metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

Parks & Environment Department
Tel. 604 432-6200 Fax 604 436-6901

File: AQ-07-00

August 13, 2021

City Clerk
City of White Rock
15322 Buena Vista Avenue
White Rock, BC V4B 1Y6

Dear Sir/Madam:

Caring for the Air 2021, Metro Vancouver's Annual Review of Air Quality and Climate Change

Caring for the Air is Metro Vancouver's annual publication highlighting regional actions and initiatives that improve air quality and mitigate the impacts of climate change. Written in plain language, *Caring for the Air* helps increase public engagement in and understanding of air quality and climate change issues.

2021 is the 10th anniversary of *Caring for the Air*. The 2021 edition looks back at **accomplishments over the past 10 years** and looks ahead to upcoming plans and programs, such as the ***Clean Air Plan*** **and the *Climate 2050 Roadmaps*.**

Other topics in *Caring for the Air* 2021 include:

- How the **COVID-19** pandemic response affected regional air quality
- Results of the **Strata Energy Advisor** program – energy advisor services for multi-unit homes
- How **heat pumps** can contribute to greenhouse gas reductions
- How to interpret the **Air Quality Health Index**
- Improvements to Metro Vancouver's **air monitoring network**
- Upcoming requirements for the **residential indoor wood burning regulation**
- 2020 **air quality trends**

A copy of *Caring for the Air* is included in this package. Current and previous editions of *Caring for the Air* are also available on metrovancouver.org (search: 'Caring for the Air').

If you would like additional copies for distribution, or have comments or questions about *Caring for the Air*, air quality, or climate change, please contact AQInfo@metrovancouver.org.

46284786

metrovancouver

Caring for the Air 2021

In this issue

- *Climate 2050 Roadmaps* to a carbon neutral region
- *Clean Air Plan* actions
- COVID-19 and air quality

Contents

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 Chair

In this landmark edition of *Caring for the Air*, Metro Vancouver celebrates many of the key milestones we've achieved over the last decade while underscoring the important work underway and the challenging road ahead.

In recent years, we have endured unprecedented wildfire seasons with smoke from distant forest fires settling into our region for days or weeks at a time. These periods of deteriorated air quality make us all acutely aware of the damaging health effects of wood smoke pollution and the role of climate change in exacerbating wildfire activity.

Indeed, climate action has emerged as our top priority — in this issue, you will read about how Metro Vancouver achieved carbon neutrality as an organization and how we are stepping up plans, based on scientific evidence, towards carbon neutrality in the entire region.

Back in October 2011, Metro Vancouver adopted the *Integrated Air Quality and Greenhouse Gas Management Plan*, as a 10-year vision for air quality and GHG management in the region. Fast forward ten years, and Metro Vancouver is developing the next iteration — the *Clean Air Plan*.

Air quality and climate change are inextricably linked, and the *Clean Air Plan* includes actions to significantly reduce air contaminant emissions over the next decade. These actions support *Climate 2050*, Metro Vancouver's regional climate action strategy, and include bold steps to reduce GHG emissions and accelerate climate change mitigation as well as adaptation measures.

This edition of *Caring of the Air* also examines some of the climate change and air quality implications of the COVID-19 global pandemic. As we look toward a robust economic and social recovery, many of the environmental improvements we saw over the past year give us hope that an environmentally-sound and socially-just recovery is feasible.

Clean air is one of the things that makes our region such a desirable place to live, work and play, and we thank all the regional, municipal, First Nation, and provincial staff and partners who work tirelessly to help keep our air clean.

Adriane Carr
Chair, Metro Vancouver Climate Action Committee

A Decade of *Caring for the Air*

This year marks the 10th anniversary of *Caring for the Air*. A lot has happened in the 10 years since the first edition in 2012, and there's a lot more planned for the next 10 years and beyond.

Metro Vancouver's air quality has steadily improved thanks to new programs and policies, and our response to new threats to air quality and climate change.

Let's take a look back at some of the changes in the past decade, and a look forward at what the next 10 years can bring.

Continues on next page

From page 1

A Decade of *Caring for the Air*

Air Monitoring

Since 2012, Metro Vancouver has:

- added four air monitoring stations to increase the network to 31 stations;
- built a new mobile air monitoring unit (MAMU) and deployed it to nine locations;
- upgraded particulate matter monitors to measure a portion of particulate matter not previously measured; and
- completed an in-depth review of the network, which included recommendations for improvement (see page 14).

Metro Vancouver's air monitoring network will continue to evolve to meet the region's air monitoring needs, whether it's for new pollutants, locations, or technology.

Air Quality Objectives

Air quality objectives are health-based targets for acceptable outdoor air pollutant concentrations. Over the last ten years, we've tightened our objectives to help drive air quality improvements. In the coming years, Metro Vancouver will further improve our objectives, including the objective for fine particulate matter ($PM_{2.5}$), which will meet or be better than federal standards for 2025.

Past, Present, and Future Air Quality and Climate Actions

Looking back over the past decade, Metro Vancouver has collaborated with other organizations to protect our air quality and climate by developing educational programs, policies, and regulations, including:

- programs to reduce energy use and emissions from buildings (see page 6 to learn more about the Strata Energy Advisor program for multi-unit homes);
- a wood stove exchange program to provide rebates for replacing old, inefficient wood-burning appliances with new, cleaner burning ones;
- an electric vehicle outreach program;
- bylaws to reduce emissions from non-road diesel engines and residential indoor wood burning appliances (learn more about new residential wood burning requirements on page 18 and regulation updates on page 20); and
- public services on air quality, such as providing real-time air quality data on www.AirMap.ca and www.ClearAirBC.ca, or issuing air quality advisories when air quality is poor.

What comes next?

As our region and climate changes, so can sources of air pollution. Emerging threats include:

- **Wildfires**: Four of the last six years (2015, 2017, 2018, 2020) have had significant air quality impacts from wildfire smoke. The Metro Vancouver region generally has good air quality, so short-term poor air quality events are especially noticeable. Climate projections for our region include warmer, drier and longer summers, which could lead to more intense and more frequent wildfire smoke impacts.
- **Ground-level ozone**: Ground-level ozone is formed by a chemical reaction between nitrogen oxides (NOx) and volatile organic compounds (VOC) during hot and sunny days. While ozone formation is not new in Metro Vancouver, new regional sources of these 'precursors' are leading to increased ozone in areas and at times of the year that typically don't experience high ozone concentrations. For example, wildfire smoke can transport a mix of chemicals that increases ozone formation.

Unexpected challenges, such as the **COVID-19 pandemic**, can also influence air quality: see page16 to learn more.

As new challenges emerge, Metro Vancouver is committed to taking bold actions to tackle them. Looking ahead, Metro Vancouver's new *Clean Air Plan* (page 8) lays out actions to protect our air quality for the next 10 years, and the *Climate 2050 Roadmaps* (page 4) outline how Metro Vancouver will reduce GHG emissions by 45% from 2010 levels by 2030, and become a carbon neutral region by 2050. Furthermore, the *Regional Ground-Level Ozone Strategy* (RGLOS) will be refreshed to address new sources of ozone precursors.

