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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMTTEE

REGULAR MEETING

Friday, March 11, 2022
1:00 p.m.
Meeting conducted electronically pursuant to the Procedure Bylaw
28th Floor Boardroom, 4515 Central Boulevard, Burnaby, British Columbia
Webstream available at http://www.metrovancouver.org

A G E N D A[1]

1. ADOPTION OF THE AGENDA

1.1 March 11, 2022 Regular Meeting Agenda
That the Climate Action Committee adopt the agenda for its regular meeting scheduled for March 11, 2022 as circulated.

2. ADOPTION OF THE MINUTES

2.1 February 11, 2022 Regular Meeting Minutes *pg. 4*
That the Climate Action Committee adopt the minutes of its regular meeting held February 11, 2022 as circulated.

3. DELEGATIONS

4. INVITED PRESENTATIONS

5. REPORTS FROM COMMITTEE OR STAFF

5.1 Draft Climate 2050 Industry and Business Roadmap *pg. 9*
That the MVRD Board direct staff to proceed with engagement on the draft *Climate 2050 Industry and Business Roadmap*, as presented in the report dated February 17, 2022, titled "Draft *Climate 2050 Industry and Business Roadmap*".

5.2 Mobile Air Quality Monitoring Using Drone-Based Sensors *pg. 68*
That the MVRD Board authorize staff to use the allocation from the Regional District Sustainability Innovation Fund for the project "Mobile Monitoring of Fugitive and Other Industrial Air Emissions with 'Flying Labs'" to evaluate the feasibility of using other mobile monitoring platforms for air emissions assessment.

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

5.3 Addressing the Use of Heavy Fuel Oil and Exhaust Gas Cleaning Systems in Marine Vessels in the Region *pg. 72*

That the MVRD Board authorize the Board Chair to:

a) write to the federal ministers of Environment and Climate Change Canada and Transport Canada to request the prohibition of scrubbers and require the use of cleaner, lower sulphur fuels that meet sulphur content limits without the use of scrubbers, in the North American Emission Control Area (ECA), and prioritize the use of shore power; and

b) write to the Vancouver Fraser Port Authority to express support for their actions to prohibit the discharge of scrubber washwater while a vessel is at berth or anchor and further encourage this action to apply to vessels transiting all the waters within the Port, as well as support their air emissions program that incentivizes the use of cleaner fuels and shore power.

5.4 Manager's Report *pg. 76*

That the Climate Action Committee receive for information the report dated February 25, 2022 titled "Manager's Report".

6. INFORMATION ITEMS

6.1 Metro 2050 Next Steps: Addressing Member Jurisdiction Comments and Climate Policy *pg. 80*

6.2 Correspondence dated February 22, 2022 from Clarissa Huffman re City of Port Coquitlam Climate Action Plan - Phase 2 Workshop *pg. 99*

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.

That the Climate Action Committee close its regular meeting scheduled for March 11, 2022 pursuant to the *Community Charter* provisions, Section 90 (1) (i) and 90 (2) (b) as follows:

"90 (1) A part of a board meeting may be closed to the public if the subject matter being considered relates to or is one or more of the following:

(i) the receipt of advice that is subject to solicitor-client privilege, including communications necessary for that purpose;

90 (2) A part of a meeting must be closed to the public if the subject matter being considered relates to one or more of the following:

(b) the consideration of information received and held in confidence relating to negotiations between the regional district and a provincial government or the federal government or both, or between a provincial government or the federal government or both and a third party."

10. ADJOURNMENT/CONCLUSION

That the Climate Action Committee adjourn/conclude its regular meeting of March 11, 2022.

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, Zoë – Port Moody
Steves, Harold – Richmond
Wilson, Chris – Coquitlam
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 1:02 p.m. on Friday, February 11, 2022 in the 28th Floor Boardroom, 4515 Central Boulevard, Burnaby, British Columbia.

MEMBERS PRESENT:
Chair, Councillor Adriane Carr*, Vancouver
Vice Chair, Councillor Sav Dhaliwal, Burnaby
Councillor Petrina Arnason*, Langley Township
Councillor Laura Dupont*, Port Coquitlam
Councillor David Hocking*, Bowen Island
Councillor Dylan Kruger*, Delta
Director Jen McCutcheon*, Electoral Area A
Councillor Jessica McIlroy*, North Vancouver City (departed at 2:57 p.m.)
Mayor Ron McLaughlin*, Lions Bay
Councillor Allison Patton*, Surrey
Councillor Zoë Royer*, Port Moody
Councillor Harold Steves*, Richmond
Councillor Chris Wilson*, Coquitlam
Councillor Ahmed Yousef*, Maple Ridge

MEMBERS ABSENT:
Chief Ken Baird, Tsawwassen

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

1. ADOPTION OF THE AGENDA

1.1 February 11, 2022 Regular Meeting Agenda

It was MOVED and SECONDED
That the Climate Action Committee
a) amend the agenda for its regular meeting scheduled for February 11, 2022, by adding Item 3.1 Late Delegation – Alex Boston, Renewable Cities and Fellow MJ Wosk Centre, Simon Fraser University; and
b) adopt the agenda as amended.

CARRIED

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

2. ADOPTION OF THE MINUTES

2.1 January 14, 2022 Regular Meeting Minutes

It was MOVED and SECONDED
That the Climate Action Committee adopt the minutes of its regular meeting held January 14, 2022 as circulated.

CARRIED

3. DELEGATIONS

3.1 Late Delegation - Alex Boston, Renewable Cities and Fellow MJ Wosk Centre, Simon Fraser University

Alex Boston, Renewable Cities and Fellow MJ Wosk Centre, Simon Fraser University, spoke to the Climate Action Committee regarding the overlap between the *Clean Air Plan* and the proposed *Metro 2050* strategy emphasizing the urgent need for climate course correction and strategy alignment for the region.

Presentation material titled "Climate 2050 Land Use Policy Implications" is retained with the February 11, 2022 Climate Action Committee agenda.

4. INVITED PRESENTATIONS

4.1 Ralf Nielsen, Director, Enterprise Sustainability and Caitlin Cooper, Project Manager, Regional Transportation Strategy, TransLink

Ralf Nielsen, Director, Enterprise Sustainability, spoke to the Climate Action Committee highlighting TransLink's climate action targets to achieve net zero greenhouse gases (GHG) emissions by 2050, the roadmap to net zero emissions, and critical efforts to achieve goals.

Members discussed how ridership can be increased to promote the use of public transportation and reduce the number of vehicles on the road.

Presentation material titled "TransLink's Climate Action Strategy" is retained with the February 11, 2022 Climate Action Committee agenda.

5. REPORTS FROM COMMITTEE OR STAFF

5.1 2022 Liquid Waste Sustainability Innovation Fund Application

Report dated January 19, 2022 from Lillian Zaremba, Program Manager, Collaborative Innovations, Liquid Waste Services, presenting one project recommended for Sustainability Innovation Funding for the Climate Action Committee and the GVS&DD Board's consideration.

Presentation titled "2022 Sustainability Innovation Fund Applications" is retained with the February 11, 2022 Climate Action Committee agenda.

It was MOVED and SECONDED

That the GVS&DD Board approve the allocation from the Liquid Waste Sustainability Innovation Fund of $270,000 over two years starting in 2022 for Phase 1 of the Biorock: Innovative Building Material for Shoreline Protection, Carbon Sequestration, and Habitat Creation project.

CARRIED

5.2 2022 Regional District Sustainability Innovation Fund Applications

Report dated January 10, 2022 from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment Department, presenting eight projects recommended for Sustainability Innovation Funding for the Climate Action Committee and the MVRD Board's consideration.

2:57 p.m. Councillor McIlroy left the meeting.

Presentation titled "2022 Sustainability Innovation Fund Applications" is retained with the February 11, 2022 Climate Action Committee agenda.

It was MOVED and SECONDED

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

a) Showcasing Innovation in Alternative Powered Park Operations and Maintenance Equipment to Reduce Emissions: $35,000 in 2022;
b) Social and Community Data Model – Phase 2: $180,000 over two years starting in 2022;
c) Net Zero Water Technology Accelerator: $175,000 over two years starting in 2022;
d) Integrating greenhouse gases requirements into air emission permits and regulations: $150,000 over two years starting in 2022;
e) Taking out the Trash: Transitioning to Zero-Carbon Heavy Duty Vehicles through Waste Collection Trucks: $400,000 over three years starting in 2022;
f) Metro Vancouver Large Building Retrofit Accelerator: $850,000 over three years starting in 2022;
g) Driving Down Emissions: Working with Key Partners to Develop a Regional Pathway to Accelerate Transportation Emission Reductions: $455,000 over two years starting in 2022; and,
h) Smart Cities: Hyperlocal Air Quality Monitoring: $250,000 over two years starting in 2022.

CARRIED

5.3 2022 Water Sustainability Innovation Fund Applications

Report dated January 10, 2022 from Lucas Pitts, Director, Policy, Planning and Analysis, Water Services, presenting six projects recommended for Sustainability Innovation Funding for the Climate Action Committee and the GVWD Board's consideration.

Presentation titled "2022 Sustainability Innovation Fund Applications." is retained with the February 11, 2022 Climate Action Committee agenda.

It was MOVED and SECONDED

That the GVWD Board approve the allocation from the Water Sustainability Innovation Fund for the following projects:

a) 10-year Salmon Enhancement Action Plan: $180,000 over two years starting in 2022;
b) Hydrological Models for the Capilano and Seymour Watersheds: $750,000 over three years starting in 2022;
c) Digital Transformation of Water Transmission System Planning & Analysis: $950,000 over three years starting in 2022;
d) Feasibility Study to Optimize Transmission System Energy Use: $350,000 over two years starting in 2022;
e) Regional Equity and Affordability of Drinking Water: $550,000 over three years starting in 2022; and,
f) New Technology for the Determination of E.Coli in Recreational Water to Enhance Public Safety: $200,000 over two years starting in 2022.

CARRIED

5.4 Alignment between MoveUP Proposal and Metro Vancouver Climate 2050 Buildings Roadmap

Report dated January 27, 2022 from Nav Hundle, Senior Policy and Planning Analyst, Jason Emmert, Program Manager, Climate Policy, Parks and Environment Department, providing an analysis of the proposal from MoveUP, and its alignment with the *Climate 2050 Buildings Roadmap,* as directed by the Climate Action Committee.

It was MOVED and SECONDED

That the MVRD Board direct staff to engage with the Canadian Office and Professional Employees Union (MoveUP) as part of the implementation of the *Climate 2050 Buildings Roadmap,* to seek opportunities for collaboration related to their proposal titled "Capitalizing on Retrofitting Opportunities for Greenhouse Gas Emissions Reductions and Job Creation".

CARRIED

5.5 Manager's Report

Report dated January 28, 2022 from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment Department, providing the Climate Action Committee with updates on various initiatives and Metro Vancouver's participation as an intervenor in the British Columbia Utilities Commission proceedings.

It was MOVED and SECONDED
That the Climate Action Committee direct staff to bring forward a report for information on Metro Vancouver's participation as an intervenor in the British Columbia Utilities Commission proceedings related to Fortis Energy Inc.'s revised Renewable Natural Gas Program to the February 25, 2022 MVRD Board meeting.

CARRIED

It was MOVED and SECONDED
That the Climate Action Committee receive for information the report dated January 28, 2022 titled "Manager's Report".

CARRIED

6. INFORMATION ITEMS
No items presented.

7. OTHER BUSINESS
No items presented.

8. BUSINESS ARISING FROM DELEGATIONS
No items presented.

9. RESOLUTION TO CLOSE MEETING
No items presented.

10. ADJOURNMENT/CONCLUSION

It was MOVED and SECONDED
That the Climate Action Committee conclude its regular meeting of February 11, 2022.

CARRIED
(Time: 3:34p.m.)

_____ _____

Manveer Atwal,
Legislative Services Coordinator

Adriane Carr, Chair

50904001 FINAL

To: Climate Action Committee

From: Sheryl Cumming, Project Engineer
Jason Emmert, Program Manager, Climate Policy
Parks and Environment Department

Date: February 17, 2022 Meeting Date: March 11, 2022

Subject: **Draft Climate 2050 Industry and Business Roadmap**

RECOMMENDATION

That the MVRD Board direct staff to proceed with engagement on the draft *Climate 2050 Industry and Business Roadmap*, as presented in the report dated February 17, 2022, titled "Draft *Climate 2050 Industry and Business Roadmap*".

EXECUTIVE SUMMARY

The draft *Climate 2050 Industry and Business Roadmap* is the next in a series of ten *Roadmaps* that will guide the region's policies and collective actions to transition to a carbon neutral, resilient region by 2050. The draft *Climate 2050 Industry and Business Roadmap* lays out the goals, targets, strategies and actions for reducing greenhouse gas emissions and increasing climate resilience in industry and business sectors. Staff will gather feedback on the draft *Industry and Business Roadmap* during an engagement period, with the intent of bringing an updated *Roadmap* for endorsement by the MVRD Board in 2022. The 2030 targets and greenhouse gas reduction actions in the *Roadmap* were adopted in the *Clean Air Plan*. Therefore, this engagement period will focus on the 2050 goals and targets, climate resilience strategies and actions, and the implementation process for actions.

PURPOSE

To seek MVRD Board direction to proceed with engagement on the draft *Climate 2050 Industry and Business Roadmap*.

BACKGROUND

The MVRD Board adopted the *Climate 2050 Strategic Framework* and directed staff to begin the development process of ten *Climate 2050 Roadmaps*. In 2019, the MVRD Board authorized staff to begin an integrated engagement process for *Climate 2050* and the *Clean Air Plan*, using a series of issue area discussion papers related to the roadmaps. This report presents the draft *Climate 2050 Industry and Business Roadmap* (see Attachment), and provides information on the approach to engagement to gather feedback on this draft, leading to a finalized roadmap later in the year.

CLIMATE 2050

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*, adopted in 2021.

Climate 2050 Roadmaps, including the *Climate 2050 Industry and Business Roadmap*, are intended to be "living, breathing" documents that chart the path to achieving the region's climate goals and targets. 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 businesses, residents, and governments to implement and expand these actions to accelerate the transition to a climate resilient and carbon neutral region.

Climate 2050 Roadmaps*, *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. The *Clean Air Plan* supports *Climate 2050's* vision of a carbon neutral region by identifying the initial actions needed to meet the region's 2030 greenhouse gas target, a 45% reduction in greenhouse gas emissions from 2010 levels. Greenhouse gas reduction goals, targets, and actions in the *Industry and Business Roadmap* reflect those already approved in the *Clean Air Plan*. The *Climate 2050 Industry and Business Roadmap* also references the goals, targets, strategies and actions in *Climate 2050 Buildings and Transportation Roadmaps* that are related to commercial activities. These *Roadmaps* were endorsed by the MVRD Board in 2021.

Metro Vancouver, in partnership with its member jurisdictions, implements the regional growth strategy to manage the anticipated growth in the region over the next 30 years. The regional growth strategy is currently being updated, and the draft *Metro 2050* further advances our shared regional objectives for a healthy, sustainable and prosperous region. This is done in large part through the effective coordination of land use and transportation planning, and the use of six regional land use designations and policies that identify and protect the region's employment and industrial lands. Climate policies and actions related to Industrial and Employment lands are part of the update to *Metro 2050* and will be part of the scope of the *Climate 2050 Land Use and Growth Management Roadmap*, currently under development.

DRAFT CLIMATE 2050 INDUSTRY AND BUSINESS ROADMAP

The *Climate 2050 Industry and Business Roadmap* supports the vision and presents a policy action plan that will contribute to a carbon neutral and climate resilient region. In addition to outlining the challenges and benefits of implementing climate action for industry and business, the draft *Climate 2050 Industry and Business Roadmap* lays out 28 actions for reducing emissions and increasing climate resilience, organized under the following 8 strategic areas:

1. Accelerate Emissions Reduction from Industrial Facilities
2. Reduce Non-Road Emissions and Support Early Adoption of Zero Emission Non-Road Equipment
3. Explore Opportunities for Technological Carbon Capture
4. Reduce Greenhouse Gas Emissions through Procurement and other Business Practices
5. Assess Climate Vulnerabilities for Businesses in the Region
6. Support Industry and Business Resilience to Flooding through Better Information and Planning
7. Improve Business Resilience to Extreme Heat and Air Quality Events
8. Support Water Conservation to Increase Resilience to Shifting Precipitation Patterns

The *Industry and Business Roadmap* proposes an implementation timeline to encourage swift early action on key issues. With short timelines and ambitious targets, staff have continued to work with all orders of government and other partners to maintain an action focus while planning and developing the *Roadmap*.

Reducing Greenhouse Gas Emissions from Industry and Business

Industry and Business account for approximately 48% of the total GHG emissions in the region, including from sources such as industrial facilities, non-road equipment, commercial transportation, and commercial buildings. In addition to the goals and 2030 targets approved in the *Clean Air Plan* and 2050 targets in the *Climate 2050 Buildings* and *Transportation Roadmaps*, the draft *Industry and Business Roadmap* includes the following 2050 goal and targets for GHG emission reduction:

Long-term Goal: Industry and Business is carbon neutral by 2050.

2050 Targets:

- All industrial facilities are carbon neutral.
- 100% reduction in greenhouse gas emissions from non-road engines

Reaching the 2030 targets, and transitioning to a carbon neutral region by 2050 will depend on adoption of new technologies and business practices in part driven by strong climate policy. Initial modelling of actions in this Roadmap indicates they could achieve significant emissions reductions while also indicating that a gap remains between the modelled results and the targets. More work will need to be done to understand how to maximize the effectiveness of the actions and identify additional actions to reach the region's 2030 and 2050 climate targets.

Climate Resilience for Industry and Business

Metro Vancouver's network of communities, businesses, workers and customers are already experiencing climate-influenced events, including extreme heat events, forest fires, and extensive flooding. To increase climate resilience of businesses in the region, businesses and government need to understand how the projected climate changes will impact individual businesses and entire business sectors. The draft *Industry and Business Roadmap* includes the following goal and targets for climate resilience:

Long-term Goal: The region's industries and businesses are resilient to the current and future impacts of climate change.

Targets:

- By 2030, All industrial facilities have identified existing, unmitigated climate hazards that could impact their operations and supply chains.
- By 2050, All industries and businesses are resilient to current and future impacts of climate hazards.

The *Climate 2050 Industry and Business Roadmap* includes climate resilience strategies and actions aimed at improving available climate information, setting standards, and coordinating planning so industry and businesses are better able to respond to climatic events that can disrupt and impact business operations, facilities, and supply chains.

ENGAGEMENT PROCESS

The goals, strategies and actions in the draft Industry and Business Roadmap incorporate public and stakeholder feedback received through engagement processes for the *Climate 2050 Industry* discussion paper in early 2020 (see Reference), and for the *Clean Air Plan*, respectively. A summary report on the *Clean Air Plan* engagement was received by the Climate Action Committee on November 13, 2020.

Staff will seek feedback and recommendations for revisions on this draft Roadmap from those most likely to be impacted or have a role in implementation. This includes but is not limited to; industry and business stakeholders, other governments, including First Nations, and organizations with a responsibility for implementation. Information and opportunities to provide feedback are also shared with the broader public. The engagement will reflect the Board Policy on Public Engagement and an ongoing commitment to engagement throughout the development of *Climate 2050*.

It is important to note that the GHG reduction actions in the *Climate 2050 Industry and Business* Roadmap are already approved for implementation through the *Clean Air Plan* adoption. Therefore, engagement will highlight the climate resilience actions, and for the mitigation actions, will largely focus on considerations for implementation. A robust database of the audiences listed above was developed for the *Clean Air Plan* and will be expanded to reflect the focus on this engagement.

During the Clean Air Plan engagement, many industry representatives requested Metro Vancouver convene a dialogue across industrial sectors to discuss implementation, citing interest in, as examples: phasing, opportunities to hear from other governments, and shared interest in new technologies. Staff will pursue that opportunity, in particular as Metro Vancouver advances actions requiring new or revised policy and regulation.

ALTERNATIVES

1. That the MVRD Board direct staff to proceed with engagement on the draft *Climate 2050 Industry and Business Roadmap*, as presented in the report dated February 17, 2022, titled "Draft *Climate 2050 Industry and Business Roadmap*".

2. That the MVRD Board receive for information the report dated February 17, 2022, titled "Draft *Climate 2050 Industry and Business 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 2022, 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 development of the *Clean Air Plan* and 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 *Industry and Business Roadmap* lays out strategies and actions to transition industries and businesses to reach carbon neutrality and to be resilient to climate change by 2050. If authorized by the Board, Metro Vancouver intends to seek feedback on the draft *Industry and Business Roadmap* from the industry and business stakeholders, other governments, including First Nations, and agencies of organizations with a responsibility in implementation, as well as the broader public.

Staff recommend Alternative 1: for the Board to authorize staff to proceed with public engagement on the draft *Climate 2050 Industry and Business Roadmap*. Engagement will focus on the climate resilience actions, as well as implementation of the greenhouse gas reduction actions that are already included in the Board-adopted *Clean Air Plan*. Feedback from engagement will inform the development of a final *Industry and Business Roadmap* for Committee and Board consideration, planned for 2022.

Attachment

Climate 2050 Industry and Business Roadmap, draft dated February 2022 *(45038945)*

Reference

Climate 2050 and *Clean Air Plan* Discussion Paper on Industry, report dated September 20, 2019

45694940

CLIMATE **2050 Roadmap**

Industry & Business

A pathway to a carbon neutral, climate resilient regional economy

February 2022

DRAFT

FRONT COVER: [PHOTO CAPTION]
PHOTO COURTESY OF [CREDIT]

Metrotower III, 4515 Central Boulevard, Burnaby, BC, V5H 0C6
www.metrovancouver.org
February 2022

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.

