metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE

MEETING

Thursday, April 6, 2023
9:00 am
Meeting conducted electronically/in-person pursuant to the Procedure Bylaw
28th Floor Committee room, 4515 Central Boulevard, Burnaby, British Columbia

A G E N D A[1]

1. ADOPTION OF THE AGENDA

1.1 April 6, 2023 Meeting Agenda
That the Climate Action Committee adopt the agenda for its meeting scheduled for April 6, 2023 as circulated.

2. ADOPTION OF THE MINUTES

2.1 March 9, 2023 Meeting Minutes *pg.5*
That the Climate Action Committee adopt the minutes of its meeting held March 9, 2023 as circulated.

3. DELEGATIONS

4. INVITED PRESENTATIONS

4.1 Melina Scholefield, Executive Director, Metro Vancouver Zero Emissions Innovation Centre
Subject: Zero Emissions innovation Centre

4.2 Diana Stephenson Senior Vice President, Customer & Corporate Affairs, BC Hydro
Subject: Perspectives on Climate 2050 Energy Roadmap

4.3 Brent Graham, Senior Manager, Government Relations & Public Policy and Mandy Assi, Senior Manager, Community & Indigenous Relations, Fortis BC
Subject: Climate 2050 Energy Roadmap Considerations

5. REPORTS FROM COMMITTEE OR STAFF

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

5.1 Climate Impacts on the Water Supply Areas

Verbal Update

Designated Speaker: Peter Marshall, Field Hydrologist, Environmental Management, Water Services Department

5.2 Metro Vancouver's Climate 2050 Energy Roadmap *pg. 11*

That the MVRD Board:

a) endorse the *Climate 2050 Energy Roadmap* as attached to the report dated March 10, 2023, titled "Metro Vancouver's Climate 2050 Energy Roadmap" as part of a series of Roadmaps towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the energy sector;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Energy Roadmap*; and
c) direct staff to update the Roadmap, as needed, in response to changes in science, technology, and policy.

5.3 Metro Vancouver's Climate 2050 Nature and Ecosystems Roadmap *pg. 72*

That the MVRD Board:

a) endorse the *Climate 2050 Nature and Ecosystems Roadmap* as attached to the report dated February 15, 2023, titled "Metro Vancouver's Climate 2050 Nature and Ecosystems Roadmap" as the initial Roadmap to achieve the *Climate 2050* vision, goals, and targets for a carbon neutral and resilient region supported by healthy and biodiverse ecosystems;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Nature and Ecosystems Roadmap*; and
c) direct staff to update the Roadmap, as needed, in response to new information.

5.4 MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023 *pg. 142*

That the MVRD Board:

a) give first, second, and third reading to *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023*; and
b) pass and finally adopt *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023.*

5.5 MVRD Ticket Information Utilization Amendment Bylaw No. 1363, 2023 *pg. 155*

That the MVRD Board:

a) give first, second, and third reading to *Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 202*3; and
b) pass and finally adopt *Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 2023.*

5.6 Climate Action Dialogues *pg. 168*

That the Climate Action Committee receive for information the report dated March 10, 2023, titled, "Climate Action Dialogues".

5.7 Manager's Report

That the Climate Action Committee receive for information the report dated March 13, 2023, titled "Manager's Report". *pg. 171*

6. INFORMATION ITEMS

6.1 Climate Impacts on the Water Supply Areas *pg. 174*

6.2 News Article from Canadian Press, March 3, 2023 re Parkland Cancels Plans to Build Stand-Alone Renewable Diesel Complex at BC Refinery *pg. 179*

6.3 Howe Sound Community Forum & Átl'ka7tsem / Howe Sound Biosphere Region Updates *pg. 180*

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 meeting scheduled for April 6, 2023 pursuant to section 226 (1) (a) of the *Local Government Act* and the *Community Charter* provisions as follows:

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

(h) an administrative tribunal hearing or potential administrative tribunal hearing affecting the municipality, other than a hearing to be conducted by the council or a delegate of council;

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

(2) A part of a council 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 municipality 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 meeting of April 6, 2023.

Membership:

Dominato, Lisa (C) – Vancouver
Johnstone, Patrick (VC) – New Westminster
Berry, Ken – Lions Bay
Bose, Mike – Surrey
Carr, Adriane – Vancouver
Gu, Alison – Burnaby
Lahti, Meghan – Port Moody
Leonard, Andrew – Bowen Island
McCutcheon, Jen – Electoral Area A
McNulty, Bill – Richmond
Pope, Catherine – North Vancouver District
Ross, Jamie – Belcarra
Ruimy, Dan – Maple Ridge
Wallace, Rosemary – Langley City
Woodward, Eric – Langley Township

METRO VANCOUVER REGIONAL DISTRICT
CLIMATE ACTION COMMITTEE

Minutes of the Regular Meeting of the Metro Vancouver Regional District (MVRD) Climate Action Committee held at 9:00 am on Thursday, March 9, 2023 in the 28th Floor Committee Room, 4515 Central Boulevard, Burnaby British Columbia.

MEMBERS PRESENT:
Chair, Councillor Lisa Dominato*, Vancouver (departed at 9:50 am)
Vice Chair, Mayor Patrick Johnstone, New Westminster
Councillor Mike Bose, Surrey
Councillor Adriane Carr, Vancouver
Councillor Alison Gu*, Burnaby
Mayor Meghan Lahti, Port Moody
Mayor Andrew Leonard, Bowen Island
Director Jen McCutcheon, Electoral Area A
Councillor Bill McNulty, Richmond
Councillor Catherine Pope*, North Vancouver District
Mayor Jamie Ross, Belcarra
Mayor Dan Ruimy, Maple Ridge
Councillor Rosemary Wallace, Langley City
Mayor Eric Woodward*, Langley Township

MEMBERS ABSENT:
Mayor Ken Berry, Lions Bay

STAFF PRESENT:
Jerry W. Dobrovolny †, Chief Administrative Officer
Roger Quan, Director, Air Quality and Climate Change, Parks and Environment
Natalia Melnikov, Legislative Services Coordinator, Board and Information Services

1. ADOPTION OF THE AGENDA

1.1 March 9, 2023 Meeting Agenda

It was MOVED and SECONDED
That the Climate Action Committee adopt the agenda for its meeting scheduled for March 9, 2023 as circulated.

CARRIED

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

2. ADOPTION OF THE MINUTES

2.1 February 2, 2023 Meeting Minutes

It was MOVED and SECONDED
That the Climate Action Committee adopt the minutes of its meeting held February 2, 2023 as circulated.

CARRIED

3. DELEGATIONS

3.1 Mark Grist, President, BrightSide Solutions

Mark Grist, President, BrightSide Solutions, spoke to the Climate Action Committee regarding the highest greenhouse gas emissions reductions and the best use of Renewable Natural Gas in Heavy Duty Transportation, outlining the pricing rationale and weaknesses in FortisBC's proposal for renewable gas use, and asking Metro Vancouver to oppose discriminatory pricing for transportation customers.

In response to questions, members were informed that a future report with updates on the *Climate 2050* energy roadmap and the Fortis application would be coming to an upcoming Climate Action meeting.

Presentation material titled "BrightSide Presentation to Metro Vancouver CAC Re Highest and Best Use of Renewable Natural Gas" is retained with the March 9, 2023 Climate Action Committee agenda.

4. INVITED PRESENTATIONS

No items presented.

5. REPORTS FROM COMMITTEE OR STAFF

5.1 Climate 2050 Engagement and Public Education Strategy

Report dated February 8, 2023, from Ann Rowan, Division Manager, Collaboration and Engagement, Lucy Duso, Senior Engagement Advisor, External Relations Department, providing the Climate Action Committee with an update on the new *Climate 2050 Engagement and Public Education Strategy*, for 2023 - 2025.

Members were provided a presentation on the *Climate 2050 Engagement and Public Education Strategy*, outlining opportunities and best practices in climate engagement and communication, *Climate 2050* framework, and collaborative partnership opportunities.

Members commented on the need to focus on the positive messaging when educating on climate change, the need to involve youth and strengthen relationships with Indigenous People on climate actions. They also commented on

the need to streamline communication and policy education coming from all levels of government.

9:50 am Chair Dominato departed the meeting and Vice Chair Johnstone assumed the role of the Chair.

Presentation material titled "Climate 2050 Engagement and Public Education" is retained with the March 9, 2023 Climate Action Committee agenda.

It was MOVED and SECONDED
That the Climate Action Committee receive for information the report dated February 8, 2023, titled "Climate 2050 Engagement and Public Education Strategy".

CARRIED

5.2 2023 Regional District Sustainability Innovation Fund Applications

Report dated February 28, 2023, from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment, providing the Climate Action Committee with an overview of the nine projects recommended for Sustainability Innovation Funding for the MVRD Board's consideration.

Members were provided a presentation on the Sustainability Innovation Funds projects, outlining the annual proposal review process by the Boards.

In response to questions, members were informed about the ongoing effort to obtain funding from all levels of government and collaborate with municipalities and school boards that have experience operating zero emissions equipment. Members commented on the need to further educate and provide guidance to everyone in the region, including residents, businesses and industry.

Presentation material titled "2023 Sustainability Innovation Fund Applications" is retained with the March 9, 2023 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) Future Carbon Storage and Greenhouse Gas Emissions at Burns Bog under Different Management and Climate Scenarios for $184,779 over three years starting in 2023;
b) 1-In-50 Year Deep Energy Retrofit Project for Existing MURB's for $970,000 over three years starting in 2023;
c) Prefabricated Mass-Timber Panels in Existing MURB's for $692,000 over three years starting in 2023;
d) LBC for Existing Affordable Housing Projects for $200,000 over two years starting in 2023;
e) Decarbonized On-Demand Domestic Hot Water System for $370,000 over four years starting in 2023;

f) AirCnC: Cool 'n' Clean Air Centres for $200,000 over two years starting in 2023;
g) Revving Up the Shift to Green Machines for $240,000 over two years starting in 2023;
h) Extended Reality (XR) Modelling Platform for Metro Vancouver for $800,000 over two years starting in 2023;
i) Metro Vancouver Events Sustainability Audit for $80,000 in 2023.

CARRIED

5.3 2023 Liquid Waste Sustainability Innovation Fund Application

Report dated February 21, 2023, from Lillian Zaremba, Program Manager, Collaborative Innovations, Liquid Waste Services, providing the Climate Action Committee with an overview of the project recommended for Sustainability Innovation Funding for the GVS&DD Board's consideration.

Members were provided a presentation on the Liquid Waste Services application for the Sustainability Innovation Fund outlining the purpose of the project and highlighting the process of green hydrogen production from wastewater by-products.

Presentation material titled "2023 Sustainability Innovation Fund Applications" is retained with the March 9, 2023 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 $625,000 over two years starting in 2023 for the Hydrogen System Integration at Lulu Island Wastewater Treatment Plant (Phase 1) project.

CARRIED

5.4 2023 Water Sustainability Innovation Fund Applications

Report dated February 9, 2023, from Linda Parkinson, Director, Policy, Planning and Analysis, Water Services Department, providing the Climate Action Committee with an overview of the five projects recommended for Sustainability Innovation Funding for the GVWD Board's consideration.

Members were provided a presentation on the Water Services applications highlighting projects' benefits and phases of the projects.

Presentation material titled "2023 Sustainability Innovation Fund Applications" is retained with the March 9, 2023 Climate Action Committee agenda.

It was MOVED and SECONDED

That the GVWD Board approve the allocation from the Water Sustainability Innovation Fund of $1,700,000 for the following projects, starting in 2023:

a) Reducing Oxygen Use and Increasing Resiliency at the Coquitlam Water Treatment Plant for $150,000 over two years;

b) Studying the Preliminary Feasibility of Green Hydrogen Production from Hydropower at Cleveland Dam for $250,000 over two years;
c) Evaluation of Biofiltration at the Seymour Capilano Filtration Plant for $300,000 over three years;
d) Next Generation Snowpack Monitoring – Phase 3 for $450,000 over three years;
e) Building the Next Generation of Seasonal Water Supply & Demand Planning Tools for $550,000 over two years.

CARRIED

5.5 Appointment of Assistant District Director and Enforcement Officers

Report dated February 7, 2023, from Kathy Preston, Director Environmental Regulation and Enforcement, Parks and Environment, appointing one Metro Vancouver employee as a Board-designated assistant district director and five Metro Vancouver employees as Board-designated officers, and rescinding the appointments of four former employees.

It was MOVED and SECONDED

That the MVRD Board:

a) pursuant to the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008* and the *Environmental Management Act*:
   i. appoint Metro Vancouver employee Julie Saxton as assistant district director;
   ii. rescind the appointments of Doreen Cheng, Manjit Dhillon, Marlene Fuhrmann, and Peter Hagens as officers; and
   iii. appoint Metro Vancouver employees Mosi Aghbolaghy, Michael Goods, Jim Penrose, Jeffery Schmidt and Joanne Tunkiewicz as officers.
b) pursuant to section 28 of the *Offence Act* for the purpose of serving summons for alleged violations under the *Greater Vancouver Regional District Air Quality Management Bylaw 1082, 2008*:
   i. rescind the appointments of Doreen Cheng, Manjit Dhillon, Marlene Fuhrmann, and Peter Hagens; and
   ii. appoint Metro Vancouver employees Jeffery Schmidt and Joanne Tunkiewicz.

CARRIED

5.6 Manager's Report

Report dated February 28, 2023, from Roger Quan, Director, Air Quality and Climate Change, Parks and Environment, providing the Climate Action Committee with updates on the Community Wood Smoke Reduction Program, a letter of support for City of Vancouver's Climate Emergency Action Plan and Climate Justice Charter, and inviting members to join discussion on Solid Waste Management Plan vision and guiding principles.

It was MOVED and SECONDED
That the Climate Action Committee receive for information the report dated February 28, 2023, titled "Manager's Report".

CARRIED

6. INFORMATION ITEMS

6.1 Metro 2050 Climate Policy Enhancement Study – Project Initiation

6.2 News Article from the Daily Hive, February 15, 2023 re New TransLink incentive: Scrap your car and get 6 months of public transit rides

7. OTHER BUSINESS
No items presented.

8. BUSINESS ARISING FROM DELEGATIONS
No items presented.

9. RESOLUTION TO CLOSE MEETING

It was MOVED and SECONDED
That the Climate Action Committee close its regular meeting scheduled for March 9, 2023 pursuant to section 226 (1) (a) of the *Local Government Act* and the *Community Charter* provisions as follows:

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 and a third party.

CARRIED

10. ADJOURNMENT/CONCLUSION
Vice Chair Johnstone declared the meeting adjourned at 11:13 am.

Natalia Melnikov,
Legislative Services Coordinator

Patrick Johnstone,
Vice Chair

58631071 FINAL

To: Climate Action Committee

From: Nicole Chan, Project Engineer
Parks and Environment Department

Date: March 10, 2023 Meeting Date: April 6, 2023

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

RECOMMENDATION

That the MVRD Board:

a) endorse the *Climate 2050 Energy Roadmap* as attached to the report dated March 10, 2023, titled "Metro Vancouver's Climate 2050 Energy Roadmap" as part of a series of Roadmaps towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the energy sector;

b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Energy Roadmap*; and

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

EXECUTIVE SUMMARY

The *Climate 2050 Energy Roadmap* is one in a series of ten *Climate 2050* Roadmaps that presents a robust pathway to transition to 100% clean, renewable and resilient energy used in the region by 2050. The actions in this Roadmap and the other *Climate 2050* Roadmaps will achieve over 80% clean, renewable energy by 2050 and staff will continue to explore opportunities to further accelerate emission reductions during detailed planning and implementation. Energy use in Metro Vancouver is associated with approximately 90% of the region's overall greenhouse gas emissions. The *Energy Roadmap* includes six strategies and 36 actions to reduce emissions and enhance resilience. It identifies nine big moves. A draft of the *Energy Roadmap* was presented to the Climate Action Committee and Board in April 2022. During engagement on the draft roadmap staff heard input from local governments, energy utilities, the Province, and other key stakeholders. In response, staff have added and modified actions related to equity, renewable energy supply, and additional collaborations with First Nations. This report seeks endorsement of the *Climate 2050 Energy Roadmap* by the MVRD Board.

PURPOSE

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

BACKGROUND

Following the MVRD Board adoption of the *Climate 2050 Strategic Framework* in September 2018, staff were authorized in October 2019 to begin an integrated engagement process for *Climate 2050*, using a series of issue area discussion papers related to the roadmaps. A discussion paper on the *Climate 2050 Energy Roadmap* was received by the Climate Action Committee at its February 12, 2021 meeting, followed by a draft Energy Roadmap at the April 8, 2022 meeting. With the

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

CLIMATE 2050 STRATEGIC FRAMEWORK

Climate 2050 will guide our region's policies and collective actions to transition to a carbon neutral and resilient region over the next 30 years. Metro Vancouver is implementing *Climate 2050* through ten issue area Roadmaps, which describe long-term goals, targets, strategies and actions to reduce regional greenhouse gases (GHGs) and ensure that this region is resilient to climate change impacts.

Implementation is also driven by Metro Vancouver's management plans including for liquid waste, solid waste, drinking water and regional parks, as well as the regional growth strategy and *Clean Air Plan.* For actions within the jurisdiction or responsibility of others, Metro Vancouver can play a supporting and convening role, working closely with other orders of government, First Nations, and member jurisdictions, along with other key stakeholders, to advance implementation.

METRO VANCOUVER'S *CLIMATE 2050 ENERGY ROADMAP*

The *Climate 2050 Energy Roadmap* (Attachment 1) is Metro Vancouver's pathway to ambitious and necessary change in our energy system. The Roadmap sets the goals that "all of the energy used in Metro Vancouver is derived from clean, renewable sources" and that "all regional energy infrastructure is reliable and resilient to the current and future impacts of climate change." The Roadmap contains six strategies and 36 actions to reduce emissions and enhance resilience.

Potential Greenhouse Gas Reductions

The *Climate 2050 Energy Roadmap* establishes targets of 60% and 100% clean, renewable energy used in the region by 2030 and 2050, respectively. Modelling previously presented to the Committee estimates that actions in this and other Roadmaps could achieve approximately 40% clean, renewable energy by 2030 and over 80% by 2050, with associated significant reductions of GHG emissions in the region. However, these reductions will still fall short of the 2030 and 2050 targets adopted by the Metro Vancouver Board, which reflect the reductions needed to limit global warming to 1.5 degrees Celsius. Achieving these science-based targets presents a significant challenge as well as opportunity for the region's residents, businesses, and energy sector. Implementation of the *Energy Roadmap* is a critical next step, and Metro Vancouver and its partners will continue to explore opportunities to further accelerate emission reductions during the detailed planning and implementation of the actions.

Big Moves in the *Energy Roadmap*

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

1. Align British Columbia's Energy Objectives with Strong Climate Action
2. Strong Climate Mandate for Energy Utilities
3. Electrification Rates
4. Time-of-Use Rates, Demand Response Programs, and Electric Vehicle Peak Reduction Programs
5. More Stringent Low Carbon Fuel Standards
6. Implement Renewable Gas Content Requirements

7. Prioritize Sustainability in Biofuel Feedstock
8. Account for the Full Climate Impact of Fossil Fuel Production and Export Projects
9. Comprehensive Climate Risk and Vulnerability Assessment

Metro Vancouver is working to ensure Roadmap content is accessible to a broad audience. As Roadmap content is endorsed and published in full, staff will also provide an executive summary and unpack the Roadmap content in plain language as a web resource.

CONSULTATION AND ENGAGEMENT PROCESS
In 2022, staff conducted an informational webinar and various stakeholder engagement workshops. The full draft roadmap was publically available on the Metro Vancouver website, and the opportunity to provide feedback promoted through social media platforms, the Climate 2050 mailing list, and targeted emails to key stakeholder groups. Participants in the engagement included the energy utilities, municipalities, the Province, university research groups, business groups, the health authorities, and the public. A number of stakeholders cited strong support for the accelerating electrification and limiting fossil fuel expansion strategies. A summary of the feedback received can be found in Attachment 3.

The key revisions to the draft roadmap include:

- A new action related to reducing energy poverty.
- An action was modified to reflect the need to modernize the electrical grid.
- A new action relating to implementing tracking, verification, and reporting requirements for renewable gas supply.
- A new corporate leadership action on transitioning corporate energy use to 100% clean, renewable energy between 2035 and 2040.

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

- Additional context on the need to provide reliable energy for mechanical cooling to ensure resident health and safety in extreme heat events.
- Additional context relating to providing additional supports for equity-seeking groups.
- Additional context on supply of renewable gases, including medium- and long- term availability, and risks associated with out-of-province renewable gas supply.
- Additional content about the role of rooftop solar energy.

First Nations Engagement
In 2022, staff sent an engagement letter to the ten in-region First Nations. Feedback was received from two Nations, citing a desire for increased collaboration between First Nations and Metro Vancouver on key actions, and concerns with affordable access to clean, renewable energy. In response, a number of actions were revised to strengthen collaboration with First Nations, and to consider equitable supports to Indigenous households throughout the energy transition.

ALTERNATIVES
1. That the MVRD Board:
   a) endorse the *Climate 2050 Energy Roadmap* as attached to the report dated March 10, 2023, titled "Metro Vancouver's Climate 2050 *Energy* Roadmap" as part of a series of Roadmaps

towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the energy sector;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Energy Roadmap*; and
c) direct staff to update the Roadmap, as needed, in response to changes in science, technology, and policy.

2. That the MVRD Board:
   a) endorse the *Climate 2050 Energy Roadmap* as attached to the report dated March 10, 2023, titled "Metro Vancouver's Climate 2050 *Energy* Roadmap" as part of a series of Roadmaps towards achievement of the *Climate 2050* vision, goals, and targets for greenhouse gas reduction and resilience in the energy sector, with amendments proposed by the Climate Action Committee;
   b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Energy Roadmap*; and
   c) direct staff to update the Roadmap, as needed, in response to changes in science, technology, and policy.

3. That the MVRD Board receive for information the report dated March 10, 2023, titled "Metro Vancouver's *Climate 2050 Energy Roadmap*" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

The resources required to develop and engage on the *Climate 2050 Energy Roadmap* were approved under the 2021, 2022, and 2023 budgets. Continued alignment of implementation activities and deliverables for the *Climate 2050 Energy Roadmap* with the other roadmaps is intended to make the best use of resources available. As such, resource and cost implications will be brought back to the Committee and Board in coordination with annual budgeting and work planning processes. The 2024 and subsequent annual budgets and five-year financial plans will reflect the resource needs to begin implementation of actions in the *Climate 2050 Energy Roadmap*.

CONCLUSION

Metro Vancouver's *Climate 2050 Energy Roadmap* sets an ambitious path towards 100% clean, renewable, and resilient energy by 2050. During 2022, staff conducted engagement on the draft Energy Roadmap, and used that input to guide the revisions. To achieve the 2030 and 2050 targets, Metro Vancouver and its partners need to start on the actions in the Energy Roadmap as soon as possible, using the full extent of each agency's authority, while continuing to explore opportunities to further accelerate emission reductions and improve the resiliency of the energy system. Staff recommend Alternative 1, to endorse the *Climate 2050 Energy Roadmap*.

Attachments

1. *Climate 2050 Energy Roadmap*, dated March 10, 2023
2. *Climate 2050 Energy Roadmap*, Executive Summary
3. Summary of Engagement Feedback

49392603

CLIMATE **2050 Roadmap**

Energy

A pathway to clean, renewable, and resilient energy in Metro Vancouver

April 2023

FRONT COVER: PANORAMIC NIGHT VIEW IN METRO VANCOUVER

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

March 2023

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: qićəy̓ (Katzie), q̓ʷɑ:ńƛəń (Kwantlen), kʷikʷəƛəm (Kwikwetlem), máthxwi (Matsqui), xʷməθkʷəy̓əm (Musqueam), qiqéyt (Qayqayt), se'mya'me (Semiahmoo), Sḵwx̱wú7mesh Úxwumixw (Squamish), scəẃaθən məsteyəxʷ (Tsawwassen), and sə́lílwətaʔɬ (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.

The goals and targets at the heart of Metro Vancouver's climate-related plans are based on the best available information. Reaching them is a top priority for the organization and the region. We must take bold action now to become a carbon neutral region by 2050, while recognizing that changes to our climate are already occurring, and that climate resilience must be a central consideration for the development of the region. The *Climate 2050 Energy Roadmap* was developed between 2020-2022 and introduced for stakeholder comment during the COVID-19 pandemic. Across the globe, the pandemic response has provided a glimpse of what is possible and what we can achieve with coordinated efforts and common goals in a time of crisis.

The actions in this Roadmap reflect 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

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. Metro Vancouver's core utility services include drinking water, sewage treatment, and solid waste management, along with regional services like regional parks, affordable housing, regional land use planning, and air quality and climate action that help keep the region one of the most livable in the world.

Mission

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

1. Serve as a Regional Federation

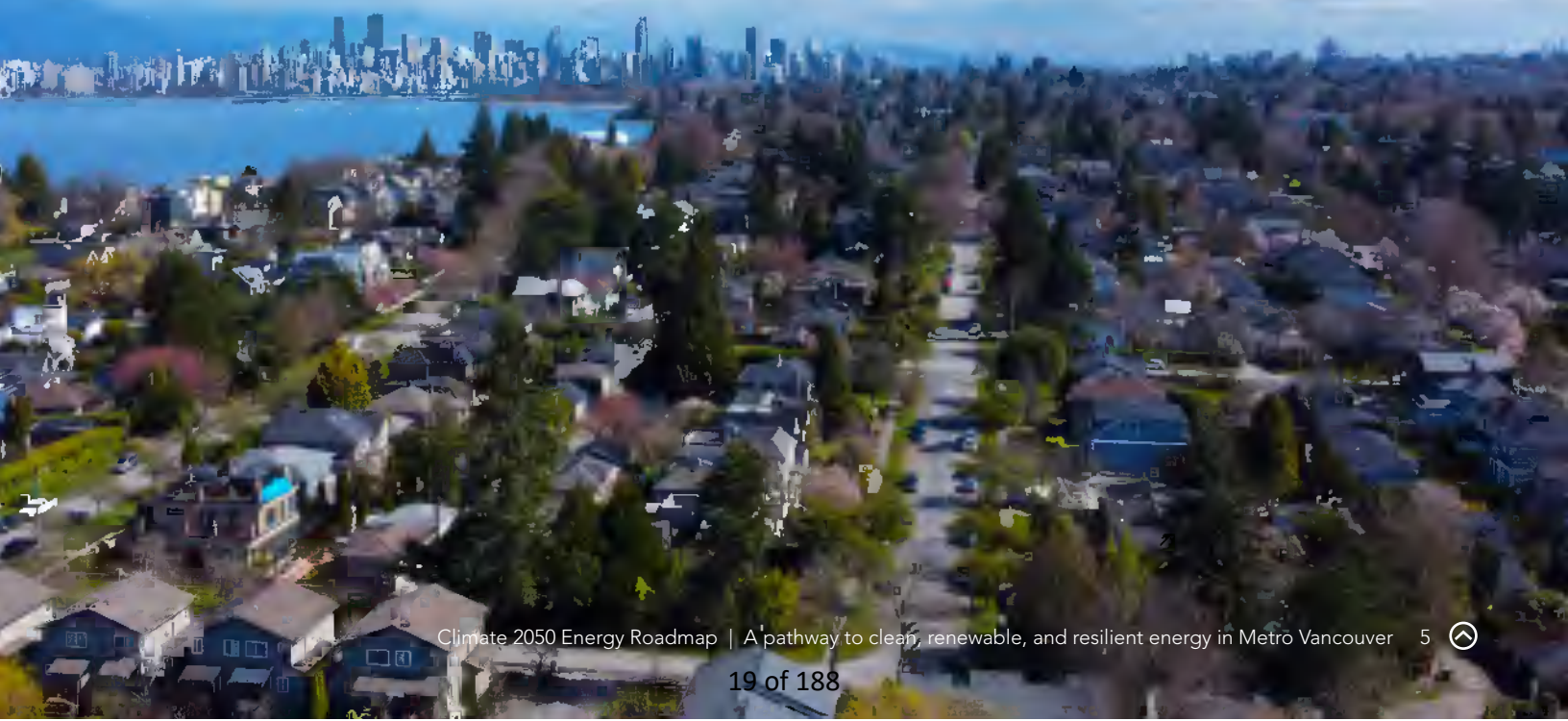
Serve as the main political forum for discussion of significant community issues at the regional level, and facilitate the collaboration of members in delivering the services best provided at the regional level.

2. Deliver Core Services

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

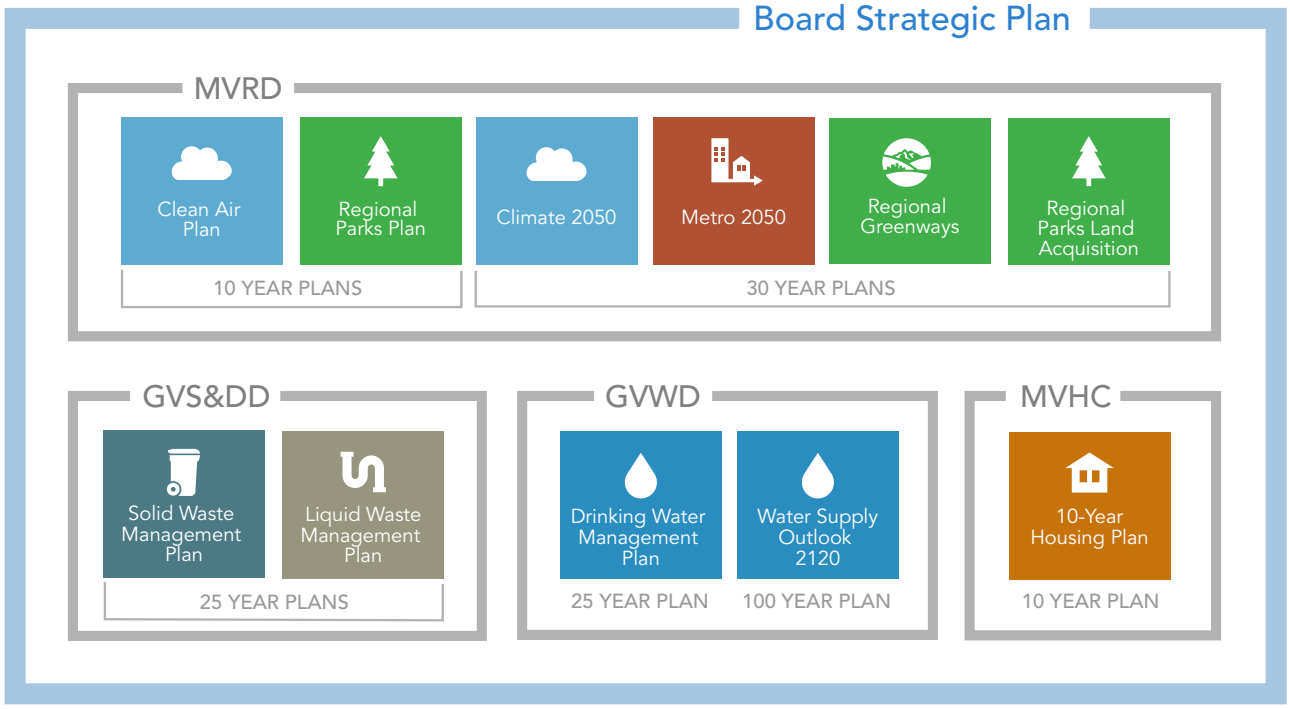
3. Plan for the Region

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



Building a Resilient Region

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



REGIONAL MANAGEMENT PLANS/STRATEGIES

Metro Vancouver's Roles and Responsibilities for Climate Action

The actions to achieve carbon neutrality and build 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 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

Energy is essential to our daily lives. We rely on energy every day to work, study, play, and so much more. However, human use of fossil fuels (such as gasoline, diesel, and fossil natural gas – often referred to as 'natural gas') as an energy source is associated with 90% of greenhouse gas emissions in our region. Fossil fuels have traditionally been used to heat our homes, move people and goods, and power industrial processes, but this is rapidly changing.

Transitioning to clean, renewable energy will be essential to meeting emission reduction targets and reaching a carbon neutral region by 2050. Reducing energy use and increasing energy efficiency are the first steps to reducing emissions from energy and increasing resiliency. The next step is to replace fossil fuel use with clean, renewable energy, such as electricity. In British Columbia (BC), 98% of electricity generated is low or zero carbon, derived from renewable sources such as hydro, biomass, or wind power. Many technologies that can replace fossil fuels with electricity are already commercially available, such as electric vehicles and heat pumps for heating homes and buildings. In addition to reducing greenhouse gas emissions, switching to clean, renewable electricity can improve air quality, contributing to the health of residents in the region.

As we transition to clean, renewable energy, it is critical that we develop an energy system that is resilient to the impacts of a changing climate. Impacts such as extreme heat and severe storms threaten the reliability of our energy supply. We must protect existing energy infrastructure, and build resilient energy systems, to ensure that energy supply continues to be reliable.

The goals and targets Climate 2050 Energy Roadmap are closely linked to the actions in the the other Climate 2050 Roadmaps in particular the **Transportation, Buildings and Industry & Business Roadmaps**.

Metro Vancouver, together with its member jurisdictions, has been taking action on climate change for decades. But we need to do more to achieve the deep reductions in greenhouse gas emissions required to meet our goals and to prepare for the impacts of climate change. Coordination and collaboration with other orders of government, First Nations, energy regulators, energy utilities, and other regional partners will be essential to transitioning to 100% clean, renewable, and resilient energy.

The *Energy Roadmap* lays out 36 36 actions for transitioning to clean, renewable energy, and increasing resiliency, organized under the following six strategic areas:

1. Plan for the Transition to Clean, Renewable, and Resilient Energy
2. Accelerate Electrification
3. Increase Sustainable Production of Low Carbon Biofuels and Hydrogen
4. Limit Expansion of Fossil Fuel Production
5. Protect Existing Energy Systems from Current and Future Climate Impacts
6. Build New Energy Systems that are Climate Resilient

WIND TURBINE

Contents

Navigate back to the Table of Contents by clicking this button.

VIEW FROM WEST VANCOUVER

Visioning Clean, Renewable, Resilient Energy in 2050

In 2050, the Metro Vancouver region has transitioned away from fossil fuels such as gasoline, diesel, and fossil natural gas (often referred to as 'natural gas'), to 100% clean, renewable energy. Society has substantially reduced its energy use through development of walkable urban centres and reliable public transport; buildings that use very little energy; a circular economy which reduces the need for energy-intensive resource extraction, manufacturing, and distribution of goods; and use of energy-efficient equipment and processes.

The remaining energy use is 100% clean, renewable. Energy supply is integrated and diverse – for example, energy is distributed through a smart electricity grid and renewable gas distribution system, but also from local, independent systems such as microgrids. Most buildings and vehicles are electrified, while some buildings, large trucks, industrial processes, marine, air, and rail applications rely on a combination of district energy systems, low carbon hydrogen, and biofuels. Use of clean energy has resulted in improved regional air quality. Energy infrastructure is resilient and reliable – energy outages are infrequent, despite increased extreme weather due to climate change, and essential services all have backup power systems in place.

Climate 2050 Energy Roadmap

A pathway to clean, renewable, resilient energy in Metro Vancouver

The Challenge

Energy is critical to our daily lives – energy heats and cools our homes, fuels our vehicles, and powers our society. However, the majority of the energy we use today is derived from fossil fuels, a major source of greenhouse gases and health-harming air contaminants (such as fine particulate matter). Fossil fuels, primarily gasoline, diesel, and fossil natural gas, are responsible for 90% of the region's greenhouse gas emissions. Transitioning to clean, renewable energy is critical to reaching climate targets for both 2030 and 2050. However, this will require a large-scale transformation in how we generate, distribute, and use energy. We need to plan for what a future energy system will look like, and accelerate the transition towards 100% clean, renewable, and resilient energy.

A carbon neutral region is the best option for future generations to maintain a good quality of life beyond 2050. We have to make some difficult decisions and investments today to avoid passing on the full burden and responsibility of climate action to future generations at higher cost and consequence. Metro Vancouver and many of its member jurisdictions have committed to ambitious, science-based targets and bold leadership in action to respond to the climate crisis. This plan responds to the global challenge to come together, think big, and act now.

What is a Carbon Neutral Region?

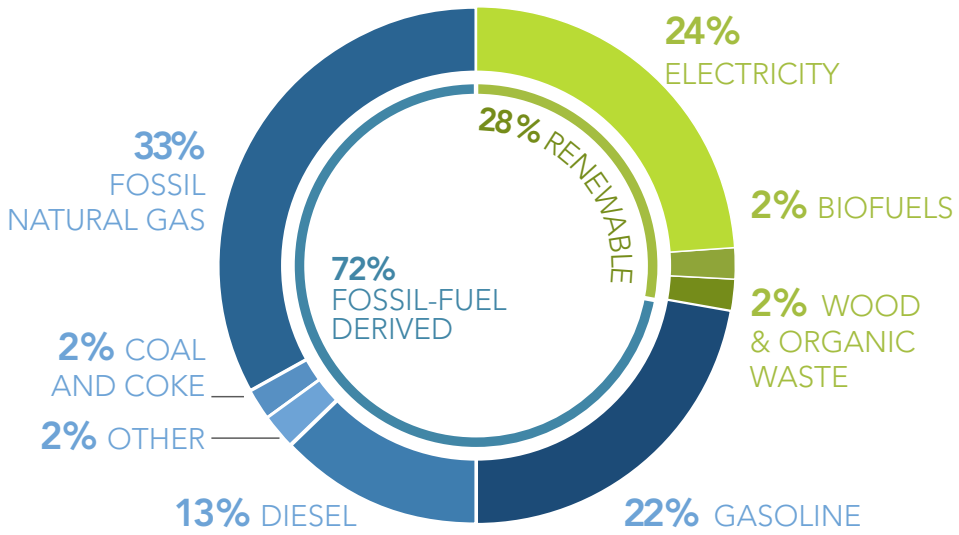
A carbon neutral region means that we have achieved the deepest greenhouse gas emission reductions possible across all economic sectors, and any emissions left are balanced out by the carbon dioxide removed from the atmosphere by the plants, trees, and soil in the region, as well as by potential carbon capture technologies that are currently under development.

