



Connect Smart Project: Rethinking Mobility for All

Community Workshop and Engagement Report

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Acknowledgment of Contributors

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Audrey Muir (Senior Transport Engineer at CBCL) and Shamsad Irin (Engineer-in-Training at CBCL) contributed to the Town of Bridgewater workshop held in Lunenburg County Lifestyle Centre (LCLC). Participants in the Halifax workshop came from traditional and non-traditional partners, including Halifax Municipality, Province of Nova Scotia, Dalhousie University, Ecology Action Center, CarShare Atlantic and One Shot Parking. We also appreciate the Natural Science and Engineering Research Council of Canada (NSERC) and the Canada Foundation for Innovation (CFI) for their continuous support of our research.

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1. Introduction

Connect Smart Project is a part of the Connect 2 grant program that is sponsored by the Nova Scotia Department of Energy. The project challenges the way Nova Scotians think about their daily commute as well as the local and regional transit. It explores how communities are envisioning the adoption of new mobility options and services, including shared mobility options, electric vehicles, transit, and active transportation, among others. Dalhousie Transportation Collaboratory (DalTRAC) has engaged professionals (planners, urban designers, engineers, etc.), and community groups (cycling advocates, walking and transit groups) in an open dialogue to envision a smart transportation network. To facilitate engagement, DalTRAC conducted two workshops, a social media campaign and is hosting a website. The website and the social media campaign will continue the conversation on how to plan and prepare for emerging technology-based mobility opportunity.

2. Halifax Workshop

2.1 Presentation

DalTRAC hosted the Halifax workshop on the 16th February, 2018 from 2 – 4 pm (see Appendix A for Workshop Poster). The workshop began with Dr. Habib presenting an overview of the future of mobility technologies as well as research synthesis on shared mobility, electric vehicles, autonomous vehicles and mobility as a service (MaaS) (see Appendix B for presentation slides and Figure 1). He provided an overview of the emerging trends in transportation and relevant future expectations. The presentation also included research findings from DalTRAC researchers that focuses on Nova Scotia.



Figure 1: Dr. Habib's Presentation in the Halifax Workshop

Dr. Habib discussed the adoption of shared mobility services, their benefits, and their impact. One of the main themes highlighted is the goal of reducing the number of vehicles on the road. Dr. Habib also compared access to vehicles and ownership and presented the projected adoption of shared and autonomous mobility from a study conducted by Jameson, Giffi & Vitale (2016) from Deloitte Insights. In addition to that, he presented current ridesharing initiatives in Canada. One of which is the Smart Commute program by METROLINX and the municipalities in the Greater Toronto and Hamilton Area. He presented the benefits associated with the program such as saving money, reducing stress, and reducing pollution, among others. He also presented studies done by some of his students on the topic of shared mobility. Dr. Habib emphasized the need for a regulatory framework to promote and integrate new modes of transportation with current ones. In addition, he stated that travel behavior is being influenced by the use of smartphones and social networking. He iterated the fact that there is currently a large focus on computer science and the emerging world, and that one of the main problems associated with this is the privacy of the people whose information is shared through their smartphone usage. Dr. Habib also discussed the benefits of electric vehicles, as well as the adoption trends of electric vehicles in Europe and Canada. He emphasized the need to start thinking and planning for electric vehicles in Nova Scotia, which includes the implementation of electric vehicle parking.

Connected autonomous vehicles are emerging as popular and trending mode of transportation. Many car companies are researching how to develop and operate autonomous vehicles without requiring human intervention. As a result, many cities are currently hosting pilot projects that test autonomous vehicles on their roads, while other cities are surveying regulatory frameworks, and planning issues raised by autonomous vehicles. Dr. Habib discussed the potential benefits of automated vehicles with relevance to safety, mobility and the environment. He also discussed the methods of connecting automated vehicles, and the road to establishing and developing a future with 5G cellular connection. He also presented some planning implications of autonomous vehicles, including the need to update infrastructure and develop strategies to handle the amount of open data available. Dr. Habib also discussed the Halifax Peninsula Autonomous Vehicle Impact Study, which he and his Ph.D. student, Jahed Alam, conducted (see Figure 2). He stated that the study shows that the vehicle kilometer traveled (VKT) will probably increase as the number of autonomous vehicles on the road increases.



Figure 2: Traffic Flow Visualization in Microsimulation Model for Halifax

The final part of the presentation was Mobility as a Service (MaaS). Dr. Habib presented the concept, and the planning implications associated with it. He discussed the need for creating research for MaaS demand, creating pilot projects, and developing regulatory frameworks. He also stated that we need to start thinking about these systems, their implications, and the type of data we should be collecting. He concluded that we are very far from realizing an automated transportation system and shared mobility, electric vehicles, autonomous vehicles and MaaS, take time to implement. Therefore, we should take a proactive approach in regulating transportation in order minimize negative outcomes in the future.

Following the presentation (see Figure 3), Dr. Habib asked the 31 attendees of the workshop to introduce themselves (name and affiliation). After which, he, along with members of the DalTRAC team, divided the participants into groups and lead the workshop discussions.



Figure 4: Dr. Habib Facilitating a Workshop Discussion

2.2 Workshop Session #1

This session focused on preparing for the future of mobility through the discussion of potential planning issues and needs that will arise along with mobility technologies in Nova Scotia. This session also encouraged the participants to think about our vision for the future of mobility. Participants were organized into several groups of 8-10 people. We provided each person with a session sheet to describe the activities during the session and the materials they should use to answer the questions (flip charts / sticky notes).

There were three activities in the first session; one individual activity and two group activities:

- A. Imagine yourself in a world with shared mobility and autonomous vehicles (individual)
- B. Brainstorming session: what are the planning issues and needs for future mobility in Nova Scotia? (group)
- C. Shared vision buzzwords (group)

See Appendix C for the raw data/responses collected from the participants of the workshop.

A. Imagine Yourself in a World with Shared Mobility and Autonomous Vehicles

Process

In the first activity, participants were asked to draw how they see themselves in the future among emerging mobility technologies. We asked everyone to draw on sticky notes, which we pinned on the walls for the participants to see (see Figure 4).

Results

In the drawings, some participants showed a car filled with people, representing the shared mobility aspect. Some suggested that they will be sharing the commute time with family, and friends. Most illustrated that the time they will not spend driving will be spent working, reading a book, meditating, having dinner, or watching a movie in the car. The main shared themes were the possibility of being more productive while commuting, as well as an increase in social interaction time.

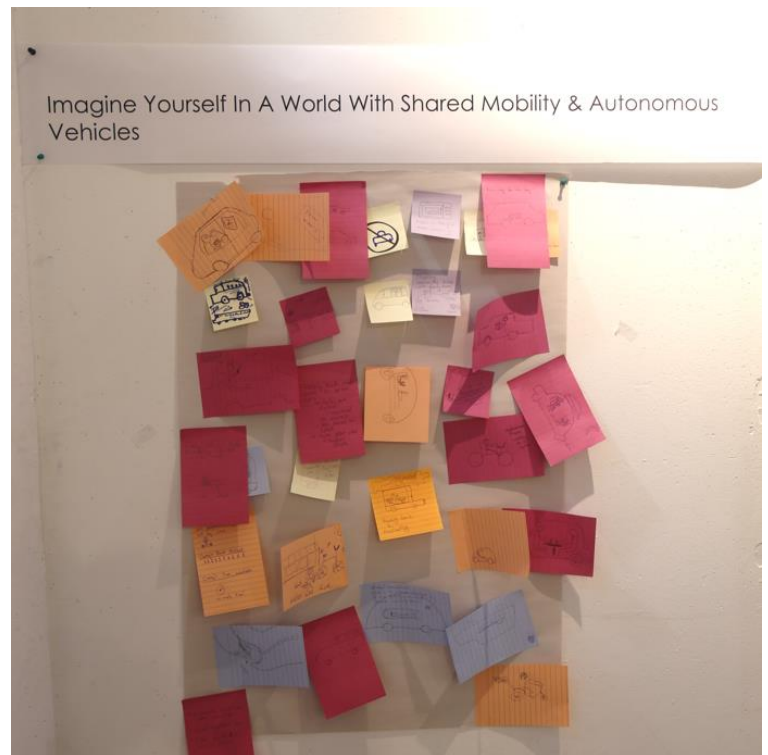


Figure 4: Results from Activity A from the First Workshop Session

B. Brainstorming Session: What are the Planning Issues and Needs for the Future of Mobility in Nova Scotia?

Process

For the second activity, we asked participants to brainstorm some issues and needs of future of mobility in Nova Scotia. We asked the groups to summarize the main points of their discussion on large pieces of paper, which we pinned on the walls (see Figure 5). We also asked them to choose a group leader to present their group's ideas to all the participants.

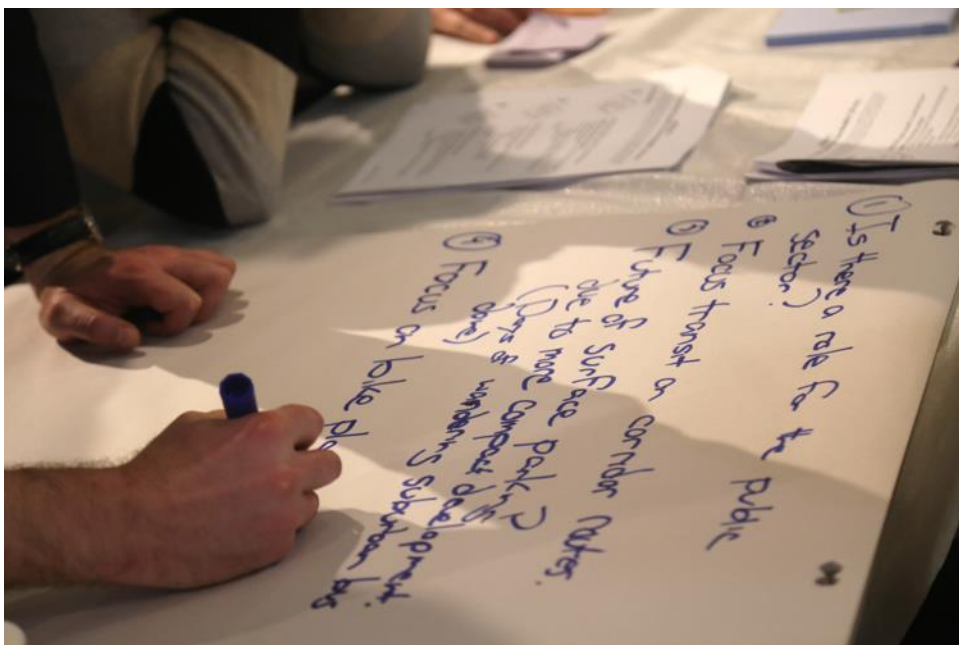


Figure 5: Group Brainstorming in Activity B of the First Workshop Session

Discussion of Results

One of the primary planning needs that the participants identified is the need to retransition the streets to focus on integrated active transportation and the creation of transit corridors. As parking needs decrease, city planners can reallocate some of the existing parking lots to public space. In addition, when ride-hailing services become available in Nova Scotia, there will be a need to redesign some roads to include drop-off locations.

Since Nova Scotia has a growing proportion of aging population, there is a concern on how people will embrace the new technology. There was also a discussion regarding the need for a regional transportation strategy that tackles new transportation methods, as well as the impacted infrastructure. The strategy should also include regulations for the economic aspect new technology, as well as incentives for people to use car sharing services, and build less parking now.

Since the first mobility revolution (i.e. cars) worsened pollution, encouraged sprawl, and made cities less walkable, participants were worried about the impact of the second mobility revolution that includes autonomous vehicles. One of the discussed issues during the workshop is the possible increase of sprawl. With automated vehicles and the possibility of repurposing vehicle time to be more productive, people might not have a problem with living further away from the city, or their work location. Therefore, there might be a need to incentivize people to live in the city to decrease the impact of sprawl. There was also a discussion regarding the issue of safety and liability: who will be liable if an accident with autonomous vehicles occur? Is it the manufacturer? Does the driver still hold any responsibility?

