



Squandered Money

Funding Mass Transit to Reduce Emissions

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EXECUTIVE SUMMARY

Federal, provincial and municipal governments in Canada are spending several billion dollars a year to expand public transit, increasingly focused on light rail systems. The public rationale for this frequently cites the need to promote modal shift from cars to transit to reduce greenhouse gas emissions and 'save the planet'.

In fact, while transit use is rising modestly and mainly in very large cities, almost four out of five Canadians continue to commute by personal vehicle.

The costs of light rail transit systems are rising considerably. An increasing number cost over \$200 million per kilometre to build, and operating subsidies for all transit systems are rising.

The Canadian Urban Transit Association Vision 2040 calls for transit ridership to increase by 86% from 2012 to 2040. Yet, even doubling transit ridership would only reduce GHG emissions by 2.5 megatonnes per year, reducing transportation-related emissions by 1.5% and total emissions by 0.4%.

Transit subsidies are the most expensive possible way to reduce emissions, and cost over \$1,000 per tonne of emissions avoided.

Spending on transit as a climate policy will not "save the planet". Instead, it is a sad case of squandered money.

Squandered Money

Funding Mass Transit to Reduce Emissions

One of the cardinal beliefs of those who claim that human-caused greenhouse gas emissions are causing potentially catastrophic climate change is that building urban mass transit systems will play a large role in reducing such emissions. This belief is reflected in every statement by the government of Canada on infrastructure funding, by the Canadian Urban Transit Association (CUTA), by Canadian municipalities seeking billions of dollars in government funds and by many in the Canadian media. The purpose of this article is to examine whether the facts support this view, and the costs that are being borne by taxpayers.

What Role Does Urban Transit Play?

“Urban transit” refers to the publicly-funded passenger transportation systems by bus, tram, subway, light-rail and other means in many medium-to-large sized cities. These systems form one part of the system by which people commute from home to workplace and back. The uses of transit are affected by urban populations and by settlement patterns, including the growth of suburbs, the population density within city cores, and the location of employment, whether in the cores or elsewhere.



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Two recent surveys by Statistics Canada have thrown considerable light on how these patterns have changed over the past decade. According to the National Household Survey of 2011,¹ roughly 15.4 million Canadians commuted to work. **Seventy-four per cent of commuters, or 11.4 million workers, drove a personal vehicle to work, and another 5.6% or 867,000 people, made the trip as passengers. In other words, four out of five commuters used personal vehicles.** By comparison, 11% used public transit.

Of the public transit users, 63.5% commuted by bus, 25.0% by subway or elevated rail, 11.2% by light rail, streetcar or commuter train and 0.3% by ferry.

These figures vary considerably by urban area. In 2011, for example, the percentage of commuters who used public transit was over 20% in Toronto, Montreal, Vancouver and Ottawa, but under 7% in cities like Kingston, Windsor, Sherbrooke, Regina, and Kelowna.

Commuters who travelled by public transit took longer to get to work, on average, than commuters who used cars. In 2011, commuters who used cars spent an average of 23.7 minutes travelling to work, compared with 40.4 minutes for bus riders, 44.6 minutes for subway users and 52.5 minutes for light rail, streetcar or commuter train passengers.

In a report based on the 2016 census, Statistics Canada delved into the background trends that are influencing commuting patterns in the eight largest Census Metropolitan Areas (CMAs): Toronto, Montreal, Vancouver, Calgary, Ottawa-Gatineau, Edmonton, Quebec, and Winnipeg.² The results are interesting:

- Since 1996, jobs have been moving away from the city centres; in Toronto, for example, the proportion of people working 25 km or more from the city centre increased from 20% in 1996 to 26% in 2016.
- The percentage of workers who live 25 km or more from the city centres have also increased in all CMAs. People simply are moving to where they can have larger residences.
- Among traditional commuters, the proportion of public transit commuters increased in all CMAs.
- **In 2016, most people (78%) still commuted to work by car. This is true even in the very largest CMAs where transit use is growing. For example, in 2016, commuters who travelled by car constituted 67.7% of the total in Toronto, 69.1 % in Montreal and 67.6% in Vancouver.**

The slight growth in transit use over time is borne out by CUTA data, which indicates that transit trips per capita are rising about 1.55 to 2% per year.

¹ https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-012-x/99-012-x2011003_1-eng.cfm

² <https://www150.statcan.gc.ca/n1/pub/75-006-x/2019001/article/00008-eng.htm>

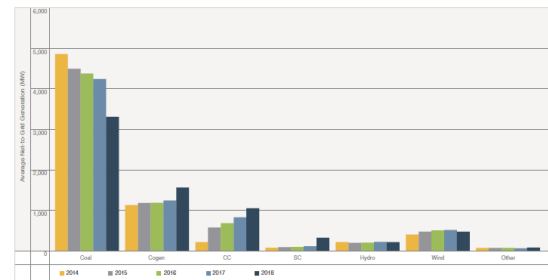
According to data published by Statista Research, most transit users are under 35 years old.³ **Eighty-two per cent of Canadian residents between the ages of 35 and 54 say that they rarely or never use transit, as do 91% of residents 55 and over.**

The Cost of Transit

Unfortunately, there are no data publicly available to indicate the total value of annual sales in Canadian urban transit systems. Nor are data available concerning the costs of capital and operating Canada’s urban transit systems. (CUTA may have these data but they do not make it available to non-members.) All the public is left with are various occasional media reports on the capital expenditures made on various transit systems expansions and reports of new capital expenditure subsidies by federal, provincial and municipal governments.



