
Autonomous Vehicles in the Greater Toronto and Hamilton Area: A Discussion on Policy and Professional Perspectives

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Foreward

As the regional transportation agency for the Greater Toronto and Hamilton Area (GTHA), Metrolinx is committed to planning, building and operating the region's rapid transit network, and creating connections that enable us to accomplish more together. With our municipal partners, we provide leadership in coordinating, financing, developing, and implementing an integrated transportation network that is multimodal and collaborative. Our work to transform the mobility of people and goods in the region is guided by The Big Move (2008), the first long-range Regional Transportation Plan (RTP) for the GTHA.

Collaborative planning enables us – Metrolinx, municipalities, transit providers and many other partners – to build upon the progress we have made since 2008. The RTP has completed a legislated review that involved extensive background research and technical analysis. The next RTP, with a 25-year outlook to 2041, is due in late-2017, and will emphasize maximizing our transportation infrastructure investments while focusing on optimizing how the network operates.

The traditional travel options available to residents for half a century are being reinvented as new mobility models and technologies emerge. These new options can bring benefits to users, but create complexity and controversy when they replace or interact with incumbent services and policy frameworks.

These new and emerging service models, autonomous and connected vehicles, and other communications technologies have the potential to influence how people and goods move around our region. The future depends on users' preferences for these services and the policy frameworks that guide the technologies' use. The GTHA has an opportunity to collaboratively develop a vision for an integrated mobility future that embraces the strengths of these new shared service models and technologies while anticipating and mitigating potential risks.

Working in collaboration with Ryerson's School of Urban and Regional Planning, we have gained a better understanding of a range of perspectives about autonomous vehicles and the potential implications for the GTHA's transportation network. The work undertaken with this team of graduate students helps enhance our collective understanding about the future opportunities and challenges of autonomous vehicles and helps inform the next RTP.

Executive Summary

Autonomous vehicles (AV) are an emerging technology that are becoming increasingly prevalent in local governments across North America, including municipalities in Ontario. As such, it is critical that provincial and municipal governments consider how AVs will influence the transportation system and plan for how best to incorporate AV technology into regional policy-making. Currently, the potential impact of AVs is uncertain, which makes planning for their future integration challenging. The increase in interest and use of AVs in cities across North America coupled with the uncertainty of the technology's impacts prompts the need for preparation, collaboration, and the development of a shared understanding of the role of the public sector in the transition to AVs.

Currently, Metrolinx is undertaking a legislated review of the Regional Transportation Plan (RTP), "The Big Move" (2008). Graduate planning students from the University of Ryerson University hosted a workshop to gather municipal stakeholder perspectives, concerns, and questions regarding the uptake of AVs in the GTHA, in order to inform policies to be considered for the next RTP, expected in late-2017.

Conversations at the workshop, led to the emergence of three major themes:

1. The need for an overarching regional vision for AVs;
2. The need for clear and consistent infrastructure planning that can positively affect the integration of AVs; and
3. Mechanisms to stay informed and disseminate AV learnings.

Eight recommendations for Metrolinx and municipal partners are proposed from the three major themes:

1. Establish a GTHA AV working group or 'hub' that provides opportunities for Metrolinx and regional and local municipalities to share insights and perspectives when developing policy and programs;
2. Implement a sustainable funding program that offers a combination of incentives and grants that municipalities would be eligible to apply for;
3. Develop a decision-making framework that clearly indicates the roles and responsibilities of each involved stakeholder, as well as, to clarify liability and legal ambiguity;
4. Establish pilot projects for hard infrastructure and supports for testing of soft infrastructure (e.g. digital resources; data collection);
5. Identify key performance indicators intended to measure outcomes associated with AV adoption;

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6. Develop standardized data collection methods and frameworks for GTHA stakeholders;
 7. Compile a shared list of resources including academic literature, industry newsletters or social media, to keep municipalities up to date with the uptake of AVs and
 8. Facilitate stakeholder capacity-building (e.g. internal training, building expertise with sharing of information) to strengthen knowledge of AVs and determine how to incorporate AV advances into municipal plans and policies.

1.0 Introduction

Autonomous vehicles (AV) are an emerging technology that may have significant implications for municipalities and transit providers. Preparing for the proliferation of AVs involves coordination among a diverse array of stakeholders, ranging from transportation planners, to automobile manufacturers, to elected officials.

AVs could have significant impacts on our regional transportation networks, yet there is considerable uncertainty about the timeline for wide-scale adoption. The public sector will play an important role in determining how AVs materialize in urban centres. There is an opportunity for governments to take a proactive approach in setting a planning and policy framework that addresses public needs during the transition to AVs. This report intends to prompt thinking and dialogue among urban planners, transportation professionals, and government practitioners, regarding potential tools and techniques to foster effective and well-informed planning and decision-making about AVs.

Fully autonomous vehicles, including cars, trucks, and buses, are guided by sensors and connected software which can take full control of the vehicle, in some cases without the need for a driver to be present (Zon, Ditta, 2016).

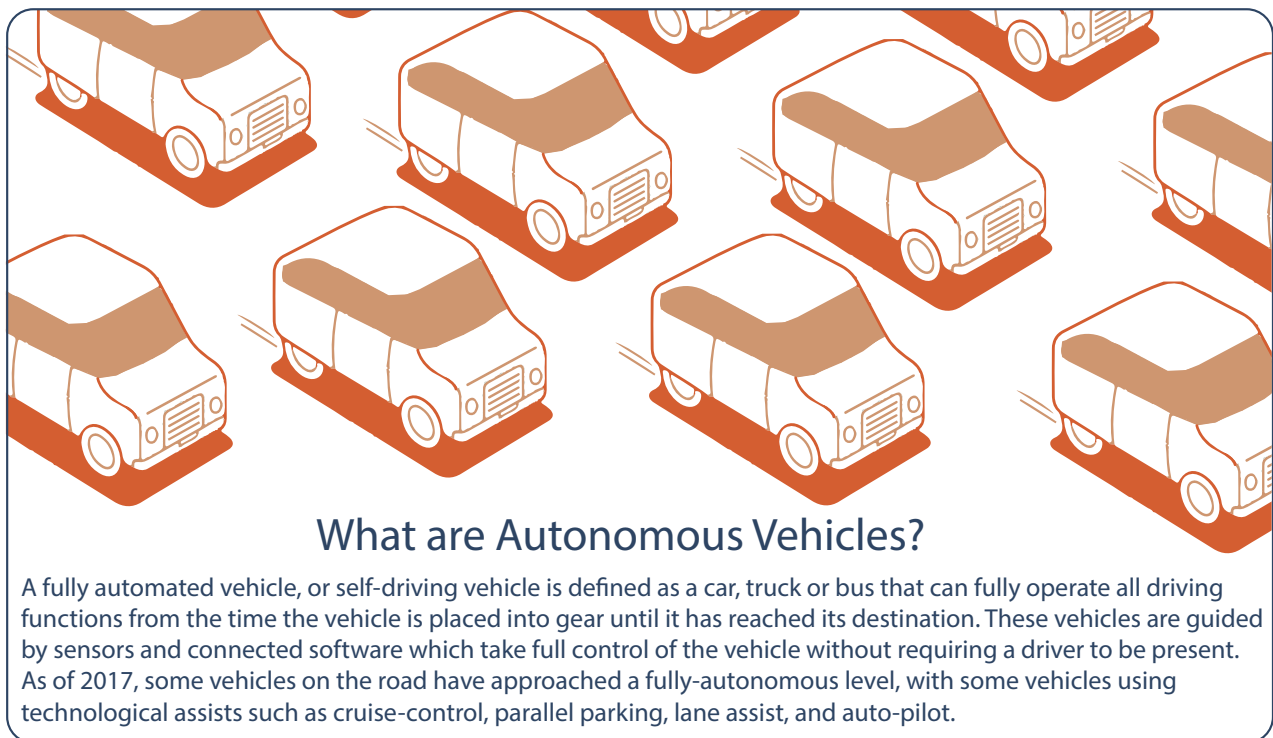


Figure 1: What are Autonomous Vehicles?

AVs are defined along a spectrum of automation ranging from integrated technological assistance (e.g. assisted cruise-control, parallel parking, and lane assist) to vehicles that can fully operate all driving functions through the course of a trip (SAE International, 2014). There are already many semi-autonomous vehicles operating on public roads. Fully-autonomous vehicles, able to accomplish all safety-critical functions, are becoming increasingly common. With Uber's driverless fleet in Pittsburgh and Arizona, Google's Waymo, vehicles from traditional automakers like Tesla and Ford, and AV testing in California, Michigan, and Ontario, fully-autonomous vehicles are becoming an increasingly anticipated reality with ensuing implications for cities and local governments.

