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Sharing the Road

The Promise and Perils of Shared Mobility in the GTHA

BY SARA DITTA & MICHAEL CRAWFORD URBAN
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EXECUTIVE SUMMARY

The Greater Toronto and Hamilton Area's (GTHA) transportation system faces significant challenges related to congestion, long commute times and limited integration across the region. At the same time, global trends and emerging technologies are disrupting traditional modes of mobility. The arrival of the "sharing economy" – in which online marketplaces allow consumers to forgo ownership and purchase real-time access to specific products or services instead – has governments around the world scrambling to respond effectively. For decision-makers, these developments present major opportunities and challenges for improving the region's transportation system.

For consumers, "shared mobility" – which describes the innovations in mobility enabled by the sharing economy – offers the possibility of significant benefits, including more convenient and less costly transportation options. More broadly, these emerging business models have the potential to limit greenhouse gas emissions, reduce congestion and fill gaps in the GTHA's transportation system. Alongside these potential benefits come challenges, however, as shared mobility stands to disrupt many existing services and traditional jobs associated with them within the transportation system, as well as threatening to undermine policies designed to support equity and accessibility.

Consequently, policymakers should adopt approaches that are proactive, flexible, innovative and collaborative to ensure that the benefits of shared mobility are secured while avoiding its potential pitfalls. More specifically, transportation strategies in the GTHA must incorporate shared mobility services by improving support for multi-modal transportation – the use of multiple modes of transportation (e.g. bike and subway) as parts of a single trip – and encouraging more public-private partnerships between transportation providers. Furthermore, several key issues must be addressed, ranging from specific concerns about taxation to issues that are broader in scope such as the inclusiveness of our transportation system.

Simply maintaining the status quo poses a significant risk for the GTHA, namely a fragmented transportation system that does not meet the needs of the region's residents. However, lessons from other jurisdictions illustrate that governments and public transit agencies can work proactively and collaboratively to help prevent such outcomes and effectively harness shared mobility for the public good.

This report offers six broad recommendations for building a robust and flexible system that can effectively respond to the emergence of shared mobility:

1] Expedite regulatory reform

2] Prioritize partnerships

3] Ensure open data, technological neutrality and interoperability

4] Develop leadership and coordination mechanisms

5] Re-align incentives to promote shared mobility

6] Embrace emerging technologies

Notably, this report recommends that the Government of Ontario lead and develop a flexible and responsive regulatory framework. This framework should aim to integrate shared mobility into the GTHA's transportation system by using it to better enable multi-modal travel. Specific recommendations range from calling for all GTHA municipalities to quickly develop frameworks for regulating ride-sourcing services such as UberX – something that has already been done in Toronto but is at various stages in other municipalities – to launching more partnerships between public transit and private shared mobility providers.

Overall, if it is integrated into the transportation system appropriately, shared mobility offers the GTHA a number of significant positive opportunities that policymakers should seize. However, doing so will require a willingness to explore new ways of doing business. As part of these efforts, policymakers will need to more fully embrace the ideal of a "customer-first transportation system," as laid out in *The Big Move*, the region's transportation plan.

Clearly, the arrival of Uber in the GTHA and in cities around the world has demonstrated the risks that taking a passive approach to innovation can create for policymakers. The GTHA's transportation system cannot afford to repeat the past two years of regulatory uncertainty and unpredictability. Policymakers in today's age need to proactively seize the initiative and work with foresight and vision toward solutions that harness new technological innovations for the advancement of the transportation system's overarching objectives. This final lesson is particularly important given the similar, but more serious and far-reaching, challenges associated with the imminent arrival of automated vehicles and the next wave of transportation innovation.

Simply maintaining the status quo poses a significant risk for the GTHA, namely a fragmented transportation system that does not meet the needs of the region's residents.

1 INTRODUCTION

Traditional modes of transportation are changing and evolving worldwide. In recent years, the pace of that change has accelerated remarkably with the growth of new business models that enable consumers to share access to vehicles such as cars and bikes, rather than own them, known as "shared mobility."

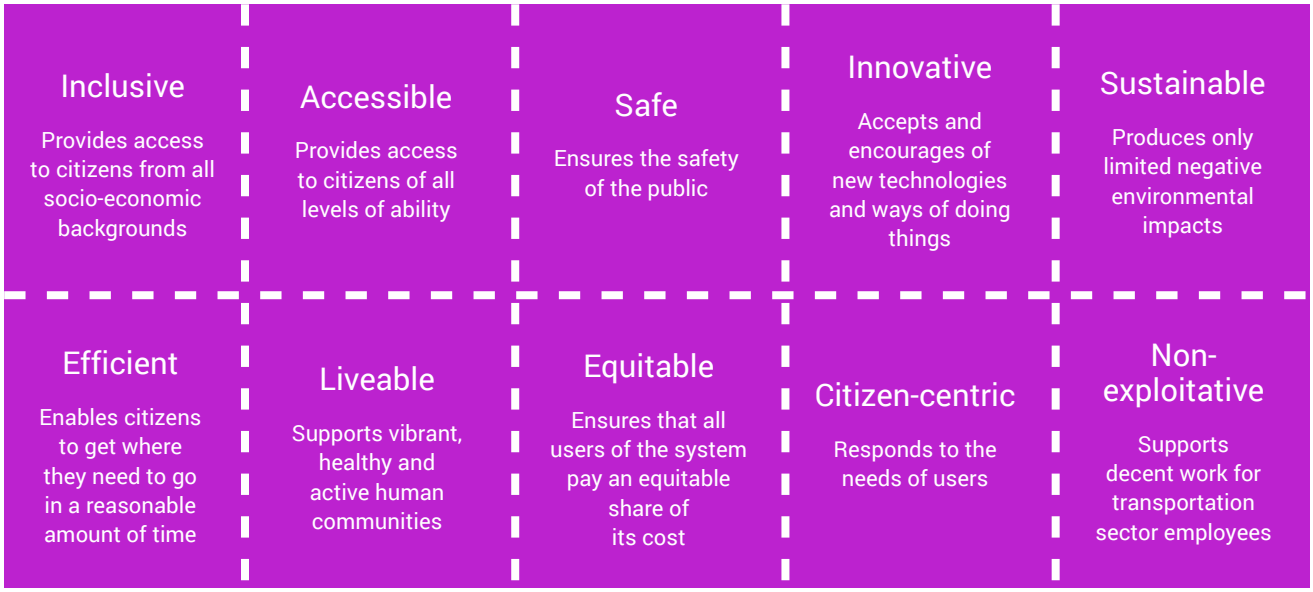
Shared mobility offers significant opportunities to consumers, often providing more convenient and less costly transportation options. More broadly, it has the potential to reduce congestion, limit greenhouse gas emissions and fill gaps in existing transportation systems. Simultaneously, however, it creates new challenges, including potentially disrupting existing services and jobs within the transportation sector and undermining policies aimed at supporting transit systems' equity and accessibility.

Nevertheless, there is clearly demand for more flexible, responsive and citizen-centric mobility solutions, as many people are already flocking to new services such as car-sharing, bike-sharing and ride-sharing. Indeed, instead of relying on one form of transportation, consumers are increasingly embracing a portfolio of alternatives.

Amid ongoing challenges including congestion, aging infrastructure and uneven transit capacity, the Greater Toronto and Hamilton Area (GTHA) is now confronting the impact of shared mobility. This already significant transportation challenge has become only more complicated as each of the region's 10 public transit agencies attempt to grapple with this complex development on an individual basis.

Overall, the choice policymakers face is not whether to integrate shared mobility into the GTHA's transportation system, but how to maximize the overall benefits to the region's citizens while doing so.

10 characteristics of an effective transportation system



Integrating shared mobility into this system will be complex, but the upcoming review of the region's transportation plan, *The Big Move*, presents a key opportunity to forge a strong vision for the future. Leveraging shared mobility in building a more effective transportation system will be an important step in this process.

In order to harness the benefits of shared mobility and avoid its pitfalls, this report highlights the need for a comprehensive regional approach that connects new shared mobility tools with already-existing assets to deliver the region's transportation objectives as effectively as possible. To be successful, this approach must be implemented within a flexible framework that recognizes the dynamic character of this fast-changing marketplace and the unique contexts of individual municipalities. Crafting this framework will be challenging and will require policymakers to be proactive, innovative, flexible and collaborative.

Developing a system that embodies these 10 characteristics of effectiveness, despite competing fiscal constraints and legacy commitments, presents a formidable challenge. Success will require resolving short-term issues, including regulating firms such as Uber in a way that balances innovation with fairness and public safety. More importantly, however, it will also require developing a more forward-looking and responsive regulatory framework, capable of adapting to a constantly changing landscape in which technological change is only accelerating. Indeed, getting this approach right represents a critical test case ahead of the arrival of even more disruptive developments – such as automated vehicles[1] – that are already on the horizon.

1 The term automated vehicles includes both vehicles with high levels of automation that still require a human driver and fully-autonomous vehicles. For more information, see Zon, N. and Ditta, S. February 2016. "Robot, Take the Wheel; Public Policy for Automated Vehicles". *Mowat Centre*. pg. 4. https://mowatcentre.ca/robot-take-the-wheel/

Overall, the choice policymakers face is not whether to integrate shared mobility into the GTHA's transportation system, but how to maximize the overall benefits to the region's citizens while doing so. Based on an examination of the current policy environment, and the opportunities and challenges that shared mobility has created, this paper will offer recommendations on how to achieve this outcome.

METHODOLOGY

Our research and analysis is based on structured individual interviews with 12 experts in Canada and abroad, additional unstructured consultations with GTHA transportation experts and a review of relevant literature. Though this paper focuses on the GTHA, the region serves as a microcosm, as many similar issues will have to be addressed outside its borders – throughout the rest of Ontario and beyond.

Key elements of effective shared mobility policymaking

PROACTIVE

Early action by policymakers is necessary to get ahead of and overcome the conflicts that the rise of shared mobility is likely to create. It would also be valuable for policymakers to incentivize certain behaviours among both users and providers while these emerging technologies are still new and patterns of use are still malleable.

INNOVATIVE

Embracing new technologies provides policymakers with opportunities to leverage the innovations associated with shared mobility – such as new transportation formats and sources of data – to improve the region's transportation system.

FLEXIBLE

Flexible frameworks provide an opportunity to act quickly in light of emerging and fast-changing models within the shared mobility landscape and to avoid unnecessarily inhibiting beneficial innovations.

COLLABORATIVE

Collaboration across governments will be critical to crafting a cohesive regulatory response to shared mobility. Coordination between governments and shared mobility providers will also be important to effectively incorporating these new models into the transportation system, including through public-private partnerships.

2 WHAT IS SHARED MOBILITY?

The past decade has seen the emergence of the "sharing economy" in which consumers use online platforms and marketplaces to buy goods and services directly from one another (instead of from traditional businesses) and/or share the same assets on a rental/time-share basis (instead of buying them). In general, services within the sharing economy have found success by using new technologies to leverage underutilized assets to meet demands not being served by traditional markets.

The term "shared mobility" is more specific and refers to those parts of the sharing economy focused on transportation. In general, customers use applications (apps) on their mobile phones to connect to drivers or owners of vehicles who rent out their cars, bikes or driving services on a short-term basis. Shared mobility has grown in popularity in recent years by offering customers greater convenience compared to public transit, along with competitive rates compared to other modes of transportation such as taxis and even personal automobile ownership. Overall, the sharing economy has already unlocked significant economic potential and projections suggest that shared mobility could experience significant growth – up to 35 per cent per year in some sectors – in coming years. [2]

Shared mobility could also strengthen our transportation system. With a greater variety of transportation options, shared mobility provides travellers with more opportunities to shift from

The sharing economy has already unlocked significant economic potential and projections suggest that shared mobility could experience significant growth – up to 35 per cent per year in some sectors – in coming years.

2 Freese, C. and Schönberg, A. 2014. "Shared Mobility; How new businesses are rewriting the rules of the private transportation game". *Roland Berger Strategy Consultants GMBH*. pg. 10. https://www.rolandberger.com/media/pdf/Roland_Berger_TAB_Shared_Mobility_20140716.pdf

journeys in single-occupancy vehicles to more sustainable and efficient multi-modal journeys – particularly by helping to fill critical gaps in the transportation system, such as the "first-mile/last-mile" problem.[3]

Shared mobility takes many forms and interacts with a variety of existing aspects of the transportation system. Below, we examine eight key features of the shared mobility landscape and provide a high-level overview of each.

The **first-mile/last-mile (F/L mile) problem** refers to the difficulties faced by travellers as they connect the ultimate starting and ending points of their journey with mass transit services like subways. Solving this problem often requires a different and additional mode of transportation from the one used for the majority of the journey. The F/L mile problem is a critical issue because the need for this additional journey, and the inconvenience it represents, often discourages use of transit and helps increase personal automobile usage.

Key features of the shared mobility landscape

3 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". *Shared-Use Mobility Centre.* pg 1. http://sharedusemobility-center.org/wp-content/uploads/2015/09/SharedUseMobility_ReferenceGuide_09.25.2015.pdf

The term "**minimum grid**" is specific to Toronto and refers to a proposal for a connected grid of 100 km of protected bicycle lanes (physically separated from vehicular traffic) on main streets and an additional 100 km of bicycle boulevards (two-way bicycles lanes not separated from vehicular traffic) on low-traffic streets. The minimum grid is an example of the interconnected and comprehensive city-wide networks that advocates argue are needed to enable the quick and safe bicycle travel that will in turn spur more extensive use of bike-sharing, as well as significant increases in cycling more generally.

Bike-sharing

Bike-sharing involves the shared use of a bicycle or fleet of bicycles by multiple users. Typically, users access bikes through a fixed network of stations, enabled by information technology (IT), usually located in high-density areas. Toronto Bike Share and Hamilton's SoBi system[4] are the main examples in the GTHA. In general, payment is completed by credit or debit card and charged based on duration of use, though annual membership schemes are also common. In less dense areas, or for trips from less to more dense areas, bike-sharing tends to be used in conjunction with transit, largely because it offers a solution to the F/L mile problem.[5]

Users cite convenience as the primary reason for bike-sharing usage. Consequently, bike-sharing is highly dependent on users' proximity to docking stations, the density and size of the network and the quality of an area's biking infrastructure.[6] Recent research has also indicated that a strong bike-sharing network has the potential to improve safety for users.[7]

4 SoBi is a hybrid system that also allows users to lock bikes at non-dock locations within the service area for a small additional charge.
5 Shaheen, S. Martin, E. Chan, N.Cohen, A and Pogodzinski, M. 2014. "Public Bikesharing in North America During a Period of Rapid Expansion: Understanding Business Models, Industry Trends and User Impacts".*Mineta Transportation Institute*. pg. 95-96. http://transweb.sjsu.edu/PDFs/research/1131-public-bikesharing-business-models-trends-impacts.pdf
6 Fishman, E. 2016. "Bikeshare: A Review of Recent Literature". *Transport Reviews* 36(1) 92-113. pg. 97.
7 Martin, E. Cohen, A. Botha, J. and Shaheen, S. March 2016. "Bikesharing and Bicycle Safety". *Mineta Transportation Institute*. pg. 28. http://transweb.sjsu.edu/PDFs/research/1204-bikesharing-and-bicycle-safety.pdf

Car-sharing

Car-sharing refers to the shared use of a car or fleet of cars by many users. The most popular model involves a membership scheme, which provides access to an operator-owned fleet that is distributed throughout an area, usually a dense urban core, at multiple reserved parking locations. Cars are booked online and, in addition to membership costs, users are generally charged by trip duration and/or distance travelled.

Two-way car-sharing, the most common form, involves users returning the car to its original location at journey's end, thereby requiring a round trip. The less common, but faster growing, one-way model allows users to leave the car at any of a number of specified second points, thereby enabling one-way trips. Less well-known car-sharing schemes such as Turo (which recently launched in Ontario) and more niche services such as FlightCar (which enables travellers to rent out cars they leave at the airport while travelling) employ peer-to-peer models (P2P) – through which platforms connect multiple owners, instead of a single fleet owner, with renters.[8]

Ride-sourcing[9]

Ride-sourcing, also sometimes called ride-hailing, is the use of an online platform that connects travellers with drivers offering to transport them in exchange for payment. Companies such as Uber and Lyft, often termed Transportation Network Companies (TNCs), are the most widely-known operators of these platforms. TNCs operate a wide variety of services including on-demand luxury car services (UberBlack) and larger format hired-vehicle services (Lyft Plus). They also offer more niche services, such as private transportation for unaccompanied children (Shuddle), a service that merges child care and taxi service.

Newer forms of ride-sourcing, in which multiple customers travelling on a similar route share a ride provided by a hired driver (UberPool and Bandwagon), have also emerged and are beginning to blur the distinction between ride-sourcing and some other forms of shared mobility. Nevertheless, the most popular form of ride-sourcing involves travellers using an app to hire a non-professional driver to transport them in the driver's personal vehicle (UberX and Lyft). In conjunction with other modes – such as higher-order public transit (e.g. subways) – ride-sourcing can provide a cost-effective alternative to personal car ownership.[10]

8 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". pg. 5-6.

9 While many commentators refer to ride-sourcing as ride-sharing, we reserve the term ride-sharing for modes which involve adding additional passengers to a journey that a driver would otherwise make regardless.

10 Silver, N. and Fischer-Baum, R. 28 August, 2015. "Public Transit Should be Uber's New Best Friend". *FiveThirtyEight*. http://fivethirtyeight.com/features/public-transit-should-be-ubers-new-best-friend/

Ride-sharing

Ride-sharing involves adding passengers to an existing journey. Unlike ride-sourcing, the driver is not hired by the passenger(s) and does not make a profit, though riders may help defray the costs of the journey to the driver. Ride-sharing, in the form of carpooling, is not new but has generally been limited to pre-existing offline social networks. Outside of a few specific examples in Washington, D.C. and Houston – where it is called "slugging" – spontaneous ride-sharing between strangers is rare in North America and dependent on specific local conditions.

