Summing Things Up (2014-2018): What Has Our Research Uncovered?

McMASTER INSTITUTE FOR TRANSPORTATION & LOGISTICS

November 29, 2018

Our Principal Investigator

- Professor Pavlos Kanaroglou (1948-2016)
- Founding Director, MITL
- Tier 1 Canada Research Chair in Spatial Analysis (2001-2015)
- Director, Centre for Spatial Analysis

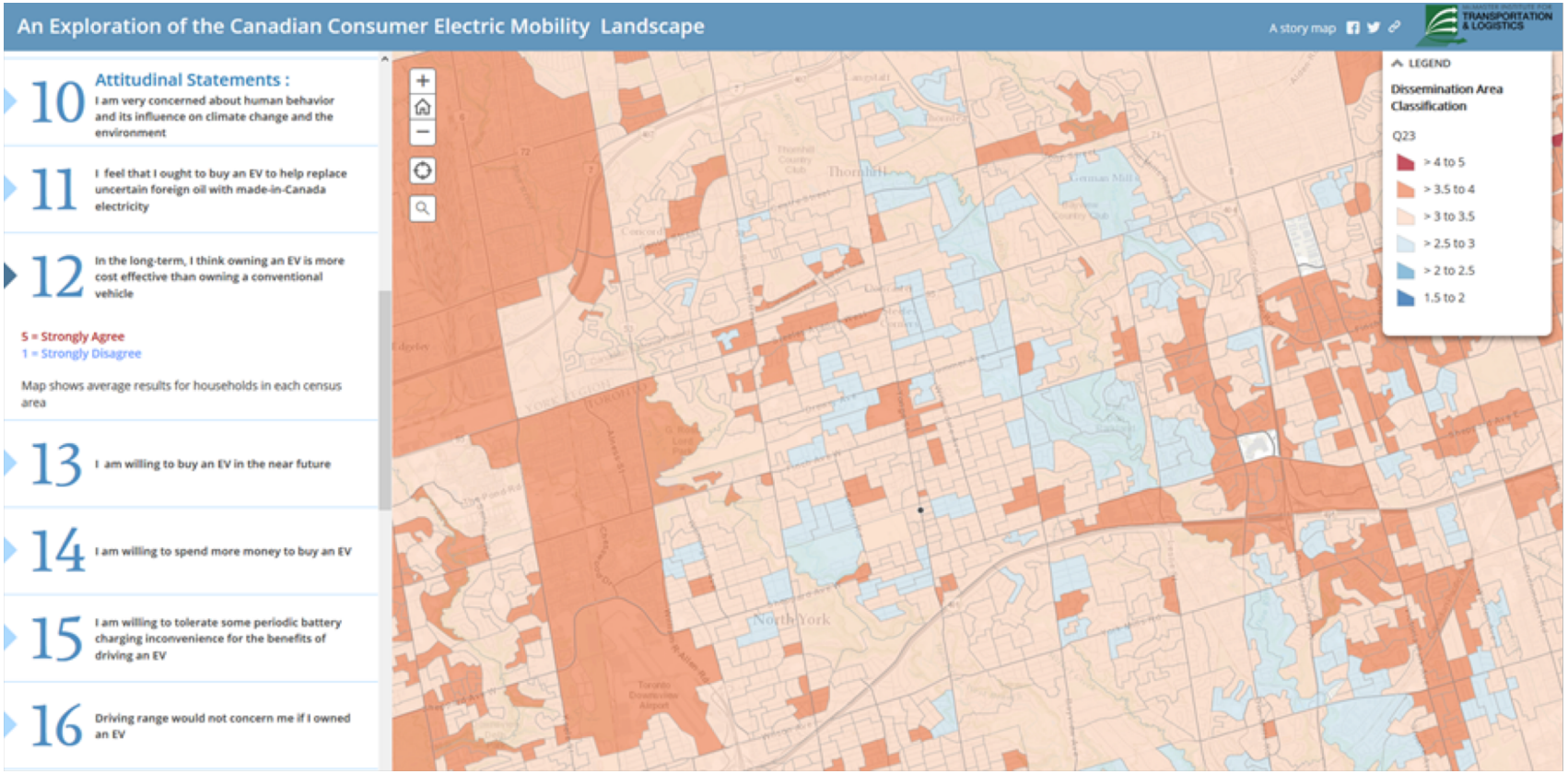
Outline

- Review of Our Primary Data Collection Efforts
- On the progression of electric mobility in Canada
- The Geography of EV-Relevant Attitudes and Other Factors
- Accomplishments, Highlights and Implications

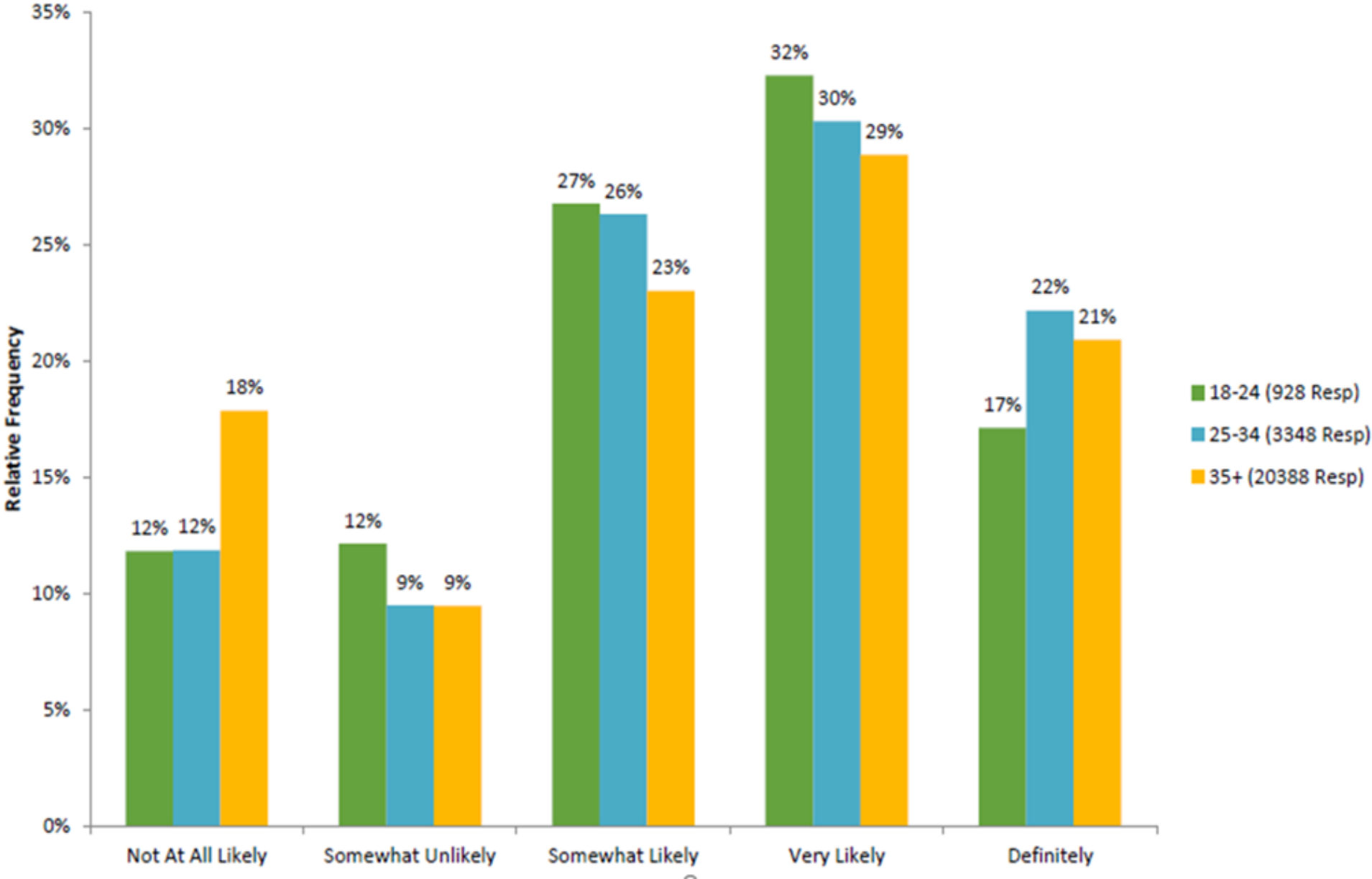
Primary Data Collection

- 2 National, large-scale consumer surveys (2015 and 2018)
- A distinct data collection effort with EV owners associations (2018)
- 1 National survey of businesses, non-profits and government agencies for fleets (early 2017)
- An additional consumer survey capturing EV implications for rental fleets (2015)
- A cross-national tour at the municipal level to interview public transit entities (2015)

