



UNIVERSITY OF
TORONTO



MOBILITY NETWORK

A University of Toronto Institutional Strategic Initiative

Annual Report

May 1, 2022 – April 30, 2023

Submitted to University of Toronto's Vice-President, Research and Innovation

Submitted by PI Prof. Eric J. Miller, PhD

July 6, 2023

**MOBILITY IS A MEANS TO A
GREEN, JUST, PROSPEROUS
WORLD FUTURE**

OUR VISION

To catalyze transformation in the ways mobility results in a more equitable, sustainable, and prosperous future.

OUR MISSION

To establish the University of Toronto as a global leader in advancing knowledge and developing solutions for achieving equity, sustainability, and prosperity.

OUR VALUES

- RESEARCH EXCELLENCE
- COLLABORATION IMPACT
- CAPACITY BUILDING
- LEADERSHIP
- INNOVATION
- EQUITY
- SUSTAINABILITY
- PROSPERITY

PROGRESS TOWARDS GOALS

In Year 2, Mobility Network executed on many elements of its Strategic Plan 2021-2024 and made significant progress on its three Strategic Goals:

- 1. Global Leadership in Mobility Research
- 2. Public/Private Sectors and Public Impact
- 3. Financial Sustainability

Year 2 Mobility Network Activities and Outcomes are summarized in this report.

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Mobility Network at the School of Cities gratefully acknowledges the support of the Faculties of Engineering & Applied Science, the University of Toronto Mississauga and Scarborough Campuses, and University of Toronto Institutional Strategic Initiatives.

EXECUTIVE MESSAGES

Eric Miller
Director



Mobility Network’s second year has been a busy and productive one. We have launched a significant training and mentorship program for our students and postdocs; grown the network through considerable internal and external networking activities; and engaged in a number of knowledge mobilization projects. We have extended our global reach, with a focus on Latin America, including an exciting collaboration with Tecnológico de Monterrey, Mexico’s leading engineering school. We started several new research projects, most notably “iCity 2.0” a three-year \$7.8 million Ontario Research Fund project dedicated to applying advanced data science methods to improved analysis, planning and design of urban regions. And we are making strides towards the Network’s fiscal sustainability as our work, and understanding of the need for sustainable, equitable transportation and the talent to lead the transformation, gains traction.

Judy Farvolden
Managing Director



In Year 2, Mobility Network engaged with researchers on all three campuses, partners at all levels of government, NGOs and industry partners answering the call for sustainable, equitable mobility. They understand that transport is the means by which people access jobs, markets and goods, social interaction, education and the services that contribute to healthy and fulfilled lives. Sustainable transport benefits everyone and advances economic and social development. Providing safe, affordable, accessible, efficient, and resilient mobility, while minimizing carbon and other emissions and environmental impacts, is a grand challenge. Mobility Network, a group of about 70 researchers from across UofT’s three campuses, whose diverse interests span the broad scope of critical issues about mobility, is the University of Toronto’s answer to that grand challenge.

Steve Farber
Associate Director



The Suburban Mobilities Cluster of Scholarly Prominence at UTSC is curating a multidisciplinary and multisectoral program of research focussing primarily on the accessibility needs of Scarborough’s diverse communities. Our work highlights the challenges faced by Scarborough residents relying on public transportation to meet their daily needs. To this end, we have conducted an innovative survey of Scarborough residents that provides information on people’s aspirations, barriers, values regarding transportation and urban form, and modules focussing on political values, social capital, and health. Additional funding is available for UTSC faculty, students, and research fellows who wish to use the data in their work. If you want to know more about this opportunity and the survey, visit [Scarborough Survey](#).

Shauna Brail
Associate Director



The University of Toronto Mississauga-Mobility Network, UTM-MN, brings together UTM researchers whose work intersects with mobility across a range of thematic areas including equity, sustainability, technology and policy. Through on-campus networking initiatives and research showcase events, we are generating new knowledge and strengthening UTM’s mobility research ecosystem. Additionally, the UTM-MN offers unique funding opportunities that help to support faculty and graduate student research, as well as professional graduate student internships. Through all these activities, the UTM-MN is focused on seeding new opportunities, partnerships, and funding both within the university and externally, engaging a range of government, non-profit and industry collaborations.

MOBILITY NETWORK BY THE NUMBERS



UNIVERSITY OF
TORONTO



1,377 
Twitter Followers

49 EVENTS HOSTED

28,442

Twitter Profile Visits, 2022

70+ RESEARCHERS

31

PARTNERS

- INDUSTRY
- GOVERNMENT
- NON-PROFIT
- ACADEMIA

1,346 
LinkedIn Followers

792

Mailing List
Subscribers

Virtual
56.9%



In-person
35.4%

7

Knowledge
Clusters

Events by category, 2022

100+

International Conference
Presentations

1,142

Communication Outputs, 2022

643

LinkedIn Unique Visitors, 2023

53

NEWSLETTERS
ISSUED, 2022

4,511

Total Website Page-views, 2022

MAKING A DIFFERENCE

The Suburban Mobilities Cluster at UTSC

The Suburban Mobilities Cluster of Scholarly Prominence at UTSC, established with the goal of achieving long-lasting societal impact by improving the quality of life in the local community, in partnership with stakeholders, government and community organizations.

In Year 2, five undergraduate research assistants, under the supervision of Prof Andre Sorensen, designed an active transportation network for Scarborough. Their report, *The Scarborough Opportunity: A Comprehensive Walking and Cycling Network*, provides recommendations to help the City of Toronto jump-start its policies for active transportation in Scarborough and achieve its policy goals for sustainability and inclusion.

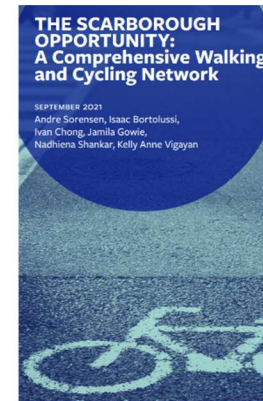
Also in Year 2, the 12 faculty members of SuMo tackled the impact of the suburban form and transportation options on rising suburban inequalities and increasing transportation impacts on climate change. Researchers investigated how Scarborough residents might experience

- The 15-minute city and complete neighborhoods
- Active transport and seniors
- Barriers to healthcare access
- Potential of cycling growth
- Newcomers access to services
- Complete streets and off-road network

The research is informed by the Scarborough Survey, an online survey completed by almost 2,000 respondents, about a third of whom reside in Neighbourhood Improvement Areas. The survey gathered information on health outcomes, automobility, social capital, political values and older adults and active transport.

In preparation, SuMo conducted two “Listening Circles” to hear from Scarborough residents about their interests and needs and designed the survey in collaboration with the North Scarborough and South Scarborough community organization.

Suburban Mobilities is offering funding of \$2,000-10,000 to faculty and students interested in using the survey results to advance the goals of the cluster. A public-facing report is in preparation.

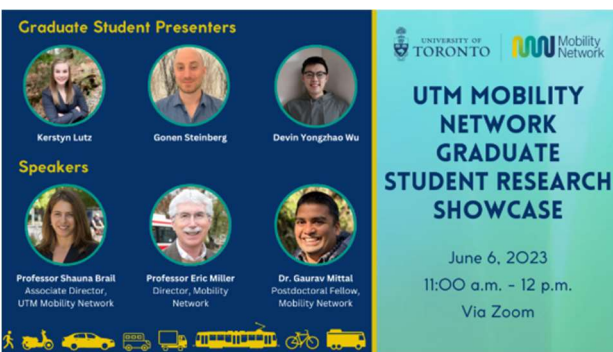


MAKING A DIFFERENCE

UTM-MN Year 2 Student Research Awards

The University of Toronto Mississauga Mobility Network announced the second round of Graduate Student Research Awards in September 2022. The awards support UTM graduate students in interdisciplinary mobility research that addresses equity and promotes resilient, sustainable and just urban growth and prosperity.

Kerstyn Lutz, a PhD student (Matthew Adams, Department of Geography, Geomatics and Environment), focuses on whether active school travel interventions can increase children's mobility and reduce school air pollution. Her research interests include children's environmental exposures and their health impacts at schools and during school travel.



Gonen Steinberg, a PhD candidate (Beth Coleman, in the Institute of Communication, Culture, Information and Technology), focuses on how urban power relations shape, and are shaped by, robotic and autonomous systems in transportation and delivery logistics. Steinberg's research employs critical theory to explore the intersection between digital media and urban space and life.

Devin Yongzhao Wu, a master's student in Physical Geography in the Department of Geography, Geomatics and Environment, focuses on investigating exposures to severe noise pollution & its effects on human mobility. Wu's research interests are in applying GIS and CS techniques or data to human activities and noise pollution.

Award winners will present their work at the UTM Graduate Student Research Showcase, June 6.

All UTM-MN awards are adjudicated by a panel of three professors according to an established rubric.