Even with the progress made in the past decade, we can all do more for our air quality and climate. Evolving challenges require innovative responses, and Metro Vancouver will continue to adapt its strategies to protect our health and the environment for the next 10 years and beyond.

AIR POLLUTANT	AVERAGING PERIOD	METRO VANCOUVER AMBIENT AIR QUALITY OBJECTIVE		CANADIAN AMBIENT AIR QUALITY STANDARD
		2012 (ppb)*	2021 (ppb)*	**2025** (ppb)*
Nitrogen dioxide (NO_2)	1-hour	107	60	42
Sulphur dioxide (SO_2)	1-hour	174	70	65
Ozone (O_3)	8-hour	65	62	60
Carbon monoxide (CO)	1-hour	26,500	13,000	n/a

*parts per billion

Mapping a Path to a Carbon Neutral Region

Climate change continues to be one of the foremost challenges facing the Metro Vancouver region and the world. Everyone can look at the recent experiences with the COVID-19 pandemic and see that both responsive and adaptive local actions are necessary to persist and thrive when faced with these global issues.

Metro Vancouver has committed to becoming a carbon neutral region by 2050 and has established a near-term target of a 45% greenhouse gas (GHG) emissions reduction by 2030. Through its overarching climate action strategy, *Climate 2050*, Metro Vancouver is developing *Climate 2050 Roadmaps* that will identify ways to guide the region's transition towards carbon neutrality and resiliency to climate change.

To inform the *Climate 2050* work, Metro Vancouver is modelling the impacts of different policies and potential actions on GHG emissions. Results confirm that collaboration between different levels of government, businesses, residents and communities, and other key partners will be essential to reduce GHG emissions to as close to zero as possible, with a small amount of emissions balanced out by projects that store carbon over long timeframes. Taking strong and urgent action now is critical in order for the region to avoid the worst impacts of climate change.

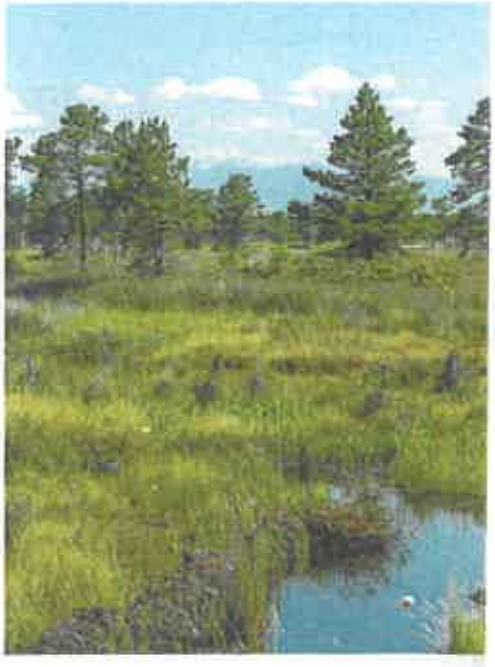
This modelling supports the *Climate 2050 Roadmaps* to identify the critical actions needed by the region on a pathway to carbon neutrality by 2050, as well as the development of Metro Vancouver's *Clean Air Plan*, which focuses on the air quality benefits of climate actions.

Achieving Corporate Carbon Neutrality

In 2019, Metro Vancouver achieved corporate carbon neutrality under the provincial Climate Action Revenue Incentive Program (CARIP). Metro Vancouver reduced its emissions and balanced its remaining carbon footprint with carbon credits from projects that avoid greenhouse gas (GHG) emissions, or increase carbon storage in natural ecosystems, including:

- Ecological restoration of Burns Bog (a joint effort with the City of Delta)
- Acquisition and conservation of forested land to expand regional parks
- Use of trenchless technology for sewer pipe installation

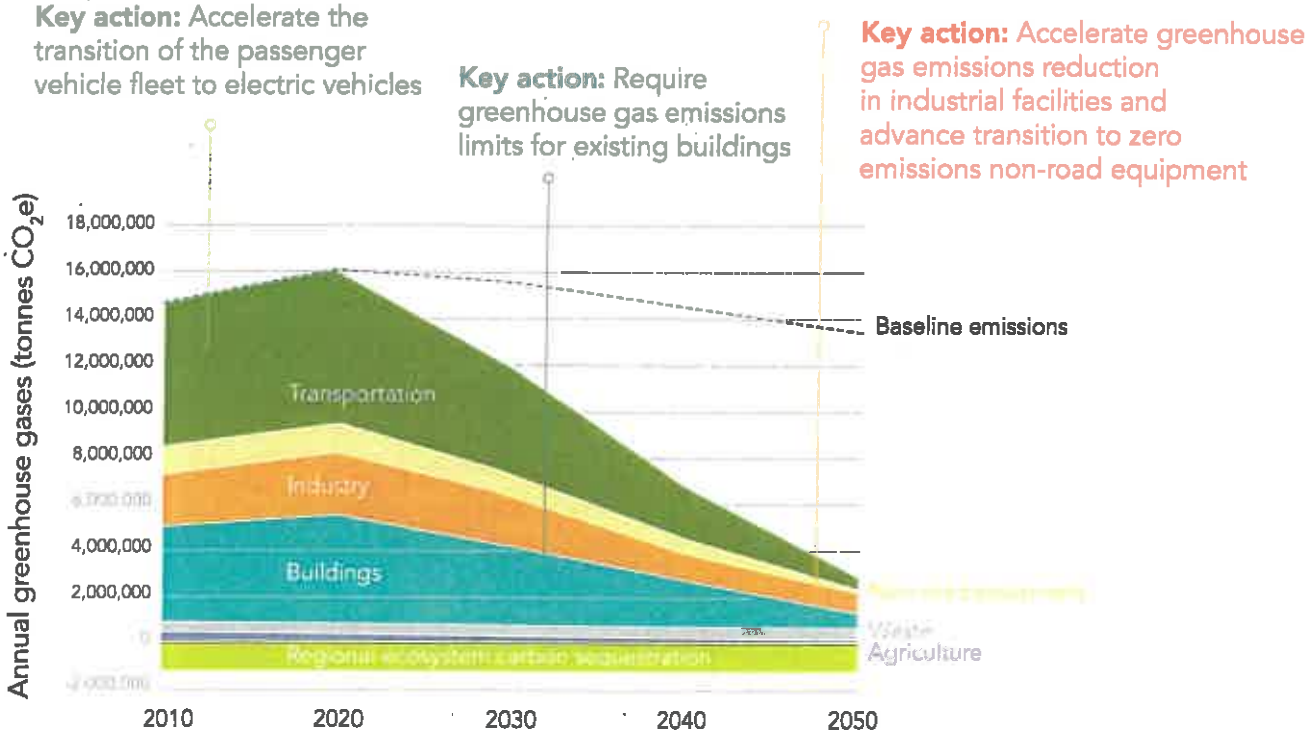
Achieving corporate carbon neutrality is an important milestone



Have a say on the development of the *Climate 2050 Roadmaps*

Visit: www.metrovancouver.org/climate2050 | Email Climate2050@metrovancouver.org

Estimated Greenhouse Gas Emissions Reductions



To learn more about the *Clean Air Plan* and actions to protect our air quality and climate, see page 8.

for Metro Vancouver. Leadership on climate action serves as a 'call to action' for other organizations, businesses and residents alike to contribute to our target of regional carbon neutrality by 2050. As Metro Vancouver's corporate GHG emissions account for less than 1% of regional emissions, region-wide action is essential to meet this target. The *Climate 2050 Roadmaps* (see above), will focus on these actions as well as those that address adaptation to climate change..