The arrival of new online technology has revived interest in ride-sharing by removing two important obstacles. First, ride-sharing apps facilitate the cumbersome logistics of splitting the cost of a ride. Second, online rating systems have helped reduce safety concerns about riding with strangers. Nevertheless, reductions in convenience and flexibility involved with adding passengers to trips is an ongoing obstacle to ride-sharing, especially for short trips such as daily commutes.[11] Several firms (Uber, Netlift, RideCo and Blancride) are working to solve this problem. Long-distance ride-sharing has been more successful, especially in Europe, where BlaBlaCar, an intercity ride-sharing platform, has more than 20 million members.[12]

Microtransit

The term microtransit refers to a spectrum of models. At one extreme, it resembles traditional transit in that it follows static routes with pre-determined pick-up and drop-off points (UberHop and Lyft Line). At the other, it more resembles ride-sourcing and ride-sharing in its dynamically generated routes customized on-demand for individual travellers (Split). In between, some public transit providers have started offering limited on-demand dynamic services still tied to existing bus stops but not to particular routes.[13]

Regardless of the model, microtransit services aim to offer more frequent, targeted and convenient transit-like services for prices that are often significantly cheaper than a traditional taxi fare – though they may be more expensive than traditional transit. This improved service usually depends on the use of vehicles that fall somewhere between traditional 40-foot buses and personal automobiles, such as vans and mini-buses. By using smaller vehicles, microtransit is able to provide better service to less dense areas that are historically under-served by public transit.[14] Microtransit-like services are also starting to serve denser areas with inadequate higher-order transit.[15]

11 Jaffe, E. 13 November, 2015. "Suburban Ride-Sharing Is Mathematically Impossible". *CITYLAB*. http://www.citylab.com/commute/2015/11/suburban-ride-sharing-is-mathematically-impossible/415494/

12 Schechner, A. 16 September, 2015. "BlaBlaCar Valued at $1.5 Billion After New Funding Round". *Wall Street Journal*. http://www.wsj.com/articles/blablacar-joins-ranks-of-billion-dollar-venture-backed-startups-1442433577

13 Kraatz, C. 10 June, 2015. "VTA Testing Dynamic Transit Service Pilot". *Santa Clara Valley Transportation Authority: News and Media*. http://www.vta.org/News-and-Media/Connect-with-VTA/VTA-Testing-Dynamic-Transit-Service-Pilot#.VstpvpwrKUk

14 Gee, M. 23 December, 2015. "Microtransit: Cities should explore innovation that will help move people". *The Globe and Mail*. http://www.theglobeandmail.com/news/toronto/microtransit-cities-should-explore-innovation-that-will-help-move-people/article27931173/ and Jaffe, E. 27 April, 2015. "How the Microtransit Movement Is Changing Urban Mobility". *CITYLAB*. http://www.citylab.com/commute/2015/04/how-the-microtransit-movement-is-changing-urban-mobility/391565/

15 Hui, A and Moore, O. 14 December, 2015. "Toronto vows to crack down on Uber even as court continues to drop charges". *The Globe and Mail*. http://www.theglobeandmail.com/news/toronto/toronto-vows-to-crack-down-on-uber-even-as-court-continues-to-drop-charges/article27744136/

Shared Parking

Shared parking refers to the use of a parking space by many users. Shared parking takes two forms. The more innovative of the two involves renting out a personally-owned parking spot, such as a driveway, through the use of an app in exchange for a small fee. The second form involves the use, by organizations already operating paid parking lots, of apps to more effectively market already-existing parking. This helps create a more efficient parking market.[16]

Both forms are linked by the more intensive use of parking resources enabled through new technologies, thereby lowering parking prices and increasing availability. Proponents also promote it as a means of enabling more efficient combinations of modes of travel (e.g. Toronto firm Rover's "radius parking" concept, which enables drivers to park their cars outside a city core and use ride-sourcing to complete their journey). By reducing time spent seeking parking spaces, shared parking can also help reduce congestion.

16 Owram, K. 3 October, 2014. "Startup WhereiPark aims to hook you up with a parking spot" *The National Post*. http://business.financialpost.com/entrepreneur/fp-startups/startup-whereipark-aims-to-hook-you-up-with-a-parking-spot?__lsa=c355-dbfc

Mobility as a Service

Mobility as a service (MaaS) is an emerging model wherein individuals replace ownership of personal transportation assets like cars by purchasing access to a portfolio of on-demand mobility services through a single provider, likely on a subscription basis. Either by maintaining mobility assets themselves or by purchasing access to assets owned by other providers, MaaS providers are able to offer subscribers the most appropriate transportation option for any particular journey.

Typically, services are bundled into packages of varying value, similar to current telecommunications bundles. UbiGo in Gothenburg (Sweden) is currently the only MaaS system in operation.[17] More advanced forms of MaaS also include trip-planning functions which orchestrate the optimal multi-modal journey for travellers given their level of coverage. The benefits of MaaS systems are that they tend to be cheaper, provide significant customer satisfaction, create more environmentally-sustainable travel patterns and offer a single point of payment for all transportation needs.[18] MaaS systems are expected to become even more attractive with the arrival of automated vehicles.

17 UbiGo. 24 May, 2015. "UbiGo – Mobility as a Service in reality". *UbiGo*. http://www.ubigo.se/wp-content/uploads/2015/06/About_UbiGo_May2015.pdf and UbiGo. 21 January, 2014. "UbiGo". *UbiGo*. https://www.youtube.com/watch?v=IDEdu-Q94RI and Chalmers University of Technology. 22 May, 2015. "New urban mobility service receives international innovation award". *News*. https://www.chalmers.se/en/areas-of-advance/Transport/news/Pages/International-innovation-award-awarded-to-a-new-urban-mobility-service.aspx

18 International Transportation Forum. 20 May, 2015. *UbiGo* (Sweden) and St Lawrence Seaway (Canada) Share Prestigious Transport Innovation Award". *Media*. http://www.itf-oecd.org/ubigo-sweden-and-st-lawrence-seaway-canada-share-prestigious-transport-innovation-award

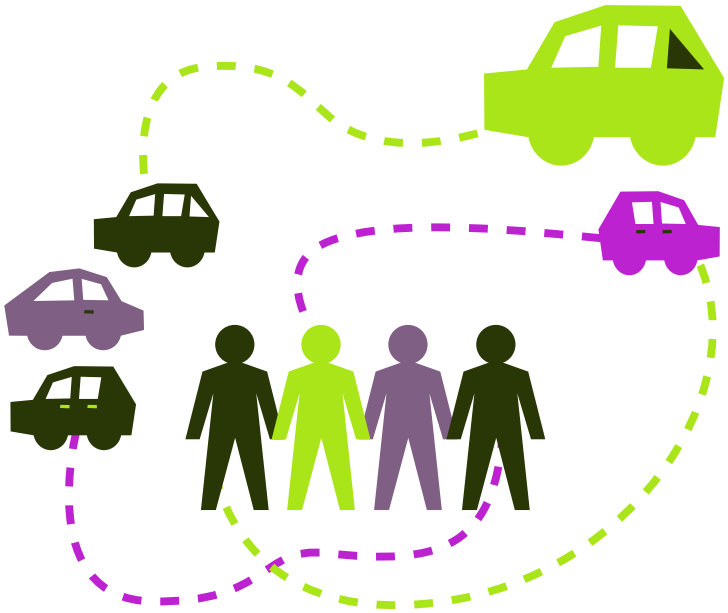
Mobility Hubs

Mobility hubs are nodes that sit at the intersection of numerous transportation networks and provide access to multiple modes of mobility in one location. Policymakers have already recognized the importance of mobility hubs for enabling easier multi-modal journeys and a more efficient transportation system. In the GTHA, mobility hubs have been identified as a priority in the region's transportation planning documents.[19]

Optimally designed, mobility hubs make transferring between modes a seamless experience. Increasingly, GTHA transit agencies are recognizing that they can be key pieces of infrastructure from which additional sources of revenue can be derived and around which retail, health care and social services can be located.[20] They can even form a core around which dense, liveable neighbourhoods can grow.[21]

Optimally designed, mobility hubs make transferring between modes a seamless experience.

Well-sited mobility hubs can increase the uptake of shared modes while also providing customers with a better experience by ensuring good access by foot and shared mobility services such as bike-sharing, ride-sharing and ride-sourcing, as well as connections to a variety of transportation networks. In so doing, mobility hubs can also facilitate integration between public transit and shared mobility options, thereby increasing the value and efficiency of both sets of services.



19 Metrolinx. September, 2011. "Mobility Hub Guidelines for the Greater Toronto and Hamilton Area". *Mobility Hub Guidelines*. http://www.metrolinx.com/en/regionalplanning/mobilityhubs/Mobility-HubGuidelines.pdf

20 Wickens, S. 25 February, 2015 "Toronto transit agency Metrolinx to take 'modest first step' into real estate". *The Globe and Mail*. http://www.theglobeandmail.com/news/toronto/toronto-transit-agency-metrolinx-to-take-modest-first-step-into-real-estate/article23194119/ and Metrolinx. November 2008. "The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area". *The Big Move*. http://www.metrolinx.com/thebigmove/Docs/big_move/TheBigMove_020109.pdf. pg. 46. For example, the Mass Transit Railway – Hong Kong's public transit agency – leverages the centrality of transportation to the functioning of dense urban centres by building large consumer destinations, such as shopping malls, in close proximity to its stations and collects rents from the businesses which are its tenants. See Padukone, N. 10 September, 2013 "The Unique Genius of Hong Kong's Public Transportation System". *The Atlantic*. http://www.theatlantic.com/china/archive/2013/09/the-unique-genius-of-hong-kongs-public-transportation-system/279528/

21 Attfield, P. 4 July, 2016. "How transit hubs can spur dense development". *The Globe and Mail*. http://www.theglobeandmail.com/report-on-business/industry-news/property-report/why-transit-hubs-must-spur-dense-development/article30742577/

3 SHARED MOBILITY IN THE GTHA

The GTHA faces significant transportation challenges. The Organisation for Economic Co-operation and Development (OECD) has observed that transit services and networks across the region are congested, poorly integrated and have not added capacity quickly enough to keep up with population growth.[22] According to Statistics Canada, commute times in the region across all forms of transportation average about 32 minutes – the longest of Canada's major cities.[23]

Recent reports indicate that these long commutes are detrimental to productivity in the GTHA. In Toronto, commuters have raised concerns about increases in traffic and congestion across the city, particularly downtown, as well as reduced parking options.[25] A 2008 study commissioned by Metrolinx estimated the costs of road congestion in the GTHA at $3.3 billion for commuters and $2.7 billion in lost economic opportunities.[26] Other more comprehensive estimates put the total cost to the region at $11 billion a year.[27]

While the region has seen a welcome increase in the rate of public transit infrastructure renewal and expansion tied to *The Big Move* – the regional transportation plan developed by Metrolinx – the majority of those projects are still years away from completion.[28]

Overall, data indicates that there is significant and growing interest in shared mobility across the GTHA. In Toronto, for instance, there are more than 400,000 Uber riders, as well as 12,000 members of car-sharing service Autoshare/Enterprise.[29] Additionally, Uber estimates that there are more than 100,000 Uber rides that cross municipal boundaries within the GTHA each week.[30] Meanwhile, various other shared mobility providers have emerged across the region, such

22 Organisation for Economic Co-operation and Development. 2009. "OECD Territorial Reviews: Toronto, Canada". *Regional Development*. http://www.investtoronto.ca/InvestAssets/PDF/Reports/OECD-toronto-review.pdf. pg. 10.
23 Campion-Smith, B. 26 June, 2013. "National Household Survey: GTA commuting times are the nation's longest". *The Toronto Star*.
24 For example: Ingraham, C. 25 February, 2016. "The astonishing human potential wasted in commutes". *The Washington Post*. https://www.washingtonpost.com/news/wonk/wp/2016/02/25/how-much-of-your-life-youre-wasting-on-your-commute/
25 Ipsos Public Affairs. 2015. "Taxi and Uber Consultation Qualitative Research". *City of Toronto*. pg. 8. http://www.toronto.ca/legdocs/mmis/2015/ls/bgrd/backgroundfile-83494.pdf
26 HDR Corporation. 1 December, 2008. "Costs of Road Congestion in the Greater Toronto and Hamilton Area: Impact and Cost Benefit Analysis of the Metrolinx Draft Regional Transportation Plan". *Costs of Congestion*. http://www.metrolinx.com/en/regionalplanning/costsofcongestion/ISP_08-015_Cost_of_Congestion_report_1128081.pdf
27 Dachis, B. July, 2013. "Cars, Congestion and Costs: A New Approach to Evaluating Government Infrastructure Investment". *C.D. Howe Institute*. http://www.cdhowe.org/pdf/Commentary_385.pdf

28 Moore, O. 14 March, 2016. "Toronto's Grand Transit Plan (Maybe, Hopefully)". *The Globe and Mail*. http://www.theglobeandmail.com/news/torontos-grand-transit-plan-maybehopefully/article29194407/
29 Ontario Chamber of Commerce. 2015. "Harnessing the Power of the Sharing Economy: Next Steps for Ontario". *Ontario Chamber of Commerce*. http://www.occ.ca/wp-content/uploads/2013/05/Harnessing-the-Power-of-the-Sharing-Economy.pdf. pg. 4.
30 Chang, B. 29 February, 2016. "Mississauga Needs Uber". *Newsroom*. https://newsroom.uber.com/canada/en/mississauga-needs-uber-2/

A 2008 study commissioned by Metrolinx estimated the costs of road congestion in the GTHA at $3.3 billion for commuters and $2.7 billion in lost economic opportunities.

as microtransit provider RideCo.[31] Metrolinx and other agencies have played a key role in the growth of some of these services, including Bike Share Toronto – which received $4.9 million from Metrolinx to double the size of its network by adding 1,000 bikes and 120 stations and to extend its reach into new parts of the city.[32]

There have also been instances, however, when the public sector has taken steps that have limited citizens' access to the potential benefits of shared mobility. Broadly, car-sharing services in Canada have been constrained by their lack of partnerships with municipal governments and an insufficient understanding of their benefits.[33] Similar barriers have been observed in the GTHA. For example, in Toronto, car-sharing provider Car2Go, frustrated by the slow pace of municipal parking reform, began allowing users to leave their shared cars on residential streets as of April 2016 – despite having been previously denied permission for such action by municipal lawmakers.

31 Delitalia, A. 15 June, 2015. "Waterloo startup RideCo brings relief to Milton commuters". *CBC News: Kitchener-Waterloo*. http://www.cbc.ca/news/canada/kitchener-waterloo/waterloo-startup-rideco-brings-relief-to-milton-commuters-1.3111736
32 Kalinowski, T. 6 July, 2015. "Bike Share Toronto to double with $4.9 million from Metrolinx". *The Toronto Star*. https://www.thestar.com/news/gta/transportation/2015/07/06/bike-share-toronto-to-double-with-49-million-from-metrolinx.html
33 Schwieger, B. and Brook, D. November, 2014. "Car-Sharing Operators Global Survey 2014". *Team Red* http://ma.team-red.de/fileadmin/produkte/downloads/CarSharing_Operators_-_Global_Survey_2014.pdf

Efforts by each level of government

MUNICIPAL

Across the country, cities have responded to the challenges presented by shared mobility in a variety of ways and at different paces. The situation in the GTHA is no exception. The significant jurisdictional diversity within the GTHA – with 10 independent public transit agencies, including the Toronto Transit Commission, GO Transit, and operators in municipalities like Burlington, Hamilton, and Oakville – poses its own challenges. Each of these municipalities possesses their own regulatory system and faces specific contexts which influence their individual approaches to tackling the challenges presented by shared mobility.

The infographic on pages 16 and 17 provides a more detailed look at the often inconsistent and fragmented approach to shared mobility across the GTHA.