Emissions from Energy in Metro Vancouver

Energy plays a vital role in powering the region's economy and our daily lives. Clean, renewable energy is energy derived from sources with low or zero emissions, and is replenished over days and years. In Metro Vancouver, 28% of the energy we use is clean, renewable energy (Figure 2), of which 24% is from clean, renewable electricity. The major energy sources used within each regional sector are as follows:

- **Buildings** – fossil natural gas, electricity, and district energy systems are used to heat and cool our homes, and electricity is used to power appliances and other devices.
- **Transportation** – diesel and gasoline fuel the movement of people, goods, and services, whether by car, truck, train, plane, or boat; electricity and biofuels power a small but increasing part of this sector.
- **Industry** – many different sources of energy are used in industrial processes including fossil natural gas, electricity, biomass, coal, and petroleum coke.
- **Non-road engines** – diesel and gasoline fuel non-road equipment such as backhoes and excavators.
- **Agriculture** – fossil natural gas provides most of the energy for greenhouses and diesel fuels farm vehicles and equipment.

FIGURE 2: SOURCES OF ENERGY WITHIN METRO VANCOUVER (2015)



Fossil fuels make up approximately three-quarters of the energy used in the Metro Vancouver region, but are associated with 90% of the region's greenhouse gas emissions [1]. Non-energy emissions are primarily related to greenhouse gases produced during natural and industrial chemical processes. Reducing the use of fossil fuels while increasing the use of clean, renewable energy is a key emissions reduction opportunity.

1 Electricity does not produce appreciable emissions within our region. As BC's electricity is primarily produced from clean, renewable sources, there is a small amount of emissions related to out-of-region electricity generation.

Is Natural Gas a Fossil Fuel?

Fossil natural gas, often referred to as 'natural gas', is a fossil fuel. Fossil natural gas was formed millions of years ago from the pressurized and heated remains of organic material and is mostly composed of methane, about 95% by volume. Methane is a potent greenhouse gas, with a global warming potential of approximately 25 times that of carbon dioxide over a 100-year timeframe or 85 times over a 25-year timeframe. In BC, fossil natural gas is primarily produced through hydraulic fracturing, a process which uses significant amounts of water to fracture rock and extract natural gas. Fossil natural gas production is also associated with fugitive methane (released to the atmosphere from accidental release or leaks) and vented methane. Within the Metro Vancouver region, combustion of fossil natural gas is responsible for 32% of regional greenhouse gas emissions.

For the energy that is used in the region, greenhouse gases are emitted during production and transport, as well as during end-use. Lifecycle greenhouse gas emissions include emissions associated with all stages of energy production and use, from extraction, processing, distribution, through to end-use, and includes fugitive emissions, such as methane. While Metro Vancouver and its member jurisdictions have limited authority over emissions that occur outside of the region, Metro Vancouver can take action to increase use of energy sources that have lower lifecycle greenhouse gas emissions, such as electricity.

Some infrastructure associated with fossil fuel production and transport is located within the region. Large amounts of solid and liquid fossil fuels are exported through port terminals overseen by the Vancouver Fraser Port Authority (Port of Vancouver). These terminals export thermal and metallurgical coal, crude oil, and liquefied natural gas. Some companies have plans to expand fossil fuel exports. While Metro Vancouver and its member jurisdictions have minimal jurisdiction over energy exports, the region is home to a sizeable fossil fuel export network, which contributes to the lifecycle emissions of many fossil fuels used outside of the region.

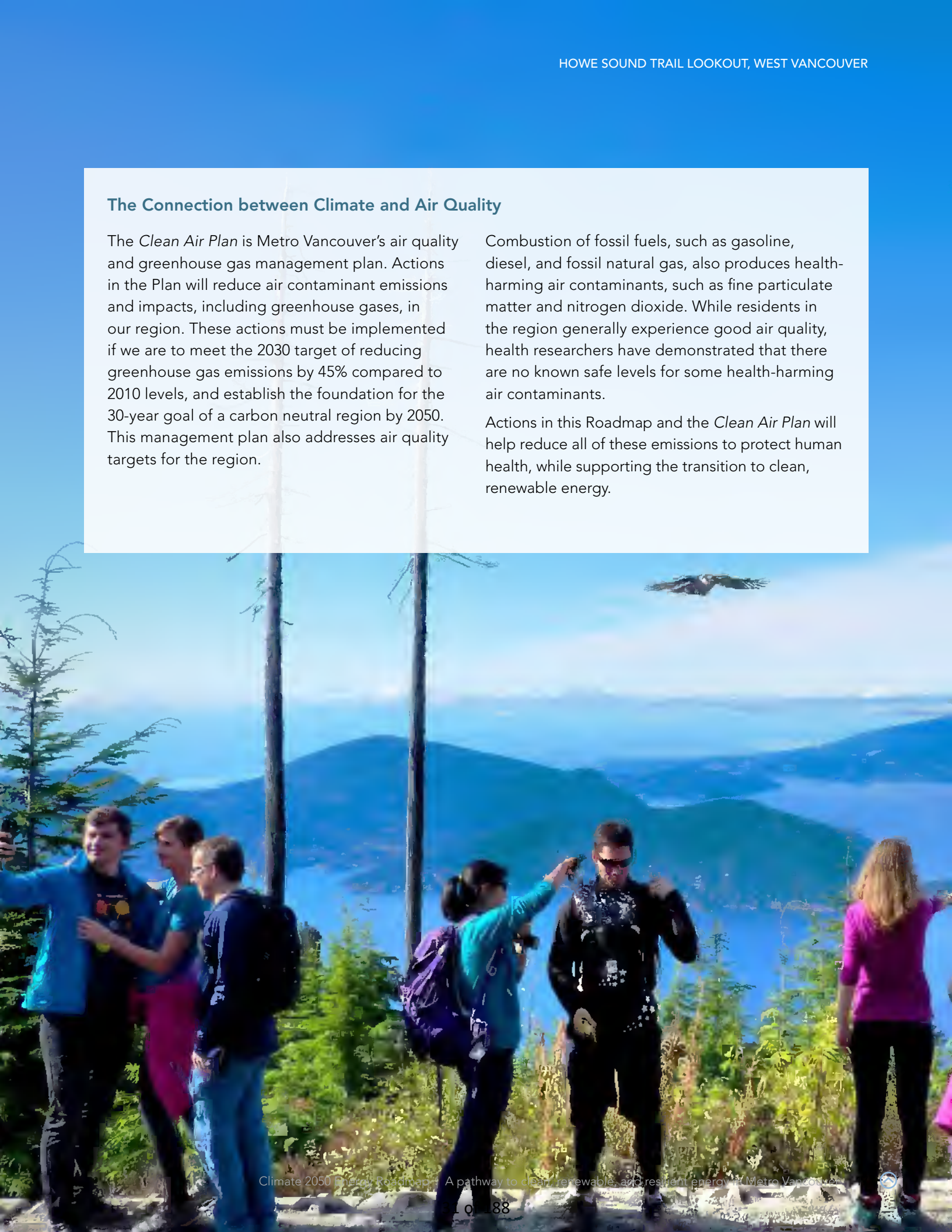
HOWE SOUND TRAIL LOOKOUT, WEST VANCOUVER

The Connection between Climate and Air Quality

The *Clean Air Plan* is Metro Vancouver's air quality and greenhouse gas management plan. Actions in the Plan will reduce air contaminant emissions and impacts, including greenhouse gases, in our region. These actions must be implemented if we are to meet the 2030 target of reducing greenhouse gas emissions by 45% compared to 2010 levels, 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.

Combustion of fossil fuels, such as gasoline, diesel, and fossil natural gas, also produces health-harming air contaminants, such as fine particulate matter and nitrogen dioxide. While residents in the region generally experience good air quality, health researchers have demonstrated that there are no known safe levels for some health-harming air contaminants.

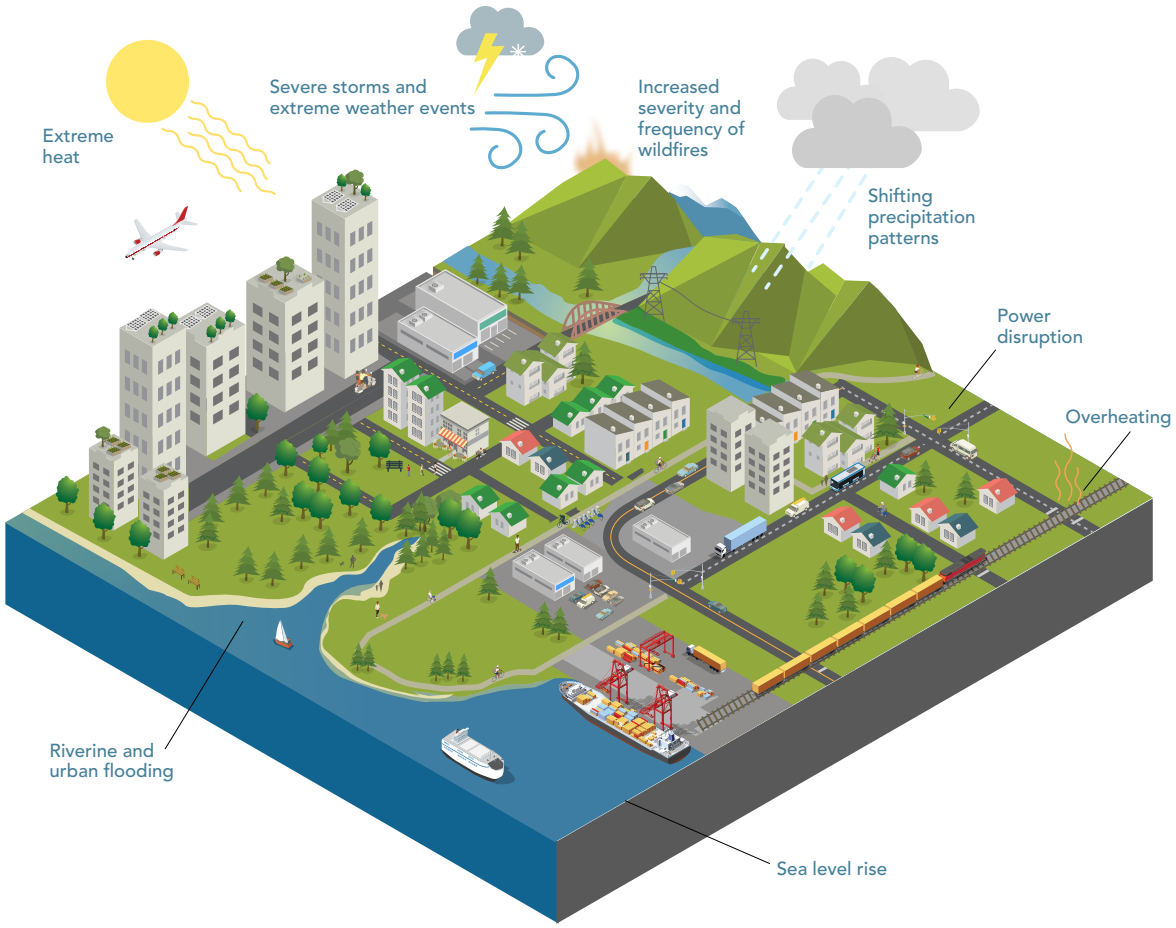
Actions in this Roadmap and the *Clean Air Plan* will help reduce all of these emissions to protect human health, while supporting the transition to clean, renewable energy.



Climate Change Impacts on Energy

The energy system that serves Metro Vancouver is made up of a complex and interconnected network of energy infrastructure including but not limited to oil and gas pipelines, natural gas compressor stations, gasoline and diesel fueling stations, high-voltage electricity power lines, electrical substations, and voltage transformers. Energy infrastructure lasts for decades and has not always been designed to accommodate the impacts of climate change. Protecting energy infrastructure from the current and future impacts of climate change will be essential to building a resilient region.

EXPECTED CLIMATE CHANGE IMPACTS



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

Climate Changes

Hotter temperatures and extreme heat events, with higher daytime and nighttime temperatures and more hot summer days. This will lead to increased frequency and severity of heatwaves, wildfires, and droughts.

Shifting precipitation patterns, including more rainfall in every season except the summer, and less precipitation falling as snow.

Severe storms and extreme weather events, including high winds and heavy rainfall, which can lead to overland flooding and landslides.

Sea level rise, with 0.5 metres expected by 2050, will impact coastal communities in the region.

Impacts Felt

Power and fuel supply disruption due to shock events that can cause damage to energy infrastructure (i.e., extreme rainfall, landslides, ice storms, windstorms, and wildfires), or due to increased strain on the energy system from extreme weather. This is especially a high risk to service continuity of essential services, such as hospitals and community centers.

Riverine and urban flooding, from periods of extreme rainfall and sea level rise, which can cause near-term and long-term damage to critical energy infrastructure at low elevations or in floodplains, such as electrical substations, underground infrastructure, or district energy systems.

Changes to seasonal water levels, as a result of reduced snowpack and hotter, drier summers, can impact hydroelectric generation and electricity supply to the region.

Clean, Renewable, and Resilient Energy

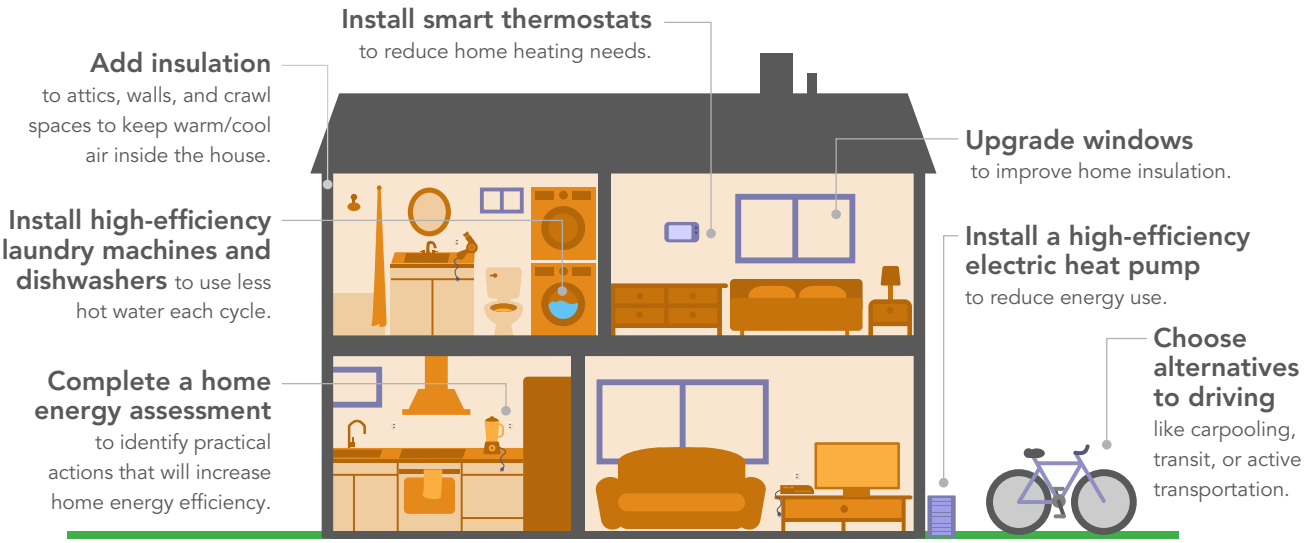
Reducing the amount of energy used in the region and transitioning to clean, renewable energy is crucial to achieving deep emission reductions. However, this will require massive shifts in the way energy is used and supplied. At the community scale, residents and businesses need to take steps to reduce energy use, as well as switch to technologies that use clean, renewable energy. At the system scale, sufficient clean, renewable energy needs to be available to meet societal demand, while ensuring that energy costs remain affordable.

As the region transitions to using clean, renewable energy, there is also an opportunity to address climate adaptation. New infrastructure associated with the supply of clean, renewable energy presents an opportunity to build back better, specifically to build new infrastructure that is resilient to the impacts of climate change and to upgrade existing infrastructure. Ultimately, the transition to clean, renewable, and resilient energy needs to be designed to ensure that it reduces regional emissions, improves the health of residents, distributes costs in an equitable manner, and increases resiliency of the energy system.

Reducing Energy Use

One of the first steps to reducing greenhouse gas emissions and other environmental impacts (i.e., land and water impacts) associated with energy production is to reduce the total amount of energy used. There are many ways that residents and businesses can directly reduce energy usage. In buildings, this could mean using a programmable thermostat or taking shorter showers to reduce fossil natural gas and electricity use. For personal transportation, this could mean shifting modes of transportation to walking, rolling, cycling, taking transit, or carpooling to reduce use of gasoline and diesel.

Another way to reduce energy use is by improving energy efficiency, which in this context, means using less energy to accomplish the same task. Technology is getting progressively more energy efficient and investing in new technology could reduce the amount of energy used. For example, hybrid vehicles are more fuel efficient than gasoline-powered cars and electric vehicles are even more efficient than hybrid vehicles. Reducing energy loss will also improve the energy efficiency of buildings, technologies and processes. For example, improving the insulating properties of the building envelope (i.e., walls, windows, foundation, and roof) to keep warm or cool air inside, in addition to heat recovery systems, will all help reduce energy use. In industrial settings, using advanced control systems to optimize equipment operation or insulating pipes to reduce heat loss can also improve energy efficiency. By using less energy, we can reduce reliance on energy, which will result in less disruption to residents and businesses during interruptions to energy supply, such as power outages.



Reducing energy usage is instrumental to reducing emissions associated with energy use and can help improve resiliency in events where energy supply is interrupted. Actions specifically related to reducing energy use in the buildings, transportation, and industry sectors can be found in the **Buildings Roadmap, Transportation Roadmap, and Industry and Business Roadmap**.

Types of Clean, Renewable Energy

Low and zero emission energy sources are critical to transitioning to clean, renewable energy. Major types of clean, renewable energy that will be important in reaching our emission reduction targets include electricity, hydrogen, and biofuels.

Electricity

In BC, 98% of the electricity generated is from renewable sources, such as hydro, biomass, or wind power. The generation, transmission, and use of electricity in BC is associated with very low emissions over its lifecycle, in comparison to the production, transport, and combustion of fossil fuels. However, there can be other land and water impacts associated with electricity generation, which need to be minimized as new clean, renewable generation is added to the electrical grid. Electricity also does not generate air contaminants at point of use, which eliminates emissions of health-harming contaminants that are produced when fuels are combusted (e.g., fine particulate matter and nitrogen oxides), thereby improving air quality and health of residents. Electricity is also used to power mechanical cooling, which will be critical for resident health and safety during extreme heat events.

Many electric technology solutions, such as electric vehicles and high efficiency heat pumps for home heating and cooling, are already commercially available. There are also significant co-benefits to using clean, renewable electricity.

- Buildings – Electric heat pumps provide both heating during the winter and cooling during the summer, making buildings more resilient to the longer, hotter, drier summers that are predicted for the region as a result of climate change. Heat

pumps may also help filter indoor air, a feature that is especially important during wildfire smoke events that are becoming increasingly common during the summer months.

- Vehicles and Non-Road Engines –The use of electric vehicles and non-road engines (e.g., construction equipment, generators) in the urban environment can reduce the impact of health-harming air contaminants on nearby populations because they produce no tailpipe emissions. Another benefit is a reduction in noise pollution.

Transitioning to use of electricity is an essential strategy to reducing emissions and reaching the region's 2030 target of 45% reduction in emissions from 2010 levels. Strategies and actions related to electrification in major sectors can be found in the **Buildings, Transportation, Industry and Business, and Agriculture Roadmaps**.

Hydrogen

Most of the hydrogen produced world-wide today is from fossil natural gas and hydrogen is mostly used as a feedstock in emission-intensive industrial sectors, such as oil refining. However, hydrogen produced from electricity can be clean and renewable, and depending on how it is used, zero emissions.

Though the technology to produce, distribute and use hydrogen energy is still developing, hydrogen could be a viable solution to decarbonize hard-to-electrify sectors, such as heavy-duty transportation and industrial applications. When powering fuel cells, hydrogen can be used as zero emission energy for the transportation sector when produced using clean, renewable energy. Strategies and actions supporting uptake of zero emission vehicles can be found in the **Transportation Roadmap**.

Hydrogen can also be blended into the gas distribution system, which can support decarbonization of the buildings and industrial sectors. Depending on the point of injection and pipeline capacity, hydrogen by volume between 5% and 15% can be blended into the existing gas distribution system, with minimal impact on boilers and similar appliances. However, hydrogen combined with methane gas at mixes greater than 15% by volume would require some changes to gas pipelines and end use equipment, such as household appliances. Also, all combustion processes produce health-harming air contaminant emissions; even combustion of pure hydrogen produces nitrogen oxides.

The BC Government has developed the **BC Hydrogen Strategy**, which helps guide the transition to hydrogen as a clean, renewable form of energy and highlights key policy actions that the BC Government will take to overcome barriers in hydrogen production, transportation, and end-use. One of the key actions in this strategy is to establish regional hydrogen hubs, which would co-locate low carbon hydrogen production and end-use applications to spur and grow hydrogen supply and demand.

A Metro Vancouver hydrogen hub could remove bottlenecks for growth of this sector based on the competitive advantage created by the collective talent of firms in the region working on hydrogen production, storage, transportation, membranes, fuel cells, testing, and consulting. The Government of Canada has developed the **Hydrogen Strategy for Canada**, which lays out a framework to position Canada as a world-leading producer, user, and exporter of clean hydrogen and associated technologies. Hydrogen will be an important part of the energy system that enables the region to reach carbon neutrality by 2050.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Hydrogen: A Form of Low Carbon Energy?

Hydrogen can be produced in several ways, and each is associated with different levels of greenhouse gas emissions. The most prominent methods have been denoted by the industry using different colours, and are outlined below, though there are other production pathways that are rapidly developing.

- **Green hydrogen** is produced using electricity, and can be zero emission and zero carbon energy if the electricity used is generated from clean, renewable sources.
- **Waste hydrogen** is produced by a commercial process in which the primary purpose is not the production of hydrogen. Waste hydrogen is considered clean, renewable energy.
- **Blue hydrogen** is produced using fossil natural gas, with capture and storage of the greenhouse gas emissions created during production. Blue hydrogen is not renewable and maintains reliance on fossil fuels.
- **Grey hydrogen** is also produced using fossil natural gas, but creates significant greenhouse emissions during production, which is released to the atmosphere. Grey hydrogen is not renewable and maintains reliance on fossil fuels.

The Government of Canada has recommended a threshold for the carbon intensity of low carbon hydrogen. Based on that threshold, green hydrogen, waste hydrogen, and blue hydrogen with at least 90% carbon capture are considered low carbon.

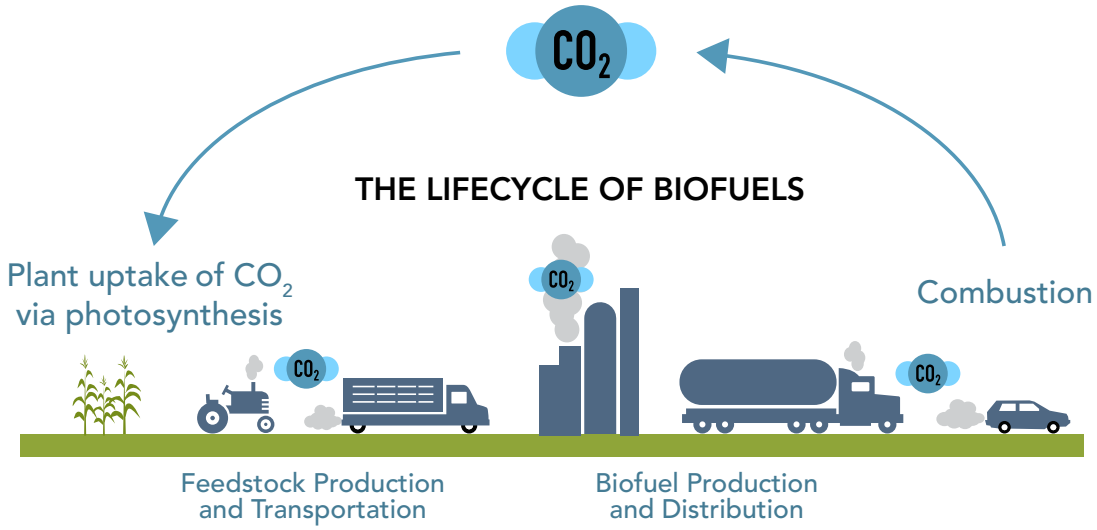
Low Carbon Biofuels

Biofuels are produced using organic matter derived from biomass such as plants. Biofuels are considered low carbon because the plants used to make biofuels absorb carbon dioxide as they grow, offsetting the carbon dioxide emitted during combustion. Biofuels have been associated with higher lifecycle emissions than other types of renewable energy due to greenhouse gas emissions associated with changes to land use, use of fossil fuel-based fertilizers, and distribution of fuel. The feedstock for most biofuel production today is edible crops, such as soy and corn, which can impact food prices as well as having adverse land-use impacts, such as deforestation. Sustainability of feedstock must be prioritized if biofuel consumption increases in the region.

The upcoming federal *Clean Fuel Standard* aims to establish sustainability criteria for biofuels and their feedstock, which are designed to exclude feedstock with high indirect land-use change risk, feedstock from land with a high biodiversity value or high carbon value, and forest biomass feedstock that is not managed sustainably. Also, while biofuels can have lower lifecycle carbon emissions compared to traditional fossil fuels, they still produce health-harming air contaminants when combusted, which can have negative impacts for public health and the environment.

Some common liquid biofuels are listed below:

- **Biodiesel** is made from vegetable oils (such as canola) and waste animal fats. It can be blended in fossil diesel in amounts up to 20% and used in conventional diesel engines.
- **Renewable diesel** is also made from vegetable oils and animal fats, but using a different process that makes the end fuel almost identical to regular diesel. It can be used directly in conventional diesel engines without requiring engine modifications.
- **Ethanol** is the most common renewable alternative to gasoline. Made from plants such as corn or sugar cane, it can be blended up to 10% in regular gasoline used in conventional gasoline engines. Flex fuel vehicles that can accommodate gasoline blends with up to 85% ethanol have become increasingly common in North America.
- There are specialized types of liquid biofuels for aircraft and marine vessels, such as sustainable aviation fuel, to support decarbonization of those sectors.



Other types of non-liquid biofuels include the following:

- **Renewable natural gas** (RNG) is a gaseous biofuel that is mostly composed of methane. It is produced primarily from anaerobic digestion of organic feedstock (such as food, agricultural, and forestry waste). Since it is primarily composed of methane, it can be substituted directly in natural gas-burning equipment as a renewable, low carbon alternative to fossil natural gas.
- **Firewood** and **wood pellets** are another common biofuel used in the region. Combustion of solid biofuels can emit significant amounts of fine particulate matter and other health-harming air contaminants when combusted, which can impact air quality and public health. Several regulations exist in the region to minimize the air quality impacts of solid biofuels, such as the *Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw 1303* and *Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation Bylaw 1087*.

If used strategically, biofuels have the potential to displace the use of fossil fuels in difficult to decarbonize sectors such as difficult-to-electrify buildings, heavy duty vehicles, and marine, air, rail and industrial processes, especially in the short term while new zero emission technologies are developed.

Industrial Processes and Clean, Renewable Energy

Switching to clean, renewable energy is also an important strategy for reducing greenhouse gas emissions from industrial processes, such as cement manufacturing, chemical and wood products processing, and many others. In cases where electrification is not feasible due to technological challenges or high thermal process needs, (e.g., cement production), switching to low carbon, renewable energy sources other than electricity provides an alternative solution in reducing greenhouse gas emissions. Examples include switching from high carbon fuels, such as coal and coke, to biofuels such as wood or renewable natural gas.

If used strategically, biofuels have the potential to displace some of the fossil fuels used in light and heavy-industrial operations. Fuel switching can be a viable strategy for decarbonization, while also acknowledging the need for industries in the region to remain competitive.

Transitioning to Clean, Renewable and Resilient Energy

Strengthen Climate Policy

Accelerating adoption of technologies that use clean, renewable energy will require strong climate policy, ranging from comprehensive regulation to deep financial incentives for residents and businesses. While some policies already exist to enable residents and businesses to switch to clean, renewable energy, stronger policies are required from all levels of government to accelerate the transition to 100% clean, renewable energy by 2050.

Key Climate Policies

Strong climate policy is essential to driving the transition to 100% clean, renewable energy by 2050. In the absence of strong policy, emissions reductions are often incremental and insufficient to achieve goals and targets. Recent climate policy announcements have set the direction for stronger action on climate, but it will be the implementation of these policies that drive deep emission reductions. Some of the key existing and upcoming climate policies that will drive adoption of clean, renewable energy in the region are listed below.

Province-wide:

- Carbon tax increasing to $170/tonne carbon dioxide by 2030 (***CleanBC Roadmap to 2030***)
- Cap of 6 million tonnes CO2e/year for natural gas utilities (*CleanBC Roadmap to 2030*)

Buildings:

- Greenhouse gas performance requirements for new construction (province-wide implementation by 2030 as per *CleanBC Roadmap to 2030*; also, some member jurisdictions have implemented low carbon energy system requirements complementary to the BC Energy Step Code)
- Requirements for all new space and water heating equipment sold in BC to have a rated efficiency equal or greater than 100% by 2030 (*CleanBC Roadmap to 2030*)
- Greenhouse gas performance requirements for existing homes and buildings (*Climate 2050 Buildings Roadmap*)

Transportation:

- 100% sales target for zero emission light duty vehicles by 2035 (*CleanBC Roadmap to 2030*)
- Sales targets for zero emission medium and heavy duty vehicles (*CleanBC Roadmap to 2030*)
- Federal vehicle efficiency standards (Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations, and Heavy-duty Vehicle and Engine Greenhouse Gas Emission Regulations)
- Reduction in average carbon intensity for gasoline and diesel of 30% by 2030, inclusive of aviation and marine fuels (Renewable & Low Carbon Fuel Requirements Regulation, *CleanBC Roadmap to 2030*)

Industry:

- New industrial facilities must have a plan to be net-zero (carbon neutral) by 2050 (*CleanBC Roadmap to 2030*)
- Integrate greenhouse gas reduction requirements into emission regulations and permits (*Clean Air Plan*)

Transform the Electrical Grid

Electricity will play a major role in the transition to clean, renewable energy. A number of organizations, including Metro Vancouver, are directly working on actions to accelerate electrification. BC Hydro's **Electrification Plan** will accelerate the transition from fossil fuels to electricity through enhanced programs and incentives. To accommodate the higher demand for electricity, the way electricity is generated and distributed will need to grow and transform to support a carbon neutral region. The key challenge will be to ensure that there is sufficient clean, renewable energy to meet demand. Within their **2021 Integrated Resource Plan**, BC Hydro has developed a plan to continue meeting the electricity needs of BC for the next 20 years, including a range of enhanced demand-side measures such as demand response programs and time-of-use rates; transmission upgrades; and development of wind and solar power.

To ensure that the electrical grid is responsive to future needs, such as integrating new sources of clean, renewable energy and increasing resiliency, there is a need to invest now in modernizing the grid to allow integration of new technologies. For example, investments in smart-charging technology will enable electric vehicles to be charged during periods of low electrical demand, and potentially supply electricity back into the grid when needed, which will support BC Hydro in managing electrical demand. Emerging energy storage technologies such as batteries and hydrogen energy storage (when hydrogen production is strategically added onto parts of the electrical grid as a form of energy storage), can help increase the penetration of renewables, such as wind and solar energy, which will help support increased power demand from electrification of buildings and some industrial processes.

As more electricity generation, transmission, and distribution infrastructure is built, there is a need to ensure that new infrastructure, along with existing infrastructure, is resilient to the impacts of climate change. Key risk management activities that BC Hydro is pursuing include: siting new infrastructure in areas that are less susceptible to climate impacts such as wildfires or riverine flooding, updating design standards and codes to ensure that they reflect future climate projections, selecting resilient material for transmission infrastructure, and ensuring existing infrastructure is regularly maintained.

However, there is still some risk posed by reliance on centralized energy systems, since a catastrophic event such as a major earthquake or atmospheric river event, could cause major systems to fail. Currently, much of the region relies on diesel generators to supply backup power in case of power outages, but diesel supply could also be impacted in the situation of a catastrophic extreme weather event (e.g., flooding and landslides that damage road and rail infrastructure). One way to increase resilience is to explore local, independent energy systems, such as microgrids. A microgrid is a system composed of electrical loads, such as electric buildings and electric vehicle chargers, and distributed energy generation resources, such as solar or wind generation, that are interconnected through an electrical grid. Most importantly, microgrids have the ability to operate independently from the central electrical grid, so can remain operating during regional power outages. While still an emerging approach, microgrids could help increase the resiliency of the electrical grid.

Home Based Solar Power

Home based solar power, such as rooftop solar panels, is one source of clean, renewable electricity. While home based solar, as a whole, is more expensive than utility scale solar and wind in BC, home based solar is one way that residents can help contribute to clean, renewable electricity supply and reduce their energy costs. As technology advances and home batteries become more abundant, home based solar power could also add resiliency to the grid. While home based solar panel is likely to make up a small portion of future electricity generation, the region will need access to any and all sources of clean, renewable electricity to meet its 2030 and 2050 targets.

Decarbonize the Fossil Natural Gas System

Decarbonization of the current fossil natural gas system will be critical to achieving carbon neutrality by 2050. Currently, the region relies heavily on the gas distribution system, which transports primarily fossil natural gas for use in heating and hot water within homes, as well as heating in some industrial processes and greenhouses. Some renewable gases, such as renewable natural gas (RNG), are drop-in replacements for fossil natural gas (since both are primarily composed of methane). Some renewable gases, such as green hydrogen, will require new gas distribution infrastructure or upgrades to existing gas distribution infrastructure. As such, the existing gas distribution network could be leveraged to deliver renewable gas.

The *CleanBC Roadmap to 2030* includes a greenhouse gas emissions cap for natural gas utilities of 6 million tonnes CO2e for 2030, which is approximately 47% lower than 2007 emission levels, and specifies that renewable gas (green hydrogen, waste hydrogen, and RNG) must make up a minimum of 15% of B.C.'s natural gas by 2030. While renewable gas currently makes up less than 1% of FortisBC's total gas supply, FortisBC has developed a **10-year forecast** for sourcing sufficient renewable gas to meet the province-wide 15% renewable gas target by 2030.

Production of renewable gas will need to scale up significantly to fully decarbonize the gas system. An expert report commissioned by the British Columbia Utilities Commission notes that RNG demand will likely outpace RNG supply in the medium- to long-term, and that without significant technological breakthroughs, RNG supply is unlikely to meet the growing demand for RNG. It should also be noted that there are considerable double-counting risks associated with RNG, particularly RNG sourced from out-of-province. Robust accounting, tracking, verification, and reporting requirements need to be implemented in order to guarantee the integrity of the emission reductions from RNG and to mitigate the risks of double-counting.

As there are limited amounts of renewable gas available to achieve the targets within *CleanBC* and the *Climate 2050 Roadmaps*, use of renewable gas should be prioritized in difficult-to-electrify sectors, such as industrial applications with high temperatures or requiring combustion for process requirements. Electrification should be prioritized in sectors where electric technologies are commercially available, such as buildings and light duty vehicles, to maximize the use of available clean, renewable energy. Additionally, until production of renewable gas increases sufficiently to fully decarbonize the current gas supply, there may be a need to right-size the gas system in the interim in order to reduce the risk of stranded gas assets and avoid excessive cost impacts to ratepayers.

As the gas system decarbonizes, new infrastructure as well as existing gas infrastructure needs to be resilient to the impacts of climate change. Upgrading existing infrastructure and ensuring that new infrastructure is designed to withstand the impacts of future climate projections, such as flooding and landslides, will be essential to increasing resiliency of the gas system. Currently, most of the fossil natural gas supplied to the Metro Vancouver region is supplied from Northeastern BC through one major pipeline. Failure of this pipeline will result in severe restrictions to gas supply to the region. Diversifying gas supply, such as integrating different sources of renewable gas, could increase resiliency of the gas system.

Increase Sustainable Liquid Biofuel Production

While provincial legislation is driving a transition to zero emission vehicles, liquid biofuels will be an important near-term strategy to decarbonize the transportation sector, as well as a longer-term solution for difficult-to-electrify sectors such as marine, air, and rail. The BC *Low Carbon Fuel Standard* provides a strong policy framework for increasing biofuel production and ensuring sustainability of feedstock. The *CleanBC Roadmap to 2030* includes a target to double the quantity of renewable fuels produced in BC annually to 1.3 billion litres by 2030. For comparison, approximately 7.4 billion litres of gasoline and diesel was consumed in BC in 2020. Notably, there are opportunities to directly produce liquid biofuels in the Metro Vancouver region.

Metro Vancouver is currently engaged in a hydrothermal processing pilot that will convert wastewater biomass into biocrude that can be refined into low carbon biofuels. If the challenges of scale-up can be overcome to achieve robust operations, hydrothermal processing could produce over 2 million litres of biocrude annually by 2035. Supporting sustainable liquid biofuel production will be crucial to ensuring that there is sufficient biofuel to achieve the region's emission reduction goals in difficult-to-electrify sectors.