Online Tool to Explore Survey Results for Any Small Area in Canada

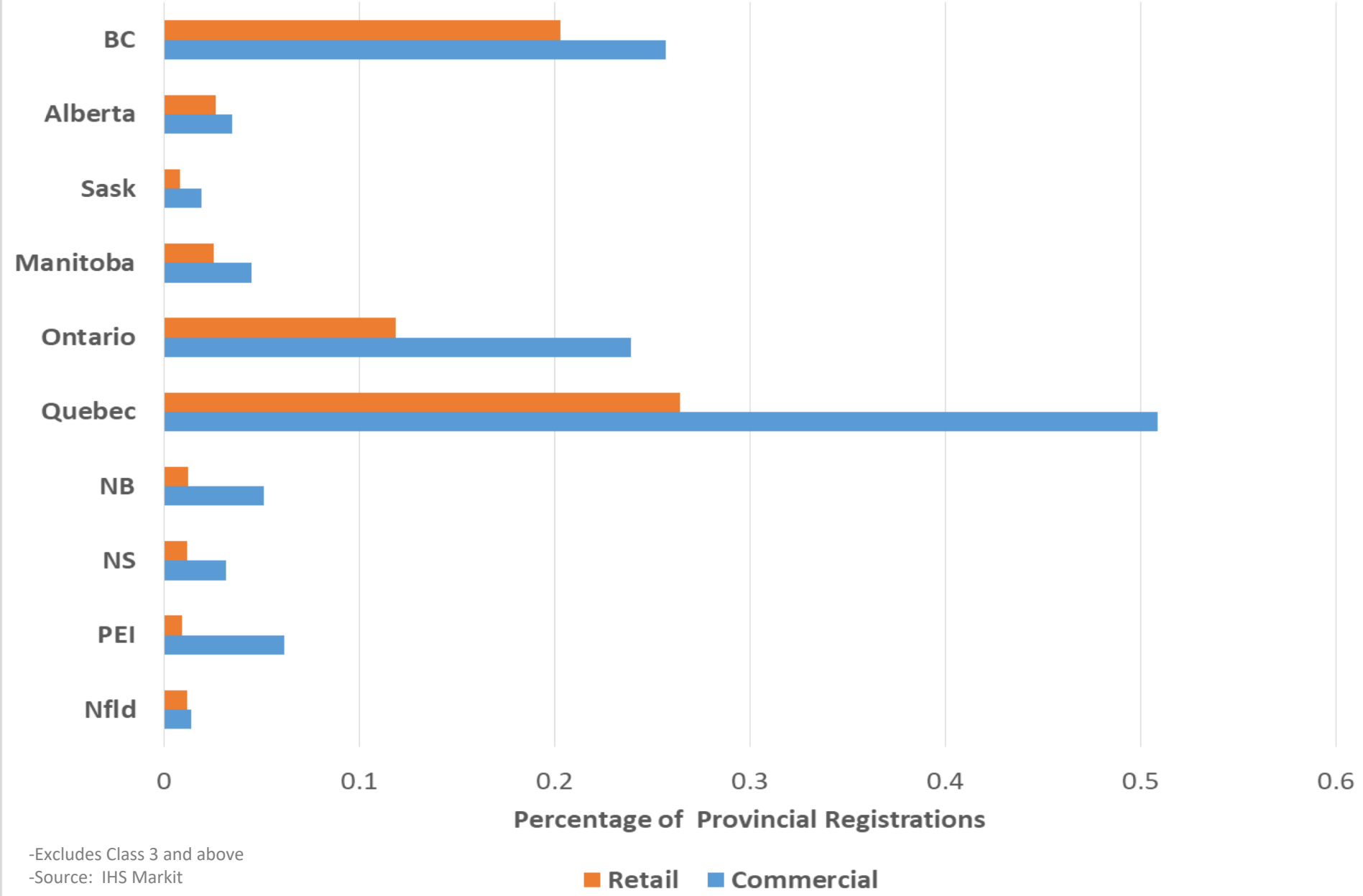


Are young people likely to acquire vehicles in the future?



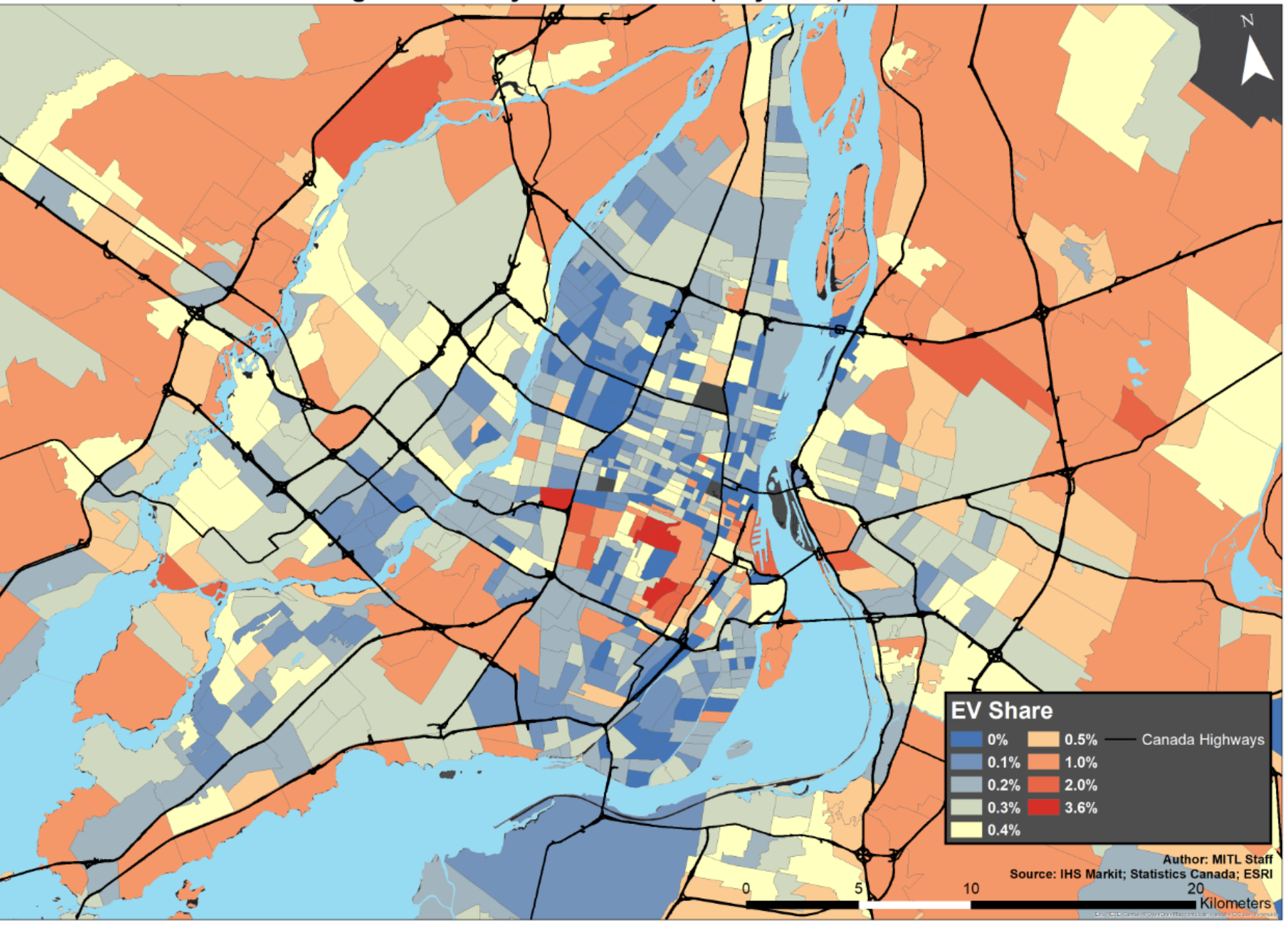
The Progression of Electric Mobility in Canada

Plug-In Vehicles as a Percentage of Retail/Commercial Registrations (July 2017)

