

INQUIRIES For a Sustainable Future

**A Decision-making Approach
to the Study of Selected Canadian Issues**

SUSTAINABLE TRANSPORTATION

**Reflections on the movement of people and of freight,
with special attention to the role of the private automobile**

**produced by the Centre for Sustainable Transportation
in cooperation with
Learning for a Sustainable Future**

April 1998

Surveys in Canada and elsewhere have shown that there is strong public support for steps that could be taken towards securing sustainable transportation. The question arises as to why, with all this evident willingness to change, more is not done towards reducing transportation's impacts, both individually and collectively?

Towards Sustainable Transportation, Report on an OECD Conference, Environment Canada, 1997.



The
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Le
Centre pour
un transport
durable

THE ISSUE IN PERSPECTIVE

Motorized transportation, and the automobile in particular, are now providing our society with some of the most difficult choices people have ever faced.

Our way of life has become dependent on the ready availability of high-quality transportation to move ourselves and the things we need without effort and at little financial cost. We've known for a long time that much of this transportation, especially cars and trucks, produces local pollution that causes damage to human health and local ecosystems. In North America, at least, this local pollution is mostly declining, even though traffic is increasing.

We are learning now that transportation—along with many other human activities—is also damaging the global environment in ways that, if continued, could make the planet uninhabitable. The climate is being altered (global warming). The layer of ozone in the atmosphere that protects living things against severe ultraviolet radiation is being depleted (ozone depletion). To prevent further global warming and further ozone depletion there will have to be dramatic reductions in emissions of certain pollutants from transportation.

People alive today for the most part will suffer little if we cannot reduce the emissions of the so-called greenhouse gases that cause global warming. Our descendants, including our grandchildren and their grandchildren, could suffer a lot. We could suffer today if, in order to reduce emissions of greenhouse gases, we have to change our way of life and, as a consequence, reduce our prosperity.

This is the difficult choice. Do we maintain our current methods of transportation and possibly harm our grandchildren? Or do we change how we move ourselves and our freight so as to avoid inflicting possible harm on them, and possibly harm ourselves?

*The question can be asked in another way: **Should we try to make our transportation sustainable?** Sustainability means behaving now in ways that keep opportunities open for future generations. It concerns above all how we behave in relation to the environment. Sustainability also means eradicating poverty and social distress, because these too can reduce opportunities for people who come after us.*

The main problem with our transportation is that it depends on refined oil that produces large amounts of carbon dioxide when burned in vehicles' internal combustion engines. CO₂ is a naturally occurring gas. You breathe it out; plants absorb it. But if there is too much CO₂ in the atmosphere it acts as a blanket and warms up the surface of the planet. Another problem is that the oil in the ground is running out. If we use it all up during the next 40 years, our grandchildren will have none for any purpose. They will not have oil for transportation, which consumes 70% of extracted oil. They will also have no oil for making of plastics and other useful materials, which is what most of the other 30% is used for.

One way of reducing emissions of carbon dioxide and other greenhouse gases is to have less transportation: less movement of people and less movement of goods. This is easy in principle but hard to put into practice. The general trend has almost always involved more transportation, not less.

Another way to reduce emissions is to improve vehicles and fuels so that less fuel is burned and less carbon dioxide and other greenhouse gases are released. This is a harder thing to do, but it can be more acceptable because it involves less disturbance of the way we live.

The main questions addressed in this Inquiry are these:

- (1) Should we make our transportation more sustainable?*
- (2) If so, how do we do it?*



1. HOW TRANSPORTATION HAS CHANGED

Travel has been a part of human experience since the migrations of our distant ancestors out of Africa. The Americas have been the end points of some of the most astonishing movements of people: from Asia, across what is now the Bering Strait to as far south as Terra del Fuego, in the millennia before history, and from Europe and Africa in the current millennium. But until the mid-1800s, travel everywhere was uncomfortable, dangerous, and enormously time-consuming. Freight movement posed even greater difficulties.

The appalling state of the roads [in Britain] in the 17th and 18th centuries is evident from most contemporary accounts. For much of the year, the soft dirt or gravel roads remained impassable. They were often so narrow that two pack-horses could only pass with difficulty, and in winter became so flooded that they were turned into permanent bogs, strewn with big boulders. Only the most adventurous travelled, and there were many parts of the country which travellers never visited and whose inhabitants knew little beyond their narrow districts. Christopher Savage, *An Economic History of Transport*, Hutchinson, 1966.

Travel in Canada was a little easier, on account of the extensive waterways and the solid winter surfaces, but the distances were huge, often unimaginable. Rail made the difference.

The first general consequence of railway development was the great increase in passenger travel which it stimulated. ... [it] increased tenfold [in Britain] between 1850 and 1885. Passenger travel by rail also influenced the growth of towns. The first suburbs were really the product of the railway age, for it was only through improved communications that populations could distribute themselves away from crowded city centres. ... Railways also narrowed social and class distinctions. ...

Railways also caused a big expansion in freight transport. They did for distribution what standardized machinery did for production. Being able to rely on regular and speedy delivery, merchants carried smaller stocks. The food supplies of ... large cities improved. Perishables, such as meat and vegetables, could now be brought in by rail from a great distance.

While long-distance journeys behind horses ceased, horse-drawn traffic as a whole was stimulated by the railways. ... the number of coaches running to and from the new railway stations employed a greater number of horses than the old stage-coach system. Christopher Savage, *An Economic History of Transport*, Hutchinson, 1966.

Rail was more than a means of transportation in Canada; it made Canada possible and became a symbol of its existence.

Confederation in the East rested upon a sense of collective identity, which, however rudimentary, managed to survive and, slowly, even to grow; but westward from Lake Superior the old complex pattern of the fur trade had long since gone. The explorations of Mackenzie and Fraser and Thompson, the concomitant of the North West Company's lust for furs and empire, were only memories, and the domination of Montreal had almost been forgotten. The word "Canadian" in the west had to develop new associations after half a century of neglect. Given railways, men might be drawn away from narrow identities around which swung tight old loyalties. Railways were to expand horizons, and in doing so change society, its orientation and its allegiances, slowly but finally. As they effected the gradual destruction of village independence and the extension of metropolitan influences, so also would they make possible more comprehensive political combinations. The Canadian Pacific Railway was to become the symbol of the new meaning of Canada, even as the long and arduous canoe route, six thousand kilometres from Fort McLeod to Montreal, was the symbol of the old.

P.B. Waite, *The Life and Times of Confederation*, University of Toronto Press, 1962.

But in spite of the significance of rail, many of the so-called Fathers of Confederation travelled to the 1864 Charlottetown Conference by boat, leaving Quebec City during the evening of August 29. Those were different times, when people lived shorter lives but had more time to spare.