Limit Expansion of Fossil Fuel Production

In addition to accelerating the transition to clean, renewable energy, expansion of fossil fuel production must be simultaneously limited on a global scale. Both the International Energy Agency and the United Nations Environment Programme have noted that new production of fossil fuels is incompatible with limiting global warming to 1.5 degrees Celsius. New fossil fuel infrastructure can have an asset lifetime upwards of 30 years and could become stranded assets as the global demand for fossil fuel decreases. Thus, to ensure that global warming can be limited to 1.5 degrees Celsius and to minimize the risk of stranded assets, we need to limit expansion of fossil fuel production and explore how to repurpose existing infrastructure for supply of clean, renewable energy. Within the region, this means working with the British Columbia Oil and Gas Commission (BCOGC), which regulates oil and gas operations, refineries, and geothermal development in BC, to limit expansion of fossil fuel production. Existing infrastructure also needs to be repurposed as much as possible; renewable natural gas should be distributed within the existing gas distribution system and renewable diesel should be distributed through existing diesel distribution networks.

Transitioning to clean, renewable energy will also impact workers and communities currently relying on the fossil fuel industry. Governments, businesses, and industry should evaluate how the shifts in the global, national, and local economy will impact workers and communities and take the appropriate steps to minimize these impacts. For example, as the world transitions away from coal, workers in the coal mining industry may be adversely impacted. Government programs, such as income support and education and skills building programs, will help minimize impacts of the energy transition on workers and communities.

Plan for the Transition to 100% Clean, Renewable, and Resilient Energy

Given the complexities and interconnectedness of the energy system, transitioning to 100% clean, renewable, and resilient energy by 2050 will require careful planning today. In 2015, electricity and fossil natural gas made up more than 50% of the energy use within Metro Vancouver. Electricity and natural gas are mostly supplied by provincially regulated utilities, BC Hydro and FortisBC. It will be essential to work with the energy utilities and their regulator, the British Columbia Utilities Commission (BCUC), to plan for the transition to 100% clean, renewable, and resilient energy.

Under the *Utilities Commission Act*, the BCUC and energy utilities are required to consider **BC's energy objectives**, which include BC's greenhouse gas emission reduction targets. While the BCUC is required to consider BC's energy objectives when approving utility rates, programs and projects, the *Utilities Commission Act* is not explicit on how greenhouse gas objectives are considered and balanced with other objectives, such as affordability and reliability. It is critical that BC's energy objectives align with the targets outlined in this Roadmap and the *CleanBC Roadmap to 2030*, while explicitly outlining how greenhouse gas reduction is considered and balanced with other government priorities.

It will be important to conduct similar planning exercises to ensure that supply of other emerging sources of clean, renewable energy can be scaled up to match the demand needed to achieve BC's greenhouse gas reduction targets and the goals and targets within this Roadmap. The BC Hydrogen Strategy outlines a pathway to accelerate the production and use of renewable and low-carbon hydrogen. Scaling up of emerging sources of clean, renewable energy will require coordinated action from multiple stakeholders, including Metro Vancouver.

Social Equity

Social equity (as used in this Roadmap) refers to the promotion of fairness, justice, and the removal of structural barriers that may cause or aggravate disparities experienced by different groups of people. Metro Vancouver's efforts to move towards clean, renewable, and resilient energy will continue to incorporate the voices and needs of a range of communities to ensure that fairness and equity are of the highest priority, and that no one is left behind in this transition. Additional supports will need to be provided to vulnerable groups to support an equitable transition. Organizations responsible for energy-related climate policies must consider whether inequity is created or magnified, and address these inequities to ensure a just transition. Actions that reduce emissions must also support an equitable distribution of benefits, such as improved air quality and jobs related to clean, renewable energy, and avoid an inequitable distribution of costs, such as unaffordable energy costs for homes and businesses.

Integrating equity into Metro Vancouver's climate change programs is a work in progress. Metro Vancouver is developing a strategic approach to assessing equity during implementation of the *Clean Air Plan* and the *Climate 2050 Roadmaps*. This will include community input, health impact assessments, and other equity evaluation tools.

The Journey to Clean, Renewable, and Resilient Energy

The *Energy Roadmap* is focussed on the systemic changes required of our energy system to support a transition to clean, renewable energy. However, transformation of the energy system will not only require strategies and dedicated actions within this Roadmap, but also within the other *Climate 2050 Roadmaps*.

Linkages to other *Climate 2050 Roadmaps*

There are many linkages between energy and other Climate 2050 issue areas.

Buildings – conserve energy, install more efficient equipment, and switch to heating and cooling systems that use clean, renewable energy.

Transportation – switch to low energy modes of personal transportation (e.g., walking, biking, public transit), improve efficiency of engines, switch to more efficient freight transportation methods, switch to zero emission vehicles, increase zero emission refueling infrastructure, and increase use of low carbon, renewable biofuels.

Industry and Business – increase energy efficiency of industrial processes and explore equipment that can use clean, renewable energy.

Infrastructure – improve process efficiencies to reduce energy use and utilize water and wastewater infrastructure to generate clean, renewable energy.

Waste – reduce energy use and emissions associated with waste collection and disposal and consider circular economy principles within energy generation, including how waste can be used to generate clean, renewable energy.

Agriculture – increase energy efficiency of agricultural processes, explore equipment that can use clean, renewable energy, and explore viability of using agricultural waste to generate clean, renewable energy.

Land Use and Growth Management – direct higher density forms of residential and commercial growth to urban centres and locations with good transit to encourage walking, biking and transit, and to allow people to live without a car; facilitate more multi-unit residential housing which uses fewer resources and less energy per unit.

Nature and Ecosystems – nature and ecosystems cool urban areas, reducing the need for air conditioning and decreasing overall energy use.

Goals and Targets

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

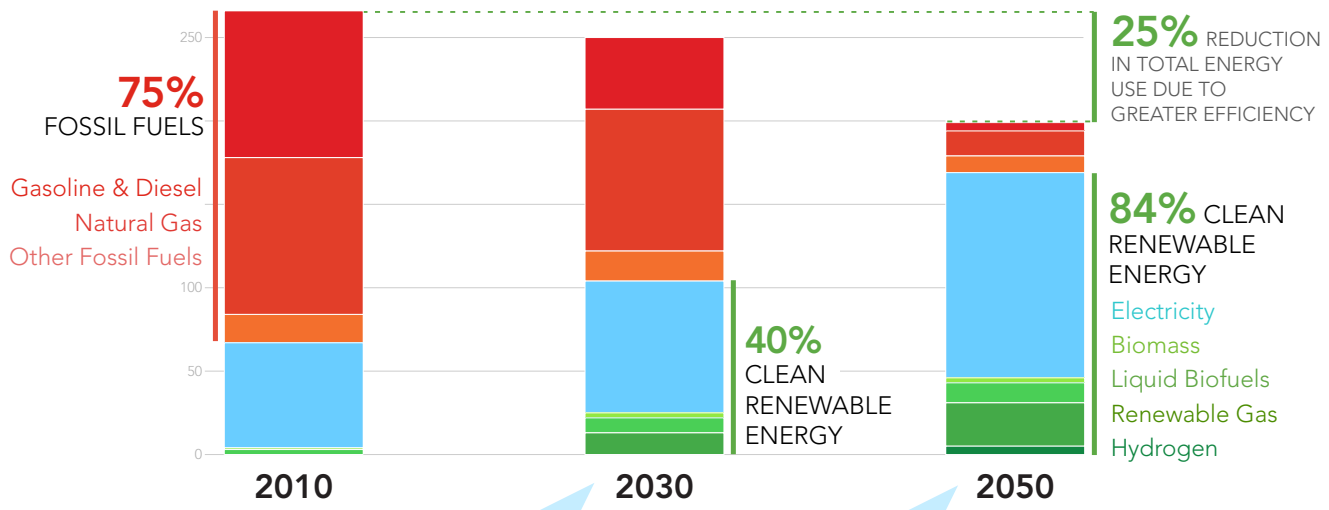
Achieving this vision means setting goals in each of the *Climate 2050 Roadmaps*, organized by sectors in the region, that contribute towards getting to a carbon neutral, resilient region.

Metro Vancouver has set the following climate goals for energy, to help visualize the region we will live in and to track progress out to 2030 and 2050.

GOAL	TARGETS
All of the energy used in Metro Vancouver is derived from clean, renewable sources	By 2030: • 60% of the energy used in the region is derived from clean, renewable sources By 2050: • 100% of the energy used in the region is derived from clean, renewable sources
All regional energy infrastructure is reliable and resilient to the current and future impacts of climate change.	By 2030: • All energy providers have identified known, unmitigated climate hazards that could impact energy infrastructure. • All new energy infrastructure is protected from known, unmitigated climate hazards. By 2050: • The energy system is protected from the current and future impacts of climate change.

The diagram below shows the possible impacts of the strategies and actions described in this Roadmap and the other *Climate 2050 Roadmaps* on reducing total energy use and increasing the use of clean, renewable energy, within an aggressive and achievable scenario.

POTENTIAL IMPACT OF THE STRATEGIES AND ACTIONS DESCRIBED IN THE CLIMATE 2050 ROADMAPS



2030

- Expanded active transportation infrastructure and transit service
- All new passenger vehicles sold in the region are electric
- Medium-duty/heavy-duty zero emissions vehicle mandate
- Increased stringency of the BC Low Carbon Fuel Standard
- Almost all new buildings are electric
- GHG limits for large existing buildings

2050

- Almost all passenger vehicles are zero emissions
- Most medium-duty/heavy-duty vehicles are either zero emissions or using low carbon biofuels
- The majority of buildings in the region are zero emissions or using low carbon energy
- Increased uptake of renewable natural gas by industrial users
- Progressive electrification of non-road equipment
- Significant decrease in overall driving as more trips are made on transit, active modes, and through shared mobility options.

The actions in this Roadmap reflect both current policies and new directions that reflect the best ideas, approaches, and available technologies. While these strategies and actions are significant in increasing uptake of clean, renewable energy, achieving approximately 40% by 2030, this still falls short of meeting the 2030 and 2050 targets in this Roadmap. Metro Vancouver and its partners will continue to explore opportunities to further accelerate uptake of clean, renewable energy during the detailed planning and implementation of the actions. Thus, the Roadmap should be viewed as an iterative, dynamic path forward – as new policies, ideas, approaches, and technologies emerge, Metro Vancouver will update this Roadmap, and the other *Climate 2050 Roadmaps*, to enable further progression towards the established goal and targets.

Reaching these ambitious goals will also require extensive collaboration between Metro Vancouver and key partners. Many of the actions identified in this Roadmap will be led by other governments and agencies (e.g., national, provincial, local), First Nations, energy utilities, and industry. Fortunately, many of the organizations needed to make this transition are already actively working toward similar goals, beginning with Metro Vancouver member jurisdictions and their community and corporate plans, the Government of BC and its *CleanBC Roadmap to 2030* plan, the Government of Canada and its 2030 Emissions Reduction plan, as well as First Nations, energy utilities, and, increasingly, industry associations.

Clean, Renewable Energy Strategies

Strategy 1: Plan for the Transition to Clean, Renewable, and Resilient Energy

Achieving a carbon neutral region by 2050 will require that the region transitions to clean, renewable, and resilient sources of energy. Having a comprehensive plan will help ensure that the transition is successful, fair, and equitable. As energy regulators, the BC Utilities Commission and the BC Oil and Gas Commission can ensure that energy utilities are planning to meet *CleanBC* and *Climate 2050* objectives. The BC Government will also play an instrumental role in developing the regulatory framework that enables the utilities to plan for the energy transition.

1.1 Align British Columbia's Energy Objectives with Strong Climate Action.

BIG Move

Work with the BC Government, member jurisdictions, First Nations, and the BCUC, on updating BC's energy objectives within the *Clean Energy Act* to reflect strong action on climate change, in alignment with the goals and targets outlined in this Roadmap and the *CleanBC Roadmap to 2030*. This could include: greenhouse gas reduction requirements for all utilities, such as the natural gas utilities emission cap announced in the *CleanBC Roadmap to 2030*; targets for energy efficiency and conservation for all utilities; increases to the amount of electricity in BC sourced from clean or renewable resources; changes to the definition of affordable rates; and changes to how utilities can recover costs.

1.2 Strong Climate Mandate for Energy Utilities.

BIG Move

Advocate to the BC Government to update the *Utilities Commission Act* to ensure that that the BCUC regulates public utilities in a manner that ensures their compliance with, and appropriate contribution to achieving, the updated energy objectives in the *Clean Energy Act*, as per Action 1.1.

1.3 Revise Utility Regulation to Align with Strong Climate Action.

Advocate to the BC Government to revise and in some cases, repeal, outstanding regulations and directions applying to public utilities and regulators, to ensure that they align clearly and directly with the updated energy objectives as per Action 1.1.

BIG Move **Big Moves** are foundational to achieving the 2030 and 2050 targets, and should lead to the most significant greenhouse gas reductions and/or climate resilience.

Corporate LEADERSHIP **Corporate Leadership** actions are ones Metro Vancouver will implement in its corporate operations to demonstrate leadership and support regional actions.

CAP **Clean Air Plan** actions are ones adopted within Metro Vancouver's Clean Air Plan.

1.4 Long-term Planning Scenarios for the Transition to 100% Clean, Renewable Energy.

Advocate to the BC Government, the BCUC, and the energy utilities, to include multiple, coordinated long-term planning scenarios within their long-term resource plans, including a scenario with accelerated electrification and declining gas demand. The plans should include strategies to mitigate rate impacts and reduce risk of stranded assets.

1.5 Regional Climate Action in Energy Utility Regulatory Processes.

Work with member jurisdictions and First Nations to provide input to relevant BCUC and BCOGC proceedings related to regional and/or municipal climate policy. Input would focus on evaluating the impact of projects, programs, and rates proposed by regulated entities and assess whether they align with regional climate and municipal climate policy and the updated energy objectives as per Action 1.1.

1.6 Implement Tracking, Verification, and Reporting Requirements for Renewable Natural Gas Supply.

Advocate to the BC Government to implement tracking, verification, and reporting requirements for renewable gas supply, in line with systems that have been implemented in leading jurisdictions such as California. Tracking, verification, and reporting requirements will guarantee integrity of the environmental attributes associated with renewable natural gas supply, and mitigate risks of double-counting.

1.7 Reduce Energy Poverty.

Work with the BC Government, the BCUC, energy utilities, member jurisdictions, and First Nations, on reducing the number of households in energy poverty, particularly racialized, recent immigrant, and Indigenous households, through equitable policy design, targeted programs and incentives, and inclusive engagement.

1.8 Transition Corporate Energy Use to 100% Clean, Renewable Energy.

Corporate LEADERSHIP

Transition Metro Vancouver's corporate energy use to 100% clean, renewable energy between 2035 and 2040, such as energy use from buildings, on-road fleet, non-road fleet, and industrial facilities.

POWERHOUSE

Strategy 2: Accelerate Electrification

Electrification is a key decarbonization strategy to meet emission reduction targets. Technologies that use electricity can have critical co-benefits such as improved air quality, cooling benefits, and reduced noise pollution – making it a priority pathway for achieving significant greenhouse gas reductions. While electricity is currently widely used, there may be infrastructure constraints for electricity supply that need to be resolved as large parts of the region electrify. To address these constraints, BC Hydro is exploring a number of programs that will support electrification and reduce demand on the electrical grid, such as time-of-use electricity rates and related demand response programs. Success of these programs will require adoption of smart technologies by BC Hydro, residents, and businesses.

2.1 Electrification Rates.

Advocate to BC Hydro, the BC Government, and the BCUC to enable rate structures that support electrification in alignment with BC Hydro's Electrification Plan, including discounted rates for customers who adopt heat pumps and discounted rates for households that struggle with meeting home energy needs, particularly Indigenous households. These rates should be combined with additional funding to promote electrification, as outlined in Action 2.1 in the *Climate 2050 Buildings Roadmap* and Actions 2.3, 2.6, 3.5 and 3.8 in the *Climate 2050 Transportation Roadmap*.

2.2 Time-of-Use Rates, Demand Response Programs, and Electric Vehicle Peak Reduction Programs.

Advocate to BC Hydro and the BC Government to implement time-of-use rates, demand response programs, and electric vehicle peak reduction programs, as outlined in BC Hydro's 2021 Integrated Resource Plan. This will help reduce the amount of new electrical generation required in BC and help some customers save on their energy bills. This would be supported by increasing public awareness of these programs, as outlined in Action 2.7 in the *Climate 2050 Buildings Roadmap* and Action 2.7 in the *Climate 2050 Transportation Roadmap*.

2.3 Modernizing the Electrical Grid.

Work with BC Hydro on modernizing their grid to support accelerated electrification and resiliency. Grid modernization will enhance the BC Hydro's ability to support electrification initiatives and enable the grid to be more resilient, flexible, and reliable.

2.4 Regional Grid Constraints.

Work with BC Hydro, member jurisdictions, and First Nations to address areas of the electrical grid in Metro Vancouver where grid capacity would limit current and future electrification, thus requiring substantial costs for upgrades. Overcoming regional grid constraints will support accelerated electrification.

2.5 High Performance Heating and Cooling Equipment Import and Sale Standards.

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

2.6 Minimize Air, Land, and Water Impacts.

Work with the BC Government, member jurisdictions, and First Nations to ensure that land and water impacts are minimized in new clean, renewable electricity generation, transmission, and distribution. This would include impacts on biodiversity and agriculture.

Strategy 3: Increase Sustainable Production of Low Carbon Biofuels and Hydrogen

Biofuels and hydrogen can help decarbonize difficult-to-electrify sectors, such as industrial processes and goods movement. However, there is currently a limited supply of sustainable biofuels and hydrogen, and thus a need to increase production while avoiding unintended impacts. There are opportunities within the region to sustainably produce biofuels from organic waste feedstock (i.e., liquid waste, solid waste, and agricultural waste). Increasing biofuel production from these sustainable sources will greatly support the transition to clean, renewable energy.

3.1 More Stringent Low Carbon Fuel Standards.

BIG Move CAP

Advocate to the BC Government to further increase the stringency of the BC *Low Carbon Fuel Standard* to reduce the carbon intensity of transportation fuels, primarily through increasing use of renewable diesel and ethanol. Advocate to the Government of Canada to further tighten the federal *Clean Fuel Standard* to include more stringent carbon intensity targets for all transportation fuels.

3.2 Implement Renewable Gas Content Requirements.

BIG Move CAP

Advocate to the BC Government to establish content requirements for renewable gas, in line with targets in the provincial *CleanBC* plan. Renewable gas includes renewable natural gas, which has a lower carbon intensity than natural gas from fossil fuels.

3.3 Prioritize Sustainability in Biofuel Feedstock.

BIG Move

Work with the BC Government and the Government of Canada to ensure that feedstock for biofuel production is sourced sustainably and responsibly. This would include impacts on biodiversity and agriculture.

3.4 Regional Hydrogen Hub.

Work with the BC Government, Canadian Hydrogen Fuel Cell Association, B.C. Centre for Innovation and Clean Energy, member jurisdictions, First Nations, and other regional partners on the development of a regional hydrogen hub in Metro Vancouver, in alignment with the *BC Hydrogen Strategy*. A regional hydrogen hub would co-locate low carbon hydrogen production and end-use applications, such as industrial users, to spur and grow hydrogen supply and demand.

3.5 Regional Sources of Liquid Biofuels.

Explore opportunities and air quality impacts for regional production of liquid biofuels, such as renewable diesel, from organic feedstock.

3.6 Develop Local Sources of Sustainable Aviation Fuel.

CAP

Support airlines at the Vancouver International Airport and other regional partners in increasing local availability of sustainable aviation fuel.

3.7 Streamline Emission Requirements for Anaerobic Digestion Facilities.

CAP

Develop an emission regulation for anaerobic digestion of manure, other agricultural waste, and commercial food waste. The regulation would maintain equivalent protections for regional air quality and human health as the existing permit process, and would provide a simpler path to regulatory compliance.

3.8 Expand Anaerobic Digestion of Agricultural Waste.

CAP

Advocate to the BC Government, the Government of Canada, energy utilities, member jurisdictions, and First Nations to expand development of anaerobic digestion facilities to process manure, other agricultural waste, and commercial food waste. This could include funding (e.g., incentives, tax credits, loans) and removal of barriers in existing regulations. Any expansion should avoid the loss of agricultural land in Metro Vancouver.

3.9 Phase Down Use of Thermal Coal and Petroleum Coke.

Develop regulatory requirements for industrial facilities to phase down the usage of thermal coal and petroleum coke in the region by 2030. This could support industrial facilities in transitioning to low carbon energy sources, such as biofuels, to meet greenhouse gas reduction requirements, as outlined in Action 3.1.2 within the *Clean Air Plan*.

3.10 Metro Vancouver as a Regional Clean, Renewable Energy Provider.

Corporate LEADERSHIP

Increase provision of clean, renewable energy, such as waste heat, electricity, biofuels, and hydrogen, to the region. Metro Vancouver manages various waste streams, such as liquid waste, organic food waste, and construction and demolition waste, that can be used to produce clean, renewable energy, while adhering to the concepts of a circular economy.

3.11 Innovative Research on Optimizing Energy Recovery from Waste Streams.

Corporate LEADERSHIP

Conduct innovative research on optimizing energy recovery from waste streams to advance technical knowledge and commercial availability of potentially industry-changing technologies.

DESCRIPTION OF THE HYDROTHERMAL LIQUEFACTION PROCESS THAT METRO VANCOUVER IS PILOTING

Strategy 4: Limit Expansion of Fossil Fuel Production

To limit global warming to 1.5 degrees Celsius, the world will need to limit expansion of fossil fuels as well as accelerate the transition to clean, renewable energy. Limiting expansion of fossil fuel production will support global climate action as well as reduce the potential of stranded assets in a carbon neutral future.

4.1 Account for the Full Climate Impact of Fossil Fuel Production and Export Projects.

BIG Move

Advocate to the BC Government and the Government of Canada to acknowledge through a policy statement that any new fossil fuel production and export projects (coal, oil, natural gas, liquefied natural gas), or expansions to fossil fuel production and export sites are likely to cause unacceptable environmental effects, such as climate change. This policy statement will help inform provincial and federal ministers in determining whether these types of projects are in the public interest and whether they hinder or contribute to BC's and Canada's ability to meet its commitments in respect of climate change, as required under the federal *Impact Assessment Act* and BC *Environmental Assessment Act*. This will also support Metro Vancouver in assessing the full climate impact of projects located within the region, which can include impact on regional and global emissions.

4.2 Eliminate Subsidies and Public Financing for Fossil Fuels.

Advocate to the Government of Canada to eliminate fossil fuel subsidies by 2023, develop a plan to phase out public financing of the fossil fuel sector, and eliminate flow-through shares for oil, gas and coal projects, as announced in the Deputy Prime Minister and Minister of Finance's 2022 **Mandate Letter**.

4.3 Just Transition Plan for Workers and Communities Engaged in the Fossil Fuel Industry.

Advocate to the BC Government to develop a Just Transition Plan with extensive stakeholder input, that will complement the *CleanBC Roadmap to 2030* and *Climate 2050 Roadmaps* to develop actionable recommendations that ensure that workers and communities engaged in the fossil fuel industry are not left behind in the transition to clean, renewable energy.

Resilient Energy Strategies

Strategy 5: Protect Existing Energy Systems from Current and Future Climate Impacts

While reducing regional emissions will contribute to the global effort against climate change, some impacts from a changing climate are locked in and are likely to occur even with deep emission reductions. Rising sea levels, increased frequency and severity of riverine flooding, and more frequent and intense heatwaves, wildfires, and droughts are already impacting our energy system, and are likely to continue to impact regional energy networks. Much of our critical energy infrastructure will remain standing for decades, but has not been designed to withstand impacts from changing climate hazards. Identifying current and future climate impacts, and protecting and upgrading existing energy infrastructure from the hazards posed by these impacts, is essential to maintaining a resilient energy system. Reducing vulnerability of critical regional infrastructure, such as improving backup power systems, can limit impacts caused by disruption to the energy system.

5.1 Comprehensive Climate Risk and Vulnerability Assessment.

BIG Move

Work with the BC Government, member jurisdictions, First Nations, and energy utilities in the region to complete a comprehensive regional climate risk and vulnerability assessment that would support a more coordinated approach to climate adaptation in the region. This could complement or include other regional vulnerability assessments, such as those outlined in Action 6.4 in the *Climate 2050 Buildings Roadmap* and Action 6.5 in the *Climate 2050 Transportation Roadmap*.

5.2 Prepare for Regional Disruption due to Extreme Weather Events.

Work with the BC Government, member municipalities, First Nations, energy utilities, and other regional partners responsible for emergency management and response, to develop and maintain climate change adaptation plans that establish protocols to respond to, and rapidly recover from, disruption to the regional energy system due to severe climate-related weather events.

5.3 Protect and Increase Resilience of Existing Regional Energy Generation Infrastructure.

Work with member jurisdictions, First Nations, local businesses, and energy utilities to increase the resilience of generation infrastructure, such as cogeneration facilities and district energy systems, and ensure they are protected from current and future climate impacts.

5.4 Protect and Increase Resilience of Existing Energy Distribution Infrastructure.

Work with the BC Government, member jurisdictions, First Nations, and energy utilities to ensure that regional energy distribution infrastructure, such as electrical substations, power lines and pipelines, are protected from current and future climate impacts.

5.5 Ensure Critical Regional Infrastructure has Backup Power.

Work with member jurisdictions, First Nations, and energy utilities to ensure that critical regional infrastructure have access to backup power, ideally low-carbon, to minimize interruptions to essential services during climate-related weather events.

Strategy 6: Build New Energy Systems that are Climate Resilient

In addition to protecting critical energy infrastructure and networks, steps must also be taken proactively to build a more resilient energy system. Climate change adaptation needs to be considered during the location, construction, maintenance, and operation of new energy infrastructure to avoid creating vulnerabilities that make adaptation more difficult and expensive in the future. Design standards with updated climate projections should be employed to ensure resiliency is integrated into the design of new energy infrastructure. Proactive work should be undertaken to foster innovation and develop technologies that support a climate resilient energy system.

6.1 Design for Climate Resilient Energy Infrastructure.

Work with the BC Government, member jurisdictions, First Nations, and energy utilities and their regulatory bodies to ensure that all newly constructed and retrofitted energy infrastructure, including generation, transmission, and distribution infrastructure, are designed to be resilient to current and future impacts of climate change.

6.2 Pilot Innovative Renewable Energy + Storage Systems to Improve Resiliency.

Work with member jurisdictions, First Nations, and energy utilities in piloting innovative renewable energy + storage systems to improve resiliency, such as home solar plus battery systems or using excess grid electricity to produce hydrogen.

6.3 Vehicle-to-Grid Technologies.

Corporate LEADERSHIP

Work with BC Hydro and other interested electric vehicle infrastructure owners to pilot test the viability and utility of bi-directional vehicle chargers with zero-emission vehicles. Using electric vehicles as decentralized batteries could help reduce the need for new electricity generation and increase resiliency in the electrical grid during periods of increased demand or system disruption.

PORT MOODY

ALDERGROVE REGIONAL PARK

Setting the Path Ahead

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

Electricity is one of the most important sources of clean, renewable energy for significant early reductions of greenhouse gases in the region, particularly for buildings and personal transportation. Electric air-source heat pumps and electric vehicles are becoming readily available and deployable on a large scale. It is critical that the actions identified in this Roadmap support both faster uptake of electric technologies and support BC Hydro in scaling up electricity supply and modernizing the grid. Taking early action to reduce emissions can also help improve air quality and enhance resilience in energy systems, which will ensure that energy supply is resilient to changing climate conditions and increased prevalence of extreme weather events.

As large parts of the economy electrify, there will be some sectors that will be difficult-to-electrify, such as some existing buildings, industrial processes, and goods movement. Action that supports rapid development and scale-up of zero emission and low carbon options for these sectors is needed to ensure that the energy system can transition to 100% clean, renewable energy by 2050.

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

CLIMATE 2050 ENERGY ROADMAP ACTION TIMELINE

STRATEGY	2022-2024	2025-2029	2030-BEYOND
Plan for the Transition to Clean, Renewable, and Resilient Energy	Align British Columbia's Energy Objectives with Strong Climate Action		
	Strong Climate Mandate for Energy Utilities		
	Revise Utility Regulation to Align with Strong Climate Action		
	Long-term Planning Scenarios for the Transition to 100% Clean, Renewable Energy		
	Regional Climate Action in Energy Utility Regulatory Processes		
	Implement Tracking, Verification, and Reporting Requirements for Renewable Natural Gas Supply		
	Reduce Energy Poverty		
	Transition Corporate Energy Use to 100% Clean, Renewable Energy		
Accelerate Electrification	Electrification Rates		
	Time-of-use Rates, Demand Response, and Electric Vehicle Peak Reduction Programs		
		Modernizing the Electrical Grid	
	Regional Grid Constraints		
	High Performance Heating and Cooling Equipment Import/Sale Standards		
	Minimize Air, Land, and Water Impacts		
Increase Sustainable Production of Low Carbon Biofuels and Hydrogen		More Stringent Low Carbon Fuel Standards	
	Implement Renewable Gas Content Requirements		
	Prioritize Sustainability in Biofuel Feedstock		
	Regional Hydrogen Hub		
		Regional Sources of Liquid Biofuels	
	Develop Local Sources of Sustainable Aviation Fuel		
		Streamline Emission Requirements for Anaerobic Digestion Facilities	
	Expand Anaerobic Digestion of Agricultural Waste		
	Phase Down Use of Thermal Coke and Petroleum Coke		
	Metro Vancouver as a Regional Clean, Renewable Energy Provider		
	Innovative Research on Maximizing Energy Recovery from Waste Streams		
Limit Expansion of Fossil Fuel Production	Account for the Full Climate Impact of New Fossil Fuel Production and Export Projects		
	Eliminate Subsidies and Public Financing for Fossil Fuels		
	Just Transition Plan for Workers and Communities Engaged in the Fossil Fuel Industry		
Protect Existing Energy Systems from Current and Future Climate Impacts	Comprehensive Climate Risk and Vulnerability Assessment		
	Prepare for Regional Disruption due to Extreme Weather Events		
	Protect and Increase Resilience of Existing Regional Energy Generation Infrastructure		
	Protect and Increase Resilience of Existing Energy Distribution Infrastructure		
	Ensure Critical Regional Infrastructure has Backup Power		
Build New Energy Systems that are Climate Resilient	Design for Climate Resilient Energy Infrastructure		
		Pilot Innovative Renewable Energy + Storage Systems to Improve Resiliency	
		Vehicle-to-grid Technologies	

Measuring our Progress

The table below lists examples of some of the performance indicators that could be used to help Metro Vancouver measure regional progress towards meeting the targets set out for this purpose. The performance indicators used will depend, to some extent, on the availability of this information from other organizations.

Because the *Energy Roadmap* is calling for actions from many different partners and stakeholders, data sharing will be foundational to understanding the pace of progress towards our common goals, and will help governments to continue to shape equitable and cost-effective pathways to a carbon neutral future. While much of the data needed to measure progress in on-road transportation are already collected, there are significant data gaps for rail, marine, and air transportation. Additional work is underway to understand what key performance indicators and data effectively measure progress towards regional resilience (noted in the table below as "TBD").

ROADMAP ELEMENT	KEY PERFORMANCE INDICATOR	DATA SOURCE	DATA IS CURRENTLY COLLECTED
Regional Clean, Renewable Energy Use	Percentage of clean, renewable energy used	Regional GHG inventory	Yes
	tCO2e from regional energy use	Regional GHG inventory	Yes
	Energy use by type (GJ)	Metro Vancouver BC Hydro FortisBC BC Government	Partial
Plan for the Transition	tCO2e from regional electricity use	BC Hydro Local & BC Governments	Partial
	tCO2e from regional gas use	FortisBC	Yes
	Thermal coal and petroleum coke use in industrial processes (GJ)	Regional GHG Inventory	Yes
	Renewable energy supplied by MV	Metro Vancouver	Yes
Accelerate Electrification	Number of high-efficiency electric equipment installed	Shelf/Industry surveys	No
	Number of new buildings with low carbon energy systems	Local government building permits	Yes
	Regional vehicle fleet make up by engine type: internal combustion, electric, hybrid, hydrogen (number of vehicles, % of total regional vehicle stock)	ICBC Metro Vancouver TransLink	Yes
	Number of electric vehicle chargers	Municipalities BC Government Charging service providers	Yes
	Regional equipment registration by model year, engine tier and fuel type (GJ)	Metro Vancouver – Non Road Diesel Engine Emission Regulation Port of Vancouver	Partial

ROADMAP ELEMENT	KEY PERFORMANCE INDICATOR	DATA SOURCE	DATA IS CURRENTLY COLLECTED
Sustainable Production of Low Carbon Biofuels and Hydrogen	Biofuels used in-region (GJ)	Regional GHG Inventory	Partial
	Sustainable feedstock used, associated with biofuel consumption in region (tonnes)	BC Government Government of Canada Market research firms	No
	Kilometres travelled by aircraft using zero or low emission fuels (km, % of total km travelled)	Transport Canada Regional airports Airlines	No
	Number of in-region anaerobic digestion facilities	Metro Vancouver	Yes
	Biofuel production from Metro Vancouver facilities (GJ)	Metro Vancouver	Yes
Limit Expansion of Fossil Fuel Production	Number of new, in-region, completed projects related to new or expanded fossil fuel production and export	Metro Vancouver Industry Surveys	Partial
Protect Existing Energy Systems	TBD	TBD	TBD
	TBD	TBD	TBD
	TBD	TBD	TBD
Build New Climate Resilient Energy Systems	TBD	TBD	TBD
	TBD	TBD	TBD

Glossary

Biodiesel is made from vegetable oils (such as canola) and waste animal fats. It can be blended in fossil diesel in amounts up to 20% and used in conventional diesel engines.

Biofuels are produced using organic matter derived from biomass such as plants. Biofuels can be gaseous, liquid, or solid. Common biofuels include biodiesel, renewable diesel, ethanol, renewable natural gas, firewood, and wood pellets.

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

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

Combustion refers to the process of burning a fuel to make energy.

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

Electrical grid is the network through which electricity is generated, transmitted, and distributed to the end user. The electrical grid includes electrical generation infrastructure, such as hydroelectric dams, and transmission and distribution infrastructure, such as transformers, substations, and power lines.

Ethanol is the most common renewable alternative to gasoline. Made from plants such as corn or sugar cane, it can be blended up to 10% in regular gasoline used in conventional gasoline engines.

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.

Fossil natural gas, sometimes called natural gas, is a fossil fuel composed of mostly methane, about 95% by volume. Combustion of fossil natural gas generates greenhouse gas emissions.

Fugitive emissions are unintended discharges to the atmosphere resulting from accidental release or leaks.

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

Ground-level ozone (O_3) can have harmful impacts on everyone, especially children, seniors, 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.

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 all greenhouse emissions associated with the production, distribution, and use of a particular energy source, from feedstock extraction, processing, transportation, to end-use. For example, lifecycle emissions of gasoline would span all associated emissions, from extraction of oil from the ground until combustion in a vehicle.

Microgrids refers to systems composed of electrical loads and distributed energy generation resources, that are interconnected through an electrical grid. Microgrids have the ability to operate independently from the central electrical grid, so can remain operating during regional power outages.

Natural gas, referred to as fossil natural gas in this Roadmap, is a fossil fuel composed of mostly methane, about 95% by volume. Combustion of natural gas generates greenhouse gas emissions.

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

Renewable diesel is also made from vegetable oils and animal fats, but using a different process that makes the end fuel nearly identical to regular diesel. It can be used directly in conventional diesel engines without requiring engine modifications.

Renewable gas is gas produced from renewable resources. This primarily includes green hydrogen, waste hydrogen, and renewable natural gas.

Renewable natural gas is a gaseous biofuel that is mostly composed of methane; it is produced primarily from anaerobic digestion of organic feedstock (such as food, agricultural, and forestry waste).

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

Stranded assets are assets that have suffered from unanticipated or premature write-downs, devaluation, or conversion to liabilities.

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.


metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

EXECUTIVE SUMMARY

Climate 2050 Energy Roadmap

A pathway to clean, renewable, resilient energy in Metro Vancouver

Vision Summary

By 2050, the Metro Vancouver region has transitioned away from fossil fuels to 100% clean, renewable energy while also becoming much more energy efficient and reducing overall energy use. Energy infrastructure is resilient and reliable, despite increased extreme weather due to climate change.

The *Climate 2050 Energy Roadmap* is a pathway to ambitious and necessary change in this region's energy system. Transitioning to clean, renewable energy is essential to meeting emission reduction targets and reaching a carbon neutral region by 2050.

Reducing energy use and increasing efficiency are the first steps to reducing emissions from energy. The next step is to replace fossil fuel use with clean, renewable energy, (electricity, for example).

As we transition to clean, renewable energy, the energy system must be resilient to the impacts of the changing climate. Impacts such as extreme heat and severe storms threaten the reliability of our energy supply. Protecting existing energy infrastructure, and building a resilient energy system will ensure that supply continues to be reliable.

GOALS AND TARGETS

Metro Vancouver has set the following climate goals for energy, to help visualize the pace of transition and to track progress out to 2030 and 2050.

All of the energy used in Metro Vancouver is derived from clean, renewable sources

TARGETS

By 2030:

- 60% of the energy used in the region is derived from clean, renewable sources

By 2050:

- 100% of the energy used in the region is derived from clean, renewable sources

All regional energy infrastructure is reliable and resilient to the current and future impacts of climate change.

TARGETS

By 2030:

- All energy providers have identified known, unmitigated climate hazards that could impact energy infrastructure.
- All new energy infrastructure is protected from known, unmitigated climate hazards.

By 2050:

- The energy system is protected from the current and future impacts of climate change.