Protecting Carbon Stored in Regional Park Lands

Conserving forest within a park can prevent the release of stored carbon that could be released if the land were developed. Acquiring and stewarding new park land will enable Metro Vancouver to ensure the carbon stored in the trees, plants and soils remains stored for decades to come, contributing to Metro Vancouver's corporate carbon neutrality.

Opening the Door to Greener Condos and Townhouses

Chances are that you or someone you know is reading this while perched in their condo or nestled in their townhouse. About one third of Metro Vancouver households live in multi-unit or 'strata' housing. Stratas account for about 20% of our regional greenhouse gas (GHG) emissions from buildings. This is about the same amount as heavy-duty vehicle emissions!

Yet, historically, strata buildings have been underserviced by energy efficiency programs because of the challenges with making collective decisions. But instead of seeing stratas as a barrier to GHG reductions, Metro Vancouver saw them as an opportunity.

Strata Energy Advisor Program

Metro Vancouver's Strata Energy Advisor pilot program provided professional energy advisory services to condo and townhouse stratas to assist with evaluating and developing energy efficiency projects. The program also helped Metro Vancouver understand barriers and opportunities for GHG reductions in strata buildings and learn how to support them to take on energy saving projects.

Strata Energy Advisor Program in numbers

- **20**-month pilot project
- **82** energy assessments and project business cases
- **38** completed energy saving projects
- **2265** tonnes of lifetime GHG reductions
- Over **$320,000** per year in utility cost savings to owners

How can my strata building get involved?

The pilot project wrapped up in 2019, and the lessons learned are informing the *Climate 2050 Buildings Roadmap*, which will include actions needed to reduce regional GHG emissions.

Metro Vancouver is investigating how to scale up the pilot project so more stratas can benefit from the assistance of professional energy advisors.

Learn more at www.stratasenergyadvisor.ca.

A 1974 10-storey building installed weather stripping in common areas and all units: **annual cost savings of over $700** and **annual GHG savings of 2.5 tonnes**

A 1989 3-story building replaced a standard efficiency domestic hot water boiler with a high efficiency condensing boiler: **annual cost savings of almost $2700** and annual GHG savings of 7.6 tonnes

Warming Up to Heat Pumps

The largest source of greenhouse gas emissions in the buildings sector comes from existing residential buildings. Roughly two-thirds of the buildings that are here today will still be here in 2050, when the Metro Vancouver region is aiming to reach carbon neutrality. Most of these homes burn natural gas for space or water heating, contributing to greenhouse gas emissions that are putting our planet in peril.

One climate-friendly solution that's becoming more popular among BC residents is installing an electric heat pump. Heat pumps can heat and cool your home using a fraction of the energy of other systems.

How does a heat pump work?

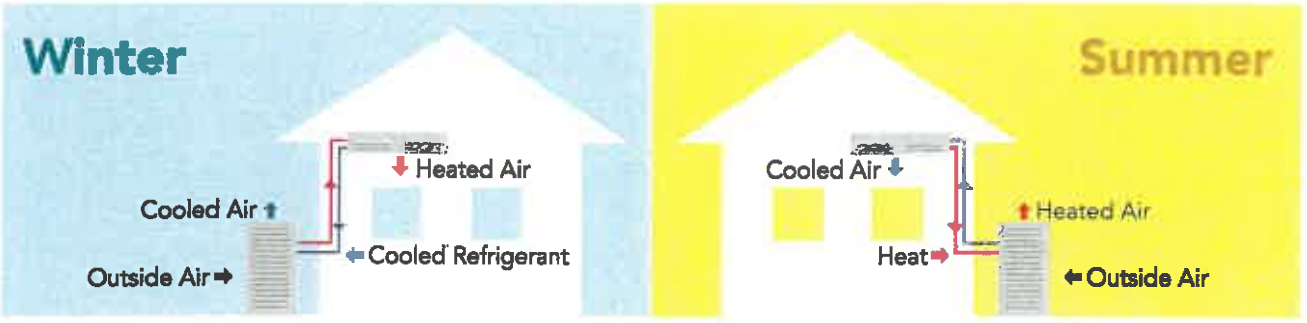
A heat pump works similarly to a refrigerator or air conditioner. In the winter, a heat pump extracts heat from the outside air or ground and brings it into your home. In the summer, it pulls heat from inside your home and moves it outside. By using refrigerants to help move the heat, heat pumps are by far the most energy efficient technology available for space heating and cooling and hot water heating. Depending on outdoor air temperatures, heat pumps can be up to 300-500% efficient. In contrast, electric baseboard heaters are typically 100% efficient, and a high performance natural gas furnace is about 95% efficient.

There are many different types of heat pump systems (for example, ducted vs. ductless systems), so there is bound to be one that is suitable for your home and local climate. Consult a professional contractor who has experience with different heat pump installations, and they will help you design the best system for you.

ADVANTAGES	DISADVANTAGES
Can both cool and heat a home	Higher upfront cost than a gas furnace
Highly energy-efficient	Efficiency reduced when it is below freezing outside
Low greenhouse gas emissions	Needs suitable space outside your home for the condenser unit

Learn more:

- Visit bchydro.com and search 'heat pump'
- BetterHomesBC.ca provides incentives, including heat pump rebates, for residents doing home renovations



Turning a Plan Into Action: How the *Clean Air Plan* Will Improve Air Quality and Reduce Greenhouse Gases

Metro Vancouver's residents generally experience good air quality. Climate change projections for the region for 2050 include longer, hotter and drier summers, warmer and wetter fall and winter seasons with decreased snowpack, and more extreme weather events, which can compromise public health and the environment, including our region's good air quality.

What is the *Clean Air Plan*?

