

# Transportation

## Contribution to Greenhouse Gas Emissions and Air Pollution

Today there are more than 18 million cars on Canada's roads – about one for every two Canadians. This is one of the highest per capita rates of car ownership in the world. On average, each car travels more than 16,000 km per year, meaning that each year Canadians drive a total of over 282 billion km per year.

Transportation is one of the main sources of GHG emissions in Canada, contributing about 25% (190 Mt) of total GHG emissions. Road transportation accounted for about 76% (133Mt) of this. Since 1990, emissions from vehicles have increased by about 36% (38Mt) with most of this (22Mt) from light trucks and SUVs. Almost half the cars on the road are SUVs or light trucks. Compared to 1990, more people are driving further in less fuel-efficient cars.

The average vehicle emits over 4 tonnes of pollutants annually. Passenger vehicles account for 21% of Nitrous Oxide (NOx) emissions, 51% of Volatile Organic Compounds (VOC) emissions, and 4% of fine particulate emissions. Fortunately, emissions of air pollutants on a per vehicle basis are declining due to regulatory changes, however, overall they are on the rise because there are now more cars on the road, being driven more kilometres.

By reducing our reliance on personal vehicles and fossil fuels such as gas and oil, we can contribute to better air quality, slow down climate change, and improve our health.

Comparison of emissions by transportation mode (g/person -100km)

Transportation Mode	NOx	VOCs	CO
Light rail	43	0.2	2
Transit bus	95	12	189
Van pool	24	22	150
Car pool	43	43	311
Single-occupant car	128	130	934

Source: Modified from Lowe (1990)

## What Can You Do? ... And Why?

### 1. Use alternative, sustainable modes of transportation

- Walk, cycle, rollerblade, carpool, take public transit.
- One busload of passengers takes 40 vehicles off the road during rush hour, saves 70,000 litres of fuel per year and prevents the release of 9 tonnes of air pollutants per year.
- One person using public transit instead of a car for a year can save nearly one tonne of pollutants from being emitted into the atmosphere.
- On average, a carpool saves 2,000 litres of gasoline a year.
- For distances of up to 5 km in urban areas, cycling is the fastest mode of transportation, door to door.

- As a bonus you save yourself stress and parking fees and get some exercise, or read a book while you travel on the train or subway.

## 2. Adopt fuel-efficient driving habits

- Slow down – going from a cruising speed of 120km/hr to 90km/hr will decrease fuel consumption by about 20%.
- Avoid rapid starts and hard braking. These habits reduce travel time by only 4% (about 2.5 minutes for an hour long trip), but increase fuel consumption by 39% and increase emissions by about 5 times.
- Stop idling. Ten seconds of idling uses more fuel than restarting the engine. An idling engine releases twice as many exhaust fumes as a moving vehicle. If every driver in Canada avoided idling for 5 minutes a day, we could prevent 1.6 million tonnes of carbon dioxide from being emitted. So turn your car off in traffic jams or while waiting for a red light.
- Limit your use of the air-conditioning. In stop-and-go traffic, air conditioning can increase fuel consumption by as much as 20%.
- Remove roof racks and roof storage units when not in use to reduce aerodynamic drag and fuel consumption.
- Remove unnecessary items from your trunk. The lighter your car, the higher your fuel efficiency.
- Don't overfill your tank. Spillage is major source of VOC that react to form ozone.

## 3. Drive less

- Get organized – plan your trips and errands to minimize driving time.
- Shop and choose other activities close to home.
- Walk or bike to school.
- Car share. Join a car-sharing co-op or form one at your place of work.
- Have a no-drive day once a week (or more). How many km can you travel using alternatives to the car?
- Commit to walking or biking to destinations within a certain distance of your home.

## 4. Maintain your car

- Check your tire pressure at least once a month. Driving your vehicle with just one tire under inflated by 6 psi can reduce the life of the tire by 10,000 km and increase your vehicle's fuel consumption by 3%, costing you extra money and releasing more pollution into the air. Two-thirds of personal vehicles in Canada have at least one tire under or over-inflated.
- A poorly maintained car uses up to 50% more fuel and produces up to 50% more emissions than a car that is serviced regularly.

## 5. Purchase a fuel efficient car

- Check out the list of the most fuel-efficient vehicles by category and year at <http://oee.nrcan.gc.ca/transportation/personal-vehicles-initiative.cfm?text=N&printview=N>
- The federal government's ecoAuto Rebate program offers rebates of \$1000-\$2000 to people who buy vehicles that meet specific fuel efficiency standards (6.5 L/100km or better for new cars). Go to <http://www.tc.gc.ca/programs/environment/ecotransport/ecoauto.htm> for more information and a list of eligible vehicles. Several provinces also offer rebates.

