drive

the way life moves

INSIDE

the way life moves

drive

When I got my driver's licence, freedom was the only thing on my mind.

Freedom to go to the mall or a party on Saturday night without hopping on the bus or hitching a ride with my folks. Freedom to drive down to a friend's house or my hockey game without needing a lift from someone. Freedom to come and go as I please.

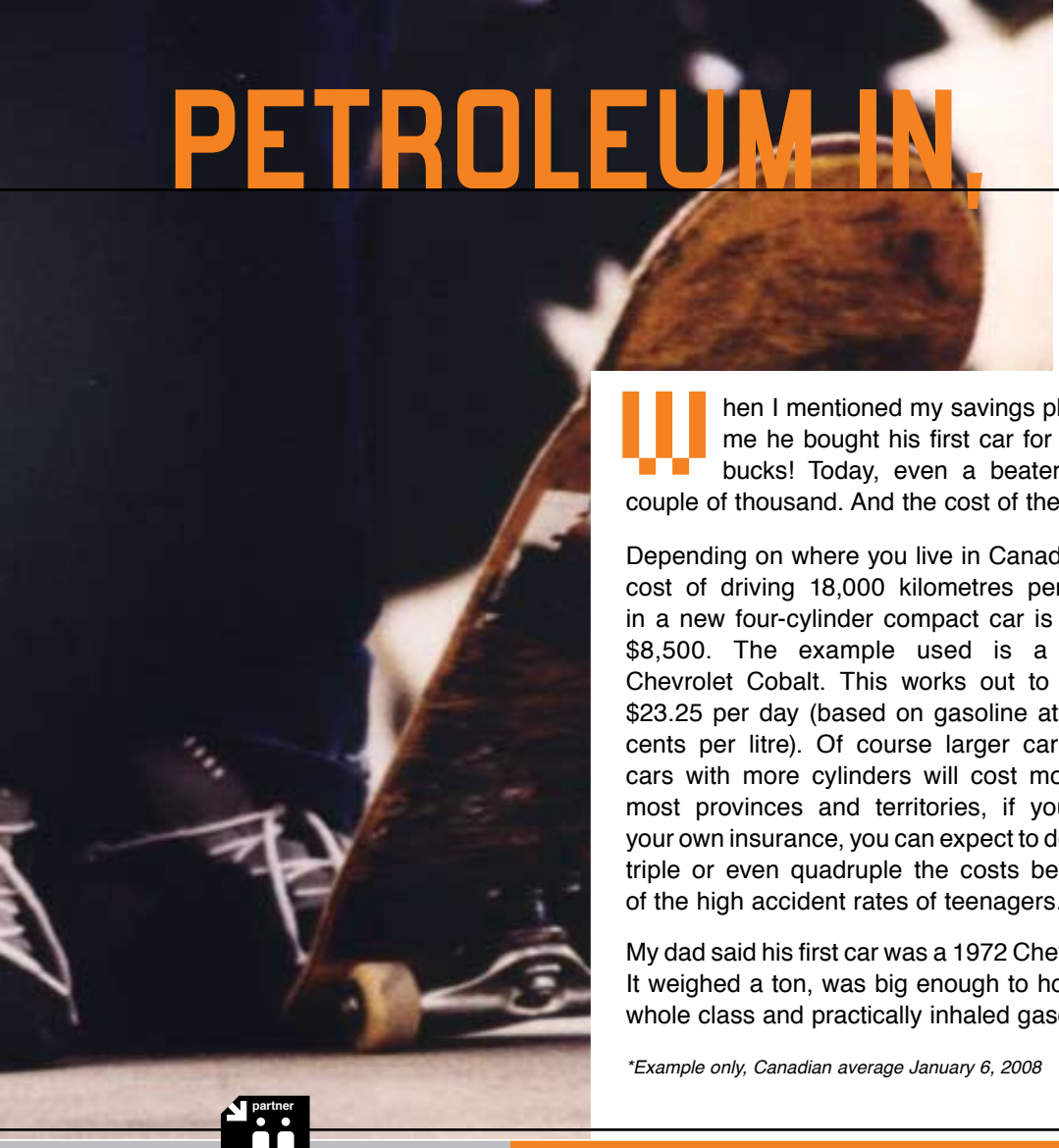
Because I didn't have the cash to buy a car right away, whenever I wanted to go out, I still had to borrow the keys. That was exactly what I had been trying to escape. So I decided I would put $50 into a car fund every two weeks from the money I earned at my part–time job. I was on the road to freedom.

