MOBILITY NETWORK SUMMER SCHOOL 2023

Measuring what matters: Cities and urban mobility in an era of climate emergency

Syllabus

UNIVERSITY OF TORONTO
FACULTY OF APPLIED SCIENCE & ENGINEERING

POSITIVE ZERO
TRANSPORT FUTURES

Mobility Network Summer School 2023:
Measuring what matters:
Cities and urban mobility in an era of climate emergency

Dates: June 20, 2023: 12:00 p.m. to 5:30 p.m. & June 21, 2023: 8:30 a.m. to 5:00 p.m.

Venue: Multi-Faith Centre, Koffler House, University of Toronto (St. George Campus)
569 Spadina Cres, Toronto, ON M5S 2J7

1. Overview of summer school

1.1 Background

The issue of climate change is one of the most pressing challenges facing humanity today, and government investments in infrastructure can play a critical role in addressing this issue. However, it is not enough to simply invest in new infrastructure without carefully evaluating the potential climate and social impacts of these investments. This year's summer school will focus on the evaluation of government investments in terms of their benefits for climate and society.

1.2 Content

Over the course of the two-day program, students will participate in a series of mini-lectures and case studies that will guide them through the process of producing a set of performance measures that can be used by government agencies to evaluate the "net zero" effect of investments and policy decisions. These measures will help to ensure that investments in infrastructure contribute to the overall goal of achieving net-zero carbon emissions and a more equitable society.

Throughout the program, students will have the opportunity to apply this indicator framework to real-world case studies to assess its effectiveness. By the end of the two days, students will produce a roadmap evaluating the climate and social impacts of government investments, which they can then use to advocate for more sustainable and equitable investment decisions in their own communities. Overall, summer school will provide students with the knowledge and skills they need to become leaders in the field of sustainable development and help to build a more sustainable future for all.

1.3 Instructors

Professor Marianne Hatzopoulou, Civil & Mineral Engineering, University of Toronto
Professor Laura Minet, Department of Civil Engineering, University of Victoria
Professor Daniel Posen, Civil & Mineral Engineering, University of Toronto
Professor Eric Miller, Civil & Mineral Engineering, University of Toronto
Dr. Judy Farvolden, Managing Director, Mobility Network, University of Toronto
Dr. Junshi Xu, Research Associate, Civil & Mineral Engineering, University of Toronto
Dr. Shayamila Mahagammulla Gamage, Postdoctoral Fellow, Civil & Mineral Engineering, University of Toronto

2. Learning outcomes

By the end of the 2-day program, attendees will:

- Explore the relevant literature on project evaluation in the context of climate change and gain a deeper understanding of the principles underlying effective evaluation methods.
- Develop an appreciation for the challenges associated with policy and decision-making in the context of municipal and provincial climate change strategies.
- Learn how to quantify the impacts of investments in terms of both climate and societal outcomes and develop a set of practical skills for assessing the effectiveness of government investments and policies.
- Collaborate with their peers in a group context, engaging in collective brainstorming sessions that fostered a more dynamic and collaborative approach to problem-solving.
- Gain experience in effectively communicating the outcomes of case study discussions to a lay audience, developing their ability to articulate complex ideas in a clear and concise manner.

3. Schedule

Day 1: June 20 Tuesday, 2023	
12:00 - 12:45 pm	Lunch and registration
12:45 - 13:15 pm	Introduction: Prof. Marianne Hatzopoulou
13:15 - 14:00 pm	Brief presentations on case studies: Dr. Junshi Xu
14:00 - 15:30 pm	Guest speakers (2 / 45min. each) - Prof. Daniel Posen - Prof. Laura Minet
15:30 - 17:00 pm	Breakout groups around each case study: - Groups go over case studies together. - Identify roles and prepare a plan for the development of the performance measures and quantification approaches
17:00 - 17:30 pm	Groups report on chosen case study and proposed plan
17:30 pm	End of Day 1 program
18: 00 - 20:00 pm	Welcome reception (optional) Location: Madison Avenue Pub, 14 Madison Ave, Toronto, ON M5R 2S1

