ADVANCING EQUITY IN THE GTA

Mobility as a Service

A FEASIBILITY STUDY ON IMPLEMENTING MAAS IN THE GREATER TORONTO AREA











Canadian Institut Urban Urbain du Institute Canada







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Glossary

Active transportation: Types of personal travel that are human powered, including but not limited to walking, jogging, cycling, skateboarding, rollerblading, and nonmechanized wheel chairing.

Application Programming Interface (API): A software intermediary that allows two applications to interact with each other. APIs are an accessible way to extract and share data within and across organizations.

Complete communities: Places, such as mixed-use neighbourhoods or districts, that offer and support opportunities for people of all ages and abilities to conveniently access most of the necessities for daily living, including an appropriate mix of jobs, local stores, and services, a full range of housing, transportation options, and public service facilities.

Conventional transit: Traditional public passenger transportation services operating on fixed routes buses, motor coaches, and rail-based transportation — maintained and operated by a public sector transit agency.

Greater Golden Horseshoe: A provincially designated planning area within Southern Ontario that spans along the western coast of Lake Ontario, including all the municipalities from the Region of Niagara and Haldimand County in the south, the Region of Waterloo and County of Wellington to the west, up to Georgian Bay in the north, and the Counties of Peterborough and Northumberland to the east.

Greater Toronto Area: A geographic area that includes the City of Toronto, and the surrounding Regional Municipalities of Halton, Peel, York, and Durham.

Higher-order transit: High-capacity public transportation lines that operates in whole or in part on a dedicated right-of-way, such as regional rail, light rail trains, subways, and bus rapid transit.

Micro-mobility: Refers to transportation over short distances by way of a variety of electric or human powered, low-speed vehicles, such as bikes and scooters, and even skateboards to wheelchairs. This includes commercially operated fleets of bicycles and electric scooters.

Mobility aids: Devices designed to help people with physical limitations to move independently.

Mobility hub: Located at major transit stations, these are places that provide travellers with seamless access to the regional transit system, designed for high levels of pedestrian and cyclist activity. These serve as focal points that integrate various modes of

transportation through infrastructure design and public realm improvements.

Ride-hailing: An act by a customer to arrange an ondemand vehicle for a trip by means of a third-party website or mobile application.

Transportation equity: A general concept looking at how transportation services and mobility access are distributed among different populations. Serves as a lens to determine the fairness of transportation systems and recommend changes to improve mobility access for disadvantaged groups.

Universal basic mobility: A system where all citizens have access to a minimum level of affordable transportation options regardless of socioeconomic status or ability.

Universal design: A process that aims to make services accessible and usable by all people regardless of age, physical or cognitive ability, and socioeconomic status.

Urban growth centre: Mixed-use, high-density, public transit-oriented districts planned and forecasted to become focal points for population and employment growth throughout the Greater Golden Horseshoe. Urban growth centres are designated under the provincial Growth Plan for the Greater Golden Horseshoe.

Overview



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This feasibility study was conducted by the Canadian Urban Institute in partnership with AECOM to gain a comprehensive understanding of the MaaS concept and its desirability and feasibility in the Greater Toronto Area (GTA), particularly with respect to addressing equity challenges.

Mobility as a Service (MaaS) is an integrated platform for transportation services. It combines multiple modes including public transit, taxis, ride-hailing, scooter, bike, and car sharing, and sometimes even parking fees and road tolls on one easy-to-use navigation and payment app.

This report outlines a framework for MaaS acceptance and implementation as a starting point to further the conversation around MaaS in the GTA. This includes identifying key partners, developing agreed upon goals, and establishing a common framework that includes fare and policy integration, data sharing standards, cost-effectiveness, and a means of leveraging existing transportation systems towards a more integrated mobility service delivery.

Based on best practice research and engagement with a broad array of stakeholders, we found that the implementation of MaaS must consider, at a minimum, technical solutions including the potential for integration of disparate fares; the unique policy and political context including the willingness and ability for cross-jurisdictional collaboration; and consideration of existing travel patterns – especially in the post-COVID context. In addition, appropriate physical infrastructure is necessary for MaaS implementation, especially in the context of active and micro-mobility options. This includes but is not limited to transit shelters and hubs, and bike lanes and sidewalks that are accessible, comfortable, and safe. This is especially true to address equity and accessibility gaps.

The benefits of MaaS for the GTA are numerous. For users, MaaS can expand mobility access by providing convenient, easy-to-use, and more costeffective transportation options. It has the potential to bridge-and perhaps even close-the transportation equity gap while encouraging the adoption of more sustainable modes of travel.

For transit agencies and municipalities, particularly those in low-density areas, MaaS can contribute to solving the first-and-last mile problem and provide options where conventional fixed-route services are less feasible. Similarly, by augmenting an existing transportation system, MaaS can improve the overall function of the system thereby improving the quality of service of conventional transit, increasing ridership, and contributing to more compact and complete communities that are less reliant on automobile usage.

While the benefits of MaaS are clear, our key takeaway is the need for a convening body to bring together all municipalities, the province, private operators, nonprofit community organizations, and diversity groups to align goals towards MaaS acceptance, application, implementation, and iteration.

As the core and surrounding regions continue to grow, MaaS can help orient transit systems to support existing patterns of development, intensification, and future growth plans. Based on best practices in MaaS systems that have been implemented, the comprehensive and flexible nature of MaaS ensures that greater uptake in transit and micro-mobility use is evenly distributed to address first-and-last-mile challenges and broaden mobility access.



The Case for Mobility as a Service

What is Mobility as a Service (MaaS)?

MaaS is an integrated platform for transportation services. It combines multiple modes including public transit, taxis, ride-hailing, scooter, bike, and car sharing, and sometimes even parking fees and road tolls on one easy-to-use navigation and payment app.

MaaS can support equity goals, such as universal basic mobility, and manage incentives, such as targeted discounts, encouraging travellers to use the most efficient and sustainable modes for each trip.¹ MaaS also has the potential to introduce more flexibility, inclusivity, affordability, and connectivity to our movement systems.² But these outcomes are not guaranteed and depend on the way MaaS is implemented.



The Role of MaaS in the Greater Toronto Area

The MaaS approach to transportation services allows transit agencies to improve mobility access by leveraging existing technology and public-private partnerships to deliver transit services cost-effectively. It also leverages major regional transit infrastructure investments and initiatives to create more compact communities to reduce personal automobile dependency and contribute to greenhouse gas (GHG) emission reduction targets.

GTA commuters often rely on multiple transit agencies for their daily activities. But integrated regional transportation planning in the GTA is complex and characterized by multiple jurisdictions with separate network systems and fare structures. The COVID-19 pandemic has also greatly impacted mobility throughout the region.

Private, public, and non-profit sector stakeholders recognize that pre-pandemic transit service delivery models require a rethink as the region adjusts to the new normal. Alternative models may be necessary to distribute regional mobility access sustainably and equitably. MaaS can also help achieve equity goals as part of a more comprehensive approach to achieving transportation equity in the region. With the goals of improving mobility access, reducing auto-dependency, and improving service delivery, MaaS must be considered along with the desires of communities and the impact of public policy that prioritizes automobile use.



