

metrovancover

Caring for the Air 2022

In this issue

Innovative solutions
to climate challenges

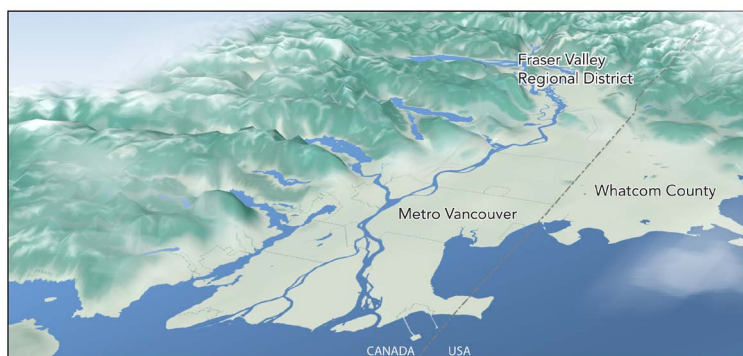
Extreme weather and air quality

Roadmaps to carbon neutral
transportation and zero
emissions buildings



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The Lower Fraser Valley Airshed

Air pollutants can travel between Metro Vancouver and surrounding areas. Managing air quality successfully requires effective collaboration with our neighbours and other levels of government, and participation from businesses, public institutions, non-government organizations, and residents. Articles in this publication reflect this cooperation.

Message from the Chairs



Last year's *Caring for the Air* celebrated our 10th edition. This year marks another anniversary – 50 years of the air quality service in the Metro Vancouver region.

The air quality program has evolved

over 50 years, always striving for an evidence-based approach to assessing regional air quality, tracking the success of our programs, and identifying new priorities, all while responding to new challenges.

Clean air continues to be a key priority in making our region such a desirable place to live, work, and play. One of the common threads over 50 years has been collaboration, and we acknowledge our member jurisdictions, regional, First Nation, and provincial staff and partners who work with us to keep our air clean and to respond to the climate change challenge.

Sav Dhaliwal
Chair, Metro Vancouver Board



2021 demonstrated that climate change impacts are increasing in severity, and highlighted the urgency for action. Over 140 days, we saw a dramatic shift from droughts and a heat dome — with

associated impacts in the form of wildfires and smoke, ground-level ozone concentrations not seen since the 1980s, and devastating health and infrastructure impacts — to an atmospheric river event and significant flooding.

In this year's edition, you will read about ongoing actions to respond to climate change and continue to improve regional air quality, including implementation of the *Clean Air Plan* and the *Climate 2050 Roadmaps*, and how we build innovation into our programs and policies.

Adriane Carr
Chair, Metro Vancouver Climate Action Committee

Climate Action Committee Membership:

Carr, Adriane (C) – Vancouver

Hocking, David – Bowen Island

Patton, Allison – Surrey

Dhaliwal, Sav (VC) – Burnaby

Kruger, Dylan – Delta

Royer, Zoë – Port Moody

Arnason, Petrina – Langley Township

McCutcheon, Jen – Electoral Area A

Steves, Harold – Richmond

Baird, Ken – Tsawwassen First Nation

McIlroy, Jessica – North Vancouver City

Wilson, Chris – Coquitlam

Dupont, Laura – Port Coquitlam

McLaughlin, Ron – Lions Bay

Yusef, Ahmed – Maple Ridge

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

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



Clean Air Plan:

Making Big Moves to Reduce Emissions

In 2021, the Metro Vancouver Board approved the *Clean Air Plan*, which includes actions to reduce regional greenhouse gas (GHG) emissions and yield air quality health benefits estimated at up to \$1.6 billion. This plan is strongly linked to Metro Vancouver's *Climate 2050 Strategy*: both plans aim to reduce GHG emissions, while the *Clean Air Plan* also focuses on improving day to day air quality.

Metro Vancouver and member jurisdictions have been improving and protecting the region's air quality and climate for decades, and staff are now accelerating actions to meet the aggressive emission targets laid out in the *Clean Air Plan*. There are major impacts to inaction: extreme weather is already becoming more frequent and intense with rising global temperatures. In 2021, wildfires, record-breaking heatwaves, rainfall, and flooding demonstrated that climate change is happening here and now, with potentially catastrophic effects.

So how can we ensure that we are doing our part to reduce global emissions and the potential impacts of climate change? First, we need to work together. The *Clean Air Plan* was strengthened with public feedback and equity is key to the plan's success. This spirit of collaboration, with residents, businesses, and other governments, must continue as we implement actions to reach our targets.

The *Clean Air Plan* is organized around six topics, such as transportation, industry, and buildings. Each topic contains "Big Moves" that are the foundational actions needed to support significant emission reductions.

Some of the Big Moves that would be led by Metro Vancouver include:



Develop GHG performance standards for buildings: Existing buildings would need to meet GHG emission performance targets, which would reach zero carbon emissions before 2050.



Develop emission requirements for passenger vehicles: Requirements could include low or zero emission zones or a vehicle emissions levy with rebates for replacing older vehicles.



Integrate GHGs into regulations and permits: Current air emission regulations and permits address air contaminants only. Adding limits or fees for GHGs could encourage industrial facilities to consider transitioning to cleaner energy.

Now is the time for everyone to do their part to keep our air clean and reduce our contribution to global climate change.



Extreme Weather Brings the Effects of Climate Change to Metro Vancouver

The heat dome, wildfire smoke, and floods experienced in Metro Vancouver in 2021 show that climate change is already impacting our lives. These extreme weather events emphasize the need for action now to reduce emissions and increase resilience in the coming years.

Air quality in the region has been severely degraded by wildfire smoke in five of the last seven summers. The unprecedented heat dome in June 2021 was associated with 740 excess deaths across BC and triggered an early start to an extremely active wildfire season, especially in the BC Interior. The heat dome also set temperature records across BC and exceeded what some climate models are projecting for 2050, such as the number of days with overnight temperatures above 20°C.

As a result of the heat, ground-level ozone concentrations reached levels not recorded since the late 1980s, despite programs and regulations implemented over the last two decades to reduce air contaminants that form ground-level ozone. This shows how extreme weather can erode emission reductions already realized. High ground-level ozone concentrations also add another health threat during already dangerous heat waves.

Experts predict that the Metro Vancouver region will continue to experience increases in both the severity and frequency of extreme weather events in the coming decades. These could range from more intense atmospheric rivers, like the one experienced in November 2021 which led to catastrophic flooding and landslides, to drier and hotter conditions leading to more wildfires and air quality impacts.