PROVINCIAL

In Ontario, the provincial government made commitments in its 2015 and 2016 budgets to support the sharing economy by fostering an environment that would enable innovative businesses to grow.[34] Nonetheless, as of August 2016, there has been little direct action on shared mobility. There have been efforts by opposition parties, however, to have the province take a more active role in regulating the sharing economy, including the introduction in 2015 of the *Opportunity in the Sharing Economy Act*.[35]

FEDERAL

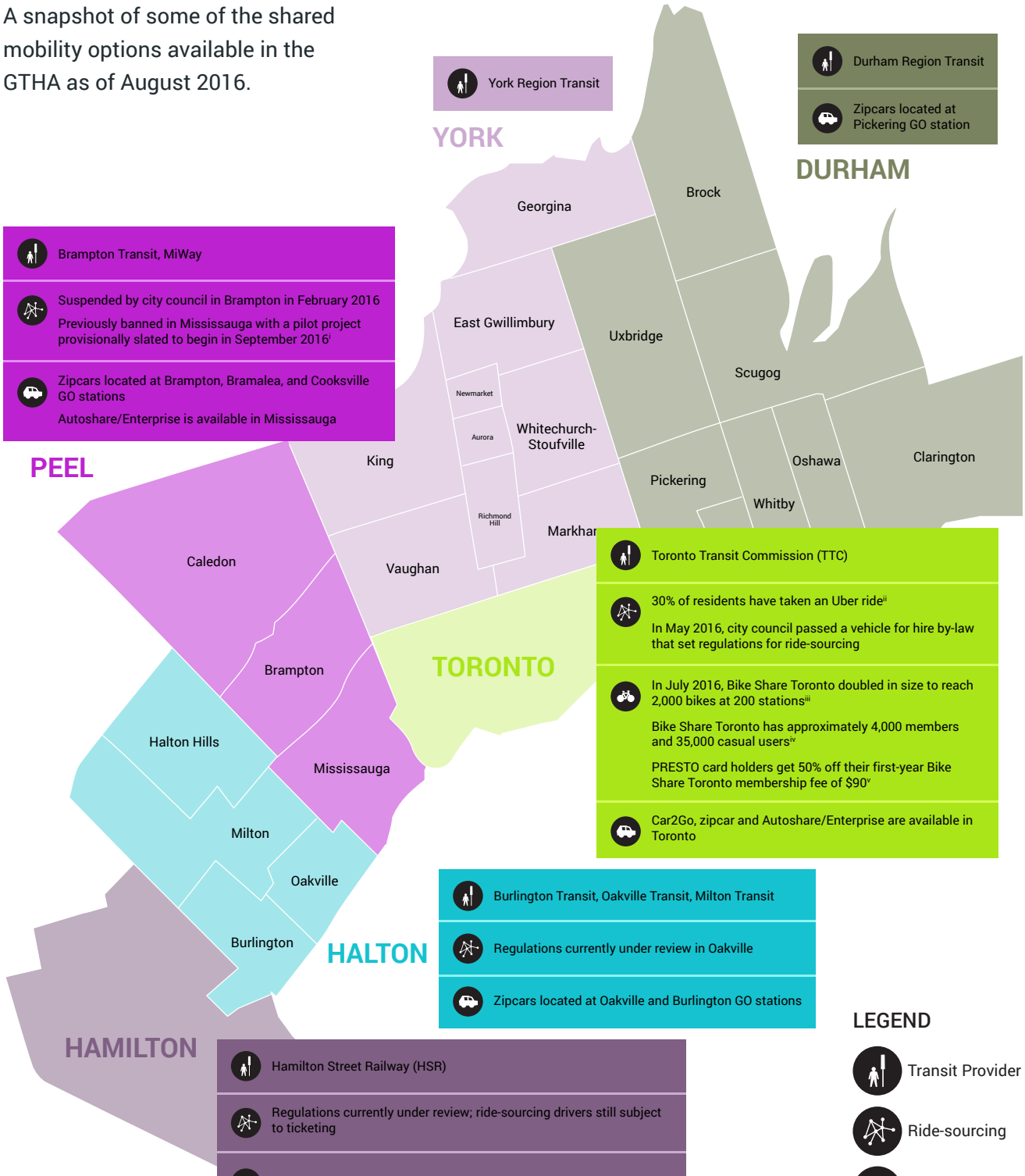
Canada's federal government is currently taking steps to analyze challenges inherent to the emergence of shared mobility. A committee of five deputy ministers is reportedly studying the implications of the sharing economy, particularly the challenges associated with regulating services such as ride-sourcing.[36] Critically, however, the Canada Revenue Agency has not yet clarified ride-sourcing drivers' responsibilities for remitting HST (ride-sourcing firm Uber does not collect or remit HST claiming that it is the drivers' responsibility). As a result, there is widespread perception that drivers are only required to remit HST if their taxable revenues exceed $30,000.[37]

34 Ministry of Finance. 26 November, 2015. "Backgrounder: Fostering a more innovative and dynamic business environment". *Government of Ontario*.
35 Csanady, A. 1 October, 2015. "It's like Uber but for everything: Ontario could be first province to regulate the sharing economy." *The National Post*. http://news.nationalpost.com/news/canada/canadian-politics/its-like-uber-but-for-everything-ontario-could-be-first-province-to-regulate-the-sharing-economy

36 Boutilier, A. 1 February, 2016. "Ottawa examines challenges of 'disruptive' expanding sharing economy". *The Toronto Star*. http://www.thestar.com/news/canada/2016/02/01/ottawa-examines-challenges-of-disruptive-expanding-sharing-economy.html
37 Powell, B. 21 July, 2015. "Uber says drivers are expected to collect HST". *The Toronto Star*. http://www.thestar.com/news/city_hall/2015/07/21/uber-says-drivers-are-expected-to-collect-hst.html

Data by Region

A snapshot of some of the shared mobility options available in the GTHA as of August 2016.



Union Station Mobility Hub

Offers the following transport options

- CAR-SHARING
- NATIONAL & INTERNATIONAL RAIL
- COMMUTER RAIL
- BIKE-SHARING
- SUBWAY
- AIRPORT EXPRESS RAIL
- REGIONAL BUS

Milton GO Connect Microtransit Pilot Project

- April 2015 to April 2016
- Dynamically-routed app-based microtransit service for Milton residents travelling to Milton GO station
- Provided by local firm RideCo
- Customers could order their ride ahead of time or on-demand, track their vehicles in real-time and pay digitally via the app at a cost of $1.95 per ride
- Surveys indicated that customers would have paid significantly more for the service
- 25% of customers used service daily

ESTIMATED NUMBER OF TRIPS IN THE GTHA THAT:

ARE BIKEABLE[viii] **40%**

ARE WALKABLE **17%**

THE GTHA INCLUDES:

- **30** MUNICIPALITIES
- **9** MUNICIPAL TRANSIT AGENCIES
- **1** REGIONAL TRANSIT AGENCY

42 million TRANSIT RIDES CROSS GTHA BOUNDARIES EVERY YEAR[ix]

More than 100,000 UBER RIDES cross municipal boundaries within the GTHA each week[vii]

Local app-based RIDE-SHARING FIRM BLANCRIDE has 12,000 users in the GTHA[x]

In April 2016, peer-to-peer (P2P) CAR-SHARING FIRM TURO launched in Ontario

i Grewal, S. 11 May, 2016. "Mississauga bans UberX and other ride-sharing services". *The Toronto Star*. https://www.thestar.com/news/gta/2016/05/11/mississauga-bans-uberx-andother-ride-sharing-services.html and Newport, A. 18 July, 2016. "Will Uber Surging Forward in Toronto Affect Mississauga?" *insauga*. http://www.insauga.com/will-uber-surging-forward-in-toronto-affect-mississauga and Colpitts, I. 27 June, 2016. "Uber and taxi industry pilot project in Mississauga ends without compromise in place". *Mississauga News*. http://www.mississauga.com/news-story/6742934-uber-and-taxi-industry-pilot-project-inmississauga-ends-without-compromise-in-place/

ii Peat, D. 25 February, 2016. "More Toronto residents riding Uber: Poll". *The Toronto Sun*. http://www.torontosun.com/2016/02/25/more-toronto-residents-riding-uber-poll

iii Fox, C. 27 June, 2016. "Installation of 120 new Bike Share Toronto stations begins today". *CP24.com*. http://www.cp24.com/installation-of-120-new-bike-share-toronto-stations-begins-today-1.2963282

iv CBC News. 28 June, 2016. "Bike Share Toronto's major expansion underway". *CBC News Toronto*. http://www.cbc.ca/news/canada/toronto/bike-share-expansion-1.3655927

v CBC News. 28 June, 2016. "Bike Share Toronto's major expansion underway".

vi Bennett, K. 20 March, 2016. "SoBi Hamilton, the city's popular bike share, turns 1". *CBC Hamilton*. http://www.cbc.ca/news/canada/hamilton/news/sobi-hamilton-the-city-s-popular-bike-share-turns-1-1.3499753

vii Chang, B. 29 February, 2016. "Mississauga Needs Uber". *Newsroom*. https://newsroom.uber.com/canada/en/mississauganeeds-uber-2/

viii Metrolinx. November 2008. "The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area". *The Big Move*. http://www.metrolinx.com/thebigmove/en/strategies/strategy2.aspx

ix Woo, L. and Upfold, C. 27 April, 2016. "GTHA Fare Integration". *TTC/Metrolinx Joint Board Meeting*. http://ttc.ca/About_the_TTC/Commission_reports_and_information/Commission_meetings/2016/April_27_Joint/Reports/Item_4_Joint_TTC-MX_Fare_Integration.pdf (slide 2)

x Brownell, C. 18 February, 2016. "BlancRide hopes its app will get carpooling to catch on in the Americas". *The National Post*. http://business.financialpost.com/entrepreneur/fp-startups/blancride-hopes-its-app-will-get-carpooling-to-catch-on-in-the-amercias?__lsa=cfe7-8d86

4 IMPACTS ON PUBLIC TRANSIT AND SUSTAINABILITY

Shared mobility offers significant potential benefits, including reduced congestion and increased sustainable transportation options. However, inaction or flawed implementation could result in increases to congestion and risks for the environment associated with shared mobility. Therefore, to access potential benefits and avoid detrimental impacts, governments must take steps that are proactive, flexible, innovative and collaborative – particularly in interactions between public transit agencies and shared mobility providers.

Many of the possible benefits of shared mobility lie in its ability to potentially shift societal assumptions away from high personal automobile ownership and associated travel by single-occupancy automobiles. By reducing the need to own a car and increasing the efficiency of vehicles on the road, shared mobility can enable increased multi-modal travel, including more public transit use. Therefore, for shared mobility to realize its greatest potential value, it will require an integrated transportation system that enables users to seamlessly connect from one transportation mode to another – with convenience, speed and cost rivaling that of personal car ownership.[38]

Impacts on the environment and land use

In an ideal system, shared mobility would significantly mitigate the negative environmental impacts of our transportation system by reducing its greenhouse gas (GHG) emissions and enabling more efficient land use. Such an outcome will require government action that anticipates the potential for shared mobility models to change travel behaviour and incentivize options that are sustainable and friendly to the environment.

Shared mobility can help reduce GHG emissions by encouraging decreased personal automobile ownership and usage, increased use of transit and increased use of active modes of transportation like biking and walking. Car-sharing, for example, has been found to result in reduced net emissions in North America.[39] In fact, one study found that car-sharing members were able to reduce their driving by 27 per cent and their emissions by an average of 51 per

38 The Canadian Automobile Association estimates the average cost of owning a car in Canada at about $9,500 a year. Canadian Automobile Association. 25 February, 2013. "CAA provides real picture of annual driving costs". *CAA News*. http://www.caa.ca/caa-provides-real-picture-of-annual-driving-costs/

39 Martin, E. and Shaheen, S. December 2011. "Greenhouse Gas Emission Impacts of Carsharing in North America". *IEEE Transactions on Intelligent Transportation Systems*. 12(4) 1074-1086. pg. 1084.

cent – a result largely due to members shifting to other, more environmentally-friendly forms of transportation.[40] Similarly, bike-sharing has also encouraged more walking, decreased driving and enabled more use of transit in dense areas – thereby providing additional environmental and health benefits.[41]

The direct impact of ride-sourcing on congestion and emissions is not yet known as it is unclear to what extent the availability of these services impacts driving habits.[42] Uber contends that the introduction of UberPool, a service which allows passengers to split an Uber ride, in Los Angeles has resulted in emissions reductions equivalent to 1,400 metric tonnes of CO_2 in eight months.[43] Conversely, some suggest that by encouraging more drivers to drive around looking for fares, ride-sourcing can add to congestion and GHG emissions. Recent research, however, seems to indicate that ride-sourcing drivers are more efficient than taxis in this respect as they have a higher "capacity utilization" rate – meaning they spend more driving time, on average, with a passenger – and less time cruising for a fare than do taxis.[44] Equally, though, there are also concerns that the convenience of ride-sourcing may actually induce both new and additional trips in cars in place of more sustainable transportation options, thereby adding to congestion and environmental impact.[45] Clearly, more research in this area is needed before the full aggregate impact of ride-sourcing on congestion and emissions is known.

Shared mobility may also ease parking pressures, which can indirectly reduce congestion and negative environmental impacts by limiting the number of cars on the road.[46] Shared parking services offer the possibility of increased parking supply through more intensive land use. In so doing, land that would be otherwise needed for parking could be freed up for other uses,[47] reducing some of the pressures driving urban sprawl. Additionally, more efficient parking technology could reduce or eliminate the need to drive in search of parking – a practice which has been found to be a significant contributor to congestion.[48] Similar to ride-sourcing, however, easier parking may also induce additional automobile travel, thereby creating a negative congestion and environmental impact.

40 Chen, D and Kockelman, K. "Carsharing's Life-Cycle Impacts on Energy Use and Greenhouse Gas Emissions." Under review for publication in *Transportation Research Part D*. 1-16. pg. 9. http://cee.virginia.edu/tdonnachen/research/research/ and Martin, E. and Shaheen, S. December 2011. "Greenhouse Gas Emission Impacts of Carsharing in North America". pg. 1080.

41 Shaheen, S. Martin, E. Chan, N.Cohen, A and Pogodzinski, M. 2014. "Public Bikesharing in North America During a Period of Rapid Expansion" pg. 16.

42 Hawkins, A. 13 November, 2015. "Uber and Lyft will be subjects of an environmental impact study". *The Verge*. http://www.theverge.com/2015/11/13/9730458/uber-lyft-environment-impact-cost-NRDC-Berkeley-study

43 Lederman, M. 17 February, 2016. "Uber founder decries regulation at TED conference". *The Globe and Mail*. http://www.theglobeandmail.com/news/british-columbia/uber-founder-decries-regulation-at-ted-conference/article28781165/?cmpid=rss1&click=sf_globe

44 Cramer, J. and Krueger, A. 2016. "Disruptive Change in the Taxi Business: The Case of Uber". *American Economic Review: Papers & Proceedings*. 106(5) 177–182. pg. 177

45 Rayle, L. Shaheen, S. Chan, N. Dai, D. Cervero, R. November 2014. "App-Based, On-Demand Ride Services: Comparing Taxi and Ridesourcing Trips and User Characteristics in San Francisco". *University of California Transportation Center Working Paper*. pg. 13. http://www.its.dot.gov/itspac/dec2014/ridesourcingwhitepaper_nov2014.pdf

46 San Francisco Municipal Transportation Agency. July 2013. "Car Sharing Policy and Pilot Project". *San Francisco Municipal Transportation Agency*. pg. 2. http://sfpark.org/resources/car-sharing-policy-and-pilot-project/ see also Cornet, A. Mohr, D. Weig, F. Zerlin, B. Hein, A-P. February, 2012. "Mobility of the Future: Opportunities for Automotive OEMs". *McKinsey & Company*. pg. 7.

47 Stromberg, J. 27 June, 2014. "Why free parking is bad for everyone". *Vox*. http://www.vox.com/2014/6/27/5849280/why-free-parking-is-bad-for-everyone

48 Hurst, M. 15 January, 2014. "Q&A: UCLA's parking guru Donald Shoup". *Nation, World + Society*. http://newsroom.ucla.edu/stories/q-a-ucla-s-parking-guru-donald-249859

The rise of multi-modality and connections to public transit

Policymakers will need to particularly consider connections between shared mobility options and public transit to seize the opportunity that shared mobility offers to improve environmental and sustainable outcomes. At the moment, shared mobility has the potential to be both a complement and a competitor to public transit.[49]

SHARED MOBILITY AS A COMPLEMENT TO TRANSIT

More transportation options can reduce car ownership and trips and, in some cases, create more transit riders by easing access to public transit.[50] More options can also increase walking, cycling and other alternative modes of travel.

Reductions in car ownership occur because shared mobility allows for more intensive use of shared assets than would be possible when cars are individually owned and mostly sit idle. Such shared models are attractive because they greatly reduce the cost of travel for many users and reduce the hassle associated with owning vehicles (maintenance, storage, etc.). These models are complementary to transit because, by encouraging alternatives to cars, they tend to increase the proportion of trips for which users take transit.[51] Indeed, for every shared car added to a car-sharing service, an estimated nine to 13 privately-owned cars are removed from the road.[52]

Ride-sourcing also has the potential to complement transit in certain situations. For instance, Uber's UberHop transit-like service provides greater mobility options to areas where existing services do not meet high demand, thereby addressing limits in the capacity of public transit. Similarly, the Toronto Transit Commission (TTC) has stated that services like UberPool are not expected to have a major impact on TTC operations and ridership levels due to the size of their operations and differing business models.[53]

Furthermore, a major role of ride-sourcing, bike-sharing and other shared mobility services is to provide F/L mile connections to public transit, especially outside of dense urban cores, which enables the substitution of more sustainable transit for personal vehicle trips. Data from Lyft, a ride-sourcing company primarily operating in the U.S., indicates that the most popular destinations for riders using its service were public transit stops.[54] Additionally, one study found that both Uber and Lyft were most commonly used when transit is unavailable, such as during late nights, and were more of a substitute for trips by automobile than public transit.[55]

49 Johal, S. 16 December, 2015. "Uber ups the ante. So what's the TTC going to do about it?" *The Globe and Mail*. http://www.theglobeandmail.com/opinion/uber-ups-the-ante-so-whats-the-ttc-going-to-do-about-it/article27779111

50 Martin, E. and Shaheen, S. 2011. "The Impact of Carsharing on Public Transit and Non-Motorized Travel: An Exploration of North American Carsharing Survey Data". *Energies*. 4: 2094-2114. pg. 2102.

51 Shaheen, S. and Christensen, M. 2013. "Shared-use Mobility Summit: Retrospective from North America's first gathering on shared-use mobility". *University of California (Berkley) Transportation Sustainability Research Centre*. pg. 2. http://tsrc.berkeley.edu/sites/default/files/Shared-Use%20Mobility%20Summit%20White%20Paper%201.pdf

52 Martin, E. Shaheen, S. Lidicker, J. 2010. "Impact of Carsharing on Household Vehicle Holdings". *Transportation Research Record: Journal of the Transportation Research Board*. 2143: 150-158. pg. 157.