Day 2: June 21 Wednesday, 2023	
8: 30 - 9:00 am	Breakfast available
9:00 - 10:45 am	Breakout groups identify a list of indicators that they believe are important, that can be measured, and which are relevant to their case study
10:45 - 12:30 pm	Breakout groups develop methods for quantifying each indicator and identifying data needs
12:30 - 13:30 pm	Lunch
13:30 - 15:00 pm	Breakout groups estimate/guess the potential outcomes of the case study in terms of their indicator framework

15:00 - 15:30 pm	Breakout groups prepare a 200-word policy brief (a short summary of how their work can enhance the evaluation of the case study) and final presentations
15:30 - 16:30 pm	Groups report on work
16: 30 - 16:45 pm	Completion of Summer School feedback survey
16:45 pm	End of Day 2 program

4. Reading materials

4.1 Academic literature on externalities stemming from transportation infrastructure, such as greenhouse gas (GHG) emissions, air pollution, health impacts, etc.

(1) Weisbrod, G.; Lynch, T.; Meyer, M. Extending Monetary Values to Broader Performance and Impact Measures: Transportation Applications and Lessons for Other Fields. *Eval. Program Plann.* **2009**, *32* (4), 332–341. https://doi.org/10.1016/j.evalprogplan.2009.06.011.

(2) Ward, J. W.; Michalek, J. J.; Samaras, C. Air Pollution, Greenhouse Gas, and Traffic Externality Benefits and Costs of Shifting Private Vehicle Travel to Ridesourcing Services. *Environ. Sci. Technol.* **2021**, *55* (19), 13174–13185. https://doi.org/10.1021/acs.est.1c01641.

(3) Griswold, J. B.; Madanat, S.; Horvath, A. Tradeoffs between Costs and Greenhouse Gas Emissions in the Design of Urban Transit Systems. *Environ. Res. Lett.* **2013**, *8* (4). https://doi.org/10.1088/1748-9326/8/4/044046.

(4) Riley, E.; Harris, P.; Kent, J.; Sainsbury, P.; Lane, A.; Baum, F. Including Health in Environmental Assessments of Major Transport Infrastructure Projects: A Documentary Analysis. *Int. J. Heal. Policy Manag.* **2018**, *7* (2), 144–153. https://doi.org/10.15171/ijhpm.2017.55.

(5) Yang, C. H.; Lee, K. C.; Chen, H. C. Incorporating Carbon Footprint with Activity-Based Costing Constraints into Sustainable Public Transport Infrastructure Project Decisions. *J. Clean. Prod.* **2016**, *133*, 1154–1166. https://doi.org/10.1016/j.jclepro.2016.06.014.

(6) Karjalainen, L. E.; Juhola, S. Urban Transportation Sustainability Assessments: A Systematic Review of Literature. *Transp. Rev.* **2021**, *41* (5), 659–684. https://doi.org/10.1080/01441647.2021.1879309.

(7) Tiwari, G.; Jain, D.; Ramachandra Rao, K. Impact of Public Transport and Non-Motorized Transport Infrastructure on Travel Mode Shares, Energy, Emissions and Safety: Case of Indian Cities. *Transp. Res. Part D Transp. Environ.* **2016**, *44*, 277–291. https://doi.org/10.1016/j.trd.2015.11.004.

(8) Bueno, P. C.; Vassallo, J. M.; Cheung, K. Sustainability Assessment of Transport Infrastructure Projects: A Review of Existing Tools and Methods. *Transp. Rev.* **2015**, *35* (5), 622–649. https://doi.org/10.1080/01441647.2015.1041435.

(9) Tran, N. H.; Yang, S. H.; Huang, T. Comparative Analysis of Traffic-and-Transportation-Planning-Related Indicators in Sustainable Transportation Infrastructure Rating Systems. *Int. J. Sustain. Transp.* **2021**, *15* (3), 203–216. https://doi.org/10.1080/15568318.2020.1722868.

(10) Chester, M. V.; Horvath, A. Environmental Assessment of Passenger Transportation Should Include Infrastructure and Supply Chains. *Environ. Res. Lett.* **2009**, *4* (2). https://doi.org/10.1088/1748-9326/4/2/024008.

