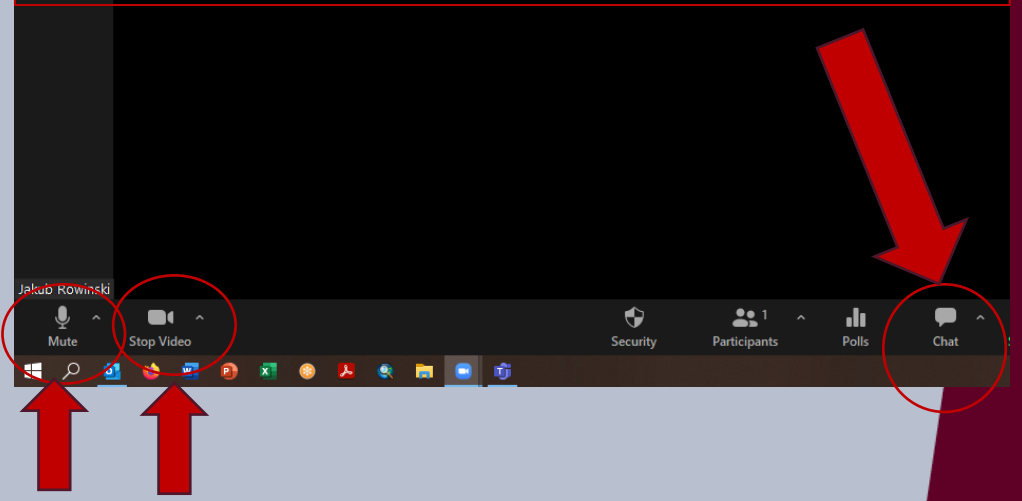
August 17 Freight Initiatives Committee Agenda

- Roll Call
- Approval of Minutes
- Update on NJTPA Freight Division Activities
- Presentations: Urban Delivery Strategies
  - **A Comparative Analysis of Commercial Vehicle Load Zone Programs Across US Cities** – Dr. Giacomo Dalla Chiara, Senior Research Scientist, Urban Freight Lab, University of Washington
  - **E-cargo Cycles and Microhubs for Urban Delivery: Assessment of a pilot in downtown Toronto and the case for city-wide expansion** – Dr. Farah Ghizzawi, University of Toronto
  - **NJTPA E-commerce Delivery Mitigation Study** – Dr. Alison Conway, The City College of New York and Dr. Branislav Dimitrijevic, New Jersey Institute of Technology
- Two-Minute Reports on Freight Activities from Committee Members
- Next Meeting: Monday, October 19, 2026
- Adjournment

Please use the Chat box to ask questions during the presentations and if requesting credits, please post your name and email, followed by either AICP or PE with your NJ PE license number



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Key Freight Division Activities

- FY 2025 Freight Concept Development Program Studies
  - Concept Development for Southern Middlesex County North-South Truck Corridor Project
  - Concept Development for East Hanover Avenue Bridge Catenary Rail Clearance Project
  - Preliminary Screening for Plate F Vertical Rail Clearance in Perth Amboy
  - Program Support
- E-Commerce Delivery Mitigation
- Passaic County Urban Core Trucking Study

NJTPA

Presentations

Presentations: Urban Delivery Strategies

- **A Comparative Analysis of Commercial Vehicle Load Zone Programs Across US Cities** – Dr. Giacomo Dalla Chiara, Senior Research Scientist, Urban Freight Lab, University of Washington
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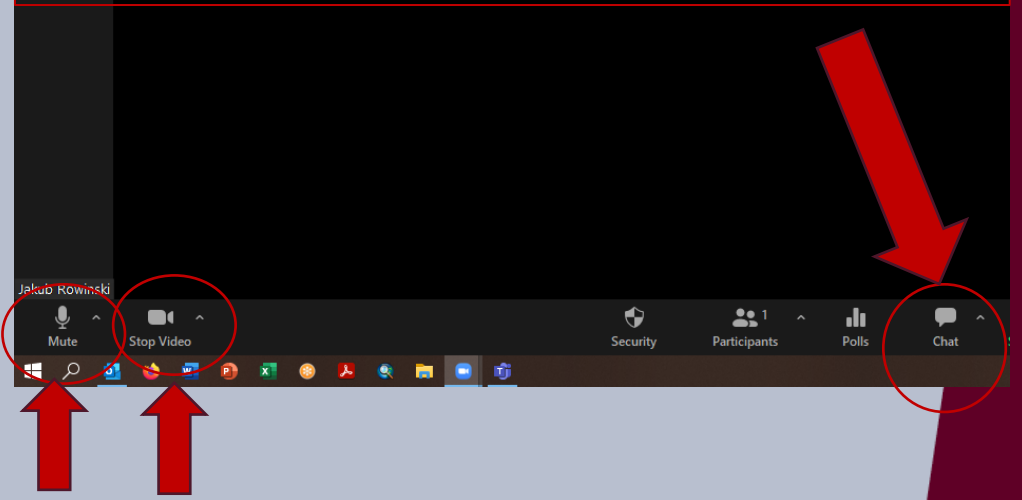

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NJTPA

August 17th, 2026
NJTPA Freight Initiatives Committee

Commercial Vehicle Load Zone (CVLZ) programs in US cities

URBAN FREIGHT LAB
UNIVERSITY of WASHINGTON
College of Engineering

OPEN MOBILITY FOUNDATION®

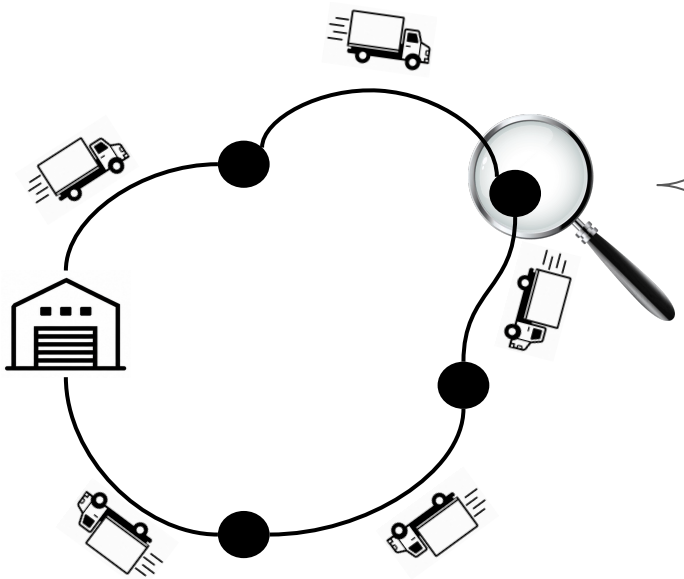
Giacomo Dalla Chiara
Senior Research Scientist, Urban Freight Lab

Co-authors:
Yu-Chen Chu, Kelly Rula[1], Arsalan Esmaili , Brian Hamlin[1], Alison Conway[2], Anne Goodchild

[1] Seattle Department of Transportation (SDOT); [2] City College of New York (CCNY)

The last-50-feet

The last-mile



The last-50-feet

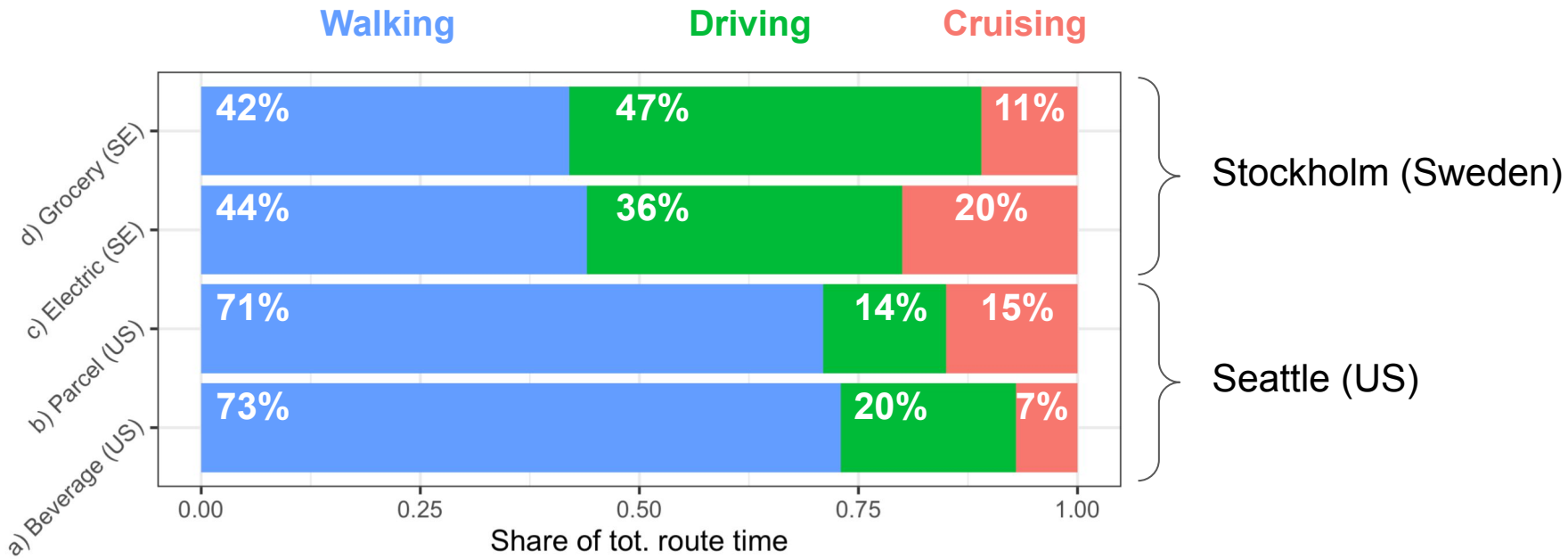
Cruising

Idling

Walking

time

Time spent driving, cruising, and walking



→ The last-50-feet “contribute” to **the majority of a delivery driver’s time**

Truck queueing for loading bays
Singapore, SG

Unauthorized truck parking,
Philadelphia, US

Long walking sub-routes, Seattle,
US

Planning for the last-50-feet

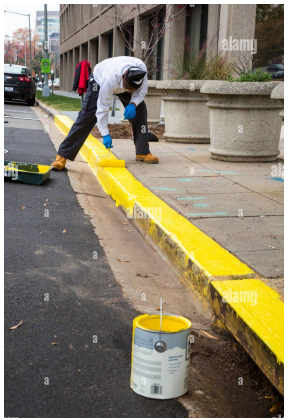
Passenger transportation: parking programs are considered key travel demand management strategies

How are cities managing freight parking?