For lower-income groups, transit is often the only option for independent travel. Without it, their ability to access daily activities and participate in the labour force is limited.³ Within the GTA, two types of neighbourhoods are at a greater risk of transport poverty:⁴ low-income, high-density apartment tower communities located away from higher-order transit routes, and low-income suburbs.⁵ Furthermore, the lack of transit service connecting homes and workplaces to the nearest public transportation nodes in 905 municipalities outside of Toronto — called "the first and last-mile problem" — is one of the main deterrents to the use of public transit.⁶

Findings reveal that partnerships with the private sector can expand the geographic coverage of transit services. If implemented correctly, MaaS will contribute to equitable transportation outcomes and aid in solving the region's first and last-mile problem. Several regional municipalities have implemented varying forms of on-demand transit services to substitute conventional fixed-route services in low-density areas to feed travellers into the higher-order transit network. These innovative and flexible approaches to service provision present a baseline framework through which MaaS can build upon and integrate additional mobility providers.

However, on-demand services are just a small part of MaaS systems. To truly foster equitable mobility, a comprehensive approach to transportation and land use planning must be adopted to create more opportunities for diverse peoples to live in walkable and compact neighbourhoods in close proximity to employment, social, and recreational opportunities. Transit systems and physical infrastructure must be universally designed and adapted to ensure that anybody can freely move about the region as needed regardless of their cognitive and physical ability. For MaaS to be successful, policymakers and practitioners must keep in mind that the ultimate goal of transportation is to help travellers access their daily needs, and that fostering the enabling conditions for active transportation, micro-mobility, mobility aids, and conventional transit are far more important than just integrating ride-hailing.









Potential Value of MaaS

FOR TRAVELLERS

Has the potential to significantly expand the mobility options available to travellers

Can help users who are physically, economically, or socially disadvantaged

Can serve as a means to access affordable mobility options and help travellers identify, navigate, pay, and receive discounts or incentives through a single platform

Provides alternative modes that are more cost-effective than personal automobile travel

Offers alternative means to accommodate individuals without access to a smartphone, computer, and/or internet through call centres

FOR TRANSIT AGENCIES

Contributes to solving the first and last-mile problem on local and regional transportation networks by connecting travellers to mobility hubs (safe and convenient crossovers between transport modes) and transit stations

Can result in increased transit ridership

Shifts travel behaviour across the region from singleoccupancy automobile dependence to a greater reliance on the higher-order transit network

FOR COMMUNITIES

Improves people's access to daily social, recreational and economic activities

of travel

Helps reduce personal automobile travel

sustainable lifestyles

FOR THE GOVERNMENT OF ONTARIO

The wide array of mobility options provided would connect GTA residents to additional employment opportunities

Helps spur economic growth within the province by supporting greater mobility for workers

- Offers a convenient and integrated navigation and payment tool for travel to/from and within the GTA
- Supports local investment to enable new methods
- Aids in providing equitable access to transportation, reducing traffic congestion, and promoting more

FOR MUNICIPALITIES

Can potentially build on existing flexible frameworks and pilot programs

Can be contracted to private sector operators which can be cost-effective in low-density areas where conventional fixed-route services are less financially feasible

Leads to supplementary mobility options serving as feeder modes into existing mobility hubs and higher-order transit systems

Leverages transit investments by better connecting communities to higher-order transit

Fosters sustainable transit options toward achieving net zero GHG emission targets

FOR PRIVATE MOBILITY OPERATORS

Creates business opportunities for organizations striving to be stewards of corporate social responsibility

Helps solve first and last-mile problem

Advances transportation equity

Reduces personal automobile dependency and contributes to increasing transit ridership



Study Purpose and Methodology

The Greater Toronto Area (GTA)⁷ MaaS Feasibility Study marks a collaboration between AECOM's Cities practice and the Canadian Urban Institute (CUI). It is tailored to include customized goals, objectives, and strategies to meet the region's specific transportation needs and provide a framework for achieving MaaS acceptance and implementation in the GTA.

Our goal is to aid in charting a path towards a more mobile, sustainable, and prosperous region by connecting transportation networks, planning strategies, and the people whose collaboration can improve the quality of life within the GTA.

The GTA MaaS Feasibility Study (feasibility study) aims to comprehensively understand the MaaS concept and its desirability and viability in the GTA by examining recent trends and lessons learned on MaaS deployments worldwide. This includes a

review of existing conditions on the multiple MaaS components that have already begun in the Greater Golden Horseshoe (GGH)⁸ region and other relevant Canadian and international case studies as a baseline.

AECOM and CUI assessed the feasibility of implementing MaaS in the GTA based on the following policy framework elements:

- Infrastructure
- Data and technology
- Management and operation
- Governance
- Finance
- Institutional practices
- Equity and public engagement





Goals and Objectives

This feasibility study provides a common language to advance the conversation with and among regional transportation service providers and policymakers and serves as an initial resource for those who would like to consider MaaS in the GTA.

Driven by the need to create more equitable transportation solutions, we've identified MaaS as a possible means to contribute to improving mobility access and service delivery in the region. To pursue this solution, it is essential to understand the current context, the work completed so far, and any barriers to widespread adoption. Furthermore, this study explores local initiatives, and alignment of goals and best practices from international stakeholders to build a framework for MaaS implementation in the GTA.





Research and Engagement Findings

Transportation and Land Use must be integrated

The GTA is a vast region made up of urban cores, suburban communities, parklands, and rural expanses. Each municipality operates its own transit network with differing ridership demands and available service options. Each also has different council-approved directions regarding the integration and use of certain modes. For example, e-scooters may be permitted in one jurisdiction and not another.

Transportation planning cannot be considered in a vacuum as active transportation and micromobility mode adoption depend on the availability of infrastructure to accommodate them. This could be achieved through developing a street grid pattern, promoting a greater mix of land uses, separating pedestrian and cycling paths from vehicular right-of-ways, and improving the safety of street crossings. Despite the geographic and built form differences throughout the region, all municipalities require a combination of walking, micro-mobility, taxi and ridehailing, and public transit. There is a need for regional integration as many residents travel outside of their municipality. The province's *A Place to Grow. Growth plan for the Greater Golden Horseshoe* designates urban growth centres—areas planned for high density residential and commercial concentration connected by the regional higher-order transit network—which present opportunities for integrating various mobility options.

A MaaS approach can build upon these existing initiatives—urban intensification to create more compact communities, public realm and infrastructure improvements to accommodate walking and cycling, transit investments, and regional mobility hubs—to support the creation of interconnected complete communities across the GTA.

Shifting from subsidizing automobile use

Research in the United States has shown that the utility of private automobile use, supported by highway investments, low motor fuel taxes, and minimum parking requirements, greatly impacts rates of transit adoption more so than policies to encourage transit use.⁹ Without addressing public policy that supports automobile use, adopting MaaS holds the risk of perpetuating certain on-demand modes that continue to maintain-single occupancy vehicles on roads in large numbers.

Altering automobile friendly policies so that drivers fully compensate society for the significant costs they impose by driving would cause individuals to consider the costs of driving more carefully.¹⁰ These revenues can be redirected to transit investments and public realm improvements to encourage the adoption of non-auto modes. This shift would make public transit more attractive to more travelers and solidify transit as the foundation of MaaS.





