URBAN MOBILITY TASK FORCE INTERIM REPORT

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Primer

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COUNCIL OF MINISTERS RESPONSIBLE FOR TRANSPORTATION AND HIGHWAY SAFETY

The Urban Mobility Task Force, under the **Council of Ministers Responsible for Transportation and Highway Safety**, developed this document as part of a series of Primers looking at current mobility issues affecting the Canadian urban landscape today. The Primers examine the current state of these issues and have identified associated trends, challenges, and opportunities. They are short overviews and are designed to initiate a discussion on urban mobility issues intended for transportation policy professionals, planners and decision makers.

INTRODUCTION

The rate of technological innovation presents significant opportunities and challenges for sustainable transportation in Canadian urban regions. Big data,[i] intelligent transportation systems (ITS),[ii] and other advanced technologies have revolutionized transportation systems everywhere, potentially making them more efficient and reliable. In contrast, reliance on technology can have negative side effects, especially when the technology breaks down or when there is a cybersecurity breach. This module provides an overview of the current state of innovative mobility and examines the challenges and opportunities with innovation and technological change for urban transportation systems in Canada. The central question for policy professionals to tackle is determining what role new technology and innovations can play in addressing urban transportation issues.

CURRENT STATE

One of the most significant technological tools that has transformed mobility has little to do with transportation – the smartphone. Most people in major urban centres can use a smartphone to determine the best mode and route, as well as the estimated time it will take to get somewhere. Some apps even provide the cost, reserve services, allow people to pay for multimodal trips, and/or provide the potential greenhouse gas (GHG) emissions per mode of transportation for the trip, so the user can make an informed decision on which route/mode to choose. These types of apps have proliferated in recent years and often rely on ITS data to provide information (e.g., weather, congestion) to travellers and shippers, allowing them to make transportation choices.[1] While these apps have greatly improved mobility, they have also disrupted current transportation systems.

The demand for Uber and Lyft, two companies that provide a platform for ride-sourcing through a mobile app, led to disruption to the transportation sector. Not only did they displace value from the long-entrenched taxi industry, some studies suggest they have contributed to a decline in public transit use and an increase in congestion. It should be noted that this is not yet conclusive, as other studies suggest that ride-sourcing services have been found to have a variable relationship with transit.[2] Furthermore, the availability of these services is not always equitably distributed both geographically or for people with disabilities.

Additionally, the increased usage of electric personal transportation devices, such as e-scooters and e-bikes has governments trying to determine the best way to regulate this new travel mode. Several jurisdictions have implemented pilot projects, such as Calgary

[i] Extremely large data sets that may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behavior and interactions.

[ii] ITS are transportation systems with integrated information and communications technologies that improve efficiency and safety.

and Montréal.[3] Consultations are also taking place across jurisdictions, to try and determine the best way to regulate this newer form of travel.

Transit, one of the most significant urban mobility solutions and options, has also experienced technological advancements. An example of emerging technologies in transit includes dynamic routing software.[iii] In jurisdictions where transit operates on a fixed schedule and routes in low-density or low-demand environments, transit operators are using new software to route buses where they need to go based on user demand. For example, Belleville, Ontario has implemented an On-Demand Transit Pilot which has helped increase ridership by 300 per cent while also decreasing per vehicle mileage by 30 per cent.[4]

Passenger transportation is only one side of how urban mobility is changing – new technological developments and innovations are also focused on how to move goods in around cities in an efficient, sustainable and cost-effective way. The rise of online shopping, for example, has led to complications specifically around the last-mile of delivery and companies are continually trying to develop more dynamic transportation networks to respond to this issue. Simply increasing the number of delivery vehicles on the roads could have negative impacts on congestion and GHG emissions. Innovative ideas such as new urban supply concepts (e.g., smart lockers[iv]), asset sharing, electrification, and alternative vehicles (e.g., autonomous vehicles, delivery drones) could help address this challenge. For example, there is an opportunity for electric vehicles (EVs) to potentially help with congestion impacts, emissions and noise reduction, with the possibility to shift some deliveries to off-peak times without significant impact on sleep.