Commercial Vehicle Load Zone programs

A **commercial vehicle load zones (CVLZ) program** is a collection of **infrastructure**, **policy** and **regulatory** strategies cities adopt to manage commercial vehicle access and facilitate loading/unloading and the provision of services in urban areas

Infrastructure



Load Zone (LZ) allocation and design

Policy

Authorized LZ users & pricing

Regulation

Enforcement & max dwell time

Research objectives

What infrastructure, policy, and regulatory strategies are cities adopting to manage freight parking in urban areas?

- Are there **similarities/differences** among strategies adopted by different cities?
- Is there a "**agreement**" on what works and what does not?
- Is there a **gap between research and practice** in urban freight parking management?

How can freight parking management strategies support livable communities (completeness, safety, sustainability, efficiency)?

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Transportation Research Part A

journal homepage: www.elsevier.com/locate/tra

Commercial Vehicle Load Zone programs in US cities

Giacomo Dalla Chiara [a,*], Yu-Chen Chu [b], Kelly Rula [c], Arsalan Esmaili [a], Brian Hamlin [c], Alison Conway [d], Anne Goodchild [a]

[a] Department of Civil and Environmental Engineering, University of Washington, Seattle, WA, USA
[b] Department of Urban Design and Planning, University of Washington, Seattle, WA, USA
[c] Seattle Department of Transportation, Seattle, WA, USA
[d] Department of Civil Engineering, City College of New York, New York, NY, USA

Methodology

1. Cities CVLZ program selection

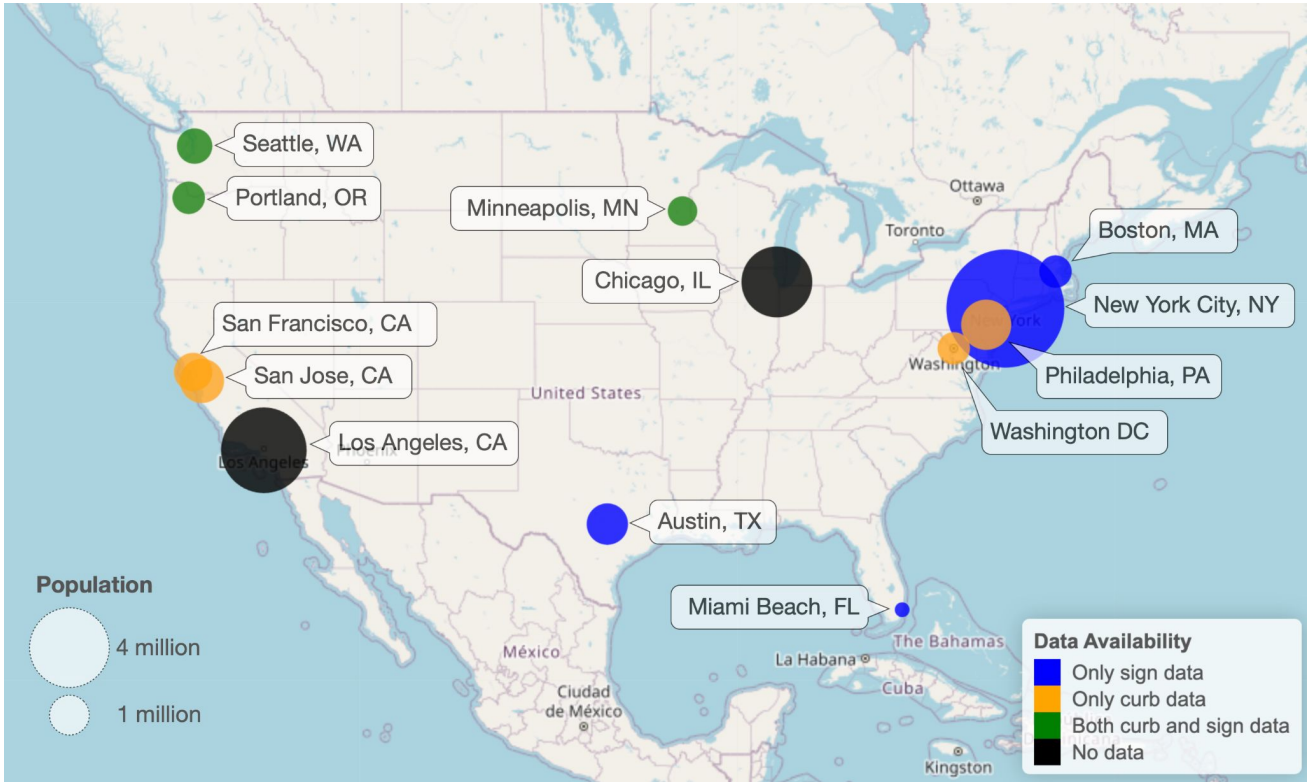
SMART OMF OPEN MOBILITY FOUNDATION®

2. Policy & regulation analysis

Municipal codes, ordinances & public agencies websites

3. Infrastructure analysis

Curb data & sign data



Results

Policy
- Load Zone users
- Load Zone types
- Load Zone pricing

Regulation
- Time limits
- Enforcement

Infrastructure
- Load Zone design
- Load Zone allocation

Policy | Load Zone Users

Who are the authorized users of Load Zones (LZs)? → definition of freight vehicle/activity

Physical characteristics

- Vehicle length, width, no. wheels
- Gross weight thresholds
- Presence of passenger windows/seats
- Vehicle model
- Display of commercial logo and insignia

Licensing status

Abind to state and federal license requirements and definitions

Activity performed

- load/unload of goods, freight, merchandise
- Building and utility services
- “Car” deliveries
- Commercial passenger transportation

Policy | Load Zone Types

What physical infrastructure cities provide for commercial vehicle parking?

Curb-commercial

Commercial LZs

General commercial activities

Truck LZs

Heavy goods vehicles

Specialty LZs

Neighborhood LZs (NYC), entertainment, hotel, green, smart, …

Curb-passenger

General LZs

Include pickup-dropoff

Paid parking areas

Primarily for passenger

Other

Alleys

Service roads

No-parking zones

Travel lanes

Double parking

Policy | Pricing

Three approaches to commercial vehicle parking pricing

Permit programs

Pay once for unlimited use

Fleet managers

Pay-per-use

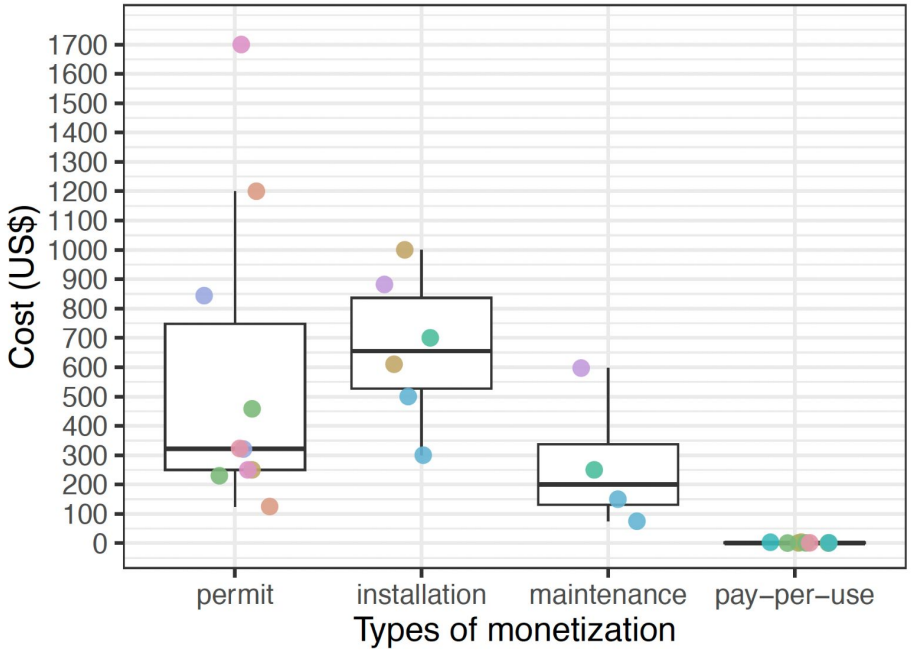
Pay per parking event

Drivers

Installation + maintenance

Pay per parking event

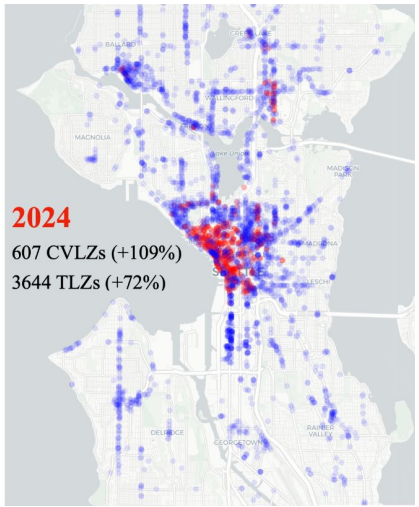
Business establishments

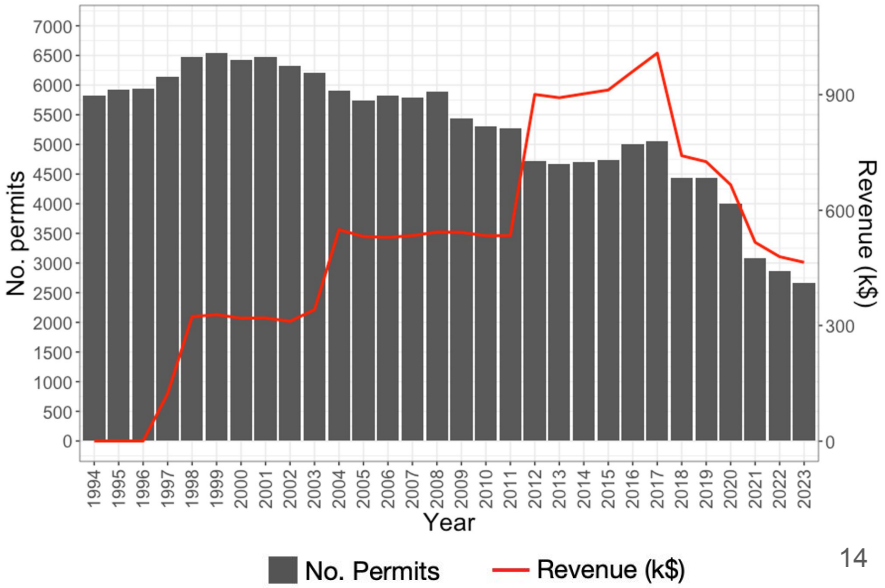


Policy | Case study: Seattle CVLZ permit program

The Seattle CVLZ program was established in 1989:

- Permit-based ($250/year): mean 5,260 permits sold per year
- Max dwell time: 30 minutes
- Only for load/unload of commercial vehicles

