

Cycling Trends and Policies in Canadian Cities

by

John Pucher (pucher@rci.rutgers.edu)

<http://www.policy.rutgers.edu/faculty/pucher.html>

and

Ralph Buehler (ralphbu@eden.rutgers.edu)

Bloustein School of Planning and Public Policy

Rutgers University

New Brunswick, New Jersey 08901

Tel: 732-932-3822, ext. 722

23 April 2005

Abstract

Bicycling accounted for an average of 1.2% of work trips in Canada in 2001, but with considerable variation by province and metropolitan area. In this study, we chose six Canadian cities for detailed analysis of their cycling trends and policies: Montreal and Quebec City in Quebec; Ottawa and Toronto in Ontario; and Vancouver and Victoria in British Columbia. All of these cities have made impressive efforts to encourage more and safer cycling. Most of the cities report increases in cycling levels over the past two decades but appear to have reached a limit due to lack of funding for crucially needed cycling infrastructure (bike paths and lanes, parking, intersection modifications, etc.). In addition, the low-density, car-oriented suburban sprawl spreading around most Canadian cities has been increasing trip distances, thus making cycling decreasingly feasible outside the urban core. Finally, Canadian cities and provinces have not imposed any significant restrictions on car use or imposed increases in taxes, fees, and other charges for car use, such as most European cities have implemented to discourage driving and increase transit use, walking, and cycling. If Canadian cities really want to further increase cycling levels, they will have to further expand cycling infrastructure, curb low-density sprawl, and impose more restrictions and charges on car use.

Keywords

Bicycling, Canada, modal split, sustainable transport, traffic safety, urban travel

This is a preprint version of the revised and illustrated article that appeared in *World Transport Policy and Practice*, March 2005, volume 11, issue 1, pp. 43-61. The published version is accessible at the internet site: www.eco-logica.co.uk/WTPPArticles.html.

This article reports on the results of research funded by a grant from the Canadian Studies Program of the Canadian Government, February 2004 to January 2005.

Introduction

In 2002, the Canadian Government ratified the Kyoto Protocol, thus officially committing the country to reduce its greenhouse gas (GHG) emissions. By the year 2012, Canada must achieve at least a 6% reduction in total GHG emissions below the 1990 emissions level (Environment Canada, 2004). Unfortunately, Canada does not appear to be headed in the right direction. Indeed, from 1990 to 2002, its total emissions of GHG grew by 20%, and GHG emissions from transport sources grew even faster—by 24% (Environment Canada, 2004; Gilbert and Irwin, 2004). In order to reduce GHG emissions by the required 6% by 2012, it will be essential for Canada to curtail transport emissions in particular, since they account for a fourth of all GHG emissions.

Encouraging Canadians to use their bikes for a higher percentage of trips—and their cars for a lower percentage—would be an ideal way to start reversing the alarming increases in Canadian GHG emissions (Transportation Association of Canada, 1993, 1998, 2004). Bicycling is surely the most sustainable transport mode. Bikes emit virtually no GHG at all. Unlike the private car, bikes cause no pollution of any kind and use no non-renewable energy sources. Moreover, they require far less roadway and parking space, thus helping to relieve the growing congestion problems in most cities. Bicycling is also a very equitable mode of transport, since it is affordable by virtually everyone, and with proper training, most people can learn to cycle. Finally, cycling is an extraordinarily valuable form of cardiovascular exercise that improves both physical and mental health (Pucher and Dijkstra, 2003).

This article examines the status of cycling in Canadian cities. We document trends in cycling over time, as well as differences in cycling levels among different Canadian provinces and metropolitan areas. Perhaps most important, we examine the wide range of policies and programs that Canadians have implemented to promote more cycling while also making it safer, more convenient, and more feasible. Some measures have been quite successful and innovative, providing valuable lessons for other countries about how best to increase cycling while improving its safety.

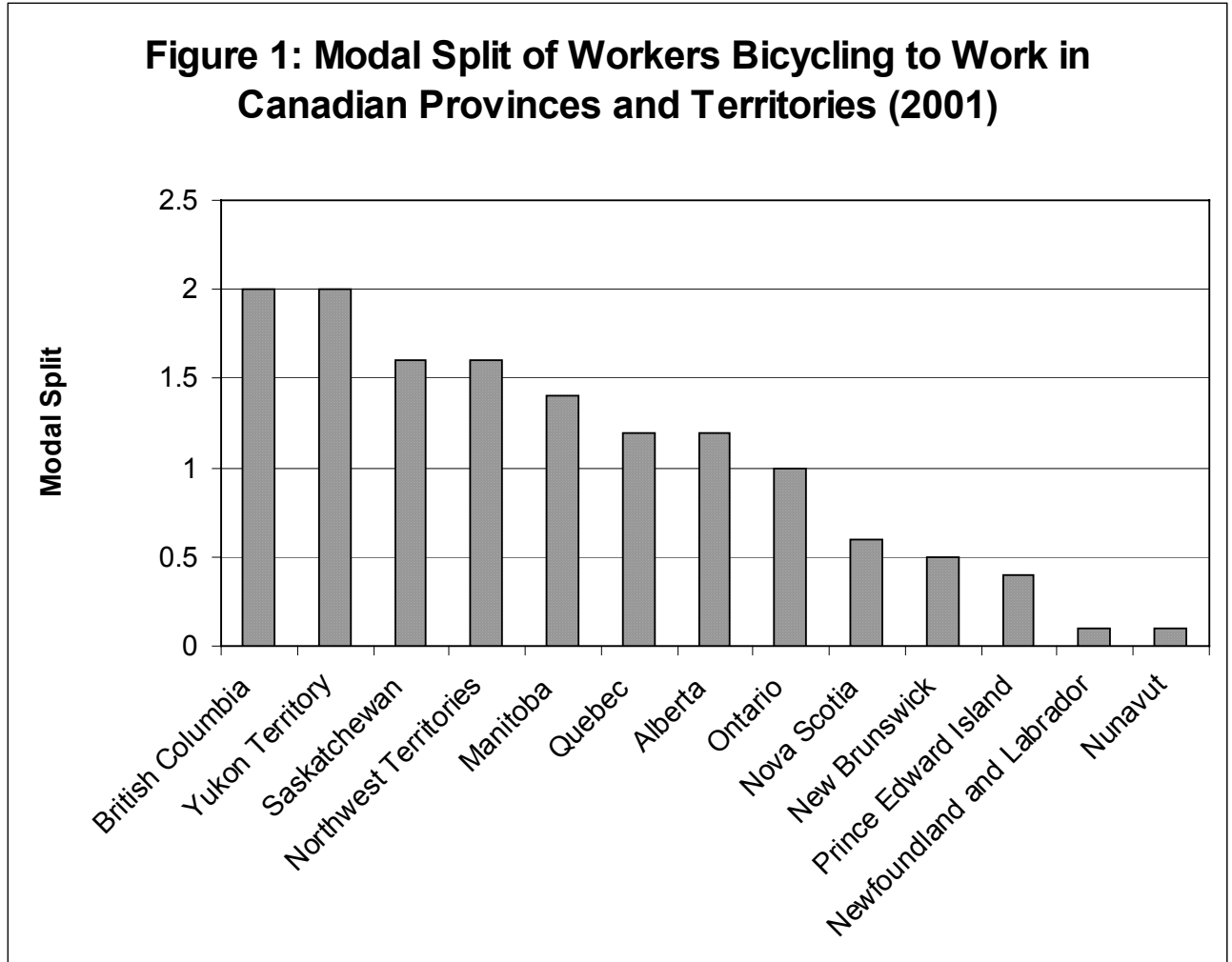
The article begins with an overview of aggregate time trends and geographic differences in Canadian cycling levels and injury rates. Most of the policy analysis, however, is focused on six case study cities in Canada's three most populous provinces: Montreal and Quebec City in Quebec; Toronto and Ottawa in Ontario; and Vancouver and Victoria in British Columbia. Since urban transport policy in Canada is determined at the provincial and local level, disaggregate case study analysis is the only way to examine the nature, extent, and impacts of cycling policies in Canada.

Overall Trends and Spatial Variation in Canadian Cycling

As shown in Table 1, bicycling accounted for only 1.2% of Canadian work trips in 2001. That was a 10% increase over the 1996 bike share of 1.1%, but it remains a tiny percentage of trips. With over a fourth of trips in Canadian cities less than 2 miles long—a distance that can easily be covered by bike—there is obviously much potential for increasing cycling and thus reducing car use that contributes so much to GHG emissions.

	<u>Total Number of Work Trips per Day</u>			<u>1996</u>	<u>2001</u>
	<u>1996</u>	<u>2001</u>	<u>% increase</u>		
<i>All Modes</i>	12,183,410	13,450,855	10.4	100	100
Car, Truck, Van as Driver	8,934,025	9,929,470	11.1	73.3	73.8
Car, Truck, Van as Passenger	899,340	923,975	2.7	7.4	6.9
Public Transport	1,233,870	1,406,585	14.0	10.1	10.5
Walk	850,855	881,085	3.6	7	6.6
Bicycle	137,435	162,910	18.5	1.1	1.2
Other	127,885	146,835	14.8	1	1.1

Levels of cycling vary widely among Canada's provinces: from a high of 2.0% in both British Columbia and Yukon Territories to a low of 0.1% in Newfoundland and Labrador (see Figure 1). Of Canada's three most populous provinces, British Columbia has about twice as high a cycling share of work trips as Ontario. Moreover, while the cycling share rose from 1996 to 2001 in both British Columbia (from 1.9% to 2.0%) and Quebec (1.1% to 1.2%), it remained constant in Ontario (at 1.0%). Perhaps most remarkable is the extraordinarily high level of cycling even in the far north. Indeed, Yukon ties British Columbia for the highest bike share of work trips (2.0%), and the Northern Territories (1.6%) far exceed both Ontario (1.0%) and Quebec (1.2%). So much for the myth that cycling is only possible in warm, sunny climates!