Quality of service improvements are catalytic

Of the factors impacting transit ridership levels within the control of transit agencies, research in some American regions have shown that improvements to quality-of-service are more effective at stimulating ridership than adjusting fare pricing or service coverage and frequency.¹¹ A MaaS platform would serve as a user-friendly method of providing easily attainable information on a variety of modes, from fare costs, stop and station locations, connections, and service changes. This would provide travellers with a better sense of certainty regarding their trips, improving the experience of mobility in the region and increasing the attractiveness of transit use. Evolving services to meet the needs of diverse groups will require ongoing user engagement and satisfaction surveys.

Pandemic era impacts should be considered

Issues around car-dependent communities and insufficient transit service have been studied for decades. The COVID-19 pandemic focused further attention on inequities across the GTA transportation network as people reliant on transit networks had few travel options for their day-to-day needs.

Ever since the pandemic, mobility patterns have changed as employers and employees have shifted to remote work in numbers never seen before. Therefore, the utility of transit systems built to serve daily rush hour commutes have been put under scrutiny. Some transit agencies do not expect ridership to return to pre-pandemic levels, while others have seen ridership levels surpass them, which demands a



rethink of service delivery and revenue collection. Greater flexibility is required to account for various traveller behaviour preferences and needs in an era of uncertainty regarding how future travel patterns will evolve or settle.

MaaS can be a critical part of the solution to delivering adequate and affordable transit services, especially in areas not served by higher-order transit investments.

Community engagement and co-design are necessary

Post-pandemic public transit service requires a rethink of its purposes, evaluation frameworks, and viability of the service delivery model. Transit delivery should be tailored beyond serving peak





hour commuters to improving the quality of life in low-income and disadvantaged communities that rely on transit services. MaaS adoption presents an opportunity to improve transportation equity by effectively integrating public and private mobility assets to create greater access to mobility services.

Transit systems and physical infrastructure must be universally designed and adapted to ensure that anybody can freely move about the region as needed regardless of their cognitive and physical ability. This necessitates cross-jurisdictional specialized transit service integration.

To achieve the goal of universal basic mobility, meaningful and ongoing engagement with disadvantaged communities must be conducted to understand lived experiences and identify the impacts of transit system changes and different mobility options. Many disadvantaged travelers rely on nonauto modes or would do so if they were convenient and affordable.¹² Particular attention must be placed on the quality and integration of these non-auto modes. Co-design is a key method of ensuring that changing transportation policies and systems are responsive to the needs of these groups.

Transportation needs to be affordable

Experts define affordable household spending at no more than 45 percent spent on transportation and housing costs combined.¹³ In the context of the GTA, with many households spending more than 30 percent of their income on housing-related costs, that leaves even less budget for transportation. Walking, then bicycling followed by public transit are the most affordable modes in terms of annual costs, compared to personal vehicles that are expensive to acquire and maintain, and sometimes impose large, unpredictable costs.¹⁴ A more equitable transportation system, supported by MaaS, increases the viability of less expensive mobility options.

MaaS platforms have been used to deliver subsidies, which can be an effective way of increasing transit ridership. Focused fare programs aimed at specific populations, such as targeted discounts for students and the transit-dependent, have been proven in many cases to be effective in attracting riders.¹⁵ The targeted use of incentives can be leveraged to nudge traveller behaviour towards public transit and more sustainable modes.

Public engagement in Pittsburgh

For the City of Pittsburgh's MovePGH program, public information sessions were conducted for community groups, advocacy groups, and other stakeholders to inform them of shared transportation benefits and to obtain feedback to help adjust the project's policy and implementation strategy. Community meetings are held on an ongoing basis to understand how the program can be specifically tailored to benefit communities.



Mode integration is necessary for efficiency and equity

An ideal MaaS system integrates multiple modes to provide mobility options in all areas for all communities during all times of the day. Accessible options will differ based on built form, the feasibility of specific modes, and interested providers, but the goal of MaaS should be to leverage available public and private assets to improve mobility access across the board, especially for those who currently lack it. MaaS is a key tool to enable travellers to choose the best mode(s) for each trip.

A flexible on-demand subsidy model presents a potentially cost-effective method of expanding geographic mobility access. Flexible frameworks allow transit authorities to regularly reassess service arrangements, introduce or alter incentive programs, and replace on-demand with conventional and vice versa as transit demand changes.

Several representatives of engaged private mobility providers have stated that their corporate goals are to support transit, not replace it. Targeted incentives and subsidies for on-demand transit and micro-mobility options could potentially fill first and last-mile gaps where the cost of fixed-route services cannot be justified.

On-demand transit services implemented in York and Durham Regions

York and Durham Region use branded ondemand fleets in low density service areas. As ridership increases to a support level, they replace it with a conventional fixed route. Where it decreases, they can replace the route with on-demand service.

Addressing the digital divide in Innisfil and Toronto

For travellers without access to a smart phone and data plan, Innisfil Transit and TTC's Wheel-Trans set up 24/7 toll-free call centres for individuals to book on-demand and specialized transit services.

A MaaS platform should be easy and convenient to use

An ideal MaaS system integrates multiple transportation modes into a single platform where private mobility operators and public agencies operate within a common application program interface (API). The API should enable efficient multi-modal trip planning and provide easily accessible trip information to users across a region. Surveys and focus groups should be used to inform the creation of a platform and its functionality once implemented.

The wide use of smart phones provides a means for widespread MaaS adoption. Such a platform can be leveraged to provide easily accessible transit information regarding line closures, modifications, cancelations, and construction impacts. It should include all relevant information pertaining to all modes included within the suite of options and allow users to customize their information preferences. But for those without smart phones and data plans, there must be alternative methods set up to provide access to these services.

Public and private sector misalignment is a barrier

Stakeholders in the GTA identified a misalignment between public and private sector interests as the primary barrier to successful MaaS implementation. To be successful, MaaS requires a clear multisector vision and a thorough understanding by all participants of the issues to be addressed to align goals and secure long-term buy-in. Clear expectations and reciprocal relationships that allow for adjustments as services evolve are required to minimize friction between the public and private sectors. Local governments and planning authorities should develop a model operating policy that defines minimum stakeholder value expectations and encourages innovation from the private sector.

Cross-jurisdictional collaboration is required

Collaboration and true partnership across With prior user consent, MaaS platforms can facilitate municipalities and levels of government are critical data collection to identify movement patterns during to successfully implementing MaaS. In some reduced service hours and highlight gaps in the transit international examples, regional transit authorities are network that must be addressed. in place to guide the work. In others, governing bodies have been created to usher in MaaS implementation. **Evaluation should consider** Such a group, whether formalized or ad-hoc, will be necessary to set clear expectations and outcomes for equity factors MaaS considerations, align the interests of all partners, Evaluation of MaaS programs must include social and create a flexible framework that respects each equity factors¹⁶ looking at transportation and land municipality's unique priorities and regulations within use (e.g., public transit access, school proximity, the regional transportation system.

intermodal facilities, etc.), demographics (e.g., **Transparency and data access** ethnicity, English proficiency, age, disability, etc.), and socioeconomics (e.g., vehicles per household, are necessary household income, travel time, etc.). Disaggregated data collection is useful to compare the experiences Access to data is a key component of a successful of those with ample transit access versus those who MaaS system. In Europe, regulators require lack it, or to determine the experience of a particular private mobility operators to share their data with group of people related to a specific mobility option. government bodies as a prerequisite to being This is necessary to determine the real impacts integrated into transportation systems creating a level MaaS will have on the quality of life of the region's of certainty around data agreements. residents. The findings of such an analysis will inform Municipal and transit planners require transportation considerations regarding different demands for network companies to transparently provide data to transportation, and how to best target incentives allow them to accurately determine the impacts of and infrastructure investments to meet the needs of services provided and inform future MaaS planning disadvantaged groups.

and decision-making. In Canada, better data is also required to determine the equity impacts of transportation initiatives and programs.