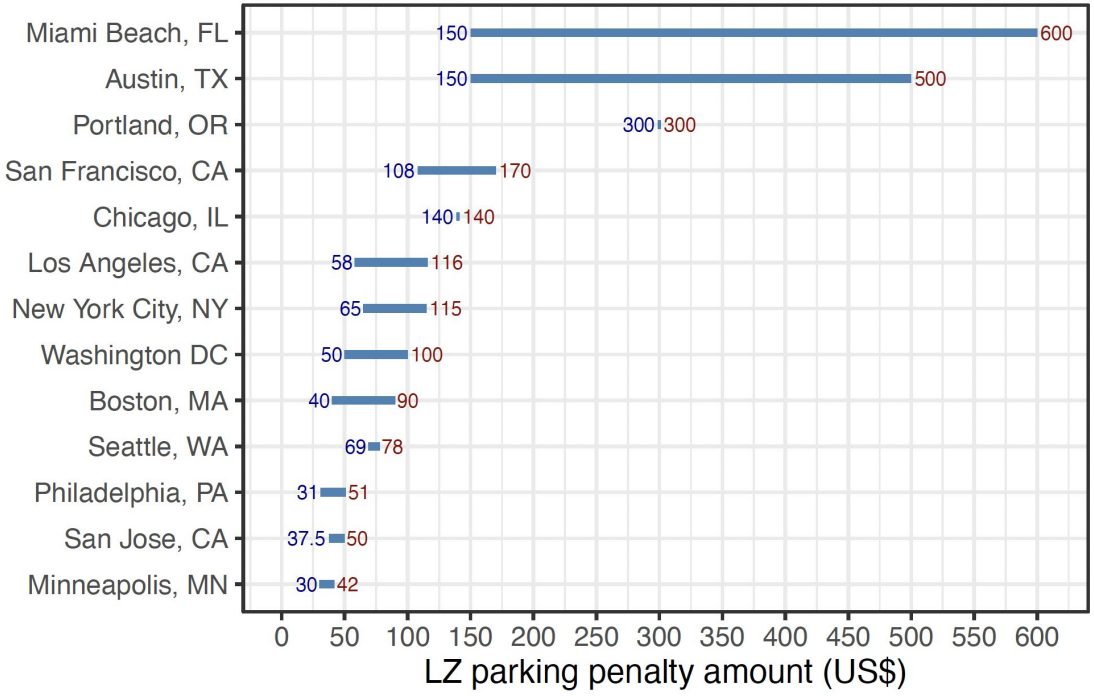




Regulation | Time limits & enforcement

Primarily based on issuing monetary fines per infraction:

- Abuse of commercial permit
- Exceeding time limits or parking outside permitted hours
- Non-commercial vehicle misuse

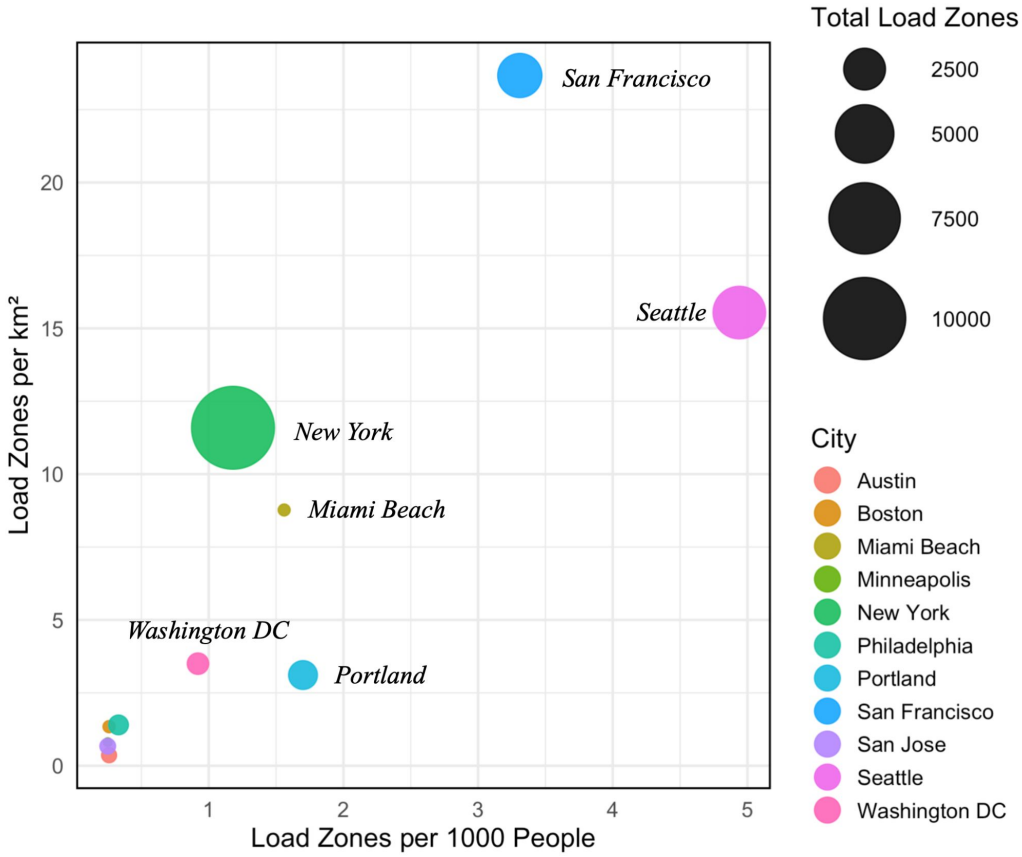


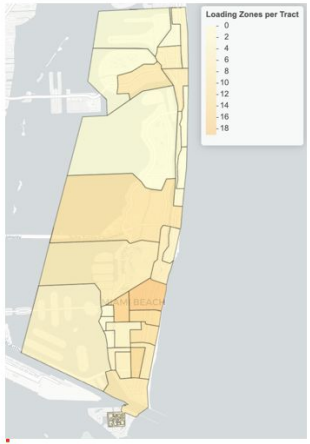
Infrastructure | Allocation

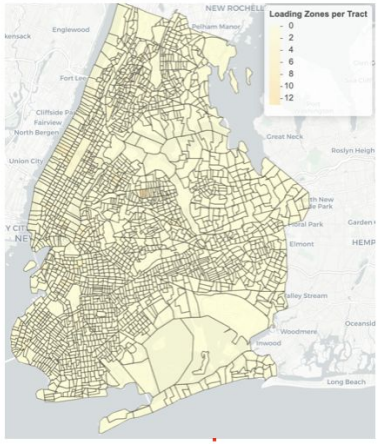
Physical network characteristics vary by city:

- Between 82 and 10,170 LZs
- In km: 2.6 to 49.1 km of LZ (0.1 to 10% of curb)
- Density: 0.25 to 4.94 LZ/1000 people

→ Other than NYC, allocation is ad-hoc / by request







Austin (NNI: **0.08**, 283 LZs)

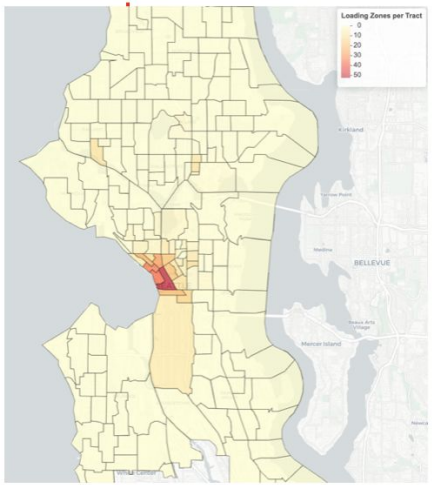
Miami Beach (NNI: **0.48**, 171 Lzs)

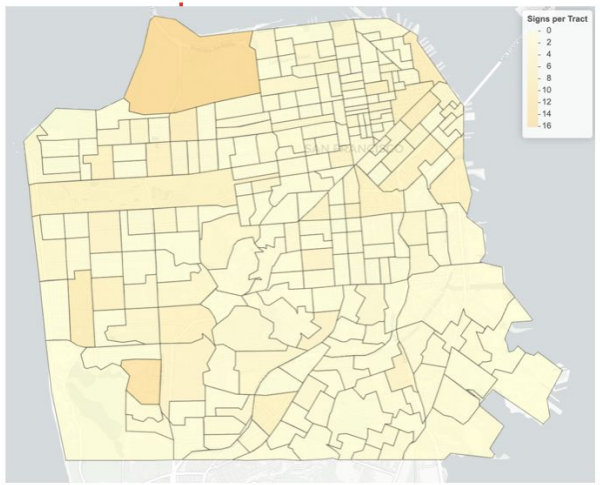
NYC (NNI: **1.04**, 595 NLZs)

Seattle (NNI: **0.12**, 570 CVLZs)

San Francisco (NNI: **0.64**, 324 GLZs)

Nearest Neighbor Index (NNI)





The Nearest Neighbor Index (NNI) measures the degree of spatial dispersion

Conclusions

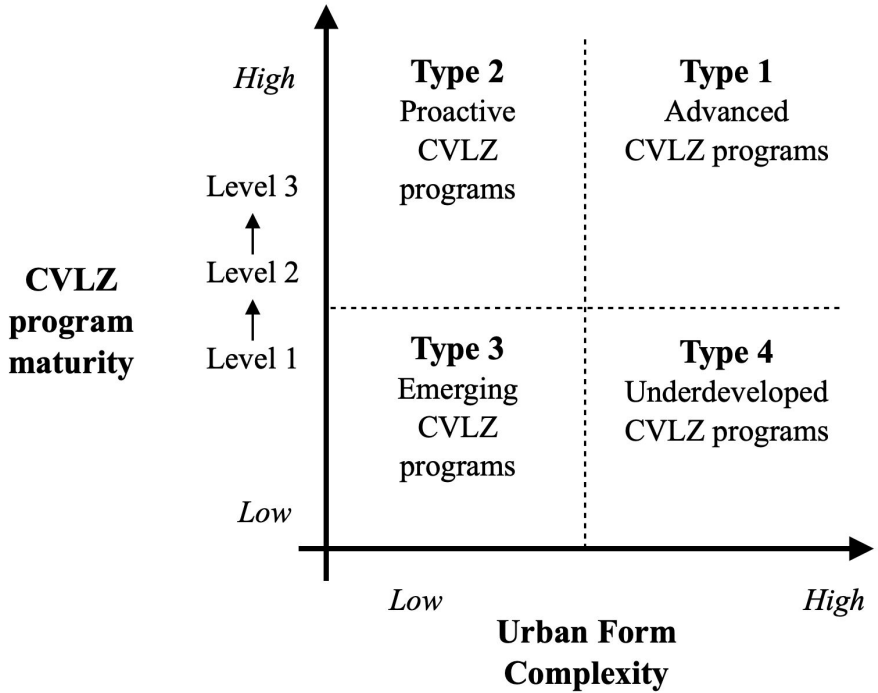
CVLZ program “maturity”

CVLZ programs identified have different “maturity” levels:

1. **Foundational allocation**
   Recognition of commercial parking activities & allocation

1. **Commercial users differentiation**
   Recognition of different use-types

1. **Active management**
   Actively influence parking behaviors



Discussion

Practice

- General lack of data and data/policy standardization
- “Universal” CVLZ program vs. need of customization
- No unified definition of “commercial vehicles” → who should a CVLZ program accommodate?
- Freight stakeholders outreach

Research

- Lack of methodology for LZ allocation
- Lack of understanding of how pricing impact parking behaviors for freight vehicles
- Role of research in guiding CVLZ practices

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[d] Department of Civil Engineering, City College of New York, New York, NY, USA

Thank you!