Source: Statistics Canada (2003)

Table 2 contains the cycling share of work trips for each of Canada’s metropolitan areas with at least 100,000 inhabitants. They are grouped into five different population categories so that cities can be compared with other cities of roughly the same size. Of Canada’s two largest cities, Montreal has a considerably higher bike share of work trips than Toronto (1.3% vs. 0.8%). In the next largest category, however, Vancouver, BC and Ottawa-Hull are tied at 1.9%. In the middle category, the bike share ranges from 1.5% in Calgary, Alberta to 0.9% in Hamilton, Ontario. The next category displays much more variation, with a 10:1 ratio of bike shares: from 4.8% in Victoria, BC (the highest share of any Canadian city) to only 0.5% in Oshawa, Ontario. The smallest size category has the most variation, with a 25:1 ratio of bike shares: from 2.5% in Saskatoon, Saskatchewan to only 0.1% in St. John’s, Newfoundland.

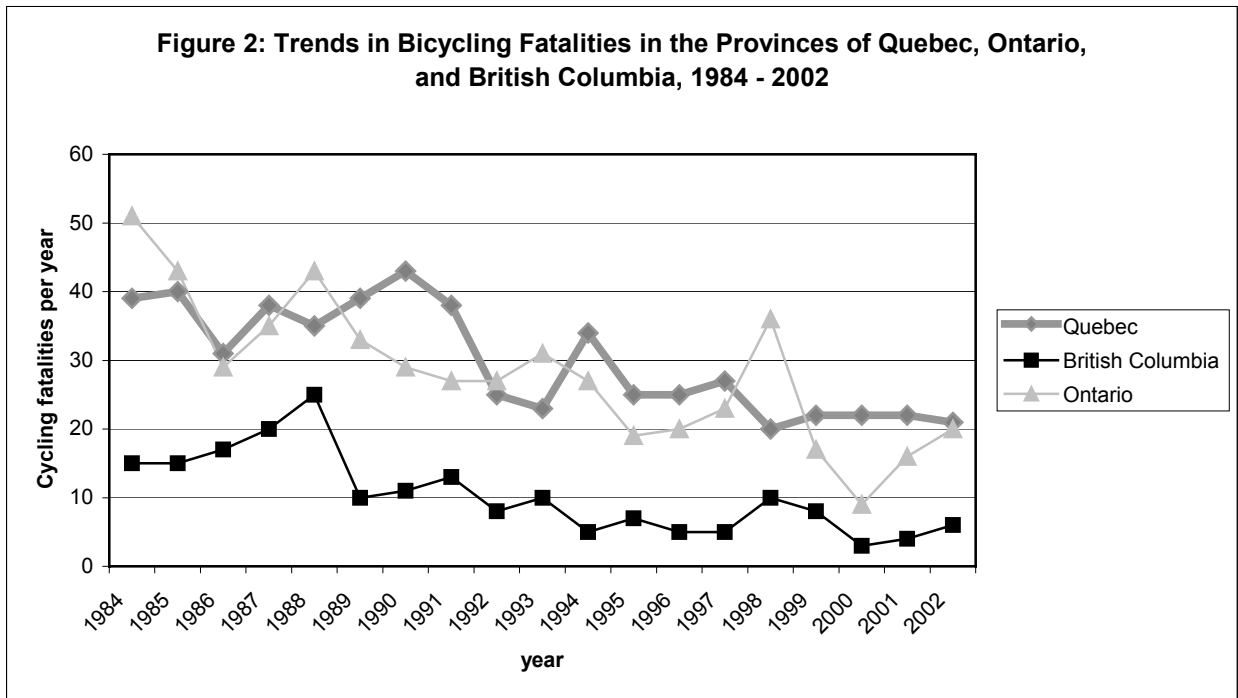
Table 2 Bicycling Share of Work Trips in Canadian Metropolitan Areas, by Population Size Categories, 2001

<u># of Inhabitants</u>	<u>Modal Split</u>	<u>Metropolitan Area</u>	<u>Population</u>
3 million or more	1.3	Montreal	3,426,350
	0.8	Toronto	4,682,897
Group Mean	<u>1.1</u>		
1 million to 2,999,999	1.9	Vancouver	1,986,965
	1.9	Ottawa Hull	1,063,664
Group Mean	<u>1.9</u>		
500,000 to 999,999	1.5	Calgary	951,395
	1.4	Winnipeg	671,274
	1.3	Quebec	682,757
	1.2	Edmonton	937,845
	0.9	Hamilton	662,401
Group Mean	<u>1.3</u>		
250,000 to 499,999	4.8	Victoria	311,902
	1.5	London	432,451
	1.1	Windsor	307,877
	1.1	Kitchener	414,284
	0.9	St. Catherines-Ni.	377,009
	0.9	Halifax	359,183
	0.5	Oshawa	296,298
Group Mean	<u>1.5</u>		
100,000 to 249,999	2.5	Saskatoon	225,927
	2.2	Kingston	146,838
	1.5	Trois Rivieres	137,507
	1.4	Regina	192,800
	1.0	Thunder Bay	121,986
	0.9	Abbotsford	147,370
	0.8	Chicoutimi-Jonquiere	154,438
	0.8	Sherbrooke	153,811
	0.4	Greater Sudbury	155,601
	0.4	Saint John	122,678
	0.1	St John's	172,918
Group Mean	<u>1.1</u>		

Source: Statistics Canada (2003)

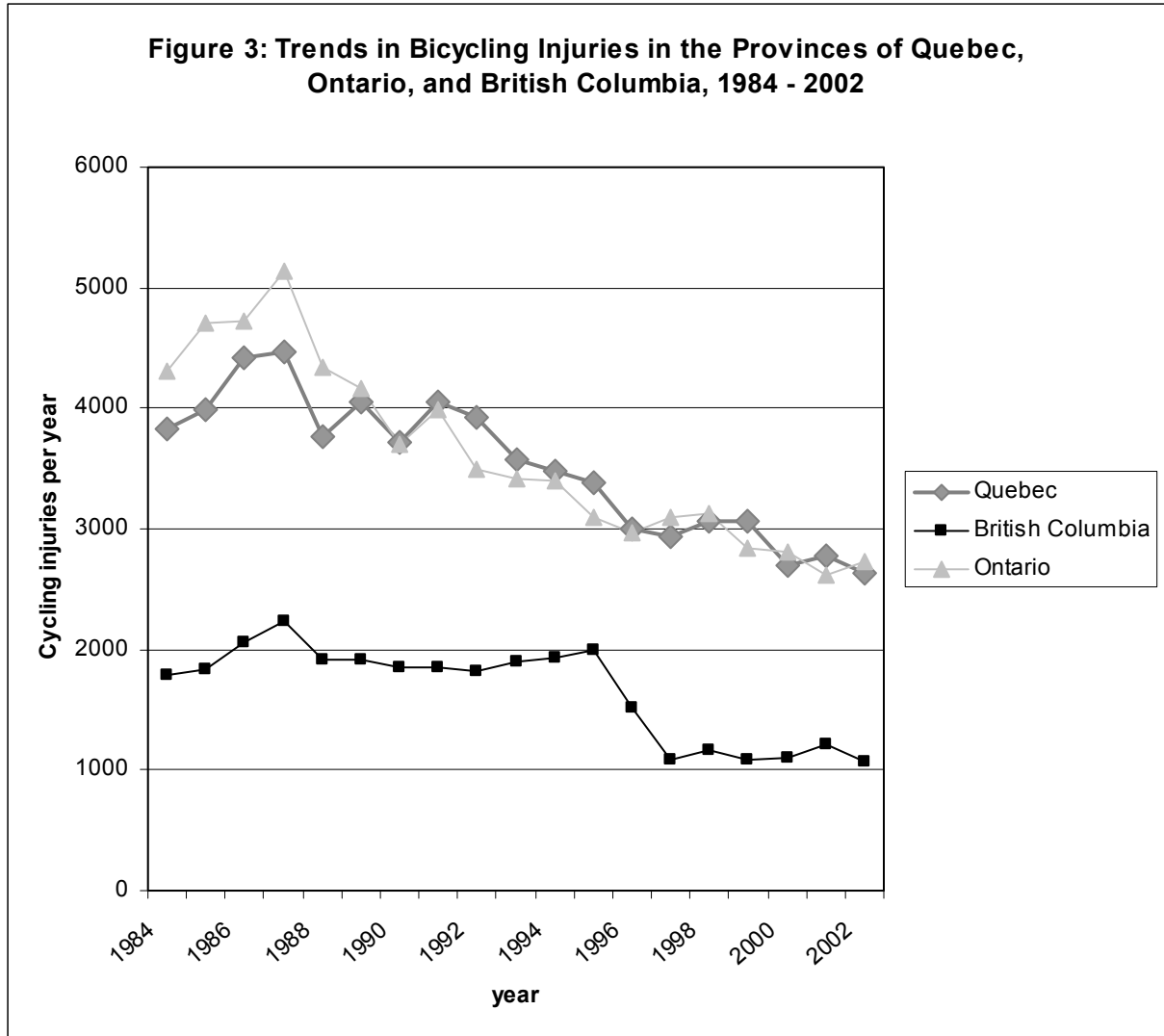
Trends in Cycling Fatalities and Injuries

Both the aggregate Canadian data cited above—and the case studies discussed later in this article—suggest considerable growth in cycling over the past two decades. In spite of increased exposure through more cycling, both fatalities and injuries have fallen considerably over that same period. For Canada as a whole, total cycling fatalities fell by 50% from 1984 to 2002 (from 126 to 63), and total cycling injuries fell by 33% (from 11,391 to 7,596) (Transport Canada, 2004).