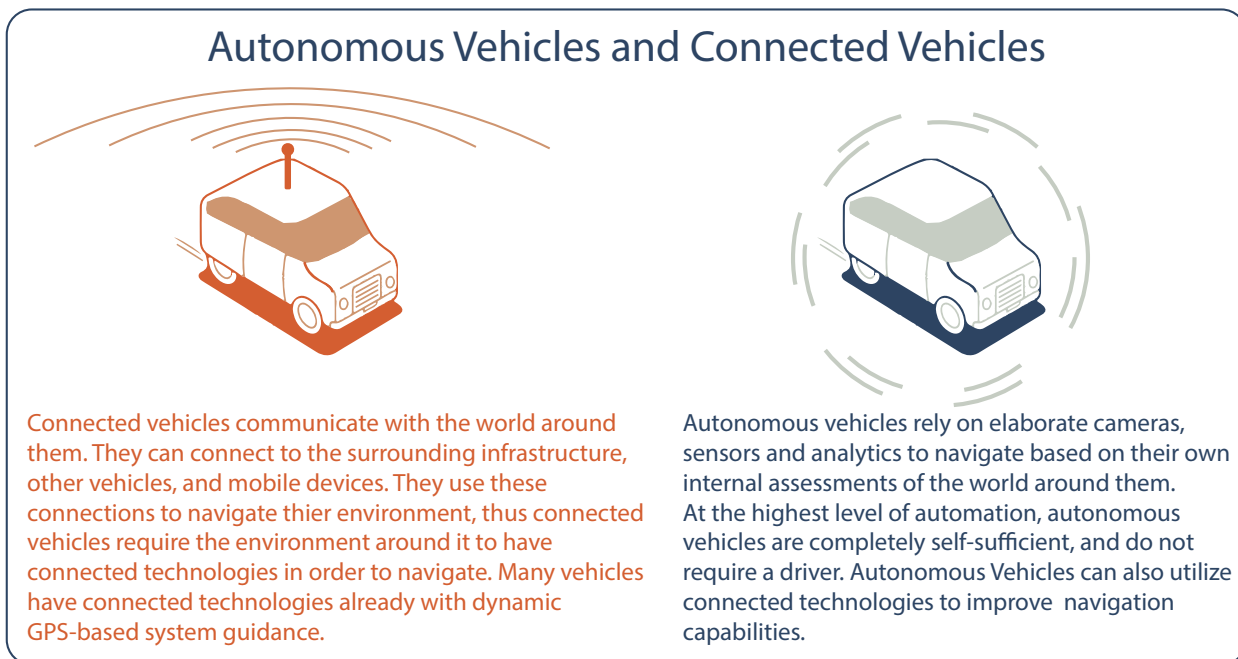


Figure 2: Autonomous and Connected Vehicles

The report is the culminating output from a workshop, Planning and Policy for Autonomous Vehicles in the GTHA, held on March 6th, 2017, with 25 municipal stakeholders from across the Greater Toronto and Hamilton Area (GTHA). Participants included urban and transportation planners, policy advisors, and engineers. Through a series of presentations and facilitated activities, the attendees explored potential policy implications of AVs in the GTHA. The workshop was led by Ryerson Graduate Students, in partnership with Metrolinx to gather stakeholder feedback and inform policies for the next Regional Transportation Plan (RTP), expected in late-2017.

2.0 Background Context

It is important to understand the various circumstances affecting the uptake of AVs. This section provides information on the levels of automation and potential implications that may arise from the advanced levels of automation. Further, this section explores various approaches to the integration of AVs in policy. An overview of the Regional Transportation Plan (RTP) and legislated review is also provided to explore the role of AVs in the various components of the RTP such as the vision, goals, opportunities, and challenges.

2.1 Different Levels of Automation

Within the scope of AVs there are multiple levels of automation, including levels that are semi-autonomous and levels that are fully autonomous. From levels 0-3 there is still a need for driver control however the burden lessens as the level of automation increases. At level 4, the vehicle software undertakes all aspects of driving responsibilities; however the driver must still be present in the vehicle. At level 5 the vehicle still undertakes all aspects of driving responsibility and a driver no longer needs to be present in the vehicle (SAE International, 2014).

SAE level	Name	Narrative Definition	Execution of Steering and Acceleration/Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System Capability (Driving Modes)
Human driver monitors the driving environment						
0	No Automation	the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems	Human driver	Human driver	Human driver	n/a
1	Driver Assistance	the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	Human driver and system	Human driver	Human driver	Some driving modes
2	Partial Automation	the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i>	System	Human driver	Human driver	Some driving modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the dynamic driving task with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i>	System	System	Human driver	Some driving modes
4	High Automation	the <i>driving mode</i> -specific performance by an automated driving system of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i>	System	System	System	Some driving modes
5	Full Automation	the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i>	System	System	System	All driving modes

Figure 3, Levels of Automation (SAE International, 2014)

2.2 Potential Implications

The uptake of AVs could lead to a variety of implications, many of which have been discussed by scholars and industry professionals through academic and grey literature. The most prevalent implications include: land use, congestion, accessibility, liability, safety, and privacy. The proliferation of AVs can potentially have positive impacts, negative impacts, mixed impacts or may not have an impact at all. These six implications are illustrated below (Figure 4), and their connections to the findings of this research will be further discussed throughout this report.

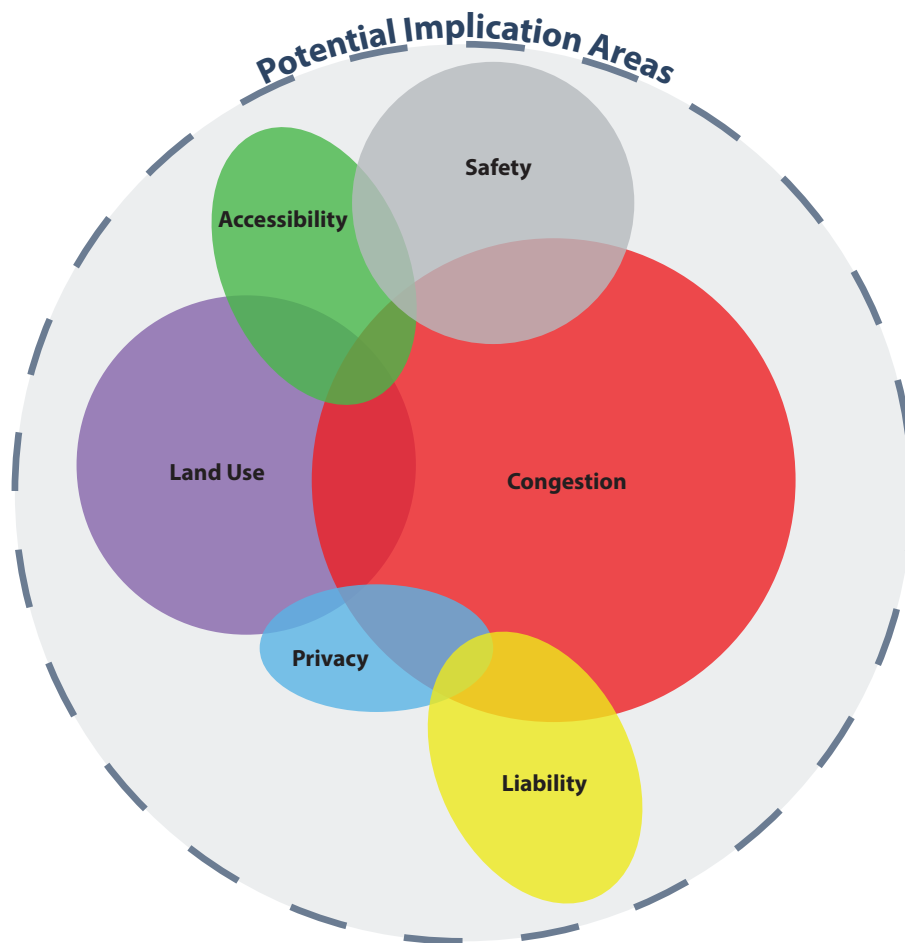


Figure 4: Implication Areas. Potential implications are elaborated upon throughout the report and colour coded according to the implication area (i.e. see Liability section in yellow on p.21)

2.3 Policy Approaches and Development

AVs, with no driver, or even a steering wheel, are in the midst of being regulated throughout Ontario. At the provincial level the Ontario Ministry of Transportation published Regulation 306/15 under the Highway Traffic Act in October 2015 (Government of Ontario, 2015). These regulations set rules that allow for AV testing pilots across the province, beginning in January 2016. To participate, interested parties must submit a formal application and ensure that a legal driver will be able to take control of the vehicle at any time (Ticoll, 2015). Further, the Government of Ontario Centres of Excellence Connected Vehicle/Automated Vehicle Program has invested almost 3 million dollars into matching fund grants to support research and development (Ticoll, 2015).

Significant progress in AV exploration and testing has been observed in the Waterloo Region. Currently, the Waterloo Centre for Automotive Research (WatCAR) has over 15 active groups and labs that are working on AV research. These projects are partially funded by the Centres of Excellence grants, and are supported by various academic, industry, and institutional partners (WatCAR, 2017). Notably, the Waterloo Autonomous Vehicle Laboratory (WAVELab) has led substantial AV research pertaining to motion planning and lane marking detection for autonomous driving (WaveLab - Research Projects, 2017).

Within the City of Toronto, the Transportation Services division led the establishment of the AV Working Group in June 2016. This working group has been supported by an array of research conducted by the University of Toronto, Ryerson University, as well as municipal stakeholder consultation. In 2017, the working group announced a work plan entitled 'Preparing for Autonomous Vehicles', which lays the groundwork to determine roles and responsibilities of various City departments during the uptake of AVs (Lanyon, 2017). The work plan transcends beyond transportation services and identifies opportunities for AV preparation within the built environment, mobility, information and data, and economic impact (Lanyon, 2017).