UTM Mobility Network Summer Internship Award



Summer Internship Award (Professional Graduate Programs)

Summer Internship Awards Announcement



Shaba Taskin, granted the UTM Mobility Network Summer Internship Award, undertook an internship for PointA, a sustainable transportation not-for-profit. This grant, matched by funding from MITACS and PointA, enabled Shaba to support the sustainable transportation economic cluster work in Toronto. Shaba is focusing on the development of a plan for a future sustainable transportation hub and supporting the cycling sector.

MAKING A DIFFERENCE

Urban Modelling Collaboratory: Leadership

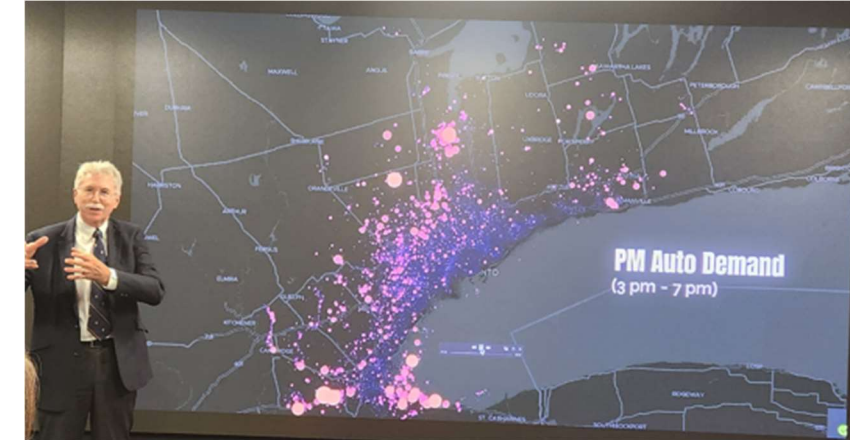
The transportation systems of growing urban regions are increasingly failing to meet their primary mobility, transport, and quality of life goals, and, in fact, are generating widespread adverse impacts on society and the environment. In addition, rapid innovations in both mobility technology and services have the potential to bring disrupt transportation systems just as the automobile did, over a century ago. Further, the COVID-19 pandemic has disrupted travel behaviour norms for commuting, business interactions and shopping, as well as on urban design and life in cities as a whole.

Building from its base in the Travel Modelling Group, the Urban Modelling Collaboratory is networking researchers at the University of Toronto and globally to develop “next generation” models of activity and travel that will capture the “new normal” in travel behaviour – as well as how this behaviour will continue to adapt as cities and economies continue to evolve. UMC is reaching out to U of T behavioural researchers in economics, management, political science, public health and sociology. Globally we are engaged in active dialogue with researchers in leading universities in the field, including ETH Zurich, Imperial College London, Leeds, Monash, TU Munich, UNSW and UT Austin, among others. These efforts are expected to result in a major NSERC grant application in 2023-24, while opportunities for funding international collaborations are also being explored.

In parallel, TMG and UMC are implementing the current generation of advanced models that have been previously developed by TMG and applied in the Greater Toronto Area to Halifax, Montréal and Monterrey, Mexico to advance the state of operational modelling practice and to lay the foundation for implementation of next generation models as they come online.

Through Year 2, UMC research was presented to academic and practitioner audiences worldwide.

- Applied Urban Modelling 2022, University of Cambridge, July 2022
- Tecnológico de Monterrey Collaboration on Transportation, Urban Planning and Cities, August
- Mobile Systems and Pervasive Computing 2022, Niagara Falls, August
- Seeon Symposium on Activity-Based Modeling, Kloster Seeon, Bavaria, September
- Australian Institute of Traffic Planning and Management Ltd. Transport Modelling Network Knowledge Sharing Workshop, October
- Mobility Council, Transportation Association of Canada, Edmonton, October
- Transportation Planning Committee, Transportation Association of Canada, Edmonton, October
- Mobility Team – ONS Data Science Campus, Office for National Statistics, UK, October
- Department of Civil, Materials & Environmental Engineering, University of Illinois, Chicago, November
- Experiences & Challenges Online Seminar Faculty of Architecture & Urbanism, University of Chile, Santiago, November
- Finding Connections, Travel Behaviour Modelling Workshop, December
- 16th International Conference on Travel Behaviour Research, Santiago, Chile, December



STRATEGIC GOAL: GLOBAL LEADERSHIP IN MOBILITY RESEARCH

All Paths Lead to Mobility Network

*From what we hear, **all paths in Toronto lead to you** when it comes to transportation research. Sabine Muscat, Senior Program Manager, Technology and Digital Policy, Heinrich Boll Stiftung, Washington, DC.*



In June, Mobility Network hosted a delegation from the **Heinrich Boll Green Political Foundation**, a taxpayer-funded German political foundation. On their North American tour, the delegation visited a diverse group of highly qualified and accomplished urban planners, policymakers, public transit officials, innovators, and activists. They came to U of T to learn about Mobility Network research in the area of multimodal transportation modeling and the

application of GTA Model4 to the Greater Toronto Area and elsewhere, how such modeling systems might lead to more sustainable and inclusive urban mobility and issues of data access/data privacy with regard to smart mobility solutions.

Sustainable Mobility in Bogotá, Colombia

Mobility Network's director was invited by Claudia López Hernandez, the Mayor of Bogotá to join an international group of experts from North America and Europe participating in a series of public panel sessions celebrating "Sustainable Mobility Week", January 30-February 3, 2023, including the city's famous "Car Free Thursday" on February 2. The panel toured the many mobility projects underway in Bogotá, did various media interviews, and advised the mayor and her cabinet on how to optimize her policies with respect to public transit, active (walk and bike) transportation and the building of safe, sustainable and equitable communities.

FIRST, WE TAKE TORONTO ... TRAVEL MODELLING GROUP TAKES MODELLING RESEARCH INTO PRACTICE

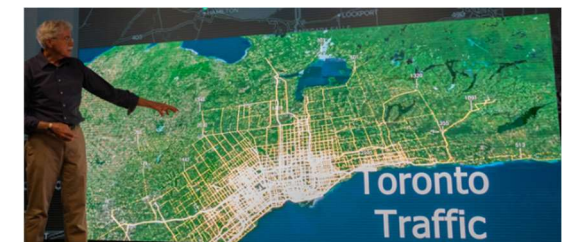
Mobility Network's Travel Modelling Group, with Montréal's Autorité Régionale de Transport Métropolitain and Polytechnique Montréal, is transferring the GTAModel activity-based travel demand forecasting model system to the greater Montréal region for operational strategic planning applications. The Montréal application is the first full-scale operational application outside of the Toronto region, while TMG is also assisting WSP Canada in implementing GTAModel for the Halifax Joint Regional Transportation Agency.

GTAModel was developed by TMG and first went into operational use by the City of Toronto in 2016. Since then, it has been adopted by almost all transportation planning agencies in the Greater Toronto Area.



GTAModel incorporates leading travel behaviour theory within the most computationally efficient travel demand modelling software in the world to provide highly robust forecasts of regional travel demand to analyse a wide range of policies, including major road and transit investments, pricing policies, assessment of alternative land use policies on travel demand and congestion, and mobility equity and environmental impacts, among others.

In its 13th year, TMG is supported by the Ontario Ministry of Transportation, Metrolinx and the regional and major local municipalities of the GTHA. It works closely with staff at partner agencies to improve travel demand modelling practice in the region by translating U of T research into practice and by training agency staff in the latest demand modelling methods. Over time, TMG's full-time technical staff have also populated both private and public sector organizations with highly trained modelling professionals.



STRATEGIC GOAL: GLOBAL LEADERSHIP IN MOBILITY RESEARCH

Making the Case for the Economic Benefits of Transit

Mobility Network is **Making the Case for Transit** for the Toronto Transit Commission, one of the largest, and oldest, integrated transit systems in the world, serving the Greater Toronto Area, a region that is projected to grow in population to almost 10 million people by 2041. A transdisciplinary group of leading Mobility Network researchers collaborated on Phase 1 of research into the *Economic Benefits of Transit* to quantify the economic benefits of transit in Toronto, regionally, provincially and nationally.



Eric J. Miller | Professor, Dept. of Civil & Mineral Engineering
Role: Principle Investigator, will model the transit demand resulting from scenarios on capital investment



Judy Farvolden | Executive Director, Mobility Network
Role: Manage the research project



Steven Farber | Associate Professor, Dept. of Human Geography
Role: Research the social and community outcomes



Marianne Hatzopoulou | Professor, Dept. of Civil & Mineral Engineering
Role: Research the impacts of emissions on health & the environment



Richard DiFrancesco | Associate Professor, Dept. of Geography & Planning
Role: Build the economic input/output model, analyze investment scenarios



David A. Wolfe | Professor, Dept. of Political Science
Role: Provide analysis on the contribution of transit to regional and economic development



Amer Shalaby | Professor, Dept. of Civil & Mineral Engineering
Role: Research the benefits and costs of subway service frequency and reliability



Matti Siemiatycki | Professor, Dept. of Geography & Planning
Role: Review the TTC's 2022 Operating Budget, 10-year Capital Budget & Plan, and 15-year CIP

“There was some great data in this report on how service is impacting greenhouse gas emissions and how it’s impacting the GDP for everyone one dollar that goes into transit we are generating \$2.40 for GDP or for the City’s revenue coffers. Why aren’t we talking about this?” TTC Commissioner Jagdeo

University/Government/Industry Collaboration



The **Purolator Urban Quick Stop** serves as a mini hub for couriers on electric cargo bikes to retrieve and deliver packages to the surrounding areas. This results in a more sustainable approach to delivering, less traffic congestion, fewer cyclist conflicts, and truck driver health improvement. The pilot demonstrates the

potential to expand e-cargo tricycle deliveries to other Purolator locations across Canada and provides the City of Toronto with insight to develop sustainable last-mile delivery options in dense urban areas.