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Scalability is a key aspect of **MaaS implementation**

Stakeholders suggested that MaaS be implemented as a pilot in a limited area, such as a mobility hub or transit terminus. With a flexible framework in place, the system can be expanded in the future to include additional private mobility providers, service areas, and incentive structures.

This limited scope allows implementers and observers to evaluate the results to inform later iterations or expansion of the program. Municipal regulations, physical infrastructure, and economies of scale will guide private mobility operators included at the outset.

Outside of peak travel times, and in areas of lower ridership, private mobility operators can fill gaps in transit networks to provide quicker and more reliable daily trips to improve quality of life and well-being.

Rider incentives

Barcelona-based RIDEAL is developing a platform to enable public and private organizations to manage, monitor, and control their rider incentive programs. They provide an API that can be plugged into any MaaS platform. This would allow any public or private organization to target incentives for specific users in specific areas at specific times for specific modes. When targeted correctly, incentives have the potential to nudge riders toward public transit.

Table 1: Modes and types of services MaaS can support

Transport mode or service	Role of MaaS	Requirements
Walking	Navigation	Safe walking conditions
Cycling	Navigation	Safe cycling infrastructure and secure bicycle parking facilities
Scooter and bike sharing	Location and payment	Payment
Car sharing	Location and payment	Payment
Taxi / ride-hailing	Ordering and payment	Dispatching, arrival, and payment
On-demand transit	Ordering and payment	Dispatching, arrival, and payment
Ride sharing	Matching	Ride matching
Fixed-route transit	Navigation and payment	Arrival and payment
Private automobile	Navigation and payment	Parking and toll payment
Equity and transit demand management incentives	Targeted discounts and incentives	Ability to offer targeted information and prices

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Principles for MaaS in the GTA

Based on our key takeaways and analysis of current conditions, we have developed a set of principles that should guide the adoption and implementation of MaaS in the GTA.

Improving equitable access to mobility

The goal of a MaaS program should be to improve transportation outcomes for all residents in all communities. This will foster greater opportunities for people to access the region's social, recreational, and economic opportunities.

Maintaining public transit as the foundation of a multi-modal network

A MaaS program should build upon existing public transit networks. Based on cost-benefit analyses, ondemand options, and alternative mobility providers, MaaS should be used to plug gaps in the existing transit network where introducing conventional fixed-route services does not make financial sense. On-demand and micro-mobility, where financially feasible, would serve as feeder modes into higherorder transit, and improve the cost-effectiveness of providing transit services.

Encouraging sustainable mode shift

A MaaS program must align with municipal goals of sustainable mode shift, contributing to GHG emission reductions, reducing traffic congestion, and freeing up urban space. The targeted use of incentives can effectively reduce the cost of desirable modes and shift user travel behaviour.

User convenience

Just as mobility is more than the existence of many transportation modes, MaaS is more than a technical interface overlaying available modes. The quality of travellers' transport experience is an essential part of the system. The transport options need to be accessible, affordable, efficient, safe, and sustainable to ensure a positive user experience.

Building partnerships

Implementing on-demand services to augment public transit in low-density areas presents an opportunity to explore further the use of non-traditional partners in transit service provision. This will require cross-municipal regional collaboration, a unified approach to privatesector partnerships, and respect for municipal priorities set out by each municipal council.

Integrating regional travel

A MaaS platform should be a standardized experience for any user across the region. MaaS would build upon existing inter-transit agency integration initiatives in a region as inter-connected as the GTA, fostering a seamless and convenient mobility experience for users traveling within and through multiple jurisdictions.

Keeping it flexible

The success of MaaS is dependent on the ability to iterate over time and revisit partnership agreements to realign goals. By starting small and assessing the impacts of pilots based in social equity factors, implementers can build upon successes and gradually expand the program across the entire region, keeping in mind each municipality's unique conditions and goals.

Framework for MaaS Acceptance and Implementation

Drawing on stakeholder engagement, research, and case studies, we have identified the approach needed so that MaaS implementation serves the region's residents while respecting municipal goals and strategic objectives, based on the above principles.

As we considered the steps required to reach regional MaaS acceptance and implementation, the findings of our engagement reveal that in an environment of multiple transit agencies and jurisdictions, the success of MaaS hinges on the ability and willingness of a wide range of participants to come together.

While creating a new regional transportation body to oversee this process is unlikely in the context of southern Ontario, relationships between GTA transit agencies can be characterized as collaborative. There are existing ad-hoc bodies that may be well positioned to form the foundation of an intermunicipal and inter-sectoral MaaS working group.

Whether convened by an existing entity in the transportation governance space, or a neutral third party, it will be necessary to determine an approach to identifying goals and resolving conflicting interests. Such a convening body shouldn't be limited to transportation service providers and governments, but also integrate an advisory group representing various user groups, especially equity-deserving groups.

Starting point for GTA MaaS

CONVENING A **GROUP OF PARTNERS**

Municipalities Province Transit agencies Private operators Non-profits Community organizations

DEVELOPING AGREED-UPON GOALS

- Scoping problems to solve
- Inter-municipal alignment
- Inter-sectoral alignment
- Determining:
- an approach to non-traditional partnerships
- a process for integrating an equity lens, public engagement, and co-design
- a process for piloting, assessment, and iteration

ESTABLISHING A POTENTIAL FRAMEWORK FOR MAAS SUCCESS

Collaborative multi-sectoral environment Fare and regional policy integration Leveraging existing initiatives Data sharing standards Pilot projects, flexibility, and iteration Augmented public transit service delivery Improved mobility access for all communities First and last-mile connections Cost-effectiveness Regular check ins with users and providers

Case Studies

There are a few examples within North America where on-demand services or MaaS have been used to meet transit demand instead of implementing a conventional transit system.

Examining these case studies provided valuable information on how other regions have gone about making transit more accessible.

These case studies are detailed in the following sections.

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TTC Wheel-Trans's Family of Services

CITY OF TORONTO

Integrating conventional with specialized services

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3

5 Move PGH (City of Pittsburgh): Moving the dial on introducing new modes and driving equity in mobility

Pittsburgh, Pennsylvania is the first city in the US to launch a MaaS pilot program.

The City of Pittsburgh (the City) partnered with the Transit App to create an integrated trip planning and payment platform. This two-year pilot, launched in July 2021, was conducted to create a more affordable, accessible, and equitable mobility ecosystem that incorporates buses, electric bikes, mopeds, scooters, carpo<mark>olin</mark>g, and car sharing.

Infrastructure

To facilitate transfers between different modes, the City focused on creating shared mobility hubs throughout the city. Their goal is to deploy 50 hubs that physically co-locate multiple mobility options by the end of the pilot. To date, they have installed 20 hubs where passengers can view real-time information on transit service schedules and routes, identify other mobility hub locations, and determine the availability of nearby scooters, bike share, and car share options. The plan is to install 30 more hubs in the near future.