Additionally, the Toronto Transit Commission (TTC) released a report in March 2017 discussing the potential impacts of driverless buses within Toronto. TTC CEO Andy Byford commented that the agency should take a wait and see approach in dealing with AVs and that they would like to be a leader in using AV buses. However, the many unknowns for the TTC (and all transit providers) make addressing the potential implications of AVs a challenge (Toronto Transit Commission, 2017; Spur, 2017).

In Shared Mobility in the GTHA (2017), Metrolinx presents the opportunities and challenges of shared mobility building upon a workshop involving 80 stakeholders from 24 municipalities. In this report, shared mobility is defined as "a subset of new

mobility referring to a broad set of transportation services and business models that are shared among users including bikesharing, carsharing, micro-transit, ride-sourcing and ridesharing” (Metrolinx, 2017b, p.8.). While shared mobility is a term separate from AVs, there is future potential for the merging of AVs with shared mobility services. Shared mobility services have the potential to advance regional social, political and economic objectives such as reducing congestion, minimizing GHG emissions, and providing a more consistent transportation network. Similar to the findings, pertaining to AVs, from the workshop conducted for this report, stakeholders highlighted that coordinated regional policy is required between all levels of government to take an adaptive approach when dealing with shared mobility (Metrolinx, 2017b).

2.4 Regional Transportation Planning in the GTHA

2.4.1 Stakeholders

Regional transportation planning involves a number of government stakeholders that have distinct perspectives, overlapping priorities, and multi-faceted considerations. Metrolinx, an agency established by the provincial government, is the regional transportation agency for the GTHA. Its mandate is to “champion, develop, and implement an integrated transportation system for our region that enhances prosperity, sustainability, and quality of life” (Metrolinx, 2017a).

Ontario’s Ministry of Transportation, also has a stake in the regional transportation planning of the GTHA, but has a larger sphere of influence and is also responsible for transportation policy across Ontario. MTO aims to move “people and goods safely, efficiently, and sustainably to support a global competitive economy and a high quality of life” (Government of Ontario, 2017).

Regional and local municipalities are significant government stakeholders involved in regional transportation planning in the GTHA. While there is considerable uncertainty surrounding the uptake of AVs in the GTHA, the 6 regional and single-tier municipalities (i.e. Toronto, Hamilton, York, Halton, Durham, and Peel) and 24 local municipalities (Metrolinx, 2008) play a critical role in preparing for AVs.

Key Stakeholders

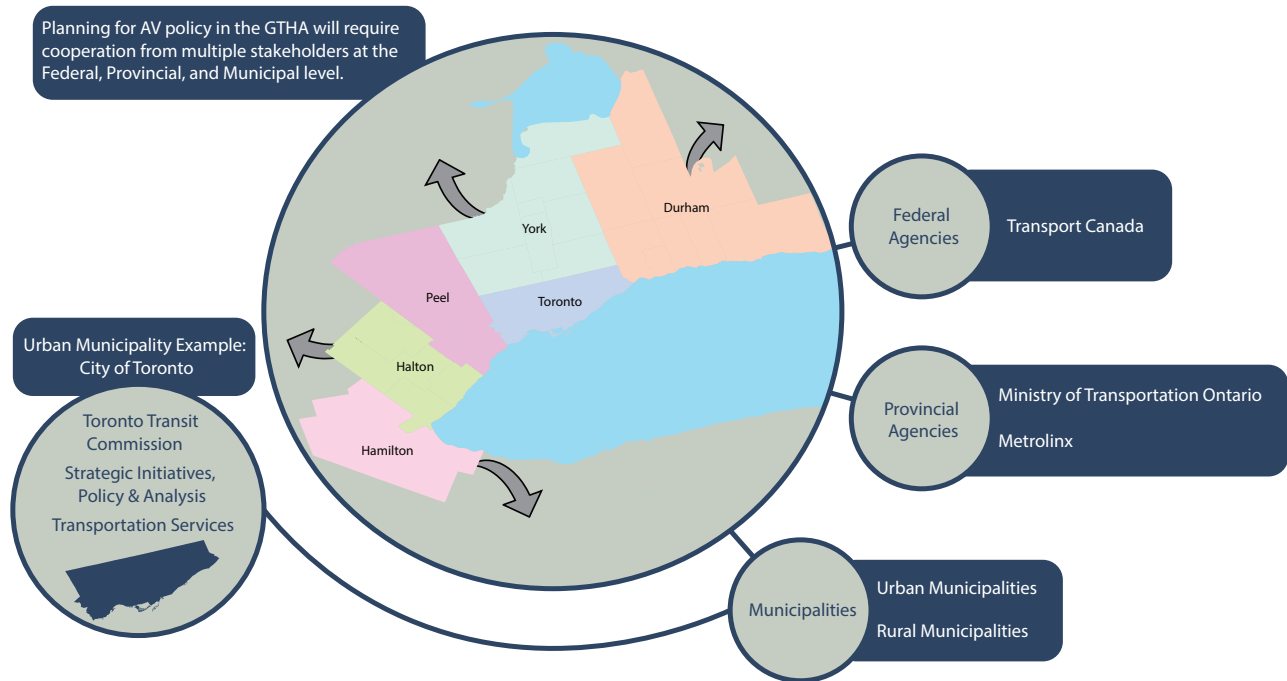


Figure 5: Key Stakeholders in Planning for AVs within the GTHA

Context-specific challenges and opportunities are important considerations among the regional and local municipalities. The municipalities in the GTHA range from highly dense urban centres, to suburban areas, to rural communities. As such, the built forms in various municipalities are diverse and result in specific considerations for each context. Regional transportation planning requires inclusion of the GTHA's diverse needs when planning for AVs. This can be achieved through extensive research and integrated coordination that considers both the implications of AVs and the differentiation among urban areas. The research and coordination would aim to develop an understanding of how AVs will influence and depend on the various built forms across the region.

In addition to built form, municipalities across the GTHA are also highly differentiated in terms of their transportation systems and services. Depending on population and resources, cities offer different levels of transit such as subway, light rail transit, bus rapid transit, cycling networks, and no public transit system. There are also differing political systems that govern and take responsibility for the transportation system of each city or region.

2.4.2 Building the Next Plan

As Metrolinx moves to develop its next Regional Transportation Plan (RTP), it intends to utilize a strong, conceptual framework that builds on the existing RTP, *The Big Move*, published in 2008. Metrolinx is developing the next RTP with strategic input from municipal leaders, key stakeholders, and the general public as well as internal technical research and analysis conducted by Metrolinx.

2.4.3 Vision

Metrolinx's future vision is as follows: "In 2041, the region's integrated transportation system will allow people to get around easily and will contribute to a high quality-of-life, a thriving, sustainable and protected environment, and a prosperous and competitive economy" (Metrolinx, 2016, p.22). To achieve this vision, the RTP proposes to:

- Offer a variety of mobility options to get around which will help contribute to a high-quality of life within the region;
- Provide modes of travel which contribute to a thriving, protected and sustainable environment; and
- Support a strong, prosperous and competitive economy by connecting people to jobs, moving goods, and delivering services efficiently.

The implementation of the RTP's vision is undertaken by municipalities – through Official Plans and Transportation Master Plans, Active Transportation Plans and other related initiatives.

2.4.4 Goals

There are six proposed goals that outline how Metrolinx intends to achieve its vision for the region, according to Metrolinx's RTP Discussion Paper (2016). These are:

- Connectivity and Convenience;
- Equity and Accessibility;
- Health, Safety, and Comfort;
- A Well-Planned Region;
- Exemplary Environmental Footprint; and
- Prosperity and Competitiveness.

2.4.5 Forward Thinking on Mobility Options

Metrolinx's RTP Discussion Paper (2016) makes specific reference to the importance of understanding and preparing for new and emerging trends for mobility. The report signals that these trends could bring benefits, yet may also introduce "controversy and complexity" (Metrolinx, 2016, p.42). For example, Metrolinx identifies the rapidly growing influence of Transportation Network Companies such as Uber and Lyft.

2.4.6 Opportunities

Metrolinx outlines the potential benefits of AVs, particularly the possibility of using AVs to help solve current first and last mile problems for GO Transit users (Metrolinx, 2016). Further, Metrolinx discusses that AVs may improve safety for vehicular drivers, pedestrians, and cyclists. An improved urban realm may be possible due to a decreased need for parking as well as improved road capacity for pedestrians and cyclists.

Suburban transit users may receive the greatest benefits of AVs, especially in low-density and rural areas where conventional transit has high operating costs. With these benefits in mind, it is extremely important to note that there are still many unknowns. The outcomes of AVs largely depends on public perceptions and ownership models (e.g. shared, private, etc) (Metrolinx, 2016).

2.4.7 Challenges

In the RTP Discussion Paper (2016), Metrolinx highlights the importance of collaboration among provincial, regional, and municipal governments, and the private sector. This collaboration aims to ensure that future new mobility technology, especially AVs and their impacts, are considered in transportation planning, modeling, and project assessment. The region's complex governance structure results in a slow response to the private sector's emergence of AVs and on-demand services. Governments will have to work collaboratively to maximize benefits at the provincial and municipal levels. This can be done through scenario planning that is informed by monitoring the progress of related technology and the impacts of pilot testing (Metrolinx, 2016).

