

INTRODUCTION TO THE CTRF 2025 CONFERENCE

Trevor Hanson, Joseph Monteiro, Barry E. Prentice, and Anna Robak

The theme of the 2025 conference is “What’s the future of transportation productivity? From Supply Chains to Personal Mobility”. A matter that has become of increasing concern as productivity and mobility patterns and supply chains are still being reconfigured after the COVID-19 pandemic. This pandemic sent ripples throughout the economy from a rise in inflation to labor unrest. It resulted in a number of strikes and a number of days lost in the transportation sector which rose dramatically. To add to these problems, changes on the world scene are also creating uncertainty as a result of the threat of tariffs from a change in the government in the US and the new elections expected in Canada.

At the 60th conference, CTRF will examine changes that are occurring in transportation from personal mobility to global supply chains. COVID-19 has changed work habits dramatically and with that travelling patterns to work. Electric vehicles, e-bikes, automation and the use of artificial intelligence in transportation are becoming more visible in the economy. In addition, strikes in nearly all transportation sectors have resulted in hundreds of thousands of hours of work lost. All these developments have an effect on transportation and the economy. More specifically, how has it affected transportation productivity? How has it affected mobility patterns and supply chains? Should the government have reacted differently to strikes? Are policy and regulations adapting to these changes? To add to this, while the threat of inflation and higher interest rates have receded, new threats have emerged on the horizon like increased tariffs from the US, unemployment, and an uncertain political climate together with increasing demands to deal with climate change due to global warming.

The conference proceedings contain a rich collection of papers on these issues with particular emphasis on the post-Covid-19 impacts on transportation systems, mobility of people, and transit. These proceedings demonstrate the range and depth of topics that make the Canadian Transportation Research Forum the foremost annual venue of its kind.

Organization of the Proceedings and an Overview of Individual Papers

The papers in this Proceedings are organized under twenty sessions. 1. Connecting this vast land; 2. Vehicle of choice; 3. Enabling fair and ethical transportation; 4. How to catch a bus; 5. Enabling competitive supply chains; 6. Policy and planning; 7. Urban emissions begone!; 8. Statistics and data issues; 9. There’s something in the air; 10. Lasting shock (my, how we’ve changed); 11. Urban transport planning; 12. Datasets, tools and methods for enabling fairness; 13. EV uptake: Plans and challenges OR: where’s my charger?; 14. Keep the goods flowing; 15. Park it; 16. Making cities safer to move and deliver; 17. Keep the goods flowing (2); 18. Productivity: Frameworks and evidence; 19. Healthy cities; and 20. Perspectives and types. A brief summary of each paper is provided hereafter.

1. Connecting this vast land

Measuring Air Connectivity: The What, How, and Why – Kathryn Tooley, Jody Kositsky, Ian Kincaid

Given the importance of air connectivity across the country, it is prudent to understand the different ways of measuring air connectivity. There are basic metrics such as number of direct destinations, or total number of seats, but these metrics do not take into account other factors that are important to connectivity, such as the size of the destination or economic importance. The authors propose a measure for connectivity that accounts for not only the size destination (and number of onward connections), but also accounting for one stop connections. This allows for connectivity to be measured by accounting for the hub and spoke model common in aviation.

The impact of Canadian Foreign Policy on Bilateral Passenger Air Traffic - Sameer Esmail, Julien Carron, Marc Rioux

Over the last two decades, a correlation has emerged between the Government of Canada's policies on immigration, tourism, and trade and Canada's bilateral air transport agreements. This paper demonstrates how government policy actions on immigration, tourism, and trade can both support and hinder the development of air traffic by conducting a historical review of passenger traffic in relation to key policy changes, highlighting their influence on travel patterns in subsequent years. Transitioning to the current context, the paper explains how a new era of policy restrictiveness in areas such as immigration and trade could change bilateral passenger traffic flows between Canada and foreign markets.

Sustainable ecotourism and airship travel - Barry E. Prentice, John Wilms

Ecotourism is a global growth industry and Canada is well-positioned to attract more tourists for these types of activities. However, remote locations are under-served with respect to access and are inherently vulnerable. This presents significant difficulties for tourists who want to see Canada's wildlife in their natural habitats. In addition, the use of transport to get close to wildlife for viewing opportunities can be stressful for the animals and may damage terrain. This article explores the use of passenger airships for ecotourism. Modern designs with electric propulsion make airships ideal for unintrusive ecotourism operations.

Access to destinations in the North: A case study of Yellowknife - Alexandra Sbrocchi, Anastasia Soukhov, Léa Ravensbergen

The authors examine the spatial accessibility of Yellowknife, NT. Yellowknife is currently undergoing the creation of their first comprehensive transportation master plan. The authors explore how the newly calculated Spatial Access Measure (SAM) provided by Statistics Canada may compliment this initiative. They first reviewed how SAM may relate to more commonly used 'remoteness indices' relevant to Northern community planning. Then, they evaluate how dissemination areas rank in terms of their SAM to important care destinations such as grocery stores and healthcare, recreational, and education facilities by active transportation modes. They discuss the suitability of this measure in potentially reflecting lived experiences from different dimensions, like youth's access to school. Overall, the study seeks to evaluate the applicability of the newly calculated SAM in the Northern context and outline future research needs.

Paving the way for a sustainable interregional transportation system in Québec - Nicolas Charron, Catherine Morency

This research will provide a methodological pathway to build the public transport infrastructure needed to decrease the use of private vehicles in interregional trips to meet the sustainable transportation goals set by the provincial government in its policies. With a province-wide representation of transit networks, it is now possible to compare total travel time by transit and by car, thus determining what proportion of the population has a viable alternative to their private vehicles when traveling across the province. With both supply and demand in transport observed through the first long distance OD survey available, methods used to design a long-distance transit network will be reviewed.

Assessing individual perceptions of using futuristic modes for Kelowna international airport: a structural equation modeling approach - Uthpalee Hewage, Mahmudur Fatmi

This study investigates factors influencing individuals' perceptions of using Autonomous Transit (ATS) for exclusive airport access along the Okanagan Rail Trail. Approximately 1,500 responses were collected from a 2024 survey of Kelowna and Lake Country residents using random sampling. Respondents were presented with scenarios emphasizing trust, safety, and convenience in adopting ATS for airport access to indicate their preferences. The survey also collected other information. Structural Equation Modeling was used to identify and evaluate relationships among factors influencing ATS perceptions since it simultaneously evaluates direct and indirect relationships and the effects of control variables. Results

offer guidance to policymakers and transit planners in designing innovative, user-centric solutions for efficient airport access in cities like Kelowna.

2. Vehicle of choice

Integrated Decision-Making for Residential, Workplace, and Work Modality Choices in Two-Worker Households - Md Nobinur Rahman, Mahmudur Rahman Fatmi

Telecommuting has transformed the way two-worker households approach long-term decisions regarding residential location, workplace, and work modalities. This study explores the interconnections among these choices using data from the 2018 Okanagan Travel Survey conducted in British Columbia, Canada. This study employs random utility maximization-based discrete choice modelling approaches, specifically Cross-Nested Logit (CNL) models. The results show that households are more likely to adjust their work modalities, such as telecommuting, rather than altering their residential or workplace locations.

Has anything changed yet? Insights from Okanagan travel survey – Shivam Khaddar, Imrul Shafie, Mahmudur Fatmi, Danielle Devries, C.

This study proposes a joint discrete choice model to account for complex interdependencies (work/live/travel) and capture trade-offs. In this model, work arrangement type (e.g., work from home, work away from home, no fixed work place), residential location (e.g., single detached, apartment, row/town house) and travel mode (e.g., auto, bike/walk, transit) are modelled as a package choice. The data for this study comes from 2024 Okanagan Travel Survey, conducted in the Okanagan region of British Columbia, Canada. The model results confirm the presence of complex interdependencies among these choice dimensions. Lastly, the findings of the study can be utilized to develop robust land use and transportation policies.

Developing a Joint Discrete-Continuous Machine Learning Model for Travel Mode and Trip Departure: A Multi-task Learning Approach - Mohamad Khalil, Mahmudur Fatmi

This study develops a joint artificial neural network (ANN) to simultaneously model travel mode and trip departure time. The authors evaluate two MLT-ANN architectures: hard-parameter sharing MTL (HP-MTL) and cross-stitch MTL (CS-MTL). Additionally, they compare them against single-output neural networks (SO-NNx) and econometric models. The results indicate that the more complex CS-MTL performed similarly to SO-NNx in most measures but was outperformed by HP-MTL, likely due to negative learning from increased complexity given task interdependencies. In contrast, HP-MTL showed significant improvements.

How can land developers contribute more to reducing single occupancy vehicle use? - Reihaneh Azhdar, Adam Weiss

This paper aims to understand the effect of Transportation Demand Management (TDM) policies implemented in high-rise condominiums in the Greater Toronto and Hamilton Area on residents' mode choice and mobility patterns. A web-based stated adaptation survey was designed and conducted in the study area, and the collected data were used to estimate a series of multinomial logit models, highlighting effective policies and factors influencing condo residents' modal shifts. The model results suggested that an innovative condo-specific parking policy, along with transit fare incentives, and the provision of e-bike share stations, and e-bike share membership discounts, could encourage residents to adopt sustainable modes and reduce private car use. The model findings could support land developers in predicting the effectiveness of TDM policies in residential developments.