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URBAN FREIGHT LAB
UNIVERSITY of WASHINGTON
College of Engineering

FREIGHT INITIATIVES COMMITTEE · AUGUST 17, 2026

E-cargo Cycles and Microhubs for Urban Delivery

Assessment of a Pilot in Downtown Toronto and the Case for City-wide Expansion

Farah Ghizzawi (Presenter), Usman Ahmed, Junshi Xu,
Milad Saeedi, Marianne Hatzopoulou and Matthew J. Roorda

University of Toronto

ACKNOWLEDGMENTS

Partners & funding

— Pilot delivered in partnership with Purolator Inc. and the City of Toronto.

— Funded by the Purolator Research Chair, the City of Toronto, the Region of Peel, and the Natural Sciences and Engineering Research Council of Canada (NSERC).

PROJECT TEAM

Matthew J. Roorda (PI), Marianne Hatzopoulou, Usman Ahmed,
Farah Ghizzawi, Junshi Xu, and Milad Saeedi — University of Toronto

AGENDA

What we'll cover

01

Why it matters

The case for rethinking last-mile delivery

02

The pilot

Urban Quick Stop, downtown Toronto

03

Pilot results

Operations, emissions, and air quality

04

Scaling city-wide

The microhub location model and its results

05

Policy & path forward

Implications, takeaways, next steps

01

CHAPTER ONE

Why it matters

The case for rethinking last-mile delivery in dense neighbourhoods

WHY IT MATTERS

Freight keeps the city running — at a real cost

- Freight moves ~42% of Canada’s transportation GHG emissions — on track to overtake passenger vehicles by 2030
- Delivery trucks compete for scarce curb space, adding congestion and safety risk
- E-commerce sales have nearly tripled since 2017, pushing more delivery trips into dense neighbourhoods
- In-cabin pollutant levels can exceed outdoor levels, exposing drivers to elevated air pollution
- Toronto’s freight sector has a role to play in meeting the city’s climate targets

Canada’s target: 40–45% GHG reduction by 2030 · net-zero by 2050

02

CHAPTER TWO

The pilot

Three e-cargo tricycles, one microhub, and real deliveries in downtown Toronto

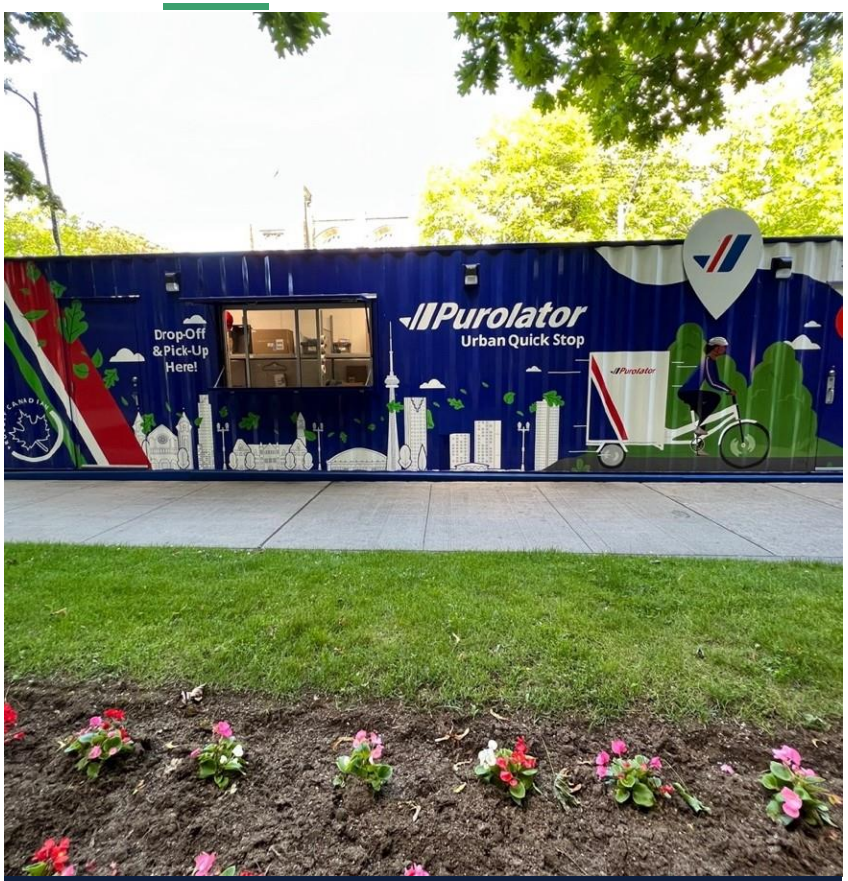
E-cargo tricycle on a downtown delivery route

THE PILOT

The Urban Quick Stop microhub

- Delivered in partnership with Purolator Inc., beginning August 2022
- Centred on the University of Toronto downtown campus, serving 3 adjacent neighbourhoods
- The Urban Quick Stop: a remodeled shipping container occupying 5 curbside parking spots
- Doubles as a retail pickup/drop-off point, shipment storage, and overnight tricycle charging
- 3 e-cargo tricycles replaced truck deliveries in each neighbourhood

The pilot in pictures



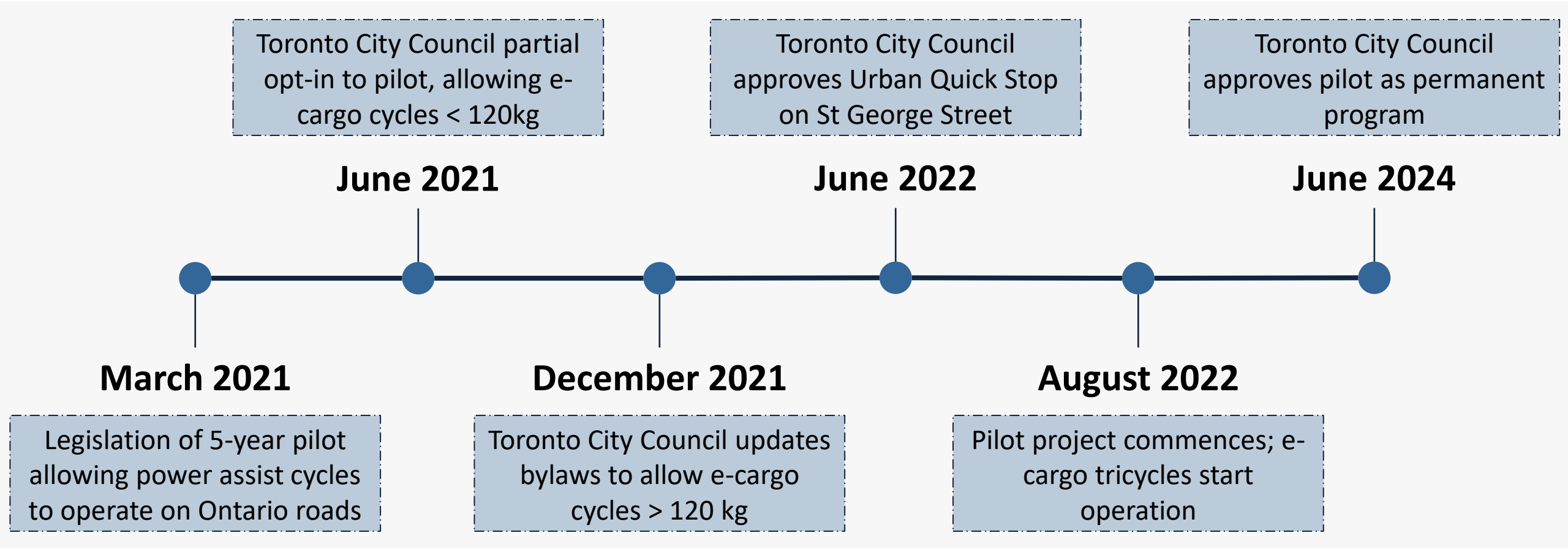
The Urban Quick Stop microhub

Truck delivering to the hub

E-cargo tricycle on route

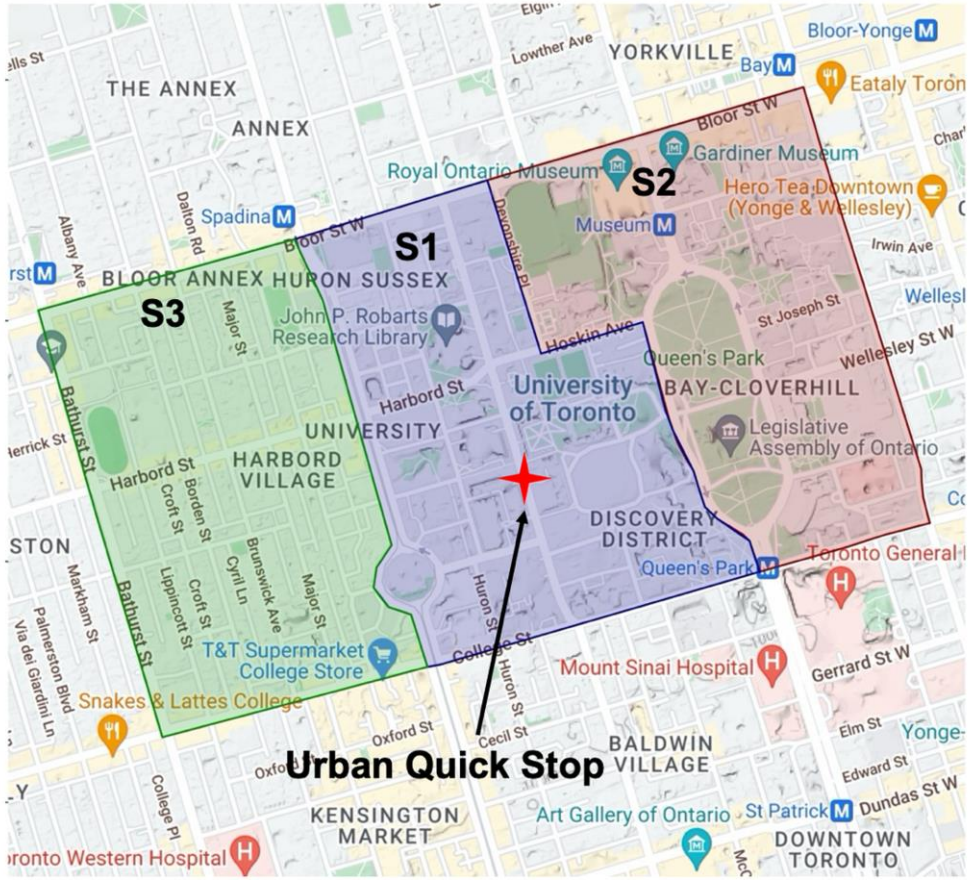
THE PILOT

Getting e-cargo tricycles on the road



THE PILOT

Study area and data sources



S1 University of Toronto main campus — offices, teaching space, residences

S2 Low-to-medium density residential, retail along main streets

S3 Ontario legislative buildings, affiliated colleges, institutional uses

DATA SOURCES

- **Trajectory data**
- **Delivery records**
- **Shipment logs**

48 tours before the pilot (Jun–Aug 2022) · 55 tricycle + 78 truck tours during (Aug–Dec 2023)