On March 3, 2023, Purolator received the U of T Sustainable Action Award, in the category of External Business or Partner, for the environmental benefits of The Urban Quick Stop pilot project.



STRATEGIC GOAL: PUBLIC/PRIVATE SECTORS AND PUBLIC IMPACT

Engaging Local Community Groups

In a “first-of-a-kind”, Mobility Network, in collaboration with Mobilizing Justice, launched a “Community Equity and Advisory Table” to engage with local community groups, particularly Black, Indigenous, women, persons with disabilities and households from lower socio-economic strata, in our research design and training activities.



The CEAT, drawn from the Canadian urban communities engaged with Mobilizing Justice researchers, is actively guiding and shaping Mobilizing Justice research. CEAT is an exciting experiment in redefining community-based research and engagement that we hope will translate into other community engagement activities within Mobility Network and beyond.

A survey of CEAT members indicates that they perceive their involvement is valuable, valued, and enjoyable.

Mobilizing Justice is a multi-year SSHRC Partnership Grant within Mobility Network’s Urban Equality & Inclusion Knowledge Cluster.

MOBILIZING JUSTICE

Towards Evidence-Based Transportation Equity Policy

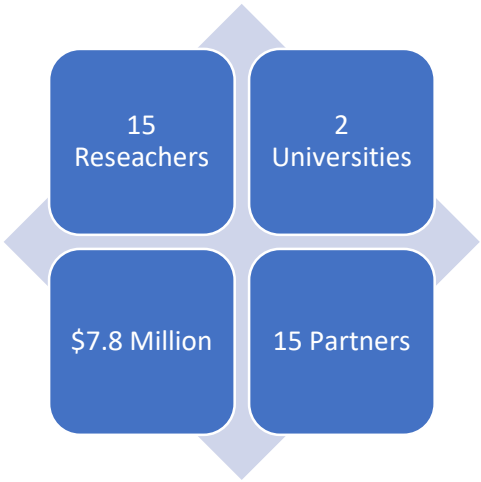
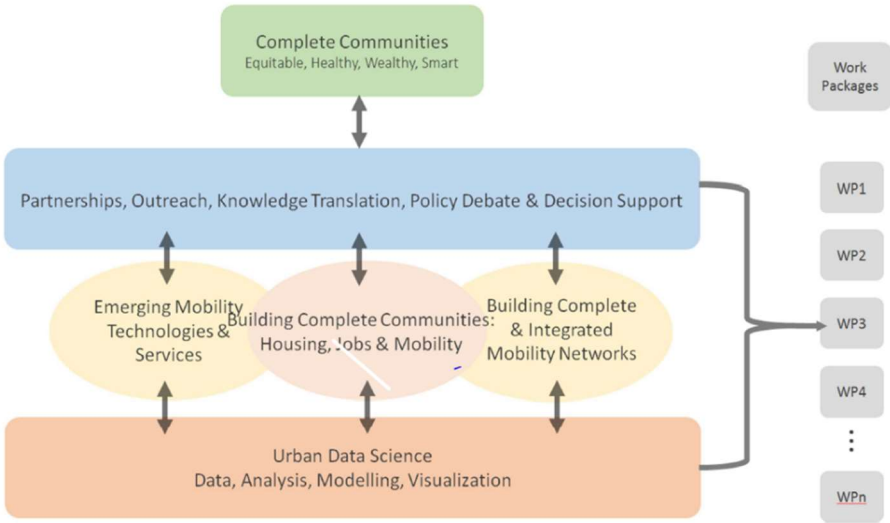
STRATEGIC GOAL: FINANCIAL SUSTAINABILITY: Research Grants

iCity2: Urban Data Science for Future Mobility

“iCity 2.0: Urban Data Science for Future Mobility” is one of 15 projects funded by the Ontario Research Fund – Research Excellence Round 10. Principal Investigator Dr. Eric J. Miller leads a multidisciplinary team of 13 professors from UofT and OCAD-U with expertise in transportation engineering, computer science, visual analytics, geographic information science, urban planning, economics, sociology, architecture, and design.

The project, which will run for four years until 2026, received \$3.9 million dollars which is being matched by institutional, government and industry support from a multi-sector partnership that brings planning knowledge, design expertise, piloting capabilities, data and analysis platforms and critical access and insight into the needs of adopters of the research outcomes.

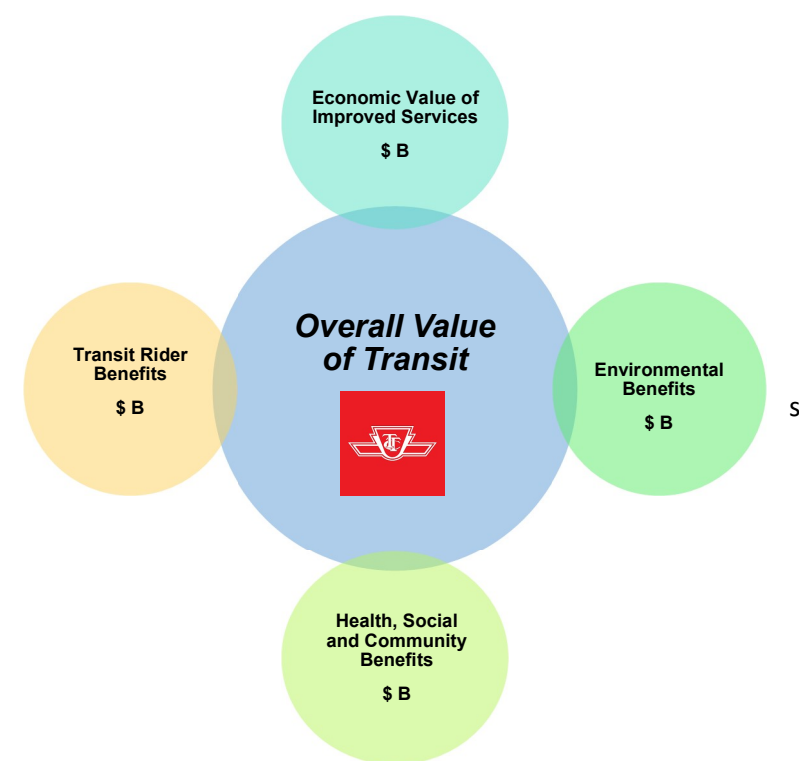
Private Sector Partners		Public Sector Partners
Hatch	DiamondCorp	City of Toronto
Swiftride	Autodesk Canada	Peel Region
Esri Canada	Enviroics Analytics	York Region
Pantonium	Real Property Solutions	TTC
Daniels Corp		
Non-Governmental Organization Partners		
United Way Greater Toronto		Maximum City



STRATEGIC GOAL: FINANCIAL SUSTAINABILITY: Research Grants

Phase 2 of the Economic Benefits of TTC

With ridership levels recovering, though not yet returned to pre-COVID-19 levels, TTC is now planning for future capital investments. In Phase 2 of this research, the TTC Team reconvenes to identify and assess the economic benefits realized from the investments in transit services and capital works described in “Making Headway: Update to the TTC Capital Investment Plan 2022-2036”, analyze the economic impact of the Toronto Transit Commission as a transit provider in the local, regional, provincial and national economy and qualify and quantify the social, equity, health and environmental benefits realized from investment in TTC services and their respective contributions to economic recovery, health and resilience.



Where will we live? How will we work? How will we get there?

This research project is analyzing the post-COVID19 relationship between property market indicators, household locational preferences and travel patterns, and the changing demand for urban and suburban built environments. Research shows there is demand amongst certain segments of the population for living in neighbourhoods that offer rapid transit accessibility and higher-density built environments rich in urban amenities, but it’s not clear how transportation systems and housing markets will adjust as we emerge from the global COVID-19 pandemic.



Led by Chris Higgins, UTSC Human Geography, with collaborators Steve Farber, UTSC Human Geography, Eric Miller and Khandker Nurul Habib, Civil & Mineral Engineering, *Transit, Telework, and Housing Markets: Investigating Locational Preferences for Transit - Oriented Development in Pre- and Post-Pandemic Canadian Cities* is funded by a SSHRC insight Grant, June 2022 – May 2024.