Metro Vancouver, together with its member jurisdictions, has been taking action on air quality and greenhouse gas (GHG) emissions for decades. The *Clean Air Plan* was born out of a need to accelerate these actions to reduce our impacts on global climate change and to protect our health and the environment. Developed over the past two years with

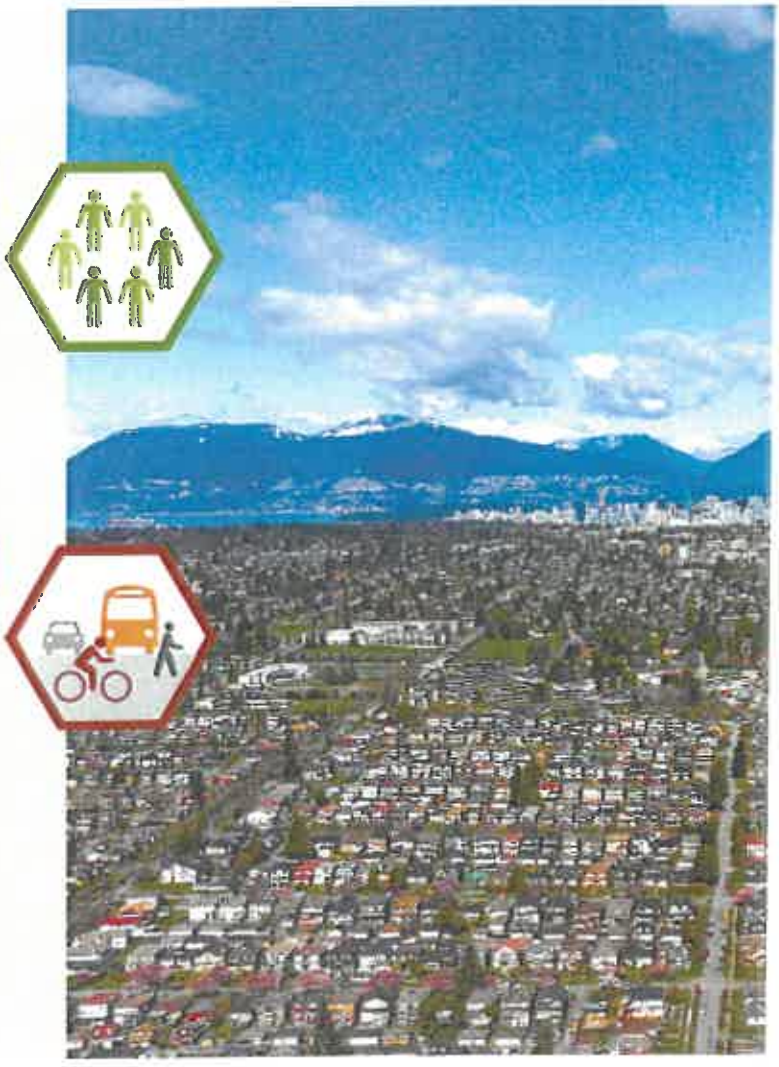
Summary of Actions

Equity

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

Transportation

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



input from residents, governments and stakeholders, the *Clean Air Plan* is Metro Vancouver's latest air quality and GHG management plan. It identifies how the Metro Vancouver region can improve air quality and reduce GHG emissions within the region over the next 10 years.

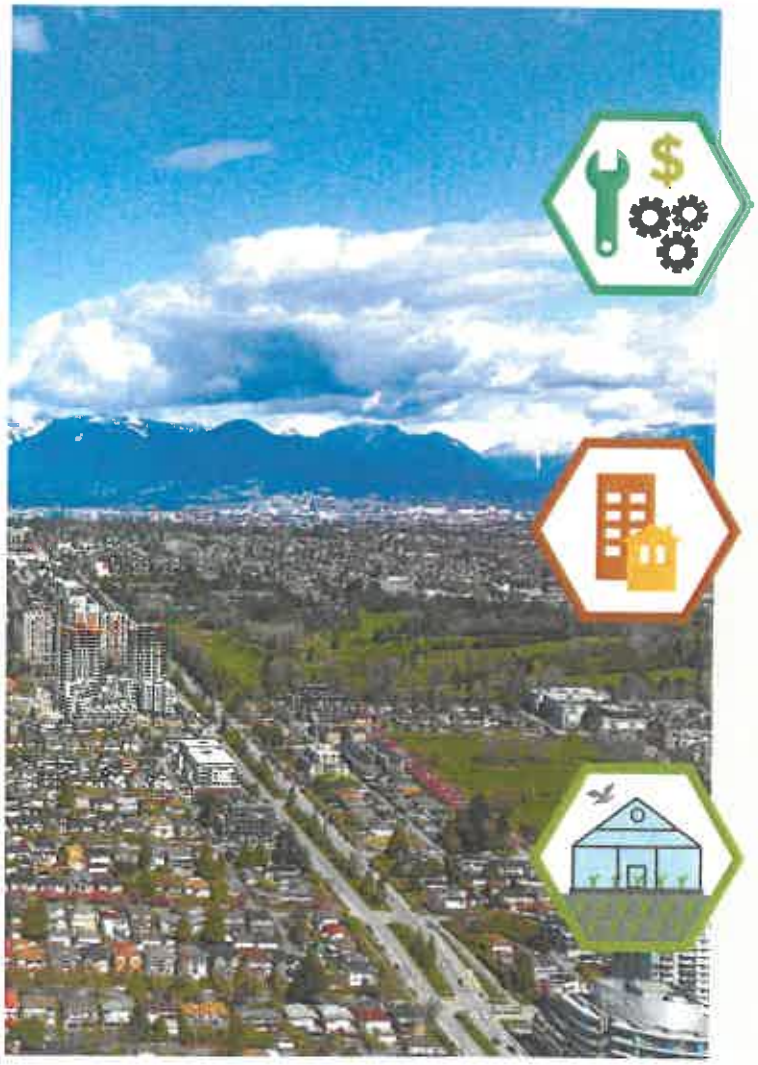
The *Clean Air Plan* complements *Climate 2050*, Metro Vancouver's overarching long-term strategy that will guide our region's policies and collective actions to transition to a carbon neutral and resilient region over the next 30 years. *Climate 2050* and the *Clean Air Plan* are tightly integrated, as GHGs and air contaminants can come from the same sources. The *Clean Air Plan* focuses on actions that reduce both GHGs and air pollutants.

If all the actions in the *Clean Air Plan* are successfully implemented:

- Social health benefits of up to $1 billion
- GHG emissions reduced by approximately 2 million tonnes by 2030

Next steps

The *Clean Air Plan* will be reviewed by the Metro Vancouver Board in 2021. Once adopted, it will drive new bold actions to improve air quality and reduce GHG emissions.



Industry & Business

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

Buildings

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

Agriculture

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

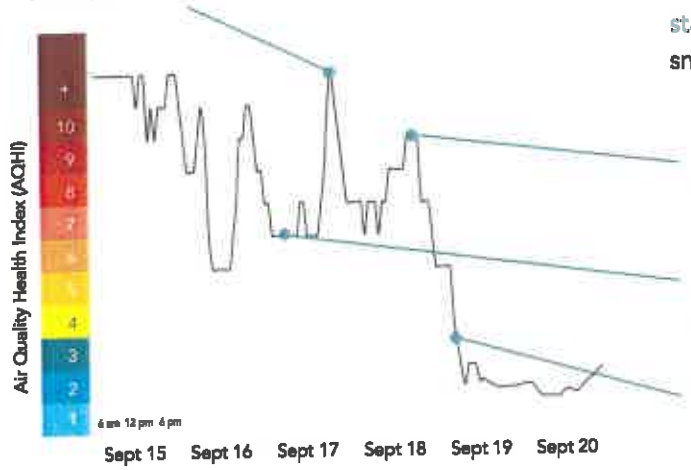
How the Air Quality Health Index Can Protect You

Metro Vancouver issues air quality advisories to inform residents about degraded air quality and what they can do to protect their health. An air quality advisory may be in effect for an entire day or longer, but conditions can change hour by hour. Here's how you can use the Air Quality Health Index (AQHI) to understand the health risk at any time.