Although significant progress has been made over the last few decades to reduce regional air contaminant emissions, more aggressive action is required. The high ozone concentrations experienced in June show how extreme weather associated with climate change can compromise decades of progress, so we must continue to adapt and find innovative solutions as threats emerge.

Read more about climate actions in Metro Vancouver's *Climate 2050 Roadmaps* on pages [12 to 15](#) and how Metro Vancouver supports innovative projects on pages [5 to 7](#).



Preparing for Wildfire Smoke Season

Wildfire smoke can impact your health, especially if you have asthma, chronic obstructive pulmonary disease, or other underlying conditions. You can minimize your health risk by preparing for smoke before it arrives.

Some people are more likely to experience health effects from smoke exposure than others. Anyone who has a disease with a management plan should speak with their doctor about adapting it for smoky conditions. People who use rescue medications such as inhalers should ensure they have an ample supply in the summer, particularly when traveling.

Think about how best to limit the amount of smoke that gets into your home or bedroom. Tips include keeping windows closed and running forced air systems to recirculate air indoors. Consider purchasing a portable air cleaner or building a box fan air filter to reduce smoke particles in the air. Wildfires often occur when it is hot outside. Make sure that your plan does not result in overheating, as being too hot is a bigger risk than breathing smoke for many people.



Example of a homemade box fan air filter

Keep masks stocked at home. Well-fitted N95 (or KN95) respirators provide the best protection from wildfire smoke, but well-fitted three-layer disposable and cloth masks can also help. Remember – the air must pass through the material of the mask, not around it! You can stay up-to-date on smoke risks by monitoring forecasts, by signing up for air quality alerts, or by downloading air quality apps. Finally, talk about your smoke readiness plans with others in your family and community and help them to develop their own plans.

More Resources

Visit bccdc.ca/wildfiresmoke to learn more about:

- Preparing for wildfire smoke
- The health effects of wildfire smoke
- Portable air cleaners
- DIY box fan air filters
- Masks for smoke

Visit canada.ca and search 'combined wildfire smoke and heat'

For air quality alerts in Metro Vancouver visit [Airmap.ca](https://airmap.ca)

For smoke forecasts visit firesmoke.ca

Courtesy of BC Centre for Disease Control

With Great Climate Goals Come Great Innovation

The ambitious goals in Metro Vancouver's *Clean Air Plan* and *Climate 2050* are supported by innovative solutions to help meet the rising urgency for accelerated action to meet air quality and climate targets.

Sustainability Innovation Fund

Metro Vancouver's Sustainability Innovation Fund supports projects that demonstrate an innovative approach to advancing the region's sustainability while encouraging partnerships with other organizations. Projects span the breadth of Metro Vancouver's service areas and could explore uncertain or higher risk areas, such as new technologies or services. Many recent projects have focused on greenhouse gas (GHG) reduction, air quality, and energy efficiency.

gas reduction targets. It will connect building owners to available resources and provide tailored solutions on how to meet any future regional GHG regulations.

Sustainability Scholars

Metro Vancouver participates in the University of British Columbia's Sustainability Scholars program, a paid internship for UBC graduate students that offers them real world experience in advancing sustainability in the region. The scholars' projects can also help Metro Vancouver develop new policies and programs.

**project
spotlight**

Hydrothermal Processing – Biofuel Demonstration Facility

Hydrothermal processing is an emerging technology that can produce low carbon transportation fuels from wastewater biomass. This project involves the design, fabrication, implementation, and testing of a demonstration-scale facility at the Annacis Island Wastewater Treatment Plant.

**project
spotlight**

Exploring the Effects of Climate Change on Forest Health

Three different scholars undertook projects in 2016, 2019, and 2020 to understand how climate change affects forest health, with each building on the previous scholar's work. These projects expand our understanding of forest ecosystems so Metro Vancouver can monitor disturbances to forest health, recognize early signs of stress, and adapt or intervene if needed. This way, we can ensure that forest ecosystems continue to provide environmental services such as the removal and storage of carbon dioxide.

**project
spotlight**

Metro Vancouver Large Building Retrofit Accelerator

The regional retrofit accelerator program will create a resource hub to support owners of large buildings and increase the number of deep carbon building retrofits required to successfully meet greenhouse

Learn more about the Sustainability Scholars program and other projects at sustain.ubc.ca/teaching-applied-learning/ubc-sustainability-scholars-program.

Learn About Other SIF Projects

Visit metrovancouver.org and search 'sustainability innovation program' for a summary of projects that accelerate action to meet air quality and climate targets and look out for this symbol to find other Sustainability Innovation Fund projects in this issue of *Caring for the Air*.





LumiAir: Your Air Quality is Lit!

If you visited the Pacific National Exhibition during the summer of 2021, you might have met LumiAir, Metro Vancouver’s latest addition to the air quality toolbox. LumiAir is an interactive display that shows real-time air quality data from the closest Metro Vancouver air monitoring station. You can compare that data to cities around the world or to scenarios such as days with wildfire smoke or a ground-level ozone advisory. LumiAir also shows historical air quality data from decades ago and highlights programs and policies that have helped improve the region’s air quality.

LumiAir aims to make air quality data more accessible to communities and will be touring the region, making stops at community centres, libraries, and other public spaces and events.



A ‘Flying Lab’ Takes to the Sky

Metro Vancouver tested a ‘flying lab’ of small sensors mounted on a drone in the summer of 2021. The sensors collected air quality measurements over a large area at varying heights.

The equipment was tested at three sites with different types of emissions: Annacis Island, the

Coquitlam Water Supply Area, and a construction site in Surrey. The sensors collected data for several air contaminants including particulate matter (tiny particles suspended in the air) and various gases (nitrogen dioxide, total volatile organic compounds, and sulphur dioxide).

Lights, Camera, Climate Action!

This project will identify alternative clean and modular power sources to replace portable diesel generators in the film industry. Portable diesel generators create greenhouse gases, other air contaminants such as diesel particulate matter, and noise pollution. The film industry has recognized the need to transition to cleaner sources of mobile power. Metro Vancouver will be supporting this transition by analyzing the feasibility of different clean power opportunities for the film industry and similar users, and recommending cleaner modular options. The project will also pilot a clean power source in one of Metro Vancouver's parks to demonstrate its applicability and report on lessons learned.



The flights were part of a project to assess drone technology for potential air quality measurement applications like detecting hotspots of poorer air quality, assessing fugitive emissions (emissions that are not from a controlled stack or vent), and enhancing understanding of emissions from industrial sources. The results offered an exciting glimpse of the potential for collecting detailed

spatial information. Although the technology is not quite ready to be used for routine air quality measurements, using drones could provide a novel and unique tool to improve air quality management and regulation. Work is continuing with these small sensors to better understand how they can help Metro Vancouver's air emissions monitoring activities.