City of Toronto Automated Vehicles Tactical Plan: Managing Travel Demand

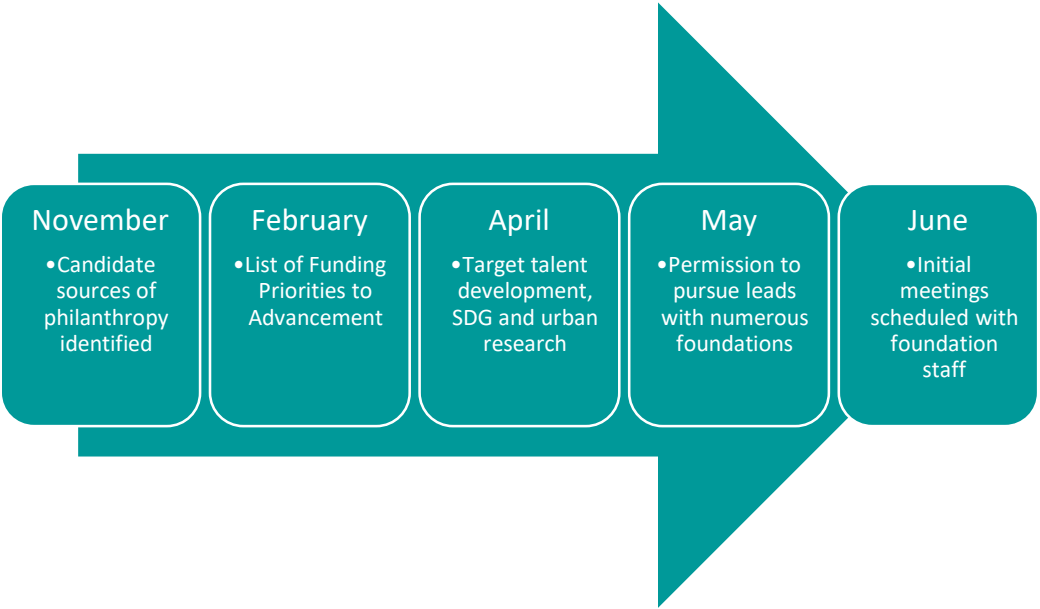
This research project is supporting the development of the City of Toronto’s Automated Vehicles Tactical Plan and upcoming Micromobility Strategy, and, in particular, the potential impact of zero-occupant automated vehicle operations on roadway congestion, greenhouse gas and air pollutant emissions, parking, and other possible issues. The project also involves engaging stakeholders to identify potential solutions and begin generating options for the City of Toronto to implement if and when zero-occupant vehicles become prevalent.



DIVISION OF UNIVERSITY ADVANCEMENT SUPPORT

In Year 2, the Division of University Advancement engaged in identifying promising leads for Mobility Network support, with Advancement Research identifying promising prospects in response to Mobility Network’s Funding Priorities:

- 1. Foundations and companies that have a keen interest in urban development.
- 2. Organizations investing in community-building work, shaping public policy (e.g., the Max Bell Foundation), training changemakers of tomorrow (e.g., banks interested in youth leadership).
- 3. International institutional funders, corporate partners in particular, that position their work around the UN Sustainable Development Goals.
- 4. Alumni with philanthropic capacity.



Initial meetings are being held with the Ford Foundation and the Federation of International Automotive Associations and Mobility Network has permission to pursue several more leads.

MOBILITY NETWORK FUNDING PRIORITIES

Mobility Network’s Funding Priorities are designed to support progress against its Strategic Plan, but supporting Mobility Network Activities identified in the Strategic Action Plan:

- Internal Networking
- Research Development & Support
- Training, Mentoring & Professional Development
- External Networking
- Globalization
- Knowledge Mobilization

The Funding Priorities will build the collaboration space within which U of T’s highly multidisciplinary mobility research teams, drawn from engineering, architecture, social sciences, management and public health, from across the University of Toronto’s three campuses, will collaborate with partners to develop the policies and technologies we need to meet the mobility demands of our growing population. The knowledge created and mobilized by Mobility Network research will catalyze transformation in the ways we move people and goods to create a more equitable, sustainable and prosperous future.



Mobility Network research is organized in seven intersecting Knowledge Clusters:

- Climate & Health
- Urban Equality & Inclusion
- Freight & Urban Goods Movement
- Behaviour Analysis & Modelling
- Mobility Technology & Services
- Land Use Planning & Economy
- Governance, Policy Analysis & Managing Change

Visionary donors will help make this research, under any or all of Mobility Network’s Knowledge Clusters, a reality.

UN SUSTAINABLE DEVELOPMENT GOALS AND SUSTAINABLE TRANSPORT

In 2012, the UN General Assembly, endorsed [The Future We Want](#), the outcome document of the United Nations Conference on Sustainable Development. Sustainable transport is included in the common vision of *The Future We Want*.

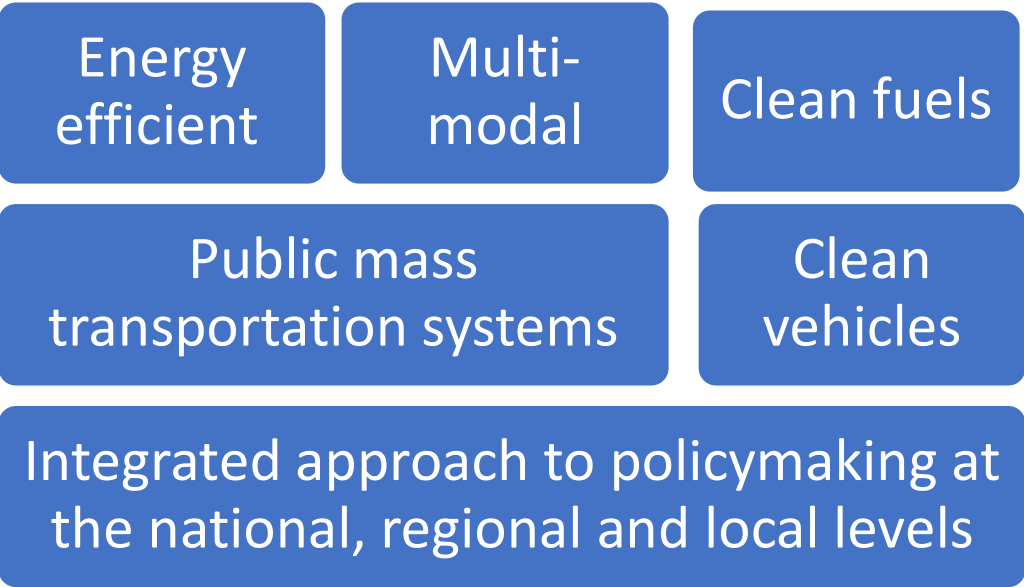
“Sustainable transport is the provision of services and infrastructure for the mobility of people and goods— advancing economic and social development to benefit today’s and future generations—in a manner that is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts.”
Mobilizing Sustainable Transport for Development: Analysis and Policy
Recommendations from the United Nations Secretary-General's High-Level Advisory Group on Sustainable Transport, New York City, United Nations, October 2016.



We note that transportation and mobility are central to sustainable development. Sustainable transportation can enhance economic growth and improve accessibility. Sustainable transport achieves better integration of the economy while respecting the

environment. We recognize the importance of the efficient movement of people and goods, and access to environmentally sound, safe and affordable transportation as a means to improve social equity, health, resilience of cities, urban-rural linkages and productivity of rural areas. In this regard, we take into account road safety as part of our efforts to achieve sustainable development.

We support the development of sustainable transport systems, including energy efficient multi-modal transport systems, notably public mass transportation systems, clean fuels and vehicles, as well as improved transportation systems in rural areas. We recognize the need to promote an integrated approach to policymaking at the national, regional and local levels for transport services and systems to promote sustainable development.



PHILANTHROPIC GIFTS RECEIVED IN YEAR 2

407 ETR Gift in Support of Research

During the past year, Mobility Network received a gift from the 407 ETR Concession Company Ltd. to support new transportation modelling research. The gift will enable a two-year research project examining Highway 407 pricing policies and their social equity, economic, and environmental impacts on the Greater Toronto-Hamilton Area. Mobility Network researchers will use the U of T-developed GTAModel activity and travel demand model, which is currently in operational use by most transportation planning agencies in the GTHA, in combination with the SimMobility model developed by MIT. The project will extend both models’ capabilities to include road pricing options and impacts and compare the performance of the GTAModel and SimMobility model systems.



The Roschlau Graduate Fellowship in Sustainable Urban Mobility

A gift from Michael W. Roschlau, PhD, U of T alumnus and former President & CEO of the Canadian Urban Transit Association, has established the first-ever Graduate Fellowship in Sustainable Urban Mobility at the University of Toronto. The new \$5,000 scholarship is aimed at graduate students who are passionate about research related to sustainable urban mobility. The fellowship will be offered annually for a period of five years. With this gift, Dr Roschlau aspires to stimulate innovative applied research, to inform public policy and to



assist a student in pursuing their field of study. Recipients will produce a policy paper on their research and share their findings at a public seminar organized by Mobility Network.

