Insights for Enhancing Urban Freight Accessibility

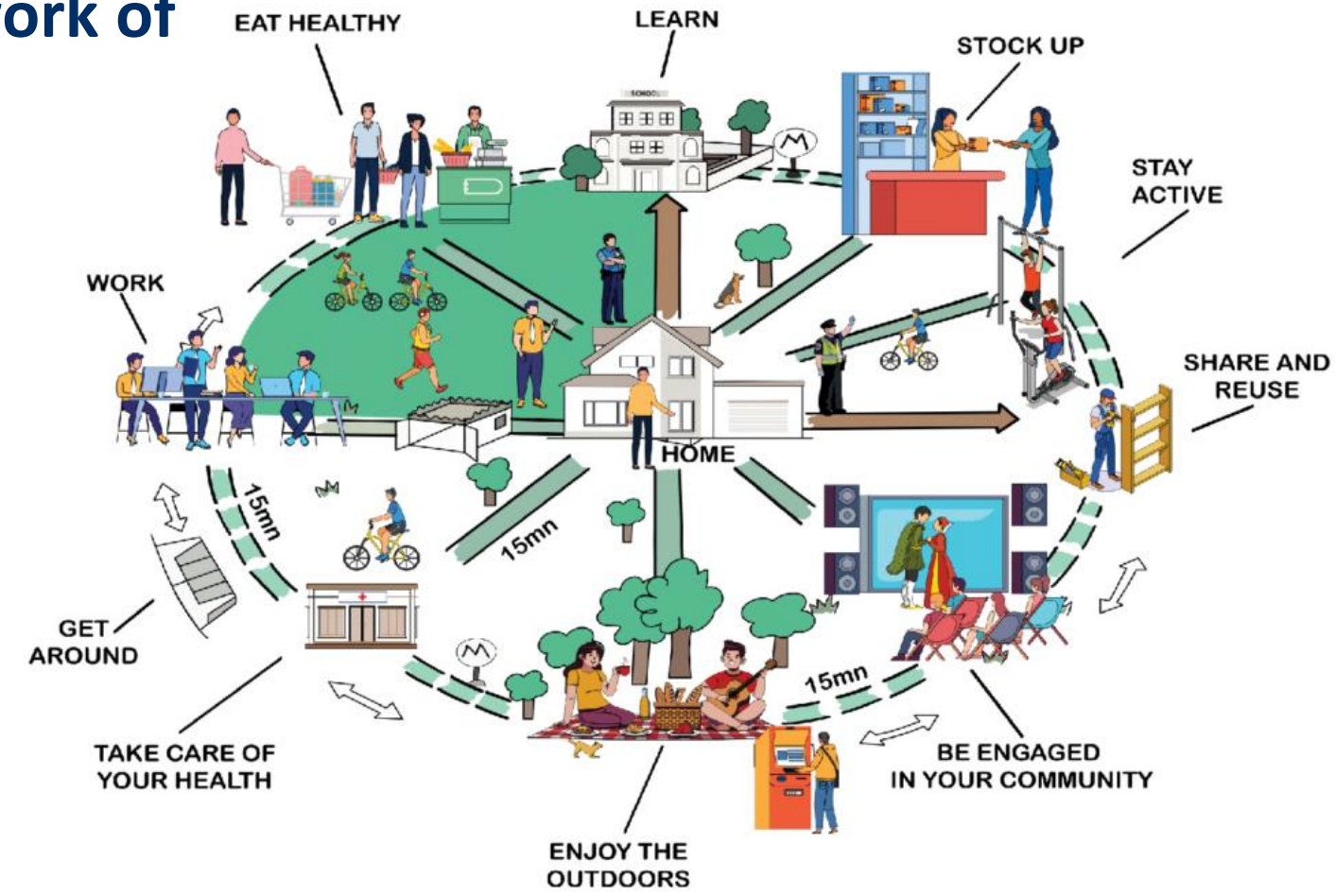
Julia Amaral, Joris Beckers, Carlos Rivera-Gonzalez

Postdoctoral Researcher

University of Antwerp

Goal and Content

- **Goal: contribute to logistics discussions within the framework of the 15-minute city concept**
- **Content:**
  - Mobility-Logistics (MoLo) hubs
  - Freight accessibility framework



MoLo Hubs

People-Centric Mobility & Logistics Hubs

- **EU-funded transnational project, tackling challenges related to urban mobility and logistics**

