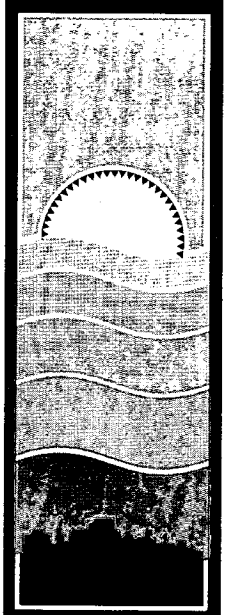
CCME

Canadian Council of Ministers of the Environment
Le Conseil canadien des ministres de l'environnement

# WHAT IS SMOG?

Photochemical smog is a harmful mixture of gases primarily formed when sunlight interacts with certain industrial pollutants and exhaust from cars and trucks. The term "smog" was first coined many years ago to describe the combination of smoke and fog in the atmosphere. Today, the main component of smog in many Canadian cities is ground-level ozone.



## Where does SMOG come from?

Ground-level ozone occurs as the result of a reaction between naturally occurring nitrogen oxides ($NO_X$) and oxygen in the air. However, human-created $NO_X$ and volatile organic compounds (VOC) accelerate the ozone-formation process, resulting in excessive amounts of ground-level ozone. $NO_X$ results from the burning of fossil fuels such as gasoline, natural gas, oil and coal. VOC comes mainly from the evaporation of liquid fuels, solvents and organic chemicals, as well as from gasoline burning. Because smog-forming reactions depend on temperature and sunlight, smog problems are particularly acute on hot, sunny summer days.

## Why do some areas have worse SMOG problems than others?

The frequency and severity of smog depends on the size of a city, its population and vehicle density, and the kind of industry it supports. Smog is not just a city problem; it flows into rural areas as well. Since ozone, $NO_X$ and VOC can be transported by air currents, the extent of a smog problem in a particular area can be affected by smog levels in locations up to several hundred kilometres away.

Climate and topography can also affect smog levels. For instance, although rain can clean the air of the pollutants that cause smog, this may result in acidic rain water. Wind can also blow smog away, but if cities are surrounded by hills or mountains, the reduced air flow can cause smog levels to increase.

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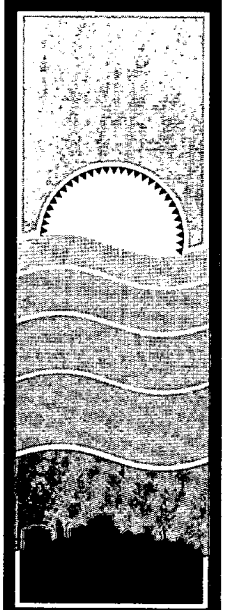
# REDUCING SMOG



## What is SMOG?

Photochemical smog is a noxious mixture of gases formed in the lower atmosphere when sunlight acts upon certain pollutants such as industrial pollutants and exhaust from cars and trucks. The main component of smog is ground-level ozone.

## Where does SMOG come from?

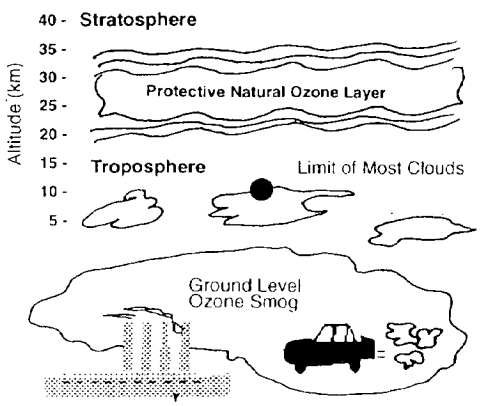
Ground-level ozone is produced by a reaction between nitrogen oxides ($NO_x$) and volatile organic compounds (VOC) in the atmosphere. $NO_x$ is produced when fossil fuels such as gasoline, natural gas, heating oil and coal are burned, for instance, in transportation and electricity generation. VOC comes mainly from the evaporation of liquid fuels, solvents and organic chemicals and from gasoline burning. Because smog-forming reactions depend upon temperature and sunlight, smog problems are generally more acute on hot, sunny summer days.

## What is so bad about SMOG?

Smog can be a powerful and irritating pollutant. Even short term exposure of only one or two hours can irritate our nose and throat, and cause respiratory problems such as coughing and painful deep breathing.

Exercising outdoors increases the likelihood of respiratory difficulties due to smog, since more air is inhaled during physical activities. In addition, ground-level ozone increases our susceptibility to other respiratory illnesses and may result in premature aging of the lungs.