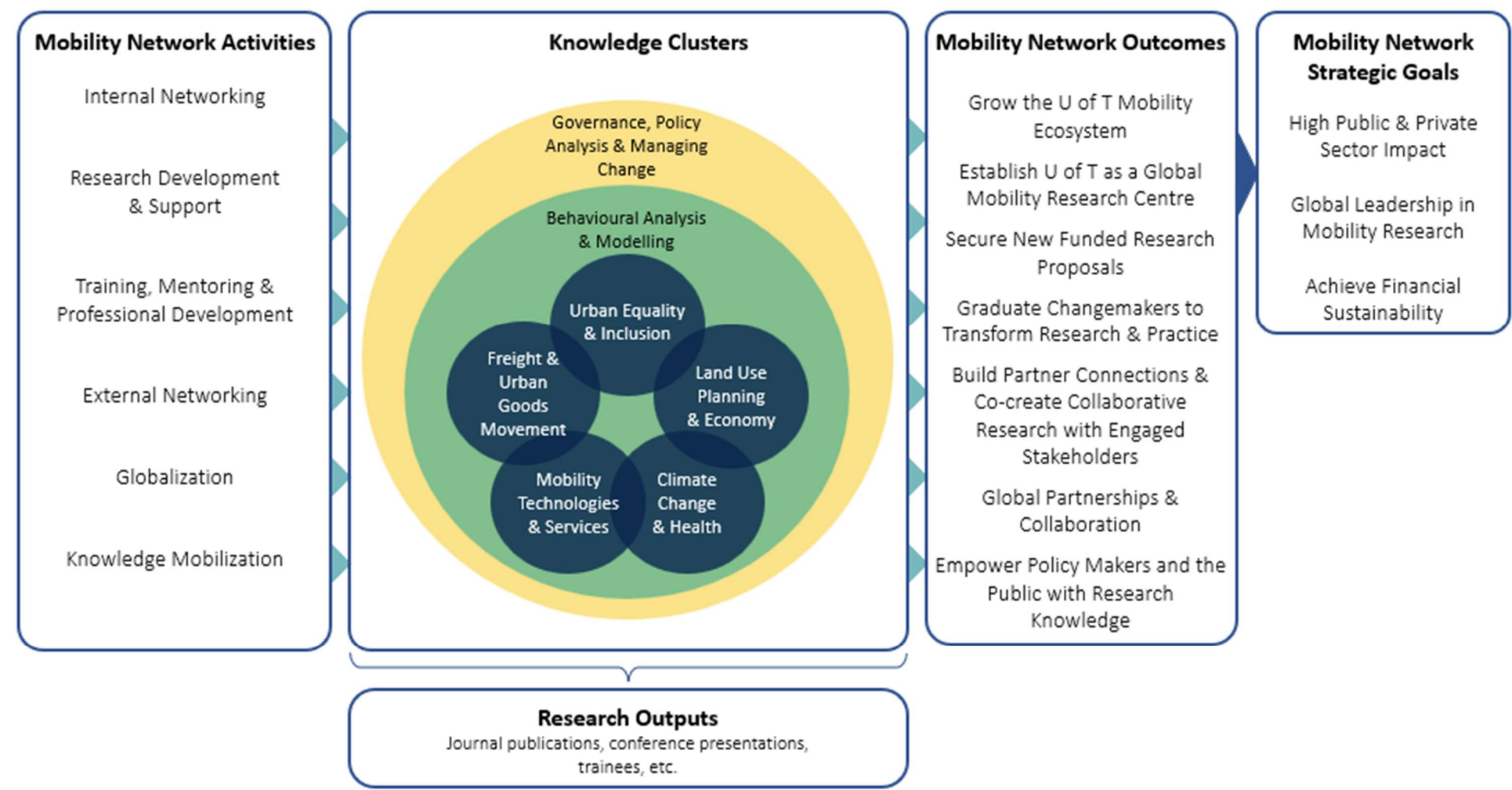
The first holder of of the Roschlau Fellowship is Mwendwa Kiko, a first year PhD student in the Department of Civil & Mineral Engineering, supervised by Professor Eric Miller. From September 2023 to April 2024, Kiko will undertake primary research on his chosen topic, "Electric Vehicles and Gas Stations: Applying a Travel Demand Model to the Study of their Mutual Effects".

I am honoured and delighted to be the recipient of this year’s award. The Mobility Network has a tradition of groundbreaking, impactful research, and I hope to add my contribution to it through this work, Mwenda Kiko



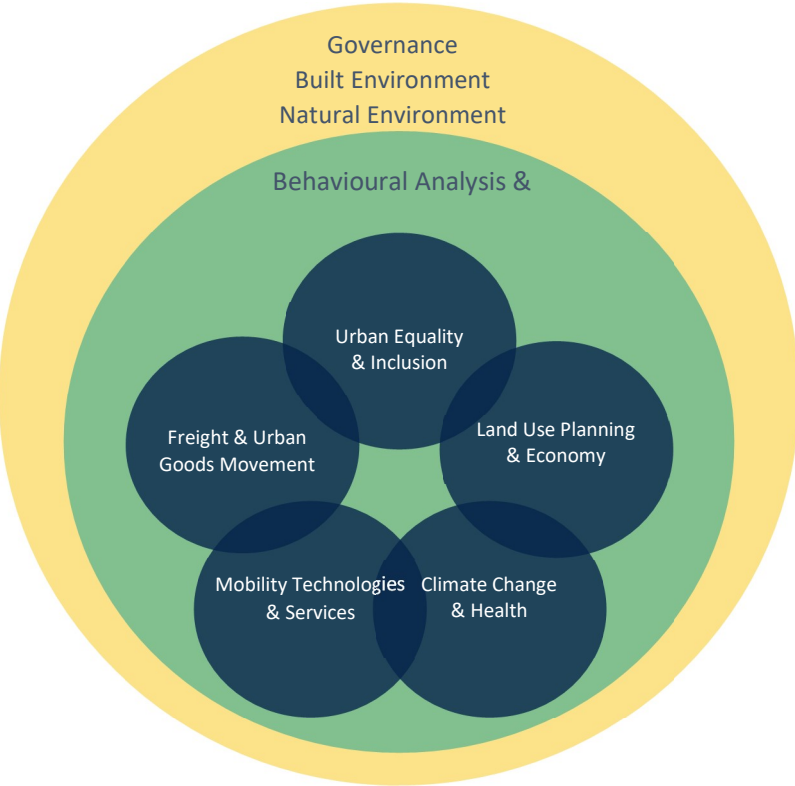
THE STRATEGIC PLAN IN ACTION

Mobility Network activities are designed to create a U of T community across campuses and disciplines, to develop and support collaborative research for members of that community, to train, mentor and develop the graduate students and post doctoral fellows who will become leaders in the field, to build our network of key stakeholders, to take our work global and to mobilize the knowledge generated by the power of Mobility Network. The following sections describe Year 2 Mobility Network Activities in each of these categories.



RESEARCH DEVELOPMENT & SUPPORT

Finding Connections Workshops



A series of five workshops brought U of T researchers from Sociology, Public Health, Human Geography, Civil & Mineral Engineering, Geography & Planning, the Institute for Management & Innovation, Economics and Aerospace together in different configurations to exchange views and knowledge with the goal of developing potential streams for future research.

Travel Behaviour Modelling discussed how travel models might be adapted to acknowledge that people are not always rational because they lack knowledge, and their beliefs may be based on misperceptions. Stress, changing behaviour in those around them and “nudges” may get people to change their behaviour.

Mobility Technology & Services concluded that the inevitable advance of technology needs to be balanced with our values which include safety and trust, reliability and resilience, and decarbonizing transportation. The solution is to integrate new mobility technology that allows people to access what they need: jobs, markets and goods, social interaction, education and a full range of other services contributing to healthy and fulfilled lives.

Land Use Planning & Economy discussed how transportation infrastructure is a key determinant of the “carrying capacity” of a region, a city, a neighbourhood and access to affordable housing and how the lack of integrated, long-range, regional transportation planning threatens our ability to accommodate our growing population.

Mobility & Climate Justice explored the tensions between the need to imperative we face to reduce emissions and the urgent needs of people for equitable access to affordable housing and transportation.

Infrastructure and Time: What can/should we do in 1-5 years? explored how the dual needs to prioritize effective rapid approaches to infrastructure in the near term without investing in dead ends, while simultaneously establishing robust planning and decisions processes for large infrastructure investments that take decades, makes the exploration of time and infrastructure complex and pressing.

RESEARCH DEVELOPMENT & SUPPORT

Faculty Funding Grant Awards

The work contributed by these leading researchers underpins UTM's strategic priorities and goals towards producing world-class research and in creating sustainable and cohesive communities. Together, they support interdisciplinary research at UTM in areas that are critical for our communities on the heels of a global pandemic and will contribute to building knowledge on inclusive cities and societies, healthy lives, and a sustainable future.