CLEAN, RENEWABLE ENERGY STRATEGIES AND ACTIONS

To achieve these goals and targets, the *Energy Roadmap* has outlined 36 actions under six strategies:

1. Plan for the Transition to Clean, Renewable, and Resilient Energy
2. Accelerate Electrification
3. Increase Sustainable Production of Low Carbon Biofuels and Hydrogen
4. Limit Expansion of Fossil Fuel Production
5. Protect Existing Energy Systems from Current and Future Climate Impacts
6. Build New Energy Systems that are Climate Resilient

BIG Move **Nine actions are considered Big Moves.**

1. Align British Columbia's Energy Objectives with Strong Climate Action.
2. Strong Climate Mandate for Energy Utilities.
3. Electrification Rates.
4. Time-of-Use Rates, Demand Response Programs, and Electric Vehicle Peak Reduction Programs.
5. More Stringent Low Carbon Fuel Standards.
6. Implement Renewable Gas Content Requirements.
7. Prioritize Sustainability in Biofuel Feedstock.
8. Account for the Full Climate Impact of Fossil Fuel Production and Export Projects.
9. Comprehensive Climate Risk and Vulnerability Assessment.

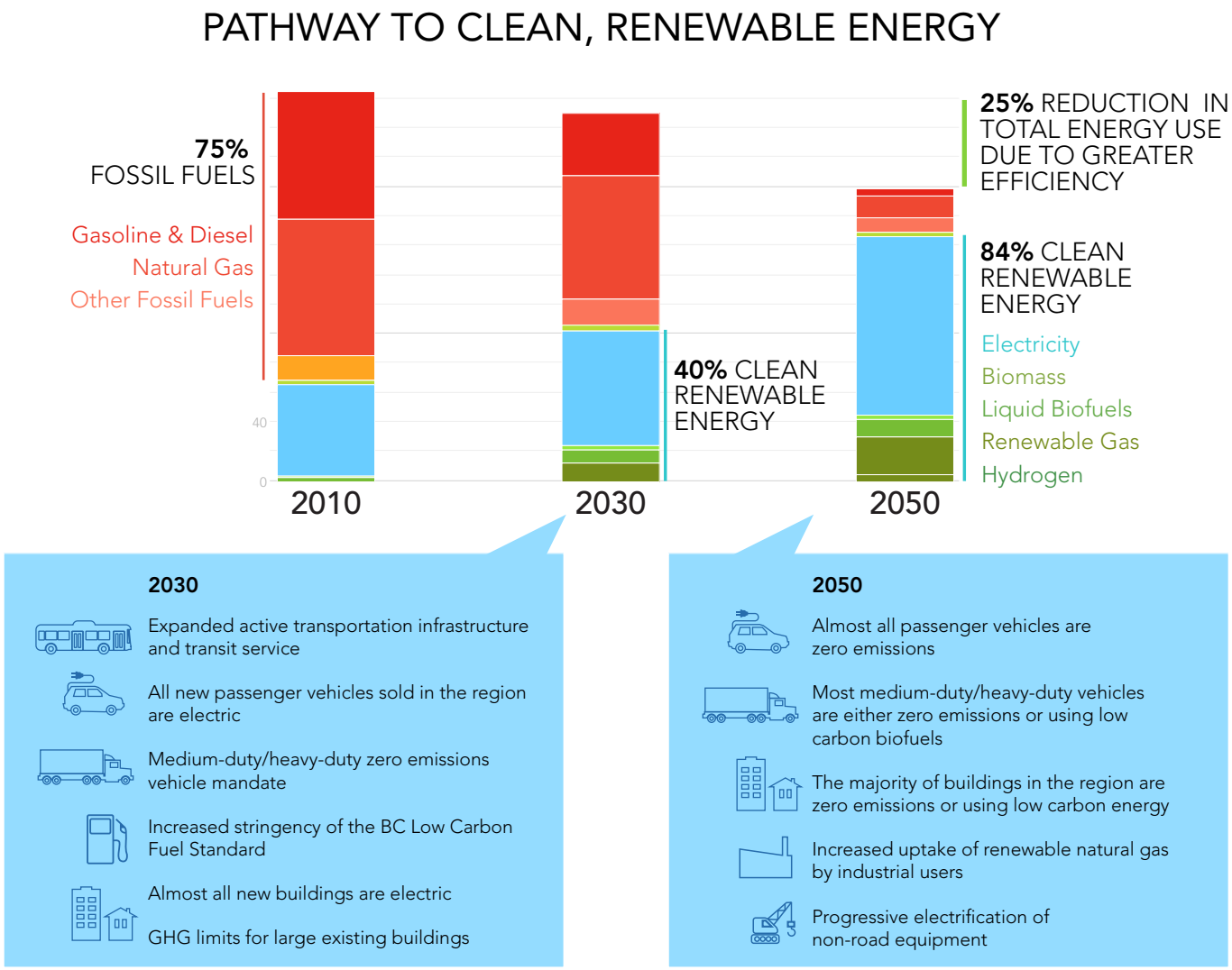
Corporate LEADERSHIP **Four actions are identified as Corporate Leadership Actions:**

1. Transition Corporate Energy Use to 100% Clean, Renewable Energy.
2. Metro Vancouver as a Regional Clean, Renewable Energy Provider.
3. Innovative Research on Optimizing Energy Recovery from Waste Streams.
4. Vehicle-to-Grid Technologies.

CLEAN, RENEWABLE ENERGY PATHWAY TO 2050

Measuring the energy impact of the *Climate 2050 Roadmaps*

Metro Vancouver analyzed the impact of the actions to reduce emissions across all the Climate 2050 Roadmaps. This infographic illustrates the transition to clean, renewable energy driven by those actions. The actions in the *Climate 2050 Energy Roadmap* are critical to ensuring there is enough clean, renewable energy for successful implementation of the actions in the other Roadmaps.



NEXT STEPS AND IMPLEMENTATION

Metro Vancouver will advance implementation of the actions in *Climate 2050 Energy Roadmap* through its role as planning agency, regulator, utility service provider, and a regional forum. Coordination and collaboration with regional partners is essential to implementation.

More information and a complete list of draft actions related to the energy transition can found at the Climate 2050 website at *Climate 2050 Energy Roadmap*.

Summary of Engagement Feedback

Interest	How We're Responding
Support for Electrification and Limiting Fossil Fuels Strategies	What we heard: There was strong support for electrification and for additional collaboration with BC Hydro on initiatives supporting electrification such as upgrades to the grid, supportive rate structures and decentralized energy generation. There were also comments related to the importance of strengthened action around eliminating or minimizing support for fossil fuel production. How we're responding: Staff have maintained the accelerate electrification and limit fossil fuel production strategies within the Roadmap. Staff have also added in additional content related to the role of rooftop solar.
Equity	What we heard: There was acknowledgement and support of the equity sections within the Roadmap. There were comments around implementing additional supports for equity-seeking groups within the energy transition. How we're responding: An action was added on reducing energy poverty through equitable policy design, targeted programs and incentives, and inclusive engagement.
Adaptation	What we heard: There were significant comments around the need to address cooling in homes in light of extreme heat events (i.e., 2021 heat dome). How we're responding: Staff have added content relating to the importance of providing reliable energy for cooling to ensure resident health and safety in extreme heat events.
Renewable natural gas and fossil natural gas	What we heard: A number of stakeholders wanted to ensure that the region is adequately managing an energy transition away from all gas, while some stakeholders requested clarification about the role of renewable gases (i.e., renewable natural gas, hydrogen) and any related health impacts. How we're responding: Staff are supportive of a diversified energy system, and acknowledges the role renewable gases will play in the energy transition. Staff also recognize that there is a very limited supply of in-Province renewable gas, and there are a number of outstanding issues associated with out-of-Province renewable gas supply. Therefore, staff have reconfirmed our position that renewable gases should be prioritized for use in difficult-to-electrify sectors, such as industry, and added in additional information on the limitations of renewable gas.

To: Climate Action Committee

From: Edward Nichol, Regional Planner, Regional Planning and Housing Services
Josephine Clark, Natural Resource Management Planner, Parks and Environment
Jason Emmert, Program Manager, Climate Policy, Parks and Environment

Date: February 15, 2023 Meeting Date: April 6, 2023

Subject: **Metro Vancouver's Climate 2050 Nature and Ecosystems Roadmap**

RECOMMENDATION

That the MVRD Board:

a) endorse the *Climate 2050 Nature and Ecosystems Roadmap* as attached to the report dated February 15, 2023, titled "Metro Vancouver's Climate 2050 Nature and Ecosystems Roadmap" as the initial Roadmap to achieve the *Climate 2050* vision, goals, and targets for a carbon neutral and resilient region supported by healthy and biodiverse ecosystems;
b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Nature and Ecosystems Roadmap*; and
c) direct staff to update the Roadmap, as needed, in response to new information.

EXECUTIVE SUMMARY

This report presents the *Climate 2050 Nature and Ecosystems Roadmap*, one of ten *Climate 2050* Roadmaps that will guide our region's policies and collective actions to transition to a carbon neutral, resilient region by 2050. The region's ecosystems store approximately 65 million tonnes of carbon, sequestering an additional one million tonnes of carbon from the atmosphere each year and providing additional biodiversity, resilience, and human health co-benefits. To maximize these benefits, the *Climate 2050 Nature and Ecosystems Roadmap* lays out strategies and actions to protect and restore ecosystems, connect green infrastructure, integrate natural assets, support a resilient urban forest, and advance nature-based solutions to climate change. Like the other *Climate 2050* Roadmaps, the Nature and Ecosystems Roadmap is intended to be dynamic, and change over time, in response to opportunities. To achieve the vision, goals and targets established in this Roadmap, Metro Vancouver and its partners need to implement the actions as soon as possible, using the full extent of each agency's authority, while continuing to explore new opportunities to enhance existing actions and for additional actions. A draft of the Nature and Ecosystems Roadmap was presented to the Climate Action Committee and MVRD Board in April 2022. Staff have since completed engagement through a number of avenues, and have included a summary of key feedback that has been considered in finalizing the *Nature and Ecosystems Roadmap*. This report seeks endorsement of the *Climate 2050 Nature and Ecosystems Roadmap* by the MVRD Board.

PURPOSE

This report presents the *Climate 2050 Nature and Ecosystems* Roadmap, seeking endorsement by the MVRD Board.

BACKGROUND

In September 2018, the MVRD Board adopted the *Climate 2050 Strategic Framework* and directed staff to initiate development of the *Climate 2050* Roadmaps. The Board subsequently authorized staff to begin an engagement process for *Climate 2050*, using a series of issue area discussion papers related to the ten Roadmaps. The Climate Action Committee received the *Climate 2050 Discussion Paper on Nature and Ecosystems* at its May 2020 meeting (Reference 1). Following engagement on the Discussion Paper, a draft *Nature and Ecosystems Roadmap* was provided to the Climate Action Committee at its April 2022 meeting (Reference 2). With the completion of engagement on the draft Roadmap, staff have now finalized the *Climate 2050 Nature and Ecosystems Roadmap* (Attachment), and are seeking endorsement by the Board.

CLIMATE 2050

Climate 2050 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 including the *Clean Air Plan*, *Metro 2050* (the regional growth strategy) and the *Regional Parks Plan 2022*.

METRO VANCOUVER'S CLIMATE 2050 NATURE AND ECOSYSTEMS ROADMAP

The *Climate 2050 Nature and Ecosystems Roadmap* supports the vision to achieve a carbon neutral and resilient region through healthy and biodiverse ecosystems. In addition to outlining challenges and benefits, the *Climate 2050 Nature and Ecosystems Roadmap* lays out 31 actions for storing carbon and building resilience, organized under the following five strategic areas:

1. Protect, Restore, and Enhance the Region's Ecosystems
2. Connect Green Infrastructure
3. Integrate Natural Assets into Conventional Asset Management and Decision-Making Processes
4. Support a Resilient, Robust, and Healthy Urban Forest
5. Advance Nature-based Solutions to Climate Change

Big Moves in the *Nature and Ecosystems Roadmap*

Among the 31 actions, the *Climate 2050 Nature and Ecosystems Roadmap* identifies the following seven Big Moves:

1. Protect an Additional 10% of the Region for Nature
2. Develop a Regional Green Infrastructure Network
3. Incorporate Natural Assets into Asset Management and Financial Planning
4. Integrate Ecosystems and their Services into the Design of Major Infrastructure
5. Achieve 40% Tree Canopy Cover Within the Region's Urban Areas
6. Explore Innovative Funding and Incentive Programs
7. Plan for Climate Change Impacts on Ecosystems

The *Climate 2050 Nature and Ecosystems Roadmap* proposes an implementation timeline to encourage swift early action on key issues. Given the timelines and ambitious targets and goals, staff have continued to advance relevant work plan items across departments and collaborate with

other governments and partners while planning and developing the Roadmap.

Metro Vancouver is working to ensure Roadmap content is accessible to a broad audience. As Roadmap content is endorsed and published in full, staff will also provide an executive summary and unpack the Roadmap content in plain language as a web resource.

Potential Impact on Greenhouse Gas Emissions
A conservative estimate of the carbon stored in the vegetation and soils of the region's ecosystems (such as wetlands, forests, and riparian areas) is 65 million tonnes. Every year, an estimated one million tonnes of additional carbon is sequestered from the atmosphere and added to the carbon stores held by the region's ecosystems. Protection of ecosystems helps ensure stored carbon remains locked away and ongoing sequestration of carbon continues. Restoration and enhancement of ecosystems improves the region's long-term carbon storage potential.

Carbon sequestration and storage is one of the many benefits achieved through ecosystem protection and restoration. However, significantly increasing the amount of carbon stored in ecosystems requires large areas and long timeframes. While the *Climate 2050 Nature and Ecosystem Roadmap* actions are supplemental solutions to the greenhouse gas emissions reduction actions outlined in other *Climate 2050* Roadmaps, they are still essential to meeting the regional target of a carbon neutral region by 2050.

Potential Impact on Regional Resilience
Actions related to nature and ecosystems are integrated climate solutions in that they help to both store carbon and increase resilience. Resilience is increased through a broad range of 'ecosystem services' including cooling and shading urban areas, capturing and cleaning stormwater, moderating floods, and reducing the impacts of coastal storms. To provide these services, ecosystems must be healthy, biodiverse, and able to withstand the impacts of climate change. Protecting, restoring and enhancing nature and ecosystems maximizes their ability to provide climate resilience benefits to the region.

Implementation of the Nature and Ecosystems Roadmap
The actions in the *Climate 2050 Nature and Ecosystems Roadmap* will be implemented through Metro Vancouver's regulatory and planning authority, delivery of regional services, and its role as convener of and advocate for issues of regional significance. The Roadmap considers equity and identifies opportunities to reduce disproportionate impacts. It also identifies actions for implementation by other governments and organizations. Progress on achieving the goals and targets will be measured against key performance indicators, and reported publically.

Climate 2050 Nature and Ecosystems Roadmap, Regional Parks Plan and Metro 2050
Metro Vancouver works with member jurisdictions to develop, implement and steward *Metro 2050*, the regional growth strategy. The strategy represents the regional federation's ongoing commitment to building a compact metropolitan region - where approximately two thirds of the land is designated for agricultural, recreational, and conservation uses. *Metro 2050* defines actions and directions for Metro Vancouver, member jurisdictions, and TransLink. Though *Metro 2050* and *Climate 2050* are distinct plans, they are intended to be mutually supportive, with policies and

actions that are complementary and focused on common objectives. The *Climate 2050 Nature and Ecosystems Roadmap* builds on *Metro 2050* with further actions to protect stores of carbon and build resiliency with nature and ecosystems.

Important connections also exist between the *Climate 2050 Nature and Ecosystems Roadmap* and the *Regional Parks Plan 2022*. Metro Vancouver manages regional parks to protect important natural areas across the region and provide opportunities for people to connect with nature. The *Regional Parks Plan 2022* was updated to more fully address climate change and incorporates many actions from the *Climate 2050 Nature and Ecosystems Roadmap*.

CONSULTATION AND ENGAGEMENT PROCESS

The full draft Roadmap was publically available on the Metro Vancouver website from June to February 2023 and the opportunity to provide comments and feedback forms was promoted to relevant Metro Vancouver Advisory Committees, as well as through emails, online newsletters, social media platforms, and a recorded webinar. Staff engaged with those likely to comment, be impacted or have a role in implementation, including targeted meetings with key subject matter experts, municipal staff, environmental NGOs and First Nations.

Summary of Feedback

Interest	**How We're Responding**
Action 5.1	*What we heard:* • Implementation of Action 5.1 should begin sooner than 2024-2029; • There are opportunities to incorporate innovative financial mechanisms into other strategies (e.g. Strategy 1); and • There is no reference to gauging public support for various financial mechanisms such as conservation funds. *How we're responding:* • Action will now begin in 2021-2023; • Language was added to clarify that the outcomes of action 5.1 may support the implementation of other Roadmap strategies; and • Language was updated to reflect the need for gauging public support in Action 5.1.
Convening partners and sharing information	*What we heard:* • The document could further emphasize Metro Vancouver's role in convening other partners and sharing information. *How we're responding:* • Edits were applied to action 1.8, 2.2, 3.4, and 4.2 to reflect the importance of convening partners and sharing information.
Advancing green infrastructure	*What we heard:* • There are potential conflicting priorities between utility and drainage access points and green infrastructure implementation. *How we're responding:* • Metro Vancouver staff are working internally to integrate and align green infrastructure priorities across departments.

Feedback Received Through Other Management Plans
In addition to engagement on the draft Roadmap, relevant feedback was also received through updates to the regional growth strategy (*Metro 2050*) and the regional parks plan which took place during the same timeframe.

Many actions that received strong engagement support through *Metro 2050* were brought forward into the Nature and Ecosystems Roadmap, such as including regional targets for land protection and tree canopy cover, and the identification of a regional green infrastructure network.

Relevant feedback received through engagement for the *Regional Parks Plan 2022* included recognition of the importance of protecting nature, enhancing ecosystem connectivity, and the role of nature in human health and regional resilience.

First Nations Engagement
In 2022, staff sent an engagement letter to the ten in-region First Nations, inviting input on the Roadmap. Feedback was received from two Nations. Key engagement themes included:

- An emphasis on future policy alignment and integration opportunities with traditional laws;
- Noted climate change impacts (such as flooding) and their impact on ecosystems and wildlife;
- Climate change impacts on culturally significant species, such as Western Red Cedar trees;
- Climate grief and anxiety associated with climate change and its impact on cultural traditions;
- The importance of exploring partnerships with First Nations on various Roadmap actions; and
- The importance of sharing best practices.

Unique to this Roadmap, staff also contracted with two Indigenous, and Indigenous-owned business consultants to 1) review the draft Roadmap and provide feedback on existing content, and 2) recommend additional opportunities to reflect Indigenous perspectives. Based on the consultant recommendations and internal engagement with Metro Vancouver's Indigenous Relations department, staff revised the Roadmap to reflect the importance of Indigenous Knowledge in various sections of the document.

ALTERNATIVES
1. That the MVRD Board:
   a) endorse the *Climate 2050 Nature and Ecosystems Roadmap* as attached to the report dated February 15, 2023, titled "Metro Vancouver's Climate 2050 Nature and Ecosystems Roadmap" as the initial Roadmap to achieve the *Climate 2050* vision, goals, and targets for a carbon neutral and resilient region supported by healthy and biodiverse ecosystems;
   b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Nature and Ecosystems Roadmap*; and
   c) direct staff to update the Roadmap, as needed, in response to new information.

2. That the MVRD Board:
   a) endorse the *Climate 2050 Nature and Ecosystems Roadmap* as attached to the report dated February 15, 2023, titled "Metro Vancouver's Climate 2050 Nature and Ecosystems Roadmap" as the initial Roadmap to achieve the *Climate 2050* vision, goals, and targets for a carbon neutral and resilient region supported by healthy and biodiverse ecosystems, with amendments proposed by the Climate Action Committee;
   b) direct staff to continue working with member jurisdictions and other partners to implement the actions in the *Climate 2050 Nature and Ecosystems Roadmap*; and
   c) direct staff to update the Roadmap, as needed, in response to new information.

3. That the MVRD Board receive for information the report dated February 15, 2023, titled "Metro Vancouver's Climate 2050 Nature and Ecosystems Roadmap" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

The overall resources required to develop and engage on *Climate 2050* Roadmaps have been approved in program budgets for 2021 and 2022, including staff time and consulting expenditures. Continued alignment between *Climate 2050* Roadmaps and regional management plans is intended to make the best use of resources available, as well as minimize time commitments for interested parties providing feedback. The 2023 and subsequent annual budgets and five-year work plans will reflect the resource needs to begin implementation of actions in the *Climate 2050 Nature and Ecosystems Roadmap*.

CONCLUSION

Metro Vancouver's *Climate 2050 Nature and Ecosystems Roadmap* sets an ambitious path to maintain and restore healthy and resilient ecosystems that store carbon, moderate the impacts of a changing climate, and provide a range of other co-benefits. The *Nature and Ecosystems Roadmap* has been updated based upon feedback received on the draft in 2022. To achieve the 2030 and 2050 targets, Metro Vancouver and its partners need to start on the actions in the *Climate 2050 Nature and Ecosystems Roadmap* as soon as possible, using the full extent of each agency's authority, while continuing to explore opportunities to store carbon and bolster resilience. Staff recommend Alternative 1, to endorse the *Climate 2050 Nature and Ecosystems Roadmap*.

Attachment

Climate 2050 Nature and Ecosystems Roadmap

References

1. *Climate 2050 and Clean Air Plan* Discussion Paper on Nature and Ecosystems, report dated April 17, 2020
2. *Draft Climate 2050 Nature and Ecosystems Roadmap*, report dated March 9, 2022

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CLIMATE **2050 Roadmap**

Nature & Ecosystems

A pathway to storing carbon and building a resilient future with Nature and Ecosystems in Metro Vancouver

April 2023

FRONT COVER: FOREST

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

April 2023

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: qićəy̓ (Katzie), qʷɑ:ńƛəń (Kwantlen), kʷikʷəƛəm (Kwikwetlem), máthxwi (Matsqui), xʷməθkʷəy̓əm (Musqueam), qiqéyt (Qayqayt), se'mya'me (Semiahmoo), Sḵwx̱wú7mesh Úxwumixw (Squamish), scəẃaθən məsteyəxʷ (Tsawwassen), and sə́lílwətaʔɬ (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.


LOWER SEYMOUR CONSERVATION RESERVE

Metro Vancouver

Metro Vancouver is a federation of 21 municipalities, one electoral area, and one treaty First Nation that collaboratively plans for and delivers regional-scale services. Metro Vancouver's core utility services include drinking water, sewage treatment, and solid waste management, along with regional services like regional parks, affordable housing, regional land use planning, and air quality and climate action that help keep the region one of the most livable in the world.

Mission

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

1. **Serve as a Regional Federation**

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

2. **Deliver Core Services**

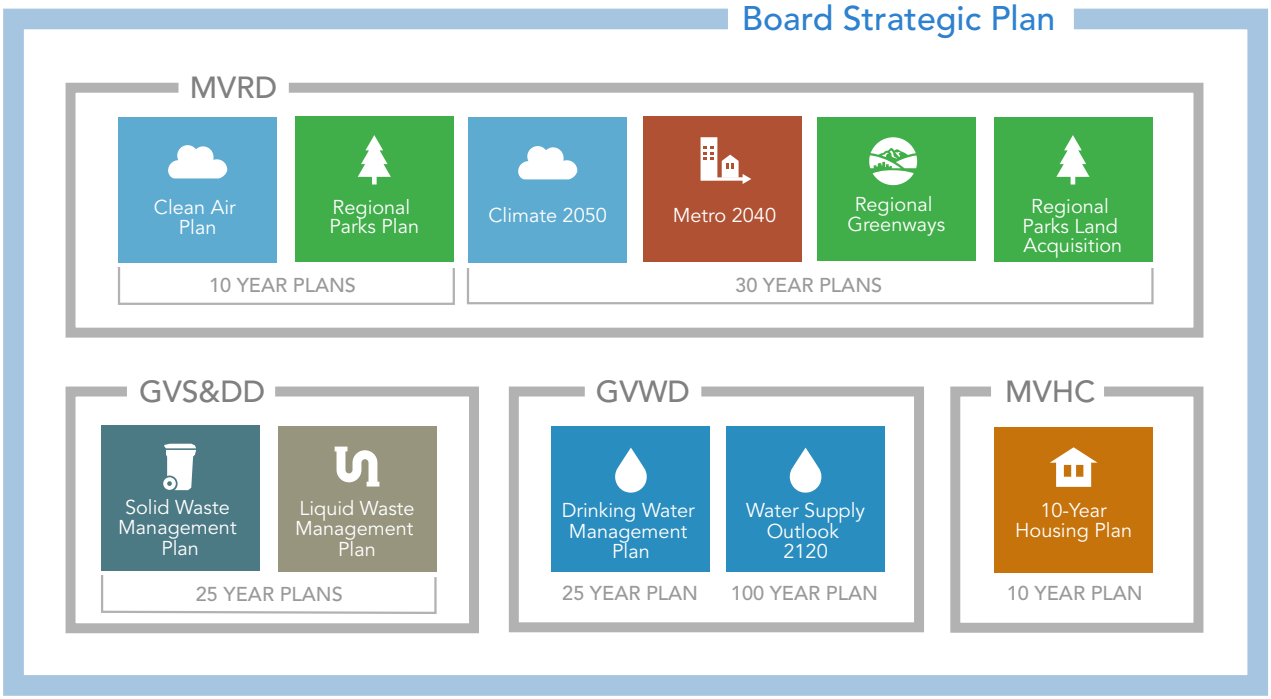
Provide regional utility services related to drinking water, liquid waste and solid waste to members. Provide regional services, including parks and affordable housing, directly to residents and act as the local government for Electoral Area A.

3. **Plan for the Region**

Carry out planning and regulatory responsibilities related to the three utility services as well as air quality, 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.



Adopted by the Metro Vancouver Board in 2018, the *Ecological Health Framework* encapsulates Metro Vancouver's collective efforts around ecological health and provides guiding principles, goals, and strategies to help achieve the vision of "a beautiful, healthy, and resilient environment for current and future generations". To help guide corporate actions, the Framework set three high-level goals: 1) build ecological resilience and minimize impacts; 2) protect natural areas and conserve ecosystem services; and 3) nurture nature within communities. The *Climate 2050 Nature and Ecosystems Roadmap* complements and builds on the *Ecological Health Framework* by identifying additional corporate and regional actions to maximize carbon storage, resilience, and other critical ecosystem services.

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 Vancouver, with its members, protects important lands and 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*.


MINNEKHADA REGIONAL PARK

The Roadmap at a Glance

Metro Vancouver's ecosystems are vital to the people and wildlife who live here. In both urban and natural areas, these ecosystems have tremendous cultural and spiritual importance, contribute to the region's livability, provide a sense of place, and foster biodiversity. Nature and ecosystems help us address climate change by sequestering carbon annually and storing it over the long-term, while also bolstering our resilience to climate change impacts such as extreme heat and flooding. Nature and ecosystems are themselves at risk of a changing climate, exacerbated by other stressors such as land development and invasive species.

Despite the challenges faced, the region is well-positioned to take action and maintain a healthy environment. By protecting, restoring, and enhancing ecosystems, and connecting them together across the region through a robust green infrastructure network, we can support productive and resilient ecosystems that help us address climate change. Natural asset management — a concept that involves accounting for the benefits nature provides — continues to gain traction across the region. Improving the health and extent of the region's urban forest is another opportunity to take climate action close to where people live and work. Lastly, our collective efforts to address climate change can include nature-based solutions that help address multiple problems, such as biodiversity loss and climate change, simultaneously.

Although there is much work to be done, there are some important actions that can be implemented now to supplement the efforts in other sectors to reach a carbon neutral and resilient region by 2050. It is critical that the actions identified in this Roadmap are implemented rapidly to prevent future ecosystem loss and degradation, and to maximize long term carbon storage, resilience, and other co-benefits. We are not alone in this challenge.

VIEW OF THE URBAN FOREST

The *Nature and Ecosystems Roadmap* lays out 31 actions for storing carbon and increasing resiliency, organized under the following five strategic areas:

1. Protect, Restore, and Enhance the Region's Ecosystems
2. Connect Green Infrastructure
3. Integrate Natural Assets into Conventional Asset Management and Decision-Making Processes
4. Support a Resilient, Robust, and Healthy Urban Forest
5. Advance Nature-based Solutions to Climate Change

The actions in this Roadmap demonstrate the importance of working collectively to reach climate objectives, and will complement other regional plans that support healthy and biodiverse ecosystems. Working closely with First Nations, the federal and BC governments, member jurisdictions, and other key partners will be critical to effectively implement the actions in this Roadmap. Together, we can ensure that nature and ecosystems are an integral part of creating a carbon neutral and resilient region.

Incorporating Indigenous Knowledge into Climate Action

The *Nature and Ecosystems Roadmap* emphasizes that a healthy natural environment is vital to the region's response to climate change, as well as the health and well-being of people. Our current decision-making frameworks do not properly recognize the importance of natural systems and operate as if humans are separate from or a higher priority than nature. The *Nature and Ecosystems Roadmap* recognizes that we need to do things differently moving forward.

Since time immemorial, First Nations have been stewards of the region's lands, waters, and air. Practiced and learned for millennia, complex knowledge systems grounded in earth based observation are known collectively as 'Indigenous Knowledge'. The *Declaration on the Rights of Indigenous Peoples Act* (DRIPA) emphasizes Indigenous rights to conserving the environment and protecting Indigenous knowledge.

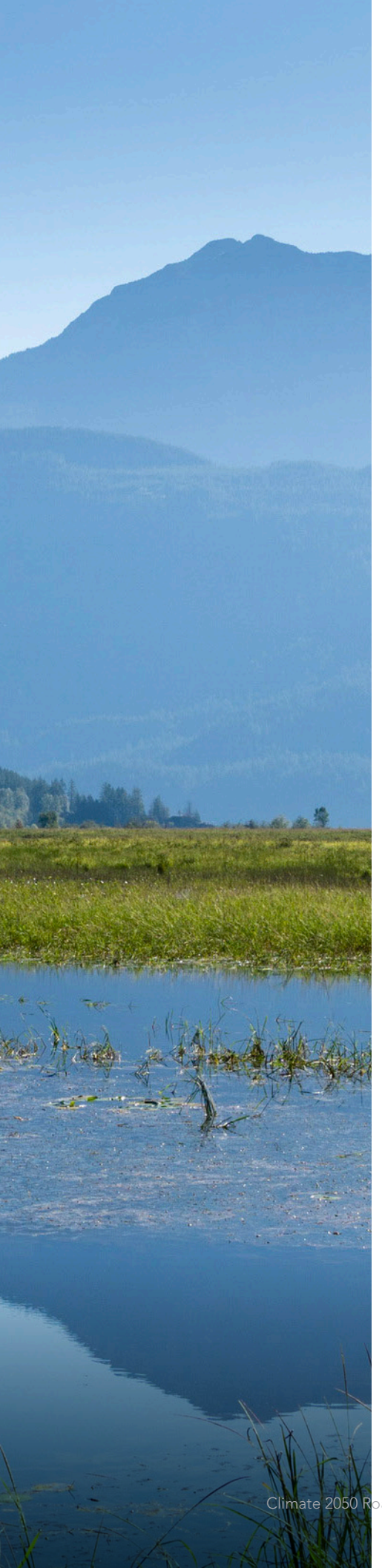
Indigenous Knowledge systems and Western science may function differently, but these two approaches can be mutually supportive. Bringing these ways of knowing together and combining their strengths requires a commitment to work together to build trust and understanding.

As the Truth and Reconciliation Commission of Canada report states, reconciliation between Indigenous and non-Indigenous Canadians, from an Indigenous perspective, also requires reconciliation with the natural world.

Inspired by the work of the Truth and Reconciliation Commission of Canada, Metro Vancouver is working together with First Nations to strengthen relationships by exploring pathways to reconciliation, such as increased engagement, dialogue, and collaboration.

CODD WETLAND ECOLOGICAL CONSERVANCY AREA

WIDGEON MARSH REGIONAL PARK



Contents


CRIPPEN REGIONAL PARK

Visioning Healthy and Resilient Nature and Ecosystems in 2050

Our vision is that in 2050, Metro Vancouver is a place where the natural environment provides benefits to humans and other species alike, and the relationship between people and nature is more intrinsically known and understood by residents across the region. Indigenous Knowledge of the natural world is respected and honoured and informs decision-making alongside Western science. Nature and ecosystems are recognized for their inherent value as irreplaceable systems, but also for their ability to foster biodiversity, store carbon, and moderate the impacts of climate change. The way we "do business" has undergone a paradigm shift, such that these benefits are recognized and accounted for in decision-making processes. Ecosystems are healthy in natural areas, but also within the communities where people live, work and play. Our region is known globally as a leader in fostering relationships and partnerships - working together to enable the protection, enhancement, restoration, and connection of ecosystems, and implementing nature-based solutions to support biodiversity, moderate the impacts of climate change, and store carbon over the long-term.

Climate 2050 Nature and Ecosystems Roadmap

A pathway to storing carbon and building a resilient future with Nature and Ecosystems in Metro Vancouver

The Challenge

This Roadmap is about ambitious and necessary protection, enhancement and restoration of our natural environment. It presents a robust plan for this region to maintain a healthy environment that is supported by productive and resilient ecosystems. Nature and ecosystems have the capacity to store carbon and help moderate the impacts of a changing climate, and they provide numerous other benefits; however, these natural systems are themselves at risk due to a changing climate, land development, invasive species, pollution, and other factors. Decisions we make now to protect, restore, enhance, and connect nature and ecosystems across the region will have a lasting impact on the state of the natural environment in the future.

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

The Connection between Climate and Air Quality

The *Clean Air Plan* is Metro Vancouver's air quality and greenhouse gas management plan. Actions in the Plan will reduce air contaminant emissions and impacts in our region, including greenhouse gases, over the next 10 years. These actions will 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. The *Clean Air Plan* also addresses air quality targets for the region.

Residents in the region generally experience good air quality, but additional emission reduction actions are needed to continue protecting human health and the environment. Some air contaminants, such as ground-level ozone, can damage plants and reduce vegetation growth, adding to the stress on nature and ecosystems imposed by climate change. As temperatures rise and droughts become more frequent, forests in the Pacific Northwest are at increased risk to wildfires. Wildfires create significant amounts of fine particulate matter, the air contaminant with the greatest air quality-related health impacts in our region. While this topic area is touched on in the *Nature and Ecosystems Roadmap*, response to the air quality impacts of wildfires will be addressed in more detail in the *Human Health and Well-being Roadmap*, as well as the *Clean Air Plan*.

Climate Change Impacts on Nature and Ecosystems

While nature and ecosystems store carbon and help us adapt to climate change impacts, many natural areas and the services they provide are themselves at risk from a changing climate. For example, trees store carbon, cool our streets, and capture and regulate floodwater, but they are less able to provide these benefits if they are suffering from drought and extreme heat.

Many species and ecosystems in the region are being impacted by climate change because they cannot adapt fast enough – for instance, Pacific salmon are affected by warming stream temperatures, stressing fish and increasing vulnerability to disease (see Species Case Study on page 26). Climate change adaptation must be considered when managing ecosystems in urban and natural areas, including the development of best practices supported by current climate science. While specifics are likely to change when new climate change projections are completed and more data becomes available, high-level trends are likely to remain consistent over time. Metro Vancouver would like to combine different sources of knowledge by working with First Nations to understand observed changes in climate and the natural environment.

We can contribute to the region's collective climate resilience by monitoring the extent and health of urban and natural ecosystems, providing space in our communities for nature to adapt and flourish, and considering the natural environment as a critical part of climate action.

The region's nature and ecosystems are, and will continue to be, affected by climate change and associated hazards – these hazards could cause impacts in numerous ways. However, nature and ecosystems can also minimize the impacts of climate change. These relationships are outlined in Table 1 below.

Anticipated impacts to nature and ecosystems from climate change may also affect species important to First Nations for traditional ceremonial use, foods and medicines.

WESTERN RED CEDAR IN A STATE OF DECLINE IN WEST VANCOUVER (DISTRICT OF WEST VANCOUVER)

Climate change and its associated impacts on ecosystems can also cause feelings of grief and anxiety, negatively impacting mental health and well-being. This issue will be explored in greater detail in the *Human Health and Well-Being Roadmap*.

TABLE 1: CLIMATIC CHANGES AND HAZARDS AND THEIR POTENTIAL IMPACTS ON NATURE AND ECOSYSTEMS

CLIMATIC CHANGES AND HAZARDS	ANTICIPATED IMPACTS TO NATURE AND ECOSYSTEMS	HOW NATURE AND ECOSYSTEMS CAN MINIMIZE IMPACTS
Sea level rise and flooding (coastal and riverine)		
Rising water levels	• Shoreline ecosystems will be lost as they are caught between rising waters and hardened shoreline infrastructure (known as coastal squeeze). • Extreme flooding causes structural changes to rivers and shorelines, shifting ecosystems and impacting fish and wildlife. • Flood waters deposit excess sediment over fish habitat, including spawning areas, impacting fish health and populations. • During a flood, toxic substances from low-lying areas (e.g. urban and industrial sites) can be released, damaging ecosystems.	• Natural shorelines reduce the impacts of riverine and coastal flooding by absorbing water and wave energy. They also provide space for ecosystems to adapt and move as water levels rise.
Changing salinity in rivers	• Salt water will move further upstream during lower river flows, affecting freshwater aquatic ecosystems.	
Combined impact of sea level rise, storm surge and coastal flooding	• The ecological impacts of coastal storms and flooding are exacerbated by sea level rise.	• Coastal and intertidal ecosystems (such as mudflats and seagrass beds) protect at-risk communities by reducing the impacts of waves and extreme tides, absorbing excess water, and buffering the impacts of coastal storms.
Changing precipitation patterns		
More intense rainfall events	• Increased pollutant run-off, turbidity, and erosion, leading to poor water quality and impacts to freshwater and marine ecosystems. • Increased risk of landslides, disrupting wildlife habitat and movement.	• Wetlands, riparian ecosystems and other vegetated areas reduce the impacts of flooding, prevent erosion, and absorb and filter rainwater, reducing the strain on stormwater infrastructure – but in extreme events, natural systems can be overwhelmed.