Bylaw and Regulation Updates

Simplifying Open Burning Authorization

Open burning is any burning outside of a structure and that does not vent through a chimney or stack. Emissions from burning vegetative debris, such as leaves and branches, in the open air are currently authorized through site-specific [approvals or permits](#). In 2021 and early 2022, Metro Vancouver engaged residents, businesses, First Nations, member jurisdictions, and other government organizations

on a proposed regulation to manage these emissions. The [proposed regulation](#) will continue to protect public health and the environment while offering a simpler, more efficient, and less costly authorization process.

To learn more, visit metrovancover.org and search 'open burning.'



Reducing Emissions from Open Burning

Open burning of vegetative material generates air contaminants. A project completed in 2021 compared emissions from open burning of agricultural vegetative debris to alternative disposal methods, such as chipping or composting. The project also looked at barriers to using alternatives, and created a guide to help reduce those barriers.

The alternative methods produced lower emissions of greenhouse gases and particulate matter compared to conventional open burning, even when considering both direct emissions (for example, from chipping) and indirect emissions (such as those from transporting the chipper to the site). In spite of this, alternatives are not always used because of factors such as cost, availability, feasibility, and concerns about spreading diseases and pests. The guide is expected to be available on Metro Vancouver's website by the end of 2022. It will provide information about how to reduce emissions, where to find equipment, and how to use the byproducts of the vegetative material.

This work complements the development of an open burning emission regulation (see above), by promoting alternatives that can eliminate burning while producing useful byproducts.

Cannabis Production and Processing Emission Regulation

Metro Vancouver began seeking feedback on a proposed regulation for managing emissions from commercial cannabis production and processing operations. Emissions from cannabis facilities include volatile organic compounds that can contribute to the formation of harmful ground-level ozone and fine particulate matter.

The second phase of public engagement concluded in February 2022. Based on feedback received during two phases of engagement, staff are preparing a proposed emission regulation that will be presented to the Metro Vancouver Regional District Board by early 2023.



New Air Contaminant Fees for Industrial Emissions

In 2022, Metro Vancouver will be increasing air quality permit and regulatory fees. The new fees reflect updated information on the health costs of air contaminants and support the additional resources needed to manage and protect regional air quality.

Metro Vancouver charges fees for permits that specify the maximum amount and types of air contaminants a facility is authorized to emit. These fees encourage facilities to reduce emissions, but also recover the costs of air quality regulatory services like inspections and enforcement. The fees were last updated in 2008, and since that time costs for regulatory services have dramatically increased, partly due to more information requests, appeals, and complaints. The new fees will help to ensure that Metro Vancouver can continue to reduce emissions, improve air quality, and protect public health.

Who Pays Fees for Emissions?

All businesses with permits to emit air contaminants in Metro Vancouver, and those that fall under Metro Vancouver's air emission regulations, pay fees for air emissions. A public opinion survey commissioned by Metro Vancouver showed strong support for this "polluter pay" approach, and that fees should be higher for the more harmful contaminants.

The changes will be phased in between 2022 and 2028.

To learn more, visit [metrovancouver.org](https://www.metrovancouver.org) and search 'air quality fees.'

Key Changes to Air Quality Fees



Increasing fees for air contaminants:

New health research demonstrates that public health costs from air contaminants are greater than previously thought, so existing fees for air contaminants, including the more harmful ones such as fine particulate matter, photoreactive volatile organic compounds, and nitrogen oxides, are increasing. New fees for greenhouse gas emissions have also been established, except where the provincial carbon tax already applies.



New fees for odorous air

contaminants: Managing odorous emissions is one of the reasons why costs for regulatory services are going up. Over 80 per cent of complaints received are related to odour, but Metro Vancouver previously did not charge fees for odorous air contaminants. New fees for odorous air contaminants should discourage emissions, as well as offset the costs of managing them.



Expansion of the Non-Road Diesel Engine Emission Regulation

Metro Vancouver’s Non-Road Diesel Engine Emission Regulation has been in place since 2012. The regulation protects air quality and public health by reducing emissions from non-road diesel engines, which can worsen heart and respiratory diseases and contribute to cancer.

Between November 2020 and April 2021, Metro Vancouver invited feedback from the public, businesses, First Nations, member jurisdictions, and government organizations on a proposed expansion of this regulation. In October 2021, the Metro Vancouver Regional District Board adopted a new bylaw with enhanced requirements.

Non-Road Diesel Engines

Non-road diesel engines are used in a wide range of construction, industrial, commercial, and stationary equipment such as excavators, bulldozers, and forklifts. These engines are generally not intended for use on public roads.

The bylaw does not apply to engines less than 25 horsepower, normal farm practices, or personal recreational machines.

New Requirements

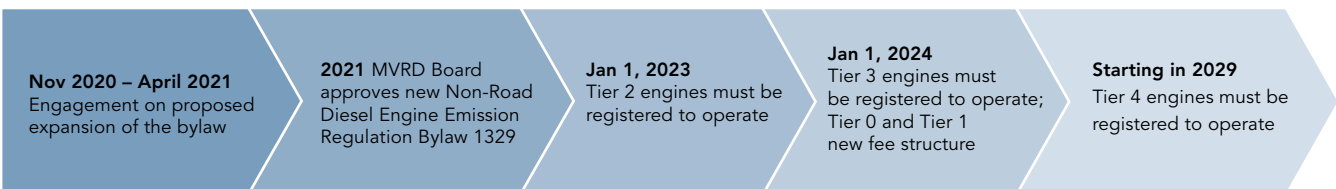
Non-road diesel engines are categorized by tiers, depending on their size and year of manufacture. Tier 0 are the oldest, highest emitting engines and Tier 4 are modern engines with more emission controls. The previous bylaw covered only Tier 0 and Tier 1 engines. The expanded bylaw recognizes that while the newer tiers of non-road diesel engines are cleaner, they still contribute to health and environmental impacts. The new bylaw includes Tier 2 starting in 2023, Tier 3 in 2024, and Tier 4 in 2029. Regulating Tier 4 engines is intended to encourage electrification and other decarbonization options that will reduce health and climate impacts.

Other changes include updated fees and rebates to promote further reduction of harmful diesel particulate matter and nitrogen oxides, prohibiting use of higher emitting engines near sensitive receptors such as hospitals, community care facilities, and elementary schools, as well as adding requirements for emergency generators.

The Vancouver Fraser Port Authority also has a non-road diesel engine emission reduction program. Metro Vancouver collaborates with the port authority to align the requirements of both programs.