- Sport utility vehicles (SUVs), mini-vans, and pick-up trucks are built on 'light truck' frames, which do not have strict fuel efficiency standards like other passenger cars. They consume 50-70% more fuel than other passenger vehicles, and as a result, emit more pollution.
- Between 10% and 15% of Canada's car fleet is made up of older, pre-1988, or poorly maintained vehicles that generate up to 50% of total vehicle emissions. Removing these vehicles from the road would make a large contribution to reducing air pollution.
- A vehicle that is 25% more fuel-efficient will save you about \$360 on an average gasoline bill of \$1440.

## 6. Use cleaner fuels

- Alternatives to gasoline, including propane, natural gas, ethanol, methanol and oxygenated gasolines (blends of gasoline and ethanol or methanol) burn more efficiently and emit fewer GHG and pollutants.
- In Canada, ethanol is used as a blending ingredient with gasoline at concentrations of 5%-10%. All gas-powered vehicles can use these ethanol-blended fuels.
- As a bonus, fuels blended with ethanol not only reduce emissions, they also improve engine performance.

## **Alternative Fuels**

### ➤ **Hydrogen Fuel Cells'**

Vehicles that are powered by hydrogen fuel cells use an electric motor where the electricity is created through a chemical reaction between hydrogen fuel and oxygen. Fuel cell vehicles can be fueled with pure hydrogen gas stored onboard in high-pressure tanks. They also can be fueled with hydrogen-rich fuels, such as methanol, natural gas, or even gasoline, but these fuels must first be converted into hydrogen gas by an onboard device called a 'reformer'. When hydrogen is the sole fuel source, the only tail-pipe emissions are water and heat. While fuel cells have promise, the net effect on GHG emissions will be depend on how the hydrogen is produced and distributed. Go to <http://www.fueleconomy.gov/feg/fuelcell.shtml> for more information on hydrogen fuel cell technology.

### ➤ **Hybrids (Gas-Electric)**

Hybrids are vehicles that use a combination of an internal combustion engine and an electric motor that is powered by a large rechargeable battery. The battery in a hybrid is recharged either from the engine or from energy captured while braking. Because hybrids use less fuel than regular cars, their emissions of GHGs are lower. For every 500 litres of fuel saved by driving a hybrid, over a tonne of CO<sub>2</sub> is prevented from being emitted into the atmosphere. They also emit less air pollutants overall. Hybrid cars are now widely available (e.g. Toyota Prius, Honda Civic hybrid, Ford Escape hybrid). Go to [http://www.hybridexperience.ca/Basics\\_Of\\_Hybrids.htm](http://www.hybridexperience.ca/Basics_Of_Hybrids.htm) for more information on hybrids and hybrid technology.

### ➤ **Biodiesel**

Biodiesel is the name of a clean burning alternative fuel, produced from renewable resources (e.g. vegetable oil). Biodiesel contains no petroleum, but can be blended at any level with petroleum diesel to create a biodiesel blend. It can be used in diesel engines with little or no modifications. Compared to emissions from petroleum diesel,

biodiesel emits: 50% less ozone, 47% less carbon monoxide, 47% less particulate matter, and 67% less VOCs. Emissions of SOX are virtually eliminated. In addition, less CO<sub>2</sub> is emitted during production of biodiesel, compared to petroleum diesel, resulting in a net reduction in CO<sub>2</sub> emissions of about 78%. Go to <http://www.biodiesel.org/> for more information on biodiesel.

### ***Did You Know?***

- Each litre of gasoline you burn in an average sized car contributes 2.5 kg of GHG. Each km you drive contributes about 240g of CO<sub>2</sub>.
- The Mercedes-Benz Smart Car gets 3.8 litres/100km on the highway and 4.6 litres/100km in the city. The Toyota Prius gets about 4.0 litres/100km (highway) and 4.2 litres/100km (city). A gas-powered mini-van gets about 8 liters/100km (highway) and 12 litres/100km(city).
- In some municipalities you can ride on hybrid diesel-electric buses. Victoria, Winnipeg and Vancouver are using hybrid buses as part of their public transit fleets.
- The BC Hydrogen Highway project aims to build a 'hydrogen highway' refueling network from Vancouver International Airport to Whistler in time for the 2010 Olympic and Paralympic Games. The goal is to speed up commercialization of fuel cell technology.