MoLo Hubs LinkedIn

Objectives

- MoLo Hubs aims to integrate and explore synergies between mobility and logistics services
- Make logistics services more attractive and user-friendly by offering them where users are
- Make mobility hubs more attractive by increasing their range of functions

Impact

- Better services for local communities
- Contribution to the mobility transition and reduction of car use and emissions
- Reduction of urban freight transport and emissions
- Create solutions that support low-car/car-free urban development

MoLo Hubs Pilots

- **Pilots will be conducted in five cities:**
  - Aalborg (Denmark)
  - Amsterdam (Nederlands)
  - Borås (Sweden)
  - Hamburg (Germany)
  - Mechelen (Belgium)
- **The pilots aim to improve:**
  - Waste collection
  - Package delivery/pickup
  - Service trips

Image © CoMoUK

Waste Collection Pilot

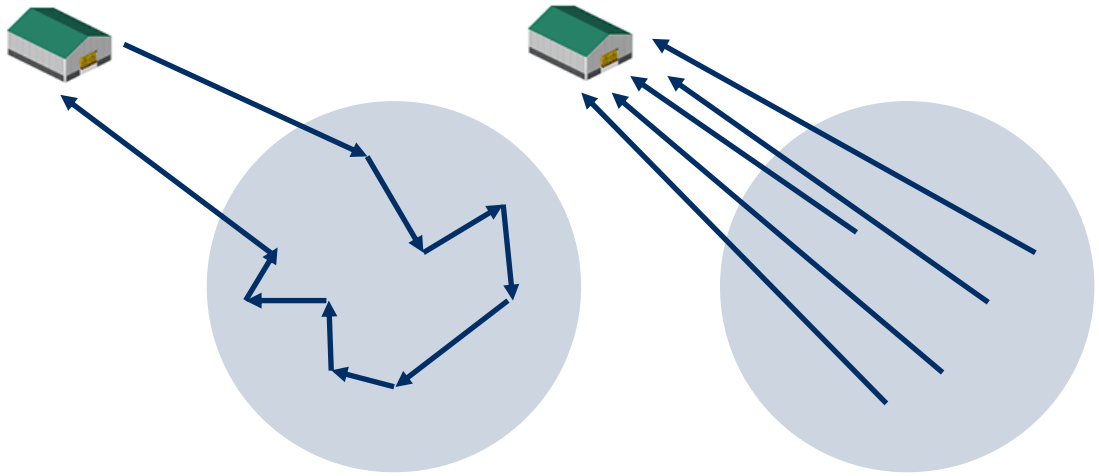
- **Challenge: hazardous waste collection is currently handled by household collection (causing waste truck traffic in residential areas) or centralized recycling yards in industrial areas (causing car traffic)**
- **Possible solution: neighborhood collection points at mobility hubs as an intermediate solution between collection at source and recycling yards**

Example of a collection point:

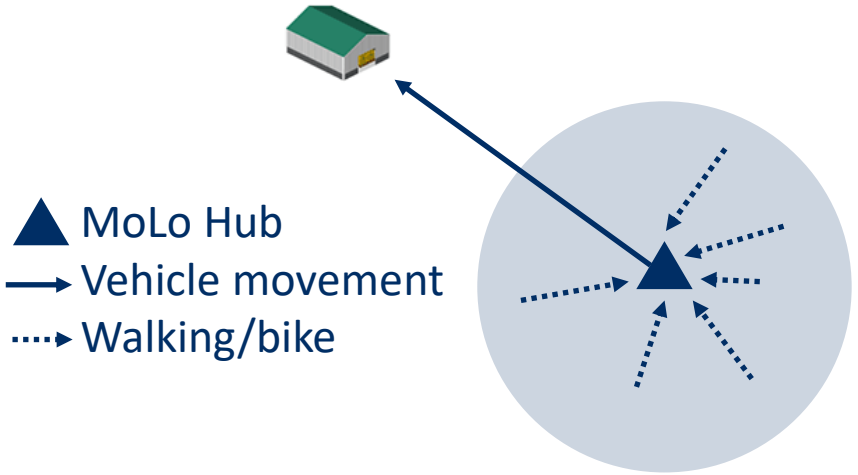
(up to 14 different waste types,
up to 120l capacity per compartment,
specially protected compartments
for specific waste types)