The trip down the St. Lawrence in the *Queen Victoria* was a delight for everyone. The beautiful weather of that sunlit summer still held; the Canadians [i.e., delegates from what is now Ontario and Quebec] enjoyed themselves, sprawled in deck chairs, and watched the steep north shore of the great river recede below the horizon. The steamer followed the south shore. ... By early Thursday morning, September 1, the *Queen Victoria* had sighted the western tip of Prince Edward Island and thence followed the red ochre shoreline, with its green fields and white cottages. ... about noon they came quite suddenly upon Charlottetown.

P.B. Waite, *The Life and Times of Confederation*, University of Toronto Press, 1962.

But trains between cities and St. Lawrence River steamers were not enough.

By 1890, most of the settled areas of Canada were well supplied with steam railroad service that provided adequate transportation for longer distance travel. But there was still a need for improved facilities for movement from farm or village to nearby cities, and for frequent service between adjacent cities. For the farmer, direct rail service was not available, except after a drive by horse and buggy to the nearest station. Even for travel between nearby towns and cities where rail service was available, the infrequency of schedules and the usually inconvenient location of stations made the service inadequate in terms of the needs. For this type of travel, much of it for shopping, working in a nearby city, visiting friends or relatives, or attending school, church or meetings, frequency of service was of utmost importance. Similarly, steam railroad service was unsuited for many commercial travellers who sought to visit a number of towns each day. It was into this vacuum that the electric railway moved. Although it could never meet the needs perfectly—particularly of farmers not fortunate enough to be located close to the lines—it represented a major step, and had its development not been cut short by the motor vehicle its accomplishments would have been far greater.

John F. Due, *The Intercity Electric Railway Industry in Canada*, University of Toronto Press, 1966.

Electric railways within cities—streetcars—are still with us and are even showing a slight resurgence. But the last intercity electric railway car ran in 1959, between Port Colborne and Thorold, Ontario. Horse-borne and horse-drawn transportation had ended earlier, with several benefits but also some resistance.

When motor transport began to replace horses in the early 20th century, everyone noticed how relatively quiet and clean town centres became.

Kenneth O. Morgan, *Illustrated History of Britain*, Oxford University Press, 1984.

Every now and then a scare is started about the decadence of the horse. First the bicycle and then the automobile was to drive him off the road. I unhesitatingly assert that any vehicle which costs \$1,000 a year for repairs and supplies will never supplant the horse in public favour.

E. King Dodds, *Canadian Turf Recollections*, 1910 (cited in *Colombo's Canadian Quotations*, 1974)

The \$1,000 mentioned in the last quotation would be equivalent to more than \$15,000 in 1998 dollars, and that did not include the cost of the vehicle. Automobiles were definitely a luxury item. They did not remain so. Henry Ford reduced their price through mass production, and they became a household item. Now in parts of the United States, there is an average of more than one car per driver. A person may own many cars, perhaps one for commuting, one for camping, one for other family trips, and one to create a good impression.

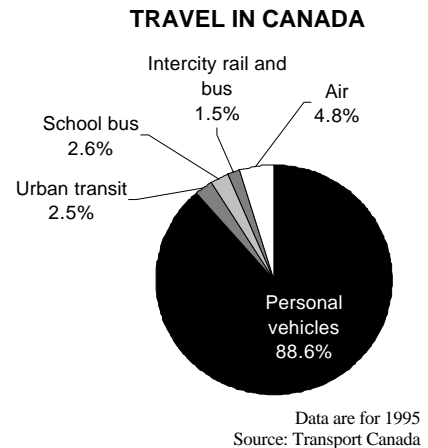
Nothing is entirely new. There is a report of a demonstration of a three-wheeled, turbine-powered automobile in Beijing more than 3000 years ago. There were complaints about the (non-motorized) traffic in Rome 2000 years ago that led Julius Caesar to ban the use of carts during the day, resulting in even more complaints about nighttime noise. What is new in our time is the pervasiveness of motorized transport, and its centrality to how we live and work.



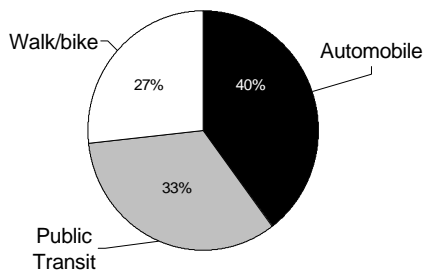
2. TRANSPORTATION TODAY

The pie chart on the right shows how Canadians travel by motorized transportation *within Canada*. The average Canadian travels about 18,000 kilometres a year in Canada and, as the chart shows, almost all of that is by car or by another kind of personal vehicle such as a motorcycle, sport-utility vehicle or passenger van.

The only other significant amounts of travelling done by Canadians are travel by car within the United States and international travel by air, including to the United States. International air travel is the fastest growing form of travel. It may also be the most environmentally damaging because high-flying planes inject their exhaust gases into a layer of the atmosphere where it can be especially harmful.



TRIPS BY DOWNTOWN RESIDENTS IN THE TORONTO REGION



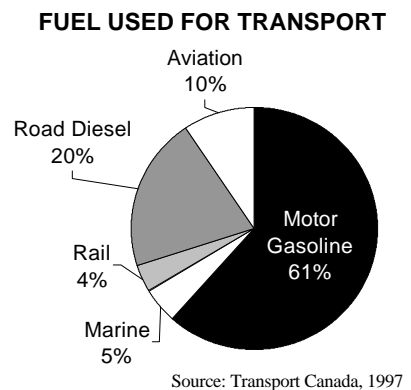
Source: Transportation Tomorrow Survey, 1996

Walking and bicycling are hardly noticeable on the national scale, but they are significant modes of travel for people who live in the central parts of cities. The pie chart on the left shows how residents of downtown Toronto do their travelling *within the Toronto region*. (This pie chart is based on numbers of trips made. The one above is based on distances travelled per person.)

Movement of people is the major part of Canada's transportation scene; movement of freight is the other part. The best way to compare the two forms of transportation is to look at the energy they use. Almost all of the energy used for transportation is provided by liquid fuel derived from crude oil: gasoline, diesel fuel or aviation fuel.

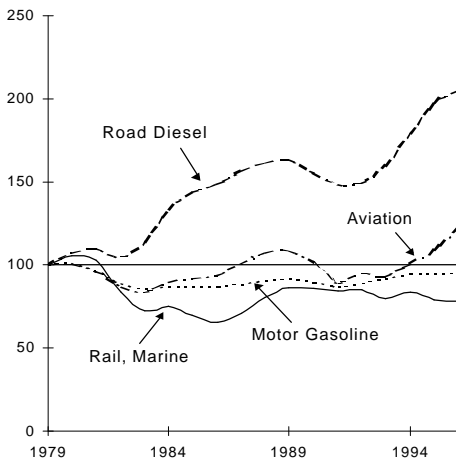
The pie chart on the right shows how the 55 billion litres of vehicle fuel used in Canada in 1996 was shared among the different modes of transportation. Motor gasoline and aviation fuel are used almost entirely for moving people. Road diesel fuel and fuel for rail and marine transport are used almost entirely for moving freight.