03

CHAPTER THREE

Pilot results

How e-cargo tricycles performed against trucks — operationally and environmentally

PILOT RESULTS

Operational performance: before vs. during

	Distance / Day	Stops / Day	Dwell Time / Stop	Parcels / Stop	Customers / Stop	Walking Dist. / Stop
Truck Before Pilot	25.4 km/day	19	17.8 min	6.4	3.8	199 m
Truck – Oversized During Pilot	39.5 km/day	24	10.7 min	5.4	1.9	133 m
E-Cargo Tricycle During Pilot	29.5 km/day	25	7.2 min	4.2	2.7	122 m

PILOT RESULTS

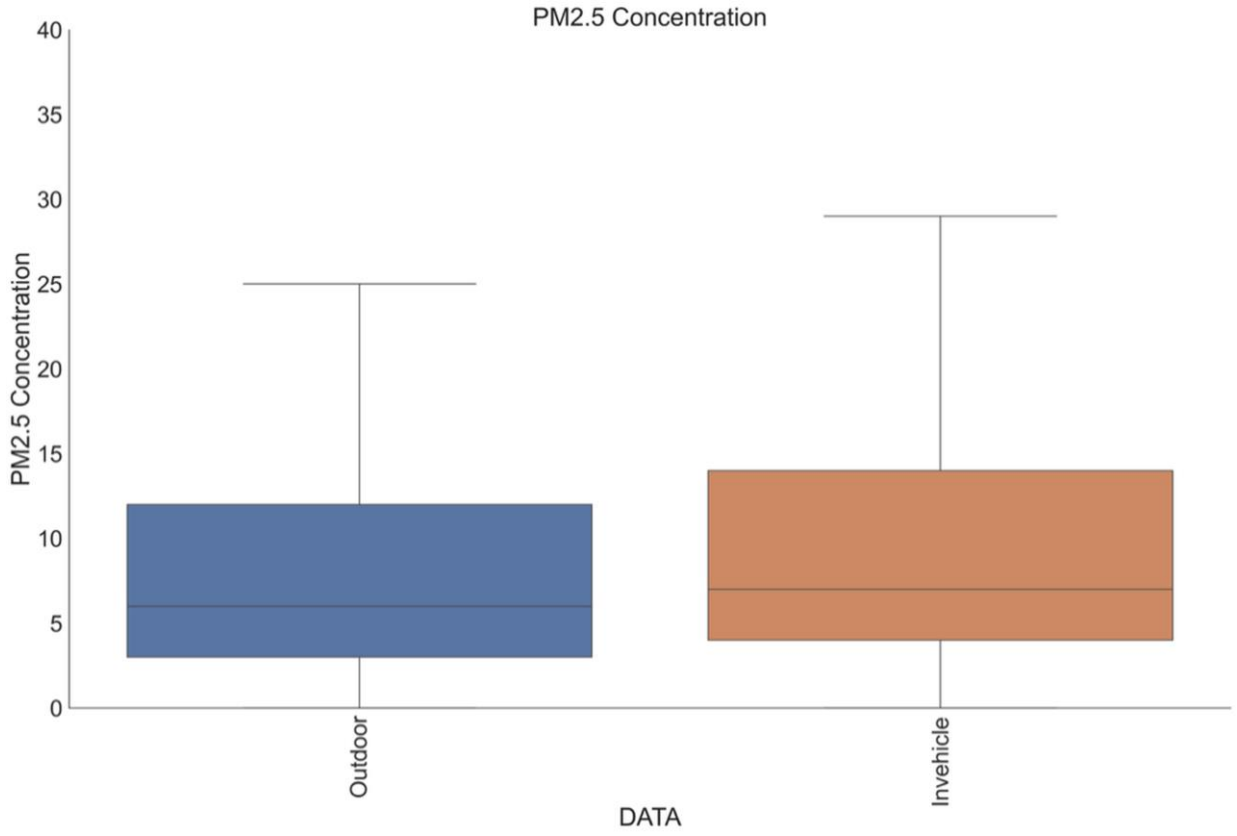
~3 tonnes

of GHG emissions eliminated per year, for every truck replaced by an e-cargo tricycle

MOVES-model emission estimates for light commercial trucks in the study area — 10.5–13 kg GHG/day

PILOT RESULTS

Truck driver air quality



In-cab vs. outdoor PM2.5 concentration

- In-vehicle PM2.5 concentrations are significantly higher than outdoors (Welch's t-test, $t = 13.54$, $p < 0.001$)
- Consistent across 41 days of continuous in-cab and outdoor monitoring
- Truck drivers face elevated pollutant exposure while working inside the cabin
- E-cargo tricycles eliminate this extra driver exposure entirely

04

CHAPTER FOUR

Scaling city-wide

From a three-tricycle pilot to a citywide microhub network

SCALING CITY-WIDE

From pilot to city-wide: the microhub model

1

Use pilot-observed parameters

Tricycle range & microhub capacity (3 tricycles/hub)

2

Map citywide demand

2023 shipment demand across all 597 Toronto traffic zones

3

Optimize hub locations

Choose the number and location of microhubs to minimize total cost

4

Test sensitivity

Vary tricycle capacity, range, and microhub cost

SCALING CITY-WIDE

What the model optimizes

MINIMIZE — TOTAL COST

Cost of opening microhubs + Cost of delivery tours from each hub

Solved simultaneously across all 597 Toronto traffic zones — not a preselected shortlist of sites

1

One hub per zone

Every neighbourhood is assigned to exactly one microhub

2

Capacity limit

A microhub can't take on more parcels than 3 tricycles can deliver in a day — the pilot-observed maximum

3

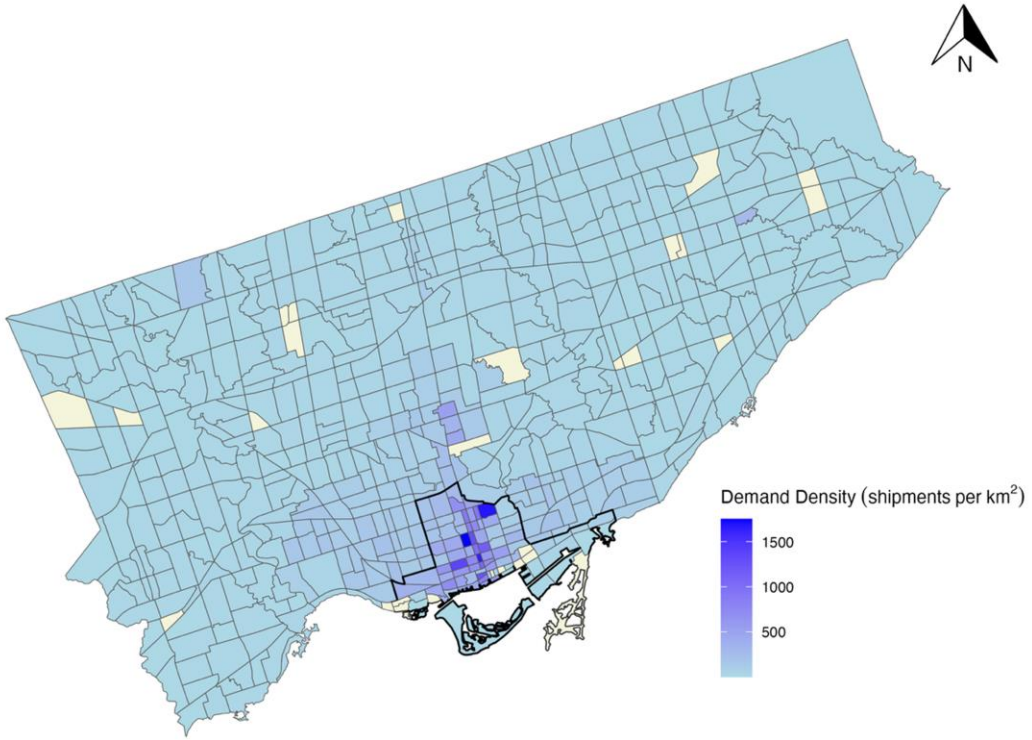
Battery range

Delivery tours can't exceed a tricycle's single-charge range — the pilot-observed maximum

Tour lengths estimated with the continuous-approximation method (Larson & Odoni, 1981), k = 0.765