To learn more, visit metrovancover.org and search ‘non-road diesel.’

Registration Requirements for Different Non-Road Diesel Engine Tiers in Metro Vancouver



How to Follow Residential Indoor Wood Burning Requirements in Metro Vancouver

Everyone in Metro Vancouver who is responsible for a residential indoor wood burning appliance, including a fireplace or woodstove, must comply with best burning practices (see [Schedule B](#) of Bylaw 1303). Indoor wood burning is also prohibited (with some exceptions) between May 15 and September 15 every year.

Starting September 15, 2022, anyone who intends to use a residential indoor wood burning appliance will need to submit a best burning practice declaration to Metro Vancouver. Residents within Metro Vancouver's [Urban Containment Boundary](#) will also need to register eligible appliances starting September 15, 2022, before using the appliance, and renew and confirm declarations and registrations at least every three years.



Does the Residential Indoor Wood Burning Bylaw 1303 apply to me?

If you own, operate, or are otherwise responsible for a woodstove, a fireplace, or another type of residential indoor wood burning appliance, then Bylaw 1303 applies to you.

How do I submit a declaration of compliance with best burning practices?

Metro Vancouver is creating an online declaration system. Visit metrovancover.org and search 'residential wood burning' for more information about submitting your declaration.

Where can I find out more?

Metro Vancouver's [website](#) has more information, links to videos, and will provide access to the declaration and registration systems. You can also call 604-451-6677 for more information.

Am I inside or outside Metro Vancouver's Urban Containment Boundary?

The Urban Containment Boundary designates the area in the region within which urban development may occur. Wood burning appliances within this area have stricter requirements because there is higher population density and smoke could impact more people. Use this tool (gis.metrovancover.org/mvmaps/ucb) to check if your address is inside the Urban Containment Boundary.

How do I register my appliances?

Metro Vancouver is creating an online registration system. Visit metrovancover.org and search 'residential wood burning' for more information about registering an appliance.

Who do I contact if I am concerned about wood smoke in my neighbourhood?

Call 604-436-6777 or use the [online form](#) at metrovancover.org, search 'air quality form.'

More questions about Bylaw 1303? Connect with Metro Vancouver staff at riwb@metrovancover.org.





Climate 2050 Roadmaps are Guiding us Towards a Resilient and Carbon Neutral Region

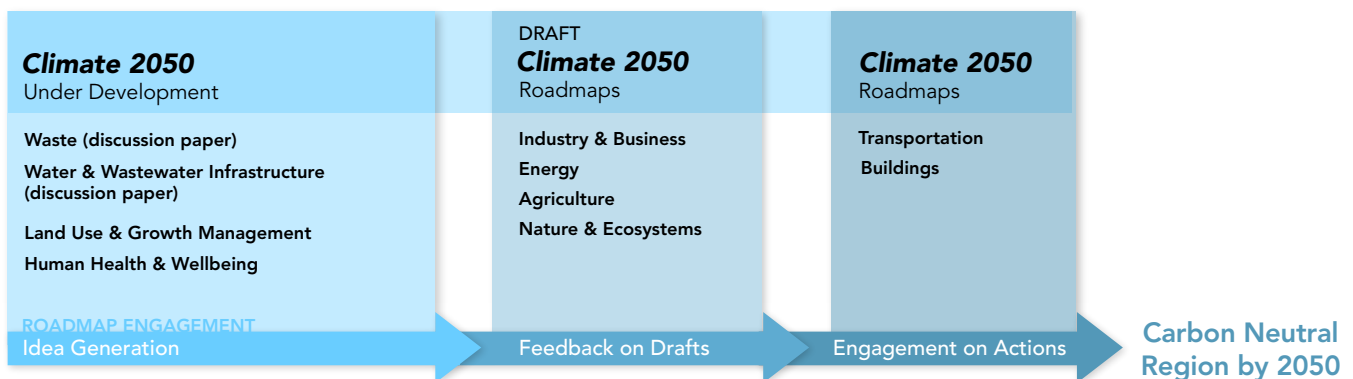
Metro Vancouver has committed to becoming a resilient and carbon neutral region by 2050, but how will we get there? The answers lie in the *Climate 2050 Strategic Framework and Roadmaps* which will guide the region’s policies and actions to reduce greenhouse gas emissions and ensure that the region is resilient to climate change impacts. Each of the ten roadmaps will focus on a different topic, such as buildings or transportation, and will describe goals, targets, strategies, and actions to help us meet our commitments.

Developing the roadmaps is a collaborative and evolving task spanning several years. In 2021, the first two roadmaps were completed, and there are more to come.

Learn more about the *Transportation Roadmap* on [page 13](#) and the *Buildings Roadmap* on [page 14](#).

For the most up-to-date information about the roadmaps, visit metrovancover.org/climate2050.

Climate 2050 Roadmaps Status: June 2022





Climate 2050 Transportation Roadmap:

A Pathway to Carbon Neutral Transportation

The *Climate 2050 Transportation Roadmap* outlines a pathway to a regional transportation system that is carbon neutral and resilient to the impacts of a changing climate by 2050. Although transportation is currently the largest source of regional greenhouse gas emissions, it also presents some of the best opportunities to start reducing emissions, particularly for personal transportation.

The *Transportation Roadmap* describes a vision where movement of goods and people produces no greenhouse gas emissions, with almost all vehicles powered by electricity or hydrogen. In order to realize this vision, we must implement the actions in the *Transportation Roadmap* as soon as possible.

Extreme flooding and landslides in 2021 caused extensive damage to road and rail networks in and out of the region. These extreme events demonstrated that reducing emissions isn't the only action needed to address climate change. We must also develop a transportation network that is resilient to the impacts of a changing climate. The first step in this process will be developing a better understanding of the vulnerability of our regional transportation system to climate change.

Taking Action Now: Exploring Curbside Charging in the City of Vancouver

The BC Government has announced that by 2035, all new vehicles sold in the province will be zero emissions — meaning they will run entirely on electricity, on electricity supplemented with gasoline, or on hydrogen. This transition means residents and businesses that park on-street will need access to electric vehicle (EV) charging.

In 2019, the City of Vancouver completed a pilot project to explore siting, access, and licensing of curbside EV chargers for residents and businesses. The pilot concluded that licensing fixed outlets on the curb for residential applications was not a viable solution, owing to high installation costs and scalability. However, in January 2022, the non-residential licence was renewed as a permanent program for businesses to install EV charging on the public right-of-way in front of their building. In the short term, the residential program has been replaced with a lower cost licence to allow the use of extension cords and cord covers to charge vehicles on-street. Other options like under-sidewalk and near-home off-street charging are also being explored.