Additionally, participants discussed the possible increase of sedentary lifestyles, and the decrease of walking and cycling in the city. Others were more optimistic and thought that the city can become more walkable as the number of cars decreases. Another main concern is the funding of the infrastructure, as owners of electric vehicles will not have to pay gas taxes, and tolls might be removed in Nova Scotia.

C. Shared Vision Buzzwords

Process & Results

For the third activity, we asked participants to describe what our shared vision should be in one word. We asked them to write their ideas on the sticky notes, which we later pinned on the walls. The most popular vision keyword was accessibility, followed by integrated mobility, sustainability and connectivity (see Figure 6).



Figure 6: Vision Buzzwords from Activity C of the First Workshop Session

2.3 Workshop Session #2

The second session focused on identifying short-term and long-term planning goals to prepare for the future of mobility. It encouraged participants to identify ideas for future research opportunities. For this session, participants rearranged themselves into four groups based on their thematic preference: shared mobility, electric vehicles, autonomous vehicles or mobility as a service.

There were three activities in the second session; one individual activity and two group activities:

- A. What should our planning goals be in the short-term and long-term? (group)
- B. What should our research agenda be? (group)
- C. Workshop evaluation (individual)

See Appendix D for the raw data/responses collected from the participants of the workshop.

A. What Should our Planning Goals be in the Short-Term and Long-Term?

Process

During the first activity, we asked participants to share their ideas and planning solutions to prepare for the future of mobility based on their group's theme. We also asked them to select a person in their group to present their ideas to the workshop (see Figure 7).



Figure 7: Discussions from Activity A of the Second Workshop Session

Discussion of Results

For shared mobility, there was a consensus that over the short-term, cities should raise awareness on shared mobility opportunities, including ride-hailing, and car share services. There also needs to be research done on the types of shared mobility that are available around the world, and if those opportunities are applicable in the local context of Nova Scotia. Over the long-term, there must be a collective agreement on the type of infrastructure that shared mobility services might need (e.g. drop-off zones). Since technology is flexible, we should be proactive and adaptive about writing policy, especially as technology advances and changes.

For electric vehicles, the goal is to restructure and move from fuel-operated vehicles. We need to assess the capabilities of the electric grid, and understand whether we'll have the capability to support charging electric vehicles throughout the day, especially at during the night charging sessions. We will also need to think about repurposing gas and fuel stations to

accommodate electric charging stations. In conjunction with the previous goals, we would need a consistent regulatory framework that considers all aspects of future mobility, including efficiency, and safety. Over the long-term, cities should think about not only electrifying cars, but electrifying trains, bikes, and motorcycles, among others. City planners should think about the implications of electric vehicles towards pedestrians and cyclists. For example, in terms of safety, EVs are quiet vehicles that may pose a risk to pedestrians crossing the street who cannot hear them. Additionally, we should start thinking about the incorporation of electric vehicle bylaws to ensure that we are prepared for the transition. There must be major investments in infrastructure that include the conversion of fuel stations to electric vehicle charging stations.

For autonomous vehicles, there must be effective regulations to ensure the privacy and protection of collected data. There should also be regulations and an understanding on who owns the data (private vs. public sector), and how it could be shared throughout different jurisdictions. Another goal is to incentivise people to share autonomous vehicles to minimize the effects of sprawl. There should also be regulations to prevent developers from creating gated communities for driverless cars. Since parking needs might decrease, there may be one-time opportunity to recapture those areas for compact, mixed-use “Complete Communities” focused around higher-order transit stations to ensure the viability of public transit on key corridors while also facilitating walking, cycling, carsharing and ridehailing, as well as offering an alternative to sprawl. Lastly, over the long-term, we might need to restrict human drivers on public streets.

For Mobility as a Service (MaaS), we will need to encourage developers to build residential and commercial buildings that have pick-up and drop-off zones. Ideally, cars will be waiting for their passengers in those specified zones, instead of in parking lots. Currently, in Nova Scotia, ride-hailing services, like Uber, are prohibited but they are expected to dominate over the mobility sector. Therefore, we need to start accepting and fostering the growth of these services to ensure their efficiency in the city. Another topic of interest is how ride sharing services could become a monopoly of fairly dominant players. As a result, we need to consider the role of the government in this new era of mobility revolution and if the government should own its own network of vehicles. Overall, as new technology and developments emerge, there must be effective engagement and communication strategies to ensure the willingness and acceptance of the public to change.

B. What Should our Research Agenda be?

Process

Participants brainstormed some research ideas that DalTRAC could look into in relation to technology-enabled future mobility. They put these ideas on sticky notes, which we put on the wall.

Discussion of Results

Some of the most prominent ideas that might be within DalTRAC’s research agenda is to look into are the possible impact of autonomous vehicles on parking demand in the city. Another

one is exploring options and plans to mitigate future congestion in the peninsula of Halifax following the arrival of mobility technologies such as shared mobility and/or autonomous vehicles. DalTRAC should also look at predicting emission and energy use in relation to the adoption of new technology (e.g. shared autonomous vehicles and electric vehicles). Participants also thought that there needs to be a study on how feasible a park and ride plan would be for the city of Halifax and the possibility of keeping cars out of the downtown. Another suggestion was to investigate optimum design for pick-up and drop-off lanes for shared autonomous vehicles in Halifax and the impact of future mobility on the land use of the peninsula. Additionally, participants suggested a study about the potential of ride-hailing services in Halifax and the social, economic and political implications. Other suggestions include mapping the built and social environment for future mobility hotspots, and mapping the peak travel time to understand vehicle density throughout the day.

The following is a representation of the research questions asked:

General:

- What are the potential benefits of mobility technologies for the HRM/Province?
- How can the government participate in the evolution of mobility technology?
- How can Halifax join other cities in planning for future mobility technologies?
- In the context of technology-based future mobility, how can we mitigate congestion in the peninsula?
- What are options of bike share systems and what are their impact on travel behavior?
- Will installing street cars on major corridors be beneficial for HRM?
- How will future mobility technologies impact rural areas?
- How can the city be more accessible by bikes?
- What are the future mobility hotspots in terms of the built and social environment?
- How can we map congestion for the existing road network as well as future mobility-driven network in HRM?
- What kind of services can help families cope with having one car or none?
- How can families maintain a car-free lifestyle with children?

Shared Mobility:

- How feasible is a park and ride plan in HRM?
- What is the optimum design for pickup/drop-off shared mobility lanes?
- How can car sharing impact other transportation modes (e.g. walking and biking) in Halifax?
- What would the impact of ride-hailing services be on Halifax?
- How can we incentivize people to avoid personally owned vehicles?
- What is the total lifecycle energy impact on the shift to shared vehicles vs. shift to individual electric vehicles?
- How can car sharing accommodate the diverse needs of families with children?
- How feasible are electric vehicles in HRM?
- What is the impact of future mobility technologies on parking demands?

- How can we implement policy related to future mobility technologies?

Connected and Autonomous Vehicles:

- How can we incentivize walking as a mode of transportation in the era of autonomous vehicles?
- What partnerships can DalTRAC pursue with the social science disciplines regarding research on poverty and equity around autonomous vehicles?
- How can we ensure the safety of vulnerable road users during their interaction with autonomous vehicles?
- How can we discourage human driving in the future of shared autonomous vehicles?
- What's the social impact of autonomous and electric vehicles?
- How can we maintain transit priority in a world of autonomous vehicles?
- How feasible are autonomous vehicles in HRM?
- What is the impact of parking in an autonomous world?

Electric Vehicles:

- How can we standardize charging technology?
- What is needed in terms of grid capacity to support the electric vehicle network?
- What is the electrification strategy in terms of land use planning (e.g. where should chargers be located? Who owns them?)
- What are the costs and benefits of encouraging electric vehicles in the city?
- What is the feasibility of retrofitting railcars for battery-electric propulsion?
- What's the social impact of autonomous and electric vehicles?

Mobility as a Service (MaaS):

- How can the government sponsor Mobility as a Service infrastructure/products?
- What is the role of the government in MaaS?
- Can micro-mobility be a subsidized transit service run by public agencies?
- How do transit apps affect congestions?
- How can we ensure the integration of active transportation in MaaS products?

C. Workshop Evaluation

At the end of the workshop, we asked the participants to fill the evaluation sheet for the workshop. The purpose of the evaluation is to measure the success of the workshop and gain insight on the improvement of future workshops.

We administered an evaluation survey at the Halifax Connect Smart workshop. The purpose is to objectively measure the success of the workshop elements. The survey evaluates the design of the engagement sessions by assessing the relevance of the presented content, and the usefulness of the activities. The survey ended with three open-ended questions, allowing participants to answer what they liked best and least from the sessions and to provide any additional comments. There were 34 workshop attendees and 23 survey respondents.

3. Workshop Evaluation Results

We present the following analysis based on the order of questions in the survey. In 4 of the questions, we asked respondents to rank their answers on a 5-point Likert scale. 1 represents “strongly disagree” and 5 represents “strongly agree”. The survey is in Appendix E.

Question 1: Were you familiar with smartphone app-based on-demand mobility services before the workshop? (E.g. Uber, Lyft)

The purpose of the first question is to understand the familiarity of the participants with smartphone app-based mobility services. We provided the participants with three options:

- A. Yes, I have heard of them and used them elsewhere
- B. Yes, I have heard of them but have not used them
- C. No, I have never heard of them

48% of the participants have heard of the smartphone app-based on-demand mobility services, and have used them in a city other than Halifax (see Figure 8). Another 48% of participants have heard of those services but have not used them. No one reported that they have not heard of them.

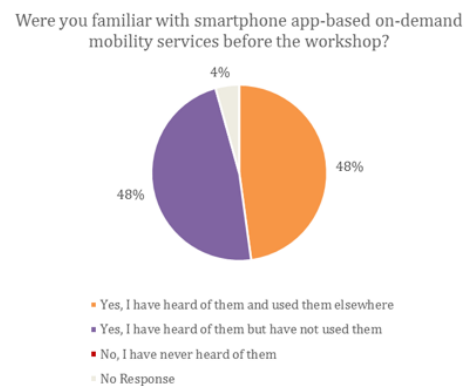


Figure 8: The Participants’ Response to the First Question of the Survey

Question 2: I was excited to attend this workshop

This is the first statement of four using the 5-point Likert scale. 52% of the participants responded with “strongly agree”, 39% responded with “agree” and 9% responded “neutral” (see Figure 9). No one disagreed or strongly disagreed.

I was excited to attend this workshop.

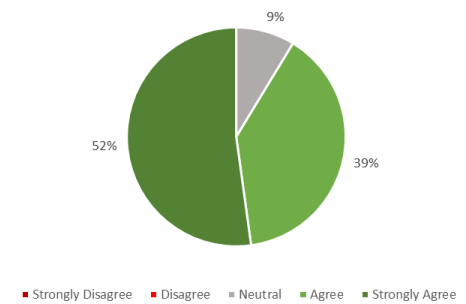


Figure 9: The Participants’ Response to “I Was Excited to Attend this Workshop”

Question 3: The workshop content was relevant, comprehensive and easy to understand

65% of the participants strongly agreed that the workshop content was relevant, comprehensive and easy to understand (see Figure 10). About 31% of participants agreed with the statement and 4% were neutral. No one disagreed or strongly disagreed with the statement.

The workshop content was relevant, comprehensive and easy to understand.