FIGURE 12: Annual average net-to-grid generation by technology



Contrary to Minister McKenna’s tweet, Alberta’s power grid runs on coal and natural gas. Neither Calgary Transit nor the C-train ‘run on the wind.’

³ <https://www.statista.com/statistics/486810/public-transport-use-frequency-age-canada/>

One online source offers estimates of the total capital costs and per kilometer cost of construction of several light rail transit systems in Canada, as shown in Table 1.⁴ The numbers in Table 1 are out of date and should be taken as rough estimates, but the values are very high. They exclude the major capital expenditures being made on bus, subway and LRT construction in Quebec and in smaller cities across Canada.

Table 1
Capital Costs of Canadian Rail Transit Systems (December 2015)

<u>City</u>	<u>Project</u>	<u>Cost</u> <u>(\$millions)</u>	<u>Cost Per Km</u> <u>(\$millions)</u>
Vancouver	Canada Line	2,054	116
Vancouver	Evergreen Line	1,360	123
Vancouver	Broadway LRT	1,100	90
Calgary	Green Line	4,500	117
Edmonton	Metro	665	204
Edmonton	Valley Line	1,800	138
Mississauga	Hurontario LRT	1,400	70
Kitchener-Waterloo	ION Transit	739	43
Ottawa	Confederation Line	2,130	177
Surrey	Light Rail Transit	2,100	84
Surrey	Expo Line	1,800	113
Toronto	York-Spadina	2,900	337
Toronto	Eglinton Crosstown	5,300	279
Toronto	Finch West LRT	1,200	109
Toronto	Sheppard East LRT	1,000	83
Toronto	Bloor-Danforth Ext.	3,560	468
Victoria	VRRT Proposal	844	57

Source: <https://blog.daryldelacruz.com/2015/12/06/capital-costs-of-canadian-rail-transit-systems/>

⁴ <https://blog.daryldelacruz.com/2015/12/06/capital-costs-of-canadian-rail-transit-systems/>

The available data show that an increasing number of light rail transit systems cost over \$200 million per kilometre to build. Some in Toronto are projected to cost over \$300 million per kilometre. One has to wonder why, with such escalating costs, cities are choosing light rail systems over bus rapid transit systems. Could it be that the availability of massive funding from federal and provincial government sources, and the appeal to politicians to building big-ticket, allegedly more modern transit systems, has altered the municipal choices?

Other sources of information include the funding announcements of the federal and provincial governments. The federal government's Budget 2015 announced that \$3.4 billion would be spent over three years to "upgrade and improve" public transit systems across Canada. **Budget 2017 announced that the federal government would spend another \$25.3 billion over the next decade, including \$5 billion spent by the Canada Infrastructure Bank.** In March, 2019, the Quebec government announced that its spending on infrastructure over the next ten years will rise to \$115 billion, almost \$12 billion of which will be on transit. On April 11, 2019, the Ontario government announced that it would commit \$144 billion to infrastructure spending over the next decade, including \$66.7 billion for public transit. The federal, provincial and municipal governments are clearly looking to the carbon dioxide pricing systems as sources of funds for these spending plans, arguing that the transit spending supports climate policy goals.



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It will not pass the notice of people who live in rural areas and smaller municipalities that the lion's share of the federal and provincial government expenditures on transit will go to the largest cities. In effect, the regions with the lower incomes and fewer economic opportunities are subsidizing the larger cities, and the residents of the larger cities are being freed from the full consequences of the transit spending decisions of their municipal governments.



Definition: Population density is the number of people per unit of area.

Description: The map displayed here shows how Population density varies by country. The shade of the country corresponds to the magnitude of the indicator. The darker the shade, the higher the value.

Source: [CIA World Factbook](https://www.cia.gov/library/publications/the-world-factbook/docs/2019_01_01.html) - Unless otherwise noted, information in this page is accurate as of January 1, 2019.

Source: <https://www.indexmundi.com/map/?v=21000>

Population density is a factor for consideration in the value and cost-benefit of mass transit, especially expensive built infrastructure like light rail transit or high speed trains.

Japan has 333 people/km² - Canada has 4 people/km².