CLIMATIC CHANGES AND HAZARDS	ANTICIPATED IMPACTS TO NATURE AND ECOSYSTEMS	HOW NATURE AND ECOSYSTEMS CAN MINIMIZE IMPACTS
Longer dry spells in the summer	• Drought conditions, combined with higher temperatures, reduce annual tree growth and increase mortality rates. • Warmer waters and less flow during the dry season, combined with an earlier freshet, will stress and limit migration of salmon and other aquatic species. • Drought can stress newly planted restoration areas, increase the risk of fire and disease, and increase the likelihood that trees are blown over during high winds. • Longer and more intense wildfire season, driven by both heat and drought. • Long periods of drought will dry out wetlands by lowering water tables.	• Trees and other vegetation help to retain the little water available during drought conditions by reducing the loss of water from the soil, which also cools the air. • Intact forest and riparian vegetation alongside streams and waterbodies provide shade, keeping waters cooler and reducing evaporation.
Increased precipitation in winter, spring and fall	• Forests can be damaged and soils lost by heavy rain storms, resulting in flooding, slope instability and tree failure.	• Healthy, intact forests are better able to stabilize slopes and resist change. • Vegetated areas capture and regulate rainwater, reducing the strain on stormwater infrastructure.
Changing temperatures		
Extreme heat	• Heat sensitive ecosystems (e.g. wetlands) and species (e.g. salmon, bats, western red cedar) become stressed at higher temperatures. Impacts are compounded by drought conditions. • Ecosystems and species can be driven to move as conditions become less suitable; however, finding new locations that support their needs may not be possible. For example, cold climate, high-elevation alpine ecosystems are restricted in their ability to move. • Higher outdoor temperatures increase the formation of ground-level ozone, which can damage plants.	• Healthy trees and other vegetation help protect people from extreme heat, by reducing the urban heat island effect. • Trees adjacent to riparian and wetland areas support fish and other wildlife by keeping water cool.
Warmer winters	• Increased spread of pathogens, pests and invasive species that are controlled by low winter temperatures.	• Healthy, biodiverse ecosystems are more resilient and better able to resist pathogens, pests and invasive species.

CLIMATIC CHANGES AND HAZARDS	ANTICIPATED IMPACTS TO NATURE AND ECOSYSTEMS	HOW NATURE AND ECOSYSTEMS CAN MINIMIZE IMPACTS
Seasonal shifts	• Shifts in seasonal temperatures (e.g. early spring/ late fall) can cause disconnects between species and their habitats or food sources. For example, migratory pollinators may return to their home habitat after flowers have already bloomed.	• Resilient, large, and connected ecosystems across the landscape help native species adapt to changing conditions.
Ocean warming and acidification	• Impacts to marine and intertidal ecosystems (e.g. die-offs during heatwaves), stress on native species due to changing conditions, and new incidences of invasive aquatic species.	• Impacts can be reduced by lessening human-caused stressors such as over-fishing and pollution, and ensuring healthy biodiverse coastal ecosystems. • Seagrasses may help to reduce salinity and buffer the impacts of ocean acidification.
Wind storms		
High winds exacerbate other hazards	• Wind storms, in conjunction with sea level rise, can lead to greater storm surge.	• Natural breakwaters such as reefs can reduce wave action. • Contiguous areas of forest are more resilient to wind damage. Buffer trees can also protect infrastructure and crops from wind.

Note: These climatic hazards can cause cascading impacts – for example, flooding tends to be more severe following a wildfire, landslides tend to occur following heavy rainfall, and severe storms may cause more damage in coastal areas as the sea level rises. Cascading events were experienced in British Columbia during November 2021 when intense precipitation (an "atmospheric river") resulted in severe flooding and landslides. Non-climatic hazards can also exacerbate climatic ones; for instance, subsidence can increase the risk of coastal flooding and exacerbate sea level rise, and earthquakes can disrupt flood protection infrastructure. Climate change impacts will magnify existing stressors on ecosystems from other human activities. Our understanding of how ecosystems will be affected by cumulative impacts is incomplete, but we do know that large, healthy, connected, and biodiverse ecosystems are more resilient to climate change impacts.

Carbon Storage and Sequestration from Nature and Ecosystems in Metro Vancouver

Carbon stored in nature and ecosystems, including forests, wetlands and intertidal areas, takes thousands of years to accumulate. A conservative estimate of the total carbon stored in the vegetation and soils of the region's nature and ecosystems is 65 million tonnes[1]. Every year, these areas sequester additional carbon, removing carbon dioxide from the atmosphere and storing it away long-term. The ecosystems that Metro Vancouver protects in the drinking water supply areas, along with the regional parks system, store 22 million tonnes of carbon. Although carbon storage is not the primary function of these areas, ongoing protection of these significant carbon stores is critical to the region's efforts to reduce greenhouse gas emissions. Figure 2 shows the key natural carbon stores in the region.

Carbon is released from ecosystems when trees are cut down, soils are disturbed, and water cycles are altered (e.g., draining wetlands). Becoming a carbon neutral region by 2050 will require protection of regional ecosystems to ensure the carbon they store remains in place and they are able to continue to remove carbon from the atmosphere, year after year. Restoring, connecting and enhancing these ecosystems in locations that can sustain them can also improve the region's long-term carbon storage potential.

LARGE TREES STORE THE MOST CARBON

1 Figures derived from Metro Vancouver's regional carbon storage dataset. The estimate provided applies to the full extents of Metro Vancouver's drinking water supply areas, along with estuarine and intertidal areas.

Carbon Sequestration and Storage

Carbon sequestration is the removal of carbon dioxide from the air on an annual basis. The measure of annual sequestration would be considered as part of the region's efforts to measure carbon neutrality by 2050.

Carbon storage refers to the total amount of carbon stored in the vegetation and soils of ecosystems such as forests, wetlands and intertidal areas, which often takes thousands of years to accumulate.

Carbon sequestration and storage is one of many benefits achieved through ecosystem protection and restoration, but it is not a silver bullet solution – it is a supplemental solution to directly reducing our greenhouse gas emissions through actions explored in other *Climate 2050 Roadmaps*. Significant increases in carbon storage levels in natural systems require ample space for ecosystems to grow and shift, and long timeframes.

FIGURE 1: ESTIMATED GREENHOUSE GAS EMISSIONS REDUCTIONS COMPARED TO CARBON SEQUESTRATION AND STORAGE BY NATURE AND ECOSYSTEMS

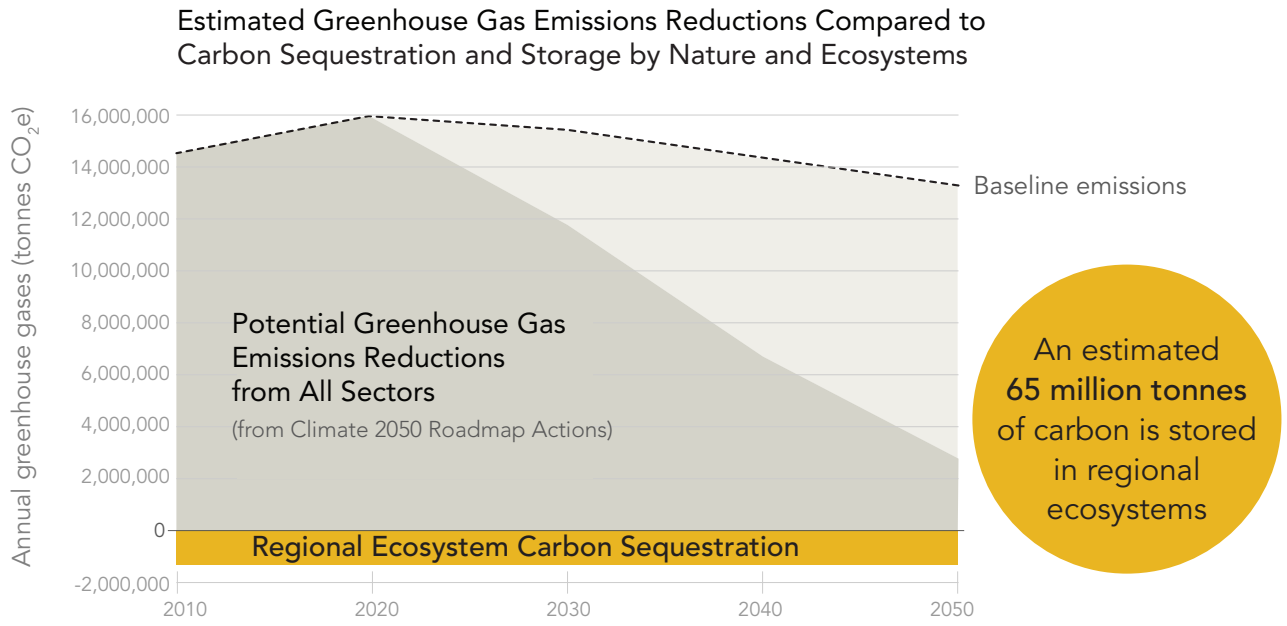
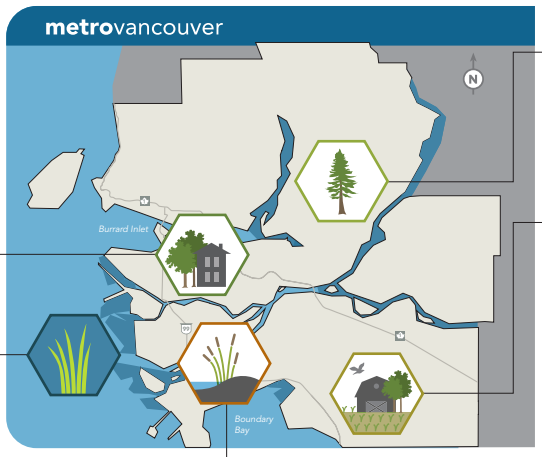


FIGURE 2: KEY NATURAL CARBON STORES IN THE REGION AND THEIR IMPACTS ON REGIONAL CLIMATE RESILIENCE

Millions of tonnes of carbon are stored in vegetation and soil in the Metro Vancouver region

Trees in the region's **urban forests** store about **8 million tonnes** of carbon. These trees also capture stormwater, cool our streets, and improve human health and well-being.

Coastal ecosystems store carbon (often referred to as "Blue Carbon"), protect shorelines from coastal storms, and provide habitat for fish and wildlife.



Extensive forests in the north of the region store over **40 million tonnes** of carbon. These forests provide clean water and wildlife habitat.

Agricultural land stores carbon in vegetation and soils; Delta's agricultural soils alone store close to **1 million tonnes** of carbon. In addition, agricultural land provides food security, economic benefits, and wildlife habitat.

Burns Bog and other **wetlands** store large amounts of carbon. They also control floodwaters, improve water quality, and provide essential wildlife habitat.

DOWITCHERS FLYING

Storing Carbon and Building Resilience Through Nature and Ecosystems

The following section outlines several key concepts that underpin the strategies and actions in this Roadmap. These key concepts are foundational for understanding how nature and ecosystems can become incorporated into the region's climate action strategy.

For nature and ecosystems to be effective as part of climate action planning, biodiversity must be considered and prioritized throughout all actions to ensure ecosystem health, and to avoid unintended consequences (e.g. planting of vegetation that maximizes carbon storage, but negatively affects wildlife and habitat for species). Ecosystems that are biodiverse are able to provide more ecosystem services, or co-benefits. Many ecosystem services are climate change related; for instance, trees and forests can store carbon but also provide shading, cooling, and other benefits associated with climate change adaptation. Green infrastructure refers to the types of natural, enhanced and engineered assets that provide ecosystem services. Linking different types of green infrastructure together into a functional network is best practice to maximize ecosystem services. Nature-based solutions are a type of green infrastructure that helps address both biodiversity loss and climate change simultaneously. Nature-based solutions are increasingly being integrated into climate action plans to supplement other technological and engineered solutions, such as those identified in other *Climate 2050 Roadmaps*.

Biodiversity

The Metro Vancouver region's rich and diverse natural environment is vital to the people and wildlife who live here. The region's natural areas have tremendous cultural and spiritual importance, contribute to the region's livability, provide a sense of place, and foster biodiversity, which can be broadly defined as the variety of life. The region is home to the Fraser River Estuary, an important and productive marine ecosystem that forms the mouth of one of the largest salmon-bearing rivers in the world, and supports one of the highest concentrations of migratory birds in Canada. The Fraser River Estuary is one of four Important Bird Areas (IBA) being assessed as Key Biodiversity Areas – internationally recognized sites defined by a global standard – within Metro Vancouver. Large, contiguous ecosystems such as these have benefits for biodiversity, but the smaller, "stepping stone" habitats are important as well. For example, while the north shore mountains contain some of the highest quality habitat in the region, habitats at lower elevations are used by birds migrating back to the region in early spring while habitats in the north shore forests are still frozen. Collectively, the region's ecosystems - from the forests, wetlands, and watercourses to the urban trees and parks - form a mosaic of habitats that support biodiversity.

" Biodiversity enables Nature to be productive, resilient and adaptable. Just as diversity within a portfolio of financial assets reduces risk and uncertainty, so diversity within a portfolio of natural assets increases Nature's resilience to shocks, reducing the risks to Nature's services."

THE ECONOMICS OF BIODIVERSITY: THE DASGUPTA REVIEW

Climate change and biodiversity loss are two interlinked challenges occurring simultaneously, both globally and locally. Metro Vancouver's ecosystems are affected by a changing climate (see Table 1), and the lower mainland of southwestern British Columbia where they are situated has been identified as an ecoregion at significant risk to biodiversity loss. As climate change places stress on ecosystems, they become less resilient and less capable of storing carbon. In order for nature and ecosystems to provide benefits and ecosystem services, they must be resilient to the impacts of human activities, including climate change. Resilient ecosystems are both healthy and biodiverse. For example, a healthy forest that supports a wide variety of tree species will store more carbon and recover faster from disturbances, such as fire or pests, because not all species will be impacted to the same degree and some will rebound more easily. Protecting and enhancing biodiversity in nature and ecosystems maximizes their ability to provide climate change benefits.

SOCKEYE SALMON

Species Case Study: Pacific Salmon

In the Pacific Northwest, salmon are a keystone species, supporting people, ecosystems and wildlife. Salmon have cultural, spiritual and food source significance in our region, particularly to First Nations communities. First Nations' connection to water and salmon remains strong despite the impacts of colonization. The Fraser River is one of North America's greatest salmon-producing rivers. The river and its main tributaries within Metro Vancouver – Kanaka Creek, Pitt River (Alouette River, Widgeon Creek), Coquitlam River and Brunette River – weave through the region, providing important habitats for salmon and other species.

Eagles, bears, and orcas all rely on salmon as a food source. As migrating salmon return to rivers and are eaten by other species, essential nutrients from their carcasses are transferred to forests and other ecosystems.

Salmon, and the habitats they thrive in, are at risk from climate change impacts. In the Metro Vancouver region, we are projected to experience warmer and wetter winters, hotter and drier summers, reduced snowpack, and more precipitation falling as rain and less as snow. These impacts may decrease the amount of water available in streams during dry periods, raising stream temperatures. Salmon are sensitive to warming temperatures – they may not enter streams until the water has cooled to a specific temperature, and warmer temperatures can affect both survival and reproductive success. The Fraser River summer water temperature has warmed by, on average, 1.5°C since the 1950s, and this trend is projected to continue. We can take action to help salmon adapt to climate change impacts. Restoring riparian corridors with native vegetation can cool stream temperatures. Integrating fish passage into the design of flood control infrastructure will ensure salmon can continue to reach their spawning grounds.

We can also identify and protect critical salmon spawning habitat – often this habitat provides other ecosystem services. For example, eelgrass serves as nursery habitat for salmon, but also reduces wave impacts from coastal storms, and stores carbon.

Ecosystem Services

The importance of nature and ecosystems in the Metro Vancouver region is intrinsic, invaluable and unmeasurable, and these environments have significant cultural and spiritual importance for all communities. The concept of 'ecosystem services' (see Figure 3) has emerged as a tool to allow us to more fully understand the breadth of benefits that nature provides, including cultural ones. Many of these benefits also relate to climate change – for instance, nature and ecosystems store carbon, cool city streets, clean stormwater, and moderate floods. The concept of ecosystem services can help underscore the fact that we live in reciprocity with nature; while ecosystems provide benefits to humans, we also co-exist in concert with the natural world.

Ecosystem services are not typically accounted for in decision-making, and this lack of understanding results in a devaluation of nature, contributing to its ongoing loss and degradation. As technology and methods that allow for measurement of ecosystem services improve, it will become easier to incorporate ecosystem services into broader decision-making, resulting in better outcomes for both people and nature.

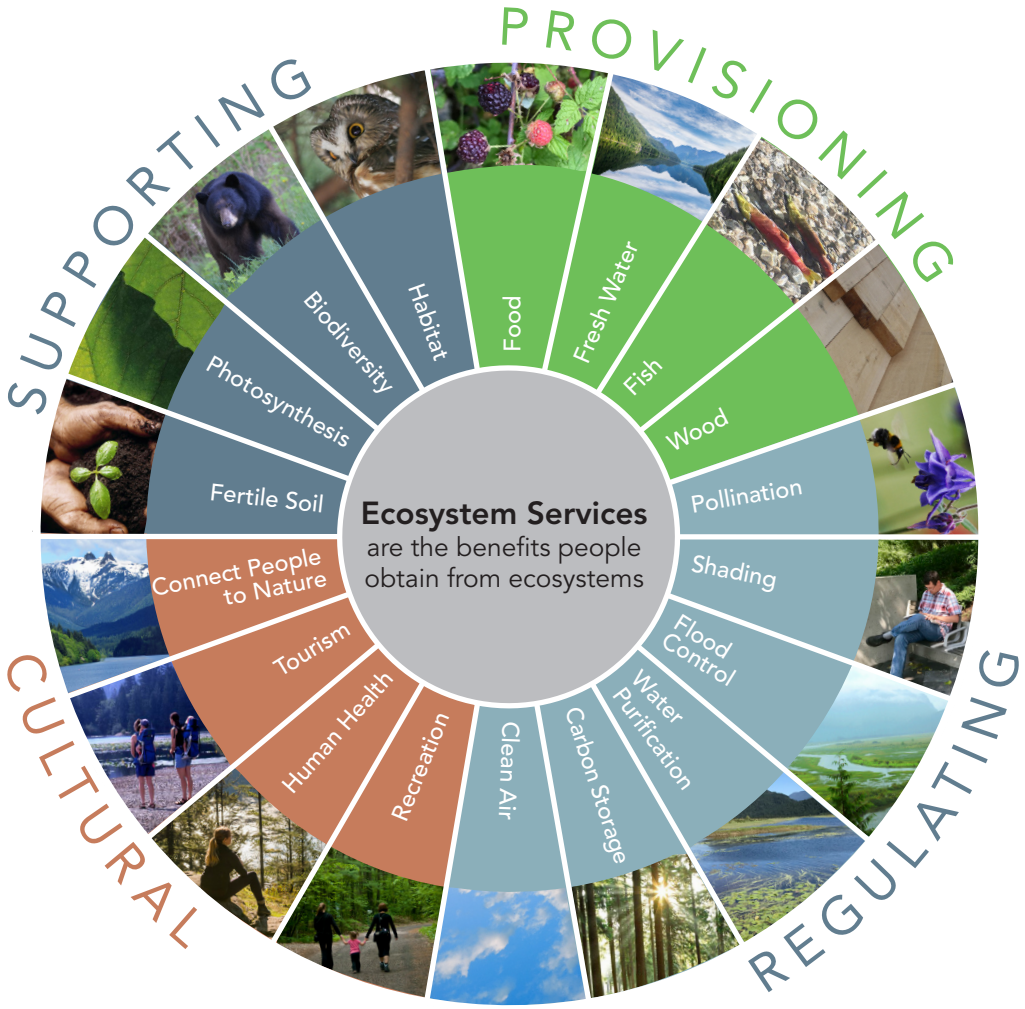
Human Health Benefits of Nature and Ecosystems

Health benefits from nature are wide-ranging and include:

- Improved mental health, including reduced depression and stress
- Improved physical health, including reduced obesity, diabetes, and cardiovascular disease, and increased immune system function
- Improved pregnancy outcomes
- Improved cognitive function, with slower cognitive decline in the elderly and improved cognitive development in children
- Improved social cohesion
- Reduced mortality risk
- Reduced medical costs

Social factors including income level, gender, and ethnicity can have a significant influence on how healthy a person is, with vulnerable populations experiencing greater health inequality. Evidence suggests that the health benefits linked with access to green space may be strongest for vulnerable populations.

FIGURE 3: ECOSYSTEM SERVICES PROVIDED BY HEALTHY ECOSYSTEMS



Green Infrastructure

The term Green Infrastructure refers to the natural, enhanced and engineered systems (shown in Figure 4) that collectively store carbon, help communities adapt to climate change, and provide society with a range of other ecosystem services. This Roadmap considers green infrastructure across all landscapes and land use types, from urban street trees and green roofs to natural ecosystems such as wetlands, forests, and watercourses.

FIGURE 4: TYPES OF GREEN INFRASTRUCTURE

Stormwater management is a key driver for the implementation of enhanced and engineered green infrastructure solutions, and demand for this ecosystem service is likely to increase due to climate change. However, a major benefit of green infrastructure is that it provides a wide range of ecosystem services beyond stormwater management, including support for biodiversity and human health and well-being. In order to maximize benefits, green infrastructure needs to be planned and implemented with multiple ecosystem services in mind.

Metro Vancouver member jurisdictions have considerable experience planning and implementing green infrastructure projects; however, there is a need to move beyond individual projects and pilots to broad implementation across the region, with consideration given to 'networking' the individual elements of green infrastructure into a functioning system.

Green Infrastructure – a Cross-Cutting Climate Action

Green infrastructure will need to be integrated across different land uses and involve a range of sectors. This Roadmap focuses on the importance of creating a network of green infrastructure and planning for co-benefits, including support for biodiversity. Connections between other *Climate 2050* issue areas and green infrastructure are outlined below:

Land Use and Urban Form – the land use planning framework supports green infrastructure planning and implementation through the protection of lands important for conservation, recreation, and agriculture, as well as the integration of green infrastructure into the design of new or redeveloped urban areas, reducing the loss of trees and greenspace, and creating better places for people and nature.

Agriculture – agricultural land includes remnant natural vegetation such as wetlands and riparian areas, and other permanent vegetation (e.g. hedgerows). These areas provide opportunities for wildlife, pollinator and bird habitat and connectivity across the landscape. Supporting long-term farm health and resiliency through the expansion of regenerative agriculture practices (e.g. cover cropping) also enhances biodiversity and ecosystems services.

Transportation – opportunities exist to reduce climate change impacts on the transportation network by integrating green infrastructure into transportation networks (e.g. through planting trees and other vegetation along road and railway verges and recreational greenways). Siting of infrastructure to avoid fragmentation of green infrastructure networks also supports a regional green infrastructure network.

Water and Wastewater Infrastructure – green infrastructure in urban areas tends to be heavily focused on stormwater management benefits. Green infrastructure can supplement grey infrastructure by filtering stormwater and reducing the amount of stormwater overflow during smaller rain events. Considering other benefits from green infrastructure (such as support for biodiversity and human health) increases the range of potential benefits achieved in urban areas.

Buildings – buildings dominate the urban landscape, so there is significant potential to leverage the climate-related benefits of green infrastructure (e.g. providing shade and capturing rainwater) by incorporating green infrastructure elements onto and around built structures.

Energy – green infrastructure (such as trees) can reduce the amount of energy needed to cool buildings and people by providing shade and reducing air temperatures.

Human Health – green infrastructure provides a range of health benefits to people through connection to nature, as well as by providing services that support adaptation, including providing shade and capturing flood waters. For more information on the connections between nature and human health, see page 27.

Nature-Based Solutions

Green infrastructure, if designed and implemented with biodiversity outcomes as a priority (e.g. a green roof that creates habitat for pollinators), is an example of a nature-based solution to climate change.

Locally and internationally, there has been a growing understanding and recognition of the climate change and biodiversity co-benefits that ecosystems provide, and this has led to the emergence of nature-based solutions as a focus for climate action. Nature-based solutions are holistic actions that protect, sustainably manage, and restore ecosystems, while simultaneously addressing societal challenges such as climate change. These solutions provide benefits for humans and wildlife alike, and ideally, these solutions recognize that humans and nature are interconnected and mutually dependent. For example, seagrass meadows store carbon, reduce impacts of coastal storms on shorelines, and provide essential habitat for fish and other species.

While climate change actions have historically been focused on technological and engineered solutions – which continue to be important – nature-based solutions can supplement these actions and become an integral part of climate action planning. The intentional inclusion of nature-based solutions in climate action plans is a relatively new approach and awareness, protocols and standards for these types of interventions continue to evolve. International guidance documents such as the *IUCN Global Standard for Nature-based Solutions* provide a framework for the verification, design, and scaling up of nature-based solutions. First Nations have stewarded the lands, waters, and air for millenia as part of a reciprocal relationship with nature. These long practiced approaches can inform current efforts to integrate nature-based solutions into climate action planning.

FIGURE 5: NATURE-BASED SOLUTIONS FOR ADDRESSING CLIMATE CHANGE

Barriers and Opportunities

The Metro Vancouver region is growing by approximately 35,000 people per year, and the impacts from human activities, including urban development, logging, and climate change have resulted in ecosystem change and loss. Nature and ecosystems offer important benefits, but if they are lost, it will require substantial time and available space for them to regenerate into mature, functioning systems. Additional barriers, and opportunities to overcome them, are included in Table 2 below:

TABLE 2: BARRIERS AND OPPORTUNITIES ASSOCIATED WITH STORING CARBON AND BUILDING RESILIENCE WITH NATURE AND ECOSYSTEMS

BARRIER	OPPORTUNITY
The region is facing a dual challenge of climate change and biodiversity loss, the impacts of which are interrelated.	Taking action on both biodiversity loss and climate change together is the key to success. There is an opportunity to implement nature-based solutions that help to address both challenges. Healthy, resilient, and biodiverse ecosystems are needed to support biodiversity and climate action.
Species and ecosystems are experiencing increasingly challenging environments that will continue to change in the future.	It is important to consider future climate conditions in planning processes; for instance, considering how future climate conditions might impact the urban forest, invasive species, natural resource management, and restoration work.
This region has a constrained land base, high costs and competition for land, and a steadily increasing population – all of which present challenges when trying to conserve space for nature and ecosystems. To achieve substantial gains in carbon storage, for instance, would require significant space for tree planting and ecosystem restoration.	Space for nature must be considered and integrated throughout different land uses. This prioritization requires innovation and collaboration; for instance, collaboration between multiple departments to maximize both housing density and tree canopy in urban areas. Multi-functional ecosystems across land uses support more habitats, which improves overall biodiversity.
Informed decision-making requires regionally-specific data (e.g. vulnerability of ecosystems to climate change, susceptibility to new invasive species), and this data is not always available or current.	Some regional datasets have been developed to inform decision-making. These datasets were generated, and will be updated, using a consistent methodology across the region, and trend reporting can occur at regular intervals. As technology improves and costs decrease, some data will become increasingly more accessible. Partnerships with agencies and organizations that produce relevant data can also help overcome this barrier.
Lack of understanding of Indigenous Knowledge systems can make it difficult to integrate it into existing processes and with Western science.	First Nations have been stewards of the region's lands, waters, and air since time immemorial. There is an opportunity to learn together and share knowledge to address climate change, contributing to improved understanding between Indigenous and non-Indigenous Peoples.

BARRIER	OPPORTUNITY
Approaches such as nature-based solutions may not be widely understood due to a lack of knowledge and training. This uncertainty leads to perceived risks around the performance, cost and maintenance of using new and innovative solutions. In addition, the results from case studies and pilot studies in other locations are not always transferable to this region.	There is an opportunity to develop knowledge in a range of sectors through professional training. Providing a regional forum to share technical knowledge, as well as the development of standards and guidelines, can help to dispel some of the uncertainties and instill confidence in new practices. Embedding new approaches as shared objectives across organizations avoids the risk of siloed initiatives within one department or discipline.
The inherent value of nature and the benefits it provides society are not fully recognized, leading to a lack of priority given to protection and restoration efforts.	Integrating natural assets and the ecosystem services they provide into decision-making will improve overall understanding and support efforts to prioritize protection and restoration.
The coastal and marine environment in the Metro Vancouver region is uniquely impacted by climate change. Ecosystems in these environments are affected by coastal squeeze, warmer temperatures, changing hydrology, and ocean acidification. These environments are governed by multiple agencies with differing levels of legislative authority, making it difficult to collaborate on solutions to these challenges.	There is an opportunity to monitor and share information related to the coastal marine environment among regional partners, and to connect with governments, agencies and organizations that have more direct influence in coastal and marine environments, including member jurisdictions, First Nations, and the federal and BC governments.

Equity Considerations

The impacts of climate change will affect everyone, but they pose a greater threat to people who are already vulnerable due to overlapping factors such as income and health. For example, vulnerable populations with lower incomes have fewer resources and less adaptive capacity to respond to climate change impacts; these challenges can be magnified by poor health. Typically, those who are the most at-risk to climate change impacts have contributed the least to greenhouse gas emissions. Given the interlinkage between vulnerable populations and climate change impacts, incorporating equity considerations into climate change policy is imperative.

As climate action is planned and implemented, it will be important to consider how different groups are affected by climate impacts, and who may be at a greater risk. Including these considerations throughout the process may mean targeting or timing action to assist those who are most vulnerable. A relevant example would be identifying vulnerable communities living in areas with low levels of tree canopy, parks and other green space.

Green infrastructure enhancements can have unintended social consequences; for instance, researchers are investigating whether 'green gentrification' is contributing to the displacement of marginalized communities. If green infrastructure is to provide benefits to those most in need, it is essential to consider the potential for these kinds of unintended consequences and involve the community early in an inclusive planning process.

CAPILANO RIVER REGIONAL PARK

The Journey - Storing Carbon and Building Resilience through Nature and Ecosystems

Climate 2050 Roadmap Connections

There are many links between nature and ecosystems and other issue areas. Metro Vancouver is exploring which linkages must be considered when developing climate policies and actions.

Land Use and Urban Form – policies that support more compact, complete communities, and protect ecologically important areas from development lead to increased resilience and carbon storage.

Water and Wastewater Infrastructure – green infrastructure such as green roofs and rain gardens improve building energy efficiency, and absorb rainfall and stormwater, which reduces the loading on built infrastructure during smaller rain events and restores urban biodiversity. Separation of combined sewers into separate sanitary and storm systems allows for partial restoration of original drainage courses (e.g. daylighting streams).

Energy – nature and ecosystems cool urban areas, reducing the need for air conditioning and decreasing overall energy use.

Human Health and Well-Being – nature-based climate change solutions (such as planting trees in urban areas) improve mental and physical health.

Agriculture – agricultural lands can be managed to protect natural areas, and enhance ecosystem services that build resilience to climate impacts and store carbon.

Buildings – nature and ecosystems can help reduce greenhouse gas emissions from buildings and increase resilience by protecting from flooding and heat.

Waste – biosolids and compost are soil amendments that improve soil health, improve water retention, promote vegetation growth, and restore disturbed ecosystems.

Climate Goals and Targets for Nature and Ecosystems

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

Achieving this vision means setting goals in each of the *Climate 2050 Roadmaps*, in order to ensure that each sector in the region plays as strong a role as possible in getting to a carbon neutral, resilient region.

What is a Carbon Neutral Region?

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

Metro Vancouver has set the following goals for nature and ecosystems in this region:

Goal

Nature and ecosystems are resilient, protected, maintained, enhanced, restored and connected, to maximize ecosystem services across the region.

TARGETS

By 2050:

- Protect 50% of the region for nature
- Achieve 40% tree canopy cover within the Urban Containment Boundary

Goal

Nature-based solutions that support biodiversity are included in the region's response to climate change.

MEASURABLE OUTCOMES:

Measurable outcomes for nature-based solutions are still to be determined based on additional review and discussion.

Many of the actions identified in this Roadmap will need to be participated in or led by other governments (e.g., national, provincial, local, and First Nations) as well as other regional partners. Metro Vancouver has a long history of working with other governments towards common goals. Fortunately, many of the organizations needed to make this transition are already actively working toward similar goals, including: the Provincial Government and its *CleanBC Plan*, *CleanBC Roadmap to 2030*, and *Climate Preparedness and Adaptation Strategy*; the Federal Government's recently strengthened climate plan called *A Healthy Environment and a Healthy Economy*; First Nations climate-related goals and initiatives; Metro Vancouver's member jurisdiction's own community and corporate climate plans; utilities; and, increasingly, industry associations.

Best Practices to Guide Success

The next section outlines 5 strategies and 31 actions; these measures set a pathway forward for nature and ecosystems to support the vision of a carbon neutral and resilient region by 2050. The following principles should be considered as best practices when implementing the actions throughout this Roadmap:

1. Prioritize biodiversity, equity, and conservation objectives when implementing nature-based climate solutions.
2. Integrate different forms of knowledge, including Western science and Indigenous Knowledge.
3. Prioritize planting native species in natural areas. Prioritize planting native species in urban areas where possible, but use non-native species to augment in challenging sites where native species will not thrive.
4. Choose solutions that support multiple ecosystem services, rather than focusing on only one ecosystem service.
5. Prioritize protection of mature trees and ecosystems.
6. Integrate environmental objectives so they are shared priorities across whole organizations and everyone is working to achieve them.
7. Offsetting the loss of ecosystems (e.g. through habitat compensation) should be done on a net-gain basis, but only considered after options for avoiding and reducing impacts have been explored.
8. Ensure long term maintenance and ecosystem health is considered and prioritized after planting.

Connecting the Nature and Ecosystems Roadmap and Metro 2050

Metro Vancouver works with member jurisdictions to develop, implement and steward *Metro 2050*, the regional growth strategy. The strategy represents the regional federation's ongoing commitment to building a compact metropolitan region - where approximately two-thirds of the land is designated for agricultural, recreational, and conservation uses. *Metro 2050* defines actions and directions for Metro Vancouver, member jurisdictions, and TransLink.

Though *Metro 2050* and *Climate 2050* are distinct plans, they are intended to be mutually-supportive, with policies and actions that are complementary and focused on common objectives. The *Climate 2050 Nature and Ecosystems Roadmap* builds on *Metro 2050* with further actions to protect stores of carbon and build resiliency with nature and ecosystems.

BIG Move

Big Moves are foundational to achieving the 2030 and 2050 targets, and should lead to the most significant greenhouse gas reductions and/or climate resilience.

Corporate LEADERSHIP

Corporate Leadership actions are ones Metro Vancouver will implement in its corporate operations to demonstrate leadership and support regional actions.

METRO 2050

Metro 2050 identifies actions that are already adopted through *Metro 2050*, the regional growth strategy.

TREE IN MINNEKHADA REGIONAL PARK

Strategy 1: Protect, Restore, and Enhance the Region's Ecosystems

To become a carbon neutral and resilient region by 2050, we need to make substantial commitments to protect, restore, and enhance nature and ecosystems, and at a larger scale than ever before. Currently, about 40% of the region's land base is protected by government and other organizations in the form of parks and other publically-owned lands, for the purposes of conservation or recreation. Large, healthy, connected, and biodiverse ecosystems are more resilient to climate change impacts and therefore better able to store carbon and support climate change adaptation. Scientific reviews of how much of the Earth should be protected vary, but 50% - also know as 'Nature Needs Half' - is considered a mid-point of estimates and is supported by a range of scientific studies (see callout box - Why Protect 50% of the Region?).

Increasing the amount of parkland in the region also provides additional space for the region's growing population to access nature and recreate, contributing to community and individual health and well-being. Given that this region faces significant land use constraints, meeting this target will involve making trade-offs between competing priorities, reducing the amount of land available for urban development and other uses.

Indigenous Peoples have lived on these lands since time immemorial, and continue to steward the lands, waters, and air as part of a reciprocal relationship with nature. Historically, protected areas have often been places where restrictions were in place for First Nations, preventing access to natural areas to practice cultural activities. Moving forward, the participation and leadership of First Nations in protected area management should be prioritized through collaborative agreements and approaches to shared stewardship.

Why Protect 50% of the Region?

There have been growing efforts globally to set ambitious area-based targets for protection. For example, the High Ambition Coalition for Nature and People, an intergovernmental group of 70 countries including Canada, committed to protecting 30% of land and seas by 2030 (known as 30 x 30). This is intended as an interim goal, with another 20% needed as 'climate stabilization areas' to keep climate change below 1.5 degrees.

Studies estimating the percentage of the Earth that should be protected provide values from 30% to 70%, or even higher. **The call for 50% - known as Nature Needs Half - is a mid-point of these values and is supported by a range of scientific studies.**

Ecosystem Loss in the Metro Vancouver Region

Metro Vancouver maintains the Sensitive Ecosystem Inventory (SEI) of the region's most important ecological areas and monitors it for change. Between 2009 and 2014, 1,600 hectares of ecosystem loss was documented, including 1,000 hectares of forest, 120 hectares of wetland, and 100 hectares of riparian areas. Primary drivers of ecosystem loss were urban development (as planned within local official community plans) and logging (as permitted by the BC government).

The losses documented by the SEI represent just four years of change. Estimates of ecosystem loss since European settlement began in the early 1800's help to place recent losses within a longer timeframe of cumulative impacts. For example, as much as 85% of the region's freshwater wetlands were lost by 1990[2].

2 Boyle, C.A., L. Lavkulich, H. Schreier, E. Kiss. 1997 Changes in land cover and subsequent effects on Lower Fraser Basin ecosystems from 1827 to 1990. Environmental Management. 21: 185-196.

