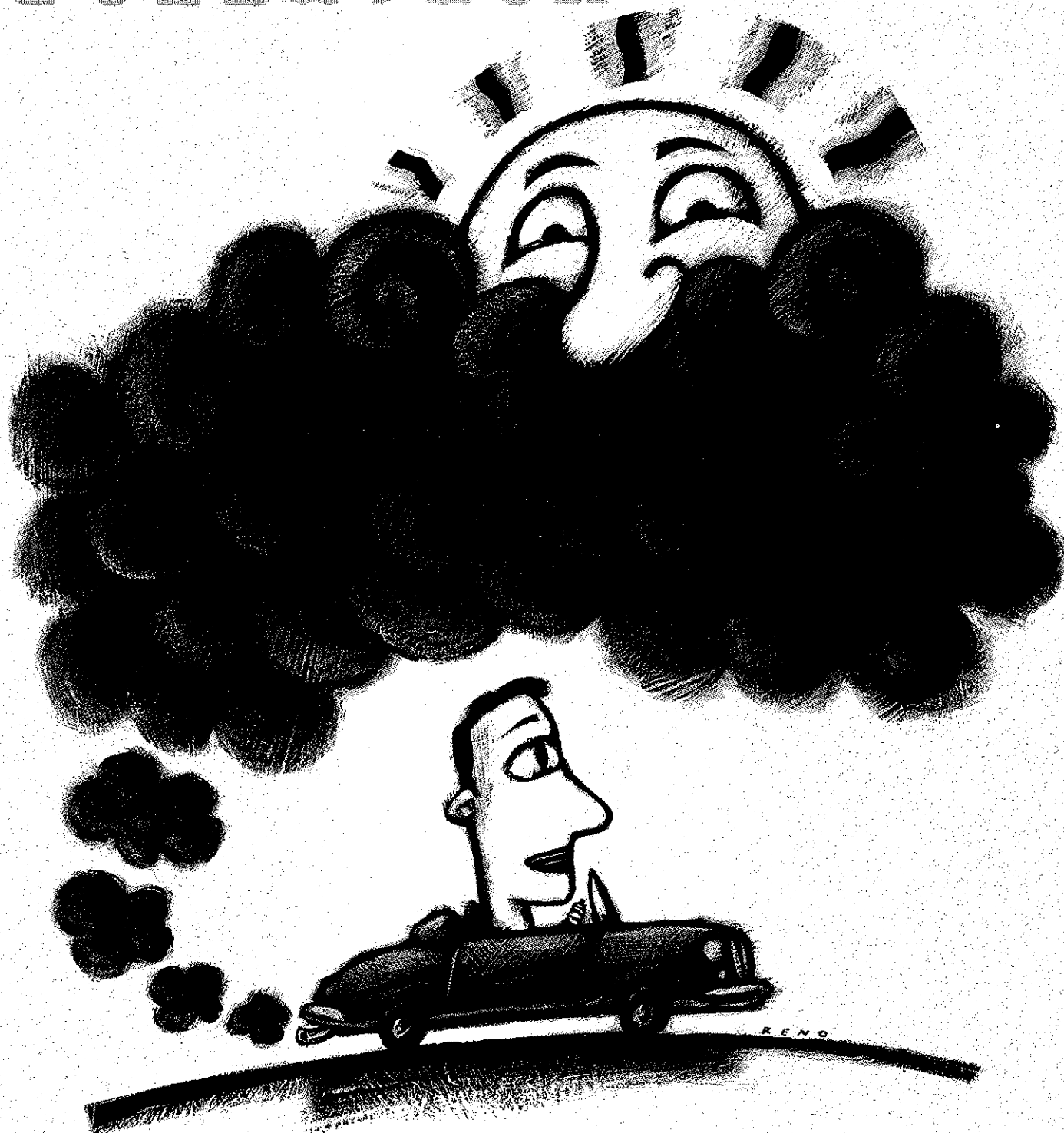


The Automobile and... Atmospheric Pollution



Environment
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Québec Region

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The Automobile: Indispensable, but....

