TransLink New Mobility Lab Research Compendium

2018–2024

TRANSLINK

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Land Acknowledgement

TransLink respects the First Nations in Metro Vancouver for their stewardship of the region from time immemorial and acknowledges all First Nations, Inuit, and Métis Peoples for their continued resilience as active members of the community for generations to come. We recognize that in planning and managing the region's transportation system we have a role to play in supporting reconciliation.

Foreword

The movement of people and goods across our cities and regions has been undergoing significant transformations because of technological advances in digital connectivity, electrification, automation, and the rise of new business models centred around shared access over ownership. At TransLink, we refer to these emerging developments in transportation as “New Mobility.”

The pace and scale of these changes in our sector have been rapid and at times disruptive, so that a business-as-usual approach is no longer viable. As the regional transportation authority for Metro Vancouver, TransLink has a responsibility to navigate our region towards a mobility future that provides access for everyone. We will need to harness the power of these changes to support public interests. But we cannot do this alone – we need strong partnerships across government, industry, and academia to achieve our collective goals.

The New Mobility Lab, established in 2018, is TransLink’s academic research partnership and grant funding program dedicated to fostering applied transportation research with leading institutions across Canada. These research partnerships help to inform and shape transportation policy and programs in our region and support us in more effectively navigating the challenges of these industry revolutions.

Since its establishment, the New Mobility Lab has supported 13 applied research projects from some of Canada’s leading transportation researchers. In the same time period, through the UBC Sustainability Scholars program, the New Mobility Lab has

partnered with 18 master's students on a number of applied research initiatives within the organization. TransLink values these academic partnerships for their unbiased and forward-thinking perspectives to push the envelope on what is being developed for a variety of transportation planning and policy initiatives.

Research projects have covered a wide range of themes, including electrification of vehicle fleets and charging infrastructure strategies, Mobility as a Service (MaaS) multi-modal trip planning and booking platforms, automated self-driving vehicles, electric and shared micromobility devices, artificial intelligence (AI) for big data analysis, physical to digital curb management approaches, and many more.

TransLink acknowledges the tremendous value that these academic partnerships bring to support us in better understanding some of the key challenges and opportunities facing our organization. These research publications on emerging transportation technologies and business models have helped provide solutions to improve transportation choices, reduce greenhouse gas emissions, and improve safety, accessibility, affordability, and equity for people and businesses across the region.

It is with pleasure that I present the New Mobility Lab Research Compendium update (2018-2024) as a reference to summarize the applied research that has been supported by TransLink to date and how the results from these partnerships are advancing our regional and enterprise goals.

—Sarah Ross, Vice President of Planning and Policy, TransLink

The New Mobility Lab

Rapid change is underway in the mobility ecosystem – in large part due to technological developments in digital connectivity, vehicle automation and electrification, and the rise of new service delivery and business models centred on shared-use transportation. At TransLink, we refer to such new and emerging developments in transportation technology, business, and service models as “New Mobility.”

What is the New Mobility Lab?

The New Mobility Lab is TransLink’s primary platform for partnering with academic research institutions and researchers to advance our collective understanding and to help shape policy and solutions related to new transportation technologies, and business and service models. It was established to support and encourage transportation innovation in our region by providing stable, multi-year funding towards a coordinated program of applied transportation research of high interest and relevance to the Metro Vancouver region.

The funded research spans a range of disciplines, including engineering, planning and policy, urban design, computer science, environmental and resource science, business, psychology, sociology, and economics. Each year the New Mobility Lab identifies several priority research topics of particular interest, but all topics related to new mobility with local or regional relevance are welcome.

ABOUT THE NEW MOBILITY LAB

Key Programs

The New Mobility Lab was established to engage academics on applied research that would help inform and shape the future of transportation in Metro Vancouver. The New Mobility Lab currently administers three main programs: the New Mobility Research Grant, the TransLink/UBC Sustainability Scholars Program, and the New Mobility Research Dialogue.

1. The **New Mobility Research Grant** offers grant funding of up to $50,000 to well-defined projects undertaken by Canadian post-secondary researchers over two-year periods to support applied research in the areas of new and emerging transportation technology, service, and business models that helps to advance regional goals and priorities. Research can be in any discipline, including consumer and market research, policy analysis, planning and design, modelling and visualization, and technology development, verification, demonstration, prototyping, and testing. From 2018-2024, the New Mobility Lab awarded a total of $650,000 over 13 different projects, for an average value of $50,000 per project.

2. The **TransLink/UBC Sustainability Scholars Program** connects UBC graduate students with applied research questions in the area of sustainability and new mobility that TransLink has identified as priorities. The Lab provides funding for 250 hours of work per scholar. From 2018-2024, the Lab provided a total of $124,200 to support 18 different scholars in their applied research. Several of the scholars have gone on to be recruited into full-time positions at TransLink.

3. The research produced by both programs is featured at the **New Mobility Research Dialogue**. The Dialogue creates a space for academic researchers and public sector staff to discuss the latest research results and to collaborate in identifying new research needs within the region.

Research in the Public Interest

The aim of the Lab is to explore, test, and implement innovative ways to improve mobility in Metro Vancouver and further three key goals that TransLink has set out to specifically guide regional New Mobility efforts:

1. Enable seamless and efficient door-to-door mobility for people and goods,
2. Promote safe, healthy, clean, and compact communities, and
3. Ensure affordable and equitable access for all.

Research supported by the New Mobility Lab should also help achieve the goals and targets set out in the **Regional Transportation Strategy (RTS)**. The current RTS, known as Transport 2050, envisions a region where we provide sustainable transportation choices, support a compact urban area, and foster a healthy environment, economy, and communities. It established two headline targets: that by the year 2045, half of all trips are made by walking, cycling, and transit, and the distances people drive have been reduced by one-third.

Transport 2050 was finalized in early 2022 after extensive public engagement and approval from the Mayors' Council and TransLink's Board of Directors. This update is contemplating the introduction of additional headline targets focused on: increasing equitable access to jobs and other opportunities, increasing the share of trips made without a personally-owned vehicles, reducing time spent stuck in traffic, ensuring that housing and transport costs remain affordable for households, eliminating transportation-related fatalities and serious injuries, increasing physical activity with a greater share of trips made by active modes, and eliminating greenhouse gas (GHG) emissions from transport.

Knowledge Translation: Research into Practice

Over the course of their work, researchers supported through the New Mobility Lab have actively engaged with TransLink staff as well as staff from other municipal, regional, and Provincial agencies, to ensure that their research programs and findings directly contribute to the advancement of the above regional goals and targets.

In 2018, the New Mobility Lab prioritized research that focused on:

- leveraging travel and travel-related data,
- understanding user behaviours where personalization and on-demand services are increasing user choice,
- accurately communicating and mapping the effects of incentives to help influence user mobility choice, and
- evaluating the effects of electrification on networks including transportation and smart grids.

In 2019, the New Mobility Lab prioritized research that focused on:

- big data in transportation and its potential for improving roadway and transit efficiency, safety, mode shift, and seamless experience for travelers,
- ride-hailing research on governance and impact of various forms of regulation as well as the impact these services have on other modes of transportation and achieving regional goals,
- curb management and infrastructure for electric, automated, connected, and shared modes of transportation to inform on policy measures to allocate, regulate, and value curb space and design, and

- Mobility as a Service (MaaS) related research to understand the potential for mode shift, pricing schemes, bundling mobility options, and feedback and incentive mechanisms.

As part of the New Mobility Lab's knowledge translation efforts, researchers have provided workshops, presentations, and webinars to communicate their findings and recommendations and feed directly into local and regional policy and program development. For example:

- Phase 1 Open Data Architecture for the New Mobility Industry research by Dr. Hendrik Wolff included monthly meetings with the Strategic Planning and Policy department and a final presentation on 'A Framework for Aggregators Apps: Revolutionizing the MaaS Industry in Greater Vancouver.' This work has directly informed, and shaped TransLink policy development and investment decisions intended to enable a robust and effective MaaS ecosystem.

- In February 2020, Dr. Tarek Sayed's research culminated with new models for real-time safety evaluation of signalized intersections developed using data obtained from several intersections in British Columbia and Alberta with the potential for application to other jurisdictions via a proposed self-learning adaptive traffic signal control (ATSC) algorithm to optimize safety in real-time. This work has helped to inform and shape the policy and investment decisions of municipal road authorities and traffic safety professionals in Metro Vancouver.

- AnnaLisa Meyboom's research on 'Transitioning into New Mobility: Designing the Digital Curbside' engaged TransLink and municipal staff during a two-day workshop and webinar in July 2020 on 'Future Curb Design and Management'. The results will be compiled to guide the development of recommendations for municipalities to update their curb management policies and coordinate pilot demonstration projects to test and evaluate concepts to better manage the various road users via physical design and/or digital applications.

- Dr. Martino Tran conducted a webinar in May 2020 for TransLink staff to present an analysis on 'Artificial Intelligence for Inclusive Urban Mobility Systems' to inform social media communication campaigns, public engagement efforts, and data analysis for customer experience improvements. TransLink staff are now actively exploring these techniques to help leverage social media inputs to help rebuild transit ridership post-pandemic.

- The ‘Readiness for Shared Micromobility: Public Perceptions in Metro Vancouver’ research findings led by Dr. Meghan Winters includes case studies and key informant interviews, focus groups, and populations surveys. These were presented to members of TransLink and partners at the Regional Transportation Advisory Committee (RTAC) New Mobility Subcommittee (NMSC) in September 2020 to provide recommendations and support further coordination for the planning and implementation of shared micromobility across Metro Vancouver. Municipal and TransLink staff have been incorporating these recommendations into efforts to launch shared micromobility pilots.

- In October 2020, Dr. Jonn Axsen’s research team held a virtual ‘lunch and learn’ event to communicate the results of the surveys conducted as part of a ‘Consumer awareness and response to New Mobility innovations project, including shared, automated, and electric mobility.’ This research will inform municipal and regional efforts to both shape new mobility services in the public interest and to communicate effectively with the public about them.

- In June 2023, Dr. Alex Bigazzi’s research team held a virtual ‘lunch and learn’ event to communicate the results on the topic of “*Perceived Comfort & Safety of Automated Vehicles”.*

- In February 2025, UBC REACT Lab team held a virtual ‘lunch and learn’ event to communicate the results on the topic of ‘Four-Year Trends of Personal Mobility Devices in Metropolitan Vancouver: The Evolution of Mode Shares, Speeds, and Comfort in Off-Street Paths’ to understand the evolving usage of micromobility devices and their impacts on other path users.

This applied research has brought greater understanding on the needs and perceptions of the travelling public, the needs and space requirements of new vehicle technologies, how curbsides, intersections, and public rights-of-way could be better managed, and how commercial transport providers and mobility data could be better regulated and managed.

2018 Grant

Project Descriptions & Researcher Backgrounds

Alexander Bigazzi, Ph.D.
Assistant Professor, Department of Civil Engineering and School of Community and Regional Planning
Director, REACT Lab
University of British Columbia

HUMAN-ELECTRIC HYBRID VEHICLES: IMPLICATIONS OF NEW NON-AUTO MOBILITY OPTIONS FOR STREET DESIGN AND POLICY IN THE VANCOUVER REGION (2018)

Research Questions

1. *How will new non-auto mobility options (electric bicycles and other no-/low-power vehicles) impact speed dynamics on non-auto facilities and interactions among non-auto travellers?*
2. *What transportation system policies, plans, and designs are needed to mitigate conflicts among non-auto modes?*

Goals and Outcomes

The goal of this research is to establish baseline data for non-auto vehicle usage around the region, from which projections and forecasts can be made.

The research will include recommendations of strategies regarding vehicle classification for regulatory purposes, and facility operating restrictions and design. Road user segmentations for infrastructure will similarly be suggested, with corresponding facility design vehicles, operating restrictions, and design features (cross-section widths, grades, and speed limits). Other strategies will also be explored based on the findings of the first part of the research, such as education or other "soft" measures such as Pedestrian Priority Zones that can mitigate conflicts.

Collect transportation planning and policy from municipalities, TransLink, Province and Transport Canada and examine the extent to which the plans and street design policies align with the developed recommendations or may need to be re-examined to accommodate the introduction of new non-auto mobility options in the region.

