soil.

**Clean, renewable energy** is low or zero emissions 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.

**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, diesel particulate matter, ground- level ozone, nitrogen dioxide, sulphur dioxide and volatile organic compounds.

**Ecosystem services** are the benefits people obtain from ecosystems. Ecosystem services provided by farmland include nutrient and organic matter recycling (from food waste), food for pollinators, wildlife habitat, flood control, and carbon sequestration.

**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 (generally referred to as climate change mitigation).

**Green Infrastructure** "Natural and human made elements that provide ecological and hydrological functions and processes. Green infrastructure can include components such as natural heritage features and systems, parklands, stormwater management systems, street trees, urban forests, natural channels, permeable surfaces, and green roofs. - Green Infrastructure Ontario

**Hazard** refers to a dangerous phenomenon, substance, human activity, or condition. In this context, hazards are caused or made worse by climate change. Examples include rainstorms, extreme weather, wildfires, storm surges, and landslides.

**Impacts** refers to the consequences of realized risks on ecosystems, economies, infrastructure and communities. Impacts may be referred to as consequences or outcomes, and can be adverse or beneficial.

**Methane** ($CH_4$) is a short-lived greenhouse gas and is 25 times more effective than carbon dioxide at trapping heat in the atmosphere. Methane emissions from agriculture are produced by ruminant animals such as cattle and sheep through a bacterial process called enteric fermentation, as well as being released from manure storage sites, especially when wet because of the lack of oxygen during decay. Natural gas is mostly composed of methane.

**Natural assets** are the stock of natural resources and ecosystems (including geology, soil, air, water and all living things) that provide benefits to people. Examples include forests, wetlands, and streams. It is from these natural assets that humans derive a wide range of services, often called ecosystem services, which make human life possible.

**Natural infrastructure** can be considered an *active* form of nature likely focused on the most important of these benefits. Natural infrastructure comprises an *active management component* aimed at providing (or conserving) the key advantages—such as climate resilience, clean water and biodiversity. It differs from traditional "grey" infrastructure, such as pipes, tunnels and factories, which are completely constructed by humans. Natural infrastructure is a form of "green" infrastructure, a term that also includes systems with positive environmental outcomes, such as renewable energy or electric vehicles.

**Nature-based solutions** (**NBS**) refers to the sustainable management and use of nature for tackling socio-environmental challenges. The challenges include issues such as climate change, water security, water pollution, food security, human health, and disaster risk management.

A definition by the European Union states that these solutions are "inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. The Nature-based Solutions Initiative meanwhile defines them as "actions that work with and enhance nature so as to help people adapt to change and disasters". Such solutions bring more, and more diverse, nature and

natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions".[1] With NBS, healthy, resilient and diverse ecosystems (whether natural, managed or newly created) can provide solutions for the benefit of societies and overall biodiversity. Nature-based Solutions (NbS) are defined by IUCN as "actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits".

Promoting nature-based solutions to enhance ecosystem functions, expand green infrastructure and increase resilience.

**Nitrous oxide** ($N_2O$) is a long-lived greenhouse gas, and is 298 times more effective than carbon dioxide at trapping heat in the atmosphere. Nitrous oxide emissions from agriculture is primarily produced by microbes as they process nitrogen in soils from fertilizers, manures and other inputs.

**Regenerative agriculture** can rebuild soil organic matter, restore degraded land and improve the water cycle by utilizing natural nutrient cycles, restoring soils, raising carbon levels, protecting water, and enhancing biodiversity and ecosystem services. OR/AND: is a holistic land management practice that holds the potential of reversing climate change by rebuilding soil organic matter and restoring degraded soil biodiversity resulting in carbon drawdown and improvement of the water cycle (Regeneration International, 2017). This farming method that regenerates soil fertility, improves water retention, fosters biodiversity, and sequesters carbon.

**Resilient/Resilience** capacity to withstand and/or recover from hazards, risks and challenges associated with a changing climate. Also referred to as adaptive capacity which is the capacity of ecosystems, economies, infrastructure 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, resilience involves changing services and functions so they are more sustainable.

**Sensitivity** is the degree to which a community or system is affected (positively or negatively) by climate variability or change. The effect may be direct or indirect.

**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

To: Climate Action Committee

From: George Friedrich, Senior Project Engineer, Liquid Waste Services
Nicole Chan, Project Engineer, Parks and Environment

Date: October 13, 2021 Meeting Date: November 5, 2021

Subject: **Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2016 to 2020)**

**RECOMMENDATION**

That the Climate Action Committee receive for information the report dated October 13, 2021, titled "Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2016 to 2020)".

**EXECUTIVE SUMMARY**

Metro Vancouver uses energy to provide services to the region, which generates greenhouse gas emissions, but also produces low-carbon energy for internal use and for sale to others. Metro Vancouver spent nearly $30 million in 2020 to purchase energy and maintain its energy generation systems. Metro Vancouver's energy use, related GHG emissions, and costs, was up 9%, 31%, and 19% respectively, in 2020 compared to 2014, while population has grown by 10%. Increases were driven by the need to transport the historic stockpile of land-dried biosolids at Iona Island WWTP, increased electricity use during the Annacis Island WWTP cogeneration system upgrade, and the installation of larger natural gas burners at the Waste-to-Energy Facility to meet new regulatory requirements. However, the corporate energy management program has resulted in cumulative energy savings of 11,700 GJ and cost savings of approximately $2.7 million over that same time period.

To help manage operating costs and maintain Metro Vancouver's commitment to corporate carbon neutrality, Metro Vancouver is developing energy and GHG emissions targets by service area to continuously improve energy efficiency and enhance renewable energy generation opportunities.

**PURPOSE**

To inform the Climate Action Committee of trends in Metro Vancouver's corporate energy use, energy costs, and greenhouse gas (GHG) emissions for 2016 through 2020 and to provide an update on energy management and GHG emissions management actions by service area.

**BACKGROUND**

The *Corporate Energy Management Policy* (Reference 1) articulates Metro Vancouver's commitment to continuously improving the efficiency of its energy use, production, generation, and recovery, as well as establishing energy targets, and regularly reporting on progress toward those targets.

At its meeting on September 18, 2020, the Climate Action Committee received a staff report on trends for corporate energy use, energy costs, and GHG emissions related to energy use for the period 2014 through 2018 (Reference 2). This report provides an update on those metrics, as well as management

activities, for the period 2016 through 2020. This report also provides process emissions trends from Metro Vancouver's wastewater treatment plants (WWTP) and Waste-to-Energy Facility.

As part of the *Climate 2050* strategy, the Metro Vancouver Board has adopted regional targets to become a carbon neutral region by 2050, with an interim target of reducing GHG emissions by 45% from 2010 levels by 2030. Corporate energy and GHG management will be aligned with these regional targets wherever possible, while maintaining delivery of all Metro Vancouver's services.

## METRO VANCOUVER'S ENERGY AND EMISSIONS PROFILE

### Managing Energy Use and Energy Costs

Metro Vancouver's Corporate Energy Management Program aims to identify and implement energy savings opportunities in the operation and maintenance of existing facilities, and to ensure new facilities are designed with an energy-efficiency lens. Since the *Corporate Energy Management Policy* was adopted in 2014, up to the end of 2020, the energy conservation projects implemented by the program have resulted in cumulative energy savings of 11,700 GJ, resulting in cumulative operating cost savings of approximately $2.7 million and ongoing savings of over $800,000 per year.

Despite these efforts, Metro Vancouver's total energy use has been trending upwards, increasing 9% in 2020 compared to 2014. Much of the increased energy usage can be attributed to the operation of major new facilities such as the Capilano Raw Water Pump Station (2015) as well as increases in fossil fuel use for Iona Island WWTP residuals hauling and Waste-to-Energy Facility operation. On a per-capita basis, energy use has remained relatively constant between 2014 and 2020.

Metro Vancouver and its contractors purchase energy to power facilities, buildings, and mobile equipment in order to provide vital services to the region. Purchase of energy (primarily electricity, natural gas, diesel, and gasoline) and the maintenance of Metro Vancouver's energy generation systems cost nearly $30 million in 2020, an increase of 19% over the energy management baseline year of 2014. Population has increased approximately 10% over this same time period.

### Corporate GHG Emissions and Trends

Total corporate GHG emissions from all energy use were 29,019 tonnes carbon dioxide-equivalent ($CO_2e$) in 2020, an increase of 31% over 2014. This increase is driven by increases in fossil fuel use for transporting the historic stockpile of land-dried biosolids at Iona Island WWTP, increased electricity purchases at Annacis Island WWTP during the cogeneration system upgrade, and increased natural gas use at the Waste-to-Energy Facility after the installation of larger natural gas burners in 2018 to meet new regulatory requirements in the facility's provincial Operational Certificate.

Another factor, as required by the Provincial Government, was the use of published "grid" electricity GHG emissions factors that reflect electricity generated within BC as well as with "dirtier" electricity imported from outside the province. These emissions factors are adjusted annually, and result in an increase in corporate GHG emissions from electricity use compared to those in previous reports.

Process emissions from WWTPs increased by 20% compared to 2014 due to an increase in the volume of biogas that was flared during the Annacis Island WWTP cogeneration system upgrade. Process emissions from the Waste-to-Energy Facility increased by 11% compared to 2014, as the disposal ban

on organic materials in 2015 has led to an increase in the proportion of non-biogenic GHG emissions, along with the increase in natural gas use noted above. With completion of the cogeneration system upgrade, and removal of the Iona stockpile, staff expect emissions to reduce to historic levels.

Metro Vancouver's annual Climate Action Revenue Incentive Program (CARIP) report for 2020, presented to the Climate Action Committee in July 2021 (Reference 3), reported emissions of 15,437 tonnes $CO_2e$, which reflects "traditional local government services" per the provincial reporting framework. The 29,019 tonnes $CO_2e$ reported here includes additional energy-related emissions from all Metro Vancouver services, including Housing and the Waste-to-Energy Facility.

**GHG Reduction and Renewable Energy Projects and Opportunities**

As detailed in the attachment, staff are reviewing opportunities to manage emissions from existing energy use, and to identify new and enhanced emissions reductions projects, including: improved operating efficiencies; conversion of more fleet vehicles to low-carbon technologies; and incorporation of low-carbon technologies in major capital projects. These projects are supported by a suite of corporate policies that emphasize corporate Metro Vancouver GHG management, including the *Carbon Price Policy*, the *Fleet Planning and Acquisition Policy*, the *Liquid Waste Heat Recovery Policy*, and the *Sustainable Infrastructure and Buildings Policy*.

In addition to using purchased energy and pursuing increased efficiencies, Metro Vancouver also generates, produces, and recovers substantial amounts of clean and renewable energy as part of its operations, which can offset some costs and emissions associated with purchased energy. In most cases, the energy produced is used by Metro Vancouver, but there is potential to increase energy production beyond Metro Vancouver's own needs. A long-standing example is the electricity generated at the Waste-to-Energy facility, which is sold to BC Hydro.

Liquid Waste Services produces methane-rich biogas at four of its five WWTPs. Most of the biogas is used to generate heat and electricity for plant needs. However, biogas that is not used by the treatment plants can be cleaned up and sold to FortisBC as renewable natural gas (RNG). Sales of RNG began in 2021 from the Lulu Island WWTP. FortisBC sells RNG to a growing market, displacing fossil natural gas use and thus reducing regional GHG emissions. Similar projects are under consideration at other Metro Vancouver WWTPs.

Another example is the waste heat that will be recovered from the effluent discharged by the North Shore WWTP, currently under construction. The recovered heat will be used for in-plant heating and for sale to Lonsdale Energy Corporation (LEC), significantly reducing LEC's natural gas use and associated GHG emissions. Metro Vancouver is also working with the municipalities of Richmond, New Westminster, and Surrey to pursue opportunities to recover waste heat from Metro Vancouver's sewer system for use in future municipal district energy systems.

Although energy recovery and production for external use is not part of Metro Vancouver's core mandate, energy opportunities are examined where there is potential for regional emissions reductions, renewable energy provision to the community, or significant revenue generation. As part of *Climate 2050*, Metro Vancouver is developing an *Energy Roadmap* that will include policies and

actions to transition the regional energy supply to clean, renewable energy over the next 30 years. This Roadmap will include regionally significant corporate energy projects that support this goal.

In addition, the Sustainability Innovation Fund has supported a number of projects and opportunities that are expected to influence Metro Vancouver's ongoing corporate energy and GHG profile.

**Establishing Corporate Energy Efficiency and GHG Emissions Reduction Targets**
In its 10-Year Plan (published in 2019), Housing committed to reducing energy consumption by 25% (from 2015 National Energy Code for Buildings) for major rehabilitations and for new construction, and to reducing GHG emissions in the Housing portfolio by 45% by 2030 compared to 2010 levels. Liquid Waste Services has committed to reducing energy use by 10% compared to 2019 by 2030. In 2020, all Metro Vancouver departments committed to setting energy and GHG emissions targets. This process is ongoing and reporting toward achieving those targets is expected to begin in 2022.

## ALTERNATIVES

This is an information report. No alternatives are presented.

## FINANCIAL IMPLICATIONS

In 2020, Metro Vancouver spent nearly $30 million to purchase energy and maintain its energy generation systems. Energy unit rates are expected to increase over time. A robust Energy Management Program can help Metro Vancouver manage energy-related costs while supporting corporate GHG emissions reductions. Estimated annual savings from energy conservation projects completed between 2014 and 2020 are over $800,000 per year.

BC Hydro and FortisBC contribute up to $150,000 per year toward the salaries of energy management staff. This funding is renewed annually and is contingent on meeting agreed-upon energy performance objectives. FortisBC funding up to $180,000 is also being used in 2020 and 2021 toward a temporary position developing the *Climate 2050 Energy Roadmap*. Since 2014, Metro Vancouver's Corporate Energy Management Program has accessed support funding of more than $765,000 for salaries, and energy efficiency studies and projects.

Sales of RNG from Lulu Island WWTP to FortisBC began in 2021. Net average revenues over the life of the system are expected to be approximately $1 million per year. Metro Vancouver has identified additional potential revenue streams for sale of renewable energy in the future.

## CONCLUSION

Metro Vancouver aims to manage both energy and GHG emissions in a manner that balances service quality and reliability, fiscal responsibility, and environmental impact. Metro Vancouver has undertaken a range of regionally significant GHG reduction projects that have enabled it to achieve corporate carbon neutrality under the provincial CARIP program. However, energy use and costs continue to increase. As part of the implementation of its *Corporate Energy Management Policy* and *Climate 2050*, Metro Vancouver seeks to reduce energy use and costs by setting energy and GHG emissions targets by service area, identifying and implementing energy conservation opportunities, and pursuing opportunities to generate clean, renewable energy. Reporting on progress toward achieving these targets will be provided at regular intervals.

## Attachment

Metro Vancouver's Annual Corporate Energy and GHG Emissions Management Report: 2016 to 2020 *(47800275)*

## References

1. Metro Vancouver Corporate *Energy Management Policy*
2. Managing Metro Vancouver's Corporate Energy and Greenhouse Gas Emissions (2014 to 2018), report dated August 14, 2020
3. Metro Vancouver's Achievement of Carbon Neutrality in 2020, report dated June 22, 2021

47509170

# Metro Vancouver Annual Corporate Energy and Greenhouse Gas Emissions Management Report

## 2016 to 2020

29 September, 2021

# TABLE OF CONTENTS

# LIST OF TABLES



# LIST OF FIGURES

# 1. EXECUTIVE SUMMARY

Metro Vancouver spent nearly $30 million on energy use in 2020, which resulted in more than 29,000 tonnes of carbon dioxide equivalent ($CO_2e$) greenhouse gas (GHG) emissions. In 2020, Liquid Waste Services was Metro Vancouver's largest energy user followed by Solid Waste Services, Water Services, Housing, Corporate Services, and Regional Parks. Figure 1, below, summarizes five-year trends in energy use, energy costs, and GHG emissions from energy use.

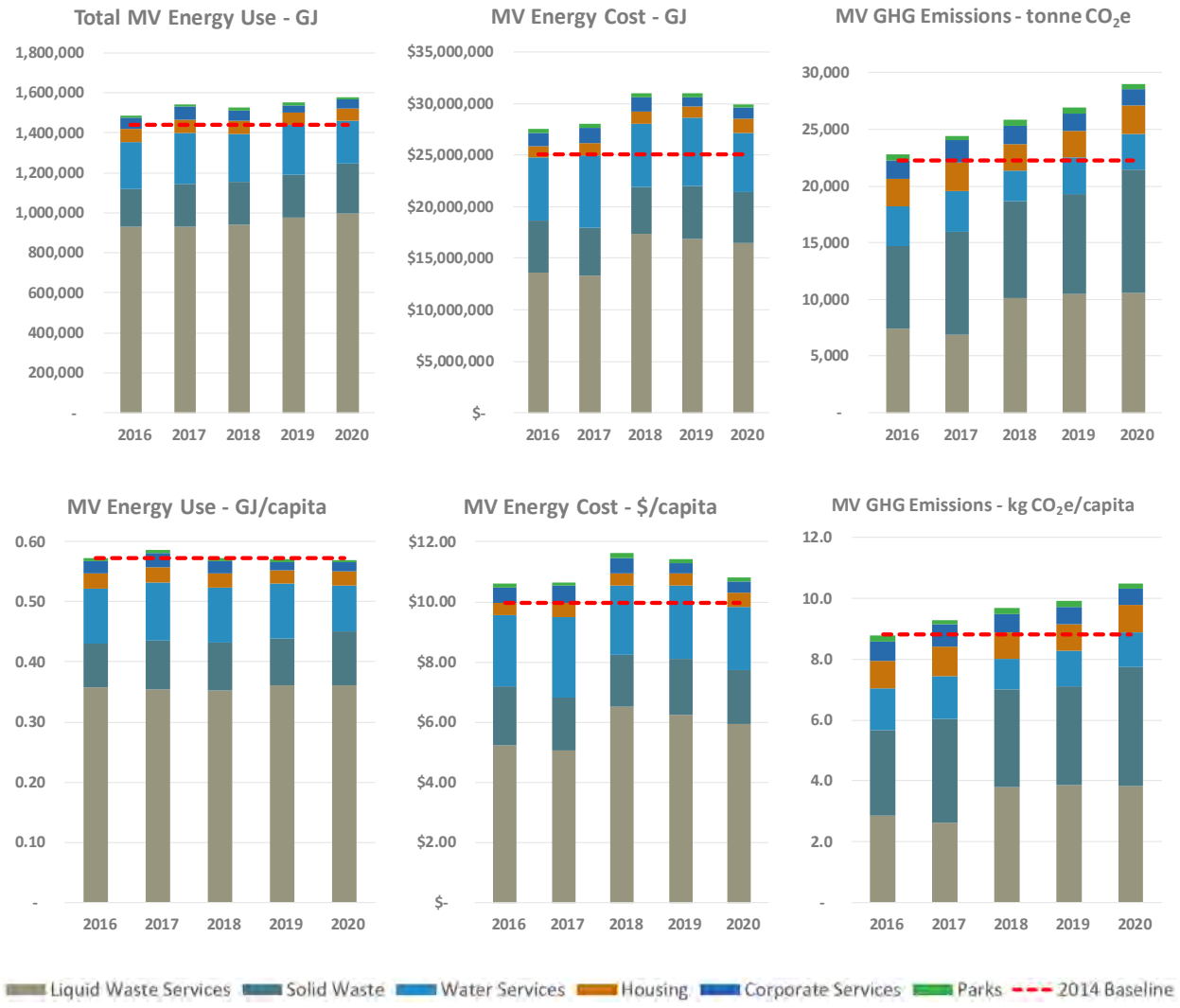



**Figure 1: Five-Year Trends by Service Area**

As shown in Figure 1, 2020 Corporate energy use has increased by 9% compared to 2014 (Metro Vancouver's energy management baseline year), energy costs have increased by 19%, and GHG emissions

associated with energy use have increased by 31%. Much of the cost increase seen from 2017 to 2020 was the result of increased electricity purchases required while the Annacis Island Wastewater Treatment Plant cogeneration engines were taken out of service in late 2017 to enable the cogeneration system upgrade. Commissioning of the new upgraded system began in 2020 and is expected to be complete in 2021. Also shown in Figure 1 and compared to 2014, per capita energy use has remained relatively constant, per capita energy cost has increased by 9% and per capita GHG emissions have increased by 19%. Increases in GHG emissions are driven largely by increases in Liquid Waste Services purchased electricity and fossil fuel use for residuals management as well as Solid Waste Services fossil fuel use for Waste-to-Energy Facility operation.

The Provincial government has recently mandated changes to the methodology used in calculating GHG emissions from electricity use. All GHG emissions from electricity use included in this report employ the new methodology. This change has resulted in significantly higher Corporate GHG emissions than previously reported.

Energy efficiency projects completed from 2014 through 2020 have contributed to savings of over 36,500 GJ per year. Cumulative cost savings from these projects over this period are estimated at $2.6 million and cumulative GHG emissions reduction are 1,760 tonnes $CO_2e$.

Progress has been made toward implementing corporate policies related to energy use and GHG emissions including the *Corporate Energy Management Policy*, the *Sustainable Infrastructure and Buildings Policy*, the suite of *Asset Management* policies, and development of the *Climate 2050* Roadmaps. Energy target-setting is underway for all departments.

In 2020, all service areas committed to setting energy and GHG emissions management targets in 2020 and establishing reporting systems to monitor progress toward meeting those targets. This work is ongoing and is expected to be complete for monitoring and reporting 2022 energy use. For its corporate emissions, Metro Vancouver has achieved carbon neutrality in 2015, 2019, and 2020, as defined by the Provincial Climate Action Revenue Incentive Program (CARIP); however, CARIP ended in 2020 and the recently-announced replacement program to support local government climate action has not yet been released. Metro Vancouver is committed to pursuing carbon neutral status on an ongoing basis.

# 2. INTRODUCTION

Energy plays a fundamental role in allowing Metro Vancouver to provide services to the region. Energy use represents one of Metro Vancouver's largest operating costs – totaling nearly $30 million in 2020 – and is Metro Vancouver's second-largest[1] source of corporate greenhouse gas (GHG) emissions. In 2020, Metro Vancouver used more than 1,500,000 gigajoules (GJ) of energy including both purchased energy – such as electricity, natural gas, diesel, gasoline, propane, and steam – and energy that Metro Vancouver self-generated. In addition to the energy that Metro Vancouver uses, it also generates electricity at its Waste-to-Energy facility through combustion of municipal solid waste. This electricity is sold to BC Hydro. Liquid Waste Services has invested in a new biogas upgrading system that began selling renewable natural gas to FortisBC in 2021.

Effective energy and GHG emissions management is therefore critical to demonstrating Metro Vancouver's corporate fiscal responsibility and commitment to climate change mitigation.

This report presents Metro Vancouver corporate trends in energy use, energy cost, and GHG emissions for each service area from 2016 through 2020. Service areas examined in this report comprise Liquid Waste Services, Water Services, Solid Waste Services, Metro Vancouver Housing Corporation (Housing), Regional Parks (Parks), and Corporate Services. The report also provides updates on progress that Metro Vancouver has made in implementing corporate policies related to energy and GHG emissions management and an update on the role that Metro Vancouver staff play in participating in various energy and climate-related corporate initiatives.

[1] GHG emissions from the combustion of municipal solid waste at the Metro Vancouver Waste-to-Energy Facility are Metro Vancouver's largest source of corporate GHG emissions.

# 3. ENERGY PRODUCTION/GENERATION, USE, COST AND GHG EMISSIONS TRENDS

With the objectives of managing corporate GHG emissions and energy-related operating costs, Metro Vancouver's *Corporate Energy Management Policy* commits the organization to continuously improving the efficiency with which it uses and produces energy. This section summarizes trends in corporate Metro Vancouver energy use, purchased energy costs, and GHG emissions related to energy use as well as trends in energy production/generation. These trends are compared to data from 2014: the year that the *Corporate Energy Management Policy* was adopted.