Climate 2050 Buildings Roadmap: A Pathway to Zero Emissions and Resilient Buildings

Buildings emit one quarter of the greenhouse gases in the Metro Vancouver region. Most of this comes from burning natural gas, a fossil fuel, for space and hot water heating.

The *Climate 2050 Buildings Roadmap* envisions a future where residents live in healthy, resilient, zero emissions buildings. To get there, this means first reducing how much energy the home needs for

heating or cooling, followed by using zero emissions equipment that is powered by BC's low carbon and renewable electricity. Lastly, to keep energy costs lower, smart home features can optimize building systems. These actions can also keep occupants healthier, more comfortable, and safer from extreme weather caused by climate change, like higher temperatures and heavy rain events.

Taking a Whole Building Approach to Reach Zero Emissions

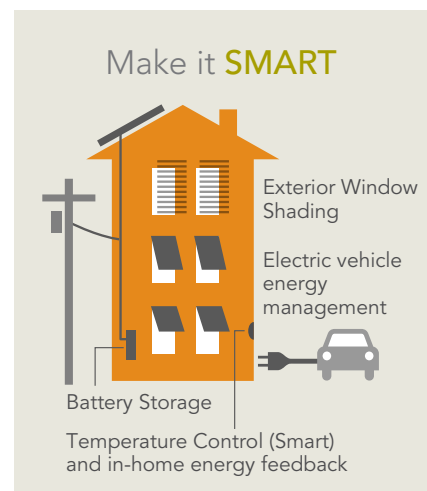
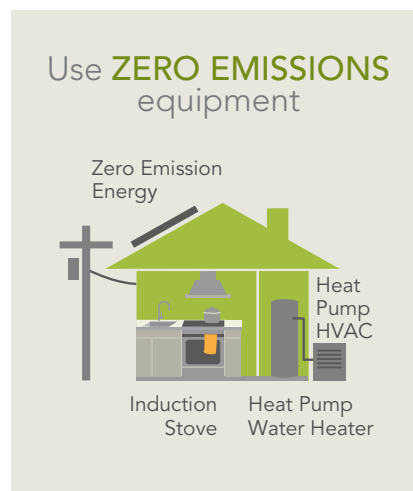
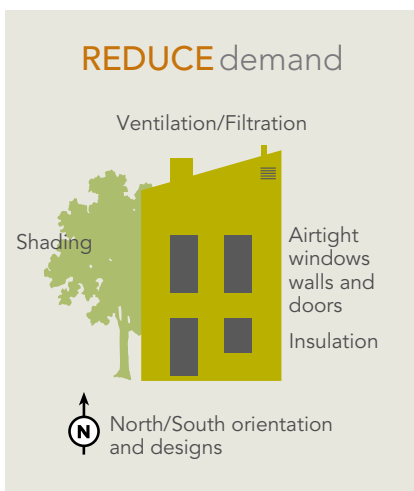




Photo courtesy of H.W. Flesher Housing Co-op

Taking Action Now: Heat Pump Installation at H.W. Flesher Housing Co-op, Vancouver

This co-op’s meeting hall was too cold in the winter and too hot in the summer. The head of maintenance had learned from a resident about heat pumps, which can heat and cool a home, so he had one installed in the hall in 2018. Residents immediately noticed the warmth, and as a bonus, the damp smell from excess moisture was gone.

Building on the success and excitement around the meeting hall’s heat pump, the co-op voted to replace the electric baseboards with heat pumps in all of the townhouses.

The retrofit was completed in 2021. It took five months and cost about \$400,000 for 87 units, but the co-op received over a third of the money back in energy efficiency rebates from BC Hydro. The co-op anticipates they will be using about a third less energy compared to heating with electric baseboards, and importantly, will be able to stay cool during dangerous heat waves.

We already have all the tools we need to make every home and building in the region healthy, resilient, and produce zero emissions. Many residents and building owners are already shifting to low emissions buildings, but thousands more low carbon renovations will be needed every year to reach our climate goals. The *Buildings Roadmap* aims to reduce barriers, such as higher costs and

low awareness of heat pumps and other solutions, so no one will be left behind in the transition to zero emissions buildings.

Learn more at metrovancover.org, search ‘buildings roadmap.’



How Greenhouse Gas Emissions Can Provide Insight into Consumption Behaviours

To help understand the emissions related to our activities, such as consuming products and services, Metro Vancouver completed a consumption-based emissions inventory (CBEI) for the region. The CBEI complements Metro Vancouver’s ‘in-region’ inventory, which accounts for greenhouse gas (GHG) emissions that occur within the region. The CBEI also accounts for ‘embodied’ emissions that occur outside the region’s geographical boundary, but are associated with goods and services consumed within the region.

A CBEI helps guide and evaluate regional emission reduction programs. It also underscores the importance of strategies that reduce GHG emissions while avoiding unintended consequences of actions that might reduce GHG emissions within the region, only to push those emissions outside the region.

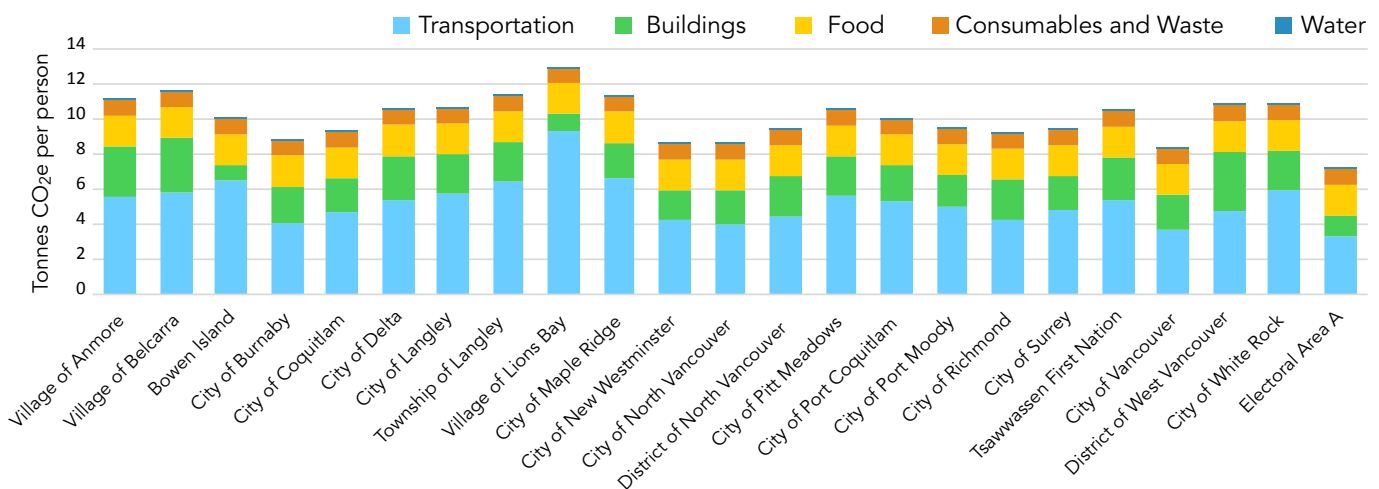
- The CBEI also reports emissions by community. Generally, larger communities such as Vancouver or Surrey have higher emissions due to their larger populations. Lower density communities with larger homes or those that rely more on vehicles showed higher emissions per person (see graph).