Benefits of the Waste Collection Pilot

Status QUO



With MoLo Hub



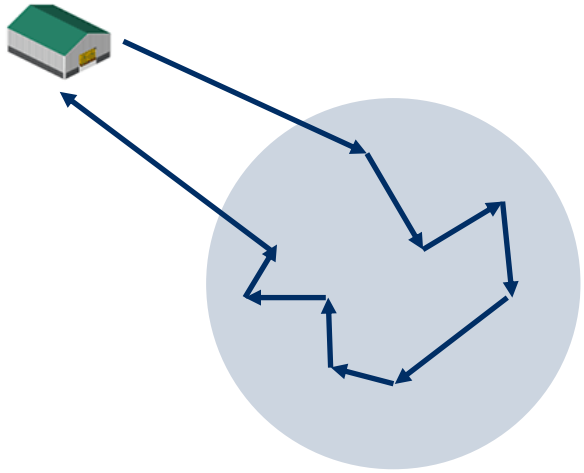
- **Potential benefits:**
  - Reduce VKT (Better traffic, less emissions)
  - Less illegal waste disposal by making the collection site more accessible to citizens

Package Delivery/Pickup Pilot

- **Challenge: the growth of e-commerce increased the demand for packages. Although pickup points are already in place, they might require a dedicated trip from the user to the pickup location.**
- **Possible solution: add delivery lockers to mobility hubs that users already use in their daily lives**

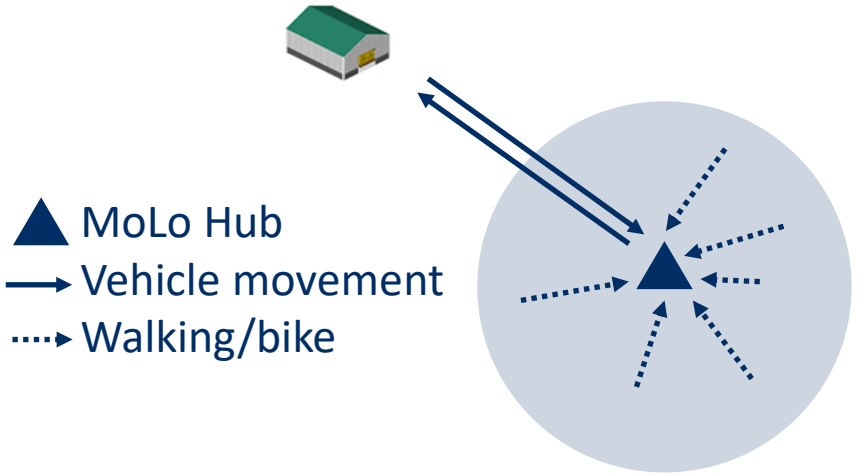
Benefits of the Package Delivery/Pickup Pilot

Status QUO



Household collection

With MoLo Hub



- **Potential benefits:**
  - Make delivery lockers more accessible by putting them next to public transport and shared mobility
  - Reduce VKT (better traffic, less emissions)
  - Reduce the share of failed deliveries
  - Reduce logistic costs

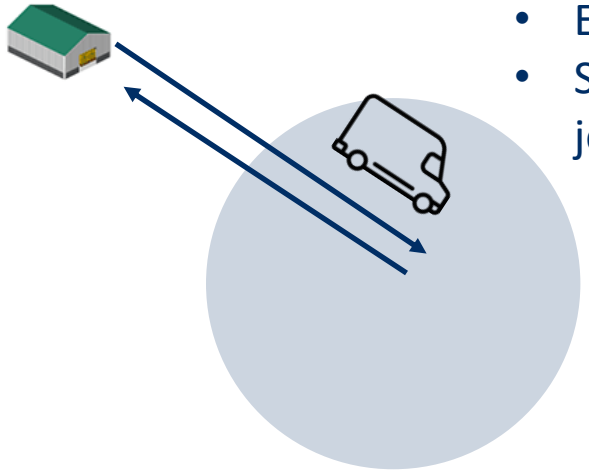
Service Trip Pilot

- **Challenge: service technicians struggle with congestion, lack of parking and high parking costs**
- **Possible solution: Technicians can park their vans in the hubs, utilizing light electric vehicles (e-cargo bikes or e-scooters) to reach their destinations. The hubs also provide secure spaces for storing materials and tools.**