2.5 Role of Municipalities

GTHA municipalities are also beginning to recognize the need to be proactive and prepare for AVs. Without a standardized framework or overarching regional goals, municipalities risk ceding leadership of cities and their transportation systems to the private sector. Municipalities should focus on the potential changes that might occur from the adoption of AVs and what steps can be taken to determine practical solutions. Policy documents and municipal plans, such as Transportation Master Plans and Official Plans, provide an opportunity to introduce language that is flexible and adaptable to the uncertainty of AVs. Additionally, amidst AV uncertainty and a potentially changing landscape, sunset provisions can ensure plans are refreshed as needed and remain current.

Further, by providing opportunities for residents to engage in the decision-making process, they can help develop solutions that work for people's daily lives (Anderson, 2017). As AVs will affect many different areas, it is essential to establish cross-agency cooperation between different entities and groups such as municipalities, the Province, Metrolinx, and the private sector.

3.0 Workshop Summary

3.1 Overview

On March 6th, 2017, 25 transportation professionals representing a diverse range of municipalities and entities attended the Planning and Policy Workshop for Autonomous Vehicles (the “workshop”) at the Centre for Social Innovation, Annex location in Toronto. Representatives from the Province of Ontario, Metrolinx, Regions of Peel, Durham, Halton, and York, Municipalities of Oshawa, Mississauga, Vaughan, Pickering, Milton, Burlington, Brampton, Newmarket, and the Toronto Transit Commission. Attendees were assigned to tables in advance of the workshop to ensure a diversity of regions and stakeholders were represented in each group.



Figure 6: Planning and Policy Workshop for Autonomous Vehicles

The stakeholder workshop provided an in-depth understanding of the current status of AVs within municipal and regional governments and outlined potential challenges AVs may bring to municipal and regional governments. The feedback from the workshop informs the three overarching themes that ground our recommendations. Overall, the workshop was important for developing a regional dialogue on AVs, exploring their potential challenges, opportunities, and implications for governments within the GTHA.

The workshop included 4 primary facilitation activities:

- Surfacing Issues
- Roles of Stakeholders
- Catalytic Questions
- Policy Drafting

For detailed information on the workshop agenda, presentations, activities, and participant feedback; please refer to Appendix A.



Figure 7: March 6, 2017 Workshop at CSI Annex

4.0 Breakdown of Surfacing Issues

The following represents the most significant issues raised during the surfacing issues exercise at the workshop. Attendees were asked what key planning issues related to AVs would impact their work. Figure 6 indicates the issues that are most pertinent for attendees. The words in a larger font were expressed by stakeholders more frequently, while the smaller words were only mentioned once or twice

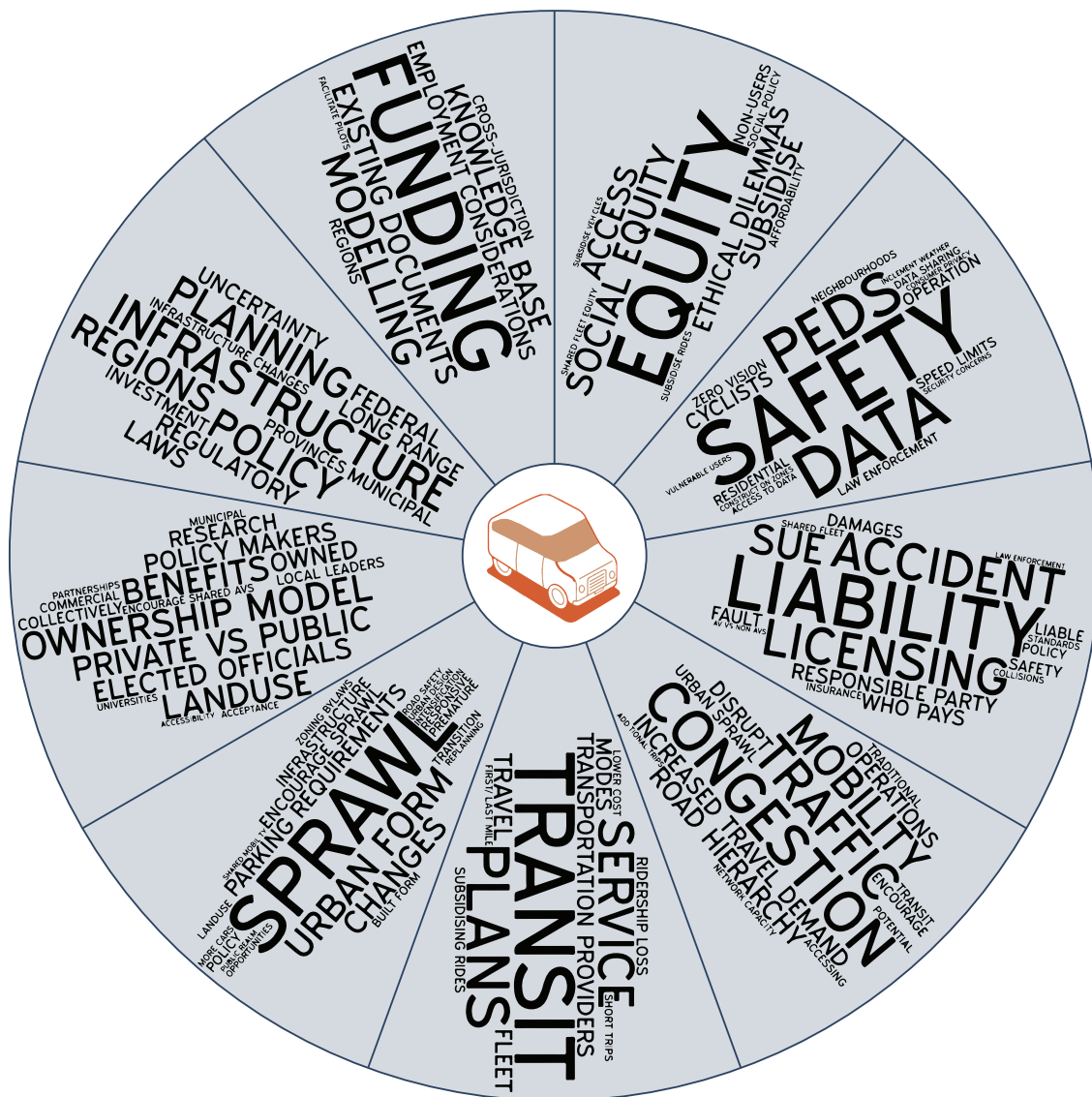


Figure 8: Surfacing Issues Results

5.0 Who's Involved?

During the 'Roles of Stakeholders' exercise, attendees envisioned the following roles for stakeholders involved in AV planning across the GTHA (Figure 9). The importance of each role, as determined by the attendees of the workshop, is denoted by the small circles beside each responsibility. The circles next to each role reflect the number of times in which that responsibility was mentioned by attendees.