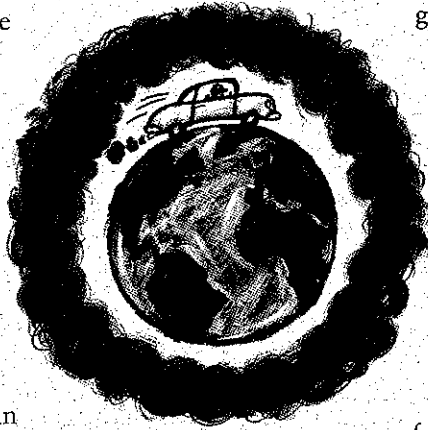
It is difficult to imagine life without the automobile. Undoubtedly, the automobile is the invention that has had the greatest impact on the 20th century. The advent of the car has modified our use of the land, and the social and economic fabric of our country. Canada has one of the highest car ownership ratios in the world, with close to one automobile for every two inhabitants. All tolled, these automobiles travel more than 200 billion kilometres each year - 1 000 times the distance between the earth and the sun.

The automobile has influenced our habits and our way of seeing the world. Unfortunately, it has also affected the quality of our environment in various ways, at every stage of a vehicle's life cycle.

Vehicles contribute to the deterioration of the environment in a number of ways: from extraction of the raw materials necessary to their manufacture and of the fuels that get them rolling, through the construction of infrastructures such as roads and bridges, and the air pollution arising from their use, to generation of wastes from vehicle maintenance (used oils and batteries), and ending with their ultimate disposal. This is part of the price we pay for the advantages of the automobile.

Vehicle Emissions

Automobile fuel combustion produces pollutant emissions in quantities that may be harmful. It is incorrect to say that certain types of fuels are non-polluting. The proportion of various pollutants may vary from one type of fuel to another, but a 100% "green" fuel does not exist. Following are the main contaminants found in exhaust fumes.



HYDROCARBONS (HC)

Gasoline is a very complex mixture of hydrocarbons composed mainly of carbon (C) and hydrogen (H). Gasoline is never completely burned in the engine, so

HC emissions are found in the exhaust fumes. Furthermore, gas fumes may leak from the fuel tank or the pipes. Many hydrocarbons are not only toxic, but also contribute to the formation of other pollutants such as ozone.

CARBON MONOXIDE (CO)

Gasoline is blended with air in the cylinders of the engine. During ignition and explosion, carbon in the fuel combines with oxygen in the air to form carbon dioxide (CO₂) and water vapour. However, when the mixture does not contain enough air, carbon monoxide is formed. This odourless and invisible gas, when present in sufficient quantity, causes asphyxiation that can lead to loss of consciousness or even death.

NITROGEN OXIDES (NO_x)

In addition to causing irritation of the respiratory system, nitrogen oxides contribute to acid rain and the formation of ground-level ozone (smog).

PARTICULATES

Incomplete combustion results in the formation of particulates; this is especially true of diesel fuel. Not only do they reduce visibility, particulates also have toxic properties and can be inhaled and retained in the lungs.

Among the other pollutants emitted by automobiles are carbon dioxide (CO₂) and sulphur dioxide (SO₂). In Canada, the transportation sector is the most important source of emissions of HC, NO_x, CO and CO₂ to the atmosphere.

The Automobile and Major Atmospheric Pollution Problems

The automobile plays a very important role in many local and global atmospheric pollution problems.

GROUND-LEVEL OZONE (SMOG)

Ozone is one of the main components of urban smog, a yellowish fog that can be observed hovering over certain cities on hot summer days. Ozone is a secondary pollutant formed by a photochemical reaction (activated by sunlight) between NO_x and HC, two pollutants emitted in large quantities by cars. In addition to being an irritant for the respiratory system, ozone affects crops and forests. It is believed to be in part responsible for the degradation of maple groves observed during the 1980s in Québec.

ACID RAIN

SO₂ and NO_x are responsible for the acid rain that affects our lakes and forests, in addition to causing damage to buildings and structures (bridges, monuments).

GLOBAL WARMING

Certain gases act as a blanket, keeping the surface of the planet warm. This is what is called the "greenhouse effect".