<https://www.indexmundi.com/g/r.aspx?v=21000>

The Canadian Urban Transit Association Vision 2040 states that urban transit makes a major contribution to environmental quality by reducing GHG emissions.⁵ It sets out proposed targets for per-capita ridership growth by 2040. These targets include a 50% increase in per-capita trips in large and medium cities and 100% increase in smaller municipalities. Combined with population growth, CUTA projects this will increase trips by 86% by 2040 from those in 2007. Assuming continuation of current operating cost recovery from transit fees, **CUTA estimates that this ridership growth will entail an increase in government operating subsidies from \$2 billion in 2007 to \$3.7 billion in 2040 (in constant 2007 dollars).**

John Lawson, formerly the Chief Economist for Transport Canada, analyzed the comparative emissions of GHGs by mode in the work that he did for the Report of the Transportation Table for the National Climate Change Strategy in 1999, and he updated that analysis in a 2012 paper.⁶ The analysis notably included estimates of emissions in terms of carbon dioxide equivalent (and therefore grams per passenger-kilometre) for light duty vehicles (i.e. cars, SUVs and pickup trucks) and urban transit. As he acknowledged, there are uncertainties about the estimates because of the limited data concerning vehicle-kilometres and average occupancies. In the case of transit, vehicle-km are recorded, but passenger-km are not measured directly and published, so they were inferred from transit vehicle-km and assumed occupancies. However, these are the best estimates available.

As part of his analysis, Lawson assessed the implications of shifting passengers between modes, assuming that the operating conditions, including load factors, remained the same. **A doubling (i.e. 100% increase) of transit ridership would transfer 16.25 billion passenger-km from light duty vehicles to transit and reduce emissions by 2.53 megatonnes (Mt) per year.**

A doubling of urban transit ridership far exceeds the “stretch” goals suggested by transit agencies in the past and exceeds even the 86% goal set out in the CUTA Vision for 2040. However, according to Environment and Climate Change Canada, the emissions from all transportation sources in 2017 were 174 Mt, and emissions from all sources were 716 MT.⁷ **So, doubling transit ridership at great cost would reduce Canada’s transportation-related emissions by 1.5% and total emissions by 0.4%.**

Several Canadian cities have declared that a climate “emergency” exists, and that GHG emissions must decline by 45% or more from current levels by 2030. Implicit in such declarations is the assumption that emissions from light duty vehicles will decline sharply

⁵ https://cutaactu.ca/sites/default/files/cutabook_complete_lowres.pdf

⁶

https://www.researchgate.net/publication/275034314_Lawson_1_THE_CONTRIBUTION_OF_THE_TRANSPORT_SECTOR_TO_AN_EFFECTIVE_GREENHOUSE_GAS_STRATEGY

⁷ <https://www.canada.ca/en/environment-climate-change/services/climate-change/greenhouse-gas-emissions/sources-sinks-executive-summary-2019.html#toc5>

within a decade. The preceding analysis shows that even unprecedented increases in transit ridership will come nowhere close to achieving that. Commuters, left to their free choices, will continue to use personal vehicles.

It is notable that few, if any, discussions of the role of transit investments in reducing GHG emissions address the costs of abatement; that is the cost per tonne of GHG emission avoided. A coherent and balanced approach to choosing among emissions reduction options should, at least, favour doing the lowest cost options first. Yet, even the work on the National Climate Change Strategy in 1999 failed to produce an estimate of the costs of abatement. **It indicated that the cost was likely to exceed several hundred dollars per tonne, much higher than all other options available.**



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Conclusion

Even in Canada's largest cities, the vast majority of commuters still travel by personal vehicle; for Canada as a whole, four out of five do. The movement of people and employment to the suburbs and to locations increasingly distant from urban cores is changing the pattern of commuting that transit systems were designed to serve in the past. Transit use is growing in the largest cities but at very slow rates overall, while the costs of capital and operating subsidies have increased by billions of dollars per year.

Amid frequent announcements of tens of billions of dollars in new transit expenditures by all orders of government, Canadians have no reliable sources of information about the total costs being incurred. In spite of frequently repeated claims that transit expenditures will increase ridership and reduce GHG emissions, the evidence is that, at best, they will have

only a marginal impact. Spending on transit as a climate policy, therefore, will not “save the planet”. Instead, it is a sad case of squandered money.



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About the Author

Robert Lyman is an Ottawa energy policy consultant and former public servant of 27 years, a diplomat for 10 years prior to that. His complete biography can be read [here](#).

About

Friends of Science Society is an independent group of earth, atmospheric and solar scientists, engineers, and citizens who are celebrating its 16th year of offering climate science insights. After a thorough review of a broad spectrum of literature on climate change, Friends of Science Society has concluded that the sun is the main driver of climate change, not carbon dioxide (CO₂).

Friends of Science Society

P.O. Box 23167, Mission P.O.

Calgary, Alberta

Canada T2S 3B1

Toll-free Telephone: 1-888-789-9597

Web: friendsofscience.org

E-mail: [contact\(at\)friendsofscience\(dot\)org](mailto:contact@friendsofscience.org)

Web: climatechange101.ca