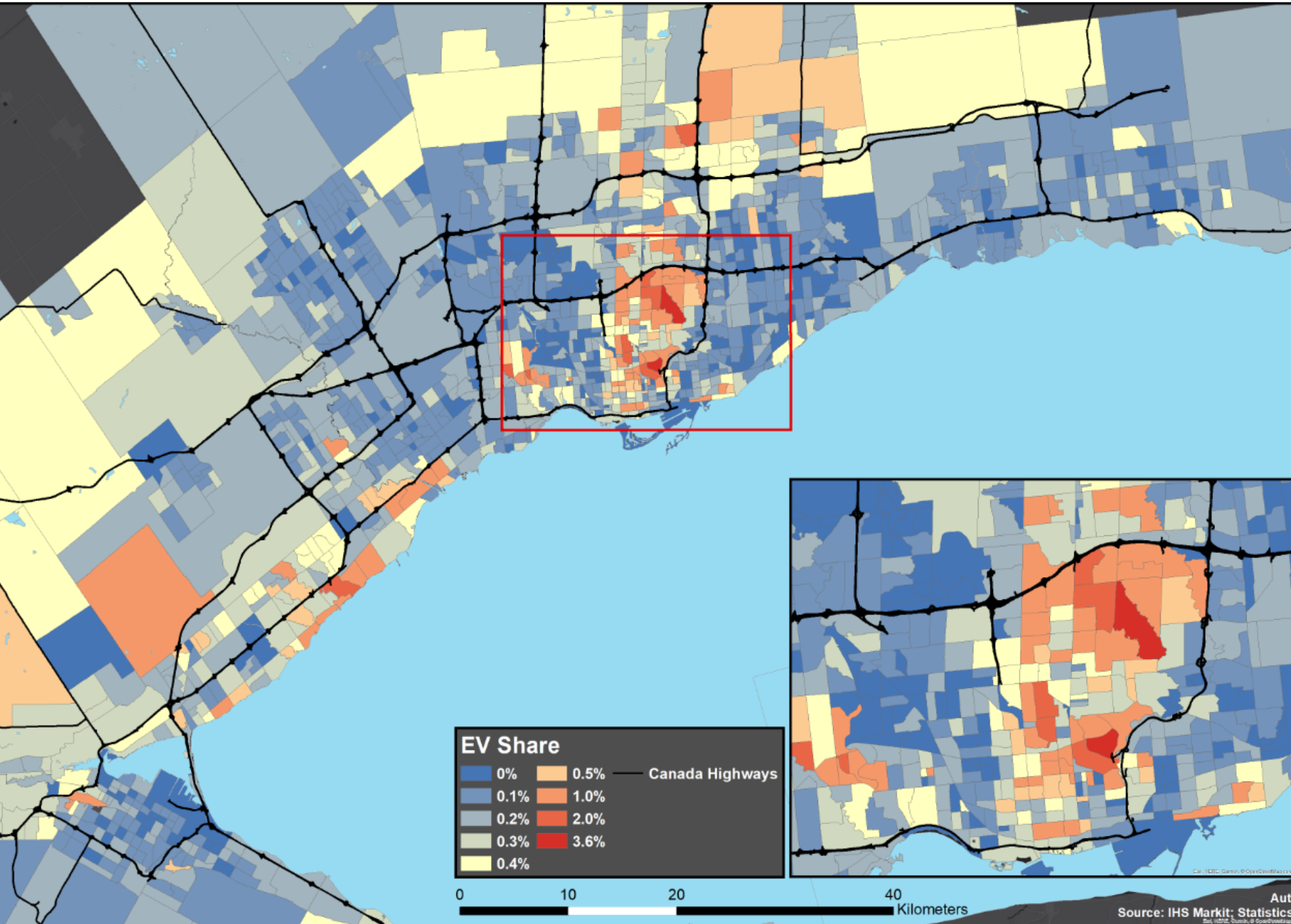


-Excludes Class 3 and above
-Source: IHS Markit

EV Share of Total Retail Registrations by Census Tract (July 2017) -- Greater Montreal

