

Clearing the Air on the TTC:

Recommendations to Increase the Environmental Benefits
of the TTC

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This report has been prepared by:
Toronto Environmental Alliance & TTCriders



About the Toronto Environmental Alliance: Since 1988, the Toronto Environmental Alliance has campaigned locally to find solutions to Toronto's urban environmental problems. A not-for-profit organization, TEA advocates on behalf of all Torontonians for a green, healthy and equitable city. We rely on our members to help us work with communities and we act as an environmental watchdog at City Hall. Our Mission is to promote a greener Toronto. We work with concerned individuals, community groups, professionals and workers, encouraging the participation of local people on local issues. Our Vision is a green, healthy and equitable city with economic activity that sustains our environment.

About the TTCriders: TTCriders is an organization created give a voice to the interests and concerns of the millions of us who use the TTC. We seek to ensure that our public transit provides good, dependable service and is accessible and affordable for everyone in our communities. Drivers have the Canadian Automobile Association, homeowners have organizations in many parts of the city, and cyclists have formed an effective lobby group. Transit riders deserve to be well represented when decisions are being made about fares, service delivery, or transit priorities.

TTCriders is a collaborative concerned about the state of Toronto's transit system that includes: the Canadian Federation of Students - Ontario, Social Planning Toronto, Toronto ACORN, the Toronto & York Region Labour Council, and the Toronto Environmental Alliance.

Executive Summary

The TTC is vital to Toronto. Without it, Torontonians would be living in perpetual gridlock and spending even more of their waking hours commuting. Moreover, Toronto's air would be significantly dirtier and we would be emitting hundreds of thousands of tonnes of additional greenhouse gas (ghg) emissions into the atmosphere.

During the 2010 municipal election, there was much discussion about the future of the TTC. Lots of suggestions were made about how to improve existing services and about how best to expand the TTC, especially into Toronto's inner suburbs. Almost all of the discussion centred on finances, the merits or drawbacks of various forms of transit vehicles and what type of new transit modes should be built. There was almost no consideration of how proposed changes and expansion plans would impact the environment, specifically air quality and ghg emissions.

Election campaigns are a great opportunity for candidates, pundits and the public to debate ideas and options. Now, the new Councillors and Mayor must move from debate to action. Decisions about the TTC's existing operations and expansion plans must be made and we cannot afford bad decisions. In particular, we cannot afford decisions that harm our air quality or our ability to reduce ghg emissions.

This report offers information and recommendations to assist our elected officials in making decisions to improve our air quality and to reduce our ghg emissions. In particular, this report provides:

- An estimate of the ghg emissions avoided due to transportation by TTC instead of private vehicles.
- An estimate of the ghg emissions avoided should the 2007 Transit City Plan be fully implemented.
- An analysis of the ghg emissions produced by subways and Light Rail Transit (LRT) using Light Rail Vehicles (LRVs).

Based on this information, we urge the new City Council and the Toronto Transit Commission to maximize the environmental benefits of the TTC by adopting the following recommendations:

1. Develop a baseline analysis of ghg and smog emissions resulting from current practices as well as a baseline analysis of avoided emissions resulting from current practices.
2. Develop a methodology to assess the ghg and smog emissions of various operational changes and that the results of this methodology be considered when making decisions about which operational changes to adopt.
3. Continue implementing the 2007 Transit City Plan and only change course if careful analysis of other expansion plans can clearly demonstrate that they offer greater reduction of ghg emissions per dollar spent and better service to TTC users.

We hope these recommendations will be adopted by our elected officials to help determine the best options for service improvements and for system expansion. Doing so will result in improving and expanding the TTC in such a way that most effectively cleans Toronto's air and contributes to reductions in ghg emissions.

Measuring the Environmental Benefits of Current and Future TTC Operations

Surprisingly, the TTC has never published any information that identifies current greenhouse gas (ghg) and smog emissions, nor the avoided ghg emissions and smog emissions resulting from people using the TTC instead of private vehicles. Without such public baseline estimates, it becomes effectively impossible to calculate and track how future changes to existing operations may help or hinder attempts to reduce ghg and smog emissions. As governments increasingly respond to the ever-mounting costs of climate change, this baseline information and tracking will become both invaluable and necessary.

TEA and TTCriders have developed a first generation methodology that we hope the TTC will further develop and refine (see Appendix A). Based on this methodology, we estimate that by using the TTC instead of private vehicles, Torontonians annually avoid emitting roughly 357,000 tonnes of greenhouse gases into the atmosphere. This is based on the fact that in 2009, the TTC moved roughly 471 million passengers about 214 million km and reduced annual car trips by roughly 261 million.¹ In other words, if the TTC were shut down today, we would be taking another 261 million annual car trips that would burn roughly 140 million litres of gasoline² while increasing traffic on roads by as much as 60%.³

Tracking ghg and smog emissions is as important as tracking expenditures, especially since there are known health and financial costs to climate change and smog.⁴ The TTC needs to know the amount of ghg and smog emissions its services create and avoid through reduced vehicle use. Accordingly,

Recommendation 1: The TTC develop a baseline analysis of ghg and smog emissions resulting from current practices as well as a baseline analysis of avoided emissions resulting from current practices.