Thus we can conclude that roughly 70 per cent of the motorized transportation in Canada is for the movement of people and 30 per cent is for the movement of freight. Of course, there are many fewer vehicles involved in freight movement because freight vehicles are usually much larger.



Fuel use is a good index of the amount of transportation; it is also a good indicator of transport's environmental impact. This is because most of the global and local impacts of transportation are to do with the distribution and combustion of fossil fuels.

SALES OF PETROLEUM PRODUCTS IN CANADA
(1979=100)



Source: Transport Canada, 1997

has declined a little over the last few decades.

Even though the number of cars is growing (and the number of cars on the road is growing even faster), the amount of fuel used for cars has been more or less constant during the last two decades. This is because overall the improvements in automobile fuel efficiency have kept pace with the growth in automobile traffic.

This is certainly not true of truck traffic, which mostly uses diesel fuel. As the graph on the left shows, use of road diesel fuel has doubled during the same period.

Indeed just about all of the increase in energy use by transportation and in the environmental impacts of transportation during the last few decades have been on account of the growth in truck traffic.

The graph shows there has been a recent increase in the use of aviation fuel, and that fuel use for rail and marine transportation

Although the total amount of fuel used by rail is only one fifth of that used by trucks (see the bottom pie chart on the previous page), rail carries 25% more freight overall. This means that rail freight is about six times more efficient than road freight.

Not everything that is carried in trucks can be carried by rail. However, any effort to reduce the environmental impacts of transportation would do well to give priority to shifting some of the freight movement from road to rail.

Text and graphs adapted from the *Sustainable Transportation Monitor*, Centre for Sustainable Transportation, 1998

3. OUR LOVE AFFAIR WITH THE CAR

As we have seen from the last Topic, there is much more to transportation than cars, but cars are what most people think of first when they reflect on today's transportation, the benefits they bring and the challenges they pose.

... people value cars. They buy cars as soon as they can afford them, and they prefer them to other means of transport. This attachment is not the 'love affair' suggested by advertisements; it is not based in sensuality. The attachment derives from the unprecedented freedom, privacy, convenience, and security that cars provide. ... Rising car sales provide hard evidence of the perceived benefits of motor vehicles. Even in the United States, with more than one vehicle per licensed driver, ownership is still expanding. Other economically advanced countries are not far behind; car markets are nowhere near saturation. ... Increases are even more dramatic in less affluent countries, where the vast majority of the world's population lives.

Daniel Sperling, *Future Drive: Electric Vehicles and Sustainable Transportation*, Island Press, Washington, D.C., 1995.

An article by Agnate Bogestad in the Swedish newspaper Orbitad gave more concrete reasons why most people prefer the car.

With the car you can steer your own route entirely by yourself. In the car you can bring an extra sweater, boots and an umbrella, in case the weather should change sometime during the day. You can keep your computer and your briefcase in it while you do the shopping or pick up the kids at the day-care centre. You can just sit and collect your thoughts for a while.

Had she been writing in North America, she might have said she used the car because she felt safer in it than while walking or using public transit.

The 1996 Census of Canada showed that 72% of commuters in the Toronto region get to and from work by car, in spite of good public transit in many parts of the region. This was reported in the Globe & Mail newspaper in an article by Jane Armstrong entitled "Commuters Maintain Love Affair With Car." The article stimulated this letter to the editor:

Re. Commuters Maintain Love Affair with Car. Naturally! Everyone likes Santa Claus and sugar daddies. The love affair endures until the reality of cost becomes apparent.

Commuters buy a cheap two-car garage with a house attached, recently built on productive farmland. They do not pay for highways, service roads, new schools, sewer systems, pollution, loss of agricultural productivity or the time they waste commuting. Through government, we taxpayers are the sugar daddies supporting this profligate land use. As long as taxpayers are willing to subsidize commuting, bedroom communities will flourish.

The love affair with the car will cool when the lover has to pay the full cost of his commuting affair. Divorce is inevitable. A taxpayer revolt will end the illegitimate passionate relationship between commuters, developers and government.

Lorne Almack, Claremont, Ontario, March 25, 1998

Mr. Almack's letter, and a column on Toronto's urban sprawl that appeared in the Globe & Mail at about the same time, provoked this letter:

Here's a news flash: It's not the cheap housing. Many of us like suburbs and recoil at the thought of living cheek-by-jowl in large cities. The drive to work is a small price to pay for a decent place to raise our kids and a little green space to call our own. Furthermore, we pay the same income and sales taxes as those enlightened urbanites, plus a pile more at the pump and when purchasing and maintaining our vehicles. I wonder how much of our money goes towards maintaining transit systems we will never use?

Doug Cochrane, Barrie, Ontario, March 28, 1998.

Like most relationships between people, those between people and their cars are quite complex. Car manufacturers extol the joys of the open road, but the actual experience of driving is often quite different.

Americans are famously attached to their cars; it's the driving they can't stand. "Driving and habitual road rage have become virtually inseparable," says Leon James, a professor of psychology at the University of Hawaii, who specializes in the phenomenon. In the most comprehensive national survey on driving behavior so far, a Michigan firm, EPIC-MRA, found that an astounding 80% of U.S. drivers are angry most or all of the time while driving. Simple traffic congestion is one cause of irritation, but these days just about anything can get the average driver to tap his horn. More than one third of respondents to the Michigan survey said they get impatient at stoplights or when waiting for a parking space; an additional 25% can't stand waiting for passengers to get into the car. And 22% said they get mad when a multi-lane highway narrows.

Andrew Ferguson, "Road Rage," *Time*, January 12, 1998.

Even if driving makes people angry it remains true, as the sociologist and psychoanalyst Alexander Mitscherlich has argued, that the car is not just a means of transport but it is also a "status symbol, a shelter for lovers, and a drug for those with a strong addiction to movement."

The idea of the car as a status symbol is pervasive. Some people almost define themselves by the cars they own, or even by the fact that they drive a car rather than take a bus. In some parts of North America, a man over 30 who rides a bus is seen as a 'loser'; buses are 'loser-cruisers.' Such strong, sometimes deeply ingrained attitudes must change if our transportation patterns are to change.



4. TRANSPORTATION AND THE ECONOMY

The automobile has left its mark on the 20th century as an extraordinary means of transport, communication and freedom. It has played a major role in transforming the life-style of individuals. It is the driving force behind the economy. Engineers and all decision-makers involved in this transformation can be proud of their achievement.