Professor Shashi Kant, of the Institute for Management and Innovation, will utilize funding from the Faculty Funding grant to extend his work on the Estimation of Carbon Emissions from Commuting of Employees and Students to the UTM Campus. The Mobility Network Funds are supported by additional funding from the Climate Positive Energy & Climate Positive Campus Initiative at the University of Toronto.



Professor Florian Shkurti, of the Department of Mathematical and Computational Sciences, will use the UTM Mobility Network Faculty Funding Grant to support his work on Generating Physically Realizable Adversarial Driving Scenarios via Differentiable Physics and Rendering Simulators. In combination with funding from the Amazon Research Award in Robotics, Florian's work moves UTM forward in robotics innovation in mobility.

Professor Tara Vinodrai, of the Institute for Management and Innovation, with funding from both a SSHRC Insight Grant and the Mobility Network is exploring data from Statistics Canada to understand the mobility implications of the pandemic in her work Understanding Mobility Dynamics during the Pandemic: Work from Home, Employment and Transit Use in Canadian Cities. This work lays the foundation for further studies rooted in this data.

TRAINING, MENTORING & PROFESSIONAL DEVELOPMENT

Summer School, “Planning More Equitable Transportation Systems,” July 2022

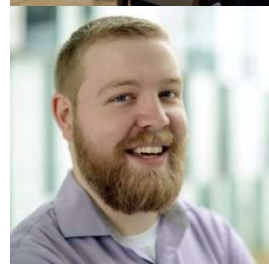
An international group of thirty students and postdoctoral fellows, along with eight instructors and facilitators, took part in Mobility Network’s first summer school. The summer school program provided participants with a deeper understanding of the theories of distributive justice and the theory and measurement of accessibility, as well as knowledge of how equity analysis can be applied to both transit and active travel planning in practice. Over



the two-day period, participants heard, questioned, and discussed insightful presentations from experts, and learned how to use tools and methods to define, measure and analyze transportation equity.

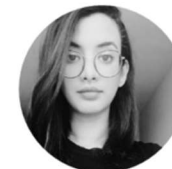
This was followed by two sessions of hands-on work led by Professor Steven Farber, Department of Human Geography, University of Toronto

Scarborough, and Dr. Willem Klumpenhower, Postdoctoral Fellow at Transit Analytics Lab, Department of Civil & Mineral Engineering, using Mobilizing Justice’s draft handbook “Equity Analyses of Transport Futures”.



TM-MN Year 1 Student Research Showcase

Mobility Network Mississauga celebrated research by five award-winning UTM graduate students who were the first recipients of the UTM-MN Graduate Research Awards. Haifa AlArasi, Emily Power, Sophie Roussy, Shaba Taskin, and Hanlin Zhou presented their UTM-MN funded research projects and participated in a Q & A and discussion moderated by Dr. Lisa Lorena Losada Rojas, Postdoctoral Fellow, Mobility Network.



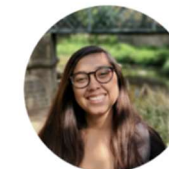
Haifa AlArasi



Emily Power



Sophie Roussy



Shaba Taskin



Hanlin Zhou

In her opening remarks, Prof. Shauna Brail noted how intercampus connections are fostered by the UTM-MN Research Awards and the showcase event, and how the wide variety of mobility-related research underscores the many ways in which mobility affects our lives.

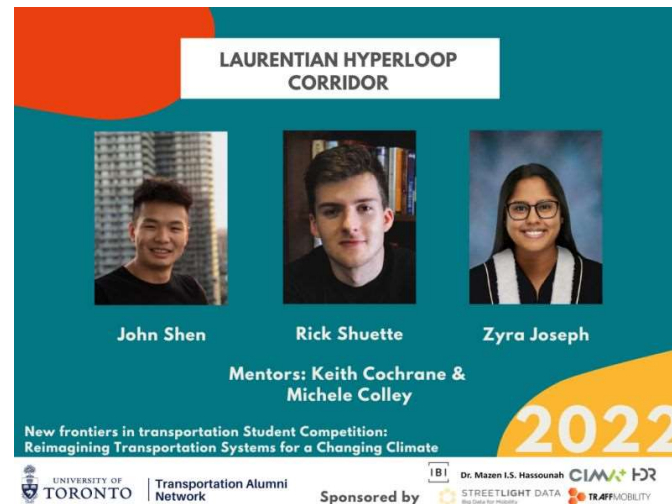


TRAINING, MENTORING & PROFESSIONAL DEVELOPMENT

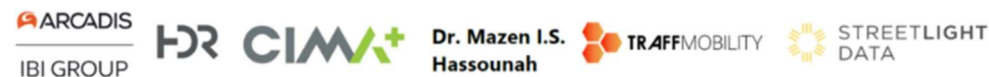
New Frontiers in Transportation Student Competition Symposium

The University of Toronto Transportation Alumni Network hosted its fourth annual U of T student research competition symposium on September 20, 2022, on the timely theme "Reimagining transportation systems for a changing climate."

The student competition symposium was the final stage of a process that began with information events in late May and proceeded through the summer with teams of students or recent graduates representing at least two different academic disciplines working over two months to study and develop a transportation solution to transform current policy or practice under the guidance of a pair of volunteer mentors. A panel of three volunteer judges reviewed the submitted reports prior to the final presentations at the symposium.



The judges awarded the first prize of \$650 for each team member to the *Laurentian Hyperloop Corridor* team, the second prize of \$450 for each team member to *Active Transportation in a Changing Climate* and the third prize of \$375 per team member to *Inequality in Accessing Climate-Resilient Modes of Transportation*. The competition was generously supported by industry sponsors.



TRB Prep Session



revised by volunteer graduate students and postdoctoral fellows. There were many great "lessons learned".



In January 2024, graduate students and postdoctoral fellows headed to Washington, DC to present at the for the 102nd Transportation Research Board Annual Meeting, many for the first time, due to COVID travel restrictions in the two previous years. Mobility Network hosted two "TRB Prep Sessions", a presentation on Effective Communications with Matt Strohack of U of T's Engineering Communications Program and a workshop to which presenters brought their draft presentations to be reviewed and

TRAINING, MENTORING & PROFESSIONAL DEVELOPMENT

Post-Doctoral Fellow Community of Practice



Emerging mobility leaders Matt Palm, Research Coordinator of Mobilizing Justice, and Ignacio Tiznado Aitken, Mobility Network Postdoctoral Fellow at UTSC, took the lead on organizing the Mobility Network Community of Practice, open to all postdoctoral fellows and research associates involved in mobility research.

The Community of Practice is a dynamic, mutually supportive collective and a safe space for postdocs to interact, collaborate, and grow together as researchers and scholars. CoP sessions are an opportunity for PDFs and RAs to meet their peers, discuss their research interests, the research problems and challenges they've encountered and the solutions they've found, their future plans and ambitions and their U of T postdoc experience.

Ideas for future workshops include sharing and testing out presentation ideas, sharing tools and data, workshopping papers-in-progress, and helping with paper publication processes.



The term "Community of Practice" was first used in 1991 to refer to a group of people who "share a concern or a passion for something they do and learn how to do it better as they interact regularly."

Transportation Systems Engineering Science Option

Mobility Network is working with the Division of Engineering Science to develop an option in Transportation Systems. This would be a unique in North America program in U of T's leading engineering undergraduate program, whose graduates we believe would have very significant impact on both transportation research and practice. A multi-department working group of professors and Engineering Science alumni have been developing a draft curriculum and proposal, in consultation with the Division. A survey of current Engineering Science students was conducted during the Winter Term of 2023 to gauge support for such an option. The current plan is to take the proposal through the governance process in 2023-24 for implementation with admission of the first class in the fall of 2024.



Division of Engineering Science
UNIVERSITY OF TORONTO

BUILDING OUR NETWORK OF KEY STAKEHOLDERS

CivMin Distinguished Lecture

"It's always great to see such a tremendous turnout for these Distinguished Lectures that are transportation-related. Every year I think transportation wins the prize for the widest and greatest and most number of people coming out from not just within the university, but from outside the university as well.", Professor Brent Sleep, Chair of the Department of Civil and Mineral Engineering



Professor Jinhua Zhao, the Edward and Joyce Linde Associate Professor of City and Transportation Planning at the Massachusetts Institute of Technology, delivered the Distinguished Lecture for the Department of Civil and Mineral Engineering, "Behavior and computation: What defines the future of urban mobility?" the evening of

March 27. Prof. Zhao is well-known for his work at the MIT Mobility Initiative and as the host for the popular virtual weekly seminar series, MIT Mobility Forum.