Supporting Regional Goals

- The emergence of new micromobility options requires standardized classification for regulatory and planning purposes. The public sector can benefited from this research in a number of ways such as facility planning, designing policies, piloting, and coordinating new micromobility options in the region.
- The comprehension of different users and their interactions can leverage the benefits new technologies bring to our communities, such as improving access, health, and safety in our communities, and increasing the adoption of sustainable transportation options and mitigating any potential risks innovating technologies can present.

Project Details

New mobility options create opportunities to address enduring challenges in the transport sector related to traffic congestion, air pollution, climate change, public health, energy consumption, and more. At the same time, they present new challenges to urban transport systems where there is already competition for space and access among road users, which can spill over into conflicts. How can we capture the potential benefits of more diverse travel options, while mitigating the risks of a wider variety of vehicles and services operating within constrained city street spaces? The objectives of this research are to address two broad questions: 1) How will new non-auto mobility options (electric bicycles and other no-/low-power vehicles) impact speed dynamics on non-auto facilities and interactions among non-auto travellers? and 2) Given these new non-auto mobility options, what transportation system policies, plans, and designs are needed to mitigate conflicts among non-auto modes? Is the Metro Vancouver region ready to accommodate these new modes with existing infrastructure and policies? For example, do we need to re-think the operations and even the terminology of “bike lanes”? To address these objectives, we will undertake substantial new field data collection work, including speed surveys, classification counts, and intercept surveys on non-auto facilities around the region.

REACT Lab Team

REACT is a group of researchers, inspired by the idea that truly sustainable transportation engineering and planning are possible, and that better information can lead to better decisions. Our focus is utilitarian bicycle and pedestrian travel analysis and modeling (speed and route choices, network design, energy expenditure, air pollution, and health).

Researcher's Background

Dr. Alexander Bigazzi is an assistant professor at the University of British Columbia with a joint appointment in the Department of Civil Engineering and the School of Community and Regional Planning. He received his Ph.D. in Civil Engineering from Portland State University in 2014, investigating urban bicyclists' uptake of traffic-related air pollution. At UBC, he teaches classes and conducts research at the interface of transportation engineering and planning. His primary research areas include transportation emissions and air quality, active travel behaviour (walking and cycling), emerging human-electric hybrid vehicles (such as e-bikes), and sustainable traffic management and modeling. Dr. Bigazzi's research integrates technical and behavioural components of transportation systems for a comprehensive understanding of the complex pathways from policy, planning, design, and management decisions to operational, environmental, social, and health outcomes. Dr. Bigazzi heads a research lab at UBC (the REACT Lab) that is developing new understanding of how human energy expenditure influences travel behaviour, and what that means for new approaches to expanding access to and participation in active transportation. He is currently on the Transportation Research Board Standing Committee on Transportation and Air Quality. His research has been supported by the Natural Sciences and Engineering Research Council of Canada (NSERC), the Social Sciences and Humanities Research Council of Canada (SSHRC), Health Canada, TransLink, Cascadia Urban Analytics Cooperative, Canadian Foundation for Innovation, BC Knowledge Development Fund, City of Vancouver, City of Victoria, and the private sector (VeloMetro Mobility, ChipDrop, Pedego Bikes, Ohm Bicycles, and others).

Tarek Sayed, Ph.D., P.Eng., FCAE, FEIC, FCSCE

Professor, Faculty of Applied Science, Department of Civil Engineering

Tier 1 Canada Research Chair of Transportation Safety and Advanced Mobility

University of British Columbia, Canada

REAL-TIME SAFETY AND MOBILITY-OPTIMIZED SIGNALIZED INTERSECTIONS

Research Question

1. *Can a transferable safety model for signalized intersections be developed to evaluate safety in real time?*
2. *Can a novel self-learning adaptive traffic signal control algorithm be developed to optimize safety of signalized intersections in real time?*

Goals and Outcomes
The research's goal is to develop safety models that can be used to evaluate the safety of signalized intersections in real-time based on different traffic variables, such as traffic volume, queue length, shock waves, and platoon ratio. These models will investigate the transferability of the developed real time safety models across different locations/jurisdictions and will be incorporated in adaptive signal control algorithms to optimize both safety and mobility in real-time to minimize vehicle delays and safety by minimizing vehicle interactions. The study will test and validate the developed multi-objective optimization procedure using calibrated traffic microsimulation models. The procedure should be applicable under different market penetration rates of CVs to cover the transition period before the fill deployment of the CVs technology.

Supporting Regional Goals

- TransLink's efficiency and reliability of services can be improved by providing intersection management in real-time through coordinated infrastructure monitoring.
- Connected vehicle technologies may provide big data on road usage that can help inform the management of mobility operations.
- Connected vehicle data analysis can help to optimize intersection efficiency, decrease congestion, improve travel times, and decrease delays resulting in better service for our customers.
- Research and analysis in this area is ever more relevant as new and different service providers begin integrating vehicle communication technologies and the need for connected infrastructure increases.

Project Details

Prepared by Mohamed Essa, M.Sc., EIT., PhD Candidate & Research Assistant

Existing advanced traffic management and emerging connected vehicles (CVs) technology can generate a considerable amount of data on vehicle positions and trajectories. This data can be used for real-time safety optimization of intersections. To achieve this, it is essential to first understand how changes in signal control affect safety in real-time and to develop safety models that can be used to evaluate the safety of signalized intersections in real time. Specifically, there is a need for models that can consider the effects of dynamic traffic parameters (e.g., traffic volume, shock waves, queue length, platoon ratio) on safety within short time periods (e.g., the signal cycle). These safety models could then be incorporated into an adaptive traffic signal control (ATSC) algorithm to optimize both traffic safety and traffic mobility using real-time CVs data.

This project has two main objectives toward optimizing the safety and mobility of signalized intersections in real time using CVs data. First, to develop, using real-world traffic data, safety models for signalized intersections at the signal cycle level that can be used to evaluate safety in real time based on various dynamic traffic parameters, such as traffic volume, queue length, shock waves, and platoon ratio and to check the model's transferability to other jurisdictions. Second, to develop a novel self-learning ATSC algorithm to optimize the safety of signalized intersections in real time.

Real-time safety models for signalized intersections were successfully developed. Traffic video-data were recorded for six signalized intersections located in two cities in Canada. Traffic conflicts and various traffic variables at each signal cycle were extracted from the recorded videos. The traffic variables included: traffic volume, maximum queue length, shock wave characteristics (e.g. shock wave speed and shock wave area), and the platoon ratio. The results showed that all models have good fit and almost all the explanatory variables are statistically significant leading to better prediction of traffic conflict occurrence beyond what can be expected from the traffic volume only. The developed models can give insight about how changes in the signal cycle design affect the safety of signalized intersections. The transferability of the models to other jurisdictions was tested using video data for two corridors of signalized intersections in California and Atlanta. Overall, the results showed that the real-time safety models are transferable, which confirms the validity of using them for real-time safety evaluation of signalized intersections.

A novel self-learning ATSC algorithm was developed to optimize the safety of signalized intersections in real time. The algorithm was developed using the Reinforcement Learning (RL) approach and was trained using the simulation platform VISSIM. The trained algorithm was then validated using real-world traffic data obtained from two signalized intersections in the City of Surrey, British Columbia. Compared to the traditional actuated signal control system, the proposed algorithm

reduces shock waves, traffic conflicts, and vehicle delays by approximately 71 per cent, 31 per cent, and 44 per cent, respectively. To the best of the authors' knowledge, this is the first self-learning ATSC algorithm that optimizes traffic safety in real time.

Researcher's Background

Dr. Sayed is a Fellow of the Engineering Institute of Canada, the Canadian Academy of Engineering, and the Canadian Society for Civil Engineering and was the editor of the Canadian Journal of Civil Engineering for eight years.

He has a distinguished research track record in transportation engineering and has received a high number of honors and awards. In 2004, UBC granted Dr. Sayed the title of Distinguished University Scholar, an honour held by a very small group of professors at UBC. Beyond several best paper awards, he also received the Sandford Fleming Award from the Canadian Society of Civil Engineering "*for a member who has made particularly outstanding contributions to the development and practice of transportation engineering in Canada*" (2009), and the Award of Academic Merit from the Transportation Association of Canada (2010) "*in recognition of long-term contribution to the advancement of the academic field and the development of tomorrow's transportation leaders*." In 2011, he received the Wilbur Smith Distinguished Transportation Educator Award for outstanding contributions to the field of transportation engineering from the Institute of Transportation Engineers (ITE). In 2014, he was awarded the Centennial Road Safety Award from the Transportation Association of Canada. This one-time award recognizes his outstanding transformational and long-term contributions to road safety over the past 100 years. And in 2015, Dr. Sayed received the Prince Michael International Road Safety Award for the most outstanding international road safety initiative.

During his research activities, he has addressed a wide spectrum of transportation system applications with a focus on traffic operation and safety, Intelligent Transportation Systems, and the application of information technologies. Over the past 16 years, he supervised to completion 85 Master and PhD students. He is the author or co-author of more than 350 journal and conference papers, including 220 published in the leading international journals. As well, he has completed numerous consulting projects in traffic operations and safety in North America and internationally, many of these relating directly to his research contributions and findings.

Martino Tran, PhD

Assistant Professor, School of Community and Regional Planning

Director, Urban Predictive Analytics Lab

University of British Columbia, Canada

ARTIFICIAL INTELLIGENCE FOR INCLUSIVE URBAN MOBILITY SYSTEMS

Research Questions

1. *How inclusive is the Metro Vancouver transport system? What is the mobility needs of diverse and vulnerable citizens (elderly, youth, low income, etc.)?*

Goals and Outcomes
A Mobility Experience Dashboard will be developed and piloted in collaboration with TransLink to provide real-time intelligence on public movement patterns, travel experience, and accessibility in different locations of the region throughout the day. The dashboard will provide real-time intelligence on aligning end-user's needs with the best transit option for vulnerable population segments. The research will develop and analyze transport accessibility maps for public and private transport options. Transport accessibility will be geospatially mapped and assessment of capacity and demand for each transport mode will be calculated. The study will also develop travel behaviour analytics and multi-model optimization using machine learning algorithms to integrate citizen generated and transport data layers to determine transport access, activities, and destinations.

Supporting Regional Goals

- TransLink believes that providing quick, reliable, and accessible service for all ages and abilities is essential to increase equity in Metro Vancouver.
- Research analyzing social inclusiveness and future travel behaviour in the regional transportation system allows TransLink to plan, provide options, focus investments, and establish policies that support safety, inclusion, and accessibility.
- This research project will provide insight to key elements used to improve mobility for various travel needs and purposes.
- The Mobility Experience Dashboard will allow decision-makers to easily generate and visualise travel trends and real-time activity.

Project Details

A major global challenge is how to intelligently plan future transport systems that are sustainable and improve the well-being of citizens. However, we currently have poor understanding of the diverse behavior and movement of people in cities. As urban populations rapidly change and new disruptive transport services become available, predicting future demand for mobility is crucial for smart and inclusive transport planning and investment. An inclusive mobility system means providing opportunities for all individuals, especially the most disadvantaged, to access services that enable full and healthy lives.

This research leverages new theory and techniques from artificial intelligence (AI) and urban analytics to improve predictions of travel behavior that account for the diverse mobility needs of vulnerable populations (seniors, youth, low-income). Geospatial algorithms will be developed to predict multimodal transport options that account for:

- Locations of vulnerable sub-populations from the larger population,
- Assessing travel accessibility to essential facilities and services (hospitals, schools, jobs), and
- Predicting future travel behaviour patterns and level of transport access.

A Mobility Experience Dashboard will be developed to provide real-time intelligence on public movement patterns, travel experience, and accessibility in different locations of the city throughout the day. This includes analysis and prediction of: mode choice, trip journey purpose, and end-user experience with a focus on the mobility needs vulnerable populations (elderly, young, disabled) in Metro Vancouver. The mobility dashboard will address the following questions:

Demographic analysis

- Where are people going?
- Where are they coming from?
- What is their trip journey purpose (work, leisure, social, family, health care)?
- What is their travel experience, level of satisfaction?