Then I talked to my father ...

Activities are done individually, with a partner or in a small group.

individual partner group

PETROLEUM IN, PETROLEUM OUT



When I mentioned my savings plan to my dad, he told me he bought his first car for $300. Three hundred bucks! Today, even a beater is worth at least a couple of thousand. And the cost of the car isn't all you pay.

Depending on where you live in Canada, the cost of driving 18,000 kilometres per year in a new four-cylinder compact car is about $8,500. The example used is a 2008 Chevrolet Cobalt. This works out to about $23.25 per day (based on gasoline at 78.7* cents per litre). Of course larger cars and cars with more cylinders will cost more. In most provinces and territories, if you buy your own insurance, you can expect to double, triple or even quadruple the costs because of the high accident rates of teenagers.

My dad said his first car was a 1972 Chevrolet. It weighed a ton, was big enough to hold my whole class and practically inhaled gasoline.

**Example only, Canadian average January 6, 2008*

THE COST OF DRIVING

OPERATING		OWNERSHIP	
Fuel	$1,281	Insurance*	$1,741
Maintenance	$425	Licence and registration	$118
Tires	$268	Depreciation**	$942
		Finance charges (loan interest)***	$3,661
Total	$1,974	Total	$6,462

OVERALL $8,436

Source: Canadian Automobile Association

* Insurance Costs are based on a "commutation" category or typical example of insurance coverage vehicle driven less than 16 kilometres per day, to and from work, with no young driver.
- $250 deductible comprehensive
- $500 deductible collision
- $1,000,000 inclusive third party liability (total insurance cost)

Please consult with your insurance professional for other options.

** For kilometrage in excess of 18,000 kilometres annually, an additional depreciation allowance of $26.00 per thousand should be added to the ownership costs. The depreciation factor of $3,661.00 is an average annual figure predicated on car trade-in values of this vehicle at the end of four years with 72,000 kilometres on the odometer.

***Based on 8.75 interest; 10% down payment, four-year loan.

partner

ACTIVITY

PETROLEUM INSIDE OUT

1. How can you tell if a product is made with petroleum or petrochemicals? Petrochemical products are often lightweight, stretchy, soft, slippery or colourful.
2. With a partner, ask permission to examine the interior and exterior of a friend's vehicle. Make a list of all the components you can see that you think are made with petroleum or petrochemicals. Add to your list all the petroleum-based components that are in the engine, like fluids and parts. When you think you have completed your list, use the Internet to research any other petroleum-related vehicle products you may have missed.
3. Share your final list with the rest of the class. Why do you think so many vehicle parts are made with petrochemicals?

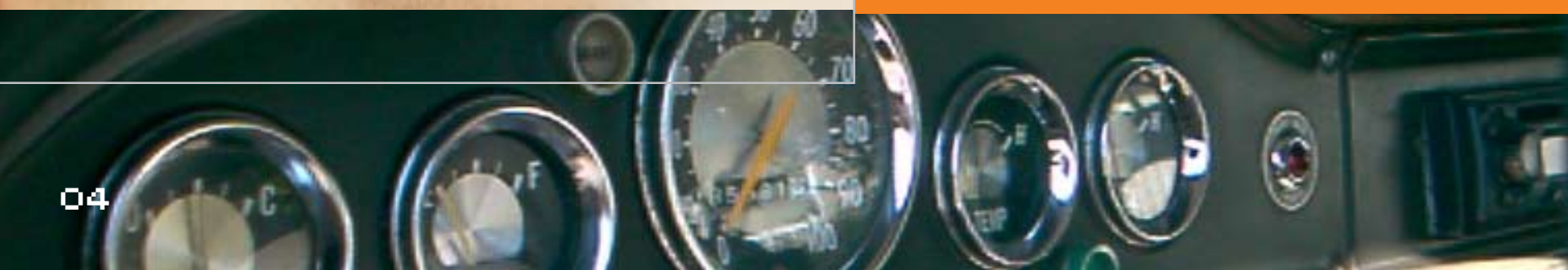
My dad knows a lot about cars. Compared to 1972, he thinks today you get much more car for your money. Thanks to technological innovations, cars are now more comfortable, more fuel efficient, more attractive and safer. Many of these changes are the result of research and development done by the petroleum industry.

Take tires for instance. They used to be rubber, but now they're a synthetic material called polybutadiene, made from petroleum. Polybutadiene tires make for a smoother ride, won't skid in the rain and last a long time.