The AQHI is a Canadian health index designed to help people understand how air quality can affect their health, and how they can protect themselves when air quality is poor. It uses a scale of 1-10+ to indicate potential health risk and to recommend actions for reducing risk.

During wildfire events, smoke conditions can change quickly. The AQHI is available for six different areas in our airshed and is updated every hour to reflect current air quality conditions. For example, the graph below shows AQHI data from an air quality advisory in Metro Vancouver in September 2020. Although the advisory was in effect from September 8 to 18, the AQHI fluctuated during that time and there were short windows of cleaner air.

Hourly changes to the AQHI during an air quality advisory



I'm a healthy 31-year-old – should I bike to the store?
Reduce or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation.

I'm a soccer coach – should I cancel practice tonight?*
Reduce or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.

I have asthma – is it safe to go for a run?*
Consider reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.

I'm an older adult – can I go on my hiking group?*
Enjoy your usual outdoor activities.

* People with heart or breathing problems are at greater risk. Follow your doctor's usual advice about exercising and managing your condition.

Air Quality Health Index (AQHI)

- It is the recommended tool for Metro Vancouver residents to understand health risk in the region.
- In BC it categorizes health risk based on the higher of:
  - The combined levels of ground-level ozone (O_3), nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$).
  - $PM_{2.5}$ level during smoky conditions.
- An AQHI forecast is also available.

Where you find your index matters

Some websites or apps run by private companies display a health index, but these indices might not be based on the best scientific evidence and might not reflect typical air contaminant concentrations. For example, they could be based on someone's private air monitor inside their home beside their smoky stove. You certainly wouldn't want to use this data to inform your trip to the park with the kids.

Always use reputable sites to check your community's AQHI, such as www.Airmap.ca for Metro Vancouver, www.env.gov.bc.ca/epd/bcairquality/readings/find-stations-map.html for the rest of BC, or the national AQHI smartphone app open.alberta.ca/interact/aqhi-canada.

Air Quality in 2020

In 2020, the BC Centre for Disease Control noted that degraded air quality can increase susceptibility to COVID-19, as well as the severity of the infection, leading to further concerns for the health of Metro Vancouver residents during the summer wildfire season.

Metro Vancouver generally has good air quality, and air pollutant concentrations remained at levels that were better than air quality objectives for most of the summer. However, in September 2020, the region was under an air quality advisory for eleven days due to wildfire smoke from the west coast of the United States. A rare weather pattern with high winds and dry conditions rapidly increased the number and size of wildfires, leading to rapid smoke production which blanketed the Metro Vancouver region.

During two hot periods in 2020, the weather patterns and urban emissions increased the formation of ground-level ozone, leading to two ozone air quality advisories, one in late July and one in mid-August.

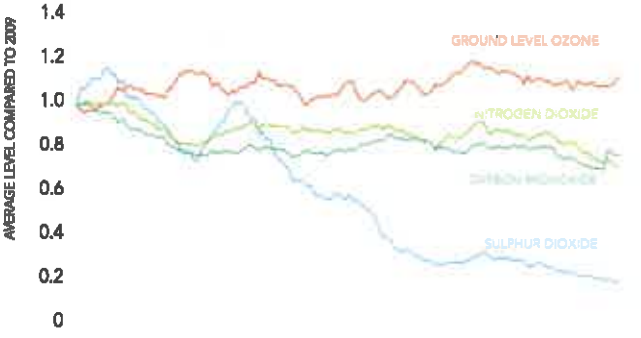
Air Quality Trends

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. High concentrations of fine particulate matter in 2020 reflect the impacts of wildfire smoke in the region in September. Most gas phase air 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 increased slightly 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 better now than in the 1980s and early 1990s.

Trend in fine particulate matter

Trends in gas phase air pollutants



Air Quality in 2020 - Data Summary

FINE PARTICULATE MATTER IN 2020

*Based on incomplete data

In 2020, fine particulate matter ($PM_{2.5}$) levels throughout the region were worse than the Canadian Ambient Air Quality Standard (calculated using data from 2018, 2019, and 2020) at more than half of monitoring stations, as shown on the map. This was a result of short term high concentrations in 2018 and 2020 largely due to smoke from out-of-region wildfires. Measurements averaged over 2020 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 2020. Widespread exceedances occurred in September when the region was under an air quality advisory due to wildfire smoke. Exceedances of the short term objective also occurred in March, April, October and November, likely when the region was under an air quality advisory due to open-air burning and residential wood burning.

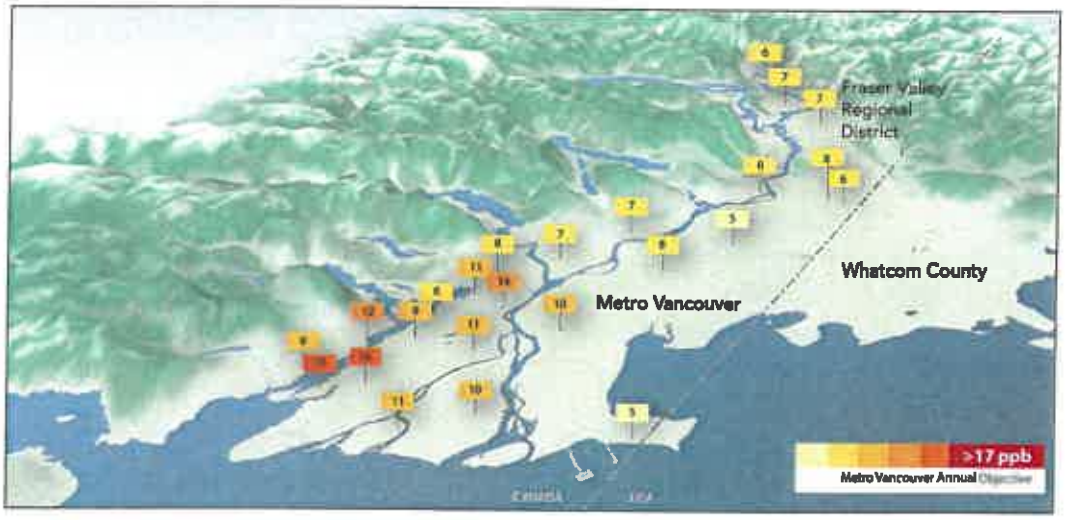
GROUND-LEVEL OZONE IN 2020

Ground-level ozone (O_3) forms when nitrogen oxides and volatile organic compounds react in the air in the presence of sunlight. The map above shows how measurements for 2020 compared to Metro Vancouver's 1-hour air quality objective. In 2020, elevated levels of O_3 were experienced in July and August with Chilliwack, Pitt Meadows, Mission and Abbotsford-Airport exceeding Metro Vancouver's 1-hour O_3 objective. These exceedances occurred briefly during hot, sunny weather.