Source: Transport Canada (2004)

Figures 2 and 3 portray cycling safety trends for Canada’s three largest provinces. Fatalities fell by 61% in Ontario, by 60% in British Columbia, and by 46% in Quebec. Injuries fell by 41% in British Columbia, by 37% in Ontario, and by 31% in Quebec. Thus, cycling has become much safer in all three provinces, especially considering the growth in cycling levels over the same time period, which suggests an even sharper fall in fatalities and injures per km cycled. The two figures suggest that safety improvements have been greatest in Ontario and British Columbia, but comparisons among provinces are difficult—due to likely differences among provinces in their rates of population growth and trends in cycling levels.



Source: Transport Canada (2004)

These aggregate trends suggest that Canadian cycling is indeed thriving—increasing in both quantity and quality. Clearly, however, there are important differences between provinces and among cities. Moreover, the specific measures taken to promote cycling can only be examined at the provincial and local level.

Before analyzing bicycling trends and programs in six case study cities, we briefly summarize policies at the federal and provincial level.

Federal and Provincial Bicycling Policies

The federal government in Ottawa has no involvement at all in cycling policies or funding. That derives from its likewise very limited role in urban transport in general, including public transport. With the exception of Transport Canada's modest funding of occasional research and education programs, urban transport is left to the provinces and cities.

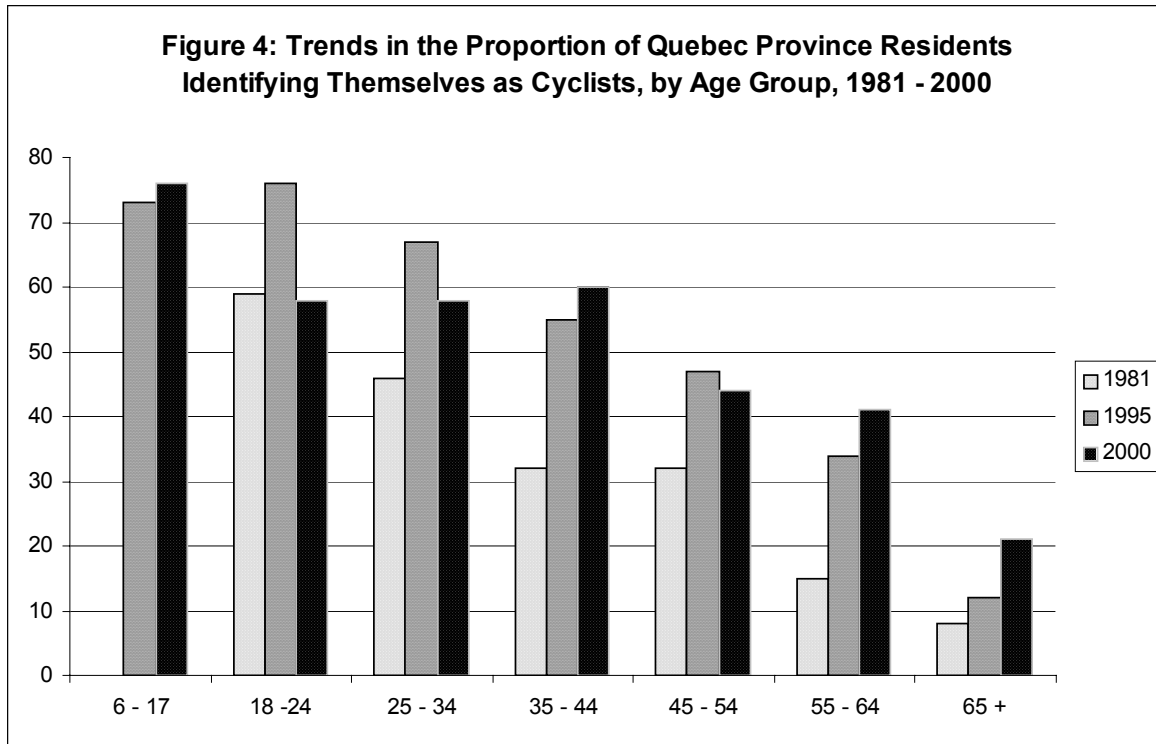
The extent of provincial involvement in cycling policies and funding varies considerably by province. As described in the case studies in detail, Quebec has been deeply involved in a range of programs to promote cycling, increase its safety, coordinate local efforts, and fund infrastructure improvements. By comparison, Ontario provides virtually no funding, planning or program coordination for cycling. Ontario's involvement is limited to the regulations that most provinces have about whether helmet use is mandatory and on which highways cycling is permitted. British Columbia (BC) has been somewhat more involved than Ontario in promoting cycling. The provincial government has a modest capital funding program for cycling infrastructure and a provincial cycling advisory committee to help coordinate local efforts. Moreover, the BC Ministry of Transport now tries to accommodate cyclist needs in most provincial highway projects. Clearly, however, no province has been nearly as actively involved in cycling promotion as Quebec.

Cycling Trends and Policies in Quebec: Montreal and Quebec City

Quebec's Ministry of Transport and the province-wide organization Velo Quebec play crucial roles in cycling policies and programs in all parts of the province. In 1995 the province adopted an official Bicycle Policy (Quebec Ministry of Transport, 2004). Its stated goal is to increase use of bicycles for transport, while improving cycling safety. All provincial infrastructure projects, including roadway projects, must incorporate the needs of cyclists in their design. Moreover, the plan introduces uniform bikeway design and traffic control standards. The provincial role in cycling is so important that some statistics are only available for the province as a whole, and many programs and policy issues can only be assessed on a province-wide basis. Where possible, however, we isolate the specific situation in each of Quebec's two largest cities, Montreal and Quebec City.

The Province of Quebec overall does not have a particularly high percentage of work trips by bike—indeed, it is the same as for Canada as a whole (1.2%). Montreal, however, has a much higher bike share of work trips than Canada's other major metropolis, Toronto (1.3% vs. 0.8%), in spite of colder weather throughout the year. Quebec City also has a 1.3% bike share of work trips, about the average for Canadian cities of that size, but impressive given the cold climate there. Over half of Quebecois (54%) cycle at least once a year, and with 750 bikes per 1,000 population, roughly two-thirds of adults own at least one bike (Velo Quebec, 2001).

Perhaps most notable is the large increase in cycling over recent years. Thus, the number of adult Quebecois who cycle weekly doubled from 1991 to 2000, to 1.7 million—31% of Quebec’s residents. Most of the growth in cycling has come from increased cycling among middle-aged and older adults. As shown in Figure 4, the percentage of Quebecois in the oldest age categories (55-66 and 65+) who cycle at least occasionally every year almost tripled between 1981 and 2000 (Velo Quebec 2001). By comparison, the incidence of cycling barely increased at all in the two youngest age categories. Nevertheless, it is still true that those younger categories have higher rates of cycling (76% for those aged 6 to 17 vs. only 21% for those 65 and older).



Source: Velo Quebec (2001)

The Census data on cycling for the work trip probably underestimate total cycling, since only about 20% of cyclists in Quebec province say they use their bikes mainly or even occasionally for practical transport. An origin-destination travel survey conducted for the Montreal metropolitan area in 1998 reported an overall bike share of 1.5% for the period from late August to mid-December (including non-work trips) (Agence Metropolitaine de Transport, 2001). That is a bit higher than the 1.3% bike share of work trips reported by the 2001 Canadian Census (taken in May). According to the 2000 Etat du Velo survey, 8.4% of Montreal cyclists said they ride at least once a day between May and August. Moreover, 7.9% of cyclists said that the bike is their main means of transport for trips within Montreal. Of course, weather is an important factor throughout the province. Whereas 50% of Montreal cyclists say they use their bikes in October and November, only 7% cycle from December to March. Even that is an amazingly high percentage given the brutally cold winters with an average of three feet of snow.

Although the bike share of work trips reported in the 2001 Canadian Census is the same in both Montreal and Quebec City (1.3%), other surveys suggest slightly higher cycling shares of travel in Montreal. The *Etat du Velo* survey found that 6.2% of Quebec City cyclists ride every day between May and August (vs. 8.4% in Montreal). While the same 50% of bicyclists in both cities said they cycled in October and November, only 2% of Quebec City bicyclists ride from December to March (vs. 7% in Montreal), probably because winters in Quebec City are even colder than in Montreal, and with twice as much snow. Nevertheless, a higher percentage of Quebec City bicyclists report cycling more than 500 km a year (15% vs. 13% in Montreal). In both cities, roughly half of cycling is on separate bike paths and lanes: 50.2% in Montreal and 45.6% in Quebec City.

Surely the most impressive accomplishment in Quebec has been increasing cycling levels while sharply reducing cycling injuries. For the period 1987 to 2000, for example, total number of bicycles in Quebec more than doubled, and the number of regular cyclists increased by 50%, while cycling fatalities fell by 42%, serious injuries fell by 56%, and minor injuries fell by 38%. It is unlikely that this has anything to do with helmet use, since it is not required in Quebec, and only 28%-35% of cyclists (all age groups) wear helmets (*Velo Quebec* 2001).

Clearly, one reason for both the growth in cycling levels and its increasing safety is the enormous expansion of both off-road and on-road cycling facilities throughout the province of Quebec. From 1992 to 2000—during Quebec's cycling boom—there were 4,000 km of additional bikeways built throughout the province, bringing the total to almost 7,000 km. In Montreal, there are 210 km of separate bike paths, 95 km of bike lanes, and 66 km of bike routes on lightly traveled roads. One distinct feature of Montreal's on-street bike lanes is that they are two-directional, with cyclists traveling in opposite directions on adjacent lanes, both on the same side of the street. Moreover, they are only in effect from April 15 to November 1 since there is so little cycling in winter. Although it is much smaller, Quebec City has even more cycling facilities: 220 km of separate bike paths, 121 km of bike lanes, and 66 km of bike routes on lightly traveled roads. About a fourth (28 km) of Quebec City's bike lanes are two-directional, as in Montreal (*Velo Quebec*, 2004a). Most impressive, perhaps, is the celebrated *Route Verte*, a \$120 million bikeway network that connects all parts of the province. For Quebec province as a whole, 41% of bike trips are on separate bike paths as opposed to shared roads (*Velo Quebec*, 2001).