"Over time, throughout human history, we invented a fantastic set of technologies that help us move from point A to point B. Many from MIT and University of Toronto contributed to some of this design and implementation of the system. But the question is, is the technology innovation necessarily translating into the betterment of the transportation and mobility system? That's the question I would ask." Professor Jinhua Zhao

U of T Transportation Alumni reception

In February the U of T Transportation Alumni Network hosted its first networking reception since COVID-19 derailed plans for the 2020 event. Among the 80 reception attendees, transportation researchers at University of Toronto were well represented, as were independent consultants and transportation professionals employed at a variety of organizations, including: Access Planning; Alta Planning + Design Canada, Inc.; Arcadis IBI Group; Arup; CIMA+; City of Hamilton; City of Toronto; HDR; Left Turn Right Turn; Metrolinx; Mott MacDonald; Ministry of Transportation of Ontario; Parsons Inc.; Ratio.City; Steer; StreetLight Data; The Atmospheric Fund; Waterfront BIA; and WSP.



Established in 2018 to bring together generations of U of T graduates who work in transportation, UTTAN is a volunteer-run alumni community that plans events and programs for alumni and current U of T students interested in the transportation field.



UTTAN activities are generously supported by industry sponsors.

GOING GLOBAL

To enhance U of T’s status as a world-leader in mobility research and training we have to “go global”. **Building on our almost decade-long successful collaboration with the** Development Bank of Latin America **and with the support of U of T Engineering Partnerships,** we are actively pursuing opportunities in Latin America with the Development Bank of Latin America, the Inter-American Development Bank and direct contacts with Canadian consulates and universities in Brazil, Chile, and Mexico. Of particular interest are opportunities to recruit international students in collaboration with programs like U of T’s International Doctoral Cluster program and CALDO, which connects Latin American students with Canada’s leading research-intensive universities and facilitates networking events between top international research universities.

Mobility Network has work underway in Mexico, Panama, Columbia, and Argentina and has concluded work in Uruguay.

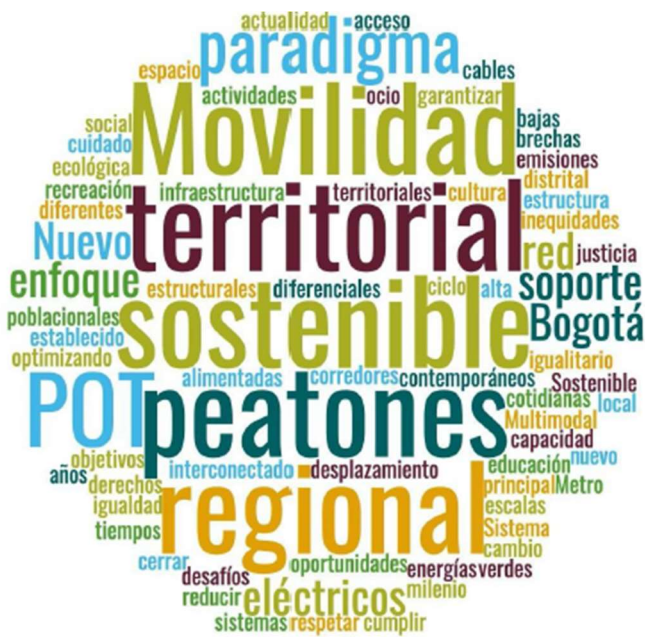
Technologico de Monterrey collaboration



(L-R) Professor Roberto Ponce López, Professor Eric Miller, Dr. Gonzalo Peraza March 22, 2023. (Photo: Mobility Network)

Decanal funding from Faculty of Applied Science & Engineering supporting a new research collaboration with Tecnológico de Monterrey will apply the GTAModel to support the investigation of transit infrastructure investments in Monterrey, Mexico. GTAModel V4.0, developed by the Travel Modelling Group at the University of Toronto, forecasts how different transportation infrastructure investments and operating policy decisions affect travel patterns. The project kicked off in March with a visit from Tec researchers who received training in the GTAModel. The Monterrey, Mexico application is TMG’s first international full-scale operational implementation.

“We concluded a successful week of work in @UofT with @UofTMobilityNet. We are making progress in generating a model to obtain information that allows us to make long-term decisions for mobility in Monterrey.”
Postdoctoral researcher Dr. Gonzalo Peraza of Tecnológico de Monterrey



GOING GLOBAL

The Development Bank of Latin America (CAF) collaboration

Mobility Network's collaborative relationship with CAF, which dates to 2016, involves the application of advanced data science methods to problems in sustainable mobility in major Latin American urban regions. Most recently, Eric Miller and his team applied machine learning methods to the analysis of smartphone GPS location tracking data in Bogotá, Buenos Aires and Panama City. Challenges in translating smartphone tracking data into robust models of urban travel demand remain.

The results of an earlier study in Montevideo, using both cellphone trace data and transit smartcard data to build representations of travel behaviour in the region, are currently in use by planners in Montevideo.

Inter-American Development Bank

With the assistance of the U of T Office of the Vice-President International Partnerships, Mobility Network is exploring partnerships with IDB for both training and research opportunities in Latin America.

Canada-Brazil Chamber of Commerce

The Faculty of Applied Science Partnerships Office connected Mobility Network to opportunities with the Canada-Brazil Chamber of Commerce. This led to participation in two workshops on governance models for sustainable mobility in Brazil, March 2023, for the State of Parana (Curitiba). Preliminary discussions of a possible travel demand modelling applications in Curitiba are underway.

Urban Modelling Collaboratory Leadership in Activity-Based Modelling

Mobility Network's Urban Modelling Collaboratory has been actively engaged in research collaborations with leading activity/travel demand modelling groups worldwide. Activities in Year 2 include:

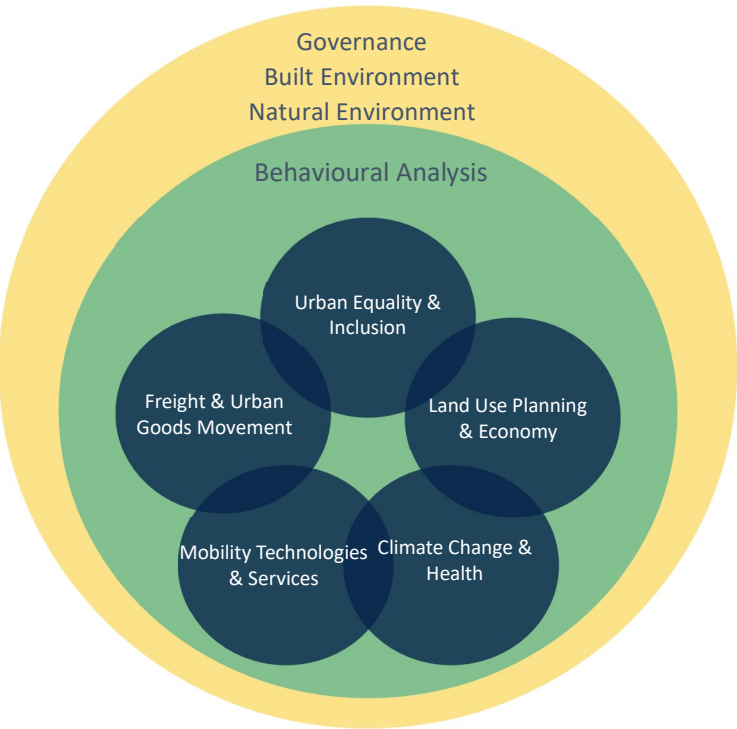
- Providing advice an agent-based microsimulation modelling to the Office of National Statistics and the Department for Transport, both in the UK.
- Collaborations with both Monash University and the University of New South Wales on the transfer of GTAModel to Melbourne and Sydney, respectively. In the case of UNSW, this has results in several papers using the Sydney model to test COVID control policies, while discussions are underway with Monash to develop a formal joint research project, most likely through the NSERC Alliance program.
- The launch of new collaboration with the University of Leeds to apply machine learning methods to Toronto multi-year survey data to examine behavioural dynamics.
- Participation in an invitation-only symposium in Seeon, Bavaria in September 2022 to start crafting the research agenda for "the next generation" of activity-based travel models. This led to a follow-up session at the US Transportation Research Board Annual Meeting in Washington DC in January 2023. UMC is a leader in planning the next three-day workshop in the series, to be held in Austin, Texas in late October 2023.



KNOWLEDGE MOBILIZATION

The Knowledge Clusters shared their research outcomes through a series of public symposiums, panels discussions and workshops.

Each of the events was hosted by Mobility Network in partnership with its member research groups and projects.



Urban Equality & Inclusion

Mobilizing Justice First Annual Symposium, September

Climate Change & Health

Place-based Solutions for Decarbonizing Transport, September

Mobility Technology & Services

Transformative Transportation '22: 5th Annual CATTs Symposium, June

TAL Research Day July Freight & Urban Goods Movement, July

Freight & Urban Goods Movement

CLUE City Logistics for the Urban Economy Symposium, June

2022 Smart Freight Symposium, November

Behavioural Analysis & Modelling

TMG Workshops

- Creating Custom EMME Tools
- Synthesizing Future Year Population

MOBILIZING JUSTICE



KNOWLEDGE MOBILIZATION

The Way Forward

In Spring 2022, Mobility Network launched “The Way Forward” which engaged 28 Mobility Network researchers from across U of T in a series of seven panel discussions on pivotal mobility issues, including land use, governance, equity, decarbonizing transportation, AVs and safety, complete communities and intelligent transportation systems. The virtual sessions attracted wide attention from the university, government, non-governmental organizations and consulting communities, and the public.