### ***Air Travel***

Air travel accounts for a relatively small proportion of total CO<sub>2</sub> emissions but those emissions have a disproportionately large impact on the climate. A litre of fuel burned at high altitude has 2-4 times greater impact on the climate than a litre of fuel burned at ground level because of the effects of NO<sub>x</sub> and contrails. Contrails are made up of water vapour, ice particles and other emissions released when jet fuel is burned. They can persist for several hours, spread to 2 km wide before dispersing, and contribute to the formation of cirrus clouds. Contrails and cirrus clouds contribute to global warming by trapping heat radiated from the Earth. This warming effect is greater for night flights than daytime flights because daytime contrails also block sunlight, partially offsetting their warming effect.

In 2004, domestic aviation accounted for 7.8Mt or 1% of Canada's GHG emissions. Although this seems small compared to emissions from vehicles, it is a 22% increase from 1990, and has an impact equivalent to 16-32 Mt. Furthermore, it doesn't include fuel burned on international flights.

#### **If you have a choice, don't fly.**

- Take the train or bus instead of flying. Both trains and buses are more fuel-efficient than airplanes per passenger km, especially for short haul flights (where trains and buses are realistic alternatives). Driving is even a better option than flying if there is more than one person in the vehicle and you drive a fuel-efficient car.
- Take a vacation closer to home. There are some great places to explore in Canada!

#### **If you do fly:**

- Choose daytime flights over night flights
- Choose direct flights (fewer take-offs and landings)
- Buy offsets to cover the carbon emissions from your flight. A number of airlines and travel agents give you the option of purchasing offsets when you book your ticket

(WestJet even pays the offset for you), or you can calculate and purchase your offsets online. A number of these sites are listed on <http://www.tufts.edu/tie/tci/carbonoffsets/TCI-offset-handout.htm> and [http://www.davidsuzuki.org/Climate\\_Change/What\\_You\\_Can\\_Do/carbon\\_neutral.asp](http://www.davidsuzuki.org/Climate_Change/What_You_Can_Do/carbon_neutral.asp)

### **Source and Useful Links**

David Suzuki Foundation:

[http://www.davidsuzuki.org/Climate\\_Change/What\\_You\\_Can\\_Do/air\\_travel.asp](http://www.davidsuzuki.org/Climate_Change/What_You_Can_Do/air_travel.asp)

Environment Canada Clean Air Online, Transportation: [http://www.ec.gc.ca/cleanair-airpur/Transportation-WS800CCAF9-1\\_En.htm](http://www.ec.gc.ca/cleanair-airpur/Transportation-WS800CCAF9-1_En.htm)

Environment Canada Clean Air Online, Taking Action: [http://www.ec.gc.ca/cleanair-airpur/Tips-WS49BCE76D-1\\_En.htm](http://www.ec.gc.ca/cleanair-airpur/Tips-WS49BCE76D-1_En.htm) and [http://www.ec.gc.ca/cleanair-airpur/Taking\\_Action-WS3A492C0F-0\\_En.htm](http://www.ec.gc.ca/cleanair-airpur/Taking_Action-WS3A492C0F-0_En.htm)

Environment Canada. What You Can Do: [http://www.ec.gc.ca/eco/main\\_e.htm](http://www.ec.gc.ca/eco/main_e.htm)

Government of Canada. 2006. National Inventory Report 1990-2004. Greenhouse Gas Sources and Sinks in Canada. Available online at: [http://www.ec.gc.ca/pdb/ghg/inventory\\_report/2004\\_report/toc\\_e.cfm](http://www.ec.gc.ca/pdb/ghg/inventory_report/2004_report/toc_e.cfm)

Intergovernmental Panel on Climate Change (1999). Aviation and the Global Atmosphere: <http://www.grida.no/Climate/ipcc/aviation/>

Statistics Canada. 2006. Human Activity and the Environment: Annual Statistics. The Scrap-It Program: <http://www.scrapit.ca/>

Transport Canada. Urban Transportation Showcase Program: <http://www.tc.gc.ca/programs/environment/utsp/showcases.htm>

Transport Canada. Transportation in Canada 2004. Available online at: [http://www.tc.gc.ca/pol/en/Report/anre2004/5\\_e.htm](http://www.tc.gc.ca/pol/en/Report/anre2004/5_e.htm)

US Department of Energy. Alternative Fuels Data Center: <http://www.eere.energy.gov/afdc/altfuel/altfuels.html>

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