The higher levels of ground-level ozone that contribute to smog often damage agricultural crops and vegetation. Current agricultural losses are estimated to be nearly $70 million in Ontario and $9 million in the Lower Fraser Valley of British Columbia. Furthermore, excessive ozone levels may also contribute to the decline of several Canadian forest areas.




## How about the ozone layer?

While ozone is everywhere in the atmosphere, higher levels are concentrated in two main areas: the stratosphere, located between 15km and 40km above the Earth's surface, and at ground-level where we live and breathe. Ozone occurs naturally in both of these areas, but at certain times of the year the natural balance is disturbed by too much ozone at ground level and too little in the stratosphere.

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## Stratospheric Ozone

Stratospheric ozone plays an important role in the atmosphere. It forms a protective layer around the Earth as it absorbs the intense ultra-violet radiation from the sun and prevents most of it from reaching the Earth's surface. The consequences of more intense radiation reaching the Earth are serious. Although some ultra-violet radiation is needed to sustain life and help plants grow, too much radiation increases risk of skin cancer and eye cataracts, and reduces yields of important agricultural crops such as wheat, rice, corn and soya beans. Therefore, it's important that we ensure levels of this beneficial stratospheric ozone don't continue to diminish.

## Ground-level Ozone

Ground-level ozone occurs naturally, but only in very low concentrations. These concentrations increase when pollutants in the air react in the presence of sunlight under warm temperatures and result in harmful levels of ozone.

Controlling NOx and VOC is one of the best ways to limit ground-level ozone to acceptable levels.

## Does Canada have a SMOG problem?

Yes. In some areas of the country, smog is one of the most serious air quality problems we have. Our problems are not as severe as those in cities such as Los Angeles or Mexico City, but they warrant our immediate attention. The Canadian Ambient Air Quality Objective for ground-level ozone is 82 parts per billion. In several of Canada's major cities, summer ozone levels can exceed our air quality objective. For example, Windsor, Toronto, Montreal and Vancouver are cities where the ozone air quality objective is exceeded an average of 10 or more days in the summer.

When levels of smog reach harmful proportions, it is wise to change our outdoor activities in the following ways:

- Avoid strenuous outdoor exercise, especially during the afternoon and early evening when ground-level ozone levels are at their highest. Opt for indoor activities whenever possible at these times.
- Avoid exercising near heavy traffic areas, at least during rush hour, to minimize exposure to smog.

## Why do some cities have worse SMOG problems than others?

The frequency and severity of smog depends upon the size of a city, its population and vehicle density and the kind of industry it supports. Smog is not just a city problem; it flows into rural areas as well. Since ozone, NOx and VOC can be transported by air over long distances, the frequency and severity of smog in a particular area can be affected by smog levels in areas several hundred kilometres away.

Climate and topography also affect smog levels. Although rain can clean the air of the pollutants that cause smog, this may result in acidic rain water. Wind, too, can blow smog away, but if cities are surrounded by hills or mountains, air flow patterns are reduced, and smog levels increase.

## What is being done to address the SMOG problem in Canada?

In November 1990, the Canadian Council of Ministers of the Environment (CCME) adopted a Management Plan designed to reduce smog-producing emissions across the country. The first phase of the Management Plan, now in implementation, includes the development of regulations, guidelines and other initiatives to lower $NO_x$ and VOC.

A number of control initiatives are currently being implemented. These include car inspection and maintenance programs such as "AirCare" in British Columbia and the recovery of gasoline vapours at Vancouver- and Toronto-area service stations. In addition, new nationwide automobile emission standards, and control programs for the control of commercial emission sources in the Montreal area, have been set. These controls involve paint applications, printing and dry cleaning.

The Greater Vancouver Regional District has also approved an Air Quality by-law which includes new measures designed to limit both point and mobile emission sources.

## Public Education

As part of the CCME Management Plan, a public awareness and education program is being implemented at the national level. This fact sheet is one of the products of this program.

Several regional public education projects are underway across the country to help Canadians learn to reduce smog.

In the Lower Mainland of B.C., an inter-agency network called GO GREEN is in the third year of an awareness and education campaign aimed at reducing total motor vehicle emissions in the region. The GO GREEN program promotes transportation alternatives to solo driving and links the initiatives of its municipal, provincial and federal partners for maximum effects.

GO GREEN's lead partner is the public transit agency, BC Transit. In November 1991, BC Transit introduced the first training program in Canada focusing on trip reduction techniques for commuters. This training pioneers the application of Transportation Demand Management principles, which extend well beyond alternative transportation, to provide a framework for policy development and regulation.