Your input is valued.

This Roadmap was drafted in late 2021/early 2022, based on feedback received from a broad range of industry and business groups, organizations and stakeholder groups between 2019 and 2021. Engagement was centred around the Metro Vancouver *Industry Discussion Paper* to support *Climate 2050*, introduced for public and stakeholder comment in late 2019.

Feedback is valued and project teams will continue to seek input on this draft Roadmap through 2022. This current phase of engagement will include opportunities to provide both feedback on-line and through interactive discussions. We will continue to ensure feedback is reflected as we begin to implement these actions. Feedback to the project team will be posted to the Metro Vancouver website www.metrovancouver.org, search "Climate 2050 Industry and Business Roadmap".

The goals and targets in Metro Vancouver's climate-related plans are based in science. The interim target, set in Metro Vancouver's Clean Air Plan, of reducing greenhouse gas (GHG) emissions in the region by 45% below 2010 levels by 2030 now has a time horizon of less than ten years. But taking bold action now is essential if the region is to attain carbon neutrality by 2050. Across the globe, the pandemic response has revealed a glimpse of what is possible and what we can achieve in a time of crisis, if we establish common goals and pursue coordinated efforts.

The actions in this Roadmap reflects both current policies and new directions that reflect the best ideas, approaches and available technologies. As with all good planning, this Roadmap must be viewed as an iterative, dynamic path forward. The goals will remain clear but the Roadmap will be updated as new policies, ideas, approaches and technologies emerge.

Metro Vancouver

Underlined words are key concepts defined in the **Glossary** on page XX.

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.

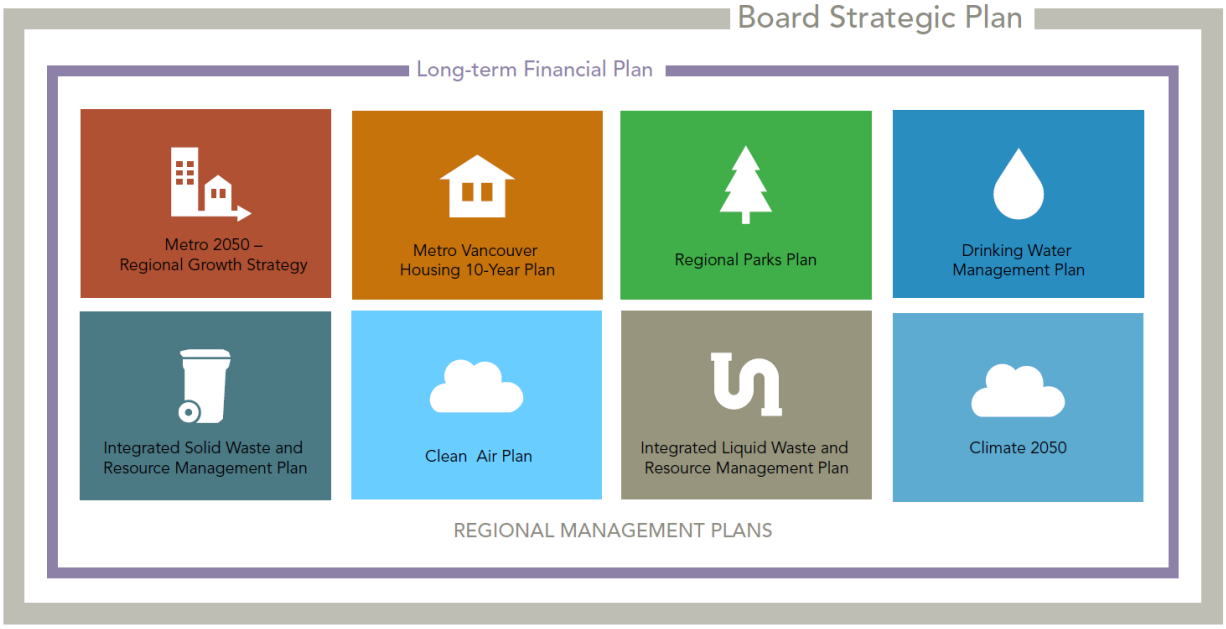
1. Serve as a Regional Federation
Serve as the main political forum for discussion of significant community issues at the regional level, and facilitate the collaboration of members in delivering the services best provided at the regional level.

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.



Metro Vancouver's Roles and Responsibilities for Climate Action

The actions to achieve carbon neutrality and building a more resilient region will depend on the collaborative efforts of many players in the region as well as the federal and provincial government. However, Metro Vancouver has some unique and important roles and responsibilities for advancing climate action.

- 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 2040*, 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.
- Invest Vancouver is Metro Vancouver's economic development leadership service with the vision of a dynamic and resilient regional economy that delivers prosperity for all. It aims to foster greater regional collaboration on economic development issues, to advise leaders on sound economic policy and strategy, and to brand the region and its key industries to a global audience with the intention of attracting strategic investment. Invest Vancouver focuses on key export oriented industries in which the region has a productive advantage. This includes many aspects of the green economy, including clean technology, renewable energy and clean transportation.
- 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.

These roles are necessary but not sufficient to achieve our goals of a climate neutral, resilient region. Metro Vancouver will be looking to other orders of government, First Nations and other regional partners to lead and collaborate in the implementation of a number of key actions in the *Climate 2050 Roadmaps.*

The Roadmap at a Glance

This Roadmap is focused on the goals, strategies and actions required for industries and business in the region to reduce greenhouse gas emissions and build climate resilience. Commercial activity in the region generates roughly half of the region's total greenhouse gas emissions. At the same time many businesses are already experiencing impacts and disruptions to their operations and supply chains due to climate change.

This *Climate 2050 Industry and Business Roadmap* identifies the policies and actions for Metro Vancouver and its partners, including businesses, to achieve a carbon neutral and resilient economy by 2050. As part of this transformational change, the strategies for industry and business aim to overcome barriers, address challenges and explore new opportunities (see box below).

The focus of this *Roadmap* is on strategies and actions that will reduce emissions from heavy and light industrial facilities and commercial sectors as well as non-road equipment, (e.g., manufacturing, construction, port and trade activities, food processing). In addition, strategies and actions are included for intensifying low carbon procurement by the public sector, and expanding opportunities for carbon capture, utilization, and storage technologies. Commercial activities related to buildings, transportation, as well as agriculture are covered in other *Climate 2050 Roadmaps* (references to these other Roadmaps can be found throughout the document).

Metro Vancouver, together with its member jurisdictions, has been taking action on climate change for decades. But it has not been enough to achieve the deep reductions in greenhouse gas emissions required and we need to do more to prepare for the impacts climate change is already having on the region. Coordination and collaboration with other levels of government, First Nations, business and industry, and other regional partners will be essential to achieving a carbon neutral and resilient region.

The *Industry and Business Roadmap* lays out actions for reducing emissions and increasing resiliency, organized under the following strategies:

Strategies for Achieving Carbon Neutrality in Industry and Business:
1 Accelerate Emissions Reduction from Industrial Facilities
2 Reduce Non-Road Emissions and Support Early Adoption of Zero Emission Non-Road Equipment
3 Explore Opportunities for Technological Carbon Capture
4 Reduce Greenhouse Gas Emissions through Procurement and other Business Practices

Strategies for Climate Resilient Industry and Business
5 Assess Climate Vulnerabilities for Businesses in the Region
6 Support Industry and Business Resilience to Flooding through Better Planning and Information
7 Improve Business Resilience to Extreme Heat and Air Quality Events
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Visioning a Carbon Neutral and Climate Resilient Regional Economy

In 2050, our thriving, diverse regional economy is carbon neutral and resilient to climate impacts. Innovation, creativity, diversity, and carbon neutrality are the characteristics of the Metro Vancouver economy. Businesses operate in zero emissions buildings while people and goods move via zero emissions vehicles and active transportation. Industrial activities have greatly improved energy and material efficiency, shifted to using clean, renewable energy and zero emissions equipment. Through innovation, the region is recognized for advancing innovation in carbon capture, utilization, and storage approaches. Local businesses design and deliver goods and services that are consistent with circular economy principles that generate less waste and minimize emissions of greenhouse gases.

Businesses in the Metro Vancouver region are prepared for and resilient to the impacts of climate change. This is the outcome of a collaborative process to identify climate risks and vulnerabilities to the regional economy and then to develop and implement plans and actions to mitigate the threats from climate change.

The drive to a carbon neutral and resilient region has created the stimulus to make businesses in Metro Vancouver global leaders in the research, development and commercialization of climate solutions. Our low carbon products and expertise in renewable energy, clean transportation, and carbon capture technologies are exported and transferred around the world.

The Challenge

While transitioning to a carbon neutral, climate resilient region by 2050 presents opportunities and benefits for business in the region, there are also challenges. Decarbonization across the Metro Vancouver region will require nearly all commercial, institutional, and industrial activity to be powered by clean, renewable energy. This will require rapidly expanding the use of clean renewable energy such as electricity and renewable gas, replacement of thousands of vehicles and pieces of equipment across the region, and investing in new technologies to capture the carbon dioxide that is emitted from chemical processes and any remaining fossil fuel use.

Businesses and governments will also need to plan for and make investments to protect the businesses, residents, and workers within our communities from more frequent flooding, extreme heat events, and other climate impacts that are already locked in and unavoidable given past levels of greenhouse gas emissions. The need to simultaneously reduce emissions while taking action to prevent climate impacts will be a stress on businesses.

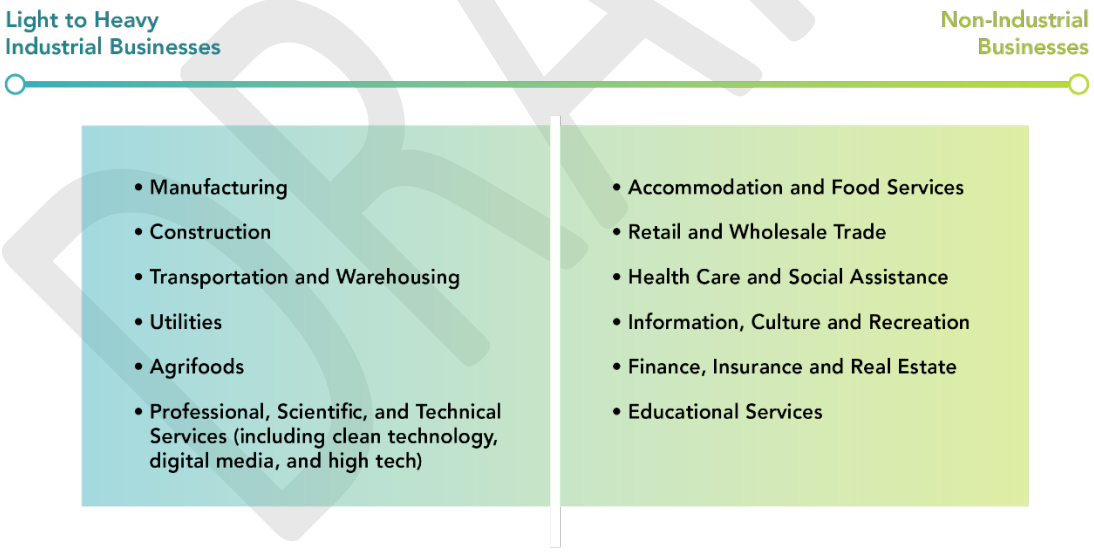
Through our engagement with industry and business, we have heard concerns about the actual availability of the technologies and products, the cost of transition, and regulatory certainty. Although many options for clean technologies and clean, renewable energy are already available in the market, it is critical to their widespread adoption that they are competitively priced and more widely available. In the case of specialized applications, some leaps in technical innovation are still needed. New technologies and approaches may cost more for businesses, institutions, governments, and residents. How these costs will be shared across society depends, in part, on government regulations.

The “Barriers and Opportunities” section of this Roadmap explores the unique circumstances of businesses in moving towards carbon neutrality and climate resiliency.

Industry and Business in the Metro Vancouver Region

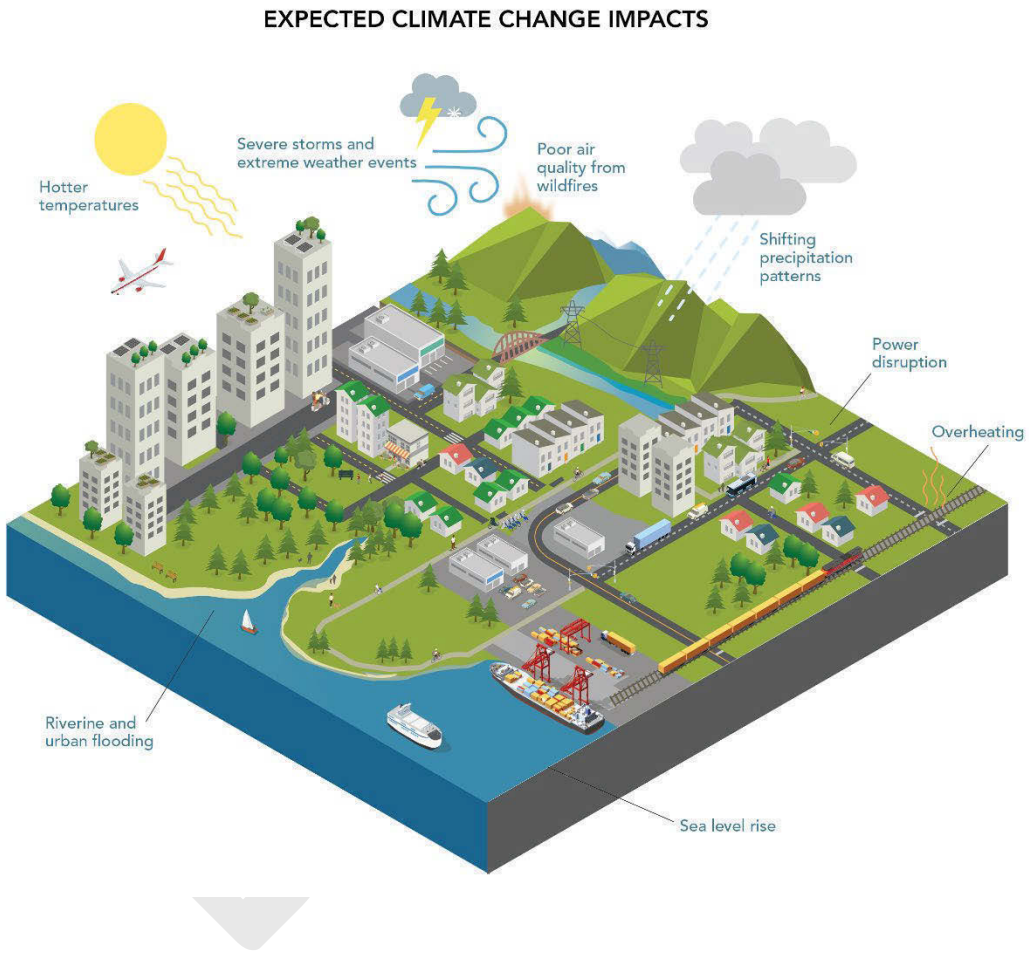
There are more than 100,000 businesses in the Metro Vancouver region, with 1.5 million workers generating GDP in 2019 of $149 billion. These businesses and their workers account for over half of total employment in British Columbia. The businesses comprise a diverse mix of sectors from manufacturing to educational services that have different greenhouse gas emissions profiles and risks associated with climate change.

The regional economy is changing, reflecting the dynamics of a growing metropolitan region that is Canada's Pacific gateway. The strategies and actions in this *Industry and Business Roadmap*, as well as the commercial transportation and buildings actions referenced from the other *Climate 2050 Roadmaps* will reduce emissions from a spectrum of businesses, from light and heavy industrial to non-industrial businesses. A number of actions are focused on emissions from industrial businesses (e.g. industrial facilities, non-road equipment) while others are focused on emissions typical of non-industrial businesses (e.g. buildings, vehicle fleet). Climate resilience actions will apply to the spectrum of businesses in Metro Vancouver.



Climate Change Impacts on Industry and Business

Our region's network of communities, businesses, workers and customers are already being impacted by the climate changes that are locked in due to historic emissions, and these impacts are projected to accelerate despite the significant reductions in greenhouse gas emissions that we aim to achieve in the coming years and decades. The uncertainty created by a shifting climate and the need for resiliency means governments and businesses need to think differently about infrastructure and planning.



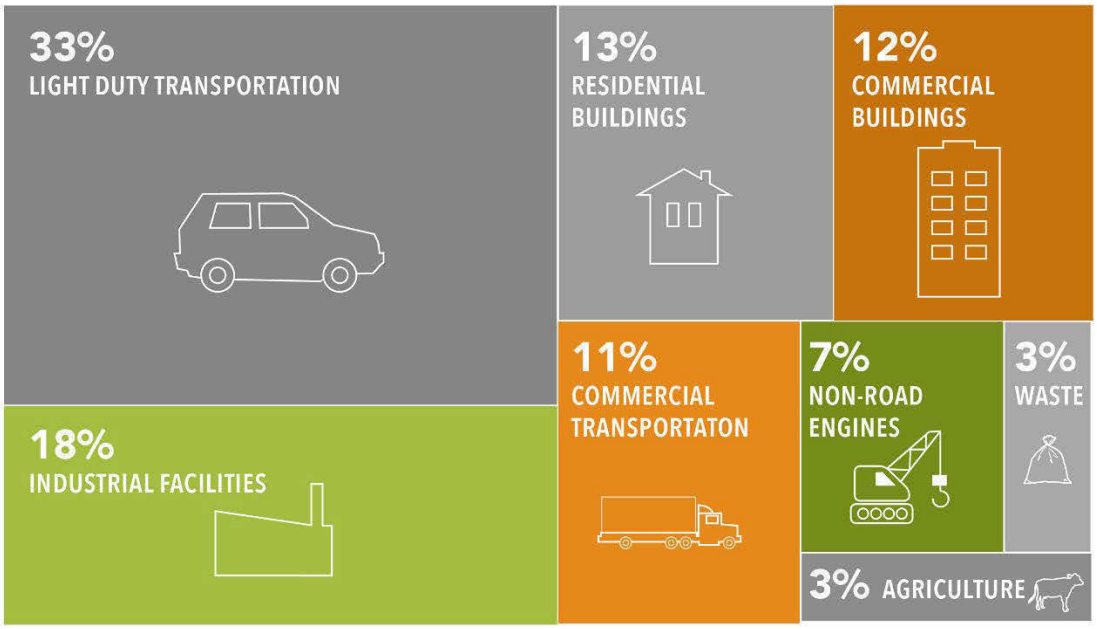
Recent climate-influenced events, including the "heat dome", forest fires, and extensive flooding in 2021, exposed how susceptible infrastructure and commercial activities are to the impacts of a changing climate. Businesses that were directly impacted by floods or fires experienced loss or damage to their assets, and their workers may have seen impacts on their health and safety. In addition, many businesses suffered from disruptions in their supply chains due to failures in the transportation systems.

The scientific projections of climate change and their impacts indicate that we can expect the following changes and impacts in Metro Vancouver into 2050:

Climate Changes	Impacts Felt
Warmer temperatures: with increasing daytime and nighttime temperatures, there will be more hot summer days and fewer winter days with frost or ice.	**Heatwaves** can impact the safety and comfort of workers due to increased indoor temperatures in commercial buildings and outdoor work environments, where cooling may be inadequate. Heatwaves can also change the operational needs of certain businesses (e.g., refrigerated warehousing and transportation, agriculture.)
Longer summer dry spells: summer rainfall will decline by nearly 20%, with increased likelihood of extended drought periods.	**Poor air quality** from wildfire smoke events, which can compound impacts with existing sources of air contaminants (e.g., ground-level ozone, pollution from traffic and industry). Disruptions to business operations can occur when workers' health and safety is compromised due to poor air quality.
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.	**Power disruption** due to overloaded grids from increased demand from cooling systems, and from shock events including flooding and storms.
More extreme precipitation events: more rain will fall during the wettest days of the year and the frequency of extreme rainfall events will increase.	**Riverine, coastal and urban flooding** caused by periods of heavy rainfall during extreme weather events (e.g., storms), rapid snowmelt, or a combination of both. This can lead to localized flooding in industrial sites and commercial spaces, and disruptions to the commercial transportation system, including truck routes and rail lines which could have cascading effects for supply chains.
Decreased snowpack: the deep spring snowpack in the mountainous watersheds is expected to decrease by over 50% compared to present day.	**Reduced water supply** as a result of reduced snowpack and hotter, drier summers that can strain drinking water supplies during times of the year when demand is the greatest.
Sea level rise: in addition to these weather-related changes predicted in our region, warming global temperature is projected to bring at least 1 meter of sea level rise by 2100, which will impact coastal areas in the region.	**Sea level rise** in coastal areas of our region will increase flood risk for industrial facilities and commercial activities located in low elevation areas, including the ports. 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.

Regional Emissions from Industry and Business

Industry and business-related activities contributed roughly half of the 15 million tonnes of the regional greenhouse gas emissions estimated for 2015. The graph below captures the range of activities that generate the region's total greenhouse emissions in Metro Vancouver. Industrial facilities accounted for 2.5 million tonnes (18%) and non-road equipment, 1 million tonnes greenhouse gas emissions (7%), respectively.