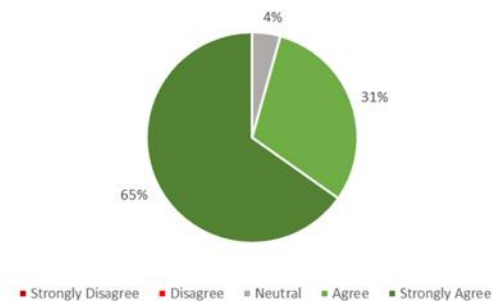


Figure 10: The Participants’ Response to “The Workshop Content was Relevant, Comprehensive, and Easy to Understand”

Question 4: The activities were useful learning experiences

30% of the participants strongly agreed that the activities were useful learning experiences (see Figure 11). About 57% of participants agreed with the statement and 13% were neutral. No one disagreed or strongly disagreed with the statement.

The activities were useful learning experiences.

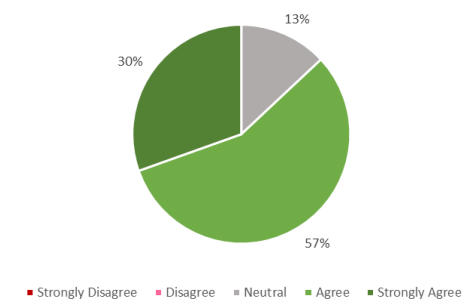


Figure 11: The Participants’ Response to “The Activities were Useful Learning Experiences”

Question 5: The workshop lived up to my expectations

57% of the participants strongly agreed that the workshop lived up to their expectations (see Figure 12). About 30% of participants agreed with the statement and 9% were neutral. Around 4% disagreed with the statement.

The workshop lived up to my expectations.

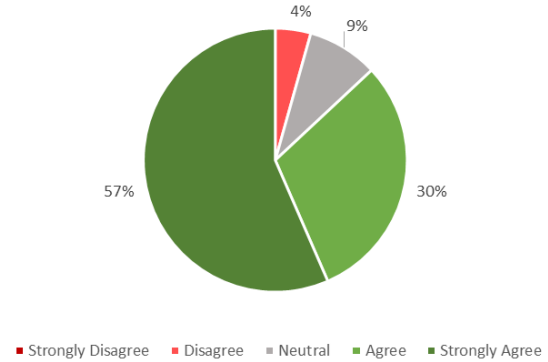


Figure 12: The Participants' Response to "The Workshop Lived up to my Expectations"

Question 6: What did you like best about this workshop?

We also asked two open-ended questions (question 6 and 7) to give participants more freedom in expressing their ideas and opinions. We categorized the responses to those questions based on similar themes. The categories are:

- Presentation
- Activity Sessions
- Break
- Start Time
- Duration
- Facilitation

The majority (65%) of participants enjoyed the sessions the most, and 26% of them enjoyed the presentation the most (see Figure 13). 9% of the participants opted not to answer the questions. More specifically, participants thought the sessions had a positive collaborative component, where they were able to engage and share different ideas with different sectors (e.g. students, public, and private sector). In regards to the presentation, participants enjoyed the amount of information presented.

What did you like best about this workshop?

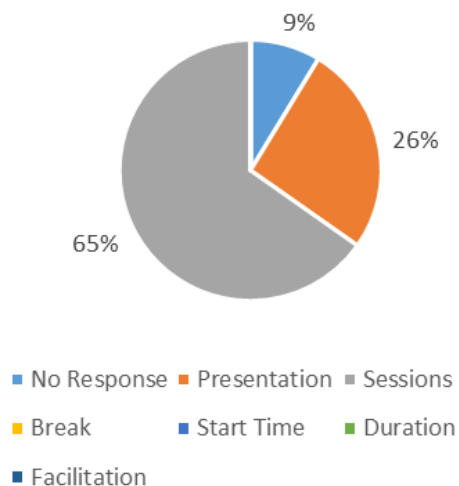


Figure 13: The Participants' Response to "What Did You Like Best About This Workshop?"

Question 7: What did you like least about this workshop?

About 39% chose not to respond to the question (see Figure 14). 22% of participants disliked the facilitation the most. Many disliked the tables that were used during the workshop as they were long and narrow. They suggested we further divide the groups into smaller ones. They also suggested that we provide some of the information (e.g. session activities) before the workshop. 13% disliked the length of the workshop; many suggested increasing the duration of the workshop to get a more cohesive product and conclusion from the workshop. 13% disliked the presentation; some attendees pointed out the use of acronyms and lack of definitions. About 9% of the participants disliked the start time of the presentation as they suggested that we host the workshop in the morning instead of the afternoon, and that we avoid having the workshop right before a long weekend. 4% stated that they would like a longer break. 9% of the participants opted not to answer the questions.

What did you like least about this workshop?

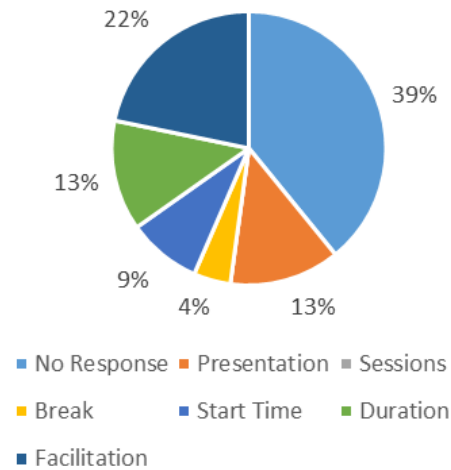


Figure 14: The Participants' Response to "What Did You Like Least About this Workshop?"

4. Town of Bridgewater Workshop

Citizens for Public Transit invited Dr. Habib to speak at their Annual General Meeting (AGM) in the Town of Bridgewater. The meeting was attended by approximately 30 participants, which included members of the public and the private sector. Dr. Habib used the workshop as an opportunity to speak about the local and regional connections between the Town of Bridgewater and the surrounding areas. He discussed the importance of transit to reduce the number of vehicles on the road, provide mobility for people of all ages, and benefit health. In addition, he summarized that transit is successful due to efficiency and competitive travel times. He also illustrated a few transit case studies from communities in Nova Scotia, such as Kings Transit, and the Town of Yarmouth Transit.

Dr. Habib proceeded to discuss the Transit Feasibility Study that DalTRAC completed in partnership with CBCL (see Figure 15). The point of the study was to explore fixed route transit options for the Town of Bridgewater and its edges within the Municipality of the District of Lunenburg. Dr. Habib also shared his experience of riding the Town of Bridgewater transit bus, which has been running as a pilot project since September 2017. He presented the community benefits of transit that increase the sense of community and safety. For example, transit creates new mobility opportunities for seniors and people with disabilities, reduces the need for two cars per family, and increases the number of people on the street. Dr. Habib also emphasized the importance of the local-regional connections in the advancement of mobility in a community. He encouraged the formation of partnerships, and engagement with stakeholders to develop creative ideas and locate funding opportunities.



Figure 15: Dr. Habib Presenting at the Bridgewater Workshop (top) and a New Bridgewater Transit Bus (bottom)

5. Social Media Campaign

Introduction

According to Dia, Hassan and Chong (2017), social media is an effective tool for facilitating learning and reflection in post-secondary institutions. We implemented the Connect Smart social media campaign through DalTRAC's existing Facebook and Twitter pages to promote discussion, engagement and excitement about sustainable transportation methods and the future of transportation infrastructure. The goal of the social media campaign was to raise awareness on the future mobility technologies through a wider online audience. The social media posts included videos, images, contests, discussion questions, incentives and a hashtag trend over 16 posts. The #ConnectSmart hashtag was an important asset that proceeded every post to encourage trending and solidify the overarching message of the

campaign. The 10-day campaign started on February 7, 2018 and ended on February 16, 2018 (see Figure 16). We are relaunching the social media campaign during the summer in order to attract more interest.

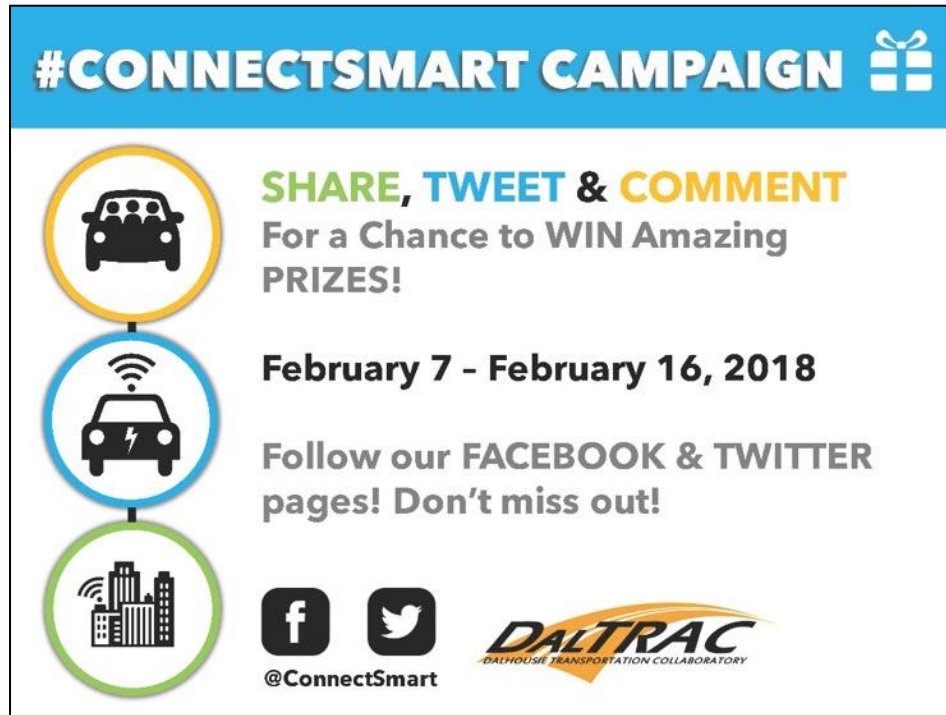


Figure 16: Promotional Image for the Connect Smart Social Media Campaign

Target Audience

The target audience of this campaign was all users of transportation systems in Nova Scotia, including walkers, rollers, cyclists, drivers, and public transit riders. It also extended to anyone that had an interest in transportation topics and issues in general.

Examples of Posts

Figure 17 illustrates some examples of posts used during the Connect Smart social media campaign.