In general, the Government of Quebec bears the cost of bikeway projects on provincial roadways, while municipalities finance bikeway projects on city streets. Additional provincial financing is available for municipalities through the financial assistance programs for the construction (25% matching grants) and maintenance (50% matching grants) of *La Route verte*. Overall, the province pays for about half of all new bikeway construction.

Cycling safety is promoted in many schools thanks to the Quebec car insurance company SAAQ (Societe d'Assurance Automobile du Quebec). It distributes free bicycling safety instruction materials to all schools in the province. To motivate students, it offers prizes of free bikes and bike helmets for winners of various cycling safety competitions. SAAQ also works with local police to sensitize them to cyclist safety issues, and the need to require both motorists and cyclists to obey traffic laws affecting cycling safety (SAAQ, 2004).

Provision of separate cycling rights of way seems to be the main approach to increasing cycling levels and safety in Quebec. It appears, however, that Quebec does considerably less traffic calming, intersection modification, parking provision, and intermodal coordination than in Ontario and British Columbia. There are only a few intersections with push-button activated bike traffic lights, but no automatic sensors for cyclists, as in Toronto, Ottawa, and Victoria. Of course, cyclists as well as pedestrians get the usual green light once during every traffic light cycle.

While bikes can be taken on some buses (Velo Bus Moulins), metros, and suburban trains, especially at off-peak times, there are no special provisions for bikes on most transit vehicles (Agence Metropolitaine de Transport (AMT), 2004 and Velo Quebec, 2003). Few buses come equipped with bike racks, and on metros and suburban trains, it can be difficult for cyclists to navigate steps as well as crowded vehicles and stations. Fortunately, bike parking has been expanded at metro and suburban rail stations, thus facilitating cycling for the short trips to and from transit stops, and then use of transit for the longer trip (Velo Quebec, 2003 and AMT, 2004). In 2000, Montreal had 1,600 bike parking spaces at metro stations and 550 spaces at suburban rail stations. Both Montreal and Quebec City have been increasing the number of bike racks on sidewalks, and their universities have thousands of bike parking spaces on their campuses (Velo Quebec, 2003).

Quebec has been at the forefront of cycling promotion in Canada, indeed in all of North America, thanks to Velo Quebec, a private non-profit organization funded mainly by member fees, events, and sponsors. Although Velo Quebec works closely with Quebec's Ministry of Transport, it only receives about a tenth of its revenues from the province and municipalities (Velo Quebec, 2004b). It sponsors numerous special events such as tours, conferences, races, and cycling courses. In Montreal, for example, it organizes special bike rides for different age groups, of different lengths and difficulty, and even a special night ride. In June 2004, La Feria du Velo celebrated the 20th anniversary of the annual Tour de l'Ile in Montreal, with over 66,000 cyclists participating. Similarly, there are various kinds of well-publicized bike rides in and around Quebec City from May through September. Velo Quebec sponsors a bike-to-work week in Montreal (now expanding to other cities throughout Quebec) in early June called Velo-Boulot (Velo Quebec, 2004c). It also publishes a cycling magazine (Velo Mag), maintains an informative, multifaceted website (www.velo.quebec.ca), and operates a cycling café in Montreal that offers food as well as cycling publications and supplies (Maison des Cyclistes).

Cycling Trends and Policies in Ontario: Toronto and Ottawa

In stark contrast to Quebec, the province of Ontario plays virtually no role at all in promoting cycling, coordinating cycling programs, or funding cycling infrastructure. Thus, municipalities in Ontario are left to determine cycling policies for themselves. Both Toronto and Ottawa have actively supported a range of programs to encourage more cycling and increase its safety.

Of the two cities, the Ottawa metropolitan area has a considerably higher level of cycling—indeed, more than twice as high as the Toronto metropolitan area: 1.9% vs. 0.8% of work trips, according to the 2001 Canadian Census (Statistics Canada, 2003). The Census's bike share of work trips in Ottawa was confirmed in 2002 by a survey of 1,009 Ottawa area residents showing that 2.0% used the bike as their primary mode for the work trip, with an additional 12% of residents using the bike as a secondary mode (City of Ottawa, 2003a and 2003c). Both the Census data and cordon counts suggest that cycling's share of travel in metropolitan Ottawa has been falling slightly. The Census, for example, reports a decrease from 2.1% of work trips in 1996 to 1.9% in 2001. Cordon counts by the city in 1995 and 2001 confirm that decline, albeit for all trip purposes, with an average 15% decline in the number of bikes crossing key points in several corridors leading to the central city, and an average 25% decline in the number of bike trips relative to the number of car trips in the same corridors (City of Ottawa, 2002). Nevertheless, Ottawa still has the highest bike share of travel of any major city in all North America. According to a 2003 survey of 1,001 persons, 57% of adults in Ottawa cycle at least once a year (City of Ottawa, 2003). Of those cyclists, almost two-thirds (63%) describe themselves as mainly utilitarian cyclists, compared to about a third (37%) who cycle mainly for recreation. Not surprisingly, 73% of all Ottawa households have at least one bike, and 66% have two or more. As in most Canadian cities, cycling in Ottawa varies greatly by time of year, with only about 5% as much cycling in the middle of winter as during the peak summer months.

Cycling trends vary greatly in Toronto between the inner and outer portions of the metropolitan area. For the greater metro area, the Canadian Census reports the same 0.8% bike share of work trips in both 1996 and 2001 (Statistics Canada, 2003). For the much smaller, core area called Metro Toronto, however, the Census bike share of work trips rose from 1.1% in 1996 to 1.3% in 2001. The Transportation Toronto Survey (TTS) indicates a slight increase in the combined bike/walk share of trips for that same core area from 7% in 1986 to 8% in 2001 (all trip purposes, 24 hours) (Transportation Information Steering Committee, 1986-2001). City cordon counts also suggest considerable cycling growth in the inner portions of the metro area, with an average 24% increase in the number of bike trips in 20 key cycling corridors from 1999 to 2003 (Decima Research, 2000; City of Toronto, 2001). The very different travel trends in the inner and outer areas of greater metropolitan Toronto are confirmed by the 2001 TTS survey, which found a combined walk/bike share of 27% for the core area, 9% for the core ring, 6% for the inner suburbs, and 5% for the outer suburbs.

The percentage of cyclists among Toronto area residents is lower than in Ottawa (48% vs. 57%). Moreover, in sharp contrast to Ottawa, 42% of Toronto cyclists described themselves as utilitarian cyclists (vs. 63% in Ottawa), while the remaining 58% of Toronto cyclists cycle mainly for recreation and not for practical transport (Decima Research, 2000). Corresponding to its lower level of cycling, Toronto also has a lower percentage of households with at least one bike (62% vs. 73% in Ottawa). One striking similarity, however, is the dramatic drop in cycling during the winter months, with only 7% as much cycling in the winter as in the peak summer months. While the winters in Toronto are not nearly as severe as in Ottawa, Montreal, and Quebec City, they appear to be cold and messy enough to discourage most cycling.

Corresponding to the impressive 62% decline in cycling fatalities and 37% decline in cycling injuries in the province of Ontario from 1984 to 2002, both Ottawa and Toronto have succeeded in improving cycling safety. In the past ten years, for example, cycling injuries have fallen by 33% in Ottawa, and cycling fatalities have been cut in half (City of Ottawa 1999-2003 and 2003b). Over the same period, cycling injuries in Toronto fell by 9%, and fatalities fell by about two-thirds (City of Toronto, 2005a). In 2003 there were over three times as many reported cycling injuries in Toronto as in Ottawa (1,013 vs. 295), although Toronto has less than twice as many daily bike trips (18,285 vs. 10,090). The apparently greater cycling safety in Ottawa might be attributable to the far more extensive system of separate cycling facilities there, as well as lower volumes of motor vehicle traffic on Ottawa's roads compared to Toronto.

Ottawa and Toronto have undertaken a broad range of measures to improve cycling safety (City of Ottawa, 1994 and 2001; City of Toronto, 2001 and 2003). Both cities have greatly expanded their systems of bike paths and lanes to provide more separate rights of way for cyclists. As of 2003, Ottawa had 511 km of bike routes on arterial and secondary roads, of which 83km had separate bike lanes, 81 km had paved shoulders specifically for cycling, and 35 km had extra-wide shared lanes. Ottawa also has 311 km of off-road bike routes. Included in the Ottawa's total of 822 km of cycling facilities is the extensive system of bike paths known as the National Capital Pathway, mainly along waterways or in parks and greenways. The City of Ottawa publishes a detailed cycle route map indicating the location and type of all bike routes as well as bike parking throughout the city. It is superimposed on a detailed city map to facilitate matching bike routes and parking with all destinations in the city.

Although Toronto has been steadily expanding its network of bike routes, it remains much smaller than Ottawa's. In 2003, it offered 252 km of bikeways (compared to Ottawa's 822 km), including 154 km of off-road paths, 63 km of bike lanes, and 35 km of shared roadways (City of Toronto, 2001 and 2004). Toronto's official Bike Plan sets an ambitious goal of 1,000 km of bikeways by 2011, but it has a long way to go, and funding is limited. While Ottawa offers more cycling facilities, Toronto has more extensive traffic calming of its residential neighborhoods, making cycling on shared streets both safer and more pleasant. As in Ottawa, there is also a detailed map of cycling routes in Toronto, designating various kinds of bike routes, bike share pickup/drop-off sites, transit connections, and other items of interest to cyclists. Toronto introduced a

new bikeway network signage system in 2004 that provides uniform design, clearer, easier-to-follow directions, and improved connections between bikeways on and along roads and those in parks.