In many cases, it is unknown how new technologies, some of which have already been deployed, will affect mobility behaviours in urban regions. For example, some of the big unknowns that are receiving significant attention and funding are automated and connected vehicles (AV/CVs), mobility as a service (MaaS),[v] and smart cities.

CHALLENGES

Rapid technological advancements and innovative solutions in the transportation sector present numerous challenges for governments. The private sector is developing most of these tools and ideas, making it challenging for governments to understand its role, if any, and to strike a balance between enabling innovation and regulating new developments. The section below highlights some of the key challenges that governments must address in the face of technological and innovative transformations.

Future of Vehicles

AV/CVs, zero emission vehicles (ZEVs), and shared mobility[vi] are changing the transportation landscape, but it is not fully clear what their impact will be on congestion, GHG emissions, safety, and land development. For example, as automated vehicles become more prevalent, they could free up time people had previously spent driving and reduce the need for parking by circulating, returning home, or operating as a

[iii] Dynamic routing is a networking technique that provides optimal data routing. Unlike static routing, dynamic routing enables routers to select paths according to real-time logical network layout changes.

[iv] Smart lockers are scalable, customizable, electronic, and often cloud-based systems that gives onsite and remote workers and visitors an easily accessible space of their own.

[v] Mobility as a Service (MaaS) is the integration of various forms of transport services into a single mobility service accessible on demand.

[vi] Shared mobility is broadly defined as transportation services and resources that are shared among users, either concurrently or one after another.

shared vehicle service. This scenario could lead to more congestion and urban sprawl. Other concerns include issues around the safety of AV/CVs, sufficient charging infrastructure at strategic locations, and the erosion of funding sources from the gas tax (if most vehicles become electric) and parking (if most vehicles become autonomous). This in turn has led jurisdictions to consider other funding streams, such as a "usage fee" on vehicles that do not consume gas, for example.[5]

In recent years, the popularity of ride-sourcing services has contributed to increased traffic congestion. Also, ride-sourcing and the eventual onset of AV/CVs has made curb-management a major concern for planners, as increasingly more vehicles block traffic or bike lanes while dropping off or picking up passengers. In order to tackle this added congestion, Montreal, for example, launched a one-year pilot project in the Ville-Marie borough to address curbside management, while also reducing GHG emissions and noise pollution associated with the last mile of delivery. The Colibri pilot encourages heavy vehicles to unload at Îlot Voyageur, a former bus station. From there, zero-emission vehicles, such as electric cargo bikes, make the deliveries. Since these zero-emission vehicles are more agile, they are less likely to cause or be stuck in traffic jams.

As urban regions invest in transportation infrastructure such as public transit and bike lanes to provide alternatives to automobile use, determining what type of transportation system would be ideal in the future may be the most complex challenge for governments and all mobility stakeholders. Another challenge in the future of vehicles is the growing interest in establishing policies that move towards a net-zero carbon economy. This would significantly affect the types of vehicles manufactured in the future.

Asset management

Procuring and maintaining technological infrastructure is costly, especially given how rapidly technology changes. For example, a city could invest millions of dollars on an advanced traffic management system only to find that the technology is obsolete or ineffective in less than five years. In addition, governments must determine how much to spend on updating and maintaining legacy infrastructure since some of this infrastructure may not meet the transportation needs of a city as new technologies are deployed in the near future.

Security and privacy

In a future of AV/CVs and ITS, most systems of mobility will be connected through wireless technology and will require the constant exchange of data to properly function. As a result, these systems could be subject to cyberattacks/hacking that could compromise the safety of transportation systems and the privacy of personal information. Currently, the private sector is collecting enormous amounts of data and what it does with this data is relatively unknown.[6] The lack of awareness also raises concerns around leaks of personal information and data breaches.

Data management

The digital changes occurring in society have created an excess of data that can be used by the transportation sector for better planning and management. While the transportation sector has made use of this data, there is often too much to analyze and a lack of capacity to process it.[7] The data must also be reliable and comparable, which is difficult if collected from different sources.