Data and technology

The City collaborated with the Transit App to develop a payment system that integrates with the app's tripplanning software. The MaaS app is called Move PGH and allows users to pay bus fares, carpool, and rent micro-mobility devices and automobiles. For now, it does not provide a flat rate per trip, however, City staff aim to introduc<mark>e t</mark>hat as part of the MaaS system.

In terms of data agreements and data sharing, Transit App allows full access to route information without a paywall.

Furthermore, the City also used open data platforms with ridership data to help plan and identify highly used stations.

Spin, a scooter share company, was at the forefront of the pilot project and worked with the City's premiere mobility operators—now known as the Pittsburgh Mobility Collective (PMC)—to integrate them into Pittsburgh's MaaS system.

The City entered into an agreement with these private operators that included exclusive rights to operate within Pittsburgh for the two-year pilot, and in return, the City did not have to pay for the program. Pittsburgh has also established data-sharing relationships with private operators who track scooter locations to ensure equitable distribution and provide ridership and utilization data from bike and scooter share, and ride-hailing programs.

Management and operations

Pittsburgh's Department of Mobility and Infrastructure (DOMI) launched the Move PGH program alongside the City's first fleet of dock-less e-scooters. The program is a public-private partnership between Pittsburgh Regional Transit and private mobility operators to build a better transportation system.

The City also partnered with a local foundation to conduct a complementary pilot program called Universal Basic Mobility. This program will cover the cost of all transportation services in the MaaS system for 100 low-income individuals for six months.

Governance

The pilot program required significant coordination with the Pennsylvania state government before its launch since e-scooters were not legalized in the state. This pilot will ultimately inform state and local policy regarding the operation of e-scooters. Coordination among other City departments was also required to manage the operation of and access to the public right-of-way including the sidewalks, curbs, streets, and bridges that comprise the roadway network. Furthermore, the DOMI was also responsible for all permitting and policy around micro- and shared mobility operators to ensure that residents and visitors have the social and economic mobility they deserve.

Finance

Move PGH was made possible by philanthropic grants from the Richard King Mellon Foundation and the World Resources Institute. The grants totalled \$700,000 USD and funded staffing and resources needed for the program.¹⁷ The City does not pay any mobility operator to operate in the City. However, Spin pays a trip fee of \$0.10 USD per scooter trip to fund the infrastructure that supports the program. Spin also invests in the Move PGH program by installing and maintaining mobility hubs which physically co-locate multiple mobility options.

Institutional practices

The Move PGH program is a public-private partnership initiated through a DOMI Request for Proposals (RFP) to form a collection of mobility operators. The City selected one mobility provider for each mode to streamline regulations, enforcement, and coordination, and leverages unique financial and infrastructure investments from mobility operators.

Pittsburgh used a less formal Memorandum of Understanding to establish commitments and expedite the process rather than legally binding contracts.

Equity and public engagement

Numerous engagement efforts were made to ensure the program serves the needs of all users. The Move PGH website and social media accounts create awareness of the program and garner feedback through online surveys. Public information sessions were conducted for community groups, advocacy groups, and other stakeholders to inform them of shared transportation benefits and to obtain feedback to help adjust the project's policy and implementation strategy. Community meetings are also held regularly to understand how the program can be specifically tailored to improve shared mobility and inform the public on taking advantage of the Move PGH resources.

The Universal Basic Mobility pilot program's subsidies will increase access to the MaaS system and drive greater equity within lower-income communities. Subsidy recipients are still being selected and researchers from Carnegie Mellon are authorized to collect the data from participants including their financial records to determine their use of services.

Furthermore, in the future, monthly surveys will be issued to participants to report their experiences. An app will be installed on their phone to assess their mobility patterns and gather information regarding their origins and destinations. The pilot will have limited participants and is not intended to help expand and sustain the project.

Innisfil Transit (Town of Innisfil): Iterative implementation of on-demand services improving the reach of transit

In 2015, the Town of Innisfil (the Town) commissioned a Transit Feasibility Study to evaluate the need for public transit and to assess the costs and benefits of a traditional bus service versus door-to-door ondemand ride sharing. The Town ultimately chose the latter for its dispersed population of 44,000 (as of the 2021 census).

Innisfil Transit was launched as a pilot in May 2017 as a public-private partnership between Uber for general trips and Barrie Taxi (now Barrie-Innisfil Taxi) for wheelchair-accessible trips. While not exactly a MaaS deployment the Town's use of a ride sharing service instead of traditional public transit is the first of its kind in Canada. The current model is a per-trip subsidy the Town provides for on-demand ride-hailing to cover a portion of the rider's fare. Riders can save \$4 travelling anywhere within the town's boundaries, where trips to and from certain hubs typically cost between \$4 to \$6.

Each year, Council has extended their existing agreements while implementing enhancements to the provided services. Since its inception, the Innisfil Transit model has been expanded to include:

- website
- Innisfil Transit rates
- health and wellness centre

Infrastructure

Uber, Barrie-Innisfil Taxi, and Driverseat operate their own vehicular fleets, and the Town pays a subsidy for each trip. Unlike traditional transit systems owned, operated, and maintained by the municipality, this model requires no municipally-borne capital or

- GoGoGrandparent, provided by GoGo Technologies, a service that allows residents without a smartphone or the ability to request their own Innisfil Transit trip to book a ride through a 24/7 toll-free number or

- A partnership with Driverseat as an additional option to request rides in wheelchair-accessible vehicles with door-to-door service at the same affordable

- The Essential Trip Assistance Program (ETAP), was implemented during the pandemic to provide vouchers for four free rides to or from grocery stores and pharmacies, as well as the local Food Bank and

- The Fair Transit Program, created to help remove financial barriers to mobility; eligible residents receive 50 percent off all Innisfil Transit rides and are exempt from the 30-ride per month limit.

maintenance as these costs still exist but for private operators.

With forecasted population growth and the planned Innisfil GO Transit rail station, Town staff identified the need to scale up Innisfil Transit to accommodate the increased demand for transit services. The Town will consider integrating other service models such as a fixed route bus system and the associated capital infrastructure costs to implement it.¹⁸

Data and technology

To access Innisfil Transit services and discounted rates, riders require a smartphone with internet access and the downloadable Uber app. To initiate a discounted ride through the app, the rider must choose the Innisfil Transit option prioritized at the top of the list. Riders then drop a pin or enter the name or address of their desired destination. Trips may then be pooled or shared among riders traveling in the same direction. Accepted payment methods include credit cards, debit, Uber gift cards, and PayPal.

For those without a smartphone, GoGo Technologies provides a 24/7 call-in service for riders to book rides through a toll-free number. Once registered, riders can book a ride with Uber using the automated phone service or by speaking to a representative. Payment for this service requires either a credit card or an Uber gift card.

The Town's access to Uber's trip data is limited and constrains staff's ability to make informed decisions affecting changes to the service. Uber does not provide raw data, citing privacy concerns, and opts to instead accept research questions and analyze the data themselves. Uber then packages its findings for the Town.

While the initial expense of establishing Innisfil Transit was not cost efficient, the view at the time was that it was better to have an option than no option. A former Town employee identified the need to implement a plan to manage a greater than expected uptake of their per-trip subsidy model, which did not exist then. The implications of unforeseen behaviour shifts, such as increased winter usage due to unfavourable driving conditions, require consideration and measurement to inform iteration.