In addition, commercial transportation associated with goods movement (e.g., heavy duty truck, rail, marine and air) accounts for about 11% of regional greenhouse gas emissions and a similar amount of emissions come from commercial buildings. (Note a small portion of light duty vehicle emissions are also associated with commercial transportation, such as taxis and couriers.) Agriculture accounts for 3% of regional emissions. More information about these emission sources are provided in the *Climate 2050 Roadmaps* for *Transportation, Buildings*, and *Agriculture*.

Call out Box: The Connection between Climate Change 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.

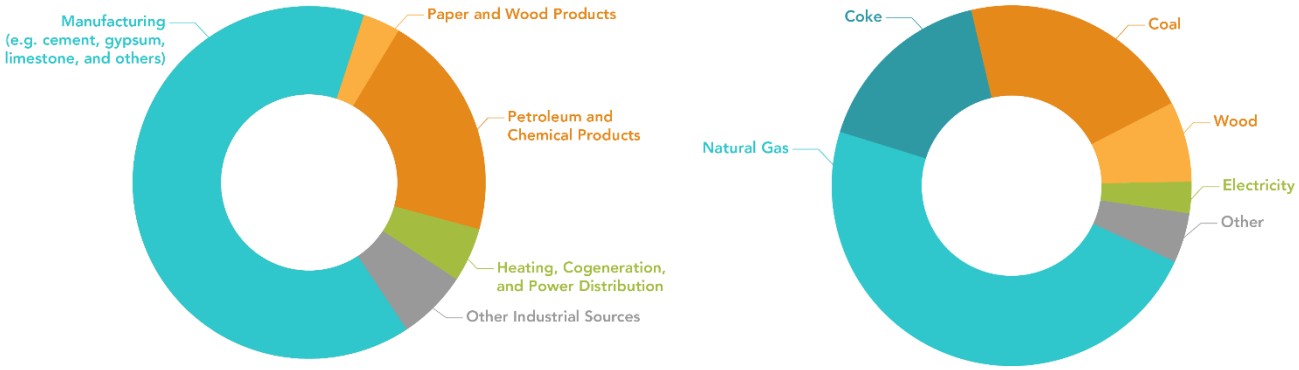
Residents in the region generally experience good air quality. However, health researchers have demonstrated that there are no known safe levels for some air contaminants that are harmful to human health. In the Metro Vancouver region, commercial activities are a significant source of regional greenhouse gas emissions, as well as emissions of health-harming air contaminants that impact regional air quality. Industrial facilities and non-road equipment generate over 25% of nitrogen oxides, over 40% of particulate matter, and over 50% of sulphur oxides produced in the region. Commercial transportation, commercial buildings and agriculture also generate health harming air contaminants.

Metro Vancouver is responsible for managing and regulating air contaminants in the region, including greenhouse gases, under its authority delegated by the BC Government in the *Environmental Management Act*. Metro Vancouver uses this authority to establish emission requirements for industrial facilities and non-road equipment (and other sources) through regulations and permits. The *Clean Air Plan*, Metro Vancouver's air quality and greenhouse gas management plan, will reduce health-harming air contaminant emissions and impacts in the region through to 2030. Many actions that reduce health-harming air contaminants will also reduce greenhouse gas emissions thereby supporting the goal of becoming a carbon neutral region by 2050.

Emissions from Light and Heavy Industrial Facilities

Industrial facilities in the Metro Vancouver region manufacture and process products such as cement, petroleum, gypsum, limestone, paints and chemicals, wood and paper, metal, and food. The greenhouse gas emissions from these industrial facilities are primarily generated from burning fuel during the manufacturing process. More than 75% of the energy used to operate industrial facilities are fossil fuels such as natural gas, coal and coke (see Figure 1). In some cases, the manufacturing process for a product or good (e.g., cement, limestone) includes chemical reactions that release significant quantities of greenhouse gases such as carbon dioxide.

Figure 1*: *Breakdown of Industrial Facility Greenhouse Gas Emissions



Emissions from Non-Road Engines

Non-road equipment is used in many industries and businesses in the region and generates greenhouse gas emissions from the use of diesel or gasoline. Non-road equipment includes cranes, loaders, forklifts, generators, lawnmowers, and more. Industries with the two largest sources of greenhouse gas emissions from non-road equipment are construction and cargo-handling. The use of non-road equipment contributes about 7% of the region's total greenhouse gas emissions.

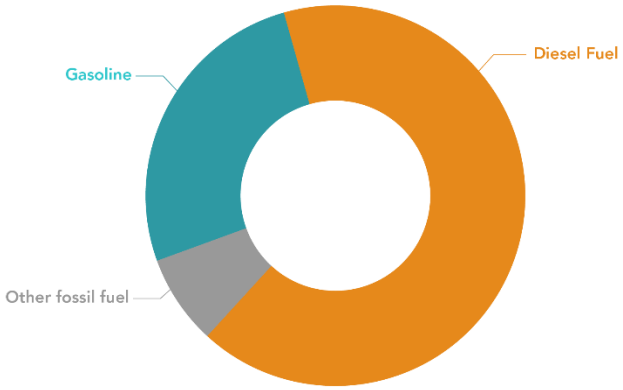


Figure 2* *Breakdown of Non-Road Equipment Greenhouse Gas Emissions by Energy Type

Achieving Deep Emissions Reduction in Industry and Business

Nearly all businesses in the region, from small to large, generate greenhouse gas emissions from the use of fossil fuels. Some manufacturing activities also generate emissions from chemical processes. The main technological options for significant emission reductions include: a shift to clean, renewable sources of energy; scaling up adoption of low to zero emission vehicles, engines and equipment; prioritizing use of low carbon materials; and advancing and adopting carbon capture, utilization, and storage technologies. To achieve the deep emissions required to achieve carbon neutrality, adoption of this suite of decarbonization approaches will need to begin now.

Clean, Renewable Sources of Energy

Switching to clean, renewable energy is a central strategy for reducing greenhouse gas emissions across the region. The use of high efficiency electric heat pumps is an effective way of achieving deep emissions reductions wherever lower temperature heat is required, including for space and water heating within industrial and commercial facilities. Higher temperature thermal processes (e.g., in cement production) may require combustion of low carbon biofuels (e.g., renewable gas) or hydrogen instead of fossil fuels.

Hydrogen is expensive to produce and technologically challenging to distribute, store, and use, but it is a promising energy carrier that could be used to decarbonize some hard-to-electrify activities, such as in heavy-duty transportation and industrial applications. The BC Government has developed the *BC Hydrogen Strategy* to guide the transition to hydrogen as a low carbon energy source. The Government of Canada has also developed the *Hydrogen Strategy for Canada* as a framework to position Canada as a world-leading producer, user and exporter of clean hydrogen, and associated technologies.

It is important to recognize that use of low carbon biofuel or hydrogen, while reducing greenhouse gas emissions, may result in emissions of health-harming air contaminants. In addition, an increased demand for the organic feedstock (such as agricultural products or residues, wood waste, or fats from rendering) that are used to generate renewable energy could also have impacts on our agricultural systems, forests, and other ecosystems. An assessment of lifecycle greenhouse gas emissions from renewable energy sources can quantify the environmental impacts associated with all the stages of production and use and can guide decision making on the selection of an energy source.

Powering vehicles and buildings by clean electricity will also be an important strategy for reducing commercial greenhouse gas emissions (see the *Climate 2050 Transportation* and *Buildings Roadmaps* for more detail).

Switching to clean, renewable energy sources will require capital investment, and its use may cost more on per unit basis than fossil fuel energy. These additional costs will need to be offset by energy efficiency improvements and transition support from utilities and governments.

Zero Emission Non-Road Engines and Equipment

Electrification of non-road equipment is evolving and low-emission technologies have significantly advanced in recent years. Policy actions such as the requirements for cleaner engine standards can

accelerate the transition towards low or zero emission equipment, as well as those that accelerate uptake of currently available options. Switching to zero emission non-road equipment not only leads to reductions in greenhouse gas emissions but may also result in improved air quality where that equipment is used, which can benefit worker health.

Electric non-road equipment is becoming increasingly available for various applications, including construction and demolition, commercial and warehousing operations, cargo-handling, and lawn and garden maintenance. Governments can support the uptake of electric equipment through supportive incentives, regulations, and the provision of appropriately located charging infrastructure.

Low carbon biofuels can also play a role in reducing emissions from non-road equipment. Engines that currently use liquid fossil fuels can be readily switched to using biofuels such as ethanol and renewable diesel. While the use of some types of biofuels may require engine modifications, others, such as renewable diesel, can be used directly in conventional engines.

Getting Down to Business – Zero Emission Construction Sites

Cities across the globe are leading the charge to reduce emissions from their non-road equipment fleets. In Oslo, Norway, a pilot program using electric non-road equipment for municipal construction and maintenance projects. This pilot is part of its commitment to achieve zero emissions for all municipal construction sites by 2025 and for all construction sites (public and private) to be zero emissions by 2030. A similar program in Gothenburg, Sweden called “Electric Worksite” involves partnering with manufacturers to test the requirements of zero emission electric construction and maintenance equipment, with the objective to encourage wider adoption. Within North America, California’s small off-road engine regulation requires small non-road engines, such as maintenance equipment and portable generators, to be low- to zero emission beginning in 2024.

Photo credit from Volvo CE develops full power of electric ecosystem with E Worksite

Prioritization of Low Carbon Products and Services

Most activities involved in providing goods and services (such as design, logistics, manufacturing, transportation, and waste management) are linked to greenhouse gas emissions. The embodied emissions of a good or service is a way of quantifying the emissions associated with its production, transportation, use and disposal. Compared to direct greenhouse gas emissions associated with fossil fuel use and industrial operations, embodied emissions are more complex to estimate, and are not yet widely tracked or reported.

Better understanding of embodied emissions could inform public and corporate procurement policies and programs to advance the use of low carbon products and services, and could reduce greenhouse gas emissions both within and outside our region. Production and procurement of low carbon products should be prioritized to help generate and support jobs in a decarbonized regional economy.

Getting Down to Business – Low Carbon Procurement Policies

Governments are implementing measures to support low carbon products in their public procurement processes. The Buy Clean California Act (established in 2017) aimed to limit and reduce embodied (supply chain) emissions in public infrastructure projects. In 2020, Marin County in California set limits for greenhouse gas emissions from concrete products. Similarly, the Bay Area Low Carbon Concrete Code requires all projects using concrete to meet strict emissions intensity standards. Within Canada, the City of Langford within the Capital Regional District may be the first local government to adopt a low-carbon concrete policy. The policy will take effect in mid-2022, and requires municipal projects to submit a third-party verified Environmental Product Declaration (EPD) to track the environmental impacts of purchased concrete materials and demonstrate lower GHG intensity than category benchmarks.

Call-out Box: Circular Economy's Role in the Transition to Carbon Neutrality

Globally, there is a need to change the way materials, products, and food are made, to reduce input resources and minimize waste. A circular economy approach can both decrease embodied emissions and create new economic opportunities for businesses. The approach focuses on closing material and energy loops so the economy does more with less. The circular economy is based on three principles: eliminate waste and pollution; circulate products and materials (at their highest value); and regenerate nature. This represents an alternative to the conventional, linear model of "take-make-dispose".

BC Materials is a construction company that operates within Europe and transforms excavated soil from construction sites into other construction materials (e.g., compressed earth blocks, clay plaster), and sells it directly to new developers. This circular approach reduces embodied carbon as well as direct emissions in the buildings using these construction materials. The emissions associated with transporting materials to new sites and landfills are reduced; the owners benefit from alternative carbon neutral solutions; and the building occupants enjoy better thermal insulation.

The National Zero Waste Council, an initiative of Metro Vancouver, takes part in leading Canada's transition to a circular economy by bringing together governments, businesses and NGOs to advance a waste prevention agenda that maximizes economic opportunities for the benefit of all Canadians.

Sources: Policy Options; Ellen MacArthur Foundation

Advancement in Carbon Capture, Utilization, and Storage Technologies

Carbon capture, utilization, and storage refers to technologies that capture carbon dioxide from high-emitting applications, (e.g., cement manufacturing) as well as technologies that remove carbon directly from the atmosphere, and then safely and permanently store the captured gas. These technologies will be required in a relatively small number of industrial and commercial activities that still generate large amounts of greenhouse gases after more conventional efforts to reduce emissions have been adopted. Specific carbon capture, utilization, and storage technologies are advancing at different rates, and some are poised to be used in commercial and industrial applications already. Additional innovation and investment in these technologies and the infrastructure to support them will be necessary for large-scale carbon capture projects, and to find effective, safe and permanent storage solutions. Enabling policies and financial mechanisms (e.g., increasing the price of carbon emissions), are likely to be needed to support the expanded use of carbon capture, utilization, and storage technologies.

Building Climate Resilience in Industry and Business

Building climate resilience for industry and business means addressing the range of climate-influenced hazards that can impact individual businesses and whole business sectors. Examples include: more frequent flooding and landslides due to extreme precipitation; extreme heat; and wildfire smoke.

As Canada's gateway to the Pacific, Federal, Provincial and local governments will need to plan to adapt the region's transportation infrastructure (road, marine, rail, and air) to be resilient to the threats posed by a changing climate. A resilient regional transportation system will be critical for businesses to maintain reliable connections to local or international supply chains. Likewise, business will need to ensure that buildings and facilities in which businesses operate have sufficient cooling and enhanced air filtration to protect workers during more frequent extreme heat and air quality events. Strengthening industry and business resilience to these and other climate impacts will require a shift in planning and investment by both governments and the private sector, informed by up to date climate information.

Awareness of Climate Risks and Vulnerabilities to Business

Connecting businesses to available and appropriate climate data and potential climate impacts can increase understanding of climate risks and the basis for evaluating risk response options. Some jurisdictions have used a "cluster" approach (based on similar climate risks and supply chains) to help tailor climate data, climate resiliency tools and guidance for the region's industries and businesses (see example in call-out box).

Getting Down to Business – Italy's Industrial Cluster Approach to Climate Resilience

Industries in Italy have developed a cluster approach to building resilience to the impacts of climate change. The Improve Resilience of Industry Sector (IRIS) program aims to support businesses, especially small and medium sized ones, in becoming more climate resilient through identification of specific adaptation measures. Businesses belonging to the same production area or belonging to the same production chain are grouped in "industry clusters" to assess the associated climate risks and to develop a cluster specific climate adaptation plan.

The program includes operational solutions that are analyzed and proposed to businesses whose production, facilities, or infrastructure may be increasingly at risk for disruptions due to climate influenced events. IRIS actions include: carrying out climate risk assessment in pilot clusters; developing climate adaptation plans in pilot clusters; analyzing opportunities related to financial and insurance tools for business resilience; and developing a web portal for a climate risk self-assessment.

IRIS is the first project in Europe focused on climate change effects in the industrial sector and suggests the cluster approach to increase business resilience. This approach is particularly interesting for small and medium enterprises because it fosters sharing of resources and skills.

Sources: Improve Resilience of Industry Sector (IRIS)

Preparation for Climate Impacts Projected for the Region

Climate change projections are anticipated to impact communities and businesses in the region as was witnessed during the climate-driven extreme weather events in 2021. Businesses can take action now to better manage exposure to risk and minimize damages to their assets. Examples of future-proofing business operations and processes include:

- add space cooling in buildings to prepare for hotter summers,
- improve air filtration in buildings to manage wildfire smoke events,
- prepare heat response plans to protect workers and operations, and
- ensure buildings and other assets in flood prone areas can withstand flood events.

While businesses must manage their own assets and business operations, governments and utilities will need to ensure that the infrastructure that businesses and residents depend on is resilient to extreme events and other climate impacts, including:

- plan for flood protection during severe storms,
- provide reliable access to utilities (e.g., power, water, sewer, fiber optic), and
- ensure a reliable transportation network for the supply chain.

Metro Vancouver's regional growth strategy, *Metro 2050* and *Climate 2050*'s *Land Use and Growth Management Roadmap*, currently in development, will include new policies to strengthen climate resilience action. Metro Vancouver's Regional Industrial Lands Strategy (RILS) establishes a vision on the future of industrial lands in the region, recognizing the role of industrial lands to support a prosperous, sustainable regional economy and to provide space for industrial services needed in our growing region. The RILS recognizes the climate risks such as flooding that may impact some industrial land and activities.

Call-Out Box: Lower Mainland Flood Management Strategy

The Fraser Basin Council has been leading a multi-year project to develop the Lower Mainland Flood Management Strategy (LMFMS) aimed at reducing flood risk and improving the flood resilience of communities along BC's lower Fraser River and south coast. The LMFMS brings together decision-makers including the Government of Canada, the Province of British Columbia, Lower Mainland local governments, First Nations and non-governmental and private sector entities in the region to work collaboratively on flood management.

Getting Down to Business – Resilient Industry Initiatives

The City of New York developed a resilient industry toolkit that was designed to support industrial businesses located within NYC's floodplain to cost-effectively adapt to climate change. The toolkit includes an overview of flooding vulnerability in industrial areas and identifies relevant flood resilience practices that can be implemented by businesses. Other elements of the toolkit include illustrations and cost estimates for adaptation actions for prototypical waterfront sites (e.g., film studio, warehouse, brewery). The overall program is an example of a public-sector approach to building resiliency in specific industrial sectors.

Barriers and Opportunities

Alignment in Climate Policies

Policy and regulatory certainty is important for businesses to make long-term capital investments and changes to their practices and procedures consistent with reducing greenhouse gas emissions and increasing their resiliency. Businesses are faced with a complex regulatory environment designed to advance climate, social and environmental objectives so the objectives and targets must be clear. In addition, the climate policies and regulations of all levels of governments must be aligned in order to ensure that they are not in conflict, in addition to creating a level playing field to ensure that competing businesses are required to meet the same standards and assume similar costs. Alignment of policies across jurisdictions is essential to prevent carbon leakage (see box).

Metro Vancouver recognizes its responsibility to analyze the impact of federal and provincial climate policies, including carbon pricing and border carbon adjustment policies, on regional businesses before developing policies and regulations to reduce greenhouse gas emissions while minimizing the impact on the regional economy.

Call-out box: Carbon Leakage in Industry and Business

Carbon leakage refers to an economic scenario when stringent climate regulations in one jurisdiction push businesses or commercial activities to move to a jurisdiction with weaker climate regulations. In this situation, global greenhouse gas emissions are not reduced. Instead the activity creating emissions just moves elsewhere and may lead to an overall increase in emissions depending on the energy source in the new location and longer shipping distances. Businesses moving out of the region to avoid more stringent emission regulations will likely result in negative economic impacts including job loss and reduced tax revenues.

The "energy-intensive, trade-exposed" industries that operate within the Metro Vancouver region may be at a higher risk for carbon leakage. Energy-intensive, trade-exposed industries are generally capital intensive, require large amounts of energy to operate, generate emissions inherent in the chemical processes, and compete internationally for markets at home and abroad. These industries include cement, lime and gypsum, and chemicals. The capital intensive nature of these businesses means that planning for the replacement and retrofitting of equipment typically occurs over longer time frames.

Market Availability and Cost of Zero Emission Technology

Although many of the technologies and products necessary to rapidly reduce greenhouse gases are already available in the market (e.g., electric passenger vehicles, heat pumps for space heating), in other cases, equipment for specialized applications (e.g., industrial heat pumps, medium/heavy-duty electric vehicles) are not widely available or cost significantly more than their conventional, higher emission counterparts.

The availability of zero emission non-road equipment is a good example. Electric options are available for certain applications (e.g., forklifts), while other technologies (e.g., construction equipment) are not yet

widely available in the region, though they are becoming available in other markets. Some types of non-road equipment that already have electric options available (e.g., generators), can still be prohibitively expensive for many industrial and commercial applications compared to their fossil fuel counterparts. Government incentives and other financial support can help offset the cost of adopting zero emission technologies.

Innovation and Technological Development

Certain economic sectors will require significant innovation and technological development to achieve cost effective deep emission reductions and reach carbon neutrality. Carbon capture, utilization, and storage is an example of technology that requires further development to bring down its cost and make it feasible for different sector applications. Other technological areas that require investment in research and development, pilot testing, and finally broad commercialization include new building components and energy storage. The drive to innovate emissions reduction and resiliency solutions creates opportunities for job and business growth.

Invest Vancouver, Metro Vancouver's economic development service, is focused on certain industry areas with technological development potential and economic opportunities, as described in the call-out box.

Call out box – Invest Vancouver

Invest Vancouver is Metro Vancouver's recently launched economic development service with the vision of a dynamic and resilient regional economy that delivers prosperity for all. Invest Vancouver is a collaboration of leaders from a cross section of the region, including: industry and business associations, community and labour organizations, port authorities, Boards of Trade and Chambers of Commerce, academic institutions, agriculture, First Nations, and Metro Vancouver Directors.

With a mission to position our region for success in a rapidly evolving global economy, Invest Vancouver exists to foster greater regional collaboration on economic development issues, to advise leaders on sound economic policy and strategy, and to brand the region and its key industries to a global audience with the intention of attracting strategic investment.

Infrastructure Investment to Support Greenhouse Gas Reductions and Climate Resilience

Investment in public and private infrastructure consistent with deep emissions reduction and strengthening climate resilience is essential moving forward. Significant investments in the electrical grid (e.g., distribution lines, transformers) will be required to support charging for electric vehicles and non-road engines and electrification of buildings and industry. Similarly, changes to the natural gas distribution system may be required to allow hydrogen to be distributed within the system. Enabling carbon capture at a large scale will likely require repurposing some of the region's pipeline infrastructure to transport captured greenhouse gases to storage areas outside the region.