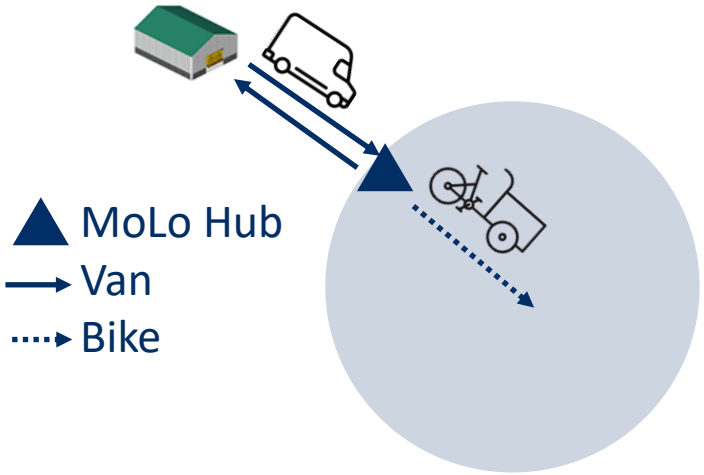
Benefits of the Service Trips Pilot

Status QUO

- Traffic congestion
- Difficult to find parking spot
- Expensive parking
- Service providers started to decline jobs due to lack of access



With MoLo Hub



- **Potential benefits:**
  - Reduce van traffic in the city center (better traffic, less emissions)
  - Reduce the competition for parking space
  - Increase access to service providers
  - Reduce service provider's cost

Freight Accessibility Framework

Freight Accessibility Framework

- **Goal: achieve greener, more compact supply chains**
- **Objectives:**
  - Quantify freight accessibility based on generalized cost of travel between shipper and receivers
  - Provide insights on land use policies and demand management strategies that can reduce externalities of urban freight transportation
- **Publication:**
  - Rivera-Gonzalez, C., & Amaral, J. C. (2024). Assessment of freight accessibility in New York City: A spatial-temporal approach. *Journal of Transport Geography*, 114, 103777.