Xavier Karcher, Former Vice-chairman and Chief Operating Officer of Citroen Automobile

In the value of its products, the automotive industry leads all other manufacturing industries. More than 100 countries make parts and components. Supplier industries provide even more jobs than the millions provided by manufacturing cars. (The typical car requires 680 kilograms of steel, 230 kilograms of iron, 90 kilograms of plastics, and 45 kilograms each of rubber and aluminum.) Still more millions work in related businesses such as service stations, repair shops and car agencies.

World Book Encyclopedia, 1993

Canada's automotive industry is the sixth largest in the world (after the U.S., Japan, Germany, France, and South Korea). In 1996, just under 2.4 million light-duty vehicles were produced in Canada—including automobiles, vans, sport-utility vehicles, etc.—and about 30,000 heavy-duty vehicles.

Just over 500,000 people are employed in the production of vehicles and parts, and in the sale of new and used vehicles and their maintenance. Another 250,000 or so are employed as truck drivers (truck driving is the most common job for men), and perhaps another 250,000 are employed in other aspects of the transportation sector, including taxicab and bus drivers, train engineers, managers, and support personnel. This is all out of a total Canadian labour force of some 15 million.

As well as the million or so Canadians employed in transportation, close to 500,000 are employed in one or another aspect of the oil industry in Canada, some 70% of whose products end up as transportation fuel.

The direct economic impact of transportation is closely related to the employment it generates. It follows that transportation is directly responsible for almost 10% of Canada's economy. There is also a substantial indirect economic impact. Some of this indirect impact arises from the ways in which our transport systems help economic activity. For example, a car makes it easy for a salesperson to visit potential customers. Other kinds of indirect impact are to do with the jobs transport makes necessary such as road repairs and some hospital activity. Clearly any move to reduce the amount of transportation in Canada, or even the amount of oil used for transportation, could have profound economic impacts.

But transportation is something of a paradox economically. For both ordinary people and businesses it is mostly a means to an end rather than an end in itself. People tend not to travel just for the sake of traveling but rather for some purpose such as getting to work, to school or to the shopping mall. If the traveling can be done more efficiently then society as a whole, including the economy as a whole, should benefit.

This point is clearer if you think of a business that has to pay to ship goods to customers. If the customers move closer or the freight costs become lower for some other reason the business will save money and be able to reduce its costs or make larger profits, thus potentially benefitting the economy as a whole.

Arguing that too much transportation could be a drag on the economy is not helpful to the people who would be thrown out of work if the amount of transportation were to be reduced. A conference is being held in July 1998 that will address the economic benefits in sustainable transportation, benefits that would result in alternative kinds of employment. Here are some of the benefits to be discussed:

Local circulation of money: In Los Angeles, it has been estimated 80 cents of every dollar spent on public transport gets to be recirculated in the region, translating into \$3.80 in goods and services. Conversely, 85¢ of every dollar spent on gasoline leaves the region. *Money staying in the region gets to be spent in the region, creating local employment.*

Cost-effective services: 'Cops on Bikes' programs lower costs and increase flexibility compared to policing in automobiles. *If people pay lower taxes and feel safer they are more likely to start or expand businesses and hire other people.*

Infrastructure costs lower: New urban expressways cost up to \$60 million per kilometre while rail and bike facilities cost on average \$9 million and \$0.05 million, respectively. *Again, lower taxes can stimulate business. Alternatively, the funds that might be spent on expressways could be used to provide better maintenance of existing roads.*

Reduces transportation costs: A business plan for a videoconferencing network at the B.C. Ministry of Transportation projects that an investment of \$977,000 will recover \$2,241,500 in travel costs over two years. *Local work can be created, in providing the videoconferencing facilities and making the equipment.*

Enables economic development generally: In Montgomery County, Maryland, a study found that if growth continued in the usual pattern, traffic congestion would stifle economic development. In contrast, if growth focussed on pedestrian and bike-friendly clusters along an expanded transit system, and commuter subsidies discouraged car use, jobs and households could double without exacerbating traffic congestion. *Anything that stifles economic development limits job growth; anything that allows it to proceed helps job creation.*

From material prepared for *Moving the Economy: Economic Opportunities in Sustainable Transportation*, International Conference, Toronto, July 1998.

Even fiscal conservatives have recognized the economic benefits accruing from some moves towards more sustainable transportation.

... many conservatives believe that transit does not have a positive impact on economic growth and development. Studies described in this report have found that rents are higher near transit stations, office vacancy rates are lower near transit systems, transit service increases development, and thus additional jobs are created and tax revenues collected because of transit investment.

Paul M. Weyrich and William S. Lind, *Conservatives and Mass Transit: Is It Time for a New Look?*
Free Congress Foundation, 1996



5. TRANSPORTATION AND THE ENVIRONMENT

Transportation in Canada is on an unsustainable path, meaning that if it continues the way it is there will likely be serious problems for the environment, the economy, and society. Consider these trends:

- [By some counts] transportation is the fastest growing source of greenhouse gas emissions from human activity. Natural Resources Canada projects that greenhouse gas emissions from Canadian transportation will rise 52 per cent between 1991 and 2020.
- Despite tighter vehicle-emissions regulations ... ground-level ozone and particulates in cities in Canada are increasing because of increases in numbers of vehicles, their average size, and the distances they are driven.
- Government responses to date are not expected to reduce total emissions—they will only stabilize them at current levels.

Sustainable Transportation in Canada—Backgrounder, National Round Table on the Environment and the Economy, 1996

In Canada, the transportation sector:

- is almost totally dependent on fossil fuels.
- consumes almost 30 per cent of all energy and almost 74 per cent of all petroleum products used by Canadians.

In spite of its important role, the transportation sector has been largely absent from the climate change debate. ... This situation is rapidly changing because:

- The threat of climate change is being brought home to ordinary Canadians through the popular media.
- Urban air quality is becoming a public health issue. Canada may face additional health care costs of \$11 billion to \$38 billion between 1997 and 2020, because of transportation-related air emissions.
- Shrinking municipal budgets are forcing people to rethink the ways we provide and pay for urban transportation.

A Primer on Urban Transportation and Global Climate Change, Transportation Association of Canada, 1998

There have been improvements, but not enough.

During the past decade, progress has been made in improving the energy efficiency of automobiles and in reducing regulated air pollutants. On a per-kilometre basis, smog-causing emissions have been reduced by more than 90 per cent since the 1970s, and corresponding improvements have been made in new car fuel consumption. Although new cars are more efficient than older cars that are being retired, efficiency improvements have begun to level off in recent years. The gains made during the past two decades in reducing emissions of regulated air pollutants and improving fuel efficiency will soon be overcome by increasing per-capita rates of car ownership and use, and by the projected increase in [the] population.