Investments in public infrastructure also underpin industry and business climate resilience. As one example, diking infrastructure is key to protecting industrial and agricultural land that is often located in

low lying areas near the region's rivers and coastline. In 2012, the BC Government estimated that the dikes in the Lower Mainland required $9.5 billion in upgrades to address climate and seismic risks. Much of the land protected by these dikes is used for commercial purposes.

Integrating Climate Considerations in Normal Business Practice

As described above, climate change is already impacting industry and business and the transition to a carbon neutral, resilient future will touch on the operations of many businesses. To manage this transition and to be better able to respond to the uncertainty caused by climate change, businesses need to incorporate climate considerations into normal business practice. This may involve accounting for climate risk as part of the existing risk assessment of a business (see box on Managing Climate Risk). Businesses can also incorporate the tracking of greenhouse gas emissions as part of financial reporting to better integrate financial decisions with emissions reduction.

Consumers can be active in driving the demand for low carbon products. This can be supplemented by procurement policies of business, governments and institutions that support the growth of businesses supplying low carbon products to the market.

Call out box: Managing Physical and Transition Risks of Climate Change

Climate-related risks are often classified into two broad categories: physical and transition risks. Physical risks arise from the changes in weather and climate that impact businesses, supply chains, and the availability of labour, as described above. A changing climate and the transition to a low carbon economy also creates transition risks for businesses, affecting their profitability and competitiveness. Transition risks can be subdivided into several types:

- Policy and Legal Risks – the potential for financial impact due to policy changes such as carbon pricing, regulation, regulations around land-use, or legal risk as a result of litigation for failure to mitigate impacts to climate change or enact sufficient adaptation measures.
- Technology Risk – technological changes that support the transition to a low carbon economy, including renewable energy technology, could affect the competitiveness of certain industries.
- Market Risk – Shifts in supply and demand for products and services create a wide range of risks to businesses.
- Reputational Risk – consumer and community perceptions of different industries and businesses may change as a result of an organizations perceived contribution to, or detraction from the transition to a low carbon economy.

Call out box: Disclosure of Climate-Related Risks

In response to investors, governments and other stakeholders seeking to better understand how businesses manage risks. The Task Force on Climate-related Financial Disclosures (TCFD) has emerged as a globally-accepted framework that provides guidance and best practices for businesses to report on climate-related risks. Financial regulators in several jurisdictions, including in Canada, are moving towards

requiring publicly-traded companies to disclose climate-related risks. In addition, local governments are considering the value of implementing TCFD.

TCFD or similar frameworks can help identify and quantify climate-related risks to key decision makers within an organization and to external parties. It allows climate risk to be assessed in line with other risks and provides a means to incorporate climate risks, and opportunities, into organizational budgeting and capital planning activities while pushing companies to formalize their climate strategy, metrics and targets to better assess and manage their climate risk.

The Journey to Carbon Neutrality and Resilience

Call out Box: Linkages to other *Climate 2050 Roadmaps*
There are linkages to the industry and business sector in the other *Climate 2050* roadmaps. You can find additional information on these topics in the following:

Buildings Roadmap – actions to reduce emissions from space and water heating in commercial buildings and adapt commercial buildings to climate impacts.

Transportation Roadmap – actions to reduce emissions from the vehicles and other modes of transportation used for the movement of goods, raw materials, products between industries and consumers, as well as for connecting people from their homes and communities to their places of work.

Agriculture Roadmap – actions to reduce emissions from agricultural activities, operations, and agricultural equipment.

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

Land-use and Growth Management Roadmap – ideas that shape the form and location of industrial land and commercial buildings in the region. Also linked to the regional growth strategy, which discusses coordination of land use and transportation planning.

Energy Roadmap – actions to increase the use of clean, renewable energy by industry and businesses.

CONNECTING THE *CLIMATE 2050 INDUSTRY AND BUSINESS* ROADMAP AND THE CLEAN AIR PLAN	
Clean Air Plan	*Industry and Business Roadmap*
• Greenhouse gas reduction goals, strategies and actions. • Air quality goals, strategies and actions. • Goals, strategies and actions for other sectors such as buildings and transportation.	• Greenhouse gas reduction goals, strategies and actions. • Resiliency strategies for industry and business • Challenges, opportunities and benefits of transitioning industry and business towards a decarbonized economy.

Climate Goals and Targets for Industry and Business

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

Metro Vancouver has also set a regional 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*, organized by sectors in the region, and contributing towards getting to a carbon neutral, resilient region.

Metro Vancouver has set the following climate goals for industrial and non-industrial businesses in the region to help visualize the region we will live in, and to track progress out to 2030 and 2050. The table below includes goals and targets for industrial facilities and non-road equipment (pages 30-31).

The goals and targets for commercial buildings, commercial transportation and agriculture are also listed (pages 31-33). Refer to the *Climate 2050 Roadmaps* for Buildings, Transportation, and Agriculture for more information on the strategies and actions associated with these goals.

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

Greenhouse Gas Emission Reductions

The long-term goal is that Industry and Business is carbon neutral by 2050.

Goals	Targets
All industrial facilities are carbon neutral	By 2030: - A 35% reduction in greenhouse gas emissions from industrial facilities from 2010 levels. By 2050: - All industrial facilities are carbon neutral.
All non-road equipment operating within the region use zero emission technologies powered by clean, renewable energy.	By 2030: - 35% reduction in greenhouse gas emissions, from 2010 levels

	By 2050: - 100% reduction in greenhouse gas emissions

Commercial Transportation	
All medium and heavy duty trucks and rail locomotives operating within the region use zero emission technologies powered by clean, renewable energy.	By 2030: - 35% reduction in greenhouse gas emissions, from 2010 levels By 2050: - 100% reduction in greenhouse gas emissions - All medium duty trucks are zero emission, powered by clean, renewable electricity or hydrogen - All heavy duty trucks and rail locomotives use either zero emission technologies or biofuels
All aircraft and marine vessels operating within the region use low emission and zero carbon technologies powered by clean, renewable energy.	By 2030: - 35% reduction in greenhouse gas emissions, from 2010 levels By 2050: - 75% reduction in greenhouse gas emissions, from 2010 levels
Commercial Buildings	
All buildings are zero emissions from heating and cooling by 2050.	By 2030: - 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.

Climate Adaptation

Goals	Targets
The region's industries and businesses are resilient to the current and future impacts of climate change.	By 2030: - All industrial facilities have identified existing, unmitigated climate hazards that could impact their operations and supply chains. By 2050: - All industries and businesses are resilient to current and future impacts of climate hazards.

Commercial Transportation	
The regional transportation system is safe, reliable, and resilient to the current and future impacts of climate change.	By 2030: - All major transportation infrastructure projects are located outside of areas with known, unmitigated climate hazards. By 2050: - All transportation networks and infrastructure are protected from current and future impacts of climate hazard.
Commercial Buildings	
Residents are protected by buildings that are resilient to high temperatures, harmful air quality, severe storms and flooding by 2050.	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.

Strategies for Achieving Deep Emission Reductions in Industry and Business

Figure 3 shows the estimated greenhouse gas emission reductions from some of *Climate 2050* strategies addressing greenhouse gas emissions from Industry and Business. It illustrates the potential emission reduction impacts of Strategy 1 for industrial facilities and Strategy 2 for non-road equipment, as well as potential impacts of emissions reduction strategies in commercial buildings and transportation. Further work is required to estimate the impacts of the other strategies in this *Industry and Business Roadmap*.

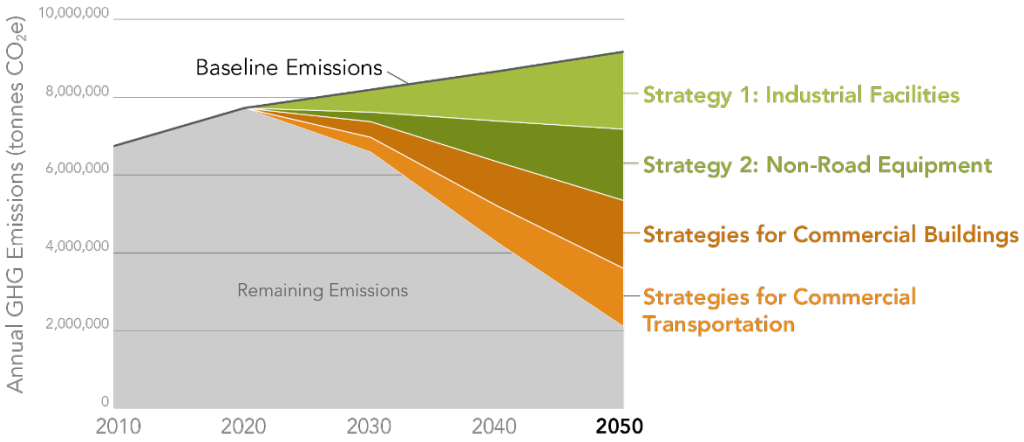


Figure 3 Potential impacts of strategies for industry and business[1,2]

[1] Remaining emissions include those captured by other strategies or those identified as gaps

[2] Based on Metro Vancouver's *Modelling a Carbon Neutral Region* Project. Strategies in commercial buildings and commercial transportation are further discussed in the *Climate 2050 Buildings and Transportation Roadmaps*, respectively.

Emission Reduction Actions for Industry and Business in other *Climate 2050 Roadmaps*

Other *Climate 2050* Roadmaps contain strategies and actions to reduce greenhouse gas emissions from Industry and Business. Below are a few examples of key actions relevant for Industry and Business from the *Climate 2050 Buildings* and *Transportation Roadmaps,* and the draft *Agriculture Roadmap* (for more information on these strategies and actions including the estimated greenhouse gas reductions, see the *Climate 2050* website.)

Climate 2050 Buildings Roadmap

- Greenhouse Gas Performance Requirements for Existing Large Buildings
- New Financing Tools for Low Carbon Upgrades
- Training and Education in Zero Emissions and Resilient Buildings
- Emissions Requirements for District Energy Systems
- Incorporate Embodied Emissions into the BC Building Code

Climate 2050 Transportation Roadmap

- Require Zero Emission Sales Targets for New Medium and Heavy Trucks
- More Stringent Low Carbon Fuel Standards
- Make Low and Zero Emission Medium and Heavy Trucks More Affordable
- Support Innovation in Zero Emission Technology for Medium and Heavy Trucks
- Support Innovation in Low and Zero Emission Marine and Rail Technologies

Draft Climate 2050 Agriculture Roadmap

- Reduce Emissions from Greenhouses
- Incentives for Farmers to Transition to Lower Emission Equipment
- Expand Anaerobic Digestion of Agricultural Waste
- Support Innovations in Agricultural Operations

Key to reading the strategies and actions

Potential Impacts of Strategies	The highest potential emission reductions due to all actions in the strategy, relative to the expected baseline emissions in 2030 and in 2050. Greenhouse gas estimates include carbon dioxide, methane and nitrous oxide.
Big Moves	Big Moves are foundational to achieving the 2030 targets, and should lead to the most significant emission reductions.
Metro Vancouver Corporate Leadership	Metro Vancouver Corporate Leadership actions are ones Metro Vancouver will implement in its corporate operations to demonstrate leadership and support regional actions.

Strategy 1: Accelerate emission reductions from industrial facilities

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

Potential Impacts of Strategy	Key Partners
Reduce annual greenhouse gases by up to 520,000 tonnes in 2030 Reduce annual greenhouse gases by up to 2,000,000 tonnes in 2050	- Government of British Columbia - Government of Canada - Industrial facilities

1.1 **More Stringent Greenhouse Gas Requirements for Large Industrial Emitters. (BIG MOVE)**
Advocate to the Government of BC to implement more stringent requirements for BC-based industrial facilities with significant greenhouse gas emissions. This could include increases to or expansion of the carbon tax, as well as mandatory carbon offsets. Requirements would be supported by incentives under Action 1.3 below.

1.2 **Integrate Greenhouse Gases into Emission Regulations and Permits. (BIG MOVE)**
Develop and implement processes to integrate greenhouse gas reduction requirements into new emission regulations, amendments of existing emission regulations, new permits, and permit amendments. Integration would consider greenhouse gas regulations implemented by the Government of BC, as well as the benefits and tradeoffs of reducing greenhouse gases versus improving regional air quality. Integration could include greenhouse gas emission limits and fees, and could require permitted industrial facilities to evaluate opportunities to transition to clean, renewable energy, better utilize waste heat, or to phase out the use of some fossil fuels.

1.3 **Implement Renewable Gas Content Requirements. (BIG MOVE)**
Advocate to the Government of BC to establish content requirements for renewable gas, in line with targets in the provincial *CleanBC* plan. Renewable gas includes renewable natural gas, which has a lower carbon intensity than natural gas from fossil fuels.

1.4 **Industrial Emission Reduction Incentives.**

Advocate to the Governments of Canada and BC to enhance or develop incentives for industrial facilities to reduce emissions of greenhouse gases and other air contaminants. Incentives could include rebates on carbon tax or energy efficiency upgrades, tax credits, and innovative financing mechanisms. Incentives should be based on emission reductions that meet or exceed relevant industrial emission benchmarks.

1.5 **Develop Sector-Specific Regulations.**
Develop and update sector-specific regulations to accelerate emission reductions from specific industrial, commercial, or business sectors that operate industrial facilities. Sectors targeted would be based on air quality and climate change impacts, emission reduction potential, emerging issues and other factors related to industrial facilities.

1.6 **Provincial and Federal Industrial Emission Standards.**
Advocate to the Governments of Canada and BC to continue developing stringent emission standards for industrial facilities to help improve air quality. Industrial sectors could include chemicals, petroleum refining, pipelines, shipping of bulk goods, and wood products.

1.7 **Carbon Tariffs.**
Advocate to the Governments of Canada and BC to establish carbon tariffs or carbon border tax adjustments for imported industrial, manufactured and agricultural goods. This will help industrial facilities and businesses in the region to compete fairly against imported goods with higher carbon content.

1.8 **Regional Industrial Facilities Emissions Working Group.**
Work with the Government of BC, local First Nations, regional industry, business associations, academic institutions, port terminals and other partners to explore the opportunities for establishing a regional industrial facilities emissions working group. If established, the working group would collectively identify the best opportunities to both minimize air quality impacts from industrial facilities and reduce greenhouse gas emissions from industrial facilities. The working group could help accelerate emission control innovation at industrial facilities, including supporting pilot projects.

1.9 **Phase out High Global Warming Refrigerants.**
Advocate to the Government of Canada to accelerate the phase out of halocarbons that have a high global warming potential, including refrigerants and blowing agents. The accelerated phase out should include coordination with technical and industry associations on certification and solutions for businesses.

Strategy 2: Reduce non-road emissions and support early adoption of zero emission non-road equipment.

Almost 850,000 non-road equipment units are used in the region, primarily for construction and commercial operations, cargo-handling, and lawn and garden maintenance. They are a source of harmful

diesel particulate matter, nitrogen oxides, and greenhouse gases. Metro Vancouver's *Non-Road Diesel Engine Emission Regulation* (and the Vancouver Fraser Port Authority's related program) are helping to manage emissions from older, higher-emitting non-road diesel engines. More stringent emission requirements for new and existing non-road engines will help achieve the 2030 non-road targets for greenhouse gases and diesel particulate matter. The Governments of Canada and BC should support development and commercialization of zero emission non-road engines, which would reduce air contaminant emissions over the long term.

Potential Impacts of Strategy	Key Partners
Reduce annual greenhouse gases by up to 220,000 tonnes in 2030 Reduce annual greenhouse gases by up to 1,800,000 tonnes in 2050	- Government of BC - Government of Canada - Vancouver Fraser Port Authority

2.1 **Tighten Emissions Regulation for Non-Road Diesel Engines. (BIG MOVE)**
Update Metro Vancouver's emission regulation for non-road diesel engines with more stringent requirements that could cover additional air contaminants, equipment types, fuels and engine sizes. These updates should incentivize the early adoption of zero emission non-road equipment. Any updates should be coordinated with Vancouver Fraser Port Authority to align requirements as much as possible.

2.2 **Emission Standards for New Non-Road Equipment.**
Advocate to the Government of Canada to establish more stringent fuel economy and emission standards for new non-road equipment. Cleaner non-road equipment standards will improve regional and local air quality and increase the availability of low and zero emission non-road equipment.

2.3 **Funding for Cleaner Non-Road Equipment.**
Advocate to the Governments of Canada and BC to enhance funding (e.g., incentives, loans, tax credits) to replace or retrofit existing non-road equipment to reduce emissions, including greenhouse gases. Higher incentives should be available for zero emission equipment and if old equipment is scrapped.

2.4 **Identify Infrastructure Needs for Zero Emission Non-Road Equipment.**
Work with energy utilities, member jurisdictions, the Vancouver Fraser Port Authority, industry and other regional partners to identify the regional infrastructure needs to support a long-term transition to zero emission non-road equipment. This would consider the refueling and charging needs for different types of non-road equipment, funding requirements, potential pilot projects, and should align with similar actions for passenger vehicles and medium and heavy duty trucks in the *Climate 2050 Transportation Roadmap*.

2.5 **Encourage Cleaner Non-Road Equipment through Municipal Approvals.**

Advocate to member jurisdictions to implement incentives to encourage the use of low or zero emission non-road equipment for construction, film, and other industrial sectors. For example, builders and developers using cleaner non-road equipment could receive development benefits such as lower building permit fees.

2.6 **Awareness Program on Zero Emission Non-Road Equipment.**
Develop and implement an awareness and outreach program for residents and businesses about the benefits of zero emission non-road equipment, working with member jurisdictions and other regional partners. The program would include regularly updated information on the availability of zero emission equipment, and guidance on "right-sizing" non-road fleets, as well as supporting regional coordination of purchases (i.e., bulk buy) to help reduce costs.

2.7 **Transition Metro Vancouver's Corporate Non-Road Fleet to Zero Emissions. (Metro Vancouver CORPORATE LEADERSHIP)**
Transition Metro Vancouver's non-road fleet to zero carbon emissions by 2040, and zero emissions by 2050.

Strategy 3: Explore opportunities for technological carbon capture

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

Potential Impacts of Strategy*	Key Partners
Reduce annual greenhouse gases by up to 50,000 tonnes in 2030 *To be updated as Strategy is implemented.	- Government of BC - Businesses that operate Industrial facilities - Associations representing businesses with industrial facilities - Academic Institutions

3.1 **Carbon Capture in Metro Vancouver Region.**
Work with industry, academia and other regional partners to explore the potential opportunities for carbon capture technologies in the region, including pilot projects and uses of captured carbon dioxide.

3.2 **Develop Carbon Capture Standards.**
Advocate to the Government of BC to develop technical standards for carbon capture technologies.

Strategy 4: Reduce greenhouse gas emissions through procurement and other business practices

Businesses in the region are already helping reduce greenhouse gas emissions through climate action initiatives. Additional technical support and guidance will help businesses adopt cleaner operating practices and further reduce their greenhouse gas emissions. Developing regional guidance on buying low carbon products will help reduce the embodied greenhouse gas emissions of goods and services. These steps will help achieve the 2030 regional targets to reduce greenhouse gas emissions. Key partners for this strategy include member jurisdictions, business associations, local businesses, and the Governments of Canada and BC.

Potential Impacts of Strategy	Key Partners
To be developed as Strategy is implemented.	- Member jurisdictions - Government of BC - Industries and businesses

4.1 **Regional Low Carbon Procurement. (BIG MOVE)**
Work with member jurisdictions, industry and business groups, and other regional partners to develop and implement regional guidance on procurement to prioritize low carbon products, equipment and services for construction and other projects. The guidance could outline best practices, available certifications, methods for lifecycle greenhouse gas emissions calculation, circular economy considerations (e.g. disposal), greenhouse gas targets and emission disclosure requirements. Products covered by the guidance could include, for example, low carbon cement and concrete products. The guidance should align with Metro Vancouver's *Climate 2050 Buildings Roadmap* on reducing embodied emissions in buildings.

4.2 **Integrate Climate Considerations into Standard Business Practices.**
Advocate to the Governments of Canada and BC to integrate climate considerations into financial reporting and other standard business practices. Integration could include public disclosure of business carbon footprints and climate-related risks, as well as changes to legislation or accounting standards. These practices would push businesses and industrial facilities to prioritize management of climate risks in operations and practices.

4.3 **Low Carbon Metro Vancouver Corporate Procurement. (Metro Vancouver CORPORATE LEADERSHIP)**
Establish low carbon procurement guidance as a Metro Vancouver corporate standard. Products covered by the guidance could include, for example, low carbon cement and concrete products. This could demonstrate how procurement can support low carbon (and resilient) buildings,

infrastructure and services. Metro Vancouver will explore opportunities to collaborate with its suppliers on low-carbon innovation and measures to help prioritize low carbon products.

Strategies for Climate Resilient Industry and Business

Climate Resilience Actions for Industry and Business in other *Climate 2050 Roadmaps*
Below are examples of key climate resilience actions relevant for Industry and Business from the *Climate 2050 Buildings, Transportation* and the draft *Agriculture Roadmaps* (for more information on the strategies and actions in these roadmaps including the estimated greenhouse gas reductions, see the *Climate 2050* website)

Climate 2050 Buildings Roadmap

- Require Cooling Measures in New Buildings and Major Retrofits
- Apply Leading Standards for Ventilation and Filtration in New Buildings

Climate 2050 Transportation Roadmap

- Protect Key Transportation Hubs
- Minimize Risk Exposure for New Transportation Infrastructure
- Build Climate Resilient Transportation Infrastructure

Draft Climate 2050 Agriculture Roadmap

- Provide Secure Tenure for Farmers
- Reduce Emissions from Greenhouses
- Ensure Long-term, Reliable Access to Water
- Increase Access to Climate Information for Local Farmers and Agricultural Producers

Strategy 5: Assess climate vulnerabilities for businesses in the region

To increase the climate resiliency of the regional economy, we need a deeper understanding of the projected climate impacts that the region will experience, and an understanding of how different types of businesses could be affected. Metro Vancouver can work with partners to conduct an assessment of the climate change risks and vulnerabilities to the region's economy including risks to specific industry and business sectors, and communicate those risks to support resiliency planning.