Schedule optimization

- Optimize over population segment, trip journey purpose, time, distance, and cost.
- Improve transit scheduling, routing, operations, and maintenance.
- Improve end-user experience.
- Cost-benefit analysis of transit vs. other modes (personal car, ridesharing, on-demand).

Urban Predictive Analytics Lab RESEARCH TEAM

The Urban Predictive Analytics Lab at the University of British Columbia combines computational methods, data analytics, and systems-theoretic approaches to model, analyze, and simulate interdependency between infrastructure, technology, people, and the environment in urban settings. We are particularly interested in understanding how these factors will play out in the emerging smart cities movement. We are driven by the following research challenges and questions:

- Who will benefit from new technology and data to ensure inclusiveness, equity, and quality of life?
- To what extent can we predict future impacts, manage risk, and transition to sustainable cities?
- How can we inform decision-making, policy, and investment strategies in the face of complexity and uncertainty?

To address these challenges our core areas of competence include:

Data-Driven Scenario Planning – we develop data intensive scenarios to understand the current conditions and possible future trajectories of urban populations, technology, and infrastructure.

Predictive Modelling and Simulation – we build advanced management systems to collect, curate, and process massive data sets, and apply high performance computing to predict the consequences of future urban trajectories and scenarios.

Evidence-Based Policy Analysis – we use our results to educate technical leaders, engage industry and community stakeholders, and inform infrastructure and technology investment decisions to achieve positive societal and environmental outcomes.

Researcher's Background

Dr. Martino Tran's research focuses on understanding the environmental and societal impacts of infrastructure and technology in cities. He applies complexity sciences and computational methods to measure, characterize, and model interdependencies between human behaviour and technology use in the built environment. Overarching research questions include: who benefits from new technology and what are the equity implications? What are the limitations and opportunities for technology to improve human well-being and mitigate climate change? How can scientific research inform policy and decision-making to achieve sustainability outcomes?

Martino completed his PhD in Environmental Science specializing in Computational Modelling at the University of Oxford, where he developed algorithmic behavioural models of social network influence to understand and predict early adoption of electric vehicles for climate change mitigation.

Hendrik Wolff, Ph.D.
Associate Professor, Faculty of Economics
Co-editor of the Journal of Environmental Economics and Management, the leading journal publication on environmental economics
Member of the editorial council of Journal of the Association of Environmental and Resource Economists (JAERE)
Simon Fraser University, Canada

AN OPEN DATA ARCHITECTURE FOR THE NEW MOBILITY INDUSTRY

Phase 1

Research Questions

1. *How should data ownership be defined and what are the concerns of privacy and security issues for the various stakeholders?*
2. *What are potential effects of data sharing on business models (e.g. compliance costs)?*
3. *What are the best ways to design potential data mid-layer infrastructures?*
4. *What are the advantages and disadvantages of implementing MaaS policies at different levels of government (federal, provincial, local)?*

Goals and Outcomes
The research study explicitly calculates the welfare gains to the Lower Mainland from different app-regulation options and show how to overcome problems such as the absence of an integrated platform for mobility, monopolization, and coordination and regulation. Phase 1 developed a basic model of the MaaS industry and defined a role for aggregators in the New Mobility Services industry. The research shows how a mandatory open data policy could promote competitiveness in the New Mobility Service industry and how a mid-layer or Computer Reservation System (CRS) operated as a public utility could boost efficiency and give access to valuable mobility data.

Supporting Regional Goals

- TransLink, as the transportation authority in Metro Vancouver and a service provider, may benefit from this research related to the coordination, governance, privacy, and data management of Mobility as a Service (MaaS).
- The integration of public and private transportation services on a single digital platform has the potential to encourage mode share shift towards more sustainable modes of travel and enable a seamless experience for customers.
- The proper management of these platforms may help facilitate reliable and convenient transportation options for customers while ensuring our transportation system achieves goals related to sustainability, efficiency, and affordability.

Project Details

The New Mobility Services (NMS) industry is growing rapidly throughout the world, providing enormous opportunities to companies and individuals. At the same time NMS poses new challenges to cities, such as how to structure the industry.

The NMS industry is likely to become a winner-take-all market because it features strong network effects. Stated simply, when an operator becomes more appealing to users as its userbase increases, this is a network effect. In ride-hailing platforms, the more drivers there are, the easier it is to get a ride, and the more potential riders there are, the easier it is for drivers to make money. Data is an additional factor: with more users, more data can be collected, leading to an improved service, which in turn leads to more users, and so on. These network effects also create a large barrier to entry for new firms to start an innovative service from scratch: one needs a large user base to attract more users. For a new firm entering the NMS market a lot of advertising effort is necessary to overcome the hurdle of starting with zero users. Similarly, new entrants will lack the data necessary to provide the same quality of service as established firms, even if they have new ideas that would thrive with a large enough user base.

The structure of the NMS industry will tend towards having very few firms dominate the industry. It leads to the creation of walled gardens, where one single platform can lock customers into a proprietary environment. Walled gardens are problematic for a

city as its residents will depend on one service provider for all transportation needs. This would make residents vulnerable to one corporation's pricing, data regulation, and investment strategies. The company that controls the dominant platform can decide which services will be discontinued and which users to accept, leaving users without an outside option if the monopolist fails to serve their needs.

We develop four policy options, considering each policy's effects on individuals, public transport, the taxi industry, businesses, and the NMS industry itself: (1) Unregulated market, (2) Mandatory Open Data, (3) Mid-Layer as Public Utility, and (4) Exclusive Contract with an Aggregator.

Option 1, the unregulated market, is undesirable for the reasons discussed above. Options 2-4 introduce the role of aggregators and the role of data regulation. An aggregator is a technology that aggregates multiple mobility services in a single, digital platform. They can combine multiple modes of transportation supplied by different operators, intercomparing thousands of potential routes in a fraction of a second and offering up the fastest, cheapest, or otherwise best options.

Option 2 uses mandatory open data to promote aggregators that are neutral and effective, as they can offer options from all NMS without having to enter into expensive bilateral contracts. Option 3 combines mandatory open data with a data mid-layer, an intermediary between operators and aggregators that further facilitates the functionality of aggregators while reducing anti-competitive network effects. Option 4 is the aggregator itself offered as a public service.

Researcher's Background

Dr. Wolff has emerged as an expert in transportation, energy, and environmental economics. He has successfully developed and applied new econometric techniques to study various transportation and energy policies, and his research is internationally recognized as novel and impactful on policy. With co-author Ryan Kellogg, Wolff won the award for most outstanding publication in environmental and resource economics in 2009. His research has led to important policy changes at the World Bank and United Nations, and he has been invited to consult for the U.S. Department of Energy, the President of the World Bank, and the Minister of the Environment of China. His work has been discussed on US national television (i.e., ABC News) and international media (i.e., Wall Street Journal). In his free time, Hendrik enjoys the magnificent nature in British Columbia with the many opportunities for trail running on the North Shore, downhill skiing in Whistler, snowshoeing or hiking on top of mountain peaks, and in the evenings attending a yoga class.

2019 Grant

Project Descriptions & Researcher Backgrounds

Alexander Bigazzi, Ph.D.
Assistant Professor, Department of Civil Engineering and School of Community and Regional Planning
Director, REACT Lab
University of British Columbia

PERCEIVED COMFORT AND SAFETY OF ROAD USERS IN REAL-WORLD INTERACTIONS WITH AUTONOMOUS VEHICLES (2019)

Research Question

1. *Do other road users operate differently when interacting with AVs, and are those interactions perceived as comfortable and safe?*

Goals and Outcomes
This research will investigate how vehicle autonomy affects the travel experience of other road users, both combined with and independent of the distinct operational features of Autonomous Vehicles (AV) interactions and mediated by traveler characteristics. The goal is to explore the impact AV technology has on the travel experience of other road users (e.g., delays) and whether these interactions are perceived as more or less comfortable and safe compared to other vehicles. The research will explore if those differences in perception vary among certain segments of the population disproportionately along with operational characteristics of the roadway.

Supporting Regional Goals

- The impact of new technologies, such as Autonomous Vehicles, on road users is essential to understand for TransLink and the public sector to form frameworks, strategies, and future policies.
- It is essential for TransLink to research and pilot Autonomous Vehicles to understand the potential this technology can provide to improve mobility in the region and reduce operating costs.
- Research in this area can set the foundation to ideate pilots, plan future street infrastructure and design and improve customer-oriented service.

Project Details

with Dr. Jodi Honey-Rosés of the UBC School of Community and Regional Planning

Autonomous vehicle (AV) technology is advancing rapidly, but important questions remain about how non-automated road users (pedestrians, cyclists, drivers) will interact with AV in real-world settings. This research addresses the question: do other road users operate differently when interacting with AV, and are those interactions perceived as comfortable and safe? To address this question, we will use an autonomous shuttle pilot project being undertaken at the University of British Columbia. We will collect and analyse video data of road user interactions with the AV and collect data on perceptions of comfort and safety using intercept and web surveys. Analysis of these data will reveal how vehicle autonomy affects the travel experience of other road users, both combined with and independent of the distinct operational features of AV interactions and mediated by traveler characteristics. The UBC pilot project provides a unique opportunity to inform strategies for the responsible introduction of AV in Metro Vancouver and beyond.

AnnaLisa Meyboom

Associate Professor, School of Architecture & Landscape Architecture, Faculty of Applied Science
Director of the Transportation Infrastructure and Public Space Lab (TIPSlab)
University of British Columbia, Canada

TRANSITIONING INTO NEW MOBILITY: DESIGNING THE DIGITAL CURBSIDE

Research Questions

1. *What are the current and future disputes over the curb space?*
2. *What design strategies can adapt to constant changing demands of new mobility while guaranteeing a people-centric, transit-oriented, holistic design?*

Goals and Outcomes
The research will test new configurations and solutions for different urban conditions and typologies and propose design reconfiguration of spaces in eight different locations and municipalities in the Metro Vancouver area served by TransLink. The research will highlight future curb space allocation design strategies and guidelines based on research and design proposals. The research will propose implementation methodologies and highlight needed policy change to achieve new configurations.

Supporting Regional Goals

- The research focuses on eight different locations and municipalities in the Metro Vancouver area served by TransLink.
- TransLink can improve bus reliability and increase ridership through management and design of the curb at high-demand locations such as transit centres and high-volume transit corridors.

- New and shared modes of transportation are shifting curb use and demand.
- Curbside management strategies can be effective in discouraging single-occupancy vehicles, encouraging sustainable modes of transportation, and improving safety related to curbside activities.
- Safe, active, accessible, and equitable access for everyone can be leveraged by exploring different curb designs and modal prioritization.

Project Details

As we transition into new mobility, the use and design of the public realm will need to adjust in response to anticipating disruptive changes associated with new mobility operators and service providers, as well as new curbside management and enforcement technologies. Cities are already experiencing a spatial dispute over the curb space, caused by the plenitude of its uses and users, often with conflicting needs and benefits. The proposed research sets to first map out this dispute by analyzing the existing and anticipated future curb space uses and users, as well as their interconnected relationships. Design solutions will be tested in eight different locations in municipalities across the Metro Vancouver area, served by TransLink. These studies will serve as a base for urban design and implementation strategies and tactics for new mobility, which will be assessed by their adaptability to rapid and unpredictable transformation of cities and development in technologies.

Ideally, transitional design solutions for future curb space allocation and use, should correspond to anticipated changing needs generated by the disruption associated with new mobility, which is set to further impact the existing spatial dispute over the curb space.

In the absence of a holistic approach for the allocation of space between the different parties disputing the public realm, different new mobility operators and new entrants may push their own agenda. Additionally, on-ground design solutions and enforcement require clear policies regarding management and monetisation of the curb space use in the context of a Mobility-as-a-Service related platform. While there is some discussion around autonomous urbanism, there is less focus on design solutions for the transition period prior to automation, responding to the highly dynamic new mobility landscape. As new mobility diffuses into the city space,

inadequate permanent designs may be costly to reconfigure and may impair the sustainability objectives of cities.

The research seeks to better understand the current and future dispute over the curb space through mapping the different disputing uses, users, and their spatial and organizational needs.

The proposal will imagine design strategies allowing adaption to constantly changing demands of new mobility, while guaranteeing a people-centric, transit-oriented, holistic design.