## 3.1 ENERGY UNIT COSTS

Energy costs play a significant role in the analyses and discussions that follow. Energy costs are driven by a combination of energy consumption – which Metro Vancouver can manage by establishing processes to design efficient systems and to operate and maintain those systems for peak efficiency – and energy unit rates over which Metro Vancouver has no control. Table 1 provides trends for aggregate energy unit rates (total cost divided by total energy use) for Metro Vancouver.

**Table 1: Aggregate Energy Unit Rates**

| Metro Vancouver Aggregate Energy Unit Rates ($/GJ) | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Electricity | $ 23.01 | $ 26.21 | $ 26.72 | $ 25.19 | $ 25.52 | $ 26.51 | 14% | 16% | 9% | 11% | 15% |
| Stationary Fuels | $ 12.39 | $ 12.04 | $ 9.04 | $ 11.04 | $ 10.30 | $ 13.24 | -3% | -27% | -11% | -17% | 7% |
| Steam | $ 20.43 | $ 17.93 | $ 19.91 | $ 20.88 | $ 25.20 | $ 25.29 | -12% | -3% | 2% | 23% | 24% |
| Mobile Energy | $ 36.28 | $ 30.26 | $ 30.57 | $ 34.72 | $ 32.84 | $ 25.60 | -17% | -16% | -4% | -10% | -29% |

**Notes:**

Decrease (change less than zero)

Increase (change greater than zero)

Stationary Fuels and Mobile Energy are all fossil fuels, primarily gasoline, diesel, natural gas and propane. From 2016 through 2019, fossil fuel unit rates have generally decreased compared to 2014. Natural gas is the dominant fuel used by Metro Vancouver in the Stationary Fuels category and the 2020 increase in the Stationary Fuels unit rate was predominantly a result of increasing natural gas prices. Only one Metro Vancouver site (Housing's Regal Place) purchases steam, which is generated by Creative Energy using natural gas. The Steam unit rate increased significantly in 2019 and 2020 likely in response to increasing natural gas prices.

Unit rates for purchased electricity have increased by 15% since 2014. The reduction in 2018 and 2019 aggregate electricity rate compared to 2016 and 2017 is a result of increased electricity purchased by Annacis Island Wastewater Treatment Plant while the cogeneration engines were out of service to allow the installation of larger capacity engines/generators. As a very large energy consumer, that facility is billed by BC Hydro under a lower unit rate than the majority of all other Metro Vancouver facilities. This

effect began to reverse in 2020 as commissioning of the new Annacis cogeneration engines began, thus reducing the fraction of total electricity purchased at the lower Annacis rate and increasing the Metro Vancouver aggregate price.

## 3.2 ENERGY USE, COST, AND GHG EMISSIONS TRENDS BY SERVICE AREA

**2020 Energy Use, Cost, and GHG Emissions Distribution by Service Area**

Figure 2 presents the distribution of 2020 energy use, energy costs[2], and GHG emissions from energy use amongst all Metro Vancouver service areas. Energy costs presented in this report include costs for purchased energy as well as maintenance costs Metro Vancouver incurs in maintaining its own energy generation systems. GHG emissions from other sources are discussed in Section 4.

Metro Vancouver's total corporate GHG emissions presented in this report are not the same as the GHG emissions reported to the province under the Climate Action Revenue Incentive Program (CARIP). The reportable emissions under CARIP are limited to a defined set of "traditional services", which excludes GHG emissions from Housing, solid waste facilities such as the Metro Vancouver Waste-to-Energy Facility, and certain contracted emissions. This report includes both those GHG emissions reported under CARIP as well as the noted emissions excluded from CARIP.

In recent years, Provincial guidelines for calculating GHG emissions from electricity use have used GHG emissions intensity factors that reflect only emissions from electricity generated within BC. In 2021, the Climate Action Secretariat announced that local governments will be required to use new annual emissions intensities – going back to 2010 – that also include emissions related to electricity imported into BC. These "Integrated Grid" factors are used throughout this report and have resulted in significantly increasing Metro Vancouver's corporate GHG emissions. Future Integrated Grid factors will be incorporated into Metro Vancouver's reporting methodology as the Provincial Government updates the factors.

[2] All energy costs presented in this report are actual for the year those costs were incurred.

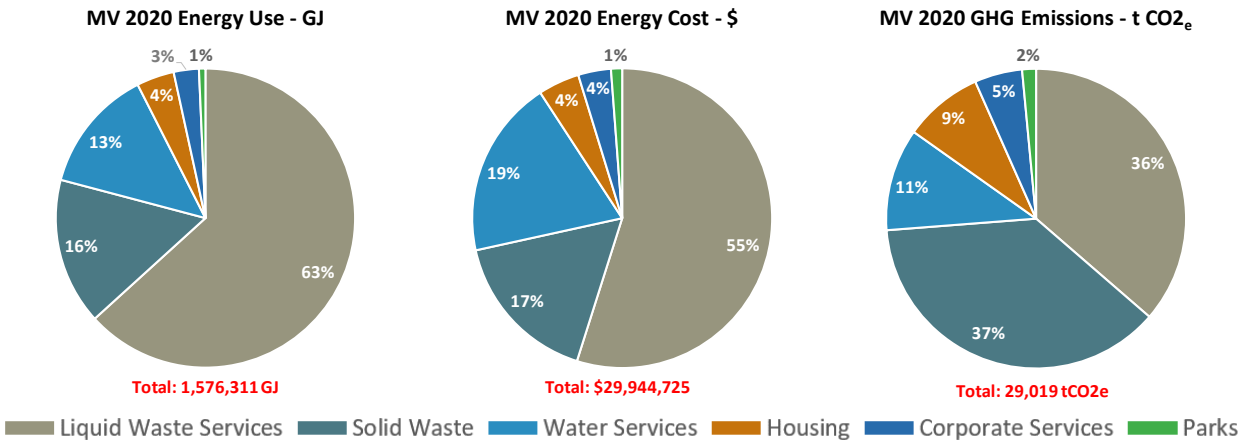



**Figure 2: 2018 Energy Use, Cost, and GHG Emissions Distribution by Service Area**

In 2020, Liquid Waste Services was the largest corporate energy user followed in order by Solid Waste Services, Water Services, Housing, Corporate Services, and Regional Parks. Energy costs in 2020 followed the same relative trends. GHG emissions intensities (mass of $CO_2e$ emitted per unit of energy used) are greatest for fossil fuels such as natural gas, diesel, gasoline, and propane. In contrast, the majority of grid electricity in British Columbia is hydroelectrically generated and therefore considered a clean, renewable source of energy with very low GHG emissions intensity. These relative differences in GHG emissions intensities is the reason that the GHG pie chart shown in Figure 2 appear very different to the Energy Use and Energy Cost pie charts. Liquid Waste Services and Solid Waste Services use large amounts of fossil fuels to transport wastewater treatment residuals (biosolids, grit, and scum for Liquid Waste Services; filtration residuals for Water Services) and municipal solid waste, respectively; Solid Waste Services, Housing, and Corporate Services use significant quantities of natural gas. Water Services energy use is predominantly low-emissions electricity plus some fossil fuel use for managing residuals generated through the water treatment process at Seymour Capilano Filtration Plant.

The following sections present five-year trends in energy use, energy cost, and GHG emissions associated with energy use for Corporate Metro Vancouver and for each service area.

Metro Vancouver's Corporate Energy Management Policy commits the organization to continuous improvement in energy performance. Because energy use is often driven by variables outside Metro Vancouver's control, key performance indicators (KPIs) have been established for Corporate Metro Vancouver and for each service area to monitor progress toward meeting the continuous improvement objective. The following sections also present five-year KPI trends for the corporation and for each service area. For each metric, comparisons are drawn against 2014, Metro Vancouver's energy management baseline year.

**Corporate Metro Vancouver**

This section discusses energy trends for Corporate Metro Vancouver, the aggregate of all services areas: Liquid Waste Services, Solid Waste Services, Water Services, Housing, Parks, and Corporate Services. Figure 3 presents Metro Vancouver corporate five-year trends by service area for energy use, energy cost (including generation maintenance costs), and GHG emissions from energy use both gross and KPI-normalized; these data are tabulated in Table 2.

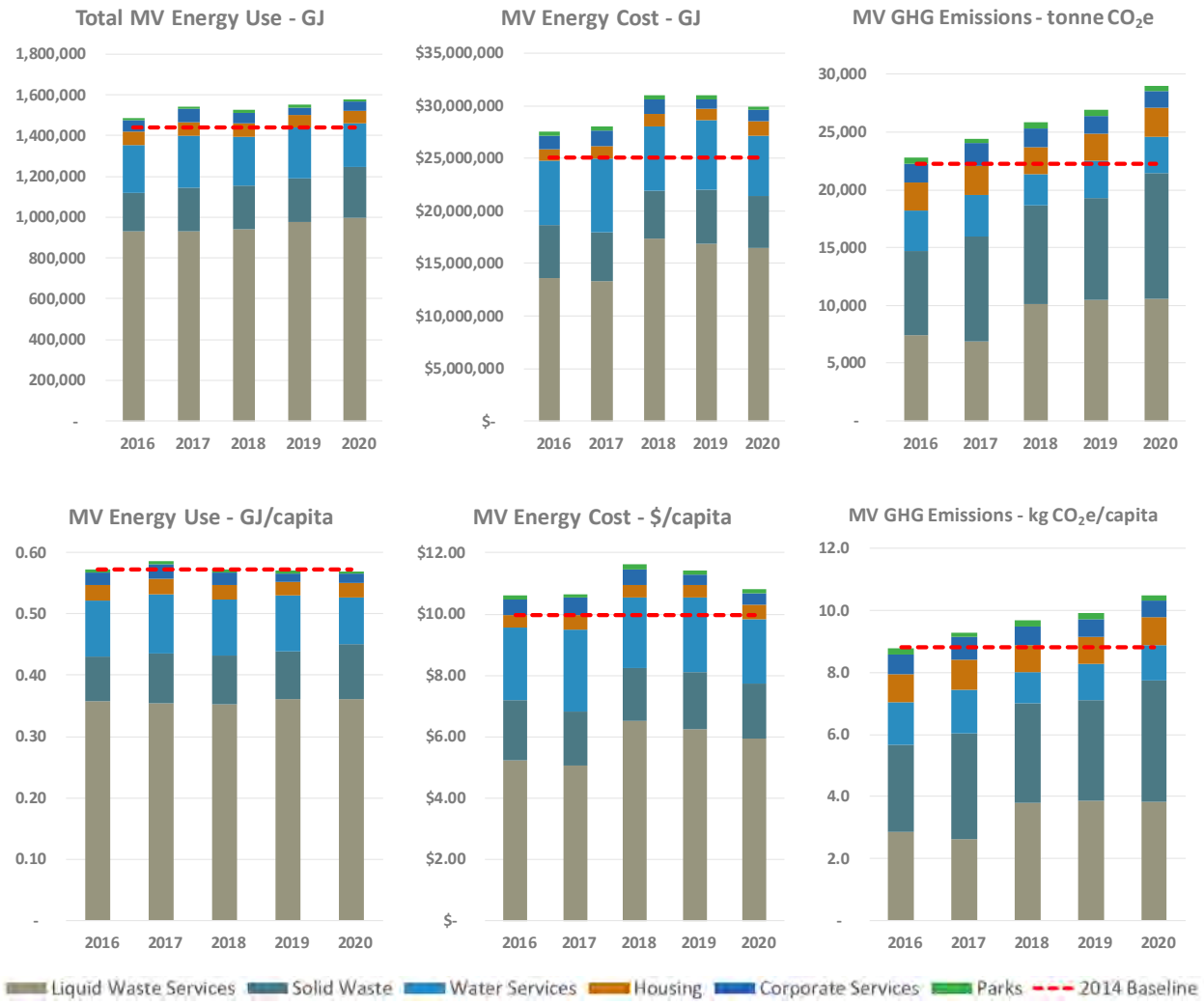



**Figure 3**: **Five-Year Trends by Service Area**

Table 2 also provides percent changes for each metric compared to 2014, the energy management baseline year. Throughout this report, percent changes highlighted green indicate performance improvements or changes favourable to energy or GHG emissions management (e.g. a decrease in annual wastewater volume requiring treatment); percent changes highlighted red indicate a degradation in

performance or changes unfavourable to energy or GHG emissions management (e.g. an increase in annual wastewater volume requiring treatment).

**Table 2: Five-Year Energy and GHG Emissions Trends – Corporate Metro Vancouver**

| Metro Vancouver | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 1,442,301 | 1,486,436 | 1,540,707 | 1,526,764 | 1,550,137 | 1,576,311 | 3% | 7% | 6% | 7% | 9% |
| Total Cost ($) | $ 25,083,905 | $ 27,500,630 | $ 28,021,285 | $ 30,988,809 | $ 31,017,644 | $ 29,944,725 | 10% | 12% | 24% | 24% | 19% |
| Total GHG Emissions (t CO2e) | 22,225 | 22,788 | 24,448 | 25,832 | 26,921 | 29,019 | 3% | 10% | 16% | 21% | 31% |
| Population | 2,517,276 | 2,593,187 | 2,629,574 | 2,666,670 | 2,714,794 | 2,766,954 | 3% | 4% | 6% | 8% | 10% |
| GJ/capita | 0.573 | 0.573 | 0.586 | 0.573 | 0.571 | 0.570 | 0% | 2% | 0% | 0% | -1% |
| $/capita | $ 9.96 | $ 10.60 | $ 10.66 | $ 11.62 | $ 11.43 | $ 10.82 | 6% | 7% | 17% | 15% | 9% |
| kg CO2e/capita | 8.8 | 8.8 | 9.3 | 9.7 | 9.9 | 10.5 | 0% | 5% | 10% | 12% | 19% |

**Notes:**

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Since 2014, Metro Vancouver has experienced an increase of approximately 9% in energy use with costs increasing by 19% over the same period. Cost increases are largely driven by increases in electricity rates. Much of the cost increase seen from 2017 through to 2020 was the result of increased electricity purchases required when the Annacis Island Wastewater Treatment Plant cogeneration engines were taken out of service in late 2017 to enable the cogeneration system upgrade, the commissioning of which began in 2020. Increases in GHG emissions experienced in 2018 through 2020 were driven by these increases in electricity purchases and fossil fuel use by Liquid Waste Services (for transportation of wastewater treatment plant residuals) and Solid Waste Services Waste-to-Energy facility operation.

Corporate Metro Vancouver KPIs for energy use, energy costs, and GHG emissions from energy use are calculated per capita total regional population as summarized in Table 2. Corporate energy use per capita has remained relatively constant since 2014. Reasons for increases in energy cost per capita and GHG emissions per capita are provided in the preceding paragraph.

**Liquid Waste Services**

Table 3 summarizes Liquid Waste Services gross energy and GHG emissions trends, as well as those trends normalized against the Liquid Waste Services KPI: per megalitre[3] of wastewater collected and treated.

[3] One megalitre equals one million litres

**Table 3: Five-Year Energy and GHG Emissions Trends – Liquid Waste Services**

| Liquid Waste Services | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 948,600 | 929,001 | 931,013 | 940,172 | 977,847 | 997,064 | -2% | -2% | -1% | 3% | 5% |
| Total Cost ($) | $ 12,604,704 | $ 13,604,077 | $ 13,309,087 | $ 17,361,336 | $ 16,911,851 | $ 16,433,740 | 8% | 6% | 38% | 34% | 30% |
| Total GHG Emissions (t CO2e) | 7,591 | 7,444 | 6,877 | 10,102 | 10,503 | 10,553 | -2% | -9% | 33% | 38% | 39% |
| ML Collected & Treated | 440,763 | 437,520 | 449,542 | 455,545 | 434,466 | 459,118 | -1% | 2% | 3% | -1% | 4% |
| GJ/ML Collected & Treated | 2.152 | 2.12 | 2.07 | 2.06 | 2.25 | 2.17 | -1% | -4% | -4% | 5% | 1% |
| $/ML | $ 28.60 | $ 31.09 | $ 29.61 | $ 38.11 | $ 38.93 | $ 35.79 | 9% | 4% | 33% | 36% | 25% |
| kg CO2e/ML | 17.2 | 17.0 | 15.3 | 22.2 | 24.2 | 23.0 | -1% | -11% | 29% | 40% | 33% |

**Notes:**

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

As Metro Vancouver's largest energy user, Liquid Waste Services significantly influences overall Metro Vancouver energy and GHG emissions trends. Liquid Waste Services has experienced an upward trend in energy use since 2016. Significant Liquid Waste Services energy cost increases are predominantly the result of increasing purchased electricity use coupled with increasing electricity unit rates. Since the late 1990s, Annacis Island Wastewater Treatment Plant has used biogas produced in the wastewater treatment process to power engines that cogenerate electricity and heat for use in the plant. In December 2017, the cogeneration system was taken out of service to allow the installation of new engines and generators with significantly higher cogeneration capacity. The cogeneration system remained out of service for the duration of 2018 and 2019. Since the cogeneration system was decommissioned, electricity that would have been generated on-site had to be purchased from BC Hydro. This was a significant contributor to the cost increases seen in 2017 through 2020. Commissioning of the new cogeneration system began in the spring of 2020 and continued into 2021.

Increases in GHG emissions that began in 2018 and continued through 2020 are primarily a result of increased use of fossil fuels for transportation of the historic stockpile of land-dried biosolids at Iona Island Wastewater Treatment Plant to beneficial use sites and landfill for non-conforming materials. This work will continue for several more years until the stockpile is removed in preparation for the secondary upgrade of the treatment plant. As a result of the Annacis Island cogeneration engines being taken out of service in December 2017, GHG emissions from Annacis Island electricity purchases also contribute significantly to this trend,

### Solid Waste Services

Solid Waste Services is Metro Vancouver's second largest energy user in 2020. Table 4 summarizes Solid Waste Services gross energy and GHG emissions trends, as well as those trends normalized against the Solid Waste Services KPI: per tonne of municipal solid waste disposed.

**Table 4: Five-Year Energy and GHG Emissions Trends – Solid Waste Services**

| Solid Waste Services | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 192,026 | 189,144 | 212,472 | 214,257 | 213,565 | 250,156 | -2% | 11% | 12% | 11% | 30% |
| Total Cost ($) | $ 5,246,106 | $ 5,058,848 | $ 4,629,528 | $ 4,574,779 | $ 5,116,848 | $ 4,994,201 | -4% | -12% | -13% | -2% | -5% |
| Total GHG Emissions (t CO2e) | 7,570 | 7,227 | 9,038 | 8,584 | 8,788 | 10,854 | -5% | 19% | 13% | 16% | 43% |
| Mass Disposed (tonnes) | 542,477 | 557,495 | 590,002 | 590,805 | 577,950 | 572,222 | 3% | 9% | 9% | 7% | 5% |
| GJ/tonne disposed | 0.35 | 0.34 | 0.36 | 0.36 | 0.37 | 0.44 | -4% | 2% | 2% | 4% | 23% |
| $/tonne disposed | $ 9.67 | $ 9.07 | $ 7.85 | $ 7.74 | $ 8.85 | $ 8.73 | -6% | -19% | -20% | -8% | -10% |
| kg CO2e/tonne disposed | 14.0 | 13.0 | 15.3 | 14.5 | 15.2 | 19.0 | -7% | 10% | 4% | 9% | 36% |

**Notes:**

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Mass disposed data in Table 4 includes garbage and organics. Increases in energy use and GHG emissions starting in 2017 are driven by increases in natural gas use at the Waste-to-Energy Facility and apparent increases in fossil fuel use for solid waste hauling. In 2017, a major hauling contract transitioned from one contractor to another. Solid Waste Services staff believes that the former contractor's fuel reporting was erroneously low, resulting in the increases in energy use and GHG emissions that began in 2017 and continued through to 2020. Increases in energy use and GHG emissions since 2017 are predominantly the result of increased natural gas use at the Waste-to-Energy Facility.

### Water Services

Table 5 summarizes Water Services gross energy and GHG emissions trends, as well as those trends normalized against the Water Services KPI: per megalitre of drinking water treated and delivered.

**Table 5: Five-Year Energy and GHG Emissions Trends – Water Services**

| Water Services | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 181,141 | 237,419 | 257,042 | 241,632 | 246,718 | 211,296 | 31% | 42% | 33% | 36% | 17% |
| Total Cost ($) | $ 4,564,972 | $ 6,130,003 | $ 7,051,137 | $ 6,143,349 | $ 6,614,060 | $ 5,763,046 | 34% | 54% | 35% | 45% | 26% |
| Total GHG Emissions (t CO2e) | 2,698 | 3,551 | 3,625 | 2,650 | 3,191 | 3,207 | 32% | 34% | -2% | 18% | 19% |
| ML Treated & Delivered | 381,261 | 383,536 | 389,177 | 389,800 | 383,400 | 378,734 | 1% | 2% | 2% | 1% | -1% |
| GJ/ML Treated & Delivered | 0.475 | 0.62 | 0.66 | 0.62 | 0.64 | 0.56 | 30% | 39% | 30% | 35% | 17% |
| $/ML | $ 11.97 | $ 15.98 | $ 18.12 | $ 15.76 | $ 17.25 | $ 15.22 | 33% | 51% | 32% | 44% | 27% |
| kg CO2e/ML | 7.1 | 9.3 | 9.3 | 6.8 | 8.3 | 8.5 | 31% | 32% | -4% | 18% | 20% |

**Notes:**

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Water Services was Metro Vancouver's third-largest energy user in 2020. Water Services has experienced between 17% and 42% increase in energy use and between 26% and 54% in energy costs since 2014 largely attributed to the completion of the Twin Tunnels in early 2015. Prior to 2015, approximately 17% of water delivered to member jurisdictions originated from Capilano Lake and was treated by chemical disinfection but not filtration. Since the completion of the Twin Tunnels, all Capilano Lake water is pumped by the Capilano Raw Water Pump Station (CRWPS) to Seymour Capilano Filtration Plant (SCFP) where it is filtered and disinfected. A downward (positive) trend is seen starting in 2018, which can be attributed to less pumping at CRWPS and reduced fleet fuel use.

Water Services energy use KPI (GJ/ML) and energy cost KPI ($/ML) have increased significantly with the operation of CRWPS and associated increased flows through SCFP. Since 2015 (CRWPS commissioning),

the energy and energy cost KPIs have varied in relation to the amount of water pumped by CRWPS. Improvements seen in the GHG emissions from energy use KPI (kg $CO_2e$/ML) in 2018 through 2020 is attributed to the ongoing optimization of CRWPS operation and a decrease in fossil fuel use for SCFP residuals management.

### Housing

Table 6 summarizes Housing gross energy and GHG emissions trends and those trends normalized against the Housing KPI: per million square metres of conditioned floorspace per heating degree day (HDD)[4].

**Table 6: Five-Year Energy and GHG Emissions Trends – Housing**

| Housing | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 66,969 | 63,517 | 67,531 | 62,431 | 62,004 | 63,980 | -5% | 1% | -7% | -7% | -4% |
| Total Cost ($) | $ 1,133,904 | $ 1,055,580 | $ 1,182,707 | $ 1,136,708 | $ 1,111,539 | $ 1,337,153 | -7% | 4% | 0% | -2% | 18% |
| Total GHG Emissions (t CO2e) | 2,490 | 2,368 | 2,547 | 2,368 | 2,369 | 2,477 | -5% | 2% | -5% | -5% | -1% |
| Million $m^2$*HDD | 750 | 724 | 833 | 774 | 810 | 787 | -3% | 11% | 3% | 8% | 5% |
| kJ/($m^2$*HDD) | 89.283 | 87.71 | 81.07 | 80.69 | 76.56 | 81.32 | -2% | -9% | -10% | -14% | -9% |
| $/(million $m^2$*HDD) | $ 1,511.71 | $ 1,458 | $ 1,420 | $ 1,469 | $ 1,372 | $ 1,699 | -4% | -6% | -3% | -9% | 12% |
| g CO2e/($m^2$*HDD) | 3.3 | 3.27 | 3.06 | 3.06 | 2.93 | 3.15 | -1% | -8% | -8% | -12% | -5% |

**Notes:**
Improvement / Favourable (change less than zero)
Degradation / Unfavourable (change greater than zero)

Since 2014, Housing has made significant investments in energy-efficient natural gas space heating and domestic hot water heating equipment, a building envelope upgrade at two sites, targeted window replacements, lighting efficiency upgrades, and laundry appliance efficiency improvements. Additional natural gas savings have been realized through tenant energy awareness campaigns conducted at seven Housing sites. These investments have translated into the performance improvements noted in Table 6. The 2020 increase in energy use and GHG emissions is partially a result of completing and opening Heather Place A, which uses natural gas for space heating and domestic hot water heating. Cost increases seen in 2020 are a due primarily to rate increases for natural gas and, to a lesser degree, electricity.