A Strategy for Sustainable Transportation in Ontario. Report of the Transportation and Climate Change Collaborative, National Round Table on the Environment and the Economy, 1995

It's not only cars, trucks, and planes:

Every litre of fuel diverted to pleasure boating has a long, long shadow, looming as large, environmentally speaking as 70 litres of fuel pumped into a road vehicle. ... One hour of pleasure boat operation is equivalent to more than 1,100 kilometres in a car. ... Pleasure boating produces as much hydrocarbon pollution as all the cars, trucks, and buses—all the road vehicles—in North America.

Andre Mele, Polluting for Pleasure, 1993

As well as the global effects from emissions of greenhouse gases and the more local effects on air quality, transportation has other adverse effects on the environment. It pollutes waterways and eats up what is often good agricultural land. Transport routes—roads and rail lines—cut up ecosystems and interfere with migration paths. Transportation consumes huge amounts of resources, many of them not renewable.

Urban sprawl, in part driven by our automobile-oriented society, eats up nearby agricultural land and reinforces dependence on distant food supplies. Moving food over long distances brings additional concerns about environmental impacts and resource use.

How much of your dinner tonight will have been grown locally? And how much will have travelled several hundred or several thousand kilometres, just to reach your table?

Measuring food-kilometres is a complex task but the results make disturbing reading. An analysis of the materials needed to produce our food can be startling. Ten litres of orange juice needs a litre of diesel fuel for processing and transport, and 220 litres of water for irrigation and washing the fruit. The water may be a renewable resource, but the fuel is not only irreplaceable but is a pollutant, too.

The problem is that fossil fuels, such as petrol [gasoline] and diesel, are remarkably cheap. The price of the fuel itself does not reflect the cost of providing the roads on which the vehicles travel. Nor does it reflect the cost of the environmental damage that burning fossil fuel creates. Nor the cost of developing alternatives when the oil wells run dry. All these costs will have to be paid for sooner or later, but they are not added to the price of the food. If they were, we might think very differently about whether we wanted to pay the true price for fresh lettuce from California, strawberries from Israel, and flowers from Kenya.

The Real Cost of Food, Auto-Free Times, Summer 1997.

Here are some facts on urban sprawl in Canada:

Canadian cities and towns expanded steadily between 1971 and 1996, gobbling up more than 12,250 square kilometres of surrounding land. This area, more than twice the size of Prince Edward Island, represented an increase of some 77 per cent in urban land use over the period. Much of the expansion occurred around smaller centres (those with populations of less than 100,000), where it was not uncommon to record a doubling in the area of urban land.

Of the total amount of land converted to urban uses during the period, slightly less than half was dependable agricultural land. ...

More than half of Canada's very best farmland is concentrated in Ontario. Most of this land is found in the same part of the province where urbanization has been, and continues to be, the greatest. ... In 1966, nearly 19 per cent of this land was being used for urban purposes. This land is, for all intents and purposes, permanently lost to agriculture.

Other provinces having significant areas of Class 1 farmland have also experienced losses due to urbanization. The most important of these occurred in Alberta and Manitoba.

Econnections: Linking the Environment and the Economy, Environment Canada, 1997.



6. TRANSPORTATION AND SOCIETY

One of the problems with the increasing automobilization of society is that people without cars lose the ability to travel.

... in car-oriented industrial countries, those who either cannot afford a car or are unable to operate one often have no access to jobs, schools, health centres, and other important destinations. Children, the handicapped, the poor, and the elderly are not only made less mobile by an auto-based system, but they also bear the brunt of its costs: the physically weak suffer the most from pollution, and the poor are those most often displaced by roads.

Marcia D. Lowe, *Alternatives to the Automobile: Transport for Livable Cities*, Worldwatch Institute, 1990

In many poor communities in the United States, and increasingly in Canada, even public transit is scarcely available, noted Jane Holtz Kay in her 1997 book Asphalt Nation. She quoted one transportation policy director as saying, “Some 40 years ago, Rosa Parks sparked the greatest social change of my lifetime by refusing to sit at the back of an Alabama bus. Today Rosa Parks might find bus service non-existent in her community. Or she might find that people of colour were the only passengers on the bus.”

Driven everywhere, children and young people, prevented from gaining independence, are among the biggest losers. This quote is from the report of a study conducted in Britain, where there are no school buses, but many of the trends and concerns apply to Canada.

A survey of children’s travel in 1971 ... revealed that 80 per cent of seven- and eight-year-olds got to school on their own. Our survey of children in the same schools in 1990 ... revealed that this figure had dropped to 9 per cent. The main reason parents gave for not allowing their children to travel to school on their own was fear of traffic. ... Comparing the results of the surveys, we found that children are now much more confined and supervised. ... The number of junior-school children driven to school has increased from one tenth in 1971 to one third.

... As traffic increases, other opportunities are reduced. Children are prevented from playing in the street and elderly people fear to cross it. The local post office and neighbourhood shops disappear and with them reasons for venturing forth on foot. Life becomes more anonymous and the world outside the home grows more threatening, especially at night...Although the environmental harm done by cars is increasingly conceded, there is a widespread reluctance to acknowledge the social damage they do.

John Adams et al., *One False Move: A Study of Children’s Independent Mobility*, Policy Studies Institute, London, 1991

*Then there are the individual economic costs, which can become social costs. According to Alan Thein Durning, in his 1996 book *The Car and the City*, the average person spends 27 hours a month paying for the 32 hours a month he or she spends driving. In many cases, those 27 hours can make the difference between work and over-work.*

Even in spite of the large costs involved in owning and operating a car, it seems that automobile use is heavily subsidized. Durning cites a Canadian study:

[According to] Todd Litman, economist and principal of the Victoria Transport Policy Institute, “The financial price Northwest motorists pay for each kilometre they drive is 32¢, but the full cost is 92¢.” ...motorists make non-monetary payments—in time and in assuming the risk of accidents—worth another 30¢ per kilo-

metre. So motorists pick up two thirds of the cost of driving. They bill other people, especially non-drivers, the poor, and taxpayers, for the remaining third. In economic terminology, these costs imposed on others are 'external.' At first, 30¢ in external costs does not sound like much; it's not even bus fare. But consider that vehicles in Canada travel over 300 billion kilometres a year.

What offences are counted in the 30¢ a kilometre? The biggest costs, a nickel or more each, are air pollution, sprawl, congestion, accident risk imposed on others, and subsidies for parking. The smaller costs are worth pennies or fractions of pennies apiece. They include waste generation, water and noise pollution, land values lost to roads and parking facilities, and a litany of auto-related government expenses not fully recovered from fuel and vehicle taxes—such as road construction and maintenance, protection of oil fields and supply lines, traffic policing, and emergency services at auto accidents.

Underpricing automobile use leads to massive transfers of wealth—and well-being—from people who drive less to people who drive more. Households with annual incomes less than \$20,000 drive a fourth as much on average as households with incomes more than \$75,000. And urban households drive about a third as much as suburban households. Furthermore, more than one in ten Canadians are in households that own no automobile; these people pay all the external costs of driving. Car-less households are disproportionately made up of the disabled, elderly, female, and poor. ... Under-pricing automobile use also leads to massive overuse of driving.