Toronto and Ottawa have many intersections with special bike traffic signals, including some with innovative roadway sensors that detect waiting bikes and automatically trigger a green light for cyclists. Such intersections feature pavement markings indicating where cyclists should stop in order to activate the signal sensors. Both cities also have numerous intersections with push button triggered signals, but they are usually for both cyclists and pedestrians.

Toronto and Ottawa have done much more than any city in Quebec to promote safer cycling by improving cycling and motorist behavior. Ontario provincial laws require helmet use up to the age of 18, and legislation is now being considered to make it mandatory for all age groups. In Ottawa, for example, 68% of all cyclists—and even 54% of adult cyclists—wear helmets (City of Ottawa, 2003b and 2003c). That is about twice as high as the 33% of Toronto cyclists and 28%-35% of cyclists in Quebec Province who wear helmets (City of Toronto, 2005b; Velo Quebec, 2001).

Extensive CAN-BIKE courses in both Toronto and Ottawa offer a variety of education and training courses for all age groups and skill levels. In Ottawa, CAN-BIKE is currently contracted out to a private, non-profit group called Citizens for Safe Cycling, which also organizes bike tours for seniors and bicycling camps and special safety courses for children. In addition, Ottawa schools offer instructional programs for cycling skills and traffic safety, funded by the Ottawa Public Health Department and implemented by the Ottawa Safety Council. The Council also operates a miniature safety village with typical but smaller-scale roads, bike lanes, and traffic signals to teach children traffic skills. The Ottawa police organize bicycling rodeos in neighborhoods throughout the city to teach basic cycling skills as well as traffic laws pertaining to cyclists. Enforcement is important. The Ottawa police conduct occasional one-week bicycling safety blitzes, making intensive checks on bike safety and cracking down on illegal cycling on the sidewalk, in the wrong direction, and against the light. Similarly, police target motorists who fail to respect the legal rights of cyclists. Until recently, Ottawa offered the option of attending a Bike School for offenders in lieu of paying fines. In 2004, the province of Ontario prohibited that alternative to paying fines.

Toronto's safety programs are similar to those in Ottawa, including CAN-BIKE courses run from 14 community centers, with a total of 74 courses in 2003, producing about 400 graduates (City of Toronto, 2001 and 2003). Recently, the City of Toronto took over the CAN-BIKE program and now runs it directly through its parks and recreation department, with instructors hired as city employees. Toronto also has an extensive bike safety publicity campaign, with a variety of posters, stickers, decals, and brochures showing proper helmet use, proper procedure for cars passing bikes, reminders to watch for bikes when opening car doors, and warnings to cyclists not to ride on sidewalks. As in Ottawa, the Toronto police are actively involved in a range of programs to enhance cycling safety. They have a special bike squad, with over 900 officers having completed

CAN-BIKE courses to become eligible for the squad. The police also have an annual two-week enforcement campaign called Cycle Right, which targets both bicyclist and motorist violations of traffic regulations affecting bike safety. Finally, the police give bicycling safety talks and organize bicycling rodeos in many Toronto schools.

Toronto offers the most extensive bike parking facilities in all of North America, with a total of 14,500 bike parking spaces on city sidewalks as of 2004. The famous post-and-ring bike stand was developed in Toronto and has become a symbol of Toronto cycling (City of Toronto, 2001). Roughly a thousand new post-and-ring stands are installed every year. Toronto's zoning code was amended in 1993 to require all large new developments to provide both bike parking and shower facilities for cyclists. Similarly, Ottawa's zoning and building codes require bike parking for certain kinds of commercial land uses, and also provides incentives for firms to provide showers for their employees who bike to work. The City of Ottawa provides well over 6,000 bike parking spaces, not including the many thousands of bike parking spaces at federal offices and large employers, for which bike parking statistics are not available (City of Ottawa, 2004).

Intermodal coordination of cycling with public transport appears to be much better in Ottawa than in most Canadian cities. In addition to bike parking at all light rail (O-Train) and express bus (Transitway) stops, an increasing number of Ottawa buses come equipped with bike racks from mid-April to October 31 (over 200 by 2004). 12% of cyclists take advantage of this "rack and roll" program, enabling them to take buses for the longer portions of their trips. Toronto does not yet provide any buses with bike racks, but bikes may be carried onto buses during off-peak periods. In Ottawa, drivers of buses without racks use their own discretion whether to permit bikes to be taken onto the bus, presumably based on how crowded the bus is. Ottawa permits bikes on their O-Train at all times of day, while Toronto's subway and suburban rail trains only permit bikes during off-peak hours. Taking bikes onto buses, subways, and trains in Toronto is, at any rate, rather unrealistic, often involving inconvenient, time-consuming, and sometimes dangerous maneuvers up and down stairs, along platforms, and through narrow aisles. Fortunately, there is bike parking at many subway and commuter rail stations in Toronto, thus facilitating bike and ride. Taking bikes on rail and bus rapid transit in Ottawa is more realistic, since all stations are wheelchair accessible, either via ramps or elevators, thus facilitating bike access as well. Even there, however, it can be time-consuming and inconvenient for cyclists to board buses without racks or wait for elevators to access rapid transit platforms.

Both Toronto and Ottawa offer an impressive array of programs to promote cycling (City of Toronto, 2001 and 2004; City of Ottawa, 2001). The Toronto cycling map, for example, is revised annually and distributed for free at numerous locations throughout the city. The improved bike route signage system in itself is an attempt to encourage more cycling by making it easier to find the best routes to desired destinations. The highest profile promotional effort is the annual Bike Week in late May or early June. In 2004, there were over 100 events, over 30,000 participants, and over 60 different community groups and sponsors. Bike Week also features the city's largest charity event, Bike for Heart, which attracted over 12,000 cyclists in 2004. The City of Toronto publishes a

monthly newsletter called Cyclometer, which is mailed out to about 2,500 cyclists as well as posted on a special bicycling website. That same website (www.city.toronto.on.ca/cycling/index.htm) advertises bicycling events, disseminates information on cycling safety, lists CAN-BIKE courses, offers downloadable maps, the long-range cycling plan and other useful reports, and provides links to neighborhood cycling groups. The website also facilitates reporting of repair and snow removal problems on cycling facilities and permits direct requests for installation of post-and-ring bike stands at specific locations. Toronto has a unique Cycling Ambassador Program that employs about ten proficient cyclists who reach out to communities throughout the city, disseminating information about cycling, promoting safety, assisting with cycling courses, and gathering feedback from communities to improve the city's cycling policies and programs. Toronto also offers Bike Friendly Business Awards to firms that do the most to promote cycling among their employees and customers, and Bike to School programs (part of Active and Safe Routes to School) in more than 60 Toronto schools to encourage school children to cycle to school.

In addition to all of those efforts by the City of Toronto, two groups have been key to promoting cycling. Advocacy for Respect for Cyclists (ARC) is the main advocacy group, producing an annual report card on cycling conditions, holding street memorials whenever a cyclist is killed, and arranging for legal defense of cyclists (www.respect.to). The Community Bicycle Network (CBN) promotes cycling by cooperating with provincial and government agencies, as well as with Transport Canada at the federal level. It operates Bike Share, a community bike-lending program, organizes monthly seminars about sustainable transport, and runs Wrenches with Wrenches, a bike repair and skills clinic taught by women for women (www.communitybicyclenetwork.org).

The City of Ottawa works closely with Citizens for Safe Cycling (CfSC) on most cycling promotional programs. The Complete Ottawa Cycling Guide was distributed for free to all households in 2000 and reprinted in a local newspaper annually until 2004. In early June, there is an event called Commuter Challenge, including Bike to Work Day, marking the start of the cycling season. The end of the season in September is marked by the Harvest Ride bike tours. The various rides offer a range of distances and skill levels for all types of cyclists, and are accompanied by food, seminars, and many other events to provide a festive atmosphere. In addition, there are several charity events (le Tour Nortel and MS Bike Tour) as well as numerous longer, regional bike tours that attract thousands of participants. The City of Ottawa and CfSC even make a special effort to promote winter cycling by offering cold weather cycling seminars at workplaces and community centers and by publishing a special guide called "Cycling 365." Finally, there is a large squad of Ottawa police on bikes, thus providing an important official presence on bike. They carry out the full range of enforcement responsibilities, not just monitoring cycling behavior. There are also bike paramedics, bike parking officers, and a volunteer bike pathway patrol to increase security, provide information, help with bike repairs, and provide emergency first aid.

Cycling Trends and Policies in British Columbia: Vancouver and Victoria

As shown in Figure 1, British Columbia has about twice as high a bike share of work trips as either Ontario or Quebec. To some extent, that is probably due to less seasonal variation in temperature and, in particular, the milder winters in southwestern Canada. It is not due to more favorable topography, as portions of both Vancouver and Victoria are quite hilly. The compactness of Victoria, however, may help explain the high levels of cycling there. Most development is restricted by geography to the tip of Vancouver Island, bordered by water on most sides, by rural and agricultural land to the north, and by a greenbelt to the west. That generates many short trips that can be covered by cycling. Some interview respondents suggested that British Columbians are in general more physically active than other Canadians, with Victoria and Vancouver ranked by Health Canada as #1 and #2 in overall levels of physical fitness. Thus, British Columbians might also be more likely to cycle for transport as well as recreation. While both Vancouver and Victoria have been expanding their cycling route networks, cycling infrastructure does not explain a bike mode share in British Columbia that is twice as high as the Canadian average, since bikeway networks in Ontario and Quebec are more extensive. Better weather, more compact development, and greater inclination toward physical activity probably contribute to the higher cycling levels in British Columbian cities, but there is no solid evidence of their actual impacts.