Management and operation

As a per-trip subsidy for the on-demand transit model, the service cost to the Town increased with greater adoption and use by residents. While the service cost the Town nearly doubled that of the contemplated traditional bus service in the first year alone, later measures such as a \$1 fare increase, a monthly 30-trip cap, fiveminute wait times, automatic carpooling, and the elimination of the ETAP in 2022 have brought the operating costs of the service back within budgetary targets. Flexibility in delivering the Fair Transit Program and ETAP during the pandemic demonstrate how the model can be customized to meet specific community needs at varying times.

Research by Toronto Metropolitan University's (TMU, formerly Ryerson University) TransForm Lab in 2021 found that the current model reaches four times more riders than the considered bus routes could have served, and that 66-75% of all trips occurred outside of the contemplated bus ridership catchment area and service hours.¹⁹ Given the low-density population of Innisfil, the on-demand model has proven more cost-effective than a traditional fixed route improving mobility access for more residents across the town.

A representative of Uber stated that there is not much profit in augmenting public transit. According to a former employee of Innisfil, Uber did not make enough money on Innisfil Transit for the model to be replicated elsewhere.

Governance

The public-private partnership allowed the Town to access knowledge and expertise it did not have inhouse. Timelines also move faster on the private side. But the difference in organizational culture between the Town and Uber caused some friction. Uber had initially committed to including components in the app that, unbeknownst to the Town, were still under development and ultimately left undelivered.

Finance

Council approved \$870,000 for Innisfil Transit trips in the Town's 2022 budget. Staying within budget would not have been possible without scaling back and terminating ETAP subsidies.

The Town relies significantly on provincial funding. As part of the 2022–2023 Gas Tax Program, the town was allocated \$376,471 for use in 2022. It also received \$212,228 through the Safe Restart Agreement program to help cover the costs of revenues the Town did not collect through ETAP and the cost of research partnerships with TMU.

As of April 2022, the Town will receive a grant of \$50,000 from Infrastructure Canada to support its Transportation Master Plan. This grant provides an additional funding to the \$100,000 already approved by Council for the Transit Master Plan capital project.

The Town has accumulated nearly \$500,000 within its Gas Tax Reserve. This can be used for capital or operating transit expenditures and will be used to scale up Innisfil Transit and offset 2022 costs as needed. The upcoming transportation plans will consider the best use of funds. Staff identified that this reserve could be leveraged when applying for federal and provincial grant programs such as Infrastructure Canada's Rural Transit Solutions Fund which staff intend to apply for in 2023.

Institutional practices

Uber is currently the sole ride-hailing provider for general trips. A former Town employee felt that if there were multiple ride-hailing providers at the start, Innisfil Transit "probably would have failed" as the market did not have the economies of scale nor the number of drivers to make it work. The partnership with Uber simplified the process of launching the Innisfil Transit pilot.

As Town staff have only recommended extending the existing agreement by one year at a time, the pilot has evolved through an iterative process and will form the foundation of expanded transit service as the Town considers other service models for integration in its Transit Master Plan.

According to the April 2022 update report, the partnership with GoGo Technologies to deliver the 24/7 call-in service, "alleviated a significant amount of staff time from the Customer Service, Finance and Planning teams," which far exceeded the costs to deliver the service through GoGo.

Equity and public engagement

Mobility access

The on-demand model resulted in greater geographic the teen's driver, and access Uber's Safety Line. There mobility access over the traditional bus option. is a no front seat policy and teens can only ride alone While Innisfil Transit was never meant to support or with other teens with approval from their guardians. low-income households, there were workarounds as initially municipal Customer Service coordinated The call-in service created in partnership with GoGo accessible vehicular access and Uber bookings for Technologies improved mobility access for those those without a smartphone. The creation of the without a smartphone and internet access. When Fair Transit Program provides 50 percent discounts it was managed by staff, the hours were limited to eligible residents in households below the "Low compared to GoGo's 24/7 availability. In response to Income Cut-Off" set by Statistics Canada. Eligibility comments from those unable to use the Uber app also exempts riders from the 30-ride monthly cap and without a credit card, Uber gift cards are now available provides two free return trips from the Innisfil Food for purchase from the Town Hall front desk, local stores, Banks each month. and on Uber's website.

Riders who depend on Innisfil Transit to make more than 30 trips per month can apply to have their monthly limit increased to 50. Special attention is given to seniors, students, and those who depend on it for work.

Typically, Uber's minimum age to ride is 18 years or older. The Town partnered with Uber to pilot teen accounts for youth aged 13-17 to access discounted rates. The app adds teens to their parent or legal

guardian's Uber Family Profile. Once approved, teens can request UberX trips similar to or cheaper in price than the Innisfil Transit option.

Trips can only start when drivers enter the correct PIN set by the teens. Parents and legal guardians can livetrack the trip, receive unexpected event alerts, contact

Transit surveys

The Town conducted Innisfil Transit satisfaction surveys annually during 2019 and 2020. The results were then analyzed by TMU's TransForm Lab in 2021 as part of a partnership with the Town to study the social impacts and performance of the transit system to guide its future growth. Another round of surveying will align with the work of the Transit Master Plan.

TTC Wheel-Trans's Family of Services (City of Toronto): Integrating conventional with specialized services

Toronto Transit Commission's (TTC) Wheel-Trans is the City of Toronto's (the City) specialized transit service that provides safe, reliable and accessible transit options for persons with physical, sensory, cognitive, and mental health disabilities.

The service originally operated solely as a door-todoor on-demand service using TTC-owned accessible vehicles, and contracted services through accessible taxis and sedans.

From 2015 to 2016, total annual rides increased by 11% to 3.9 million rides. By Spring 2017, there were 41,000 active Wheel-Trans customers with 800 more applying monthly. Due to the increasing demand for accessible transit options and the limited availability of the specialized fleet, Wheel-Trans devised a program to make more efficient use of TTC bus, streetcar, and subway assets combined with initiatives to increase the accessibility of the whole transit network.

Introduced as a pilot in 2017, the Family of Services (FOS) connects Wheel-Trans customers to and from an accessible conventional fixed route service. For example, a customer will be picked up from home by a Wheel-Trans vehicle, dropped off at an accessible subway station or bus stop to board an accessible TTC vehicle, and disembark down the line at another accessible stop. They are then picked up by a second Wheel-Trans vehicle to reach their destination.

The program is currently voluntary with most users turning down FOS trips in preference for door-to-door service. FOS trips will become mandatory by 2024. City staff recognized that there have been challenges to implementing FOS as an attractive model for customers.

Infrastructure

The 2020 Wheel-Trans fleet included 125 Wheel-Trans mini-buses, 129 Wheel-Trans large vans, 335 available accessible taxis, and 2,800 sedans in the contracted services. Shared stops along FOS bus and streetcar routes are all clearly marked, comply with accessibility standards, and are equipped with stop poles. To note missed connections, blue no-show boards for Wheel-Trans connections are installed permanently to shared stop poles. By 2020, TTC had built sixteen mobility transfer hubs at eleven key locations across the City to benefit FOS users transferring between Wheel-Trans and TTC services. These are large accessible shelters designed to facilitate comfort. They are dry, well-lit, spacious enough for multiple mobility devices, and feature sensor-activated radiant heating and generous seating. Staff have identified that TTC's entire bus and streetcar fleet, and over half of the subway stations are now wheelchair and scooter friendly. Transit vehicles also feature next-stop and route announcements.