Adapted from Alan Thein Durning, *The Car and the City*, Northwest Environment Watch, Seattle, 1996

And there are other, less well specified social costs borne by the drivers themselves:

A generation or so ago, in the complacent fifties, the motion was not so perpetual. ... Now, though, with four times the 50 million vehicles of that era and far more dispersed trips, the traffic never ceases. Highways become sealed chambers of isolation as commuters put in an average of ten forty-hour weeks behind the wheel each year. Back roads and arterials stall during our three-plus daily trips on errands. Steaming and waiting in traffic, we pay penance for the growth in cars and trips. Trading time behind the wheel for space in the exurbs, work-bound Americans travel from before daybreak to after dark to ever more sprawling homes.

Jane Holtz Kay, *Asphalt Nation*, 1997

But perhaps the largest social costs will be encountered in what are often called developing countries. Already there is a major air pollution problem in most of the major cities of these countries, increasingly on account of the rapid growth in motorized traffic. But, while all suffer from the air pollution, relatively few people own vehicles.

In China, for example, whose cities have some of the worst air pollution in the world, the bicycle, used by the majority, is being discouraged in favour of the automobile, owned by well under five per cent of the population. Automobile ownership is being encouraged and is rapidly expanding, but it is hardly possible to imagine ownership patterns of the kind that exist in North America. The local and global consequences of such widespread ownership could be severe.



7. REDUCING TRANSPORT'S IMPACTS THROUGH BETTER TECHNOLOGY

Whenever people turn their minds to 'doing something' about transportation's environmental and other problems they think first about possible technological solutions, for good reason.

Technical fixes preserve the fundamental attraction of vehicle travel—mobility, convenience, and privacy—while requiring few behavioral changes. They support rather than subvert travellers' wishes and needs. Given the shortcomings of travel-reduction strategies and the huge promise of new technologies, the focus of any effort to create a more environmentally benign transportation system should be technical innovation.

The public strongly prefers this approach over restrictions on their behavior. ... the behavioral changes to accommodate the inconveniences associated with electric and other alternative fuel vehicles are trivial compared to the changes associated with switching to mass transit and even carpools.

Daniel Sperling, *Future Drive: Electrical Vehicles and Sustainable Transportation*, Washington D.C. 1995

There was a big improvement in the average fuel efficiency of automobiles in North America during the 1970s and 1980s, mostly the result of standards imposed by the U.S. Government. Now the fuel consumption of new North American cars is close to 10 litres per 100 kilometres, just a little above levels in Europe, which have remained unchanged for several decades. Further increases in fuel efficiency are promised. The most ambitious concepts have been dubbed "supercars." One description follows:

Ultra-light passenger cars with modern hybrid-electric drives could average less than 1.6 litres per 100 kilometres with demonstrated technologies. Consumption of about 1.0 litre per 100 kilometres appears achievable with 'state-of-the-shelf' technologies already demonstrated. ... Far from sacrificing other attributes for efficiency, ultra-light hybrids could be more safe, peppy, clean, fuel-flexible, durable, reliable, quiet, comfortable, and beautiful than existing cars, yet be priced about the same or less. Emissions are expected to be two to three orders of magnitude lower than today's cars—indeed, lower than those of power plants to re-charge battery-electric cars, even within the local airshed.

Supercars' surprising efficiency is due to previously neglected synergies between ultra-light construction (chiefly from advanced composites) and hybrid drive. ... Supercars could also buy time to implement, but cannot replace, fundamental transportation and land-use reforms.

Amory Lovins, Rocky Mountain Institute, 1994

It's not only improvements to cars and other vehicles that are being worked on. Some current major developments concern what are known as Intelligent Vehicle/Highway Systems (IVHS), which have been described as follows:

...a broad array of electronic communications technologies designed to do several things: smoothly regulate the flow of traffic; give drivers up-to-the-moment information on road conditions; take over some actual driving tasks, such as steering or braking to avoid collisions; assess road tolls without hindering traffic; help track and guide commercial fleets (including freight trucks) and emergency vehicles; and make buses and car pools more efficient and more convenient to use.

According to plans for later stages of IVHS, fully automated cars would drive themselves along the highway, guided by wires embedded in the road. Once drivers keyed in their destination, they could just sit back and enjoy the ride. Eventually, convoys of smart cars would travel bumper to bumper at high speeds. By eliminating the distance between vehicles, proponents claim, these caravans would free up extra space on the highway. The explicit goal of IVHS is an effective doubling of infrastructure capacity, although some experts have suggested that the systems, if fully implemented, could yield a three- to seven-fold expansion.

Marcia D. Lowe, "Reinventing Transport," in Lester R. Brown et al (eds.) *State of the World*, Norton, New York, 1994.

The development of smart vehicles and highways has been described as “the largest public works project in United States history.” Marcia Lowe, from whose report the last quotation was taken, is a strong critic of IVHS. She claims that IVHS is hardly more than a device for allowing more cars on the road, thereby reducing transit use, and will never be able to keep up with the expanding traffic volume. She says further that because IVHS could manage traffic only on major roads there would be serious problems in terms of congestion and parking availability when the vehicles in their larger numbers reach urban roads “of merely average intelligence.”

Yet another approach known as Personal Rapid Transit (PRT), which has been described as “perhaps the most exciting approach to reducing congestion.”

This new technology should overcome virtually all of the problems that beset present public transport systems. The new PRT technology, developed over a period of 20 years at the University of Minnesota, is now being engineered by the Raytheon Company of Sudbury, Massachusetts. ...

The system consists of small, dedicated, computer-operated electric vehicles that carry three or four seated passengers. The vehicles, powered by linear induction motors, ride on their own elevated guideway, allowing the vehicles to travel safely at high speeds. Because the capital cost of a passenger seat is independent of the size of the vehicle, small vehicles were chosen for the system, permitting smaller support structures for the guideways that are much lighter and less expensive than the massive concrete pillars required for traditional transit systems.

Elevated guideways are preferable to either underground systems (which are costly to build and entail considerable community disruption during construction) or grade-level systems (which are subject to vandalism and present barriers to community movement). ... As a result, for a given investment, many more PRT stations and guideways can be constructed allowing service to areas of lower density: in a properly designed system there should be a PRT system within a 10-minute walk of almost any point in a metropolitan area. James J. MacKenzie, World Resources Institute, 1994.

All this technology sounds wonderful, but will it do the job?

Improvements in technology will contribute much toward attaining sustainable transportation. But the improvements will likely not be enough to make transport sustainable. Indeed, research by the Paris-based Organization for Economic Cooperation and Development (OECD) on what has to be done to reach sustainability suggests that technology will take us no more than a third of the way there. The rest of the needed reduction in environmental impacts will have to come from reductions or changes in transport activity.