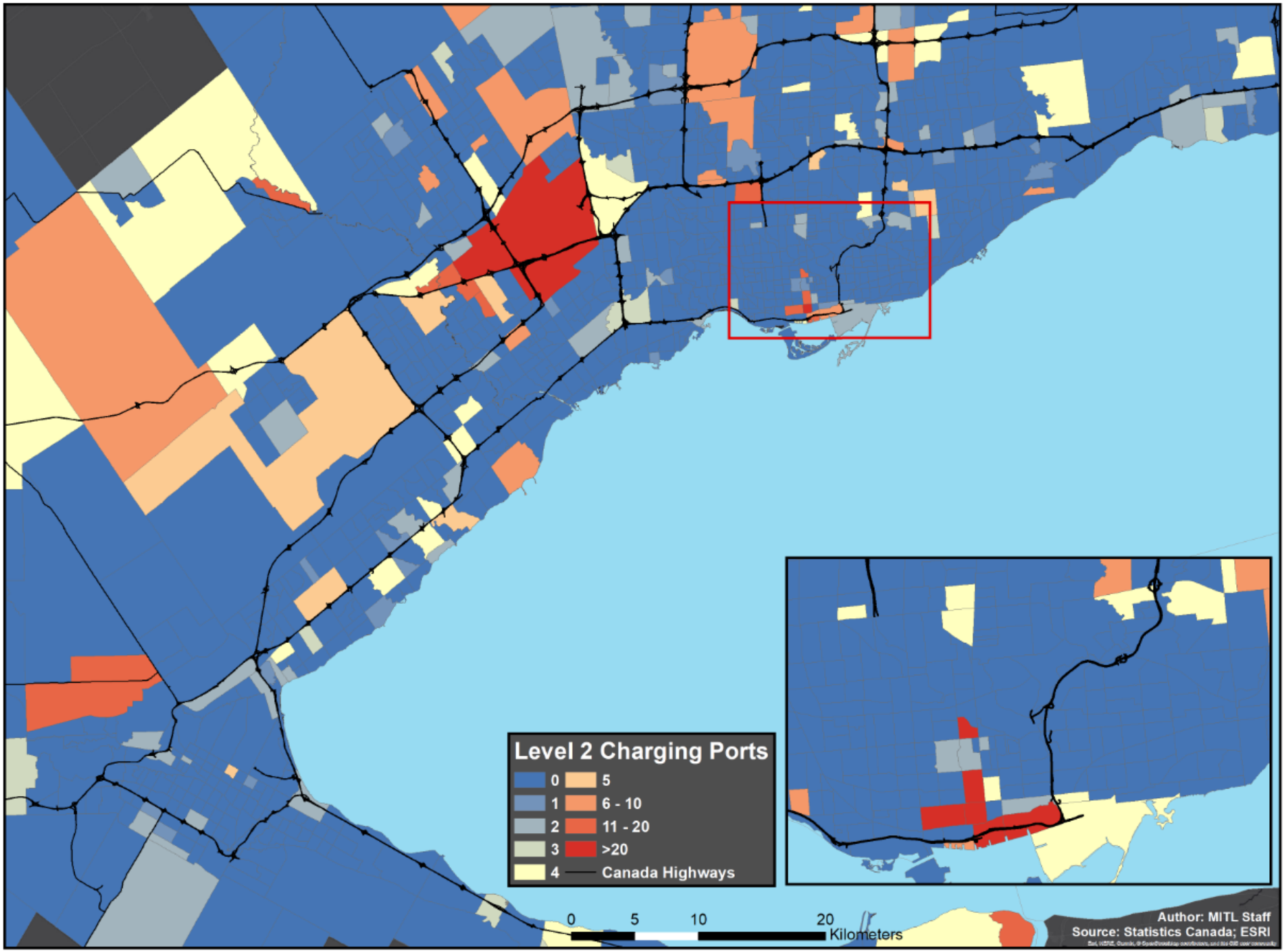


EV Share of Total Retail Registrations by Census Tract (July 2017) -- GTHA

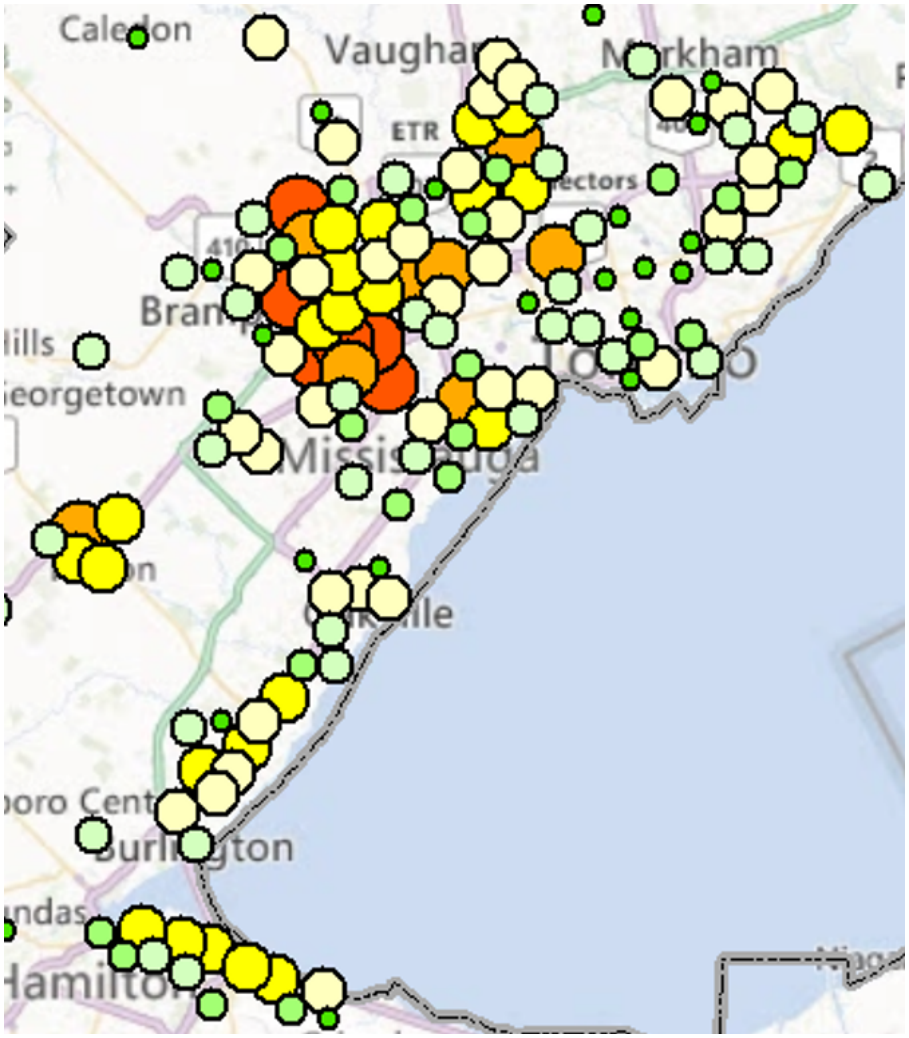


Source: IHS Markit; Statistics

Level Two Charging Ports - GTHA



Daily Large Truck Trip Originations

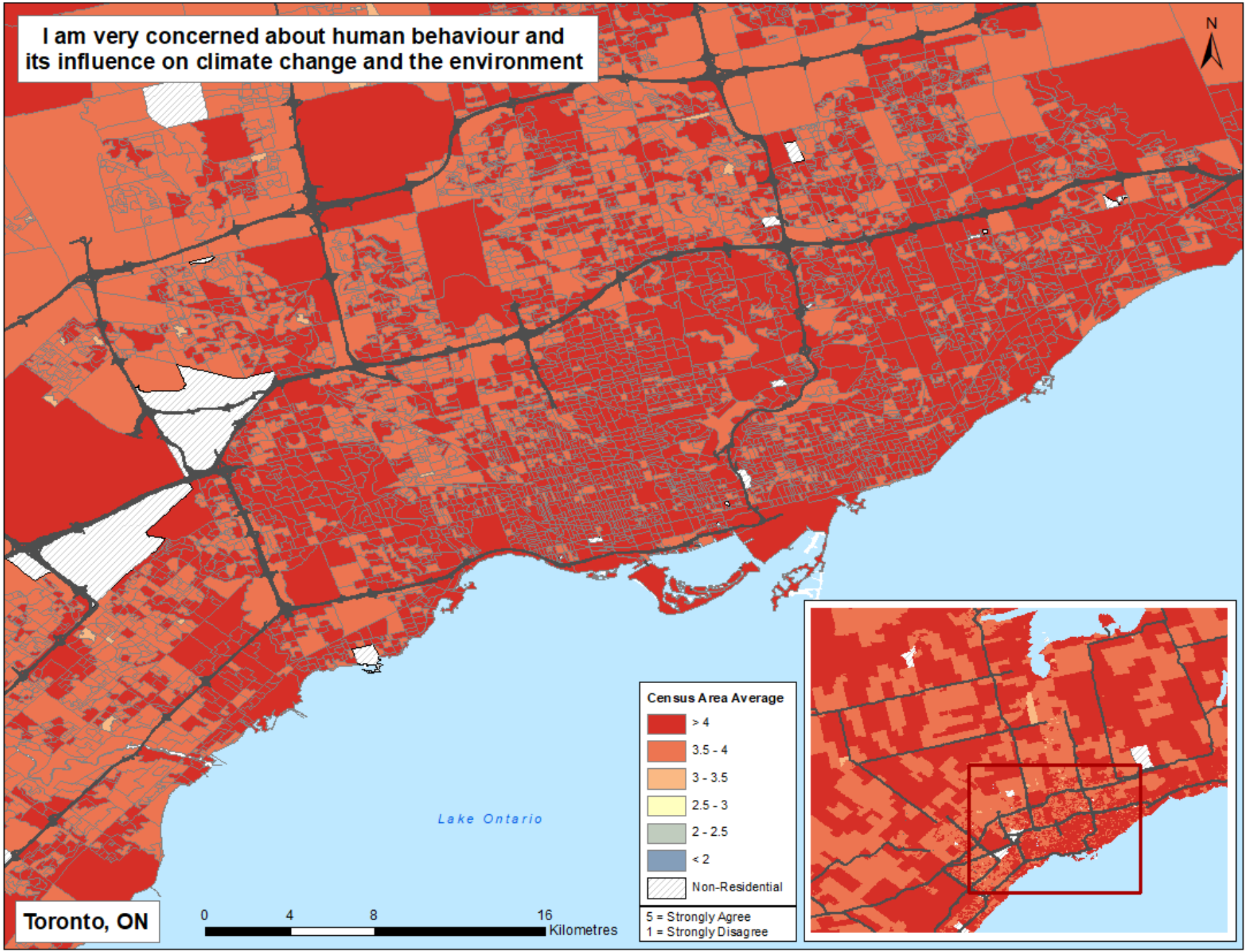


Source: MITL 2014, "Truck Freight Generators and Attractors in the Province of Ontario"