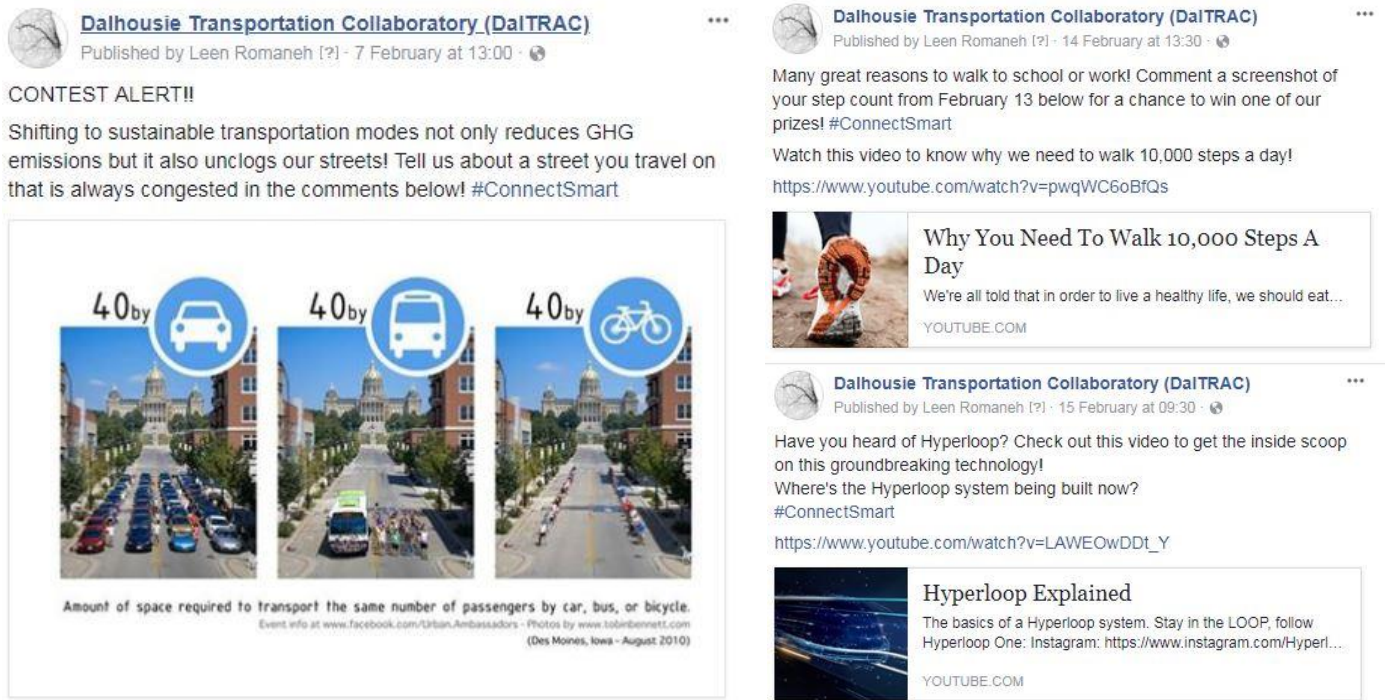


Figure 17: Examples of Posts during the Connect Smart Social Media Campaign

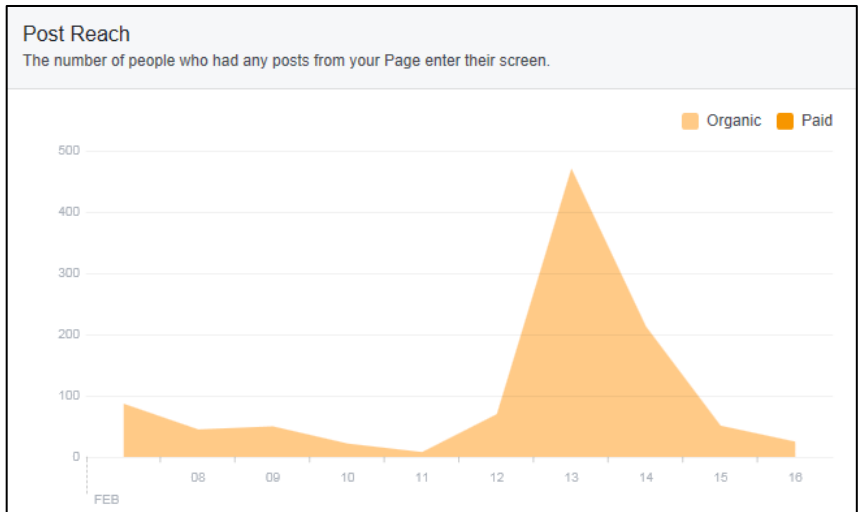
Evaluation

After the Connect Smart social media campaign was completed, DalTRAC employed the following methods to evaluate the success of the campaign:

- Facebook Insights to measure reaches, views, likes, shares, comments and followers on the DalTRAC Facebook page
- Twitter Analytics to measure views, likes, retweets, comments and followers on the DalTRAC Twitter page

Discussion of Results

The DalTRAC Facebook page was viewed 37 times throughout the campaign. Most notably, page views peaked on February 13 at 27; the same day that an existing post was shared to official Dalhousie Facebook groups and pages. In addition, page likes increased from 174 to 178 throughout the campaign. At the post level, 1,032 people were reached, which represents the number of people who saw any post from the campaign. In alignment with page views, post reaches peaked on February 13 at 470 and a detailed breakdown is shown in Figure 18. Additionally, reaches from the Connect Smart Workshop event are highlighted in Figure 18.



Event Date	Event	Published	Reach	Responses
02/16/2018 2:00 PM AST	Connect Smart Workshop	02/08/2018 11:19 am	78	10

Figure 18: Post Reach for the Entirety of the Campaign and the Connect Smart Workshop Event

The most successful post was published on February 9, 2018, which is shown in Figure 19 below. This post included a brief set of instructions to incentivize viewers and an image to inform and engage the audience about the campaign. In terms of interactions, 646 people were reached, 37 people clicked on the post, 9 people liked the post and 3 people shared the post. This post was shared to official Dalhousie Facebook groups and pages to expand the reach of the campaign.

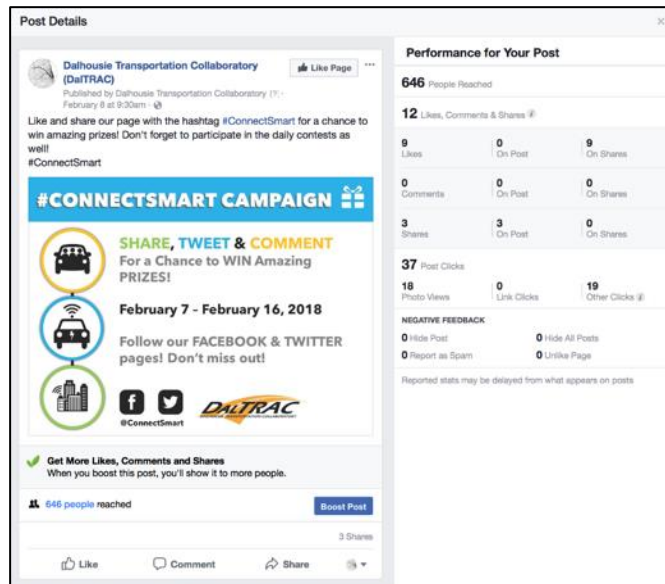


Figure 19: The Most Successful Facebook Post from the Campaign

It is clear that reach was imperative to the success of individual posts and the DalTRAC Facebook page as a whole. In general, posts with a higher reach had more likes, comments and shares as more people were exposed to the content on their screen. For example, this trend was most apparent in the shared post from February 8, 2018.

Another important metric was page views, which was dependent on post reach and shares. For example, the post from February 8, 2018 reached 646 people and it was shared 3 times. As a result, page views peaked at 27 on February 13, which equated to approximately 73 percent of the total page views from the entire campaign.

Incentives were also an effective form of engagement. For example, 8 out of the 16 posts mentioned an opportunity to win a prize and these posts received a total of 24 likes, comments or shares. In contrast, the 8 posts that did not mention an incentive received a total of 3 likes, comments or shares.

Overall, the social media campaign was not as successful as expected. In the future, to improve the level of engagement, post reach should be encouraged by sharing posts to additional groups and pages to expand the target audience. This will not only promote likes, shares and comments, but it will also increase page views. In addition, a longer campaign with higher outreach could expand post reach and page views due to a higher chance of exposure. This is why we are planning on republishing the social media campaign during the summer. Lastly, incentives were an effective engagement technique that should be applied in the future to increase likes, shares and comments.

6. Connect Smart Website

DalTRAC is launching a website that will be a source for the public, professionals and community groups in regards to transportation technologies and the future of mobility. The site provides useful resources that could enrich people's knowledge on the topic of future mobility. The site is currently under review by Dalhousie University and is expected to be launched in March, 2018. Figure 20 illustrates a screenshot from the website. We also plan on continuing to host and update the website as a permanent resource.

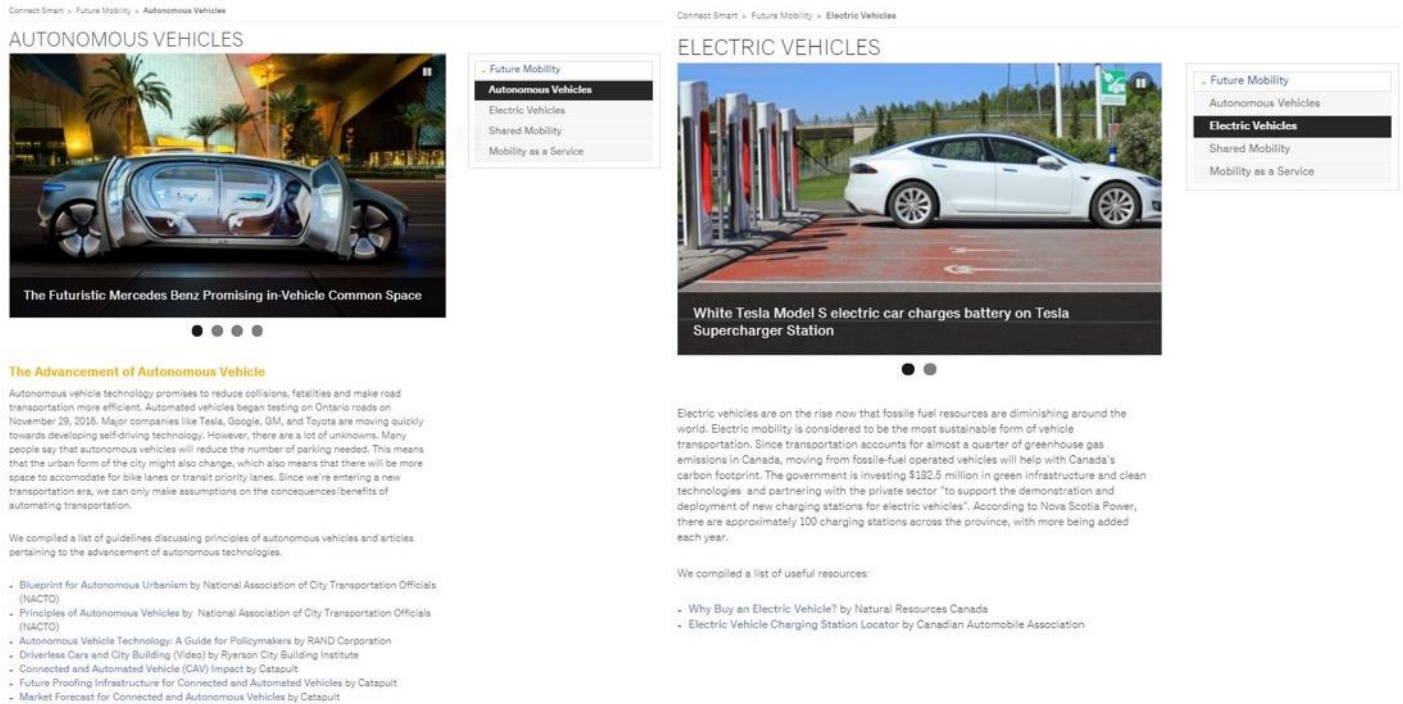


Figure 20: Samples from the Connect Smart Website.

7. Conclusion

The Connect Smart project engaged, facilitated and educated both professionals and the public through two workshops in the Town of Bridgewater and Halifax, and the social media campaign. The on-going social media campaign will attract more interest in the future of mobility technologies. We are also hosting a Connect Smart website that includes information and resources to articles that discuss shared mobility, electric vehicles, autonomous vehicles, and mobility as a service.

The project has impacted planners, urban designers, engineers, and community groups. It generated meaningful discussion regarding sustainable transportation options and the future of mobility technology. The workshops allowed participants to generate ideas, share research findings, case studies and opinions on integrating new mobility options and technology (i.e. electric vehicles) with the existing system. This report could be used as a knowledgebase when developing shared mobility plans and when integrating new mobility options. Finally, this project has helped evolve DalTRAC's research agenda. The project assisted in generating stimulus for a cultural shift in planning practices in the Province of Nova Scotia. The project encouraged the public to rethink their mode of transportation, and provide valuable information on the benefits of sustainable transportation and shared mobility options.