Headlights and tail lights, which used to be glass, are now shatterproof polycarbonate – another petroleum by-product. The polycarbonate provides better visibility at night and allows designers to make cars that are sleeker and more fuel-efficient.

Inside the car, we sit on comfortable, petroleum-based urethane foam cushions covered in hard-wearing, spill-resistant, synthetic fabric or imitation leather. The same goes for the armrests, headrests and dashboard. Less metal and more plastic is great for keeping the noise level down so I can play my favourite music on the CD player. Thanks to petroleum technology, even the CDs are made from petroleum products. An all this urethaney stuff can be recycled into other things like carpet.

If you pop the hood, nylon, polypropylene and polyester are everywhere. And I haven't even mentioned fluids like antifreeze, windshield cleaner, synthetic oil, brake fluid, power steering fluid and everyone's favourite – gasoline. All of that stuff comes from petroleum, too.



Even though today's cars have the most efficient internal combustion engines ever, and burn the cleanest gasoline ever made, each of the planet's 806 million cars and light trucks still sends emissions into the atmosphere. And, the number of cars worldwide is expected to hit around a billion by 2020. According to Canada's Greenhouse Gas Inventory, 1990-2006, Environment Canada's most recent reports on emissions, Canada's 19.2 million light-duty vehicles alone emitted about 87.5 million tonnes of carbon dioxide in 2006. That's a lot of emissions.

Then there's the question of how to use petroleum – one of the world's most precious, non-renewable resource – more efficiently and more wisely. For all the improvements made to internal combustion engines over the years, they are only up to 20 per cent efficient in converting energy to traction, according to the U.S. Environmental Protection Agency. And while the quality of gasoline continues to improve, burning gasoline still creates emissions.

> If present demand continues, by 2020 our appetite for energy to move freight and people will likely be 50 per cent greater than it was when I started school. This means as consumers we'll use a lot more gasoline, diesel and aviation fuel, and have a greater impact on our environment.

I asked my dad what he thought of all this. He said it's true that driving my own car would give me freedom but that I need to think about the environmental costs that would come with it. He says he's trying to be a responsible consumer by driving his small car less, keeping his engine tuned and the car tires inflated to the right pressure.

individual

ACTIVITY

EMISSIONS DIET

1. An "average vehicle" is driven approximately 24,000 kilometres per year. Find a friend or family member who drives an "average vehicle". Interview that person to find out how far they drive to work, on weekends and on vacation.

2. That same "average vehicle" emits about six tonnes of carbon dioxide, carbon monoxide, hydrocarbons and nitrogen oxides per year. Create a generic mathematical formula to calculate how much that would be per driving day or per average trip, based on 24,000 km of driving per year. Use a kilogram per kilometre calculation to calculate how many kilograms of emissions your friend's or relative's vehicle emits every year.

3. Using your tables and notes, identify a number of ways to reduce your friend's or relative's vehicle use. For example, your friend might be able to carpool to work one day a week, take the bus on his or her monthly visit to grandma's place in the next town and walk to a Tuesday night basketball game. Use your per day or per trip estimate to assign an emissions estimate to each reduction effort, and try to get your friends or relatives car to lose a full tonne of emissions during the next year.

LOOKING IN THE REAR VIEW MIRROR

I've got this great social studies teacher who will let us study just about anything that really interests us if it's related to the curriculum. The other day she told us to write an essay about an important theme in Canada's history. I used this as an opportunity to learn more about my current obsession – cars and transportation.

If you can believe it, transportation is the world's biggest industry. In Canada, it is crucial to our prosperity because we're a geographically huge nation. We need to travel a lot of kilometres to move goods from one area to another.

In the 19th century, the Canadian Pacific Railway was the mass transit of its day. It united the country politically and allowed people and goods to move across the country. This gave our economy a real shot in the arm. Interestingly enough, the engines burned coal to create the steam that moved the train. Today, the energy we use to transport produces fewer emissions.

Today, transportation keeps Canada competitive within the global trading community. Each day, we do more than $2.2 billion worth of business with other countries through imports and exports. One out of every three jobs depends on our export economy.

The goods we export and import move across Canada by rail, transport truck, ship or plane. Railways carry half our freight. Trucks are close behind, while ships are a distant third. Airplanes move little freight but are vital to carrying business passengers and tourists.

As our economy has grown, so too have our cities. Canada has been an urban nation since 1921 and 60 per cent of our 31.6 million citizens now live in cities of more than 100,000 people.