SCALING CITY-WIDE

Toronto shipment demand

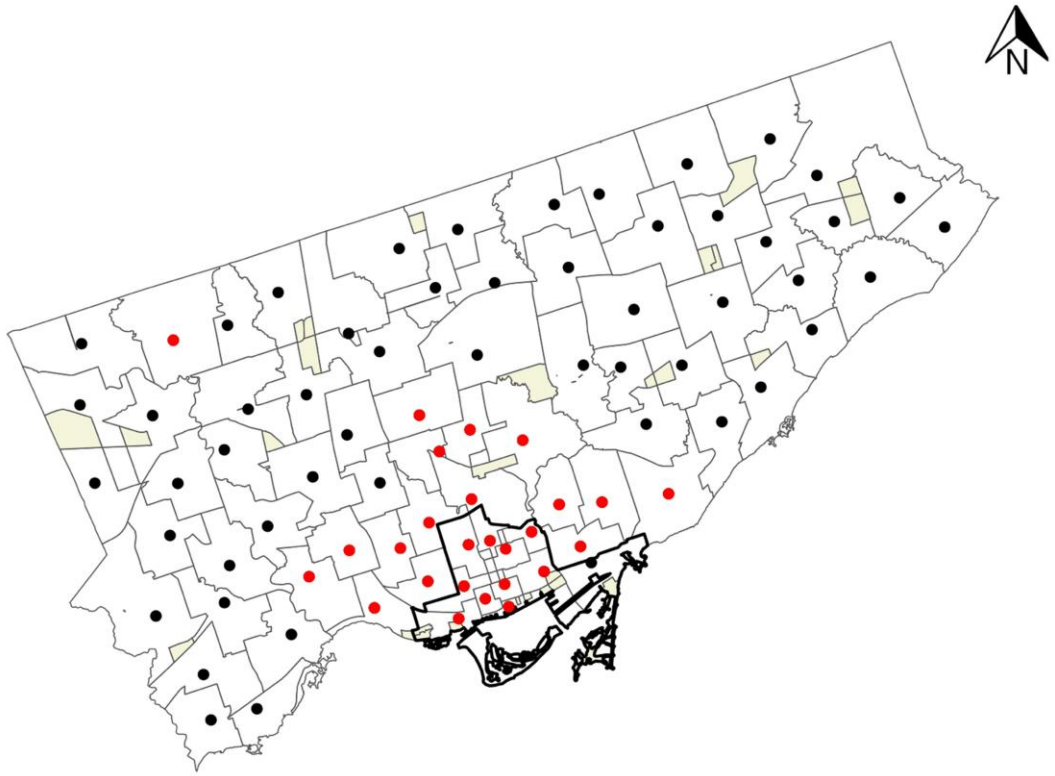


2023 courier shipment demand

- Aggregated to 597 Toronto traffic analysis zones (TAZs)
- 10,000–25,000 shipments/day across Q1–Q3
- Demand peaks in Q4 (holiday season)
- Highest density in downtown Toronto
- Model sized to the 95th-percentile weekday demand

SCALING CITY-WIDE

City-wide results: 79 microhubs needed



Optimal microhub locations (N = 79); red = ≥50% capacity utilization

- 79 microhubs would serve 95th-percentile weekday demand across Toronto
- 11 microhubs in downtown Toronto, 68 in the inner urban area
- 237 e-cargo tricycles required in total (3 per microhub)

SCALING CITY-WIDE

Where microhubs make the most sense

- Utilization is far higher downtown, where demand density is greatest
- Demand density — not tricycle range — is the key factor in microhub viability

Metric	Downtown Toronto	Inner Urban Area
Microhubs required	11	68
Microhubs at ≥50% capacity	10 (91%)	16 (24%)
Mean service area / hub	0.36 km²	1.19 km²

SCALING CITY-WIDE

A glimpse at the sensitivity analysis

- Downtown is capacity-constrained; the Inner Urban Area is cost-constrained
- Tricycle range barely matters — doubling it alone changes nothing

Scenario	Downtown	Inner Urban
Base case	11	68
2× tricycles / microhub	7	66
2× tricycle range	11 (no change)	68 (no change)
Microhub cost +20%	11	57
Microhub cost +40%	11	53

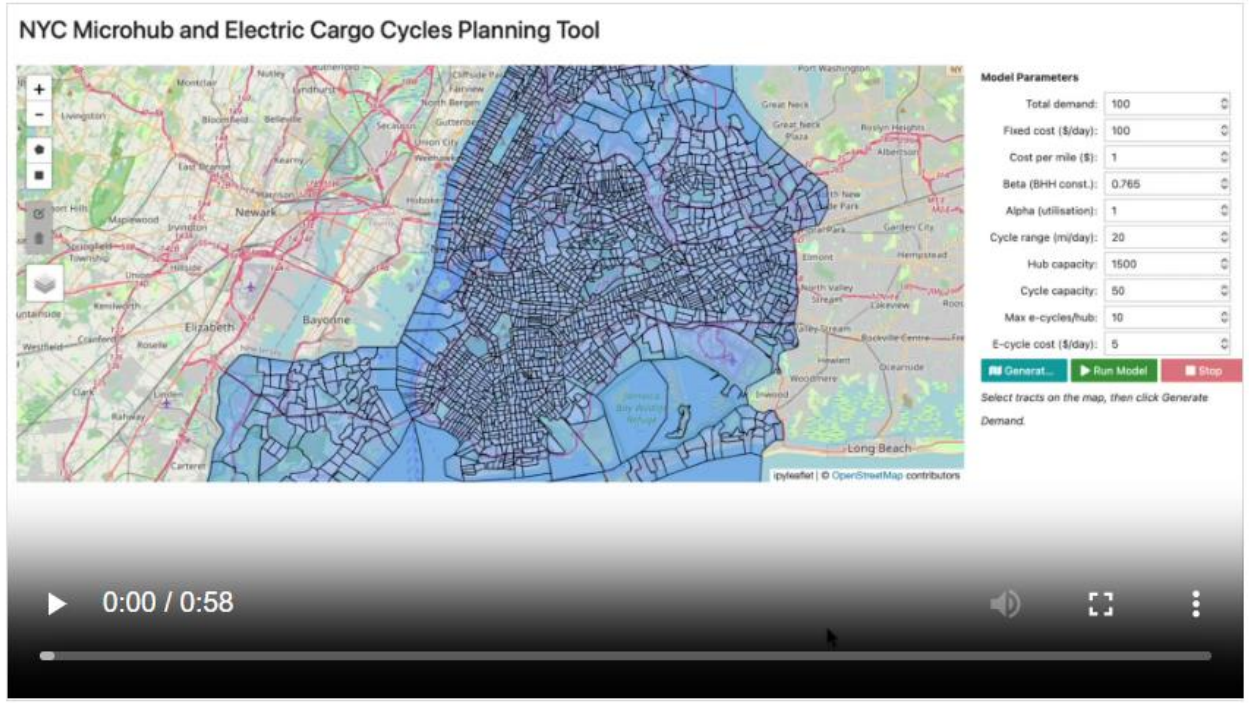
Bottom line: capacity limits matter most where demand is dense; cost matters most where it's thin.

SCALING CITY-WIDE

From model to tool: applied to New York City

Usman Ahmed has packaged this same optimization model into an interactive planning tool, and this is the exact engine behind the Toronto results in this presentation.

1. **Microhub sizing**
   Estimates the number of microhubs required to serve a study area
2. **Location selection**
   Identifies optimal microhub locations
3. **Service area assignment**
   Assigns service areas to each microhub
4. **Fleet & route sizing**
   Calculates e-cargo cycles needed per hub and total tour distance



DEMONSTRATED ON NEW YORK CITY

https://usmanahmed.net/modeling-tools.html

05

CHAPTER FIVE

Policy & path forward

What the pilot means for city policy — and what comes next

POLICY IMPLICATIONS

What the city can do

- Dedicate curbside or off-street space for microhubs in high-demand areas, building on the Urban Quick Stop precedent
- Upgrade cycling infrastructure for the size and continuity needs of cargo tricycles
- Integrate microhub space requirements into development approvals for major projects
- Offer incentives, such as low/zero-emission zones, to encourage courier adoption
- Prioritize downtown and other high-density areas first, where microhubs pay off fastest

KEY TAKEAWAYS

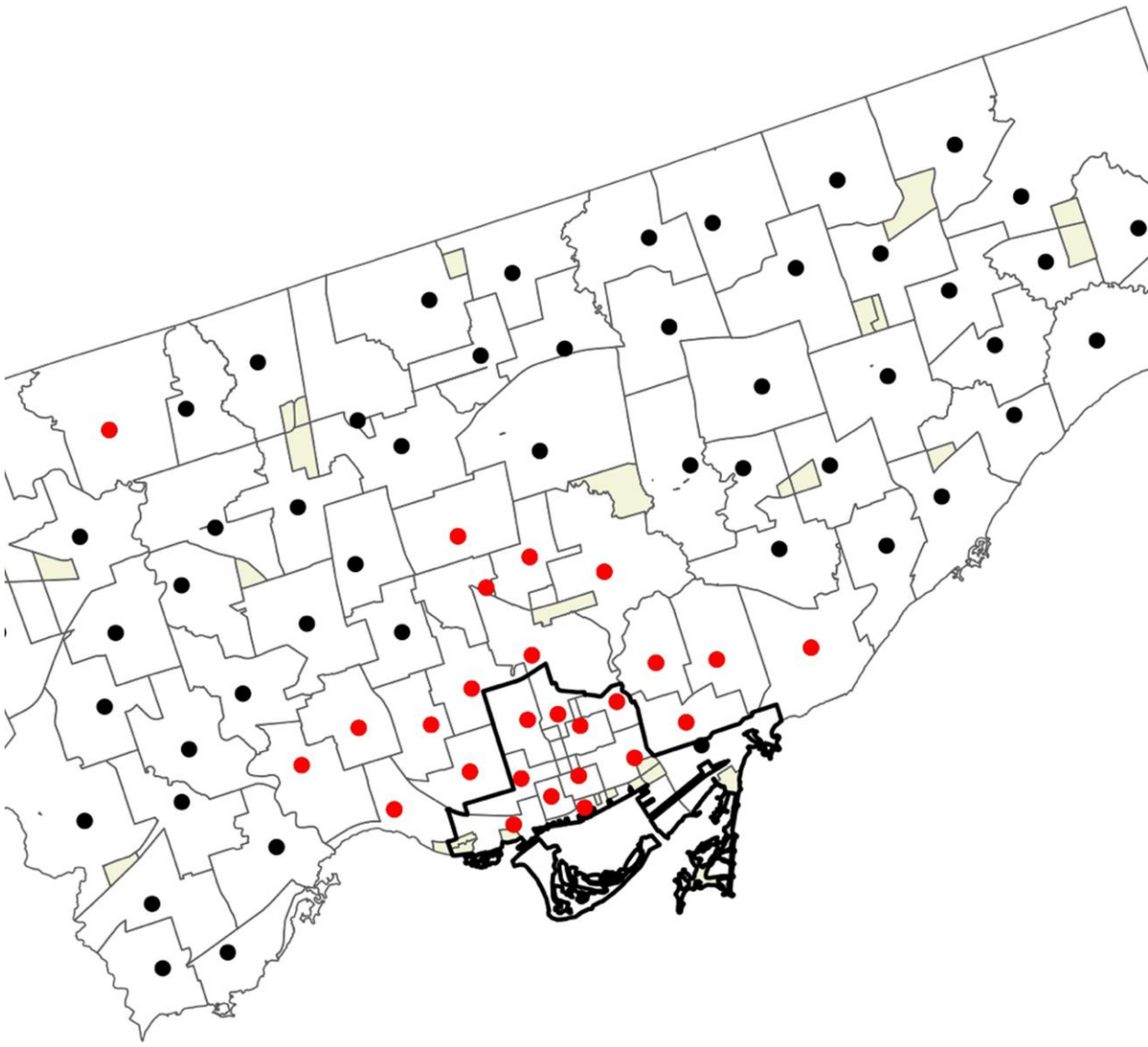
The bottom line

1	**One-for-one replacement**	E-cargo tricycles can replace delivery trucks in dense neighbourhoods without compromising delivery efficiency
2	**~3 tonnes saved**	Each truck replaced eliminates about 3 tonnes of GHG emissions per year and removes driver exposure to in-cabin air pollution
3	**79 microhubs, citywide**	79 well-placed microhubs (237 tricycles) could serve 95th-percentile daily demand across Toronto
4	**Density beats range**	Demand density, not battery range, determines where microhubs pay off; downtown is the highest-value first step
5	**A proven regulatory path**	Provincial cycle legislation, municipal bylaws, and an on-street permit show this can be done again