Do Improvements in Sustainable Mobility Systems Drive Changes in Car Ownership? - Antoine Laporte, Catherine Morency

This research investigates the evolution of key indicators related to private car access, such as driving license ownership, household car ownership, and access-to-car ratios (the ratio of driving licenses to

cars). A range of methodologies is employed to analyze trends, with a particular focus on aggregate trend analysis and the estimation of a difference-in-differences model. This model is applied to zones where significant enhancements to sustainable transportation systems have been implemented. The findings provide insights into whether such changes have measurable impacts on car dependency. By addressing this critical question, the study contributes to understanding how sustainable mobility strategies influence broader transportation behaviors and supports decision-makers in designing effective policies to promote sustainable urban mobility.

Is one-day travel data enough? A comparative analysis of 1-day and 7-day data in BC - Imrul Kayes Shafie, Mahmudur Fatmi

Traditional travel surveys, typically capture activity patterns for a single weekday, operate on the assumption that daily travel behaviors remain consistent throughout the week. However, recent shifts, such as hybrid work arrangements, challenge this assumption by introducing significant variations in daily travel patterns across the week. To address this limitation, the British Columbia Activity Time Use Survey (BC ATUS) collected one-day web-based activity data and seven-day smartphone app-based GPS data in the Greater Vancouver and Greater Kelowna regions. The findings emphasize the necessity of seven-day data in capturing nuanced travel behaviors, providing critical insights for equitable and effective post-pandemic urban planning.

3. Enabling fair and ethical transportation

Five Years of the ATPDR: Outcomes and Opportunities - Sonya Sula

This paper reflects on the past 5 years of the Accessible Transportation for Persons with Disabilities Regulations (ATPDR) with a focus on air travel, exploring accomplishments, challenges, and opportunities. It argues that compliance does not necessarily lead to accessible outcomes. As one navigates towards 2040, how might one shift the focus from a compliance-based approach to a framework that prioritizes dignity, autonomy, and empowerment? Over the next five years, what might be done to affect change in the industry and elevate accessibility to the same levels of safety and security?

Ethical Implications of Autonomous Vehicles in the Urban Context: A Trolley Problem Perspective - François-Guillaume Landry, Moulay A. Akhloufi

This paper explores the application of the trolley problem in autonomous vehicle decision-making through a literature review. The authors first describe the trolley problem and how it can be used as a tool to solve ethical dilemmas revolving around AVs. Next, they introduce several ethical frameworks as solutions to trolley cases and discuss how these frameworks integrate within regulatory and cultural contexts. They conclude with a discussion on the ethical values involved in various dilemmas related to the deployment and operation of AVs.

Measuring the "Age-Friendliness" of a Community: Evaluation of Audit Guides for supporting Engineering Decision-making - Zahra Sedaghat, Trevor Hanson

This research piloted multiple guides, including some Public Health Agency of Canada (PHAC) - recommended, on 62 selected road segments in Fredericton, NB. While the audit tools permitted a consistent method of compiling information, there were limitations, including: extensive data collection requirements (e.g. one had 165 built environment measures per segment), overly subjective attributes to measure, inconsistent scoring schemes, lack of a total score of "age-friendliness", lack of weighting on the importance of relevant attributes, inability to evaluate at a network level, and reliance on foot-based audits (completed virtually where possible). A GIS-based analysis approach was piloted by identifying attributes from an audit tool most likely to be available from city open data sources and using this to propose an approach for city-wide age-friendly community evaluation.

Using GPS-supported prompted recall-based travel diaries to understand the travel behaviour of persons with a mobility disability - Madeline Whitehouse, Trevor Hanson

The rate of disability in New Brunswick is currently higher than the national average, however, the impact of having a mobility disability on someone's ability to independently meet their transportation needs is not well understood. This research aimed to address this knowledge gap by piloting a 5-day travel diary survey using GPS devices and prompted recall interviews for persons with a mobility disability (n = 13) solicited from a larger mail-out survey (678 distributed, 99 Returned).

Piloting An Optimization Approach for Demand Responsive Paratransit Services In New Brunswick, Canada - Abby Cartwright, Trevor Hanson, James Christie

This research used geographically aggregated passenger data from 6 months of trip-making by a Accessible Demand-Response Transit (DRT) provider to estimate per capita trip rates, identify origin/destination pairs, and to pilot an exact solution method of Mixed Integer Linear Programming (Christie Method) for vehicle deployment. The Christie Method was able to reasonably replicate the conditions of the existing service provider subject to their level of service requirements and was then applied to a community use-case based on extrapolated trip rates. While effective, the exact solution approach increases processing time exponentially for any additional constraints, therefore other heuristic approaches may warrant future considerations.

Optimizing accessible bus stop distribution - a case study in equity driven transit design for the City of Ottawa - Hamza Mustafa, Adam Weiss, Ata Khan

This paper proposes a location optimization-based solution that aims to equitably distribute the location of accessible bus shelters. The modelling method provides location optimization capability by means of integrating Geographic Information System (GIS)-based network analysis, linear/nonlinear programming and observed ridership data. The case study consists of definitional problems, methodological details, data sources, optimization scenarios which will include alternative distributions of accessible bus shelters across the transit network, followed by conclusions, and recommendations. The findings and recommendations will offer a pragmatic analysis of the tradeoffs between different optimization strategies for enhancing transit inclusivity.

4. How to catch a bus

Sensitivity analysis of historical bus travel times and improving travel time estimations in bus scheduling - Yuxuan Wang, Catherine Morency, Martin Trépanier

This study aims to address research gaps by decomposing observed transit travel times, identifying how much variation can be attributed to each element and their interaction effects using sensitivity analyses, and demonstrating potential ways to improve bus schedules. The analyses show that red-light waiting times are heavily affected by trip departure times and their interaction effects, where a few minutes of change can greatly affect the red times and overall travel times due to the varying cycle lengths in fixed signal timing plans. Therefore, historical travel time observations are conditional based on signal synchronizations given their departure times and planners must plan for the different signal synchronization patterns when adjusting bus schedules. To help plan for red time variations, the authors demonstrate some simple calculations the planners can perform to improve travel time estimations.

Typology of Bus Routes and Demand Variability: Combined Insights from Land Use and Route Features - Bitu Farokhian, Catherine Morency

Defining a typology of urban bus routes is critical for understanding how different types of services and route characteristics influence travel demand patterns. This study aims to establish a comprehensive typology of bus routes in Montreal. Once the bus route typology is created, the clusters are merged with the daily transactional validation data to analyze the variability of demand during the different phases covering the COVID period (spanning from 2019 to 2024), using variability measures. This analysis

sheds light on how different route types responded to pandemic-related and shifts in travel behaviors. Finally, this research highlights the features that play a key role in shaping demand patterns, whether related to land use, network accessibility, or other route characteristic features, which will be valuable for future transportation planning and policy development.

Assessing the Impact of Major Public Transit Service Changes on Travel Behaviors - Amandine Goracy, Catherine Morency

This research examines the effects of significant improvements in transit travel times on various travel behavior indicators. Using data from the Montreal metropolitan area, the study identifies areas where transit travel times have markedly improved over a five-year period and evaluates corresponding changes in behaviors such as mode choice, transit trip rates, and the spatial distribution of transit trips. Transit travel time matrices are compared to detect origin-destination pairs with notable changes, using filters based on spatial and temporal parameters. Furthermore, distribution models are calibrated to analyze how changes in travel times influence the spatial structure of trips and overall transit demand. This analysis offers valuable insights into the relationship between transit supply improvements and travel behaviors, informing strategies to promote sustainable and efficient urban mobility.

Canada needs more people (To ride the bus) - Paul D. Larson

This paper explores determinants of transit ridership, leading to public policy recommendations for increasing transit ridership of small Canadian census metropolitan areas. The determinants of transit use can be classified into controllable and uncontrollable factors. While weather patterns and population growth are relatively uncontrollable, transit authorities can control a variety of service features, such as number of routes, number of stops and frequency of service. Drawing on archival data and interviews with CMA transit authorities, cases will contrast several small CMAs across Canada, in an attempt to better understand various drivers of ridership performance, ranging (in 2021) from 1.2 percent in Drummondville, Quebec to 4.9%.

Exploring individual perceptions of autonomous transit: a stated choice modelling approach – Uthpalee Hewage, Mahmudur Fatmi, Manoj Sangameshwar

The study investigates perceptions of Autonomous Transit Services (ATS) along the Okanagan Rail Trail, a multi-modal pathway connecting major regional hubs. Using random sampling method, 1,500 responses were gathered from Kelowna and Lake Country residents. A mixed logit model examined the influence of socio-demographics, mobility tools, land-use patterns and individual attitudes on mode choice. The findings aim to provide actionable insights for urban-planners and policymakers to promote ATS adoption and advance sustainable urban mobility.

Network-wide transfer synchronization strategies in a public bus system with real-time data - Laura Kolcheva, Prof. Martin Trépanier, Prof. Antoine Legrain

Transportation Modeling and Data Transfer speed and reliability are key factors influencing public transportation use. Fixed schedules often fail under unpredictable traffic, causing missed transfers. To address this challenge, the authors propose two online stochastic optimization (OSO) algorithms for the real-time transfer synchronization problem using three control tactics: hold, skip-stop, and speedup. Their approach is based on an offline model that minimizes total passenger travel time by solving time-expanded graphs incorporating all possible control tactics. Building on this model, they develop two OSO algorithms integrating historical and real-time data to generate scenarios on future bus network conditions and make dynamic decisions. The results demonstrate improvements in the number of successful transfers and in passenger travel times, showcasing their practical potential.