All this urban growth edges into farmland and wildlife habitats, and demands more roads, highways and parking lots. And larger cities mean greater distances between home and work. Three out of four urban Canadians now drive every day. About 41 per cent of that driving time is spent getting to and from work and most of the rest involves driving kids to school, going shopping and getting to hockey and baseball games.

group

ACTIVITY

OUR AUTOMOBILE ECONOMY

1. In a group of three or four, make a web diagram to illustrate all the goods and services connected directly or indirectly to motor vehicles in Canada. Consider resource extraction, manufacturing, refining, distribution, insurance, parking, roads and highways, maintenance, disposal, recreation, safety, environment and any other categories you can think of. When you are finished, compare your web with that of another team to find anything you may have missed. Identify which of the goods or services you listed produce materials that cannot be recycled.

2. Now imagine a new environmental law is being proposed in your community. This law would ban the use of motorized vehicles (cars, trucks, motorcycles, etc.) except for emergency use. That means any other transportation needs would have to be filled via public transit.

3. Think about how the law would affect your own life, as well as your community as a whole. Use the F.A.I.R. model to identify the important issues to consider if the law were imposed. (a **F.A.I.R.** analysis includes arguments **F**or, arguments **A**gainst and any other **I**nteresting **R**emarks.) Once you've had a chance to consider all the F.A.I.R. aspects, hold a class vote on the proposed law.

partner

ACTIVITY

SO EXHAUSTING

All that driving plus the fleets of vehicles providing public transportation, emergency services and commercial delivery lead to more emissions and noise.

In 2006, according to Natural Resources Canada's Office of Energy Efficiency, the transportation sector of our economy used 29.6 per cent of all the energy we produce, making it the second largest energy consumer in Canada.

Our industrial sector was first at 38.9 per cent of all consumption, followed by the residential sector at 16 per cent, the commercial sector at 13 per cent, and the agricultural sector at 2.5 per cent. Not surprisingly, the transportation sector generates 46.3 per cent of emissions from the combustion of fossil fuels.

That's because the cars and trucks we drive and the airplanes we rely on for longer trips create most of these emissions. In one year, a properly tuned passenger car driven 24,000 km emits about 6,400 kilograms of carbon dioxide (CO2), 188 kilograms of carbon monoxide, 19 kilograms of hydrocarbons and 13.8 kilograms of nitrogen oxides (NOx). That's putting a lot of stuff in the air.

In the presence of sunlight, large quantities of nitrogen oxides, hydrocarbon emissions and particle emissions, primarily found in vehicle exhaust, can react to form ozone, a component of smog. In a recent study, scientists from the University of Toronto and Environment Canada discovered that breathing smog-polluted air starts a chemical reaction that causes an immediate effect – blood vessels in the arms of volunteers were shown to constrict by two to four per cent. The scientists noted this would not likely harm a healthy person in the short-term but could have a significant impact on those with existing heart disease or circulatory problems. Children's lungs are particularly vulnerable to the effects of smog.

Materials

- Cotton swabs
- Notepaper
- Tape
- Variety of motor vehicles

1. With a partner, choose a motor vehicle from the school's outdoor parking lot and ask the owner if you may test the vehicle's particulate emissions. Set up a chart like this to compare your chosen vehicle with others.

Make	Model	Engine	Year	Amount of particulate matter
Chevrolet Truck	Silverado	C-15	2008	High

2. Use your cotton swab to swipe the inside of the vehicle's tailpipe a few times. Be careful! Only conduct this experiment outside. Exercise caution as the tailpipe may be hot, especially if the vehicle has just arrived in the parking lot. Be careful not to touch it with your hand or clothing.

3. Tape your cotton swab to your notepaper. Look carefully at everyone's cotton swab and notes. What do you think caused the blackness on the swabs? Are some blacker than others? If so, which ones? Which vehicles had corroded tailpipes? Try to find reasons for lower or higher levels of particulate matter, based on the type and age of each vehicle and the fuel type used. You will likely want to question the vehicle owner regarding fuel, maintenance, driving habits, etc.

4. Write a short summary of the experiment and your findings.

DECISIONS,

DECISIONS

We still want it all. We want the freedom that comes with having our own cars, the economic benefits of transportation and a clean environment. We have to find a solution that can accommodate all three.

For example, only five per cent of the fuel used by most automobiles is needed to move the driver; the rest just moves the vehicle.