The regional municipality of Ottawa-Carleton in Ontario has introduced the Transportation Environment Action Plan, a public education program to teach people about alternative transportation techniques. The program has developed innovative ways to show how commuting to work can be made easy through public transit, walking, cycling and ridesharing.

In Toronto, the Healthy City Office is developing a public education program to promote the use of public transit, make cycling to work safer, easier and more convenient, and provide partners for employees who want to rideshare.

The City of Calgary is initiating the world's first voluntary automobile emissions testing program. The program, called "SMOG FREE", is an acronym for "Save Money On Gas ... From Reduced Exhaust Emissions." Under the program, Calgary residents will be able to get their vehicle emissions measured at local service outlets. Sponsors will offer coupons called "SMOG FREE BUCKS" for a ten dollar reduction on service costs to improve or repair exhaust systems.

## What can I do to help reduce SMOG?

Here are a few ways that people can limit the production of smog:

### Become Travel Smart:

- Use alternative transportation methods such as walking, cycling and using public transit systems. *A full 12-metre bus holds enough people to replace about 50 cars in rush hour!*
- Share rides. *Two people in a vehicle cuts the fuel consumption per person in half.*
- Drive within the speed limit. *Reducing speed from 100 to 80 km/hr reduces fuel consumption by 15 to 20 percent.*
- Maintain your vehicle properly. *Regular tune-ups and oil changes result in a smoother running engine and less energy waste.*
- Keep your tires properly inflated. *It doesn't cost much and it ensures greater fuel economy.*
- Reduce idling. *Most cars and trucks require only 15 to 30 seconds idling before being driven, even in winter.*
- Turn off engines while waiting at car washes, stores, railroad crossings or fast food outlets.
- Reduce unnecessary travel by writing letters, sending faxes or teleconferencing.

### At Home:

- When buying a home, choose an energy efficient model.
- Use fans instead of air conditioners. *Fans use much less energy.*
- Use fluorescent or energy-saving incandescent lighting. *It uses less energy and helps reduce emissions.*
- Use oil-based paints and solvents, such as gasoline and mineral spirits, only when necessary. Be sure to handle and dispose of these materials with care!

### When Shopping:

- Consider the environmental impacts of products before purchasing. Use the EcoLogo as a guide to products that are less harmful to the environment. Environment Canada identifies such products with a symbol that illustrates three intertwined doves.
- When buying a car, consider its fuel efficiency. The less fuel burned the less pollutants emitted. Alternative fuels (propane, natural gas and ethanol) are a good choice if available in your area. Ask your local gas utility or auto propane dealer for more information.
- Buy smaller cars to help reduce pollution as well as travel costs.
- Buy energy-efficient appliances with the help of the Energuide label. This label rates the energy efficiency of the appliance. The lower the consumption rating, the less energy the appliance uses.

Since smog is primarily a result of fuel burning, reducing energy use and making wise buying decisions all contribute to cleaner air.

## Where can I get more information about SMOG?

The State of Environment (SOE) reporting group at Environment Canada is publishing an in-depth background article on smog, its origin, its extent and ways to reduce it. The Environmental Health Directorate at Health and Welfare Canada has also produced extensive information on the effects of smog on our health.

For further information, please call the NOx/VOC Office at:

Phone: (613) 233-8563
Fax : (613) 233-4229

or write to:

NOx/VOC Office
100 Sparks Street,
Suite 360,
Ottawa, Ontario
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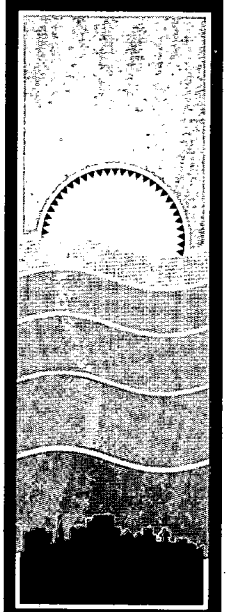
# REDUCING SMOG

**SMOG** is a harmful mixture of gases primarily caused by the burning of fossil fuels.

As little as one to two hours of short-term exposure to smog can irritate our nose and throat and cause respiratory problems. Long-term exposure can damage agricultural crops and vegetation.

By reducing energy use and making wise buying decisions, we can all help to reduce smog in Canada. The following are some tips to help you limit your contribution to this serious environmental concern:



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Buy smaller cars as a means to reduce pollution as well as travel costs.

Buy energy-efficient appliances with the help of the Energuide label. This label rates the energy efficiency of the appliance. The lower the consumption rating, the less energy the appliance uses.

For more information about smog and what you can do to help reduce smog in Canada, please contact the $NO_X$/VOC Office at the address below.