5. Enabling competitive supply chains

Networks in Canadian transportation-do they create barriers to entry? - Joseph Monteiro, Barry Prentice, Anna Robak

The term ‘barrier to entry’ was popularized in the economic jargon after Joe Bain’s treatise on the subject though it was used as a strategy to deter competition as long as one can remember. The concern about barriers to entry has been a major concern with politicians and antitrust policy makers. Recently, the Competition Bureau in Canada launched an inquiry into competition into the domestic air passenger service followed by the US Department of Justice and Department of Transport. The Bureau plans to examine barriers to entry and expansion as part of the scope of its study. This paper begins by briefly examining the definition and treatment of barriers to entry in Canada, it then examines a few studies on the subject followed with our opinion on these barriers in Canada and concludes with policy implications.

Networks in Canadian Transportation and Competition - Joseph Monteiro, Anna Robak

Networks have always been important in transportation. Recent investigations in Canada and elsewhere provides the motivation for this paper - networks in transportation. Part one reviews the definition of networks and whether these networks are widespread in Canadian Transportation and its importance. Part two reviews the use of mathematics in networks and the economic theory of networks in transportation. In part three, whether networks in transportation create economies is briefly examined and their treatment under the competition law. Part four provides a few concluding remarks.

Strengthening Supply Chains in Canada: Data Development and Insights - Zahra Aback, Lawrence McKeown

The authors begin by reviewing post-pandemic supply chain disruptions and their economic manifestations. It then provides a recap of the work to date, and outlines planned data development. Next, it features two of the data products under development. The first is a composite Supply Chain Services Price Index to measure the distribution and delivery costs across the entire transportation and warehousing sector. The second is a pilot Survey of Marine Vessel Operators to gather critical financial and operational statistics on Canada’s commercial marine industry.

What Matters for Canadian Aviation Policy? A mixed-methods multi-stakeholder approach to identifying objectives for policy alternatives - Emma Neale

There have been several calls for reform to the Canadian air transport industry but with many entities in the aviation ecosystem, preferences and priorities for policy objectives differ greatly. To determine various stakeholder objectives of managing an air transportation ecosystem, a Value-Focused Thinking approach is used by interviewing experts and analyzing policy documents through a thematic and text-analysis. Though stakeholder preferences vary, findings suggest overarching objectives (i.e. competition, viability and governance) overlap. The elicitation of objectives through a robust research process provides a comprehensive framework that can assist air transport policy decision making, by working backwards from shared objectives that can yield agreed upon alternatives.

Port Infrastructure Needs Assessment of Canadian Port Authorities - Nickolas Roberts

This study surveyed the port infrastructure needs of the 17 Canada Port Authorities (CPAs) until 2040. The author’s analysis quantifies the magnitude of investment needed for capital projects, highlights funding gaps, and identifies the key challenges faced in regard to funding port infrastructure in Canada. Furthermore, the author has reviewed how port infrastructure investment is approached in other jurisdictions (the US, Australia and the Netherlands). Overall, this study expresses a clear need for port infrastructure investment and addresses the challenges faced by CPAs to ensure Canada improves its supply chain competitiveness. Canadian ports face strong competition and risk losing trade to US ports which also serve major trade gateways to the North American market. Canada competes for investment capital globally and must demonstrate an appealing case for attracting capital.

Developments by North American freight railways to reduce and eventually eliminate ghg emissions from locomotives - Malcolm Cairns

This paper will survey current developments by the North American railways to reduce and eventually eliminate GHG emissions from their freight locomotives after presenting the significance of GHG emissions from locomotives as a proportion of total railway emissions. This involves three broad strategies - further the use of: fuel efficiency, bio fuels and advanced technology for new locomotives - and how they might be adopted in light-duty, medium-duty and heavy-duty rail service.

6. Policy and planning

Activity-based models and their democratization - the new age of transportation planning – Mausam Duggal, Eric J. Miller, Nemanja Radakovic, Adam Lanigan, Stephen McCarthy

Activity-Based Models (ABMs) have traditionally been the domain of mega regions because they are resource-intensive to develop, require significant investments in data collection, software development, and operational costs. The challenge lies particularly in obtaining statistically robust household travel surveys, which must capture diverse behaviors, preferences, and communication arrangements across populations. Efforts to enhance the transferability of ABMs between regions have proven instrumental in addressing these challenges. By adapting foundational behavioral parameters from existing models, ABMs can be efficiently transferred, calibrated, and fine-tuned to reflect local conditions, significantly reducing development costs.

How do we spend time in the virtual and physical spaces: Does it vary by worker profile? - Shoumic Shahid Chowdhury, Mahmudur Fatmi, Muntahith Orvin, T.

This study investigates how individual attributes influence activity participation and duration, relationships between activity engagement and duration, and interdependencies among activities. Using data from Metro Vancouver, the study examines these dynamics across four groups: commuters, telecommuters, non-workers, and hybrid workers, based on 24-hour activity logs from the British Columbia Activity Time Use Survey. Findings from the Bayesian Belief Network (BBN) revealed significant direct and causal relationships between in-home and out-of-home activity participation and their durations. Furthermore, in-home activities influence each other, as do out-of-home activities.

Efficient Modeling of Passenger Flows: A Simplified Passenger Demand model - Dimantha De Silva , Ashok Kinjarapu, Sean Owens, Anson Lau

This study presents a simplified approach towards modeling passenger flows across a regional transportation network, focused on ferry transport. The model considers travel times, intermodal transfer times, boarding and alighting times, and the corresponding fares associated with the movement of passengers. These costs and times are categorized by passenger type and are represented as a link- or node-based generalized cost. The generalized cost function build-up also accounts for bottlenecks, inefficiencies, congestion, boarding issues, and delays, etc. The model has been developed in collaboration with BC Ferries to understand demand on the ferry network and to test shifts in demand with potential new ferry routes. Future applications include analyzing demographic shifts, modeling future capacity needs, and assessing the impact of mode shift policies, providing a robust framework for strategic transportation planning.

Understanding job mobility and why people change jobs - Md Nobinur Rahman, Mahmudur Rahman Fatmi, Muntahith Mehadil Orvin

Understanding the interplay between job and residential mobility is essential for informed land use and transportation planning. This study presents an integrated framework to examine the interconnected decisions of job and residential relocations alongside associated location choices. The findings emphasize strong interactions between job and residential mobility, providing valuable insights for policy

development. The developed models will be integrated into the Simulator for Transportation, Energy, and Land Use for Regional Systems (STELARS), currently under development at The University of B.C.

Advancing pedestrian level-of-service estimation with intelligent vision detection systems - Tricia Martinez, Ahmad Mohammadi, Peter Y. Park, Gunho Sohn

This study introduces an innovative approach to real-time pedestrian level-of-service (PLOS) estimation that captures density and accounts for restricted movement. The system development consists of three phases: Detection, PLOS Modeling, and Application. Mathematical indicators are computed in real-time, offering enhanced PLOS measurement. Finally, the model is tested through a case study with countermeasures proposed to improve PLOS. The pilot study conducted on York Lane at York University, evaluates one base scenario and 5 alternatives. Under similar conditions, removing static obstacles improved restricted movement by 10%, while eliminating dynamic obstacles yielded a 15% improvement in comparison to the base scenario. The real-time virtual PLOS estimation system offers urban planners an effective tool to minimize restricted movement and enhance pedestrian infrastructure.

Modelling the variability in Halifax residents' time-use behaviour for work, shopping and recreational activities - Md. Rifat Hossain Bhuiyan, Muhammad Ahsanul Habib

The primary objective of this research is to quantify the day-to-day variation of ten predefined activity types, focusing on both intra-day and inter-day variability. Variability will be quantified using the Euclidean sum of square differences. Additionally, a regression model will be employed to assess the influence of exogenous factors on activity variability. The findings from this study will offer valuable insights into which activity types exhibit higher variability and may be more challenging to model in activity-based travel demand models. This research will also enhance understanding of the factors contributing to heterogeneity in daily activity patterns.

7. Urban emissions begone!

Environmental assessment of housing and mobility at the local level - a review of studies - Mathilde Zanolini, Catherine Morency

The notion of “residential footprint” consists in aggregating the environmental impacts of the dwelling and the environmental impacts of the mobility induced by the home location, over their entire life cycle. This presentation proposes a review of 61 scientific literature documents. First, the methods to conduct an assessment of the environmental sustainability of residences, as well as data requirements, are outlined. Second, the results of the studies are analyzed and compared. The studies highlight the importance of simultaneously considering housing and daily mobility, both of which account for a significant share of the residential footprint. They also make it possible to identify the explanatory factors for the different levels of impact, which is essential for implementing equitable measures to reduce households’ environmental footprint.

Air emission analysis of the low emission zone policy towards heavy-duty diesel trucks restriction in downtown - Negar Razzaghi, Vahid Hosseini

This study assesses transportation-related emissions across Edmonton’s land use zones using a bottom-up urban vehicular emission inventory, with the goal of exploring potential Low Emission Zones (LEZs). Besides establishing the zone-based mobile source emissions, the study will evaluate the impact of LEZ common policies, for both groups of heavy-duty vehicles (HDVs) and light-duty vehicles (LDVs), by calculating the spatial and temporal distributions of GHG and Criteria Air Contaminants (CACs) emissions which can help identifying the action zones. This model is coupled with a spatial visualization tool, to support understanding the impact of traffic restrictions on neighborhoods.

Unlocking the potential of cargo bikes for urban deliveries in medium-sized cities - Suzanne Pirie, Martin Trépanier, Walter Rei

This study proposes a novel method to evaluate the feasibility of cargo bikes for freight deliveries in medium-sized cities. The approach leverages open data to analyze key factors such as land use, elevation, weather conditions, population density, and bike lane networks. To address diverse urban contexts, the analysis incorporates scenario-based modeling using dominant land-use patterns and land-use entropy. The findings support the strategic adoption of cargo bikes as a realistic and efficient strategy for sustainable urban freight solutions in medium-sized cities.

