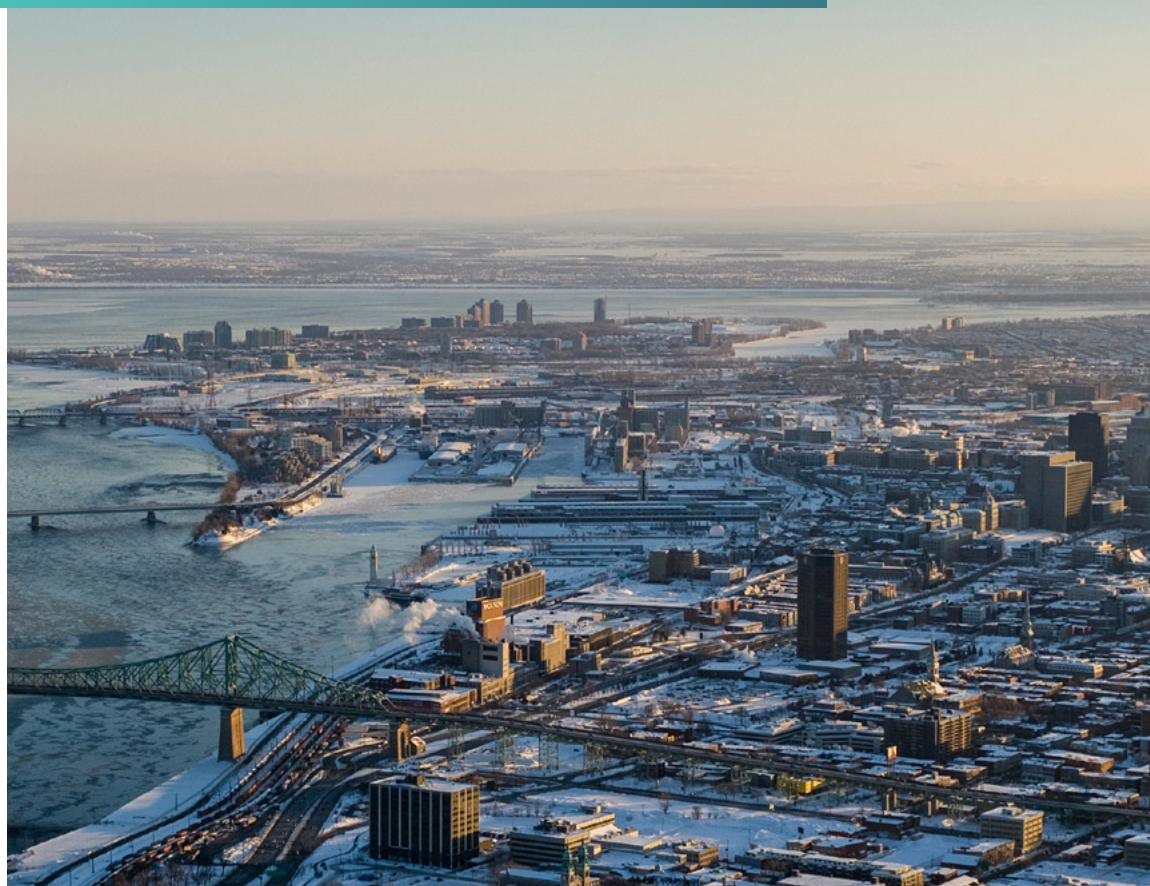


AIR QUALITY IN MONTRÉAL

- 3**
Air pollution
and health
- 4**
Air pollutants
- 6**
The health impacts
of air pollution
- 10**
Monitoring
- 12**
Poor air quality
days and smog
- 13**
Observations
and commitments





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AIR POLLUTION AND HEALTH

Air pollution is a public health issue throughout the world. Much progress has been achieved in Canada. However, it remains an issue, particularly in large cities such as Montréal.

This document is intended to inform the population of Montréal about the most important air pollutants, their origin and their impact on the Montréal population.