### Corporate Services

The Corporate Services service area includes Corporate Safety, Human Resources, Fleet Management, and Corporate Facilities. Throughout this report, energy use, energy costs, and GHG emissions associated with energy use specific to fleet vehicles and equipment have been allocated to individual departments where specific vehicles and equipment are assigned to those departments. Energy data for vehicles and equipment that are not assigned to individual departments (pool vehicles and loaner vehicles, for example) are reported in Corporate Services. Table 7 summarizes Corporate Services gross energy and

[4] The heating degree day (HDD) is the recognized energy management metric used to quantify the energy required to heat a building. It is the number of degrees that a day's average temperature is below 18 °Celsius. Annual HDD is the summation of daily HDDs over the course of a year.

GHG emissions trends and those trends normalized against the Corporate Services KPI: per capita regional population.

**Table 7: Five-Year Energy and GHG Emissions Trends – Corporate Services**

| Corporate Services | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 36,556 | 54,442 | 61,522 | 54,818 | 37,809 | 42,896 | 49% | 68% | 50% | 3% | 17% |
| Total Cost ($) | $ 872,617 | $ 1,276,532 | $ 1,521,160 | $ 1,347,631 | $ 864,612 | $ 1,058,056 | 46% | 74% | 54% | -1% | 21% |
| Total GHG Emissions (t CO2e) | 1,080 | 1,651 | 1,975 | 1,583 | 1,568 | 1,494 | 53% | 83% | 47% | 45% | 38% |
| Population | 2,517,276 | 2,593,187 | 2,629,574 | 2,666,670 | 2,714,794 | 2,766,954 | 3% | 4% | 6% | 8% | 10% |
| GJ/capita | 0.015 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 45% | 61% | 42% | -4% | 7% |
| $/capita | $ 0.35 | $ 0.49 | $ 0.58 | $ 0.51 | $ 0.32 | $ 0.38 | 42% | 67% | 46% | -8% | 10% |
| kg CO2e/capita | 0.4 | 0.6 | 0.8 | 0.6 | 0.6 | 0.5 | 48% | 75% | 38% | 35% | 26% |

**Notes:**
Improvement / Favourable (change less than zero)
Degradation / Unfavourable (change greater than zero)

From the time that Metro Vancouver purchased Metrotower III as its new Head Office building in January 2016, until the former two Head Office buildings were sold in early 2019, Metro Vancouver operated all three buildings. This is the primary reason for the significant increases in all Table 7 indicators up to 2018. Following the sale of the former Head Office buildings in early 2019 and completion of energy efficiency improvements late in 2018 at Metrotower III, energy and GHG emissions trends improved in 2019 but partially rebounded in 2020 as a result of energy use associated with increased ventilation rates in Metrotower III during the COVID19 pandemic.

### Regional Parks

Table 8 summarizes Regional Parks gross energy and GHG emissions trends and those trends normalized against the Regional Parks KPI: per capita regional population.

**Table 8: Five-Year Energy and GHG Emissions Trends – Regional Parks**

| Parks | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 17,008 | 12,912 | 11,127 | 13,454 | 12,195 | 10,919 | -24% | -35% | -21% | -28% | -36% |
| Total Cost ($) | $ 531,123 | $ 375,589 | $ 327,666 | $ 425,006 | $ 398,735 | $ 358,528 | -29% | -38% | -20% | -25% | -32% |
| Total GHG Emissions (t CO2e) | 797 | 546 | 386 | 545 | 502 | 434 | -31% | -52% | -32% | -37% | -46% |
| Population | 2,517,276 | 2,593,187 | 2,629,574 | 2,666,670 | 2,714,794 | 2,766,954 | 3% | 4% | 6% | 8% | 10% |
| MJ/capita | 6.756 | 4.98 | 4.23 | 5.05 | 4.49 | 3.95 | -26% | -37% | -25% | -34% | -42% |
| $/capita | $ 0.21 | $ 0.14 | $ 0.12 | $ 0.16 | $ 0.15 | $ 0.13 | -31% | -41% | -24% | -30% | -39% |
| kg CO2e/capita | 0.3 | 0.21 | 0.15 | 0.20 | 0.18 | 0.16 | -33% | -54% | -35% | -42% | -50% |

**Notes:**
Improvement / Favourable (change less than zero)
Degradation / Unfavourable (change greater than zero)

Savings shown for all indicators in Table 8 are primarily attributed to fuel reductions for the Parks fleet since 2014 and winter shut-down of the swimming pool at Capilano River Regional Park beginning in 2019.

## 3.3 ENERGY PRODUCTION/GENERATION TRENDS BY SERVICE AREA

This section summarizes trends in Metro Vancouver corporate energy production/generation from 2016 through 2020 for the three Metro Vancouver service areas that generate energy: Liquid Waste Services (Metro Vancouver's largest energy generator), Solid Waste Services, and Water Services. Annual trend

data is compared against the 2014 energy baseline year: the year that the Corporate Energy Management Policy was adopted. In this report, *energy production* refers to the production of sources of energy (such as biogas produced at wastewater treatment plants) and *energy generation* refers to the conversion of energy sources into usable energy (electricity and heat).

**Liquid Waste Services**

Liquid Waste Services produces methane-rich biogas – a clean, renewable energy source – at four of its five wastewater treatment plants when volatile suspended solids in the wastewater are metabolized (destroyed) by micro-organisms in the solids treatment processes. Most of the biogas produced is used within the plants for beneficial purposes: to generate heat and/or electricity or to power pumps. Table 9 summarizes biogas uses at the four wastewater treatment plants where biogas is produced. Biogas production in excess of what can be used by each plant is flared to the atmosphere (wasted).

**Table 9: Wastewater Treatment Plant Biogas Uses – Liquid Waste Services**

| Wastewater Treatment Plant | Biogas Uses |
|---|---|
| Annacis Island | • Electricity and heat generation in cogeneration engines<br>• Heat generation in boilers |
| Iona Island | • Electricity and heat generation in cogeneration engines |
| Lulu Island | • Heat generation in boilers |
| Lions Gate | • Heat generation in boilers<br>• Wastewater pump engines |
| Northwest Langley | • This facility does not produce biogas |

Table 10 provides trends in total biogas production, percent of biogas used, and biogas production per tonne of volatile suspended solids removed from the wastewater. Most of the energy used by Liquid Waste Services is derived from clean, renewable sources: purchased electricity and energy derived from biogas. Non-renewable (fossil) energy is used primarily to transport wastewater treatment residuals to beneficial use sites and landfills for material that can't be beneficially used. Table 10 also provides trends in the percentage of energy used by Liquid Waste Services that is derived from renewable sources. Changes are measured relative to the energy management baseline year of 2014: the year that the Corporate Energy Management Policy was adopted.

**Table 10: Biogas Production and Utilization Trends – Liquid Waste Services**

| LIQUID WASTE SERVICES - BIOGAS PRODUCED AND USED | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Mass Volatile Solids Destroyed (tonne) | 40,791 | 39,991 | 41,780 | 42,940 | 42,914 | 40,553 | -2% | 2% | 5% | 5% | -1% |
| Volume Biogas Produced (m3) | 33,586,289 | 33,706,654 | 33,889,059 | 35,707,557 | 37,423,064 | 35,701,917 | 0% | 1% | 6% | 11% | 6% |
| Volume Biogas Produced per Mass Volatile Solids Destroyed (m3/tonne) | 823 | 843 | 811 | 832 | 872 | 880 | 2% | -1% | 1% | 6% | 7% |
| Biogas Systems Maintenance Costs[+] | $ 3,515,945 | $ 3,954,992 | $ 3,308,403 | $ 3,858,870 | $ 3,957,481 | $ 4,371,745 | 12% | -6% | 10% | 13% | 24% |
| % Biogas Used | 69% | 71% | 69% | 50% | 54% | 62% | 3% | 0% | -27% | -22% | -10% |
| % Renewable Energy Use | 92% | 93% | 94% | 89% | 89% | 91% | 0% | 2% | -4% | -3% | -2% |

**Notes:**

Improvement / Favourable

Degradation / Unfavourable

Renewable Energy** = Electricity Purchased + Biogas-Derived Energy Used

[+] - includes costs to maintain digestion systems, cogeneration equipment, and Lions Gate influent pump engines

Annual biogas production per mass of volatile solids destroyed has increased since 2014. The dramatic decrease in percent biogas usage from 2018 through 2020 was a result of the Annacis Island Wastewater Treatment Plant cogeneration engines being taken out of service in December 2017 for a system upgrade. Once fully-commissioned in 2021, the new cogeneration system is expected to utilize significantly more biogas than the old cogeneration system and biogas percent utilization rates are expected to exceed historical levels. Costs to maintain Annacis Island digestion and cogeneration systems increased in 2016, 2018, 2019, and 2020. The decrease in percent renewable energy use seen starting in 2018 was primarily the result of increased fossil fuel used for hauling larger quantities of the historic biosolids stockpile in preparation for the upgrade of the Iona Island WWTP.

Table 11 provides trends for combined electricity production from biogas at Annacis Island and Iona Island Wastewater Treatment Plants.

**Table 11: Electricity Generation from Biogas Trends – Liquid Waste Services**

| LIQUID WASTE SERVICES - COGENERATION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Biogas Used in Cogens (m3) | 18,679,458 | 18,946,373 | 17,316,388 | 8,024,538 | 9,003,155 | 13,052,865 | 1% | -7% | -57% | -52% | -30% |
| Electricity Self-Generated (GJ) | 149,610 | 148,112 | 132,972 | 61,035 | 67,673 | 104,376 | -1% | -11% | -59% | -55% | -30% |
| Electricity Generated per Volume Biogas Burned (MJ/m3) | 8.0 | 7.8 | 7.7 | 7.6 | 7.5 | 8.0 | -2% | -4% | -5% | -6% | 0% |
| Cogen Maintenance Costs* | $1,625,226 | $1,900,804 | $1,860,029 | $617,200 | $1,179,729 | $1,758,149 | 17% | 14% | -62% | -27% | 8% |
| Cogen Maintenance Costs per Unit Electricity Generated ($/kWh) | $ 0.039 | $ 0.046 | $ 0.050 | $ 0.036 | $ 0.063 | $ 0.061 | 18% | 29% | -7% | 60% | 55% |
| BC Hydro Purchase Price[+] ($/kWh) | $ 0.051 | $ 0.055 | $ 0.057 | $ 0.057 | $ 0.061 | $ 0.060 | 7% | 11% | 11% | 18% | 17% |

**Notes:**

Improvement / Favourable

Degradation / Unfavourable

* - Annacis maintenance costs excluded during cogen upgrade (2018 and 2019)

[+] - Price shown for Iona Island WWTP

Liquid Waste Services, in partnership with BC Hydro, completed a project in 2015 that has allowed additional electricity generation of approximately 12,600 GJ per year from the Iona Island Wastewater Treatment Plant cogeneration engines. This improvement reduces electricity purchases from BC Hydro and results in significantly less flaring of biogas.

The Annacis Island cogeneration engines were out of service from December 2017 through to the spring of 2020 when commissioning of the new engines began. The volume of gas utilized by the cogeneration systems, electricity production, and electricity generated per volume of biogas combusted all began to improve in 2020 as the new Annacis Island cogeneration engines were commissioned. System commissioning continued in 2021.

Maintenance costs for the Annacis cogeneration system are not included in the table above during the period that the system was out of service for upgrade (2018 and 2019). Cogeneration system maintenance costs per unit of electricity generated exceeded the unit cost of electricity that would have been paid to BC Hydro to purchase this electricity in 2019 and 2020. This performance metric is expected to improve once the Annacis cogeneration system is fully commissioned.

**Solid Waste Services**

Since 1988, Solid Waste Services has generated steam, and later electricity, through burning municipal solid waste at its Waste-to-Energy facility that manages roughly a quarter of the region's municipal solid waste. As the waste burns, the hot gases from the combustion process pass into a boiler area where they heat water-filled tubes. The water boils to become steam while the gas passes through an air pollution control process. The steam produced in the boiler area is used to power a turbine that converts the steam into electricity. The facility produces enough electricity to power 16,000 homes per year. The electricity is sold to BC Hydro generating more than $6 million in revenue each year. Table 12 summarizes Waste-to-Energy Facility electricity generation trends from 2016 through 2020 with comparisons drawn to the 2014 energy management baseline year.

**Table 12: Metro Vancouver Waste-to-Energy Facility Electricity Generation Trends – Solid Waste Services**

| WTEF ELECTRICITY GENERATION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Inbound Tonnage (tonne) | 275,266 | 254,256 | 259,747 | 253,123 | 253,184 | 244,362 | -8% | -6% | -8% | -8% | -11% |
| Electricity Generation (GJ) | 537,110 | 624,053 | 611,018 | 587,633 | 621,374 | 544,558 | 16% | 14% | 9% | 16% | 1% |
| Electricity Generation per Tonne Municipal Solid Waste Burned (GJ/tonne) | 1.95 | 2.45 | 2.35 | 2.32 | 2.45 | 2.23 | 26% | 21% | 19% | 26% | 14% |

**Notes:**
Improvement / Favourable (change greater than zero)
Degradation / Unfavourable (change less than zero)

Tonnage managed by the Waste-to-Energy Facility has decreased compared to 2014 while electricity generation per tonne of municipal solid waste processed has increased compared to 2014. This increase in electricity generation capacity is attributed to the disposal ban on organic materials such as food scraps that Metro Vancouver put in place in January 2015. With organics removed from the Waste-to-Energy process stream, there has been a relative increase in proportion of municipal solid waste of higher heating value which provides more heat when burned. As the boilers are heat limited, this allows the facility to generate more electricity per tonne of municipal solid waste. Electricity generation per tonne of municipal solid waste burned dropped significantly in 2020 compared to the previous four years.

**Water Services**

The elevations of the Seymour Capilano Filtration Plan and the Coquitlam Water Treatment Plant provide the water transmission system with a significant amount of "free" energy in the form of gravity-generated hydraulic pressure. Using gravity supply, the water utility is able to avoid pumping in much of the transmission system when regional water demands are low enough to allow this practice. Gravity transmission contributes to energy cost savings.

Water Services produces hydroelectricity as treated drinking water flows from Seymour Capilano Filtration Plant to Capilano Energy Recovery Facility where the water turns a turbine and generates electricity. This electricity is used to offset a portion of the purchased electricity required to operate pumps at the Capilano Raw Water Pump Station. Table 13 summarizes trends in Capilano Energy Recovery Facility electricity generation and maintenance costs since the facility was commissioned in February 2016. The table also includes percent changes relative to 2016.

**Table 13: Capilano Energy Recovery Facility Electricity Generation Trends – Water Services**

| CERF ELECTRICITY GENERATION | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | Percent Change Relative to Baseline 2016 | | | |
| | Baseline 2016 | 2017 | 2018 | 2019 | 2020 | 2017 | 2018 | 2019 | 2020 |
| Treated Water Tunnel Flow (ML) | 146,745 | 144,482 | 156,324 | 149,521 | 140,293 | -2% | 7% | 2% | -4% |
| Electricity Generation (GJ) | 14,482 | 10,658 | 31,217 | 20,987 | 24,282 | -26% | 116% | 45% | 68% |
| Flow Utilization (MJ/ML) | 99 | 74 | 200 | 140 | 173 | -25% | 102% | 42% | 75% |
| Generation Capacity Utilization[+++] | 27% | 20% | 58% | 39% | 45% | -26% | 116% | 45% | 68% |
| % BC Hydro Generation Requirement | 42% | 31% | 91% | 61% | 71% | -26% | 116% | 45% | 68% |
| Annual Maintenance Costs | $ 48,105 | $ 130,594 | $ 56,920 | $ 138,797 | $ 140,988 | 171% | 18% | 189% | 193% |
| BC Hydro Incentive Clawback Payments | $ 45,498 | $ - | $ - | $ - | $ - | n/a | n/a | n/a | n/a |
| (O&M Costs* + Clawback) per Unit Electricity Generated ($/kWh) | $ 0.02 | $ 0.04 | $ 0.01 | $ 0.02 | $ 0.02 | 90% | -72% | 2% | -10% |
| BC Hydro Purchase Price ($/kWh) | $ 0.04 | $ 0.05 | $ 0.05 | $ 0.05 | $ 0.05 | 4% | 7% | 14% | 13% |

**Notes:**

Generation Capacity Utilization[+++] - based on 1.7MW generator operating continuously

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

O&M Costs* - costs for Operations site visit labour plus all site maintenance

n/a - not applicable

Since its commissioning in 2016, the facility has experienced several operational issues each year except 2018, which have resulted in lower than expected electricity generation. Generation capacity utilization – the percentage of actual electricity generation compared to theoretical generation potential of the 1.7 megawatt (MW) turbine – has ranged from a minimum of 20% in 2017 to a maximum of 58% in 2018. Water Services is developing operational strategies to maximize the flow passing through the turbine and maintenance strategies to minimize turbine down-time. These strategies will optimize Capilano Energy Recovery Facility electricity generation.

Annual costs for facility maintenance and labour for facility site visits have ranged from a minimum of approximately $48,000 in 2016 to $141,000 in 2017.

Water Services received approximately $2.7 million incentive funding from BC Hydro for the construction of Capilano Energy Recovery Facility. The funding agreement requires Water Services generate 9.5

gigawatt hours of electricity per year (34,200 GJ/year) to avoid clawback payments to BC Hydro (pro-rated to the amount of the shortfall). The shortfall during the first year of operation (2016) required Water Services to repay BC Hydro $45,498 in 2019. Clawback payments for generation shortfalls in subsequent years have not yet been determined with BC Hydro.

Electricity generated by Capilano Energy Recovery Facility is used by the Capilano Raw Water Pump Station thus offsetting electricity that would have had to have been purchased from BC Hydro to operate the Pump Station. Considering all costs of generation (annual Operations labour costs, maintenance costs, and BC Hydro clawbacks paid to date), costs per unit electricity generated have remained below the rate that would have been paid to BC Hydro for Pump Station electricity for all years reported. This analysis does not include debt financing for facility construction.

Water Services recovers energy from water pressure at three additional facilities: turbines at Seymour Falls Dam and Cleveland Dam generate electricity; and water pressure at Cleveland Dam Pump House is used to drive water distribution pumps. Table 14 summarizes energy generation trends at these facilities from 2014 through 2018.

**Table 14: Other Energy Generation Trends – Water Services**

| OTHER ENERGY GENERATION | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Cleveland Dam Pump House (GJ)* | 2,574 | 2,857 | 2,619 | 2,805 | 2,771 | 2,573 | 11% | 2% | 9% | 8% | 0% |
| Cleveland Dam Turbine (GJ)+ | 2,475 | 2,439 | 2,424 | 2,518 | 2,450 | 2,541 | -1% | -2% | 2% | -1% | 3% |
| SFD Turbine (GJ) | 1,611 | 1,579 | 1,696 | 1,569 | 1,473 | 1,561 | -2% | 5% | -3% | -9% | -3% |
| **Total** | **6,660** | **6,875** | **6,738** | **6,892** | **6,694** | **6,674** | **3%** | **1%** | **3%** | **1%** | **0%** |

**Notes**

* - Calculated pump house flows

+ - Calculated from the turbine generation curve for an average annual Capilano Lake level

Improvement / Favourable (change greater than zero)

Degradation / Unfavourable (change less than zero)

# 4. OTHER GHG EMISSIONS TRENDS

In addition to GHG emissions originating directly from energy use (discussed above), Metro Vancouver's total corporate GHG emissions also include emissions originating from non-energy sources.

Solid Waste Services' Waste-to-Energy Facility is Metro Vancouver's largest source of quantified non-energy GHG emissions.

The facility emits GHGs through the combustion of municipal solid waste and natural gas to fuel the process burners. Emissions from municipal solid waste are classified as either biogenic (derived through the combustion of organic material) or fossil-based (derived through the combustion of fossil-based materials such as plastics and natural gas). Table 15 summarizes the facility's trends in biogenic (organics-derived) and fossil-derived GHG emissions.

**Table 15: GHG Emissions from Metro Vancouver Waste-to-Energy Facility – Solid Waste Services**

| GHG Emissions (t CO2e) - Solid Waste Services Waste-to-Energy Facility | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Biogenic Emissions from MSW | 158,383 | 141,842 | 168,676 | 147,857 | 152,646 | 151015 | -10% | 6% | -7% | -4% | -5% |
| Fossil Emissions from MSW | 108,171 | 117,569 | 117,998 | 127,034 | 119,659 | 140,971 | 9% | 9% | 17% | 11% | 30% |
| Fossil Emissions from Natural Gas | 563 | 802 | 1,014 | 1,990 | 2,007 | 3,504 | 42% | 80% | 253% | 256% | 522% |
| **Total GHG Emissions** | **267,117** | **260,213** | **287,688** | **276,881** | **274,311** | **295,490** | -3% | 8% | 4% | 3% | 11% |

**Notes:**
Improvement / Favourable (change less than zero)
Degradation / Unfavourable (change greater than zero)

Biogenic emissions from waste combustion have generally decreased since Metro Vancouver introduced the disposal ban on organic materials in 2015. This has led to a corresponding increase in fossil-based emissions from waste combustion as the proportion of non-biogenic material managed at the facility has increased. The increase in natural gas emissions at the Waste-to-Energy Facility is due to the installation of larger capacity gas burners in 2018, as required by the facility's Operational Certificate. These gas burners are used to maintain furnace temperatures during start up and shut down events and any other time as necessary to maintain the secondary combustion zone temperature and control carbon monoxide emissions. Metro Vancouver is working with the Waste-to-Energy Facility operator to ensure natural gas is used only when necessary. Projected natural gas usage for 2021 is similar to 2019.

Liquid Waste Services has several other potential sources of other GHG emissions. Of these emissions, those resulting from flared biogas are the only emissions that have thus far been quantified and tracked as summarized in Table 16.

**Table 16: GHG Emissions from Wasted Biogas – Liquid Waste Services**

| LIQUID WASTE SERVICES - GHG EMISSIONS FROM WASTED BIOGAS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline Year (2014) | | | | |
| | Baseline Year (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Energy Wasted (GJ) | 260,937 | 227,934 | 244,897 | 412,074 | 404,243 | 313,395 | -13% | -6% | 58% | 55% | 20% |
| GHG Emissions from Energy Wasted (t CO2e) | 76 | 66 | 71 | 120 | 117 | 91 | -13% | -6% | 58% | 55% | 20% |

**Notes:**

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

The amount of biogas flared and associated GHG emissions increased significantly in 2018 primarily due to the decommissioning of the Annacis Island Wastewater Treatment Plant cogeneration engines in December 2017 to make way for higher capacity units. Since that time and throughout 2018 and 2019, biogas was used to directly fire the plant's boilers but because boiler demand alone is less than cogeneration engine demand (which supplied both heat and electricity), more biogas was flared (wasted). These emissions began to decrease in 2020 as commissioning of the upgraded Annacis cogeneration system began.

Other potential sources of non-energy-related Liquid Waste Services GHG emissions include fugitive emissions of biogas and nitrous oxide – both very potent GHGs – from the collections system, the wastewater treatment process, lagoons, and stockpiles. Although studies were conducted several years ago to estimate GHG emissions from lagoons and stockpiles at the IIWWTP, the results were inconclusive due to high levels of uncertainty in measurements and methods used. Similarly, investigations in 2019 by UBC Sustainability Scholars regarding potential sources of fugitive methane and nitrous oxide emissions from Annacis Island Wastewater Treatment Plant demonstrated high uncertainties in estimating fugitive emissions. Liquid Waste Services has not yet quantified emissions associated with refrigerant use and the production, transportation, and use of chemicals used in treatment processes and consumables.