SULPHUR DIOXIDE IN 2020

Average concentrations of sulphur dioxide for 2020 are shown on the map with all stations well below Metro Vancouver's annual objective of 5 ppb. Peak levels were better than Metro Vancouver's 1-hour objective of 70 ppb at all stations in 2020.

NITROGEN DIOXIDE IN 2020



Nitrogen dioxide (NO_2) concentrations were better than Metro Vancouver's long-term objective (17 ppb) at all monitoring stations, as shown on the map. The highest average NO_2 concentrations were measured in highly urbanized areas near busy roads. More than half of the regional emissions of nitrogen oxides (which includes NO_2) come from transportation sources. In 2020, NO_2 concentrations were better than Metro Vancouver's short-term objective (60 ppb) at all monitoring stations except for North Vancouver-Second Narrows which met the objective. Short-term measurements of NO_2 at North Vancouver-Second Narrows were influenced by local construction activity in 2020.

Improving Metro Vancouver's Air Monitoring Network

Metro Vancouver regularly conducts an in-depth review of its ambient air quality monitoring network to ensure that the network continues to meet the needs of the region and to plan for future enhancement. One major outcome of the review is identifying emerging air quality technology and trends in the region.

Over the last few years, residents, researchers, and government agencies are becoming more interested in the use of small sensors, which have been the subject of Metro Vancouver's Air Aware project (see box). One part of the network review completed in 2021 examined the possible integration of these sensors into Metro Vancouver's regulatory monitoring network and how these inexpensive yet potentially less accurate sensors could supplement our understanding of local and regional air quality.

The 2021 network review also looked at the previous review's recommendations and found that most of the recommendations from the previous review were accomplished, which included more ground level ozone monitoring and developing 'Super Sites'. Super Sites measure more air contaminants than other stations. They monitor all the criteria air contaminants including sulphur oxides, nitrogen oxides, particulate matter, carbon monoxide, ammonia, ground level ozone, and volatile organic compounds; the chemical composition of particulate matter; black carbon; and visual air quality. This review has also demonstrated that Metro Vancouver's network is one of the more comprehensive regional monitoring networks in the world.

The 2021 network review made 13 recommendations, including:

- **Improve the spatial coverage of the current network**, specifically for areas south of the Fraser River, agricultural land in the Fraser Valley Regional District and areas that are not populated or have a very small population to better understand the impacts of urban emissions on the environment.
- **Integrate small air sensors into the monitoring network.** The current permanent network is comprised of sophisticated monitoring equipment to accurately measure air pollutants. With the increase in inexpensive yet less accurate small sensors, there is value in using these to supplement the spatial coverage of the permanent network. Small sensors can also support community-level monitoring and serve as educational and engagement tools. Other jurisdictions such as the US Environmental Protection Agency are exploring how to integrate measurements from sensors into their broader monitoring networks. For example, a pilot project demonstrated that during a wildfire event, sensors can show localized air quality data that is not captured by some existing air monitoring networks.

- **Begin continuous monitoring of carbon dioxide** (CO_2) at an existing air monitoring station. This will provide valuable information on local CO_2 concentrations and will be helpful in tracking changes as Metro Vancouver and other organizations in the region continue to implement policies to drive down greenhouse gas emissions.

Understanding air sensors

Find out how to choose and use the right sensor for your air monitoring needs, how sensors differ from the equipment used at government air monitoring stations, how to interpret the data, and more on Metro Vancouver's Air Aware website.

Visit metrovancouver.org and search 'Air Aware'.

Network News

An in-depth network review is completed regularly, but Metro Vancouver's air monitoring network evolves outside of these formal reviews, and is regularly upgraded to respond to new needs and technologies.

Air monitoring at Vancouver's MacLean Park: Metro Vancouver, supported by the Vancouver Fraser Port Authority, will be installing a new air monitor at MacLean Park in Vancouver's Strathcona neighbourhood. This compact pole-mounted station will allow air to be monitored in a location that didn't have enough space for a typical monitoring station, and will measure some of the same air pollutants as its larger counterparts, such as fine particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2) and sulfur dioxide (SO_2).

Equipment upgrades: Tiny particles in the air, known as particulate matter (PM), can have different health impacts depending on their size and composition. In 2013, Metro Vancouver upgraded its PM monitoring equipment to measure some PM that the previous equipment could not. Nearly 10 years later, Metro Vancouver is evaluating the latest technology for another upgrade within three years to further improve PM measurements.

Equipment wasn't the only change to the network: in 2020, the COVID-19 pandemic also required air quality technicians to change how they work. Deemed an essential service, the technicians followed provincial health guidance and comprehensive safety protocols, such as physical distancing and proper sanitization, when maintaining air monitoring stations to ensure the network continued to operate as usual. See page 16 for how the pandemic response affected regional air quality.

Where's MAMU?

MAMU, Metro Vancouver's Mobile Air Monitoring Unit, is used for specialized studies in locations that are not served by a permanent monitoring station, or to measure a specific pollutant. In April 2021, MAMU completed its 1-year deployment on Musqueam's Indian Reserve No. 2 lands in Vancouver. This monitoring will provide information on air quality in the Musqueam community and support Metro Vancouver's Iona Island Wastewater Treatment Plant Biosolids Dewatering Facility project.

COVID-19 & Air Quality: Learnings from an Involuntary Experiment

When the COVID-19 pandemic hit Metro Vancouver in March 2020, life in the region and around the world changed significantly. Many businesses either closed or shifted to work from home models. This drastic change in lifestyle was reflected in the region's air quality.

Air quality impacts

During March and April 2020, Metro Vancouver's near-road air quality monitoring station at Clark Drive and 11th Avenue in Vancouver recorded more than a 30% drop in traffic when compared to the same months in 2019. Other major traffic routes across the region saw similar reductions. Less traffic and fewer businesses operating meant less transportation-related emissions, such as nitrogen dioxide (NO_2), especially in dense urban areas.

However, not all air contaminants decreased in Metro Vancouver. Other contaminants associated with combustion, such as carbon monoxide (CO), saw some reductions but not as strongly as NO_2. Fine particulate matter even appeared to increase early on in the pandemic in residential and rural areas, especially in the evening hours. This was likely because of increased residential wood burning since more people were home. Fine particulate matter levels in these areas returned closer to previous years' concentrations once the weather warmed up and less wood burning occurred.

Some pandemic restrictions were relaxed by the Provincial Health Officer in late spring and early summer. Traffic data collected at Clark Drive also reflected these changes: after the significant reduction in traffic in March, April and May, a modest increase has been observed, but total traffic is still almost 15% below the same time period in 2019.

COVID-19 or the weather?