It was produced by the Direction régionale de santé publique de Montréal (DRSP), the city of Montréal and the Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs (MELCCFP).



AIR POLLUTANTS

Many of the pollutants present in the ambient air originate from the burning of organic materials such as coal, oil and natural gas. The sources of air pollution vary according to their location or the situation. The main sources of pollution are: transportation, industries, heating and dwellings.

Many pollutants are also naturally present in the air, as is the case with certain metals. These are designated as *background noise*.

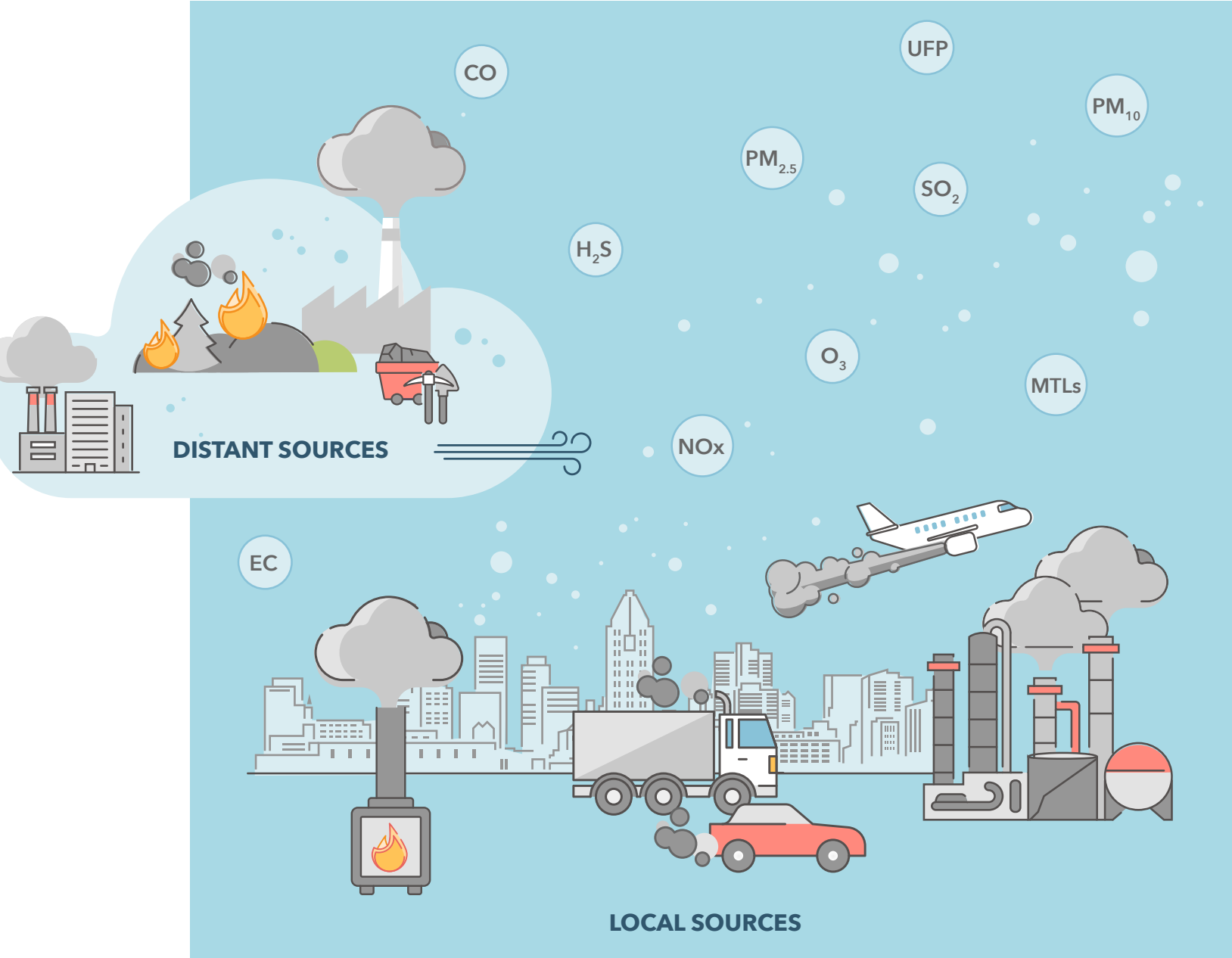
Air quality is also influenced by the climate and weather conditions (e.g. the wind, rain showers and humidity). Pollutants that travel long distances can be found in Montréal.

