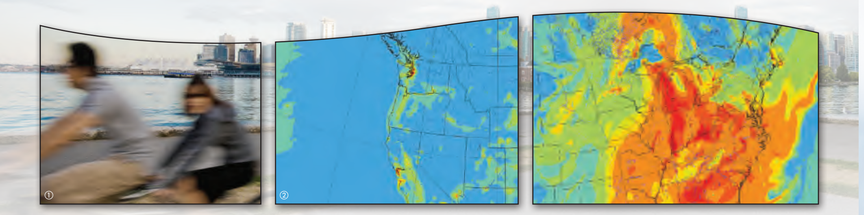
Environment Canada Environnement Canada

Weather and Air Quality



Canada

Over the past few decades, the air in Canada has been getting steadily cleaner, as considerable efforts have been made to reduce air pollution. However, many sources of pollution remain, such as cars, trucks, factories, wood stoves and road salt.

In many parts of Canada, we often have days with clean air, followed by heavy smog, and then a sudden return to clear, fresh air. The amount of pollutants released into the air does not usually change so quickly, so what is happening? Surprisingly, the weather is the switch that turns smog on and off.

Air pollutants can have a serious impact on our health. This is why Environment Canada produces the Air Quality Health Index (AQHI) daily. This public information tool provides air quality information and forecasts. The AQHI lets you plan ahead to protect your health and the health of those close to you.

How the Weather Affects Air Quality

The Wind

The wind can carry pollutants towards us or away from us. Smoke from forest fires, as well as other less visible pollutants, can be carried over long distances to arrive on our doorsteps. When there is little or no wind, local pollutants build up in the air. We see this in both summer and winter under temperature inversions that come with light or no wind.

...and the Lay of the Land

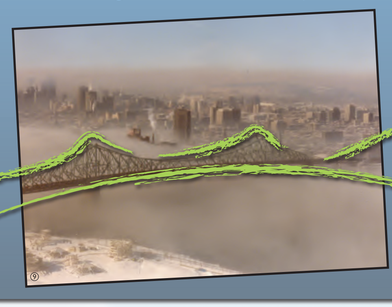
Hills, mountains, valleys, flat plains and rolling prairie can affect the movement of air and the pollutants it carries. In valleys at night, the air settles in, trapping its burden of pollutants. A brisk wind blowing over a flat open area will help to scatter pollutants, improving local air quality.

Warm Sunny Days

Hot sunny days in the summer may be accompanied by smog. The intense summer sun causes chemical reactions among the pollutants that are already in the air, leading to the formation of ground-level ozone,* a major component of smog.

Smog

Smog is a mixture of air pollutants that are harmful to our health and the environment. It can occur year-round, although the combination of pollutants can change from summer to winter. In summer, the main component of smog is usually ground-level ozone,* although occasionally winds carrying smoke from forest fires can bring large amounts of small suspended particles. In winter, smog consists mostly of small suspended particles, caused by car exhaust and burning wood in stoves and fireplaces.



Temperature Inversion

Hot air rises—this is how hot air balloons work. We normally have warm air at ground level, and cooler air above. In a temperature inversion, the temperatures are upside down—the cooler air is at ground level, and the warmer air higher up. The cooler air cannot rise, and the warmer air above acts like a lid, trapping pollutants at the ground where we live and breathe.

Rain and Snow

We all know how the air feels cleaner and fresher after it rains. This is because both rain and snow clean the air, removing most of the pollutants. However, these do not disappear by magic from the environment; they are absorbed into the ground and into the streams.

** Ozone is a natural gas found in the atmosphere. In the higher atmosphere, it forms a protective layer that intercepts the majority of the dangerous ultraviolet rays, but in the lower atmosphere, or troposphere, where we live, it is a nuisance to human beings and constitutes a pollutant.*

Monitoring and Forecasting

Measuring, processing and forecasting air quality

In partnership with provinces, territories and municipalities across Canada, Environment Canada measures and studies outdoor air quality. Over 350 monitoring stations, containing a variety of sophisticated measuring instruments, are part of the National Air Pollution Surveillance (NAPS) Program. This program gathers and shares these data with scientists across North America to track and understand changes in air quality.

Environment Canada uses these data in its world-class air quality forecast model, a highly specialized computer program that simulates how air pollution changes with time. Developed by Environment Canada scientists, the GEM-MACH 15** model is hosted on a supercomputer in Montréal. The model combines air pollution emissions with changing weather conditions, to produce an air quality forecast. This forecast focuses on the three pollutants that make up the Air Quality Health Index: ground-level ozone, nitrogen dioxide and fine particulate matter.

Environment Canada's forecasting team uses this model output, current conditions, local knowledge and other factors to produce Air Quality Health Index forecasts. The meteorologist's knowledge of the role of weather in predicting smog is making an important contribution to public health. This gives Canadians advance notice of air quality conditions, enabling them to plan their activities for the next day and reduce their exposure to air pollution.

*** GEM-MACH: Global Environmental Multi-scale – Modelling Air Quality and CHemistry.*

Environment Canada's Air Quality Health Index

Are you "at-risk"?

Check your Local Air Quality Health Index at www.ec.gc.ca/cas-aqhi

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