An excess of these gases (called "greenhouse gases") can cause a warming of the climate. Changes in



the global climate may have important consequences on ecosystems, precipitation patterns, sea level, etc. The extent and consequences of these changes remain unknown, but they may constitute the most important environmental challenge facing us today. The main greenhouse gas, CO₂, is produced by combustion and the automobile is one of its major sources. Other greenhouse gases emitted by the automobile include chlorofluorocarbons (CFC), contained in air conditioning systems, nitrous oxide (N₂O), and several hydrocarbons.

DEPLETION OF THE OZONE LAYER

The upper layers of the atmosphere contain a significant quantity of ozone, which acts as a filter that protects us from the ultraviolet (UV) rays of the sun. UV radiation is known to cause skin cancer and accelerate the ageing of the eyes. Certain pollutants reach this altitude and help destroy this ozone, resulting in what is commonly known as the hole in the ozone layer. CFC is a major contributor to the depletion of the ozone layer.

TOXIC SUBSTANCES

The automobile is an important source of toxic substances that may cause, for example, cancers or neurological problems.

Among the toxic substances emitted by the automobile are included polycyclic aromatic hydrocarbons (PAHs), benzene, toluene, xylene, aldehydes, as well as particles emitted by diesel engines.



A Regulated Vehicle

FEDERAL REGULATION

It is the responsibility of Transport Canada to establish emission standards for vehicles. These are manufacturing standards that apply only to new vehicles sold in Canada. The Canadian standards are the same as those currently in force in the United States.

PROVINCIAL REGULATION

The province of Québec has a regulation that prohibits tampering or removal of anti-pollution systems for in-use vehicles.

OTHER PLANNED MEASURES TO REDUCE AUTOMOBILE EMISSIONS

- Mandatory inspection and maintenance of light-duty vehicles.

In Canada, British Columbia is the only province where vehicle inspection is mandatory. Such programs have been implemented in many American states. The goal is to detect vehicles with excessive emissions.

- Modification of fuel composition.

It is possible to modify the composition of fuel in order to reduce emissions of toxics such as hydrocarbons or benzene.

Anti-Pollution Equipment

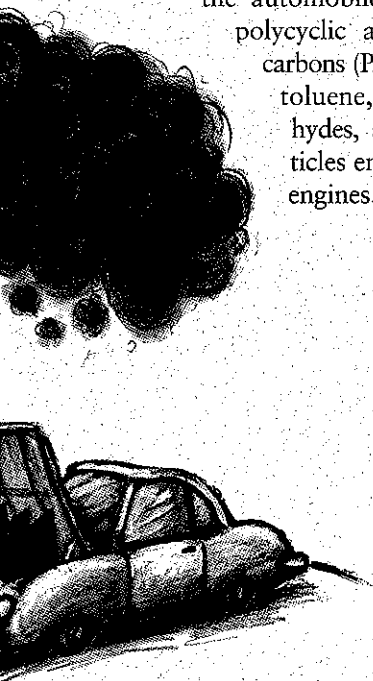
Automobiles are equipped with a host of accessories designed to reduce the emission of contaminants. At least twenty of these are either added to the engine or are already incorporated into it. As a general rule, these accessories have three types of functions. Some are to ensure more complete fuel combustion, thereby reducing HC and CO emissions. Others are intended to limit the loss of fuel through evaporation, thus reducing emissions of HCs. Still, others are designed to eliminate the pollutants whose production could not be avoided. If these accessories are defective, your car may consume more fuel and, as a result, pollute more.

What You Can Do...

SAVE WHILE REDUCING POLLUTION

There are several ways to reduce the impact of the automobile on air quality:

- Be thrifty! Sudden acceleration and high-speed driving increase gas consumption and, consequently, your automobile emissions — in addition to costing you more...
- Plan your trips by combining several errands; you will reduce your travelling distance.
- Don't let your engine idle for no reason during waiting periods or in traffic jams. A silent engine is a non-polluting one.
- In winter, your engine doesn't need a long warm-up time. It will warm up just as well while driving at moderate speed!



■ Keep your vehicle in good working order. A regular tune-up helps to reduce fuel consumption.

■ Respect the manufacturer's specifications. For example, an automobile designed to use regular gasoline will not necessarily function better or pollute less with the super formula.