The most important pollutants are:

- particles $<10\ \mu\text{m}$ in diameter (PM_{10}),
fine particles $<2.5\ \mu\text{m}$ in diameter ($\text{PM}_{2.5}$),
ultrafine particles $<0.1\ \mu\text{m}$ in diameter (UFP);
- nitrogen oxides (NO_x);
- carbon monoxide (CO);
- ozone (O_3);
- sulphur dioxide (SO_2);
- hydrogen sulphide (H_2S);
- elemental carbon (EC);
- metals (MTLs) (e.g. cadmium, barium, iron and aluminum).

See Figure 1 for the various emission sources of these pollutants. For further information about these pollutants, please visit [MELCCFP](#).

Figure 1. Diagram illustrating local and distant sources of pollutants.





THE HEALTH IMPACTS OF AIR POLLUTION

Poor air quality has significant impacts on human health.

In Montréal, the measured levels of pollutants remain low and demonstrate that their impacts on human health (individual risk) remain limited. However, although the individual risk is low, a significant number of people are exposed to air pollutants on the island of Montréal, thus resulting in health problems among the population (population risk). In order to mitigate these risks, it's important to act in such a way that the population is exposed to the lowest pollutant levels possible.

What the studies realized in Montréal have to say?

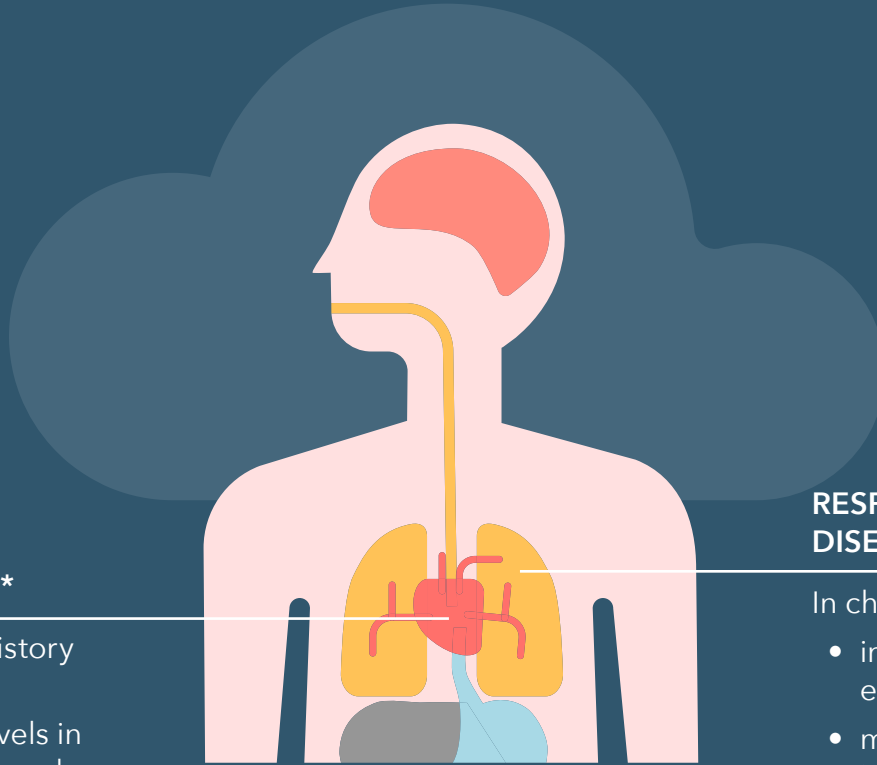
The studies demonstrate that the most vulnerable persons to air pollution are:

- children;
- the elderly;
- those persons suffering from chronic health problems (e.g. hypertension, diabetes, asthma).