Sustainable Transportation Monitor, Centre for Sustainable Transportation, Toronto March 1998.

Indeed, even organizations concerned to promote motoring and tourism believe that technology is only a part of the answer. What is your view?

There is no single solution or one policy instrument capable of tackling the problem of CO₂ emissions from passenger cars. An effective strategy must promote fuel efficiency on the one hand and reduced car dependency on the other. This requires a mix of policies to encourage new vehicle/fuel technologies that reduce energy consumption, combined with greater available choice for the public between different forms of transport. It is this combination that is a precondition of an effective strategy for reducing CO₂ emissions from passenger cars.

From a joint statement by the International Tourism Alliance and the International Automobile Federation, Paris, France, November 1997.



8. OTHER WAYS OF REDUCING TRANSPORT'S IMPACTS

Getting people out of their cars and into public transit can be a good solution. Well-occupied buses and trains pollute less and they take up less space, thus reducing the costs and environmental impacts of road construction.

... the average car in a Canadian city is carrying only 1.3 people. What we need are higher densities per vehicle. Car-pooling achieves that. But the maximum impact comes from transit. A standard bus replaces about 50 cars in rush hours. ... At peak hours, two standard buses can carry 130 people. Total space occupied: 25 metres of a single lane. To carry the same number of people by car—given average ridership—requires that the single lane be stretched to some 500 extra metres. Cars park downtown. Buses don't.

Adapted from *The Environmental Benefits of Urban Transit*, Canadian Urban Transit Association, Toronto, 1995.

But public transit has not been doing well.

After two decades in which auto use increased along with public transit ridership, Canada's ability to balance public and private means of urban mobility appears to have broken down. Since 1990, urban transit has steadily lost riders while urban auto use continues to increase. ... Transit subsidies to regain lost ridership, externality pricing of city driving, and land use regulations that discourage suburban sprawl will be needed to maintain alternatives to the auto and to preserve the quality of urban life that Canadians have long taken for granted.

Anthony Perl and John Pucher, "Transit in Trouble? The Policy Challenge Posed by Canada's Changing Urban Mobility," *Canadian Public Policy*, 1995

Here's what the public transit industry thinks should be done to remedy the situation.

Federal and Provincial tax measures should be provided to encourage and promote increased use of public transit. Some potential tax measures include:

- Transit passes supplied by employers should become a non-taxable benefit. Additionally, parking spaces provided by employers should be treated as taxable benefits.
- Tax credits to individuals for the purchase of transit fares.
- Tax credits to developers and employers who help underwrite the cost of high quality transit services linking their place of business to high capacity transit services.
- Federal funding/subsidies for the construction of rapid transit facilities or for the purchase of rapid transit rolling stock, and for the retrofitting of diesel bus engines to use more environmentally friendly fuels. A special tax on gasoline may be appropriate for this purpose.

The Environmental Benefits of Urban Transit, Canadian Urban Transit Association, 1990.

Half of all car trips are five kilometres or less, trips that could often be made without motorized transportation, i.e., by bicycling or walking. Bicycling and walking can make a great contribution to personal health and well-being. Here are some recommendations by Health Canada concerning what it calls 'active transportation':

- Keep the 'parent taxi service' to a minimum. Walk your children to visit friends, to the library, and to sporting events whenever possible.
- Urge families in your neighbourhood to walk or cycle to community events.
- Contact school organizations to help promote 'safe walks' to and from school.
- Plan out the day's activities and errands to make the fewest number of car trips possible.
- Link cycling and walking to transit stations.

There are simple steps neighbourhood groups can promote:

- Organizing bike lanes with painted lines on streets, where appropriate, to enhance the safety of cyclists.
- Encourage zoning changes to allow more mixed-use and bring retail, employment and recreational facilities closer to residential areas.
- Reduce speed of traffic on streets. *Developing Communities for Active Transportation, Health Canada, 1995.*

Land-use and transportation planners have proposed many other measures:

... major disincentives to automobile use would be required as well as major transit and land-use initiatives. These could include such mechanisms as tolls, increased gasoline taxes, reserved lanes for truck traffic and cars with multiple occupants. It could also include other major restrictions on the use of the automobile, such as the prohibition of non-essential vehicles in downtown areas.

The Greater Toronto Area: Concepts for the Future, Metropolitan Toronto Planning Department, 1990

A plan for Amsterdam provides insight into what might be done to improve urban transportation:

Amsterdam wants to be the first major European city that virtually banishes the car from its heart.... The present image of the automobile here is approximately that of a leech on the body of the community.

“For years the city was forced to adapt to cars,” said Rob Pistor, a city official and one of the plan’s chief strategists. “Cars will now have to adapt to the city.” ... Cars will be squeezed off the streets by wider sidewalks and new bicycle lanes, and parking spaces will be cut back sharply. In the final stage, all non vital traffic is to be banned....

Moreover, the city held a referendum last March—the first in Amsterdam’s history—in which almost 53 percent of the voters backed a plan for a virtually car-free centre. ... “We are reconquering the lost public spaces,” Mr. Pistor said. “We need them for walking, cycling, shopping and sitting around, for markets, music or other street events.” ...

Dave van Ooyen, a city traffic specialist, said, “We think the most effective instrument to reduce cars is to reduce parking. The idea is to cut parking spaces in half.” Other steps planned this year include new speed limits of 30 kilometres per hour and higher parking meter fees, now \$3 per hour. ...

The city says it will expand metro and tram lines and plans garages near the terminals on the city periphery. It also says it will provide more and safer locations to park and repair bicycles to encourage cyclists. Amsterdam already has a head start: one-third of downtown traffic consists of bicycles.

Ultimately, the plan foresees that apart from taxis, police cars, ambulances and fire trucks, only the disabled and some of the residents will have access to the canal zone. The city council has still to decide how many permits will be available for residents. Buses and large trucks will be banned and small business vans will be allowed to load and unload for short periods.

While the plan has wide backing from frustrated residents, business groups are warning against the dangers: what may be a victory for the quality of life could bring on the decline if not the collapse of economic life in the inner city.

“Amsterdam Plans Wide Limits on Cars,” The New York Times, January 28, 1993.

In 1998, we can report that the plan is slowly being implemented, too slowly for the residents, but too quickly for many of the business people. Cars still dominate the centre of Amsterdam. The economy continues to thrive. A new focus is the establishment of car-free (or almost car-free) housing developments. There were ten bidders for every one of the 600 owner-occupied and rented apartments in the first such development, which was constructed according to ecological principles. These included substantial barriers to car ownership coupled with ready access to high-quality public transport. The residents of the project are said to be content: “very pleased with the green and child-friendly character of the site—a village in a city,” according to Ineke Karemaker, the project manager on behalf of the local municipality.