This baseline analysis is crucial for making informed decisions about future TTC operations. As was apparent throughout the election campaign, many proposals were made about how to improve TTC services. In assessing the merits of various proposals, elected officials must factor in the impact on the city's finances, riders and the environment, in particular ghg and smog emissions. The TTC has mechanisms in place to assess costs and impacts on riders. It does

¹ TTC ridership statistics available here: http://www3.ttc.ca/About_the_TTC/Operating_Statistics/2009.jsp

² See Appendix A for sources used to derive this number.

³ Based on statistics about modes of transport available here: http://www.toronto.ca/invest-in-toronto/mode_trans_work.htm

⁴ See http://www.toronto.ca/health/hphe/pdf/air_pollution_burden_boh.pdf for statistics on the health impacts of smog in Toronto, especially from transportation. See <http://webarchive.nationalarchives.gov.uk/> & http://www.hm-treasury.gov.uk/d/CLOSED_SHORT_executive_summary.pdf for information about the global costs of dealing – and not dealing – with climate change.

not have a mechanism to assess potential operational changes from a smog and climate change perspective. Accordingly,

Recommendation 2: The TTC develop a methodology to assess the ghg and smog emissions of various operational changes and that the results of this methodology be considered when making decisions about which operational changes to adopt.

With this methodology in place, decision makers considering changes to current operations would know how various options would affect the TTC's overall environmental performance. It would also allow the TTC to consistently update its baseline analysis of ghg and smog emissions.

Using Environmental Goals to Determine the Better Way Forward with Transit Expansion

There is unanimous agreement that the TTC must expand, especially into Toronto's inner suburbs. Much of the election campaign was spent discussing various expansion options.

Essentially, the options presented to Torontonians include the following:

- The Transit City Light Rail Plan, adopted by City Council, Metrolinx and supported by Premier McGuinty in 2007 (the 2007 Transit City Plan)
- The reduced Transit City plan adopted by Metrolinx in May 2010 (the Metrolinx Plan)
- Subway expansion underneath select major roads (the Subway Plan)
- A hybrid of the Metrolinx Plan and the Subway Plan (the Hybrid Plan)

Most of the discussion centred on finances, the merits or drawbacks of various forms of transit vehicles and what type of new transit modes should be built. There was almost no consideration of how proposed expansion plans would impact the environment, specifically air quality and ghg emissions.

To date, only the 2007 Transit City Plan has an estimate about its ghg impact. According to the TTC, once implemented, Transit City would annually reduce ghg emissions by 213,000 tonnes.⁵ Put differently, the equivalent of roughly 53 million annual car trips will be avoided saving about 23 million litres of gasoline.

The 2007 Transit City Plan also has many other merits. Compared to subways, Light Rail Transit (LRT) systems can be built faster and the eight proposed lines would get fast, reliable transit to all corners of the City that are currently under-served.

⁵ See Slide 37 at http://www.toronto.ca/involved/projects/malvern_lrt/pdf/2009-06-29_display_boards.pdf

There is no information available on how the Subway and the Hybrid Plans would reduce ghg emissions or offer better service for the greatest number of people. There is also no information available to suggest the Subway and Hybrid Plans would deliver as much ridership as the 2007 Transit City Plan for the same amount of money and in the same amount of time. Making any decisions to move away from the Transit City Plan towards a yet-to-be developed new plan with unknown financial and economic consequences is ill-advised until there is more information available. Accordingly,

Recommendation 3: Continue implementing the 2007 Transit City Plan and only change course if careful analysis of other expansion plans can clearly demonstrate that they offer greater reduction of ghg emissions per dollar spent and better service to TTC users.

This recommendation implicitly suggests that the City should push hard to get Metrolinx and the Province of Ontario to recommit to implementing the 2007 Transit City Plan. With a renewed funding commitment, the original 2007 Transit City Plan could be implemented in a slightly longer timeframe.

Addressing the Subway vs. Light Rail Transit (LRT) Controversy

In a world where tax dollars were not scarce, where there was lots of time to plan and build transit, where traffic congestion was a minor irritant, and where climate change was not a global threat, subways would likely be the preferred option for most transit expansion in Toronto. We do not live in that world. We must reduce ghg emissions as quickly as possible, tax dollars are incredibly scarce, traffic congestion costs the economy billions of dollars and Torontonians in our inner suburbs need fast, accessible transit as soon as possible.

With this in mind, an analysis was done of the two technologies that were most discussed during the election – Light Rail Transit (LRT) systems and subways – from the perspective of which technology provides the greatest reduction in ghg emissions per dollar spent.⁶

Recently, the Pembina Institute released data that allows one to calculate the greenhouse gases emitted by various types of transit vehicles per 1 million passenger kilometres travelled.⁷ Table 1 provides these results.