PATH FORWARD

Next steps

- Refine the model for oversized shipments and multi-day demand
- Explore shared microhubs across courier companies in lower-demand areas
- Advise the City on curbside and off-street microhub locations
- Partner with the City to pilot a second microhub site



Thank you

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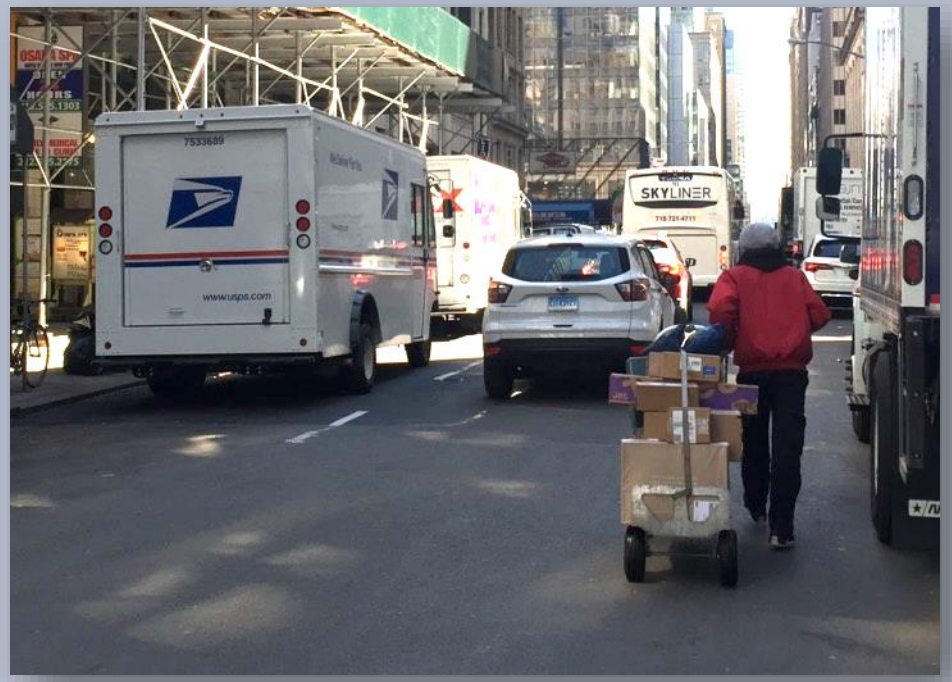
University of Toronto



E-Commerce Delivery Mitigation Study

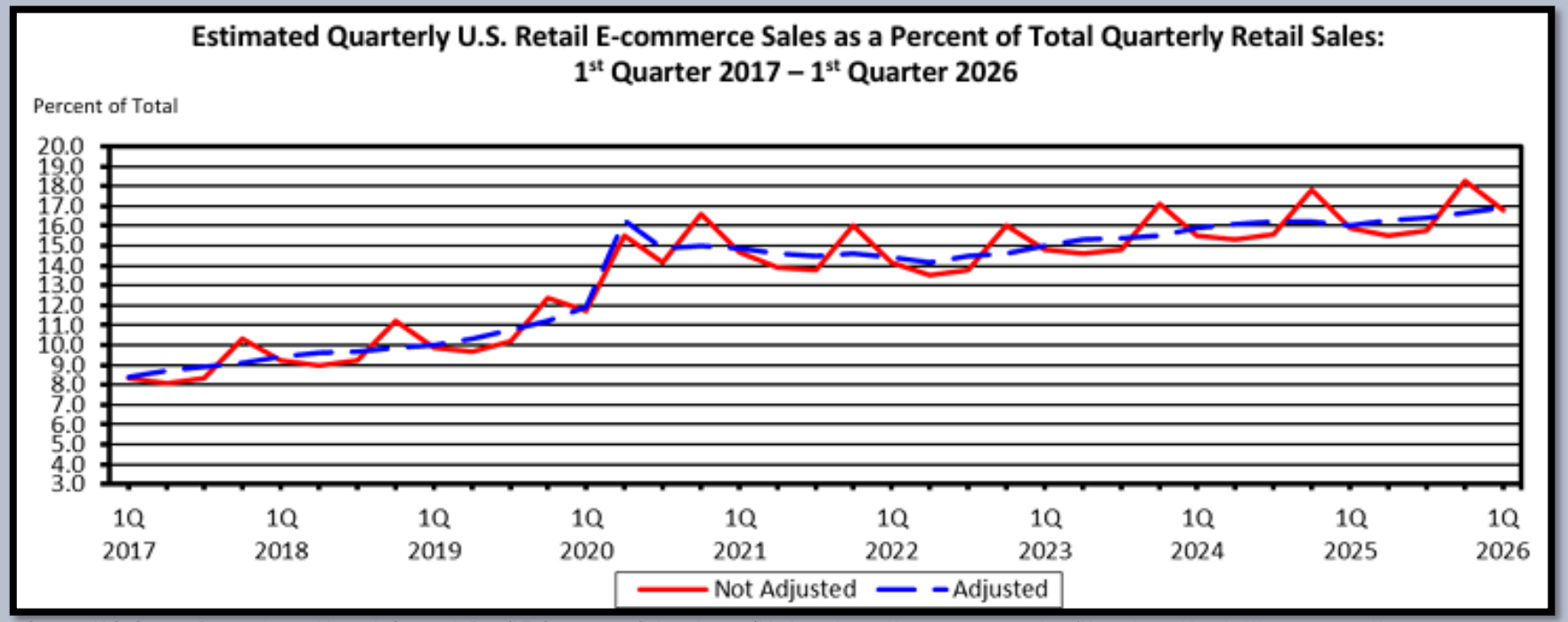
Branislav Dimitrijevic, Associate Professor, NJIT
Alison Conway, Professor, CCNY

Freight Initiatives Committee Meeting

August 17, 2026

NJTPA NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

E-Commerce Growth



Source: U.S. Census Bureau (2026, May 18). Quarterly Retail E-Commerce Sales. Accessible from: https://www.census.gov/retail/mrts/www/data/pdf/ec_current.pdf.

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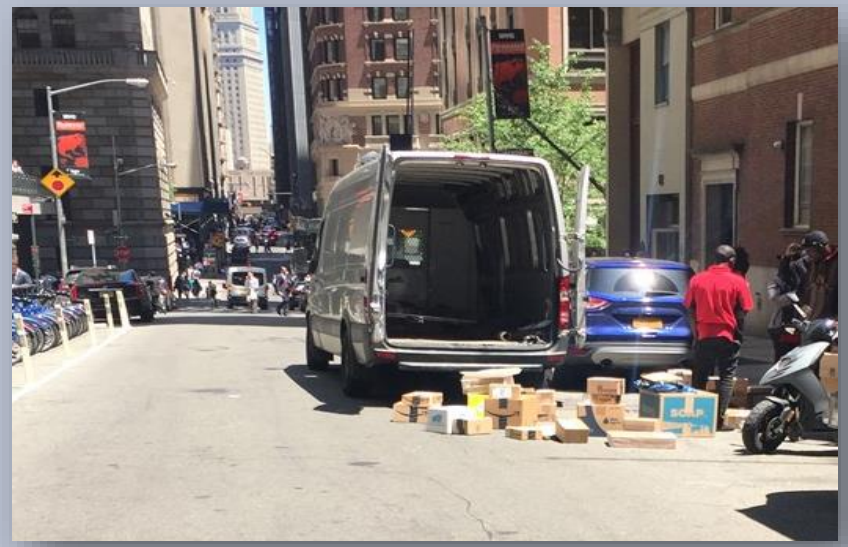
Challenges

- Urban (Street) Congestion
  - Compromised mobility
  - Compromised traffic safety
  - Compromised air quality (due to engine idling and low-speed circulation)
- Inefficient, unsafe, inappropriate use of curb space
- Inefficient freight/delivery operations
- Quality of life issues and deteriorating convenience of urban living



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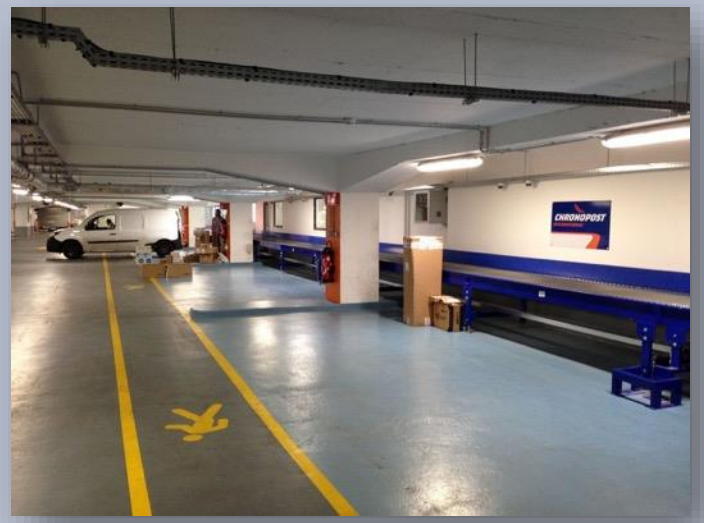
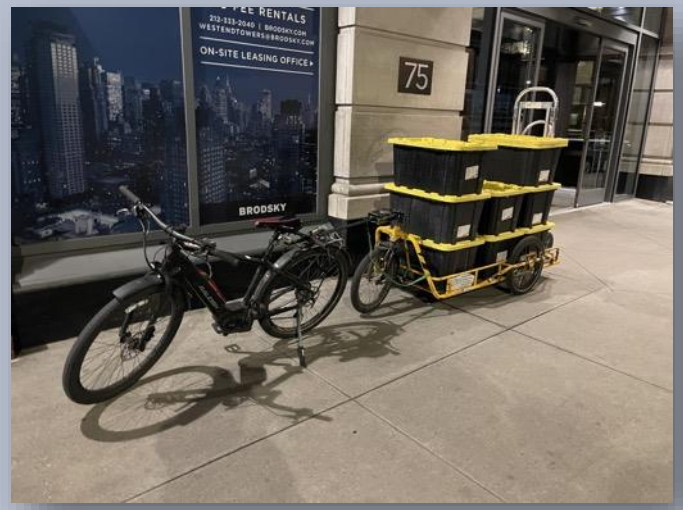
Mitigation Strategies