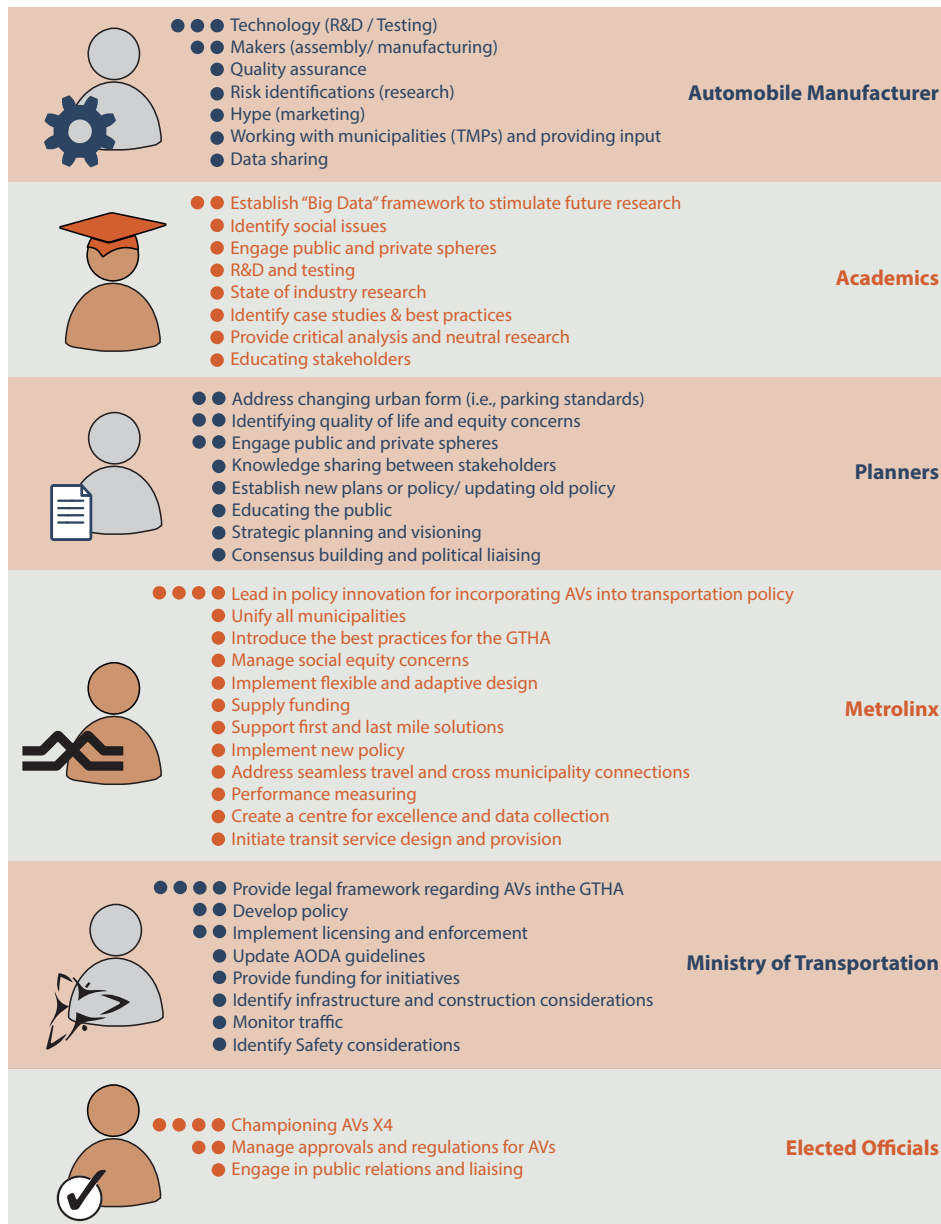


Figure 9: Roles of Stakeholders Results

Additionally, the attendees identified additional stakeholders and described their potential role in planning for AVs across the GTHA which can be found below in Figure 10.

Insurance Companies	Partner with policy makers and government to develop insurance and liability laws
Independent Transit Authorities & Fleet Management	Provide insight when it comes to implementation of transit related policies AV vehicle and fleet management Handle licensing Issues
Transport Canada	Develop policy and regulations Develop safety standards Provide funding for initiatives
Federal Government	Funding Safety Standards
Engineers	Design and build effective infrastructures
Law Enforcement	Enforce new laws related to AVs
Goods Movement	Early adoption candidate
Private Partners & Developers	Provide capital investments Private infrastructure installation (fiber optics, private parking etc...)
Tech Firms	Engage in R&D with manufacturers




Figure 10: Roles of Stakeholders Additional Results

6.0 Analysis and Areas for Consideration

The following section reflects the professional perspectives of the diverse stakeholders who attended the day-long workshop discussing the integration of AVs into planning and policymaking across the GTHA. Prior to participating in this workshop, the majority of attendees noted that they had low to moderate knowledge of AVs. As such, the activities and presentations throughout the day had significant impact on shaping the attendees understanding of how AVs will affect municipalities in the GTHA.

The following catalytic questions were used to engage attendees in discussion at the workshop and have informed the development of the analysis in this report:

1. What might your municipality need from the RTP to assist in planning for AVs?
2. How might AVs influence, accommodate, or support future transit and transportation master plans in relation to first and last mile problems?
3. What liability issues shape your willingness to manage AV use?
4. What planning, educational, or technological tools and initiatives might planning and transportation professionals use to help ensure that non-users are safe during the uptake of AVs?

Building on the analysis of all activities and feedback collected throughout the day, the results have been categorized into three overarching themes:

- The need for an overarching regional vision for AVs;
- The need for clear and consistent infrastructure planning that can positively affect the integration of AVs; and
- Mechanisms to stay informed and disseminate AV learnings.

Each theme includes explanations based on attendee notes, comments, and feedback from the workshop. Further, this information has informed the development of eight key recommendations pertaining to this topic (**see Section 7**).

6.1. Setting a Regional Vision for Autonomous Vehicles

A clear regional vision is needed when considering the adoption and integration of AVs into regional policymaking, to ensure the GTHA progresses towards a sustainable future, with transportation networks reflective of desired norms, values, and behaviour. There is an opportunity for Metrolinx to provide this vision through the Regional Transportation Plan (RTP), with support from the Province of Ontario Ministry of Transportation (MTO), single and upper-tier regional municipalities, and local municipalities. Workshop attendees indicated that this regional vision should address five distinct topics:



1. Establishing a direction for AVs through policy;
2. Establish leadership from senior levels of government in AV policymaking;
3. Identifying roles and responsibilities of involved stakeholders;
4. Facilitating cross-jurisdictional collaboration; and
5. Providing financial support for implementation

Workshop comments on topics involving a regional vision for AVs are summarized as follows:

6.1.1 Establish a Direction for AVs in the GTHA Through Policy

A recurring theme throughout the workshop was the critical need for an established policy direction to help guide municipalities through the process of understanding and adopting AVs. Workshop attendees stated that this should come from Metrolinx and MTO, in an attempt to unify all regional and local municipalities under one policy direction. As explored here and in section 6.2.2, the policy direction should be consistent, strong, relevant, and collaborative across the GTHA.

- Proposed policy direction should work seamlessly between existing Metrolinx and MTO policies.
- Policy should clearly indicate the preferred type of ownership model, so that municipalities can follow suit and take supporting actions. If a shared model is preferred, policies should encourage AV adoption; however, if the private ownership model is preferred, policies and actions would require more regulatory powers.

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- Policy needs to strongly indicate the desired future of transportation in the GTHA, and clearly define how that can be accomplished, as well as what actions will be taken in an occurrence of AV system failure.
 - Attendees stressed the importance of creating new opportunities for regional and municipal stakeholder input when shaping these policies. Collaboration among GTHA regions and municipalities helps to ensure that policy direction is consistent, contains the appropriate educational components, and considers the different priorities of all regional and local municipalities.

6.1.2 Leadership from Senior Levels of Government

Several attendees noted the importance of leadership from senior levels of government for integration of AVs into transportation policy making to reduce disjointed policies, provide guidance, negotiate priorities, and deal with conflicts of interest across municipalities. Further, the provincial government was repeatedly identified as an important stakeholder to direct policy, as they have ongoing research agreements with universities and have greater authority in areas such as legal frameworks, insurance, vehicle standards, and licensing.

- Attendees stated that Metrolinx and MTO should develop and enforce the vision in the RTP.
- The role of the Province includes implementing the vision, accounting for the unique needs and perspectives of each municipality, developing provincial and regional regulations, acting as a provider, and understanding the context-specific impact of AVs on other modes of transportation when supporting municipalities.
- The role of municipalities includes implementing policy direction, using consistent language in policy and planning documents, and expressing their local needs.

6.1.3 Identify Roles and Responsibilities

Identification of roles and responsibilities of many multi-tier stakeholders is critical for effective planning. The workshop attendees stressed the importance of matching stakeholder roles with the correct responsibilities. For instance, one table of attendees stated that the municipalities should be tasked with implementing AV infrastructure, however they should not be developing policy. This idea was further expressed with other attendees asserting that supportive policy needs to come from multiple entities – however the overarching policy goals should be directed by the Province and Metrolinx.

- There was an expressed need for identifying which levels of governments would influence development of automation technology and regulations, and be responsible for demanding reporting and crash data. Further, a framework would need to be created that

indicates who is able to make each decision.

- Regarding liability, there was concern for who is responsible in the result of an AV crash. Attendees pointed to multiple factors, including: software failure, vehicle failure, and human error; and concluded that high-level policy should be tasked with allocating legal responsibility. This proposed high-level policy, designed to clarify roles and responsibilities, would set expectations in guiding who is at fault, and then placing responsibility on certain entities.
- According to workshop attendees, municipalities should be responsible for tackling challenges in implementing and enforcing these new regulations.

6.1.4 Cross-Jurisdictional Collaboration

Cross-jurisdictional planning and collaboration was noted as a common theme throughout the entire workshop. When discussing the RTP, attendees pointed to the importance of policy supporting the development of cross-jurisdictional coordination through either working groups or planning efforts. This level of coordination would provide opportunities to enable regional and inter-municipal comparison, build an understanding for uniformity in language and planning, develop consistent physical infrastructure between regions, and identify cross-jurisdictional liability (**see 6.3.2 Knowledge Sharing**).

- Workshop attendees expressed that cross-jurisdictional collaboration cannot be initiated or led by the regional and local municipalities, but rather, should be spearheaded by Metrolinx or MTO.
- Cross-jurisdictional planning should be flexible to accommodate adjacent areas including Niagara Region and Waterloo-Wellington Region.

Potential Implication: Liability

Traditionally, liability for automobile collisions has been associated with user error. When thinking about liability in relation to AVs it becomes more speculative in nature. There is the possibility for liability to shift a great deal or not at all. The scope of who is liable may be broadened; will it be the owner, the operator, or the manufacturer of the vehicle? (Lari, et al., 2015). Depending on who is or who can be liable, the implementation of AVs will be affected. For example, if automobile manufacturers are liable, the production of AVs may slow down (Anderson, et al., 2014). If municipalities are liable for adapting infrastructure, they may be more hesitant to encourage AVs.