Redesign proposals will be presented for eight locations throughout the Metro Vancouver area, served by TransLink. These can serve the respective municipalities for policy adaptation, as well as the implementation of demonstration and pilot projects.

Transportation Infrastructure and Public Space Lab (TIPSlab)

The Transportation Infrastructure and Public Space (TIPSlab) is an interdisciplinary research group which examines the potential and implications of future transportation infrastructure. TIPSlab aims to integrate social and ecological concerns into emerging design methodologies.

As collaborative team engaged with current design theories in architecture, landscape architecture, planning, and engineering, the lab speculates on future opportunities for infrastructure design and provides grounded scenarios for pulling the future closer.

The lab is based in the School of Architecture and Landscape Architecture and has worked in collaboration with the Sauder School of Business, School of Community and Regional Planning as well as the varied engineering departments at UBC.

Researcher's Background

AnnaLisa Meyboom is an Associate Professor in the School of Architecture & Landscape Architecture and the Director of the Transportation Infrastructure and Public Space Lab (TIPSlab) at the University of British Columbia. In her earlier years she was a bridge engineer, after which she completed her Master of Architecture and has practiced in both fields since. Her area of research expertise is the design of future transportation infrastructure and its critical and catalytic relationship to public space. She has designed electric vehicle infrastructure networks and examined the future impact of autonomous vehicles on urban form. She promotes the inclusion of social, cultural, and economic aspects in the design of infrastructure and has developed processes and mechanisms by which to do this.

AnnaLisa Meyboom is an Associate Professor in the School of Architecture & Landscape Architecture and the Director of the Transportation Infrastructure and Public Space Lab (TIPSlab) at the University of British Columbia. Her area of research

expertise is the design of future transportation infrastructure and its critical and catalytic relationship to public space.

Meghan Winters, Ph.D.
Associate Professor, Faculty of Health Sciences
Michael Smith Foundation for Health Research Scholar
Lead, Cities, Health, and Active Transportation Research (CHATR) Lab
Simon Fraser University, Canada

READINESS FOR SHARED MICROMOBILITY: PUBLIC PERCEPTIONS IN METRO VANCOUVER

Research Questions

1. *Who are the potential users of shared micromobility, and how are they distributed regionally?*
2. *What are the barriers and facilitators for use of micromobility?*
3. *What is the potential for integration with transit services, in terms of first and last mile?*

Goals and Outcomes
The research will produce locally relevant data which can help to inform a coordinated, context-aware approach toward policy that supports a smoother transition toward shared micromobility services in Metro Vancouver. The research produced three documents including a Case Studies report, a Focus Group Surveys Results, and Policy Recommendations. The Case Studies report offers insights and key informant interviews on the implementation and usage patterns of shared micromobility. The Focus Group Survey's Results compiles the information the surveys and aims to scope the understanding and awareness of shared micromobility across different groups in the region, including motivators and barriers to their use. The Policy Recommendations report is a collaboration with HUB Cycling and includes their perspectives on recommendations for the implementation of Shared Micromobility in the region and the responsible organizations.

Supporting Regional Goals

- TransLink is interested in exploring future integration of micromobility with transit services to improve sustainable transportation in the region.
- Shared micromobility services can provide convenient and reliable transportation options, as well as first- and last-mile connections to transit hubs throughout Metro Vancouver.
- The widespread adoption and implementation of micromobility services may be best achieved by understanding current public perceptions and decreasing barriers for usage to ensure healthy, safe, and equitable access when these shared modes become available in our region.

Project Details

Shared micromobility is a catch-all phrase that is used to describe a variety of shared, publicly available, human and electric powered vehicles including bike share (docked and station-based), electric bicycles, and electric scooters. As shared micromobility services expand, Metro Vancouver is challenged to establish policy, infrastructure, and regulatory frameworks which will integrate shared micromobility with existing transportation services.

This project, led by the Cities, Health, and Active Transportation Research (CHATR) Lab in partnership with HUB Cycling, aims to examine public perceptions of micromobility in Metro Vancouver to understand the potential for adoption and use of shared micromobility in the region. Using learnings from parallel case studies and key informant interviews, the research will use focus groups and a population survey to answer the following research questions:

1. Who are the potential users of shared micromobility, and how is this distributed regionally?
2. What are the barriers and facilitators for use of micromobility?
3. What is the potential for integration with transit services, in terms of first and last mile?

Cities, Health, and Active Transportation Research (CHATR) Lab

We work together with communities to understand the intersection of population health, urban environments, transportation and safety, producing evidence to support practice, policy, and programs.

We envision a future where all Canadians have access to environments that are safe, enjoyable, and inclusive — where getting around contributes to active lifestyles, vibrant city culture, sustainable natural spaces, health, and well-being for all.

Focus Areas

- Active transportation
- Urban form and healthy built environments
- Road safety for cyclists and pedestrians
- Physical activity and mobility
- Social connections and well-being
- Equity
- Public policy
- Crowd-sourced data and citizen science

Methodology

- Administrative data
- Population-based surveys
- Natural experiments: “how much benefit” and “for whom”
- Focused primary data collection (intercept surveys, personal-activity sensors)
- Qualitative data collection (focus groups, interviews)
- Observational research
- Spatial analysis and GIScience

Researcher’s Background

Dr. Meghan Winters is an epidemiologist interested in the link between health, transportation, and city design. She conducts research and knowledge exchange activities in close collaboration with local governments, health authorities, and non-governmental organizations. She leads the Cities, Health, and Transportation Research (CHATR) Lab (www.chatrlab.ca), with a program of research that focuses on ways that cities can play a role in promoting mobility, health, social connections, and resiliency amongst people of all ages and abilities.

Dr. Winters received her Ph.D. in 2011 from the School of Population and Public Health at the University of British Columbia. She completed a post-doctoral fellowship at the Centre for Hip Health and Mobility, studying older adults’ mobility and the built

environment. Dr. Winters joined the Faculty of Health Sciences at Simon Fraser University as an Assistant Professor in July 2011.

Out of the office, Meghan aims to spend the maximum time outside, biking, camping, picnicking, and exploring with her family in tow.

Hendrik Wolff, Ph.D.
Associate Professor, Faculty of Economics
Co-editor of the Journal of Environmental Economics and Management,
Member of the editorial council of Journal of the Association of Environmental and Resource Economists (JAERE)
Simon Fraser University, Canada

AN OPEN DATA ARCHITECTURE FOR THE NEW MOBILITY INDUSTRY

Phase 2

Research Questions

1. *How should data ownership be defined and what are the concerns of privacy and security issues for the various stakeholders?*
2. *What are potential effects of data sharing on business models (e.g. compliance costs)?*
3. *What are the best ways to design potential data mid-layer infrastructures?*
4. *What are the advantages and disadvantages of implementing MaaS policies at different levels of government (federal, provincial, local)?*

Goals and Outcomes
The research study explicitly calculates the welfare gains to the Lower Mainland from different app-regulation options and show how to overcome problems such as the absence of an integrated platform for mobility, monopolization, and coordination and regulation. Phase 2 research includes close collaboration with TransLink staff to focus on developing the details of an implementation strategy for the various policy elements for the introduction of MaaS in Metro Vancouver. Phase 2 elaborates on specifics such as data ownership, user privacy, and data security for various stakeholders in this public private engagement, the potential effects of data sharing on business models and best practices for the establishment of data mid-layer infrastructure, MaaS policies at various levels of government as well as pricing and regulation schemes.

Supporting Regional Goals

- TransLink, as the transportation authority in Metro Vancouver and a service provider, may benefit from this research related to the coordination, governance, privacy, and data management of Mobility as a Service (MaaS).
- The integration of public and private transportation services on a single digital platform has the potential to encourage mode share shift towards more sustainable modes of travel and enable a seamless experience for customers.
- The proper management of these platforms may help facilitate reliable and convenient transportation options for customers while ensuring our transportation system achieves goals related to sustainability, efficiency, and affordability.

Project Details

In the second phase of our project, we closely evaluated four anti-trust policy options for jurisdictions to regulate the New Mobility Services (NMS) industry, considering each policy's effects on individuals, public transport, the taxi industry, businesses, and the NMS industry itself: (1) Unregulated market, (2) Mandatory Open Data, (3) Mid-Layer as Public Utility, and (4) Exclusive Contract with an Aggregator.

Option 1, an unregulated market, is undesirable because strong network effects will lead to walled gardens. Services are able to use the data generated from users to create better services, leading to a higher number of users, leading to more data, and so on. The first services to enter a market (e.g. Uber and Lyft entering the ride-hailing industry) have an advantage. Additionally, in an unregulated market, aggregators depend on bi-lateral contracts with each operator in order to access the operator's data. Some aggregator apps are backed by large car makers, for example Moovel (funded by BMW and Daimler) or Transit (funded by Renault Nissan Mitsubishi Alliance). The companies standing behind such aggregators have interest in their product being displayed favourably on the app. This hampers the pro-competitive effects of such aggregators and makes it harder for aggregators to sign contracts with more operators.

With option 2, Mandatory Open Data, we arrive at a simple yet powerful change to regulation: no real-time data-sharing means no business licence granted to the operator. Aggregator apps, drawing on data made available by operators, can make the NMS market more competitive, inhibiting the formation of a walled garden. Option 2 also impacts the supply side of the NMS market, as it levels the playing field for all providers and allows existing operators and new innovative firms to compete against larger corporations.

Option 3 combines the open data requirement with another essential feature: a mid-layer, or computer reservation system (CRS) to gather information, provide oversight, and act as a central clearinghouse for data requests. The mid-layer is an intermediary between operators and aggregators that can be run as a public utility. There are several advantages to adding such infrastructure. A CRS reduces entry costs for both NMS firms and aggregators by providing access to data and data infrastructure. By taking data on all available vehicles from operators and disseminating that data to all aggregators, a CRS eliminates duplicate requests. Finally, in its position as the central data clearinghouse, the CRS can request additional data from operators.

Option 4 is a strategy adopted by other cities, including Los Angeles, Denver, and Dallas. It involves an exclusive contract between the city and a single aggregator app. The intent is to give cities more control of the aggregator space. However, without competitive pressure in the aggregator space there is less incentive to provide an innovative service. This strategy also creates a single point of failure: if there is a problem with the app, all users are left stranded. We believe that cities can gain the advantages of control by running a CRS, without losing the advantages of competition among aggregators.

Our economic analysis shows that option 3 will best serve Metro Vancouver residents as it provides the benefits of market competition while guarding against the formation of monopolies in the new mobility space. Furthermore, it involves creating a new public utility that will gather and disseminate the valuable data generated by the NMS industry, providing cities with information for setting policy.

2020 Grant

Project Descriptions & Researcher Backgrounds

Jonn Axsen, Ph.D.

Associate Professor, School of Resource and Environmental Management

Director, Sustainable Transportation Action Research Team (START)

Simon Fraser University, Canada

Zoe Long

Resource & Environmental Management PhD

Simon Fraser University (SFU)

Sustainable Transportation Action Research Team (START)

CONSUMER RESPONSE TO NEW MOBILITY INNOVATIONS IN METRO VANCOUVER

Research Objectives:

1. *Describe consumer awareness, adoption, interest in adopting, and perceptions of shared, automated, and electric mobility innovations,*
2. *Compare this response across metro regions (Metro Vancouver, Greater Toronto Area, and Metropolitan Montreal Area),*
3. *Identify the characteristics of consumers that are more likely to adopt each innovation (e.g. demographic details, values, and lifestyle), and*
4. *Describe consumer support (or opposition) to policies that may guide the deployment of new mobility innovations.*

Goals and Outcomes
Identify and advance opportunities to improve consumer awareness of new mobility innovations such as pooled ride-hailing, car-sharing, and electric vehicles. Explore factors influencing interest in ride-hailing and car-sharing, recognizing that while some reservations remain there is sustained interest from nearly one-third of respondents.

Goals and Outcomes
Examine the potential for electrification within shared mobility fleets, noting that approximately one-third of respondents are more inclined to use these services if electric vehicle options are available. Assess the role of shared mobility in improving first and last mile connections to public transit, with a focus on urban populations where interest in these modes is already higher.