The Geography of EV- Relevant Attitudes and Other Factors

Ranked Attitudinal Statements for Toronto

1. I am very concerned about human behaviour and its influence on climate change and the environment
2. Plugging In an EV at my home is not practical
3. I am willing to tolerate some periodic battery charging inconvenience for the benefits of driving an EV
4. I am willing to spend more money to buy an EV
5. Driving Range would not concern me if I owned an EV
6. I already know several locations where I could plug in if I had an EV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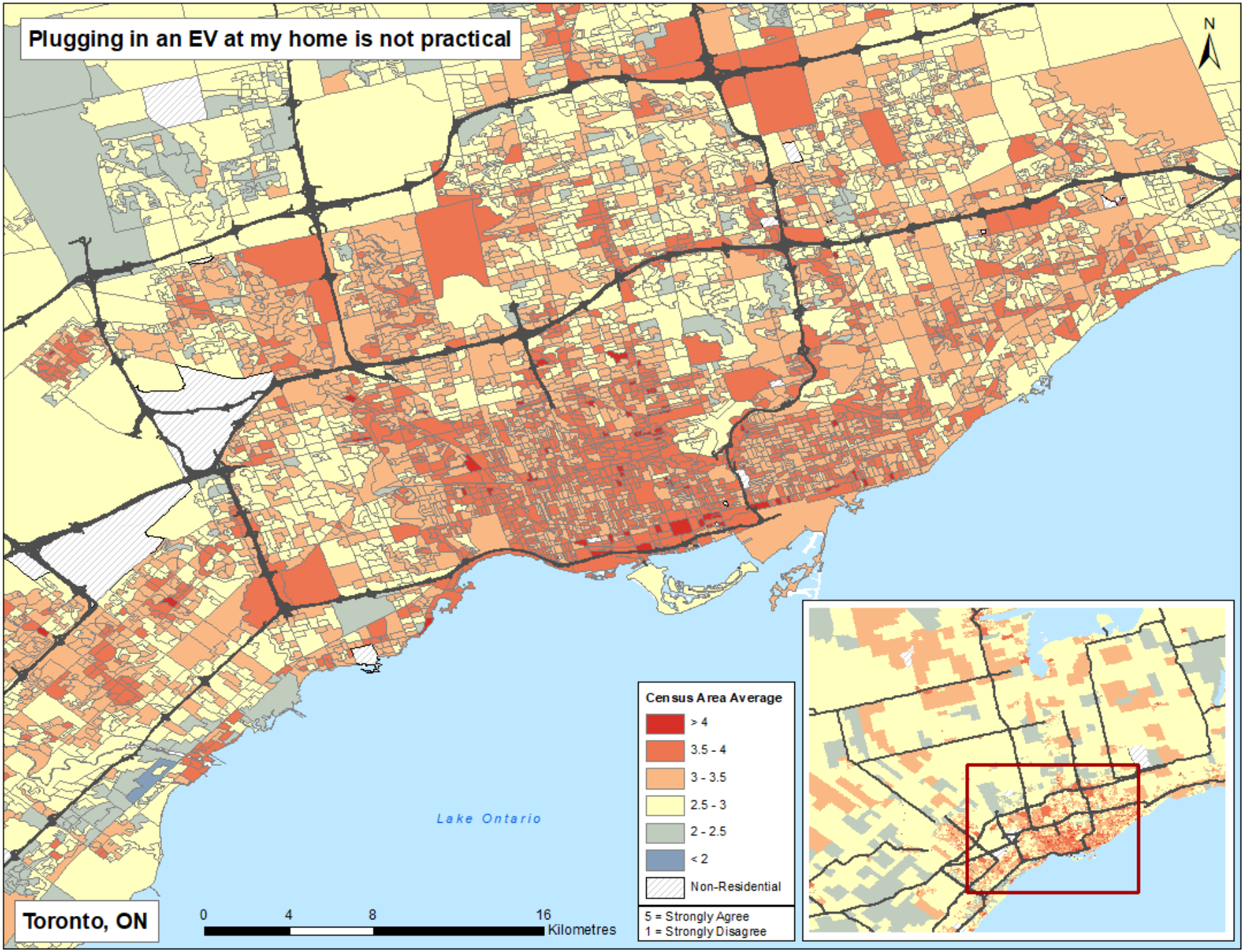
N
Lake Ontario
Census Area Average
> 4
3.5 - 4
3 - 3.5
2.5 - 3
2 - 2.5
< 2