On-street micro-hubs



Off-street micro-hubs

Parcel lockers



Curb management

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NJTPA E-Commerce Delivery Mitigation Study

Objectives

1. **Review and document the best practices**
2. **Identify and describe strategies** for addressing specific challenges and problems
3. **Locate areas where mitigation strategies may be successful**
4. **Develop a concept and an actionable plan** for deployment of optimal e-commerce mitigation strategies

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Study Work Plan (Tasks)

Task 1: Technical Advisory Committee (TAC) and Outreach

Task 2: Project Management

Task 3: Best Practices Review

Task 4: Evaluate the Existing Conditions and Identify Locales for Urban Freight Delivery System Implementation

Task 5: E-commerce Mitigation Strategies and Initial Stakeholder Outreach

Task 6: E-commerce Delivery Mitigation Strategy Concept

Task 7: Study Synthesis and Final Report

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Best Practice Review

Factors of Interest

- Solution types
  - Infrastructure characteristics
  - Commodity characteristics
  - Vehicle types
  - Business models
- Market areas
- Built environments
- Regulatory environments
- Stakeholders and stakeholder roles
- Performance metrics
- Success factors
- Barriers to implementation

Planned activities:

- Review of US and international case studies
  - Agency reports
  - Academic studies
- Stakeholder interviews

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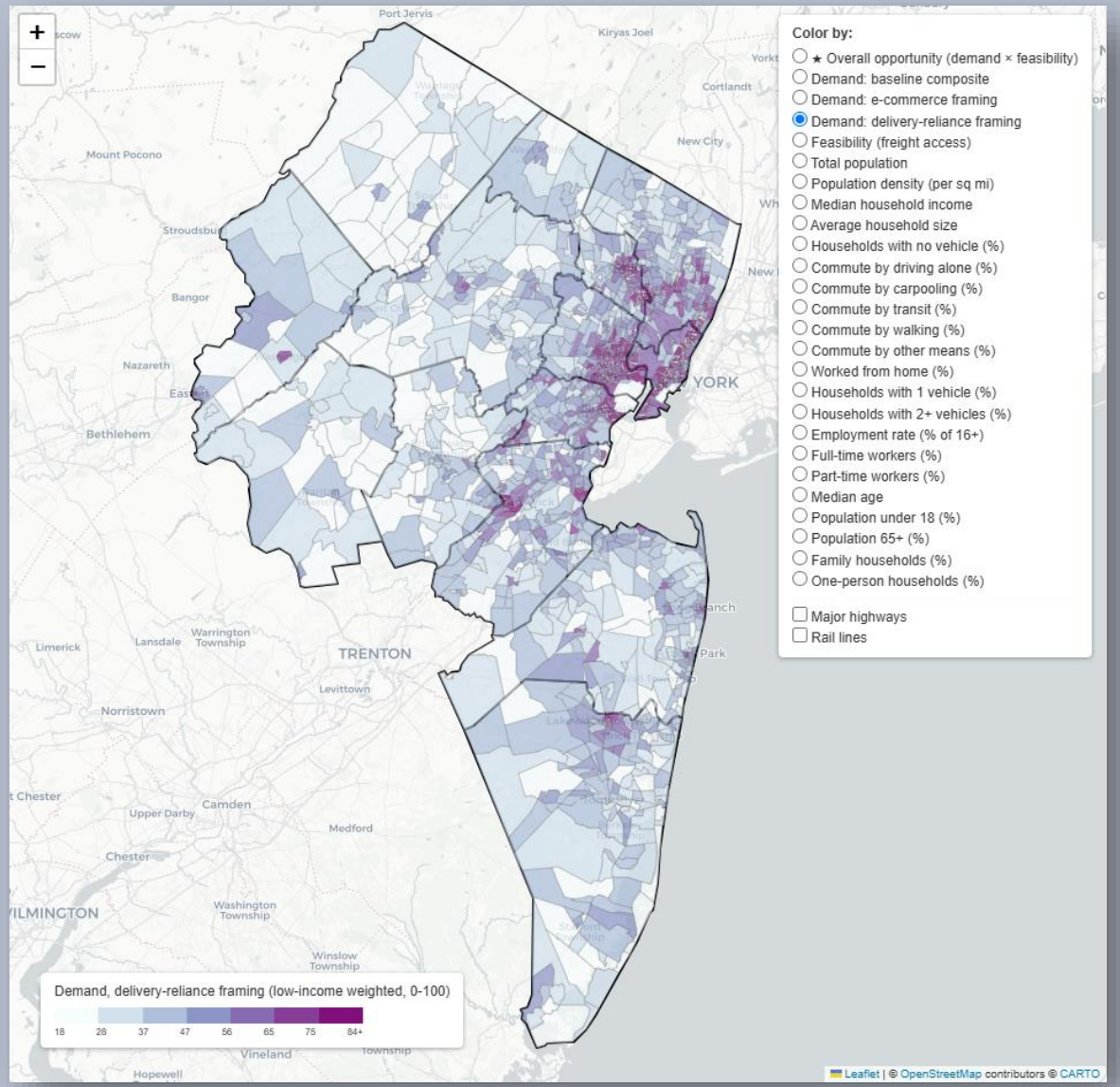
Data-Driven Analysis and Prioritization

- Identify high-priority areas for mitigation
- Data sources
  - US Census products
  - Geotab Data and Altitude Platform
  - Nielsen IQ
  - LOCUS Truck Data



Wolfowitz, A., M. Dodd, and F. Rezapour Fardin (2026). Preliminary Demand Investigation Map. Data: Source: 2024 American Community Survey.

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Stakeholder Engagement

- Technical Advisory Committee (TAC) and Outreach (Task 1)
- Best Practice Review (Task 3) – Interviews with organizations that have implemented e-commerce delivery management strategies (e.g., facility/micro-hub operators, delivery service providers, vehicle manufacturers, public agencies)
- Strategy Development Stakeholder Outreach (Task 4)
  - Local community outreach – get input on the existing conditions and feedback on potential strategies.
  - E-commerce parcel delivery operators and support technology service providers – existing challenges and feasible/preferred solutions.
- E-commerce Delivery Mitigation Strategy Concept (Task 6) – Conduct proposed concept review meetings with municipalities and/or local community representatives in proposed priority areas.

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Study Schedule

Task	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
1. TAC/Outreach																		
2. Project Management																		
3. Best Practice Review																		
4. Location Evaluation																		
5. Strategy Identification																		
6. Concept Development																		
7. Synthesis/Final Report																		

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Thank you!

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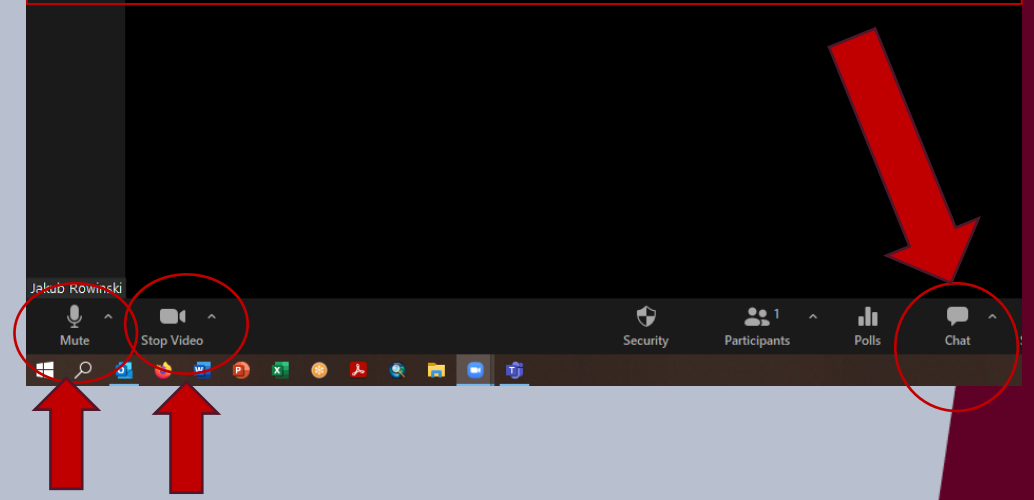
Defining the Vision. Shaping the Future.

August Freight Initiatives Committee

Please use the Chat box to ask questions during the presentations and if requesting credits, please post your name and email, followed by either AICP or PE with your NJ PE license number



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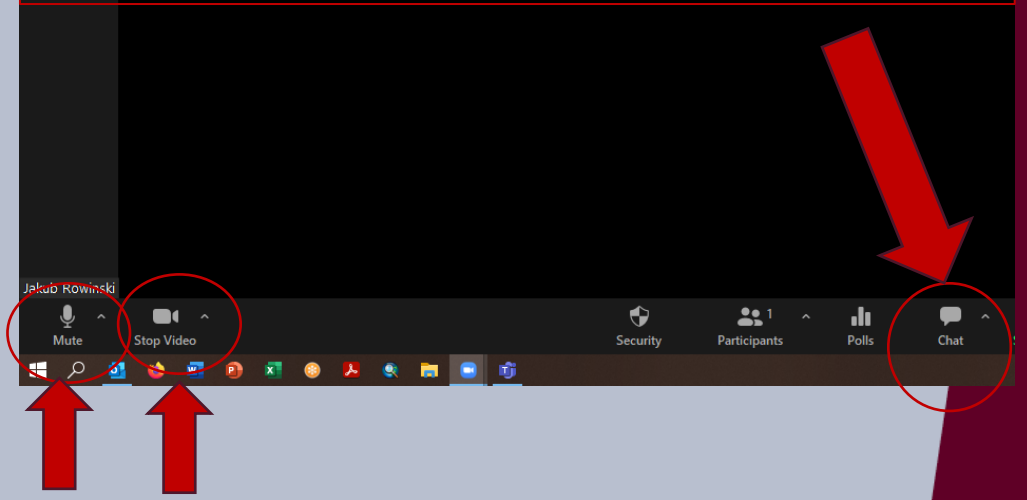
August 17 Freight Initiatives Committee Agenda

- Roll Call
- Approval of Minutes
- Update on NJTPA Freight Division Activities
- Presentations: Urban Delivery Strategies
- Two-Minute Reports on Freight Activities from Committee Members
- Next Meeting: Monday, October 19, 2026
- Adjournment

Please use the Chat box to ask questions during the presentations and if requesting credits, please post your name and email, followed by either AICP or PE with your NJ PE license number



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