6.1.5 Need for Financial Support During Implementation

Attendees expressed a need for proposed AV policy to be connected with a sustainable and predictable funding source. When participating in the 'Roles of Stakeholders' activity, attendees believed that funding should be allocated to municipalities by three primary sources: Metrolinx, MTO, and Transport Canada. Further, attendees discussed that financial support would be helpful if it was offered in two formats: incentives and grants. With each municipality at different stages in preparing for AVs, this two-system financing option is adaptive in providing the appropriate funding for each area's context-specific needs.

- Incentives: meant to encourage municipalities to explore new technology, consider adopting AVs, promote them throughout their municipal departments, and conduct pilot projects.
- Grants: meant to assist municipalities with implementing hard and soft AV infrastructure, AV programs, and working groups. Attendees noted the grant system should be targeted towards municipalities who are preparing for experimentation or implementation of AVs.
- Attendees stated that municipalities should not have to pay for research and development for policy- and decision-making, as it should remain the financial responsibility of the provincial government.

6.2. Experimentative Infrastructure for Uncertainty

Attendees identified the need for clear, consistent, and implementable hard and soft infrastructure that accommodates and facilitates the integration of AVs. A surfacing issue identified during the workshop was the uncertainty for long range planning and infrastructure investment decisions. Attendees asked, "how do we modify tools we're using now to account for AVs"? This question has significance given the unpredictability and varying repercussions that may arise during the uptake of AVs (Metrolinx, 2016). To answer this question, the experimentative infrastructure for uncertainty theme is organized into five categories:

1. Consistency of hard infrastructure across jurisdictions;
2. Clear, robust policies;
3. Technological infrastructure;
4. Data collection framework; and
5. Testing strategies.

Comments from the workshop related to the topics involving experimentative infrastructure for uncertainty are summarized as follows:

6.2.1 Cross-Jurisdictional Consistency of Hard Infrastructure

Attendees highlighted the desire for a process of infrastructure planning, standardization, and clarity to ensure consistency of hard infrastructure across jurisdictions. It was suggested that designated AV areas, networks, and corridors with corresponding public awareness campaigns be considered (**see theme Learning and Information Provision**).



Attendees also identified a number of considerations pertaining to hard infrastructure, including: **adaptive reuse of parking, first-and last-mile infrastructure, and changes to the road network as a result of the more consistent speeds of AVs**. While attendees stressed the need for consistency and standards, they also noted that certain infrastructure is differentiated across the GTHA due to various contextual factors. It is important to consider where case by case decision-making is applicable.

- Attendees noted a need for new municipal construction, maintenance, signage and transit standards. A primary concern in the development of these standards is determining who will be responsible. For instance, if MTO sets different standards for road design across regions, will AVs be aware of these differentiations, could this result in complications for the integration of AVs, and who would be liable for any inconsistencies?
- Attendees noted a number of hard infrastructure issues when considering AVs, including:
 - The disruption of the traditional road hierarchy (e.g. encouraging increased traffic on local and collector roads);
 - Impacts on road network capacity;
 - The effects of AVs on urban sprawl and whether they will increase congestion; and
 - The repercussions of AVs on other travel modes (e.g. active transportation; public transit).
- Standardization is a key takeaway from the stakeholder engagement workshop and transcends other categories in this theme (**see 6.2.4 data collection framework**).

Standardization is a key takeaway from the stakeholder engagement workshop and transcends other categories in this theme as well (see 6.2.4 data collection framework).

Potential Implication: Congestion

The impacts of AVs on congestion are unclear and there is much disagreement on this issue. Some suggest that road capacity will be increased because of the potential for platooning (vehicles travelling much closer together) and the benefit of increased efficiency due to the removal of human response time (Anderson, et al., 2014). AVs could reduce congestion if the introduction of shared autonomous vehicles (SAVs) is combined with a high efficiency public transit system. The combination of SAVs and public transit could eliminate up to 65% of vehicles during rush hour (International Transport Forum, 2015). Alternatively, some suggest AV technology may increase congestion.

Some suggest that AVs may induce more vehicle travel due to the lower burden of driving. The attractiveness of being able to engage in other activities such as work or leisure while traveling may incentivize people accept a longer commute. This may contribute to a greater total VKT (vehicle kilometers travelled). People who are unable to drive a conventional vehicle may make more trips by car than before, thanks to AV technology (Anderson, et al., 2014).

6.2.2 Strong, Clear, and Coherent Policies

Robust, clear policies that direct the conversation and reflect the vision set by Metrolinx and the Province of Ontario was a prominent soft infrastructure topic discussed throughout the workshop. Soft infrastructure can be defined as services which include government programs, policy documents, planning frameworks, and legislation. Several surfacing issues highlighted policies, regulatory frameworks, and differing policies among regions and provinces.

Attendees identified the need for strong policies to encourage desired behaviour and action. Clear policies are useful particularly for the integration of AVs with other modes of transportation currently established, such as public transit. Policies can also establish and allocate legal responsibility for the hard infrastructure established or modified in response to the uptake of AVs. Attendees drew attention to the language used in policy-making plans such as Transportation Master Plans, noting that it should not be restrictive and should include the ability for performance measures (**see section 6.2.4: Data Collection Framework**).

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- Attendees noted that changes will need to be made to the Places to Grow Act, Growth Plan for the Greater Golden Horseshoe, and Greenbelt Act. AV policy needs to have a large scope extending beyond the GTHA. Further, all levels of policy need to be integrated and consistent, including Official Plans and Transportation Master Plans.
 - Policy should consider the distinction between rural and urban areas throughout the GTHA – ensuring that the consistent policy is flexible enough to account for contextual needs. The policy could be supplemented by a spatial map that indicates where AV infrastructure has been built and where they are permitted, and conversely, where they are not permitted. This also pertains to Theme 3: Learning and Information Provision, **section 6.3.3 Civic Technology**.
 - Attendees stressed the importance of establishing policies at multiple levels of government that: use consistent language, have similar forms of measurement, and strive for similar outcomes so that each new initiative generates comparable data and is not ‘reinventing the wheel’.
 - Attendees noted that AV policies should support good planning principles associated with land use, public health, safety, social equity, etc. Policies should be flexible to aid planning efforts during the transition.
 - The need for bylaws and regulations related to infrastructure transformations was repeatedly identified by attendees. For instance, the standardized licensing for rideshare and taxis was identified, noting that Uber does not differentiate between users in Toronto, Aurora, or other jurisdictions across the GTHA.

Potential Implication: Land Use

AV technologies could present significant impacts on land use planning. They may have either positive or negative effects, or no effect at all depending on various factors including ownership models, adoption rate, or contextual circumstances.

For instance, AVs could impact land use through a reduced need for parking. This could affect both present and future land use. Parking that currently exists can be re-purposed and more space could be created for intensification (Anderson et al, 2014). With future land uses, parking could dictate where development occurs. Development areas where parking is reduced may provide an incentive to developers due to the decreased economic burdens of development.

AVs may also have negative effects on land use. The potential for ‘drivers’ to multi-task while traveling in AVs, may result in people choosing to live further away from their place of work. This could eventually lead to urban sprawl and the creation of more low-density neighbourhoods (Anderson, et al., 2014).

6.2.3 Technological Infrastructure

Opportunities exist for the development of digital and electronic infrastructure, able to account for the uncertain implications that will result from the transition and adoption of AVs.

- Digital resource centres were identified as a tool that planning and transportation professionals could use to advance AVs as a mobility as a service system.
- Attendees proposed the development of mobile or web-based applications that incorporate all AV transit providers. The applications would consolidate all of the transit information on the same platform available for users to determine the best route across multiple modes of travel (e.g. Uber, public transit, private vehicles, etc).

6.2.4 Data Collection Framework

A data collection framework was a key priority noted by attendees. In response to concerns of data sharing, availability, and accessibility, a data collection framework incorporates the need for standardization that allows for comparability, interoperability, and performance measuring. A standardized data collection framework, that is employed across the GTHA and includes performance measuring and modelling future impacts, could inform Metrolinx investments and provide opportunities for collaboration between municipalities and regions. Metrolinx has a role to play in performance measurement and the development of the data collection framework. Attendees also noted that additional data needs to be available to stakeholders, extending beyond what is presently collected.

Attendees noted the following responsibilities or direction for Metrolinx to employ in promoting a standard data collection framework across the GTHA:

- Attendees noted the following responsibilities or direction for Metrolinx to employ in promoting a standard data collection framework across the GTHA:
 - Set a direction in the RTP giving the regions orders or guidelines on what to collect;
 - Facilitate routine data collection and routine publishing (e.g. census); and
 - Encourage local ownership of data collection.
- Attendees agreed that a standard format for data is needed and asked the following questions:
 - How can we set up a common data collection framework that everyone can use? And to what extent is it open?
 - How can we modify current data tools to collect better and new data?
 - How can the data be accessed by different municipalities and to what degree is the data aggregated?

-
- How can we set up a common data collection framework that everyone can use? And to what extent is it open?
 - How can we modify current data tools to collect better and new data?
 - How can the data be accessed by different municipalities and to what degree is the data aggregated?

Potential Implication: Privacy

The potential connected nature of AVs will generate vast amounts of data, including: operator's travel habits, GPS locations, speed, traffic, weather/road conditions, and behaviour of other road users (Lari, et al., 2015). One problem that could occur with the mass collection of personal data is potential security breaches (Lawson, n.d.). Alternatively, this data could be used to benefit entities such as municipalities (Zon, Ditta, 2016). To combat these two opposing objectives it may be useful to create policies to protect users and specify access to this data.