Emission reduction potential of urban bike-sharing systems - Ali Azimi, Yannick Ntibansiga, Negar Razzaghi, Vahid Hosseini

As urban areas strive to reduce greenhouse gas emissions, bike-sharing systems emerge as a promising solution to decrease private vehicle reliance. This study presents a robust methodology to quantify the emission reduction potential of bike-sharing systems in Vancouver, focusing on three core steps: trip purpose classification, mode substitution simulation, and emission factor estimation. The findings highlight the effectiveness of bike-sharing systems in reducing urban transportation emissions and emphasize their role as a cost-effective decarbonization strategy.

Spatial analysis of onroad transport emission distribution across communities in Surrey, BC - Maha Shehadeh, Vahid Hosseini

This study aims to map on-road transportation emissions in various communities within the City of Surrey, B.C, using GIS and geospatial analysis techniques. Transportation is a significant contributor to air pollution and greenhouse gas emissions, making it crucial to analyze its spatial distribution to inform sustainable urban planning. By integrating geospatial datasets, the author associates transportation emissions with specific community boundaries, providing a detailed spatial representation of pollutant emissions and identify emission hotspots. Results highlight spatial disparities in emissions, with high-density traffic areas showing elevated levels of pollutants like nitrogen oxides (NO_x) and particulate matter (PM). These findings offer insights into community exposure to transportation-related air pollution, which is crucial for targeted mitigation strategies and mobilizing equity.

8. Statistics and data issues

Innovative tool for spatial data fusion and analysis in transportation - Alexandre Brunet, Catherine Morency

The authors' research aims to develop an innovative tool capable of facilitating the fusion and integration of various geospatial datasets in transportation. This tool will enable the efficient handling of multi-source and multi-scale data, including points (households), lines (transport networks), and polygons (land evaluation zones), while automating repetitive and time-intensive tasks. The proposed approach also allows for the calculation and visualization of buffers at different scales, the extraction of relevant metrics such as density, averages, or standard deviations, and the intuitive presentation of results. This automation aims to optimize analysis processes, reduce delays, and enhance the accuracy of results. By simplifying manipulations, this research will contribute to a better understanding of spatial dynamics while providing a powerful tool for researchers and decision-makers in transportation.

Investigating the Accuracy, Transferability and Efficiency of Different Mode Imputation Methods with GPS Data - Mohammad Haghighi, Ladan Berahman, Eric J. Miller

This study addresses research gaps using a large-scale GPS trip dataset with mode labels, obtained via a smartphone application. The study evaluates accuracy and generalizability of rule-based, statistical, and machine learning methods while accounting for data intensiveness, computational complexity, and implementation feasibility as factors of efficiency. Also, trips are categorized by regions to analyze the performance of models trained in one region and tested in another, offering novel insights into the robustness and transferability of these methods. This comprehensive analysis identifies the trade-offs

needed to achieve accurate and efficient mode imputation, enhancing the practical applicability of these techniques in real-time mode detection.

Evaluating the Spatial Transferability of an Agent-based Integrated Urban Model - Ifratul Hoque, Mahmudur Fatmi, Muntahith Orvin, Mohamad Khalil

This study evaluates the transferability of Simulator for Transportation, Energy, and Land Use for Regional Systems (STELARS), developed for the Okanagan, to Vancouver by synthesizing Vancouver's population and generating components using BC Assessment and BC ATUS 2023 datasets. Assuming similar behavior, initial transferability is assessed with metrics like Root Mean Square Error. Parameter optimization techniques, such as adjusting alternative-specific constants, and Bayesian updating are then applied to improve prediction accuracy. This study aims to identify the most effective method to enhance spatial transferability, providing insights for making IUMs robust and adaptable across regions.

Enhancing Transit Smart Card Destination Estimation Algorithm Using Count Data - Melvin Huang, Martin Trépanier, Amaury Philippe

Smart card data in public transportation provides valuable information on passenger movements. Over time, significant improvements have been made to destination estimation tools, particularly by incorporating criteria that use historical passenger transaction data, along with those based on stop sequences. These advancements have increased the number of destinations estimated. Missing information for certain trips, can introduce biases into the results. To overcome these limitations, an enhanced destination estimation model is proposed. It combines traditional criteria with an optimized version of the "weighted random sampling" (WRS) criterion, leveraging both the transaction historical data and some external counting data. This approach aims to improve the accuracy and reliability of estimations, especially for complex trips. A detailed description of the WRS method is presented.

What happens when smartphone gps data fails? Reconstructing lost travel sequences in 7-day diaries using subsequence pattern mining algorithm - Imrul Shafie, Mahmudur Fatmi

The study uses a dataset from the British Columbia Activity Time-Use Survey (BC ATUS) which combines a 1-day web-based activity diary with a subset of 7-day smartphone app trip diary data. While the app data provides valuable insights, it is often incomplete, with missing trips and activity durations. To address this problem, this study employs a sequence of econometric and machine learning models to impute missing values by incorporating socio-demographic attributes, temporal patterns, and activity characteristics. This approach improves data completeness while addressing cost and quality concerns in 7-day smartphone data collection. By overcoming these challenges, our method supports more accurate travel behavior modeling and informed transportation policy decisions.

Event-Aware Missing Data Imputation Network (EMDIN): Leveraging Social Event Features for Enhanced Traffic Data Imputation - Ali Ardestani, Hao Yang, Saiedeh Razavi

This study introduces the Event-Aware Missing Data Imputation Network (EMDIN), a novel model designed to predict the impact of different types and sizes of social events by leveraging event-specific features, such as type, location, attendance, timings, and parking availability. EMDIN integrates advanced spatiotemporal learning techniques, including graph convolutional networks and long short-term memory (LSTM) layers, enhanced by a two-stage imputation decoder. The model features a dynamic forgetting mechanism in the LSTM layers that prioritizes recent traffic patterns as events approach, while the two-stage decoder further refines missing value predictions using attention-weighted spatiotemporal features. This study underscores the importance of incorporating social events to improve imputation accuracy and provides a robust framework for addressing dynamic urban traffic challenges caused by events.

9. There's something in the air

Decarbonizing Canadian airports: an optimization model for a strategic supply of hydrogen - A. Esmélia Catcha-Picard, Ahmed Abdulla

The authors present a model optimizing the design and operation of a hydrogen-based microgrid at airports. This microgrid will provide energy for aircraft, ground support equipment, vehicle refueling (including hydrogen for heavy-duty vehicles and electricity for light-duty vehicles), and heating systems for airport buildings. In this paper, the authors apply this model to the Toronto Pearson International Airport, exploring various hydrogen supply scenarios. In doing so, they assess the impact of different policy decisions and economic factors on the system's overall cost and carbon emissions.

Sustainable aviation fuel in Canada: opportunities and obstacles – Maryna Klymchuk, Robert Parsons, Paul D. Larson, Alex Paseka, Arshpreet Gill

This paper explores the urgency and challenges associated with Sustainable Aircraft Fuel (SAF), as well as potential solutions to meet key stakeholder needs. Moving forward on SAF in Canada remains tricky. SAF will certainly cost somewhat more than conventional, but air carriers are constrained by bottom lines, and cannot afford excessive costs. Oilseed-based SAF is the most technically advanced and economically viable option for them, yet international standards, unfortunately, end up deferring away from and restricting such product. Potential domestic SAF producers face financing concerns and threats from excessive U.S. subsidies. They need certainty and supports. Canada's oilseed producers are caught in the midst of trade disputes, facing severe impacts. Canada risks losing this new industry together with associated added value and jobs.

Incorporating Marginal Emission Factor into Eco-Conscious Air Itinerary Selection - Kaleab Woldeyohannes Yirgu, Amy Kim

Environmental protection initiatives in the air travel sector encourage passengers to consider their personal emissions footprint in selecting travel itineraries. These initiatives mainly rely on average emission factors (AEFs) whereby air passengers are anticipated to choose itineraries with lower AEFs. However, these AEFs cannot represent the marginal impact of changing demand on emissions. The authors findings indicate that AEFs significantly underestimate the emissions savings of choosing itineraries that originate from large hubs over those that originate from smaller airports. Therefore, it is critical to incorporate marginal emission factors in environmental initiatives in the air travel sector.

Incorporating Climate Change Impacts Into Aviation Demand Forecasting - Christopher Greer and Ian Kincaid

Climate change is a global challenge that will impact all aspects of society and the economy, including the transportation sector. In recent years, governments around the world have enacted legislation and regulations to address and mitigate the impacts of climate change, with many more likely to do so in the coming decade. It is expected to impact the demand for air travel in the future. This paper will examine some of the key risks and uncertainties facing aviation demand forecasting arising from climate change adaptation policies, regulations, and their impacts on travel intentions and demand. The research will consider methods to incorporate climate change factors into existing forecasting techniques and highlight how climate change effects could impact demand forecasts.

Air passenger willingness to pay for carbon offsets: an incentivized experiment - William G. Morrison

This paper reports on a novel experiment to study air passenger willingness to pay for carbon offsets. In the experiment participants make an incentivized decision to purchase one of three trips involving air travel with real cash consequences, based on real flights and prices. A control group, with opt-in carbon offsets, is compared to three treatment groups: (1) mandatory carbon offsets, (2) opt-out carbon offsets and (3) opt-out carbon offsets under saliency conditions (pre-purchase information provision). The results suggest minimal competitive effects of a carbon offset while providing support for a significant default

bias effect when comparing opt-in versus opt-out schemes. Information provision increases willingness to pay for offsets, but the effect is small and insignificant.