(11) Milovanoff, A.; Balasubramanian, R.; Minet, L.; Cheah, L.; Posen, I. D.; MacLean, H. L. Greenhouse Gas Emission Mitigation Pathways for Urban Passenger Land Transport under Ambitious Climate Targets. *Environ. Sci. Technol.* **2021**, *55* (12), 8236–8246. https://doi.org/10.1021/acs.est.0c06671.

(12) Lee, J. Y.; Lee, C. K.; Chun, Y. Y. Greenhouse Gas Emissions from High-Speed Rail Infrastructure Construction in Korea. *Transp. Res. Part D Transp. Environ.* **2020**, *87* (August), 102514. https://doi.org/10.1016/j.trd.2020.102514.

(13) Chavez-Baeza, C.; Sheinbaum-Pardo, C. Sustainable Passenger Road Transport Scenarios to Reduce Fuel Consumption, Air Pollutants and GHG (Greenhouse Gas) Emissions in the Mexico City Metropolitan Area. *Energy* **2014**, *66* (2), 624–634. https://doi.org/10.1016/j.energy.2013.12.047.

(14) Dalkic, G.; Balaban, O.; Tuydes-Yaman, H.; Celikkol-Kocak, T. An Assessment of the CO2 Emissions Reduction in High Speed Rail Lines: Two Case Studies from Turkey. *J. Clean. Prod.* **2017**, *165*, 746–761. https://doi.org/10.1016/j.jclepro.2017.07.045.

(15) de Almeida Guimarães, V.; Leal Junior, I. C. Performance Assessment and Evaluation Method for Passenger Transportation: A Step toward Sustainability. *J. Clean. Prod.* **2017**, *142*, 297–307. https://doi.org/10.1016/j.jclepro.2016.05.071.

4.2 Academic literature on project assessment and evaluation, decision making, etc.

(1) de Almeida Guimarães, V.; Leal Junior, I. C. Performance Assessment and Evaluation Method for Passenger Transportation: A Step toward Sustainability. *J. Clean. Prod.* **2017**, *142*, 297–307. https://doi.org/10.1016/j.jclepro.2016.05.071.

(2) Annema, J. A.; Mouter, N.; Razaei, J. Cost-Benefit Analysis (CBA), or Multi-Criteria Decision-Making (MCDM) or Both: Politicians' Perspective in Transport Policy Appraisal.

Transp. Res. Procedia **2015**, *10* (July), 788–797. https://doi.org/10.1016/j.trpro.2015.09.032.

(3) Toth-Szabo, Z.; Várhelyi, A. Indicator Framework for Measuring Sustainability of Transport in the City. *Procedia - Soc. Behav. Sci.* **2012**, *48*, 2035–2047. https://doi.org/10.1016/j.sbspro.2012.06.1177.

(4) Batur, İ.; Koç, M. Travel Demand Management (TDM) Case Study for Social Behavioral Change towards Sustainable Urban Transportation in Istanbul. *Cities* **2017**, *69* (January), 20–35. https://doi.org/10.1016/j.cities.2017.05.017.

(5) Jones, H.; Moura, F.; Domingos, T. Transport Infrastructure Project Evaluation Using Cost-Benefit Analysis. *Procedia - Soc. Behav. Sci.* **2014**, *111*, 400–409. https://doi.org/10.1016/j.sbspro.2014.01.073.

(6) Banar, M.; Özdemir, A. An Evaluation of Railway Passenger Transport in Turkey Using Life Cycle Assessment and Life Cycle Cost Methods. *Transp. Res. Part D Transp. Environ.* **2015**, *41* (2015), 88–105. https://doi.org/10.1016/j.trd.2015.09.017.

(7) Rabello Quadros, S. G.; Nassi, C. D. An Evaluation on the Criteria to Prioritize Transportation Infrastructure Investments in Brazil. *Transp. Policy* **2015**, *40*, 8–16. https://doi.org/10.1016/j.tranpol.2015.02.002.