9. WHAT SUSTAINABLE TRANSPORTATION COULD BE LIKE

What would the future look like, if cities were not dominated by cars? The very heart of a city would be reserved for people on foot and passengers arriving by metro or trolley. Proceeding outward from the centre, streets would become the shared domain of pedestrians, cyclists, trolleys, and buses. Slow automobile traffic would be allowed beyond the city's densest core, but convenient bus and rail services—running between stops placed within walking or cycling distance of most points—would offer a faster mode of travel. Express public transport routes would link outlying areas to each other and to the downtown. Car parking would be progressively less restricted as one moved away from the city centre.

People would make most short trips by foot or bicycle, and longer urban trips by walking or biking to transport stops, then continuing by bus, metro or trolley. Many long drives and short airplane flights between cities would be replaced by train trips. Automobiles' main function would be to make trips for which these other modes are inconvenient, such as transporting loads of things or groups of people, travelling at odd hours when public transport is running infrequently, and certain recreational uses.

Marcia D. Lowe, *Alternative to the Automobile: Transport for Livable Cities*, Worldwatch Institute, 1990.

In the early 1990s, city planners and others in Vancouver and Toronto explored how their cities could cope if there were no cars early in the 21st century. In one of a number of personal reflections a Toronto planner wrote:

One of the biggest changes would be in shopping. Absence of cars would obviously lead to the demise of drive-in shopping centres, malls and very large supermarkets that depend on auto access. The supermarket and giant 'power' stores that offer cut rates depend on a kind of subsidy that the customer gives the retailer by bringing the purchases home himself or by travelling long distances to a central point to shop. Large stores carry this principle of customer subsidy to the transportation of goods even further, by not offering deliveries and encouraging customers to assemble items themselves. Without private cars, shopping obviously would have to be located much closer to customers. This would mean revival of the corner store, a revival of main street shopping, a tremendous increase in the use of shopping carts, which are very common in New York even in the most affluent areas because they are the most convenient way to transport goods from a supermarket. Delivery boys (or girls) on bicycles might flourish again.

Another planner, asked to present a child's perspective, provided the following:

I am looking forward to the summer when we can take the train up to the cottage for our two-week vacation by the lake. We share the cottage with other families who use it at different times and we can rent a car for our private use during our stay. Dad says having a car like this reminds him of the old times and he sure likes to get out and drive it a lot. I don't mind having a car but the roads around the cottage are really busy and dangerous. Also, you do not get to meet people like you do back in the City where the streets are friendlier and people share the buses and the available cars. But the lake at the cottage is great and there are no power boats to disturb the peace and quiet of it all.

The City without cars is really neat for kids. You have to be careful of the streets where vehicles are allowed to go but most of the time you can roam pretty freely. We all have bikes and skateboards and tobogganing on old, abandoned roadways is great in the winter. We really have the neighbourhood to ourselves and we all know every short-cut, back alleyway and good hiding places. We also know the houses where people like kids and where they don't. I know the grown-ups sometimes complain a lot about not having their own cars. Their big complaint seems to be that you have to be more organized and have to adjust to bus and train schedules.

Adults, without cars, have to be more organized generally, particularly when it comes to things like planning shopping trips, trips to the doctor or dentist or holiday jaunts. Parents with little kids probably find it the most difficult but for most kids themselves, once they can get out of the house and play—life on the streets without cars is great.

Cities Without Cars, Canadian Urban Institute, 1994.

Here is a vision of what urban transportation should look like in the future, developed by one of Canada's leading professional transport associations:

It is the year 2023:

- A long-term urban development plan has been approved. It emphasizes multi-use town centres and high density, mixed use along connecting corridors. Transit has funding and operating priority in those corridors.
- Short-medium term community/neighbourhood plans have been approved. They emphasize compact, mixed-use communities based on pedestrian, cycling, and transit-friendly design.
- Transit, highways, arterials, parking, and truck routes are planned and coordinated across the urban area.
- The percentages of trips made by walking, cycling, transit, and high occupancy automobiles are all increasing; the percentage of trips made by single occupant automobiles is decreasing.
- The average distance and time for peak-hour commuter travel is decreasing.
- An area-wide parking strategy is in place and enforced.
- There are very few places that still require on-street goods transfer.
- The physically challenged enjoy universal access to public transport facilities and services.
- Roads and bridges are in a good state of repair.
- Air pollution from motor vehicle sources is declining.
- Urban transportation infrastructure and services are adequately funded from stable and sustainable revenue sources.
- Political leaders have the support of a well-informed public when making decisions on urban development and transportation systems to serve the area.

A New Vision for Urban Transportation, Transportation Association of Canada, 1993



REFLECTIONS ON SUSTAINABLE TRANSPORTATION

1. “... people value cars ... and they prefer them to other means of transport.” (Topic 3). Is this statement true? Why or why not? Conduct a fast poll of your class to see how many answer “yes” and how many prefer other means of transport. What are main reasons given for each preference?

Conduct a more detailed class survey of students and their families to answer the following question:

How would you assess the role of the car in your family life? (give at least one example to illustrate your answer)

- a) essential to your family’s livelihood
- b) a necessary convenience
- c) part of our lifestyle, standard of living
- d) not a factor, other means of transport used

Display the results of your survey in a pie chart of the kind used in Topic 2. What does the pie chart tell you?

2. Describe the growth in the use of the car over the last 100 years. Why has the car now being singled out as a major issue of concern? Outline its impact on the natural environment, the urban and rural landscapes, and on public health?
3. Explain the importance of the automotive industry to Canada’s economy. Begin by listing the kinds of jobs that depend on the use of a car.
4. Summarize the case for more sustainable transportation, and set out the challenges to be faced in achieving it.
5. Using Topic 9 and your own ideas, describe your vision of what sustainable transportation might mean in your community in the year 2023. Briefly describe the differences between your vision and the present reality. Suggest what role the following should play in achieving your vision:
 - a) new technologies
 - b) changes in public attitudes and behaviour
 - c) changes in advertising
 - d) changes in governments’ policies at the municipal, provincial, and federal levels.
6. The federal and provincial governments are discussing how to meet international agreements for reducing emissions into the atmosphere, including emissions from transportation, that contribute to potential climate change. In doing so, they have to balance concerns about the economy and for society with concerns about the environment. What suggestions would you make to help them to develop a national, long-term strategy for securing sustainable transportation?
7. What can individuals do to ensure that transportation becomes more sustainable within their communities?

TOPICS

1. How Transportation has Changed
2. Transportation Today
3. Our Love Affair with the Car
4. Transportation and the Economy
5. Transportation and the Environment
6. Transportation and Society
7. Reducing Transport's Impacts Through Better Technology
8. Other Ways of Reducing Transport's Impacts
9. What Sustainable Transportation Could be Like

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