53 Municipal Licensing and Standards. September, 2015. "Ground Transportation Review: Findings Report". *City of Toronto*. pg. 34. http://www.toronto.ca/legdocs/mmis/2015/ls/bgrd/background-file-83503.pdf

54 Kaufman, R. 9 November, 2015. "Why Lyft Is Making Friends With Transit Agencies". *Next City*. https://nextcity.org/daily/entry/lyft-transit-agency-partnership-first-mile-last-mile-goals

55 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". pg. 30.

In light of these trends, Lyft announced in October 2015 that it was engaging in its first formal partnership with a public transit agency – the Dallas Area Rapid Transit (DART).[56] Lyft has also launched an initiative called Friends With Transit, which is designed to engage with public transit agencies. Similarly, Uber has taken steps to embrace the connection between its services and public transit, recently partnering with technology company TransLoc to integrate information on Uber trips into data it already provides to users on public transit routes through its app.[57]

Bike-sharing offers similar benefits by strengthening connectivity to public transit.[58] In Toronto, 97 per cent of respondents to a survey on bike-sharing reported that the platform enhanced public transportation in the city.[59] Nevertheless, the same study found that while bike-sharing may increase use of public transit in suburban areas outside of cities, it has also decreased its use in dense urban cores – potentially due to the greater convenience of bicycle trips for shorter distances compared to using crowded downtown transit networks.[60] In this context, the Metrolinx-funded expansion of the Toronto Bike Share program to more lower-density areas can be expected to connect more users to transit.[61]

SHARED MOBILITY AS A COMPETITOR TO TRANSIT

While ride-sourcing firms and other shared mobility platforms see their services as a complement to existing transit services, concerns have been raised about competition between shared mobility platforms and transit – particularly as these firms have recently introduced services that are becoming increasingly similar to public transit, such as UberHop and Lyft Line.

Participants involved in consultations on ride-sourcing in Toronto indicated that they use such services "specifically as a support or replacement to public transportation from a cost and convenience perspective."[62] This survey found that there are four key reasons people who would otherwise use public transit use ride-sourcing: weather, traffic/transit delays, travelling with others and distance of destination. Another study found that as many as 33 per cent of ride-sourcing trips would have been made via public transit if ride-sourcing had not been available.[63] This suggests a level of substitution of less efficient and sustainable ride-sourcing rides for transit that could be problematic if generalized.

Similarly, bike-sharing members in Toronto reported that they use buses and rail transit less overall as a result of bike-sharing options. However, results indicate that respondents still use transit to some degree, likely in combination with bike-sharing.[64]

56 Kaufman, R. 9 November, 2015. "Why Lyft Is Making Friends With Transit Agencies". *Next City*. https://nextcity.org/daily/entry/lyft-transit-agency-partnership-first-mile-last-mile-goals
57 Somerville, H. 11 January, 2016 "Uber pushes into public transit with new app partnership". *Reuters*. http://www.reuters.com/article/us-uber-partnership-idUSKCN0UP18L20160111
58 Shaheen, S. Martin, E. Cohen, A. 2013. "Public Bikesharing and Modal Shift Behavior: A Comparative Study of Early Bikesharing Systems in North America". *International Journal of Transportation*. 1(1) 35-54. pg. 36.
59 Shaheen, S. Martin, E. Cohen, A. 2013. "Public Bikesharing and Modal Shift Behavior". pg. 46.
60 Shaheen, S. Martin, E. Cohen, A. 2013. "Public Bikesharing and Modal Shift Behavior". pg. 52.
61 Spurr, B. 5 July, 2016. "Toronto Bike Share rolls into the big time with major expansion". *The Toronto Star.* https://www.thestar.com/news/gta/2016/07/05/bike-share-toronto-rolls-into-the-big-time-with-major-expansion.html

62 Ipsos Public Affairs. 2015. "Taxi and Uber Consultation Qualitative Research". pg. 9.
63 Shaheen, S. and Chan, N. Spring 2015. "Mobility and the Sharing Economy: Impacts Synopsis", *Shared Mobility Definitions and Impacts*. pg. 3. http://innovativemobility.org/wp-content/uploads/2015/07/Innovative-Mobility-Industry-Outlook_SM-Spring-2015.pdf
64 Shaheen, S. Martin, E. Cohen, A. 2013. "Public Bikesharing and Modal Shift Behavior". pg. 47.

NEXT STEPS: ENSURING COMPLEMENTARITY

Greater integration between shared mobility and public transit is a key next step in harnessing the complementary value of shared mobility. Indeed, integration among shared services run by private operators and public transit agencies has been described as "one of the next frontiers in urban transportation."[65] Some of the greatest potential associated with shared mobility – such as greater efficiency, accessibility and sustainability – will only emerge in the context of a more collaborative approach.

One of the benefits offered by shared mobility is that its services can help fill gaps in existing transit services, particularly for F/L mile connections. Improving these connections could strengthen the overall performance and efficiency of transportation across the region and provide a better experience for users. For instance, the quality of transportation services available in suburban and rural areas, as well as in low-income neighbourhoods, varies considerably in the GTHA, as do connections to existing higher-order transit services such as subways and GO trains. These inconsistencies, coupled with challenges such as parking availability at mobility hubs, have provided an opportunity for shared mobility services to meet unmet demands and improve travellers' experiences.

Several other connectivity problems are also currently limiting complementarity between public transit and shared mobility services in the GTHA. For instance, limitations on use of space and parking in and around transit stations are barriers to such services' abilities to provide connections to transit users aiming to transfer to other forms of transportation. Especially at peak periods, a lack of designated waiting areas – similar to taxi stands – for ride-sourcing and ride-sharing vehicles inhibits the realization of many of the benefits these services offer. Lack of compatibility in coordinating with other modes of transport through trip-planning and payment systems also represent obstacles.

Finally, the potential for some competition between public transit and shared mobility platforms should not necessarily be viewed as problematic. Competition could induce innovation and service improvements – potentially resulting in improved customer experiences on issues such as fares, quality and safety. Such outcomes have already occurred due to competition between ride-sourcing services and taxis.[66] Managing the tension between this competition and maintaining a viable public monopoly over certain services required to protect the public interest will be difficult. Nevertheless, this challenge should not preclude exploring opportunities to introduce some competitive pressures.

65 Shaheen, S. and Christensen, M. 2013. "Shared-use Mobility Summit". pg. 21.

66 "Taxi Competition," *IGM Economic Experts Panel*. September 29, 2014. http://www.igmchicago.org/igm-economic-experts-panel/poll- results?SurveyID=SV_eyDrhnya7vAPrX7

5 KEY ISSUES

Seven key issues have been identified in this report, all of which must be confronted by policymakers as the importance of shared mobility for the GTHA's transportation system grows. These issues represent obstacles to the growth of shared mobility, actions which could enhance and direct its evolution, or foreseeable implications of the rise of shared mobility. They also range from issues of immediate concern to ones that will figure prominently in broader policy discussions well into the future. Each of them will require policymakers to respond in new ways to ensure a change from the status quo that effectively harnesses the benefits of shared mobility.

While we have identified these seven issues as critical at the moment, given shared mobility's rapidly-shifting landscape, some of these issues will no doubt fade in importance as new ones emerge. Indeed, ride-sourcing insurance had previously been identified as a key issue before it was announced in July 2016 that the Financial Services Commission of Ontario had approved insurance that would cover ride-sourcing drivers, thereby removing the gap that had previously existed between personal automobile insurance and expensive commercial insurance.[67]

A significant proportion of these key issues are connected to the rise of ride-sourcing – which has been particularly controversial as governments have taken steps to regulate it around the world in 2015 and 2016. While other parts of the shared mobility landscape face issues as well, the following issues were identified as the most pressing.

KEY ISSUES

- » Ride-sourcing and accessibility
- » Shared mobility and precarious employment
- » Transit-like service restrictions
- » App-based trip-planning and fare payment services
- » Big data, anonymity and privacy
- » Road- and land-use pricing
- » Inequality and inclusion

67 Reynolds, C. 7 July, 2016. "Ontario approves insurance plan aimed at Uber," *The Toronto Star*. https://www.thestar.com/news/gta/2016/07/07/ontario-approves-insurance-plan-aimed-at-uber.html

Ride-sourcing and accessibility

Shared mobility offers opportunities for individuals with disabilities to access a greater number of transportation options. Additionally, shared mobility is positioned to revolutionize paratransit by reducing its inflexibility and costs – a critical development given the GTHA's aging population. By injecting competition and adding new features – including on-demand dispatch and dynamic routing – shared mobility could also improve customer experiences and spark an increase in both the supply of and demand for these services.[68]

Nonetheless, shared mobility will not automatically result in positive outcomes and has already raised some accessibility concerns. First, many new services are not yet subject to mode-specific accessibility requirements. TNCs have attracted complaints alleging poor training, insufficient equipment and other inadequacies. In response, TNCs have taken some steps to improve their services, for example, designing their apps to ensure accessibility for blind and hearing-impaired individuals. In Toronto, Uber has recently re-launched an improved wheelchair-accessible service with local partners.[69]

Nevertheless, governments are increasingly seeing fit to regulate in this area. For example, Toronto's new ride-sourcing bylaw requires that all ride-sourcing firms operating more than 500 vehicles provide wheelchair-accessible services at similar wait times and prices to basic non-accessible services. Other cities have tried a different approach, offering incentives to encourage ride-sourcing companies to expand their stock of wheelchair-accessible vehicles.[70]

A second concern is that shared mobility threatens to undermine existing accessibility systems. For example, by threatening the viability of the taxi industry, TNCs threaten existing regulatory regimes through which accessible taxi rides are cross-subsidized by standard fares.[71] Similarly, the accessible taxicabs required by many existing regimes are only useful if there are trained drivers available. In some jurisdictions, drivers are leaving their accessible taxis to drive non-accessible vehicles for TNCs.[72]

Finally, there are concerns that the passenger rating systems used by TNCs enable tacit discrimination against passengers with disabilities. Since they can be less lucrative to serve because they take longer to embark and disembark – drivers can rate these passengers poorly thereby making it difficult for them to access rides in the future.[73] Moreover, because of the recent emergence of shared mobility, there are few industry-specific complaints processes for individuals with disabilities to use to seek remedies for this and other forms of mistreatment.[74]

68 Kane, J. Tomer, A. Puentes, R. 8 March, 2016. "How Lyft and Uber can improve transit agency budgets". *The Brookings Institute*. http://www.brookings.edu/research/papers/2016/03/08-lyft-uber-transit-agency-budgets-kane-tomer-puentes

69 Smith Cross, J. 17 January, 2016. "Accessibility advocates welcome UberWAV service in Toronto". *Metro*. http://www.metronews.ca/news/toronto/2016/01/17/uberwav-service-applauded-by-toronto-accessibility-advocates.html

70 Ngo, V. October 2015. "Transportation Network Companies and the Ridesourcing Industry: A Review of Impacts and Emerging Regulatory Frameworks for Uber". *City of Vancouver / School of Community and Regional Planning, University of British Columbia*. https://sustain.ubc.ca/sites/sustain.ubc.ca/files/GCS/2015%20Project%20Reports/Transportation%20Network%20Companies%20and%20the%20Ridesourcing%20Industry%20-%20Victor%20Ngo%20-%20Public.pdf

71 Kay, J. 24 August, 2015. "Uber v. Taxi: One must die for the other to live". *The Walrus*. http://thewalrus.ca/uber-v-taxi/

72 Committee for Review of Innovative Urban Mobility Services. 2015. "Between Public and Private Mobility: Examining the Rise of Technology-Enabled Transportation Services". *Transportation Research Board*. Special Report 319. pg. 86. and Trautman, T. 30 June, 2014. "Will Uber Serve Customers With Disabilities?" *Next City*. https://nextcity.org/daily/entry/wheelchair-users-ride-share-uber-lyft

73 One solution attempted in Chicago is to allow disabled passengers to opt out of this system, though this too presents challenges. Trautman, T. 30 June, 2014. "Will Uber Serve Customers With Disabilities?".

74 Trautman, T. 30 June, 2014. "Will Uber Serve Customers With Disabilities?".

Shared mobility and precarious employment

Increasingly, the sharing economy is being criticized for its labour practices and shared mobility is no exception, with TNC drivers often cited as exemplars of these larger problems.[75] This critique is important – both because of these more general trends in employment and its impact on the integration of shared mobility into the wider transportation system.

In a context where precarious employment is claiming a larger share of the job market in general,[76] decisions on how to regulate TNCs will reverberate in this wider policy discussion. On one hand, many drivers are pleased with the flexibility offered by TNC employment, a claim seemingly supported by Uber's claims that the majority of its drivers in Toronto worked less than 10 hours a week on average between 2014 and 2015.[77] Others worry, however, that TNC's reliance on casual labour is contributing to the worrying growth of the so-called "gig economy."[78] They contend that the government should curb the growth of these companies, not work with them. Similarly, some are concerned that the insistence from TNCs that their driver-partners are independent contractors is designed to free these companies of important responsibilities such as providing workers with benefits or contributing to employment insurance.[79]

Having to pay a second time when crossing a boundary or changing modes is a major disincentive that inhibits multi-modal transportation and, by extension, transit use.

Public agencies' decisions on whether to cooperate with TNCs, and the implicit approval that such cooperation would entail, will be heavily influenced by this debate. Public transit labour unions in particular will likely resist cooperation with firms that engage only independent contractors.[80] More generally, governments and public agencies will need to determine the type of employment that they are comfortable with tacitly endorsing, should they enter into any public-private partnerships. For instance, in Kansas City, the on-demand microtransit partnership the transit agency embarked on with Bridj uses unionized transit agency employees to drive the mini-buses.

75 Scheiber, N. 2 February, 2016. "Uber Drivers and Others in the Gig Economy Take a Stand". *The New York Times*. http://www.nytimes.com/2016/02/03/business/uber-drivers-and-others-in-the-gig-economy-take-a-stand.html?smid=tw-share&_r=0

76 Younglai, R. 25 October, 2015. "Rise of 'sharing' services Uber, Airbnb points to a precarious labour climate". *The Globe and Mail*. http://www.theglobeandmail.com/report-on-business/economy/jobs/rise-of-sharing-services-uber-airbnb-points-to-a-precarious-labour-climate/article26968204/

77 Tencer, D. 15 September, 2015. "Toronto Uber Drivers On Average Made $3,125 In First Year". *The Huffington Post Canada*. http://www.huffingtonpost.ca/2015/09/15/uber-driver-earnings-canada-toronto_n_8140444.html

78 Hill, S. 27 March, 2016. "Good riddance, gig economy: Uber, Ayn Rand and the awesome collapse of Silicon Valley's dream of destroying your job". *Salon*. http://www.salon.com/2016/03/27/good_riddance_gig_economy_uber_ayn_rand_and_the_awesome_collapse_of_silicon_valleys_dream_of_destroying_your_job/?utm_source=twitter&utm_medium=socialflow

79 Haavardsrud, P. 24 January, 2016. "Analysis: Uber discussions need to go beyond the fact it offers a cheaper ride". *CBC News: Business*. http://www.cbc.ca/news/business/uber-canada-gig-economy-1.3414206

80 Interestingly, Toronto's new ride-sourcing by-law requires all city agencies to use taxicabs when they require hired vehicles.

Transit-like service restrictions

The arrival of microtransit has highlighted the potential for friction between new innovations in shared mobility and existing monopolies held by public transit agencies.[81] Part of this tension derives from how public agencies aim to ensure equitable service across their networks by cross-subsidizing less popular routes with revenues from more popular ones. By cherry-picking riders from the most profitable routes, private microtransit could threaten this model.[82] Moreover, by shifting travellers into a greater number of lower-capacity vehicles, microtransit services may actually add vehicles to already congested city streets and increase GHG emissions. Nevertheless, microtransit also has the potential to increase ridership on higher-order transit corridors through the improved F/L mile connections it offers.[83]

Rethinking these monopolies to better enable partnerships between public agencies and private providers could allow microtransit services to be employed more strategically as a means of addressing gaps in existing transit services, such as poor F/L mile connections. Moreover, by providing these connections, microtransit might even increase ridership on higher-order transit corridors. Similarly, by replacing underused buses with mini-buses and vans, on-demand microtransit could offer improved local service in low-density areas at a lower cost and environmental impact, especially at off-peak times when conventional transit is expensive to provide and uncompetitive.

Integration of trip-planning and fare payment services

Ensuring that users are able to easily plan trips is essential to any transportation system's success. Doing so means providing dynamic, intuitive and reliable trip-planning capabilities. Increasingly, this means delivering information through apps on smartphones. Numerous companies and transit agencies are already pursuing app-based trip-planning functionality. These range from Google Maps, to more transit-specific apps like Rocket Man, to agency-affiliated apps like Metrolinx's own Triplinx. Basic trip planning is only the first step though. As the integration of car-sharing and ride-sourcing booking capabilities into some trip-planning apps suggests, other functions will likely follow.

After the integration of trip planning, the next logical step is for fares to follow the same path. Having to pay a second time when crossing a boundary or changing modes is a major disincentive that inhibits multi-modal transportation and, by extension, transit use. Early estimates suggest that a discounted or free cross-boundary fare may result in a 9.5 to 16.5 per cent increase in cross-boundary transit trips yearly.[84] To unlock the full potential of shared mobility, however, fare structures also need to integrate different modes and services offered by multiple providers. Some, albeit quite limited, examples of this already exist – such as "emergency ride home" (ERH) programs that provide transit pass holders with occasional taxi rides for emergencies.[85]

81 This friction has already been blamed for the demise of at least one GTHA transportation start-up. Simcoe, L. 6 May, 2015. "Liberty Village shuttle service Line Six officially shuts down". *Metro*. http://www.metronews.ca/news/toronto/2015/05/06/liberty-village-shuttle-service-line-six-officially-shuts-down.html

82 Kane, J. Tomer, A. Puentes, R. 8 March, 2016. "How Lyft and Uber can improve transit agency budgets".

83 Shared-Use Mobility Center. March, 2016. "Shared Mobility and the Transformation of Public Transit." http://sharedusemobilitycenter.org/wp-content/uploads/2016/04/Final_TOPT_DigitalPagesNL.pdf. pg. 31.

