



# Auto\$mart



## Learn the facts: Emissions from your vehicle

### What is the issue?

Vehicles produce emissions that affect human health and the environment.

### What do I need to know?

When a vehicle burns fuel, such as gasoline or diesel, the exhaust contains a complex mixture of gases. These tailpipe emissions are classified as:

#### → Criteria air contaminants

- Criteria air contaminants (CACs) include carbon monoxide (CO), nitrogen oxides (NO<sub>x</sub>), sulphur oxides (SO<sub>x</sub>), volatile organic compounds (VOC), particulate matter (PM) and ammonia (NH<sub>3</sub>).
- Vehicle CACs are regulated in Canada and have been subject to progressively more stringent emission standards for more than 30 years.
- Today's vehicles produce 99% fewer CACs than vehicles built in the 1970s thanks to advances in engine and emission control technologies and improved fuel quality standards.

#### → Greenhouse gases

- Greenhouse gases (GHGs) include carbon dioxide (CO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>).
- Vehicle GHGs are regulated in Canada in order to drive improvements in vehicle efficiency and reduce GHGs from the transportation sector.
- CO<sub>2</sub> is the principle GHG.
- Light-duty vehicles produce about 12% of Canada's GHG emissions.
- GHGs trap heat in the atmosphere and contribute to climate change.
- N<sub>2</sub>O and CH<sub>4</sub> produced by the engine can be reduced with a catalytic converter.
- A catalytic converter cannot reduce the CO<sub>2</sub> produced by the engine.
- Drivers can reduce GHG emissions by choosing more fuel-efficient vehicles, by driving less and by implementing more fuel-efficient driving techniques (see the section How can I help?).



Carbon dioxide	GHG
CO <sub>2</sub> is a colourless, odourless, non-flammable gas produced by burning fossil fuels. CO <sub>2</sub> is the principle GHG. Although not directly harmful to our health, CO <sub>2</sub> emissions contribute to climate change.	
Gasoline engines produce 2.3 kg of CO <sub>2</sub> per litre of gasoline consumed.	
Diesel engines produce 2.7 kg of CO <sub>2</sub> per litre of diesel fuel consumed.	
Nitrous oxide	GHG
N <sub>2</sub> O is a colourless, sweet-smelling, non-flammable gas. It is also a potent GHG that has 300 times the global warming potential of CO <sub>2</sub> and can persist in the atmosphere for 100 years.	

<b>Methane</b>	<b>GHG</b>
CH <sub>4</sub> is a colourless, odourless, flammable gas. Its global warming potential is more than 20 times that of CO <sub>2</sub> , and it can persist in the atmosphere for approximately 12 years.	
<b>Carbon monoxide</b>	<b>CAC</b>
CO is a colourless, odourless, poisonous gas that is the result of incomplete combustion. CO levels are higher when the air/fuel mixture is too rich (i.e. too much fuel for the amount of air). CO reduces the ability of the blood to carry oxygen from the lungs.	
<b>Nitrogen oxides</b>	<b>CAC</b>
Under high temperature, nitrogen and oxygen atoms form nitrogen oxides such as nitric oxide (NO) and nitrogen dioxide (NO <sub>2</sub> ). NO <sub>x</sub> pollutants can combine with reactive VOCs in the presence of sunlight to form ground-level ozone (O <sub>3</sub> ), which is a colourless and highly irritating gas that is a major component of smog. NO <sub>x</sub> pollutants can form nitrate particulates and also react with water vapour to form nitric acid, which contributes to acid rain.	
<b>Volatile organic compounds</b>	<b>CAC</b>
VOCs are carbon-containing gases and vapours such as gasoline fumes but exclude CO <sub>2</sub> , CO, CH <sub>4</sub> and chlorofluorocarbons. Reactive VOCs can combine with NO <sub>x</sub> in the presence of sunlight to form ground-level ozone (O <sub>3</sub> ). O <sub>3</sub> is a major component of smog.	
<b>Particulate matter</b>	<b>CAC</b>
PM is solid or liquid particles in the atmosphere. Soot or smoke is made up of particles that are large or dark enough to be visible. Vehicle particulate emissions consist mainly of fine PM that is generally not visible. This PM is also known as PM <sub>2.5</sub> because the particles are less than 2.5 microns in diameter.	

## How can I help?

**Drive less.** There are many ways to drive less. You can walk, bike, telework, take public transit, carpool or combine all of your errands into one trip.

**If you buy a vehicle, choose a fuel-efficient model.** Research before you buy and make a lifetime estimate of fuel consumption a cost and performance requirement.

**Keep to the speed limit.** Driving at 120 km/h burns 20% more fuel than driving at 100 km/h. On the highway, use cruise control to maintain a steady speed and reduce fuel consumption.

**Adopt fuel-efficient driving habits.** Accelerate smoothly because rapid acceleration and sudden braking wastes fuel. Plan your driving and look ahead at traffic. Anticipate problems and keep a safe distance between your vehicle and the one ahead to avoid sudden braking. Avoid driving in peak traffic periods.

**Maintain correct tire pressure.** Operating a vehicle with the tires under-inflated by 56 kPa (8 psi) can reduce the life of the tires by more than 10 000 km and increase the vehicle's fuel consumption by up to 4%.

**Don't idle.** If you're going to be stopped for more than 60 seconds – except in traffic – turn the engine off. For cold starting, even in the winter, you need only 15 to 30 seconds of idling before beginning to drive (but make sure the windows are clear and are not fogging). The engine and drivetrain warm up better when the car is in motion. However, you should drive gently until the engine is up to operating temperature.

**Refuel right.** Stop pouring the fuel at the “click” that indicates the tank is full to avoid overfilling and spills. Spills cause surface contamination and release harmful VOCs on evaporation. Also, you should refuel during cooler periods of the day to minimize the release of VOCs.

## What are the savings and benefits?

By reducing your fuel consumption, you will save money and reduce GHGs and other emissions.

### More information

Canada's Action on Climate Change, [www.climatechange.gc.ca](http://www.climatechange.gc.ca)

Environment Canada, [www.ec.gc.ca](http://www.ec.gc.ca)

National Association of Clean Air Agencies, [www.4cleanair.org](http://www.4cleanair.org)

Natural Resources Canada, [www.nrcan.gc.ca](http://www.nrcan.gc.ca)

Pollution Probe, [www.pollutionprobe.org](http://www.pollutionprobe.org)

The International Council on Clean Transportation, [www.theicct.org](http://www.theicct.org)

U.S. Department of Transportation, [www.italladdsup.gov](http://www.italladdsup.gov)

U.S. Environmental Protection Agency, [www.epa.gov](http://www.epa.gov) and

[www.fueleconomy.gov](http://www.fueleconomy.gov)

### References

Environment Canada 2006. *On-Road Vehicle and Engine Emission Regulations*, December 2006.

Environment Canada 2010. *Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations*, October 2010.

Environment Canada, 2010. *National Inventory Report 1990–2008: Greenhouse Gas Sources and Sinks in Canada*, 2010.

NPRI 2009, *National Pollutant Release Inventory*, 2009.