As private sector companies continue to invest in the development of new technologies, collecting data helps them make improvements and can also provide a

commercial advantage. As a result, some companies are reluctant to share their data with governments, which can hinder efficient planning and management of public interventions in transport. To mitigate this, some governments have started requiring data management (i.e., ownership) policies with Transportation Network Companies (e.g., Uber) in order to implement partnerships.

Resistance to Change

Despite general adoption of technologies, humans are sometimes resistant to technological changes. There are cases in Arizona of people attempting to obstruct the testing of AV/CVs, and a new organization was established in the United States to defend the "right" to drive as a way to counter the onset of autonomous vehicles. In addition, there is a long history of technological innovations replacing jobs and displacing people in the labour market. Further automation and electrification within the transportation sector has the potential to result in a decline in employment opportunities and a need for skills re-training programs. Resistance to change can also be seen in industries where there is little competition, which can prevent innovation adoption or development. This can sometimes be further perpetuated when governments design regulations that restrict competition, for example, as for the taxi industry.[8]

Compatibility and standardization

In the absence of standards, and with the speed of innovation, there is a risk that different stakeholders, private and public, could invest in and deploy different incompatible technologies. If different jurisdictions adopt technologies that are incompatible, it could result in complex issues around interoperability, creating inefficient transportation corridors and complicated connections. Ongoing efforts by the public sector are trying to prevent this issue from happening. For example, the Canadian Standards Association is developing guidelines and a standardization roadmap for the safe deployment of automated and connected vehicle technologies in Canada.[9]

TRENDS

Despite major technological and innovative advancements to make transit, active transportation,[vii] and shared mobility more appealing, and despite the recent transit ridership growth in Canada,[10] the personal automobile continues to dominate travel patterns in Canadian cities. As such, a significant trend in urban mobility is the rapid pace of technological innovation related to automobiles. Tools to improve traffic flow and vehicle safety already exist, including smart infrastructure, smart cars, advanced driver assist systems, traffic management systems, and partial vehicle automation. These tools are continually being updated and are growing exponentially through capital investments from both the private and public sectors. As they become more prevalent, it is likely that use of private and shared automobiles will continue to be popular and that it may become safer and more efficient.

Even with the continued popularity of the personal automobile, the options for ride-sourcing have proliferated in recent years. Facilitated by innovative operation models (e.g, Turo, Zipcar, Communauto, Bixi), vehicle and bicycle sharing have grown to become worldwide industries. Options for electric transportation devices, such as e-scooters and e-bikes are also becoming

[vii] Active transportation is any self-propelled, human-powered mode of transportation, such as walking or bicycling.

more popular, with companies vying to fill this need. As a result, there has been somewhat of a shift in consumer behaviours that will likely continue to demand more integrated and innovative mobility options.

Mobility as a service (MaaS) describes the integration of services/modes of transportation accessible from a single app and on demand. This is achieved by combining transportation services from public and private transportation providers through a unified platform. This trend capitalizes on the shift away from privately owned vehicles by increasing the availability and interconnectivity among modes and greater alternatives to vehicle ownership in urban regions. Apps such as Whim are multimodal platforms that integrate numerous modes of transportation (e.g., public transit, bike sharing, taxis, car rentals), making it easier for the user to plan and pay for a trip. Simplifying the way people move around the city through technological innovation is key to reducing the number of single-occupancy vehicles on roads.

Governments are increasingly investing in ITS to optimize their transportation assets and maximize social, environmental and economic benefits.[11] Examples of ITS include traffic management systems, traveller information systems, public transportation management, commercial vehicle electronic clearance, and road-weather-information-systems (RWIS). For instance, as part of Quebec's Sustainable Mobility Policy, the Ministère des Transports du Québec (MTQ) has set up an ITS development framework. The measures of this framework are based on Québec's ITS Plan which was developed with input from over 60 stakeholders from the public and private sectors. The measures included in the framework can be grouped into three priorities: assure the availability of information to improve mobility in all regions of Québec; improve the compatibility of ITS while ensuring the privacy of data; and work to keep MTQ up to date on the latest technological innovations in the ITS field. Increased digitization in the transportation sector, including increased use and sharing of data, can help to improve various aspects of the transportation system, such as freight flows through urban centres, for example, by optimizing the use of road infrastructure and using systems that control freight transportation vehicles and coordinate logistics services.