8. Bibliography

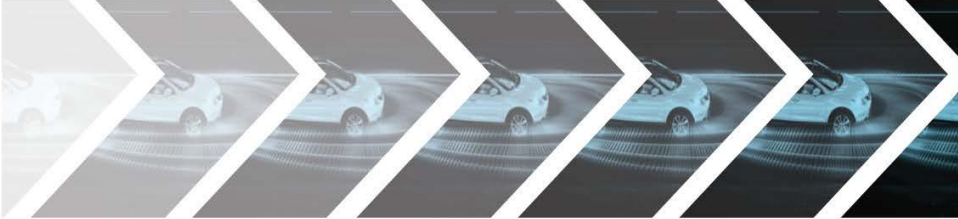
Corwin, S., Giffi, C. A., Jameson, N., & Vitale, J. (2016, September 29). *Deloitte Insights*. Retrieved from Deloitte: <https://www2.deloitte.com/insights/us/en/focus/future-of-mobility/future-of-mobility-transformation-in-automotive-ecosystem.html>


Dia, H., Hassan, R., & Chong, E. (2017). Using social media. *Institute of Transportation Engineers. ITE Journal*, 87(12), 39-43. Retrieved from <http://ezproxy.library.dal.ca/login?url=https://search.proquest.com/docview/1985146503?accountid=10406>

Facebook. (2018). Facebook Insights. Retrieved from <https://www.facebook.com/DalTRACHalifax/insights/?section=navOverview>

APPENDIX A

This appendix includes the poster that DalTRAC created to promote the Halifax workshop.





#CONNECT SMART DalTRAC WORKSHOP 2018


Learn about emerging technologies that are shaping the future of transportation

Dalhousie University
Exhibition Room,
Ralph M. Medjuck
Building
5410 Spring Garden Road
Halifax, NS


16 February 2018
2 pm – 4 pm

Snacks and
Beverages are
Provided


Help us develop a shared vision to plan for the future of mobility



Technology



Innovation



Environment

APPENDIX B

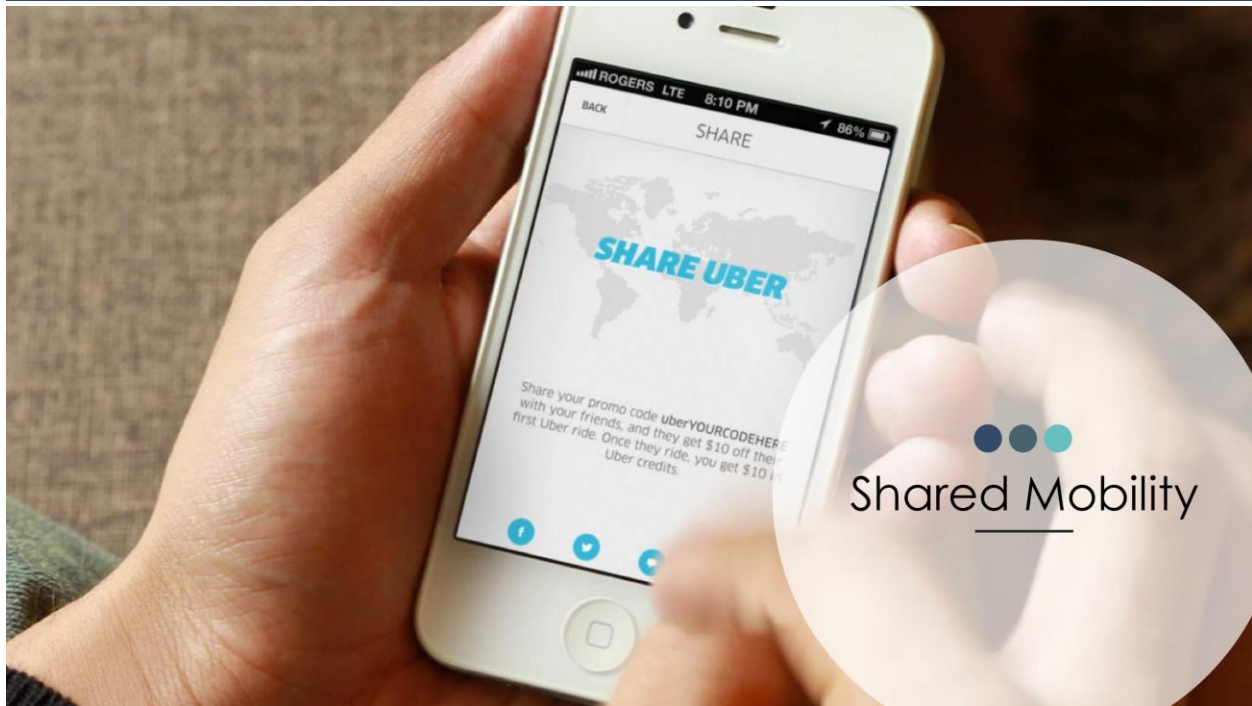


Connect Smart Workshop



- 01 The Future of Mobility (30 minutes)
Shared mobility, electric vehicles, autonomous vehicles & mobility as a service
- 02 Objective: Where Do We Go Now?
What does it mean for urban planners, designers, policy makers, engineers and the public?
- 03 Session #1: Group Discussion (30 minutes)
How can we prepare for future mobility?
- 04 Session #2: Group Discussion (35 minutes)
Planning and Research Agenda

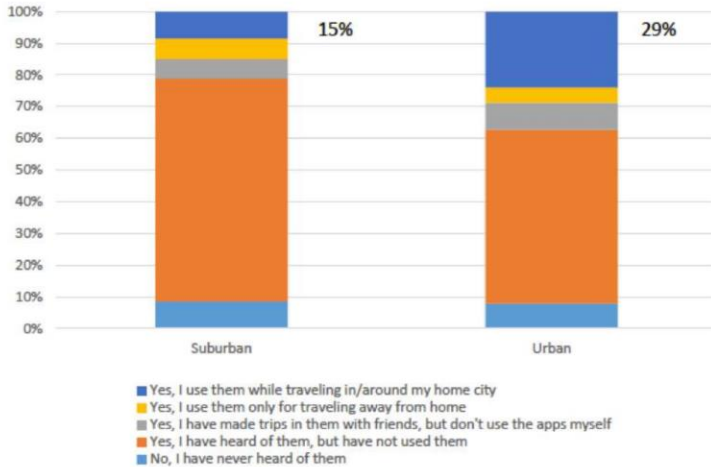
“The mobility of the future is emission-free, seamlessly networked and – if desired – will also be capable of making completely autonomous driving possible”.





Adoption of Shared-Mobility Services

Study by UCDAVIS (Clewlow, Mishra, Jenn, Laberteaux, 2017)



Locations:

- Boston, MA
- Chicago, IL
- Los Angeles, CA
- New York, CA
- Seattle, WA
- San Francisco, CA
- Washington, D.C.



Shared Mobility Benefits

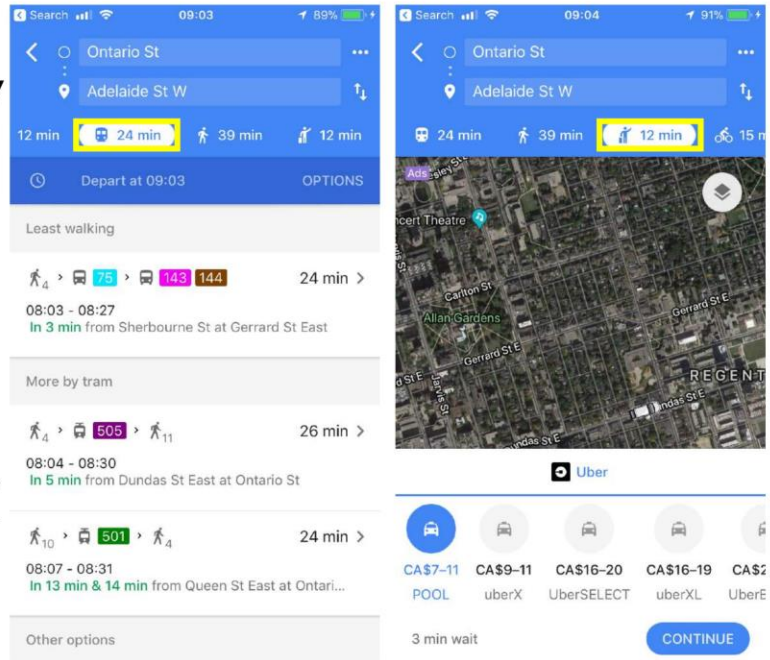
MIT Study (Alonso-Mora, Samaranayake, Wallar, Frazzoli & Rus, 2018)

- Reduces the number of vehicles on the road by **X 3**
- **95%** of demand can be covered by **2,000** vehicles instead of **14,000** taxis (New York)



Shared Mobility Benefits

In this example, taking public transit in Toronto costs \$3.25 and takes double the time to get to the same destination with a car. UberPool costs \$7-11, you would share the ride with other people, and get to your destination faster.



Impact of Shared Mobility

Ride hailing services have demonstrated car ownership can decline when travellers' needs are satisfied.

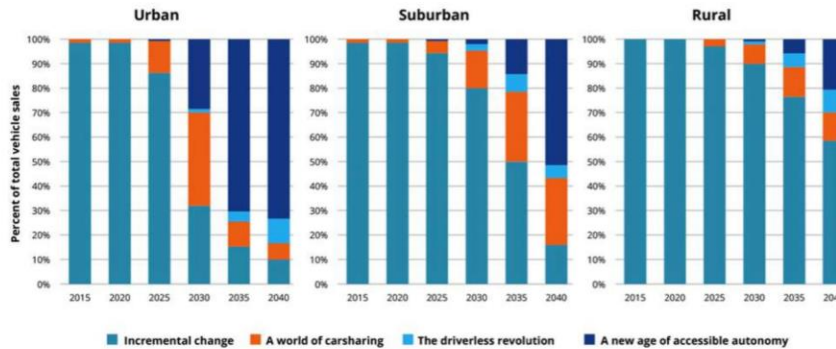




Access vs. Ownership? (U.S. Example)

Deloitte University Study (Jameson, Giffi, Vitale, 2016)

Projected adoption of shared and autonomous mobility across different geographies



By 2030, shared vehicles could overtake personally owned vehicles in **urban areas**. Shared driver-driven vehicles will likely grow quickly until 2030 but then lose market share to shared autonomous vehicles.

Suburban areas will likely be slower to shift to shared and autonomous mobility, but by 2040, personally owned vehicles might be only a small portion of sales.

The benefits of shared and autonomous mobility are less pronounced in **rural areas**, and adoption will likely be slow.