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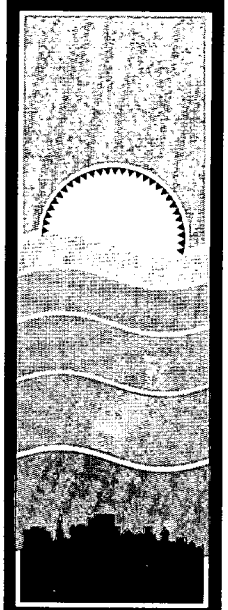
# CCME AND THE $NO_X$/VOC MANAGEMENT PLAN

The Canadian Council of Ministers of the Environment (CCME) is the major intergovernmental forum in Canada for discussion and action on environmental issues of national and global concern.

CCME is made up of environment ministers from each of the ten provinces, the federal government and the two territories. The position of President is rotated annually among participating members.

The Council meets twice a year to discuss environmental issues, exchange information, make decisions and develop policy for work to be carried out under the auspices of CCME.



## The $NO_X$/VOC Management Plan

Recognizing the seriousness of the smog problem in Canada, CCME developed a plan for the management of nitrogen oxides ($NO_X$) and volatile organic compounds (VOC)—the two families of pollutants responsible for formation of smog at ground level.

Following extensive consultations, a three-phase plan was developed for achieving the Canadian maximum acceptable ozone air quality objective of 82 parts per billion (ppb) by the year 2005.

Phase I of the Management Plan contains programs to reduce emissions from new and existing sources.

Phase II (scheduled to begin in 1996) will establish caps on $NO_X$ and VOC emissions for the target years 2000 and 2005 in areas of the country where ambient air quality levels do not meet the acceptable air quality objective.

Phase III will involve final adjustments to the emission control and reduction programs to ensure that the objective of the Management Plan is achieved.

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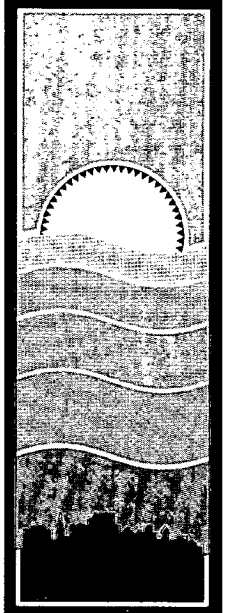
# SMOG IN CANADA

Smog, which often appears as a brown haze above many Canadian cities, is a mixture of pollutants in the air. Smog is primarily made up of ground-level ozone. Concentrations of ground-level ozone vary significantly across Canada from region to region and from day to day.

The Canadian Council of Ministers of the Environment has identified three areas of the country where ground-level ozone is a problem, or where ozone concentrations are occasionally above the acceptable level of 82 parts per billion (ppb) for periods of an hour or more.

These regions are **the Lower Fraser Valley, the Windsor-Quebec Corridor and the Southern Atlantic Region.**



## The Lower Fraser Valley

The Lower Fraser Valley, including the City of Vancouver, is bordered by the Coastal Mountains to the north and the Cascade Mountains running northeast from Washington state. These unique geographical features, along with the sea-to-shore breezes off the Strait of Georgia, contribute to the ozone problem. The resulting air-flow patterns frequently move nitrogen oxides ($NO_X$) and volatile organic compounds (VOC) from their sources in the Vancouver area to surrounding suburbs and rural communities. This is a serious environmental concern, as $NO_X$ and VOC emissions are the main ingredients responsible for ground-level ozone formation and, consequently, smog.

About 6 days a year, ground-level ozone concentrations in the Lower Fraser Valley exceed acceptable levels.

Motor vehicles are the major source of $NO_X$ and VOC emissions in this region.

## The Windsor-Quebec Corridor

The Windsor-Quebec Corridor is Central Canada's problem area. The Corridor is a narrow strip that runs along the north shores of Lake Erie, Lake Ontario and the St. Lawrence River in Ontario, and continues along the St. Lawrence River to Quebec City in the Province of Quebec.

$NO_X$ and VOC emissions carried by air currents from the United States, particularly the regions of Cleveland and Detroit, contribute significantly to the high ozone levels in the Corridor.

The Corridor experiences higher-than-acceptable levels of ozone more often and for longer periods of time than any other area of the country. Acceptable ozone levels are exceeded an average of about 16 days per year in Toronto and about 11 days in Montreal.

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## The Southern Atlantic Region

The Southern Atlantic Region refers to the areas around the Bay of Fundy, including southern New Brunswick and parts of Nova Scotia south-west of Halifax.