In Spring 2023, Mobility Network reached into its partner network for panelists whose knowledge of governance and practice complemented the knowledge of U of T researchers. The Way Forward 2023 comprised six panel discussions on changing travel behaviour post-COVID, supply chains, ethics in access and use of mobility data, affordable housing, decarbonizing transportation, and managing congestion.

Four of these panel discussions fell in Year 2.

Spring 2022	Spring 2023
 Margaret Kohn Professor and Chair Political Science, UTSC  Matti Siemiatycki Professor Geography & Planning  Robert M. Wright Associate Professor Daniels Faculty of Architecture Landscape and Design  Eric Miller Director, Mobility Network Professor, Civil & Mineral Engineering	 Iain Dobson SRRA  Khandker Nurul Habib U of T  Wendy Reuter TTC  Eric Miller U of T
Designing complete communities	Adapting to changing travel behaviour in the post-COVID city
 Baher Abdulhai Professor Civil & Mineral Engineering  Amer Shalaby Professor Civil & Mineral Engineering  Birsan Donmez Professor Mechanical & Industrial Engineering  Florian Shkurti Assistant Professor Computer Science	 I. Daniel Posen University of Toronto  Dianne Saxe City of Toronto  Adam Thorn Pembina Institute  John Robinson University of Toronto
Harnessing intelligence in transportation systems	Safeguarding reliable, sustainable supply chains

KNOWLEDGE MOBILIZATION

NECTAR Conference 2022, July 2022

In July, Mobility Network co-hosted NECTAR 2022, the 16th annual Network on European Communication and Transport Activity Research (NECTAR). U of T's Professor Michael Widener, Conference Chair, remarked on the timeliness of the 2022 conference theme,



“Mobilizing Justice: moving toward action for an equitable transportation future” in light of the increased visibility of inequities during the pandemic. The conference attracted 110 conference attendees from Austria, Belgium, Brazil, Colombia, Czech Republic, France, Germany, Hong Kong, Israel, Luxembourg, Malta, Netherlands, Portugal, Spain, Sweden, Turkey, the UK, and the USA. About a third of attendees were Canadian scholars from

across the country.

Research was presented around clusters:

- Understanding subjectivity and uncertain futures
- Equity in Transport Policy
- Delivering Equity: Intersections between Urban Delivery, Transportation and Environmental Justice
- Low emission zones: potential effects on vulnerable households, housing prices and labor markets
- Tourism in Livable, Healthy and Equitable Cities
- Accessibility as an (in)equality indicator
- Digitalization and transport equity
- Digitalization – a gift or curse for policy making.

Public Transit Short Courses

Mobility Network’s Transit Analytics Lab offered two back-to-back courses designed for practising public transit professionals or those involved in the transportation and planning industry who have an interest in public transit planning and ITS. *Public Transit Planning and ITS*, provided an overview of key concepts and best practices related to transit planning, network and service design, service standards, transit and land use, and the application of ITS technologies. *Public Transit Modelling*, provided a complementary but more focused and advanced exploration of tools that can be used for forecasting demand at both the system

and route levels, transit assignment, and microsimulation-based analysis. The courses were taught by leading transit planning researchers and practitioners and provided a balanced perspective on transit systems planning and ITS, including both state-of-the-art techniques and practical perspectives.



TRANSIT ANALYTICS LAB

MOBILITY NETWORK COMMUNITY as of April 2023

University of Toronto Mississauga
Faculty of Applied Science & Engineering
Faculty of Arts & Science
University of Toronto Scarborough
School of Cities

KNOWLEDGE CLUSTER LEADERS

Steve Farber, Urban Equality & Inclusion
Chris Higgins, Land Use Planning & Economy
Marianne Hatzopoulou, Climate Change & Health
Hugh Liu, Mobility Technology & Services
Matt Roorda, Freight & Urban Goods Movement
Eric Miller, Behavioural Analysis & Modelling

MEMBER RESEARCHERS

Alan Walks
Alberto Leon-Garcia
Amer Shalaby
Karen Chapple
Andre Auguto Cire
Andre Sorensen
Angelina Grigoryeva
Anthony Wensley
Avni Shah
Baher Abdulhai
Beth Coleman
Birsen Donmez
Chi-Guhn Lee
Christopher D. Higgins
Daniel Posen
Daniel Silver
David A. Wolfe
Enid Slack
Eric J. Miller
Florian Shkurti
Greg Evans
Heather MacLean
Hilary Brown
Hugh H.T. Liu
Jeffrey Brook
John Robinson
Jonathan Hall
Jue Wang
Julie Mah
Khandker Nurul Habib
Laura Tozer
Marc Johnson

Margaret Kohn
Marianne Hatzopoulou
Mark S. Fox
Matthew Adams
Matthew Hoffmann
Matthew J. Roorda
Matti Siemiatycki
Merve Bodur
Michael Marin
Michael J. Widener
Michael Piper
Naomi Adiv
Nathaniel Baum-Snow
Nicholas Spence
Paul M. Hess
Richard Florida
Robert Wright
Ron N. Buliung
Scott Sanner
Shashi Kant
Shauna Brail
Shoshanna Saxe
Soo Min Toh
Stephen Scharper
Steve M. Easterbrook
Steven Farber
Tamer E. El-Diraby
Tanjim Hossain
Tara Vinodrai
Tenley Conway
Theresa Enright
Timothy Chan
Tracey Galloway
Yuhon He

MEMBER RESEARCH CENTRES & PROJECTS

Centre for Automated and Transformative Transportation Systems (CATTS)
Centre for Information Systems in Infrastructure & Construction (i2c)
Centre for Maintenance Optimization and Reliability Engineering (C-MORE)
Centre for the Sustainable Built Environment
City Logistics for the Urban Economy (CLUE)
Data Management Group (DMG)
Flight Systems & Control (FSC) UTIAS
Human Factors and Applied Statistics Lab (HFAST)
ICity2: Urban Data Science for Future mobility
Innovation Policy Lab at the Munk School of Global Affairs and Public Policy
Institute on Municipal Finance and Governance (IMFG)

Intelligent Transportation Systems (ITS) Centre and Testbed
Positive Zero Transport Futures
Smart Applications on Virtual Infrastructure (SAVI)
Smart Freight Centre
Southern Ontario Centre for Atmospheric Aerosol Research (SOCAAR)
Spatial Analysis of Urban Systems at the University of Toronto (SAUSy Lab)
Transit Analytics Lab (TAL)
Transportation and Air Quality Research Group (TRAQ)
Transportation and Environmental Change Lab
Travel Modelling Group (TMG)
Travel Demand Modelling Group (TDMG)

PARTNERS

Amalgamated Transit Union
Autodesk Canada
Autorite regionale de transport metropolitain
Canadian Institute of Planners
Canadian Mortgage and Housing Corporation
Canadian Urban Institute
Canadian Urban Transit Association
CIRODD
CIRRELT
City of Calgary
City of Edmonton
City of Montreal
City of Toronto
City of Vancouver
Daniels Corporation
Diamond Corporation
Environics Analytics
Esri Canada
Federation of Canadian Municipalities
Geotab, Inc.
Hatch Ltd
Infrastructure Canada
Maximum City
McGill University
McMaster University
Memorial University
Metrolinx
OCAD-U
Pantonium Inc
Pembina Institute
Real Property Solutions
Region of Peel
Region of Waterloo
RideShark

MOBILITY NETWORK COMMUNITY as of April 2023

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Royal Academy of Engineering
Simon Fraser University
Statistics Canada
Swiftride
The Centre for Active Transportation
Toronto Transit Commission
TransLink
United Way of Greater Toronto
University of British Columbia
University of Manitoba
University of Oregon
University of Texas at Austin
University of Waterloo
Urban Strategies Inc
VIA
York Region
York University

MANAGEMENT COMMITTEE

Steve Farber, Urban Equality & Inclusion
Chris Higgins, Land Use Planning & Economy
Marianne Hatzopoulou, Climate Change & Health
Hugh Liu, Mobility Technology & Services
Matt Roorda, Freight & Urban Goods Movement
Eric Miller, Behavioural Analysis & Modelling
Shauna Brail, University of Toronto Scarborough
Shoshanna Saxe, Faculty of Applied Science & Engineering

IMPLEMENTATION COMMITTEE

Vince Tropepe, Faculty of Arts & Science
Heather MacLean, Faculty of Applied Science & Engineering
Elspeth Brown, University of Toronto Mississauga
Irena Creed, University of Toronto Scarborough
Arij Al Chawaf, ISI Office

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Eric Miller, Director
Shauna Brail, Associate Director
Steve Farber, Associate Director
Judy Farvolden, Managing Director
Pat Doherty, Events & Communications Coordinator
Khadija Butt, Education Specialist
Christos Orfanidis, Administrative Coordinator
Tarandeep Lubana, Events & Communications Assistant



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