Liquid Waste Services will continue to investigate these non-energy GHG emissions sources to determine if any are significant and will develop emissions management strategies for those deemed significant.

Similarly, the remaining service areas (Water Services, Solid Waste Services, Housing, Corporate Services, and Regional Parks) will also investigate other potential sources of GHG emissions and develop management strategies for those found to be significant.

# 5. CORPORATE POLICY IMPLEMENTATION AND INITIATIVE UPDATE

Since 2014, Metro Vancouver has developed a number of policies and initiatives aimed at managing energy costs and GHG emissions. This section provides an update on Metro Vancouver's progress toward implementing these policies and participating in these initiatives.

## 5.1 CORPORATE ENERGY MANAGEMENT POLICY

The *Corporate Energy Management Policy* was adopted by the Board in 2014. The policy articulates Metro Vancouver's commitment to continuously improving energy efficiency in its operations, and to continuously improving the efficiency of energy production, generation, and recovery. It also provides direction for staff to put processes in place to effectively manage energy following International Organization for Standardization (ISO) energy management practices. The following table provides a summary of progress Metro Vancouver has made in completing the directives defined in the *Corporate Energy Management Policy*.

**Table 17: *Corporate Energy Management Policy* Implementation Status**

| Policy Directive | Status |
|---|---|
| • Establish substantiated, realistic, and measurable targets that motivate continuous improvement and are consistent with other objectives. | • In 2018, Housing became the first department to set a GHG emissions reduction target which was published in its 2019 Work Plan. Both GHG emissions reduction targets and energy performance targets have been set in the Housing 10-Year Plan published in 2019.<br>• In 2019, Liquid Waste Services committed to reducing energy use by 10% by 2030 compared to 2019 energy use.<br>• In 2020, all service areas (Liquid Waste Services, Water Services, Solid Waste Services, Corporate Services, and Regional Parks) committed to setting energy and GHG emissions management targets in 2020 and establishing reporting systems to monitor progress toward meeting those targets. This work is ongoing and is expected to be complete for 2022 reporting. |
| • Develop a strategic energy management planning process for achieving these targets using triple bottom line analysis methods. | • Housing undertakes triple bottom line life-cycle cost analyses on all mechanical equipment upgrades. Housing is currently developing a strategic plan to meet the energy and GHG emissions targets set in its 10-Year Plan (2019). |

| Policy Directive | Status |
|---|---|
| • Regularly monitor and report on progress toward meeting these targets using a corporate energy and GHG tracking system. | • Metro Vancouver invested in software as service in 2013 to establish its corporate energy and GHG emissions database. The database will be used to report on progress toward meeting targets as they are established.<br>• Housing is participating in Building Benchmark BC, which encourages building owners and managers to measure and disclose their energy use and GHG emissions. By measuring and comparing this data, resources can be funneled towards the best interventions, in the right buildings, to achieve the highest climate benefit. In parallel, Housing has benchmarked its building portfolio to compare the performance of its existing building stock.<br>• Metro Vancouver annually reports energy and GHG emissions metrics on its publicly-accessible Performance Monitoring Dashboard.<br>• Annual reporting to the Climate Action Committee and Board will continue. |
| • Establish processes that continuously improve Energy Performance in planning, design, procurement, construction, operation, and maintenance of Metro Vancouver assets and services. | • Energy efficiency and GHG emissions management content based on life-cycle options analysis has been included in Metro Vancouver's Project Management Guidelines.<br>• Housing included energy efficiency considerations in the 2018 update of its Unit Standards.<br>• Options analysis processes have been developed for Housing and are being carried out on all mechanical equipment upgrades to identify the most energy efficient and least GHG intensive solutions on a life cycle net present value basis. This process will be formalized once refined.<br>• Housing implements options that improve building energy performance through the guidance of industry standards, BC Energy Step Code, options analysis, energy studies and modelling.<br>• Housing is a partner (along with BC Housing, BC Non-Profit Housing Association, and City of Vancouver) in the Reframed initiative led by Pembina Institute. The initiative is intended to develop a systematic approach to deep energy retrofits in the low income housing sector.<br>• Energy efficiency and GHG emissions have been or are being considered for a number of large Liquid Waste Services and Solid Waste Services capital |

| Policy Directive | Status |
|---|---|
| | projects. Formal processes will be developed for capital projects and for operations and maintenance projects.<br>• Energy efficiency and GHG emissions impacts will be considered in development of guidelines for the *Sustainable Infrastructure and Buildings Policy* (discussed in Section 5.4). |
| • Provide access to energy information and training for staff. | • A corporate energy management communication strategy is under development. The reporting system described above will become an integral component of this strategy.<br>• A Corporate Energy Management Newsletter is published on a periodic basis.<br>• Energy management workshops were delivered for O&M staff at Lulu Island Wastewater Treatment Plant and Seymour-Capilano Filtration Plant.<br>• A formal process for identifying training needs will be initiated.<br>• Housing has included an energy efficiency section in its regular newsletters to tenants and creates energy conservation posters for those residences participating in natural gas conservation competitions. The Metro Vancouver Energy Management Group presents annual energy and GHG emissions performance updates to Housing management and field staff. |
| • Empower staff to generate solutions that meet the objectives of this policy. | • Liquid Waste Services Management has endorsed its Innovation Incubator to encourage staff to bring forward ideas for innovation and efficiency that promote continuous improvement.<br>• Tenant energy awareness campaigns conducted at seven Housing sites. |

## 5.2 CARBON PRICE POLICY

In June 2017, the MVRD Board approved Metro Vancouver's Carbon Price Policy. The policy is being incorporated into life cycle cost analyses during Metro Vancouver's capital planning processes, and in particular, into financial business casing tools used for options analyses that concern energy decisions.

Metro Vancouver's corporate carbon price of $150 per tonne of CO2e emissions was applied to the business case for Liquid Waste Services' effluent heat recovery project at the new North Shore Wastewater Treatment Plant. Heat recovered from treated effluent will provide heating to Lonsdale Energy Corporation's district energy customers, displacing natural gas use and reducing regional GHG

emissions. The $17 million cost of investing in these GHG reductions, which equates to approximately $120 per tonne on a life-cycle basis, is lower than the price of carbon established in the Carbon Price Policy and is therefore a cost-effective GHG emission reduction investment.

Housing completes options analyses on all lighting and mechanical equipment (boilers, water heaters, ventilation systems, etc.) replacement projects to identify the option with the lowest life cycle net present value cost while factoring in Metro Vancouver's corporate carbon price. In 2021, Housing expanded this decision-making process to new construction projects such as Welcher Avenue and Kingston Gardens.

Currently-available electric heat pump technology could replace natural gas use and reduce Housing GHG emissions from building energy use by more than 90%. To date, the carbon price has strengthened the already-positive business case for high efficiency natural gas equipment but has not been successful in financially justifying investment in the lowest-carbon electric option. Housing experience suggests that, with existing external financial incentives, a carbon price of approximately $220/tonne $CO_2e$ would be required to justify this type of investment.

Solid Waste Services is exploring ways to incorporate carbon pricing into its procurement processes. For a recent contracted project to manage organics at the North Shore Recycling and Waste Centre, the impact of greenhouse gas emissions was factored into the technical evaluation criteria as part of the request for proposals process. Proponents were asked to provide hauling details including hauling distance, expected load factors and backhaul information so greenhouse gas emissions could be calculated for the proposed transportation route and proponents were given weighted scores accordingly. Future procurements could use the carbon price to translate greenhouse gas emissions into a value using the carbon price, so they could be evaluated as part of the financial criteria.

The corporate carbon price is also used in fleet procurement decisions discussed in Section 5.2 and sewer heat recovery business-casing discussed in Section 6.2.

## 5.3 FLEET PLANNING AND ACQUISITION POLICY

In September 2016, the Metro Vancouver Board adopted the *Fleet Planning and Acquisition Policy* aimed at:

- Reducing overall size of fleet
- Rightsizing vehicles (transitioning to smaller, more fuel-efficient vehicles)
- Reducing overall km traveled
- Transitioning to lower-carbon vehicles (reducing GHG emissions per km traveled)

Implementation of the policy is the responsibility of Metro Vancouver Fleet Services. Each year, Fleet Services evaluates market options for replacement of aging compact sedans and sport utility vehicles in the context of meeting the objectives of the Fleet Planning and Acquisition Policy. The evaluation involves life-cycle net present value costing (including the Corporate Carbon Price) for purchase and operation of each option. Preferred makes and models become those recommended in the Low Emissions Vehicle

Standards – a hierarchy of most-preferred to least preferred technologies based on GHG emissions – for vehicle replacements made in the following year.

Global positioning systems (GPSs) have been installed in all fleet vehicles. In the future, these systems could be used to improve route planning and thereby reduce fuel use and GHG emissions.

Table 18 compares trends in Metro Vancouver fleet energy and GHG emissions performance indicators for 2016 (the year the policy was adopted) through 2020.

**Table 18: Fleet Energy and GHG Emissions Reduction Performance Trends**

| Metro Vancouver | | | | | | Percent Change Relative to Baseline (2016) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Baseline (2016) | 2017 | 2018 | 2019 | 2020 | 2017 | 2018 | 2019 | 2020 |
| Fleet Size (no. vehicles) | 420 | 424 | 452 | 456 | 494 | 1% | 8% | 9% | 18% |
| Percent Fuelled Solely from Fossil Sources | 87.4% | 85.6% | 84.5% | 84.9% | 83.8% | -2% | -3% | -3% | -4% |
| Fossil Fuel Use (GJ) | 39,953 | 38,623 | 37,790 | 36,645 | 35,365 | -3% | -5% | -8% | -11% |
| Fossil Fuel Cost | $ 1,224,968 | $ 1,332,922 | $ 1,467,473 | $ 1,403,220 | $ 1,143,737 | 9% | 20% | 15% | -7% |
| GHG Emissions from Fossil Fuel Use (t $CO_2e$) | 2,722 | 2,628 | 2,571 | 2,492 | 2,404 | -3% | -6% | -8% | -12% |

**Notes:**

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)

Since adoption of the Fleet Planning and Acquisition Policy in 2016 (the baseline year for fleet performance monitoring), the size of the corporate fleet has increased by 18% while the percentage of vehicles fueled only by fossil fuels has decreased by 4%. Total emissions from the corporate fleet have decreased by 12% since 2016. Some of the decrease in 2020 fuel use is likely due to reduced fleet travel during the 2020 COVID 19 pandemic. Fleet Services is working to improve mileage data collection to allow the indicators shown in Table 18 to be normalized against distance traveled.

## 5.4 SUSTAINABLE INFRASTRUCTURE AND BUILDINGS POLICY

In October 2018 the Metro Vancouver Board adopted the *Sustainable Infrastructure and Buildings Policy*. The policy targets Leadership in Energy and Environmental Design (LEED) Gold and BC Energy Step Code Level 3 as minimum standards for occupied buildings and Envision Gold for infrastructure, and aims to ensure that the wide range of projects undertaken by Metro Vancouver are consistent in their approach to sustainable design and construction. The policy compels design teams to incorporate performance-based considerations for energy efficiency and GHG emissions, sustainable and efficient use of resources, and ecological health.

Staff have now finalized the accompanying *Sustainable Infrastructure and Buildings Design Guide*. This Guide supports project leads through the successful application of the policy to new infrastructure and building projects as well as significant retrofits to existing infrastructure and buildings. The Guide also lays out compliance pathways and technical guidelines for eligible projects to achieve the required sustainable outcomes. The Guide was developed by staff in the Air Quality and Climate Change Division, with support from an internal Steering Committee and Technical Advisory Group made up of staff from across Metro Vancouver's Departments. Training materials are currently in development to support a better understanding of the policy and navigation of the requirements. Training will be available to staff in 2022.

## 5.5 ASSET MANAGEMENT POLICIES

Metro Vancouver delivers its services through an extensive and complex portfolio of assets. In 2018 and 2019, the Board approved separate asset management policies for Liquid Waste Services, Water Services, Solid Waste Services, Housing, and Regional Parks. These policies will establish asset management principles and framework to balance asset performance, risk, and cost to deliver Metro Vancouver services. Staff are currently developing the methodology to manage these assets in a manner that minimizes asset failure risks and impact to customers and optimizes the lifecycle value of assets. Energy represents a major component of the life-cycle operating costs and GHG emissions and energy performance can be a measure of asset condition and functionality. Energy will therefore be included in processes for monitoring annual asset performance and operation costs.

## 5.6 *CLIMATE 2050*

In 2018, Metro Vancouver's Board adopted the *Climate 2050*[5] *Strategic Framework*, and amended it in 2019 to set more aggressive GHG reduction targets. *Climate 2050* aims to demonstrate bold leadership in responding to climate change by ensuring our infrastructure, ecosystems, and communities are resilient to the impacts of climate change, and by pursuing a carbon neutral region by 2050, with an interim target of reducing greenhouse gas emissions by 45% from 2010 levels by 2030. To implement this strategy, Metro Vancouver is currently developing a series of Roadmaps, which will include specific actions to reduce greenhouse gas emissions. Metro Vancouver can set the path towards carbon neutrality, but it will not be able to achieve the targets on its own without significant cooperation, collaboration, and commitment from member jurisdictions, other orders of government, partner organizations, stakeholders, and the public. With its regional partners, Metro Vancouver is developing the first iterations of the *Climate 2050* Roadmaps in 2021 and 2022.

For its corporate emissions, Metro Vancouver has achieved carbon neutrality (as defined by the Provincial Climate Action Revenue Incentive Program) in 2015, 2019 and 2020. Metro Vancouver is committed to pursuing carbon neutral status on an ongoing basis. Efforts are underway to support this commitment, including the establishment of a Liquid Waste Services department team to develop and implement projects for this purpose. The Liquid Waste Services department team is also developing corresponding plans for addressing and reducing the impacts of climate change on liquid waste infrastructure and operations, to continue to protect human health and the environment.

[5] *Climate 2050* Website: http://www.metrovancouver.org/climate2050

# 6. ENERGY- AND CLIMATE-RELATED PROJECTS

As a signatory to the B.C. Climate Action Charter, Metro Vancouver is committed to pursuing carbon neutrality. To help facilitate this goal, the *Corporate Climate Action Plan* was developed and presented to the GVRD Board in 2010. The objective of the Plan is to become a "carbon neutral corporation resilient to the impacts of climate change". This objective is to be achieved through three strategies:

- Reducing energy consumption through efficiencies;
- Transitioning to renewable energy; and
- Maximizing energy recovery.

Aligning with these strategies, this section provides an update regarding energy- and climate-related projects that have been completed by Metro Vancouver from 2014 through 2020.

## 6.1 ENERGY EFFICIENCY

Table 19 summarizes estimated annual energy savings for energy efficiency projects completed by each department from 2014 through 2020. Annual savings realized in each year perpetuate in subsequent years, summing to the Cumulative Savings shown in Table 19.

**Table 19: Energy Efficiency Project Activities by Service Area**

| Completed Energy Efficiency Projects - Estimated Annual and Cumulative Savings | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Project Completion Year | | Liquid Waste Services | Water Services | Solid Waste Services | Housing | Corporate Services | Parks | Metro Vancouver Total |
| Estimated Annual Savings (GJ) | 2014 | 772 | 2,703 | - | - | - | - | 3,475 |
| | 2015 | - | 190 | - | - | - | - | 190 |
| | 2016 | 4,579 | 623 | - | 2,801 | - | 1,124 | 9,127 |
| | 2017 | 3,152 | 818 | - | 1,338 | - | 10 | 5,318 |
| | 2018 | 2,530 | 1,688 | 60 | 525 | 2,484 | 572 | 7,860 |
| | 2019 | 1,293 | 2,196 | - | 3,628 | 738 | - | 7,856 |
| | 2020 | - | 2,385 | - | 1,030 | - | - | 3,415 |
| **Total** | | **12,325** | **10,604** | **60** | **9,322** | **3,222** | **1,707** | **37,241** |
| Cumulative Savings* | Energy (GJ) | 42,888 | 34,668 | 160 | 23,458 | 6,221 | 6,333 | 113,728 |
| | Cost | $ 1,252,897 | $ 997,482 | $ 4,672 | $ 253,439 | $ 114,343 | $ 54,743 | $ 2,677,577 |
| | GHG Emissions (t CO2e) | 127 | 102 | 1 | 1050 | 177 | 314 | 1,772 |

* - cumulative savings for projects completed in 2014 through 2020

From 2014 through 2020, Metro Vancouver completed energy efficiency projects that saved more than 37,000 GJ per year. Cumulatively these projects have reduced energy use by over 113,700 GJ, energy costs by $2.7 million, and GHG emissions by 1,772 tonnes $CO_2e$.

### Liquid Waste Services

Liquid Waste Services energy efficiency and energy generation improvement projects account for approximately 34% of total Metro Vancouver annual savings from 2014 through 2020. These include both energy efficiency upgrades to capital equipment as well as process optimization projects. Total estimated savings for Liquid Waste Services energy efficiency project completions are 12,300 GJ/year; cumulative savings from 2014 through 2020 are estimated at 42,900 GJ, $1,252,900, and 127 tonnes $CO_2e$. In addition

to energy efficiency projects, Liquid Waste Services in partnership with BC Hydro completed a project in 2015 that has allowed an average 7% increase in annual electricity generation compared to the four-year period prior to the change. This improvement reduces electricity purchases from BC Hydro and results in significantly less flaring of biogas.

**Water Services**

Water Services energy efficiency projects account for approximately 29% of total Metro Vancouver annual savings for the period reported. These projects include both energy efficiency upgrades to capital equipment as well as process optimization projects. Total estimated savings for energy efficiency project completions are 10,600 GJ/year; cumulative savings since 2014 are estimated at 34,700 GJ ($997,000) and 102 tonnes $CO_2e$. In addition to these energy efficiency projects, Capilano Energy Recovery Facility began generating electricity in 2016. From 2016 through 2020, the facility generated over 101,600 GJ of electricity that was used by the Capilano Raw Water Pump Station. The Capilano Energy Recovery Facility is expected to generate 34,200 GJ of electricity per year once operation is fully optimized.

**Solid Waste Services**

The new United Boulevard Recycling and Waste Centre – expected to be complete in 2021 – includes energy-efficient features such as translucent panels to reduce the need for electrical lighting, LED lighting, air-source heat pumps for space heating, and variable speed ventilation control. Similar energy-efficient features have been included in the design of new Central Surrey Recycling and Waste Centre – expected to be complete in early 2022. This facility is being constructed under the guidance of the Metro Vancouver Sustainable Infrastructure and Buildings Policy.

The non-ferrous recovery system recovers non-ferrous metals and additional ferrous metals from the bottom ash at the WTEF by using magnetic and eddy current separation technology. Recovered non-ferrous metals are sold to a third-party metals recycling company. The project was commissioned in the fall of 2018 and recovers approximately 250-500 tonnes per year of non-ferrous metals and an additional 400-500 tonnes per year of ferrous metals. Based on non-ferrous metals recovery data from 2019 and 2020, project emissions reductions were calculated to be 969 tonnes $CO_2e$ and 755 tonnes $CO_2e$ respectively. Metro Vancouver plans to seek third party validation of this project plan, and annual third party verification of emissions reductions calculated under the validated plan. Reporting of emissions reductions will be included in Metro Vancouver's annual climate action reporting.

Solid Waste Services' increased waste diversion efforts and disposal bans for recyclable materials have contributed to increased recycling rates and reduced regional GHG emissions from waste disposal.

**Housing**

Housing energy efficiency projects account for approximately 26% of total corporate Metro Vancouver annual savings from 2014 through 2020. Total estimated savings for Housing energy efficiency project completions exceed 9,300 GJ per year; cumulative savings since 2014 are estimated at 23,400 GJ ($253,000). Housing has strategically invested in energy-efficient mechanical equipment (boilers and hot

water heaters), laundry equipment, and lighting systems. Housing has also taken advantage of FortisBC incentives that installed equipment – free of charge – to reduce residential hot water use.

In its 10-Year Plan (published in 2019) Housing has committed to reducing energy consumption by 25% for major rehabilitations, such as comprehensive building envelope upgrades, and for new construction (from 2015 National Energy Code for Buildings). The 10-Year Plan also commits to reducing GHG emissions in the Housing portfolio by 45% over the next 10 years (compared to 2010 levels).

In 2019 a Sustainability Innovation Fund application was approved for Housing: *Energy Step Code Implementation Impacts for Building Envelope Rehabilitations of Existing Buildings*. The study will investigate the energy use, financial implications, and GHG emissions reduction impacts that the different levels of the BC Energy Step Code could have on rehabilitation of the existing Housing portfolio. Housing intends to engage a consultant in 2021 to begin this work.

The NetZero Feasibility Study for the Welcher Affordable Housing Development was completed in July 2021. The final energy model in the study outlined key design changes that would reduce the operational energy usage from the minimum BC Step Code 3 value of 120 kWh/$m^2$/year to approximately 60 kWh/$m^2$/year, and operational GHG emissions from 6.5 kg$CO_2$eq/m2/year to 0.7 kg$CO_2$eq/m2/year. Over a 50-year timeframe, this translates into an overall GHG emissions reduction of approximately 1,700 tonnes of $CO_2$. The reductions would be achieved through a combination of improvements to the building enclosure design and mechanical and electrical systems, and converting the building's energy source to fully electric from a combination of electricity and natural gas. Following the issue of the report, the MVHC Board approved proceeding with the implementation of the identified energy and GHG emission reduction design measures into the project design. Construction of the Welcher Affordable Housing Development is anticipated to begin in the first quarter of 2022.

**Corporate Services**

Colliers International (Colliers) has managed Metro Vancouver's Head Office building, Metrotower III, since mid-2018. Since then and to the end of 2020, Colliers completed several projects targeting energy efficiency improvements. These include adjustment of building systems (heating, ventilation, and lighting) controls, a parkade lighting upgrade, improvement/repairs to building's the three boilers, and a loading bay lighting upgrade. Projects completed to the end of 2020 are expected to reduce building energy use by more than 3,200 GJ per year, with cumulative savings totaling $114,000 per year, with cumulative GHG emissions reductions of 177 tonnes $CO_2$e. Colliers also completed a solid waste audit and low carbon electrification study in 2019 and 2020 respectively. This work could lead to projects that reduce energy use and GHG emissions in the future. Collier's water conservation initiatives have reduced building water usage by 7%.

**Regional Parks**

In 2016, Regional Parks invested in a high-efficiency condensing boiler to heat water for the pool at Capilano River Park. In the autumn of 2018, Regional Parks began shutting down the pool annually from the end of September through to the beginning of March. Regional Parks also installed programmable thermostats to control electric baseboard heater at its Central Area Office. From 2016 through 2018, these improvements have saved over $25,000 in energy costs and reduced GHG emissions by 145 tonnes $CO_2e$.

Additional energy efficiency initiatives undertaken by Regional Parks since 2016 include:

- A lawn mowing reduction program at Pacific Spirit, Iona Beach, Derby Reach, and Aldergrove Regional Parks that have reduced diesel use for lawn mowing at these sites by 30 to 50%;
- Mechanical and electrical upgrades to Campbell Valley washroom building that included new LED lights, sensor faucets, lower flow toilets, low VOC paint and programmable ventilation system;
- Efficiency upgrades with LED lighting and double-pane windows at various building locations across the system;
- Energy-efficient design features of the Kanaka Creek Watershed Stewardship Centre that opened in 2017;
- The new Nature Discovery Area at Aldergrove Regional Park, the area includes xeriscape planting and uses site water sources to establish new trees rather than trucking water;
- Service yard replacement projects are underway at Colony Farm (2019), Crippen (2021) and Capilano River (2022) and will include energy-efficient design to replace aged inefficient facilities; and
- Traffic / demand management strategies (including pay parking) have been implemented at several sites to encourage park visitors to carpool and use other means of travel (including public transit). These measures are expected to reduce regional energy use and GHG emissions.

**Fleet**

Refer to Section 5.3 for a summary of activities related to energy efficiency improvements for the Metro Vancouver fleet.