84 Woo, L. 28 June, 2016. "GTHA Fare Integration". *Metrolinx Board of Directors Presentation*. slide 16. http://www.metrolinx.com/en/docs/pdf/board_agenda/20160628/20160628_BoardMtg_Fare_Integration_Update_EN.pdf

85 Victoria Transport Policy Institute. 11 June, 2014. "Guaranteed Ride Home: A Backup for Commuters Who Use Alternative Modes". *Transport Demand Management Encyclopedia*. http://www.vtpi.org/tdm/tdm18.htm

The idea behind ERH programs is that by providing some flexibility in cases of personal emergency or transportation system failure (e.g. subway outage), they address many travellers' greatest concerns with alternatives to commuting by car. Smart Commute, a Metrolinx initiative, already offers an ERH program[86] but it is not available to the general public nor is it app-based. Nevertheless, by providing access to multiple modes within a single program, such programs already contain the critical idea on which MaaS systems are built and thus present potential foundations for future MaaS initiatives in the GTHA.

Big data, anonymity, and privacy

The importance of data to transportation planning will only grow in the future. TNCs already use data intensively to refine their services and develop new ones.[87] Transit agencies that use smart card payment systems – such as London's Oyster card and Metrolinx's PRESTO card – also possess significant data gathering capabilities. Eager to protect the competitive advantages that their data provides them, TNCs are reluctant to share their data. Recognizing the importance of this data, however, municipal governments are increasingly requiring TNCs to share some of their data with them in exchange for permission to operate.[88] Toronto's new vehicle-for-hire bylaw includes such data-sharing requirements for private transportation companies (PTCs, the term used in Toronto for TNCs) – though the exact shape this reporting relationship will take in practice remains to be seen. In New York City, data of this type was used by the mayor's office to determine if the growth of ride-sourcing was contributing to increased levels of congestion.[89] In Kansas City, analysis of only two months' worth of data from the transit agency's microtransit partnership with Bridj resulted in the addition of new routes to the service.[90] There are even greater potential gains to be had when this data could be leveraged to help improve route planning by transit agencies and optimize connections between different modes.

The expansion of mobility data collection naturally raises concerns about the anonymity and privacy of individuals' movements. Uber has been subjected to the most criticism in this area so far. For example, inappropriate use of its tracking system resulted in an investigation by the New York Attorney General and a $20,000 fine in January 2016.[91] Concerns have also been raised over Uber's practice of indefinitely retaining users' travel histories.[92]

These concerns are potentially just the tip of the iceberg. While data analytics offer significant benefits, the risks involved in data collection and analysis, including inadvertent and disguised discrimination, inappropriate use of personal information, and data breaches need to be

86 Smart Commute. 2016. "Smart Commute: Emergency Ride Home" *Your Travel Options*. http://smartcommute.ca/more-options/emergency-ride-home/

87 Marr, B. 7 May, 2015. "The Amazing Ways Uber Is Using Big Data". *Data Science Central*. http://www.datasciencecentral.com/profiles/blogs/the-amazing-ways-uber-is-using-big-data and Matys, C. 3 February, 2015. "Data Science Disruptors: How Uber Uses Applied Analytics For Competitive Advantage" *Georgian Partners*. https://georgianpartners.com/data-science-disruptors-uber-uses-applied-analytics-competitive-advantage/

88 Macmillan, D. 13 January, 2015. "Uber Offers Trip Data to Cities, Starting With Boston" *The Wall Street Journal*. http://blogs.wsj.com/digits/2015/01/13/uber-offers-trip-data-to-cities-starting-in-boston/

89 Office of the Mayor. January, 2016. "For-Hire Vehicle Transportation Study." *City of New York*. pg. 5. http://www1.nyc.gov/assets/operations/downloads/pdf/For-Hire-Vehicle-Transportation-Study.pdf

90 Metro: For Transit and Motorcoach Business. 29 April, 2016. "KCATA expands Bridj program" *News*. http://www.metro-magazine.com/management-operations/news/712001/kcata-expands-bridj-program

91 Bhuiyan, J. 6 January, 2016. "Uber Settles With New York Attorney General Over "God View" Tracking Program". *Buzzfeed*. http://www.buzzfeed.com/johanabhuiyan/uber-settles-godview#.flD88OVqDl

92 Roberts, J. 23 June, 2015. "Uber privacy charges are overblown—except for one thing". *Fortune*. http://fortune.com/2015/06/23/uber-privacy-epic-ftc/ Uber has also been criticized for not having a privacy policy specific to Canada. Geist, M. 21 November, 2014. "Why Uber has a Canadian privacy problem". *The Toronto Star*. http://www.thestar.com/business/2014/11/21/why_uber_has_a_canadian_privacy_problem.html

recognized and addressed. Given many GTHA transit agencies' limited experience leveraging the sort of personalized data involved, building the data analysis capacity while still protecting travellers' privacy represents an important challenge.

Road- and land-use pricing

The lack of a rationalized approach to road- and land-use pricing has greatly encouraged single-occupancy automobile use and discouraged more significant uptake of shared mobility and other more efficient and sustainable forms of transportation like transit.[93] By reforming this approach, policymakers can shift incentive structures to more accurately reflect the real costs of driving – thereby encouraging greater adoption of shared mobility.

The most obvious opportunities for immediate change involve parking. Metrolinx owns approximately 73,000 parking spaces around numerous GO stations in the GTHA. The majority of these spaces are currently not priced.[94] Many peer agencies price more of the parking they own which allows them to encourage the use of shared mobility through discounted parking fees or prioritized station access. Critically, however, any decrease in the availability of parking at mobility hubs that is not complemented by improved F/L mile connections risks pushing commuters into personal automobiles for their entire commutes.

Shared parking also offers new solutions to parking scarcity, as it could decrease congestion by reducing reliance on on-street parking. Nevertheless, increased parking availability could also induce additional private automobile trips by making it less difficult to find parking spaces.[95] Similarly, minimum parking requirements, which require that new developments include a certain number of parking spaces, result in cars occupying valuable urban real estate thereby likely raising housing costs. In an attempt to encourage more efficient land use that is more aligned with their transportation objectives, some cities, such as Minneapolis, have begun to ease parking requirements for new developments that offer options to park bicycles.[96]

Crucially, the gains offered by better pricing of parking pale in comparison to the gains that could be realized by pricing road use.[97] Road-use pricing – for example, in the form of high-occupancy toll (HOT) lanes the use of which is reserved for vehicles carrying multiple individuals or vehicles paying a toll – complements shared mobility by helping to better reveal the true costs of various modes of mobility. In doing so, it gives travellers stronger incentives to use more efficient shared modes like ride-sharing or transit.[98] Significantly, however, given the disproportionate impact that road-use pricing would have on low-income individuals, any move to increased road-use pricing without compensatory improvement in public transit and other affordable transportation options risks significantly harming the equity of our transportation system.[99]

93 Globe Editorial. 16 March, 2016. "Why give drivers a free ride? Bring on the road tolls". *The Globe and Mail*. http://www.theglobeandmail.com/opinion/editorials/why-give-drivers-a-free-ride-bring-on-the-road-tolls/article29266448/

94 Metrolinx has reserved spaces for car-sharing service zipcar at 13 GO stations and a variable number for its "carpool to GO" initiative. zipcar. 2 April, 2015. "zipcar and metrolinx bring more car sharing options to go transit stations". *Press Releases*. http://www.zipcar.com/press/releases/metrolinx2015

95 Jaffe, E. 12 January, 2016. "The Strongest Case Yet That Excessive Parking Causes More Driving". *CITYLAB*. http://www.citylab.com/commute/2016/01/the-strongest-case-yet-that-excessive-parking-causes-more-driving/423663/

96 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". pg. 4.

97 Srivastava, L. and Burda, C. December, 2015. "Fare Driving: Exploring the benefits of traffic pricing in Toronto and the GTA". *Pembina Institute*. https://www.pembina.org/pub/fare-driving pg. 1-2.

98 Coyne, A. 16 June, 2014. "Andrew Coyne: Vancouver's road pricing proposal a revolutionary fix for gridlock". *The National Post*. http://news.nationalpost.com/full-comment/andrew-coyne-vancouvers-road-pricing-proposal-a-revolutionary-fix-for-gridlock

99 Blatchford, A. 6 July, 2016. "Poorer Canadians rely heavily on cars, says analysis as Ottawa considers more road tolls". *The Toronto Star*. https://www.thestar.com/business/2016/07/06/poorer-canadians-rely-heavily-on-cars-says-analysis-as-ottawa-considers-more-road-tolls.html

Inequality and inclusion

Ensuring equitable access to mobility is an important objective for the GTHA's transportation system, and one which shared mobility can help to advance. Shared mobility also presents particular challenges, however, for users who possess limited technological capabilities and lower socio-economic backgrounds. One of the most important problems that shared mobility technologies have created concerns how to include individuals without bank accounts or access to smartphones in systems that increasingly rely on both.[100]

Metrolinx's PRESTO card system offers opportunities to address many of these issues by providing a way of storing value – similar to a debit card and bank account – that could be accepted by public and private transportation providers. PRESTO could also support citizens in need through subsidies added directly into their transportation accounts and through smarter fare-capping.

Another concern centres on low-income citizens and their disproportionate dependence on local transit services in lower-demand, often suburban, areas. These services are the most vulnerable to the erosion of transit's current cross-subsidization funding model. Such erosion places low-income riders, who often lack transportation alternatives, at risk of exclusion from services and employment opportunities.[101]

Conversely, shared mobility is also having some positive effects in this regard. For example, some cities have found that ride-sourcing companies are doing a better job of servicing suburban or non-downtown areas than taxi companies.[102] Additionally, the technology behind ride-sourcing also offers opportunities to replace local transit service with more responsive microtransit service. While still in their infancy, services such as San Jose's dynamically-routed Flex mini-bus offer potentially great benefits.[103] Such services could significantly reduce the losses incurred by transit agencies' operation of local services, thereby enabling additional investment elsewhere in the system. Trans-Cab, a part of the Hamilton Street Railway which offers a taxi ride as a F/L mile connection in certain less dense areas, represents an example of a GTHA agency already employing flexible local transit solutions of this type, albeit using legacy technology.[104]

100 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". pg. 21.
101 Cain, P. 2 December, 2013. "Map: Torontonians living far from transit, without a car". *GlobalNews*. http://globalnews.ca/news/996589/map-carless-in-the-burbs/
102 Bialik, C. Flowers, A. Fischer-Baum, R. and Mehta, D. August 10, 2015. "Uber Is Serving New York's Outer Boroughs More Than Taxis Are".
103 Santa Clara Valley Transportation Authority. "VTA Flex". *Getting Around*. http://www.vta.org/getting-around/vta-flex
104 Hamilton Street Railway. "Trans-Cab". *Schedules Routes and Maps*. https://www.hamilton.ca/hsr-bus-schedules-fares/schedule-routes-maps/trans-cab

In the GTHA, the affordability of transportation outside the downtown core has become particularly important for the region's growing low-income populations.

6 LESSONS FROM OTHER JURISDICTIONS

Cities and regions around the world are now grappling with a variety of issues raised by the emergence of shared mobility. While some are acting quickly to embrace opportunities and address challenges raised, others have been slower to respond. Though different jurisdictions have taken a variety of approaches and are operating on different timelines in responding to the emergence of shared mobility, those that have been most successful have acted proactively to advance their goals and worked to integrate shared mobility into their wider transportation systems.

Each jurisdiction is responding to the growth of shared mobility in its own way, as different platforms have achieved varying levels of market penetration depending on the location. For instance, microtransit company Bridj is only active in three U.S. cities and it is engaged in a partnership with the local government in one city (Kansas City). Similarly, Uber has varying offerings in different cities (e.g. as of August 2016, Toronto is the only Canadian city with UberPool). This variety impacts the importance of each firm to each jurisdiction and, consequently, its relationship with the company.

Four cases in particular demonstrate the value that other jurisdictions have found in integrating shared mobility into their transportation systems. While not all of the examples discussed in this section are perfectly replicable in the GTHA, the key lessons they illustrate should be useful to policymakers engaged in advancing the GTHA's own long-term transportation objectives.

Engaging in partnerships

Dallas Area Rapid Transit (DART) recently partnered with ride-sourcing firms Uber and Lyft by connecting passengers to both services through its GoPass mobile ticketing app. The aim is to make it easier for passengers to connect their journeys to locations beyond transit stops. As part of the partnership, DART passengers are offered discounts on their first rides on these platforms. DART is now working on providing passengers the opportunity to purchase tickets for all modes of transportation – both public and private – through its GoPass app.[105]

DART has also worked with zipcar, providing it with dedicated parking spots near one of its largest transit stations, and it is considering similar arrangements at other stations.[106] Indeed,

105 Wilonsky, R. 14 April, 2015. "Dallas Area Rapid Transit, Uber partner in an effort to fill in riders' 'first mile-last mile' gap". *The Dallas Morning News*. http://transportationblog.dallasnews.com/2015/04/dallas-area-rapid-transit-uber-partner-in-an-effort-to-fill-in-riders-first-mile-last-mile-gap.html/

106 Dallas Area Rapid Transit. 4 February, 2015. "Zipcar and DART Partner to Bring Convenience of Car Sharing." *DART News Release*. http://www.dart.org/news/news.asp?ID=1172

DART's approach hinges on knowing the region well and allocating resources where they are most needed. In the case of Dallas, DART identified a key gap – limitations in mobility and connectivity to public transit from certain areas outside the core of the city – which these partnerships aim to address. The initiative is considered a success, as DART's target for app downloads has already been surpassed by a large margin.

Obtaining insight about customer needs

Customer behaviour data provides an important opportunity for governments and transit agencies to gain better insight into how customers use their services. Data-sharing is a key component of a trilateral partnership in Kansas City between its transit authority, mictrotransit company Bridj, and automaker Ford. The partnership, which launched in February 2016, involves use of the Bridj app to obtain a seat on one of 10 Ford vans driven by employees of the city's public transit authority.[107] Kansas City's local government proactively initiated the project by approaching Bridj and is spending US$1.3 million to support the project.

As part of this effort, Bridj and the city have agreed to share data, enabling local policymakers to use the pilot project to learn about how users connect with bus and streetcar routes compared to a Bridj-like platform.[108] The context in Kansas City is quite different from most cities in that, currently, only one per cent of residents use public transit to travel to work.[109] Additionally, only an estimated 18 per cent of jobs in the city are accessible through a trip via public transit of less than 90 minutes.[110]

More broadly, other cities including Portland, New York City, Boston, Seattle and, as of May 2016, Toronto, have incorporated data-sharing provisions into the regulations they have adopted to govern shared mobility providers operating within their boundaries.[111] Overall, data generated by shared mobility providers have been identified as supporting innovative transportation solutions that should ultimately help build a "platform with integrated real-time data showing all available transportation connections."[112]

Incentivizing consumer behaviour

Several cities and regions have taken steps to influence consumer behaviour in ways that support specific policy goals, including decreased congestion and/or increased land-use opportunities. As part of these efforts, the San Francisco Municipal Transportation Agency (SFMTA) set a specific "mode share goal" in 2012, aiming to reduce trips via automobile to half of all transportation within the city by 2018[113] – a goal that it may have achieved early.[114]

107 Marshall, A. 17 February, 2016. "Kansas City Is Embarking on a Great Microtransit Experiment". *CITYLAB*. http://www.citylab.com/cityfixer/2016/02/kansas-city-bridj-microtransit/462615/
108 Marshall, A. 17 February, 2016. "Kansas City Is Embarking on a Great Microtransit Experiment".
109 Cronkleton, R. 25 January, 2016. "Kansas City area's commutes are among the quickest in the nation". *The Kansas City Star*. http://www.kansascity.com/news/politics-government/article56498968.html
110 Krok, A. 10 February, 2016. "Ford and Bridj team up to bring a new type of mobility to Kansas City". *Roadshow*. http://www.cnet.com/roadshow/news/ford-ride-kc-bridj/
111 Konz. P, 23 October, 2015. "How Cities Can Harness the Benefits of Shared Mobility". *CitiesSpeak: The Official Blog of the National League of Cities*. http://citiesspeak.org/2015/10/23/how-cities-can-harness-the-benefits-of-shared-mobility/
112 Hirschon, L. Jones, M. Levin, D. McCarthy, K. Morano, B. Simon, S. 2015. "Cities, the Sharing Economy and What's Next". *National League of Cities: Centre for City Solutions and Applied Research*. http://www.nlc.org/Documents/Find%20City%20Solutions/City-Solutions-and-Applied-Research/Report%20-%20%20Cities%20the%20Sharing%20Economy%20and%20Whats%20Next%20final.pdf. pg. 9.
113 San Francisco Municipal Tranportation Agency. "SFMTA Strategic Plan P Fiscal Year 2013 - Fiscal Year 2018". *San Francisco Municipal Tranportation Agency*. https://www.sfmta.com/about-sfmta/reports/sfmta-strategic-plan-fy-2013-fy-2018. pg. 9.
114 Bialick, A. 3 February, 2015. "New Data Shows Most Trips in SF Are Made Without a Private Automobile". *StreetsblogSF*. http://sf.streetsblog.org/2015/02/03/new-data-shows-most-trips-in-sf-are-made-without-a-private-automobile/

More broadly, SFMTA's "transit first" approach to transportation positions all non-personal automobile forms of transportation – including transit, walking, biking, taxis, car-sharing and ride-sharing – as high priorities for the agency.[115] As part of its efforts, SFMTA launched a pilot program that would allow car-share vehicles to park in regulated parking spaces across the city.[116] The city also updated its policies on land-use development to encourage car-sharing spaces.[117] In 2015, the agency created an Office of Innovation, designed to develop new shared mobility polices and partnerships.