Transit is also seeing significant technological advancements. Various low-carbon, smart technology options are being considered and implemented across jurisdictions. For example, the Pan-Canadian Electric Bus Demonstration and Integration Trial, a national, multi-phase project that supports the development of critical technologies for standardized electric bus and associated charging infrastructure is currently in Phase 1 across three municipal jurisdictions in Canada. Eighteen standardized electric buses and seven standardized overhead chargers will be deployed across Vancouver, Brampton, and York Region as part of this trial.[12]

A significant change that has the potential to create major disruptions across the transportation sector is the broad deployment of AV/CVs. Numerous companies and research institutes are in a global race to launch fully autonomous vehicles for use on public roads, while policy makers try to determine appropriate interventions in an environment characterized by considerable uncertainty and rapid change. Additionally, the Toronto City Council just released the first comprehensive automated vehicles plan for a North American City. This plan aims to make Toronto ready for automated vehicles by 2022 and attempts to balance long-term opportunities while anticipating and mitigating possible risks.[13]

Furthermore, emerging trends like job automation, e-commerce, digitalization of the supply chain, autonomous shipping, same-

day delivery, and the near sourcing of manufacturing are dramatically changing transportation patterns. All these developments are creating a significant wave across transportation systems and transforming how people and goods move around urban regions.

OPPORTUNITIES

Before making decisions about how to address technology adoption or how to invest in new infrastructure, governments must be clear about the policy objectives they are trying to achieve. Once these objectives are laid out, governments can determine what technologies and innovative practices will help achieve those objectives. For example, the Council of Ministers Responsible for Transportation and Highway Safety released in January 2019 the Automated and Connected Vehicles Policy Framework for Canada, which examines shared objectives to promote and invest in these technologies.

It is unknown what future technologies will look like and how they will transform mobility. For some technologies currently under development such as AV/CVs, several future scenarios can be anticipated; policy makers have a role to play in shaping that future. The best scenario is the convergence of technologies, where many technologies and innovations are adopted together to maximize the potential achievement of policy objectives. For example, the convergence of AV/CVs with EVs, vehicle sharing, and the intensification of land use in urban areas has the potential to improve urban mobility.[14],[15]

Technology strategies can also incentivize and/or facilitate travel behaviours to achieve urban mobility goals. For example, “sticks and carrots” such as “nudging” apps that reward people or provide incentives for certain travel behaviours could encourage people to use public transportation or active modes of transport. This is a simple way to reduce congestion and promote healthy lifestyles. Integrated passenger transportation such as MaaS and other online pay systems also make it easier to move around cities. For example, Translink has initiated a Shared Mobility Pilot which will allow the employees of select Vancouver-based organizations to access transit, carshare, and bikeshare services for work-related travel using a special Compass Card, which is Translink’s fare card. The pilot will test the user experience and technical integration of tying multimodal journeys together with a Shared Mobility Compass Card.

If implemented and deployed with careful policy considerations in mind, new technologies and innovations could have the potential to address several overall goals, for example:

- Reducing congestion;
- Improving air quality;
- Reducing GHG emissions;
- Improving road safety;
- Creating more equitable access to safe, affordable and efficient transit;
- Reducing reliance on the personal automobile;
- Creating more efficient and effective transportation systems that lead to better economic opportunities;
- Enhancing competitiveness of Canadian companies and manufacturers;
- Optimizing the use of existing transportation networks; and
- Greater accessibility.

Each new technology or innovation should be assessed, with policy goals established and a framework developed. Governments may have to to absorb the impact, which can often be hard to predict, but which means they need to be flexible enough. Governments can also consider the

suitability, feasibility, and desirability of certain technologies for their local circumstances and the interoperability of these technologies with neighbouring jurisdictions.