Ridesharing in Canada – Smart Commute

Program of METROLINX and Municipalities in the Greater Toronto and Hamilton Area

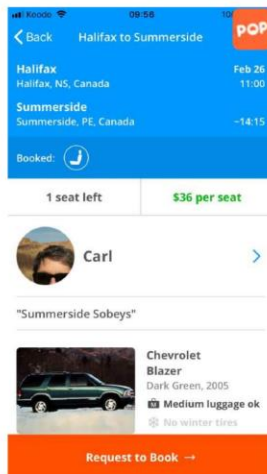


- **Save Money** – Share your commuting costs; calculate your potential savings.
- **Carpool Parking at GO** – Find your carpool partner and take advantage of designated carpool parking spaces at your local GO station
- **Free Carpool Parking** – The Ministry of Transportation of Ontario provides free carpool parking lots across the GTHA that are easy to access
- **Have Fun** – Our Commuter Attitudes survey showed that 81% of the carpoolers reported that they are satisfied with their commute.
- **Reduce Stress** – Sit back and let someone else do the driving for a change.
- **Bypass Traffic** – Take advantage of the high-occupancy vehicle (HOV) lanes.
- **Reduce Pollution** – Reduce greenhouse gas emissions by taking a vehicle off the road



Long-Distance Ridesharing in Canada

POPARIDE



kangaride

Ottawa to Toronto for \$35

ridesharing.com

Toronto to Montreal for \$34



Regulatory Frameworks Study

Technology-Enabled Ride Sourcing : An Examination of Regulatory Frameworks and Public Discourse in Canadian Cities (Ashraf & Habib, 2017)

Established

- Toronto
- Ottawa
- London
- Niagara Region
- Waterloo Region
- Hamilton
- Calgary
- Edmonton

Emerging

- Red Deer
- Lethbridge
- Windsor
- Barrie
- Kingston
- Quebec
- B.C.
- Manitoba



Technology-Enabled Ride Sourcing

An Examination of Regulatory Frameworks and Public Discourse in Canadian Cities (Ashraf & Habib, 2017)

"It's a fair, level playing field... the only one that doesn't seem to like it is Uber. They don't believe in regulation, they don't believe in proper insurance, paying their taxes" (Calgary Cab Associations President)

"In a city where accessibility can often be lackluster at best, Uber Assist and accessible taxis provide two new ways to explore-and that alone should be celebrated"(Geboers)

"We look forward to the city (Toronto) screening and licensing Uber drivers as soon as possible to ensure that all options are safe for Torontonians"(Gary & Moore, The Globe and Mail)

"Uber argues cameras are unnecessary because it already has safety measures in place, including background checks and the fact that users are provided with drivers' names, photos, license plate numbers and vehicle information (Gary & Moore)

"The decision means the city will begin screening UberX drivers for criminal backgrounds, driving record and insurance" (Dehaas)

"This is a matter of fairness for all market partners and for the safety users... I also intend to work with our partners to develop innovative solutions to provide Quebec users with a modern industry that meets their needs" Gary & Moore)

"Places that failed to move carefully when they brought in ride-sharing have seen safety issues, unpredictable prices and unstable access to services"(Duran & Yuzda)



Technology-Enabled Ride Sourcing

An Examination of Regulatory Frameworks and Public Discourse in Canadian Cities (Ashraf & Habib, 2017)

X = Discourse theme represented in regulation
O = Discourse theme not represented in regulation

City	Tracking/Rating	Licensing	Safety Checks	Insurance	Accessibility	Social
Toronto		X	X	X	X	X
Hamilton	X	X	X			
London	X	X	X		O	
Ottawa		X	X			
Kitchener-Waterloo		X	X	X		
Niagra Region	O	X	X	X		
Calgary		X	X			
Edmonton	X	X	X	X		



Shared Mobility

New services and providers are emerging



Bike Sharing



Car Sharing



Ride Sharing



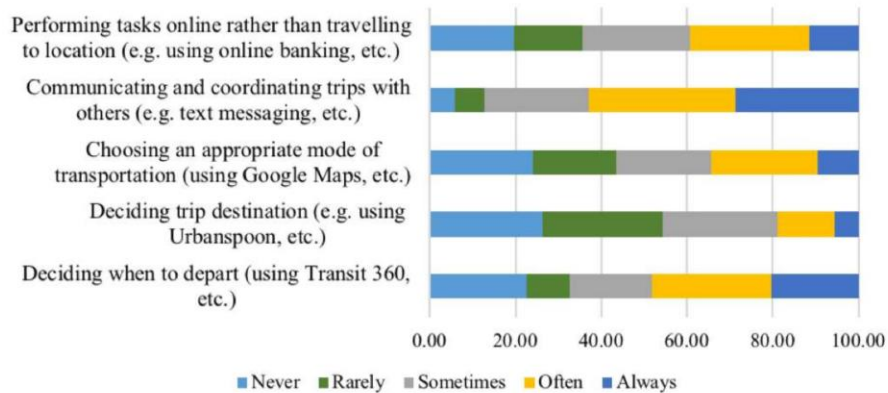
Taxi Apps



Smartphone and Travel Behaviour

Halifax Smartphone Use & Travel Survey (Jamal, Khan & Habib, 2017)

Use of smartphone applications for trip planning activities

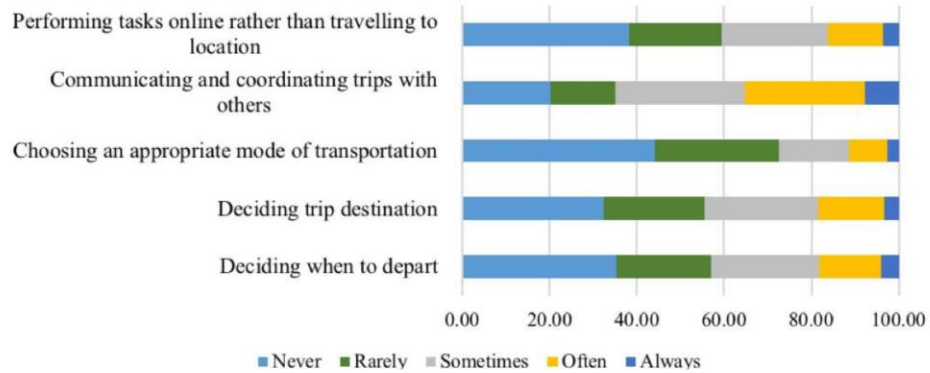




Social Networking and Travel Behaviour

Halifax Smartphone Use & Travel Survey (Jamal, Khan & Habib, 2017)

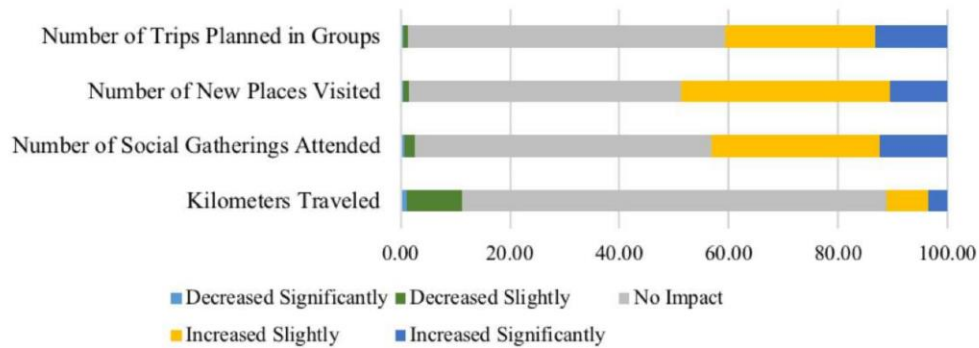
Use of social networking applications



Impact on Travel Outcome

Halifax Smartphone Use & Travel Survey (Jamal, Khan & Habib, 2017)

Impact of smartphone use on travel outcomes

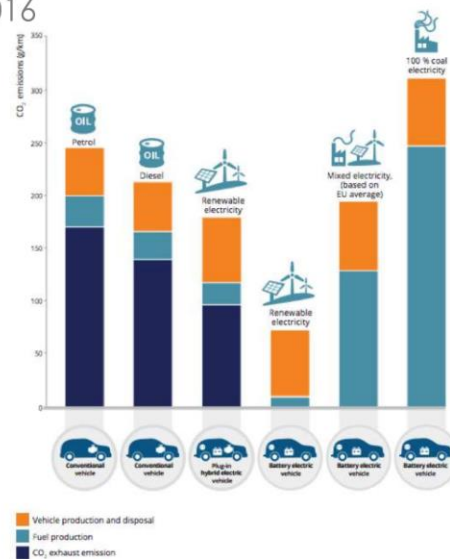




Electric Vehicles Benefits

European Environment Agency Report, 2016

- **Reduced emissions** during the electric vehicle's lifetime **outweigh the environmental effects** of the production and end-of-life phases
- Electric vehicles can reduce the environmental effects of conventional vehicles, **as long as the electricity is from renewable sources.**





Adoption Trends of Electric Vehicles

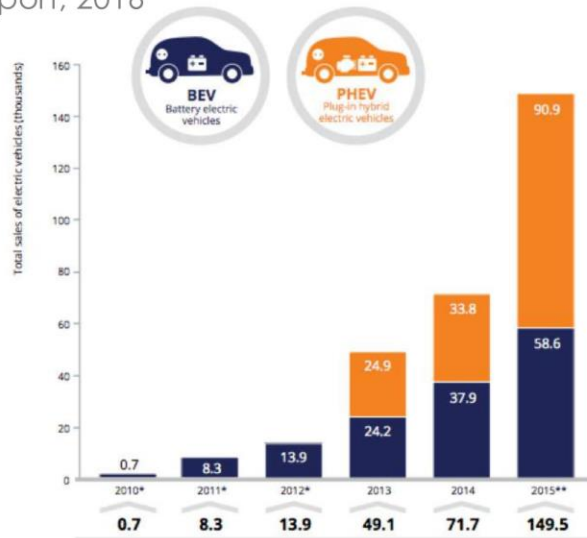
European Environment Agency Report, 2016

The largest numbers of BEV sales:

- France (+17,650)
- Germany (+ 12,350)
- United Kingdom (+ 9,900)

The largest numbers of PHEV sales:

- Netherlands (+ 41,000)
- United Kingdom (+ 18,800)



Adoption of Electric Vehicles in Canada

Study by McMaster University (Mohamed, Higgins, Ferguson, Kanaroglou, 2016)

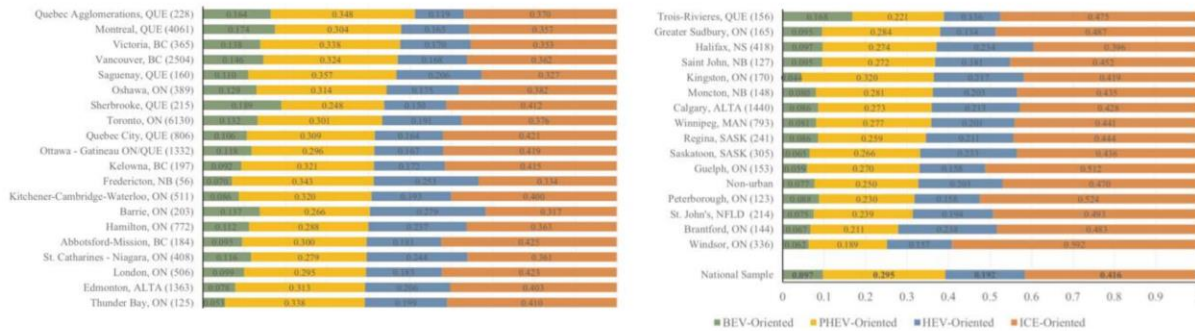


Fig. 3. Prominence of each latent class by Census Metropolitan area.



Electric Vehicles Planning Considerations



Cities Piloting CAVs

Cities that are hosting CAV tests, or have committed to doing it soon



Cities Preparing for CAVs

Surveying the regulatory, planning and governance issues raised by CAVs but did not start piloting





Autonomous Vehicles Levels

Level 0 No Automation	Level 1 Driver Assistance	Level 2 Hands Off	Level 3 Eyes Off	Level 4 Mind Off	Level 5 Steering Wheel Option
System issues warnings only	Assisted parking Adaptive cruise control	System takes over steering & acceleration	Automated highway driving System recognizes limits	Automated city driving Driverless Parking	Full automation Driver not needed



Autonomous Vehicles Levels

Level 0 No Automation	Level 1 Driver Assistance	Level 2 Hands Off	Level 3 Eyes Off	Level 4 Mind Off	Level 5 Steering Wheel Option
System issues warnings only	Assisted parking Adaptive cruise control	System takes over steering & acceleration	Automated highway driving System recognizes limits	Automated city driving Driverless Parking	Full automation Driver not needed



Benefits of Autonomous Vehicles

Study by Virginia Tech (Doerzaph, 2017)



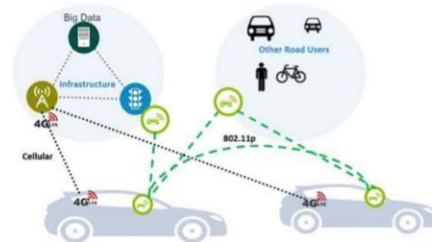
- Vehicle to vehicle communication may address up to **81%** of crashes involving unimpaired drivers (24k fatalities, 1.8M injuries, 7.3M property damage)
- Vehicle to individual communication may address up to **18%** of crashes involving unimpaired drivers
- Improved traffic flow and reduce delays (27%)
- Increased awareness of and access to multi-modal choices
- More direct, actionable information for drivers (re-routing, incidents, weather, etc.)
- Combined Eco-Signal apps may reduce CO₂ & fuel consumption (11%)
- Signal and freeway lane management combined reduce fuel consumption (22%)