The Canadian Census reports that the bike share of work trips in the Vancouver metropolitan area rose from 1.7% in 1996 to 1.9% in 2001, but that increase may have been caused by a public transport strike during the survey period, which probably forced some riders to cycle instead of taking transit. Since another regional travel survey in 1999 reported the same 1.7% bike share of work trips as indicated by the 1996 Census, it is likely that the bike share of trips has been stable in recent years (Translink, 2001). Even a 1.7% share, however, places Vancouver right behind Ottawa among Canada's cities with population over a million. As in Toronto, levels of cycling vary greatly between different portions of Vancouver's metropolitan area. While only 0.6% of suburban households made their work trips by bike in 1996, 3.3% of city residents commuted by bike, and in the university district, the share was 12.2% (Translink, 2001).

Greater Victoria has an even higher bike share of work trips than Greater Vancouver—indeed the highest of any Canadian metropolitan area: 4.9% in 1996 and 4.8% in 2001, according to the Canadian Census. The reported decline is only slight, but confirmed by Victoria Region's own Origin-Destination (O-D) Travel Surveys in 1992 and 2001, which showed a drop in the bike share of afternoon peak trips from 5.2% to 3.6% (Capital Region District, 1998, 2002a, and 2002b). Moreover, the 2001 O-D Survey found only a 2.4% bike share of all trips in the region, when all times of day and all trip purposes are included. The same survey found a much higher bike share of work trips (6.2%), indicating the much greater use of bikes for work commutation than any other purpose. Comparisons of the Census and O-D survey data may be misleading, however. The Census data were collected in May, while the regional O-D survey was done from early October to mid January, when the weather is generally cooler, rainier, and thus less

hospitable to cycling. In spite of all these statistical discrepancies, all surveys confirm that Victoria has the highest cycling share in Canada.

As noted earlier, cycling has become much safer in British Columbia, with cycling fatalities declining by 60% between 1984 and 2002, and injuries declining by 41%. Both Vancouver and Victoria report similar declines. In Vancouver, for example, cyclist crashes fell from 728 in 1992 to 229 in 2003, and fatalities fell from an average of three a year in the 1980s to only one a year by 2003 (Translink, 2004).

Increased cycling safety in British Columbia is probably due to expanded cycling facilities, traffic calming of neighborhoods, improved education and training of both motorists and cyclists, and increased helmet use. The Bike Smarts Program in Victoria is aimed at cycling education for school children aged 7-13 years (Capital Region District, 2003a). Almost half of all Victoria area elementary schools participate in this program, which entails five hour-long sessions of cycling courses (taught by regular school teachers) on rules of the road, bike mechanics, bike handling, dealing with cycling hazards, and correct helmet use. The pan-Canadian program CAN-BIKE is run by Cycling BC in British Columbia, mainly for adults learning to cycle. Safe cycling is a key element in all CAN-BIKE courses. Helmet use has been mandatory throughout British Columbia since 1995, as well as front and rear lights on bikes used after sunset. The official provincial driving manual for motorists, "Safe Driver's Guide," has expanded the "Share the Road" section, which emphasizes the need for motorists to respect cyclists' rights to use most roadways, and to drive in a way that anticipates possibly dangerous situations and minimizes the likelihood of crashes with cyclists (Capital Regional District, 1999 and 2003a).

Nevertheless, in both Vancouver and Victoria, police and insurance reports show that motorists are at fault in most crashes with cyclists (Capital Regional District, 1999). The leading motorist violations are failing to yield to cyclists at intersections (28% of cyclist injuries), dooring of cyclists by car occupants (15%), and motorists sideswiping or squeezing out cyclists from the roadway (6%). Cyclists were at fault in some instances as well, however. In 10% of crashes, they failed to yield properly at intersections. Another widespread safety problem is crashes with pedestrians caused by illegal cycling on sidewalks and failure to yield right of way to pedestrians in crosswalks.

As in other Canadian cities, both the Vancouver and Victoria regions have been steadily expanding their network of separate bike paths and lanes, while also extending their systems of bike routes on lightly traveled roads. Vancouver, for example, constructed 16 bikeways from 1986 to 1999, with a total length of 133km (City of Vancouver, 1999). Nevertheless, most of the 1,347 km of bike routes in the Greater Vancouver area in 2004 were on lightly traveled roads, sometimes with modest accommodations for bikes. Indeed, it is the specific policy of Vancouver to focus on facilitating cycling on local side streets with low traffic volumes, including streets in traffic calmed residential neighborhoods (City of Vancouver, 1999).

The Victoria Capital Region has a total of 377 km of bike routes (Capital Regional District, 2003b). They include 67km of mixed-use off-road trails—the Galloping Goose and Lochside Trails—which parallel the region's major highways and traverse much of the region. Both are heavily used in urban sections of the region's core municipalities. In addition, the Victoria region has 62km of bike lanes and 131 km of roadways with paved shoulders that are specially marked to separate cyclists from car traffic. Moreover, some Victoria neighborhoods have been traffic calmed by speed humps and bulbouts, thus reducing vehicle speeds and facilitating safe and pleasant cycling. There are ambitious plans for expanding the Capital Region's bike route network to 550 km and improving connections among routes, but funding is a key problem (Capital Regional District, 2003a).

Both Victoria and Vancouver have made special efforts to accommodate cyclists at intersections (Capital Regional District, 2003a; Translink, 2004 and 2005). Cyclist-activated traffic signals are available at many locations. In the central municipality of Victoria alone, there are 61 intersections with loop detectors for bikes, and additional ones in the outlying municipalities of the region. There are also numerous intersections with push-button activated traffic signals for bikes. Victoria is expanding the number of intersections with special bike access lanes and bike boxes for cyclists waiting for a green light. Vancouver also provides bicyclist-activated traffic lights to facilitate crossing busy intersections. Many of these signals are shared by pedestrians and cyclists (about 170, as of 2004). All new pedestrian-activated signals are now installed with curbside buttons for cyclists. Similar to Vancouver and Toronto, Victoria has 40 intersections with loop detectors in the pavement to detect bikes and trigger a green signal. Two intersections offer bike boxes for waiting cyclists. Most important, however, Vancouver has traffic-calmed many of its local residential streets through measures such as median refuges, traffic circles, artificial dead-ends for cars, and cut-through passages for bikes.

The provincial government of British Columbia provides only very limited funding for improvements in cycling infrastructure. Requiring at least an equal match by local governments, the province provided about \$2 million per year from 1995 to 2001, then suspended the program for three years, and re-instated the program in 2004 at only half the former level of support. Moreover, the province has made applications for funding absurdly difficult. Until recently, funding was not awarded until December, and cities were required to complete all construction during the three winter months, before March of the following year. That has discouraged many municipalities from applying for provincial funding at all. Nevertheless, at least British Columbia's provincial government has made some minimal effort to fund cycling facilities, in contrast to Ontario, which has done nothing at all. Moreover, all municipalities applying for provincial funding are required to establish bicycling facility plans as part of their overall community development plans. That, in itself, has been a positive development.

From 1990 to 1999, Greater Vancouver spent almost \$6 million on bikeway facilities. Translink, the regional transport authority for Greater Vancouver was established in 1999 (Translink, 2005). Since then, it has increased funding for cycling infrastructure to several million dollars a year, financed by a portion of the gasoline tax dedicated to

transport improvements. Most of Greater Victoria's cycling funding derives from general revenues of each local municipality.

Both Victoria and Vancouver have made considerable efforts at intermodal coordination with transit (Capital Regional District, 2003a; Translink, 2004 and 2005). Thus, most BC buses in both cities are equipped with bike racks, and bikes can be taken on the BC Ferries at any time. In Vancouver, bikes can be taken on the Sea Bus Ferries and West Coast Express Trains at any time, but they are only allowed on the Sky Train (the main rail transit system in Vancouver) at off-peak hours and on weekends. Both the West Coast Express and Sky Train provided bike racks at stations as well as over 400 bike lockers (Translink, 2004).

Efforts to promote cycling in British Columbia have been quite similar to those in Quebec and Ontario (Capital Regional District, 2003a; Translink 2004 and 2005). In Greater Victoria, there is an annual Bike to Work Week every June, sponsored by the Bike to Work Society and funded by the provincial government and private sector donors. Similarly, Vancouver offers an annual Bike Month throughout the region, with over fifty entertaining and educational events for all ages and ability levels, including group rides, children's safety workshops, parties, films, openings of new cycling facilities, and festivals. Vancouver also participates in the so-called Commuter Challenge, a nationwide event that promotes friendly competition among organizations and cities to determine who can get the highest percentage of employees out of single occupancy vehicles into healthier and cleaner mode of transport such as walking, cycling, transit, carpooling, vanpooling, and telecommuting (City of Vancouver, 1999, BEST, 2005).

In addition to various government efforts, many private groups actively promote cycling in British Columbia. The British Columbia Cycling Coalition has members throughout the province. In Vancouver, the two main groups are Better Environmentally Sound Transportation (BEST) and the Vancouver Area Cycling Coalition (VACC) (online at www.best.bc.ca and www.vacc.bc.ca). The Greater Victoria Bike to Work Society, Capital Bike and Walk, and the Greater Victoria Cycling Coalition are the three promotional associations in Victoria. These groups are involved in a range of cycling education programs, improving cycling facilities, developing a cycling information database, improving the legal status of bicyclists, and lobbying provincial and local governments for pro-bike policies. They also organize cycling conferences and bike rides and help publicize cycling.

Bike route maps are available for both the Vancouver and Victoria regions. In Vancouver, Translink finances and distributes the map, while in Victoria, the Greater Victoria Cycling Coalition updates the map each year and helps with distribution. The Victoria map, in particular, is impressive, including information on the nature of each bike route (steepness of inclines, motor traffic volumes, and difficult intersections) as well as transit connections, bike shops and rental locations, accommodations, and tips on how to cycle safely. In addition to maps, the Greater Victoria Cycling Coalition produces the Bike Sense cycling guide, which is distributed not only in Victoria but also in Vancouver and various other cities throughout the province.