## 6.2 ENERGY RECOVERY

**Liquid Waste Services**

***Biogas Production and On-site Utilization***

Liquid Waste Services has produced biogas from treatment processes at four of its five wastewater treatment plants for decades and this is the utility's largest existing energy recovery endeavour. The majority of the biogas is used within the four treatment plants to produce heat, electricity, and/or mechanical energy thus offsetting the purchase of fossil natural gas and grid electricity. Pursuing efficiency improvements in biogas production would increase energy recovery rates and further reduce Liquid

Waste Services fossil fuel dependence and grid electricity purchases as well as enhance opportunities for sale of renewable natural gas to mitigate regional GHG emissions.

In 2015, a multi-year project was completed by Liquid Waste Services and BC Hydro that allowed more biogas to be used by the Iona Island Wastewater Treatment Plant cogeneration engines than had been previously permitted. These improvements resulted in annual biogas utilization increasing from an average of 73% for 2010 to 2014 to an average of 81% for 2015 to 2020. This has translated to an increase of 7% in annual electricity generation comparing the same two periods.

Late in 2017, the Annacis Island Wastewater Treatment Plant cogeneration system was taken out of service and the construction phase of upgrading the system with increased generation capacity began. The new cogeneration system is expected to significantly reduce the amount of biogas that needs to be flared (wasted) and is expected to increase electricity generation by approximately 20,000,000 kWh per year. Annacis Island Wastewater Treatment Plant will use all electricity generated to reduce electricity purchases from BC Hydro. Commissioning of the new system began in spring 2020 and is expected to be complete in 2021.

***Heat Recovery***

The North Shore Wastewater Treatment Plant, currently under construction, will include a facility that will recover heat from the plant effluent for sale to Lonsdale Energy Corporation (LEC), which will significantly reduce the use of fossil natural gas in LEC's district energy system. The plant will also recover heat from effluent for use on-site to offset natural gas use.

In 2020, Metro Vancouver staff determined that recovering heat from the Lulu Island Wastewater Treatment Plant effluent for on-site use is financially viable under certain conditions, which are being pursued. The project proceeded to preliminary design stage in 2021. The Effluent Heat for RNG project at Lulu Island will reduce the amount of biogas required by the plant to meet its thermal demands thus liberating additional quantities of biogas for clean-up and sale to FortisBC as described in Section 6.3.

Sewer heat and effluent heat recovery within the Liquid Waste Services utility have the potential to contribute enough energy to heat approximately 700 high rise buildings in the region. The most promising opportunities to establish financially feasible sewer heat recovery facilities will often be new high-density development close to large sewer lines. In addition to the North Shore Wastewater Treatment Plant effluent heat recovery project described above, several municipalities, including Richmond, New Westminster, and Surrey, are currently planning large district energy systems. In 2020, preliminary design work was initiated for a sewer heat recovery project in north Richmond. Preparatory work has also begun on establishing protocols and policies required to enable capital investments in such projects, to support climate change initiatives. Initial assessments indicate that sewer heat is the most reliable and cost-effective energy source for such systems. Assuming that this heat displaces heat that would have been generated by natural gas, these systems are capable of reducing greenhouse gas emissions by tens of thousands of tonnes per year by 2030, and potentially by hundreds of thousands of tonnes per year by 2050.

***Renewable Natural Gas***

Biogas produced at wastewater treatment plants can be cleaned up and sold as renewable natural gas (RNG), a renewable source of energy. FortisBC buys RNG and delivers it to a growing market, displacing fossil natural gas use and thus reducing greenhouse gas emissions. One project of this kind began construction in July 2019 at the Lulu Island Wastewater Treatment Plant. System testing and commissioning began in February 2021 and is expected to be complete by October 2021. It will sell excess biogas, which is not needed for use at the Lulu Island Wastewater Treatment Plant, to FortisBC. This concept could be applied to other new wastewater treatment plants in the region, and could generate revenue and reduce regional greenhouse gas emissions by tens of thousands of tonnes per year. Assessments of the potential for applying this approach at several other wastewater treatment plants at Metro Vancouver have been initiated.

Research has shown that the methane content in biogas can be increased by promoting the right microbial communities within the anaerobic digesters that produce the biogas. Given the current and increasing capacity of Metro Vancouver's digesters, a team of innovators are developing a renewable natural gas (RNG) Optimizer for future trials at the Lulu Island Wastewater Treatment Plant. The RNG Optimizer could boost methane generation by 15% to 25%. This will help reduce gas cleaning requirements and substantially increase generation of GHG credits and revenues from RNG sales. The successful implementation of the RNG Optimizer at wastewater treatment facilities could motivate its application at other anaerobic digestion facilities processing agricultural or food wastes. Bench scale testing was initiated in 2021 and will continue in 2022. If successful, Metro Vancouver anticipates pilot testing at Lulu Island to follow in 2023.

***Biocrude***

Metro Vancouver is leading the implementation of the world's first hydrothermal processing (HTP) demonstration system integrated with an operating wastewater treatment facility. HTP is an emerging technology that converts wastewater biomass into biocrude (a renewable and low carbon version of crude oil), which minimizes the production, transportation and disposal of residuals from the wastewater treatment process. A local refinery and project partner will use the biocrude for refinement into a low-carbon transportation fuel such as biodiesel or biojet fuel. The first barrels of biocrude from wastewater are scheduled for production in 2023. This circular economy demonstration could reduce GHG emissions by three-fold at equivalent or lower costs than current processes. If successful, HTP systems can be scaled to many metropolitan wastewater treatment facilities globally. Further, wet feedstocks from alternate industries such as the municipal solid waste, agricultural, and forestry could provide additional decarbonization opportunities.

**Water Services**

Water Services has opportunities to recover energy from water flowing in pipes. From its commissioning in 2016 to the end of 2020, Capilano Energy Recovery Facility generated over 101,600 GJ of electricity that was used to offset a portion of electricity purchases to operate the Capilano Raw Water Pump Station.

Staff have investigated additional opportunities to generate electricity from water flowing through pipes at two pump stations and where raw water arrives at Seymour Capilano Filtration Plant from Seymour Lake. The BC Hydro Standing Offer Program that would allow generation at the pump stations was suspended indefinitely in 2017, thus temporarily precluding pursuit of these generation opportunities. Further steps related to energy recovery at Seymour Capilano Filtration Plant are on hold until a decision to proceed with full twinning of Seymour Lake water main line is made, which is not anticipated for several years.

The Angus Drive Pressure Reducing Valve Chamber, constructed in 2016, was designed to accommodate the future addition of a turbine to generate electricity as water flows from Kersland Reservoir to the City of Richmond. The project is on the Long Range Plan potentially scheduled for 2028/2029, providing BC Hydro's Standing Offer Program is reinstated.

As part of the long-term Joint Water Use Plan planning process, Water Services is evaluating the viability of using a turbine to produce electricity from water leaving the Capilano Reservoir. The electricity generated could be used at existing water facilities such as Capilano Raw Water Pump Station or sold to BC Hydro if and when its Standing Offer Program is reinstated.

**Solid Waste Services**

The Waste-to-Energy District Energy System will use heat generated at the Waste-to-Energy Facility to provide heat and domestic hot water to nearby residential and commercial developments. According to technical, environmental and economic assessments, a district energy project using heat from the Waste-to-Energy Facility could result in greenhouse gas emission reductions of up to 45,000 tonnes $CO_2e$ per year.

The new United Boulevard Recycling and Waste Centre has been designed to reduce heating energy requirements by recovering heat from ventilation air to pre-heat fresh air entering the ventilation system. These features have also been included in the design of the new Central Surrey Recycling and Waste Centre.

**Housing, Corporate Services, and Regional Parks**

Housing, Corporate Services, and Regional Parks did not undertake any energy recovery projects during the period reported. However, opportunities for heat recovery have been identified (e.g., recovering heat from ventilation systems) and will be evaluated as part of the capital improvement options analysis process.

## 6.3 TRANSITION TO RENEWABLE ENERGY

**Liquid Waste Services**

Liquid Waste Services' primary sources of stationary energy – electricity and biogas – are renewable. Opportunities nonetheless exist to transition from natural gas and mobile fossil fuels. For example, improving efficiencies of biogas production will reduce Liquid Waste Services use of fossil natural gas.

Except during the coldest days in winter, Lulu Island Wastewater Treatment Plant typically produces more biogas than it requires to meet the plant's thermal demands, with excess gas flared to the atmosphere. Construction began in 2019 to build a facility at Lulu Island Wastewater Treatment Plant that will purify the excess biogas to pipeline quality and sell the gas to FortisBC as renewable natural gas. As mentioned in Section 6.2 (Energy Recovery), the sale of this gas by FortisBC will allow others in the region to transition from fossil natural gas to renewable energy.

Contracted residuals hauling services are Liquid Waste Services' largest users of fossil fuels. Future opportunities might exist to encourage these contractors to transition their vehicles to lower-carbon fuel sources such as electricity and renewable natural gas.

With respect to transitioning fleet vehicles to lower-carbon fuel sources, the impacts of changes to the Liquid Waste Services fleet are discussed in Section 5.3.

**Water Services**

Currently, the primary source of stationary energy used by the water utility is purchased hydroelectricity which, in British Columbia, is considered a clean, renewable energy. Water Services fleet and residuals management use fossil fuels to operate vehicles. Transitioning these mobile fuels to less carbon-intensive energy sources may provide opportunities to reduce GHG emissions from these sources. Water Services is also responsible for the operation of a small number of facilities that use fossil natural gas for space heating. The technical and financial feasibility of meeting these space heating loads using electric air-source heat pumps will be investigated in the future. Beyond transitioning the Water Services fleet to less carbon-intensive fuel sources discussed in Section 5.3, no other Water Services projects are currently planned for transition to renewable energy.

As is the case with Liquid Waste Services, contracted residuals hauling services are also the largest users of fossil fuels for Water Services. Opportunities might exist to encourage these contractors to transition to lower-carbon fuel sources.

**Solid Waste Services**

Fuels used by solid waste transfer service trucks are one of Metro Vancouver's largest users of fossil fuels. Opportunities might exist to encourage these contractors to transition to lower-carbon fuel sources.

Electric vehicle charging stations have been included in the designs of the new United Boulevard and Central Surrey Recycling and Waste Centres. Natural gas will not be used at either of these facilities; all heating requirements will be met with electricity.

**Housing**

Housing is historically[6] Metro Vancouver's largest consumer of fossil natural gas, which is used for space heating and hot water heating. As mentioned earlier, electricity in British Columbia is considered a clean, renewable source of energy. Transitioning from natural gas space heating to electric space heating using high-efficiency heat pumps in Housing buildings is seen as one of the most promising opportunities for Housing to transition to renewable energy. Unfortunately, even when factoring in Metro Vancouver's internal carbon price of $150 per tonne of carbon dioxide equivalent emissions, business cases completed to date have shown that it is not yet financially viable to invest in electric heat pump technology for end-of-life mechanical system upgrades. Improved financial incentives from BC Hydro, the Provincial Government, and/or Federal Government could tip the business case to the positive in the future. In the meantime, Housing will continue to evaluate how heat pump technology could play a role in achieving the GHG emissions reduction targets set out in Housing's 10-Year Plan and in Climate 2050. Housing's focus over the next 10 years will be on new construction and major rehabilitation, and this presents a significant opportunity to shift towards electrification to meet its energy and climate objectives. Although transitioning from natural gas to electricity for facility thermal demands will significantly reduce GHG emissions related to these demands, electrification options tend to carry significantly higher capital, operations, and maintenance costs. Metro Vancouver staff are investigating means by which Housing will be able to fund these additional costs to make the transition away from natural gas financially sustainable while keeping rents affordable.

Two 2020 Housing applications to the Sustainability Innovation Fund and that pertain to renewable energy have been approved to proceed: *Building Resilience: Exploring the Potential of Renewable Energy Building Infrastructure* and *Net-Zero Feasibility Study for Welcher Affordable Housing Development.* The studies will investigate the opportunity and challenges of integrating renewable infrastructure, such as solar panels or geo-exchange energy, into new and existing housing complexes. Incorporating renewable energy infrastructure into housing retrofits and redevelopments could significantly reduce greenhouse gas emissions and provide energy resiliency. However, incorporating renewable energy infrastructure into existing developments may be challenged by space and financial constraints. If the studies demonstrate that these types of projects could be financially viable then opportunities to scale across the housing portfolio would be investigated. Initiation of the studies have been delayed due to COVID19 challenges.

[6] For the first time, natural gas use at the Waste-to-Energy exceed natural gas used by the entire Housing portfolio in 2020.

**Corporate Services**

Before sale of the its former Head Office building, Metro Vancouver evaluated the option to relocate the solar thermal collectors on that building to its new Head Office building, but costs to do so could not be justified and the project did not proceed.

**Regional Parks**

The works yard at Colony Farm Regional Park does not have access to grid electricity. In 2018, Regional Parks installed solar panels at the works yard to generate electricity that, until then, had to be generated by a gasoline-powered generator. The initiative was funded by Metro Vancouver's Sustainability Innovation Program and will reduce GHG emissions and noise pollution associated with generator operation. Staff are monitoring the effectiveness and efficiency of this pilot project to determine whether similar installations are feasible at other park or utility sites that currently rely on gas-powered generators.

Regional Parks Operation has increased use of emissions-free, battery-powered power tools and small equipment (weed-eaters) to reduce fossil fuel use and its associated GHG emissions.

To help reduce regional energy use and GHG emissions, Regional Parks has installed electric vehicle chargers for public and Metro Vancouver fleet use and is bringing forward a clean air incentive for film companies to use existing grid electricity tie-ins to replace diesel generators for local film projects.

**Fleet**

Refer to Section 5.3 for a summary of activities related to transitioning the Metro Vancouver fleet to less carbon-intensive fuel sources.

# 7. SUMMARY

Metro Vancouver spent nearly $30 million on energy use (including purchased energy and the costs of maintaining its energy generation systems) in 2020, which resulted in more than 29,000 tonnes of $CO_2e$ GHG emissions. Corporate energy use has increased by 9% since 2014, energy costs have increased by 19%, and GHG emissions associated with energy use have increased by 31%. Per capita energy use has decreased by 1%, per capita energy cost has increased by 9% and per capita GHG emissions have increased by 19%. The Provincial government has recently mandated changes to the methodology used in calculating GHG emissions from electricity use. This change has resulted in significantly higher Corporate GHG emissions than previously reported.

Energy efficiency projects completed from 2014 through 2020 have contributed to savings of over 36,500 GJ per year. Cumulative cost savings from these projects over this period are estimated at $2.6 million and cumulative GHG emissions reduction are 1760 tonnes $CO_2e$.

Progress has been made toward implementing corporate policies related to energy use and GHG emissions including the *Corporate Energy Management Policy*, the *Sustainable Infrastructure and Buildings Policy*, the suite of *Asset Management* policies, and development of the *Climate 2050* Roadmaps. Energy target-setting is underway for all service areas and is expected to be complete for 2022 reporting.

For its corporate GHG emissions, Metro Vancouver is committed to tracking and reporting its corporate GHG emissions, and pursuing carbon neutrality status on an ongoing basis.

# APPENDIX A

# SUPPLEMENTAL DATA

## Table A1: Summary of Departmental Energy and GHG Emissions Trends

| Metro Vancouver | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 1,442,301 | 1,486,436 | 1,540,707 | 1,526,764 | 1,550,137 | 1,576,311 | 3% | 7% | 6% | 7% | 9% |
| Total Cost ($) | $ 25,083,905 | $ 27,500,630 | $ 28,021,285 | $ 30,988,809 | $ 31,017,644 | $ 29,944,725 | 10% | 12% | 24% | 24% | 19% |
| Total GHG Emissions (t CO2e) | 22,225 | 22,788 | 24,448 | 25,832 | 26,921 | 29,019 | 3% | 10% | 16% | 21% | 31% |
| Population | 2,517,276 | 2,593,187 | 2,629,574 | 2,666,670 | 2,714,794 | 2,766,954 | 3% | 4% | 6% | 8% | 10% |
| GJ/capita | 0.573 | 0.573 | 0.586 | 0.573 | 0.571 | 0.570 | 0% | 2% | 0% | 0% | -1% |
| $/capita | $ 9.96 | $ 10.60 | $ 10.66 | $ 11.62 | $ 11.43 | $ 10.82 | 6% | 7% | 17% | 15% | 9% |
| kg CO2e/capita | 8.8 | 8.8 | 9.3 | 9.7 | 9.9 | 10.5 | 0% | 5% | 10% | 12% | 19% |
| **Liquid Waste Services** | | | | | | | | | | | |
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 948,600 | 929,001 | 931,013 | 940,172 | 977,847 | 997,064 | -2% | -2% | -1% | 3% | 5% |
| Total Cost ($) | $ 12,604,704 | $ 13,604,077 | $ 13,309,087 | $ 17,361,336 | $ 16,911,851 | $ 16,433,740 | 8% | 6% | 38% | 34% | 30% |
| Total GHG Emissions (t CO2e) | 7,591 | 7,444 | 6,877 | 10,102 | 10,503 | 10,553 | -2% | -9% | 33% | 38% | 39% |
| ML Collected & Treated | 440,763 | 437,520 | 449,542 | 455,545 | 434,466 | 459,118 | -1% | 2% | 3% | -1% | 4% |
| GJ/ML Collected & Treated | 2.152 | 2.12 | 2.07 | 2.06 | 2.25 | 2.17 | -1% | -4% | -4% | 5% | 1% |
| $/ML | $ 28.60 | $ 31.09 | $ 29.61 | $ 38.11 | $ 38.93 | $ 35.79 | 9% | 4% | 33% | 36% | 25% |
| kg CO2e/ML | 17.2 | 17.0 | 15.3 | 22.2 | 24.2 | 23.0 | -1% | -11% | 29% | 40% | 33% |
| **Water Services** | | | | | | | | | | | |
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 181,141 | 237,419 | 257,042 | 241,632 | 246,718 | 211,296 | 31% | 42% | 33% | 36% | 17% |
| Total Cost ($) | $ 4,564,972 | $ 6,130,003 | $ 7,051,137 | $ 6,143,349 | $ 6,614,060 | $ 5,763,046 | 34% | 54% | 35% | 45% | 26% |
| Total GHG Emissions (t CO2e) | 2,698 | 3,551 | 3,625 | 2,650 | 3,191 | 3,207 | 32% | 34% | -2% | 18% | 19% |
| ML Treated & Delivered | 381,261 | 383,536 | 389,177 | 389,800 | 383,400 | 378,734 | 1% | 2% | 2% | 1% | -1% |
| GJ/ML Treated & Delivered | 0.475 | 0.62 | 0.66 | 0.62 | 0.64 | 0.56 | 30% | 39% | 30% | 35% | 17% |
| $/ML | $ 11.97 | $ 15.98 | $ 18.12 | $ 15.76 | $ 17.25 | $ 15.22 | 33% | 51% | 32% | 44% | 27% |
| kg CO2e/ML | 7.1 | 9.3 | 9.3 | 6.8 | 8.3 | 8.5 | 31% | 32% | -4% | 18% | 20% |
| **Solid Waste Services** | | | | | | | | | | | |
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 192,026 | 189,144 | 212,472 | 214,257 | 213,565 | 250,156 | -2% | 11% | 12% | 11% | 30% |
| Total Cost ($) | $ 5,246,106 | $ 5,058,848 | $ 4,629,528 | $ 4,574,779 | $ 5,116,848 | $ 4,994,201 | -4% | -12% | -13% | -2% | -5% |
| Total GHG Emissions (t CO2e) | 7,570 | 7,227 | 9,038 | 8,584 | 8,788 | 10,854 | -5% | 19% | 13% | 16% | 43% |
| Mass Disposed (tonnes) | 542,477 | 557,495 | 590,002 | 590,805 | 577,950 | 572,222 | 3% | 9% | 9% | 7% | 5% |
| GJ/tonne disposed | 0.35 | 0.34 | 0.36 | 0.36 | 0.37 | 0.44 | -4% | 2% | 2% | 4% | 23% |
| $/tonne disposed | $ 9.67 | $ 9.07 | $ 7.85 | $ 7.74 | $ 8.85 | $ 8.73 | -6% | -19% | -20% | -8% | -10% |
| kg CO2e/tonne disposed | 14.0 | 13.0 | 15.3 | 14.5 | 15.2 | 19.0 | -7% | 10% | 4% | 9% | 36% |
| **Housing** | | | | | | | | | | | |
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 66,969 | 63,517 | 67,531 | 62,431 | 62,004 | 63,980 | -5% | 1% | -7% | -7% | -4% |
| Total Cost ($) | $ 1,133,904 | $ 1,055,580 | $ 1,182,707 | $ 1,136,708 | $ 1,111,539 | $ 1,337,153 | -7% | 4% | 0% | -2% | 18% |
| Total GHG Emissions (t CO2e) | 2,490 | 2,368 | 2,547 | 2,368 | 2,369 | 2,477 | -5% | 2% | -5% | -5% | -1% |
| Million $m^2$*HDD | 750 | 724 | 833 | 774 | 810 | 787 | -3% | 11% | 3% | 8% | 5% |
| kJ/($m^2$*HDD) | 89.283 | 87.71 | 81.07 | 80.69 | 76.56 | 81.32 | -2% | -9% | -10% | -14% | -9% |
| $/(million $m^2$*HDD) | $ 1,511.71 | $ 1,458 | $ 1,420 | $ 1,469 | $ 1,372 | $ 1,699 | -4% | -6% | -3% | -9% | 12% |
| g CO2e/($m^2$*HDD) | 3.3 | 3.27 | 3.06 | 3.06 | 2.93 | 3.15 | -1% | -8% | -8% | -12% | -5% |
| **Corporate Services** | | | | | | | | | | | |
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 36,556 | 54,442 | 61,522 | 54,818 | 37,809 | 42,896 | 49% | 68% | 50% | 3% | 17% |
| Total Cost ($) | $ 872,617 | $ 1,276,532 | $ 1,521,160 | $ 1,347,631 | $ 864,612 | $ 1,058,056 | 46% | 74% | 54% | -1% | 21% |
| Total GHG Emissions (t CO2e) | 1,080 | 1,651 | 1,975 | 1,583 | 1,568 | 1,494 | 53% | 83% | 47% | 45% | 38% |
| Population | 2,517,276 | 2,593,187 | 2,629,574 | 2,666,670 | 2,714,794 | 2,766,954 | 3% | 4% | 6% | 8% | 10% |
| GJ/capita | 0.015 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 45% | 61% | 42% | -4% | 7% |
| $/capita | $ 0.35 | $ 0.49 | $ 0.58 | $ 0.51 | $ 0.32 | $ 0.38 | 42% | 67% | 46% | -8% | 10% |
| kg CO2e/capita | 0.4 | 0.6 | 0.8 | 0.6 | 0.6 | 0.5 | 48% | 75% | 38% | 35% | 26% |
| **Parks** | | | | | | | | | | | |
| | Year | | | | | | Percent Change Relative to Baseline (2014) | | | | |
| | Baseline (2014) | 2016 | 2017 | 2018 | 2019 | 2020 | 2016 | 2017 | 2018 | 2019 | 2020 |
| Total Energy Use (GJ) | 17,008 | 12,912 | 11,127 | 13,454 | 12,195 | 10,919 | -24% | -35% | -21% | -28% | -36% |
| Total Cost ($) | $ 531,123 | $ 375,589 | $ 327,666 | $ 425,006 | $ 398,735 | $ 358,528 | -29% | -38% | -20% | -25% | -32% |
| Total GHG Emissions (t CO2e) | 797 | 546 | 386 | 545 | 502 | 434 | -31% | -52% | -32% | -37% | -46% |
| Population | 2,517,276 | 2,593,187 | 2,629,574 | 2,666,670 | 2,714,794 | 2,766,954 | 3% | 4% | 6% | 8% | 10% |
| MJ/capita | 6.756 | 4.98 | 4.23 | 5.05 | 4.49 | 3.95 | -26% | -37% | -25% | -34% | -42% |
| $/capita | $ 0.21 | $ 0.14 | $ 0.12 | $ 0.16 | $ 0.15 | $ 0.13 | -31% | -41% | -24% | -30% | -39% |
| kg CO2e/capita | 0.3 | 0.21 | 0.15 | 0.20 | 0.18 | 0.16 | -33% | -54% | -35% | -42% | -50% |

**Notes:**

Improvement / Favourable (change less than zero)

Degradation / Unfavourable (change greater than zero)


metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Cindy Onyejekwe, Senior Policy Analyst
Esther Berube, Division Manager, Bylaw and Regulation Development
Parks and Environment Department

Date: October 13, 2021 Meeting Date: November 5, 2021

Subject: **MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021**

**RECOMMENDATION**

That the MVRD Board:

a) give first, second and third reading to *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021*; and
b) pass and finally adopt *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021*.