Determining the specific impact of COVID-19 on Metro Vancouver's regional air quality is very difficult even though the overwhelming evidence shows it improved. Air quality is influenced by many factors, such as emissions and the weather. For example, during the first week of major restrictions in BC, abnormal weather conditions trapped pollution close to the ground. Even with significantly less emissions in the region, these weather conditions led to higher than normal air contaminant concentrations. Over time, these 'blips' were smoothed out and a general trend of lower than usual air contaminant concentrations emerged. This illustrates how short-term weather patterns can temporarily influence air quality.

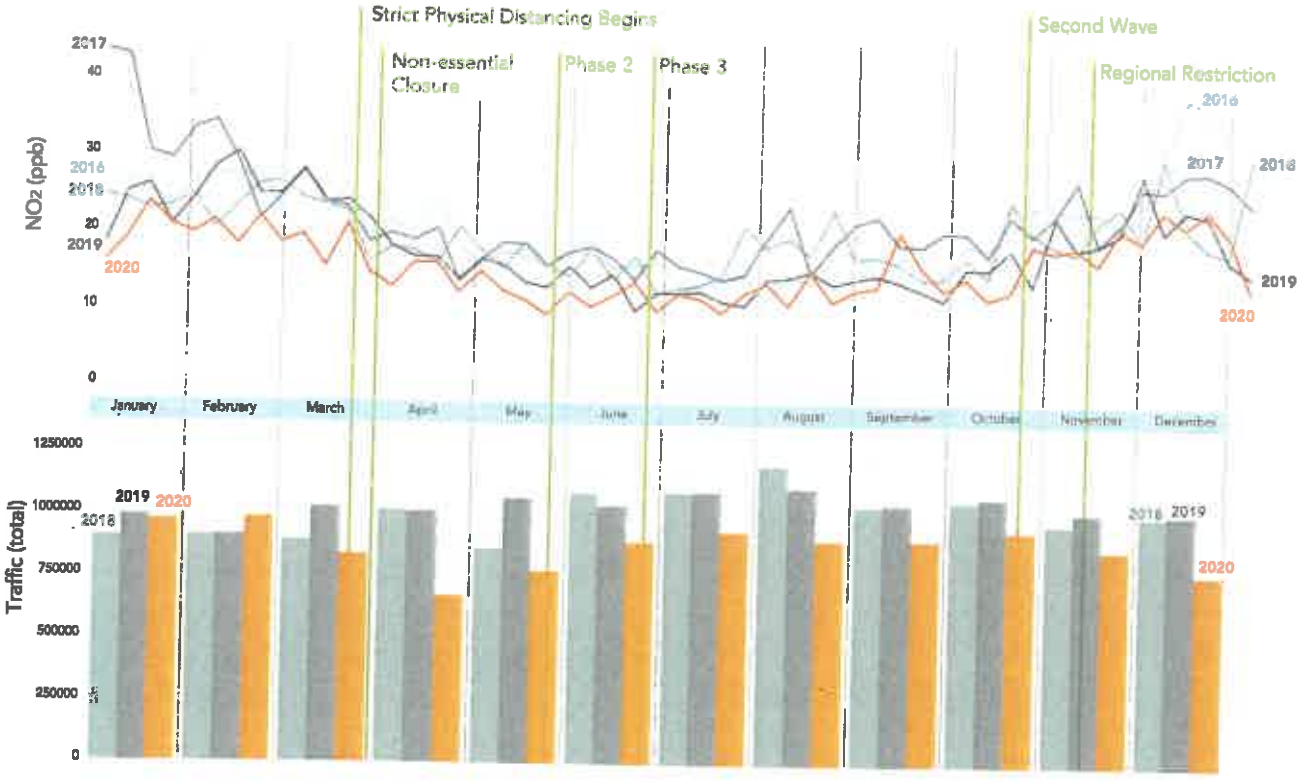
Protecting air quality, health, and the economy

A study[1] showed that in Europe, improvements in air quality may have averted over 2000 premature deaths in the short term and possibly over 20,000 deaths in the longer term. This study focused on reductions in fine particulate matter, which were more pronounced than what was experienced in the Metro Vancouver region, given our comparatively clean baseline. Nevertheless, the European study highlights how even small reductions in air quality concentrations can translate to significant improvements in health outcomes.

Metro Vancouver's air quality is typically very good but COVID-19 has provided us with an involuntary experiment which demonstrates how large reductions in emissions across the region could help to improve air quality. Transportation related activities accounted for nearly 30% of all NO_2 and greenhouse gas (GHG) emissions in Metro Vancouver in 2015. Work on Metro Vancouver's *Clean Air Plan* and *Climate 2050* strategy seeks to match or exceed the level of reductions observed during the pandemic, and are critical to setting a path for clean air and a carbon neutral region.

However, it is important to acknowledge the significant impact COVID-19 has had on the economy. Future policy development can use lessons from this pandemic but should balance improving air quality with maintaining a healthy economy.

Monthly average nitrogen dioxide (NO_2) concentrations by year at Vancouver's Clark Drive air monitoring station.



Monthly traffic counts by year at Vancouver's Clark Drive station.

1 Giani, P., Castruccio, S., Anav, A., Howard, D., Hu, W., & Crippa, P. (2020). Short-term and long-term health impacts of air pollution reductions from COVID-19 lockdowns in China and Europe: a modelling study. The Lancet Planetary Health, 4(10), e474-e482. doi:10.1016/S2542-5196(20)30224-2

Reducing Smoke from Residential Indoor Wood Burning

In 2020, Metro Vancouver introduced a new bylaw on residential indoor wood burning that aims to reduce the impacts of residential wood smoke on people's health and the environment. Wood smoke contains tiny particles that can penetrate deep into our lungs. The use of wood burning appliances, such as fireplaces and wood stoves in homes, is the main source of emissions of these particles in the region.

Under the bylaw, anyone using a residential indoor wood burning appliance must use best burning practices to minimize wood smoke emissions.

Use only clean, seasoned wood

Don't let your fire smoulder

Don't burn garbage, plastic or treated wood

Inspect and maintain your appliance

Burn small + hot fires

Additional requirements come into effect in stages.

From May 2021, residential indoor wood burning is prohibited from May 15 to September 15 each year, unless it is a home's sole source of heat, is in an off-grid home located outside the Urban Containment Boundary, or there is an emergency such as a power outage.

Starting in September 2022, users of residential indoor wood burning appliances must submit a declaration of compliance with best burning practices. Appliances inside the Urban Containment Boundary must also be registered. Only appliances that can meet emissions criteria, provide the sole source of heat, or use only manufactured firelogs can be registered.

After September 2025, the use of unregistered appliances inside the Urban Containment Boundary will be prohibited unless they are used in low-income households, with the exception of in Lions Bay, where the prohibition will take effect in 2032.

The new bylaw does not prohibit residential indoor wood burning during an emergency, such as a power outage, and does not require the removal of wood burning appliances.

For more information about the bylaw, or to watch the video about the bylaw, go to metrovancouver.org and search 'residential wood burning'.