10. Lasting shock (my, how we've changed)

Pre/Post-Pandemic Travel Behaviour in the Greater Golden Horseshoe - Ya Gao, Ying Liu, Eric J. Miller

Evidence exists that, prior to the COVID-19 pandemic, travel behaviour was relatively stable, once one accounts for “conditioning factors” such as urban growth, labour force changes, etc. Expectations are that the pandemic disrupted this stable behaviour, creating a “new normal” going forward. This paper presents an investigation of this hypothesis by comparing travel behaviour as captured in two large-sample household travel surveys conducted in the Greater Golden Horseshoe: the 2016 and 2022/23 Transportation Tomorrow Surveys (TTS). The hypotheses tested include whether changes have occurred in: work-from-home rates, transit and active (walk/bike) mode shares, off-peak travel patterns and household distributions in the region.

The Post-Pandemic Hybrid Work Environment and Its Impacts on Weekly Trip-Making Behavior - Mohammad Haghighi, Ladan Berahman, Eric J. Miller

This study uses a week-long activity-travel survey to explore how the hybrid work model affects trip-making behavior. Preliminary findings reveal that the post-pandemic hybrid work environment influences activity-travel patterns differently than the conventional pre-pandemic work from home (WFH). Notably, regular hybrid workers, splitting work evenly between home and office, show higher trip rates than occasional telecommuters, who primarily WFH. However, in general, higher rates of WFH throughout the week are associated with fewer trips and reduced travel distances as expected.

The Resilience and Recovery of Car-Sharing after the COVID-19 Pandemic - Eric Petersen, Matthias Sweet, Darren Scott

This study draws on three surveys of the Greater Toronto and Hamilton Area (GTHA) carried out in 2018, 2021 and 2023, representing near peak pre-pandemic, pandemic and post-pandemic conditions for car-sharing. Car-sharing fared quite differently in different parts of the region, with almost no drop in car share membership in Hamilton between 2018 and 2021, a modest decline in Toronto and a significant decrease in Peel and York. In addition to car-sharing, the surveys asked about teleworking and auto ownership, and the authors estimate a joint model of car-sharing, telework and auto ownership, both a pooled model and one for each survey year, in order to tease out the different role car-sharing membership (and telework) played in reducing car ownership in each period.

The lasting impact of the COVID-19 pandemic on urban transportation systems: A case study of on-street parking in Toronto - Trevor Jones, Ladan Berahman, Eric Miller

This paper examines COVID-19's long-term impacts on urban transportation systems through analyzing the spatial and temporal trends for parking in 938 paid on-street locations in Toronto. Two sets of parking transaction data were used for the analysis. The results show that parking demand decreased by approximately 20 percent while parking duration increased by approximately 10 percent in the post-pandemic period. Furthermore, the daily patterns in parking demand and duration for weekdays and Saturdays are similar between the 2019 and 2022 scenarios. Finally, the spatial distribution of on-street parking duration within Toronto is similar between the pre- and post-pandemic scenarios. These findings indicate that the COVID-19 pandemic has not significantly impacted on-street parking behaviour.

Role of teleworking intentions in post-COVID-19 travel behaviour - Hamed Malekzadeh, Catherine Morency

This research examines how perceptions of COVID-19 and health concerns shape travel behaviors and explores the attitudinal variables that explain the use of different transportation modes. Additionally, it investigates the role of these attitudinal variables as antecedents of teleworking and online shopping

intentions. This study contributes to the literature in three ways. First, it develops econometric micro-behavioral models to examine anticipated post-COVID travel behaviors. Second, it identifies behavioral differences across individuals based on their characteristics. Third, it incorporates attitudinal variables related to virtual activities into the modeling framework to assess their impact on mobility behaviors.

11. Urban transport planning

Empowering Transportation and Mobility Decisions: A Showcase of Tools Developed by the Mobility Chair - Catherine Morency, Pierre-Léo Bourbonnais, Geneviève Bastien, Yannick Brosseau, Samuel Duhaime Morissette, Gabriel Bruno, Martin Trépanier

This presentation will offer an overview of the various open tools developed (and under development) to support informed decision-making in transportation and mobility. These tools, powered by the Transition platform (www.transition.city), encapsulate years of methodological advancements and are designed to democratize access to cutting-edge methods and functionalities. By making these tools widely accessible, the Chair contributes to fostering data-driven and evidence-based decisions that address current and future challenges in transportation planning. This presentation highlights the Chair's commitment to bridging the gap between research and practice, empowering policymakers, planners, and researchers with state-of-the-art resources to improve transportation systems and mobility for communities worldwide.

How is accessibility considered in land use and transport policy documents across governance sectors - Frédéric Cournoyer, Edward Waygood, Geneviève Boisjoly

This study aims to evaluate the extent to which accessibility is integrated in land use and transport plans, with the city of Montreal as a case study. First, the authors examine the transport plans from the regional transport planning authority and from the main public transport agency. Next, transport and land use plans from three levels of governance (regional, municipal, and local (e.g., boroughs)) are analyzed. This approach enables a comprehensive analysis across governance levels and across sectors (e.g., land use, mobility and public transport planning). While focused on Montreal, this study contributes to the growing body of literature on the barriers and opportunities for a greater integration of accessibility in land use and transport policies.

Understanding Individual's Ownership of Mobility Tools Considering the Influence of Shared Mobility Services: A Multivariate Probit Modeling Approach - Manoj Sangameshwar, Uthpalee Hewage, Mahmudur Fatmi

This study investigates factors influencing the ownership of various mobility tools, including driver licenses, etc. Understanding mobility tool ownership is critical for enhancing urban transportation accessibility and efficiency. A multivariate probit (MVP) model is employed to analyze socio-demographic, trip characteristics, built-environment, and attitudinal factors using data from a 2022 transportation survey in Kelowna, BC. The MVP model accounts for correlated error components across choice dimensions, enabling robust joint estimation. Key findings indicate that single-person households and younger generations (millennials and Gen Z) prefer bicycles and shared mobility services, favoring low-emission, affordable, and flexible options. Larger households and high-income individuals prioritize car ownership for convenience.

Development of a vehicle ownership simulator within an agent-based integrated urban model - Md Shahadat Hossain, Mahmudur Fatmi, Mohamad Ali Khalil

This study aims to forecast vehicle ownership in the Greater Okanagan region, Canada, from 2021 to 2050 under alternative transportation policy scenarios. It utilizes the Vehicle Ownership Simulation module of 'STELARS' (Simulator for Transportation, Energy, and Land use for Regional Systems), an agent-based integrated urban model. The findings of this study are expected to help policymakers make informed decisions to achieve their future target regarding sustainable and clean fuel vehicles.

Computational efficiency in integrated urban models: a comparative analysis of loop-based and vectorized approaches - Mohamad Ali Khalil, Mahmudur Rahman Fatmi

This paper explores ‘vectorization’ as an alternative to iterative operations, aiming to improve efficiency through ‘batch processing’. The authors applied vectorization to the demographic dynamics (DYx) module of ‘STELARS’, an Integrated Urban Model (IUM) under development at The University of British Columbia. The results indicate that the vectorized computations reduced processing times by 3 to 1,000 times, where high gains are observed in complex models like marriage and mortality simulations. For a study area of ~200,000 individuals in 85,000 households, the vectorized DYx module completed a 10-year simulation in 90 seconds on a standard workstation, compared to 50 minutes using for-loop operation, i.e., a 33-fold improvement. This study highlights the potential of vectorization to transform IUM computational performance, particularly for large-scale simulations.

12. Datasets, tools and methods for enabling fairness

Enhancing transportation data: The development of a national origin and destination survey and its potential for policy and infrastructure planning - Yanick Clément-Godbout, Eiad El-Fateh

This paper examines Canada’s new national Origin-Destination Survey, an initiative led by Housing, Infrastructure, and Communities Canada in collaboration with Statistics Canada. The survey is designed to address a long-standing gap in Canada’s understanding of transportation and mobility patterns, providing critical data to inform policy and infrastructure planning. The paper outlines the methodological framework and design considerations and discusses the inclusion of demographic data to understand the mobility challenges faced by equity-deserving populations, ensuring the survey addresses issues of accessibility and inclusivity.

Studying Transit Productivity through a Didactic Cartography Tool - Carmela Cucuzzella, Firdous Nizar, Omar Ortiz Meraz, Pierre Gauthier

The authors present the concept of didactic cartography—an approach to teach complex systems through clear and engaging spatial data—in relation to public transit and their built environments. They propose a trans disciplinary and interactive platform - CAMMM Atlas web application - that aggregates data and disseminates information in an accessible manner. The Atlas points to areas of opportunity to increase the productivity of the transit system and improve spatial equity in the urban space. Through this tool, understanding the gaps in public transit systems will enable local transit authorities, decision makers, and other stakeholders to collaborate on spatial equity issues like multimodality, connectivity, safety, accessibility, proximity to services and amenities, etc. The multidisciplinary approach of the Atlas allows policy makers and transportation professionals to obtain concrete recommendations to improve the productivity of public transit.