(8) Li, Z.; Madanu, S. Highway Project Level Life-Cycle Benefit/Cost Analysis under Certainty, Risk, and Uncertainty: Methodology with Case Study. *J. Transp. Eng.* **2009**, *135* (8), 516–526. https://doi.org/10.1061/(ASCE)TE.1943-5436.0000012.

(9) Joumard, R.; Nicolas, J. P. Transport Project Assessment Methodology within the Framework of Sustainable Development. *Ecol. Indic.* **2010**, *10* (2), 136–142. https://doi.org/10.1016/j.ecolind.2009.04.002.

(10) Liu, M.; Balali, V.; Wei, H.-H.; Peña-Mora, F. A. Scenario-Based Multi-Criteria Prioritization Framework for Urban Transportation Projects. *Am. J. Civ. Eng. Archit.* **2015**, *3* (6), 193–199. https://doi.org/10.12691/ajcea-3-6-1.

(11) Miller, P.; de Barros, A. G.; Kattan, L.; Wirasinghe, S. C. Public Transportation and Sustainability: A Review. *KSCE J. Civ. Eng.* **2016**, *20* (3), 1076–1083. https://doi.org/10.1007/s12205-016-0705-0.

(12) Asplund, D.; Eliasson, J. Does Uncertainty Make Cost-Benefit Analyses Pointless? *Transp. Res. Part A Policy Pract.* **2016**, *92*, 195–205. https://doi.org/10.1016/j.tra.2016.08.002.

(13) Illahi, U.; Mir, M. S. Development of Indices for Sustainability of Transportation Systems: A Review of State-of-the-Art. *Ecol. Indic.* **2020**, *118* (July), 106760. https://doi.org/10.1016/j.ecolind.2020.106760.

(14) Thomopoulos, N.; Grant-Muller, S.; Tight, M. R. Incorporating Equity Considerations in Transport Infrastructure Evaluation: Current Practice and a Proposed Methodology. *Eval. Program Plann.* **2009**, *32* (4), 351–359. https://doi.org/10.1016/j.evalprogplan.2009.06.013.

(15) Saxe, S.; Guven, G.; Pereira, L.; Arrigoni, A.; Opher, T.; Roy, A.; Arceo, A.; Von Raesfeld, S. S.; Duhamel, M.; Mccabe, B.; Panesar, D. K.; Maclean, H. L.; Posen, I. D. Taxonomy of Uncertainty in Environmental Life Cycle Assessment of Infrastructure Projects. *Environ. Res. Lett.* **2020**, *15* (8). https://doi.org/10.1088/1748-9326/ab85f8.

4.3 Textbooks, municipal and NGO reports, and business cases

1. *Life Cycle Assessment: Quantitative Approaches for Decisions That Matter* by H. Scott Matthews, Deanna H. Matthews, Chris T. Hendrickson. This is a free open online book available at http://www.lcatextbook.com/.

2. *TransformTO Net Zero Strategy A climate action pathway to 2030 and beyond* by the City of Toronto. It is available at *https://www.toronto.ca/legdocs/mmis/2021/ie/bgrd/backgroundfile-173758.pdf.*

3. *The State of Climate Action Implementation in Ontario Municipalities* by Clean Air Partnership. It is available at https://www.cleanairpartnership.org/wp-content/uploads/2022/06/Final-Climate-Action-Atlas-Report-1.pdf.

4. *Ontario's Climate Change Strategy* by the Government of Ontario. It is available at https://docs.ontario.ca/documents/4928/climate-change-strategy-en.pdf.

5. *Cost Engineering Analysis: A Guide to Economic Evaluation of Engineering Projects* by Park, W. R., and Jackson, D. E.(TA177.4 .P37 1984).

6. *Metrolinx Business Case Manual Volume 2: Guidance* by Metrolinx. It is available at https://assets.metrolinx.com/image/upload/v1663237565/Documents/Metrolinx/Metrolinx-Business-Case-Guidance-Volume-2.pdf.

7. Eglinton Crosstown West Extension Initial Business Case by Metrolinx. It is available at https://assets.metrolinx.com/image/upload/v1668540646/Images/Metrolinx/2020-02-28_ECWE_IBC.pdf.