As in the Windsor-Quebec Corridor, emissions from the United States are a major contributor to this region's smog problem. Prevailing winds transporting air pollutants from the eastern seaboard of the United States are considered to be the principal reason for ozone levels in Saint John exceeding air quality standards an average of 3 to 4 days each year.

## Not Just "Urban" Smog

Although $NO_X$ and VOC are due mainly to concentrated human activity typical of major urban centres, smog is not just a city problem. Because air pollutants move with the wind, all Canadians in and around the smog problem areas must be sensitive to how their actions affect people in other communities. For example, high concentrations of ground-level ozone are often observed in rural areas downwind of major urban centres.

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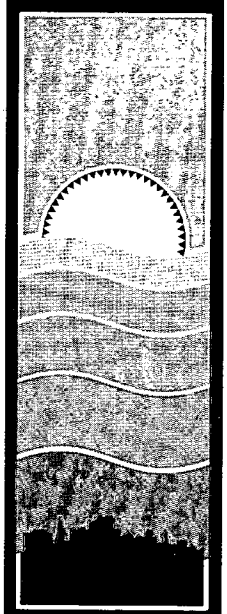
# ENVIRONMENTAL IMPACTS OF SMOG

Increased ground-level ozone damages agricultural crops and vegetation. Agricultural losses are estimated to be up to $70 million in Ontario and up to $9 million in the Lower Fraser Valley of British Columbia, depending on how often ozone exceeds acceptable levels. Ozone sensitive crops include beans, tomatoes, tobacco, potatoes, corn, soya beans and wheat.

High concentrations of ground-level ozone may also be a factor in forest decline in some areas of Canada. Ozone can cause foliar injury and reduced growth rates in several species of trees. Exposure to ozone can lead to increased susceptibility to disease and other stresses, increased mortality of individual trees and eventually to overall decline of affected species.



Ground-level ozone may also have a significant impact on human health. Given the rising costs of public health care in Canadian society, the effects of smog must be considered an economic as well as a health issue.

Nitrogen oxides (NOx), one of the leading causes of ground-level ozone, also contribute to acid air pollution by producing nitric acid. Some of this pollution falls to earth as acid rain, which erodes buildings and threatens aquatic life.

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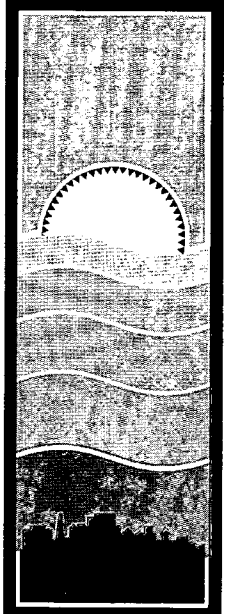
# HEALTH EFFECTS OF SMOG

While research is ongoing, much remains to be done to determine the potential effects of smog on human health. We do know that smog is a powerful and irritating pollutant, especially where the respiratory system is concerned. Short-term exposures can irritate the nose and throat, and produce symptoms such as coughing and difficult or painful breathing. While scientific studies indicate that after a few days of continuous exposure respiratory symptoms subside and discomfort disappears, damage can continue to occur in the lungs.

Anyone exposed to ozone is at some risk. However, people with asthma are considered to be the most at risk because of their extreme sensitivity to air pollutants in general. The elderly are also considered a high-risk group because of their tendency to suffer from respiratory conditions such as cardiovascular disease. Even children aren't exempt from the harmful effects of smog because they tend to spend more time outdoors being physically active.



## What You Can Do . . .

There are many steps that can be taken to reduce your exposure to smog and its potential health effects. It would be wise to change your outdoor activities, especially on hot, humid summer days, in the following ways,

**In the short term:**

- Avoid strenuous outdoor exercise, especially during the afternoon and early evening when ground-level ozone levels are at their highest. Whenever possible, opt for indoor activities at these times.
- Avoid exercising near heavy traffic areas, at least during rush hour, to minimize exposure to smog.

**In the long term:**

- Use public transportation whenever possible instead of your car.
- Walk or ride your bicycle when smog levels are not too high.
- Use alternatives to other gasoline powered vehicles and machines such as motorbikes, motorboats and gas lawnmowers.
- Learn more about alternative energy sources.

Health and Welfare Canada is currently doing research to assess the health effects of individual air pollutants and pollutant mixtures. Research increasingly involves "personal exposure monitoring." By providing people with pollution measuring devices to carry with them, researchers are able to compare personal exposure levels with pollution levels measured at regional air monitoring sites.

In collaboration with Environment Canada, Health and Welfare Canada will continue to assess the effects of short- and long-term exposure to several smog-producing pollutants. The results of these studies will allow further development of effective standards and guidelines to help protect the health of Canadians.

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