Non-Residential
5 = Strongly Agree
1 = Strongly Disagree
Toronto, ON
0
4
8
16
Kilometres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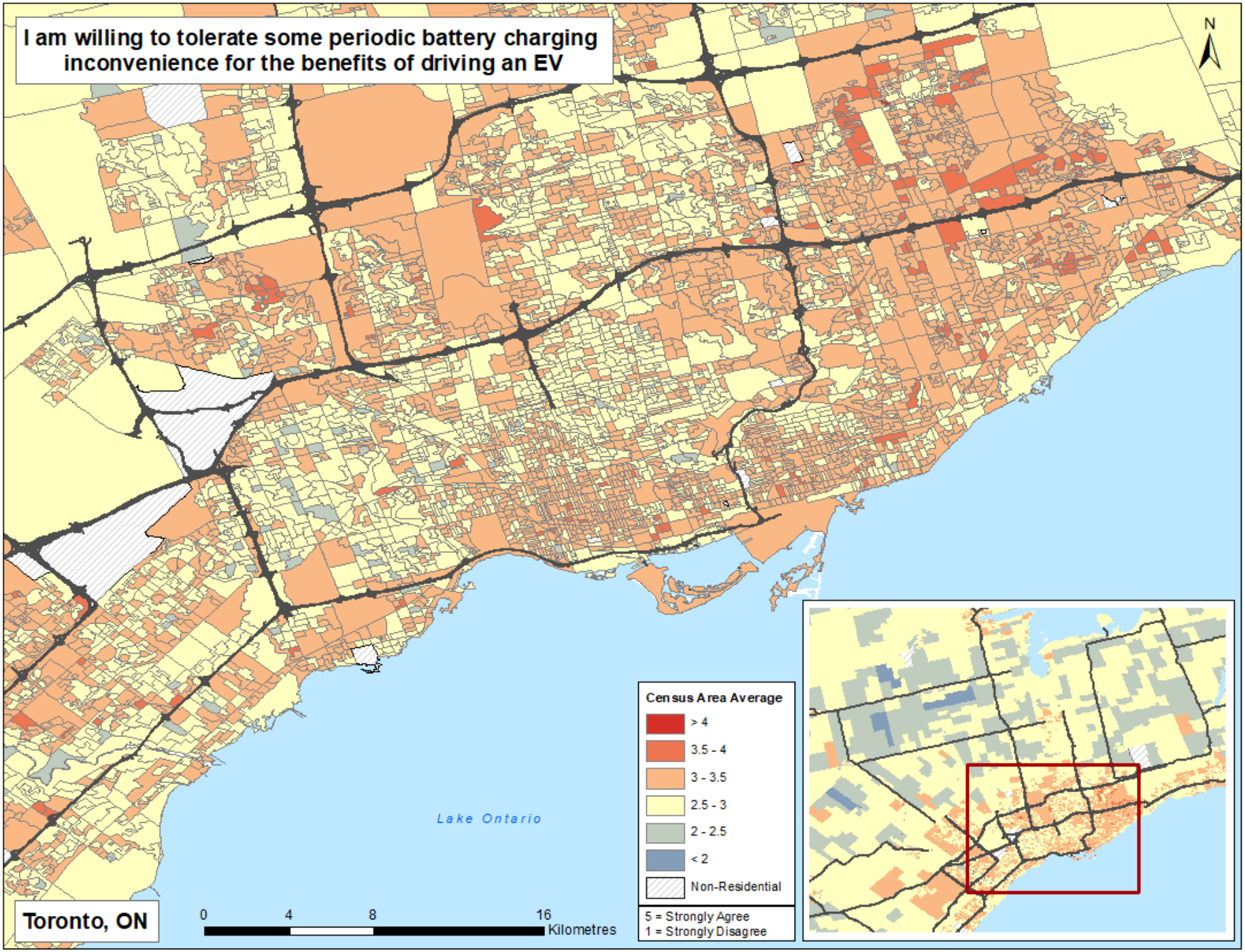
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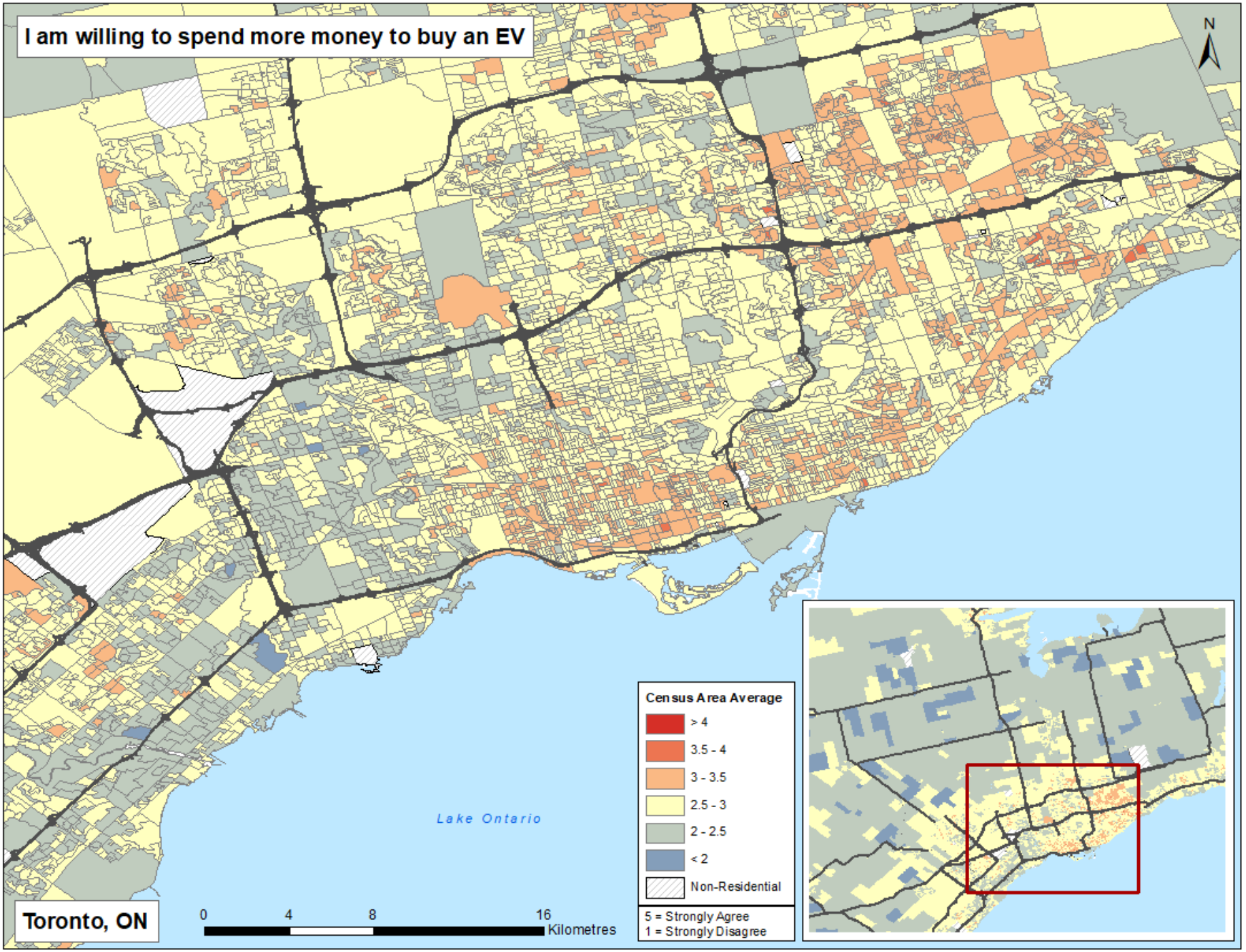
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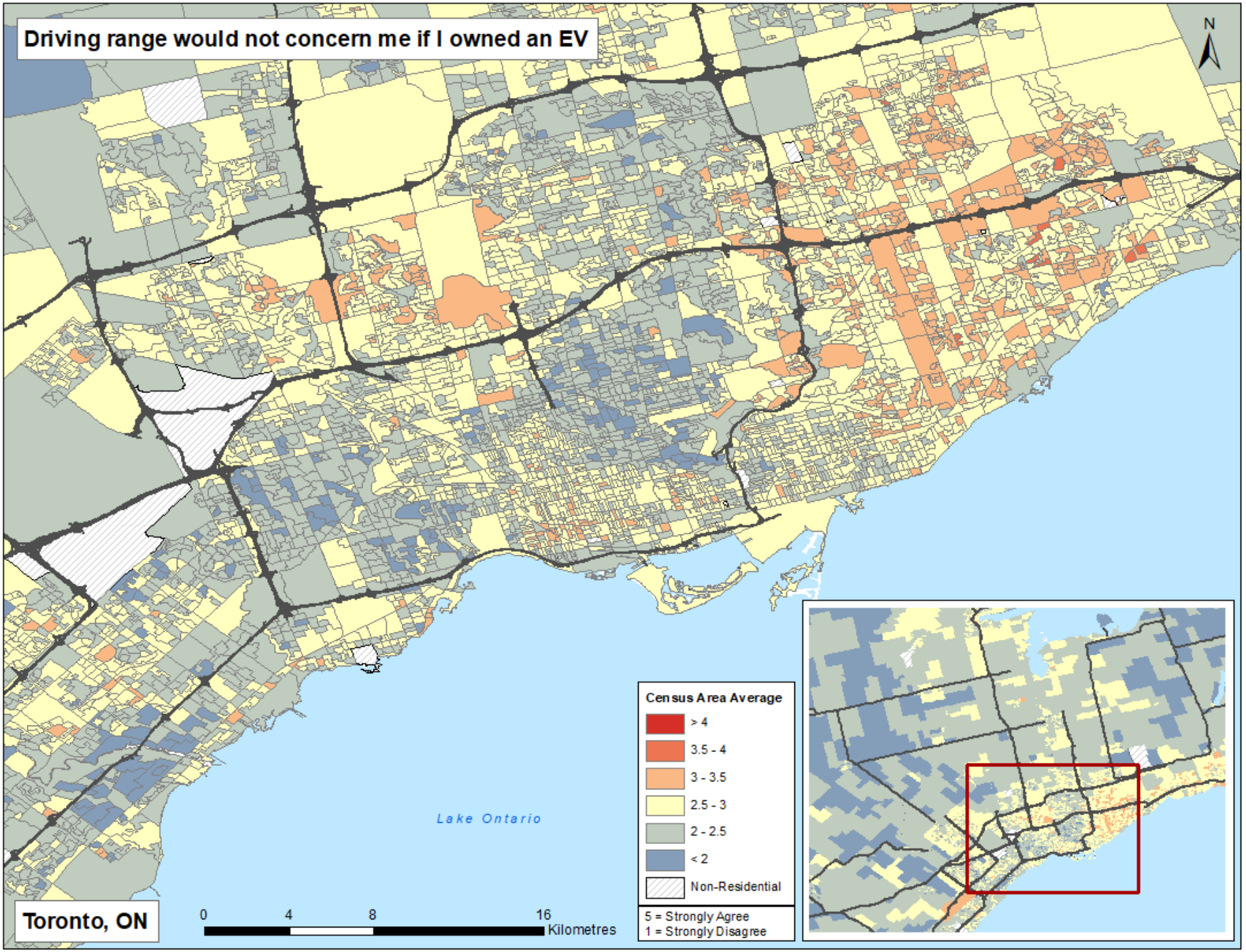
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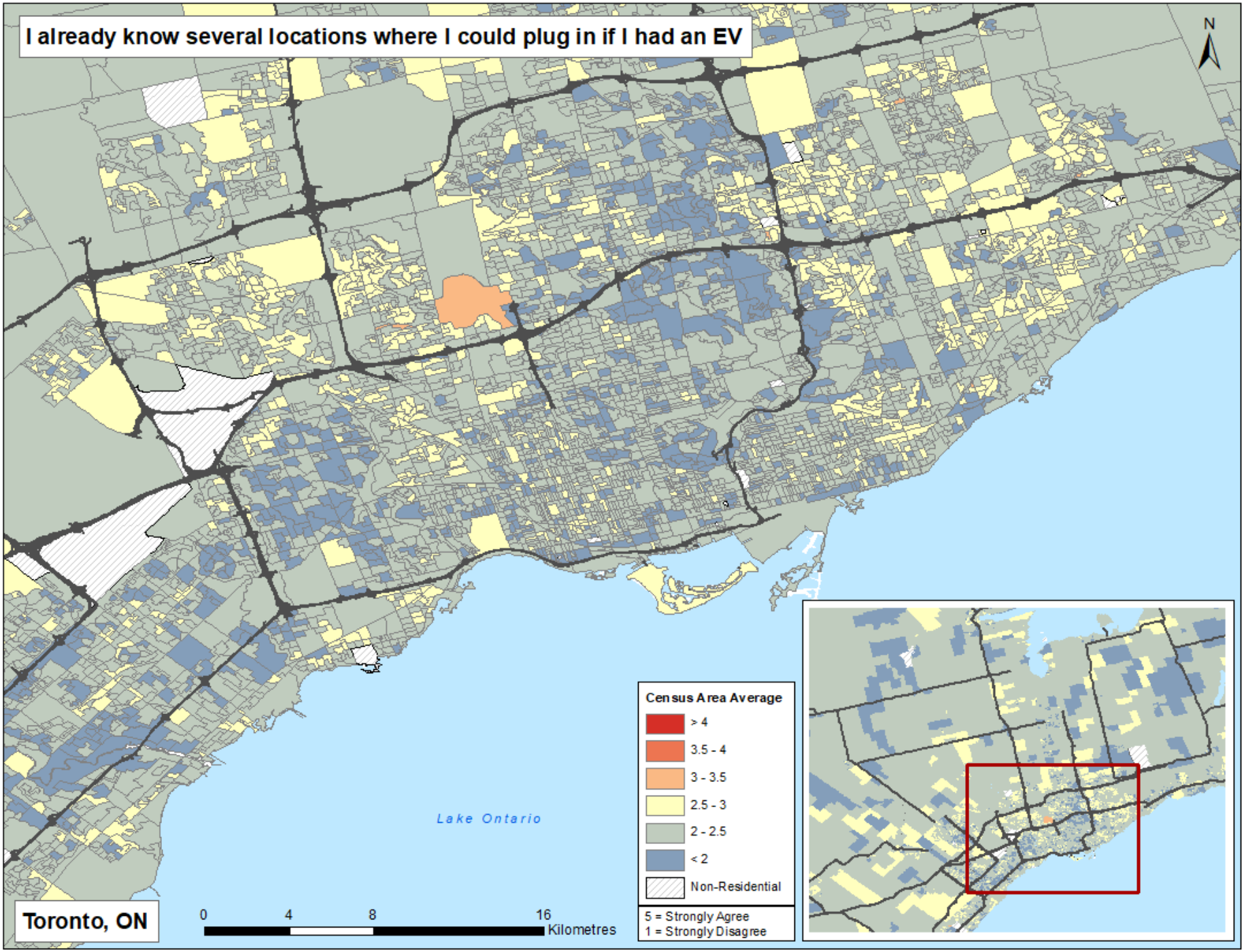
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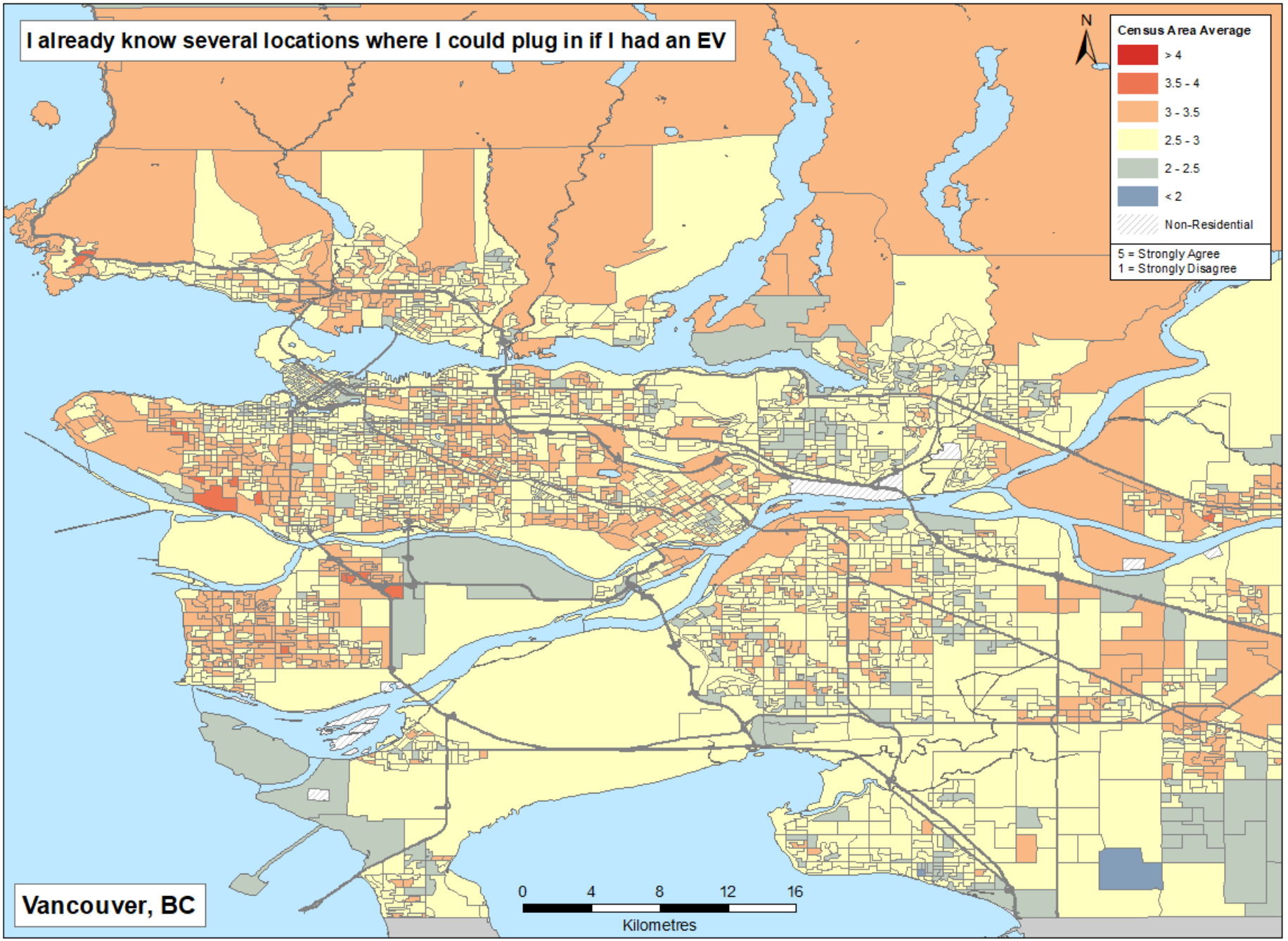
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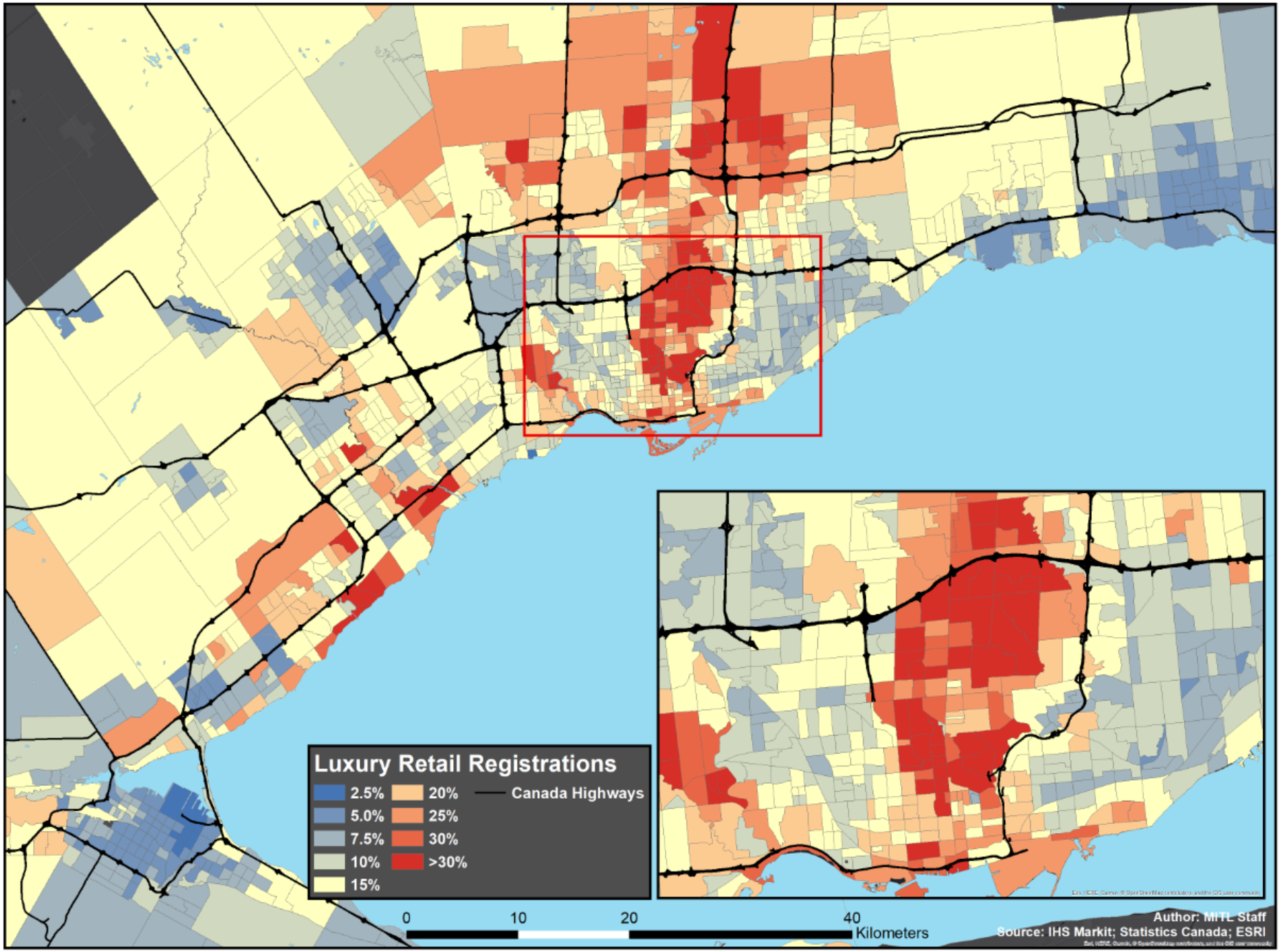
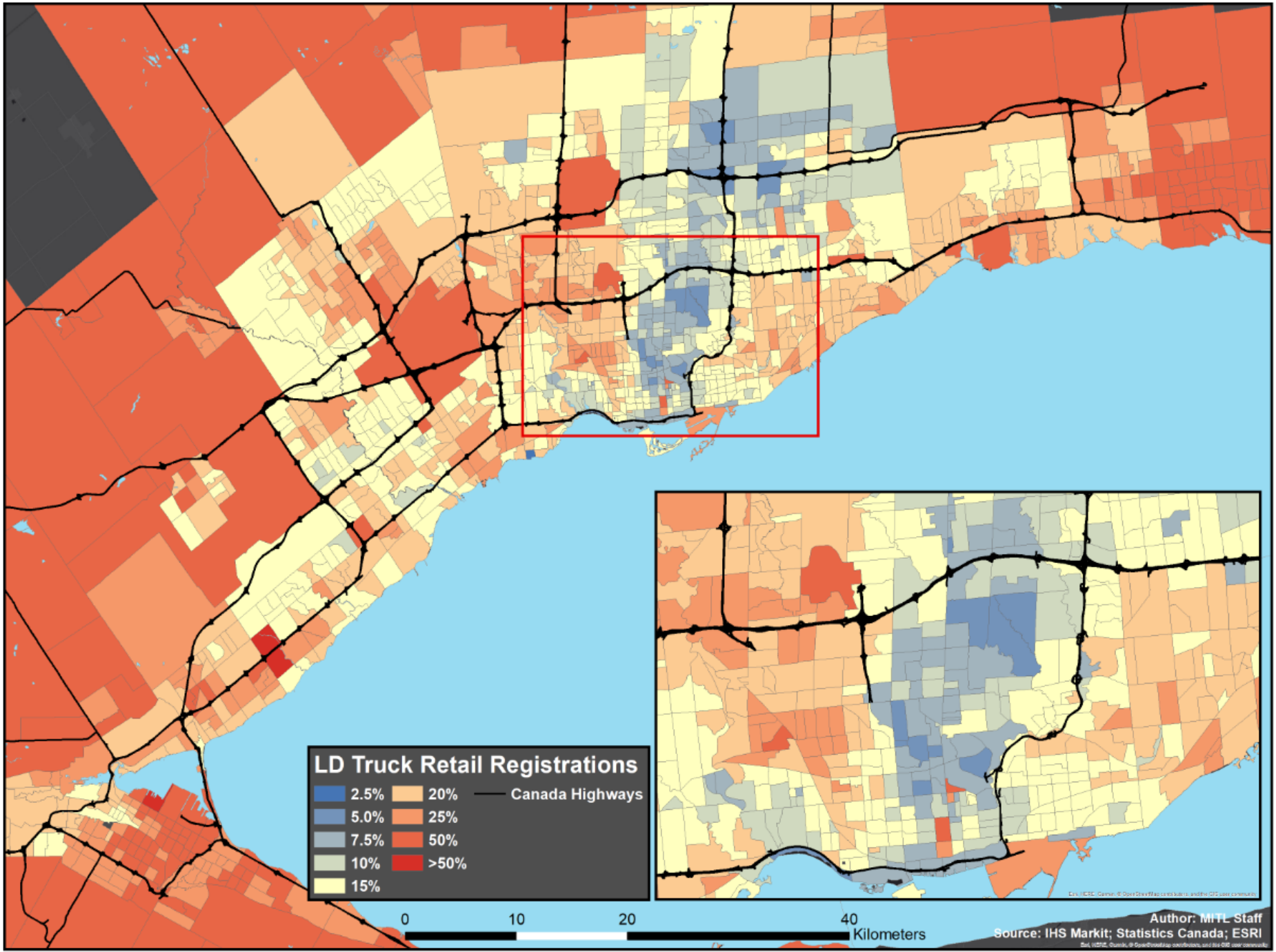
8
12
16
Kilometres