Findings from the Consumption-Based Emissions Inventory

- Metro Vancouver’s consumption-based GHG emissions are 58 per cent higher than the in-region inventory, showing that the region relies more on imported goods than local goods.
- The ‘transportation’ and ‘buildings’ categories had the highest embodied GHG emissions, mirroring the results of the in-region inventory.

This is the first CBEI prepared for the Metro Vancouver region. Metro Vancouver plans to improve the CBEI and to continue providing this important foundational data for use in implementing future emission reductions.

Learn more at metrovancover.org, search ‘consumption-based emissions inventory.’



Consumption-based emissions inventory of GHG emissions (tonnes CO₂e) per person by Metro Vancouver Community, 2015

Air Quality in 2021

In 2021, extreme heat and wildfire smoke led to four air quality advisories in the Lower Fraser Valley. In total, the region was under an advisory for 10 days.

The first air quality advisory of the season was issued by Metro Vancouver for ground-level ozone and fine particulate matter (PM_{2.5}) during a record-breaking heat dome in late June. A second ozone advisory was issued in late July.

In 2021, the temperatures measured inland in Abbotsford and Mission broke all-time high temperature records. In contrast, temperatures at the Vancouver International Airport near the coast did not break any all-time high temperature records, but did set a new record

for the highest temperature recorded in June.

The heat dome kicked off a very active wildfire season in BC, with an above average number of wildfires and area burned during the summer. Fortunately, the Metro Vancouver region was spared until later in the summer. Wildfire smoke from fires in the BC Interior and Washington seeped into the region in August, triggering two separate advisories: one in early August for PM_{2.5} and one in mid-August for PM_{2.5} and ozone.

Metro Vancouver generally has good air quality, but extreme weather associated with climate change could threaten the region's clean air. See [page 3](#) to learn more.

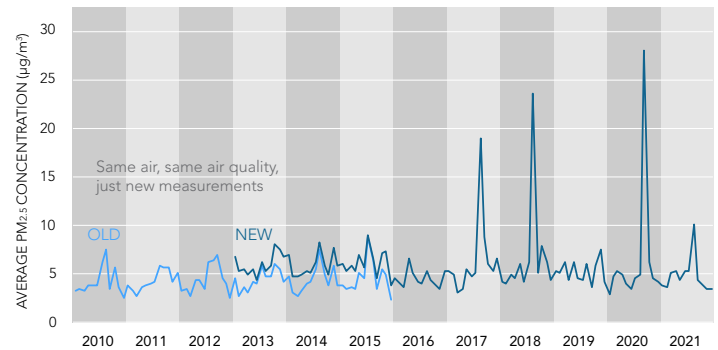
Air Quality Trends

Trends charts (right) illustrate the change in average air quality across the region over time. Measurements from monitoring stations from Horseshoe Bay to Hope are averaged to represent the outdoor air quality typically experienced in the region.

Trends show that most air pollutant levels have been improving over the last decade, even while the region's population has grown. Since 2015, several summers, including the summer of 2021, experienced elevated particulate matter concentrations due to wildfire smoke. Highest average concentrations were measured in 2017, 2018, and 2020. Most gaseous pollutants generally continued to decrease. Improvement of sulphur dioxide levels have been dramatic, mainly due to strict lower sulphur requirements for marine fuels. Average levels of ground-level ozone have slightly increased despite reductions in some pollutants that create it. This is partly due to an increase in ozone formed outside Canada coming into our region. Peak ground-level ozone levels (not shown), which occur during hot and sunny summer afternoons, are generally better now than in the 1980s and early 1990s.

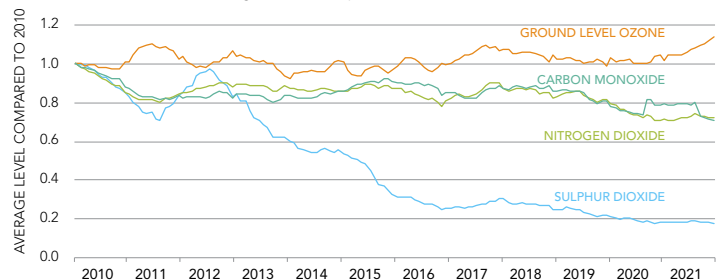
Fine Particulate Matter

In editions of *Caring for the Air* before 2022, this graph showed concentrations averaged over the previous 12 months. The graph now shows average concentrations for each month to better illustrate years influenced by wildfire smoke.