Human-centered mobility flow classification: examining the difference between travel patterns of men and women - Maria Laura Guerrero Balarezo, Daniel Romm, Jose Arturo Jasso Chavez, Martin Trépanier, Grant McKenzie, Kevin Manaugh, Raja Sengupta, Geneviève Boisjoly

This paper presents a method for a human-centered classification of urban transport flows, focused on gender. The objective is to unveil if men and women produce distinct spatial patterns to inform gender-equity aware transport planning. Using an origin-destination survey for the metropolitan area of Montreal, it applies a Hierarchical Link Clustering algorithm to produce communities of flows with similar characteristics based on geography, distance and number of trips. Then a K-means classification is applied to the resulting communities to derive movement types. Results show a distinct geographical pattern between genders. These results can be used to introduce more targeted interventions to transport systems, and further, it can be applied to other dimensions of equity beyond gender.

Comparing urban public transit accessibility across Canadian regions and times -Anastasia Soukhov, Christopher D. Higgins, Antonio Páez

In this study, the authors apply balancing factors (similar to those used in trip gravity modelling) to calculate public transit spatial accessibility in the 12 most populous CMAs in Canada and benchmark how accessibility has changed between 2019 and 2023. This work is done using an open and reproducible database. Additionally, the methods applied are more interpretable than conventional accessibility measures, making them better suited for temporal and spatial interpretation. Our hope is that this approach will facilitate the mainstreaming of open and reproducible practices and accessibility analysis in transportation planning practice in Canada.

Not My Fault - A look at Canadian Airline Policy and how it impacts the affordability of airfares - Romaine Morrison

It's well known that the cost of flying through Canadian airports remains relatively high. This paper examines the influence of government policies on airfare affordability, delve into how airlines navigate these regulations and explore potential collaborative solutions for achieving more affordable air travel.

The Case of 20-Minute Carsharing Trips: What Drives the Choice? - Émilie Savard, Martin Trépanier, Catherine Morency

In this study, the authors document the context in which users chose carsharing for these short free-floating trips. To assess alternatives, they calculate public transit travel times, evaluate bike-share availability at trip origins and destinations, estimate the cost of an equivalent taxi ride, and calculate walking times. They further incorporate historical weather data to refine their evaluation of bike-sharing and walking feasibility and their understanding of the spatial-temporal context. Finally, they conduct spatial analyses to identify problematic blind spots in public transit and areas with limited access to bike-sharing infrastructure. Based on findings from previous research, they anticipate that these trips predominantly occur in areas with limited access to public transit and bike-sharing infrastructure. This work aims to provide insights into improving transportation equity and enhancing sustainable mobility options in urban areas.

13. EV uptake: Plans and challenges OR: where's my charger?

Electric power grid challenges with high EV penetration - Andrew Moffat, Ahmed Abdulla

The authors develop an analytical framework that integrates publicly available data and makes few assumptions to generate hourly load profiles of electric vehicle charging loads across the power system. The model is developed for the Canadian province of Alberta but employs economic and transportation data that are compiled routinely by other jurisdictions, making it broadly applicable to other locations. Results show that electric vehicles (EVs) will represent 16% of the current Alberta electricity consumption on an annual basis, with peaks that reach as high as 2.5 times the current demand peaks. With the growth in EVs accelerating, the generalizable framework proposed here can be used by analysts in other jurisdictions to investigate the impact of light duty electrification on the electricity system and to prioritize investments.

Planning the Future of Charging Infrastructure and Electricity Demand for Long-Haul Electric Vehicles in Ontario, Canada Under Various Scenarios - Terence Dimatulac, Hanna Maoh, Rupp Carriveau

This study simulates various scenarios to optimize on-route charging locations in Ontario, Canada for 2040. The scenarios account for advancements in battery technology, long-term battery degradation, ancillary energy use, and seasonal variations. Results suggest that summer and winter seasons reduce ranges by approximately 3% and 8%, respectively, necessitating more charging during these seasons. Other factors like varying utilization rates and maximum space capacity constraints are found to have noticeable effects on the number of required charging locations in the province. Lastly, estimated energy demands suggest the need for substantial infrastructure upgrades, particularly during winter season, with a projected daily demand reaching about 67 GW.

Electric vehicle charging behaviour: an analysis of gap times between charging events in the City of Ottawa - Timothy Hui, Adam Weiss

The research develops a multiple variable regression model using publicly available data from the City of Ottawa to model the gap times between charging events. The regression model aims to identify temporal/seasonality variations in EV charging behavior and the significance of the presence of rapid transit, and arterial roads. It will also utilize data from the 2020 census to study the impact of site-specific dissemination area characteristics such as median income and household sizes, and average travel times. The findings provide foundational knowledge to develop more resilient and efficient integration of EV charging infrastructure into urban grids.

Electric Vehicles and Charging Infrastructure: Assessing Prevalence and Provision in Canada - Yu Sui, Michelle Tait, Lawrence McKeown

This research examines the factors driving ZEV adoption across Canada, including public charging infrastructure, incentive programs, and other factors such as income and location. Drawing on data from Statistics Canada and other agencies, the study examines patterns of ZEV adoption, charging infrastructure provision, and disparities in coverage. Public charging infrastructure is assessed by forecasting ZEV adoption rates under three scenarios. Next, Canada is divided into urban, small town and rural, and mixed areas to quantify any geographic disparities that may be emerging. The study concludes by discussing next steps including related work involving the heavy-duty vehicle fleet.

Overhead wires might be back: Optimizing in-motion charging for electric bus transit - Ali Shehabeldeen, Moataz Mohamed

This study introduces a comprehensive optimization framework that combines conductive Overhead Catenary Charging (OCC) technology with overnight depot charging to minimize overall Battery Electric Bus (BEB) system costs, both capital and operational. Capital costs are effectively reduced by strategically determining the optimal placement of OCC segments, battery capacity, and depot charging configurations. Simultaneously, operational costs are optimized through refined charging schedules that account for electricity time-of-use pricing, greenhouse gas emissions intensity, and BEB battery degradation costs. Applying this optimization framework to a real-world transit network reveals significant findings, including a 56% reduction in peak electricity demand, a 13% drop in GHG emissions, and a 27% decrease in overall charging costs.

Solar-Powered charging stations for E-Bikes: A case study in the City of Vancouver, Canada – N. Yannick Ntibansiga and Vahid Hosseini

Electric bicycles (e-bikes) are emerging as a sustainable urban transport option, but their adoption depends on efficient and eco-friendly charging infrastructure to ensure consistent availability and greater range. This study examines the feasibility of solar-powered charging stations for e-bikes in Vancouver, Canada. Recommendations include hybrid systems and policy incentives to improve sustainability and economic feasibility. These findings provide valuable insights for city planners and policymakers seeking to promote green mobility and reduce urban carbon footprints while addressing the practical challenges of deploying solar-powered e-bike infrastructure.

14. Keep the goods flowing

The significant impacts of work stoppages in Canada's transportation sector - Jonathan Thibault, Olivia Russo

The number of person-days not worked in the transportation sector resulting from strikes and lockouts has averaged over 70,000 days per year in the past decade. Over the past several decades, Canada has experienced more than 5 times the OECD average for work days lost from stoppages. This paper models the macroeconomic impacts of work stoppages in Canada's transportation sector, showing their disproportionate impacts compared to work stoppages in other sectors. Whether rail, marine, truck, or air,

transportation industries provide essential supply chain services that keep the economy moving. It is critical that policy makers recognize the impacts of labour disruptions to develop legislative solutions.

Labour disruptions: will there be a long-term solution? - Andrew Tam

The author tracks the major labour disruptions in the past two years, reviewing the issues, developments and key impacts on the nation's goods movement, trade, supply chain and economy. It will include references to the existing Canada Labour Code (CLC) and the Canada Industrial Relations Board which is an independent administrative tribunal responsible for resolving workplace disputes and certain appeals that arise under the CLC, for federally regulated sectors including transportation. In looking for potential solutions, the paper will consider the broader picture and some upcoming key developments.

From Prairie landmarks to mega hubs: the good, the bad, and the ugly of grain elevator consolidation in Canada – Supul Muhandiram, Narendra Malalgoda, Srimantoora S. Appadoo

This study investigates the economic and environmental impacts of grain elevator closures from a supply chain sustainability perspective. Economically, farmers are burdened by rising transportation costs, while increased travel distances contribute to higher greenhouse gas emissions and accelerated infrastructure degradation. A conceptual framework is proposed to examine the interconnections between economic and environmental sustainability within agricultural supply chains, drawing on principles of Sustainable Supply Chain Management (SSCM) and the Triple Bottom Line (TBL). The study emphasizes the need for policy interventions, community-driven solutions, and sustainable practices to balance economic viability with environmental stewardship, fostering resilience in Manitoba's agricultural supply chains.

Assessing the Sustainability of Shortline Rail for Local Grain Transportation in Canada - Dandeniya Tharakabhanu de Alwis, Narendra Malalgoda, Mani Venkatesh

The decline of grain elevators in Canada has increased reliance on local truck-based grain transportation, raising concerns over economic costs, environmental impacts, and rural sustainability. This study explores the potential of shortline rail as a sustainable alternative for grain transportation from farms to elevators, adopting the triple-bottom-line sustainability framework-economic, environmental, and social sustainability. The research aims to develop a comprehensive sustainability assessment framework tailored to shortline rail networks, integrating quantitative sustainability indicators and qualitative stakeholder feedback.

Cross-border freight transportation - trucking between Canada and the US - Andrew Tam

In this paper, the author presents a descriptive account of Canada-US cross-border freight transportation with a background and details or examples (e.g. regulatory and operating requirements, border crossings and infrastructure, customs and trade facilitation) to land freight transportation and trucking services. The intent of this paper is to provide an overall picture of shipping goods between Canada to the U.S. via cross-border freight transportation especially trucking, which is required for considering the current situation as well as issues and challenges facing the industry involved in cross-border trade.