**EXECUTIVE SUMMARY**

A range of tools, including notices of bylaw violation and municipal tickets, can be used to promote compliance with Metro Vancouver's bylaws. The *Greater Vancouver Regional District (GVRD) Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010* (Bylaw 1117) allows contraventions to be addressed through a Notice of Bylaw Violation where enforcement is needed, as an initial enforcement measure. New types of bylaw violations were created with the adoption of the *Metro Vancouver Regional District (MVRD) Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021 (Bylaw 1329),* which repealed and replaced a previous version of the non-road diesel engine emission regulation bylaw. The proposed amendments to Bylaw 1117 identify the bylaw violations pertaining to non-road diesel engines, for which Notices of Bylaw Violation may be issued and the accompanying penalties.

**PURPOSE**

To propose amendments to *Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010,* (Bylaw 1117) that introduce new bylaw violations and penalties to support the new Bylaw 1329, for MVRD Board adoption.

**BACKGROUND**

At its October 29, 2021 meeting, the MVRD Board adopted Bylaw 1329, which repealed and replaced *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* (Bylaw 1161), as described in the report dated October 5, 2021 provided as Reference 1. Consequently, the bylaw violations and associated penalties in Bylaw 1117 that relate to Bylaw 1161 need to be updated.

This report proposes amendments to Bylaw 1117 to authorize issuance of Notices of Bylaw Violation consistent with the new Bylaw 1329.

Bylaw 1117 and its amendments also sets out bylaw violations related to the Regional Parks function, and a separate report seeking Board adoption of amendments regarding that function will be considered by the Regional Parks Committee at its November meeting.

**BYLAW AMENDMENTS**

The *Greater Vancouver Regional District (GVRD) Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010*, as amended (Bylaw 1117), enables Metro Vancouver to promote compliance with its regulatory bylaws, by authorizing officers to issue a Notice of Bylaw Violation with accompanying penalties. Compliance with Metro Vancouver's air quality regulatory bylaws, including Bylaw 1329 and its predecessor Bylaw 1161, is primarily promoted through non-punitive education and warnings. However, in some cases, infractions require a stronger notice of bylaw violation with associated penalty as an effective and efficient alternative to legal action through the courts. A bylaw violation notice is generally used for minor bylaw infractions or as an initial form of enforcement, and disputes are screened internally, then heard and resolved through an adjudication process instead of through the Provincial judicial system.

Currently, Bylaw 1117 does not reflect the new bylaw violations associated with Bylaw 1329 adopted on October 29, 2021. Consequently, the types of bylaw violations and associated penalties in Bylaw 1117 that relate to Bylaw 1161 need to be amended to reflect contraventions of the provisions in Bylaw 1329 and to remove references to Bylaw 1161.

A summary of the main proposed amendments (Attachment 1) and the proposed amending bylaw, *MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1332, 2021* (Attachment 2) remove references to the provisions in Bylaw 1161 and identify new types of bylaw violations that align with the new Bylaw 1329 such as:

- operation of a Tier 0 or Tier 1 non-road diesel engine near a sensitive receptor such as a hospital, elementary school, or community care facility;
- failure to report hour meter reading at 500h of use;
- operating an engine having a tampered emission control device; and
- prohibited operation of a Tier 0 or Tier 1 engine.

Penalties related to a Notice of Bylaw Violation are half the amount of Municipal Ticket Information fines for the corresponding contravention, since a Notice of Bylaw Violation is generally issued by officers as an initial form of enforcement. A separate report in the Climate Action Committee November 5, 2021 agenda presents proposed amendments to *Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006.*

Future amendments to the Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw and the Ticket Information Utilization Bylaw are anticipated to reflect new requirements in Bylaw 1329 that will take effect in future years.

**ALTERNATIVES**

1. That the MVRD Board:
   a) give first, second and third reading to *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021*; and
   b) pass and finally adopt *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021*.

2. That the MVRD Board receive for information the report dated October 13, 2021, titled "MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021" and provide alternate direction to staff.

**FINANCIAL IMPLICATIONS**

If the Board approves Alternative 1, officers will be able to issue Notices of Bylaw Violation and associated penalties related to enforcement of the new *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021* (Bylaw 1329).

**SUMMARY / CONCLUSION**

Proposed amendments to the *GVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010* (Bylaw 1117) result from the repeal of *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* (Bylaw 1161) and its replacement by new Bylaw 1329, adopted by the MVRD Board on October 29, 2021. Currently, Bylaw 1117 does not reflect the new bylaw violations associated with Bylaw 1329. Staff recommend Alternative 1, to adopt the *Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021* that amends the schedule of bylaw violations and penalties in Bylaw 1117 to add the new bylaw violations associated with Bylaw 1329. Issuing Notices of Bylaw Violation provides Metro Vancouver with an initial enforcement mechanism in the form of an administrative ticket where disputes are screened internally, then heard and resolved through an adjudication process instead of through the Provincial judicial system.

**Attachments** *(48803111)*

1. Summary: Proposed amendments to Schedule K of *Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw 1117, 2010* referencing *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021* *(48612093)*
2. *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021* *(48500920)*

**References**

MVRD Climate Action Committee Report "MVRD Non-Road Diesel Engine Emission Regulation Bylaw No.1329, 2021", dated October 5, 2021

48456252

**Summary:** Proposed amendments to Schedule K of *Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw 1117, 2010* referencing *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021*

**Schedule K**

**MVRD Non-Road Diesel *Engine* Emission Regulation Bylaw No. 1329, 2021**

(New bylaw violations are shown in bold italicized text)

| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 |
|---|---|---|---|---|---|
| **Section** | **Authorized Words or Expressions** | **Discounted Penalty** | **Penalty** | **Late Payment Penalty** | **Compliance Agreement Available** |
| ***13*** | ***Discharge of emergency engine exhaust into building opening*** | ***$375*** | ***$500*** | ***$500*** | ***Yes*** |
| ***14*** | ***Failure to keep or to submit emergency engine records*** | ***$285*** | ***$375*** | ***$465*** | ***Yes*** |
| ***15*** | Operating without registration | $375 | $500 | $500 | *Yes* |
| ***19*** | ***Obstructing an officer*** ~~Obstruction by an operator~~ | ~~*$95*~~***$285*** | ~~$125~~***$375*** | ~~$155~~***$465*** | Yes |
| ***23(a), (b)*** | Operating without ***displaying*** registration no. or Tier label ~~displayed~~ | ~~*$95*~~***$190*** | ~~$125~~***$250*** | ~~$155~~***$310*** | Yes |
| ***25*** | Failure to have functioning hour meter | ~~*$95*~~***$190*** | ~~$125~~***$250*** | ~~$155~~***$310*** | Yes |

| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 |
|---|---|---|---|---|---|
| **Section** | **Authorized Words or Expressions** | **Discounted Penalty** | **Penalty** | **Late Payment Penalty** | **Compliance Agreement Available** |
| ***25*** | Failure to notify of hour meter replacement | ~~*$95*~~***$190*** | ~~$125~~***$250*** | ~~$155~~***$310*** | Yes |
| ***26*** | Failure to keep, produce or deliver low-use records | $285 | $375 | $465 | Yes |
| ***27(a)*** | Failure to report hour meter reading | $285 | $375 | $465 | Yes |
| ***27(b)*** | Failure to report hour meter reading at 200 hours of use | $375 | $500 | $500 | Yes |
| ***27(c)*** | Failure to provide meter manufacturer name, model or serial no. | $95 | $125 | $155 | Yes |
| ***37*** | ***Unauthorized discharge (registration invalid - changed ERM*)*** | ***$285*** | ***$375*** | ***$465*** | Yes |
| ***38*** | ***Failure to keep or to submit ERM* records*** | ***$285*** | ***$375*** | ***$465*** | ***Yes*** |
| ***45*** | ***Prohibited operation of a Tier 0 engine*** ~~Operating a~~ | $375 | $500 | $500 | Yes |

| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 |
|---|---|---|---|---|---|
| **Section** | **Authorized Words or Expressions** | **Discounted Penalty** | **Penalty** | **Late Payment Penalty** | **Compliance Agreement Available** |
| | ~~prohibited Tier 0 engine~~ | | | | |
| ***47*** | **Prohibited operation of a Tier 0 or Tier 1 engine** ~~Operating a prohibited Tier 1 engine~~ | $375 | $500 | $500 | Yes |
| *54* | Unauthorized engine idling | $190 | $250 | $310 | Yes |
| *56* | Failure to submit anti-idling procedure | $95 | $125 | $155 | Yes |
| ***57*** | ***Operating within 100 metres of a sensitive receptor*** | ***$375*** | ***$500*** | ***$500*** | ***Yes*** |
| ***58*** | ***Operating an engine having a tampered emission control system*** | ***$375*** | ***$500*** | ***$500*** | ***Yes*** |
| *59* | Providing false information | ~~*$190*~~ ***$285*** | ~~*$250*~~***$375*** | ~~*$310*~~***$465*** | Yes |

**** "ERM" means "emission reduction measure"***

48612093

**METRO VANCOUVER REGIONAL DISTRICT**
**BYLAW NO. 1332, 2021**
**A Bylaw to Amend "Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw 1117, 2010"**

**WHEREAS:**

A. The Board of Directors of the Metro Vancouver Regional District has adopted "Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010", a bylaw respecting the enforcement of Notices of Bylaw Violation and establishing a Bylaw Violation Dispute Adjudication System; and

B. The Board of Directors of the Metro Vancouver Regional District wishes to amend "Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010."

**NOW THEREFORE** the Board of Directors of the Metro Vancouver Regional District enacts as follows:

**Citation**

1. The official citation of this bylaw is "Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amending Bylaw No. 1332, 2021".

**Schedule(s)**

2. The following Schedules are attached to and form part of this bylaw:
   Schedule K - MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021.

**Amendment of Bylaw**

3. "Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010" is hereby amended as follows:

   a) Schedule K is deleted and replaced by Schedule K, which is attached to and forms part of this bylaw.

Read a first, second and third time this _____ day of _____, _____.

Passed and finally adopted this _____ day of _____, _____.

_____
Sav Dhaliwal, Chair

_____
Chris Plagnol, Corporate Officer

**Schedule K**

**MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021**

| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 |
|---|---|---|---|---|---|
| **Section** | **Authorized Words or Expressions** | **Discounted Penalty** | **Penalty** | **Late Payment Penalty** | **Compliance Agreement Available** |
| 13 | Discharge of emergency engine exhaust into building opening | $375 | $500 | $500 | Yes |
| 14 | Failure to keep or to submit emergency engine records | $285 | $375 | $465 | Yes |
| 15 | Operating without registration | $375 | $500 | $500 | Yes |
| 19 | Obstructing an officer | $285 | $375 | $465 | Yes |
| 23(a), (b) | Operating without displaying registration no. or Tier label | $190 | $250 | $310 | Yes |
| 25 | Failure to have functioning hour meter | $190 | $250 | $310 | Yes |
| 25 | Failure to notify of hour meter replacement | $190 | $250 | $310 | Yes |
| 26 | Failure to keep, produce or deliver low-use records | $285 | $375 | $465 | Yes |

| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 |
|---|---|---|---|---|---|
| **Section** | **Authorized Words or Expressions** | **Discounted Penalty** | **Penalty** | **Late Payment Penalty** | **Compliance Agreement Available** |
| 27(a) | Failure to report hour meter reading | $285 | $375 | $465 | Yes |
| 27(b) | Failure to report hour meter reading at 200 hours of use | $375 | $500 | $500 | Yes |
| 27(c) | Failure to provide meter manufacturer name, model or serial no. | $95 | $125 | $155 | Yes |
| 37 | Unauthorized discharge (registration invalid - changed ERM*) | $285 | $375 | $465 | Yes |
| 38 | Failure to keep or to submit ERM* records | $285 | $375 | $465 | Yes |
| 45 | Prohibited operation of a Tier 0 engine | $375 | $500 | $500 | Yes |
| 47 | Prohibited operation of a Tier 0 or Tier 1 engine | $375 | $500 | $500 | Yes |
| 54 | Unauthorized engine idling | $190 | $250 | $310 | Yes |
| 56 | Failure to submit anti-idling procedure | $95 | $125 | $155 | Yes |

| Column 1 | Column 2 | Column 3 | Column 4 | Column 5 | Column 6 |
|---|---|---|---|---|---|
| **Section** | **Authorized Words or Expressions** | **Discounted Penalty** | **Penalty** | **Late Payment Penalty** | **Compliance Agreement Available** |
| 57 | Operating within 100 metres of a sensitive receptor | $375 | $500 | $500 | Yes |
| 58 | Operating an engine having a tampered emission control system | $375 | $500 | $500 | Yes |
| 59 | Providing false information | $285 | $375 | $465 | Yes |

* “ERM” means “emission reduction measure”

To: Climate Action Committee

From: Cindy Onyejekwe, Senior Policy Analyst
Esther Berube, Division Manager, Bylaw and Regulation Development
Parks and Environment Department

Date: October 13, 2021 Meeting Date: November 5, 2021

Subject: **MVRD Ticket Information Utilization Amending Bylaw No. 1333, 2021**

**RECOMMENDATION**

That the MVRD Board:

a) give first, second and third reading to *Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021*; and
b) pass and finally adopt *Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021*.

**EXECUTIVE SUMMARY**

A range of tools, including municipal tickets and notices of bylaw violation, can be used to achieve compliance with Metro Vancouver bylaws. The *Greater Vancouver Regional District (GVRD) Ticket Information Utilization Bylaw No. 1050, 2006*, as amended, (Bylaw 1050) allows offences to be addressed by issuing Municipal Ticket Information (MTI). Officers can consider the use of an MTI where the enforcement matter is serious but where the possibility of a more expedited prosecution is appropriate. New offences were created with the adoption of the *Metro Vancouver Regional District (MVRD) Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021 (Bylaw 1329),* which repealed and replaced a previous version of the non-road diesel engine emission regulation bylaw. The proposed amendments to Bylaw 1050 identify the new offences pertaining to non-road diesel engines, for which an MTI may be issued and the accompanying fine.

**PURPOSE**

To propose amendments to *Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006*, (Bylaw 1050) that introduce new offences and fines to support the new Bylaw 1329, for MVRD Board adoption.

**BACKGROUND**

At its October 29, 2021 meeting, the MVRD Board adopted Bylaw 1329, which repealed and replaced *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* (Bylaw 1161). Consequently, the offences and associated fines in Bylaw 1050 that relate to Bylaw 1161 need to be updated. This report proposes amendments to Bylaw 1050 to authorize issuance of Municipal Ticket Information consistent with the new Bylaw 1329.

Bylaw 1050 and its amendments also sets out bylaw violations related to the Regional Parks function, and a separate report seeking Board adoption of amendments regarding that function will be considered by the Regional Parks Committee at its November meeting.

**BYLAW AMENDMENTS**

*Greater Vancouver Regional District (GVRD) Ticket Information Utilization Bylaw No. 1050, 2006*, as amended (Bylaw 1050), enables Metro Vancouver to promote compliance with its regulatory bylaws. Compliance with Metro Vancouver's air quality regulatory bylaws is promoted primarily through education, notices, and warnings. In some cases, infractions require a stronger ticket violation as an effective and efficient alternative to legal action through the courts.

On October 29, 2021, Bylaw 1161 was repealed and replaced with Bylaw 1329 to expand the non-road diesel engine emission reduction program, as described in the report provided as Reference 1. Currently, Bylaw 1050 does not reflect the new offences associated with Bylaw 1329. Consequently, the offences and associated fines in Bylaw 1050 that relate to Bylaw 1161 need to be amended to reflect contraventions of the provisions in Bylaw 1329 and to remove references to Bylaw 1161.

A summary of the main proposed amendments (Attachment 1) and the proposed amending bylaw, *MVRD Ticket Information Utilization Amending Bylaw No. 1333, 2021* (Attachment 2) remove references to Bylaw 1161 and replace them with references to ticketing offences for contraventions of the new Bylaw 1329, and add new offences related to Bylaw 1329, such as:

- operation of a Tier 0 or Tier 1 non-road diesel engine near a sensitive receptor such as a hospital, elementary school, or community care facility;
- failure to report hour meter reading at 500h of use;
- operating an engine having a tampered emission control device; and
- prohibited operation of a Tier 0 or Tier 1 engine.

Future amendments to the Ticket Information Utilization Bylaw are anticipated to reflect new requirements in Bylaw 1329 that will take effect in future years.

Fines related to Municipal Ticket Information are twice those of the Notice of Bylaw Violation penalties for the corresponding contravention, and are used as an escalated form of enforcement of bylaw provisions. A separate report in the Climate Action Committee November 5, 2021 agenda presents proposed amendments to *Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010.*

Future amendments to the Ticket Information Utilization Bylaw are anticipated to reflect new requirements in Bylaw 1329 that will take effect in future years.

**ALTERNATIVES**

1. That the MVRD Board:
   a) give first, second and third reading to *Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021* and
   b) pass and finally adopt *Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021*.

2. That the MVRD Board receive for information the report dated October 13, 2021, titled "MVRD Ticket Information Utilization Amending Bylaw No. 1333, 2021" and provide alternate direction to staff.

**FINANCIAL IMPLICATIONS**

If the Board approves Alternative 1, officers will be able to issue Municipal Ticket Information and associated fines related to compliance promotion with the new *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021* (Bylaw 1329).

**SUMMARY / CONCLUSION**

Proposed amendments to the *GVRD Ticket Information Utilization Bylaw No. 1050, 2006* (Bylaw 1050) result from the repeal of *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* (Bylaw 1161) and its replacement by new Bylaw 1329, adopted by the MVRD Board on October 29, 2021. Currently, Bylaw 1050 does not reflect the new offences associated with Bylaw 1329. Staff recommend Alternative 1, to adopt *MVRD Ticket Information Utilization Amending Bylaw No. 1333, 2021* that amends the schedule of Municipal Ticket Information offences and fines in Bylaw 1050 to add the new offences associated with Bylaw 1329. Issuing Municipal Ticket Information provides Metro Vancouver with an effective and efficient mechanism to escalate enforcement against bylaw contraventions.

**Attachments** *(48818441)*

1. Summary: Proposed amendments to Schedule K of *MVRD Ticket Information Utilization Amending Bylaw No. 1333, 2021* *(48610773)*
2. *Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021* *(48500896)*

**Reference**

Climate Action Committee Report "MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021", dated October 5, 2021

48459485

**Summary:** Proposed Amendments in Schedule K of MVRD Ticket Information Utilization Amending Bylaw No. 1329, 2021

**Schedule K**

**Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021**

| | Column 1<br>**Authorized Words or Expressions** | Column 2<br>**Section** | Column 3<br>**Fine** |
|---|---|---|---|
| ***1.*** | ***Unauthorized*** ~~***D***~~***d***ischarge of air contaminant | ***7, 12*** | $1000 |
| ***2.*** | ***Discharge of emergency engine exhaust into building opening*** | ***13*** | ***$1000*** |
| ***3.*** | ***Failure to keep or to submit emergency engine records*** | ***14*** | ***$750*** |
| ***4.*** | Operating without registration | ***15*** | $1000 |
| ***5.*** | ***Obstructing an officer*** ~~Obstruction by an operator~~ | ***19*** | ~~$250~~***$750*** |
| ***6.*** | Operating without ***displaying*** registration no. or Tier label ~~displayed~~ | ***23(a), (b)*** | ~~$250~~***$500*** |
| ***7.*** | Failure to have functioning hour meter | ***25*** | ~~$250~~***$500*** |
| ***8.*** | Failure to notify of hour meter replacement | ***25*** | ~~$250~~***$500*** |
| ***9.*** | Failure to keep, produce or deliver low-use records | ***26*** | $750 |
| ***10.*** | Failure to report hour meter reading | ***27(a)*** | $750 |
| ***11.*** | Failure to report hour meter reading at 200 hours of use | ***27(b)*** | $1000 |
| ***12.*** | Failure to provide meter manufacturer, model or serial no. | ***27(c)*** | $250 |
| ***13.*** | ***Unauthorized discharge (registration invalid - changed ERM*)*** ~~Unauthorized alteration of emission reduction measure~~ | ***37*** | ***$750***~~$500~~ |
| ***14.*** | ***Failure to keep or to submit ERM* records*** | ***38*** | ***$750*** |
| ***15.*** | ***Prohibited operation of a Tier 0 engine*** ~~Operating a prohibited Tier 0 engine~~ | ***45*** | ***$1000*** |
| ***16.*** | ***Prohibited operation of a Tier 0 or Tier 1 engine*** ~~Operating a prohibited Tier 1 engine~~ | ***47*** | ***$1000*** |
| ***17.*** | Unauthorized operation of non-road diesel engine | ***53*** | $1000 |

| | Column 1<br>**Authorized Words or Expressions** | Column 2<br>**Section** | Column 3<br>**Fine** |
|---|---|---|---|
| ***18.*** | Unauthorized engine idling | ***54*** | $500 |
| ***19.*** | Failure to submit anti-idling procedure | ***56*** | $250 |
| ***20.*** | ***Operating within 100 metres of a sensitive receptor*** | ***57*** | ***$1000*** |
| ***21.*** | ***Operating an engine having a tampered emission control system*** | ***58*** | ***$1000*** |
| ***22.*** | Providing false information | ***59*** | ~~$500~~***$750*** |

**** "ERM" means "emission reduction measure"***

48610773

**METRO VANCOUVER REGIONAL DISTRICT**
**BYLAW NO. 1333, 2021**
**A Bylaw to amend "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006"**

**WHEREAS:**

A. The Board of Directors of the Metro Vancouver Regional District (the "Board") has adopted "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006", a bylaw to authorize the use of the municipal ticket information for the enforcement of certain bylaws, to designate persons as bylaw enforcement officers, to authorize the use of certain words or expressions to designate certain bylaw offences and to set certain fine amounts; and

B. The Board of Directors of the Metro Vancouver Regional District wishes to amend "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006."

**NOW THEREFORE** the Board of the Metro Vancouver Regional District enacts as follows:

**Citation**

1. The official citation of this bylaw is "Metro Vancouver Regional District Ticket Information Utilization Amending Bylaw No. 1333, 2021".

**Schedule(s)**

2. The following Schedules are attached to and form part of this bylaw:
   Schedule A; and
   Schedule K, Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw, No. 1329, 2021.

**Amendment of Bylaw**

3. "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006" is hereby amended as follows:

   a) Section 4 is deleted in its entirety and replaced with the following:

      4. For the purpose of Greater Vancouver Regional District Air Quality Management Bylaw No. 1082, 2008, Greater Vancouver Regional District Concrete and Concrete Products Industries Emission Regulation No. 1084, 2008, Greater Vancouver Regional District Gasoline Distribution Emission Regulation No. 1085, 2008, Greater Vancouver Regional District Automotive Refinishing Emission Regulation Bylaw No. 1086, 2008, Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation Bylaw No. 1087, 2008, Greater Vancouver Regional District Agricultural Boilers Emission Regulation Bylaw No. 1098, 2008, Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021, and Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw

No. 1303, 2020, the word "officer" in Column 2 of Schedule A means any person appointed by the Board pursuant to section 31(2) of the *Environmental Management Act* to be an officer.

b) Schedules A and K are deleted and replaced respectively with Schedules A and K which are attached to and form part of this bylaw.

Read a first, second and third time this _____ day of _____, _____.

Passed and finally adopted this _____ day of _____, _____.