5.1. **Assess Regional Climate Risks and Vulnerability to Support Business Decision-making. (BIG MOVE)**
Work with the Province of BC, industry and business, and other relevant stakeholders to conduct a regional vulnerability assessment to identify climate-related hazards and risks faced by industries and businesses in the region.

5.2 **Identify Climate Vulnerability by Clusters with Industry and Business Sectors.**
Work with industry associations and other regional partners to identify "industry clusters" with similar and linked climate vulnerabilities and impacts, including vulnerabilities that can affect the

industry's value chain (both upstream and downstream of the sector). Metro Vancouver will explore opportunities to build and support climate resilience specific to key industry clusters in the region, for example through sharing of information on projected climate impacts.

Strategy 6: Support industry and business resilience to flooding through better information and planning

The Metro Vancouver region is expected to experience increased flooding due to climate change, and industrial and commercial land can be particularly vulnerable to large flood events. Businesses may also be susceptible to urban flooding caused by extreme precipitation events that overwhelm drainage systems. Addressing the increased risk of flooding to industry and business will require better information on expected changes in precipitation and the annual freshet, as well as other climatic changes. Businesses and governments can use this information to locate businesses in less vulnerable areas, implement flood protection measures, like diking and building design, and prepare response plans for flood events. Reducing the flood risk to individual and groups of businesses will reduce the overall risk that flooding poses to the regional economy.

6.1 **Support Knowledge-Sharing to Increase Resilience to Severe Storms and Flooding**

Work with regional partners (e.g. Fraser Basin Council and others) to increase industry and business awareness of flood risk and vulnerabilities due to climate change, and to work with industrial and commercial businesses to develop strategies and policy solutions that can increase industry and business resiliency.

Getting down to business – Flood Risk Management at the Port of Vancouver: A Collaborative Effort

The Vancouver Fraser Port Authority, which oversees the lands and waters that make up Canada's largest port, the Port of Vancouver, has collaborated with local municipalities (the City of North Vancouver, Districts of North and West Vancouver) and the Squamish First Nation to conduct a coordinated sea level rise risk study for the Burrard Inlet's north shore, and is also a participant in a regional flood management strategy. The Port Authority also engages tenants (e.g., shipping industry), government and supply chain partners to improve understanding of climate risk and coordination of adaptation planning.

6.2 **Coordinate Flood Protection and Flood Risk Management for Industrial Lands.**

Work with regional partners (e.g., the Fraser Basin Council, member jurisdictions, and others) to coordinate flood protection and flood risk management activities for industrial lands in the region, informed by the results of a regional climate vulnerability assessment.

Strategy 7: Improve business resilience to extreme heat and air quality events

The increased frequency and severity of extreme heat in recent years has directly and indirectly impacted business operations and supply chains in the region. High levels of ground level ozone and particulate

matter from heat and wildfires have made working outside harmful to the health of workers or caused disruptions to the movement of goods. Preparing for extreme heat and air quality events will be important for businesses to protect worker health and well-being, as well as ensuring the continuity of business operations.

7.1 **Support Employers in Developing Response Plans for Extreme Heat and Air Quality Events.**
Work with the Province of BC, health authorities, businesses, and other partners to ensure employers and workers have relevant information to prepare response plans for extreme heat and air quality events aimed at protecting the health and well-being of workers, ensuring continuity of business operations, and increasing resilience of supply chains.

Strategy 8: Support industrial water conservation to increase resilience to shifting precipitation patterns

Climate projections in our region have identified an increase in extreme weather events like heatwaves and droughts, which will impact the region's ability to supply high-quality water to industries and businesses. Water is a resource that businesses rely on for their operations. With an increase in pressure on resources, industries and businesses will need to identify opportunities for resource efficiency and to reduce demand on supply.

8.1 **Apply Leading Water Efficiency Standards to Industry.**
Advocate for highest water efficiency in standards for potable water use for industrial and commercial applications. Ongoing updates to strengthen standards for water efficiency in buildings should reflect the continuous improvement in technologies and practices for construction and plumbing.

Callout Box: A One Water Approach is where water and wastewater utilities shift away from the traditionally separated silos of drinking water, wastewater, and stormwater, 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.

8.2 **Promote water efficiency retrofit incentives and rebates for industries and business.**
Advocate to municipalities and the BC government for water efficiency retrofit incentives and rebates for industries and businesses to facilitate the uptake of water efficient practice. The upfront cost is a barrier for implementation for new systems such as the removal of once through cooling, as well as process improvements like increasing the efficiency of cooling towers. Incentives can increase the feasibility of these and other changes.

Setting the Path Ahead

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

The path towards a carbon neutral, resilient region provides an opportunity for a prosperous and sustainable region. There is strong potential and a critical need to achieve significant greenhouse gas emissions reductions among industry and business activities in the region over the next three decades. Reaching success in this will require careful coordination and alignment in climate policies between governments, as well as widespread adoption of zero emission equipment. Increased support for industries and businesses will be needed to advance carbon capture, utilization, and storage technologies – helping these technologies to evolve from research and development to broad commercialization. Increased awareness about the opportunities and benefits of a low carbon economy, powered by clean, renewable energy will help transition towards deep greenhouse gas reduction.

Investments in private and public infrastructure also underpin industry and business climate resilience. Identifying climate risks and vulnerabilities for businesses will better inform business decision-making. Knowledge sharing and better planning will make it easier for businesses in region to respond to the impacts of climate change and make the shift towards a decarbonized future.

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 few years, will make a major difference to accelerating the region's drive to a carbon neutral and resilient industry.

***Climate 2050 Industry and Business* Action Timeline**			
	2021-2023	**2024-2029**	**2030-Beyond**
Strategies for Achieving Carbon Neutrality in Industry and Business			
1. Accelerate Emissions Reductions from Industrial Facilities	More Stringent Greenhouse Gas Requirements for Large Industrial Emitters		
	Integrate Greenhouse Gases into Emission Regulations and Permits		
	Implement Renewable Gas Content Requirements		
	Industrial Emission Reduction Incentives		
	Develop Sector-Specific Regulations		
		Provincial and Federal Industrial	

Climate 2050 Industry and Business Action Timeline			
	2021-2023	2024-2029	2030-Beyond
Strategies for Achieving Carbon Neutrality in Industry and Business			
		Emission Standards	
	Carbon Tariffs		
	Regional Industrial Emissions Working Group		
		Phase out High Global Warming Refrigerants	
2. Reduce Non-Road Emissions and Support Early Adoption of Zero Emission Non-Road Equipment.	Tighten Emissions Regulation for Non-Road Diesel Engines		
	Emission Standards for New Non-Road Equipment		
	Funding for Cleaner Non-Road Equipment		
		Identify Infrastructure Needs for Zero Emission Non-Road Equipment	
		Encourage Cleaner Non-Road Equipment through Municipal Approvals	
		Awareness Program on Zero Emission Non-Road Equipment	
	Transition Corporate Non-Road Fleet to Zero Emissions		
3. Explore Opportunities for Technological Carbon Capture	Carbon Capture in Metro Vancouver Region		
		Develop Carbon Capture Standards	
4. Reduce Emissions through Procurement and other Business Practices		Regional Low Carbon Procurement	
		Integrate Climate Considerations into Standard Business Practices	
	Corporate Low Carbon Corporate Procurement		
Strategies for Climate Resilience in Industry and Business			
5. Assess climate vulnerabilities for businesses in the region	Assess Regional Climate Risks and Vulnerability to Support Business Decision-making		
	Identify Climate Vulnerability by Clusters with Industry and Business Sectors		
		Support Knowledge-Sharing to Increase Resilience to Severe Storms and Flooding	

Climate 2050 Industry and Business Action Timeline			
	2021-2023	2024-2029	2030-Beyond
Strategies for Achieving Carbon Neutrality in Industry and Business			
6. Support the resilience of industrial lands through better planning		Coordinate Flood Protection and Flood Risk Management for Industrial Lands.	
7. Improve Business Resilience to Extreme Heat and Air Quality Events		Support Employers in Developing Response Plans for Extreme Heat and Air Quality Events.	
8. Support industrial water conservation to increase resilience to shifting precipitation patterns		Apply Leading Water Efficiency Standards to Industry	
		Promote water efficiency retrofit incentives and rebates for industries and business.	

Measuring 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 Industry and Business 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 and resilient future.

Roadmap Element	Key Performance Indicator	Data Source	Data is Currently Collected
Accelerate Emission Reductions from Industrial Facilities	tCO_2e attributed to the industrial sector	Regional GHG inventory Province	Yes
	Energy source breakdown for industrial facilities (GJ)	Permits, BC Hydro, Fortis BC	Partial
	tCO2e from energy use at industrial facilities	Permits, BC Hydro, Fortis BC	Partial
	Number of industrial facilities with a demand-side management plan or environmental management system	TBD	TBD
	GHG intensity for industrial facilities	TBD	TBD
Reduce Non-Road Emissions and Support Early Adoption of Zero Emission Non-Road Equipment.	Sale of low- and zero emission non-road equipment including electric, hybrid, hydrogen (number of new equipment sales, % of total sales)	Federal Province Market research firms	Partial
	Regional equipment registration by model year, engine tier and fuel type [fossil diesel, fossil gas, biofuels, electricity, hydrogen (Gigajoules, GJ)]	Metro Vancouver – Non Road Diesel Engine Emission Regulation Port of Vancouver	Partial
	Operational hours by equipment model year, size, engine type (hours)	Metro Vancouver- Non Road Diesel Engine Emission Regulation Port of Vancouver	Partial

Roadmap Element	Key Performance Indicator	Data Source	Data is Currently Collected
	Percentage breakdown of registered fleet compared to estimated total regional fleet.	ICBC Metro Vancouver – NRDEE Metro Vancouver BC Hydro Province	Partial
	Regional equipment mix by engine type	ICBC Metro Vancouver – NRDEE	No
Explore Opportunities for Technological Carbon Capture	TBD	TBD	TBD
Reduce Emissions through Procurement and other Business Practices	Number of Metro Vancouver member jurisdiction that require product information (e.g., Environmental Product Declarations) in their procurement	TBD	TBD
	Number of companies certified as B corporation in the Metro Vancouver region	TBD	TBD
Assess climate vulnerabilities for businesses in the region	TBD	TBD	TBD
Support the resilience of industrial lands through better planning	TBD	TBD	TBD
Improve Business Resilience to Extreme Heat and Air Quality Events	TBD	TBD	TBD

Roadmap Element	Key Performance Indicator	Data Source	Data is Currently Collected
Support industrial water conservation to increase resilience to shifting precipitation patterns	TBD	TBD	TBD

Glossary

Carbon leakage refers to the situation that may occur if, for reasons of cost related to climate policies that aim to reduce emissions within a region, facilities or businesses transfer production to and increase emissions in other jurisdictions where carbon policy is either less ambitious or does not exist. This can lead to a net increase in global emissions.

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 capture, utilization, and storage (also CCUS) refer to different technological process that involves capturing carbon dioxide emissions from industrial facilities, or directly from the atmosphere. Captured carbon dioxide is then compressed and transported, to be utilized or to be safely and permanently stored.

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

Circular economy is an economy where the value of products is retained after their initial use through reuse, repair and remanufacturing. Keeping products functioning at their highest potential reduces embodied emissions and reduces emissions associated with waste management. Transitioning to a circular economy will gradually decouple economic activity from the consumption of finite resources by designing waste out of the system and helping to regenerate natural systems.

Clean, renewable energy is derived from sources with low or zero emissions or from sources that can be replenished over days or years.

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.

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.

Decarbonization (Decarbonize) refers to the removal of carbon dioxide or greenhouse gases from a system or process.

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

Economy is the system of a country or region, typically involving the production and consumption of goods and services.

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

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 (CO_2) and nitrous oxide (N_2O) as well as short-lived climate forcers such as methane (CH_4), halocarbons, black carbon and ozone. Limiting or preventing greenhouse gas emissions and removing these gases from the atmosphere is critical to avoiding catastrophic climate change (sometimes referred to as "climate change mitigation").

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

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, landslides and floods.

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.

Industry refers to any group of businesses that produces or distributes a common set of goods or services. For example, the Construction industry includes businesses involved in constructing, renovating and repairing structures, and those working on engineering and infrastructure projects. Other examples include Trade, Transportation and Warehousing, which are associated with distribution and logistics functions, and Manufacturing where businesses transform materials or substances into products.

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.

Lifecycle greenhouse gas emissions refers to greenhouse gases associated with the production and use of a material or energy source, from feedstock extraction, raw materials processing, transportation to end-use. For example, lifecycle emissions of gasoline would span all emissions associated from extraction of oil from the ground till combustion in a vehicle.

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

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

Sector is a group of industries that produces related goods or provides services.

Supply chain refers to the relationship between a company and its suppliers, including the steps taken from raw materials to getting the product or service to the customer, all aimed for overall customer satisfaction. Supply chains focus primarily on reducing costs and attaining operational excellence.

Value chain refers to a process in which a company adds value to its raw materials to produce products eventually sold to consumers. The value chain gives companies the ability to create value exceeding the cost of providing its good or service to customers – a competitive advantage in the industry, which requires alignment between what the customer wants, i.e., the demand chain, and what is produced via the supply chain.

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

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

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

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

To: Climate Action Committee

From: Julie Saxton, Air Quality Planner
Fatima Ansari, Project Engineer
Parks and Environment Department

Date: February 8, 2022 Meeting Date: March 11, 2022

Subject: **Mobile Air Quality Monitoring Using Drone-Based Sensors**

RECOMMENDATION

That the MVRD Board authorize staff to use the allocation from the Regional District Sustainability Innovation Fund for the project "Mobile Monitoring of Fugitive and Other Industrial Air Emissions with 'Flying Labs'" to evaluate the feasibility of using other mobile monitoring platforms for air emissions assessment.

EXECUTIVE SUMMARY

Drone flights were conducted carrying small sensors to measure air contaminant concentrations in three locations within the Metro Vancouver region. The work was part of a project funded by the Sustainability Innovation Fund to assess the cost and feasibility of mobile monitoring using drone-mounted small sensors to measure air contaminants from emissions sources in the region that are difficult to access or located in hazardous environments. Results revealed challenges in collecting data of sufficient quality to effectively assess emissions using drone-based monitoring platforms equipped with the relatively new technology of small sensors. Staff propose an alternative approach to completing the project that would enable a more robust assessment of using small sensors on additional types of mobile monitoring platforms.

PURPOSE

This report provides information about the first phase of a Sustainability Innovation Fund (SIF) project to evaluate the feasibility of using a drone-mounted 'flying laboratory' for monitoring of air emissions and seeks MVRD Board authorization to evaluate additional mobile monitoring platforms using the remaining budget for this project.

BACKGROUND

At it's February 28, 2020 meeting, the MVRD Board approved an allocation from the Regional District Sustainability Innovation reserve fund to assess the cost and feasibility of mobile monitoring using drone-mounted small sensors to measure air contaminants from emissions sources in the region that are difficult to access or located in hazardous environments. The project proposal focussed on drone technology and did not contemplate the use of other types of mobile monitoring platforms.

The first phase of the project has been completed. This report conveys the challenges with the use of drone-mounted monitoring equipment identified during the feasibility assessment, and seeks authorization to build on the findings by evaluating other types of mobile monitoring equipment.

APPROACH TO EVALUATING 'FLYING LABORATORIES'

Monitoring is an important tool to better understand the potential for impacts from air emissions and to identify the need to mitigate those impacts. However, measuring emissions is a challenge when the emissions are sporadic or from 'fugitive' sources that are diffuse and not discharged from a vent or stack. There are also challenges with assessing an emissions plume as it moves beyond the boundaries of a facility. The use of drone-mounted equipment was identified as a potential new approach to air emissions monitoring and sampling to address some of those challenges.

Staff sought to assess the feasibility of using drone-mounted equipment in this phase of the project through a series of test flights. The important test parameters of interest included:

- Degree of flexibility in flight planning;
- Flight duration;
- Accuracy of equipment positioning;
- Quality of air monitoring and sampling information; and
- Overall performance reliability.

DRONE-BASED MONITORING TECHNOLOGY

An extensive search for commercially available air quality sensors found only one company that offers sensors on a platform specifically designed for use on drones. Metro Vancouver worked with this company, Scentroid, to use licensed drone operators to fly a commercial battery-powered drone carrying small sensors to measure air contaminants that would be emitted from a range of sources. The equipment was capable of collecting data for three size fractions of particulate matter (PM_{10}, $PM_{2.5}$ and PM_1), nitrogen dioxide, sulphur dioxide, and total volatile organic compounds (VOC), as well as positional information. The demonstration unit used in this work was not capable of collecting a "grab sample", which is a cumulative sample over time, which is suitable for subsequent analysis in a laboratory, to provide more detailed information about the chemical composition of the sample, and concentrations of specific VOC.

A total of nine drone flights were conducted on August 17 and 18, 2021, on Annacis Island, in the Coquitlam Watershed, and in central Surrey. These sites were selected to give a range of emission sources, as follows:

- Wastewater treatment plant, industry, and traffic on a major highway (Annacis Island);
- Background measurements with few local sources of anthropogenic emissions (Coquitlam watershed); and
- non-road diesel construction equipment and other sources of particulate matter (central Surrey).

CONSTRAINTS ON DRONE FLIGHT PLANNING

Drone flights can only be done in dry weather and visual contact with the drone must be maintained. In addition, Transport Canada's rules for drone operations restrict flights in areas around airports, heliports and aerodromes. As a result, in many parts of the region basic drone operations cannot be conducted (see Reference) without special permission. It is also necessary to use qualified drone pilots to ensure safe operation of the equipment. These requirements limit the flexibility of using drones and, for this project, constrained the testing of the air monitoring sensors.

FINDINGS FROM TEST FLIGHTS

Data from the flights allowed spatial representations of air quality over the flight path to be created, as shown in Figure 1.

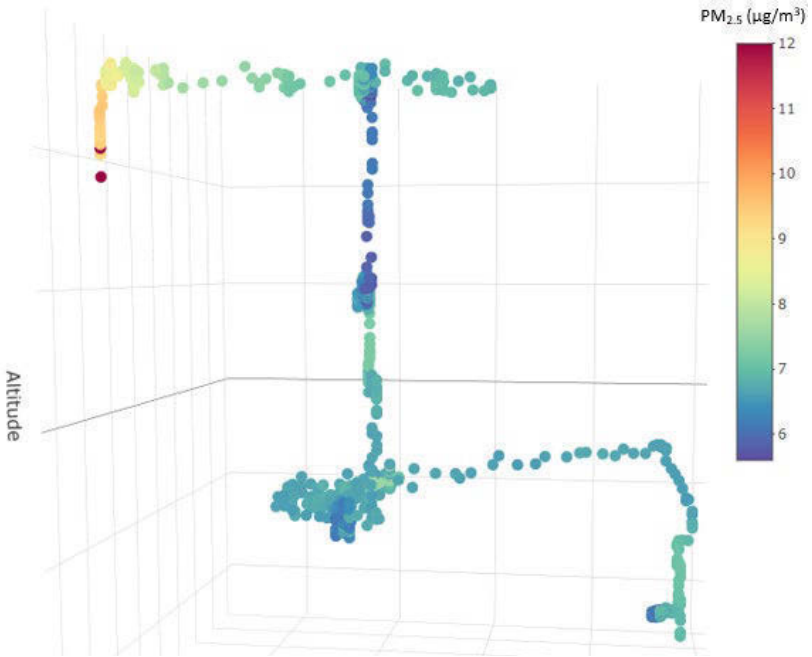


***Figure 1**. Plot of $PM_{2.5}$ concentrations at different elevations above a test site.*

Positioning and Emissions Measurement

Analysis of the data revealed inconsistencies in measurements of air contaminants as well as apparent errors in time stamping, which may have been affected by the lack of a power connection. In addition, the time needed to record a valid measurement differed for each sensor. This meant that the data for each air contaminant did not always represent conditions in the same location. Furthermore, reliable time stamping is necessary to connect measurements to a location, which is a critically important feature when using mobile monitoring equipment to identify potential sources of emissions. These factors complicated the interpretation of data collected.

Flight Duration

The maximum flight time of the drone used in this project was found to be approximately 20 minutes before the drone's battery power was consumed. The exact flight time depended on a number of factors, including the altitude at which the drone was flown and the flight path. A limited number of data points could be collected in this short time.

Performance Reliability in Absence of Power Connection

The battery on the air sensor unit allowed it to be operated for several hours of sampling, but the air sensor unit needed a power connection while not actively collecting data to remain ready for operation. These requirements limit the use of this equipment in locations with no access to power, such as from a vehicle in a remote location.

ALTERNATIVE MOBILE MONITORING PLATFORMS

Simpler mobile platforms have been used by researchers and other agencies to assess air quality in communities. These platforms, including vehicles and bicycles, offer opportunities to overcome some of the limitations of monitoring air emissions with sensors mounted on a drone, but potentially sacrificing the ability to monitor at different altitudes. Using alternative mobile platforms would allow more measurements to be made with better time stamping, to better evaluate sensor accuracy. Removing the complexity of drone flight planning and reducing reliance on licensed drone pilots would provide more flexibility with test site selection to enhance Metro Vancouver's understanding

of emissions from industrial sources, site-specific factors that affect the dispersion of emissions, and the impacts of emissions on the surrounding environment.