Cross-border transportation of pharmaceuticals between the United States and Ontario - Hanna Maoh, Terence Dimatulac, William Anderson

The work in this paper will fill the existing gap (cross-border movements of pharmaceuticals between the U.S. and Canada) by characterizing these movements to understand where in the U.S. pharmaceuticals originate, and which routes and land borders are normally used to bring them into Ontario. The analysis will be based on a variety of data sources to provide a clear picture of the key U.S. markets that Ontario trades in. Scenario analysis will examine the impacts of land border closures as well as the inability to secure pharmaceutical supplies from certain U.S. markets due to infectious disease outbreaks.

15. Park it

Analyzing the relationship between on-street parking and land-use - Trevor Jones, Ladan Berahman, Eric Miller

This paper examines how land-use impacts two critical components of on-street parking: parking location occupancy and parking duration. It uses parking transaction data from paid on-street parking locations throughout Toronto to examine the influence of the following five land-uses: low-density residential, high-density residential, hospitals, offices, and universities. The results show that for on-street parking occupancies, locations adjacent to universities generally have the highest occupancies while locations adjacent to hospitals have the lowest occupancies. Contrary to the differences observed in parking location occupancy, parking duration is similar for all the land-uses during weekdays and Saturdays. Further examination of each land-use's impact is discussed. The results show the importance of location and time dependent parking pricing.

A tool for inference and extraction of off-street parking capacity - Paul Charbonneau, Catherine Morency

This paper aims to define a methodology to infer off-street parking at the scale of a municipality in the province of Quebec. Firstly, a database structure is proposed which allows the storage of estimates coming from multiple inference methods for a given lot, at multiple points in time. A first estimation method using the parking requirements laid out in municipal zoning codes is proposed. A database structure is put forward to represent the variety of parking requirement formulations (based on square footage, seating capacity, etc.) present in zoning codes. Then an inference method using Quebec's municipal tax assessment database is tested. The results are discussed in the context of Quebec City. An Application Programming Interface is proposed to access the results.

Using data fusion to model parking location choices of trucks in the City of Toronto - Farah Ghizzawi, Matthew J. Roorda

In this study, we synthesize the attributes of truck activity and parking, including attributes of the tour, parking location, industry sector, and commodity type for the purpose of developing a parking location choice model. This is done through the fusion of four data sources to construct a record of observed parking behaviours of trucks, mainly location choices and corresponding attributes. GPS data are used to construct truck trip diaries across the City of Toronto, including stop location, duration, frequency, and trip time of day and length. Business establishment data are used to infer the industry sectors associated with each tour. Data from the Ontario Commercial Vehicle Survey are used to predict the commodity types associated with each tour. Lastly, parking characteristics are inferred from spatial data representing the features of parking infrastructure.

Analysis of reservation changes for a carsharing service in Greater Montreal - Linda Chau, Amaury Philippe, Martin Trépanier

Enhancing shared mobility can enable carsharing companies to optimise their services, improve user experiences, and increase adoption rates. The adoption of carsharing services can help alleviate traffic congestion, reduce greenhouse gas emissions, and address challenges. This research primarily focuses on station-based system and aims to understand how people use carsharing reservation systems. These insights are essential for improving carsharing services. One notable finding is the phenomenon of "fake cancellations," where 41% of cancelled reservations lead to another honoured reservation on the same day. To identify the key variables that determine whether a reservation will be cancelled or honoured, a decision tree has been constructed. Based on these findings, recommendations are developed to minimise reservation modifications.

Enhancing On-Street Parking Occupancy Prediction with Spatio Temporal Graph Neural Networks Integrating Exogenous Factors - Ayman Agoube, Abdessamad Ait El Cadi, Thierry Delot, Martin Trépanier

This paper presents a novel simplified spatio-temporal graph neural network (SST-GNN) model that addresses traditional methods of predicting parking occupancy limitations by integrating exogenous data and leveraging a graph-based representation to capture spatial relationships between parking locations. The model also incorporates a temporal mechanism to account for the dynamic evolution of parking demand. By combining intrinsic and contextual factors, the proposed approach significantly improves prediction accuracy. Experimental results on a real-world dataset demonstrate that the (SST-GNN) model outperforms traditional benchmarks in forecasting on-street parking occupancy, showcasing its potential to revolutionize smart parking systems.

16. Making cities safer to move and deliver

What makes other path users uncomfortable sharing with micro mobility devices? Investigating open-ended comments using structural topic modelling - Pegah Ghane, Alexander Bigazzi, Amir Hassanpour

The objective of this study is to identify the primary considerations of non-automobile travelers when sharing a path with personal mobility devices (PMDs). Structural topic modeling was used to identify topics spontaneously discussed by participants when explaining their comfort ratings and investigate the underlying factors affecting the topic prevalence. Results show that the primary overall considerations affecting comfort when sharing paths are facility design, PMD characteristics, and rider behavior. The topic most distinctly associated with motorized devices is “Safety risks associated with PMD design and speed attributes”. Efforts to integrate PMDs into urban transportation systems without degrading the non-motorized travel experience should focus on riders' cautious behavior, riding skills, and compliance.

A minimalist algorithm for growing safe cycling networks - Loïc Miara, Catherine Morency

This study addresses bicycle network deficiency challenges by proposing an algorithmic approach to cycling investments prioritization, aiming to maximize network productivity. The methodology focuses on identifying currently infeasible trips on a given network due to safety concerns or excessive detours. The network is then strategically expanded such that it minimizes these downsides and enhances overall connectivity and usability. Montreal's bicycle network is used as a case study, leveraging publicly available network data and trip data from the region's origin-destination survey. By systematically optimizing infrastructure investments, this research offers a practical framework for improving bicycle networks that can be used by city planners to support a modal shift.

Impact damage detectability of composite structures on advanced air mobility - Lucy Li, Changxian Li, Peyman Shabani, Jeremy Laliberte

The study features a combined experimental and numerical investigation of impact damage from a range of impactors, from sharp to blunt, and the post-damage load-carrying capabilities of composite laminates. High-fidelity impact modelling and compressive residual strength modelling provided a physics-based understanding of damage evolution and residual strength performance with excellent experimental agreement.

A bikeability index for last-mile electric cargo cycles - David Tran, Kevin Gingerich

This report develops the electric cargo cycles (ECCs) scoring index using a survey with participants riding on four routes within the York University Keele Campus. A literature review is conducted to identify twelve variables for the score. Data is collected and participants are asked to rate specified variables on infrastructure, safety and behaviour. The analytical hierarchy process is used to compute the weights for each factor using pairwise comparisons. It was found that cyclists prioritized collision risk, cyclist visibility and pavement condition the most when choosing a cycling route. Variables with the highest weights out of 100% include collision risk (24.3%-25.5%), visibility (11.1%-13.0%) and pavement condition (9.9%-12.4%). A simplified scoring index is derived using variables that could easily be applied to other routes to test its transferability.

AI-Based Predictive Modeling for E-Commerce Vehicle Classification in Neighborhoods - Yunfei Ma, Ahmed Foda, Elkafi Hassini, Moataz Mohamed

This study proposes a predictive framework to classify e-commerce vehicle trajectories using integrated datasets such as vehicle configuration, customer metadata, GPS trajectories, and duty cycle data. Capitalizing on Artificial Intelligence (AI) the authors: first developed a large language model (LLM) to filter e-commerce fleets from non-e-commerce vehicles with similar configurations; and second featured engineering on duty cycles and trajectories supports training machine learning models. The proposed AI-driven model is tuned through cross-validation and oversampling to address class imbalance and achieves nearly 80% precision, effectively distinguishing e-commerce vehicles with similar configurations. These results enable huge potential for municipal freight analytics across multiple domains.

17. Keep the goods flowing (2)

Route Choice Behavior Analysis of Truck Drivers Using Data-Driven Methods - Hamid Hasanzadeh, Bobin Wang, Xun Ji, Maaike Snelder, Lóri Tavasszy

Understanding the route choice behavior of truck drivers in urban transportation delivery networks is essential for enhancing freight mobility and optimizing route planning strategies. This study introduces a data-driven method that integrates route choice set generation with discrete choice modeling (DCM) to identify the key factors influencing truck drivers' route selection. A route choice model is established to estimate the impacts of different factors. The findings contribute to a deeper understanding of truck route choice behavior and offer practical insights for the development of smart route recommendation systems for logistics operators.

Creating electrical charging profiles for heavy-duty vehicle charging in Ontario using real-world GPS data - Sebastian Villada Rivera, I. Daniel Posen, Matthew J. Roorda

This study leverages high-resolution telematics from the American Transportation Research Institute for Ontario heavy-duty vehicles (HDV) in 2019 to produce annual heavy-duty battery-electric vehicles (HDBEVs) fleet charging profiles under various technology and operator charging scenarios. The project has two phases: data processing and charging demand modelling. Strategies include immediate charging (start charging once stationary), delayed charging (fully charge just before next departure), or minimum-power (charge at lowest constant power). Preliminary findings using August 8-14 data generated 1960 HDV schedules highlight the impact of a charging strategy.

Truck driver -VRU hazard anticipation training: a simulator study effectiveness of VRU-hazard anticipation training on novice truck Driver VRU hazard anticipation skills - Alia Galal, Birsen Donmez, Matthew Roorda

The aim of this study is to develop an evidence-based truck driver VRU hazard anticipation training module and to test its effectiveness on novice truck driver hazard anticipation skills in a simulated environment. A video-based training was developed and truck driver trainees and novices (less than 5 years of truck driving experience) were recruited through invitations to several Ontario truck driving schools. A quarter cab truck simulator and a head-mounted eye tracker were used. Results are expected to highlight drivers' improved scanning of the environment, earlier detection and reaction to hazards, and overall improved safety after training for the experimental group, compared to the experimental group's performance before training and to the performance of the control group.