Recognizing that Canadian urban regions are in a period of significant change, scenario planning can help policymakers to incorporate the uncertainty surrounding the impacts of new and emerging technologies into local plans, ensuring that transportation systems are resilient to a range of potential futures. It is crucial that Canada fosters innovation across industries, as non-transportation specific innovations/ technologies can dramatically transform the transportation sector. Above all, policy makers must recognize that technology will not solve all urban transportation problems. AV/CVs certainly have the potential to reduce congestion and improve safety, but improving rail, transit, and cycling networks and ensuring infrastructure readiness (i.e., charging infrastructure for electric vehicles) can also have the same effect.[16] In other words, continuing to invest in physical infrastructure solutions is crucial to addressing any urban mobility issue, while responding to developments in a coordinated and consistent manner.

REFERENCES

[1] House of Commons, Standing Committee on Transport, Infrastructure and Communities. “Innovative Transportation Technologies.”, 2013.

[2] Graehler, Michael, et al. “Understanding the Recent Transit Ridership Decline in Major US Cities: Service Cuts or Emerging Modes?”, Paper presented for the 98th Annual Meeting of the Transportation Research Board, 2019.

[3] Campbell, Meagan. “E-Scooter Abandonment Issues Have Cities Scrambling to Get Problem under Control.” National Post, 28 Aug. 2019, nationalpost.com/news/canada/e-scooter-abandonment-issues-have-cities-scrambling-to-get-problem-under-control.

[4] Mellor, Luke. “Initial Results from Belleville's On-Demand Transit Pilot.” Pantonium, 19 Nov. 2018, pantonium.com/initial-results-from-belleville-on-demand-transit/.

[5] Bliss, Laura. “Should Electric Vehicle Drivers Pay Per Mile?” CityLab, 23 July 2019, www.citylab.com/transportation/2019/07/electric-vehicles-gas-tax-mileage-fees-highway-trust-fund/594466/.

[6] Centre for International Governance Innovation. “Data Governance in the Digital Age: Special Report.”, 2018.

[7] Sweet, Matthias N., et al. “Big Data in Transportation Program Management: Findings and Interpretations from the City of Toronto.” Paper submitted for presentation at the Annual Meeting of the Transportation Research Board, 2015.

[8] Government of Canada, Competition Bureau. “Modernizing Regulation in the Canadian Taxi Industry.”, 2016, https://www.competitionbureau.gc.ca/eic/site/cb-bc.nsf/eng/04007.html

[9] Government of Canada, Transport Canada. “Transport Canada Supports Projects to Prepare Canada for Connected and Automated Vehicles.”, News Release, August 10, 2019.

[10] Canadian Urban Transit Association. “Transit Ridership is Growing in Canada.”, News Release, November 14, 2018.

[11] Gouvernement du Québec, Ministère des Transports. “Transporting Québec Towards Modernity: Intelligent Transportation Systems Intervention Framework.”, 2018.

[12] Canadian Urban Transit Research & Innovation Consortium. “Pan-Canadian Electric Bus Demonstration & Integration Trial: Phase I & II.”, https://cutric-crituc.org/project/pan-canadian-electric-bus-demonstration-integration-trial/.

[13] City of Toronto, Transportation Services, General Manager. “Automated Vehicles Tactical Plan and Readiness 2022.”, 2019.

[14] Kane, M. and Whitehead, J, “How to ride transport disruption – a sustainable framework for future urban mobility.”, 2017, Australian Planner 54(3): 177-185.

[15] Sperling, Daniel. “Three Revolutions: Steering Automated, Shared, and Electric Vehicles to a Better Future.”, 2018, Island Press: Washington, D.C.

[16] Saxe, Shoshanna. “I'm an Engineer, and I'm Not Buying Into 'Smart' Cities.” The New York Times, The New York Times, 16 July 2019, www.nytimes.com/2019/07/16/opinion/smart-cities.html?utm_campaign=citylab-daily-newsletter&utm_medium=email&silverid=%25%25RECIPIENT_ID%25%25&utm_source=newsletter.