Autonomous Vehicles

Methods of Connecting

Study by Virginia Tech (Doerzaph, 2017)



1) Dedicated Short Range Communications:

- Low latency
- High reliability
- High security and privacy
- Trusted connection
- Relatively short range
- Transportation agency ownership

2) 3G/4G Cellular:

- Nearly ubiquitous coverage
- Less reliable communications
- Higher latency
- Telecomm owned

3) 5G Cellular (Future):

- Still in draft technical specs but promising
- Works from much of the existing cellular infrastructure
- Performance TBD
- V2V capability TBD
- Telecom owned



Autonomous Vehicles

Virginia Connected Corridors

Study by Virginia Tech (Doerzaph, 2017)

Northern Virginia Test Bed

Fairfax County, VA

Northern Virginia

Smart Road

Virginia Tech Transportation
Institute Blacksburg, VA



Planning Implications of Autonomous Vehicles

Study by Virginia Tech (Doerzaph, 2017)

1) Infrastructure 5-10 year Lifespan

- Comms equipment, connectivity, data management & storage
- Updates to legacy equipment, such as signal controllers may be necessary

2) Mobility Implications

- Models often show benefits, but still many assumptions under such estimates
- Mixed fleet is considered a key challenge for automated systems
- Huge potential gains once operational environment is refined (~2x capacity increases)

3) Increased needs for monitoring & contingency planning

- System outage or failures become more significant
- System security becomes critical
- Privacy becomes critical

4) Capacity Building

- More capacity required
- Initial needs for broader knowledge and ability to bridge technical gaps
- Competitive hiring environment

5) Lots of Data

- Robustness of data you publish and applications it supports, what to do with the data?
- Means, desire & authority to monetize?
- Privacy concerns, public acceptance



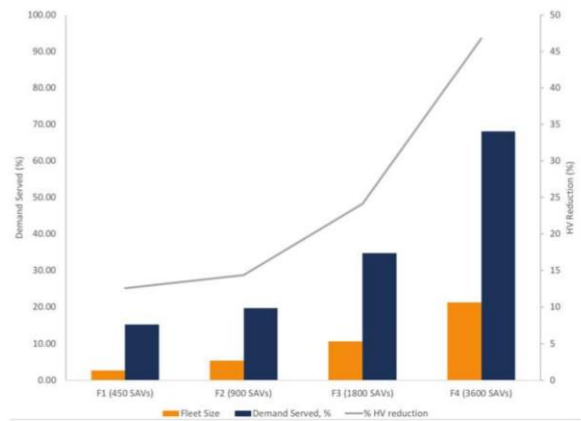
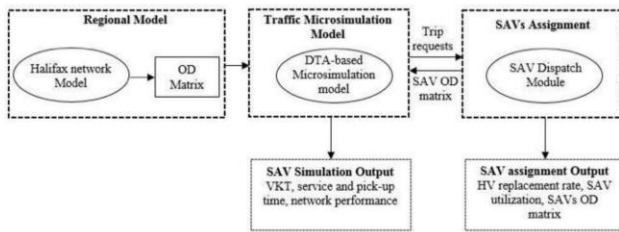
Halifax Peninsula AV Impact Study

By Alam & Habib, 2018



Halifax Peninsula AV Impact Study

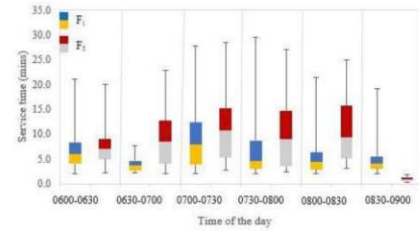
By Alam & Habib, 2018





Halifax Peninsula AV Impact Study

By Alam & Habib, 2018



Scenarios	Hours	Hourly network performance evaluation		% Changes in VKT for peak periods	
		% change in avg. speed	% change in total travel time	% change in total network VKT	% change in total Peninsula VKT
85% HV and 15% SAV trips	1 st hour	9.64	-4.7	+1.73	+4.8
	2 nd hour	-12.1	15.4		
	3 rd hour	-25.3	33.4		
80% HV and 20% SAV trips	1 st hour	7.5	-3.0	+3.63	+14
	2 nd hour	-2.4	8.5		
	3 rd hour	-15.2	18.7		

“The car is growing beyond its role as a mere mean of transport and will ultimately become a mobile living space”

Dr. Dieter Zetsche, 2017





Autonomous Vehicles

Planning for People Not Cars?

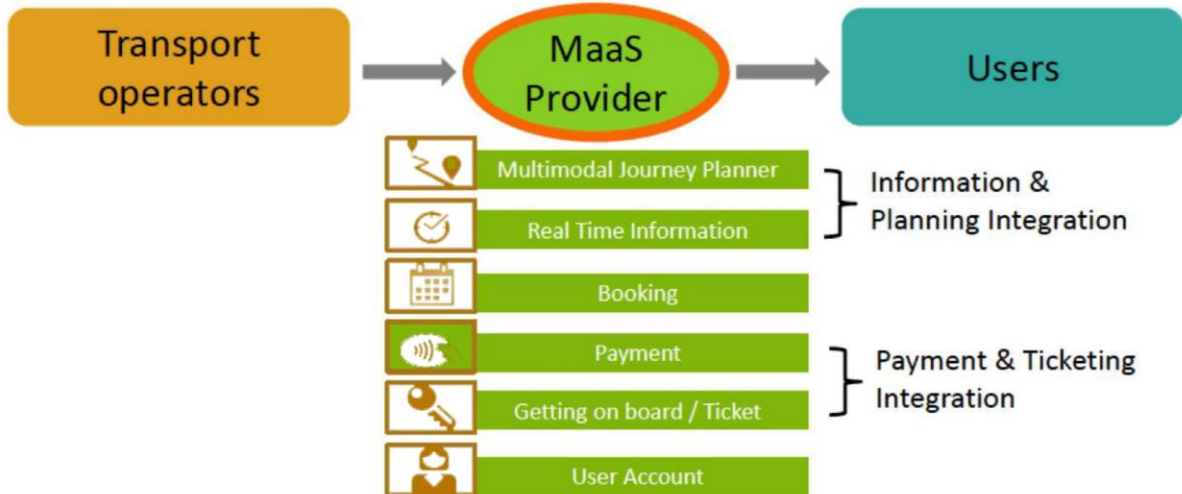


Mobility as a Service



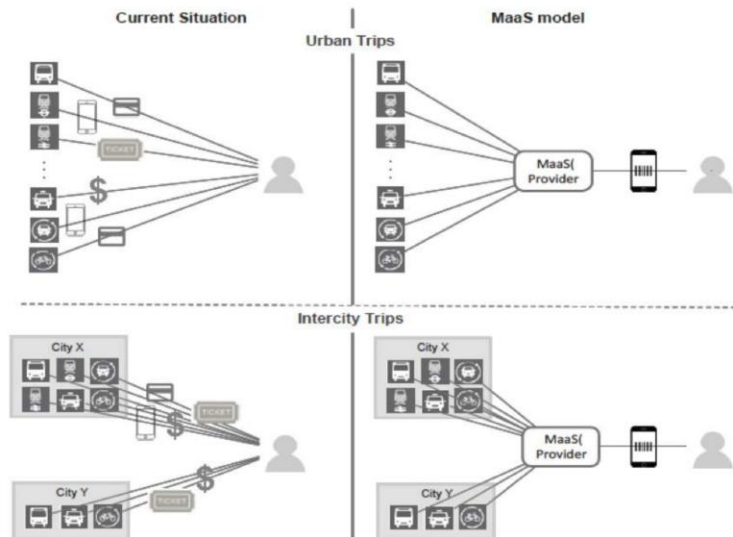
Mobility as a Service (MaaS) Concept

Research by UCL (Kamargianni, Matyas, 2017)



Mobility as a Service (MaaS) Concept

Research by UCL (Kamargianni, Matyas, 2017)





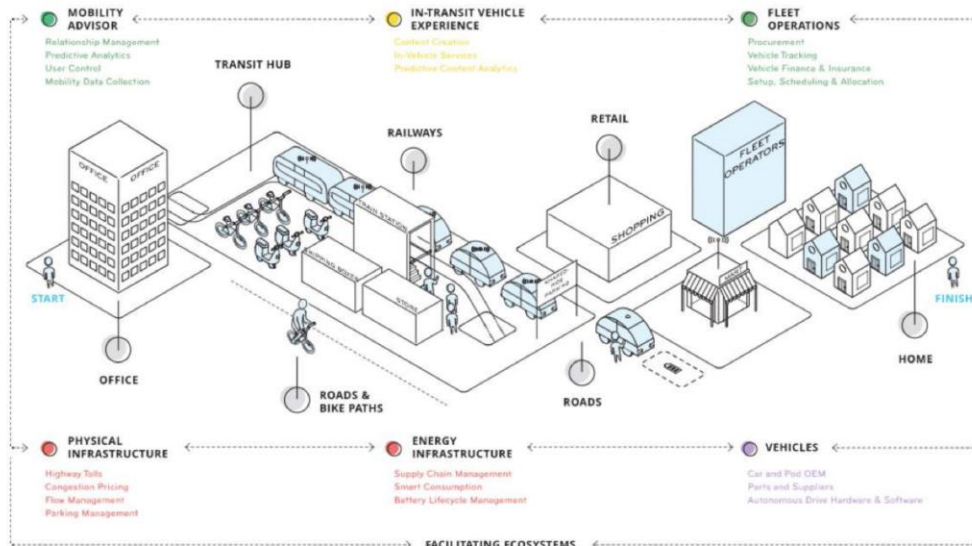
MaaS Products

Research by UCL (Kamargianni, & Matyas, 2017) (Whimapp: Helsinki, West Midlands, Amsterdam & Antwerp)

Light	Medium	Premium	Pay-as-you-go
<p>89€ /month</p> <p>Unlimited HSL Helsinki public transport + 1.000 Whim points</p> <p>Use your Whim points as you like, for example:</p> <p>2 taxi trips (~10 km/trip) daytime + unlimited local public transport</p>	<p>249€ /month</p> <p>Unlimited HSL Helsinki public transport + 5.500 Whim points</p> <p>Use your Whim points as you like, for example:</p> <p>8 taxi trips (~10 km/trip) daytime + unlimited local public transport + 2 days of car rental</p>	<p>317€ /month</p> <p>Unlimited HSL Helsinki public transport + 8.000 Whim points</p> <p>Use your Whim points as you like, for example:</p> <p>8 taxi trips (~10 km/trip) daytime + unlimited local public transport + 5 days of car rental</p>	<p>Try Whim without commitment and upgrade whenever you like.</p> <p>Transport providers:</p> <p>HSL, SBB, SGT, VEHO</p> <p>We get you to your destination using your preferred mode of transport, letting you pay as you go – all in one app!</p>



Security & Risk
Connectivity
Horizontal OS





MaaS Planning Implications

Research by UCL (Kamargianni, Matyas, 2017)

- 1) Regulatory Framework
- 2) Integration issues and Pilot Projects:
 - Greater Manchester (city and national trips – PTA)
 - Luxembourg – Germany (intercity, international trips – TO)
 - Budapest (city, national and international trips - MaaS trailblazer)
- 3) Partnership
 - Multi-trillion dollar market (TSC, 2016)
- 4) Research and Development
 - Market research for MaaS demand (supported by TfL and DfT)

We are far from realizing an
automated transportation system.