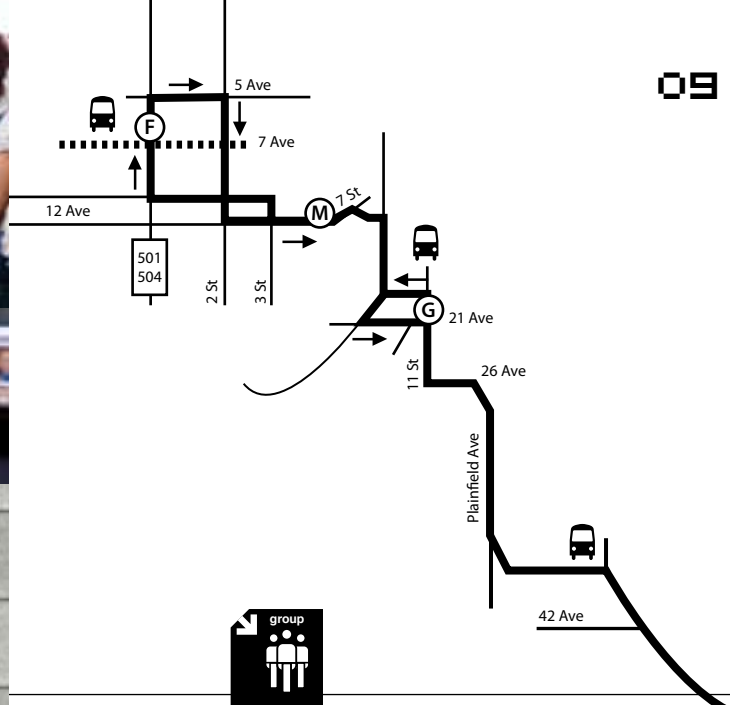
Redesigning automobiles is part of the answer. And we're making some headway in that direction.

Better fuel quality is another part of the answer. Better fuel and engine technologies and stronger government regulations have greatly reduced vehicle emissions during the last 30 years. Because leaded gasoline has not been sold at gasoline stations since the 1970s, emissions of lead have dropped by more than 95 per cent. Advances in fuel formulation have also contributed to significant reductions in smog-forming emissions. Since we now drive twice as many kilometres, however, declines in total emission volumes have been very modest.

Technology will further help us toward a reduced-emissions future. Fuel cells (usually hydrogen-based) and hybrid gasoline-electricity vehicles move us towards lower fuel consumption and a healthier environment. Some of these vehicles consume only four litres of gasoline per 100 kilometres of city driving compared to an average 11 litres per 100 kilometres for four-cylinder cars of the same class and 13.5 litres for six-cylinder cars.

In Europe and Asia, where high taxes make gasoline prices almost triple those in North American, this shift to smaller, more fuel-efficient cars is already well underway. Funny how rising costs change habits.

A few innovators are also working on radical redesigns of the automobile that combine state-of-the-art technology with the latest fuel options. Evolving transportation technologies will determine what engine and fuel combination best meet consumer and environmental goals.



ACTIVITY

CHARGING AROUND TOWN

Electric cars are considered zero-emission vehicles, although some emissions may be created while manufacturing the car and from the generation of electricity needed to power it. Because these cars run on a charged battery, they still don't go very far. Modern electric vehicles (or EVs for short) run from 25 to 250 kilometres at speeds from 40 kilometres per hour to 210 on a single charge, depending on road conditions, traffic and driving style. To help EV drivers get where they need to go, EV producers install battery charging facilities in locations around town, including malls, restaurants, workplaces, airports, parks and beaches.

If you were launching an EV company in your community, where would you locate charging facilities? Plot them on a map.

CONSIDER:

- Major driving routes
- Traffic patterns weekday rush hours, weekend getaways, etc.
- Road conditions, gravel versus paved, number of stops, etc.
- Local geography: downtown core, hills, etc.
- Popular and important destinations: hospitals, schools, airport, shopping malls, etc.
- Any other important factors

People making responsible choices are also part of the solution. Historically, people only bought larger vehicles for purposes such as farming, hauling and working in remote locations. Now, the trend in North American is toward buying these vehicles just to get around town.