Supporting Regional Goals

- The Canadian consumer's awareness and perception of New Mobility travel modes help TransLink ideate future piloting opportunities and guide partnerships.
- Shared, electric, and autonomous technologies have the potential to improve access, reduce congestion, decrease greenhouse gases, and create healthier and safer communities if implemented with a focus on the public's needs.
- Metro Vancouver's customer perspective can provide TransLink an insight on policies and actions that encourage mode shift as well as road pricing schemes and future infrastructure investment.

Project Details

There is much optimism around the potential for shared, automated, and electric transport technologies to help meet climate goals. Yet there is uncertainty about how consumers will adopt and use these new mobility innovations.

The Sustainable Transportation Action Research Team (START) is planning a three-stage project evaluating consumers' responses to three New Mobility innovations, including shared, automated, and electric mobility. This multi-stage project involves a mixed-method approach, drawing on quantitative (large-sample surveys) and qualitative approaches (in-depth, semi-structured interviews):

- Stage 1 is a quantitative survey to assess consumer awareness and response to a broad range New Mobility innovations (ride-hailing, car-sharing, automated vehicles, and electric vehicles).

- Stage 2 involves in-depth, qualitative interviews with consumers regarding their potential use of these new innovations, focusing more on automated and shared vehicles.
- Stage 3 is another quantitative survey focusing on careful elicitation of consumers response to vehicle automation technology and its interactions with shared and electric mobility.

The broad objective of Stage 1 is to describe consumer awareness, perceptions, and preferences regarding New Mobility travel modes including shared, automated, and electric mobility. Examples of these innovations include ride-hailing, car-sharing, bike-sharing, electric mobility, and automated vehicles (for private vehicles, shared vehicles and fleets). Data will be collected using a representative sample of Canadian households. This research seeks to understand what consumers, want, why, and how that might change over time – which in our view has received little attention thus far.

The specific objectives of Stage 1 are to:

1. Describe consumer awareness and perceptions of a variety of New Mobility options, including ride-hailing, car-sharing, automated vehicles, and electric mobility – individually and in combination.
2. Assess consumer response to (or willingness-to-use) these innovations.
3. Identify the characteristics of consumers that are more likely to adopt each innovation (e.g., demographic details, values, and lifestyle).
4. Describe consumer support (or opposition) to policies that may guide the deployment of New Mobility options, including road pricing schemes and infrastructure investment.

Building on experience from previous in-depth survey projects, the research team will design a survey instrument, which will be implemented to a large, representative sample of Canadian consumers (n = 3,600 including English and French versions), as well as to a large oversample of residents in Metro Vancouver, Greater Toronto Area, and Montreal Metropolitan Area households to allow for regional analyses. The survey will include sections to collect details for each respondent's household, including vehicle ownership, travel patterns, familiarity with and perceptions regarding New Mobility innovations, willingness to use New Mobility options, and support for New Mobility related policies.

Sustainable Transportation Action Research Team (START)

The SFU Sustainable Transportation Research Team (SFU-START) is a research collaborative within the Faculty of Environment at Simon Fraser University that focuses on the transition to lower impact transportation systems. SFU-START takes a unique interdisciplinary approach to its research, combining elements of economics, engineering, marketing, policy, and psychology into the analysis of sustainable transportation solutions. SFU-START conducts research and engages governments, industry and communities to actively transition the transportation sector towards a "sustainable system" that effectively:

- limits greenhouse gas (GHG) emissions and waste to be within the planet's ability to absorb them (e.g. deep cuts to GHGs),
- uses renewable resources efficiently (e.g. wind, solar, biofuels), while minimizing consumption of non-renewable resources (e.g. fossil fuels),
- is economically efficient in transition and in operation, affordable to individuals and communities, and supportive of a vibrant economy, and
- allows the basic access needs of individuals and societies to be met safely and in a manner consistent with human and ecosystem health.

START produces policy- and industry-relevant sustainable transportation research in three key aspects of transportation: vehicles and drivetrains, fuels and infrastructure, and mobility and travel demand. For each aspect, we aim to produce comprehensive research to assess different transportation technologies, practices and solutions according to technological, feasibility, consumer and citizen acceptance, business and innovation strategy, and public policy.

Researcher's Background

Dr. Jonn Axsen explores transitions to sustainable energy systems. He draws from disciplines of economics, psychology, sociology, and engineering to investigate the nexus of technology, environmental policy, and consumer behavior. Dr. Axsen's study of consumers' social valuation of plug-in electric vehicles has earned him recognition as "Young Researcher of the Year" at the OECD's 2011 International Transportation Forum. His specific research interests include:

- Adoption of pro-environmental technology
- Electric mobility and alternative fuel vehicles
- Consumer attitudes, values, lifestyle and social influence
- Citizen acceptance of energy and policy
- Energy system simulation modeling
- Climate policy design and impacts

Dr. Axsen strives to bring attention to the importance of “human” aspects of sustainable systems—understanding the attitudes, values, and lifestyles of individual consumers, and how these can change. His research methods include large-scale consumer surveys, in-depth interviews and focus groups, energy-economy modeling, social network observation and analysis, discrete choice modeling, statistical analysis, factor and cluster analysis, technology assessment, and life-cycle impact analysis. His research has been funded by public and private organizations such as the California Air Resources Board, the California Energy Commission, Natural Resources Canada, and BMW.

Specific examples of projects include:

- The Canadian Plug-In Electric Vehicle Study (2013-16), which included a Canada-wide survey of new vehicle buyers (n = 1,754), as well as household interviews and behavioural-realistic modeling. This project produced novel insights into consumer awareness, perceptions, and preferences regarding plug-in electric vehicles, and modelled the effects of electric vehicle policy on market share. *Clean Energy Canada* called this study “the most authoritative Canadian electric vehicle market study ever.”
- The Canadian Zero-Emissions Vehicle Survey (2017-19) was another in-depth, multi-part survey instrument evaluated consumer preferences and market potential for a suite of zero-emissions vehicle technologies among a sample of 2,123 new vehicle buyers. This survey included an analysis of the market potential for and characterization of the next buyers of zero-emissions vehicles Metro Vancouver.
- Dr. Axsen served as a Guest Editor for the leading academic journal in his field, *Transportation Research Part D: Transport & Environment*, titled “The roles of users in low-carbon transport innovations: Electrified, automated and shared mobility”, the special issue includes 20 peer-reviewed articles on consumer aspects of New Mobility, and was published in summer 2019.

Prof. Khandker Nurul Habib
Department of Civil and Mineral Engineering
University of Toronto

ASSESSING THE COMPETITION OF TRANSPORTATION NETWORK COMPANIES (TNC) AND PUBLIC TRANSIT IN THE GREATER VANCOUVER REGION

Research questions:

1. *What is the relationship between transportation network companies (TNCs) and public transit in the Greater Vancouver Region (GVR)?*
2. *Do TNCs interact with other shared mobility services such as taxis and carsharing?*
3. *What household, personal, and trip-related factors influence the decision to use TNCs versus other modes?*
4. *How might the entry and expansion of TNX services impact demand for transit, taxi and other modes in the GVR over the medium to long term?*

Goals and Outcomes
• Identify and quantify the nature of the relationship between TNCs and public transit in the Metro Vancouver region • Examine the competitive and complementary roles of TNCs relative to taxis and carsharing services • Collect stated preference (SP) survey data through SPRINTS survey data to understand hypothetical choices around TNC use • Merge SP data with observed data (Regional Trip Diary Survey, Census, land use, travel time, costs) to reduce bias and improve accuracy

- Develop econometric models (e.g. mixed logit, GEV) capable of predicting future TNC demand under different pricing, congestion, and policy scenarios

Supporting Regional Goals

- Support evidence-based regulation of ride-hailing services,
- Improve our understanding of the relationship between public transit and ride-hailing services and inform future regional strategic plans, and
- Inform policies put in place by local and provincial governments to manage the entry of the TNCs.

Project Details

As ride-hailing services or the TNCs have increased in prominence, there has been a growing concern that these services will attract customers away from public transit and taxi services. The competition between TNC and public transit is of particular concern to transit agencies, as these agencies tend to be reliant on farebox revenues to fund operations (in Metro Vancouver, roughly 52 per cent of operating costs are funded through fares). The potentially detrimental impacts of TNC on public transit operations have led to necessity of the investigation of the impacts of TNC on the utilization of public transit. The results of this project will inform policies put in place by local and provincial governments to manage the entry of the TNCs, as well as the Transport 2050 strategic plan.

Since the TNC has just started in Metro Vancouver, we do not have any evidence or data on competition of such services to other modes including transit. So, the proposed project envisions to develop a Stated Preference (SP) experiment survey of travel mode choices for gathering ex-ante data of such competition in Phase 1 of the project. Since SP data often have contextual and subjective biases, it is necessary to use real information pivoting and the use statistical modelling technique (econometric models) to explore true and unbiased evidence of competitions. So, the second phase of the project considers using the collected data for fusing with real travel information (captured in the household travel surveys) and the use of econometric model of TNC demand and competitions.

There are studies in the literature that have investigated the relationship between the two services, many of which have collected data through either in-person or online surveys. The studies on this topic have found that there is indeed a relationship between TNC and public transit, although the nature of this relationship is somewhat complex. In some cases, TNC complements public transit services, such as when they are used in the evenings and at night – times where public transit services are either infrequent or not in operation. In other cases, TNC cannibalized transit ridership, where a portion of ride-hailing users reported that they would have used public transit to make their trip if ride-hailing services had not been available. Overall, the TNC appears to be both a substitute for and a complement to public transit services, although some argue that the substitutive effect is stronger than the complementary effect.

2021 Grant

Project Descriptions & Researcher Backgrounds

Emily Grise
Professor of Transportation & Land use
Urban & Regional Planning
University of Alberta

PUBLIC TRANSIT CROWDING & INCENTIVES

Research Questions

1. *What policies should TransLink and regional stakeholders (e.g., local municipalities, major public and private employers) prioritize in order to motivate loyalty among existing users and retain pre-COVID-19 riders?*
2. *What constitutes riders' satisfaction and loyalty to public transit in a (post-) COVID-19 context?*
3. *How does crowding need to be reassessed, redefined, and managed to allow riders to continue safely taking PT as desired?*
4. *What service interventions and policies are likely to be most effective for influencing the behaviour of transit riders in Metro Vancouver?*
5. *Which policies and incentives are likely to modify behavior during peak travel times to positively influence rider satisfaction and loyalty?*
6. *How do distinct segments of the Metro Vancouver population perceive their personal safety onboard transit with the Safe Operating Action Plan in place?*
7. *How do distinct population segments perceive the efficacy of possible service interventions designed to flatten peak travel and how do they change their travel behavior when confronted with incentives?*

Goals and Outcomes
• Identify which policies and strategies TransLink and regional stakeholders should focus on to retain existing customers and encourage the return of pre-COVID 19 ridership. • Explore factors that contribute to satisfaction and long-term loyalty post-COVID • Determine which service changes are most effective to improve transit experience • Understand how different population groups in Metro Vancouver perceive different factors and how these influence their travel choices

Supporting Regional Goals

- Identify and prioritize policy options for TransLink and regional stakeholders that sustain the loyalty of existing customers and encourage the return of former transit users as we transition to a new 'post crisis landscape'.
- Understand transit user needs and expectations, particularly around safety, crowding, and service standards, that shape decisions to return to public transit.

Project Details

The report employed a classification of transit riders based on their attitudes towards personal safety and flexibility both before and during the COVID-19 pandemic and investigated the effect of crowding on their decision to board and the comfort of boarding a bus at various crowding levels. It also evaluated the effect of incentives on the riders' decision to change travel time or route using hypothetical scenarios. The findings of this report led to policy interventions that can engage diverse groups of riders to continue using transit in a way that is convenient, comfortable, and safe for them.

Six behavioral classes were identified based on riders' sentiment towards crowding and flexibility when commuting to and from work or education. These classes and average probabilities of belonging to them are: low concern, low flexibility class (12.97%); low concern, high flexibility class (6.26%); medium concern, low flexibility class (19.77%); medium concern, high flexibility class (16.99%); high concern, low flexibility class (15.91%); high concern, high flexibility class (28.11%).