In the GTHA, Metrolinx has similarly identified the importance of providing incentives for walking, cycling and using local transit to support connections to transit stations.[118] Metrolinx has also started working with car-sharing providers, including zipcar, to provide some parking spaces reserved for car-sharing and ride-sharing purposes.

Ensuring access for target populations

Governments have started to take steps to leverage shared mobility platforms to provide greater access to transportation for targeted populations. Chicago's bike-sharing program, Divvy, provides an example of how that city has sought to reach out to low-income populations and incorporate them in shared mobility initiatives. Divvy, which is publicly-owned and operated through a public-private partnership, launched a program in 2015 called "Divvy for Everyone" offering discounted annual bike-sharing memberships ($5 per year) for low-income residents.[119]

The initiative has also involved expanding the Divvy network into new neighbourhoods, including some that are predominantly populated by low-income families and/or under-served by transit.[120] Divvy now offers the largest bike-sharing system in North America, with stations in both suburban areas and close to major public transit stops. Moreover, Divvy is in the process of expanding and the City of Chicago is working on integrating Divvy into its transit mobile app.[121]

To date, bike-sharing use among low-income populations has been limited.[122] Other shared mobility platforms, including car-sharing and ride-sharing, tend to be most popular, at least initially, among moderate- and high-income customers.[123] Nevertheless, these platforms could offer significant potential benefits to low-income users if they were better connected to larger transportation systems.[124] Fortunately,

115 San Francisco Municipal Tranportation Agency. "SFMTA Strategic Plan P Fiscal Year 2013 - Fiscal Year 2018". pg. 4.
116 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". pg. 26
117 Shaheen, S. and Christensen, M. 2013. "Shared-use Mobility Summit". pg. 10.
118 Woo, L. 1 March, 2016. "Metrolinx: Transforming the Way We Move". *Metrolinx Presentation to CoreNet Global Canadian Chapter*. https://higherlogicdownload.s3.amazonaws.com/CORENETGLOBAL/41f4cc56-31f0-41d1-9ed4-791e7a970c09/UploadedImages/2016-02-26%20CoreNetGlobal%20final%20draft_v6.pdf. slide 29.
119 Mayor's Press Office, 7 July, 2015. "Mayor Emanuel Announces Divvy Expanding Access to Popular Bike Share System through Divvy for Everyone (D4e) Program". *City of Chicago*. http://www.cityofchicago.org/city/en/depts/mayor/press_room/press_releases/2015/july/mayor-emanuel-announces-divvy-expanding-access-to-popular-bike-s.html
120 Ziegler, C. 7 July, 2015. "Chicago rolls out $5-per-year bike sharing program for low-income residents". *The Verge*. http://www.theverge.com/2015/7/7/8908219/divvy-for-everyone-low-income-chicago-bike-share
121 Shared-Use Mobility Centre. 10 January, 2016. "Innovator Profile: Sean Wiedel, Chicago Departmenrt of Transportation". *News*. http://sharedusemobilitycenter.org/news/innovator-profile-sean-wiedel-chicago-department-of-transportation/
122 Jaffe, E. 30 October, 2015. "The Poor Bike, the Rich Bike-Share". *CITYLAB*. http://www.citylab.com/commute/2015/10/the-poor-bike-the-rich-bike-share/413119/
123 Arias, J. 8 December, 2014. "How Can Shared Mobility Help Connect Low-Income People to Opportunity?" *Blog*. https://www.livingcities.org/blog/740-how-can-shared-mobility-help-connect-low-income-people-to-opportunity
124 Shared-Use Mobility Centre. 18 June, 2015. "Will Low-income Residents Benefit Most from P2P Carsharing?" *News*. http://sharedusemobilitycenter.org/news/will-low-income-residents-benefit-most-from-p2p-carsharing/ and Arias, J. 8 December, 2014. "How Can Shared Mobility Help Connect Low-Income People to Opportunity?".

TAKING STEPS TOWARD INTEGRATED TRANSPORTATION IN CANADA

Société de transport de Montréal (STM), Montréal's public transit agency, has embraced the concept of "integrated mobility" which involves combining multiple forms of transportation to support passengers' mobility needs. Through this approach, STM made agreements with bike-sharing and car-sharing firms, provided passengers with special offers to use those platforms, and worked closely with taxis. Indeed, efforts to integrate taxis into Montreal's transportation system have allowed the transit agency to expand its reach into low-density areas. Taxis have also reaped benefits from the partnership, as they are permitted to use dedicated bus lanes which expedites their trips and reduces operating costs.[128] Furthermore, STM has also signed a partnership agreement with Montréal-based company Netlift, which facilitates carpooling for commuters aiming to connect with mass transit – an approach that encourages greater multi-modality. Despite this philosophy of integration, however, ride-sourcing companies such as Uber have not been incorporated into "integrated mobility." Indeed, Uber has been declared "illegal" by leaders at both the municipal and provincial levels of government — though it is now in the process of being regulated.[129]

128 Société de transport de Montréal. November 2010. "partenaire incontournable du cocktail transport et du mouvement collectif". *Société de transport de Montréal*. http://ville.montreal.qc.ca/pls/portal/docs/PAGE/COMMISSIONS_PERM_V2_FR/MEDIA/DOCUMENTS/MEM_STM_20101130.PDF
129 CBC News. 10 June, 2016. "Quebec passes law to regulate Uber." *CBC News Montreal*. http://www.cbc.ca/news/canada/montreal/uber-law-could-pass-today-1.3628992

some steps toward improving the equity of these systems have already been taken – such as offering monthly instead of yearly passes for bike-sharing.[125] Some cities have also started to provide incentives for shared mobility providers to serve more diverse locations and neighbourhoods.[126]

In the GTHA, the affordability of transportation outside the downtown core has become particularly important for the region's growing low-income populations. This is because these populations are increasingly concentrated in the region's outer suburbs, areas which currently have limited access to transit.[127] This all points to the increasing need for new modes to provide greater access to such populations in the region.

125 National Association of City Transportation Officials. 16 September, 2015 "Can Monthly Passes Improve Bike Share Equity?" *News*. http://nacto.org/2015/09/16/can-monthly-passes-improve-bike-share-equity/
126 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". pg. 35.
127 Stapleton, J. with Kay, J. April 2015. "The Working Poor in the Toronto Region: Mapping working poverty in Canada's richest city". *The Metcalf Foundation*. http://metcalffoundation.com/wp-content/uploads/2015/04/WorkingPoorToronto2015Final.pdf

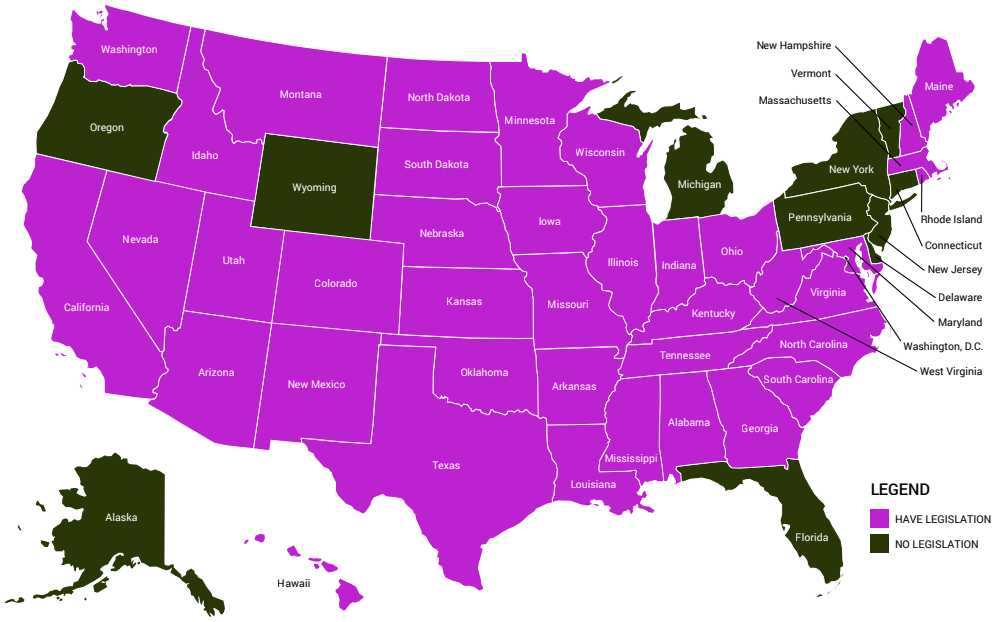
Roles for regional and national governments

Due to varying approaches by cities and regions, collaboration by all levels of government will be needed to make headway in addressing issues in the shared mobility landscape. So far, cities have usually taken the lead on shared mobility as they generally have jurisdictional authority to regulate and operate local transportation systems and public transit. Nonetheless, some state/provincial and national levels of government have also already started taking steps to address the challenges associated with shared mobility – though they have generally been slower to react, particularly in Canada.

Local governments may not be best positioned to oversee TNCs, as they have previously done with taxis. Indeed, a greater need has been identified for uniformity in regulatory structures, which regional and state/provincial levels of government are better positioned to accomplish.[131] Ride-sourcing companies have also touted the value of regional and state-wide approaches to regulation, noting that it makes it easier for drivers to travel and work across municipal boundaries.[132] A regional approach to bike-sharing has proven effective in and around Washington, D.C. – demonstrating that interconnectedness is likely to increase the success of programs by better enabling people to get to their destinations, even if it involves crossing state boundaries.[133]

Jurisdictions with state-level ride-sourcing laws in the United States

A majority of U.S. states have enacted legislation or regulations for TNCs. As of August 2016, 39 states and the District of Columbia have successfully put such measures into place.[130]



130 Property Casualty Insurers Association of America. "TNC Issue Status Map." *Industry Issues; Transportation Network Companies*. http://www.pciaa.net/industry-issues/transportationnetwork-companies

131 Committee for Review of Innovative Urban Mobility Services. 2015. "Between Public and Private Mobility: Examining the Rise of Technology-Enabled Transportation Services". pg. 60.

132 Schmidt, M. 28 April, 2016. "Uber launches in Iowa City". *The Gazette*. http://www.thegazette.com/subject/news/business/uber-launches-in-iowa-city-20160428

133 Schade, M. 6 August, 2014. "Capital Bikeshare's Regional Approach is a Winning Formula". *Mobility Lab*. http://mobilitylab.org/2014/08/06/capital-bikeshares-regional-approach-is-a-winning-formula/

Conversely, there have also been challenges with some efforts to coordinate beyond a municipal level. In Texas, for example, coordination between Dallas and Fort Worth on a ride-sourcing policy encountered barriers due to divergent views.[134] It has also been suggested that state-wide regulation can unnecessarily limit the freedom of municipalities to develop their own solutions to issues, as well as reduce the scope for innovation.[135] Nevertheless, many states in the United States have successfully enacted legislation designed to respond to the emergence of ride-sourcing on a state-wide basis.

Currently, most national level efforts involve reviewing and studying the key issues raised by the emergence of shared mobility. For instance, the Ministry of Transport of New Zealand has undertaken a review of licensing requirements for taxis, ride-sourcing and other similar types of services on a national scale.[136] In the United States, the Department of Transportation has convened an advisory committee on intelligent transportation systems to examine topics such as shared mobility, with the purpose of providing guidance on the subject.[137]

National and regional levels of governments could, and increasingly need to, play a larger role in furthering shared mobility objectives. In particular, they can do so by providing funding and expertise, as well as by helping to coordinate efforts at different levels of government. For instance, municipal government staff have noted that currently it can be difficult for cities to obtain funding to support shared mobility initiatives, such as a car-sharing pilot or infrastructure to encourage shared parking.[138] Federal governments can also play a key role in collecting performance data, specifically by ensuring consistency in gathering and disseminating such data.[139]

Within Canada, challenges associated with a lack of coordination between governments have already been observed amid efforts to regulate ride-sourcing in Edmonton. While Edmonton was the first Canadian city to pass a bylaw that would enable ride-sourcing companies to operate in January 2016, Uber suspended its services in the city soon after because the insurance required by the city's bylaw had not yet been made available by the provincial government.[140]

In the GTHA, the importance of action by the provincial government was also recognized by the City of Toronto in its May 2016 vehicle-for-hire bylaw, in which city council voted by a wide margin to request that the provincial government regulate private transportation companies.[141]

134 Hirschon, L. Jones, M. Levin, D. McCarthy, K. Morano, B. Simon, S. 2015. "Cities, the Sharing Economy and What's Next". pg. 30.
135 Light, S. Forthcoming. "Precautionary Federalism and the Sharing Economy". *Emory Law Journal*. 66. Forthcoming. pg. 6.
136 See Ministry of Transportation. "Small passenger services review". *Land*. http://www.transport.govt.nz/land/small-passenger-services-review/
137 See United States Department of Transportation. 5 October, 2015. "2015 Intelligent Transportation Systems Program Advisory Committee". *2015 Report to the US Secretary of Transportation*. http://www.its.dot.gov/itspac/pdf/2015_AdviceMemorandum.pdf

138 Parzen, J. and Frisbie, T. 2015. "Shared-Use Mobility Reference Guide". pg. 21.
139 Intelligent Transportation Society of America. 19 November, 2009. "Smart Cities and Communities, Performance-Based Transportation System Needed to Solve U.S. Congestion, Safety and Environmental Challenges". *Media*. http://www.itsa.org/index.php?option=com_content&view=article&catid=3:press-release&id=830:smart_cities_and_communities,_performance-based_transportation_system_needed_to_solve_u.s._congestion,_safety_and_environmental_challenges
140 Mertz, E. and Heidenreich, P. 29 February, 2016. "Uber temporarily suspends operations in Alberta's capital." *Global News*. http://globalnews.ca/news/2547528/government-to-announce-plan-for-ride-sharing-services-in-alberta/
141 Toronto City Council. 3 May, 2016. "A New Vehicle-for-Hire Bylaw to Regulate Toronto's Ground Transportation Industry". *City of Toronto*. http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2016.LS10.3

7 FUTURE STATE: TWO SCENARIOS IN THE GTHA

Current trends in shared mobility will produce serious challenges and important opportunities for the GTHA's transportation system over the next five years.[140] Often, it can be difficult to imagine the real-world impact of such a diverse array of factors or to understand the trade-offs that they impose on policymakers. In this section, we offer two stylized scenarios which contrast possible positive and negative outcomes and highlight the importance of the choices facing our regions' decision-makers between now and the end of 2020.

Worst-Case Scenario

A system that is slow to respond to growing technological trends could result in a worst-case scenario of growing transportation fragmentation and dwindling capacity unable to meet the needs of the GTHA's inhabitants.

By the end of 2020, the GTHA's crowded public transit system has only become more overburdened as many necessary expansions to the network are still not completed. In this context, private transportation alternatives such as ride-sourcing have grown significantly in popularity. While the specific impact of this growth is unclear, congestion has clearly increased. Worryingly, these private alternatives are increasingly skimming riders from the public transit system's most lucrative routes. This flight to private alternatives has begun to sap the political will to subsidize transit services that many medium- and high-income citizens are using less and less.

At an operational level, while trip-planning and payment functions have finally started to integrate across the GTHA's various transit agencies, progress has been painfully slow. Public transit agencies' proprietary apps are derided for their poor user interfaces, clunky or non-existent integration with private services and frequent service disruptions. While the addition of the ability to book Car2Go, Autoshare/Enterprise, and zipcar vehicles through Triplinx has impressed some, the lack of integration of these services into transit agencies' fare structure has limited the public's enthusiasm for this upgrade.

Still of even greater concern to the public is the plodding pace of integration among these transit agencies' fare structures, a problem that has, ironically, become more noticeable with the advent of improved trip-planning capabilities. Similarly, the failure to integrate the region's bike-sharing programs into the transit fare structure remains a sore point that has contributed to the stagnation in membership growth in both Toronto's and Hamilton's programs.

142 The five-year timeframe was chosen because, given the rapidly changing landscape, it is difficult to forecast with much reliability any further into the future.

One major development that has occurred is the haphazard and inconsistent regulation of ride-sourcing in several of the GTHA's municipalities – usually the result of hurried political compromises rather than well-researched and thoroughly consulted deliberative processes. Regardless, wherever it has occurred, regulation has further decreased the market share of taxicabs as more drivers and customers have flocked to Uber and its competitor Lyft, which arrived in the GTHA in early 2017. Unsurprisingly, the value of taxi licenses in the GTHA has plummeted. Additionally, both ride-sourcing and taxi fares are rising, as is the frequency with which "surge" or "dynamic pricing" is being applied. Unfortunately, due to the limited and incompatible data-sharing requirements contained in many of the TNC regulations that were passed throughout the GTHA, city councils are finding it difficult to address these problems.

Meanwhile, after a protracted legal battle, UberHop and Lyft Line were found to be infringing on the TTC's transit monopoly. This ruling lost most of its force the day it was handed down, however, as both companies immediately shifted their services from fixed routes to dynamic routing – thereby escaping legal categorization as transit services. With such competition to public transit growing, it has started to significantly harm public agencies' ridership levels. This has created the beginnings of a downward spiral of reduced service leading to reduced ridership leading to even more reduced service and so on.

The rise of ride-sourcing has also resulted in reduced quantity and quality of service for travellers with disabilities who have difficulty getting selected by drivers who avoid picking up more difficult passengers. Provision of accessible service comparable in price and speed to basic non-accessible service was a condition of the regulation of ride-sourcing in many of the GTHA's municipalities. Nevertheless, many accessibility advocates allege that ride-sourcing companies frequently fail to meet this standard.