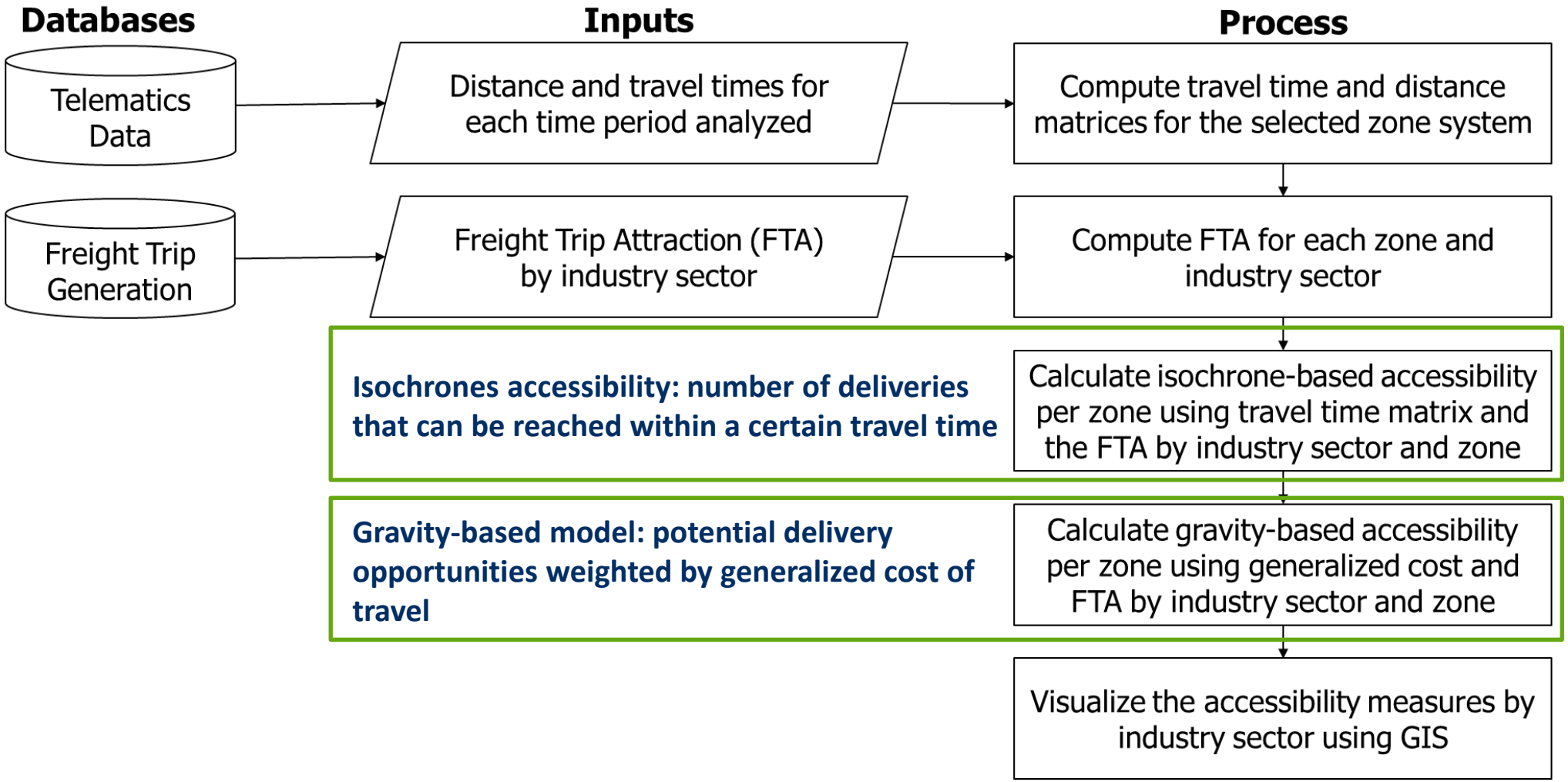
Compact Supply Chain

- **In the pursuit of sustainability, the concept of compact supply chains arises as a way of <u>reducing the distance, time, and resources required to move goods</u> between supply chain agents**

The supply chain echelon entails interactions between a shipper and a receiver.

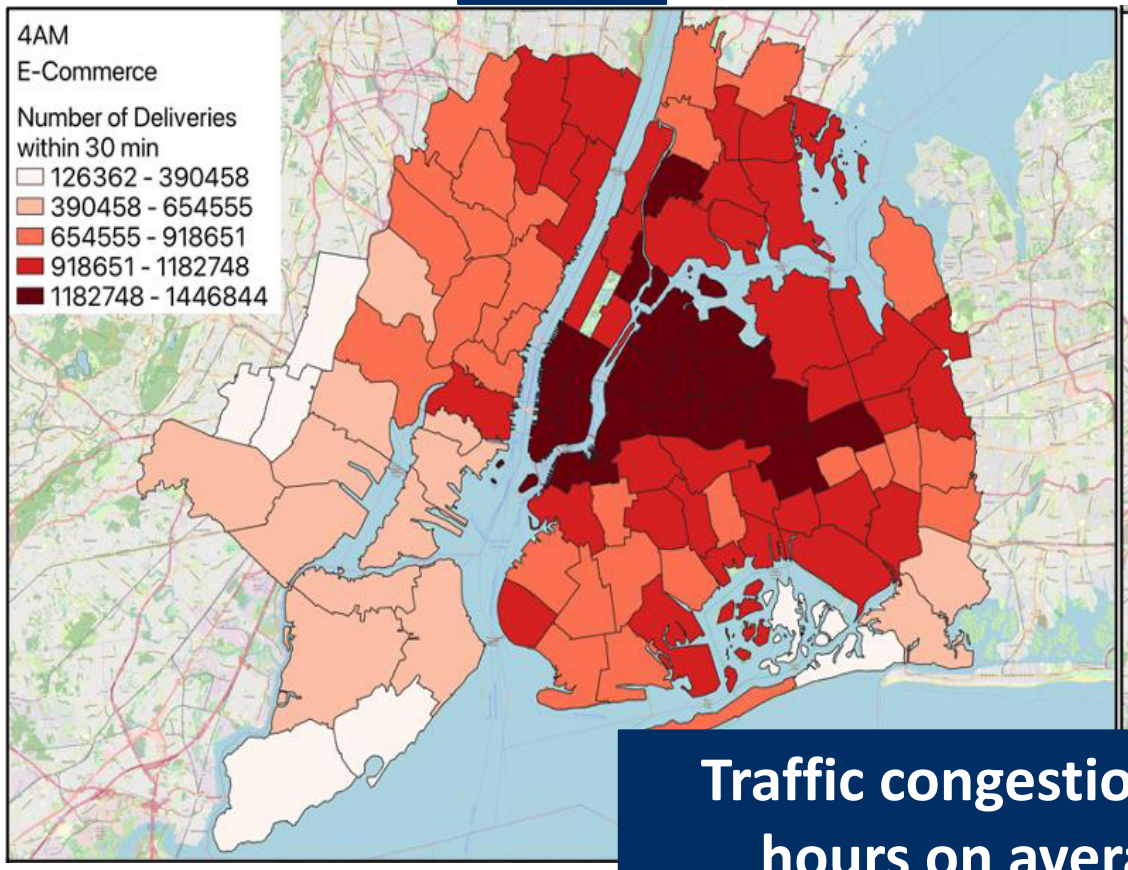
The objective is to improve accessibility to receivers, making travel between shipper and receivers more resource efficient.