The availability of subway station elevators presents a major physical accessibility barrier. According to a former Advisory Committee on Accessible Transit (ACAT) member, many new stations currently only have one working elevator representing a single failure point that could potentially eliminate access for users requiring it. ACAT is a body of residents who provide advice and recommendations to the TTC board and staff on matters related to accessible public transit. The former ACAT member called for every subway entrance to have dual elevators.

The TTC has incorporated spaces for future secondary elevators to be built later and is working to ensure that the entire transit network is fully accessible by 2025.

Data and technology

PRESTO, Metrolinx's integrated transit payment card for the GTA, is an accepted form of payment for Wheel-Trans vehicles, contracted taxis and sedans, and conventional TTC services. Wheel-Trans trips cost the same as a regular TTC fare and include the same two-hour transfer window except for sedan trips. In 2019, complimentary PRESTO cards were distributed to Wheel-Trans customers.

To access Wheel-Trans services, users must register to create customer profiles with their medical history. Based on their physical and cognitive abilities, they will be assigned one of three eligibility categories determining their access to door-to-door transit when booking trips.

- 1. Unconditional: Always require door-to-door
- 2. Conditional: Door-to-door when identified conditions are present. When conditions are absent, they will have to take an intermodal FOS trip
- 3. Temporary: Require door-to-door for a period of less than or equal to twelve months

Users can access a self-booking website which offers trips and vehicles based on eligibility. Occasional trips can be booked seven days in advance. Users receive an automated phone call the evening before, or the morning of their trip to provide exact pick-up times, destinations, and the type of vehicle required. Users who do not receive calls can contact the RideLine number for information.

Since Wheel-Trans users were used to convenient door-to-door service, the initial rollout of the program and automated trip planning resulted in backtracking which sparked criticism and fueled a lack of adoption. Since the 2017 pilot, 5,000 accessible stops have been added to the software resulting in more direct FOS trips.

A pilot mobile app was introduced in late 2020 and tested by volunteer Wheel-Trans customers. The app is meant to book, cancel, and modify trips, view history, set notification preferences, receive messages and service alerts, provide useful resources, and track Wheel-Trans vehicles in real-time. The former ACAT member mentioned there were multiple issues with the app.

Management and operation

Budgeting constraints necessitated the creation of FOS as a cost-savings measure to meet increasing demand and comply with Access for Ontarians with Disabilities Act (AODA) requirements. Wheel-Trans only operates mini-buses and large vans. As of 2020, there were over one million FOS trips.

City staff identified that the goal of FOS is to get users to their destination in a reasonable amount of time comparable to non-Wheel-Trans users, which will naturally take longer than door-to-door. Dispatchers also monitor trips for service delays that impact conventional systems, allowing Wheel-Trans to respond accordingly.

Governance

The City prevents Wheel-Trans from using private mobility operators outside of traditional taxi services. Wheel-Trans is mandated to only use licensed sedans and accessible taxis beyond their own fleet. Taxi companies such as Beck and Co-op Cabs had bid through the regular procurement process to be included in Wheel-Trans' service offerings.

Finance

TTC subsidizes each Wheel-Trans door-to-door ride for \$30 compared to \$1 for each conventional transit trip. Wheel-Trans' gross operating budget for 2022 was greater than \$133 million constituting six percent of TTC's operating budget.

Institutional practices

In updating its customer-facing policies, Wheel-Trans conducted best practice industry reviews, consulted key stakeholders, and involved ACAT. Policies were vetted through TTC's legal team, and diversity and human rights team.

The City partnered with GIRO to implement its paratransit software, HASTUS-OnDemand (HOD), to incorporate fixed-route services into on-demand trips. While HOD features several components, Wheel-Trans uses it for automated scheduling, dispatching, and reservations for FOS. The former ACAT member heard from Wheel-Trans drivers that they must often double back between pickups and drop-offs indicating inefficiencies in the automated dispatching. While TTC's service planning group considered micro-transit strategies that involve public-private partnerships, according to Wheel-Trans staff, it never gained traction.

Equity and public engagement

Public engagement

Wheel-Trans 10-Year Strategy includes consultation with ACAT. This includes removing barriers and improving customer experiences for persons with disabilities and seniors. The engagement strategy also includes a customer mode usage survey. As part of the survey results, customers asked for service improvements, increased flexibility, expanded travel options, expanded eligibility, and modernization.

Dynamic disabilities

As FOS becomes mandatory to increase usage, there has been contention over determining eligibility categories. According to staff, eligibility categories are based on the AODA. Conditional eligibility limits door-to-door service access to certain times of the day, such as outside rush hour, during the winter, or at night. These conditions are hard-coded into the scheduling system. Accessibility advocates have pushed for considering dynamic disabilities in which one's symptoms and conditions fluctuate daily. According to another former ACAT member, it is difficult for systems to quantify these disabilities. An appeals process is in place for customers who feel they have been wrongly categorized.

Equitable access

Wheel-Trans provides free travel training and resources for registered customers who want to learn how to use TTC's conventional fixed route system. This can be done through one-on-one route training, small group training sessions, or remotely over the phone or via Skype. For those with cognitive disabilities, one-on-one training allows staff to determine if the person would be a good fit for FOS or would require unconditional eligibility for door-to-door service.

Appendix A: Engagement activities

Advisory group

Several public and private thought leaders, decisionmakers, and MaaS implementers were brought together throughout the study to provide guidance and feedback. One-on-one interviews were conducted to understand their interpretation of the MaaS concept, and the implications of current MaaSrelated initiatives, and to identify common interests.

One-on-one interviews

Additional one-on-one interviews were held with public and private entities, MaaS operators, implementers, and transportation providers to get their opinion on the concept and insights on their experiences with MaaS. The interviews were tailored to the individual interviewee and their representative organizations to delve into their unique perspective and industry experience. Interviews were also conducted to identify and explore case studies.

Stakeholder engagement

Our project team set out to study international revenue Our researchers set out to identify gaps in our existing and policy frameworks, local initiatives, and global transportation networks and characterize how these best practices to develop a common language around could be addressed through MaaS. Limited community engagement sessions were conducted with three MaaS. A stakeholder roundtable was conducted that involved public and private entities, MaaS women, three youths, and one wheelchair user to discuss transportation equity and understand how implementers, transportation network companies, micro-mobility providers, academic experts, and notequity-deserving groups in the GTA interact with existing transportation networks. for-profit organizations worldwide.

Moreover, discussions focused on governance and public-private partnerships were conducted with local participants to get an in-depth understanding of the feasibility of implementing MaaS within the GTA.

Community engagement

Based on our engagement with community members living in Toronto representing women, youth, and people with disabilities, we determined some of the challenges with using the current local and regional transit networks and how the experience could be improved through a MaaS platform.

Each community member lives in different neighbourhoods of Toronto, from the core to the inner suburbs, each with differing levels of access to conventional transit modes. We heard several stories of how residents have had to shift their lives to to accommodate to the transit schedule.

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Appendix B: Existing conditions in the GTA

Physical infrastructure and development patterns

The GTA is Canada's largest metropolitan region with a population of approximately 5.6 million people spread across 25 incorporated municipalities with varying land uses, density gradients, and their own regulations and council directions related to transportation in general, and MaaS in particular.²⁰ The City of Toronto alone has a population of approximately 2.7 million.²¹ This landscape is further complicated by fragmented transit operations, as there are ten autonomous municipal transit agencies, one provincial agency, and one regional transit service (Metrolinx) that serves the GTA. Compounded by chronic underinvestment in transit infrastructure, operators in the GTA are struggling to address other priorities.