Identified Behavioral Classes & Average Probabilities of Belonging to Them:

- The higher probability of belonging to a concerned class was associated with a respondent being a woman, of working age (25-44 year old. group), having kids, and traveling during the morning peak hours (6-9 a.m. in Metro Vancouver).
- Women and seniors were less likely to belong to a class with higher flexibility, as opposed to low income and highly educated (with an undergraduate degree, or professional schools, like medicine, master's, or Ph.D. degree) individuals.

- Riders who are more concerned with crowding are less likely to board a bus in general, and this remains true with the increase in the level of crowding during the COVID-19 pandemic. On the other hand, compared to December 2020, all riders were more likely to board a bus in May 2021 (likely due to the drop in hospitalizations and uptake in vaccination).

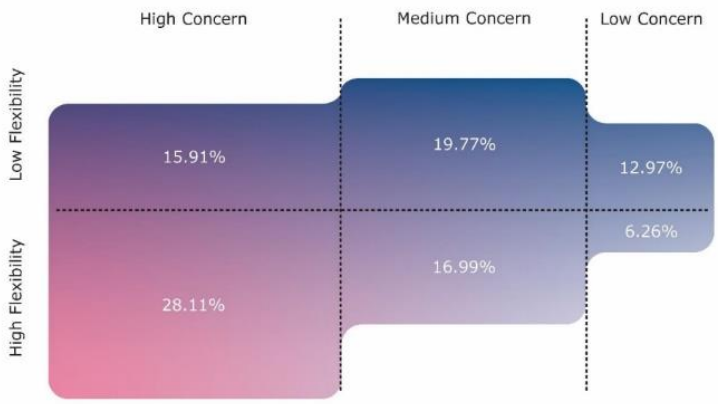
Members of all behavioral classes are less likely to feel comfortable as the crowding level onboard increases, however, the disutility of riders in the high concern classes (with both low and high flexibility) is significantly larger. Similarly, all classes were less likely to feel comfortable during the COVID-19 pandemic, especially on the crowded bus. The negative effect of access to a car on the overall feeling of comfort onboard for a rider was also observed.

Preferences & Effect of Incentives

- When considering incentive schemes to manage crowding, it should be acknowledged that the top three options that riders support are a fare discount, a $20 credit for a monthly pass, and a coupon for a free coffee, or a discount for a meal.

- Focusing on non-financial incentives, both medium- (making between $50,000 and $100,000 a year) and low-income (those earning less than $50,000 annually) earners have a higher preference for an intervention that would allow for winning points in a smartphone game when compared to high-income ones. The same is true for the younger age groups (18-24 and 25-44 year old)

- Respondents who stopped using public transit during the pandemic were less likely to favour incentives, though they have a higher probability to consider changing travel time to avoid crowding.



- People who favour incentives tend to be more likely to change their travel behavior in response to crowding. At the same time, incentives that reduce the cost of travel on public transit have more potential to shift riders' travel time, while other incentives have a more pronounced effect on the decision to travel via a less crowded public transit route.

2022 Grant

Project Descriptions & Researcher Backgrounds

Anna Artyushina, Ph.D.
PhD Digital Governance
Urban & Regional Planning
Toronto Metropolitan University (TMU)

UNLOCKING THE PUBLIC VALUE OF DATA: KEY GOVERNANCE STRATEGIES FOR THE SMART TRANSPORTATION SYSTEMS

Research Questions

1. *How can a smart transportation system be tailored for the community it is designed to serve?*
2. *What types of expertise and administrative support does the responsible governance of a smart transportation system require?*
3. *What policy interventions are needed to ensure the smart transportation system is employed responsibly and, in a privacy-preserving manner throughout its life course?*

Goals and Outcomes
• Identify successful digital governance strategies in smart transportation systems. • Fill the research gap by analysing successful cases of smart city projects. • Examine public value creation from data in smart transportation, and how governance frameworks can ensure it benefits citizens rather than private actors only. • Understand the role of public-private partnerships in shaping governance, transparency, and accountability. • Provide actionable insights for the Metro Vancouver region.

Supporting T2050 Regional Goals

6.7 Channel private sector innovation towards achieving public benefits

6.7.2. Establish or identify a regional or provincial entity to function as an urban data trust, responsible for managing the mobility data warehouse (or "mid-layer"), including:

a) Receiving real-time standardized mobility data via API from all mobility service providers licensed to operate in the region
b) Auditing and validating that data
c) Consolidating the shareable read-write data on vehicle availability, location, capacity, price, and booking for all transportation services, and making it available via API to any licenced third-party aggregator in order to enable an open and competitive ecosystem of third-party aggregator apps offering trip planning, booking, and payment for all services from a single interface.

6.7.3. Establish a regional Transport System Manager function with the ability to licence/permit a broad range of mobility service providers for operation in the region. A regional approach is intended to provide a simplified one-stop shop for industry, prevent a patchwork of local regulations, maintain a level playing field for open, fair competition; establish consistency in requirements across mobility industry sectors (such as data requirements), and support service provision to underserved communities, including providing incentives to industry to achieve equity goals. The approach should also be nimble enough to respond and adapt to new technologies and business models that could come into play in this region over the next 30 years.

Project Details

Smart transportation systems have been rapidly adopted by municipalities across the world. When employed responsibly, these data-driven solutions provide immense benefits to the city residents by making streets safer, increasing mobility services' energy efficiency, and making public transit more convenient. The data collected in public spaces can provide useful insights to the municipalities, helping them make informed and timely decisions. However, the economic and societal impacts of smart

transportation systems are often crippled by the poor-quality data and extractive practices of the technology vendors that design and implement them. Like many other smart city technologies, the data-driven transportation systems often fail to connect with the communities they serve (Cardullo and Kitchin, 2019; Irani, 2021; Raso, 2020). In some U. S. and European cities, the footage from smart streetlights has been used by law enforcement agencies to surveil and track down the citizens (Schuilenburg and Peeters, 2021; Williams, 2021). The initiatives aimed at making the city more equitable often lead to the evictions and displacement of the very people they were supposed to help (Datta 2015; Wiig 2013), and the private-run automated traffic control systems are being used to collect the troves of personal data in the public spaces (Williams, 2019). For the municipality seeking to implement a smart transportation system, adopting the right governance strategy is a priority. The digital governance strategy is a set of rules, procedures, and standards to responsibly govern the data, algorithms, and devices that run-in city spaces. In this study, I analyze key governance strategies employed by the municipalities that have successfully adopted smart transportation systems. The comparative case study method allows for the collection and triangulation of research data across regions, including culturally, economically, and socially diverse cities in North America and Asia. Taking into account the unique political and administrative contexts in which the selected smart initiatives have been implemented and run, the proposed study seeks to answer three research questions:

a) How can a smart transportation system be tailored for the community it is designed to serve?
b) What types of expertise and administrative support does the responsible governance of a smart transportation system require?
c) What policy interventions are needed to ensure the smart transportation system is employed responsibly and, in a privacy-preserving manner throughout its life course?

It is important to note that the majority of studies referenced in this application have analyzed failed smart city initiatives. The proposed research project seeks to fill the gap by looking at the successful smart city projects, as they address key practical needs of Metro Vancouver: convenient mobility options for residents, less traffic, and more efficient allocation of public resources. An ambitious and fast-growing metropolis, Metro Vancouver can adopt the best practices of digital governance tested in comparable socio-economic contexts to develop its own exemplary smart transportation system.

The proposed study employs a qualitative methodology: digital

- The primary corpus of research data in the project comes from 40–60 semi-structured interviews with the government officials and technology

professionals who have implemented, governed, and managed the smart transportation systems in the chosen cities.

- Qualitative analysis of the policy documents pertaining to each case will be conducted via the computational linguistics software Descript and NVivo.
- Comparative analysis of the cases will be conducted based on the findings from the expert interviews and the policy documents review.

2023 Grant

Project Descriptions & Researcher Backgrounds

Keunhyun Park
Assistant Professor, Urban Forestry
Department of Forest Resources Management
University of British Columbia (UBC)

Research Team: Yiyang Wang, Ph.D. candidate in Forestry, UBC

BRIDGING THE NATURE ACCESS GAP THROUGH MULTI-MODAL STRATEGIES FOR METRO VANCOUVER

Research Questions

1. *Which socioeconomically disadvantaged neighbourhoods in Metro Vancouver have limited access to regional parks and open spaces?*
2. *What effective multi-modal interventions can enhance nature access for target communities in Metro Vancouver?*

Goals and Outcomes
This research project aims to: • Identify communities in greatest need of enhanced multi-modal access to natural areas. • Design and assess intervention scenarios within these communities, emphasizing new mobility solutions. • Create a novel Multi-modal Access to Park (M2P) index, building upon the Transit-to-Parks (T2P) index. • Create an interactive map to visualize the distribution of Metro Vancouver's M2P Index and emphasize M2P opportunity areas prioritized for future improvements in new mobility solutions. • Recommend tailored strategies to support TransLink's goal of ensuring affordable and equitable access for all.

Supporting T2050 Regional Goals

Residents of Metro Vancouver highly value this region’s natural areas, such as parks and forests. Currently, just 11 of 22 of Metro Vancouver’s regional parks are accessible by transit, making them largely out of reach for some people. Transport

2050 includes actions to make it easier for everyone to get access to nature, including the following:

- Cycling and Micromobility: Coordinate the implementation of a Regional Cycling Network to provide safe and convenient cycling connections (Action 1.1.4.b)
- Transit: Make investments and network decisions to support more convenient travel by specifically including parks and natural areas (Action 1.2.2.a).

Project Details

Access to larger parks provides significant health and social benefits to individuals (Rundle et al., 2013; Jansen et al., 2017; Brown et al., 2013). In Metro Vancouver, the COVID-19 pandemic has heightened the demand for nature access—regional parks experienced a 37% increase in visitors from 2019 to 2021, reaching 16.3 million visits (Metro Vancouver Regional Park, 2022). Despite this, 74% of regional park visitors rely on private vehicles due to remote park locations and limited transit networks, with only 3% utilizing public transit (Metro Vancouver, 2019). Over-dependence on cars results in parking and traffic challenges, environmental degradation, safety hazards, and diminished recreational experiences (Rigolon et al., 2022).

Inadequate transit service to large parks disproportionately affects disadvantaged populations such as low-income individuals, disabled persons, seniors, children, and people of colour, who may have limited mobility options and cannot afford alternative recreation options (Rigolon, 2016; Rigolon, 2021; Park et al., 2021; Karner et al., 2020; Wolch, 2014). Public green spaces offer more significant benefits to lowerSES individuals compared to other urban greenery (Rigonlon et al., 2021). Enhancing transit access to open spaces is a cost-effective strategy for addressing public health disparities and promoting social sustainability (Litman, 2012). In Metro Vancouver, new immigrants, Indigenous people, low-income residents, and those with mobility issues are more reliant on public transit (Metro Vancouver, 2019; Keltie Craig Consulting et al., 2021). Improved transit connections to regional parks will allow these disadvantaged groups to enjoy the benefits of nature, aligning with Transport 2050's key goal of ensuring affordable and equitable access for all.


Regional Parks System
Transit Access Ratings
Excellent
Very Good
Good
Fair
Poor
No Access
Regional Park Reserves
Ecological Conservancy Areas
Thwaytes Landing Regional Park
Lynn Headwaters
Grouse Mountain
Crippen
Capilano River
Seymour River
Belcarra
Widgeon Marsh
Minnekhada
Pacific Spirit
Burnaby Lake
Brunette Fraser
Colony Farm
North Alouette
Pitt River
Iona Beach
Surrey Bend
Barnston Island
Derby Reach
Kanaka Creek
Tynehead
Brae Island
Glen Valley
Deas Island
Delta South Surrey
Boundary Bay
Campbell Valley
Aldergrove

2024 Grant

Project Descriptions & Researcher Backgrounds

Alexander Bigazzi, Ph.D.
Assistant Professor, Department of Civil Engineering and School of Community and Regional Planning
Director, REACT Lab
Principal Investigator, University of British Columbia

Meghan Winters, Ph.D.
Associate Professor, Faculty of Health Sciences
Michael Smith Foundation for Health Research Scholar
Lead, Cities, Health, and Active Transportation Research (CHATR) Lab
Collaborator, Simon Fraser University, Canada

PRICING AND DESIGN OF SHARED MICROMOBILITY SERVICES FOR CLIMATE AND EQUITY

Research Questions

1. *How should SMM be priced in the Metro Vancouver region to maximize the usage and GHG benefits, including possible public subsidies?*
2. *What is needed to ensure SMM is accessible to people from equity-deserving groups?*

Goals and Outcomes
• Assess how pricing structures influence ridership levels and maximize greenhouse gas reduction benefits. • Examine whether subsidizing shared micromobility is justified by environmental, equity, and societal benefits, similar to public transit. • Identify barriers faced by equity-deserving groups and recommend ways to make shared micromobility affordable and inclusive. • Explore how shared micromobility interacts with existing transit services and active transportation, ensuring pricing and policies are complementary.