_____
Sav Dhaliwal, Chair

_____
Chris Plagnol, Corporate Officer

**Schedule A**

| | Column 1<br>**Designated Bylaws** | Column 2<br>**Designated Bylaw Enforcement Officers** |
|---|---|---|
| 1 | Greater Vancouver Regional District Regional Parks Regulation Bylaw No. 1177, 2012 | Park Officer<br>Royal Canadian Mounted Police Officer<br>Municipal Police Officer<br>British Columbia Provincial Conservation Officer |
| 2 | Greater Vancouver Regional District Air Quality Management Bylaw No. 1082, 2008 | Any person appointed by the GVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |
| 3 | Greater Vancouver Regional District Concrete and Concrete Products Industries Emission Regulation No. 1084, 2008 | Any person appointed by the GVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |
| 4 | Greater Vancouver Regional District Gasoline Distribution Emission Regulation No. 1085, 2008 | Any person appointed by the GVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |
| 5 | Greater Vancouver Regional District Automotive Refinishing Emission Regulation Bylaw No. 1086, 2008 | Any person appointed by the GVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |
| 6 | Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation Bylaw No. 1087, 2008 | Any person appointed by the GVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |
| 7 | Greater Vancouver Regional District Agricultural Boilers Emission Regulation Bylaw No. 1098, 2008 | Any person appointed by the GVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |

| | | |
|---|---|---|
| 8 | Greater Vancouver Regional District Electoral Area A Zoning Bylaw No. 1144, 2011 | Division Manager Electoral Area & Environment<br>Building Inspector<br>Regional Planner<br>Division Manager Corporate Safety<br>Emergency Preparedness & Security Coordinator<br>Local Assistant to the Fire Commissioner<br>Security and Crime Prevention Officer |
| 9 | Greater Vancouver Regional District Electoral Area A Building Administration Bylaw No. 1043, 2006 | Division Manager Electoral Area & Environment<br>Building Inspector<br>Regional Planner<br>Division Manager Corporate Safety<br>Emergency Preparedness & Security Coordinator<br>Local Assistant to the Fire Commissioner<br>Security and Crime Prevention Officer |
| 10 | Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021 | Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |
| 11 | Greater Vancouver Regional District Electoral Area A Unsightly Premises and Nuisance Bylaw No. 1198, 2014 | Division Manager Electoral Area & Environment<br>Building Inspector<br>Regional Planner<br>Division Manager Corporate Safety<br>Emergency Preparedness & Security Coordinator<br>Local Assistant to the Fire Commissioner<br>Security and Crime Prevention Officer |
| 12 | Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw No. 1303, 2020 | Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act* |

**Schedule K**

**Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021**

| Column 1 | | Column 2 | Column 3 |
|---|---|---|---|
| **Authorized Words or Expressions** | | **Section** | **Fine** |
| 1. | Unauthorized discharge of air contaminant | 7, 12 | $1000 |
| 2. | Discharge of emergency engine exhaust into building opening | 13 | $1000 |
| 3. | Failure to keep or to submit emergency engine records | 14 | $750 |
| 4. | Operating without registration | 15 | $1000 |
| 5. | Obstructing an officer | 19 | $750 |
| 6. | Operating without displaying registration no. or Tier label | 23(a), (b) | $500 |
| 7. | Failure to have functioning hour meter | 25 | $500 |
| 8. | Failure to notify of hour meter replacement | 25 | $500 |
| 9. | Failure to keep, produce or deliver low-use records | 26 | $750 |
| 10. | Failure to report hour meter reading | 27(a) | $750 |
| 11. | Failure to report hour meter reading at 200 hours of use | 27(b) | $1000 |
| 12. | Failure to provide meter manufacturer, model or serial no. | 27(c) | $250 |
| 13. | Unauthorized discharge (registration invalid - changed ERM*) | 37 | $750 |
| 14. | Failure to keep or to submit ERM* records | 38 | $750 |
| 15. | Prohibited operation of a Tier 0 engine | 45 | $1000 |
| 16. | Prohibited operation of a Tier 0 or Tier 1 engine | 47 | $1000 |
| 17. | Unauthorized operation of non-road diesel engine | 53 | $1000 |
| 18. | Unauthorized engine idling | 54 | $500 |
| 19. | Failure to submit anti-idling procedure | 56 | $250 |
| 20. | Operating within 100 metres of a sensitive receptor | 57 | $1000 |

| | Column 1<br>**Authorized Words or Expressions** | Column 2<br>**Section** | Column 3<br>**Fine** |
|---|---|---|---|
| 21. | Operating an engine having a tampered emission control system | 58 | $1000 |
| 22. | Providing false information | 59 | $750 |

* "ERM" means "emission reduction measure"

To: Climate Action Committee

From: Geoff Doerksen, Air Quality Planner
Ken Reid, Superintendent, Environmental Sampling and Monitoring
Parks and Environment Department

Date: October 13, 2021 Meeting Date: November 5, 2021

Subject: **Air Quality Advisories During the Summer of 2021**

**RECOMMENDATION**

That the Climate Action Committee receive for information the report dated October 13, 2021, titled "Air Quality Advisories During the Summer of 2021".

**EXECUTIVE SUMMARY**

Metro Vancouver issued four air quality advisories during the summer of 2021, resulting in advisories being in effect for ten days - June 26 to 30 (ozone and fine particulate matter), July 30 (ozone), August 1 to 3 (fine particulate matter) and August 12 to 15 (ozone and fine particulate matter). A record-breaking heatwave in late June resulted in high ozone levels not measured in the region since the 1980s, and caused an early start to an extremely active wildfire season in B.C. During the advisories in August, high levels of fine particulate matter were primarily due to smoke from wildfires burning outside the region. Significant wildfire smoke impacts in five of the last seven summers demonstrate that Metro Vancouver's air quality program must continue to adapt to a changing climate that is expected to increase the frequency and severity of both wildfires and heatwaves.

**PURPOSE**

To provide the Climate Action Committee with information about air quality advisories issued by Metro Vancouver during the summer of 2021, historical trends, and implications for future air quality.

**BACKGROUND**

Metro Vancouver operates an air quality advisory service for the entire Lower Fraser Valley airshed, including Metro Vancouver and the Fraser Valley Regional District. Air quality advisories are issued to the public when air quality is degraded or is expected to become degraded relative to Metro Vancouver's ambient air quality objectives, which are benchmarks for acceptable air quality. The advisory service is delivered in collaboration with Environment and Climate Change Canada, BC Ministry of Environment and Climate Change Strategy (BC ENV), Fraser Valley Regional District (FVRD), Vancouver Coastal Health (VCH), Fraser Health Authority (FHA), First Nations Health Authority (FNHA) and the BC Centre for Disease Control (BC CDC). BC ENV provides an air quality advisory service for the remainder of the province.

**METRO VANCOUVER ADVISORY PROGRAM IN 2021**

Metro Vancouver operates a comprehensive network of air quality monitoring stations. Data are available in real time on Metro Vancouver's website at **airmap.ca** and informs the air quality advisory service. The contaminants of primary concern for Metro Vancouver's air quality advisory service are:

- **Ground-level ozone ($O_3$)** - is produced when nitrogen oxides (emitted when fuels are burned) and volatile organic compounds (emitted from solvents and other sources) react in sunlight.
- **Fine particulate matter ($PM_{2.5}$)** – is less than 2.5 microns in diameter (less than 1/30th the thickness of a human hair), allowing it to penetrate deep into the lungs and into the bloodstream. It can be emitted directly (primarily from fuel combustion and wildfires) or formed indirectly, such as when nitrogen oxides or sulphur oxides react with ammonia.

These contaminants have the greatest potential to reach levels in the region that may be harmful to human health. Metro Vancouver has established ambient air quality objectives for these contaminants, which indicate acceptable levels for different periods of exposure, such as 1-hour, 8-hour, 24-hour and annual.

Metro Vancouver works closely with health authorities and the BC CDC each year to develop advisory messaging and public outreach materials with actions people can take to reduce their exposure to degraded air quality (e.g., consider taking shelter in public air-conditioned buildings with cleaner, cooler air, or reduce intensity of outdoor exercise). In preparation for advisories this summer, Metro Vancouver undertook new activities including the development of 30 social media posts, and hosting an online information session for media outlets. Social media posts were used this summer to prepare the public by providing information – for example, ways to reduce exposure to wildfire smoke; use of portable air cleaners; health advice; how to receive advisory notices; and where to find current air quality data and the Air Quality Health Index (AQHI).

An information session was held for print, radio and television media outlets on June 16 for an audience of technical reporters and on-air meteorologists. A similar session was held in advance of the 2019 wildfire season. The media session included presentation and discussion with staff and partners, including BC CDC, VCH, FHA, FNHA and BC ENV. Topics included an overview and science of the advisory program, reliable sources of air quality data, and health topics (e.g., ways to reduce exposure to wildfire smoke). As has been the case in recent years, there was considerable media interest in 2021, with stories about current air quality being reported widely on radio, television, print and online media outlets. Staff conducted numerous interviews with local media.

**SUMMER 2021 ADVISORIES**

Four air quality advisories were issued during the summer of 2021, for a combined total of ten days.

**Ground-Level Ozone and Secondary Fine Particulate Advisory, June 26 - 30, 2021**

The first air quality advisory of the summer coincided with an unprecedented heat wave in late June that affected Metro Vancouver and the entire Pacific Northwest. Record-breaking temperatures were experienced, including in the community of Lytton where the all-time Canadian record was set three days in a row, eventually reaching 49.6 degrees Celsius.

The advisory was initiated on June 26, for ground-level ozone in the eastern portions of Metro Vancouver and the central Fraser Valley. On June 28, nine stations exceeded the 1-hour and 8-hour ambient air quality objectives for ozone, including a 1-hour average of 151.1 parts per billion (ppb) at the Maple Ridge station (the 1-hour objective is 82 ppb). The last time the region experienced ozone concentrations that high was in 1988. On June 29 the advisory was extended to also include the

eastern Fraser Valley, and $PM_{2.5}$ was added to the advisory for the entire region due to a buildup of local emissions and secondary formation of $PM_{2.5}$. While wildfire activity was a growing concern across the province, the region was not yet impacted by wildfire smoke during this advisory. The advisory was cancelled on June 30 as cool, clean marine air flowed into the region.

**Ground-Level Ozone Advisory, July 30, 2021**
On July 30 a single-day ozone advisory was issued for eastern parts of Metro Vancouver and the FVRD. The advisory was issued due to high concentrations of ozone as a result of nitrogen oxides and volatile organic compounds reacting in the presence of sunlight during hot and sunny weather.

**Wildfire Smoke Advisory, August 1 - 3, 2021**
On August 1 wildfire smoke from the B.C. interior and Washington state contributed to elevated $PM_{2.5}$ concentrations and hazy skies throughout the region. Exceedances of the 24-hour $PM_{2.5}$ objective occurred in the eastern Fraser Valley with other parts of the region experiencing intermittently elevated $PM_{2.5}$, but remaining better than the objectives. An advisory was issued for Metro Vancouver and the FVRD, remaining in place until August 3 when smoke cleared with onshore winds.

**Wildfire Smoke Advisory, August 12 - 15, 2021**
Smoke returned August 12 and an advisory was issued for both $PM_{2.5}$ and ozone. With heat warnings also in place, $PM_{2.5}$ exceedances were widespread and at times the AQHI was at the highest risk level (10+) throughout the region. The advisory was cancelled August 15 due to a change in the weather with cooler and wetter weather moderating wildfire activity and smoke production.

**IMPLICATIONS FOR FUTURE AIR QUALITY**
The attachment to this report provides information on historical trends related to air quality advisories, including contributing factors to advisory events. Occurrences of wildfire smoke impacting Metro Vancouver has seen an upward trend in recent years. Five of the last seven summers have experienced widespread wildfire smoke throughout the region for many days. In 2021 the late June heat wave caused an early start to what became an extremely active wildfire season, especially in the B.C. Interior. The province experienced an above average number of wildfires and area burned this summer, producing considerable smoke that at times covered much of the province. Significant smoke can also reach our region from wildfires in Washington, Oregon and California where similar trends are being observed. Climate projections for the region indicate increased risk of wildfire activity due to warmer temperatures, lesser snowpack and lower precipitation during the summer, longer fire seasons, and greater incidence of heat waves.

While the frequency and severity of ground-level ozone advisories has been reduced in the last two decades due to actions taken to reduce emissions of ozone precursors, the extreme temperatures this year resulted in high ozone concentrations, reaching peak levels not measured since the late 1980s. In our region, the June heat wave exceeded some climate projections for Metro Vancouver, including the 2050 projection for number of days with overnight temperatures above 20 degrees and the highest 1-in-20 year return period temperature for 2080. Climate projections for our region indicate extreme heat waves will become more common even if global greenhouse gas emissions are reduced 45% by 2030 and reach net zero by 2050.

Extensive wildfire impacts and the extreme heatwave demonstrate that Metro Vancouver's air quality programs must continue to adapt in response to impacts on regional air quality and a changing climate. Wildfire smoke advisories, as well as the June ozone advisory, emphasize how climate change is presenting new challenges for air quality management. The June ozone advisory shows how extreme weather events have the potential of compromising decades of progress made on reducing the severity of ground-level ozone episodes. Metro Vancouver's *Climate 2050* strategy has identified the need for adaptation to climate-related impacts on regional air quality. As *Climate 2050* actions are developed, co-benefits will be emphasized. An example from the *Buildings Roadmap* is the use of electric heat pumps to enable summer cooling in homes while also reducing GHG emissions.

The recently adopted *Clean Air Plan* outlines strategies for continuous improvement in regional air quality. The plan includes actions for updating the *Regional Ground-Level Ozone Strategy* to better consider the impacts of wildfires on regional ozone and better protections against wildfire smoke such as "clean air" shelters in public buildings, resources to help residents and businesses manage indoor air quality, and providing high quality information to the public during air quality advisories.

**ALTERNATIVES**
This is an information report. No alternatives are presented.

**FINANCIAL IMPLICATIONS**
Staff time for monitoring and analyzing air quality information, issuing air quality advisories and responding to requests from media and the public is included in annual operating budgets, including overtime for evening and weekend work during the summer period. In the last two advisory seasons, weekend staff coverage for the advisory program has been extended past the typical ending on Labour Day, by five weeks in 2020 and three weeks in 2021 due to longer wildfire seasons and ongoing threats of wildfire smoke to the region. Consideration of increased resource levels is made during annual budget preparation and may be needed if wildfire activity continues to increase in the future.

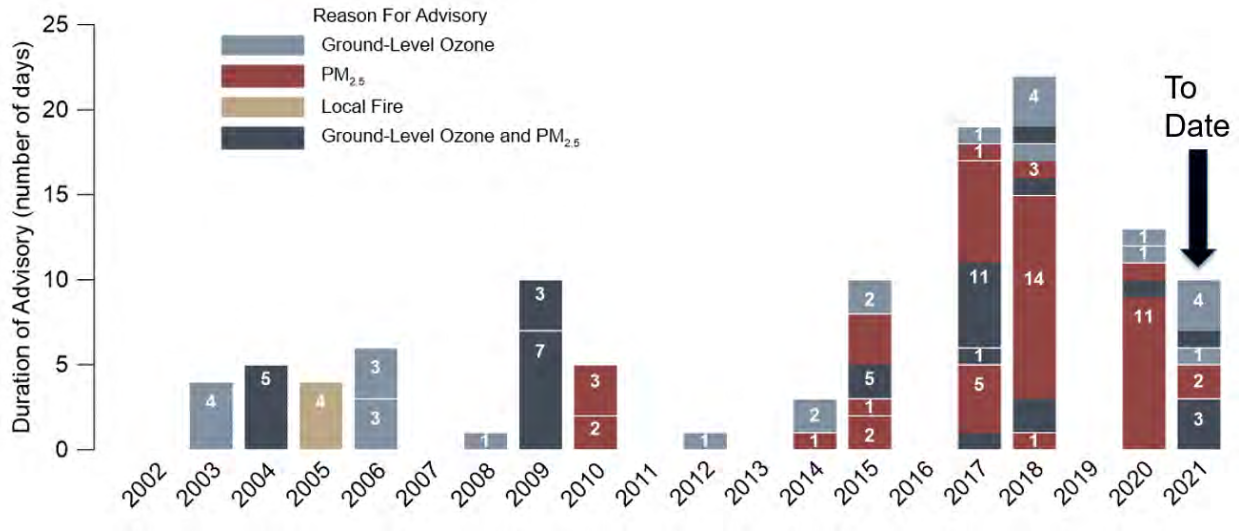
**CONCLUSION**
Public notification of degraded air quality is delivered by Metro Vancouver's air quality advisory program. There is considerable public and media interest in air quality during the summer, especially when advisories are in place. In preparation for advisory season this summer, Metro Vancouver undertook new activities: the development and posting of wildfire smoke related information to social media platforms, and hosting an online information session for media outlets. Four air quality advisories have been issued in 2021. High levels of $PM_{2.5}$ during August were primarily due to smoke from wildfires burning outside the region. The record-breaking June heatwave resulted in ozone concentrations not measured since the 1980s. Wildfire smoke advisories in five of the last seven years, as well as the June ozone advisory, emphasize how climate change is presenting new challenges for air quality management and highlighting the need for adaptation to climate-related impacts on regional air quality.

**Attachment**
Air Quality Advisory Trends *(48670769)*

47408233

***Air Quality Advisory Trends***

In the last twenty years, the number of days on which air quality advisories were in place has ranged from zero to twenty-two days annually. Shown in Figure 1 is the historical trend of the number of days the Lower Fraser Valley was under an advisory. The total number of advisory days is shown as a bar while the number of consecutive days of an advisory period is given by the number in white. The legend indicates the reason for the advisory being issued.




Notes:

- Trigger levels for advisories have changed over the years; care must be taken when interpreting advisory trends.
- The advisory in 2005 was the result of a large fire in Burns Bog.

**Figure 1: Number of days of air quality advisories in the LFV.**

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Kathy Preston, Program Manager, Environmental Regulation and Enforcement
Parks and Environment Department

Date: October 19, 2021 Meeting Date: November 5, 2021

Subject: **Board Appointment of Enforcement Officers**

**RECOMMENDATION**

That the MVRD Board:

a) pursuant to the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008* and the *Environmental Management Act*:
   i. appoint Metro Vancouver employees Matt Brinkworth and Toby Gritten as officers; and
   ii. rescind the appointments of Rick Laird, Robert Kemp and Corey Pinder as officers; and

b) pursuant to section 28 of the *Offence Act*:
   i. appoint Metro Vancouver employees Matt Brinkworth and Toby Gritten for the purpose of serving summons under section 28 of the *Offence Act* for alleged violations under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*; and
   ii. rescind the appointments for the purpose of serving summons of Rick Laird, Robert Kemp and Corey Pinder.

**EXECUTIVE SUMMARY**

Recent changes in staff have resulted in a need to update staff appointments as MVRD Board-designated officers under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*, the *Environmental Management Act* and the *Offence Act*. Staff recommend that the MVRD Board appoint staff accordingly.

**PURPOSE**

To appoint two Metro Vancouver employees as Board-designated officers and to rescind the appointments of three former employees.

**BACKGROUND**

Employment status changes for Metro Vancouver environmental regulatory staff have resulted in a need to update staff appointments to ensure appropriate authority to advance air quality management goals. Section 31 of the *Environmental Management Act* and the *Greater Vancouver Regional District Air Quality Management Bylaw No. 1082, 2008* grant authority to Board-designated officers.

**ROLE OF PERMITTING AND ENFORCEMENT OFFICERS**

Metro Vancouver's Air Quality Regulatory Program supports the goals of the Clean Air Plan by promoting compliance with air quality management bylaws and regulating the discharge of air contaminants.

Officers may enter property, inspect works, and obtain records and other information to promote compliance with the *Environmental Management Act* and MVRD air quality management bylaws.

The *Offence Act* allows regional districts to appoint bylaw enforcement officers for the purpose of serving summons for bylaw violations. Officers, if appointed for that purpose, may serve a summons in respect of alleged offences under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*.

**ALTERNATIVES**

1. That the MVRD Board:
   a) pursuant to the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008* and the *Environmental Management Act*:
      i. appoint Metro Vancouver employees Matt Brinkworth and Toby Gritten as officers; and
      ii. rescind the appointments of Rick Laird, Robert Kemp and Corey Pinder as officers; and
   b) pursuant to section 28 of the *Offence Act*:
      i. appoint Metro Vancouver employees Matt Brinkworth and Toby Gritten for the purpose of serving summons under section 28 of the *Offence Act* for alleged violations under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*; and
      ii. rescind the appointments for the purpose of serving summons of Rick Laird, Robert Kemp and Corey Pinder.

2. That the MVRD Board receive for information the report dated October 19, 2021, titled "Board Appointment of Enforcement Officers" and provide alternate direction to staff.

**FINANCIAL IMPLICATIONS**

There are no additional financial implications for expenditures as the MVRD appointees are already on staff.

**CONCLUSION**

Recent changes in staff have resulted in a need to update staff appointments as MVRD Board-designated officers under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*, the *Environmental Management Act* and the *Offence Act*. Staff recommend that the MVRD Board adopt Alternative 1.

47344635

To: Climate Action Committee

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

Date: October 26, 2021 Meeting Date: November 5, 2021

Subject: **Manager's Report**

**RECOMMENDATION**
That the Climate Action Committee receive for information the report dated October 26, 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 UPDATES**
**CleanBC Roadmap to 2030**
On October 25, 2021, the BC Government announced its CleanBC Roadmap to 2030, positioned as a stronger, more ambitious climate plan for BC. The Roadmap to 2030 includes a series of actions across the following eight pathways:

- Low Carbon Energy
- Transportation
- Buildings
- Communities
- Industry, Including Oil and Gas
- Forest Bioeconomy
- Agriculture, Aquaculture and Fisheries
- Negative Emissions Technologies

These actions are aimed at meeting BC's legislated greenhouse gas target of 40% below 2007 levels by 2030, building a cleaner economy and preparing for the impacts of climate change. The CleanBC Roadmap introduces a new target of net-zero emissions by 2050.

Based on an initial review of what has been announced, there appears to be good alignment between the provincial roadmap and Metro Vancouver's *Clean Air Plan* and *Climate 2050* roadmaps, for transportation and buildings. Staff will report back to the Committee with a more detailed assessment of the linkages, synergies, and opportunities in relation to Metro Vancouver's Climate 2050 Roadmaps and the Clean Air Plan, as well as any gaps or areas for future work.

Media releases from the provincial government and from Metro Vancouver are included as Attachments 2 and 3 to this report.

**Metro Vancouver Zero Emission Innovation Centre (ZEIC) Update**

The Metro Vancouver Zero Emissions Innovation Centre (ZEIC) is the region's new Low Carbon Cities Canada (LC3) Centre. It is one of seven Canadian LC3s with a mandate to accelerate urban climate solutions through research, capacity building, policy reform and financial innovation. ZEIC's work will support local governments and other agencies as they advance a wide range of actions to reduce greenhouse gas emissions in line with adopted plans and targets, including *Climate 2050*. Since the last update in March 2021, the inaugural ZEIC Board has been established, an Executive Director has been hired, and the centre is on track to meet all of the Federation of Canadian Municipalities "readiness requirements" for LC3s, in order to receive the $21.7 million federal endowment early in 2022.

The inaugural ZEIC Board, which has met several times since March, includes Director Jen McCutcheon (representing Metro Vancouver) and Director Adriane Carr (representing City of Vancouver), as well as members at large. The current Board membership is as follows:

- Peter Robinson (Chair)
- Chih-Ting Lo (Vice Chair)
- Adriane Carr (City of Vancouver representative)
- Jen McCutcheon (Metro Vancouver representative)
- Andrew Broderick
- Colin Doylend
- Karen Tam Wu
- Kira Gerwing
- Chris Gilmore (ex-officio, Province of BC)

Melina Scholefield is ZEIC's new Executive Director, and brings a wealth of experience from her previous roles with local government and the private sector. Melina was recently recognized with YWCA's Woman of Distinction – Environmental Sustainability Award. In her new role, she will be focusing on ensuring ZEIC meets the FCM's readiness requirements this year (in order to receive the federal endowment in early 2022) and working with the Board to confirm its strategic priorities over the coming months. One key opportunity that is being pursued is the potential to integrate the Zero Emissions Building Exchange (ZEBx) into ZEIC. ZEBx has the potential to accelerate the decarbonization of building, including retrofits, through delivery of its knowledge-sharing and capacity-building programs at a regional scale. Staff will support Director McCutcheon and Chair Carr in bringing regular updates on ZEIC to the Climate Action Committee.