8. GO Expansion Full Business Case by Metrolinx. It is available at https://assets.metrolinx.com/image/upload/v1667497052/Images/Metrolinx/GO_Expansion_FBC.pdf.

5. Case Studies (4 groups, 9-10 people in each group, each group selects one case study)

5.1 Case Study #1 Eglinton Crosstown Light rail transit (LRT)

About the Project

The Eglinton Crosstown LRT is part of Metrolinx's regional transportation plan, The Big Move, and is one of the first large-scale transit projects for the Toronto area. A midtown connection between east and west Toronto will make the trip easier. With 25 stations along the dedicated route, getting across town will be up to 60% faster than before.

- The 19-kilometre corridor will include a 10-kilometre underground portion, between Keele Street and Laird Drive.
- The LRT will have 25 stops and stations, linking to bus routes, three subway stations and various GO Transit lines.

(Resources: https://www.metrolinx.com/en/projects-and-programs/eglinton-crosstown-lrt)

Figure 1. The Eglinton Crosstown LRT Project

Controversial Aspects of the Eglinton Crosstown LRT

1. Infrastructure Costs: The construction of the Eglinton Crosstown LRT is a significant financial investment. The project is estimated to cost around $12.8 billion, making it one of the largest transit infrastructure projects in Canada.

2. Economic Impacts: The construction of the Eglinton Crosstown LRT is likely to have significant economic impacts. These can include job creation during the construction phase and potentially increased economic activity along the LRT line after its completion.

3. Business Disruption: During construction, businesses along Eglinton Avenue have experienced disruptions, which can have financial impacts. These businesses might experience reduced customer traffic due to construction, and some might be eligible for compensation from the city.

4. Public-Private Partnership: The Eglinton Crosstown LRT project is being delivered using a public-private partnership (P3) model. This model can potentially deliver cost savings compared to traditional procurement methods, but it also involves complex contractual arrangements and risks.

5. Delays and Cost Overruns: As with many large infrastructure projects, the Eglinton Crosstown LRT has experienced delays and potential cost overruns. These can increase the overall cost of the project and have wider economic impacts.

6. Environmental Impact: LRT systems in general are often associated with environmental benefits. These benefits typically include a reduction in carbon emissions and overall urban air pollution, as LRT systems can decrease the reliance on personal vehicles for transportation. However, the construction process of such systems can cause temporary disruptions and environmental disturbances, including noise, dust, and changes to local ecosystems.

5.2 Case Study #2 EglintonTOday Complete Street

About the Project

The EglintonTOday Complete Street project is an interim strategy that will achieve elements of the Eglinton Connects Vision and aims to make travel on Eglinton Avenue safer, more inviting, and attractive for everyone.

The project proposes to implement complete street features, including bikeways and public realm upgrades on Eglinton Avenue between Keele Street and Mount Pleasant Road, by

reassigning the existing road space to accommodate vehicular traffic, parking, bikeways, seasonal patio extensions, art installations and other neighbourhood and cultural events.

(Resources: https://www.toronto.ca/community-people/get-involved/public-consultations/infrastructure-projects/eglintontoday/)