The studies also estimate the number of deaths that may be associated with air pollution. For Montréal, the annual number of premature deaths related to air pollution is very low. Their number is estimated at 1,192 (0.0006 %) for every 2 million residents.

The various pollutants are associated with certain health problems

SHORT TERM IMPACTS



HEART PROBLEMS*

In adults having a history of heart failure:

- lower oxygen levels in the blood, increased heart rate, high blood pressure.

Pollutants responsible: fine particles (PM_{2.5}), ultrafine particles and elemental carbon.*

SYSTEMIC DISORDERS

Autoimmune diseases (systemic lupus erythematosus)

Pollutants responsible: fine particles (PM_{2.5}).

DEATH

Possible deaths among the elderly resulting from increased pollutant levels

Pollutants responsible: PM_{2.5}, O₃, NO₂, SO₂.

RESPIRATORY DISEASES

In children:

- increase in asthma episodes;
- more acute asthma in children suffering from asthma.

Pollutants responsible: SO₂ and certain metals such as barium, iron and aluminum found in fine particles (PM_{2.5}).

*Studies conducted at the international level show a relation between fine particles (PM_{2.5}) and certain diseases involving the heart and blood vessels (e.g. heart attacks, cerebrovascular accidents (strokes), heart failures, venous blood clots, arrhythmia).

Air pollutants, exceeding the background noise, increase the number of hospitalizations and deaths. Although these studies were not realized in Montréal, the same health issues are likely to be observed within the agglomeration as a result of similar quantities of air pollutants recorded in these studies.

LONG TERM IMPACTS

DEGENERATIVE DISORDERS

Such as dementia

Pollutants responsible:
particles (PM_{2.5})

CANCERS

Lung cancer

Pollutants responsible:
certain metals such as arsenic and cadmium found in fine particles (PM_{2.5}).

Other cancers among which breast cancer and prostate cancer

Pollutant responsible:
NO₂

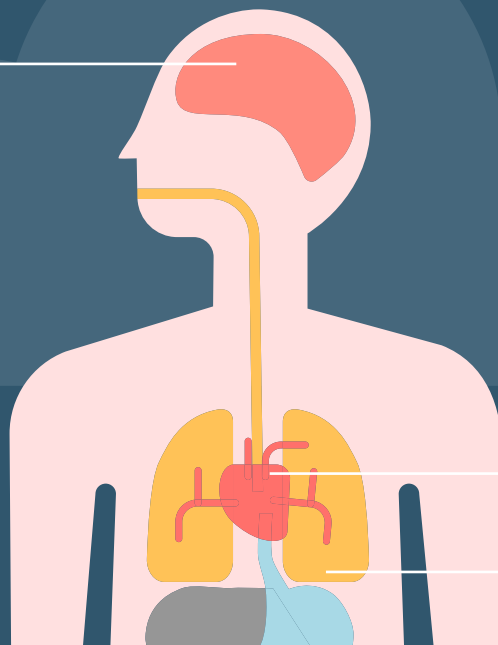
OTHER HEALTH IMPACTS

Heavy metals such as cadmium, lead and mercury can cause adverse health effects. For instance, kidney, bone and nervous system problems as well as certain cancers have been observed.

Few studies allow us to conclude that ultrafine particles adversely affect human health.

However, ultrafine particles are worrisome given that they can be found in the blood and organs.

Science does not allow us to conclude that ultrafine particles adversely affect human health, except for certain problems that affect the heart and blood vessels.