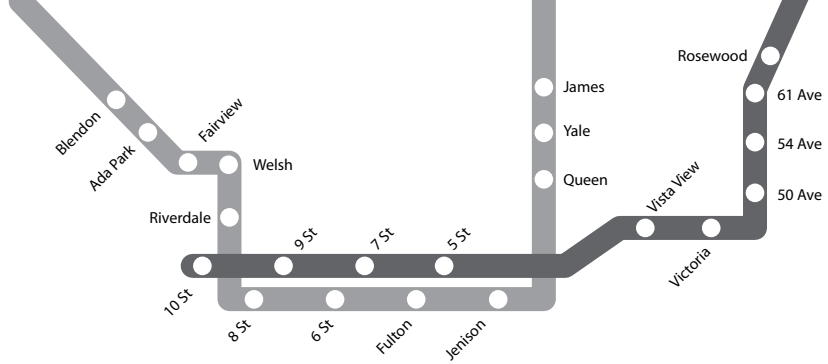
For example, almost 47 per cent of Canadians buy trucks, sport utility vehicles and minivans instead of passenger cars. These vehicles have higher emissions than passenger cars because they are heavier and burn more gasoline just to move around. However, new federal regulations ensured that all post-2004 model year vehicles and engines in Canada had to meet progressively more stringent exhaust emissions standards. Phase-in schedules vary by the type of vehicle.

Some people are making choices to dispose of their older vehicles in favour of newer, smaller cars that consume less fuel and produce fewer emissions. Some drive their vehicles only as far as the parking lot of the nearest train or bus station, where they leave them until they return from work. Others carpool, telecommute or run home-based businesses. Still others rent vehicles only when they need them or purchase a share in a single vehicle that is used by several people in their part of town. All this makes me think I should save even more money to buy a newer car that would pollute less.

Yet the Office of Energy Efficiency tells us that public transit accounted for only 2.1 per cent of the 528.5 billion passenger land kilometers travelled in Canada in 2006.

And then there are the buses and trains that I am most familiar with. They may not be glamorous, but their capacity makes them an efficient way of moving people and goods.

According to the Canadian Urban Transit Association, the the number of regular service passengers using public transit has risen from 1.55 billion in 2003 to 1.76 billion in 2007.



Part of the reason is that parents with young children, nightshift workers and those who live in areas poorly served by public transit often have no alternative to driving.

In many European countries, where car ownership has increased significantly in the last 20 years, governments have discouraged further growth by restricting parking, promoting the use of buses and bicycles and introducing the concept of car sharing. Some cities such as Amsterdam have gone as far as banning privately-owned cars from the downtown core.

Today, Canada boasts more than 15 car-sharing groups in major cities in seven provinces across the country.

Analysis of such programs in Switzerland and Germany showed that every shared vehicle replaces four privately-owned cars.

Closer to home, there is a citizens' group in Montreal called Le Monde a Bicyclette that has extolled the virtues of cycling since 1975. The group was instrumental in gaining access for cyclists to major thoroughfares, bridges and public transit. Athough the group's activities have decreased somewhat, Le Monde a Bicyclette continues to publish a newsletter, available at www.lemab.ca.

Montreal has also introduced what is being dubbed the largest, most ambitious bike-sharing program in North America. Called BIXI (bicycle and taxi), the model is simple. Users check out a bike with a credit card or access card and return it to any station after use. Following a demonstration project with 40 bikes, Montreal launched the full-scale program in May 2009 with 2,400 bicycles located at 300 stations. In the first seven weeks of operation, program users made more than 220,000 individual trips covering over a million kilometres. As second phase will involve adding more bicycles to the original program area, and 2,000 BIXI bikes and 100 new stations in another four city boroughs during the summer of 2009. By the fall, BIXI will have 5,000 bikes distributed among 400 stations.

Right now I ride my bike a lot. If I need to go farther, or if it is really cold out, I borrow my parents' car, catch the bus or hop on a commuter train.

Even so, it sure would be great to have my own car...

ACTIVITY

HOME TOWN OPTIONS

1 With a partner, find out what alternatives to individual driving your community offers. Investigate home town options such as public transit, carpooling, car sharing, bike routes or other transportation alternatives or combinations. Create a spreadsheet that details your findings, filling in the blanks for each of the headings listed in the sample shown on the right.

What transportation options are not available in your home town?

TRANSPORTATION OPTION	RENEWABLE OR NON-RENEWABLE	COST	AVAILABILITY	CONVENIENCE	ENJOYMENT	ENVIRONMENTAL IMPACTS
PUBLIC TRANSIT						
CARPOOLING						
CAR SHARING						
BIKE ROUTES						
OTHERS?						

When I got my driver's licence, I had no idea how much there was to consider when thinking about personal transporation and the Role it plays in our daily lives.

DRIVING TOWARD CHANGE

While I'm still not sure what I'll do about buying a car of my own, I now understand that the choices I make about mobility in my own life come with both costs and benefits.

Centre for Energy™