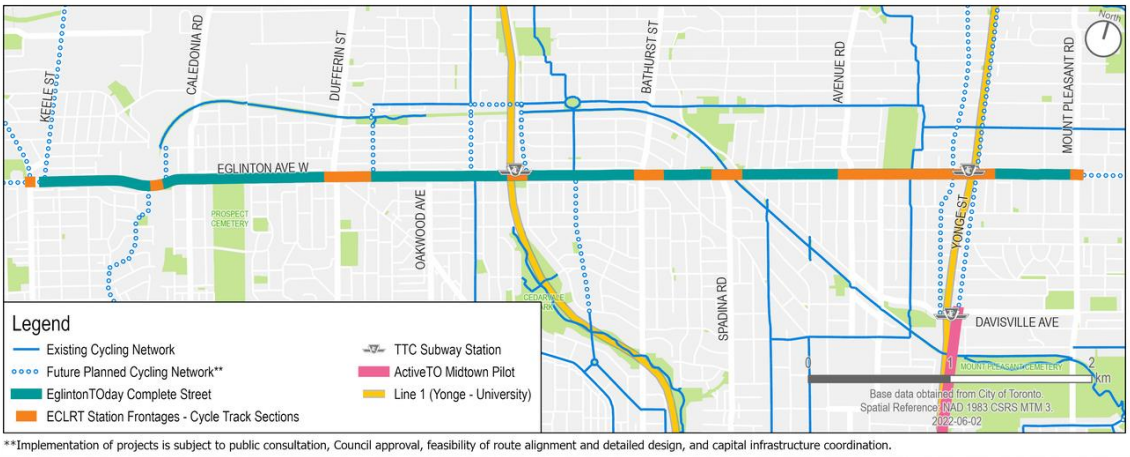

Figure 2. EglintonTOday complete street plan

Complete Streets

"Complete streets" are streets that are designed to be safe for all users: people who walk, bicycle, take transit or drive, and people of varying ages and levels of ability. They also consider other uses like sidewalk cafés, street furniture, street trees, utilities, and stormwater management.

Goals:

- ensuring safe and accessible streets for people of all ages and abilities
- giving people a range of transportation choices
- creating healthy and livable neighborhoods
- creating vibrant and attractive public spaces
- supporting economic prosperity
- improving environmental sustainability

(Resources: https://www.toronto.ca/services-payments/streets-parking-transportation/enhancing-our-streets-and-public-realm/complete-streets/overview/)

Controversy surrounding the EglintonTOday Complete Street

1. Project Delay: The project, which was originally proposed in 2014, has experienced significant delays and construction has yet to begin. This has led to frustration among local residents and stakeholders, who are upset about the project taking so long to come to fruition.

2. Traffic and Parking Concerns: Drivers have expressed concerns about the project, especially in regard to anticipated traffic issues and the loss of parking spaces. These concerns have resulted in further delays to the project, as city officials have opted for more consultations to address these issues.

3. Extended Consultation Process: The city's consultation process has been ongoing since 2013, with the aim of gathering public input on street priorities and project design. However, this long process has been a point of contention, with stakeholders criticizing the city for the slow progress and repeated consultations.

4. Project Features and Design: The project aims to reassign existing road space to accommodate a variety of features, including vehicles, parking, bikeways, seasonal patio extensions, art installations, and neighborhood events. The changes will depend on the roadway width and will include on-street parking, space for café applicants, protected cycle tracks, and streetscape features like parkettes, planters, and public art.

5. Alignment with the Eglinton Crosstown LRT: The complete street installation and road resurfacing are planned to coincide with the opening of the Eglinton Crosstown LRT. This may be adding to the pressure to finalize the design and start construction.

5.3 Case Study #3 Hazel McCallion LRT

About the Project

Metrolinx named the Hurontario LRT project as the Hazel McCallion Line, to commemorate the former Mississauga mayor. The 18-kilometre Hazel McCallion Line will feature 19 stops, travel through two urban growth centers and connect to major transit systems including GO Transit (Milton and Lakeshore West lines), the Mississauga Transitway, Brampton Transit, ZUM and MiWay. The Hazel McCallion Line will operate in its own dedicated lane ensuring a smooth, reliable, and convenient ride along the region's busiest street.

(Resources: https://www.metrolinx.com/en/projects-and-programs/hazel-mccallion-lrt)

Figure 3. Hazel McCallion LRT plan

Controversial Aspects of the Hazel McCallion LRT Project

1. Route Reduction: There was controversy when the planned northern end of the LRT route was reduced, stopping short of the originally intended endpoint in Brampton. The decision, which was based on cost concerns, drew criticism from those who saw the shortened route as less useful for promoting transit integration in the region.

2. Cost and Financing: As with many large public transit projects, the overall cost and financing plans for the LRT project have been a source of debate. Some people argued that the funding could be better used on other transit or infrastructure projects.

3. Construction Disruption: There are concerns that the construction phase of the LRT project could cause significant disruption to traffic, businesses, and residents along the route, with potential impacts on local commerce and quality of life.