Supporting T2050 Regional Goals

Action 1.1.5. Improve access to shared micromobility by enabling convenient, safe, accessible, and interoperable services that are well distributed throughout the urban parts of the region, such that they can support short local trips within Urban Centres as well as longer trips between Urban Centres.

a. Ensure shared micromobility devices are equitably accessible and affordable across the region, including communities with a high proportion of disadvantaged residents.

Action 3.2.2. Make micromobility devices such as bicycles, and mobility aids such as walkers, wheelchairs, and scooters, more widely available to more people at low cost through:

a. Public ownership of shared micromobility as a utility and extension of the public transportation system.

Project Details

Shared micromobility (SMM) is rapidly expanding in cities worldwide, bringing both new challenges for managing transportation systems and new opportunities to advance transportation system goals. The Metro Vancouver region is early in the deployment of SMM, and so now is an opportune time to develop comprehensive, coordinated strategies to develop regional SMM in ways that maximize benefits and mitigate costs and risks. TransLink, as the regional entity responsible for both transportation planning and the public transit system, is collaborating with regional partners, and will likely play a key role in coordinating regional SMM. Important questions about the future role of SMM in the region include how these services should be priced to maximize the potential benefits, and whether public subsidies are justified by societal benefits and needed to achieve those prices (given expected operating costs). Answering these questions requires consideration of how SMM pricing impacts usage and use-based outcomes (e.g., mode shift, greenhouse gas emissions), and the equity implications of subsidizing SMM, considering the context of the existing ecosystem of transportation services.

SMM services can both compete with and complement other transportation modes and services in urban transportation systems (Figure 1). SMM provides a new option for people to access destinations and activities, with direct impacts related to travel costs and health. SMM also has broader impacts on transportation systems and society through modal shift from other forms of transportation, which can impact road safety, emissions, and other externalities. The magnitude and direction of these impacts will vary with attributes of the SMM services (vehicle types, prices, etc.), the travellers, and their alternative transportation options. Local, regional, and provincial governments interact with SMM services in several ways, including establishing vehicle regulations, setting out operating agreements, and providing transportation infrastructure. The relationship can also be financial, with governments receiving service charges from and/or providing direct or indirect subsidies to SMM services.

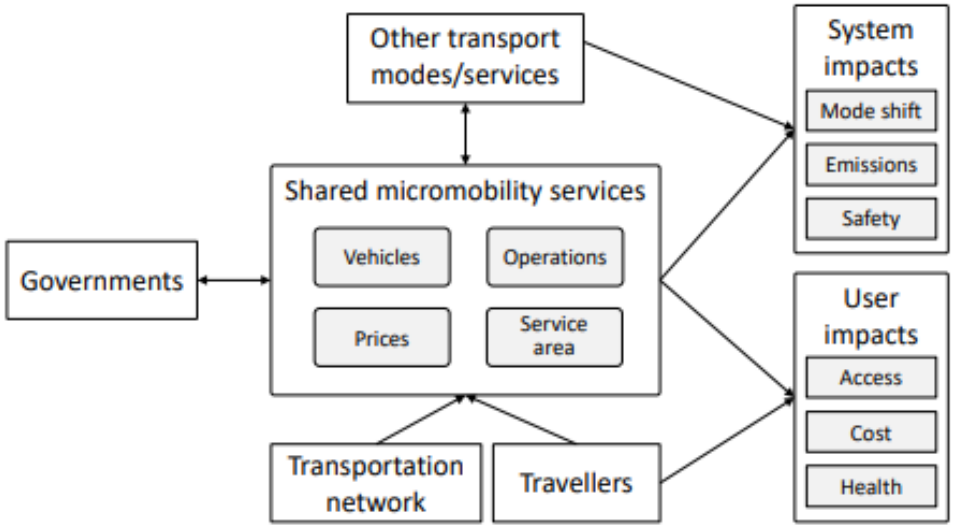


Figure 1. Study framework

Additional Information

ELIGIBILITY CRITERIA

- All public universities and colleges in Canada are eligible for funding under NMRG Program. The Principal Researchers must be a member of the faculty (full or part-time) at the sponsoring Institution.
- Researchers based abroad, who maintain an affiliation with a Canadian postsecondary institution, are also eligible to apply; however, the Principal Researcher must be a must be a member of the faculty of a Canadian public university or college.
- Postdoctoral researchers are eligible to be applicants if they have formally established an affiliation with an eligible institution at the time of application and maintain such an affiliation for the duration of the grant period.
- Graduate or undergraduate students are not eligible to apply.
- Individuals may apply for only one grant per calendar year.
- A broader research initiative, which involves multiple researchers or multi-year timelines could apply for multiple grants, so long as each grant has a distinct deliverable to be completed within two years, and all other eligibility criteria are met. However, successfully receiving one grant does not guarantee receiving additional grants.

EVALUATION PROCESS

TransLink will strike an evaluation panel of TransLink and local government staff experts to review and score incoming applications. The following criteria are used in the evaluation process:

	Description
Research Priority	Research matches research priority needs for the year.
Purpose and Importance	The importance of the research in contributing to the body of knowledge on new mobility topics, including originality and significance. There is potential to produce a breakthrough or a major advance in some portion of transportation practice.
Local Relevance and Applicability	The research is highly applied in nature and has strong long relevance for this region. There are clear benefits for TransLink, local government or other transportation agencies.
Methodology	The concept has technical and scientific merit. The methodology and theoretical approach is well defined and appropriate to the research question at hand.
Work Plan and Scope	The research plan is well-scoped, with appropriate levels of resourcing and timing, and has a high degree of likelihood to complete within the budget and timelines proposed.
Researcher Experience	The applicants and co-applicants are qualified to undertake this research plan and have evidence of past success in similar projects, facilities available to them.
Leveraged Funding	The grant funds, if awarded, help to leverage additional funding from other sources. Higher marks if co-funding confirmed.
BC-Based Researchers	Lead applicant or members of the project team are researchers at BC-based post-secondary institutions.

More information can be found on the New Mobility Lab website.

TransLink-UBC Sustainability Scholars Program

The UBC Scholar program funds students to research topics of interest for TransLink. Each scholar is assigned to a TransLink staff mentor who helps guide the scope of work and development of the research project. Topics have included future-proofing transportation mobility hubs, analysis of transit agency intergovernmental agreements for major transportation investments, fare capping, drone technology, blockchain and data sharing, bike parking operational frameworks, impacts of shared, autonomous and electric vehicles, on-demand models and shared-use transportation services data, carsharing services, and climate change adaptation planning for transit.

For more info on previous projects, see the New Mobility Lab webpage: *https://www.translink.ca/Plans-and-Projects/TransLink-Tomorrow/New-Mobility-Lab.aspx*

Saki Aono

Research Dates: October 2018-February 2019

Saki completed her master's degree in Community and Regional Planning at UBC with a specialization in transportation planning. She also has an undergraduate degree in International Development and Environment from McGill University. She is passionate about enhancing equity, accessibility, and inclusivity in sustainable transportation. Previously, Saki worked as a Research and Project Assistant at UBC's Research on Active Transportation Lab where she conducted research on the market, barriers, and potential impacts related to the adoption of electric assist bicycles in British Columbia. As a Sustainability Scholar working on the Mobility Hubs & Corridors project, Saki identified potential mobility hub locations in Metro Vancouver and provided recommendations on suitable future-proof hub elements that promote travel resiliency.

Saki worked on **IDENTIFYING BEST PRACTICES FOR MOBILITY HUBS**. She was mentored by Becky Lai and Eve Hou. Saki currently works at TransLink.

Veronica Ardila

Research Dates: May 2020- August 2020

Veronica Ardila is a Colombian architect pursuing a professional Master of Engineering Leadership in Urban Systems at UBC. Her professional background has involved working in both private and public sectors, with a focus on urban planning and urban policy review and analysis.

In her free time, she enjoys running and biking in Stanley Park, cooking, and figuring out new visualization tools on Tableau.

She is very excited about researching agreements and best practices from across the globe that are similar to TransLink's Supportive Policies Agreements (SPAs)!

Veronica will be working with Nathalie Kip and Joanna Brownell on the project titled **REVIEW AND ANALYSIS OF TRANSIT AGENCY INTERGOVERNMENTAL AGREEMENTS FOR MAJOR TRANSPORTATION INVESTMENTS.**

Elmira Berjisian

Research Dates: 2021

Elmira Berjisian, [UBC Sustainability Scholar in 2021 and 2022], completed her PhD in Civil Engineering at UBC. She conducted research for TransLink on **DEVELOPING A MODEL TO QUANTIFY GREENHOUSE GAS (GHG) EMISSIONS FROM TRANSPORTATION IN THE CURRENT AND EMERGING SHARED MOBILITY LANDSCAPE IN METRO VANCOUVER.** Elmira was mentored by Camile dos Santos Machado and Mirtha Gamiz at TransLink, and Morgan Braglewicz and Erik Blair at Metro Vancouver for this project. Later, she collaborated with Madison Lore, another UBC Sustainability Scholar, to investigate the impacts of urban and gig-based freight. This research was mentored by Saki Aono, Greg Kolesniak, and Eve Hou at TransLink. Elmira was later hired as a Student Planner to support the New Mobility team on various initiatives, including carsharing, parking, and micromobility data analysis."

Andrea Byfuglien

Research Dates: October 2019- June 2020

Andrea recently graduated with a Master of Science in Resources, Environment, and Sustainability at UBC. She holds a double bachelor's degree in psychology and Geography from The University of Melbourne. Her current research at UBC is in collaboration with UBC Botanical Garden and focuses on behavioural interventions to motivate meaningful climate action. Using the UN Sustainable Development Goals as a framework, Andrea is interested in advancing sustainable development through applied behavioural science. On her days off you will likely find her running, skiing, or somewhere in the backcountry.

This project aimed to help TransLink assess the impacts of the proposed implementation of fare capping. This research will help TransLink improve its decision making related to fare products and whether to pursue the implementation of fare capping by using insights from behavioural science to understand customer preferences and reactions to fare products, Andrea will be working with Peter Lipscombe, Policy Development, on a **ENCOURAGING SUSTAINABLE TRANSPORTATION THROUGH BEHAVIOURAL INSIGHTS: A STUDY TO ASSESS THE IMPACTS OF FARE CAPPING ON TRANSIT RIDERSHIP.**

Shareen Chin

Research Dates: April 2019- August 2019

Shareen is an urban planner with 15 years of experience working in the local and national not-for-profit, health authorities, and public post-secondary environments. Currently, she is a Senior Planner at First Nations Health Authority. Her employers include the Vancouver Economic Commission, University of British Columbia, Katimavik, and the BC Centre for Disease Control. She served as a director on the board of HUB Cycling and as a member of the Vancouver Park Board Neighborhood Matching Fund Committee. Shareen was excited at the opportunity to research drone technology for TransLink's early exploration into un-crewed aerial transportation. Her policy and industry research allowed her to attend the *Uber Elevate Summit* in Washington D.C. and connect with international industry representatives and policy experts. She hopes that her research provides TransLink a start with understanding if and how drone technology could fit with a sustainable model of transportation embraced by Metro Vancouver. Shareen worked with James LaPointe and Eve Hou on researching

REMOTELY PILOTED AIRCRAFT SYSTEM TECHNOLOGY FOR FUTURE PASSENGER AND FREIGHT TRANSPORTATION

Citlali Cruz

Research Dates: April 2019- August 2019

Citlali is currently enrolled in the Master of Public Policy and Global Affairs degree at the University of British Columbia. Her focus lies on competition policy, digital platforms regulation, and blockchain technology. In particular, she is interested in studying technology solutions that help achieve the Sustainable Development Goals.