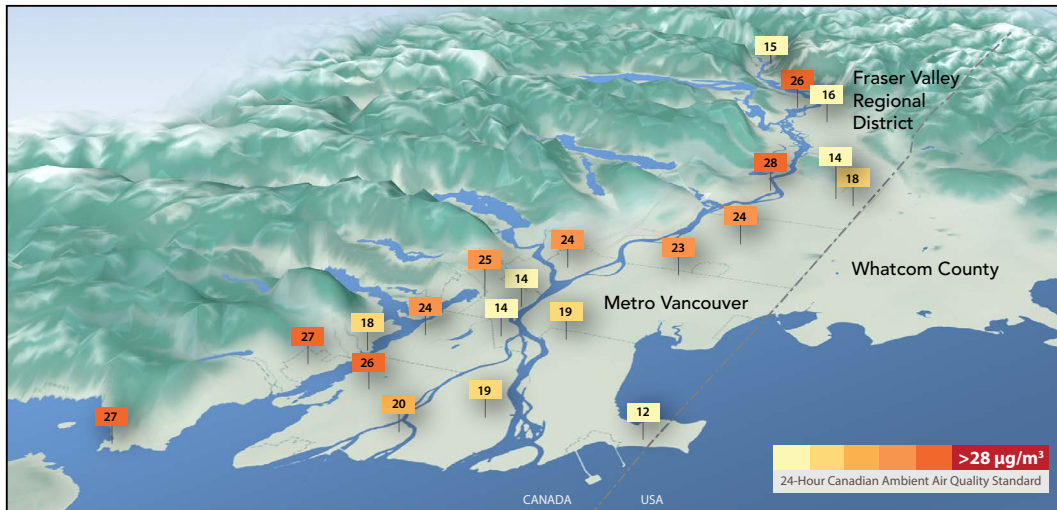
Gas Phase Pollutants

Concentrations averaged over the previous 12 months



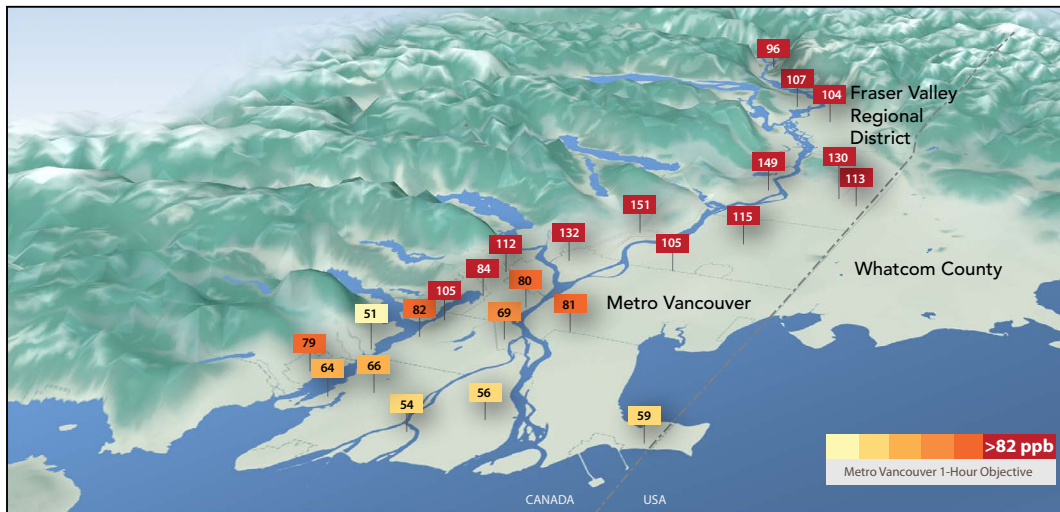
Air Quality in 2021: Data Summary

FINE PARTICULATE MATTER IN 2021



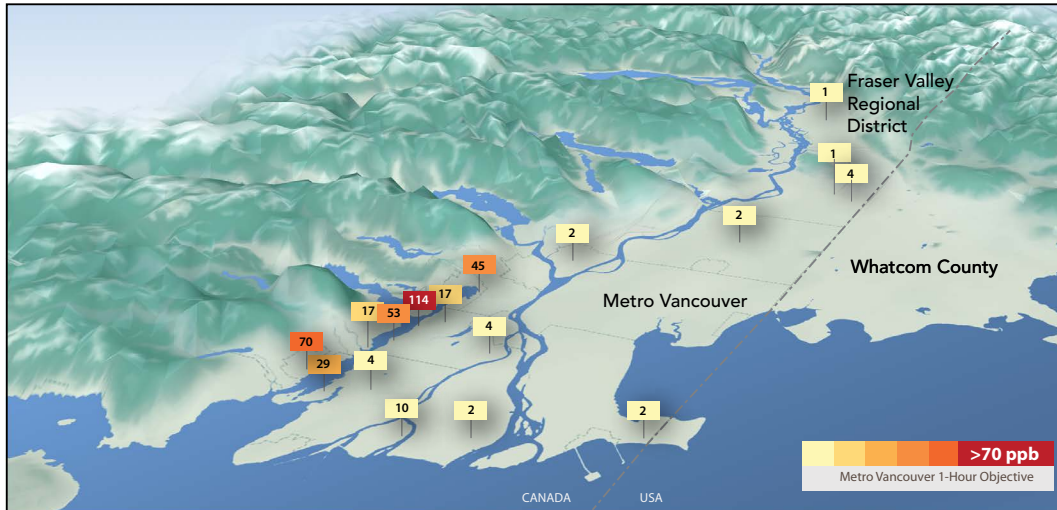
In 2021, fine particulate matter (PM_{2.5}) levels throughout the region met the 24-hour PM_{2.5} Canadian Ambient Air Quality Standard (calculated using data from 2019, 2020, and 2021) at all monitoring stations (see map above). Measurements averaged over 2021 were within Metro Vancouver’s annual objective. Peak levels based on the highest 24-hour average were worse than the short-term objective (25 µg/m³) at all stations in 2021. Some PM_{2.5} exceedances occurred in June and July, followed by widespread exceedances throughout the network in August due to wildfire smoke.

GROUND-LEVEL OZONE IN 2021



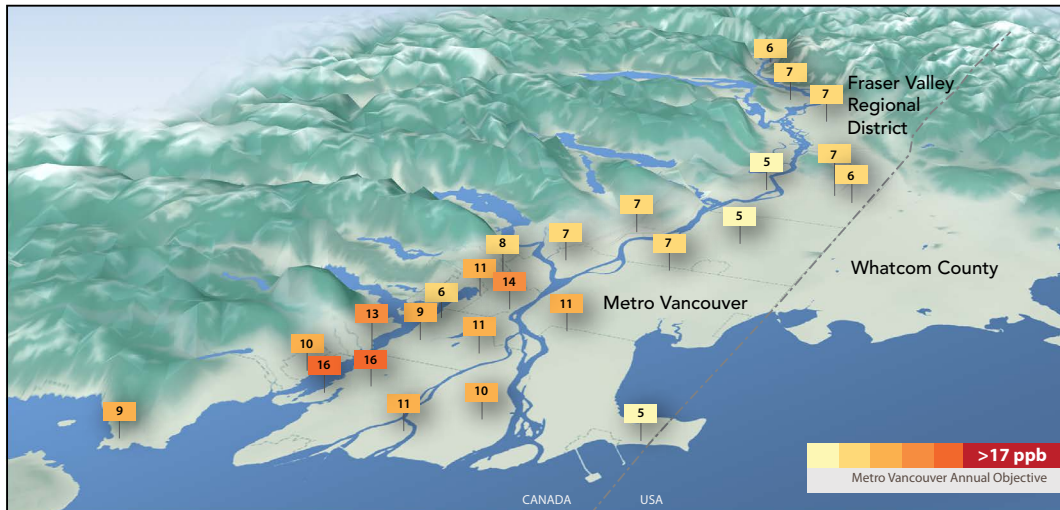
Ground-level ozone forms when nitrogen oxides and volatile organic compounds react in the air in the presence of sunlight. In 2021, elevated levels of ground-level ozone were experienced in June, July, and August with more than half of the monitoring stations exceeding Metro Vancouver’s 1-hour ground-level ozone objective (see map above). Over the last two decades, air quality programs and regulations have reduced the frequency and severity of ground-level ozone advisories. However, an extreme heat wave in late June 2021 resulted in unusually high ozone concentrations, reaching levels not seen since the late 1980s. Metro Vancouver’s 8-hour objective and the Canadian Ambient Air Quality Standard for ozone were not exceeded in 2021.