HEART PROBLEMS*

RESPIRATORY DISEASES

In children:

- development of asthma.

Pollutants responsible:
NO₂, fine particles (PM_{2.5}) and ozone (O₃).

In children already suffering from asthma:

- unusually frequent symptoms even when treated (poorly controlled asthma).

Pollutant responsible:
SO₂

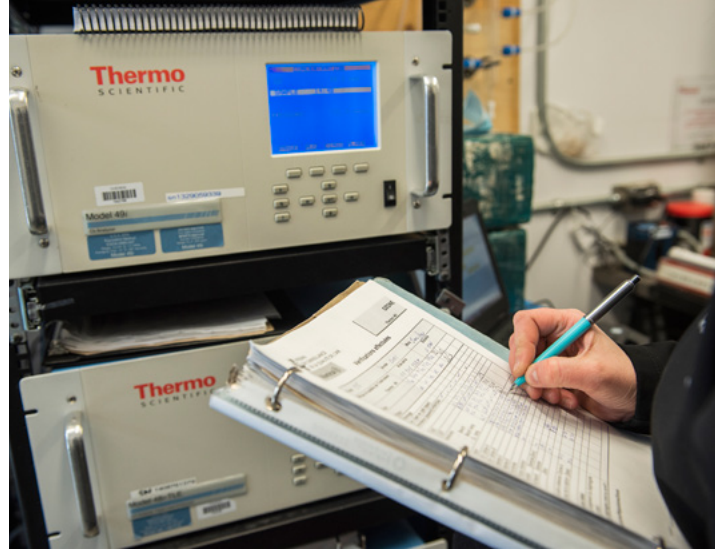
*Studies at the international level show that a long exposure to fine particles (PM_{2.5}) increases the risks of developing diseases involving the heart and blood vessels (e.g. hypertension, diabetes, cholesterol, atherosclerosis). This exposure can also result in an increase in fatalities. These effects would be observable in Montréal depending on the levels measured.



Co-exposure

When assessing the effects on human health, it's important to consider co-exposure. Co-exposure refers to being in contact with many pollutants simultaneously or successively. People are also exposed to indoor air pollutants and to other risk factors such as the lack of green spaces, environmental noise or lifestyle habits (e.g. smoking). Contact with all of these factors can also prove dangerous for the health of individuals. This is the case for people living in the poorest neighborhoods of Montréal who are often exposed to these various factors.