Similar to Ottawa, there is an increasing squad of bike police in Vancouver, having grown from 8 in 1991 to 70 in 1999 (City of Vancouver, 1999). While they obviously help ensure safe cycling, they perform the full range of police functions, and by their very presence give greater legitimacy to cycling as an acceptable mode of transport.

Clearly, cycling in Vancouver and especially Victoria benefits from many factors such as climate, compactness, and an outdoor lifestyle that encourages physical activity. While cities in British Columbia have not invested nearly as heavily in cycling infrastructure as, for example, Ottawa or Montreal, they are making increasing efforts to accommodate the considerable latent demand for cycling through a variety of measures. One can only imagine how much higher the already impressive levels of cycling in British Columbia would be if both provincial and local governments devoted as many resources to cycling infrastructure as in Quebec province.

Conclusions and Policy Recommendations

All six of the Canadian case study cities examined in this article have made impressive efforts to encourage more and safer cycling. The result is bicycling shares of urban travel roughly three times as high as in American cities of comparable size. For all metropolitan areas in aggregate, the bike share of work trips in Canada was 1.2% in 2001, compared to only 0.4% in the United States (Statistics Canada, 2003; Pucher and Renne, 2003). That is particularly impressive given the long, harsh winters in most Canadian cities.

Nevertheless, Canadian cities are now struggling with many obstacles to further increasing cycling levels. Perhaps the most important challenge is the proliferation of low-density, sprawling suburbs spreading out around virtually every Canadian city—usually outside the local governmental jurisdiction of the central city (Nivola, 1999). For example, roughly half the population of the Greater Toronto Metropolitan Area is outside the boundaries of Metro Toronto, and some observers have even described present-day Toronto as “Vienna surrounded by Phoenix” (Cervero, 1998, pg. 89). Such sprawling suburban developments are almost entirely car-oriented, with segregated land use patterns, excessively long trip distances, and an almost complete absence of facilities for cycling. Thus, as noted for several case studies, bicycling is concentrated in the denser urban core, with the bike share of travel steadily declining with increased distance from the center. The strong trend toward suburbanization of both population and jobs in Canada works against efforts to promote cycling. Unless Canadian metropolitan areas can implement more mixed-use, more compact, less car-dependent land use policies on a truly regional level that includes the suburbs, an increasing proportion of Canada’s population will live in areas where cycling is impractical as a mode of daily transport, and will only be occasionally used for recreation.

There are other reasons as well for the stagnation of cycling levels in many Canadian cities in recent years, after considerable growth during the 1970s and 1980s. Until now, only the politically “easy” measures have been adopted. Unlike the wide range of car-restrictive measures found in most European cities, Canadian cities—much like their American neighbors to the south—have been quite hesitant to impose restrictions on car use or to increase its price (Pucher and Lefevre, 1996; Pucher and Dijkstra, 2003; Pucher, 2004; Transportation Research Board, 2001). Traffic calming of residential neighborhoods, car-free zones, parking restrictions and supply limitations are not nearly as extensive as in most European cities. Moreover, gasoline prices, motor vehicle registration fees, sales taxes on cars, roadway tolls, and parking prices are generally only a fraction of European levels (Pucher, 1998).

Coordinating public transport with bicycling is crucial to encouraging increased use of both of these modes. Especially in lower-density residential areas, cycling is ideal as a feeder and distribution system to access public transport stops. Such integration can be achieved by provision of convenient and secure bike parking at both rail and bus stops, bike racks on all buses, and accommodation of bikes on all rail transit vehicles.

The wide range of “carrot and stick” measures in European cities have helped achieve bike modal shares of travel that average about 10% for Western European countries, but range widely from lows of 4% to 6% in the United Kingdom, Italy, and France to highs of 20%-30% in Denmark and the Netherlands (Pucher and Dijkstra, 2003). Unless Canadian cities can implement more of the European-style “stick” measures against excessive car use—while enhancing the safety and feasibility of alternative modes—it may be difficult to convince increasingly suburbanizing Canadians to drive less and bike, walk, and take transit more often.

Even the “carrot” measures used to encourage cycling in Canadian cities have been far more limited than in European cities (Pucher, 1997). No Canadian city has a truly comprehensive, integrated, regional network of cycling facilities such as those found in so many Dutch, German, and Danish cities. That forces cyclists to share the road with motor vehicles for most of their trips, often diminishing the safety, feasibility, and attractiveness of cycling for many potential cyclists—especially children, the elderly, the inexperienced, and anyone who finds cycling in mixed traffic unpleasant and stressful.

All surveys in both Canadian and American cities clearly indicate that more separate cycling facilities—bike paths and lanes—would most encourage people to cycle (Dill and Carr, 2003). Thus, it is imperative that Canadian cities greatly expand their investment in such separate cycling facilities if they really want to increase cycling. Virtually all of the many case study respondents contacted for this research indicated that a lack of government funding was a crucial hindrance to that needed expansion. With the exception of Quebec, no other Canadian province has provided significant funding, coordination, planning, or policy guidance to assist local communities. The Province of Ontario, in particular, has been egregiously negligent by almost completely ignoring cycling, but British Columbia has not been much better.

Similarly, Canada’s Federal Government has neglected cycling as a serious transport mode. National legislation similar to the United States’ Intermodal Surface Transportation Efficiency Act (ISTEA) and Transportation Equity Act for the 21st century (TEA-21) could greatly increase funding for investments in cycling infrastructure (U.S. Department of Transportation, 2004a, 2004b, and 2004c). The federal government should also provide more research funding and more guidance in bicycling planning in Canada. That would foster the necessary collaboration and exchange of ideas and experiences of local bicycling planners throughout Canada. Although it ratified the Kyoto Accords on curbing greenhouse gases, the Canadian Government has left it almost entirely to the provinces and cities to implement urban transport policies and programs so crucial to actually meeting the promised reductions in Greenhouse Gas emissions.

Cycling is probably the most sustainable of all transport modes, producing virtually no pollution of any kind and requiring no non-renewable energy resources at all. It is time for the Federal Government and Canadian provincial governments to provide the sort of support for cycling that would enable cities to make the needed investments in cycling infrastructure, as well as fund complementary educational, training, and law enforcement programs. Cycling education in Canadian schools is only very limited and completely

voluntary. Following the extraordinarily successful cycling education programs in Europe, Canadian provinces should require and help fund mandatory completion of a cycling education course by the third or fourth grade of primary school.

Without such increased provincial and federal government involvement, it may be that cycling in Canadian cities has now reached a plateau. Even at that limited level, Canada far outperforms the United States. It seems a pity, however, not to provide the funding that would enable Canadian cities to realize the enormous unmet potential for more cycling. That, in turn, would help achieve a range of environmental, safety, energy, congestion, and public health benefits. Acknowledgements

The research on which this article is based was funded by a grant from the Canadian Studies Program of the Canadian Government. The authors gratefully acknowledge that financial support as well as the extraordinarily kind and generous assistance from Canadian cycling experts. Indeed, most of the information for this article was provided by dozens of bicycling planners, policy analysts, safety specialists, urban planners, bicycling activists, and ped-bike coordinators in the six case study cities and by the Province of Quebec and Velo Quebec. In addition to the specific documents cited within the text and listed in the references at the end, the article also reflects information transmitted by email and fax communications, phone calls, and on-site interviews in the case study cities. The authors would especially like to thank the following for their kind assistance with our research on Canadian cycling: Marc Jolicoeur, Marc Panneton, and Marie Demers (for Montreal and Quebec City); Dan Egan, Sean Wheldrake, and Barbara Wentworth, and Nancy Smith Lea (for Toronto); Ryan Lanyon, Wilf Koppert, and Robin Bennett (for Ottawa); John Luton, David Cubberly, Larry Roberts, and Todd Litman (for Victoria); and Gavin Davidson, Peter Stary, Michael Grant, and Tamim Raad (for Vancouver).

References:

- Agence Metropolitaine de Transport. 2004. *Bicyclettes*. Montreal, Canada: Agence Metropolitaine de Transport. Accessible at: www.amt.qc.ca/tc/train/velos/index.asp?ligne=1. Accessed on 1 December 2004
- Agence Metropolitaine de Transport. 2001. *Enquete Destination-Origine: Mobilite des personnes dans la region de Montreal*. Agence Metropolitaine de Transport, Montreal, Quebec. Canada.
- Capital Regional District. 1999. *Status of Cycling in the Capital Region, 1998*. Victoria, British Columbia: Capital Regional District.
- Capital Regional District. 2002a. *2001 CRD Origin and Destination Household Travel Survey: Final Report*. Victoria, British Columbia: Capital Regional District, BC Transit, and BC Ministry of Transport (March 2002 release).
- Capital Regional District. 2002b. *2001 CRD Origin and Destination Household Travel Survey: Daily Travel Characteristics*. Victoria, British Columbia: Capital Regional District (December 2002 release).
- Capital Regional District. 2003a. *Bicycle Strategy. Working Paper No. 2 in the series "Travel Choices Strategy."* Victoria, British Columbia: Capital Regional District.
- Capital Regional District. 2003b. *Length of Cycling Network by Municipality and by Classification*. Victoria, British Columbia: Capital Regional District.
- Cervero, R. 1998. *The Transit Metropolis: A Global Inquiry*. Washington, DC: Island Press.
- City of Ottawa. 1994. *Comprehensive Cycling Plan*. Ottawa, Canada: City of Ottawa.
- City of Ottawa. 1999-2003. *Annual Collision Report*. Ottawa, Canada: City of Ottawa-Carleton.
- City of Ottawa. 2001. *Bicycle Issues and Needs Research*. Ottawa, Canada: City of Ottawa-Carleton.
- City of Ottawa. 2002. *Cycling and Pedestrian Activity Monitoring Study*. Ottawa, Canada: City of Ottawa.
- City of Ottawa. 2003a. *2002 Commuter Behavior and Attitude Survey: Draft Final Report—Cycling Excerpts*. Ottawa, Canada: City of Ottawa.
- City of Ottawa. 2003b. *Report on Ottawa Road Safety*. Ottawa, Canada: City of Ottawa.
- City of Ottawa. 2003c. *2003 Cyclist Profile Survey*. Ottawa, Canada: City of Ottawa.
- City of Ottawa. 2004. *Bike Rack Usage Survey*. Ottawa, Canada: City of Ottawa and OC Transpo, Transit Service Planning and Development.
- City of Toronto. 2001. *2000-2001 Toronto Bike Plan: Shifting Gears*. Toronto, Canada: City of Toronto. Accessible at: www.city.toronto.on.ca/cycling/bikeplan/index.htm.