Starting with Education:

Metro Vancouver's Bylaw Compliance Continuum

Officers in Metro Vancouver's Environmental Regulation and Enforcement Division assess and promote compliance with Metro Vancouver permits and bylaws. Officers have a variety of compliance tools. For each situation, officers consider the public interest when deciding which tool will be the most effective, efficient, timely, and fair.

These tools fall under a 'compliance continuum' with proactive education at one end, and punitive ticketing or prosecution at the other.

The implementation of new bylaws, or changes to bylaws, begins with education. Bylaws are often phased in so outreach can occur before bylaw requirements take effect. In these early stages, education is the most effective and efficient means of achieving compliance.

As an example, Metro Vancouver developed an outreach program for the new Residential Indoor Wood Burning Bylaw, adopted in 2020, so that residents would receive advanced notice of bylaw requirements coming into effect in May 2021.

Even when bylaw requirements are in effect, and unless a non-compliance is serious, officers may issue a warning instead of a ticket. A warning could be a verbal advisory or a notice of violation letter, with guidance on how to comply. Warnings can be highly effective, efficient and timely. They are also fair because a resident, up to this point, might truly not have been aware of or understood bylaw requirements.

If non-compliances continue and the resident has had enough time to address them, officers may issue a Notice of Bylaw Violation. If the non-compliance is significantly impacting others, officers may issue tickets or recommend prosecution not only to achieve compliance, but to also deter others from breaking the law.

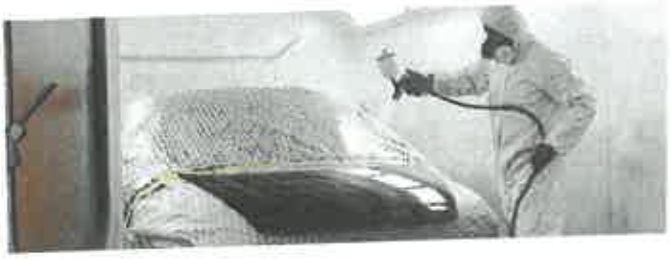
Metro Vancouver Officers use professional judgement to choose the most appropriate compliance tool that fits the seriousness of the non-compliance, results in the desired outcome, and is in the public interest.

New Requirements for Automotive Refinishing Facilities

Air contaminants from automotive refinishing facilities (autobody shops) can affect employee and public health. Using coatings and surface cleaners can release volatile organic compounds (VOCs), hazardous air pollutants, and particulate matter. Metro Vancouver's Automotive Refinishing Emission Regulation limits the release of air contaminants from these facilities.

In 2019, after consulting with the public, Metro Vancouver amended this regulation to further reduce emissions. Changes included:

- updating paint standards to meet national standards, and
- expanding the bylaw to include mobile refinishing operations and activities such as paint mixing, grinding, abrasive blasting and grease and oil removal.



In addition, starting in 2021, operators and technicians need to complete an environmental training course every two years. This new re-certification helps ensure anyone working in these facilities is aware of the regulatory requirements. Visit the British Columbia Institute of Technology (BCIT) Automotive Program website to learn more about their 'VOC – Clearing the Air' course.

For more information about the regulation, visit metrovancouver.org and search 'automotive refinishing facilities'.

Proposed Expansion of the Non-Road Diesel Engine Emission Regulation

Metro Vancouver's Non-Road Diesel Engine Emission Regulation aims to protect air quality and public health by reducing emissions from non-road diesel engines, such as construction and industrial equipment. The regulation encourages retiring or retrofitting older, higher-emitting engines.

Since the regulation was adopted in 2012:

296 higher-emitting engines were retired

88 retrofits were approved

Retirements have reduced diesel particulate matter emissions by more than 11 tonnes per year.

Metro Vancouver is looking to expand this regulation to further protect human health and the environment. Proposed changes include:

- Expanding current requirements to engines of other sizes and ages
- Restricting the use of older, higher-emitting engines around hospitals and care facilities
- Adding fees for other harmful emissions, such as nitrogen oxides

Learn more at metrovancouver.org and search 'non-road diesel engine proposed expansion'.

Reinventing the Emissions Inventory

Metro Vancouver is expanding its emissions inventory (EI) toolbox to build a more complete picture of the region's emissions. Every five years, Metro Vancouver compiles an inventory of air pollutant and greenhouse gas (GHG) emissions in the Lower Fraser Valley airshed. The last inventory was completed for 2015, and the 2020 EI is underway with some planned enhancements.

Annual Reporting of GHG Emissions

Metro Vancouver is speeding up its reporting of GHG emissions from a five-year schedule to annual GHG emissions reports, starting with 2019. Annual reporting will allow for more timely tracking of progress towards the region's emission reduction target of 45% below 2010 levels by 2030 and becoming carbon neutral by 2050. The annual report will include GHG emissions for the region and each of its member jurisdictions.

The first annual report will focus on transportation, buildings, and industry, which contribute more than 90% of the region's GHG emissions. These areas are also the subject of the first three *Climate 2050 Roadmaps* (see page 4 to learn more).

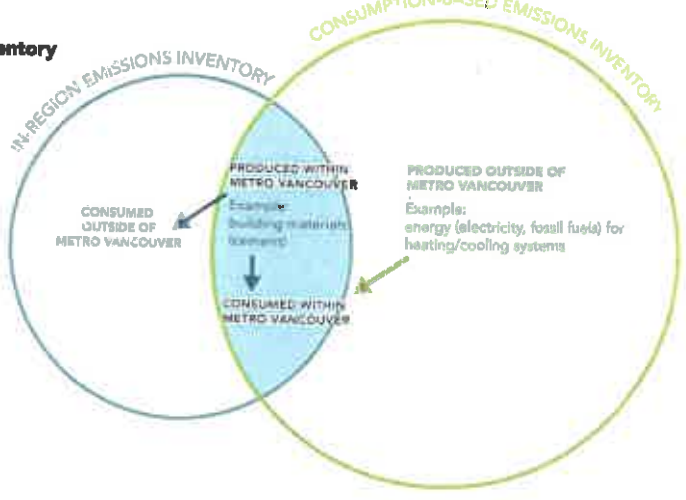
Consumption-Based Emissions Inventory

While our day-to-day activities, like driving and using a gas furnace, create GHG emissions in the region, we also create GHG emissions elsewhere when the products and services we use are created, shipped, or disposed. A consumption-based emissions inventory (CBEI) includes the GHG emissions generated from the production, transport, use and disposal of goods or services that we consume in the region, even if those emissions occur outside of the region.

Metro Vancouver is developing a CBEI to complement our five-year 'in-region' EI, which includes only GHG emissions that occur within the region. The CBEI will help us understand the global emissions resulting from our local consumption habits, and inform policies and processes that will support implementation of *Climate 2050* and the *Clean Air Plan*.

GHG emissions included in an in-region emissions inventory vs. a consumption-based emissions inventory

Example: GHG emissions from goods and services for a building



metrovancouver
SERVICES AND SOLUTIONS FOR A LIVABLE REGION

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**