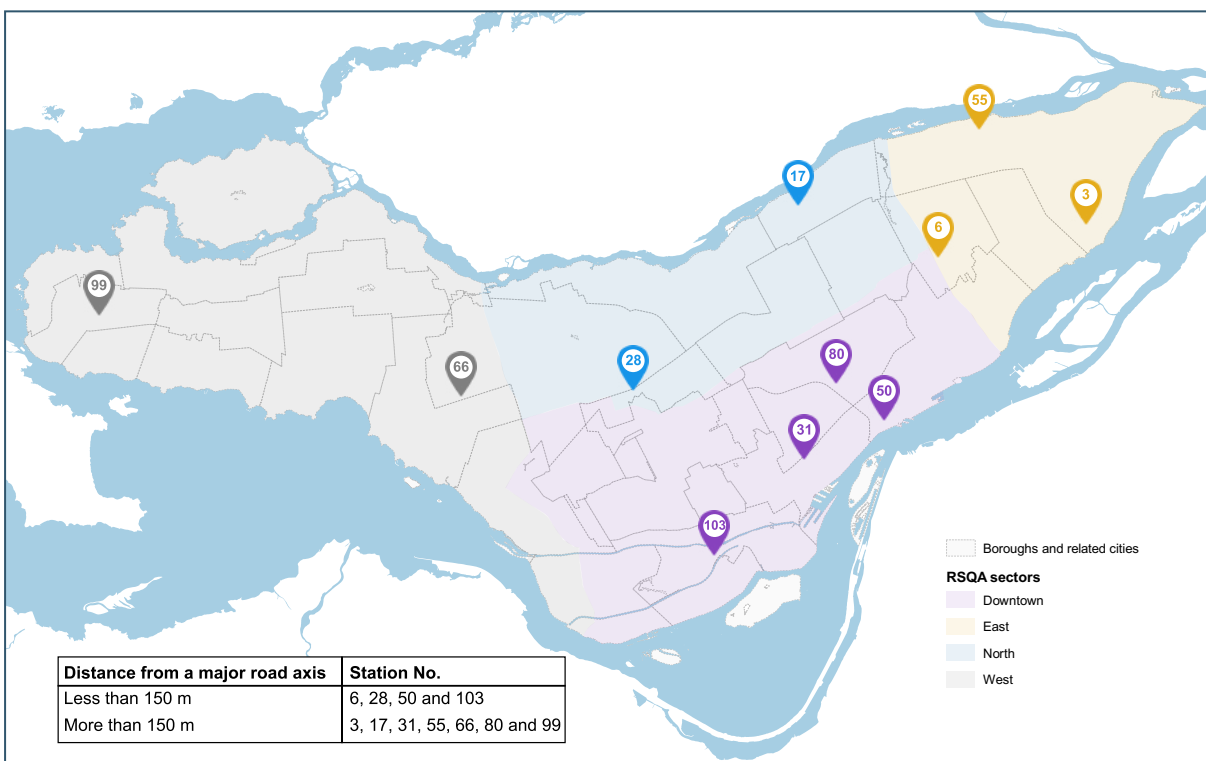
MONITORING

On the island of Montréal, there are many sampling stations operated by the [Réseau de surveillance de la qualité de l'air](#) (RSQA). These stations are intended to monitor the temporal evolution of air quality. They continuously measure the concentrations of various pollutants, such as fine particles $PM_{2.5}$, NO_x , SO_2 , CO , H_2S and O_3 . They are also fully compliant with the general guidelines of the National Air Pollution Surveillance (NAPS) program of Environment and Climate Change Canada (ECCC).

New instruments allow for a regular improvement of the monitoring system. For example, the monitoring of ultrafine particles and of elemental carbon has recently been added. A nomadic station was also commissioned at the end of 2022. As its name suggests, this station changes location at the end of each project, usually of a duration of 12 to 24 months.

The data collected by the RSQA and its annual reports are available at <https://donnees.Montreal.ca/dataset/rsqa-bilans-annuels-qualite-air>

Figure 2. Distribution of the 11 permanent monitoring stations on the island of Montréal.



The World Health Organization (WHO) updated its [Global Air Quality Guidelines](#) in 2021. These guidelines set the ultimate levels to attain in order to protect the health of populations. They refer to the weakest effects observed on human health. Their purpose is to assist governments and companies mitigate air pollution and its adverse effects. In 2019, almost all of the world’s population (99%) lived in locations where these guidelines were not respected.

It’s the Canadian Council of Ministers of the Environment (CCME) that sets the Canadian Ambient Air Quality Standards (CAAQS). According to the report on air quality, these standards are complied with in Montréal, although they are not applicable to the territory given that they overlap with the local regulations.

The monitoring conducted by the RSQA since 2000 allows for the following observations:

- The average annual concentrations of fine particles (PM_{2.5}) and nitrogen dioxide (NO₂) are generally trending downwards over time. They remain more significant near roadways (less than 150 metres). A decline in fine particles (PM_{2.5}) is also observed, especially since the enactment of the *By-law concerning solid-fuel-burning devices and fireplaces* in 2015 (measures implemented in 2018).
- The average annual concentrations of sulphur dioxide (SO₂) are also decreasing. While they may be a little higher in certain industrial sectors, they remain below the WHO guideline levels.
- The levels of ozone (O₃) measured in Montréal respect the levels recommended by the WHO.
- Carbon monoxide (CO) does not generally affect specific sectors, except for exceptional events.
- Air quality is pretty well consistent throughout the island, no sector showing a poor air quality in particular.