Prioritizing the protection of the region's remaining mature ecosystems will focus effort on the highest functioning, most biodiverse areas. Once mature ecosystems are degraded or lost, it will take many years (and potentially extensive effort and resources) to return them to a similar well-functioning state.

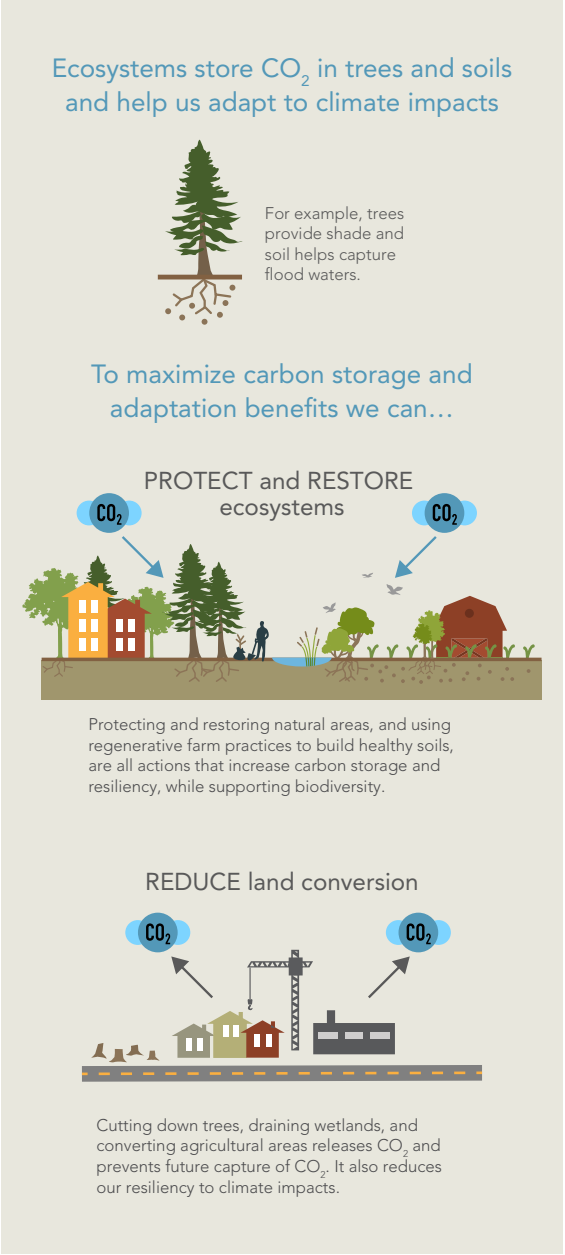
Restoration provides us an opportunity to gain back ecosystems and the services they provide. Examples of how restoration efforts could support climate action include:

- increasing ecosystem connectivity between major protected areas to allow species to move in response to climate change;
- improving the health of ecosystems to keep large carbon stores locked away;
- replacing hard shoreline infrastructure with gently sloped vegetated shorelines to reduce the impacts of sea level rise and wave action; and
- restoring or enhancing wetlands to protect against flooding and daylighting streams to improve hydrological function.

Restoration planning will need to take into account the impacts of climate change in selecting plant species and choosing native species that can cope with the new and changing conditions.

By protecting and restoring a range of ecosystem types in different situations across the landscape (e.g. both high and low elevation forests), we provide for a diversity of ecosystems, species, and conditions. Diverse ecosystems are more resilient and have a greater capacity to recover from disturbances.

FIGURE 6: THE CLIMATE CHANGE BENEFITS OF PROTECTING AND RESTORING ECOSYSTEMS



STRATEGY 1

Potential Impacts of Strategy	Key Partners
• Sets a collective regional vision for ecosystem protection • Expands the amount of land protected for nature • Increases collaboration and knowledge-sharing on ecosystem protection, restoration, and enhancement in the region	• Member jurisdictions • First Nations • BC government • Federal government • NGOs

1.1 Protect an Additional 10% of the Region for Nature.

BIG Move METRO 2050

All member jurisdictions, through implementation of the regional growth strategy, will identify local ecosystem protection targets and demonstrate how these targets will contribute to the regional target of protecting 50% of the region for nature. In addition to directly contributing to protection efforts (action 1.2), Metro Vancouver will support this process by providing data, information resources, and a forum for discussion.

1.2 Protect, Restore, and Enhance Natural Areas at the Regional Scale.

Corporate LEADERSHIP

Continue to implement the *Regional Parks Land Acquisition 2050* strategy to increase the amount of important natural areas protected in the Regional Parks system. In regional parks and the drinking water supply areas, continue to restore and enhance degraded sites, enhance biodiversity, and promote ecosystem resilience. Advocate to the federal and BC governments and other partners to protect, or fund the protection of, additional natural areas in the region, taking into consideration the importance of connecting existing protected areas.

1.3 Protect, Restore, and Enhance Nature at the Local Scale.

METRO 2050

All member jurisdictions, through implementation of the regional growth strategy, support the protection, enhancement and restoration of ecosystems through measures such as land acquisition, density bonusing, development permit requirements, subdivision design, conservation covenants, land trusts, and tax exemptions.

1.4 Incorporate Climate Change Planning into Protected Area Management.

Corporate LEADERSHIP

Develop a Regional Parks Climate Action Strategy. Continue work to improve understanding of climate impacts on the ecosystems and infrastructure in regional parks and the drinking water supply areas. Work with knowledge holders including First Nations, and other agencies with a role in protected area management, to improve understanding of climate impacts on the region's protected areas and develop best practice approaches to managing these areas in the context of a changing climate.

1.5 Prioritize the Conservation of Ecosystem Health and Biodiversity in BC Forest Management.

Advocate to the BC Government to make ecosystem health and biodiversity conservation the overarching priority of forest management and implement the recommendations of the strategic review of old forest management[3].

1.6 Support Ecosystem Protection, Restoration, and Enhancement.

Provide data, guidance materials and best practices to inform the protection, restoration, and enhancement of ecosystems in the region. Convene a forum to provide opportunities for cross-regional collaboration.

3 A New Future For Old Forests: A Strategic Review of How British Columbia Manages for Old Forests Within its Ancient Ecosystems

1.7 Reverse the Loss of the Region's Ecosystems.

Advocate to the federal government, the BC government, member jurisdictions and other agencies to commit to ecosystem restoration and enhancement at a significant scale. Collaborate with others and identify opportunities to make significant gains through restoration and look for partnerships and funding opportunities to magnify efforts.

1.8 Manage Invasive Species.

Corporate LEADERSHIP

Support regional invasive species management by developing and promoting best practices, tracking disposal options, and working with researchers to improve our understanding of the potential spread of invasive species as our climate continues to change. Employ best practices to prevent the introduction and spread of invasive species on lands managed by Metro Vancouver. Continue to support opportunities for cross-regional collaboration.

Old Growth Forests

Old growth forests of coastal BC are those with dominant trees older than 250 years, although they will have a diversity of aged trees present as the oldest trees die, creating space for younger trees to grow. The diversity of tree sizes and ages creates a wide variety of habitats, which supports many different species. As well as having high biodiversity values, old growth forests store large amounts of carbon, approximately 1,000 tonnes of carbon per hectare. Mature and young forests are also critical for carbon sequestration (ongoing uptake of carbon as trees continue to grow) and they provide ecosystem connectivity so wildlife species can move across the landscape. Protecting mature and young forests, in addition to old growth, will increase the total amount of old growth in this region over the long term.

Old Growth Forests in Metro Vancouver

Metro Vancouver secures land for regional parks to protect the region's natural areas and to connect people with nature. Metro Vancouver is also responsible for developing long range plans for managing our region's drinking water sources, including 60,000 hectares of restricted access, protected water supply areas. These areas include the most intact old-growth forest ecosystems in south-western BC. Metro Vancouver tracks old growth and other rare, fragile, or at-risk ecosystems using the Sensitive Ecosystem Inventory. Within the region, including the full extent of Metro Vancouver's drinking water supply areas that extend north of the MVRD boundary, there are 49,853 ha of old growth forest. Of this amount, 34,805 (70%) is on Metro Vancouver owned or managed lands: 33,011 ha (66%) within watersheds and 1,794 ha (4%) in Regional Parks.

Metro Vancouver Corporate Leadership in Ecosystem Protection and Restoration

The regional parks system currently includes over 13,800 hectares of land which protects natural areas and provide opportunities for people to connect with nature. Metro Vancouver is also responsible for protecting the region's drinking water supply areas from development, pollution, and human-caused disturbances. By protecting these watersheds for drinking water we are also protecting about 60,000 hectares of mostly forested land.

Ecological Health Framework – Adopted by the Board in 2018, this framework encapsulates Metro Vancouver's collective efforts around ecological health and provides guiding principles, goals, and strategies to help achieve the vision of a beautiful, healthy, and resilient environment for current and future generations. Specifically, the *Ecological Health Framework:*

- Identifies Metro Vancouver's role in protecting and enhancing ecological health as it relates to its services and functions;
- Provides a foundation for integrating ecological health into Metro Vancouver's corporate decision making;
- Identifies how Metro Vancouver will report on ecological health-related initiatives across the organization; and
- Supports regional efforts to protect and enhance ecological health.

Regional Parks Land Acquisition 2050 Strategy – *Regional Parks Land Acquisition 2050* took a systematic, evidence-based approach to identifying land suitable for protection as a regional park. The result identifies the most regionally important unprotected natural areas that could be acquired for future new and expanded parks. It envisions growing the regional parks system into a connected network of resilient regional parks and greenways that protect regionally important natural areas and connects people to them.

Invasive Species Resources – Metro Vancouver provides a suite of resources to support invasive species management, including an online course, locally-tested best management guidance for practitioners, and fact sheets for residents.

Ecosystem Restoration in Regional Parks - Guided by the *Natural Resource Management Framework*, Regional Parks has an ongoing program to restore degraded sites, enhance biodiversity, and promote ecosystem resilience in the Regional Parks System. Every year through this program, thousands of trees and other native vegetation are planted, thousands of kilograms of invasive plants are removed, ecosystem health is monitored, and habitat improvements are made to support native biodiversity.

Ecohydrological Restoration of Burns Bog - Metro Vancouver works with other stakeholders to restore the bog and prevent the drying out of peat - a process that releases greenhouse gases.

Strategy 2: Connect Green Infrastructure

Green infrastructure includes both natural and urban elements (see Figures 4 and 7). From street trees, hedgerows and green roofs to forests, wetlands, and rivers, they provide a range of climate change, biodiversity, and health benefits. These benefits are magnified when individual green infrastructure elements are connected together into a network across jurisdictional boundaries, increasing resilience to climate impacts and supporting the movement of species across the landscape. A regional green infrastructure network would maximize ecosystem services by linking together natural and urban ecosystems through a robust system of recreational greenways, aquatic blueways, and wildlife crossings and corridors.

Developing a regional green infrastructure network would necessitate creating a collaborative and cross-jurisdictional process, building on existing local networks, and identifying opportunities to maximize associated climate change adaptation, ecosystem connectivity, and human health benefits.

2.1 Develop a Regional Green Infrastructure Network.

BIG Move | METRO 2050

Through implementation of the regional growth strategy, collaborate with member jurisdictions, First Nations, and other agencies to identify a Regional Green Infrastructure Network that connects ecosystems and builds on existing local ecological networks, while maximizing resilience, biodiversity, and human health benefits. Collaboratively prepare Implementation Guidelines to support a Regional Green Infrastructure Network.

2.2 Green Urban Areas.

Support the greening of urban areas by developing and sharing best practices and guidelines to incorporate green infrastructure into new developments and redeveloped areas. Work collaboratively with member jurisdictions and other partners to identify barriers and opportunities to integrating green infrastructure in urban areas.

STRATEGY 2

Potential Impacts of Strategy	Key Partners
• Creates a process to work together to connect a cross-regional network • Integrates ecosystem connectivity into green infrastructure planning and implementation	• Member jurisdictions • First Nations • BC government • Federal government • NGOs • Academic institutions • Agricultural land owners

2.3 Green the Regional Greenways Network.

Corporate LEADERSHIP

Identify opportunities to incorporate green infrastructure, restoration of ecosystems and unprotected natural areas in greenway planning and design to enhance ecosystem connectivity and provide shading and other benefits to trail users. Advocate to other agencies who own or manage parts of the Regional Greenways Network to do the same.

2.4 Minimize Ecosystem Fragmentation.

METRO 2050

Avoid ecosystem loss and fragmentation when developing and operating infrastructure within the regional growth strategy Conservation and Recreation regional land use designation, but where unavoidable, mitigate the impacts, and advocate to other agencies to do the same. All member jurisdictions, through the implementation of the regional growth strategy, will discourage or minimize the fragmentation of ecosystems through low impact development practices that enable ecosystem connectivity.

2.5 Develop Data and Resources to Support Ecosystem Connectivity.

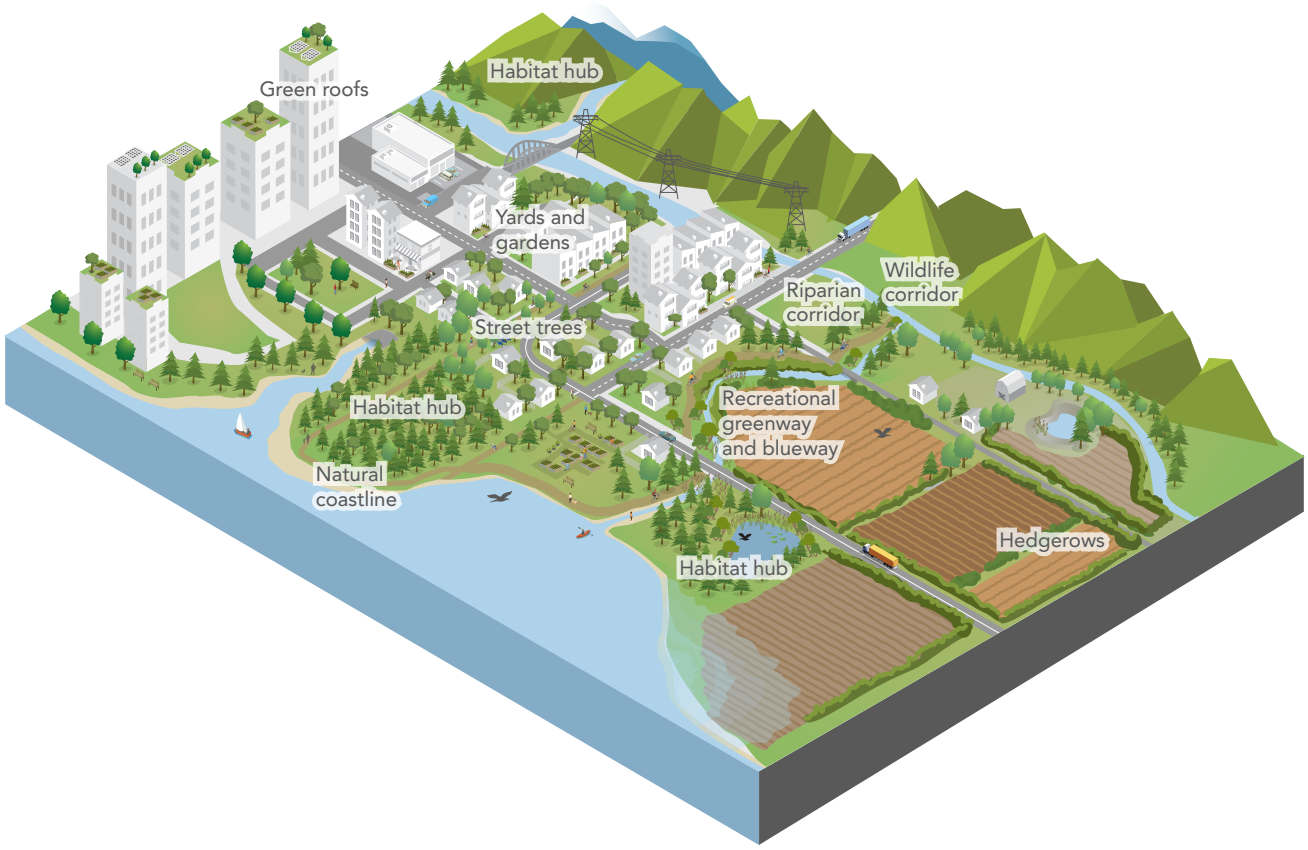
Continue to work with others to develop and share data and resources related to ecosystem connectivity, including resources that identify the impacts of climate change on connectivity.

Nature in the City

Nature and ecosystems within urban areas can maximize ecosystem services – such as cooling and shading – close to where people live, work and play. By bringing nature into the city through enhancement and restoration – also known as 'rewilding' - urban ecosystems can play a role in supporting biodiversity across multiple scales, from green roofs on individual buildings to large, open, and natural spaces at the urban periphery. A Regional Green Infrastructure Network (as described in action 2.1) would connect ecosystems both between and within the region's urban areas.

FIGURE 7: COMPONENTS OF A GREEN INFRASTRUCTURE NETWORK

Green Infrastructure Network



Components of a Regional Green Infrastructure Network

Habitat hubs are larger, intact core habitat areas and are a critical feature of any green infrastructure network. They provide areas of refuge for a diverse range of species, including those less tolerant of human disturbance. Smaller sites also provide habitat and can act as 'stepping stones' between hubs.

Corridors are linear areas of habitat that support movement of birds, fish and mammals between hubs and other areas of habitat. They can span short or long distances. As land is developed, these remaining pathways become even more critical. Also known as wildlife, habitat, or green corridors, these areas also include riparian corridors that follow the path of a stream or river.

Urban green infrastructure includes a wide variety of features that support nature in the city and provide habitat for wildlife that is tolerant of human disturbance. Features include yards and gardens, green roofs and walls, and street trees.

Recreational greenways and blueways provide opportunities for people to recreate on land and water, but these areas are also used by wildlife to move through the region. Wildlife can be supported by enhancing natural vegetation alongside green and blueways, as well as increasing the width of vegetated buffers.

Natural coastlines provide important habitat for several species, while supporting connections between marine and terrestrial habitats and along the foreshore.

Hedgerows and areas of natural vegetation within agricultural areas provide habitat and support connectivity.

Strategy 3: Integrate Natural Assets into Conventional Asset Management and Decision-Making Processes

While ecosystems should not be considered solely as "assets" from which humans derive value, the concept of "natural assets" has emerged as a mechanism to highlight that ecosystems (e.g. a wetland) can be formally acknowledged as a fundamental asset that benefits the community - in the same way that engineered assets (e.g. a wastewater treatment plant) are recognized.

Natural assets provide an extensive range of ecosystem services which are not officially recognized in traditional asset management, financial planning, or decision-making processes. Integrating natural assets into asset management processes supports improved understanding of the services they provide, and this information supports efforts to maintain and manage natural assets for their long term health and resiliency. Ensuring these natural assets are protected and monitored over the long term is crucial in the context of a changing climate, since many of the services ecosystems provide help communities respond to climate change.

While the concept of natural asset management is gaining considerable traction at the local level, Metro Vancouver can also play a key role in managing regional assets, supporting regional partners, convening key groups, providing a discussion forum, and developing and sharing data. Collectively, the region can elevate natural asset management from an optional process to an integral one. While there is no way to place a true economic valuation on nature itself (nor should nature be valued this way), a more robust understanding of the location of natural assets and the level of services they provide helps to demonstrate their critical importance to our communities, and an additional tool to help protect, restore, and enhance them.

3.1 Incorporate Natural Assets Into Asset Management and Financial Planning.

BIG Move | METRO 2050

Corporate LEADERSHIP

Through implementation of the regional growth strategy, 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. This Big Move will require multiple departments at Metro Vancouver to shift their standard practice, and collaborate across silos.

STRATEGY 3

Potential Impacts of Strategy	Key Partners
• Elevates natural asset management as standard practice rather than the exception • Provides an additional mechanism to help protect nature and ecosystems long-term • Enables consistent funding opportunities	• Member jurisdictions • First Nations • NGOs • BC government • Public Sector Accounting Board • Agricultural land owners

3.2 Integrate Ecosystems and their Services into the Design of Major Infrastructure.

BIG Move | Corporate LEADERSHIP

Demonstrate leadership and innovation by integrating nature-based solutions into the siting and design of major infrastructure where appropriate (or "where it makes sense"), and consider nature-based complements to hard (or "grey") infrastructure. Also require full carbon cost accounting and ecosystem service valuation during construction and operation of Metro Vancouver's water and wastewater infrastructure.

3.3 Consider Ecosystems and their Services in Major Development Decisions.

Work with member jurisdictions to understand and consider ecosystems and their services, including carbon storage and flood protection, in major development decisions, such as regional growth strategy amendment decisions. Using appropriate data and other forms of knowledge, consider how potential new developments may inhibit the capacity for nature to provide ecosystem services and explore alternatives.

3.4 Support Natural Asset Management at the Local Level.

Develop and share guidance materials to support natural asset management at the local level, and provide a forum to share and advance best practices. Regional datasets can be used to inform local natural asset inventories including trans-boundary areas. Forums are a vital space to connect and empower local champions of natural asset management, build a regional network, and develop internal natural asset knowledge within organizations.

3.5 Explore Opportunities to Overcome Barriers to Natural Asset Management.

Explore the legal landscape and other barriers that may inhibit natural asset management in the Metro Vancouver region. Results from this research may reveal opportunities to further reduce barriers or enable strategic frameworks and norms that support natural asset management in the region and across BC.

Municipal Natural Assets Initiative (MNAI)

The Municipal Natural Assets Initiative provides scientific, economic and municipal expertise to support and guide local governments in identifying, valuing and accounting for natural assets in their financial planning and asset management programs, and in developing leading-edge, sustainable and climate resilient infrastructure. Local communities in the Metro Vancouver region have taken the lead in working with the MNAI to understand and advance natural asset management.

District of West Vancouver's Natural Asset Inventory

The District of West Vancouver is one of the first Canadian municipalities to estimate the value of their natural assets in terms of the services they provide annually and into the future – a first step toward integrating natural assets into the District's financial and asset management plans. Metro Vancouver provided its Sensitive Ecosystem Inventory data to support this process.

Strategy 4: Support a Resilient, Robust, and Healthy Urban Forest

The urban forest includes all of the trees in the public and privately owned lands of the built environment – including the trees in backyards, streets, and parks. A healthy and resilient urban forest provides essential ecosystem services such as habitat for local wildlife, shading and cooling hotter areas, capturing rainfall and stormwater, and storing carbon (the region's urban forest currently stores approximately 8 million tonnes of carbon[4]). To implement this strategy, Metro Vancouver can establish a regional urban tree canopy cover target, improve tree canopy cover in Metro Vancouver-owned lands such as Regional Parks and Watersheds, and support member jurisdictions, stewardship groups, and other regional partners by developing and sharing relevant data and resources.

4.1 Achieve 40% Tree Canopy Cover Within the Region's Urban Areas

BIG Move | METRO 2050

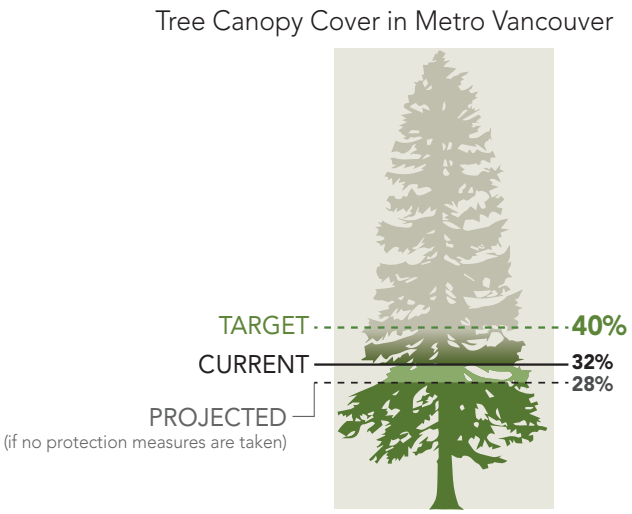
All member jurisdictions, through implementation of the regional growth strategy, will identify local tree canopy cover targets, and demonstrate how these targets will contribute to the regional target of 40% canopy cover within the region's Urban Containment Boundary. Metro Vancouver will contribute to this target by increasing tree canopy on Metro Vancouver-owned lands (where applicable), measuring and reporting on regional tree canopy cover trends, and advocating to the federal and BC governments to provide suitable funding opportunities for tree planting in urban areas.

STRATEGY 4

Potential Impacts of Strategy	Key Partners
• Increases tree canopy cover to improve ecosystem services, including those that are climate change-related • Improves the health and resiliency of the urban forest • Provides a forum for knowledge sharing and partnerships	• Member jurisdictions • Academic institutions • Health authorities • Urban forestry practitioners • First Nations • BC government • Federal government • Professional associations • Local residents

4 Figure obtained from Metro Vancouver's Carbon Storage Dataset (metrovancouver.org/data).

FIGURE 8: TREE CANOPY COVER IN METRO VANCOUVER



4.2 Provide Data and Resources to Support Urban Forest Management.

Continue to develop and share materials that support member jurisdictions and other partners in achieving a healthy and resilient urban forest. These materials can help support local and regional urban forestry objectives.

4.3 Improve Local Regulations and Management Practices.

METRO 2050

All member jurisdictions, through implementation of the regional growth strategy, will 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 acquisition, street tree planting, and reforestation or restoration policies, with consideration of climate resiliency. Through best practices and new or updated regulations, member jurisdictions have an opportunity to support a healthy urban forest by protecting and retaining existing trees, and supplementing those actions with the planting of new trees.

Tree Canopy Cover and the 40% Target

Tree canopy cover refers to the leaves and branches that form a visible layer, and the extent to which they cover the ground if one is viewing from the air. Given the ecosystem services that trees provide, we often use canopy cover as a proxy for these services. The region's canopy cover within the Urban Containment Boundary is currently 32%, and this number is expected to fall to 28% in the next 20-30 years based on projected development patterns. A canopy cover target of 40% is commonly adopted at the local level in cities around the world, and this number represents both an aspirational and achievable goal for the Metro Vancouver region. Local variation in geography, environmental conditions and historical development patterns will need to be considered, given that a 40% target is a regional average that will not be feasible for every individual member jurisdiction to meet at the local level.

Reversing the current trend of tree canopy loss and meeting a 40% tree canopy target will require collaboration and commitment throughout the region, and a major shift in the way tree protection and planting efforts are prioritized. Strategy 4 outlines critical next steps to achieve this objective.

4.4 Convene Partners on Urban Forestry Issues.

Continue to provide a forum for a diverse range of urban forestry practitioners to discuss and collaborate on issues of regional concern. These forums allow regional partners to learn from each other, share relevant information and updates, overcome barriers, and build a community of practice.

Metro Vancouver Corporate Leadership in Urban Forestry

Urban Forest Climate Adaptation Initiative - Metro Vancouver developed the Urban Forest Adaptation Initiative to assess the risks and predicted changes to the region's urban forest. The initiative provides guidance to help practitioners manage urban forests in a changing climate today and to prepare for the future.

Regional Tree Canopy Cover and Impervious Surfaces Report - This report contains an analysis of tree canopy cover and impervious surfaces in Metro Vancouver, and is accompanied by two publically-available GIS datasets.

Metro Vancouver Tree Regulations Toolkit - The Metro Vancouver Tree Regulations Toolkit identifies the available approaches to regulate trees in British Columbia, highlights considerations for selecting appropriate tools based on the local community context, and details the higher-level plans and local-scale regulatory tools that can help to preserve trees and increase tree canopy cover.

4.5 Consider Equity and Human Health in Urban Forestry Planning.

Work with health authorities, academic institutions, member jurisdictions, and other partners to further understand the connections between urban trees, human health, and equity, and consider these factors in urban forestry planning. These connections are particularly important to understand in the context of a changing climate.

Encouraging Tree Planting and Green Infrastructure on Residential Properties

Metro Vancouver's 2019 Regional Tree Canopy Cover and Impervious Surfaces Report identified that within the Urban Containment Boundary, approximately 37% of potential planting area – land that could *theoretically* be used to increase tree canopy cover – is located in residential areas. This means that local residents can play a significant role in improving residential tree canopy cover within communities. Local governments can encourage environmental stewardship, partnership, and tree planting and protection on private properties through programs and initiatives, and communicate the benefits of trees.

While trees provide significant levels of ecosystem services, other types of green infrastructure provide benefits close to where people live as well. Metro Vancouver's Grow Green platform is a helpful guide to creating and maintaining a sustainable garden or lawn space on private property - utilizing non-invasive, waterwise plants that are readily available in Metro Vancouver.

Strategy 5: Advance Nature-based Solutions to Climate Change

Nature-based solutions are actions that protect, sustainably manage, and restore ecosystems, as well as address societal challenges such as climate change, providing both human well-being and biodiversity benefits. These solutions can be an important part of climate action planning since the co-benefits extend beyond storing carbon and adapting to climate change impacts. Metro Vancouver can help advance nature-based solutions by integrating them into regional projects and plans, encouraging and supporting their uptake at the local level, and exploring new and innovative opportunities for this emerging area of practice.

5.1 Explore Innovative Funding and Incentive Programs.

BIG Move

Explore the viability of innovative financial and incentive mechanisms (such as nature-based carbon offsets and credits, conservation levies, green bonds, insurance-based funding, and payment for ecosystem services) to advance and support nature-based solutions. This Big Move also includes identifying existing funding sources, and advocating that the federal and BC governments enable and support nature-based solutions. This support could include providing reliable and sustainable funding sources and incentive programs for multiple ecosystem types and services. In addition to exploring partnership options, this Big Move will involve gauging public support for various options and determining appropriate implementation scales.

5.2 Plan for Climate Change Impacts on Ecosystems.

BIG Move

Work with other partners to conduct a vulnerability assessment of the region's ecosystems and update the Metro Vancouver Sensitive Ecosystem Inventory with climate change vulnerability information (e.g. impacts of coastal squeeze on intertidal ecosystems). This Big Move would create information that can be used across the region to inform planning efforts. It could also involve understanding how climate change impacts may affect carbon sequestration potential in the region's ecosystems.

5.3 Include Nature-Based Solutions in Climate Action Plans.

Advocate that member jurisdictions include nature-based solutions in climate action plans. Work with the federal and BC governments to identify opportunities to fund and implement nature-based solutions for climate change adaptation and carbon storage at the local level. Metro Vancouver will also provide data and a forum to share experiences and best practices.

Outcomes from action 5.1 may support implementation of other strategies and actions throughout the *Nature & Ecosystems Roadmap*.

STRATEGY 5

Potential Impacts of Strategy	Key Partners
• Supports the research, uptake, and mainstreaming of nature-based solutions in climate action planning • Provides human health and biodiversity co-benefits	• Member jurisdictions • First Nations • Academic institutions • BC government • Federal government • NGOs • Agricultural land owners

Nature-based Carbon Offsets and Credits

A carbon offset is a reduction in carbon (or an increase in carbon storage, e.g. through tree planting) that is used to compensate for greenhouse gas emissions that occur elsewhere. A carbon offset credit is a transferrable instrument certified by governments or other entities. These offsets and credits are transferred through markets – these markets exist under both **mandatory** (compliance) and **voluntary** programs, both of which require some form of verification.

- **Mandatory markets** are created and regulated by mandatory national, regional, or international carbon reduction programs.
- **Voluntary markets** function outside of compliance markets and enable the purchase of offsets on a voluntary basis.

Key Considerations for Carbon Offsets

- **Framing and Use:** Offsetting should be framed as an additional action to supplement deep reductions in greenhouse gases, rather than a compensating action that enables greenhouse gas emitting activities to continue business as usual.
- **Additionality:** Ecosystem protection/restoration to create the carbon offset must be an activity that would not have occurred without the offset – for instance, a forest that is already legally protected should not be counted in the offset process.
- **Permanence:** Ecosystems protected through offsets should be protected permanently. This can be difficult to ensure for some ecosystem types (e.g. salt marshes affected by sea level rise, and forests disturbed by pests and wildfire).
- **Leakage:** Preventing a harmful activity in one location may simply transfer that same activity to a new location – i.e. protecting a forest from logging may simply shift the activity to a new area, resulting in no net climate benefit.
- **Verification and quantification:** Given the complexity of carbon fluxes in natural systems, a project's greenhouse gas reductions must be quantified accurately and then verified by an accredited third party. Guidelines for quantification, verification, monitoring, and reporting are needed to ensure projects deliver the estimated carbon reductions. Verification methods for forest ecosystems are the most well-developed to date.

Future Work

Metro Vancouver will continue to monitor and explore the role and validity of nature-based carbon credits and offsets in the region, in addition to other innovative financial and incentive mechanisms that support nature-based solutions. Future work could also explore the role of alternative ecosystems (e.g. salt marshes) and ecosystem services (e.g. habitat, flood protection) in offset mechanisms, through mandatory, voluntary and regional scale markets.

5.4 Support the Implementation of Nature-based Solutions.

Work with academic institutions and other regional partners to explore and promote best practices and technologies for advancing innovative nature-based solutions, while ensuring risks are minimized. This action could also involve identifying legislative and other barriers to implementing nature-based solutions, and providing a forum for collaboration and knowledge-sharing with practitioners.

5.5 Manage Forests in the Context of a Changing Climate.

Advocate to the BC government to continue implementing measures that adapt forests to a changing climate (e.g. assisted migration research), enhance carbon storage (e.g. reforestation), and reduce greenhouse gas emissions associated with forest management (e.g. reduce slash pile burning). Continue to work with the BC government and local authorities in early detection and suppression of wildfire in the region's drinking water supply areas and adjacent forested areas, as well as fuel management practices in areas with high ignition risk.

Forest Fires and the Wildland Urban Interface (WUI)

Interventions to protect communities from wildfire risks will be explored further in the *Land Use and Urban Form Roadmap*.

5.6 Advance Nature-Based Solutions to Address Flood Hazards.

Work with partner organizations to advance cross-jurisdictional nature-based solutions for flood management, through processes such as the *Lower Mainland Flood Management Strategy* and the BC government's *Flood Strategy*.

5.7 Develop our Understanding of Coastal Ecosystems and Blue Carbon Potential.

Work with academic institutions and other regional partners to better understand the long-term health and carbon storage potential in the region's coastal and marine ecosystems, including tidal marshes, eelgrass and kelp. Researchers in the region are studying these ecosystems and filling data gaps, and Metro Vancouver will collaborate on next steps.

5.8 Partner with Others to Address Climate Change Issues in Coastal and Marine Ecosystems.

Work with Key Partners to address climate change issues in coastal and marine ecosystems. Given the complex overlapping jurisdictions that exist in the coastal and marine realm, action will require partnership and collaboration. Early opportunities include collaborating with the BC government on the proposed *Ocean Acidification and Hypoxia Action Plan* and *Coastal Marine Strategy*.

Climate Change and Marine and Coastal Ecosystems

Our rich marine and coastal areas provide important habitat for fish and wildlife including endangered killer whales, salmon, and hundreds of species of resident and migratory shorebirds. The ocean has spiritual, cultural and ceremonial value for local First Nations, and it provides traditional foods. Salt marshes and seagrasses can store carbon and mitigate flooding in coastal communities. However, these complex intertidal and marine ecosystems are particularly vulnerable to climate change. With rising seas and storm surge, intertidal wetlands will be lost as they are unable to move higher due to sea walls and other human-made structures. In marine environments, warmer temperatures, increased runoff from more extreme rainfall events, and changes in ocean chemistry will alter ecological processes.

CAMPBELL VALLEY REGIONAL PARK

Setting the Path Ahead

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

Nature and ecosystems are already providing critical ecosystem services that support climate action; locking away millions of tonnes of carbon in vegetation and soils, and moderating the impacts of a changing climate by reducing flooding, protecting shorelines, and cooling temperatures. However, natural systems are themselves at risk from climate change, land development, pollution, invasive species and other factors; these impacts reduce the ability of nature to provide important climate-related services.

In order to maintain the existing services provided by nature and prevent further losses, actions to protect nature and ecosystems need to be implemented without delay. This involves protecting the region's ecosystems, including the urban forest, and ecosystem connectivity across the region. These measures are supported by actions that seek to change how we do business by integrating nature into decision-making and managing natural assets for their long term health and resiliency. Actions to advance the understanding and mainstreaming of nature-based solutions are important to ensuring the region's responses to climate change leverage the benefits provided by nature, while also supporting biodiversity and human health and well-being. Actions that support restoration and enhancement of ecosystems offer an opportunity to gain back lost ecosystem function and climate-related benefits.

The timeline below contains all of the actions included in this Roadmap. Although there is much work to be done, there are some critical actions that, if started over the next two years, will support the regional vision of a carbon neutral and resilient region by 2050. Many actions contained in the *Nature and Ecosystems Roadmap* will be initiated in the short-term, but benefits and outcomes will be accrued slowly over time as ecosystems mature.