In her free time, she enjoys watching movies, listening to all kinds of music, and experimenting with watercolours. After her research with TransLink, Citlali enrolled in the Graduate Blockchain Training Path at UBC to become a specialist in the tailoring of blockchain solutions to bring more sustainable outcomes. Citlali worked with Camile dos Santos Machado on reviewing **BLOCKCHAIN FOR TRANSPORTATION: HOW CAN BLOCKCHAIN TECHNOLOGY IMPROVE THE TRANSPORTATION INDUSTRY?**

Nigel Deans

Research Dates: 2021

Nigel completed his Master of Science in Resources, Environment and Sustainability at UBC. His research project was entitled: **COMMUNICATIONS AND ENGAGEMENT BEST PRACTICES TO SUPPORT THE DEVELOPMENT OF MOBILITY/CONGESTION PRICING.** This project provided opportunities to build connections with staff from other cities across North America who are/were at various stages of exploring mobility/congestion pricing for their respective regions. Through dialogue and informal interviews with representatives, the project identified a number of key themes and best practices in terms of communications and engagement approaches to support development of mobility/congestion pricing policies. Nigel was mentored by Fearghal King at TransLink.

Rahul Dutta

Research Dates: 2023

Rahul completed his PhD in Civil Engineering at UBC. His research project was entitled: **BEST PRACTICES RESEARCH TO INFORM CLIMATE RESILIENT GUIDELINES FOR DESIGN AND OPERATION OF TRANSIT MAINTENANCE FACILITIES.** Being resilient to climate change is critical to the transportation sector as we provide a critical service to our communities. Through the UBC Sustainable Scholar Program, TransLink was provided with a very well written overview of best practices for climate resilience in the transportation sector. This report provided summaries of steps other agencies are taking to advance resilience, along with options to improve our own resilience from a professional practice perspective, an asset management perspective, and a decision-making perspective. He was mentored by Donna Bartel at TransLink.

Julia Higson

Research Dates: October 2018- April 2019

Julia is pursuing a Master of Landscape Architecture at UBC. She is interested in understanding human-environmental relationships to design resilient and sustainable urban spaces and has previously explored these interests in field work and research projects in India, Tanzania, and Japan. Julia is excited to bring her previous experience to the project on developing a bike parking operational framework for transit facilities. Julia worked with Derek Yau on **DEVELOPING A BIKE PARKING OPERATIONAL FRAMEWORK FOR TRANSIT FACILITIES**

Shabnam Khalaj

Research Dates: May 2019- August 2019

Shabnam holds a Masters in Economics from the University of British Columbia and BA in Economics from University of Tehran in Iran. She has pursued her interest in environmental issues by working as a Research Associate for Canada's top environmental policy think tank, Smart Prosperity Institute, in Ottawa after graduating from her Masters. In her current RA position, she gets the chance to work on variety of environmental issues across different sectors in Canada. Shabnam worked with Eve Hou and Josh Power (*Metro Vancouver*) to explore the **ECONOMIC IMPACTS OF SHARED, AUTONOMOUS AND ELECTRIC VEHICLE UPTAKE IN OUR REGION**

Rainer Lempert

Research Dates: October 2018- February 2019

Rainer is an MSc student at the UBC Institute of Resources, Environment, and Sustainability. He studies sustainable transportation, using a data driven approach to determine policy and business innovations that result in positive social and environmental impacts. This past summer Rainer worked for the City of Vancouver as a Greenest City Scholar, analyzing financial, spatial, and survey data to help develop municipal car share policies.

Rainer graduated from Amherst College in 2015 with a BA in Mathematics and Geology. He then spent two years working in Boston for an environmental consulting company. His experience in the consulting industry, which involved enacting solutions for predetermined policies, influenced his desire to do work that helps shape policy. Rainer conducted research on **SHARED MOBILITY DATA SHARING: OPPORTUNITIES FOR PUBLIC-PRIVATE PARTNERSHIPS.** He was mentored by James LaPointe.

Madison Lore

Research Dates: 2022

Madison completed her PhD Doctor of Philosophy in Planning at UBC. Her research project was entitled: **UNDERSTANDING THE IMPACTS OF URBAN AND INVISIBLE FREIGHT. SHE WAS MENTORED BY GREG KOLESNIAK AT TRANSLINK.**

Najma Nizar

Research Dates: 2024

Najma completed her Master of Public Policy and Global Affairs at UBC. Her research was entitled: **TOWARDS UNIVERSAL BASIC ACCESS: EXPLORING CASE STUDIES AND FUTURE DIRECTIONS. SHE WAS MENTORED BY TABRINA CLELLAND AT TRANSLINK.**

Neha Sharma

Research Dates: November 2019- June 2020

Neha is a PhD student at the Institute for Resources, Environment and Sustainability (IRES) at the University of British Columbia (UBC). Prior to starting her PhD program, she worked with World Resources Institute (WRI), a global sustainability research organization. She has worked for almost 10 years in sustainability, economic research, and data analytics with renowned research organizations and industry. Neha completed her Masters in Economics from the Gokhale Institute of Politics and Economics in Pune, India. Neha has recently moved to Canada with her family and is thrilled at the prospect of contributing to sustainable research at the transit network she heavily relies on herself, in her new home – Vancouver!

Neha worked with Mirtha Gamiz and Lindsay Wyant (BCAA-Evo) on a **IS ONE-WAY CAR-SHARING A FIRST-AND-LAST MILE SOLUTION FOR TRANSIT? LESSONS FROM BCAA'S EVO CARSHARE** to understand the role of one-way carsharing as a potential solution to the first and last mile challenge to transit. This research would inform policy making and further studies on new and shared mobility platforms that complement transit in the region.

Eshita Swain

Research Dates: 2022

Eshita's research report was entitled **IDENTIFYING AND ASSESSING OPTIONS FOR END-OF-LIFE DISPOSAL OR REUSE OF ELECTRIC BUS BATTERIES.** Her work was helpful to inform TransLink's Low Carbon Fleet and Climate Action Strategies, as well as provided insights to potential revenue generation from carbon credits and future battery recycling options for the organization. The impact of this work may reduce e-waste and have financial savings for TransLink and Metro Vancouver. She was mentored by Graham Cavanagh and Ralf Nielsen at TransLink.

Remzi Xhemalce

Research Dates: May 2020 – August 2020

Remzi Xhemalce is a Ph.D. Student and a Teaching Assistant at the Institute for Resources, Environment, and Sustainability at UBC. Previously he worked as Director for International Oil Markets at the office of the Secretary of Energy of Mexico and led the waste management company R&A Bioenergy. In the summer of 2019, he was a volunteer for the office of the Minister of Natural Resources of Canada in the organization of the 10th Clean Energy Ministerial meeting that took place in Vancouver. He is currently researching best practices for the adaptation of the transportation sector to climate change and on the role resiliency has in the way we move for sustainable and inclusive development. Remzi moved to Vancouver in January 2019 and is now passionate about backcountry skiing and has been exploring BC with his dog Wookiee. Remzi will be mentored by Saki Aono to conduct a **REVIEW OF CLIMATE ADAPTATION PLANNING FOR TRANSIT AGENCIES**

Svetlana Zdero

Research Dates: 2024

Svetlana completed her Master of Science in Population and Public Health at UBC. Her research project was entitled: **QUANTIFYING THE BENEFITS OF TRANSIT ORIENTED COMMUNITIES (TOCS) IN METRO VANCOUVER.** The research supported the ongoing integration of transportation and land use, ensuring that the right kind of growth is supported in the right places and maximizing return on investment of transit projects and service. Utilizing the "six D's" in TransLink's Transit-Oriented Communities Design Guidelines, the research identified a number of Metro Vancouver case studies of both suburban greenfield and transit-oriented development. It subsequently developed a list of comparative metrics and applied them to the case studies. Results showed that transit-oriented communities performed better on a number of measures like sustainable mode share and walkability. She was mentored by Zak Bennett at TransLink.

Zak Zenasni

Research Dates: October 2018- April 2019

Zak is the Road Ahead Program Coordinator at the City of Vancouver and a former Sustainability Scholar. He obtained a Master's in Community and Regional Planning with a Specialization in Transportation & Urban Design from UBC. Prior to joining UBC Sustainability, Zak was a Student Transportation Planner at TransLink, a researcher at UD4H, and a Graduate Teaching Assistant for the School of Architecture and Landscape Architecture at UBC. Zak is interested in utilizing technology to disrupt traditional transportation models, and how transit operators can leverage technology to reduce mobility barriers and operating cost, while improving customer satisfaction.

Zak supported the **BOWEN ISLAND: TRANSIT ON-DEMAND PILOT PROJECT**. His research explored transit on-demand business models, best practices from major cities, and key recommendations for TransLink's roll-out of on-demand transit service. This foundation will assist TransLink's New Mobility Team in the years to come as they assess on-demand transit for smaller or more remote communities around the lower mainland. He was mentored by Eve Hou.

New Mobility Research Dialogue: 2019

This annual Dialogue is an opportunity for governments, research institutions, academics, and students to review and discuss the latest research findings and creates a space for collaboration, ideation, and identification of new research needs in the region. In previous years, the Dialogue has served as an effective channel for feedback-loops between the academic community and government on matters of interest to regional transportation.

In 2019, the first New Mobility Dialogue was organized with the objective to learn about current and planned research on new mobility, explore ideas for new mobility research to inform future grant funding allocations for 2019 and 2020, and to identify opportunities to work together to advance new mobility initiatives.

The Dialogue consisted of approximately 80 attendees from academia and transportation planning staff from TransLink and municipalities. Presentations by the UBC Scholars Saki Aono on “Identifying Best Practices for Mobility Hubs”, Zak Zenasni on “Bowen Island On-Demand Transit Pilot Project”, and Rainer Lempert on “Shared-Mobility Data Sharing: Opportunities for Public-Private Partnerships.”

There was also an overview of the 2018 Lab-funded research projects from Dr. Alex Bigazzi, on “Human-electric hybrid vehicles: Implications of new non-auto mobility options for street design and policy in the Vancouver region”, Dr. Tarek Sayed on “Real-time Safety and Mobility-Optimized Signalized Intersections” and Dr. Hendrick Wolff on “A Framework for Aggregators Apps: Revolutionizing MaaS in Greater Vancouver”.

Dialogue attendees were then organized into six discussion groups to focus on specific topics including electrification, automation, connectivity, shared mobility, Mobility as a Service, and other ideas. The discussion tables provided a better understanding of the issues and questions that need to be explored through future research, and the support required to conduct the research – such as data and partnerships for improved collaboration.

Participants identified the following areas as key research priorities for the region:

- **Big data in transportation**: More and more information is being generated on how we move. Some of that data is passive (for example, cell phone location data) and other data is more actively created (such as roadway sensors). This data has a lot of potential for improving roadway and transit efficiency and safety, understanding consumer behavior in order to encourage mode shift, and creating a seamless experience for travellers. There are also questions surrounding this data, including coordination, governance, and privacy.

- **Ride-hailing**: TNCs have disrupted most major North American cities, providing a public service through an entirely private innovative business model. With ride-hailing set to arrive in BC over the next year, there are many questions surrounding how best to govern this new form of mobility, including the impact of various forms of regulation. Another stream of inquiry surrounds the impact of ride hailing on legacy industries, on other modes of transportation and on achieving regional goals of livability, emissions reductions and equity and social inclusiveness.
- **Curb management and infrastructure for new modes**: With the rise of new forms of mobility (electric, automated and shared), along with growing e-commerce, management of curb space is critical. As such, there is need for research on policy measures to allocate, regulate and value curb space and on design of future curb space and other infrastructure based on anticipated changing needs.
- **MaaS as a mode shift enabler**: Mobility as a Service (MaaS) is heralded as a game-changing shift in the way people in the future will perceive of transportation. But will bundling mobility options as a subscription service encourage mode shift? Are there pricing, feedback or incentive mechanisms that could be built into a MaaS system to influence choices? Will more mobility options in a seamless system encourage more people to forego car ownership?