⁶ It is important to note that we are talking about LRT systems made up of Light Rail Vehicles (LRVs), not streetcars. Many people confuse the two and think the 2007 Transit City Plan will build streetcar tracks equivalent to what is found in downtown Toronto. This is incorrect. LRVs will be on dedicated tracks on much wider suburban roads with fewer stops and longer trains.

⁷ See Table 25 here: <http://pubs.pembina.org/reports/driving-down-carbon-report.pdf>. Pembina supplied us with the conversions from MJ/100 PTK to ghg emissions per tonne.

Not surprisingly, Table 1 notes that diesel buses create the most ghg emissions. Electric powered subways create 29 tonnes of ghg emissions and electric powered Light Rail Vehicles (LRVs) create 39 tonnes. All things being equal, subways clearly create fewer climate change emissions than LRVs per passenger kilometre travelled.

Table 1: GHG Emissions for Various Types of Transit Vehicles

| Vehicle Type | GHG emissions (tonnes) per 1 million passenger km travelled |
|--------------------|---|
| Diesel Bus | 116.6 |
| Light Rail Vehicle | 39 |
| Subway | 29 |

However, as noted above, not all things are equal. Subways cost anywhere between 3 to 5 times more per kilometre to build than Light Rail Transit (LRT) systems.⁸ Table 2 shows the ghg emissions for LRVs and subways per dollar invested. These numbers are based on the conservative assumption that subways cost 3 times more than LRT systems. The results show LRVs emit less than half the ghg emissions of subways, when cost is factored in. In other words, in a world with limited tax dollars for public transit expansion, Light Rail Transit make more sense for the environment than subways.

Table 2: GHG Emissions for LRVs and Subways Per Dollar Invested

| Vehicle Type | GHG emissions (tonnes) per 1 million passenger km travelled per \$1 invested |
|--------------------|--|
| Light Rail Vehicle | 39 |
| Subway | 87 |

⁸ For example, this source <http://lrt.daxack.ca/LRTvsHRT/CostCompare.html> suggests subways are between 5 to 6 times more expensive than above-ground LRT systems. In October 2010, the Toronto Star reported subways cost 3 times more than LRT systems: <http://www.thestar.com/news/gta/torontomayoralrace/article/817123--reality-check-subways-are-great-but-at-what-cost>

Conclusions about Transit Expansion and the Environment

Tax dollars for public transit expansion are scarce. Moreover, we need public transit improvements across the city as soon as possible to alleviate traffic congestions and the huge waiting times Torontonians currently face in the inner suburbs. Finally, the urgency to deal with climate change puts even more pressure on the City to move quickly and provide Torontonians with an alternative to using their cars.

It is a fact that Light Rail Transit is faster to build and that more can be built per dollar spent than subways. It is also a fact that LRT systems provide more environmental benefits than subways per dollar invested. These facts suggest – for the same amount of money – the Transit City Plan will be better for the environment and for Torontonians than subway expansion. We encourage those who dispute this to provide data to back up their beliefs. In the meantime, we urge City Council to continue building Transit City.

Appendix A - Methodology

The 2009 TTC Statistics and 2006 Transportation Tomorrow Survey (TTS) were the data sources used to calculate the greenhouse gas (ghg) emissions avoided by the use of the TTC.^{1,2} Transport Canada's Urban Transportation Emissions Calculator (UTEC) was the modelling program used to perform the calculation.³ The approach was to calculate the annual ghg emission of the auto trips removed by TTC and the entire TTC system. Then, the TTC system's ghg emissions were subtracted from the auto trips' ghg emissions to give the annual ghg emissions avoided.

The auto trips' ghg emissions were calculated by multiplying the total auto trips removed with the average distance travelled during an auto trip. This gives the total annual distance traveled. The total auto trips removed and average distance travelled were obtained from the 2009 TTC Statistic and 2006 TTS respectively. The UTEC modelling program was set for the evaluation year of 2006. Then, total annual distance travelled was entered to obtain the annual ghg emissions of the auto trips removed.

The TTC system's ghg emissions were calculated by inputting the vehicle kilometres travelled by bus, streetcars, subway and Scarborough RT into the UTEC modelling program. All of the vehicle kilometres travelled were obtained from 2009 TTC Statistics. The evaluation year of the model was also set for 2006. The modelling program was customized to account for TTC's statistical assumptions of bus fleet breakdown by hybrid and diesel vehicle. The percentage of green electricity that TTC purchased was also included in the model.⁴ The TTC system's ghg emissions were obtained once these values were entered.

For further details about the methodology, please contact the Toronto Environmental Alliance.

¹ TTC Operating Statistics. Toronto Transit Commission (2010). Available at: http://www3.ttc.ca/About_the_TTC/Operating_Statistics/2009.jsp

² Transportation Tomorrow Survey. University of Toronto, Data Management Group (2006). Available at: http://www.dmg.utoronto.ca/pdf/tts/2006/regional_travel_summaries/TTS_report4_full.pdf (p. 24)

³ Urban Transportation Emission Calculator. Transport Canada (2008). Available at: <http://wwwapps.tc.gc.ca/Prog/2/UTEC-CETU/>

⁴ Personal communication with TTC staff.