6.2.5. Testing Strategies

Attendees noted that the transition to AVs seems 'pie in the sky' right now, and that tangible demonstrations, case studies, and proposed pilots would be helpful. These could be incorporated in the RTP to capture the reader's interest, as well as demonstrating what municipalities could potentially do. In potential pilot project discussions, attendees mentioned designated areas and AV-only corridors to increase control, monitor, collect data, and identify innovative opportunities given that regions and municipalities could be the ones testing, rather than responding. Pilot projects and testing strategies are significant considerations moving forward during the uptake of AVs in the GTHA.

- Piloting and testing strategies are tools for flexibility and adaptability. Participants alluded to the GTHA acting as a leader in piloting AVs and noted Metrolinx as having a role to play in considerations for flexible and adaptive design. Automobile manufacturers also have a role to play in testing through technology research and development; as do academics. Goods movement was also noted as having a role to play in early adoption. Throughout the stakeholder engagement workshop, participants submitted additional questions and comments. Two of which built upon the considerations of developing pilots in the GTHA:
 - Metrolinx expressed interest in piloting a "transportation as a service" project. That is certainly the "future" of transportation, but how will Metrolinx go about planning such a pilot, and how can local municipalities and private parties be a part of it?
 - How does a municipality go about participating in a co-study with Metrolinx?

6.3. Learning and Information Provision

Attendees expressed a keen desire to learn about and to stay informed on AVs. At the beginning of the workshop, half of the attendees expressed that they had low knowledge of AVs, and many of the remaining attendees had only moderate knowledge; demonstrating how education could have a significant role to inform municipalities and the general public. For municipalities, attendees noted that language is critically important. As such, it would be beneficial for the RTP to have definitions of AVs and break down the differences between ownership models (for example, shared vs. private use and ownership).



Attendees also noted stakeholder capacity building as key component to preparing for the uptake of AVs. For instance, there is a need for capacity building within law enforcement so that policies created for the use of AVs are effectively enforced. The learning and information provision theme is separated into three different categories:

1. Education;
2. Knowledge sharing; and
3. Civic technology.

Comments from the workshop related to the topics involving learning and information provision are summarized as follows:

6.3.1 Education

With the rapid emergence of AVs and their possible impacts, education plays a role in informing municipalities and the public on the topic, its progress, and its possible implications. Attendees noted that an educational component should be introduced through policy, expressing the importance of public education to ensure that all stakeholders have the same level of understanding. During the Roles of Stakeholders activity, attendees noted that academics and planners could play a role in educating the public about AVs. Education was not only discussed by attendees, but also by a panelist who encouraged stakeholders to stay informed and subsequently develop expertise on AVs.

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- Attendees identified different educational tools throughout the workshop that could provide information on AVs, including: provincial campaigns (e.g. distracted driving commercials to raise public awareness about AV safety); public service announcements; education campaigns; Youtube videos; websites; and digital resource centres (see 6.2.3 for more information).
 - Questions were raised by attendees about the impacts of AVs on safety and liability. The questions pertained to information provision, including: What portion of the population presently uses public transportation as opposed to cars?; What is safety in the context of AVs?; Who is at fault?; Do bikes have to be connected? How will this affect liability?; and How could non-users understand liability?
 - These questions highlighted during the workshop demonstrate an inconsistent understanding of AVs and the corresponding repercussions for stakeholders. Therefore, education could play a role in providing people with general definitions, answering what are AVs and what are the possible implications resulting from their uptake.

Potential Implication: Safety

According to the World Health Organization (2013), traffic accidents were the leading cause of death among young adults between 15–29 years of age, and the second-highest cause of death for children between 5–14 years of age. Human error accounts for 93% of vehicle collisions today (Hulli, 2016). Around 2,000 Canadians lose their lives every year in a vehicle accident (Zon, Ditta, 2016). Many are optimistic that AVs will have the potential to greatly improve safety for all road users including drivers, passengers, pedestrians, and cyclists. However, in part this may be dependent on market penetration. Fagnant and Kockelman (2014) project that at 10% of market penetration, fully automated vehicles will provide a 50% reduction in crashes and injuries. It is predicted that a 90% market penetration may achieve a 90% reduction in collisions (Ticoll, 2015).

6.3.2 Knowledge Sharing

Municipalities across the province have many differences. Not only are they different by size, location, and built form, attendees also noted that each have differing laws, norms, and citizen behaviour. For AVs to have a more positive impact across the Province, these differences need to be known. Attendees discussed that different stakeholders, including municipal officials working in various sectors (such as policy planning, transportation planning, and engineering), government officials, academics and so on, should be given the opportunity to collaborate and share their thoughts, concerns, and expertise on AVs and how they could potentially affect their work and impact their municipalities. During

the 'Roles of Stakeholders' activity, attendees noted that planners should play a role in knowledge sharing.

- Attendees noted that the RTP should consider “regional input from all stakeholders”, and suggested this be done through workshops or training sessions. Further, Metrolinx should share examples of best practices with stakeholders. They also noted that academics could do this in addition to conducting case studies.
- Attendees noted the importance of “understanding unique risks of cities”, as different laws and norms exist. For example, they noted that although AVs may recognize pedestrians, they may not recognize when a door is opening on a street car. In a city that does not have a street car, there would be no issue; however, in a city with street cars like the Toronto this could be a hazard.
- Attendees also noted that there should be federal regulations in place so that AVs operate the same way. If AVs were to operate differently in Ontario than they would in Manitoba, it could be difficult for non-users to predict how AVs would react to certain situations.

6.3.3 Civic Technology

Attendees indicated different tools to keep people informed about AVs, including digital apps on smartphones, digital maps highlighting areas where AVs would be permitted, such as AV-only zones, and websites. The digital app was the most recurring tool identified by attendees and panelists.

- Attendees felt that all transit providers should be incorporated into a single digital app, to provide users with different options on how they could get to their final destination.
- Attendees discussed a “mobility as an app service”, which would allow AVs and public transportation to be used together, providing better mobility.
- A panelist also expressed the possibility of a digital app that could allow users to choose any mode of transportation, which could be beneficial to people’s health and to the environment.
- Attendees also noted that digital apps could be used for awareness purposes. It could be used to alert AVs when pedestrians or cyclists are nearby, for additional safety.

Potential Implication: Accessibility

AVs could increase mobility for classes of people who were previously unable to operate motor vehicles, including children, senior citizens and people with a disability (Zon, Ditta, 2016). If regulation allows, these populations will essentially have the same abilities as those who have access to a motor vehicle, thereby improving accessibility to transportation. A potential challenge for policy makers will be how to increase accessibility, while continuing to ensure safety (Zon, Ditta, 2016). Although increasing mobility for people who currently do not have a full driver’s license would be beneficial, it is also important to ensure that it is safe for them to be alone in an AV.

7.0 Recommendations and Areas of Opportunity

The recommendations are a mix of conceptual and concrete strategies and initiatives. Each recommendation proposes responsibility for both the development and implementation of the strategy or initiative.



Conceptual recommendations incorporate the overarching thinking and norms and values surrounding the proliferation of AVs asking, 'what do we want AVs to do for us'

Concrete recommendations are implementation strategies and on the ground actionable items, such as planning documents, programs, and specificities for roles and responsibilities of stakeholders.

The recommendations derived from each theme are found below:

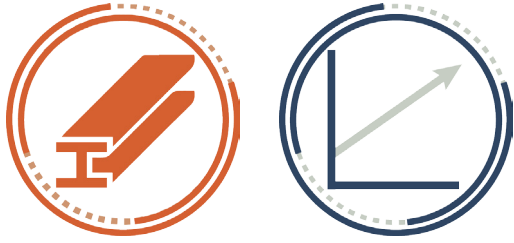


Recommendation # 1

What: Establish a GTHA AV working group or 'hub' that provides opportunities for Metrolinx, regional and local municipalities to share insights and perspectives when developing policy and programs.

Who: Metrolinx would coordinate the creation of the working group.

Theme: Vision

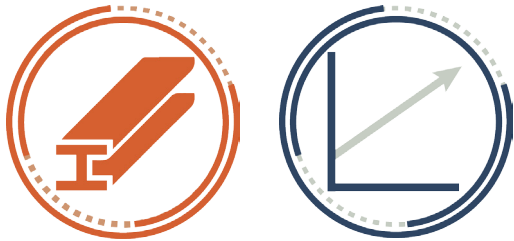


Recommendation # 2

What: Implement a sustainable funding program that offers a combination of incentives and grants that municipalities would be eligible to apply for.

Who: The Province of Ontario would develop the sustainable funding program while Metrolinx would encourage the funding program through the Regional Transportation Plan.

Theme: Vision



Recommendation # 3

What: Develop a decision-making framework that clearly indicates the roles and responsibilities of each involved stakeholder, and reduce liability and legal ambiguity.

Who: In order to have one central, shared vision, this recommendation requires a collaborative process between the Province of Ontario and Metrolinx with active communication to regional and local municipalities. The decision-making framework could be highlighted in the Regional Transportation Plan with supplementary detailed documents further clarifying what the framework entails.