CLIMATE 2050 NATURE AND ECOSYSTEMS ROADMAP ACTION TIMELINE

STRATEGY	2021-2023	2024-2029	2030-BEYOND
STRATEGY 1 Protect, Restore, and Enhance the Region's Ecosystems	1.1 BIG MOVE Protect an Additional 10% of the Region for Nature		
	1.2 Protect, Restore, and Enhance Natural Areas at the Regional Scale		
	1.3 Protect, Restore, and Enhance Nature at the Local Scale		
		1.4 Incorporate Climate Change Planning into Protected Area Management	
	1.5 Prioritize the Conservation of Ecosystem Health and Biodiversity in BC Forest Management		
	1.6 Support Ecosystem Protection, Enhancement, and Restoration		
		1.7: Reverse the Loss of the Region's Ecosystems through Restoration.	
	1.8 Manage invasive species		
STRATEGY 2 Connect Green Infrastructure	2.1 BIG MOVE Develop a Regional Green Infrastructure Network		
	2.2 Green Urban Areas		
	2.3 Green the Regional Greenways Network		
	2.4 Minimize Ecosystem Fragmentation		
		2.5 Develop Data and Resources to Support Ecosystem Connectivity	
STRATEGY 3 Integrate Natural Assets into Conventional Asset Management and Decision-Making Processes	3.1 BIG MOVE: Incorporate Natural Assets into Asset Management and Financial Planning		
	3.2 BIG MOVE: Integrate Ecosystems and their Services into the Design of Major Infrastructure		
	3.3 Consider Ecosystems and their Services in Major Development Decisions		
	3.4 Support Natural Asset Management at the Local Level		
		3.5: Explore Opportunities to Overcome Barriers to natural asset management	
STRATEGY 4 Support a Resilient, Robust, and Healthy Urban Forest	4.1 BIG MOVE: Achieve 40% Tree Canopy Cover Within the Region's Urban Areas		
	4.2: Provide Data and Resources to Support Urban Forest Management		
	4.3: Improve Local Regulations and Management Practices		
	4.4: Convene Partners on Urban Forestry Issues		
	4.5 Consider Equity and Human Health in Urban Forestry Planning		
STRATEGY 5 Advance Nature-based Solutions to Climate Change	5.1 BIG MOVE: Explore Innovative Funding and Incentive Programs		
		5.2 BIG MOVE: Plan for Climate Change Impacts on Ecosystems	
	5.3: Include Nature-Based Solutions in Climate Action Plans		
	5.4 Support the Implementation of Nature-based Solutions		
	5.5: Manage Forests in the Context of a Changing Climate		
	5.6: Advance Nature-Based Solutions to Address Flood Hazards		
		5.7: Develop our Understanding of Coastal Ecosystems and Blue Carbon Potential	
	5.8 Partner with Others to Address Climate Change Issues in Coastal and Marine Ecosystems		

PLANTING NATIVE SPECIES, TYNEHEAD REGIONAL PARK

Measuring our Progress

The table below lists examples of some of the performance indicators that could be used to help Metro Vancouver measure regional progress towards meeting the objectives of this Roadmap. Indicators in the table below may apply to more than one strategy, even if not listed. The performance indicators used will depend, to some extent, on the availability of this information from other organizations and agencies. Because this Roadmap allocates some actions to other partners, data sharing will be critical for measuring the pace of our collective progress towards common goals.

ROADMAP ELEMENT	KEY PERFORMANCE INDICATOR	DATA SOURCE	DATA IS CURRENTLY COLLECTED
Protect, Restore, and Enhance the Region's Ecosystems	Hectares of unprotected Sensitive or Modified Ecosystems	Metro Vancouver	Yes
	Hectares of protected lands and waters	Metro Vancouver	Yes
	Hectares of Sensitive or Modified Ecosystems	Metro Vancouver	Yes
	Percent of inventoried Sensitive or Modified Ecosystems rated high quality	Metro Vancouver	Yes
	Hectares of ecological restoration areas	Metro Vancouver Member jurisdictions NGOs BC government Other agencies	Yes – regional parks No – rest of region
	Number of new invasive non-native species recorded and/or considered established	BC government Federal government	Yes
	Watershed and stream health index	Metro Vancouver	No

ENJOYING IONA BEACH REGIONAL PARK

ROADMAP ELEMENT	KEY PERFORMANCE INDICATOR	DATA SOURCE	DATA IS CURRENTLY COLLECTED
Connect Green Infrastructure	Ecosystem connectivity index	Metro Vancouver	No
	Percent impervious surfaces (e.g. paved roads, buildings)	Metro Vancouver	Yes
Integrate Natural Assets into Conventional Asset Management and Decision-making Processes	Carbon stored in vegetation and soils	Metro Vancouver	Yes
	Measurement of ecosystem services (T.B.D.)	T.B.D.	No
	Number of member jurisdictions with natural asset inventories	Member jurisdictions	No
Support a Resilient, Robust, and Healthy Urban Forest	Percent tree canopy cover (for the region and the urban containment boundary)	Metro Vancouver	Yes
	Urban forest health assessment	T.B.D.	No
	Number of member jurisdictions with current (<=5yrs) tree bylaws and/or urban forest management strategies	Member jurisdictions	Yes
	Number of member jurisdictions with tree canopy cover targets	Member jurisdictions	Yes
Advance Nature-based Solutions to Climate Change	Number of member jurisdictions' climate plans that incorporate nature-based solutions	Member jurisdictions	No
	Extent of coastal ecosystems	BC government NGOs Academic institutions	No
	Ecosystem vulnerability indicators (T.B.D.)	T.B.D.	No

Metro Vancouver will continue to develop indicators as new information becomes available, and technological advances are made.

Glossary

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

Biodiversity is the variety of species and ecosystems, and the ecological processes that they are part of.

Blue carbon refers to the carbon stored in coastal and marine ecosystems.

Blueway refers to a network of water bodies (such as rivers, creeks and lakes), often used for recreation.

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

Carbon sequestration is the removal of carbon dioxide from the air on an annual basis.

Carbon storage refers to the total amount of carbon stored in the vegetation and soils of ecosystems such as forests, wetlands and intertidal areas, which often takes thousands of years to accumulate.

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

Coastal squeeze occurs when rising sea levels push coastal habitats landward. Coastal habitats are often diminished in both size and function when caught between rising sea levels and fixed infrastructure (such as a sea wall) or high ground.

Ecological health captures the connection among healthy functioning ecosystems, the valuable services they provide, and human well-being.

Ecosystems are all the plants and animals that live in a particular area together with the relationships between them and their environment.

Ecosystem connectivity is the physical and functional links between ecosystems that support biodiversity by allowing movement of species across the region.

Ecosystem services are the benefits people obtain from ecosystems, including food, fresh water, shading, and human health and well-being. These services can be grouped into four main types: supporting, provisioning, cultural, and regulating.

Equity is the promotion of fairness, justice, and the removal of systemic barriers that may cause or aggravate disparities experienced by different groups of people. This can include consideration of the many dimensions of identity, such as socioeconomic status, race, ethnicity, sex, age, disability, gender, sexuality, religion, indigeneity, class, and other equity-related issues.

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.

Green gentrification occurs when improvements to urban green space trigger a flow of wealth into an area, increasing the cost of living and forcing economically marginalized residents to relocate.

Green infrastructure is the natural, enhanced, and engineered assets that collectively provide society with ecosystem services required for healthy living.

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

Ground-level ozone (O_3) can have harmful impacts on everyone, especially children, seniors, 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, and landslides.

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

Indigenous Knowledge reflects the unique cultures, languages, governance systems and histories of Indigenous peoples from a particular location. Indigenous knowledge is dynamic and evolves over time. It builds on the experiences of earlier generations and adapts to present conditions. First Nations, Inuit and Métis each have a distinct way of describing their knowledge. Knowledge-holders are the only people who can truly define Indigenous knowledge for their communities.

Keystone species have a disproportionately large effect on the ecosystems in which they occur. Keystone species help to maintain local biodiversity within a community either by controlling populations of other species that would otherwise dominate the community, or by providing critical resources for a wide range of species.

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

Nature-based solutions are actions that protect, sustainably manage, and restore natural or modified ecosystems but also address societal challenges (such as climate change), thereby providing both human well-being and biodiversity benefits.

Recreational Greenway refers to a linear corridor often used for recreation.

Regional Greenways Network is the region's network of recreational greenways which support recreational walking, cycling, and, where appropriate, horseback riding.

Riparian refers to areas close to or on river banks.

Sensitive Ecosystem are ecosystems mapped by the Metro Vancouver Sensitive Ecosystem Inventory. Sensitive Ecosystems are ecologically significant and relatively unmodified, and include wetlands, older forests and riparian areas. Some younger and more human modified ecosystems still have ecological value and importance to biodiversity (e.g., young forests), and are also included in the Sensitive Ecosystem Inventory.

BOUNDARY BAY REGIONAL PARK

Stormwater is the water from rain or melting snow that is not absorbed into the ground. In urban areas, stormwater goes into storm sewers (the grated drains found on streets), which empty directly into rivers, creeks or the ocean. Managing stormwater and drainage is key to preserving the health of urban streams and rivers.

Subsidence is the sudden sinking or gradual downward settling of the ground's surface. Subsidence is common in river deltas.

Tree canopy cover refers to the leaves and branches that form a visible layer if one is viewing the region from the air, and the extent to which they cover the ground.

Urban forest refers to the trees within the public and private lands of a city, including the trees in parks, around buildings, along streets and in backyards.

Urban heat island effect refers to a phenomenon where built-up areas are hotter than nearby non-urban areas. The average air temperature of a city can be several degrees warmer than the surrounding landscape.

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.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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

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SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Marina Richter, Senior Policy Analyst
Cindy Onyejekwe, Senior Policy Analyst
Parks and Environment Department

Date: March 10, 2023 Meeting Date: April 6, 2023

Subject: **MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023**

RECOMMENDATION

That the MVRD Board:

a) give first, second, and third reading to *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023*; and

b) pass and finally adopt *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023.*

EXECUTIVE SUMMARY

Metro Vancouver can use a range of tools to promote compliance with its air emission regulatory bylaws. The *Greater Vancouver Regional District* (GVRD) *Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010* (Bylaw 1117) allows designated contraventions to be addressed through a notice of bylaw violation (NBV) as an initial enforcement measure or for minor infractions. The proposed amendments to Bylaw 1117 designate new bylaw infractions and accompanying penalties that are needed as a result of the implementation of new phases of the updated *Metro Vancouver Regional District* (MVRD) *Non-Road Diesel Engine Emission Regulation Bylaw 1329, 2021* (Bylaw 1329) and the adoption of the new *MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022* (Bylaw 1355). The amendments also address administrative updates.

PURPOSE

To propose amendments to Bylaw 1117, described in *MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023* (Amendment Bylaw 1362) attached to this report, for adoption by the MVRD Board.

BACKGROUND

At its October 29, 2021 meeting, the MVRD Board adopted Bylaw 1329 (Reference 1), which repealed and replaced *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* (Bylaw 1161). Certain requirements in Bylaw 1329 took effect on January 1, 2023 and others will be taking effect in 2024. In addition, the MVRD Board adopted Bylaw 1355 at its July 29, 2022 meeting (Reference 2).

In support of the coming into effect of Bylaw 1329 and Bylaw 1355, this report proposes amendments to Bylaw 1117 to update the designated bylaw contraventions that may be dealt with by notices of bylaw violation.

BYLAW AMENDMENTS

Metro Vancouver promotes compliance with its air emission regulatory bylaws using tools such as education, warnings, notices of bylaw violation (NBV), and municipal ticket information. Non-punitive education and warnings are preferred methods before stronger enforcement measures are administered. Bylaw 1117, as amended, authorizes officers to issue NBV with associated penalties for designated minor bylaw infractions, as an initial form of enforcement. NBV offer an effective and efficient alternative to legal action through the courts by providing an internal mechanism for dispute screening and adjudication.

The amendments to Bylaw 1117 proposed under Amendment Bylaw 1362 designate those bylaw contraventions that may be dealt with by NBV, arising from the phased-in requirements of Bylaw 1329 taking effect in 2023 and 2024, as well as from the new Bylaw 1355. The proposed amendments also include administrative updates to the civic address of the registry based at Metro Vancouver's head office and updates to the designated titles of staff members appointed as screening officers.

Non-Road Diesel Engines (Bylaw 1329)

Bylaw 1329 regulates harmful air emissions from all tiers of non-road diesel engines, including older, higher emitting Tier 0 and Tier 1 engines and cleaner Tier 2, Tier 3, and Tier 4 engines starting in 2023, 2024, and 2029, respectively. The proposed amendments to Bylaw 1117's Schedule K designations add infractions related to emergency engines, moderate-use engines, and registration and labelling of Tier 2 and 3 engines for which Metro Vancouver can issue NBV. Due to the phased introduction of regulatory requirements related to moderate-use engines and Tier 2 and 3 engines in Bylaw 1329, the proposed amendments to Bylaw 1117 add infractions that will come into effect as corresponding provisions in Bylaw 1329 come into effect. Future amendments to Bylaw 1117 are anticipated to reflect new requirements in Bylaw 1329 that will take effect in future years.

Open Burning (Bylaw 1355)

Open burning is disposal of vegetative debris by outdoor burning without a stack or chimney. Open burning can generate harmful smoke and contribute to degraded air quality. The new Bylaw 1355 seeks to reduce air contaminants discharged from open burning. Metro Vancouver will promote compliance with Bylaw 1355 primarily through outreach, education, and non-punitive warnings. In the event that initial enforcement actions are needed, the proposed new Schedule M in Bylaw 1117 designates those infractions under Bylaw 1355 that can be addressed through NBV and their associated penalties. If adopted, it will be possible for an officer to issue NBV for these infractions when Bylaw 1355 comes into effect in May 2023.

Penalties related to NBV are half the amount of Municipal Ticket Information (MTI) fines for the corresponding contravention, since an NBV is generally issued by officers as an initial form of enforcement. A separate report in the Climate Action Committee April 6, 2023 agenda, titled "MVRD Ticket Information Utilization Amendment Bylaw No. 1363, 2023", presents proposed

amendments to *Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006.*

ALTERNATIVES

1. That the MVRD Board:
   a) give first, second, and third reading to *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023*; and
   b) pass and finally adopt *Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023*.

2. That the MVRD Board receive for information the report dated March 10, 2023, titled "MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

If the Board approves Alternative 1, officers will be able to issue Notices of Bylaw Violation and associated penalties related to enforcement of additional provisions in Bylaw 1329 and the new Bylaw 1355.

CONCLUSION

GVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010 (Bylaw 1117) authorizes Metro Vancouver officers to issue notices of bylaw violation (NBV) as an initial measure to enforce compliance with designated contraventions of Metro Vancouver air emission regulatory bylaws or to enforce minor infractions. NBV provide an effective and efficient form of enforcement, where disputes are screened internally, and then heard and resolved through an adjudication process instead of the Provincial judicial system. The proposed amendments to Bylaw 1117 designate those bylaw contraventions arising from the phasing-in of additional requirements under *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021* and the adoption of the new *MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022* that may be dealt with by NBV. The proposed amendments also include administrative updates.

Staff recommend Alternative 1, to adopt Amendment Bylaw 1362 that amends the designated bylaw infractions and penalties in Bylaw 1117 to reflect changes associated with Bylaw 1329 and Bylaw 1355.

Attachment

Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023.

References

1. MVRD Climate Action Committee Report "MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021", dated October 5, 2021
2. MVRD Climate Action Committee Report "MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022", dated June 8, 2022

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METRO VANCOUVER REGIONAL DISTRICT
BYLAW NO. 1362, 2023
A Bylaw to amend Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010

WHEREAS:

A. the Board of Directors of the Metro Vancouver Regional District ("the Board") has adopted "Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010", a bylaw to respect the enforcement of Notices of Bylaw Violation and establish a Bylaw Violation Dispute Adjudication System; and

B. the Board of Directors of the Metro Vancouver Regional District wishes to amend "Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010."

NOW THEREFORE the Board of the Metro Vancouver Regional District enacts as follows:

Citation

1. The official citation of this bylaw is "Metro Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023".

Schedules

2. The following Schedules and Appendix are attached to and form part of this bylaw:
Schedule K, MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021;
Appendix A;
Schedule M, MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022.

Amendment of Bylaw

3. "Greater Vancouver Regional District Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010" is hereby amended as follows:

a) In sections 1 through 13, all references to the phrase "Schedules A through L" are deleted and replaced with the phrase "Schedules A through M";

b) Section 6.2 is deleted in its entirety and is replaced with the following:

6.2 The civic address of the Registry is 4515 Central Blvd, Burnaby, BC V5H 0C6.

c) Section 7.2 is deleted in its entirety and is replaced with the following:

7.2 The following are designated titles of persons that are appointed as Screening Officers:

(a) Division Manager Regional Parks Visitor and Operations Services;

(b) Supervisor, Parks Regulations and Compliance System;

(c) Environmental Control Officer;

(d) Director, Environmental Regulation and Enforcement;

(e) Program Manager, Regulation and Enforcement – Air Quality;

(f) Director of Regional Planning and Electoral Area Services; and

(g) Director, Regional Parks.

d) Section 9.1 is deleted in its entirety and is replaced with the following:

9.1 Persons acting as any of the following are hereby designated as Bylaw Enforcement Officers for the purposes of this Bylaw and the Act:

(a) Park Officer;

(b) Royal Canadian Mounted Police Officer;

(c) Municipal Police Officer;

(d) British Columbia Provincial Conservation Officer;

(e) any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*;

(f) Division Manager Electoral Area;

(g) Building Inspector;

(h) Regional Planner;

(i) Division Manager Corporate Safety;

(j) Emergency Preparedness and Security Coordinator;

(k) Local Assistant to the Fire Commissioner; and

(l) Security and Crime Prevention Coordinator.

e) Schedule K is deleted and is replaced by the Schedule K that is attached to and forms part of this bylaw;

f) Effective January 1, 2024, Schedule K is deleted and is replaced by the Schedule K contained in Appendix A, which is attached to and forms part of this bylaw; and

g) Effective May 15, 2023, Schedule M, which is attached to and forms part of this bylaw, is added in alphabetical order.

Read a first, second and third time this _____ day of _____, _____.

Passed and finally adopted this _____ day of _____, _____.

George V. Harvie, Chair

Dorothy Shermer, Corporate Officer

MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
12(b)	Failure to inspect or maintain emergency engine	$285	$375	$465	Yes
13	Discharge of emergency engine exhaust into a building	$375	$500	$500	Yes
14	Failure to keep or to submit emergency engine records	$285	$375	$465	Yes
15, 16	Operating without registration	$375	$500	$500	Yes
19	Obstructing an officer	$285	$375	$465	Yes
23(a), (b), (c)	Operating without displaying registration no. or Tier label	$190	$250	$310	Yes
25	Failure to have functioning hour meter	$190	$250	$310	Yes
25	Failure to notify of hour meter replacement	$190	$250	$310	Yes
26	Failure to keep, produce or deliver low-use records	$285	$375	$465	Yes
27(a)	Failure to report hour meter reading	$285	$375	$465	Yes
27(b)	Failure to report hour meter reading at 200 hours of use	$375	$500	$500	Yes

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
27(c)	Failure to provide meter manufacturer name, model or serial no.	$95	$125	$155	Yes
37	Unauthorized discharge (registration invalid - changed ERM*)	$285	$375	$465	Yes
38	Failure to keep or to submit ERM* records	$285	$375	$465	Yes
45, 47	Prohibited operation of a Tier 0 or Tier 1 engine	$375	$500	$500	Yes
54	Unauthorized engine idling	$190	$250	$310	Yes
56	Failure to submit anti-idling procedure	$95	$125	$155	Yes
57	Operating within 100 metres of a sensitive receptor	$375	$500	$500	Yes
58	Operating an engine having a tampered emission control system	$375	$500	$500	Yes
59	Providing false information	$285	$375	$465	Yes

*** "ERM" means "emission reduction measure"**

Appendix A

Schedule K

MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
12(b)	Failure to inspect or maintain emergency engine	$285	$375	$465	Yes
13	Discharge of emergency engine exhaust into a building	$375	$500	$500	Yes
14	Failure to keep or to submit emergency engine records	$285	$375	$465	Yes
15, 16, 17	Operating without registration	$375	$500	$500	Yes
19	Obstructing an officer	$285	$375	$465	Yes
23(a), (b), (c), (d)	Operating without displaying registration no. or Tier label	$190	$250	$310	Yes
25	Failure to have functioning hour meter	$190	$250	$310	Yes
25, 30	Failure to notify of hour meter replacement	$190	$250	$310	Yes
26, 31	Failure to keep, produce or deliver records of operation	$285	$375	$465	Yes
27(a), 32 (a)	Failure to report hour meter reading	$285	$375	$465	Yes

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
27(b)	Failure to report hour meter reading at 200 hours of use	$375	$500	$500	Yes
27(c), 32(c)	Failure to provide meter manufacturer name, model or serial no.	$95	$125	$155	Yes
32(b)	Failure to report hour meter reading at 500 hours of use	$375	$500	$500	Yes
37	Unauthorized discharge (registration invalid - changed ERM*)	$285	$375	$465	Yes
38	Failure to keep or to submit ERM* records	$285	$375	$465	Yes
45, 47	Prohibited operation of a Tier 0 or Tier 1 engine	$375	$500	$500	Yes
54	Unauthorized engine idling	$190	$250	$310	Yes
56	Failure to submit anti-idling procedure	$95	$125	$155	Yes
57	Operating within 100 metres of a sensitive receptor	$375	$500	$500	Yes
58	Operating an engine having a tampered emission control system	$375	$500	$500	Yes
59	Providing false information	$285	$375	$465	Yes

*** "ERM" means "emission reduction measure"**

MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
13(a)	Burning without registration	$190	$250	$310	yes
13(b)	Failure to pay fees	$190	$250	$310	yes
14	Failure to notify Metro Vancouver	$190	$250	$310	yes
18	Failure to follow ventilation index requirements	$290	$375	$460	yes
19	Failure to put debris into burn piles	$290	$375	$460	yes
19	Burning more than two piles	$290	$375	$460	yes
24	Failure to provide requested information	$375	$500	$500	yes
25	Failure to maintain minimum 100 metres from buildings	$375	$500	$500	yes
25	Failure to maintain minimum 500 metres from sensitive receptors	$375	$500	$500	yes
26(a)	Burning an oversized pile	$375	$500	$500	yes
26(a)	Burning more than one pile	$375	$500	$500	yes
26(b)	Burning oversized pieces	$375	$500	$500	yes

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
26(b)	Burning stumps	$375	$500	$500	yes
26(c)	Failure to complete burning in one calendar day near neighbours	$375	$500	$500	yes
29, 30	Burning outside permitted hours	$290	$375	$460	yes
32	Debris stacked above incinerator's air outlet	$290	$375	$460	yes
35	Failure to keep the recommendations for incinerator on site	$190	$250	$310	yes
36	Adding debris to ignited incinerator outside permitted hours	$290	$375	$460	yes
39	Failure to submit a plan for community wildfire risk reduction	$190	$250	$310	yes
41, 53	Burning when ventilation index for the afternoon is not "good" or "fair"	$290	$375	$460	yes
42(a), 50(a)	Failure to maintain minimum 50 metres from buildings	$290	$375	$460	yes
42(b), 50(b)	Failure to maintain minimum 100 metres from sensitive receptors	$290	$375	$460	yes
43	Failure to attend the burn	$375	$500	$500	yes

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Section	**Authorized Words or Expressions**	**Discounted Penalty**	**Penalty**	**Late Payment Penalty**	**Compliance Agreement Available**
44, 49	Failure to complete burning in one calendar day	$290	$375	$460	yes
47	Burning debris as diseased without confirmation	$375	$500	$500	yes
48	Failure to notify district director before burning	$190	$250	$310	yes
55	Failure to keep records	$190	$250	$310	yes
56	Failure to have records on site and available	$190	$250	$310	yes
57	Failure to submit records within 48 hours of a request	$375	$500	$500	yes

To: Climate Action Committee

From: Marina Richter, Senior Policy Analyst
Cindy Onyejekwe, Senior Policy Analyst
Parks and Environment Department

Date: March 10, 2023 Meeting Date: April 6, 2023

Subject: **MVRD Ticket Information Utilization Amendment Bylaw No. 1363, 2023**

RECOMMENDATION

That the MVRD Board:

a) give first, second, and third reading to *Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 2023*; and
b) pass and finally adopt *Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 2023.*

EXECUTIVE SUMMARY

Metro Vancouver can use a range of tools to promote compliance with its air emission regulatory bylaws. *The Greater Vancouver Regional District* (GVRD) *Ticket Information Utilization Bylaw No. 1050, 2006* (Bylaw 1050) allows offences to be addressed by issuing municipal ticket information (MTI) for serious enforcement matters where the possibility of a more expedited prosecution is appropriate. The proposed amendments to Bylaw 1050 designate new offences and associated fines for which an MTI may be issued, which are needed as a result of the phasing-in of additional requirements under the updated *Metro Vancouver Regional District* (MVRD) *Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021* (Bylaw 1329) and the adoption of the new *MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022* (Bylaw 1355). The amendments also address changes in titles of Board-designated bylaw enforcement officers.

PURPOSE

To propose amendments to Bylaw 1050, described in *MVRD Ticket Information Utilization Amendment Bylaw No. 1363, 2023* (Amendment Bylaw 1363) attached to this report, for adoption by the MVRD Board.

BACKGROUND

At its October 29, 2021 meeting, the MVRD Board adopted Bylaw 1329 (Reference 1), which repealed and replaced *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1161, 2012* (Bylaw 1161). Certain requirements in Bylaw 1329 took effect on January 1, 2023 and others will be taking effect in 2024. In addition, the MVRD Board adopted Bylaw 1355 at its July 29, 2022 meeting (Reference 2).

In support of the coming into effect of Bylaw 1329 and Bylaw 1355, this report proposes amendments to Bylaw 1050 to update the list of offences (and associated fines) that are designated as authorized for having an officer lay an information by means of an MTI.

BYLAW AMENDMENTS

Metro Vancouver promotes compliance with its air emission regulatory bylaws using tools such as education, warnings, notices of bylaw violation, and municipal ticket information (MTI). Non-punitive education and warnings are preferred methods before stronger enforcement is administered. In some cases, infractions require a stronger ticket as an effective and efficient alternative to legal action through the courts. Bylaw 1050, as amended, authorizes officers to issue MTI with associated fines and enables Metro Vancouver to enforce compliance with its air emission regulatory bylaws.

The amendments to Bylaw 1050 proposed under Amendment Bylaw 1363 designate those new offences for which an MTI may be issued, arising from the phased-in requirements of Bylaw 1329 taking effect in 2023 and 2024, as well as from the new Bylaw 1355. The proposed amendments also include updates to the titles of staff members appointed as Board-designated bylaw enforcement officers.

Non-Road Diesel Engines (Bylaw 1329)

Bylaw 1329 regulates harmful air emissions from all tiers of non-road diesel engines, including older, higher emitting Tier 0 and Tier 1 engines and cleaner Tier 2, Tier 3, and Tier 4 engines starting in 2023, 2024, and 2029, respectively. The proposed amendments to Bylaw 1050's Schedule K designate offences related to emergency engines, moderate-use engines, and registration and labelling of Tier 2 and 3 engines for which Metro Vancouver can issue MTI. Due to the phased introduction of regulatory requirements related to moderate-use engines and Tier 2 and 3 engines in Bylaw 1329, the proposed amendments to Bylaw 1050 add offences that will come into effect as corresponding provisions in Bylaw 1329 come into effect. Future amendments to Bylaw 1050 are anticipated to reflect requirements in Bylaw 1329 that will take effect in future years.

Open Burning (Bylaw 1355)

Open burning is disposal of vegetative debris by outdoor burning without a stack or chimney. Open burning can generate smoke and contribute to degraded air quality. The new Bylaw 1355 seeks to reduce air contaminants discharged from open burning. Metro Vancouver will promote compliance with Bylaw 1355 primarily through outreach, education, and non-punitive warnings. In the event that stronger enforcement actions are needed, the proposed new Schedule N in Bylaw 1050 designates those offences under Bylaw 1355 and associated fines that can be addressed through an MTI. If adopted, it will be possible for an officer to issue an MTI for these offences when Bylaw 1355 comes into effect in May 2023.

Fines related to MTI are twice those of the Notice of Bylaw Violation (NBV) penalties for the corresponding contravention, and are used as an escalated form of enforcement of bylaw provisions. A separate report in the Climate Action Committee April 6, 2023 agenda, titled **"**MVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Amendment Bylaw No. 1362, 2023", presents proposed amendments to *GVRD Notice of Bylaw Violation Enforcement and Dispute Adjudication Bylaw No. 1117, 2010*.

ALTERNATIVES

1. That the MVRD Board:
   a) give first, second, and third reading to *Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 2023*; and
   b) pass and finally adopt *Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 2023*.

2. That the MVRD Board receive for information the report dated March 10, 2023, titled "MVRD Ticket Information Utilization Amendment Bylaw No. 1363, 2023" and provide alternate direction to staff.

FINANCIAL IMPLICATIONS

If the Board approves Alternative 1, officers will be able to issue Municipal Ticket Information and associated fines related to enforcement of additional provisions in Bylaw 1329 and the new Bylaw 1355.

CONCLUSION

GVRD Ticket Information Utilization Bylaw No. 1050, 2006 (Bylaw 1050) authorizes Metro Vancouver officers to issue municipal ticket information (MTI) to enforce compliance with designated contraventions of Metro Vancouver air emission regulation bylaws. The ability to issue MTI allows expedited prosecution for more serious offences where appropriate. The proposed amendments to Bylaw 1050 designate new ticketable offences and associated fines arising from the phasing-in of additional requirements under *MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021* and the adoption of the new *MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022*. The amendments also address changes in titles of Board-designated bylaw enforcement officers.

Staff recommend Alternative 1, to adopt Amendment Bylaw 1363 that amends the designated offences and fines in Bylaw 1050 to enable expedited enforcement of the requirements in Bylaw 1329 and Bylaw 1355.

Attachment

Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 2023

References

1. MVRD Climate Action Committee Report "MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021", dated October 5, 2021
2. MVRD Climate Action Committee Report "MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022", dated June 8, 2022

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METRO VANCOUVER REGIONAL DISTRICT
BYLAW NO. 1363, 2023
A Bylaw to amend "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006"

WHEREAS:

A. The Board of Directors of the Metro Vancouver Regional District (the "Board") has adopted "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006", a bylaw to authorize the use of the municipal ticket information for the enforcement of certain bylaws, to designate persons as bylaw enforcement officers, to authorize the use of certain words or expressions to designate certain bylaw offences and to set certain fine amounts; and

B. The Board of Directors of the Metro Vancouver Regional District wishes to amend "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006."

NOW THEREFORE the Board of the Metro Vancouver Regional District enacts as follows:

Citation

1. The official citation of this bylaw is "Metro Vancouver Regional District Ticket Information Utilization Amendment Bylaw No. 1363, 2023".

Schedules

2. The following Schedules and Appendix are attached to and form part of this bylaw:
   Schedule A;
   Schedule K, MVRD Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021;
   Appendix A;
   Schedule N, MVRD Open Burning Emission Regulation Bylaw No. 1355, 2022.

Amendment of Bylaw

3. "Greater Vancouver Regional District Ticket Information Utilization Bylaw No. 1050, 2006" is hereby amended as follows:

   a) In the Preamble, at Clause A, the words "Section 266.1" are deleted and replaced by the words "Section 414";

   b) Section 4 is deleted in its entirety and replaced with the following:

      4. For the purpose of Greater Vancouver Regional District Air Quality Management Bylaw No. 1082, 2008, Greater Vancouver Regional District Concrete and Concrete Products Industries Emission Regulation No. 1084, 2008, Greater Vancouver Regional District Gasoline Distribution Emission Regulation No. 1085, 2008, Greater Vancouver Regional District Automotive Refinishing Emission Regulation Bylaw No. 1086, 2008, Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation Bylaw No. 1087, 2008, Greater Vancouver Regional District Agricultural Boilers Emission Regulation Bylaw No. 1098, 2008, Metro Vancouver

Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021, Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw No. 1303, 2020, and Metro Vancouver Regional District Open Burning Emission Regulation Bylaw No. 1355, 2022, the word “officer” in Column 2 of Schedule A means any person appointed by the Board pursuant to section 31(2) of the *Environmental Management Act* to be an officer.

c) In sections 5 and 6 all references to the phrase "Schedules B through M" are deleted and replaced with the phrase "Schedules B through N";

d) Schedule A is deleted and replaced with the Schedule A which is attached to and forms part of this bylaw.

e) Schedule K is deleted and is replaced by the Schedule K which is attached to and forms part of this bylaw;

f) Effective January 1, 2024, Schedule K is deleted and is replaced by the Schedule K contained in Appendix A which is attached to and forms part of this bylaw; and

g) Effective May 15, 2023, Schedule N, which is attached to and forms part of this bylaw, is added in alphabetical order.

Read a first, second and third time this _____ day of _____, _____.

Passed and finally adopted this _____ day of _____, _____.

George V. Harvie, Chair

Dorothy Shermer, Corporate Officer

	Column 1 **Designated Bylaws**	Column 2 **Designated Bylaw Enforcement Officers**
1	Greater Vancouver Regional District Regional Parks Regulation Bylaw No. 1177, 2012	Park Officer Royal Canadian Mounted Police Officer Municipal Police Officer British Columbia Provincial Conservation Officer
2	Greater Vancouver Regional District Air Quality Management Bylaw No. 1082, 2008	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
3	Greater Vancouver Regional District Concrete and Concrete Products Industries Emission Regulation No. 1084, 2008	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
4	Greater Vancouver Regional District Gasoline Distribution Emission Regulation No. 1085, 2008	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
5	Greater Vancouver Regional District Automotive Refinishing Emission Regulation Bylaw No. 1086, 2008	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
6	Greater Vancouver Regional District Boilers and Process Heaters Emission Regulation Bylaw No. 1087, 2008	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
7	Greater Vancouver Regional District Agricultural Boilers Emission Regulation Bylaw No. 1098, 2008	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
8	Greater Vancouver Regional District Electoral Area A Zoning Bylaw No. 1144, 2011	Division Manager Electoral Area Building Inspector Regional Planner Division Manager Corporate Safety

		Emergency Preparedness & Security Coordinator Local Assistant to the Fire Commissioner Security and Crime Prevention Officer
9	Greater Vancouver Regional District Electoral Area A Building Administration Bylaw No. 1043, 2006	Division Manager Electoral Area Building Inspector Regional Planner Division Manager Corporate Safety Emergency Preparedness & Security Coordinator Local Assistant to the Fire Commissioner Security and Crime Prevention Officer
10	Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
11	Greater Vancouver Regional District Electoral Area A Unsightly Premises and Nuisance Bylaw No. 1198, 2014	Division Manager Electoral Area Building Inspector Regional Planner Division Manager Corporate Safety Emergency Preparedness & Security Coordinator Local Assistant to the Fire Commissioner Security and Crime Prevention Officer
12	Metro Vancouver Regional District Residential Indoor Wood Burning Emission Regulation Bylaw No. 1303, 2020	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*
13	Metro Vancouver Regional District Open Burning Emission Regulation Bylaw No. 1355, 2022	Any person appointed by the MVRD Board to be an officer pursuant to section 31(2) of the *Environmental Management Act*

Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021

Column 1 **Authorized Words or Expressions**		Column 2 **Section**	Column 3 **Fine**
1.	Unauthorized discharge of air contaminant	7	$1000
2.	Unauthorized operation of emergency engine	12(a)	$1000
3.	Failure to inspect or maintain emergency engine	12(b)	$750
4.	Discharge of emergency engine exhaust into a building	13	$1000
5.	Failure to keep or to submit emergency engine records	14	$750
6.	Operating without registration	15, 16	$1000
7.	Obstructing an officer	19	$750
8.	Operating without displaying registration no. or Tier label	23(a), (b), (c)	$500
9.	Failure to have functioning hour meter	25	$500
10.	Failure to notify of hour meter replacement	25	$500
11.	Failure to keep, produce or deliver low-use records	26	$750
12.	Failure to report hour meter reading	27(a)	$750
13.	Failure to report hour meter reading at 200 hours of use	27(b)	$1000
14.	Failure to provide meter manufacturer name, model or serial no.	27(c)	$250
15.	Unauthorized discharge (registration invalid - changed ERM*)	37	$750
16.	Failure to keep or to submit ERM* records	38	$750
17.	Prohibited operation of a Tier 0 or Tier 1 engine	45, 47	$1000
18.	Engine discharge exceeding 20% opacity limit	53	$1000
19.	Unauthorized engine idling	54	$500
20.	Failure to submit anti-idling procedure	56	$250
21.	Operating within 100 metres of a sensitive receptor	57	$1000

Column 1 **Authorized Words or Expressions**		Column 2 **Section**	Column 3 **Fine**
22.	Operating an engine having a tampered emission control system	58	$1000
23.	Providing false information	59	$750

*** "ERM" means "emission reduction measure"**

Appendix A

Schedule K

Metro Vancouver Regional District Non-Road Diesel Engine Emission Regulation Bylaw No. 1329, 2021

Column 1 **Authorized Words or Expressions**		Column 2 **Section**	Column 3 **Fine**
1.	Unauthorized discharge of air contaminant	7, 12	$1000
2.	Unauthorized operation of emergency engine	12(a)	$1000
3.	Failure to inspect or maintain emergency engine	12(b)	$750
4.	Discharge of emergency engine exhaust into a building	13	$1000
5.	Failure to keep or to submit emergency engine records	14	$750
6.	Operating without registration	15, 16, 17	$1000
7.	Obstructing an officer	19	$750
8.	Operating without displaying registration no. or Tier label	23(a), (b), (c), (d)	$500
9.	Failure to have functioning hour meter	25, 30	$500
10.	Failure to notify of hour meter replacement	25, 30	$500
11.	Failure to keep, produce or deliver records of operation	26, 31	$750
12.	Failure to report hour meter reading	27(a), 32(a)	$750
13.	Failure to report hour meter reading at 200 hours of use	27(b)	$1000
14.	Failure to provide meter manufacturer, model or serial no.	27(c), 32(c)	$250
15.	Failure to report hour meter reading at 500 hours of use	32(b)	$1000
16.	Unauthorized discharge (registration invalid - changed ERM*)	37	$750
17.	Failure to keep or to submit ERM* records	38	$750
18.	Prohibited operation of a Tier 0 or Tier 1 engine	45, 47	$1000
19.	Engine discharge exceeding 20% opacity limit	53	$1000

Column 1 **Authorized Words or Expressions**		Column 2 **Section**	Column 3 **Fine**
20.	Unauthorized engine idling	54	$500
21.	Failure to submit anti-idling procedure	56	$250
22.	Operating within 100 metres of a sensitive receptor	57	$1000
23.	Operating an engine having a tampered emission control system	58	$1000
24.	Providing false information	59	$750

*** "ERM" means "emission reduction measure"**

Schedule N

Metro Vancouver Regional District Open Burning Emission Regulation Bylaw No. 1335, 2022

Column 1 **Authorized Words or Expressions**		Column 2 **Section**	Column 3 **Fine**
1.	Burning without registration	13(a)	$500
2.	Failure to pay fees	13(b)	$500
3.	Failure to notify Metro Vancouver	14	$500
4.	Failure to notify neighbours within 500 metres	15	$500
5.	Failure to follow ventilation index requirements	18	$750
6.	Failure to put debris into burn piles	19	$750
7.	Burning more than two piles	19	$750
8.	Failure to minimize soil content	21(a)	$750
9.	Burning unseasoned debris	21(c)	$750
10.	Burning during poor atmospheric conditions	22, 23	$1000
11.	Failure to provide requested information	24	$1000
12.	Failure to maintain minimum 100 metres from buildings	25	$1000
13.	Failure to maintain minimum 500 metres from sensitive receptors	25	$1000
14.	Burning an oversized pile	26(a)	$1000
15.	Burning more than one pile	26(a)	$1000
16.	Burning oversized pieces	26(b)	$1000
17.	Burning stumps	26(b)	$1000
18.	Failure to complete burning in one calendar day near neighbours	26(c)	$1000
19.	Burning on more days than permitted	28	$750
20.	Burning outside permitted hours	29, 30	$750
21.	Emissions exceed opacity restriction	31	$750
22.	Debris stacked above incinerator’s air outlet	32	$750
23.	Failure to continuously operate incinerator’s blowers	33	$750
24.	Failure to keep the recommendations for incinerator on site	35	$500

Column 1 **Authorized Words or Expressions**		Column 2 **Section**	Column 3 **Fine**
25.	Adding debris to ignited incinerator outside permitted hours	36	$750
26.	Failure to submit a plan for community wildfire risk reduction	39	$500
27.	Failure to notify neighbours within 150 metres	40	$500
28.	Burning when ventilation index for the afternoon is not “good” or “fair”	41, 53	$750
29.	Failure to maintain minimum 50 metres from buildings	42(a), 50(a)	$750
30.	Failure to maintain minimum 100 metres from sensitive receptors	42(b), 50(b)	$750
31.	Failure to attend the burn	43	$1000
32.	Failure to complete burning in one calendar day	44, 49	$750
33.	Burning debris as diseased without confirmation	47	$1000
34.	Failure to notify district director before burning	48	$500
35.	Failure to use an accelerant	52	$750
36.	Failure to keep records	55	$500
37.	Failure to have records on site and available	56	$500
38.	Failure to submit records within 48 hours of a request	57	$1000
39.	Burning salt-laden wood	58	$750
40.	Using an accelerant	59	$750
41.	Acting contrary to a prohibition	64	$1000
42.	Providing false information	68	$1000

To: Climate Action Committee

From: Lucy Duso, Senior Engagement Advisor, Collaboration and Engagement Division, External Relations Department

Date: March 10, 2023 Meeting Date: April 6, 2023

Subject: **Climate Action Dialogues**

RECOMMENDATION

That the Climate Action Committee receive for information the report dated March 10, 2023, titled "Climate Action Dialogues".