**Update on Metro Vancouver's Climate 2050 Roadmaps**

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. 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 (GHG) and ensure that the region is resilient to climate change impacts.

The table below provides a summary of progress related to the *Climate 2050 Roadmaps*, as well as a timeline of the anticipated milestones for the development of future *Climate 2050 Roadmaps*. To date, the *Climate 2050 Buildings* and *Transportation Roadmaps* have been completed and are being presented to the Committee at its November 5, 2021 meeting (Reports 5.1 and 5.2). These sectors represent more than half of the region's greenhouse gases and critical resiliency opportunities. A number of draft Roadmaps will also be brought to the Committee and Board in the first quarter of 2022 for the next phase of engagement.

| Roadmap | Discussion Paper | Draft Roadmap | Final Roadmap |
|---|---|---|---|
| Building | ✓ | ✓ | ✓ |
| Transportation | ✓ | ✓ | ✓ |
| Industry | ✓ | Q1 2022 | Q4 2022 |
| Energy | ✓ | Q1 2022 | Q4 2022 |
| Infrastructure | ✓ | Q3 2022 | 2023 |
| Agriculture | ✓ | ✓ | Q3 2022 |
| Nature & Ecosystems | ✓ | Q1 2022 | Q3 2022 |
| Land Use & Growth Management | N/A | Q1 2022 | Q4 2022 |
| Waste | ✓ | TBD (2023) | TBD (2023) |
| Human Health & Wellbeing | TBD (2022) | TBD (2022) | TBD (2023) |

**LumiAir: Lighting Your Path to Clean Air**

The LumiAir project, which was funded by the Sustainability Innovation Fund (SIF), aims to engage and educate the public through a thought-provoking and accessible visual display of air quality. The display allows the public to see a visual representation of air contaminant levels collected at Metro Vancouver air quality monitoring stations in their community.

In the first phase of the project, preliminary designs were developed, and focus groups were conducted to obtain public feedback that was incorporated into the final design. The second and final phase included the build and configuration of the display, which includes a touchscreen interface, kiosk display, computer, and Metro Vancouver branding.


The first deployment of LumiAir was at Metro Vancouver's PNE display (pictured) during the summer of 2021, which gave the public the opportunity to interact with it. The display shows real-time air quality

monitoring data, and comparisons to scenarios that represent community exposure during a wildfire smoke day, a hot summer day with elevated ground-level ozone concentrations, and regional air quality from decades ago. Based on feedback from the public and staff, final changes are being made to the display with a completion date of the end of the year.

**New World Health Organization Air Quality Guidelines**

The World Health Organization (WHO) released new global air quality guidelines in September 2021 (Reference 1). These guidelines establish acceptable ambient concentrations for six health-harming air contaminants. The new WHO guidelines are generally more stringent than their 2005 guidelines due to growing evidence of the negative health impacts of air contaminants, including evidence of impacts from exposure to even low concentrations of some air contaminants.

Ambient air quality objectives (AAQOs) are Metro Vancouver's equivalent of the WHO guidelines. Metro Vancouver uses AAQOs to assess ambient air quality, guide air management decisions (e.g., issuing permits and advisories), and support development of management plans and regulations.

Metro Vancouver regularly updates its AAQOs, based on various sources, including the Canadian Ambient Air Quality Standards (CAAQS), BC air quality objectives, and the WHO guidelines. Updates to Metro Vancouver's AAQOs support continuous improvement in regional air quality, in line with the targets and principles in the recently adopted *Clean Air Plan*. Metro Vancouver most recently updated AAQOs in 2020, following the adoption of more stringent CAAQS for ground-level ozone and nitrogen dioxide, as well as more stringent BC objectives for carbon monoxide. The Canadian Council for Ministers of the Environment is currently considering updates to the CAAQS for $PM_{2.5}$.

The table below compares the new WHO guideline levels (the most protective value) and interim targets (steps along the way) to Metro Vancouver's objectives for the same air contaminants. The table includes the air contaminants of greatest concern in the Metro Vancouver region, so carbon monoxide and inhalable particulate matter ($PM_{10}$) are not listed.

| Air contaminant | Averaging time* | Metro Vancouver ambient air quality objective** ($\mu g/m^3$) | WHO 2021 interim targets*** of guideline ($\mu g/m^3$) | WHO 2021 level*** of guideline ($\mu g/m^3$) |
|---|---|---|---|---|
| Nitrogen dioxide ($NO_2$) | 1-hour | 113 | - | - |
| | 24-hour | - | 50 – 120 | 25 |
| | Annual | 32 | **20** – 40 | **10** |
| Sulphur dioxide ($SO_2$) | 1-hour | 183 | - | - |
| | 24-hour | - | 50 – 125 | 40 |
| | Annual | 13 | - | - |
| Ground-level ozone ($O_3$) | 1-hour | 161 | - | - |
| | 8-hour | 122 | **120** – 160 | **100** |
| | Peak season | - | 70 – 100 | 60 |
| Fine particulate matter ($PM_{2.5}$) | 24-hour | 25 | 25 – 75 | **15** |
| | Annual | 8 (6 is goal) | 10 – 35 | **5** |

* Metro Vancouver's ambient air quality objectives generally use the same averaging times as the Canadian Ambient Air Quality Standards, which may not match averaging times selected by the World Health Organization.

** The Metro Vancouver ambient air quality objectives shown are the "numerical values", or concentrations that indicate if the objective is achieved or exceeded.
*** The interim targets are to guide reduction efforts towards the ultimate and timely achievement of the guideline level.

While several of the new WHO guideline levels are more stringent than the current Metro Vancouver objective, including for nitrogen dioxide, ground-level ozone and fine particulate matter (highlighted in **bold**), Metro Vancouver's objectives tend to be at or better than the lower end of the interim targets. Staff will consider the new WHO guidelines when updating Metro Vancouver's AAQOs in the future.

Metro Vancouver is generally compliant with the current regional objectives, but experiences short term exceedances for $PM_{2.5}$ and ozone, which can result in summertime advisories. As noted in Report 5.7 in the Committee's November 5, 2021 agenda package, climate change is presenting new challenges for air quality management. Increasing the stringency of regional air quality objectives, per guidance from the WHO, will support continuous improvement but will also emphasize the need for evolving management actions and adaptation to climate-related impacts on regional air quality.

**Attachments** *(48836931)*
1. Climate Action Committee 2021 Work Plan
2. BC Government News Release dated October 25, 2021, "BC Launches Stronger Climate Plan for a Better Future"
3. Metro Vancouver Media Release dated October 25, 2021, "Metro Vancouver Applauds CleanBC Roadmap to 2030"

**References**
1. World Health Organization Global Air Quality Guidelines

48561748

**Climate Action Committee 2021 Work Plan**
**Report Date: October 26, 2021**

**Priorities**

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

BC Gov News

## Environment and Climate Change Strategy

# B.C. launches stronger climate plan for a better future

News Release
Victoria
Monday, October 25, 2021 12:10 PM

(flickr.com)

British Columbia is launching a stronger, more ambitious climate plan to deliver on its commitment to reduce climate pollution and build a cleaner, stronger economy for people throughout B.C.

The CleanBC Roadmap to 2030 plan accelerates measures in B.C.'s continent-leading climate plan that has been proven effective and introduces new ideas to help B.C. achieve the Paris emissions reduction targets for 2030 and reach net-zero by 2050.

“Here in B.C., the threat of climate change is no longer decades or even years away. The impacts are all around us, from devastating wildfires to intense heat waves and droughts,” said Premier John Horgan. “The scale of the climate emergency demands that we act with even greater urgency than ever before. By bringing people and businesses together, we can rise to the challenge and seize the opportunity to build a stronger, more resilient B.C. for everyone. That’s what this plan is all about.”

The CleanBC Roadmap to 2030 builds on the progress British Columbia has made since 2018 by making polluting more expensive and the shift from fossil fuels to clean alternatives more affordable. The plan will help power more businesses and communities with clean, renewable made-in-B.C. hydro electricity. Working with large industry partners, it will also ensure sector-specific plans to reduce their climate pollution and meet B.C.'s targets.

“By working with all sectors, we can see clearly where we are making progress and where new thinking and resources are required,” said George Heyman, Minister of Environment and Climate Change Strategy. “The CleanBC Roadmap puts greater focus on transitioning away from fossil fuels faster and adopting clean energy solutions. It strengthens B.C.’s position to attract investment and build opportunity for British Columbians and embodies our determination and commitment to meet our climate targets.”

The CleanBC Roadmap to 2030 includes a series of actions across eight pathways. They include:

- a commitment to increase the price on carbon pollution to meet or exceed the federal benchmark, with supports for people and businesses;
- requirements for new industry projects to have enforceable plans to reach B.C.’s legislated and sectoral targets and net zero by 2050;
- stronger regulations that will nearly eliminate industrial methane emissions by 2035;
- a comprehensive review of the oil and gas royalty system to ensure it aligns with B.C.’s climate goals and provides a fair return for British Columbians, with outcomes released in February 2022;
- new requirements to make all new buildings zero-carbon by 2030;
- a nation-leading adoption of zero-emission vehicles (ZEVs) by 2030 and 100% ZEVs by 2035;
- developing new ZEV targets for medium- and heavy-duty vehicles;
- an accelerated shift toward active transportation and public transit (30% by 2030; 40% by 2040; 50% by 2050);
- increased clean fuel and energy efficiency requirements; and
- support for innovation in areas like clean hydrogen, the forest-based bioeconomy and negative emissions technology.

“We made our oil and gas sectoral targets clear a year ago and this roadmap includes our commitments to meet that reduction target. We will work with experts, industry and Indigenous Nations on programs and policies that will achieve this, including regulation where necessary,” Heyman said.

“The CleanBC Roadmap updates B.C.’s climate and clean economy plan to put the province on a path that will cut pollution in line with our emissions targets and support affordability for people and businesses along the way,” said Colleen Giroux-Schmidt, vice-president of corporate

relations, Innergex Renewable Energy Inc., and co-chair of B.C.'s Climate Solutions Council. "The plan incorporates extensive input from the independent Climate Solutions Council, and the challenge before us all now is to roll up our sleeves, harness all available resources and partners to ensure B.C. can navigate and thrive in the transition to a net-zero world."

The CleanBC Roadmap was announced highlighting Seaspan Ferries recently completed pilot project supported through CleanBC to test the performance of biofuels in its cargo vessel, the Seaspan Reliant. The company is also working on a project which will increase the size of the battery storage systems onboard two of its vessels by means of a new battery technology developed by Corvus Energy at its facility in Richmond.

"Seaspan Ferries is making great progress reducing emissions across our fleet and CleanBC has been an important part of that," said Ian McIver, president, Seaspan Marine Transportation. "This new biofuel and battery project has shown we can find innovative ways to lower greenhouse gas emissions and fuel consumption in our ships and get better engine performance and cost-savings. We're confident the new CleanBC Roadmap will help us accelerate this transition and bring even more benefits."

**Quick Facts:**

- Actions in the roadmap will result in meeting B.C.'s legislated greenhouse gas (GHG) target of 40% below 2007 levels by 2030.
- The CleanBC Roadmap was a commitment from last year's Climate Change Accountability Report and was informed by new emissions projections showing greater action to meet its 2030 GHG targets was required.

**Learn More:**

To read the CleanBC Roadmap to 2030, visit: www.cleanbc.gov.bc.ca

Read more about B.C.'s comprehensive review of the oil and gas royalty system: https://news.gov.bc.ca/releases/2021EMLI0060-001927

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

MEDIA RELEASE

October 25, 2021

**METRO VANCOUVER APPLAUDS CLEANBC ROADMAP TO 2030**

Metro Vancouver enthusiastically supports the Province of B.C.'s new *CleanBC Roadmap to 2030*, which outlines the actions necessary to achieve deep emission reductions while supporting economic resilience and affordability for residents.

"I am pleased to see alignment between the province's *CleanBC Roadmap* and Metro Vancouver's *Climate 2050* and *Clean Air Plan*," said Sav Dhaliwal, Chair of Metro Vancouver's Board of Directors. "All orders of government must work together to address climate change, and B.C.'s announcement today further demonstrates the province's leadership in achieving emission reductions and resilience targets. Metro Vancouver looks forward to working closely with the province to meet these targets."

For nearly two decades, Metro Vancouver has taken a leadership role in the region's response to climate change. *Climate 2050* sets a target of a 45-per-cent reduction in emissions from 2010 to 2030 and carbon neutrality within the region by 2050. Metro Vancouver's *Clean Air Plan*, approved last month, is the regional plan for managing air quality and greenhouse gases over the next 10 years. Actions outlined within the plan aim to reduce air contaminant emissions, including greenhouse gases, and support the commitment to a carbon neutral region by 2050.

"The province's roadmap provides immense opportunities and support for businesses within the province to build on their existing strengths and thrive in an equitable, resilient economy that prioritizes greenhouse gas emissions reductions," said David Flaks, President of Invest Vancouver, the region's economic development leadership service. "Metro Vancouver is home to a robust and rapidly growing green economy and clean tech sector. CleanBC sends the clear message that innovative businesses, particularly those engaged in low- and near-zero emissions vehicles, low-carbon fuels and charging infrastructure, and the circular economy, are well-positioned to ensure that the province and Metro Vancouver region will not simply be a profligate consumer of clean tech products, processes, and services, but also be a world-leading researcher, engineer, designer, builder, and exporter of those clean tech solutions."

The province's announcement also indicates important alignment between the regional district and province ahead of the 26th UN Climate Change Conference of the Parties (COP26) beginning Oct. 31.

"Tackling climate change requires commitment from all orders of government. We strongly support both provincial and federal governments working to address the climate crisis, through the *CleanBC Roadmap* and Canada's commitments at COP26," said Adriane Carr, Chair of Metro Vancouver's Climate Action Committee. "Our *Climate 2050* strategy lays out the actions required to hit regional climate goals, which will be supported by the actions in the *CleanBC Roadmap to 2030*."

More information on the Clean Air Plan and Climate 2050 can be found on Metro Vancouver's website.

**Media contact:**
Don Bradley, Division Manager, Media Relations & Issues Management c. 604.788.2821

---

Government of Canada Gouvernement du Canada

Canada.ca Environment and Climate Change Canada

# UK COP26 Presidency releases Climate Finance Delivery Plan, led by German State Secretary Flasbarth and Canada's Minister Wilkinson ahead of COP26

**From: Environment and Climate Change Canada**

## News release

**The plan shows the trajectory to deliver on the developed countries' goal of mobilizing $100 billion per year in climate finance**

**October 25, 2021 – Ottawa, Ontario**

Today, the UK COP26 Presidency is publishing the Climate Finance Delivery Plan, to provide clarity on when and how developed countries will meet the $100 billion climate finance goal and how the financing will prospectively proceed until 2025.

Climate finance plays a critical role in helping developing countries fight climate change and adapt to its impacts. That's why, in 2009, developed countries agreed to mobilize $100 billion in climate finance per year by 2020, and in 2015 agreed to extend this goal through to 2025. While developed countries have significantly scaled up their support over the last decade, recent trends show that it is unlikely the $100 billion goal was met in 2020.

Against this background and with COP26 approaching, the Honourable Jonathan Wilkinson, Canada's Minister of Environment and Climate Change, and Jochen Flasbarth, Germany's State Secretary at the Ministry for Environment, Nature Conservation, and Nuclear Safety, accepted a request from COP26 President-Designate Alok Sharma to work together to produce a focused Delivery Plan on the $100 billion commitment with the objective of building confidence and trust that developed countries will deliver on their promise.

Building on assessments of progress on the $100 billion goal to date, the Delivery Plan sets out an estimated trajectory of climate finance from 2021 through to 2025, taking into account new climate finance pledges from individual developed countries and multilateral development banks, as well as collective qualitative actions to improve the delivery of climate finance.

Based on the analysis from the Organisation for Economic Cooperation and Development (OECD) of recent climate finance pledges, the forward-looking Delivery Plan shows that developed countries will make significant progress towards the $100 billion goal in 2022, and provides confidence that it will be met in 2023. The data also provides confidence that developed countries can mobilize more than $100 billion per year thereafter through to 2025.

Though it is disappointing that the goal was not met on time, the redoubling or significantly increased efforts from a large number of developed countries—including Canada, UK, Germany and others—provide important signals of willingness to deliver to developing countries. The vast majority of increased climate finance in the projections comes from public finance. Given

that levels of mobilized private climate finance to date have underperformed against expectations, the plan makes clear that more needs to be done in this respect, but does not rely on a significant improvement in this for the goal to be met by 2023.

Furthermore, based on consultations undertaken by Minister Wilkinson and State Secretary Flasbarth, additional pledges from developed countries may be expected this year but are not yet ready to be included in the analysis at the time of publishing. These additional pledges are likely to further increase the projections outlined in the report. Individual country pledges to date have been published on the UK COP Presidency's Website. The Plan acknowledges a number of additional issues that developed countries will look to improve in the delivery and mobilization of climate finance to 2025, and lays out a set of guiding principles for collective actions, including increasing financing for adaptation, the need for a reasonable share of grant-financing besides loans, addressing barriers to accessing climate finance, and improving private finance mobilization.

Importantly, the Plan states that developed countries will continue to engage with developing countries and other key stakeholders and partners to ensure climate finance is delivered effectively, efficiently, and at scale.

The OECD supported the work on this Delivery Plan with its expert analysis that provides aggregate, forward-looking estimates of an increase in climate finance from 2021 to 2025. The co-authors would also like to thank Sweden for its valuable input.

Climate finance will be key at COP26 in Glasgow later this month. Providing clarity on the timing and sources of funding is only the first step on the path towards delivery. Robust conversations will continue at COP26 on ways to ensure countries are collectively doing what is needed to deliver on the goals of the Paris Agreement.

## Notes to editors

- In 2009, developed countries committed to a goal of mobilizing jointly $100 billion a year by 2020 to address the needs of developing countries, in the context of meaningful mitigation actions and transparency on implementation. This collective goal was reaffirmed under the Paris Agreement in 2015 as Parties committed to continue delivering on this goal through 2025.
- In June 2021, the Prime Minister of Canada announced that Canada will double its international climate finance commitment to $5.3 billion over the next five years. Canada's increased commitment to climate finance includes an increased focus on adaptation and recognizes that urgent action is needed to address the interconnected crises of climate change and biodiversity loss, which disproportionately affect the poorest and most vulnerable.
- Since 2015, the Government of Canada has invested over $100 billion in clean growth. The Government of Canada's existing climate actions put Canada on a path to exceed its previous target and allowed the government to set an ambitious new target of 40%–45%reductions below 2005 levels by 2030 earlier this year.
- Germany is to become climate neutral by 2045 and has outlined a path to achieve this with binding targets for the 2020s and 2030s.

- The interim target for 2030, currently 55 percent, is being increased to a 65 percent greenhouse gas reduction compared to 1990. A new interim reduction target of 88 percent has been set for 2040.
- Climate action efforts up to 2045 will thus be more appropriately distributed across the current and future generations. Germany is moving away from coal during the 2030s. Coal-fired power generation is set to end by 2038 at the latest.
- By its Climate Change Act Germany has retained the system of year-specific permissible emission levels for the individual sectors for this decade, with these levels significantly reduced.
- The new German 2030 climate target also takes account of the new, higher EU climate target for 2030, which all member states agreed on at the end of 2020 during Germany's Council Presidency.
- The EU and its Member States wish to communicate the following Nationally Determined Contribution. The EU and its Member States, acting jointly, are committed to a binding target of a net domestic reduction of at least 55% in greenhouse gas emissions by 2030 compared to 1990.
- With new 2030 mitigation targets this year from the Canada, Japan and the US, combined with ambitious action from the EU and UK countries accounting for more than half of the world's economy have now committed to the pace of emission reductions required globally to limit warming to 1.5°C.
- The financial support for international climate action has been consistently increasing and on a high level in recent years. In 2020, Germany provided in total EUR 7.83 billion for international climate finance. As part of that, Germany was significantly surpassing its pledge to double climate finance from budgetary sources to EUR 4 billion by 2020. As announced at the G7 summit, Germany also wants perspectively to further increase its climate finance, from 4 to EUR 6 billion annually by 2025 at the latest.
- The United Kingdom holds the Presidency of COP26, this year's international climate meeting and negotiations. Climate finance is one of the four COP26 goals, a key priority for the UK's COP26 Presidency.
- In 2019, the UK doubled its climate finance commitment to £11.6 billion between April 2021 and March 2026, compared with the previous five-year commitment of £5.8 billion between April 2016 and March 2021. These amounts follow on from the £3.8 billion spent on international climate finance between April 2011 and March 2016.

## Quotes

"The Delivery Plan sets out how developed countries will deliver the $100 billion goal that has long been promised to developing nations.

"Scaling up climate finance has been one of my top priorities as COP President. This plan recognises progress, based on strong new climate finance commitments. There is still further to go, but this Delivery Plan, alongside the robust methodological report from the OECD, provides clarity, transparency and accountability. It is a step towards rebuilding trust and gives developing countries more assurance of predictable support.

“We can and must do more to get finance flowing to developing nations. So in the lead up to COP26, it’s vital we see further pledges from the donor community and action on key priorities such as access to finance and funding for adaptation.”

– COP26 President-Designate Alok Sharma

“It is critically important for developing countries to be able to trust that the developed world will make good on its promises, starting with the $100 billion climate finance goal. Earlier this year, Canada doubled its climate finance commitment and is proud to have taken on this leadership role with Germany, at the request of the COP26 President-Designate. While more work needs to be done, I hope that today’s report can instill confidence and trust that developed countries will deliver on their promises to the developing world, and that Canada will continue to be a constructive player to this end internationally.”

– The Honourable Jonathan Wilkinson, Canada’s Minister of Environment and Climate Change

“Developing countries have been rightfully disappointed that, so far, developed countries have not delivered on the $100 billion promise that was already given in 2009. Hence, I am glad that the process I was honoured to lead jointly with Minister Jonathan Wilkinson has created momentum to help complying with the finance commitment overall in the period up to 2025. We are very aware that also after today’s release of the Delivery Plan, a lot of work remains. However, it is my strong hope that with this plan, we can show the international community that developed countries remain committed to deliver on their promises. I can assure you that Germany is strongly committed to the US$100 billion target. In 2020, we provided in total EUR 7.8 billion for international climate finance. We intend to increase the fraction of our climate finance coming from our national budget from EUR 4 billion in 2020 to prospectively EUR 6 billion in 2025. Thus, we will continue to provide our share in the years to come.”

– German State Secretary Jochen Flasbarth, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety

## Related products

- OECD methodological note
- Official website of COP26 (English only)
- COP26 Finance Goals (English only)
- Canada’s Climate Finance

## Contacts

Joanna Sivasankaran
Press Secretary
Office of the Minister of Environment and Climate Change
819-790-1907
Joanna.Sivasankaran@ec.gc.ca
Media Relations
Environment and Climate Change Canada
819-938-3338 or 1-844-836-7799 (toll-free)
media@ec.gc.ca

Environment and Climate Change Canada's Twitter page

Environment and Climate Change Canada's Facebook page

Stephan Gabriel Haufe
Spokesperson
Responsible for International Environmental Policy and Climate Action
Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
Tel.: 030/18305 4828
Cell.: +49 170/66 921 83
E-Mail: stephangabriel.haufe@bmu.bund.de
Internet: www.bmu.bund.de
Twitter: @HaufeStephan
Facebook: https://www.facebook.com/bmu.bund/

COP26 UK Media
COP26Media@cabinetoffice.gov.uk

Search for related information by keyword: Environment | Climate change | NE Nature and Environment | Environment and Climate Change Canada | Canada | Environment and natural resources | general public | news releases | Hon. Jonathan Wilkinson