Integrating RPAS with public transportation systems for efficient last-mile deliver – Seyedehleila Hasheminoudehi, Armin Mahmoodi, Jeremy Laliberte

This paper introduces a novel framework for optimizing delivery systems incorporating remotely piloted aircraft (RPAS), integrating advanced task allocation and routing loops to address key operational challenges in urban logistics. Inspired by studies on RPAS integration with public transportation networks for dynamic resource optimization, this work builds on a dual-loop structure: one dedicated to the

spatiotemporal allocation of delivery tasks and the other to identifying optimal routes under complex urban conditions. Using public transit systems: extends RPAS range, reduces energy consumption, and minimizes operational costs by utilizing existing infrastructure. The framework incorporates two independent optimization approaches and evaluates their relative effectiveness.

Improving the Safety of RPAS Operations in Urban Areas with Simulated Dynamic and Static Corridor Design - Armin Mahmoodi, Seyedehleila Hasheminoudehi, Jeremy Laliberte

The rapid expansion of remotely piloted aircraft systems (RPAS) operated over densely populated urban areas necessitates structured airspace management to ensure safety and efficiency. This study addresses the limitations of free-routing and proposes risk-based RPAS corridors as a solution to enhance operational control in congested urban environments. The main objective is to evaluate the capacity and safety implications of both static and dynamic RPAS corridors using a simulation model incorporating parameters like failure rates, navigation accuracy, and environmental conditions. This study offers a detailed framework for designing RPAS corridors that balances safety and efficiency. Predictive analytics and risk-based methods enable safe RPAS integration, advancing sustainable urban air mobility.

18. Productivity: Frameworks and evidence

Leveraging AI in the transportation sector: Where to start - Anna Robak, Cheryl Trent, Brynn Millar

Artificial intelligence (AI) has surprised and delighted many professionals for its potential to revolutionize the way we work and live. There are many AI applications in the transportation sector, and many of these help us learn at an accelerated rate. This paper will review the criteria necessary to evaluate AI initiatives, and provide practical guidance to urban and provincial transportation professionals on where to start with their AI journey, and how to prioritise and set a roadmap for their AI applications.

Global Best Practices and Lessons for Regional Fare Integration in Canada – Veiko Parming, Alistair Bell, Alec Knowles

This paper considers global best practices in fare integration, focusing on governance models, pricing schemes and operational strategies that facilitate effective implementation. Case studies are analyzed to identify key drivers of success. It incorporates findings from a detailed desktop review of publicly available reports, academic sources, and transit agency websites, supplemented with interviews with individuals at transit agencies and consultations with a panel of transit industry professionals. This multifaceted approach aims to provide a thorough understanding of the governance structures, technology, fare schemes and operational strategies conducive to successful fare integration. The analysis underscores the potential for Canadian regions to increase transit ridership, reduce congestion, and support sustainable, equitable, and user-friendly transit through effective fare integration strategies.

An Approach to Integrating the Assessment of Transit-Oriented Development and Supportive Infrastructure into the Transit Business Case Process - Adam Rosenblum, Sarah Harlley

This paper presents the case to go beyond traditional methods for transit appraisals to intentionally assess the comprehensive impacts of Transit-Oriented Development (TOD) and supportive infrastructure within the business case process, as well as technical guidance for how to quantify the relevant costs and benefits of each. By capturing the costs and benefits of TOD and supportive infrastructure unlocked by the transit project in question, in addition to the standard appraisal methods for assessing the transit infrastructure, the resulting business case can present a more complete picture of the project's anticipated impact. The methodologies presented are informed by research and guidance from peer jurisdictions relating to urban transit business cases.

19. Healthy cities

Cyclist Route Choice Model: Integrating Energy Expenditure Preferences for Enhanced Network Design - Diana Sanabria-Barboza, Alexander Bigazzi, Elmira Berjisian

This study examines how cyclist energy expenditure preferences are reflected in their route decisions, focusing on whether a measure of an individual's disutility of energy expenditure relative to travel time (MRS_{et}) influences preferences for factors like distance and grade. Cyclists with more energy-conservative preferences are more sensitive to route length and grade. They are more willing to take low-comfort routes along arterials, eg., to avoid longer routes and uphill grades, in contrast to less energy-conservative cyclists who are more sensitive to safety-related route attributes and more willing to detour. These insights enhance our understanding of cycling behavior heterogeneity, enabling more accurate forecasting and equitable cycling network design. Prioritizing energy-efficient cycling networks can address diverse preferences and make cycling more equitably accessible and safe.

Travel Behaviour Impacts of British Columbia's E-Bike Rebate Program - Polina Polikakhina, Alex Bigazzi, Amir Hassanpour

The objective of this study was to determine how rebate (on e-bikes in British Columbia) changed recipients' travel behaviour following their e-bike purchase and a year later. The study participants answered a range of questions related to their socio demographic attributes, e-bike purchase decisions, typical travel behavior before and after the purchase, and experience using the e-bike. The authors find that 12 months after purchase most participants still regularly use their e-bike, with 37% of e-bike trips substituting for auto travel. Average e-bike usage increased by around 50 km/week, while auto usage decreased by half that amount. They also examine the impacts of socio-economic, demographic, and contextual factors on usage of and experience with the purchased e-bikes. The study findings provide insights on the benefits and design of future e-bike incentive programs.

Longitudinal dynamic analysis of covid-19 on travel behavior in Canada and China - Xun Ji, Bobin Wang, Hamid Hasanzadeh, Owen Waygood, Yilin Sun

The COVID-19 pandemic had a serious impact on residents' work and travel around the world. China and Canada, two typical countries with two social systems, have imposed different restrictions on travel and social interactions in the face of COVID-19. This paper conducted a questionnaire survey on travelers in China and Canada, recording personal travel and social and family attributes. Latent class analysis was used to analyze travel choice behavior dynamics before, during, and after the pandemic, and to compare the travel choice behaviors of residents in China and Canada. These findings help formulate appropriate travel and social strategies to improve residents' well-being in response to similar public health emergencies such as COVID-19.

Assessing Walking Accessibility to Metro Stations: the case of Montreal, Canada - Mehdi Hamdaoui, Catherine Morency

This study introduces a walking accessibility assessment using GIS functions and open-source data. It also proposes new accessibility indicators of the quality of access to transit. The Montreal metro network is used as a case study. The authors generate walking catchment areas and test indicators of accessibility by studying their geometric properties and by comparing them with ideal ones. They use census data to further develop indicators accounting for the population. This methodology identifies stations with low accessibility and estimates potential accessibility gains. In Montreal, some 406,375 people could benefit from accessibility improvements, representing a 46.5% increase. Based on the diagnostic, scenarios were developed to address specific barriers such as infrastructure and land-use constraints.

20. Perspectives and types

How School Drop-Offs Lock Parents into Car-Based Commutes - Catherine Morency and Hubert Verreault

This presentation examines the complex relationship between school-related service trips and parental transportation behaviors. It highlights the potential of improving transportation options for children to travel independently to school as a lever to reduce car dependency among parents. The analysis estimates

the positive impacts of such changes, including shifts in mode share, reductions in kilometers traveled by car, energy consumption, and greenhouse gas emissions. Additionally, the study explores the broader benefits, such as improved health outcomes for children and enhanced family mobility flexibility. This research underscores the need for integrated planning approaches that address the role of school trips.

Traveler Typology to Understand Transit Route Choice - Alicia Brodeur, Catherine Morency

Encouraging greater public transport usage and reducing automobile dependency requires making public transport systems more competitive and appealing. To achieve this, transit networks must address the mobility needs of diverse population segments with varying travel needs throughout the day. Providing a high-quality transit system requires an in-depth understanding of users, their habits, and their route-choice decision-making process. Using observed transit routes from an Origin-Destination travel survey of Montreal, the authors develop a typology of traveler based on transit route choice strategy. This approach sheds light on user preferences and travel habits, enabling transit planners to design systems that better align with the needs and expectations of diverse traveler groups.

Decoding Multi-Modal Usage Patterns and Temporal Dynamics in the Greater Montreal Area - Catherine Morency, Jean-Simon Bourdeau

This study addresses the multi-modal usage patterns and temporal dynamics gap by leveraging a diverse set of operational data from transportation systems and services. Clustering approaches are applied to identify typical daily and weekly usage patterns. Six relatively independent data streams are analyzed: vehicle road counts, bicycle counters, transit validation records for subway and bus, GPS data for taxis, BIXI bikesharing usage data, and Communauto carsharing data. These datasets collectively cover a common area in the central part of the Island of Montreal for the years 2019-2023. The four years of continuous data enable an analysis of how usage patterns have evolved over time, offering more insights.

Even in New York, the car rules the street: Inequality in street space allocation – Daniel Romm, Maria Laura Guerrero Balarezo, Grant McKenzie

This study investigates street space allocation in New York City, using publicly available datasets, its spatial distribution across the city, and the relationship between that distribution and key socio-economic and demographic factors. We find that even in New York, a city known for being relatively friendly to non-car travel modes relative to its U.S. peers, street space is dominated by car infrastructure. Street space allocation is unevenly and non-randomly distributed, with evident clusters with high proportions of space allocated to car infrastructure in certain parts of the city. Most socio-economic and demographic variables are not correlated with spatial allocation, though some relationship is found with dwelling density, race, foreign-born population, and age.