Vision



Reality



Ottawa

First Canadian
City to Test AVs
in the Suburbs of
Kanata



Trends Affecting Mobility



Shared Economy



Mobile Internet



Self-Driving Cars



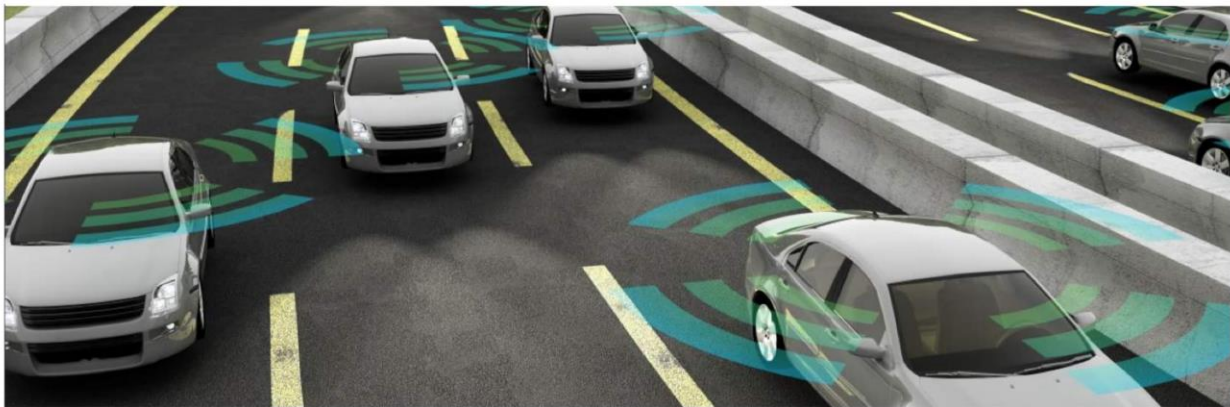
Dubai

First City to Test
“Volocopters” in
September 2017



Multi-Car Collision Avoidance (MuCCa)

- Avoid multi-car collisions on motorways.
- If an accident cannot be avoided, it'll attempt to minimise its consequences (both injuries and damage).





Autonomous Vehicles

The City of Tomorrow?



APPENDIX C

This appendix contains the raw responses to the first workshop session activities.

Question 2: Brainstorming Session: What are the Planning Issues and Needs for the Future of Mobility in Nova Scotia?

The participants identified the following planning needs and issues:

Needs:

- Demand rates are enormous, need better rates
- Standardization of infrastructure
- Is there a role for the public sector?
- Focus transit on corridor routes
- Focus on bike planning
- Province needs a regional strategy
- Aging province, will people embrace new technology? Need to figure out how to communicate
- Variable tolls as economy will make better use of roads
- Regulations – Tolling vehicle
- Infrastructure planning – grade separated crosswalk
- No regulation for Uber
- Bring in ride hailing
- Better car sharing regulations
- Protected pedestrian/bike lanes bridges for cars to cross safely over pedestrians/cars
- Turning parking lots into parks! In 10-20 years will we need all the cars we have parked?
- Incentivize people to build less parking now
- Parking needs lower
- Drop-off areas increase
- Staging areas?
- Digital infrastructure
- Trucking/delivery
- On-street parking eliminated?
- Regulation and policy
- Funding and economic framework
- Need active transportation
- Equity in transportation, more options
- Thoughtful regulation to encourage sharing
- Cheaper travel = more travel
- Reconcile urban vs. rural voices
 - Rural communities left behind with tech

- Cheaper travel could improve connectivity
- Cheaper travel could worsen sprawl
- Travel may not be wasted time in the future
 - Will we tolerate longer commutes?
 - Will work week lengthen? 50 hours?
- Will cheap transport remove local distinctiveness?

Issues:

- Rural land use planning/protection = people will want to live further
- How will you incentivize people to live in the city?
- Market is very specific to same lifestyle that sells condos, people that don't buy cars necessarily
- Social justice
- Liability in terms of accidents
- Future of surface parking? Due to more compact development (days of wandering suburban bus)
- Impact on jobs, implications for jobs, new economy will develop but type of job will transition
- Safety
- Human driving illegal?
- Human-autonomous vehicle interaction
- Waste
- Downside of tech shift: what are our values? What are our goals?
- Sedentary lifestyles
- Last mile problem still exists with transit
- 1st mobility revolution destroyed cities, what will #2 do?
- How do we fund infrastructure?
 - Tolls going away in NS
 - No gas tax with electric vehicles
 - VAT tax
 - Vehicle surcharge
 - Internalize cost
- Congestion will get worse

Question 3: Shared Vision Buzzwords

The participants came up with the following vision buzzwords:

- Accessible X 5

- Integrated X 3
- Sustainable X 3
- Connected X 2
- Reliable
- Multi-purpose
- Transformative
- Affordable
- Progressive
- Socialist
- Access
- Efficient
- Family-centric
- Diversify
- Humane
- Iterated
- Seamless
- Safety
- Equitable
- Hyper-innovation
- Forward-looking
- Rural mobility
- Inclusive
- Productivity
- Adoptive
- Empowering

APPENDIX D

This appendix contains the raw responses to the first workshop session activities.

A. What Should our Planning Goals be in the Short and Long Term?

The participants came up with the following short term and long term goals:

For Shared Mobility:

- Short term:
 - Awareness
 - Benchmarking
 - Willingness
 - Equity
- Long term:
 - Infrastructure
 - Flexible policy
 - Options
 - Reliability
 - Safety

For Electric Vehicles:

- Reassess / Re-structure Gas tax and road tolls
- Assess electric grid capability
 - Robust enough?
 - Planning for larger draws @ evening/overnight charging times
- Gas station / “fuel” station networks
 - Capacity
 - Network(s)
 - Regulatory framework
- Lack of noise issue with EVs
 - Consideration for pedestrian awareness
- Electric vehicle research beyond just road vehicles -> trains, etc.
- Can existing combustion vehicles be repurposed?
- Policy & LUBs considerations
 - Build into plans now / soon to be EV ready
 - Research -> fracking preference of rider to choose EV if given choice

For Autonomous Vehicles:

- Does AV training data get shared between jurisdictions?
- Who collects, stores, has access to data?

- Strong regulation for data privacy and security
- Data on where we are is extremely valuable
- Can the vehicles be hijacked remotely?
- Will people retain vehicles as a status symbol or will sharing prevail?
- Goal: more people sharing
- TDM policies can encourage sharing
- We need a whole new approach to maintenance -> IT staff vs. mechanics
- Fear of sharing companies making gated communities. Need regulation to prevent
- Shift from parking zones to drop-off zones
- Will it be like a large-scale school drop off loop?
- Reduced parking needs makes room for infill
- Long-term goal: replace parking and housing along transit corridors
- Long-term goal: ban human-driven cars

For Mobility as a Service:

- Short term:
 - Planning
 - Major infrastructure investment
 - Drop-off zones
 - Engagement and education communication
 - Facilitate car share & ride hailing
- Long term:
 - Planning
 - Automated bike share
 - Access to vehicle more affordable
 - How to accommodate monopoly

B. What Should our Research Agenda be?

Participants brainstormed some research ideas that DalTRAC could look into in relation to technology-enabled future mobility. The ideas included:

- Grid capacity
- Electrification strategy where should chargers be? Who owns them?
- Removing barriers to entry:
 - Social/justice issues, re: communication/transportation link
- Exploring options to mitigate congestion of the peninsula in the future following plans for intensification through technologies such as electronic road tolling or higher-order transit such as LRT
- Robust data research to support future evidence-based decision making

- Planning for interaction between autonomous vehicles and pedestrians (vulnerable road uses, future of crosswalks)
- Bike share systems (including dockless bike shares) and impact on travel behaviour, streetscape, feasibility
- How feasible is a ring road/park and ride plan in the HRM
 - Can we keep cars out of downtown?
- Can HRM benefit from street cars on major corridors?
- How can we effectively prepare our rural areas of what's to come
- At what level should government be involved in maas
- Maas and active transportation, and how can they complement each other
- What measures may be effective to discourage SOV in a world of autonomous vehicles / maas
- Looking to decrease overlapping bus routes to improve congestion
- Alternative ways for residents who live off the peninsula who don't have access to transit to commute into the downtown
- Updating parking data for HRM and dal inventory
- Looking to create bike land networks to make the city more accessible by bike. Single street implementation will not encourage a shift in habit/lifestyle
- Optimum design for pick up/drop off lanes for shared autonomous cars
- Costs + benefits of battery, electric , locomotives for urban railyards
- Feasibility of retrofitting railcars for battery-electric propulsion
- Standardization of charging technology
- Research to inform the potential benefits to HRM/Province or more generally. Important in persuading the government/public into "buying in".
- How does technology affect land use and transport?
- Will it be practical to have a permanent overlap between autonomous + driver-driven cars in cities or is the goal to eventually get to 100% autonomous?
- What are the timelines for autonomous-driver driven overlap, transitioning & 100% autonomous?
- There are many 'case-study' cities around the world. We often hear 'why is Halifax so many decades behind on topic x'. What needs to change (and how can it change) politically, socially... for Halifax to 'catch up' and not be adopting technologies or systems decades after cities.
- Mobility as a Service administered by the government. Similar to the subscription with multiple modes (taxi, transit, bike share, etc.) with multiple service levels. Minimum service level would be paid for by tax dollars. Higher service levels, would be at a premium cost point.
- How can we incentivize walking as a mode of transportation? Why aren't more walking trails connected to transit options?
- What partnerships can DalTRAC make in the social sciences regarding: poverty, equity around autonomous vehicles?

- Data collection
- Mapping the built and social environment for future mobility hotspots
- Social impact of AV and EV (equity, poverty, etc.)
- Mapping of peak time travel and where the density throughout day and night is
- Smartphone use -> mode share i.e. google maps giving bus/car/walking/biking times for a destination; does it have an effect?
- Effects of commodifying trust -> people can already help and offer rides without technology, but they don't for reasons of insufficient trust.
- At what density/intensity levels do private vehicles (autonomous or otherwise) start to run out of space? (i.e. at what density do we physically need buses, bikes & walking because we can't move enough private vehicles)
- How car sharing can expand + enable other transportation options in Halifax
- How ride hailing services can come to Halifax + the impact they would have
- How can we best incentivize people to get out of personally owned vehicles?
- Private car tax?
- Road tolls?
- Lowering prices?
- What is the total lifecycle energy impact of the shift to shared vehicles vs. shift to individual electric vehicles
- How can we maintain transit priority in a world of autonomous vehicles?
- Will micro-mobility be a subsidized transit service run publicly?
- Research how transit/vehicle sharing can accommodate the diverse needs of families
- With preschool children
- New families with first child, etc.
- With school-age children
- How can services, and planning help families cope with one car or none? How can people maintain a car-free lifestyle once they have children?
- Feasibility study of EV or AV
- Assess the regulatory environment for barriers – both HRM and provincial
- Can we get away from associating the “front door” of buildings with the drop-off area?
- Front doors should be purely pedestrian entrances – people coming by vehicle should be dropped around the side...
- Streets feel so much nicer without a row of parked cars sitting hard up against the sidewalk
- What is the impact on parking in the fully autonomous world?
- Impact on parking demands
- Interested in what are the steps to making + implementing policy? How can we take what is being done elsewhere but adopt it for local context?

APPENDIX E

Workshop Evaluation

On a scale of 1-5 where 1 is **strongly disagree** and 5 is **strongly agree**, please circle the most appropriate answer:

1. Were you familiar with smartphone app-based on-demand mobility services before the workshop? (e.g. Uber, Lyft)

- a) Yes, I have heard of them and used them elsewhere
- b) Yes, I have heard of them but have not used them
- c) No, I have never heard of them

2. I was excited to attend this workshop 1 2 3 4 5

3. The workshop content was relevant, comprehensive and easy to understand 1 2 3 4 5

4. The activities were useful learning experiences 1 2 3 4 5

5. The workshop lived up to my expectations 1 2 3 4 5

6. What did you **like best** about this workshop? _____

7. What did you **like least** about this workshop? _____

8. Additional Comments