EXECUTIVE SUMMARY

Driven by the climate science, the goal articulated in *Climate 2050* is that the Metro Vancouver region should be carbon-neutral and climate resilient by 2050. Implementing *Climate 2050* requires urgent and concentrated action by governments, businesses, institutions and the finance community; and actions supported by residents across the region. Metro Vancouver's *Climate 2050 Engagement and Public Education Strategy* identifies 12 activities to build strong public support for policy and other systemic changes. One activity is a public dialogue series. The Climate Action Dialogues are designed to engage regional opinion leaders in the scientific and economic case for actions that will significantly reduce greenhouse gas emissions in the near term.

The first regional dialogues, scheduled for May 29 and 30, 2023, will introduce the economic rationale for climate action. Future topics will the economic case for decarbonizing buildings and transportation, and in making land use decisions consistent with regional climate goals.

PURPOSE

This report provides the Committee with an update on the Climate Action Dialogues, one of the 2023 deliverables identified in the *Climate 2050 Engagement and Public Education Strategy.*

BACKGROUND

As presented to the Climate Action Committee at its March 9, 2023 meeting, the *Climate 2050 Engagement and Public Education Strategy* includes activities designed to expand and deepen public support for climate actions, including the implementation of the big moves and other actions identified in *Climate 2050*. Developing and hosting a public Climate Action Dialogue series is identified as one of the initiatives being developed to broaden the public understanding and support for climate action, especially among opinion leaders in the business community.

CATALYZING SUPPORT FOR CLIMATE ACTION: CLIMATE ACTION DIALOGUES

Achieving the goals in *Climate 2050* will be extremely challenging. They can only be met through decisive actions by all levels of government, businesses, institutions, and the finance community and effective implementation of these actions will require support from the region's residents. *Climate 2050* articulates the rationale and identifies a number of the big moves that need to be

implemented to start the region's journey to carbon neutrality. The Climate Action Dialogues are designed to engage opinion leaders across the region — including those likely to comment, be impacted, or have a role in the implementation of climate actions. The Dialogues will be an opportunity to engage this particular audience in the type of policy changes required, the importance of taking action now and then to explore how this can be achieved. The expert panel, that will begin the dialogue will discuss the need for urgent action, how action will generate benefits for the region's residents, and identify the economic opportunities, risks and rewards of taking effective actions now.

The Dialogues are an evolution of the Metro Vancouver's Sustainability Dialogue Series that engaged thousands of business, NGO and government leaders and academics over the pre-COVID decade through lunchtime presentations and discussions.

The format of each Dialogue session will include:

- An introduction by a Metro Vancouver Board Director;
- Short presentations by the expert panel to reframe the climate change discussion toward the urgency for taking action and the economic opportunities that open up from climate action;
- A next-generation focus by giving a designated youth leader the opportunity to ask the first question;
- Question and answers with the panel as well as a general conversation on the topic; and
- A post-dialogue networking opportunity.

The dialogue events will be held on a biannual basis, spring and fall, in transit-oriented urban centre locations both north and south of the Fraser River.

The Climate Action Dialogue series will be begin May 2023 and will become a cornerstone in engagement and education element of the Climate 2050 initiative. The objective will be to weave cutting edge research and analysis on the urgency of action, effective tools for making deep cuts in emissions, and the emerging economic landscape of a carbon neutral future. Topics include:

- The case for urgent climate action and the economic opportunities that could be realized now (May 2023)
- The regional business opportunities arising from strategies to decarbonize buildings (Fall 2023)
- The science and economic case for reducing emissions from transportation (spring 2024)
- The climate outcomes and economic ramifications from land use decisions (Fall 2024)

The Dialogues will be in-person, and at least one location livestreamed for virtual viewing. The Dialogues will also be filmed to generate material for post-event sharing, storytelling and promotions of further series.

May 2023 Dialogues

The first Dialogues are scheduled for May 29 in Surrey and May 30 in Vancouver and the program will run from noon to 1:00 pm followed by a 30-minute networking opportunity. The panel will speak to the value of taking climate action now and the door that is open to improve our global

competitiveness in what will become a carbon neutral and climate resilient future. This will challenge the perception that climate policies are a drag on the economy while pointing out that there is a bigger risk in moving too slowly and missing opportunities.

The expert panel has been confirmed for this Dialogue series:

- Dr. Simon Donner, a University of BC Geography Professor and member of Canada's Net-Zero Advisory Body, will set the context, and speak to the need for courage and urgent action.

- Jonathan Arnold, the Research Lead, Clean Growth, for the Canadian Climate Institute, and author of an upcoming report on policy drivers for clean growth in BC. He will outline the economic case for action, including the thesis that the economic risk is missing opportunities by moving too slowly.

- Jeanette Jackson, the CEO of Foresight Canada and Board Member of Invest Vancouver will be the third speaker. She will focus on the local region, with a call to action to engage all stakeholders in building a stronger regional clean technology innovation ecosystem.

ALTERNATIVES
This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS
The delivery of the Dialogues is resourced through existing budgets allocated to External Relations dialogues as well as some funds granted through the Sustainability Innovation Fund.

CONCLUSION
The Climate Action Dialogues are one element of the *Climate 2050 Engagement and Public Education Strategy.* They aim to engage opinion leaders in the urgent need to adopt policies and other actions that will result in deep cuts in greenhouse gas emissions and to explore the local economic opportunities that arise from taking action and actively participating in a carbon neutral future. Dialogues will be organized on a biannual basis, and will be held in locations north and south of the Fraser River. The topics for the Dialogue will change, incorporating both Climate 2050 objectives with the latest research and findings of experts in science and economic opportunities associated with climate action.

The spring 2023 Dialogues have been booked for May 29 and 30. Three speakers will discuss the economic rationale for early and effective climate action.

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metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Climate Action Committee

From: Neal Carley, General Manager
Parks and Environment Department

Date: March 13, 2023 Meeting Date: April 6, 2023

Subject: **Manager's Report**

RECOMMENDATION
That the Climate Action Committee receive for information the report dated March 13, 2023, titled "Manager's Report".

Climate Action Committee 2023 Work Plan
The attachment to this report sets out the Committee's Work Plan for 2023. 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.

BC's New Energy Action Framework
The Province of BC has introduced its New Energy Action Framework (Reference 1), which builds on actions outlined in CleanBC and is intended to drive clean economic growth and help the Province meet its legislated climate targets.

Starting in April, the Province will launch engagement with First Nations, industry, labour, environmental organizations, local governments and other stakeholders on the final design of the regulatory cap on oil and gas sector emissions, including on issues like how the cap will be allocated, credit trading, and verifiable offsets. Consultations are expected to be complete before the end of the year and the Province has indicated that it intends to implement the regulatory cap as soon as possible. Under the new framework, the Province would:

- require all proposed LNG (liquefied natural gas) facilities in or entering the environmental assessment process to pass an emissions test with a credible plan to be net zero by 2030;
- put in place a regulatory emissions cap for the oil and gas industry to ensure BC meets its 2030 emissions-reduction target for the sector;
- establish a clean-energy and major projects office to fast track investment in clean energy and technology and create good, sustainable jobs in the transition to a cleaner economy; and
- create a BC Hydro task force to accelerate the electrification of BC's economy by powering more homes, businesses and industries with renewable electricity.

Metro Vancouver staff expect to participate in the engagement process, and will seek to align any comments with the targets and strategies in the *Climate 2050* roadmaps, including the *Energy Roadmap* received by the Committee at its April 6, 2023 meeting.

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Port of Vancouver's Rolling Truck Age Program

The Port of Vancouver announced in February that it would delay the implementation of its Rolling Truck Age Program from its intended start date of April 3, 2023 for at least another nine months (see References 2 and 3). The Rolling Truck Age Program aims to cap the age of container trucks that serve the port, and supports safer, more reliable trucks and cleaner air for nearby communities. This latest delay in the program followed a previous deferral in September 2022 after discussions with Transport Canada, to allow for truck owner-operators to source compliant trucks for the program. The Port has indicated that this most recent deferral is needed in light of the current economic landscape and continued pandemic-related issues.

The Port has had increasing environmental requirements and truck age restrictions in place for container trucks since 2008, and following industry engagement, advised in 2015 that the Rolling Truck Age Program would be implemented.

In the interim, the Port has indicated that it will consider new technologies, as well as federal and provincial fleet greening programs, and intends to reassess its emissions reduction strategy and consult with the drayage sector, the port community, government, and local and Indigenous communities to further refine its approach.

References

1. New energy action framework to cap emissions, electrify the clean economy | BC Gov News
2. Rolling Truck Age Program will not move forward in April | Port of Vancouver (portvancouver.com)
3. Port Authority postponing truck replacement program for 3rd time | CBC News

Attachment

Climate Action Committee 2023 Work Plan

58729156

Climate Action Committee 2023 Work Plan
Report Date: March 13, 2023

Priorities

1st Quarter	**Status**
Climate Action Committee orientation	Complete
Climate Action Committee meeting schedule and work plan	Complete
Amendments to air quality ticketing bylaws	In progress
Sustainability Innovation Fund (SIF) – 2023 proposals	Complete
2nd Quarter	**Status**
Climate 2050 nature and ecosystems roadmap	In progress
Climate 2050 agriculture roadmap	In progress
Climate 2050 industry and business roadmap	In progress
Climate 2050 energy roadmap	In progress
draft Climate 2050 roadmap for human health and well-being	Pending
SIF - status report on previously approved liquid waste projects	In progress
SIF - status report on previously approved regional district projects	In progress
3rd Quarter	**Status**
Climate 2050 annual progress report	In progress
draft Climate 2050 roadmap for land use and urban form	In progress
Annual air quality report	In progress
Update to internal carbon price policy	In progress
Amendments to boilers and process heaters emission regulation	In progress
Next phase of engagement on large buildings GHG emission regulation	Pending
Emission regulation for cannabis production and processing	Pending
SIF - status report on previously approved water projects	In progress
4th Quarter	**Status**
Climate 2050 human health and well-being roadmap	Pending
Climate 2050 land use and urban form roadmap	Pending
draft Climate 2050 roadmap for water and wastewater infrastructure	Pending
Corporate status report on carbon neutrality and energy management	In progress
Initiate engagement on emission regulation for lawn and garden equipment	Pending
Update to regional ground level ozone strategy	In progress
Report on 2023 air quality advisory season	Pending
Annual budget and 5 year financial plan	Pending

To: Climate Action Committee

From: Peter Marshall, Field Hydrologist, Environmental Management, Water Services

Date: March 14, 2023 Meeting Date: April 6, 2023

Subject: **Climate Impacts on the Water Supply Areas**

The attached report dated February 10, 2023, titled "Climate Impacts on the Water Supply Areas" is being presented to the Climate Action Committee for consideration and recommendation at its April 6, 2023 meeting. The report is presented to the Climate Action Committee for its information only.

Attachment
"Climate Impacts on the Water Supply Areas", dated February 10, 2023

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

To: Water Committee

From: Peter Marshall, Field Hydrologist, Environmental Management, Water Services

Date: February 10, 2023 Meeting Date: March 15, 2023

Subject: **Climate Impacts on the Water Supply Areas**

RECOMMENDATION
That the Water Committee receive for information the report dated February 10, 2023, titled "Climate Impacts on the Water Supply Areas".

EXECUTIVE SUMMARY
Water Services manages a network of automated hydro-meteorological stations, and conducts several annual field sampling programs. Data collected from this monitoring program is used to actively monitor environmental conditions in the Capilano, Seymour, and Coquitlam River Watersheds. This program has become particularly important in the context of climate change, as climate variability increases and historical patterns shift.

Two recent events highlight how quickly our climate is changing: The June 2021 heatwave, and the 2022 fall drought. The infamous 'heat dome' was one of the most anomalous regional extreme heat events to occur anywhere on Earth. The recent fall drought was also unprecedented, and will be discussed in more detail below. These extreme events are occurring more frequently, and are projected to become more normal in the near future. The impacts from these events highlight the importance of comprehensive environmental monitoring, and the need for accurate weather and water supply forecasts.

PURPOSE
This report is intended to provide the Committee with information on weather and climate conditions in the water supply areas, and to highlight how quickly the local climate is changing. Several impactful local weather events from 2022 are also summarized. The report is prepared to share data with Metro Vancouver staff, and to help inform decision-making with regards to regional planning and climate change initiatives.

BACKGROUND
Water Services' monitoring programs provide reliable and timely information on source water quality and quantity, stream flow, and wildfire risk in the water supply areas. This information assists in managing source reservoirs and optimizing water treatment, which helps minimize risks to drinking water quality. The annual Watershed Climate Report summarizes key parameters including air temperature, precipitation, snowpack, stream flow, and wildfire conditions. It is an opportune time to update the Committee with the notable climate and weather-related changes within the region.

WEATHER AND CLIMATE HIGHLIGHTS

Climate Change Projections

Climate Projections for Metro Vancouver (2016) describes expected changes in temperature, precipitation, and other parameters in the Metro Vancouver region by 2050 and 2080. This report used existing climate model outcomes to provide a best estimate on how conditions will change in the region. All models from these projections show an increase in daytime high and nighttime low temperatures, with the greatest increase in the summer months. Warmer temperatures will greatly reduce peak spring snowpack levels, which in turn, will reduce summer and early-fall river inflows. For precipitation, the region can expect more intense and more frequent rainfall events in the fall and winter months. Longer summer dry spells extending into fall droughts are also more likely in the future. Recent years have given a glimpse of what conditions will be consistently like in the coming decades. These conditions illustrate how quickly the climate is changing, and how hard it is becoming to predict the severity of weather events based on historical conditions.

2022 Weather Summary

The past year brought significant weather extremes from season to season. The year 2022 will be remembered primarily for the extended summer-fall drought and extreme heat in early fall, but there were other notable events worth highlighting.

The spring was persistently cool and wet. April and May were both approximately two degrees cooler than average. Precipitation fell on 63 of 82 days between April 1 and June 21 (77%). These conditions were beneficial for the mountain snowpack, which grew from near-normal levels on April 1, to over 180% of normal in mid-June. This late-season snow accumulation was pivotal for the summer and fall water supply.

Warm and dry weather arrived in July. The summer months (June-July-August) were the second hottest on record, and August was the first month ever with mean monthly temperatures over 20°C[1]. The most exceptional period came in the first three weeks of October where new high temperature records were set on 14 of the first 17 days of the month. October averaged almost four degrees warmer than normal, despite seeing cool temperatures for the last week of the month. The water supply areas only received 48 millimeter (mm) of precipitation between July 21 and October 21, which included a 27-day long dry spell in late September and October.

The drought came to a quick conclusion at the end of October and early November as a series of atmospheric rivers targeted the south coast. These weather systems delivered over 400 mm of precipitation in just two weeks. November and December saw cool temperatures and low-elevation snowfall events, which made travel throughout the Metro Vancouver region very challenging. The end of the year experienced extreme weather including a substantial snow storm, freezing rain, and prolonged heavy rainfall. A new high water level was recorded at the Point Atkinson Tidal Monitoring Station in West Vancouver on December 27 when heavy rains and high river levels combined with a king tide.

[1] Data from the Lower Capilano fire weather station on the east side of the Capilano Reservoir. Similar conditions were observed at other weather stations within the water supply areas.

Notable Events

Seasonal drought was severe in the Lower Mainland in 2022. Persistent hot and dry weather pushed the Lower Mainland basin to provincial drought level 4 by mid-September, and level 5 for the first three weeks of October. Under drought level 5, conditions are exceptionally dry and adverse socio-economic and ecosystem impacts are almost certain. It should be noted that Metro Vancouver remained at the Stage 1 water restriction level of the *Drinking Water Conservation Plan* throughout the 2022 peak demand period. Stage 1 restrictions were extended by two weeks from October 15 to October 30 with the goal of reducing non-essential drinking water use during the extended drought. Mean monthly river inflows in September were the lowest for any month in our recorded history (c. 1914).

Hot and dry conditions also resulted in several local and regional wildfires at the tail end of the wildfire season. Most notable, the Minnekhada Regional Park fire sparked on October 1 under summer-like weather conditions. This fire grew to 14 hectares and took crews several weeks to fully extinguish. Wildfire smoke also flooded into the Lower Mainland several times in 2022, resulting in smoke-related air quality advisories for 18 days. This was the seventh year since 2015 that the region was inundated with wildfire smoke.

The Coquitlam Glacier, the last remaining glacier in the water supply areas, was surveyed in late 2022. The results show that this small glacier has decreased in area by 20% since 2014, and has lost an average depth of just over 10 metres. As glaciers get smaller their melt rate tends to increase; however, the Coquitlam Glacier has seen a five-fold increase in melt rates since 2018, which is much greater than normal. This glacier will likely disappear completely within the next 20 to 30 years. It is not a significant source of drinking water, but it is a symbol of climate change impacts in the region. Rising air temperatures, longer snow free seasons, and deposits of ash from wildfire smoke are all factors increasing the melt rate of glaciers like this.

ALTERNATIVES

This is an information report. No alternatives are presented.

FINANCIAL IMPLICATIONS

Data collected and used in this report is funded by the Watersheds & Environment program budget as well as through partnerships with other organizations. Upgrades to snow monitoring methodologies and technologies have been funded by the GVWD Sustainability Innovation Fund.

CLIMATE RESILIENCE

Population growth and climate change will continue to impact the regional drinking water source supply and transmission system, and Water Services is planning for the future with these in mind. Short and long-term plans focus on promoting conservation, improving transmission, and expanding supply.

Water Services' monitoring program is focused on collecting valuable information on environmental conditions in the water supply areas, which is used to inform decision-making. This program has adopted emerging new technologies in recent years that have enhanced the program as well as reduced greenhouse gas emissions by minimizing helicopter travel for field-based sampling.

CONCLUSION

The weather in 2022 was erratic and exhibited some of the conditions expected for the coming years based on regional climate change projections. The climate is changing rapidly, making it difficult to predict conditions based on historical averages and extremes. There is an extensive monitoring program in the water supply areas, which collects essential environmental data to support short and long-term decision making. A complete understanding of conditions in the water supply areas, and how these conditions are changing, allows Metro Vancouver to deliver high-quality drinking water and ensure the system's resilience in the face of the variable impacts of climate change from year-to-year.

Attachment

"Watershed Climate Report", dated, January 17, 2023

Reference

Climate Projections for Metro Vancouver (2016)

57804972

Parkland cancels plans to build stand-alone renewable diesel complex at B.C. refinery

Canadian Press
Mar 3, 2023 8:21 AM
Updated Mar 3, 2023 8:35 AM

CALGARY — Parkland Corp. says it will not go ahead with its plan to build a stand-alone renewable diesel complex at its refinery in Burnaby, B.C.

Gas prices are displayed as a motorist prepares to pump gas at a station in North Vancouver on May 10, 2011. Parkland Corp. says it will not go ahead with its plan to build a stand-alone renewable diesel complex at its refinery in Burnaby, B.C. THE CANADIAN PRESS/Jonathan Hayward

The company says it made the decision as it faced rising project costs, a lack of market certainty around emerging renewable fuels and legislation in the U.S. that advantages U.S. producers.

Parkland had announced a plan in May 2022 to build a stand-alone renewable diesel complex within its Burnaby refinery, capable of producing 6,500 barrels per day.

The company says it is still going ahead with its plan to expand co-processing of renewable fuel alongside traditional petroleum-based materials at the refinery to 5,500 barrels per day.

The announcement came as Parkland raised its quarterly dividend to 34 cents per share from 32.5 cents and reported a fourth-quarter profit of $69 million or 39 cents per diluted share on $8.72 billion in sales and operating revenue.

The result compared with a profit of $22 million or 15 cents per diluted share on $6.29 billion in sales and operating revenue in the fourth quarter of 2021.

This report by The Canadian Press was first published March 3, 2023.

Companies in this story: (TSX:PKI)

The Canadian Press

ÁTL'KA7TSEM HOWE SOUND BIOSPHERE REGION

March 9, 2023

To: Chair George Harvey, Metro Vancouver Regional District Board

Re: Howe Sound Community Forum & Átl'ka7tsem / Howe Sound Biosphere Region Updates

With your new Board term well underway, the *Howe Sound Biosphere Region Initiative Society* (HSBRIS) welcomes the opportunity to continue our established relationship with Metro Vancouver Board and staff. To both new and returning elected officials, we look forward to ongoing dialogue and collaborative actions that will enhance this unique and special region that UNESCO designated as the *Átl'ka7tsem / Howe Sound Biosphere Region* (AHSUBR) in 2021.

As the managing organization of the AHSUBR and also the convenor of the *Howe Sound Community Forum* (HSCF), this letter serves to update you on actions carrying over from the previous Board term as discussed at the April 2022 forum at Furry Creek.

Howe Sound Community Forum Dates

In continuing the well-established tradition of different local governments hosting the HSCF, we are pleased to announce the commitments by the hosting communities for 2023.

April 21, 2023 – Town of Gibsons (see event details here)

October 2023 – Resort Municipality of Whistler (RMOW)

Many thanks to Mayor White and Council at the Town of Gibsons and Mayor Crompton and Council at the RMOW for funding and hosting this year's forums.

To elected officials who have not yet attended a HSCF, you will find that the forum offers the opportunity to learn what your counterparts across the region are doing; what their successes and concerns are and to discuss collaborative measures that can positively impact the economic, environmental, cultural and social well-being of the region as a whole. Select individuals and representatives from community groups across the region are invited to observe the discussions.

Revised Principles for Cooperation

At the April 2022 HSCF, it was agreed that the ***Principles of Cooperation for the Átl'ka7tsem/Howe Sound Community Forum*** **(PoC)** be updated, following its previous last update in 2014. The revisions reflected the societal and logistical changes over recent years. The final version can be found here.

ÁTL'KA7TSEM HOWE SOUND BIOSPHERE REGION

Memorandum of Understanding with Howe Sound Biosphere Region Initiative Society

We are pleased to say that the following local governments are continuing with their commitment to the Howe Sound Community Forums and Principles for Cooperation. We will follow up with those that, due to timing of elections and other disruptions, have yet to confirm.

- Bowen Island Municipality
- District of West Vancouver
- Village of Lions Bay
- Metro Vancouver
- District of Squamish
- Town of Gibsons
- Resort Municipality of Whistler
- Islands Trust
- Sḵwx̱wú7mesh Úxwumixw

Through the remainder of 2022, we liaised with each local government and regional district to enter into a Memorandum of Understanding with our Society (copy of our agreement with Metro Vancouver attached).

Our Activities and the Biosphere Region Management Plan

As the managers responsible for the UNESCO designation, we are responsible for measuring and reporting on progress towards the objectives of the UNESCO Biosphere Region. Sustainable long term core funding continues to be a challenge, but our application for charitable status has been submitted. In the meantime, we are entering year two of four of funding from Environment and Climate Change Canada to work on strengthening Biodiversity Conservation. For more information on each of our initiatives and projects, please view our website.

We are pleased to welcome former Islands Trustee Dan Rogers to our board. Dan has been a loyal participant of the Howe Sound Forums. Please see our current board and team here.

We are nearing the final draft stage of our management plan known as the **Nchu'ú7mut/Unity Plan**. The draft is with the Sḵwx̱wú7mesh Úxwumixw for review and comment. Once that is complete, we will be releasing the draft to other stakeholders for review.

Our next step is to convene the *Átl'ḵa7tsem / Howe Sound UNESCO Biosphere Region Roundtable.* This select group of representatives from around the region will be tasked with ensuring the plan is relevant and addressing changes and new influences. **We will be asking the Howe Sound Community Forum members for input on how local government will be represented at the Roundtables**.

ÁTL'KA7TSEM HOWE SOUND BIOSPHERE REGION

We take pride in representing our Átl'ka7tsem / Howe Sound region at events provincially, nationally and internationally. We post our events and media articles on our social media sites Facebook, Instagram, LinkedIn and Twitter. Follow us at #howesoundbri.

Last November 5, following shortly after the municipal elections, we hosted the *Future of Howe Sound Forum*. Participants took part in visioning a sustainable future for the region. We look forward to supporting the local and regional governments toward this vision for the Future of Howe Sound:

> *In the future desired state for the Átl'ka7tsem / Howe Sound ocean and watershed, the marine and terrestrial realms will function properly through integrated ecosystems. This foundation will support an inclusive, equitable society and resilient economy where humanity and nature thrive.*

Reviewed and revised at the Future of Howe Sound Forum, November 5, 2022.

Any questions, please do not hesitate to contact us.

Sincerely.

Ruth Simons
President, Howe Sound Biosphere Region Initiative Society
howesoundbri@gmail.com
PO Box 465
Lions Bay, B.C.
V0N 2E0

Email copy to:
Chair Lisa Dominato, Climate Action Committee
CAO Jerry Dobrovolny, MVRD

Átl'ka7tsem/Howe Sound Biosphere Region Initiative
Collaborating for a Sustainable Future

Memorandum of Understanding

between

Howe Sound Biosphere Region Initiative Society ("HSBRIS")

and

Metro Vancouver Regional District ("Metro Vancouver")

In this memorandum, these terms have the following meanings:

- UNESCO — United Nations Educational, Scientific and Cultural Organization
- AHSUBR — Átl'ka7tsem/Howe Sound UNESCO Biosphere Region
- HSBRIS — Howe Sound Biosphere Region Initiative Society
- AHSCF — Átl'ka7tsem/Howe Sound Community Forum

1) **The Átl'ka7tsem/Howe Sound UNESCO Biosphere Region (AHSUBR)**
AHSUBR is located in the territory of the Sḵwx̱wú7mesh Úxwumixw (Squamish Nation People). The In-SHUCK-ch, q̓íc̓əy̓ (Katzie), Líl̓wat, xʷməθkʷəy̓əm (Musqueam), shíshálh (Sechelt), Stó:lō, səlilwətaɬ (Tsleil-Waututh) Nations, and First Nations within the St'at'imc Chiefs' Council (includes Lillooet Tribal Council Bands), and the Hul'qumi'num Treaty Group have claims in the region.

   a) The AHSUBR boundary follows the partial watershed from the height of land to the bottom of the ocean and includes lands and communities within three regional districts – Metro Vancouver (West Vancouver, Bowen Island, Lions Bay and Electoral Area A), Sunshine Coast (Gibsons and Areas E, Elphinstone and F West Howe Sound) and Squamish-Lillooet (Furry Creek, Britannia Beach, Squamish and Brackendale).
   b) The AHSUBR is 218,723 hectares, 84% terrestrial and 16% marine. 6% of the AHSUBR is Rural Regional District and Reserve Lands, 5% of the terrestrial is privately owned or "urban" and 89% of the terrestrial area is under the management and shared stewardship of the Province of BC and First Nations.

2) **Howe Sound Biosphere Region Initiative Society (HSBRIS)**
HSBRIS is a B.C. registered non-profit Society and is responsible for the management of the AHSUBR through the Nchu'ú7mut/Unity Plan; and for advancing the objectives of UNESCO Biosphere Regions (biodiversity conservation, sustainable development, reconciliation, model regions for learning, research and monitoring). UNESCO Biosphere Region organizations provide logistic support.

HSBRIS' priorities are to:

a) Advance Sustainable Development. Key partnerships and adequate supports, data and tools are in place for planning gaps across the region to be filled and the region's sustainability targets are defined and embedded with the UN's Sustainable Development Goals (SDGs) in the planning and decision-making processes.
b) Advance Biodiversity Conservation. Key partnerships work to further education, monitoring, and research, fill knowledge gaps, and increase stewardship and connection to place.
c) Advance Reconciliation, Equity & Inclusion. The AHSUBR roundtable and forums for convening in an ethical space are well established to further the relationships, dialogue and understanding in the context of all AHSUBR nations and communities.

HSBRIS provides logistic support through programs aimed at strengthening collaboration for a sustainable future. Programs include communications, convening and facilitating, advising and coordinating projects.

HSBRIS provides support to the Átl'ka7tsem/Howe Sound Community Forum and other subcommittees of the forum by planning, coordinating and reporting. HSBRIS maintains a trusted role.

3) **Metro Vancouver Electoral Area A**

Metro Vancouver has 23 members: 21 municipalities, one Treaty First Nation and one Electoral Area. Electoral Area A is the unincorporated area of the regional district.

Metro Vancouver acts as the local government for Electoral Area A, providing certain key services. Electoral Area A occupies approximately 818 Km^2 of land and includes the following communities and inhabited areas that are located within the Átl'ka7tsem/Howe Sound region boundary:

- Lands along Howe Sound, located between the District of West Vancouver and Squamish-Lillooet Regional District (excluding the Village of Lions Bay). This includes the communities of Ocean Point, Strachan Point and Montizambert Wynd.
- Bowyer and Passage Islands (in Howe Sound).

Metro Vancouver has developed an Official Community Plan (OCP) for parts of Electoral Area A, which was adopted in 2018 and follows the collective vision of *Metro Vancouver 2040: Shaping our Future*, the regional growth strategy. The vision statement for Howe Sound communities of Electoral Area A in the OCP states:

> *Howe Sound is envisioned as a quiet and peaceful area to live and to access marine and mountain recreational opportunities. Residents feel protected against threats from fire, highway traffic and rail movement. New development is limited, as this area has servicing and access constraints, and falls beyond the urban containment boundary. Any activity causing disturbance to the natural environment considers the local waterfront / mountainside character and impacts on drinking water and highway access.*

4) The Átl'ka7tsem/Howe Sound Community Forum and the Principles of Cooperation

The purpose of the AHSCF is to provide a forum for local governments, regional districts and First Nations to have discussions on how to maintain and enhance the economic, environmental, cultural and social well-being of the Howe Sound for the benefit of present and future generations. The Principles of Cooperation is a document that all members, local governments, regional districts and First Nations, signed in 2002. The Principles of Cooperation state the need, scope, common vision, shared values and structure of the forums.

5) Relevant Background

In the late 1990s, the Greater Vancouver Regional District (now Metro Vancouver) funded a process that brought together the Squamish and Sechelt First Nations, the elected officials of the three Regional Districts, and the Islands Trust. Staff from Provincial and Federal Ministries and municipalities, societies such as the Fraser Basin Council, industry, environmentalists, recreational leaders and the public at large were also invited to discuss the possibility of a Howe Sound Regional District.

This resulted in the development of the Principles for Cooperation with the GVRD (now Metro Vancouver) being a signatory to in 2002. Metro Vancouver's Electoral Area A Director has been an active member of the Forums and its committees. Electoral Area A co-hosted a community forum in 2017.

The convening of the Howe Sound Community Forum has been conducted by Ruth Simons since 2014. Ruth Simons is now the Executive Director of the Howe Sound Biosphere Region Initiative Society.

Metro Vancouver supported the nomination of Átl'ka7tsem/Howe Sound as a UNESCO Biosphere Region in principle through Board resolution in July 2017. In November 2019, Metro Vancouver provided a letter of support that was included in the nomination package.

6) It is understood:

Metro Vancouver will support and cooperate with the HSBRIS as it manages the AHSUBR and the Howe Sound Community forums and sub-committees. In doing so Metro Vancouver will act as an ambassador for the UNESCO Biosphere Region through consideration of the following, as Metro Vancouver deems appropriate, and as further detailed in Appendix A to this memorandum:

- Assigning a staff liaison position to be the main point of contact with HSBRIS.
- Continue as active and engaged participants in the Átl'ka7tsem/Howe Sound Community Forum.
- Budget for and co-host or host a forum in the future.
- Support the Principles of Cooperation and the Nchu'ú7mut/Unity Plan through the contribution of information.
- Consider the priority goals and objectives of the Nchu'ú7mut/Unity Plan through the contribution of information.
- Promote and reference with pride the AHSUBR UNESCO Biosphere Region.
- Consider potential funding resources for HSBRIS for educational opportunities and beneficial projects through grants and/or in-kind support.

This memorandum is not legally binding. This memorandum represents a non-legally binding framework for collaboration between HSBRIS and Metro Vancouver.

It is also understood this memorandum of understanding will be reviewed every new Board term and may be amended at any time by mutual agreement.

On behalf of Metro Vancouver Regional District Initiative

Jerry W. Dobrovolny, P.Eng., MBA
Commissioner/Chief Administrative Officer

Date Signed: OCT 2 0 2022

On behalf of Howe Sound Biosphere Region Society

Ruth Simons
Executive Director

Date Signed: October 11, 2022

Chris Plagnol
Director/Corporate Officer

Date Signed: OCT 2 6 2022

ÁTL'KA7TSEM HOWE SOUND BIOSPHERE REGION

metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

Memorandum of Understanding
Appendix A

1. **Assigning a staff liaison position as the main point of contact with HSBRIS.**

   This role is intended to involve knowledge transfer by attending meetings on behalf of the local government, responding to requests from HSBRIS that fall within this memorandum of understanding, and communicating back to staff and the Board. The person appointed is intended to have and share knowledge, contribute perspectives, and be knowledgeable of the history and the principles of the Átl'ka7tsem/Howe Sound UNESCO Biosphere Region and the Nchu'ú7mut/Unity Plan. They would attend meetings and maintain relationships and good communications while respecting the policy direction of the local government.

2. **Continue as active and engaged participants in the Howe Sound Community Forum.**

   It is intended that representatives of the local government's Board and staff will attend the bi-annual forums and sub-committees and will report back to the Board. The local government will consider updates to the Principles for Cooperation as these may occur and as may be agreed upon by community forum members.

3. **Budget for and co-host or host a forum in the future.**

   The local government may offer to host a forum at any time. It is intended that forums will follow a rotating schedule of the members.

4. **Support the Principles of Cooperation and the Nchu'ú7mut/Unity Plan through the contribution of information.**

   Consider the priority goals and objectives of the Nchu'ú7mut/Unity Plan in Electoral Area A policy and planning decisions.

5. **Promote and reference with pride the AHSUBR UNESCO Biosphere Region designation.**

   The local government will work with HSBRIS communications and reference the AHSUBR UNESCO Biosphere Region designation on its website, signage, and

other communication, as the local government deems appropriate, and having regard to the branding guidelines of UNESCO and HSBRIS where appropriate.

6. **Consider the priority goals and objectives of the Nchu'ú7mut/Unity Plan in Electoral Area A policy and planning decisions**

UNESCO Biosphere Regions require a management plan that considers the land and marine use of the Biosphere Region. The management plan, referred to as Nchu'ú7mut/Unity Plan, serves as a guiding document.

7. **Consider potential funding resources for HSBRIS for educational opportunities and beneficial projects.**

This may include potential opportunities to support resources for secretariat services, educational opportunities, and beneficial projects through potential grants and/or in-kind support.

These potential opportunities may be in the form of:

- Additional fees on commercial filming permits
- Create a nature tax, or service area tax
- Grants in-aid
- An annual contribution for secretariat services
- Funding a portion of project costs or matching funds with other government or funding contributions
- In-kind time of staff resources
- Waiving costs of meeting rooms