City of Toronto. 2003. Toronto Bicycle/Motor-Vehicle Collision Study, 2003. Toronto, Canada: Toronto Works and Emergency Services Department, Transport Services Division. Accessible at: www.city.toronto.on.ca/transportation/publications/bicycle_motor-vehicle

City of Toronto. 2004. Cycling Website for City of Toronto. Accessible at: www.city.toronto.on.ca/cycling/index.htm

City of Toronto. 2005a. Cycling Injuries and Fatalities. Toronto, Canada: Office of Bicycling Programs.

City of Toronto. 2005b. Survey of Helmet Use in Toronto. Toronto, Canada: Office of Bicycling Programs.

City of Vancouver. 1999. 1999 Bicycle Plan: Reviewing the Past, Planning the Future. Vancouver, Canada: City of Vancouver Engineering Services. Accessible at: www.city.vancouver.bc.ca/engsvcs/transport/cycling/1999plan.htm

Decima Research, Inc. 2000. City of Toronto 1999 Cycling Study. Toronto, Canada: Decima Research, Inc. for the City of Toronto. Accessible at: www.toronto.ca/cycling/pdf/decimareport.pdf

Dill, J. and Carr, T. 2003. Bicycle Commuting and Facilities in Major U.S. Cities: If You Build Them, Commuters Will Use Them – Another Look. Transportation Research Record No. 1,828, pp. 116-123. Washington, DC.: Transportation Research Board.
Environment Canada. 2004. Canada's Greenhouse Gas Inventory, 1990-2002. Ottawa, Canada: Environment Canada. Accessible at: www.ec.gc.ca/pdb/ghg/1990_02_report/toc_e.cfm

Gilbert, R. and Irwin, N. 2004. Issue Exploration: Urban Transportation. Ottawa, Canada: National Round Table on the Environment and the Economy.

Greater Victoria Cycling Coalition (2004). Bike Sense: The British Columbia Bicycle Operator's Manual. Victoria, British Columbia: GVCC.

ICBC (2005). Road Sense for Drivers: Share the Road (chapter 6, pp. 77-93). North Vancouver, British Columbia: Insurance Corporation of British Columbia. Accessible at: www.icbc.bc.ca/Licensing/lic_utility_resman_drivers.html

Newman, P. and Kenworthy, J. 1999. Sustainability and Cities: Overcoming Automobile Dependence. Washington, DC: Island Press.

Nivola, P. S. 1999. Laws of the Landscape: How Policies Shape Cities in Europe and America. Washington D.C.: Brookings Institution Press.

Pucher, J. 2004. Public Transportation. In Hanson, S. and Giuliano, G., eds., Geography of Urban Transportation. New York, NY: Guilford Press.

Pucher, J. and Renne, J. 2003. "Socioeconomics of urban travel: Evidence from the 2001 NHTS," Transportation Quarterly, Vol. 57, No. 3, pp. 49-78.

Pucher, J. and Dijkstra, L. 2003. "Promoting Safe Walking and Cycling to Improve Public Health," *American Journal of Public Health*, Vol. 93, No. 9, September 2003, pp. 1509-1517.

Pucher, J. 1998. *Urban Transport in Germany: Providing Feasible Alternatives to the Car*. *Transport Reviews*, Vol. 18, No. 4, pp. 285-310.

Pucher, J. 1997. *Bicycling Boom in Germany: A Revival Engineered by Public Policy*," *Transportation Quarterly*, Vol. 51, No. 4, pp. 31-46.

Pucher, J. and Lefevre, C. 1996. *Urban Transport Crisis in Europe and North America*. London, UK: Macmillan Press.

Quebec Ministry of Transport (Transports Quebec). 2004. *Provincial Assistance Programs for La Route Verte*. Quebec, Canada: Transports Quebec (Ministry of Transport). Accessible at: www.mtq.gouv.qc.ca/en/services/programmes/c6.asp. Accessed on 1 December 2004.

Quebec Ministry of Transport (Transports Quebec). 2004. *Reseau routiers—amenagements cyclables: Politique sur le velo*. Quebec City, Canada: Ministere des Transports du Quebec. Accessible at: www.mtq.gouv.qc.ca/fr/reseau/velo/politique.asp Accessed 6 December 2004

Société de l'Assurance Automobile du Québec (SAAQ), 2004. *Sois Prudent – Roule Gagnant*. Quebec City, Canada: Accessible at: Société de l'Assurance Automobile du Québec www.saaq.gouv.qc.ca/prevention/velo/campagne2004.html Accessed on 10 January 2005

Statistics Canada. 1998. *Employed labour force by mode of transportation to work by census metropolitan area (1996 Census)*. Ottawa, Canada: Statistics Canada. Accessible at: www.statcan.ca/english/Pgdb/labor42_96f.htm

Statistics Canada. 2003. *2001 Census: Where Canadians work and how they get there*. Ottawa, Canada: Ministry of Industry.

Translink (Greater Vancouver Transportation Authority). 2005. *Moving People, Goods and Services in a Growing Region*. Vancouver, Canada: Translink. Accessible at: www.translink.bc.ca/WhatsNewandBoardMeetings/Default.asp, accessed on 10 January 2005.

Translink (Greater Vancouver Transportation Authority). 2004. *Getting Around in a Bicycle Friendly Transit Network*. Vancouver, Canada: Translink. www.translink.bc.ca/Transportation_Services/Bikes/Default.asp, accessed on 12 December 2004.

Translink (Greater Vancouver Transportation Authority). 2000. *Regional Travel Survey. GVRD Residents Age 16 +*. Vancouver, Canada. Accessible online at: www.translink.bc.ca/files/polls_surveys/regtravel.pdf. Accessed on 20 January 2005.

Translink (Greater Vancouver Transportation Authority). 2001. *Use of the Bicycle for the Journey to work: An Analysis of the 1996 Census Results for the Greater Vancouver Regional District*. Vancouver, Canada: Translink.

Transportation Association of Canada. 1993. *Briefing: A New Vision for Urban Transportation*. Ottawa, Canada: TAC. Accessible at: www.tac-atc.ca/english/pdf/urban.pdf

Transportation Association of Canada. 1998. Briefing: A Primer on Urban Transportation and Global Climate Change. Ottawa, Canada: TAC. Accessible at: www.tac-atc.ca/english/pdf/global.pdf

Transportation Association of Canada. 2004. Briefing: Urban Transportation and Air Quality. Ottawa, Canada: TAC. Accessible at: www.tac-atc.ca/english/pdf/airquality.pdf

Transport Canada. 2004. Traffic accident information database. Ottawa, Canada: Transport Canada.

Transportation Information Steering Committee. 1986-2001. Transportation Tomorrow Survey. Toronto, Ontario: Ontario Ministry of Transport, City of Toronto, and 35 other municipalities in the Greater Toronto Area.

Transportation Research Board. 2001. Making Transit Work: Insights from Western Europe, Canada, and the United States. Washington, DC: National Academy Press.

U.S. Department of Transportation. 2004a. Intermodal Surface Transportation Efficiency Act of 1991. Washington, DC: Bureau of Transportation Statistics. Accessible online at: <http://ntl.bts.gov/DOCS/ste.html>

U.S. Department of Transportation. 2004b. TEA-21: Moving Americans into the 21st Century. Washington, DC: Federal Highway Administration. Accessible online at: www.fhwa.dot.gov/tea21

U.S. Department of Transportation. 2004c. National Bicycling and Walking Study: 10-year Status Report, October 2004. Washington, DC: Federal Highway Administration. Accessible online at: www.fhwa.dot.gov/environment/bikeped/study

Velo Quebec. 2001. Bicycling in Quebec in 2000. Montreal, Canada: Velo Quebec (also published in French as L'etat du velo au Quebec en 2000). Montreal, Canada: Velo Quebec. Accessible at: www.velo.qc.ca/velo_quebec/Documents/etat_velo, accessed on 30 November 2004.

Velo Quebec. 2003. Reseau Velo Metropolitain. Vol 6, No 1, 2003. Montreal, Canada: Velo Quebec.

Velo Quebec. 2004c. Les guides Velo Mag: Les Voies Cyclables au Quebec (7th edition). Velo Mag: Montreal, Canada.

Velo Quebec. 2004a. With you, bicycles go further. Montreal, Canada: Velo Quebec. Accessible at: www.velo.qc.ca/english/home.lasso, accessed on 6 December 2004.

Velo Quebec. 2004b. La Feria du Velo 2004. Montreal, Canada: Velo Quebec. Accessible at: www.velo.qc.ca/fr/expo.php?diapo=ovb2004&n=6&image=1, accessed on 6 December 2004.

Ville de Quebec. 1995. Plan Directeur Reseau Cyclable. Quebec City, Canada: Ville de Quebec, Service de l'Urbanisme, Division du Transport.