The focus of modifying this project to include other mobile platforms would be to work with academic partners who have expertise using mobile monitoring platforms or specific sensor-based instruments, rather than generic air quality monitoring capabilities.

ALTERNATIVES

1. That the MVRD Board authorize staff to use the allocation from the Regional District Sustainability Innovation Fund for the project "Mobile Monitoring of Fugitive and Other Industrial Air Emissions with 'Flying Labs'" to evaluate the feasibility of using other mobile monitoring platforms for air emissions assessment.

2. That the Climate Action Committee receive for information the report titled "Mobile Air Quality Monitoring Using Drone-Based Sensors", dated February 8, 2022 and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

Funding was received from the Regional District Sustainability Innovation Fund to evaluate the feasibility of using a 'flying laboratory' of sensors mounted on a drone to monitor air emissions. Under Alternative 1, staff seek to complete the next phase of the project in 2022, with the proposed modification, using the remaining budget.

CONCLUSION

Drone flights were conducted to assess the practicalities of using drone-mounted sensors for air emission monitoring. The objectives of the project were to assess new mobile technologies to support the air quality regulatory function. The results from the initial phase of the project revealed challenges with using currently available drone-based small sensor air monitoring technology.

Staff recommend Alternative 1 and are seeking authorization to expand testing of the use of small sensors to additional mobile platforms to better address some of the issues and limitations identified during test flights. The alternative approach to completing the "Mobile Monitoring of Fugitive and Other Industrial Air Emissions with 'Flying Labs'" project would allow a more complete assessment of the use of sensor technology on mobile platforms. It would continue to meet the objectives of the original proposal and may offer insights into the use of these technologies for various monitoring applications.

Reference

Map of Flight Restriction Areas for Drones: https://nrc.canada.ca/en/drone-tool/.

50313577

To: Climate Action Committee

From: Shelina Sidi, Senior Project Engineer
Derek Jennejohn, Lead Senior Engineer
Parks and Environment Department

Date: February 11, 2022 Meeting Date: March 11, 2022

Subject: **Addressing the Use of Heavy Fuel Oil and Exhaust Gas Cleaning Systems in Marine Vessels in the Region**

RECOMMENDATION

That the MVRD Board authorize the Board Chair to:

a) write to the federal ministers of Environment and Climate Change Canada and Transport Canada to request the prohibition of scrubbers and require the use of cleaner, lower sulphur fuels that meet sulphur content limits without the use of scrubbers, in the North American Emission Control Area (ECA), and prioritize the use of shore power; and
b) write to the Vancouver Fraser Port Authority to express support for their actions to prohibit the discharge of scrubber washwater while a vessel is at berth or anchor and further encourage this action to apply to vessels transiting all the waters within the Port, as well as support their air emissions program that incentivizes the use of cleaner fuels and shore power.

EXECUTIVE SUMMARY

At its September 10, 2021 meeting, the Climate Action Committee received a delegation about "Pollution from Exhaust Gas Cleaning Systems on Vessels," highlighting impacts from use of heavy fuel oil (HFO) and scrubbers. HFO and scrubbers are increasingly being used on marine vessels as alternative mechanisms to comply with international fuel sulphur content standards, instead of using cleaner lower sulphur fuels. Continued use of HFO and rapid uptake of scrubber technology has resulted in increased emissions of particulate matter, black carbon, and greenhouse gases, as well as marine impacts from the discharge of scrubber washwater into the sea. The federal government and the Vancouver Fraser Port Authority are seeking to address the issues of air emissions and scrubber washwater discharge. Metro Vancouver can advocate to the federal government to take action to prohibit scrubber use and require cleaner lower sulphur fuels, and support work the Port is doing to address water pollution.

PURPOSE

To respond to direction from the Climate Action Committee that staff report back with options for addressing the use of heavy fuel oil (HFO) and exhaust gas cleaning systems in marine vessels in the region in response to a delegation received at its September 10, 2021 meeting.

BACKGROUND

At its September 10, 2021 meeting, the Committee received a delegation from Anna Barford of Stand.earth. The presentation, titled "Pollution from Exhaust Gas Cleaning Systems on Vessels," provided an overview on the pollution from marine vessels' exhaust gas cleaning systems, highlighting

air pollution and water discharge issues with the use of HFO with scrubber technologies. The delegation indicated that air pollution from marine vessels should be addressed both at berth and in Canada's territorial waters, and proposed the following local and federal actions:

- *Pass a resolution calling on Transport Canada to take action on air pollution and dumping from vessels, including stopping the use of scrubbers, mandating the fuel standard without the scrubber work around, as California has done.*
- *Work with the Vancouver Fraser Port Authority to require or incentivize the use of marine gas oil, instead of HFO with scrubbers.*

After consideration, the Climate Action Committee adopted the following resolution:

> *That the Climate Action Committee direct staff to report back with options for addressing the use of heavy fuel oil and exhaust gas cleaning systems in marine vessels in the region in response to the September 10, 2021 delegation from Anna Barford, Stand.earth*.

This report responds to the Committee's direction.

THE USE OF SCRUBBERS IN MARINE VESSELS

On January 1, 2020, the International Maritime Organization (IMO) introduced a fuel standard that reduced the sulphur content in marine fuels from 3.5% to 0.5% by mass, for vessels operating outside an Emission Control Area (ECA). Prior to this, a North American ECA was established in March 2010 and became enforceable in August 2012; it requires that marine vessels operating in North American waters (defined as within 200 nautical miles of the coastline) use fuel with a maximum allowable fuel sulphur content of 0.1%. However, marine vessels can continue to use HFO with higher sulphur content if they install scrubbers as an exhaust gas cleaning system, as an alternate means of achieving compliance with IMO fuel sulphur standards.

Scrubbers together with using HFO is a lower cost option than using the lower sulphur ECA-compliant fuels. This alternative compliance mechanism has resulted in increased installations of scrubbers on marine vessels. While this technology is effective in achieving equivalent reductions of sulphur oxides, it results in higher emissions of particulate matter, black carbon, and greenhouse gases, compared with using ECA-compliant fuels. Additionally, the sulphur and other contaminants removed from the exhaust gas, including carcinogens such as polycyclic aromatic hydrocarbons (PAHs) and heavy metals, are discharged as effluent into the aquatic environment.

ACTIONS BY OTHER AGENCIES

Other levels of government have considered the issue of pollution related to the use of scrubbers on marine vessels. Environment and Climate Change Canada (ECCC) commissioned a report in 2020 that assessed the impacts of scrubber use on air emissions and water pollution (see Reference). The report recommended that countries take unilateral action as follows:

1) an immediate prohibition on using scrubbers to comply with the Canadian portion of the North American ECA because they are not equivalently effective at reducing air pollution as ECA-compliant fuels;
2) an immediate prohibition on all scrubber discharges in Canadian ports, internal waters, and territorial seas because they contribute to acidification and water pollution that can negatively affect marine life.

Regionally, the Vancouver Fraser Port Authority (VFPA) seeks to reduce emissions associated with shipping, as identified in the *Northwest Ports Clean Air Strategy*. Actions that reduce environmental impacts are also incorporated into VFPA's Port Information Guide, which outlines practices and procedures for vessels operating in the Port's waters. In November 2021, the Vancouver Fraser Port Authority issued a Notice of Amendment to update its Port Information Guide to include the prohibition of exhaust gas cleaning systems washwater discharges from vessels at berth and anchor. This prohibition is intended to be implemented on March 1, 2022. VFPA has also committed to extend this prohibition to vessels transiting all waters within the Port of Vancouver. VFPA also incentivizes the use of shore power and cleaner fuels and technologies by providing discounts on harbour dues to shipping companies that voluntarily take action to reduce their environmental impact.

METRO VANCOUVER ACTIONS

Metro Vancouver's *Clean Air Plan* and *Climate 2050 Transportation Roadmap* both identify the need to accelerate emission reductions from marine vessels by advocating to other levels of government to prioritize the use of cleaner engines, fuels, and technologies. The following actions in the *Clean Air Plan* are connected to the issues raised in this report:

- Action 1.4.1 – Accelerate Emission Reductions from Marine Vessels. Advocate to the Government of Canada and the BC Government to develop and 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 and international vessels. In the short term, the strategies 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 strategies should establish more stringent greenhouse gas emission targets, standards and regulations, to achieve a carbon neutral marine sector by 2050.
- Action 1.4.3 – Support Emissions 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.

Staff have been working with the agencies noted above in support of these actions. The recommendations presented in this report will further support the actions in the *Clean Air Plan.*

ALTERNATIVES

1. That the MVRD Board authorize the Board Chair to:
   a) write to the federal ministers of Environment and Climate Change Canada and Transport Canada to request the prohibition of scrubbers and require the use of cleaner, lower sulphur fuels that meet sulphur content limits without the use of scrubbers, in the North American Emission Control Area (ECA), and prioritize the use of shore power; and
   b) write to the Vancouver Fraser Port Authority to express support for their actions to prohibit the discharge of scrubber washwater while a vessel is at berth or anchor and further encourage

this action to apply to vessels transiting all the waters within the Port, as well as support their air emissions program that incentivizes the use of cleaner fuels and shore power.

2. That the Climate Action Committee receive for information the report dated February 11, 2022, titled "Options for Addressing the Use of Heavy Fuel Oil and Exhaust Gas Cleaning Systems in Marine Vessels in the Region" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

Under Alternative 1, the recommended actions can be completed within the approved budget for 2022.

CONCLUSION

Heavy fuel oils are being used in conjunction with scrubber systems on marine vessels as an alternative, lower cost means of complying with international fuel sulphur content standards, instead of using cleaner low-sulphur fuels. While this compliance mechanism allows for compliance with fuel sulphur requirements, the rapid uptake of this scrubber technology has resulted in higher air contaminant emissions such as particulate matter, black carbon, and greenhouse gases, as well as water pollution impacts due to discharge of scrubber washwater into the sea. Staff recommend Alternative 1, that the MVRD Board advocate to the federal government and Vancouver Fraser Port Authority to prohibit the use of scrubbers and the associated discharge of effluent in the North American Emission Control Area, require the use of cleaner lower sulphur fuels and promote the use of shore power.

Reference

Air emissions and water pollution discharges from ships with scrubbers (dated November 2020)

49337294

To: Climate Action Committee

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

Date: February 25, 2022 Meeting Date: March 11, 2022

Subject: **Manager's Report**

RECOMMENDATION
That the Climate Action Committee receive for information the report dated February 25, 2022 titled "Manager's Report".

Climate Action Committee 2022 Work Plan
The attachment to this report sets out the Committee's Work Plan for 2022. 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 2050* Engagement Update**
Metro Vancouver's draft *Climate 2050 Agriculture Roadmap* was presented to the Climate Action Committee at their meeting on November 5, 2021. Less than two weeks later, several atmospheric river events hit the region, causing devastating flooding of agricultural land in the Fraser Valley and beyond. The rain also caused numerous landslides that disrupted major routes in BC, creating additional stress on the agricultural community in Metro Vancouver. These climate-influenced flooding and landslide events in fall 2021 followed a challenging summer for agricultural activities due to unprecedented extreme heat events and extended dry periods.

In recognition of the challenges that the agriculture sector is experiencing, engagement on the draft *Climate 2050 Agriculture Roadmap* has been delayed. Staff are bringing the draft Roadmap to Metro Vancouver's Agricultural Advisory Committee on February 24, 2022, and considering options for meaningful engagement with the agriculture sector for late spring 2022.

Climate Action Highlights from B.C. Budget 2022 Announcement
On February 22, 2022, the BC Government published its 2022 Budget, which includes new investments of approximately $1 billion to support implementation of the CleanBC Roadmap, as well as significant new funding for climate adaptation and preparedness measures. Several climate action highlights of relevance to local governments are detailed below.

BC Budget 2022 includes $76 million for a new *Local Government Climate Action Program* that will help local governments take action to reduce emissions and prepare for and adapt to climate change. This new program will replace the previous *Climate Action Revenue Incentive Program* (CARIP). Program details are still to be released, but based on the budget, funding is in place for the next three years at a minimum, and is expected to be equal to or greater than what was previously allocated

under CARIP. Details, including reporting requirements, should be released in 2022 at the end of quarter 1 or start of quarter 2.

Other new climate funding commitments notable for local governments include: $79 million to continue the *Go Electric program* to provide rebates for electric-vehicle charging systems, fund hydrogen refueling infrastructure, and support commercial vehicle pilot projects; and $30 million in grants for local governments to improve active transportation infrastructure. The budget also includes funding for the development of a Circular Economy Strategy and a Clean Transportation Action Plan. Staff have been in early discussions with Provincial staff on aligning the Clean Transportation Action Plan with regional transportation emissions goals and targets.

BC Budget 2022 also outlines a number of new strategies and tax Initiatives to support the transition to a low-carbon economy, including: creation of a new *Clean Buildings Tax Rebate* to support deep energy retrofits of larger rental and commercial buildings; removal of PST from all electric heat pumps while increasing PST on fossil fuel heating equipment; removal of PST on used electric vehicles; expansion of the *Low Carbon Fuel Standard* and development of a new emissions cap on natural gas utilities; and development of a province-wide approach to carbon capture, utilization and storage.

In addition, significant new funding has been committed towards improving climate adaptation and preparedness: $145 million in new funding for BC's emergency management and wildfire services; and $83 million for a new *Climate Preparedness and Adaptation Strategy*, which includes a number of planning and monitoring initiatives, support for local and Indigenous governments, and investments to mitigate climate risks.

The full backgrounder on climate action highlights of B.C. Budget 2022 can be found at
B.C. Budget 2022 - Building a stronger environment for our future (gov.bc.ca).

Session with Professor David Holland

On February 18, 2022, Metro Vancouver hosted a conversation with climate scientist Professor David Holland, who studies atmospheric ocean sciences at New York University. He is a leading researcher on the global initiative that is studying Antarctica's Thwaites Glacier, regarding how glacier melt in the Antarctic may affect coastal communities around the world. Thwaites has been called "the Doomsday Glacier" and a warning light for climate change, as the ice shelf is expected to break off in the next five to 10 years and cause a cascade of glacier collapses, resulting in significant sea level rise.

Professor Holland joined the conversation from an icebreaker on his way back from Thwaites Glacier. Opening remarks were provided by Chair Dhaliwal and Director Carr, with participation by members of the Metro Vancouver Board, Climate Action Committee, and Flood Resiliency Task Force. The event was livestreamed with (approximately 100 attendees viewing live), and then posted to Metro Vancouver's YouTube account for future viewing, accessible at:
https://www.youtube.com/watch/a8-nT1YfPK8

Trans Mountain Pipeline Construction Update

At the January meeting, the Committee received a verbal update on construction of the Trans Mountain Pipeline, and concerns raised by an organization known as Protect the Planet, and adopted the following resolution:

> *That the Climate Action Committee refer to staff the matter of Trans Mountain's proposal to relocate and re-drill its tunnel under the Fraser River and report back to the Committee with an assessment of the potential impacts and a recommended course of action for consideration.*

Staff participate in a Technical Working Group with Trans Mountain, which is currently focused primarily on construction related impacts, to ensure there are no impacts arising from crossing or being in proximity to Metro Vancouver assets and infrastructure. Trans Mountain's proposed relocation under the Fraser River has been discussed at the Technical Working Group. On January 28, 2022, the Canada Energy Regulator approved the proposed relocation, and set out its analysis of the concerns raised.

Attachment

Climate Action Committee 2022 Work Plan

Climate Action Committee 2022 Work Plan
Report Date: February 25, 2022

Priorities

1st Quarter	**Status**
Climate Action Committee 2022 work plan and meeting schedule	Complete
Climate 2050 – draft roadmap for industry	In progress
Climate 2050 – draft roadmap for nature and ecosystems	In progress
Air quality – initiate process to update boilers and process heaters regulation	In progress
Sustainability Innovation Fund (SIF) – 2022 proposals	Complete
2nd Quarter	
Climate 2050 – management of GHG emissions from large buildings	In progress
Climate 2050 – draft roadmap for energy	In progress
Climate 2050 – draft roadmap for land use and growth management	Pending
Climate 2050 - analysis of how land use will contribute to achieving greenhouse gas reduction targets, especially for transportation	Pending
Climate 2050 – annual report and progress tracking	Pending
Air Quality – Initiate engagement on regulation for non-road two-stroke engines	Pending
Air quality – cannabis production and processing emission regulation	In progress
Air quality – open air burning emission regulation	In progress
Annual Caring for the Air report	In progress
Update on ecological health initiatives	Pending
SIF - status report on previously approved liquid waste projects	Pending
SIF - status report on previously approved regional district projects	Pending
3rd Quarter	
Climate 2050 final roadmap: agriculture	Pending
Climate 2050 final roadmap: industry	Pending
Climate 2050 – draft roadmap for infrastructure	Pending
Provincial replacement program for local government climate action	In progress
Air quality – amendments to air quality management fees in emission regulations	Pending
Air quality – amendments to ticketing bylaws	Pending
SIF - status report on previously approved water projects	Pending
4th Quarter	
Climate 2050 final roadmap: energy	Pending
Climate 2050 final roadmap: nature and ecosystems	Pending
Annual budget and 5 year financial plan	Pending
Best Management Practices for invasive species	Pending

50746104

To: Climate Action Committee

From: Heather McNell, General Manager, Regional Planning and Housing Services

Date: February 24, 2022 Meeting Date: March 11, 2022

Subject: ***Metro 2050* Next Steps: Addressing Member Jurisdiction Comments and Climate Policy**

At its February 10, 2022 meeting, the Regional Planning Committee received the report dated February 4, 2021, titled "*Metro 2050* Next Steps: Addressing Member Jurisdiction Comments and Climate Policy" (Attachment). The report responds to Board direction received by staff at the January 28, 2022 MVRD Board meeting, where the Board directed staff to delay readings of the *Metro 2050* bylaw by one month with an aim to resolving outstanding member jurisdiction concerns, and considering whether stronger climate action can be integrated into *Metro 2050,* or concurrent policy work and consensus building on stronger climate action undertaken with an aim to amending *Metro 2050* post adoption. Subsequently, this report was received by the MVRD Board on February 25, 2022.

The intent of the one-month delay was to allow time to meet with member jurisdictions with outstanding issues to see if any additional minor changes to *Metro 2050* were necessary to resolve those issues, as well as to provide additional information to the Regional Planning Committee and the MVRD Board on the climate policies included in *Metro 2050* and its relationship with *Climate 2050* and *Transport 2050*, while striving to keep to the Board approved timeline for *Metro 2050* adoption by July 2022.

At the February Regional Planning Committee meeting, General Manager McNell provided a presentation outlining how regional growth strategies work in terms of policy actions, a recap of how the climate policies in *Metro 2050* were developed, looking at how the three regional plans *Metro 2050, Transport 2050* and *Climate 2050* work together within their respective mandates toward strong climate action, a summary of the climate policies in *Metro 2050* (and how they strengthen and improve what is currently in the regional growth strategy), and finally next steps in resolving member jurisdiction concerns and bringing forward the *Metro 2050* bylaw for consideration in March.

Discussion ensued about ways to solidify the intent of the report by adding a recommendation that would propel concurrent work to build consensus around stronger climate action policy in the regional growth strategy. The Committee directed staff to:

> *"when bringing the Metro 2050 bylaw for consideration of first and second reading, to add an additional recommendation for Board consideration as follows: given the urgent need to respond to climate change and prepare for extreme weather events, direct staff to undertake work and engagement with an aim to proposing an early amendment to Metro 2050 to strengthen climate action language and policy".*

In addition, the February 4, 2022 staff report noted that "this report will also be provided to the Climate Action Committee at its March 11, 2022 meeting to ensure additional policy development will be fully aligned with *Climate 2050*." Hence, this report is being provided for information to the Climate Action Committee.

Attachment

Report dated February 4, 2022 titled "*Metro 2050* Next Steps: Addressing Member Jurisdiction Comments and Climate Policy" *(50613845)*

51099246

To: Regional Planning Committee

From: Heather McNell, General Manager, Regional Planning and Housing Services

Date: February 4, 2022 Meeting Date: February 10, 2022

Subject: ***Metro 2050* Next Steps: Addressing Member Jurisdiction Comments and Climate Policy**

RECOMMENDATION

That the MVRD Board receive for information the report dated February 4, 2022, titled "*Metro 2050* Next Steps: Addressing Member Jurisdiction Comments and Climate Policy".

EXECUTIVE SUMMARY

At its January 28, 2022 meeting, the Board directed staff to delay readings of the *Metro 2050* bylaw by one month with an aim to:

- resolving outstanding member jurisdiction concerns; and
- considering whether stronger climate action can be integrated into *Metro 2050* or concurrent policy work and consensus building on stronger climate action undertaken with an aim to amending *Metro 2050* post adoption.

The intent of the one-month delay is to allow time to meet with member jurisdictions with outstanding issues to see if any additional minor changes to *Metro 2050* are necessary to resolve those issues, as well as to provide additional information to the Regional Planning Committee and the MVRD Board on the climate policies included in *Metro* 2050 and its relationship with *Climate 2050* and *Transport 2050*, while striving to keep to the Board approved timeline for *Metro 2050* adoption by July 2022.