The existence of multiple jurisdictions and diverse urban and suburban development patterns have resulted in a complex environment within the GTA for delivering mass transit solutions. Furthermore, while urban areas can be suitable for micro-mobility, suburban communities are not. There is typically a lack of infrastructure, such as bike lanes or adequate bicycle parking, coupled with complex regulations such as locking requirements for micro-mobility devices.²² Given the low-density nature of suburban areas with long distances between destinations, micro-mobility is not a viable transportation option.

Metrolinx has started developing mobility hubs that bring together public transit, shared transport, and active travel options. Metrolinx has also created Mobility Hub Guidelines to highlight the strategies and approaches applied in creating a network of 51 mobility hubs across the GTA²³ to serve as safe and convenient crossovers between transport modes.

Fare payment and trip planning

Transit agencies across the GTA have implemented the PRESTO Card payment system. It is a reloadable fare payment card that can be used on multiple transit services in the Greater Toronto and Hamilton Area and Ottawa. Some have also introduced contactless fare payments through credit or debit cards. Furthermore, Metrolinx has implemented a co-fare discount program where riders can take advantage of free local fares with their PRESTO Card when connecting to and from GO Transit rail and bus networks and most local transit agencies within the GTA.²⁴

Transit agencies within the GTA's 905 area (the municipalities outside of Toronto) have an integrated fare payment system with GO Transit that was introduced in March 2022. Riders transferring between GO Transit and the local transit agencies (apart from TTC) within the GTA can travel for free between GO Transit and the local transit agency as part of the Co-Fare Discount.

However, no single trip planning application combines all the different transportation modes and fare payment into one interface. Applications such as Moovit and Triplinx allow users to plan trips within the GTA but only provide transit options and no ability to pay directly within the apps. Moovit is a privately owned application while Triplinx is a collaborative initiative between Metrolinx and GTA transit providers. Triplinx shows the total trip cost. However, the user must pay for each part of the trip separately.

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Multi-sectorial collaboration and agreements

MaaS is a layered and interconnected system involving the public and private sectors. The public sector is essential in removing legislative barriers to MaaS implementation while the private sector can help spark innovation and develop solutions to tackle unique MaaS challenges.

The private sector can provide the significant capital needed to fund a MaaS system. Each municipality determines its transit agency's ability to consider private-public partnerships necessitating the need for enabling regulations on a municipality-tomunicipality basis.

The GTA mainly uses a conventional method of procuring infrastructure where governments direct every phase of the process, including design, construction, finance, operation, and maintenance which has been problematic and prone to risk. The federal government and numerous provinces have made efforts to promote public-private partnerships which make up approximately 10 to 20 percent of Canada's public infrastructure.²⁵ Public-private partnerships encourage improved performance and alleviate financial, construction, and political risk from the public sector.

These partnerships provide a way of bringing additional investment to public infrastructure while allowing the public sector to harness the private sector's specialized expertise to tackle complex challenges. Public-private partnerships present an opportunity for the GTA to improve its transportation infrastructure and present greater benefits than the conventional model of design-bid-build.

Management and operation

Current transit fares in the GTA are complex as they are determined by fare structures, concessions, and products that each transit agency independently sets. There are currently eleven different ways fares are determined in the GTA, with each transit service provider setting its own rules and prices.²⁶

GTA's transit fares vary based on four different categories:

- Municipal
- Municipal premium express
- Regional (GO services)
- Specialized airport link

GTA's transit fares are influenced by trip length depending upon which of the above four service categories a transit trip falls under.

These arrangements function well for many transit users, but for those transferring into and out of Toronto the cost of a double fare may be high enough to discourage transit use for these trips.²⁷ Costs can significantly increase for those who must rely on multiple transit systems to reach their destination making it a less desirable option and deterring multiagency transit travel.

However, Metrolinx is working on an integrated fare system through PRESTO to combine the GTA's fragmented fare structure into a single payment system that enables convenient and cost-effective cross-over between transit systems and municipal boundaries.

Transit authorities have also been piloting and expanding on-demand services to provide transit options in low-density areas with low demand where operating conventional transit isn't financially feasible. These initiatives resemble limited MaaS implementations in all but name using automated software and contracted private mobility providers integrated with conventional fixed-route services.

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Data and technology

The building blocks of any MaaS system are data and technology, especially for trip planning and payment integration. As central aspects of the system, data privacy and cybersecurity requirements must span all users and data across the system.

In Canada, there is a lack of data-sharing legislation especially for private operators which is key to the success of a MaaS system. Data agreements between municipalities and transportation network companies are conducted on a case-by-case basis, resulting in differing levels of municipal access to private operator-collected data.

Widespread MaaS adoption will rely on the regional communication infrastructure and real-time data availability to support planning and service delivery. While the need for a unified public sector approach to data agreements has been identified, each municipal transit agency has its perspective and councilapproved processes funded by municipal taxpayers. Settling on a template would be complicated.

Currently, Canada has the Personal Information Protection and Electronics Documents Act (PIPEDA) in place which requires organizations to obtain an individual's consent when they collect, use, or disclose that individual's personal information.²⁸ Furthermore, Canada is working on a bill to introduce Canada's New Data Privacy Law (CPPA) which would give consumers control over their data as well as promote greater transparency about how organizations use data containing personal identifiers. This will give individuals greater control over their personal data while limiting when and how third parties can use it.²⁹

Governance and finance

All regional and municipal transportation master plans mention the principles of MaaS and touch upon the concept briefly. The transit agencies in the GTA aim for seamless integration with regional modes of transit, but despite having very similar goals they are still operating independently at different scales under separate budgets, approval processes, and priorities for each agency.

Institutional practices

The principles of MaaS can be found in multiple instances in *Connecting the GGH: A Transportation Plan for the Greater Golden Horseshoe* (GGH). Moreover, it addresses the fact that rapidly advancing technologies are enabling new mobility models that transform the transportation sector's functions. It states that new models of mobility delivery models, such as ride-hailing, and e-bike services, in conjunction with infrastructure investments that support their adoption, can complement existing shared modes like public transit by making it easier to get to and from transit stations or stops and providing mobility options in areas with limited transit service.

Furthermore, all the municipal transportation master plans align with the principles of the transportation plan for the GGH, which include integrated regionwide transit, seamless connections across the region, convenient and accessible options, first and last-mile connections between stations and communities, improved service delivery, and greater access for underserved areas and communities.

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- 8 The GGH is a geographic region that spans Southern Ontario along the coast of Lake Ontario to Lake Erie in the south and Georgian Bay to the north. While the Greater Toronto Area makes up the largest part, the GGH starts at Niagara Falls, spreads southwest to the Brantford and Kitchener-Cambridge-Waterloo regions, trails north up to Barrie and then crosses east to Peterborough to cover roughly 33,500 square kilometers.

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18 In August 2022, staff identified the need to scale up Innisfil Transit to meet the transit demands of forecasted growth expected to double the population by 2051, integrate with regional GO Transit and County of Simcoe systems, and support the needs of local businesses. The current Transportation Master Plan and upcoming Transit Master Plan will consider incorporating higher capacity vehicles and other service models, such as a fixed route

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