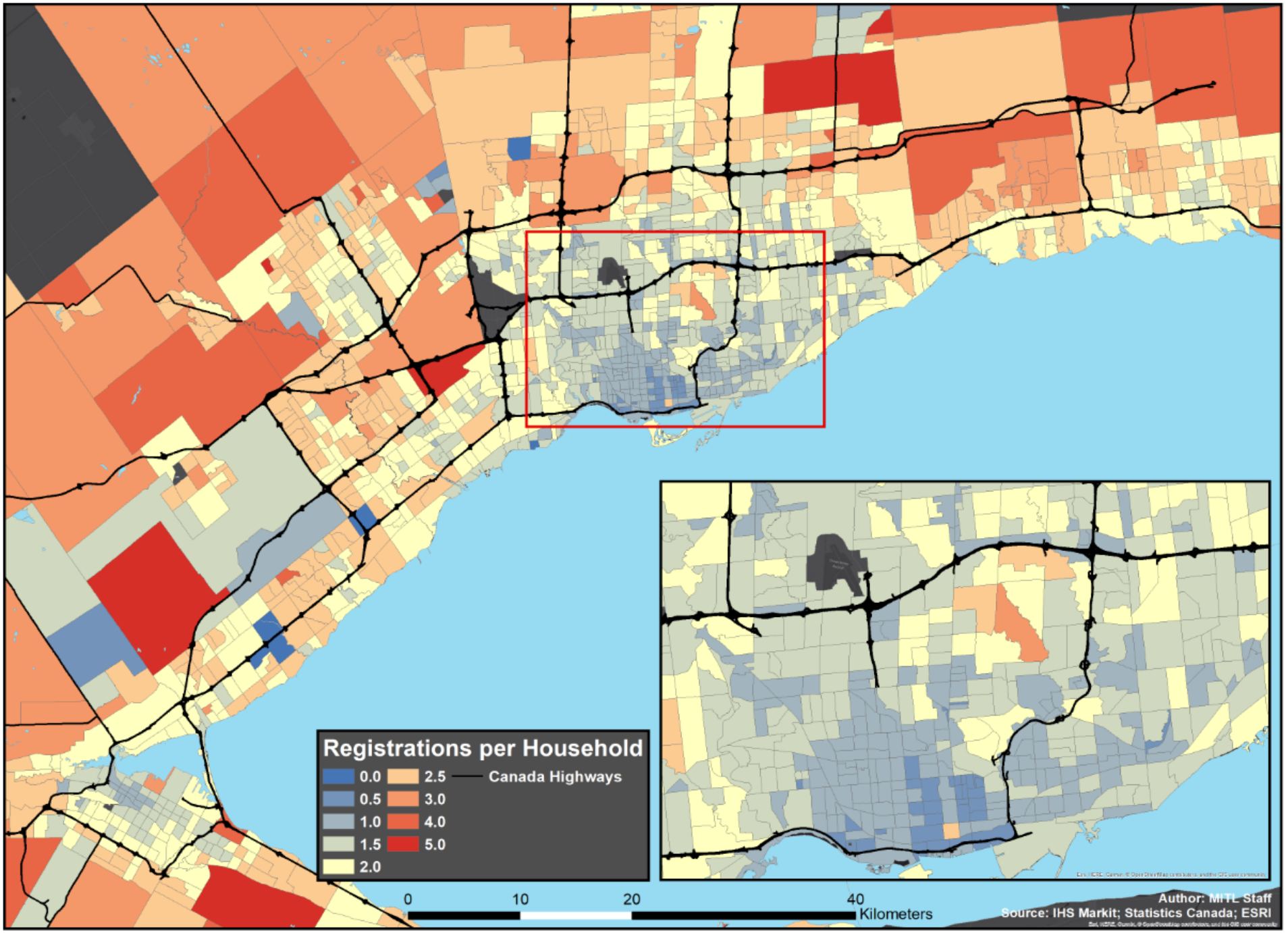
Leading Luxury Makes as a Share of Retail Registrations - GTHA