The upholding of ride-sourcing drivers' classification as independent contractors has also resulted in significant labour strife. Drivers have repeatedly disrupted service to protest their treatment by these companies, particularly the unilateral cuts to their payment rates.

Toronto is also dealing with the fallout of its long-gestating decision to convert a percentage of its on-street parking into spaces reserved for car-sharing vehicles. This decision was controversial primarily because it meant a reduction in parking for residential parking permit holders. Again, as with the regulation of ride-sourcing, city council's wait-and-see attitude allowed opposing groups to form on this issue. As the debate went on, both sides became increasingly entrenched in their positions. This created a situation where compromise became very difficult and the regulation which resolved the situation suffered accordingly.

Best-Case Scenario

Early proactive steps by all levels of governments have enabled a seamless integration of multiple transportation modes across the region, allowing for a flexible and dynamic regulatory system that is able to quickly respond to new shared mobility models that may emerge while also supporting specific government policy objectives.

By 2020, a number of visionary and proactive steps taken by the region's governments and transit agencies have significantly improved transportation access and convenience for residents across the GTHA. Foremost among these has been the impressive rollout of a series of public-private partnerships between several agencies and a variety of TNCs that have yielded popular new microtransit options. By contracting with companies like Bridj and RideCo, transit agencies have been able to seamlessly integrate microtransit options into users' trip-planning and fare payment tools while maintaining low prices. Moreover, by relying on dynamically-routed, on-demand mini-buses, transit agencies have been able to expand the scope, frequency and reliability of their services into less dense suburban areas at an attractive cost, while simultaneously improving service on high-demand routes.

Much of this progress has been enabled by leveraging PRESTO and expanding its use as a payment platform to a variety of private-sector providers. This has facilitated fare-capping, co-fares, multi-modal discounts and a seamless payment experience across the regional transportation system. It has also enabled the creation of a popular integrated region-wide "emergency ride home" program, the result of significant collaboration by a number of agencies in the region. Partially as a result of enhanced reliability and flexibility, transit ridership has spiked. Building on the success of these programs, Metrolinx has recently launched a more comprehensive PRESTO-enabled MaaS pilot program – which is proving extremely popular by increasing affordability, flexibility and convenience for customers.

Much of this success is the result of the requirement for data-sharing between shared mobility firms and government instituted initially through the creation of a ride-sourcing regulatory framework by the Government of Ontario. By providing a wealth of comparable data for the entire GTHA, planners were able to optimize route planning throughout the region and to negotiate useful partnerships with private transportation providers. The extension of this requirement to other new data-intensive transportation operators (such as car-sharing and shared parking companies) quickly followed its application to ride-sourcing. The design of these data-sharing requirements was only the first of many major dividends paid by the increased data analytics capacity recruited at Metrolinx. Other successes include regional coordination of fares and a significant region-wide increase in the percentage of trips taken in shared vehicles.

The careful and staged regulation of ride-sourcing across the GTHA, and the subsequent reviews and updates made to these regulations at regular intervals, provided significant value in responding to emerging issues. Foremost among these was the regulatory predictability which has encouraged a host of competing TNCs, including some local start-ups, to begin offering services in the region. This competition has been integral in keeping fares low and minimizing the frequency with which surge pricing has been applied.

The usefulness of these regulatory reviews has also been enhanced by the availability of the data that ride-sourcing firms were required to share under the provincial regulatory framework. Additionally, recognizing that users of many of these newer modes of transportation tended to be younger, more educated and wealthier than the average citizen,[143] regulators adopted a number of requirements aimed at increasing the inclusivity of services, which TNCs were required to fulfill in order to operate in the GTHA.

For ride-sourcing companies, these included the provision of accessible services with comparable wait times and prices, as well as enabling disabled persons to opt out of passenger rating systems. The meeting of these conditions has been closely monitored by municipalities through the aforementioned data-sharing requirements. Similarly, municipal governments acted quickly to allow on-street parking opportunities for car-sharing companies across the region – but simultaneously required these firms to provide improved access in less dense neighbourhoods and in areas with lower socio-economic indicators. Firms were also eventually required to integrate PRESTO as a payment option.

The continued improvement of mobility hubs has also greatly increased the attractiveness of all forms of shared mobility. For example, Metrolinx's expanded partnerships with car-sharing companies have significantly increased use of their parking spaces. The preferential station access and increases in space set aside for ride-sourcing and microtransit pick-up and drop-off have also been critical in supporting uptake of newer modes and reducing congestion at stations. More generally, the rise of shared parking has reduced congestion by increasing the ease of finding a parking space. This has allowed municipalities to actually reduce the stock of on-street parking without significant public backlash.

Similarly, the significant expansion of bike-sharing systems in Toronto and Hamilton, particularly at mobility hubs throughout the region, has encouraged significant growth in bike-sharing as a means of completing F/L mile connections. Bike-sharing also received a significant boost with the completion of Toronto's "minimum grid" of bicycle lanes and the gradual expansion of a network of protected long-distance bicycle routes connecting key destinations throughout the GTHA.

A downside of this increasing multi-modality is that the main higher-order transit corridors operated by Metrolinx and the TTC have become significantly more crowded as more people – especially suburban residents – use the system more regularly. However, this increased crowding has also increased the public's willingness to support greater investment into updating and building new transportation infrastructure. An example of this shift can be found in the public's willingness to repurpose the levy on hired-vehicle rides – originally put in place to buy back existing taxi licences – into an additional revenue source for transit infrastructure and operations.

143 Fishman, E. 2016. "Bikeshare: A Review of Recent Literature". Transport Reviews 36(1) 92-113. 99.

8 RECOMMENDATIONS

The coming years will see innovation reshape all aspects of the transportation system as existing and emerging providers respond to a fast-changing environment. The emergence of automated vehicles will heighten this period of rapid change. Forward-thinking, smart regulation and integration of shared mobility into the transportation system represents an important opportunity for policymakers to develop requisite agile, responsive frameworks. Fortunately, the emergence of shared mobility foreshadows challenges and offers opportunities to gain experience with these issues ahead of time.

Critically, new forms of governance and policymaking are needed, as changing technology has revealed the shortcomings of current approaches. Governments must move beyond today's transportation planning approaches, as these governance models are unable to respond to new developments in a timely manner.

To effectively serve the public interest, it is imperative that governments clearly identify and update their strategic policy objectives and use them to guide their regulatory and policymaking approaches to new technologies. The recommendations in this report are aimed at harnessing the possibilities presented by shared mobility and using it to advance the 10 characteristics that this paper has identified as integral to an effective transportation system.

Fundamentally, our analysis and recommendations are centred on the need for a broader perspective on transportation – one in which ensuring citizens' access to mobility is the ultimate goal. Key to achieving this goal will be the development of an overarching multi-modal ecosystem that:

» encompasses the use of both public and private tools and assets,

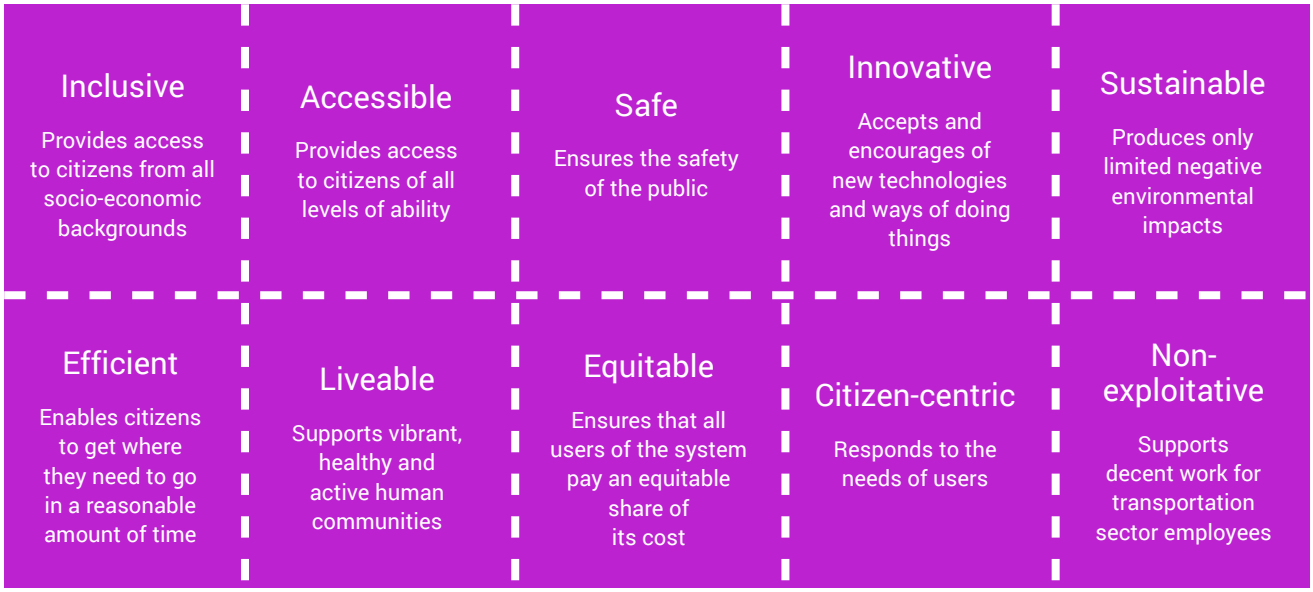
» encourages partnerships between providers,

» fosters and leverages innovation, and

» maintains a resolute focus on improving the overall user experience.

This report has emphasized the centrality of proactivity, innovation, flexibility and collaboration in the successful pursuit of such a system. We offer a series of recommendations to specific levels of government and transit agencies that will better enable them to take advantage of the benefits offered by shared mobility.

10 characteristics of an effective transportation system



1] Expedite regulatory reform

While technological advances have enabled significant innovation in shared mobility, society's ability to benefit from these innovations is constrained by outdated regulatory approaches. Flexible regulatory approaches must be developed to ensure that the growth of shared mobility serves the public good and broader transportation objectives. In the first instance, these regulations should be enacted by municipal governments.

MUNICIPAL GOVERNMENTS IN THE GTHA

» **Adopt interim regulations for ride-sourcing** as soon as practicable. These interim regulations should include:

»» **Accessibility requirements at least as strong as existing requirements** for taxis, as well as measures to prevent prohibited forms of discrimination from occurring through the use of passenger and driver rating systems.

»» **Requirements for adequate insurance** (specific to ride-sourcing or commercial driving).

»» **Requirements for robust transportation data-sharing** with governments.

»» **Regular reviews** to determine if key objectives have been achieved, gauge impacts on the broader transportation system and identify any potential reforms.

While it is important to provide municipalities with the ability to craft regulations appropriate to their unique situations, given the interconnected nature of the region's transportation system, it is vital that these regulations are compatible and enable travellers to move easily across boundaries. Therefore, it is essential for the Government of Ontario to exercise leadership, coordinate local efforts and provide municipalities with the support they need.

THE GOVERNMENT OF ONTARIO

» **Develop, as quickly as possible, an overarching provincial vehicle-for-hire regulatory framework** that ensures minimum standards across formats (ride-sourcing, taxis, etc.), while leaving scope for variation at municipal levels according to specific needs. Ideally, requirements would be primarily based on the differences in the risks involved, as is the case with drivers' insurance policies. These policies differentiate on the basis of average time spent driving per week, rather than on the technology employed – which is subject to rapid change. The development of this framework should be underpinned by a sectoral consultative mechanism (discussed further in Recommendation 4).

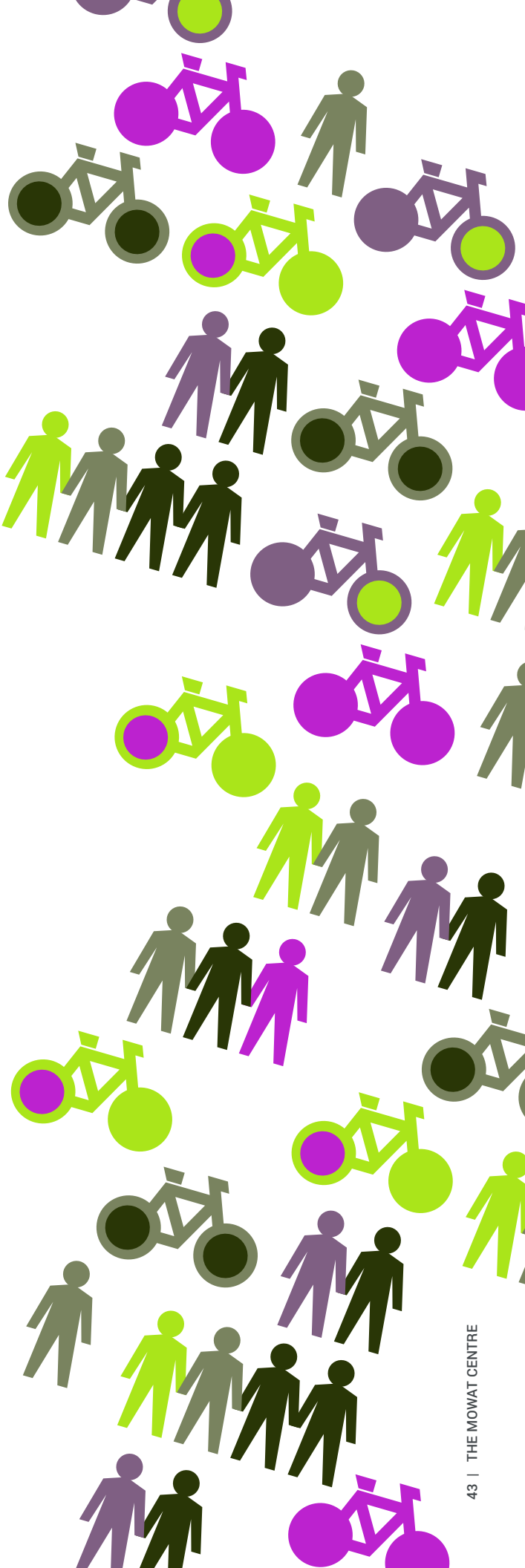
» **Clarify the nature of monopolies held by municipal transit agencies** by defining transit-like services and making it clear that municipal transit agencies can enter into partnerships with other providers. Conditions for participation in such partnerships should be outlined for transit-like services, such as sharing certain types of data.

The Government of Canada, which has been largely absent from this debate, must also play a more proactive role.

THE GOVERNMENT OF CANADA

» **Clarify the obligations of ride-sourcing drivers around remitting HST**. Ideally, this clarification would require ride-sourcing firms to collect HST as an identifiable part of fares and remit this directly to the federal government, with ride-sourcing drivers able to have this tax refunded if they are so entitled when they file their income taxes.

» **Invest in research activities** to fill gaps in knowledge around the impacts of shared mobility platforms on issues such as climate change and economic opportunity.



2] Prioritize partnerships

The public and private sectors will need to work closely to build a mobility ecosystem designed around customers and their needs. Governments should partner with various shared mobility firms to ensure better connections and integration across multiple modes of transportation, including the ability to pay fares once for a single trip using multiple modes. These partnerships should be dynamic and flexible so that they are capable of evolving as new technologies emerge.

ALL TRANSPORTATION PROVIDERS

» **Collaborate with other agencies and mobility providers** to enable a seamless and dynamic payment experience that allows travellers to pay once per journey regardless of the number of providers, jurisdictions and modes.

In order for the GTHA's transportation system to benefit from the emergence of shared mobility, the region's public transit agencies need to take a number of steps to ensure that these new technologies are integrated into the system as fully as possible and in ways that are supportive of their transit systems.

PUBLIC TRANSIT AGENCIES IN THE GTHA

» **Explore partnerships with microtransit providers** through pilot projects designed to offer more efficient local services, especially in low-density areas and at off-peak hours. If successful, these pilot projects could be expanded to replace certain existing local transit routes and increase service to currently under-served areas.

» **Explore partnerships** with microtransit, ride-sourcing and taxi firms to provide a "emergency ride home" program – providing transit pass holders with occasional taxi or TNC rides for emergencies. Ideally, this program would be region-wide, involve all transit agencies in the GTHA and build upon Metrolinx's already-existing program.

» **Ensure that these partnerships are well placed to succeed** by improving connections between various shared modes, for example, by improving pick-up and drop-off facilities at mobility hubs for microtransit, ride-sourcing and ride-sharing; and by providing priority/reserved parking for car-sharing and ride-sharing at mobility hubs.

3] Ensure open data, technological neutrality, and interoperability

Interconnectedness between municipal systems and across the GTHA is essential for the regional system's effectiveness. This will include leveraging the tools and services of many different providers – some of which do not yet exist. Governments should take all the technological steps necessary to ensure that citizens can move seamlessly through a fully interoperable system operated by multiple public and private providers. In taking these steps, however, governments and public transit agencies must be mindful of private firms' concerns over losses of competitive advantage due to data-sharing requirements. Policymakers must put in place safeguards that enable this shared data to be used productively by public agencies while also addressing private firms concerns.

MUNICIPAL GOVERNMENTS AND PUBLIC TRANSIT AGENCIES IN THE GTHA

» **Require certain consistent forms of data-sharing** as part of the regulations developed for shared mobility providers, particularly to enable governments to evaluate whether their regulatory frameworks, policies and operations are advancing policy objectives.

» **Ensure systems that governments procure are reasonably interoperable** with private providers' systems and that their systems can act as platforms for future innovators.

Many municipalities, especially smaller ones with more limited capacity, will find it difficult to engage with and regulate large well-resourced shared mobility firms, let alone to make full use of the data provided to them by these firms. The provincial government will need to exercise leadership in this area, set certain consistent minimum standards and provide all municipalities with the technical support they need to protect their citizens' interests.