■ Remember: The higher the fuel consumption, the more pollution and the higher the cost.

USE ALTERNATE TRANSPORTATION WHENEVER POSSIBLE

Using public transit or car pooling saves energy while allowing you to avoid the stress associated with driving at rush hour. Better still: walk or cycle!

COMPARISON OF EMISSIONS ACCORDING TO MODE OF TRANSPORTATION

(Unit: g/person /100 km)

MODE OF TRANSPORTATION	NO _x	HC	CO	CO ₂	Number of passengers
Subway	43	0,2	2	2 474	75/car
Bus	95	12	189	3 676	40
Car pool (vans)	24	22	150	5 323	7+
Car pool (cars)	43	40	311	8 056	3+
Single-passenger cars	128	130	934	32 223	1

Source: Adapted from "Environmental Implications of the Automobile", Environment Canada, 1993

During repair or maintenance procedures (replacing a muffler or exhaust system, for example), make sure that your mechanic properly connects all the components of the

In Conclusion ...

Most of the measures suggested to reduce air pollution caused by automobiles require only a little effort and are very effective.

By adopting these measures, not only do you contribute to protecting the environment but you save money!

FOR ADDITIONAL INFORMATION...

or copies of this document, contact:

ENVIRONMENT CANADA

Québec Region

1-800-463-4311

Internet: <http://www.wul.qc.doe.ca/>
or ENVIRONMENT CANADA

Québec Region

OTHER PUBLICATIONS AVAILABLE

Environmental Implications of the Automobile. Fact sheet on the state of the environment, EDE no 93-1, Environment Canada, 1993.

To obtain copies: 1-800-463-4311

The Auto Smart Handbook.

Natural Resources Canada, 1995.

To obtain copies: 1-800-387-2000

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ANTI-POLLUTION DEVICES AND THE POLLUTANTS THEY ACT UPON

Fuel cap

HC

Exhaust gas recirculation valve (EGR valve)

NO_x

Thermostatic air intake

HC

Cannister

HC

PCV valve

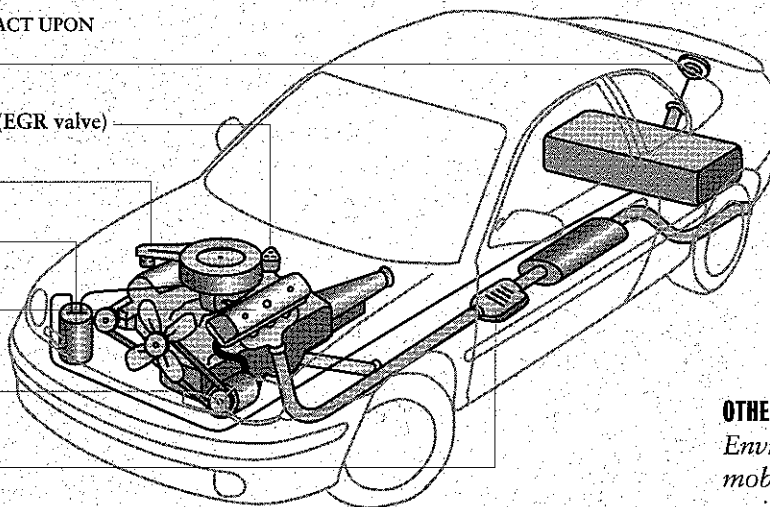
HC and CO

Air injection pump

HC and CO

Three-way catalytic converter

HC, CO and NO_x



GET YOUR ANTI-POLLUTION SYSTEM CHECKED

Several service stations and car repair shops are equipped to measure automobile emissions. A visual inspection is sometimes sufficient to detect certain problems. Make sure that your mechanic is able to conduct this type of inspection, or contact an association such as the CAA for a list of service stations that can.

anti-pollution system. Remember that it is your responsibility to maintain your car's anti-pollution system in good working order. The manufacturer's warranty on anti-pollution devices is similar to the warranty on other parts of your vehicle (for example, 5 years or 80 000 km). If it must be replaced, auto parts retailers offer replacement systems at a relatively low price.



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