4. Environmental Impact: Though LRT systems are generally considered more environmentally friendly than car travel, any large construction project can have environmental impacts. These can include disruption of green spaces, effects on local wildlife, and the carbon footprint of the construction process itself.

5. Effect on Local Communities: Critics have raised concerns about the potential gentrification that the LRT could bring, driving up property values along the route and potentially displacing lower-income residents.

5.4 Case Study #4 Ontario Line

About the Project

The Ontario Line will be a 15.6-kilometre subway line that will make it faster and easier to travel within Toronto and beyond. The line will bring 15 new stations to the city and will run from Exhibition Place, through the heart of downtown, all the way to the Ontario Science Centre. It will give people more time back in their days, with a trip from one end to the other taking less than 30 minutes compared to the 70 minutes it takes on transit today. The ongoing construction of the project will not only provide connections to more than 40 other travel options along the way, such as the TTC's Line 1 and Line 2, three GO Transit rail lines, and the Eglinton Crosstown LRT, but it will also alleviate congestion and overcrowding within the existing transit network. This relief is expected to have a significant positive impact, enhancing the overall efficiency and accessibility of the transportation system.

(Resources: https://www.metrolinx.com/en/projects-and-programs/ontario-line)

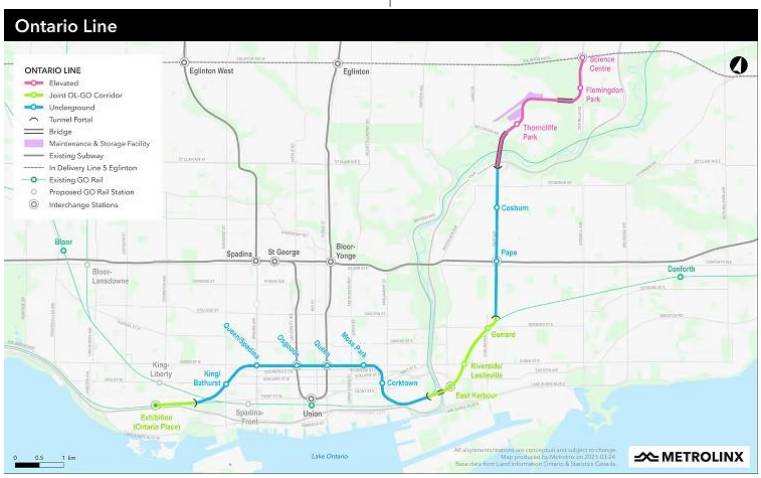

Figure 4. Ontario Line plan

Controversial Aspects of the Ontario Line Project

1. Cost and Funding: Large-scale infrastructure projects are almost always expensive and face scrutiny regarding their costs. Questions often arise about whether the cost estimates are accurate, whether the project will stay within budget, and whether the money might be better spent on other initiatives.

2. Route Selection: The proposed route of the Ontario Line has been another source of controversy. Any change in public transit routes can affect residents, businesses, and neighborhoods differently, leading to disagreements and pushback.

3. Disruption during Construction: The construction of a new subway line can cause significant disruption to the local community, including noise and dust, traffic diversions, and impacts on local businesses and residences.

4. Technology and Design: The Ontario Line was proposed to use lighter train cars and a different technology than the existing Toronto Transit Commission (TTC) subway lines. This decision attracted criticisms from some quarters, who suggested it might lead to issues with system integration, capacity, and longevity.

5.Transit Planning and Governance: There's been a longstanding debate over who should control transit planning in the GTA. Some critics of the Ontario Line have argued that it reflects the

province imposing its priorities on the city, which could undermine local control over transit planning.

6. Environmental Impact: As with any large construction project, there are concerns about the environmental impact of the Ontario Line, including issues related to noise, vibration, air quality, impacts on parks and green spaces, and the overall carbon footprint of the construction and operation of the line.