THE GOVERNMENT OF ONTARIO

» **Establish open standards for transportation data** that incorporate strong privacy protections to enable evidence-based transportation planning, policy decisions and public outreach.

» **Require certain consistent forms of data-sharing** as part of the regulatory frameworks that are developed for shared mobility providers, particularly to enable governments to evaluate whether their regulatory frameworks, policies and operations are advancing policy objectives.

» **Ensure systems that governments procure are reasonably interoperable** with private providers' systems and that their systems can act as platforms for future innovators.

4] Develop leadership and coordination mechanisms

As steps are being taken toward an integrated system of multi-modal transportation, coordination among government agencies, the private sector, not-for-profit companies and the public will become even more critical. The Government of Ontario is best positioned to provide leadership to create opportunities for developing shared objectives and to set out specific strategies for achieving these objectives. Additionally, it is in this context that many of the larger issues associated with shared mobility, such as precarious employment, can be best addressed.

THE GOVERNMENT OF ONTARIO

» **Develop regulatory frameworks**, in consultation with municipalities and other stakeholders, for new forms of shared mobility that ensure a cohesive regulatory environment across the region. Simultaneously, these frameworks should still be sufficiently flexible to provide municipalities with some scope to vary policies to address local needs.

» **Convene a series of ongoing regional forums** among municipal governments to consider issues arising from shared mobility, such as precarious employment, and to coordinate government action in these areas.

» **Develop new governance mechanisms to enable ongoing consultation with all stakeholders** – particularly those who use the system, providers already operating within it and innovators trying to improve it – which should inform frequent reviews of the system and its operations by providing findings and recommendations that can be quickly acted upon by governments.

As the agency responsible for regional transportation planning in the GTHA, it is essential that Metrolinx provide all stakeholders in the GTHA with strategic guidance on how it envisages shared mobility integrating into the regional transportation plan.

METROLINX

» **Ensure that the concept of shared mobility is fully integrated into the GTHA's critical planning documents** – especially the regional transportation plan (*The Big Move*) – as these documents continue to be updated.

5] Re-align incentives to promote shared mobility

Shared mobility provides an opportunity to support policy objectives around the environment and sustainability. Governments should take advantage of this opportunity by incentivizing the use of shared mobility in lieu of existing transportation models such as personal car ownership. Additionally, as the public sector works more closely with private firms, it can incentivize firms active in this area to more directly provide services that meet specific government objectives.

MUNICIPAL GOVERNMENTS AND PUBLIC TRANSIT AGENCIES IN THE GTHA

» **Incentivize individuals and families to use shared mobility** by:

»» **Enabling on-street parking for car-sharing** (and charge providers for this privilege) where possible. This initial allowance should be short-term and require the sharing of usage data. Ideally, this data could be analyzed and, if usage was distributed unevenly, then additional requirements (e.g. access by lower-income users) could be considered.

»» **Increasing the number and transit-connectedness of high-occupancy toll (HOT) and high-occupancy vehicle (HOV) lanes** on urban expressways so that, in cooperation with Metrolinx, other municipalities and the Government of Ontario, these lanes form part of a viable region-wide network of HOT and HOV lanes capable of encouraging more efficient use of the region's roads and greater use of shared vehicles and public transit.

»» **Exploring congestion charges or tolling in highly-congested corridors** within municipalities to encourage more shared use of vehicles in and around urban cores. Revenues from these charges must be reinvested in public transit.

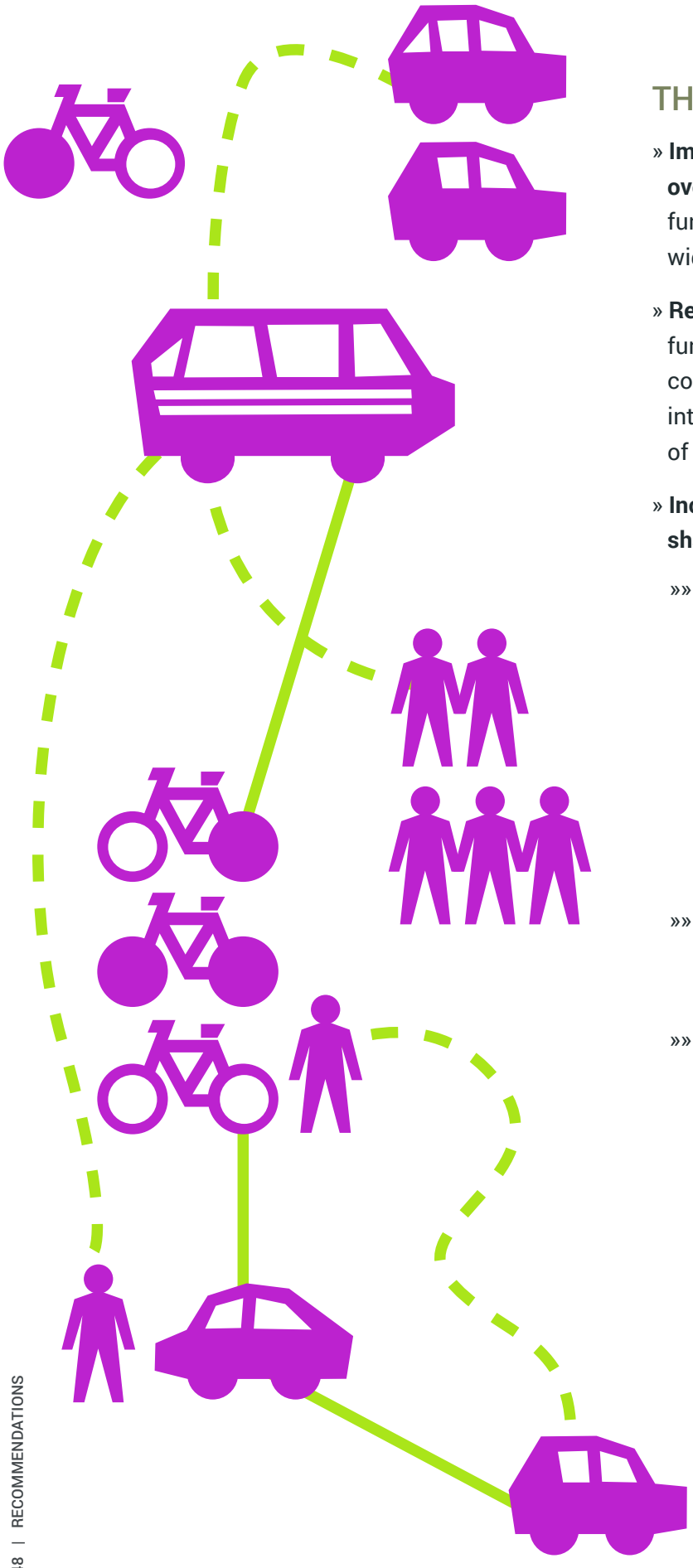
»» **Prioritizing the completion of more bike lanes in the GTHA** (e.g. complete the "minimum grid" in Toronto), the expansion of bike-sharing programs in priority areas (such as around mobility hubs) and the building of a network of dedicated bike routes linking key destinations across the GTHA.

»» **Developing targeted programs for low-income people** to access shared bikes, car-sharing and other forms of shared mobility.

»» **Modify minimum parking requirements** for new buildings by substituting some shared mobility pick-up/drop-off facilities and priority/reserved shared mobility parking spots for personal automobiles parking spots.

» **Develop incentives** for the private sector to support specific policy goals. These incentives could include pay-for-performance for ride-sourcing providers to provide services to specific types of populations, such as those with accessibility challenges or in low-income areas.

In order to re-orient incentives toward more efficient transportation patterns, the Government of Ontario must be involved. Only the province has the mandate to take steps to ensure that regulatory frameworks better reveal the true costs of all modes of transportation, so that the system is both more equitable and so that travellers are able to make more informed mobility choices.



THE GOVERNMENT OF ONTARIO

» **Implement new incentive structures to prioritize overall mobility** by developing outcomes-based funding models focused on improving system-wide mobility and user experience.

» **Require that the planning** of all new provincially-funded transportation projects include a comprehensive analysis of, and plan for, integrating both shared and automated modes of transportation, as appropriate.

» **Incentivize individuals and families to use shared mobility** by:

»» **Increasing the number and transit-connectedness of HOT and HOV lanes on the region's highways** so that, in cooperation with Metrolinx and the region's municipalities, these lanes form part of a viable region-wide network of HOT and HOV lanes capable of encouraging more efficient use of the region's roads and greater use of shared vehicles and public transit.

»» **Exploring, in partnership with the federal government, tax incentives** to encourage individuals and families to reduce car usage.

»» **Exploring small changes to the legal definition of ride-sharing** (e.g. the level of compensation allowed) to provide greater incentives for individuals to carpool.

6] Embrace emerging technologies

The rise of shared mobility has been driven by private-sector firms developing new technologies and innovative business models enabled by those technologies. Public transportation providers should similarly find and embrace new and innovative ways of delivering services to citizens by leveraging new technologies in their own operations. This does not require the public sector to develop new technologies or applications itself. However, it does require public entities to improve their capacity to leverage and partner with the private sector to adopt technology that helps them to achieve objectives more effectively.

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» **Recognize that PRESTO cards**, and the physical infrastructure that supports them, serve as a critical means for customers without bank accounts or smartphones to continue accessing transportation services as more and more services go online and require credit cards.

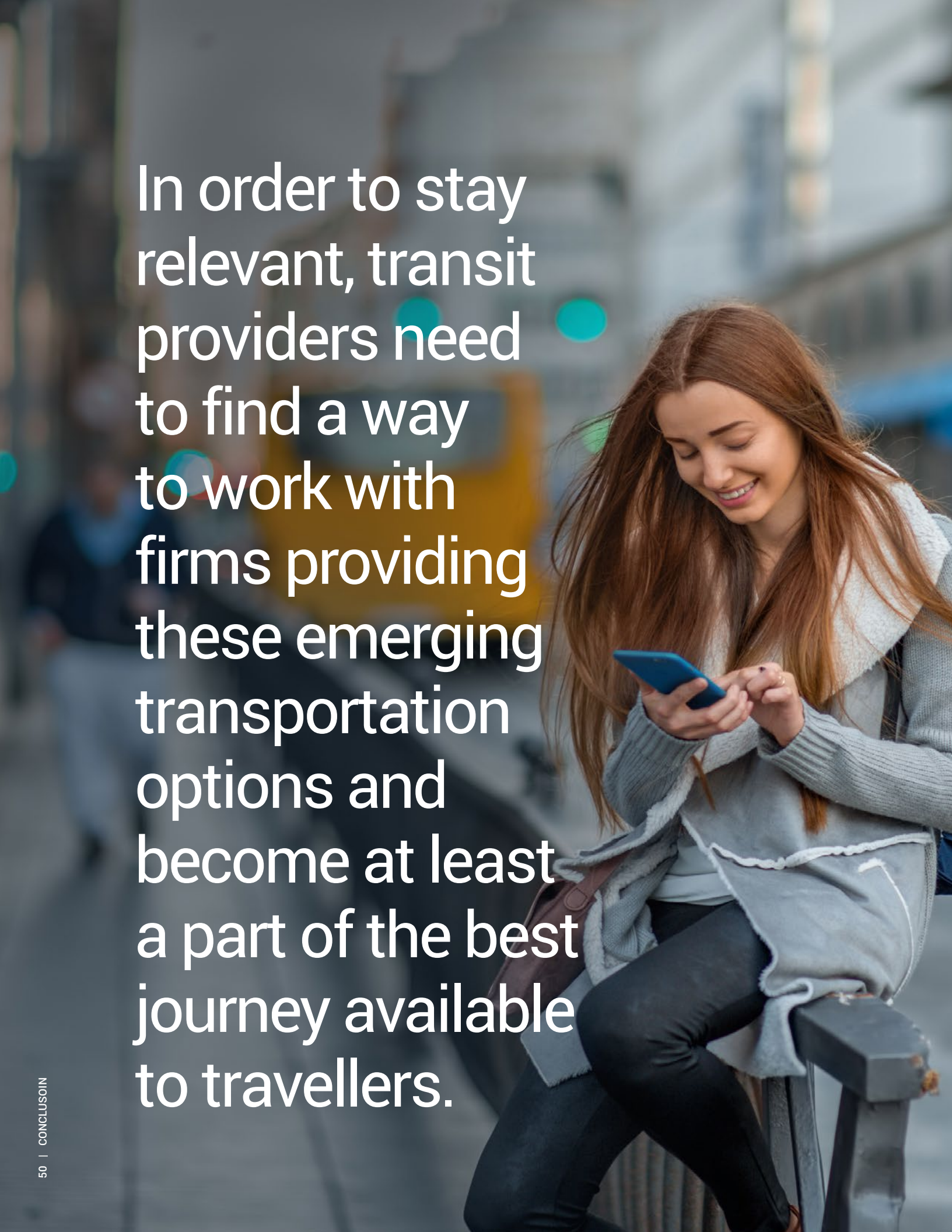
» **Develop programs** to enable customers who lack smartphones to engage with any new smartphone-enabled transportation options.

» **Explore the possibility of enabling PRESTO use** with private and not-for-profit shared mobility firms in the GTHA to better align these services with the objectives of the public transit network.

» **Work to enable PRESTO use for all GTHA bike-sharing programs** in order to further increase the attractiveness of these programs as F/L mile solutions.

» **Increase in-house data analysis capacity** and use this capacity to support transit provision across the region.

» **Develop and pilot a PRESTO-enabled Mobility as a Service (MaaS) program** in partnership with a GTHA transit agency and private providers and study its impacts.



In order to stay relevant, transit providers need to find a way to work with firms providing these emerging transportation options and become at least a part of the best journey available to travellers.

9 CONCLUSION

An effective transportation system is essential to the success and prosperity of any large, densely populated region. With the Greater Toronto and Hamilton Area already facing significant congestion and transit challenges, and with the area's population set to grow by more than a third in the next 15 years, creative solutions will be required to simply maintain service, let alone enhance it.

Shared mobility – and the varied and evolving set of innovations that are part of it – offers important opportunities to improve the GTHA's transportation system and the well-being of individuals and families. In a region with many human and physical assets, any means of better rebalancing and optimizing how those assets (whether cars, buses or people's skills) are deployed, carries huge potential.

The GTHA is a diverse region, a fact that compounds the challenges posed by the arrival of shared mobility and enhances the risk of a fragmented response. It is made up of both large cities and smaller rural areas – each with varying capacities to respond to these emerging issues. As the regulatory chaos provoked by the launch of UberX has demonstrated, the arrival of new innovations can catch policymakers flat-footed, create significant conflict and produce sub-optimal outcomes.

This report has laid out both a set of characteristics which we see defining an effective transportation system as well as a series of recommendations aimed at improving the extent to which the GTHA's transportation system embodies these characteristics in a shared mobility context. Politicians, bureaucrats, transportation planners and transit operators need to clarify their own primary objectives amid the emergence of shared mobility and proactively engage with innovators on a continuous basis to ensure that they are well-positioned to harness innovation to further those goals.

When given the option, individuals will generally choose the most convenient and cost-effective transportation options – which often now involves shared mobility platforms. Policymakers must recognize and take action based on this simple insight.

In a growing number of instances, shared mobility providers are meeting users' needs more effectively than public transit. Critically, however, there is not only room, but a real need, for both to thrive within the GTHA's transportation system. Indeed, if handled well, shared mobility has the potential to serve as a complement, rather than a competitor, to public transit.

In order to stay relevant, transit providers need to find a way to work with firms providing these emerging transportation options and become at least a part of the best journey available to travellers. There are even opportunities for public transit agencies to improve their services by working more closely with shared mobility providers. These include using shared data to obtain better insight into how riders use the system and by better focusing limited resources on services that they are uniquely positioned or mandated to provide.

Most importantly, all key players in the system must ensure that the customer experience is at the heart of their considerations. This is in line with Metrolinx's strategy, as outlined in *The Big Move*, which calls for the creation of a "customer-first transportation system."[144] This cannot be done without incorporating the shared mobility options, which have grown significantly in popularity among its customers.

This report has noted the importance of multi-modality in achieving this goal. While there is little question that public transit's role in operating high-volume, higher-order transit corridors will remain for the foreseeable future, its continued relevance in other areas is much less certain. New services ranging from bike-sharing to ride-sourcing to microtransit are likely better positioned to provide many parts of travellers' journeys due to their flexibility and timeliness. This is likely a positive outcome – or at least it can be, if governments and transit agencies provide the regulatory frameworks that allow for the integration of these new modes with existing ones while still protecting the public interest.

In many ways the advance of shared mobility presents government with a made-to-order opportunity to enact the ideal of "government-as-a-platform".[145] Leveraging this opportunity effectively – through smart but flexible regulation, innovative frameworks, collaborative partnerships and proactive policymaking – could create a model for governing in the digital era. Given that many of the challenges presented by shared mobility foreshadow the revolutionary changes that automated vehicles and other emerging technologies will likely bring, getting this new model right now must be a top priority.

144 Metrolinx. September 2013. "The Big Move: Baseline Monitoring Report". http://www.metrolinx.com/en/regionalplanning/bigmove/The_Big_Move_Baseline_Monitoring_Full_Report_EN.pdf

145 Government-as-a-platform is a concept patterned after the concept of Web 2.0. At its core, it refers to the idea that government's function is as a convenor or enabler of beneficial forms of collective action. Thus, it refers to the idea that one of government's core functions is to enable private individuals and groups to engage in beneficial activities that it would be difficult or impossible to undertake without government support – and which government itself is unlikely or poorly suited to do. For example, this often involves the creation of value through the leveraging of government data, as with citizen science initiatives or in building real-time transit tracking apps. See O'Reilly, T. "Chapter 2. Government as a platform". *Open Government*. http://chimera.labs.oreilly.com/books/1234000000774/ch02.html