Leading Light Duty Truck Makes as a Share of Retail Registrations - GTHA



Retail Registrations per Household - GTHA



Accomplishments, Highlights and Implications

Peer Reviewed Articles

- Consumer/Geodemographic
  - 5 published, 2 under review and more to come based on 2018 survey
- Public Transit (3 published)
- Environmental (3 published)
- Fleet (1 published and more expected)
- Charging Station Optimization (1 published and another expected)
- The 15th article should come soon
- An upcoming book will focus on integration (Editors: Arain, Ferguson, Mohamed and Kubursi)

Highly Qualified Personnel (HQP)

- 4 post-doctoral fellows have contributed and 3 of these are now in tenure-track positions
- 1 post-doc started recently
- 2 PhDs are being developed, one defends shortly and 1 will complete part-time
- 5 Master's Level students (3 have completed and 2 will defend in 2019)
- Many other undergrad, Co-op, and MITL-employed students have participated

Overview of Modules

Some Project Highlights

- **"Actor" Modules**
  - Openness to EVs and attitude shifts toward EVs
  - Luxury car buyers: High WTP for incentives
  - Incentive Discounting and especially for fleets
  - The "guinea pig syndrome" in e-bus context
  - Age anxiety versus Range anxiety
  - A "demographic transition" to clean vehicles
  - Urban-rural patterns, diffusion processes and characterization by leading/lagging regions
- **"Implications" Modules**
  - Net positive economic impacts in early stages of transition to EVs
  - Incentives and their role to accelerate paybacks
  - The importance of leveraging Canada's clean generation profile
  - Vehicular emissions and ties to climate change and localized health impacts
  - Linking owners survey to quantify/map charging events for network optimization

Generating Awareness

- More targeted messaging
  - By age
  - By geography
  - Clarifying on driving range/charging infrastructure
  - Emphasize that hybrids (HEVs) don't go "far enough" in reducing emissions and neither do cleaner ICE
  - Canada's clean electricity generation
  - Clearing misconceptions
  - On the nature and availability of incentives

Implications

- Clear, long-term signals from government are desirable so that actors can decide
  - Consistency of incentives outweighs their "size"
- An overall strategy backed by an array of tactics (carrots and some sticks) will communicate the message to the actors
- EVs/ZEVs are a powerful, long-term trend with wide and significant implications
  - this is not VHS versus Beta video players
- There are significant geographic discrepancies so a more prominent federal role would be helpful
- There is a clear diffusion process at play so seeing EVs on the road matters
- The contributions of other organizations to increase awareness are also highly important

Future Research

- Electrification such a prominent aspect in future transportation technologies and business models
  - self-driving vehicles, connected vehicles, ride sharing and others
- Will use this work as a springboard to examine these other aspects:
  - A confluence of many new trends coming together
- What will be the implications for Canadian society?
  - Land uses and the interplay with transport
  - Where people live and work
  - Economic, Environmental and Social
  - Relief from Metropolitan Traffic and Freight Congestion?