POOR AIR QUALITY DAYS AND SMOG

Since 2014, there have been far fewer [poor air quality days](#), especially in 2020, due to the pandemic resulting in a slowdown in activities and fewer commutes by car.

When 75% of Montréal's monitoring stations satisfy the [criteria for a poor air quality day](#), that day is characterized as a smog day.

What is a poor air quality day?

In accordance with established criteria, a day is deemed poor in terms of air quality as soon as fine particle ($PM_{2.5}$) concentrations exceed $35 \mu\text{g}/\text{m}^3$ during at least 3 hours for a given station. For a poor air quality day to be characterized as a smog day, concentrations of $PM_{2.5}$ exceeding $35 \mu\text{g}/\text{m}^3$ must be measured during at least 3 hours over more than 75% of the Montréal agglomeration territory. During a smog day, concentrations of fine particulate matter generally remain high for 24 hours and sometimes longer. (Source : city of Montréal)

Fine particles ($PM_{2.5}$) are mainly responsible for the presence of [smog](#). These particles are present throughout the year, but more so in the winter because of the demand for heating. Smog can affect the health of the most vulnerable populations.

Fewer smog days were recorded in Montréal from 2014 to 2019. As was the case for most Québec regions, 2020 saw a resurgence of smog days in Montréal. Despite a decline in activities due to the COVID-19 pandemic, adverse weather conditions are likely responsible for this increase.

And what about the east end of Montréal?

After assessing the levels of pollutants commonly measured, the air quality in the east end of Montréal is no different than that recorded in other sectors. However, it is true that SO_2 is more prevalent around industrial sectors. Nevertheless, their concentrations are declining everywhere and the annual averages are below the Canadian standards. The presence of certain metals has been detected in the ambient air of certain industrial areas in the east end of Montréal. Since 2018, several public health advisories have been published concerning arsenic, the latest of which dates from [2022](#). The first nomadic station, commissioned in 2022 by the RSQA, is located at the Jardins collectifs of Montréal-Est. Monitoring will be carried out there for a period of at least one year.



OBSERVATIONS AND COMMITMENTS

According to available data, the emissions of pollutants have declined over the past 20 years. No specific sector of the island of Montréal seems to have a poor air quality. Also, the individual health risk remains low.

In order to reduce the exposure of the Montréal agglomeration population to pollutants in the ambient air and their associated health related social inequalities, the [city of Montréal](#) and the [Direction régionale de santé publique](#) (DRSP) undertake to:



Systematize the collaboration between the Service de l'environnement and the DRSP.

Pursue the work intended to characterize the population's exposure to pollutants in the ambient air, particularly emerging pollutants as well as their health effects.



Document and communicate information on air quality and the local and regional sources of pollutants, while supporting the measures intended to mitigate local pollutants.



Approach the Communauté métropolitaine de Montréal (CMM) to set up a city of Montréal–DRSP–CMM committee whose objective would be to define a standard process to appraise and deal with public health issues, such as the population's exposure to various commercial and industrial sources of pollutants.



Enhance the collaboration between the Service de l'urbanisme et de la mobilité and the DRSP, particularly within the framework of the Land use and mobility plan and the development of means for its implementation, in order to take into account issues related to air pollution.

For its part, the MELCCFP will maintain its collaboration with the CMM and the city concerning its management of the air quality in the agglomeration of Montréal.

For further information on air quality in Montréal, please consult the following links:

- [Direction régionale de santé publique de Montréal](#)
- [Ville de Montréal, Service de l'environnement](#)
- [Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs](#)

For any questions regarding your health, please contact a doctor or Info-Santé by dialling 811.

To notify us about a situation or a problem relative to the quality of the atmosphere, please send us an email at environnement@montreal.ca.