5.5 Case Study #5 Highway Expansion 413

About the Project

The proposed 52-kilometre Highway 413 and transitway will extend from Highway 400 (between Kirby Road and King-Vaughan Road) in the east to the Highway 401/407 ETR interchange area in the west, connecting the regions of York, Peel, and Halton. The project includes a 4 km extension to Highway 410 and a 3 km extension to Highway 427 for a total of 59 km for the corridor. The highway would have 11 interchanges at municipal roads and features such as electric charging stations, service centers, carpool lots and truck inspection stations will all be explored as part of the design. The transitway would be a separate corridor running alongside the highway dedicated exclusively for public transit, such as buses or light rail transit.

(Resources: https://www.highway413.ca/)

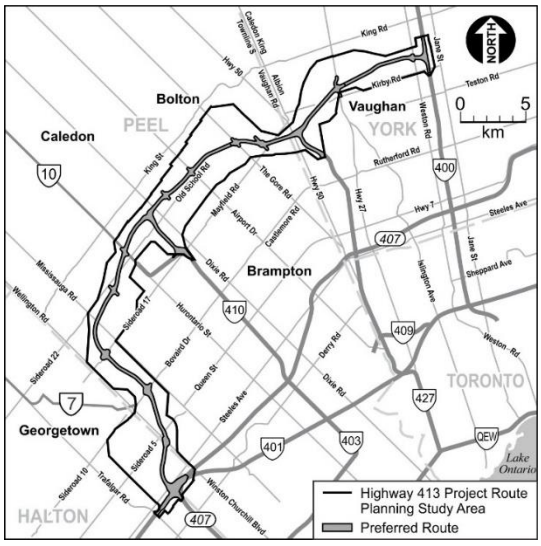

Figure 5. Highway expansion 413

Highway expansion 413 was a subject of controversy.

1. Environmental Impact: One of the major criticisms of the Highway 413 project was its potential impact on the environment. The construction of the highway would likely necessitate the destruction of farmland and natural areas, including some designated as protected greenbelt lands. Critics argued that this would result in habitat destruction, potential threats to local biodiversity, and increased carbon emissions due to the focus on automobile-based transportation.

2. Urban Sprawl and Traffic Congestion: Another argument against Highway 413 was that it would encourage further urban sprawl and might not significantly improve traffic congestion. While supporters of the project cited the need for improved transportation infrastructure to handle the growth in the Greater Toronto Area, critics pointed out that new highways often lead to increased traffic in the long run - a phenomenon known as “induced demand.”

3. Cost of Construction: The cost associated with the construction of a new highway was also a concern. The funds used for such a project could potentially be redirected towards improving public transit or other sustainable transportation options, which would also help reduce carbon emissions.

4. Impact on Local Communities: The proposed route of Highway 413 would pass through several established communities. Residents and local governments in these areas voiced concerns about the potential impacts of the highway, such as noise and air pollution, decreased property values, and disruption of community cohesion.

5. Climate Change: Critics also argued that the construction of Highway 413 would be a step in the wrong direction in terms of climate change mitigation. It would likely lead to more cars on the roads, which would increase greenhouse gas emissions. Some people suggested that the money would be better spent on public transit or other sustainable transportation options that would help reduce carbon emissions.

6. An example of a 200-word policy brief

King Street Transit Priority Corridor: A Model for Urban Transformation

The King Street Transit Priority Corridor in Toronto has shown significant impacts across environmental, economic, and social domains. This pilot initiative, which prioritized streetcar travel, led to improved transit service, and reduced vehicular noise, mitigating long-term health impacts associated with noise pollution in dense urban cores. However, programs like these along a single stretch of road may not significantly reduce overall noise levels.

Economically, the project stimulated local businesses with an increase in spending by 21% within the project area in the first few months. The project also saw an increase in daily weekday streetcar ridership by 16%, indicating the area's growing attractiveness for both residents and visitors. While travel times generally improved, the morning peak period experienced a slight increase in average travel time due to higher ridership.

Socially, new public spaces created as part of the pilot were actively used and studied to evaluate their impact and potential for improvement. This initiative represents a successful model for integrating transit priority corridors into the urban fabric, fostering environmental, economic, and social benefits.

Moving forward, such projects could be expanded to encompass broader areas and multiple transit corridors, further enhancing urban livability and environmental sustainability.