SULPHUR DIOXIDE IN 2021



Peak levels based on the highest 1-hour average are shown on the map above. These levels were better than Metro Vancouver's 1-hour objective of 70 ppb at all stations in 2021, with the exception of Capitol Hill in Burnaby where the objective was exceeded for two hours in December. Peak levels at Capitol Hill are mainly influenced by the nearby oil refinery. Average concentrations of sulphur dioxide were below Metro Vancouver's annual objective of 5 ppb at all stations in 2021.

NITROGEN DIOXIDE IN 2021



Nitrogen dioxide concentrations were better than Metro Vancouver's long-term objective (17 ppb) at all monitoring stations. Annual averages are shown on the map. The highest average nitrogen dioxide concentrations were measured in highly urbanized areas near busy roads. More than half of the regional emissions of nitrogen oxides (which includes nitrogen dioxide) come from transportation sources. In 2021, nitrogen dioxide concentrations were better than Metro Vancouver's short-term objective (60 ppb) at all monitoring stations, with the exception of North Vancouver-Second Narrows which exceeded the objective. Short-term measurements of nitrogen dioxide at North Vancouver-Second Narrows were influenced by local construction activity near the station in 2021.



Small Air Sensors Team Up With Big Monitoring Networks

In 2021, Metro Vancouver completed a review of its network of air quality monitoring stations and equipment. The network continuously monitors air quality conditions and is used for air quality planning for the region and issuing public advisories when air quality is degraded, such as during wildfire smoke events. The review found that Metro Vancouver operates a world-class air quality monitoring network and provided recommendations to further improve it.

One recommendation was to integrate small air sensors into the network. These sensors are cheaper and easier to install than traditional air monitoring equipment. They have the potential to increase air monitoring coverage across the region and collect data at higher spatial resolution than Metro Vancouver's existing network. The benefits of small sensors may have tradeoffs, such as lower data quality and reliability, which need to be considered when setting up small sensor networks.

Smart Cities: Hyperlocal Air Quality Monitoring

A project starting in 2022, "Smart Cities: Hyperlocal Air Quality Monitoring," will investigate how to deploy a dense small sensor network to supplement data already being collected by the Metro Vancouver network. The project proposes to install dozens of small sensors in concentrated areas, such as a single neighbourhood, providing high spatial resolution data to better understand how air quality may change across just a few city blocks. Hyperlocal monitoring could help identify impacts from major transportation routes and industrial emitters, inequities in air quality experienced at the neighbourhood level, the effectiveness of emission reduction strategies, and a better understanding of localized health outcomes related to air quality.



Network News

New Ambient Air Monitoring at the Waste-to-Energy Facility

Metro Vancouver's Waste-to-Energy Facility operates well within environmental standards. In 2020, facility emissions represented less than one percent of the regional airshed totals for nitrogen oxide, fine particulate matter, and greenhouse gas emissions.

In fall 2020, Metro Vancouver installed a new air quality monitoring station beside the facility to measure hydrogen chloride, sulphur dioxide, and nitrogen oxides. A hydrogen chloride monitor was also added to the nearby Burnaby South monitoring station.

Data collected to the end of 2021 shows ambient concentrations of hydrogen chloride and sulphur dioxide are less than eight per cent of ambient air quality objectives. Monitoring will continue for at least two years.

Metro Vancouver's monitoring stations had not measured hydrogen chloride before, so learnings from this study will be important for future regional air monitoring strategies and advancement in monitoring technology.

Monthly ambient air monitoring reports are posted online at metrovancover.org, search 'waste-to-energy reports.'

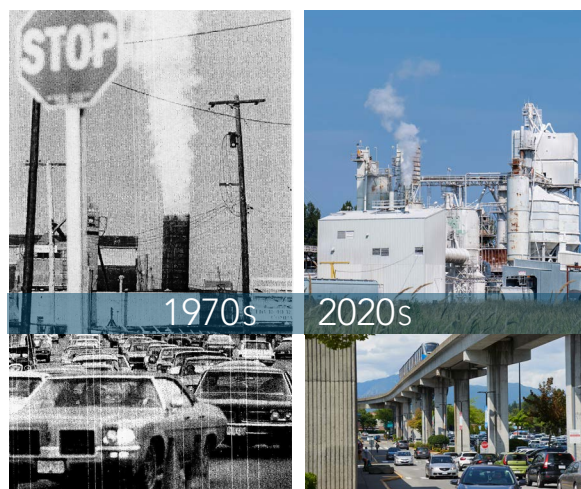
Tsleil-Waututh Nation Air Monitoring Study Complete

Metro Vancouver's Mobile Air Monitoring Unit was stationed at Tsleil-Waututh Nation's Burrard Inlet IR 3 Lands in 2018 and 2019 to better understand sulphur dioxide concentrations and emission sources in the area, such as an oil refinery and marine vessels. The study showed that air contaminant concentrations were below Metro Vancouver's air quality objectives during the study, with the exception of fine particulate matter during a wildfire smoke event in 2018. Air quality levels at the Tsleil-Waututh Reserve Lands compared favourably to other areas of the region, with some of the lowest average levels of air contaminants measured.

The full report is posted online at metrovancover.org, search 'Tsleil-Waututh study.'

Metro Vancouver's Air Quality Program Turns 50

2022 marks the 50th anniversary of Metro Vancouver's air quality program. In 1972, a series of legislative changes was completed which formalized the provincial government's delegation of authority to manage and regulate air quality in the region to Metro Vancouver (known as the Greater Vancouver Regional District at the time). Since then, Metro Vancouver has been protecting and improving our air quality and will continue to respond to threats to human health and the environment, such as climate change.





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

If you have questions or comments about *Caring for the Air*,
please contact us at AQinfo@metrovancouver.org or 604-432-6200.

Electronic copies of this and previous editions of *Caring for the Air* can be found on metrovancouver.org