PURPOSE

To provide the Regional Planning Committee and MVRD Board with a summary of climate policies in *Metro 2050*, information about how *Metro 2050*, *Transport 2050* and *Climate 2050* work together, and steps being undertaken to respond to the Board's direction.

BACKGROUND

On January 28, 2022, the MVRD Board considered a report seeking direction to bring forward the *Metro 2050* bylaw for consideration of first and second reading at the February Regional Planning and MVRD Board meetings. Board members discussed the need for stronger climate policy in the regional growth strategy, as well as the need to address outstanding issues on the part of a number of member jurisdictions. As a result, the Board passed the following resolution:

> "That the MVRD Board refer the matter back to staff for a one-month period in order to consider previously submitted comments as well as the Board's feedback, and bring forward the *Metro 2050* bylaw for consideration of 1st and 2nd reading in March 2022."

This report provides information on climate policies in *Metro 2050*, and the regional growth strategy's relationship to *Transport 2050* and *Climate 2050* to respond to the Board's direction.

REGIONAL GROWTH STRATEGY AND CLIMATE POLICY

A regional growth strategy is a strategic, long-term land based policy plan that sets out the federation's shared vision for managing growth anticipated to come to the region in a way that promotes livability by guiding transportation, settlement patterns, environmental protection, and other matters. *Metro Vancouver 2040: Shaping Our Future* (*Metro 2040*), the regional growth strategy, was accepted by all member jurisdictions, TransLink and adjacent regional districts, and adopted by the MVRD Board in 2011. Since its adoption, *Metro 2040* has been a strong and effective plan for managing growth.

In April 2019, the Board initiated an update to *Metro 2040*, known as *Metro 2050*. Like the current regional growth strategy, *Metro 2050* sets out policy actions for Metro Vancouver, member jurisdictions, and TransLink. Once adopted, member jurisdictions are required, through a regional context statement that is part of their Official Community Plan, to demonstrate how the goals, strategies, and actions of the regional growth strategy are being implemented within their local context, using the tools that are most appropriate to them. A regional growth strategy must be accepted by all member jurisdictions, TransLink, adjacent regional district Boards and the Metro Vancouver Board prior to adoption, meaning that consensus on the policy directions must be reached.

Climate and Natural Hazards Policy Review

In Phase 1 of the update to the regional growth strategy, the Regional Planning Committee, MVRD Board, member jurisdictions, TransLink, the Province, and other agencies and organizations, identified gaps and opportunities for the policies in the plan to be improved to better support planning throughout the region, and to better respond to the critical challenges facing the region, through a series of 11 themed policy reviews. At its meeting on January 14, 2021, the MVRD Board endorsed the recommendations of the Climate and Natural Hazards Policy Review (Reference 1). The recommendations focused on:

- applying a climate lens to *Metro 2050* with an emphasis on integrating with *Climate 2050*;
- ensuring member jurisdictions specify how they will meet the region's GHG emissions reduction target;
- identifying and mapping regional-scale natural hazards, risks and vulnerabilities; and
- encouraging regional growth patterns that incorporate emergency management, utility planning, and climate change adaptation considerations.

In the subsequent phase of work between January and May 2021, proposed wording amendments and additions to policy language were developed and vetted by the *Metro 2050* Intergovernmental Advisory Committee, member jurisdictions, other agencies, the Regional Planning Committee and MVRD Board. A detailed summary of the policy changes between *Metro 2040* and *Metro 2050* that focus on climate policy can be reviewed in Attachment 1. In general, *Metro 2040* is relatively silent on adaptation, and is weaker on mitigation actions and requirements.

Relationship between *Metro 2050*, *Climate 2050* and *Transport 2050* – How the Regional Plans Work Together

Over the past 3 years, Metro Vancouver staff have been working closely to coordinate research and policy directions in *Metro 2050* and *Climate 2050* with TransLink staff as they developed *Transport 2050.* Early in the development process, Metro Vancouver and TransLink staff identified policy areas where each strategy would be the lead, and where they would reflect and support the content of the other strategies based on respective mandates. As such, *Metro 2050* was determined to be the best to lead on land use and growth management elements, *Climate 2050* was to lead on how to reduce greenhouse gas (GHG) emissions from all sectors within the region, and *Transport 2050* was to lead on how to meet the long-term transportation and access needs of the region. Each strategy contains policies and actions that are complementary, supportive and reflective of the other strategies and should be considered together.

The 3 policy based strategies are mutually-supportive and share the principal climate objectives of:

- Reducing transportation emissions through containing and structuring growth in compact, transit-oriented and complete communities to enable people to meet most of their daily needs close to home;
- Explicitly considering social equity in all aspects of community building, including affordable housing, access to jobs, and climate resilience;
- Protecting natural areas and agricultural land by focusing the region's growth in Centres and along Transit Corridors;
- Aligning growth with transit and servicing infrastructure investments;
- Accelerating the shift to zero emissions vehicles and travel modes;
- Building more resilient neighbourhoods through natural hazard identification and protection of sensitive ecological areas; and
- Increasing tree canopy coverage to promote walkable, healthy communities and reduce the heat island effect.

Metro 2050

Metro 2050 builds on the well-established foundation of regional planning principles by the regional federation. In response to extensive background best practice research, engagement, and feedback received, *Metro 2050* was strengthened to contain many new and amended policy actions and references to climate change throughout all of the five goal areas. Each Goal description and Strategy preamble now reference the connections to climate change outcomes for the policies that follow, where applicable. There is also strong alignment with *Climate 2050* in key areas throughout the plan (in particular, the policy actions throughout Strategy 3.3).

At its meeting on February 28, 2020, the MVRD Board approved an amendment to *Metro 2040* to update the GHG emission reduction targets to achieve a 45% reduction in emissions for the region by 2030 (from 2010 levels) and to achieve carbon neutrality by 2050 to align with the IPCC targets for emission reduction (Reference 3). These targets have been carried forward into *Metro 2050*, and now there is a clear requirement for Metro Vancouver, member jurisdictions and TransLink to identify and demonstrate the actions they are taking to meet the targets.

New policies in *Metro 2050* strengthen its climate actions including new Metro Vancouver actions to:

- collect and maintain data on tree canopy cover, impervious surfaces, carbon storage datasets, report on gains and losses and climate related impacts on ecosystems, and share datasets;
- identify a regional green infrastructure network that connects ecosystems and maximizes climate adaptation, biodiversity and human health benefits;
- monitor energy consumption, greenhouse gas emissions, and air quality related to land use, buildings, industry, agriculture, waste, transportation, and other emission sources, and consider lifecycle energy and emissions;
- promote best practices and develop guidelines to support local government actions that reduce energy consumption and GHGs, support the transition to clean, renewable energy, create carbon storage opportunities and improve air quality;
- advocate to provincial and federal governments to establish and support legislative and fiscal actions to reduce GHGs in the building sector (e.g. accelerate transition of energy efficiency requirements in the *BC Building Code* to net-zero ready levels by 2032, increase incentives and financing tools for new low carbon, zero emissions and resilient buildings) and transportation sector (e.g. revise enabling legislation to allow regional road usage charging, support electric vehicle charging in new and existing buildings through requirements and programs);
- collaborate to develop and share information and data related to hazards, risks, and vulnerabilities in the region, which may include preparing a regional multi-hazard map;
- advocate to provincial and federal governments to review provincial legislation and guidelines regarding flood hazard management, encourage the adoption of local flood hazard policies and bylaws, and implement preparatory actions to address the implications of sea level rise on infrastructure planning, construction, and operations.

There are also new requirements that member jurisdictions demonstrate through their regional context statement how their OCPs and other plans:

- respond to health and climate change-related risks by providing equitable access to recreation facilities, green spaces, and safe walking, cycling, and rolling environments;
- support the protection, enhancement, restoration, and expansion of ecosystems to maintain ecological integrity, increase natural carbon sinks and support adaptation to climate change impacts;
- consider edge planning for Industrial lands to improve resilience to climate change impacts;
- protect agricultural land and strengthen viability to support climate change adaptation by monitoring flooding and sea level rise impacts on agricultural land and implementing flood construction requirements for residential uses;
- identify policies and strategies that reduce energy consumption and greenhouse gas emissions, create carbon storage opportunities, and improve air quality from land use, infrastructure, and settlement patterns (e.g. electrification of building heating systems, green demolition requirements, zero carbon district energy systems); and
- adopt appropriate planning standards, guidelines and best practices related to climate change (e.g. flood hazard management guidelines, wildfire urban interface reduction principles).

In addition, many of the policy actions in *Metro 2050* support and encourage GHG reductions and adaptation measures, even if climate change is not specifically referenced. For example:

- the well-established principles of urban containment and structuring growth into a series of transit-oriented Urban Centres and along transit corridors translate to reductions in the number of trips and trip length, and support a viable transit system and active transportation modes;
- new regional-scale targets to protect 50% of the land base for nature, and to increase the total tree canopy cover within the Urban Containment Boundary to 40%, which support climate resilience;
- the Agricultural, Conservation / Recreation and Rural regional land use designations that support urban containment and efficient urban infrastructure provision; and
- discouraging new development in areas that are vulnerable to natural hazards including climate change induced hazards such as sea level rise.

These are just some of the policy directions that demonstrate that effective growth management planning is also effective climate action.

New policy action 3.3.1 b) directly references Metro Vancouver's role in implementing *Climate 2050* and the *Clean Air Plan* to meet our GHG emission reduction targets; *Metro 2050* is just one management plan of several to help us meet our GHG emissions reduction targets. Furthermore, the language of policy actions 3.3.6 and 3.3.7, which identify key actions for the buildings and transportation sectors, has been aligned with the same policy language in the *Clean Air Plan* and the *Climate 2050* Buildings and Transportation Roadmaps.

Climate 2050

Climate 2050 contains goals that are complementary and reinforce the climate-related land use and transportation principles of *Metro 2050* and *Transport 2050* including directions to: encourage all personal travel to be made by active transportation or using zero emission technologies; to enhance and improve regional transit; and expand active transportation networks. *Climate 2050* also includes supportive directions to: accelerate sales targets for electric vehicles; advocate for more stringent low carbon fuel standards; improve GHG emission performance requirements for new and existing buildings; and ensure that infrastructure, ecosystems and communities are resilient to the impacts of climate change. *Climate 2050* similarly includes the same GHG emission reduction and carbon neutrality targets that are in *Metro 2050.*

The implementation of *Climate 2050* will be through a series of ten issue area roadmaps, which describe long-term goals, targets, strategies and actions to reduce regional GHG emissions and ensure that this region is resilient to climate change impacts. Implementation of the roadmaps will be driven by all of Metro Vancouver's management plans, including *Metro 2050*. In particular, the *Clean Air Plan*, approved by the MVRD Board in September 2021, sets out how Metro Vancouver will reduce GHG emissions in the region through a series of implementation initiatives; staff will be bringing forward reports to the Climate Action Committee and MVRD Board on recommendations to reduce building and transportation emissions later this year. The ongoing work on the roadmaps will set out 'big moves', and include strategies and actions to reduce emissions and work towards resilience by topic area. The roadmaps completed to date pertain to buildings and transportation,

and a draft roadmap on agriculture is currently in the engagement phase. Draft industry, nature and ecosystems, and energy roadmaps will be coming forward over the coming months. Those still to be developed include: water and wastewater infrastructure, waste management, human health and well-being, and land use and growth management. It is noted that the land use and growth management roadmap will be building on the policies of *Metro 2050*, once adopted, setting out implementation actions.

Transport 2050

Since 2019, Metro Vancouver has been coordinating closely with TransLink on the development of *Transport 2050* to ensure strong alignment between the two regional strategies. Wherever possible, staff have coordinated engagement and policy development efforts with TransLink to avoid "engagement fatigue" and duplication of efforts. This close coordination also included Provincial staff. This coordinated work includes shared mapping and growth projections data, performance measures and, where possible, harmonized language and terminology. For example, Metro Vancouver and TransLink staff jointly developed the Major Transit Network and Major Transit Growth Corridor concepts, associated policies, and maps, and worked together to engage member jurisdictions in communicating and gathering feedback on that work.

Transport 2050 was recently approved by the Mayors' Council and TransLink Board, and is strongly oriented around good land use planning to improve access, prioritize walking, rolling, and cycling for shorter trips, and transit use for longer ones. *Transport 2050* contains five goal areas, which including seeking to provide carbon free choices for everyone, and create a more resilient system that can better withstand climate impacts, that is safe and comfortable in extreme weather. The 'big moves' of *Transport 2050* align closely with the policy directions in *Metro 2050* including such supportive policies as: supporting walkable, complete, affordable communities; creating people-first streets; completing networks of traffic-protected bikeways; and expanding shared mobility options in the region. TransLink's supporting corporate Climate Action Strategy also sets out commitments for TransLink to achieve the same emission reduction targets set out in *Metro* 2050, primarily through the Low Carbon Fleet Strategy and facility upgrades.

Other Work Coordinated Between Metro Vancouver and TransLink

During the development of *Metro 2050, Climate 2050* and *Transport 2050,* staff from the two organizations worked closely on the Regional Resilience Framework, which was presented to the Regional Planning Committee at its meeting on May 7, 2021 (Reference 2), and the *Climate 2050* Roadmaps. At its May 1, 2020 meeting, in response to the COVID-19 pandemic, the Regional Planning Committee endorsed a process to revise the *Metro 2050* work plan to leverage the Long-Range Growth and Transportation Scenarios work completed in 2019 to develop a COVID-19-informed resiliency lens for *Metro 2050*'s projections, targets, and policies. Metro Vancouver staff partnered with TransLink on this project, and the results and recommendations of the Framework were integrated into the policy language of the draft of *Metro 2050*.

Metro 2050 is not intended to be a static plan; as was the case with *Metro 2040*, as new information is obtained and best practice research undertaken, amendments that improve the policy actions of the strategy will be brought forward for consideration. Further climate change mitigation and adaptation work between Metro Vancouver departments and in cooperation with TransLink is

presently underway and will continue around regional risk and vulnerability, a regional parking strategy, and continuing the GHG modelling work led by Air Quality and Climate Change, which will specifically look at the impacts of land use and form / density decisions on emissions. Future work is also planned pertaining to updates to the population and job targets in Urban Centres and Frequent Transit Development Areas. The outcomes of these projects could result in proposed amendments that would strengthen the policies and targets in *Metro 2050*.

Given the Board's direction, the climate emergency and extreme weather events of the last year, Regional Planning staff will undertake additional work through 2022 to explore stronger policy actions for *Metro 2050.* Engagement and collaboration with member jurisdictions, First Nations, the Province, TransLink, and others is needed to build consensus on any proposed amendments to *Metro 2050*.

NEXT STEPS

Metro Vancouver staff and MVRD Board members are meeting with staff and elected officials from the member jurisdictions that noted outstanding concerns or comments on *Metro 2050* at the January 28, 2022 Board meeting with an aim to resolving them prior to the March Regional Planning Committee and Board meetings. The outcomes of these discussions may result in further adjustments to the policies of *Metro 2050* beyond those noted in the issues response table appended to the *Metro 2050* report that was presented to the MVRD Board at its January meeting (Reference 4).

This report will also be provided to the Climate Action Committee at its March 11, 2022 meeting to ensure additional policy development will be fully aligned with *Climate 2050*.

ALTERNATIVES

As this is an information report, no alternatives are presented.

FINANCIAL IMPLICATIONS

There are no financial implications to this report.

CONCLUSION

At its January 28, 2022 meeting, the MVRD Board directed staff to delay readings of the *Metro 2050* bylaw by one month with an aim to resolving noted outstanding member jurisdiction concerns, and to report back on the climate action policies of *Metro 2050* and the possibilities of enhancing them, as well as their relationship with the policies and actions of *Climate 2050* and *Transport 2050*.

Over the past 3 years, Metro Vancouver staff have been working closely to coordinate research and policy directions in *Metro 2050* and *Climate 2050* with *Transport 2050.* The strategies have different legislative contexts, approvals requirements and stem from different organizational mandates. *Metro 2050* is the lead on land use and growth management elements, *Climate 2050* is the lead on how to reduce GHG emissions from all sectors within the region, and *Transport 2050* is the lead on how to meet the long-term transportation and access needs of the region. Each strategy contains policies, actions and performance measure that are complementary, supportive and reflective of the other strategies and should be considered together. Finally, *Metro 2050* is not intended to be a static

document; as new information is obtained and best practice research undertaken, amendments that improve the climate policy actions of the strategy will be brought forward.

Attachment *(50618541)*
Climate Action Policy Comparison Between *Metro 2040* and *Metro 2050*

References

1. Climate and Natural Hazards Policy Review Recommendations Report – Received by the MVRD Board on January 14, 2021
2. *Metro 2050* Regional Resilience Framework Report – Presented to the Regional Planning Committee on May 7, 2021
3. Report on *Regional Growth Strategy Amendment Bylaw No. 1295, 2019* that introduces revised greenhouse gas emission reduction targets to *Metro 2040* – Presented to the MVRD Board on February 28, 2020
4. Report dated January 7, 2022, titled, "Comments on the Draft of Metro 2050 and Proposed Next Steps" – Presented to the MVRD Board on January 28, 2022

50613845

Comparison of Climate Actions in *Metro 2040* and Draft *Metro 2050*

Each Goal **preamble** and **strategy rationale** describes the relevance of greenhouse gas emission reductions and climate change resilience for the Goal area.

Metro 2040 **Climate Actions**	***Metro 2050*** **Climate Actions**
Goal 1: Create a Compact Urban Area	
No specific climate actions for UCs or FTDAs	**Strategy 1.2 Focus growth in Urban Centres and Frequent Transit Development Areas** **Metro Vancouver will:** 1.2.15 Work with First Nations and other appropriate agencies to ensure that new development and infrastructure investment is directed to areas that are transit-oriented and **resilient to climate change impacts and natural hazards.** 1.2.19 Advocate to the Province that any future or expanded rail-based rapid transit service: a) avoid locations that are exposed to unmitigated **natural hazards and climate change risk**; **Member Jurisdictions will:** 1.2.26 Collaborate with member jurisdictions and other stakeholders on the expansion of the Frequent Transit Network, Major Transit Network, and new transit stations, and **avoid expansion of permanent transit infrastructure into hazardous areas**. Where risk is unavoidable, such as in existing settlements, **use risk-mitigation or climate change adaptation strategies** in the expansion of transit infrastructure.
No specific climate actions for complete communities	**Strategy 1.3 Develop resilient, healthy, connected, and complete communities with a range of services and amenities** **Metro Vancouver will:** 1.3.1 Support member jurisdictions and work with First Nations in developing resilient, healthy, connected, and complete communities through regional strategies, research, and best practices that: b) **reduce greenhouse gas emissions, bolster resilience to climate change impacts and natural hazards**, and improve social equity, universal accessibility, and inclusive engagement; and 1.3.2 Provide technical advice, assistance, research, and data to member jurisdictions and other agencies to improve air quality, **reduce greenhouse gases**, increase access to community services, and to better understand the health and social equity aspects of land use and infrastructure decisions. 1.3.3 Collaborate with health authorities, academic institutions, First Nations, and other researchers to share best practices, research, data, and tools that can advance land use policies to: c) reduce community exposure to **climate change** and air quality impacts, especially communities that are disproportionally impacted; and **Member Jurisdictions will:** 1.3.7 Adopt Regional Context Statements that: d) respond to health and **climate change-related risks** by providing equitable access to: i) recreation facilities; ii) green spaces and public spaces (e.g. parks, trails, urban forests, public squares, etc.); and iii) safe and inviting walking, cycling, and rolling environments, including resting spaces with tree canopy coverage, for all ages and abilities;
No specific climate actions for Rural lands	**Strategy 1.4 Protect Rural lands from urban development** **Member Jurisdictions will:** 1.4.3 Adopt Regional Context Statements that: e) support the protection, enhancement, restoration, and expansion of ecosystems identified on Map 11 to maintain ecological integrity, enable ecosystem connectivity, **increase natural carbon sinks and enable adaptation to the impacts of climate change**.