Theme: Vision



Recommendation # 4

What: Establish pilot projects for hard infrastructure and support for testing of soft infrastructure (e.g. digital resources; data collection).

Who: Pilot projects are currently being facilitated by the Ministry of Transportation (Government of Ontario, 2015). Metrolinx could help coordinate the development of pilot projects and support for testing in partnership with MTO as well as the GTHA AV working group. There could also be a supplementary document or appendix of the Regional Transportation Plan that provides inspiration for potential pilot projects noting precedents in North America and Ontario, where applicable, and proposing how pilot projects for AVs could unfold in the GTHA.

Theme: Experimentative Infrastructure for Uncertainty



Recommendation # 5

What: Identify key performance indicators intended to measure outcomes associated with AV adoption.

Who: The key performance indicators could be outlined by Metrolinx in the Regional Transportation Plan. This recommendation requires coordination with MTO as well as regional and local municipalities to ensure that the key performance indicators are effective and feasible. As such, the GTHA AV working group could develop the list of indicators to measure AV impacts and outcomes.

Theme: Experimentative Infrastructure for Uncertainty



Recommendation # 6

What: Develop standardized data collection methods and frameworks for GTHA stakeholders.

Who: Similar to recommendation #5, developing a standardized data collection framework requires cross-jurisdictional collaboration. This is a task best suited for the GTHA AV working group proposed in recommendation #1. Metrolinx could signal the direction and prompt avenues of exploration for the standardized data collection methods and frameworks through the Regional Transportation Plan.

Theme: Experimentative Infrastructure for Uncertainty



Recommendation # 7

What: Compile an online list of resources including academic literature, industry news or social media, to keep municipalities up to date with the uptake of AVs and possible implications.

Who: Metrolinx could host and maintain the central shared resource list. The resource list could also have a crowd-sourcing component whereby stakeholders would have the opportunity to upload or link to relevant literature, news, etc. This resource could also be maintained by academics in partnership with Metrolinx.

Theme: Learning and Information Provision



Recommendation # 8

What: Facilitate stakeholder capacity-building (e.g. internal training, building expertise with sharing of information, offering stakeholder workshops) to strengthen knowledge of AVs and determine how to incorporate AV advancement into municipal plans and policies.

Who: Metrolinx would facilitate stakeholder capacity-building broadly, providing resources and strategies for regional and local municipalities to use.

Theme: Learning and Information Provision

8.0 Conclusion

The central objective of the workshop - organized to gain valuable perspectives from provincial, regional, and municipal entities--was the exploration of opportunities and challenges associated with AVs. Specifically, the workshop activities aimed to stimulate critical consideration of what role the public sector should play in mitigating challenges and maximizing opportunities to ensure a future that is adaptive to technological transformation.

Through a series of engaging activities, we uncovered several emerging themes critical to the AV discussion, including the need for an overarching regional vision for AVs, clear and consistent infrastructure that can positively affect the integration of AVs, and mechanisms to stay informed and enhance AV learning opportunities. These themes prove central to our outlined recommendations and can be used to inform the development of AV policies for Metrolinx' Regional Transportation Plan update due later in 2017.

It is imperative that consistent and frequent dialogue exists moving forward, given the profound uncertainty surrounding the potential impacts of AVs. While limitations exist with the methods used – such as a single workshop to understand perspectives of a broad and diverse range of stakeholders – this report intends to stimulate and encourage this dialogue highlighting key areas for collaboration. With speculation from various sources, it is important for the region to develop its own understanding of what role each of the numerous stakeholders in regional transportation should play as we move into the future.

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10.0 Appendix A: Additional Workshop Information

Workshop Overview

Attendees level of knowledge regarding AVs was surveyed at the beginning of the day, prior to presentations and activities and it was found that approximately half of attendees had a moderate knowledge, and approximately half had less than moderate knowledge. Below is a summary of the activities, presentations, and discussions that took place on that day.

Workshop Objectives

- Explore the opportunities and challenges of AVs; and
- Role of the public sector in shaping these technologies towards a future that is integrative with existing infrastructure and adaptive to technological transformation.

To help inform the development of policies related to autonomous and connected vehicles for the Greater Toronto and Hamilton (GTHA) Regional Transportation Plan update, and related local, regional, and provincial transportation and land use plans.

Presentations

Ersoy Gulecoglu, Metrolinx

Ersoy outlined how Metrolinx is in the process of updating the RTP;

High-level technical overview of AVs:

How AVs fit into the scope of an integrated new mobility ecosystem and;

AVs role in supporting first and last mile transit operations.

Kailey Laidlaw, Ryerson University

Provided an overview of the research on AVs and public perception; and

Identified current AV knowledge and awareness, along with key demographic findings.

Panel Discussion

The panel discussion included three panel members and one moderator.

Panel Members

Bern Grush - Author and Partner, Grush Niles Strategic

David Ticoll - Distinguished Research Fellow, Innovation Policy Lab, Munk School of Global Affairs at the University of Toronto at the University of Toronto

Josh Tzventarny - Senior Advisor, Sustainability (Innovation), Metrolinx

Moderator: Matthias Sweet - Assistant Professor, School of Urban and Regional Planning, Ryerson University

The panel discussion consisted of moderated questions designed to stimulate future-forward, action-based thinking discussing the following topics:

- What are congestion impacts on the transportation network if AV adoption rates are low?
- How can governments intervene or influence ownership models, and should they?
- What are potential impacts of AVs on traditional methods of public transportation?
- What should regions and municipalities do coming out of this workshop?

Following the panel discussion, the floor was opened up to questions from the attendees.

Facilitation Activities

During the workshop there were four facilitation activities, which are summarized below.

Activity 1: Surfacing Issues

Workshop attendees were split into four tables and asked to imagine how their municipality or region will look in the coming years when AVs are being introduced and integrated with non-autonomous vehicles. Attendees were asked to identify what key issues that are expected to impact their work. Attendees wrote their initial surfacing issues on a series of index cards, and with the help of a table facilitator, surfacing issues were distilled down to five surfacing issues per table.

Activity 2: Roles of Stakeholders

Groups were given a list of six key stakeholders in AV policymaking and asked to describe the key roles and responsibilities for each key stakeholder. The provided stakeholders included automobile manufacturers, academics, transportation planners, Metrolinx, the Ontario Ministry of Transportation (MTO), and elected officials. Participants were given the opportunity to brainstorm the roles of each key stakeholder, and to identify additional key stakeholders.

Activity 3: Catalytic Questions

The themes from Activity #1 were collected and analyzed to develop four catalytic questions for further discussion. Groups had an opportunity to tackle a question first, before the question was rotated to the next table to be built upon, challenged, and annotated by the next group. Each group contributed to each of the catalytic questions.

Activity 4: Policy Drafting

Groups were asked to brainstorm where AV policy could potentially be implemented in existing policy documents, as well as, create draft municipal, regional, and provincial policies that could inform the RTP. Attendees were encouraged to think both conventionally and creatively during this exercise, understanding the importance of developing future forward policies that seek to avoid unintended consequences of current outdated policies.

Feedback Forms

Feedback forms were distributed to each attendee following the event. The results of this feedback is summarized below:

- The majority of attendees strongly agreed that the content was interesting and relevant;
- The majority of attendees agreed that the workshop was applicable to their job;
- The majority of attendees strongly agreed that the workshop activities allowed them to express their opinion; and
- The majority of attendees indicated excellent for their overall satisfaction with the workshop.

Workshop Agenda

8:30 a.m.	Breakfast and Registration
9:00 am.	Opening Remarks Glenn Pothier, <i>Facilitator, GLPi</i>
9:15 a.m.	Ryerson Student Overview Cate Flanagan, <i>Graduate Student, Ryerson University</i>
9:20 a.m.	Presentation 1: <i>A Blueprint for Autonomous Mobility: Anticipating change in the Regional Transportation Plan</i> Ersoy Gulecoglu, <i>Manager, Sustainability, Metrolinx</i>
9:40 a.m.	Presentation 2: <i>2016 Automated Vehicle Survey: Background and Basics</i> Kailey Laidlaw, <i>Research Assistant, Ryerson University</i>
9:55 a.m.	Activity 1: Surfacing Issues
10:30 a.m.	Break
10:45 a.m.	Activity 2: Roles of Players
11:00 a.m.	Activity 3: Catalytic Questions Exploration
12:00 p.m.	Lunch
12:30 p.m.	Panel Discussion: <i>Future-forward Thinking - AVs in Regional Policy</i> Panelists: Bern Grush - <i>Author and Partner, Grush Niles Strategic</i> David Ticoll - <i>Distinguished Research Fellow, Innovation Policy Lab, Munk School of Global Affairs</i> Josh Tzventarny - <i>Senior Advisor, Sustainability (Innovation), Metrolinx</i> Moderator: Matthias Sweet - <i>Professor, School of Urban and Regional Planning, Ryerson University</i>
1:15 p.m.	Coffee Break
1:20 p.m.	Activity 4: Policy Drafting + Report Back Glenn Pothier & Ryerson Students
2:05 p.m.	What's Next? Brodie Johnson, <i>Graduate Student, Ryerson University</i>
2:10 p.m.	Open Forum Glenn Pothier
2:20 p.m.	Closing Remarks Glenn Pothier & Brodie Johnson