Metro 2040 Climate Actions	*Metro 2050* Climate Actions
Goal 2: Support a Sustainable Economy	
No specific climate actions for Industrial lands	**Strategy 2.1 Promote land development patterns that support a diverse regional economy and employment opportunities close to where people live** **Metro Vancouver will:** 2.1.6 Advocate that airport authorities: c) develop strategies to **adapt to climate change impacts** and natural hazard risks. 2.1.7 Advocate that the Port of Vancouver: c) develop strategies to **adapt to climate change impacts** and natural hazard risks.
	Strategy 2.2 Protect the supply, and enhance the efficient use of, industrial land **Member jurisdictions will:** 2.2.9 Adopt Regional Context Statements that: c) include policies for Industrial lands that: ix) consider the preparation of urban design guidelines for Industrial land edge planning, such as interface designs, buffering standards, or tree planting, to minimize potential land use conflicts between industrial and sensitive land uses, and to i**mprove resilience to the impacts of climate change**; and e) include policies to assist existing and new businesses in **reducing their greenhouse gas emissions**, maximizing energy efficiency, and mitigating impacts on ecosystems. f) include policies that assist existing and new businesses to **adapt to the impacts of climate change and reduce their exposure to natural hazards risks, such as those identified within the regional growth strategy (Table 5).**
No specific climate actions for Agricultural lands	**Strategy 2.3 Protect the supply of agricultural land and strengthen agricultural viability** **Metro Vancouver will:** 2.3.9 Advocate to the Province to increase agricultural producers' knowledge and adoption of innovative practices for advancing agriculture economic development, and **resilience to climate change and natural hazard impacts, such as those identified in the regional growth strategy (Table 5).** 2.3.10 Advocate to the Province to provide incentives to encourage land management practices that **reduce greenhouse gas emissions**, improve soil health, protect natural assets, and maintain **ecosystem services** from agricultural land. **Member Jurisdictions will:** 2.3.12 Adopt Regional Context Statements that: c) include policies that protect the supply of agricultural land and strengthen agriculture viability including those that: iii) support **climate change adaptation** including: • **monitor storm water, flooding, and sea level rise impacts on agricultural land,** • **implement flood construction requirements for residential uses,** • **and maintain and improve drainage and irrigation infrastructure that supports agricultural production, where appropriate and in collaboration with other governments and agencies;**

Metro 2040 Climate Actions	*Metro 2050* Climate Actions
Goal 3: Protect the Environment and Respond to Climate Change Impacts	**Goal 3: Protect the Environment and Respond to Climate Change and Natural Hazards**
Strategy 3.1 Protect Conservation and Recreation lands No specific climate actions for Conservation and Recreation lands	**Strategy 3.1 Protect and enhance Conservation and Recreation lands** **Member jurisdictions will:** 3.1.9 Adopt Regional Context Statements that: b) include policies that support the protection and enhancement of lands with a Conservation and Recreation land use designation, which may include the following uses: vii) ecosystems not covered above that may be **vulnerable to climate change and natural hazard impacts**, or that **provide buffers to climate change impacts or natural hazard impacts for communities**; and viii) uses within those lands that are appropriately located, scaled, and consistent with the intent of the designation, including: • land management activities needed to **minimize vulnerability / risk to climate change impacts**.
Strategy 3.2 Protect and enhance natural features and their connectivity No specific climate actions for ecosystems	**Strategy 3.2 Protect, enhance, restore, and connect ecosystems** **Metro Vancouver will:** 3.2.2 Implement the Metro Vancouver Ecological Health Framework, including relevant actions to: a) collect and maintain data, including the Sensitive Ecosystem Inventory, tree canopy cover, imperviousness, and **carbon storage datasets**; report on gains and losses and **climate change impacts on ecosystems**; and share these datasets with member jurisdictions; and b) incorporate natural assets and **ecosystem services** into Metro Vancouver's corporate planning, asset management systems and investments, and provide regionally appropriate guidance on methodologies, tools and decision-making frameworks. 3.2.3 Manage Metro Vancouver assets and collaborate with member jurisdictions, First Nations, and other agencies to: b) identify ecosystems that may be **vulnerable to climate change and natural hazard impacts as part of regional multi-hazard mapping in Action 3.4.2 a);** c) identify a regional green infrastructure network that connects ecosystems and builds on existing local networks, while **maximizing resilience**, biodiversity, and human health benefits; and 3.2.6 Advocate to the Federal Government and the Province to: b) support the uptake of **nature-based climate change solutions**, including those that protect or restore foreshore ecosystems;
	Member jurisdictions will: 3.2.7 Adopt Regional Context Statements that: c) include policies that: i) support the consideration of natural assets and **ecosystem services** in land use decision-making and land management practices; ii) enable the retention and expansion of urban forests using various tools, such as local tree canopy cover targets, urban forest management strategies, tree regulations, development permit requirements, land

Metro 2040 Climate Actions	*Metro 2050* Climate Actions
	acquisition, street tree planting, and reforestation or restoration policies, with consideration of **resilience**;
Strategy 3.3 Encourage land use and transportation infrastructure that reduce energy consumption and greenhouse gas emissions, and improve air quality **Metro Vancouver's role is to:** 3.3.1 Implement the strategies and actions of the Regional Growth Strategy that contribute to regional targets to reduce greenhouse gas emissions by 45 percent below 2010 levels by 2030 and to achieve a carbon neutral region by 2050. Figure 3 identifies examples of strategies and actions contained in the Regional Growth Strategy to address climate change.	**Strategy 3.3 Encourage land use, infrastructure, and human settlement patterns that reduce energy consumption and greenhouse gas emissions, create carbon storage opportunities, and improve air quality** **Metro Vancouver will:** 3.3.1 Implement the: a) strategies and actions of the regional growth strategy that contribute to **regional targets to reduce greenhouse gas emissions by 45% below 2010 levels by the year 2030 and to achieve a carbon neutral region by the year 2050**; and b) Metro Vancouver ***Clean Air Plan*, *Climate 2050*,** and other associated actions to help achieve the regional **greenhouse gas emissions reduction targets** in Action 3.3.1 a).
Metro Vancouver's role is to: 3.3.2 Work with the federal government and the province, TransLink, municipalities, non-governmental organizations, and the private sector to: a) support the ongoing monitoring of energy consumption, greenhouse gas emissions, and air quality related to land use and transportation infrastructure; b) promote best practices and develop guidelines to support local government actions to reduce energy consumption and greenhouse gases, and improve air quality related to land use and transportation infrastructure (e.g. district heating systems and renewable energy opportunities).	**Metro Vancouver will:** 3.3.2 Work with the Federal Government, the Province, TransLink, member jurisdictions, First Nations, non-governmental organizations, energy utilities, the private sector, and other stakeholders, as appropriate, to: a) monitor energy consumption, greenhouse gas emissions, and air quality related to land use, **buildings, industry, agriculture, waste**, transportation, **and other emission sources, and consider lifecycle energy and emissions**; b) **monitor and pursue opportunities to increase carbon storage in natural areas;** and c) promote best practices and develop guidelines to support local government actions that reduce energy consumption and greenhouse gas emissions, **support a transition to clean, renewable energy (including electricity), create carbon storage opportunities**, and improve air quality. 3.3.4 Work with the Federal Government, the Province, and other stakeholders when conducting environmental assessments to reduce the environmental and health impacts related to regional air quality and **greenhouse gas emissions**.
Metro Vancouver's role is to: 3.3.3 Accept Regional Context Statements that encourage land use and transportation infrastructure that reduce energy consumption and greenhouse gas emissions, and improve air quality, and that meet or work towards Action 3.3.4.	**Metro Vancouver will:** 3.3.5 Accept Regional Context Statements that encourage land use, infrastructure, and settlement patterns that reduce energy consumption and greenhouse gas emissions, improve air quality, **create carbon storage opportunities**, and that meet or work towards Action 3.3.7.

Metro 2040 Climate Actions	*Metro 2050* Climate Actions
Actions Requested of Other Governments and Agencies 3.3.8 That the federal government and the province and their agencies establish further legislative and fiscal actions to help the public and private sectors to maximize reductions in energy consumption and greenhouse gas emissions, and improve air quality, such as: a) in the building sector, • accelerate the modernization of the BC Building Code • increase incentives for residential and commercial building retrofits • support, where feasible and appropriate, energy recovery, renewable energy generation and district energy systems and related transmission needs b) in the transportation sector, • enable the implementation of regional transportation demand management measures such as transportation user-based pricing • increase funding for sustainable transportation infrastructure • continue to advance stringent standards for on road vehicle emissions and fuel carbon content	**Metro Vancouver will:** 3.3.6 Advocate to the Federal Government and the Province to establish and support legislative and fiscal actions, that help the public and private sector maximize **reductions in energy consumption and greenhouse gas emissions**, and improve air quality, such as: a) in the building sector, i) accelerating the transition of **energy efficiency requirements in the BC Building Code to net zero energy ready levels by 2032;** ii) setting **greenhouse gas and energy performance requirements** for new and existing buildings; iii) increasing incentives and financing tools for new **low-carbon, zero-emissions, and resilient** buildings; iv) supporting large-scale building **electrification**; v) requiring **benchmarking and energy labels** for new and existing buildings; vi) supporting **reductions in embodied emissions of buildings**, and the increased use of **low-carbon circular building products and processes**; vii) supporting programs, services and incentives for **low-carbon** upgrade options in rental buildings that benefit building owners and tenants; viii) incenting equitable **transit-oriented development** through policy and funding programs; and ix) supporting, where feasible and appropriate, energy recovery, renewable energy generation and **zero-carbon** district energy systems, and related transmission needs. b) in the transportation sector, i) revising enabling legislation to allow regional road usage charging for the purposes of managing congestion and **greenhouse gases**; ii) supporting **electric vehicle charging in new and existing buildings** through requirements and programs; iii) continuing to increase the amount of reliable and sustainable funding available for sustainable transportation infrastructure and **low emission travel modes**, such as active transportation and public transit; and iv) continuing to advance stringent standards for on-road vehicle emissions and fuel carbon content.
The role of municipalities is to: 3.3.4 Adopt Regional Context Statements which: a) identify how municipalities will use their land development and transportation strategies to meet their greenhouse gas reduction targets and consider how these targets will contribute to the regional targets; b) identify policies and/or programs that reduce energy consumption and greenhouse gas emissions, and improve air quality from land use and transportation infrastructure, such as: • existing building retrofits and construction of new buildings to green performance guidelines or standards, district energy systems, and energy recovery and renewable energy generation technologies, such	**Member jurisdictions will:** 3.3.7 Adopt Regional Context Statements that: a) identify how local land use and transportation policies **will contribute to meeting the regional greenhouse gas reduction target of 45% below 2010 levels by the year 2030 and achieving a carbon neutral region by the year 2050**; b) identify policies, actions, incentives, and / or strategies that reduce energy consumption and greenhouse gas emissions, **create carbon storage opportunities**, and improve air quality from land use, infrastructure, and settlement patterns, such as: i) existing building retrofits and construction of new buildings to meet **energy and greenhouse gas performance guidelines or standards (e.g. BC Energy Step Code, passive design**), the **electrification of building heating systems**, **green demolition requirements**, **embodied emissions policies, zero-carbon** district energy systems, and energy recovery and

Metro 2040 Climate Actions	*Metro 2050* Climate Actions
as solar panels and geoexchange systems, and electric vehicle charging infrastructure; • community design and facility provision that encourages transit, cycling and walking (e.g. direct and safe pedestrian and cycling linkages to the transit system); c) focus infrastructure and amenity investments in Urban Centres and Frequent Transit Development Areas, and at appropriate locations along TransLink's Frequent Transit Network; d) implement land use policies and development control strategies which support integrated storm water management and water conservation objectives.*	renewable energy generation technologies, such as solar panels and geoexchange systems, and **zero emission** vehicle charging infrastructure; and ii) community design, infrastructure, and programs that encourage transit, cycling, rolling and walking; and c) focus infrastructure and amenity investments in Urban Centres and Frequent Transit Development Areas, and at appropriate locations along Major Transit Growth Corridors. *d) moved to 3.2.7 c) iv)
Actions Requested of Other Governments and Agencies 3.3.6 That TransLink pursue reductions of common air contaminants and greenhouse gas emissions from on-road transportation sources in support of regional air quality objectives and greenhouse gas reduction targets. 3.3.7 That TransLink manage its transit fleet and operations with the goal of increasing fuel efficiency and reducing common air contaminants and greenhouse gas emissions over time, in support of the Regional Growth Strategy and Air Quality Management Plan.	**TransLink will:** 3.3.8 Support regional air quality objectives and **greenhouse gas emission reduction targets** by advancing policy and infrastructure to support the **aggressive transition of the ground-based vehicle fleet to zero-emissions, and by transitioning the entire transit fleet to one that utilizes low-carbon fuels.**
Actions Requested of Other Governments and Agencies 3.3.5 That TransLink, in collaboration with Metro Vancouver and municipalities, establish criteria for defining major development proposals, which are referenced in the *South Coast British Columbia Transportation Authority Act*, in order to help meet the objective of concentrating major trip-generating uses in areas well served by transit.	**TransLink will:** 3.3.9 In collaboration with Metro Vancouver and member jurisdictions, establish a definition of major development proposals, which are referenced in the *South Coast British Columbia Transportation Authority Act*, to support the objective of concentrating Major Trip-Generating uses in areas well served by transit.
Strategy 3.4 Encourage land use and transportation infrastructure that improve the ability to withstand climate change impacts and natural hazard risks	**Strategy 3.4 Encourage land use, infrastructure, and human settlement patterns that improve resilience to climate change impacts and natural hazards**
Metro Vancouver's role is to: 3.4.1 Incorporate climate change and natural hazard risk assessments into the planning and location of Metro Vancouver utilities, assets and operations.	**Metro Vancouver will:** 3.4.1 Incorporate climate change and natural hazard risk assessments into the planning and location of existing and future Metro Vancouver utilities, assets, operations, **and other critical infrastructure**.

Metro 2040 Climate Actions	*Metro 2050* Climate Actions
Metro Vancouver's role is to: 3.4.2 Work with the federal government and the province, TransLink and municipalities to: a) consider climate change impacts (e.g. sea level rise) and natural hazard risks (e.g. earthquake, flooding, erosion, subsidence, mudslides, interface fires) when extending utilities and transportation infrastructure that encourages land use development; b) research and promote best practices in adaptation to climate change as it relates to land use planning. 3.4.6 That the Integrated Partnership for Regional Emergency Management, in collaboration with the federal government and the province, and other agencies: a) identify areas that are vulnerable from climate change and natural hazard risks, such as those listed in Actions 3.4.2 and 3.4.4; b) coordinate priority actions to address the vulnerabilities identified, including implementation and funding strategies. 3.4.7 That the federal government and the province, in collaboration with the Integrated Partnership for Regional Emergency Management and other agencies: a) provide financial assistance and timely data and information, such as flood hazard mapping, shoreline mapping, hydrological and hydraulic studies, to better enable local governments to fulfill their flood hazard management roles and responsibilities; b) provide a coordination role to address flood hazard issues and management decisions; c) implement appropriate preparatory actions to address the implications of long-term sea level rise on infrastructure planning, construction, and operations; d) review and improve the effectiveness of existing provincial legislation and guidelines regarding flood hazard management by municipalities.	**Metro Vancouver will:** 3.4.2 Work with the Integrated Partnership for Regional Emergency Management, the Federal Government, the Province, First Nations, TransLink, member jurisdictions, adjacent regional districts, and other stakeholders, as appropriate, to: a) **collaboratively develop and share information and data related to hazards, risks, and vulnerabilities in the Metro Vancouver region, which may include preparing a regional multi-hazard map**, and identifying and coordinating priority actions, implementation strategies, and funding mechanisms; b) plan for climate change impacts and natural hazard risks when extending utilities and transportation infrastructure that support development; c) **support the integration of emergency management, utility planning, and climate change adaptation principles in land use plans, transportation plans, and growth management policies**; d) research and promote best practices and **develop guidelines to support resilience to the impacts of climate change and natural hazards** as it relates to planning and development; e) **support regional flood management approaches**, such as the implementation of the Lower Mainland Flood Management Strategy; and f) **research and share information related to the impacts of climate change and natural hazards on vulnerable populations, and focus resilience actions on equitable outcomes**. 3.4.4 Advocate to the Federal Government and the Province that they: a) review and improve existing provincial legislation and guidelines regarding flood hazard management at the local level, **encourage the adoption of local flood hazard policies and bylaws**, and implement appropriate preparatory actions to address the long-term implications of sea level rise on infrastructure planning, construction, and operations; b) **incorporate resilience considerations into building codes and standards**; c) **modernize the provincial *Emergency Program Act* and associated regulations with requirements for land use planning, and consider land use implications in the development of climate change adaptation strategies**; and d) provide guidelines, programs, funding, and timely data and information to **support regional and local planning for climate change impacts and natural hazards**.
Metro Vancouver's role is to: 3.4.3 Accept Regional Context Statements that encourage land use, transportation and utility infrastructure which improve the ability to withstand climate change impacts and natural hazard risks and that meet or work towards Actions 3.4.4 and 3.4.5.	**Metro Vancouver will:** 3.4.3 Accept Regional Context Statements that encourage land use, settlement patterns, transportation and utility infrastructure which improve the ability to withstand climate change impacts and minimize natural hazard risks, and that meet or work towards Actions 3.4.5, 3.4.6, 3.4.7, and 3.4.8.

Metro 2040 **Climate Actions**	***Metro 2050*** **Climate Actions**
The role of municipalities is to: 3.4.4 Adopt Regional Context Statements that include policies to encourage settlement patterns that minimize risks associated with climate change and natural hazards (e.g. earthquake, flooding, erosion, subsidence, mudslides, interface fires).	**Member jurisdictions will:** 3.4.5 Adopt Regional Context Statements that: a) include policies that minimize risks associated with climate change and natural hazards in existing communities through tools **such as heat and air quality response plans, seismic retrofit policies, and flood-proofing policies**; and b) **include policies that discourage new development in current and future hazardous areas to the extent possible through tools such as land use plans, hazard-specific Development Permit Areas, and managed retreat policies, and where development in hazardous areas is unavoidable, mitigate risks**.
3.4.5 Consider incorporating climate change and natural hazard risk assessments into the planning and location of municipal utilities, assets and operations.	3.4.6 **Incorporate climate change** and natural hazard risk assessments into planning and location decisions for new municipal utilities, assets, operations, and community services.
	3.4.7 **Integrate emergency management, utility planning, and climate change adaptation principles when preparing land use plans, transportation plans, and growth management policies**. 3.4.8 **Adopt appropriate planning standards, guidelines, and best practices related to climate change and natural hazards, such as flood hazard management guidelines and wildland urban interface fire risk reduction principles.**
Goal 4: Develop Complete Communities	**Goal 4: Provide Diverse and Affordable Housing Choices**
No specific climate actions for housing	**Strategy 4.1 Expand the supply and diversity of housing to meet a variety of needs** **Member jurisdictions will:** 4.1.8 Adopt Regional Context Statements that: c) identify policies and actions that contribute to the following outcomes: viii) existing and future housing stock that is **low carbon** and **resilient to climate change impacts and natural hazards.** 4.1.9 Prepare and implement housing strategies or action plans that: c) identify housing priorities, based on the assessment of local housing market conditions, household incomes, changing population and household demographics, **climate change and natural hazards resilience**, and key categories of local housing need, including specific statements about special needs housing and the housing needs of equity-seeking groups; and
	Strategy 4.2 Expand, retain, and renew rental housing supply and protect tenants **Member jurisdictions will:** 4.2.7 Adopt Regional Context Statements that: d) identify policies and actions that contribute to the following outcomes: v) **reduced energy use and greenhouse gas emissions** from existing and future rental housing stock, while considering impacts on tenants and affordability.

Metro 2040 Climate Content	*Metro 2050* Climate Content
Goal 5: Support Sustainable Transportation Choices	
Metro Vancouver's role is to: 5.1.2 Communicate to TransLink that Metro Vancouver's objectives for the regional transportation system are: b) to support **energy consumption**, **greenhouse gas emission**, and air quality objectives (as described in Strategy 3.3).	**Strategy 5.1 Coordinate land use and transportation to encourage transit, multiple-occupancy vehicles, cycling and walking** **Metro Vancouver will:** 5.1.2 Establish the following objectives for the regional transportation system: b) reduce **energy consumption and greenhouse gas emissions** while improving air quality, as set out in Strategy 3.3; and **TransLink will:** 5.1.15 In support of coordinated land use and transportation to encourage transit, multiple occupancy vehicles, cycling, walking, and rolling: f) work with the Province, the Integrated Partnership for Regional Emergency Management, and member jurisdictions to **evaluate the potential impacts of climate change and known unmitigated natural hazards** on rapid transit alignments, station locations, and associated transportation infrastructure;
No specific climate actions for land use and transportation coordination	**Strategy 5.2 Coordinate land use and transportation to support the safe and efficient movement of vehicles for passengers, goods, and services** **Metro Vancouver will:** 5.2.4 Advocate to the Province, TransLink, and neighbouring regional districts to request that the following elements are considered when contemplating future expansion of private vehicle capacity on major roads, highways, and crossings: b) the **negative impacts on the achievement of regional greenhouse gas emission reduction targets** and air quality objectives; f) the ability of the transportation system to **withstand known and unmitigated climate change impacts and natural hazards.**

CITY OF PORT COQUITLAM
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Tuesday, February 22, 2022

Roger Quan
Metro Vancouver
Roger.Quan@metrovancouver.org

Dear Roger Quan ,

Thank you for your continued interest in our process to develop a 'made-in-PoCo' Climate Action Plan. As communities across B.C are grappling with the impacts of climate change, we are developing our own Port Coquitlam vision for a low-carbon future and identifying the steps required to get there.

We have completed Phase 1 of the planning process and are now inviting you to take part in Phase 2.

In Phase 1, we heard about community concerns and priorities for how we can do more in Port Coquitlam to tackle climate change. The Phase 1 Engagement Summary Report (available March 2, 2022) provides a summary of what we've heard from the community to date.

Since then, we have integrated what we've learned from the community with technical analysis, and will use this combined information to develop goals for Port Coquitlam's low-carbon future and preliminary actions to get us there. **This is where we need your help**.

- *Do the proposed goals address your climate-related concerns?*
- *How might these goals and actions impact or benefit you and your community?*
- *What should we prioritize as we implement the Plan to reflect our community's vision for climate action?*
- *What role can you and your community play as a partner and supporter for climate action?*

We are inviting you to take part in Phase 2 to help us answer these questions. There are several ways you can have your say:

1. We invite you or another representative from your organization to attend a small workshop with other local and regional partners and Port Coquitlam staff on March 7, 2-4pm. **Please RSVP here by March 3.**
2. Complete the Phase 2 online survey between **March 8 and April 1** and distribute it to your network.

Thank you for continuing to share your perspectives and reflections on how we can do more in Port Coquitlam to tackle this complex problem that impacts all of us. To read the Phase I Engagement Summary Report, or to take the online survey, please visit www.portcoquitlam.ca/climate.

Should you have any questions about this project please reach out to me directly.

Thank you,

Clarissa Huffman
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