Accessibility Models in Freight Transportation

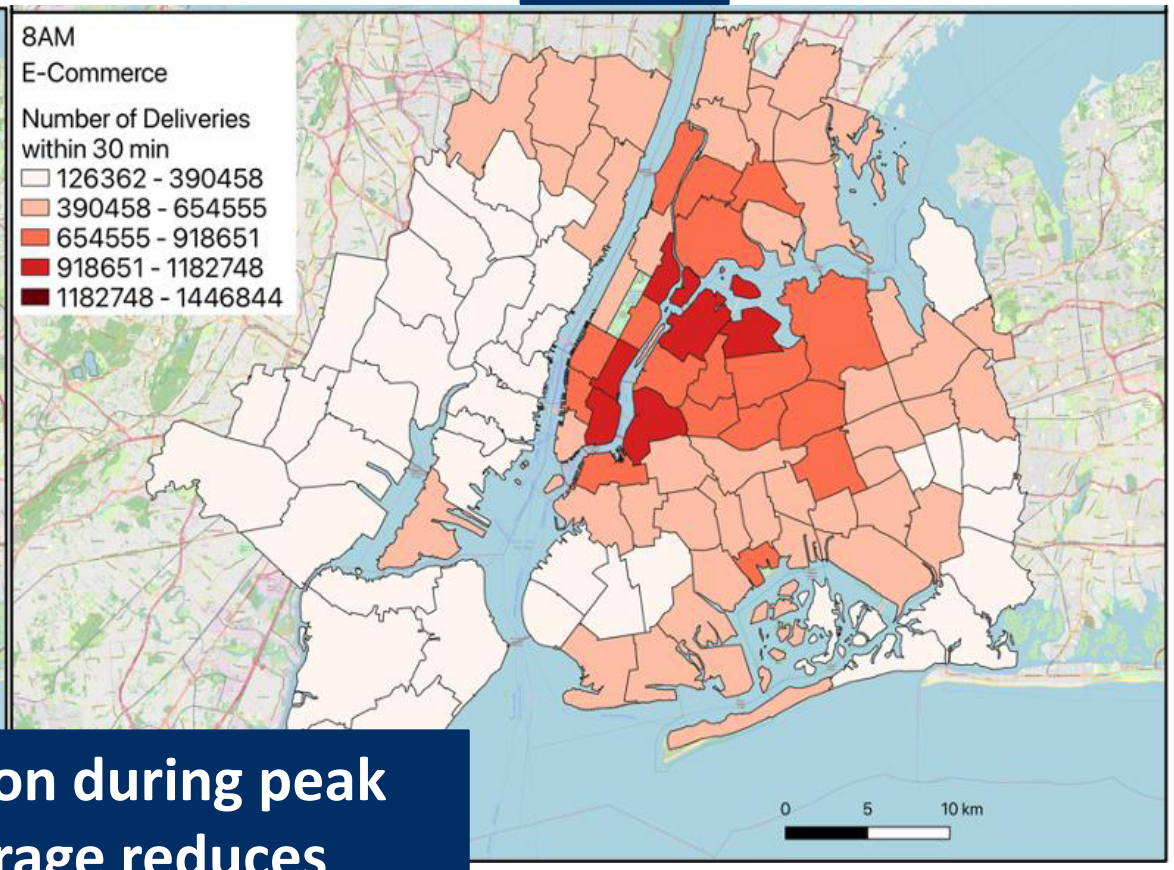


Isochrone Accessibility NYC Example

4AM



8AM



Traffic congestion during peak hours on average reduces accessibility by 46%

Gravity-based Accessibility

- **Adapted from passenger accessibility (Hansen, 1959)**
- **Potential accessibility of zone *i* is:**

$$A_i = \sum_j a_j e^{\beta(C\, d_{ij} + V\, t_{ij})}$$

Generalized Cost Function

Where:

a_j = number of deliveries in zone j (destination)

d_{ij} = travel distance between zones i and j

C = cost of distance

t_{ij} = travel time between zones i and j

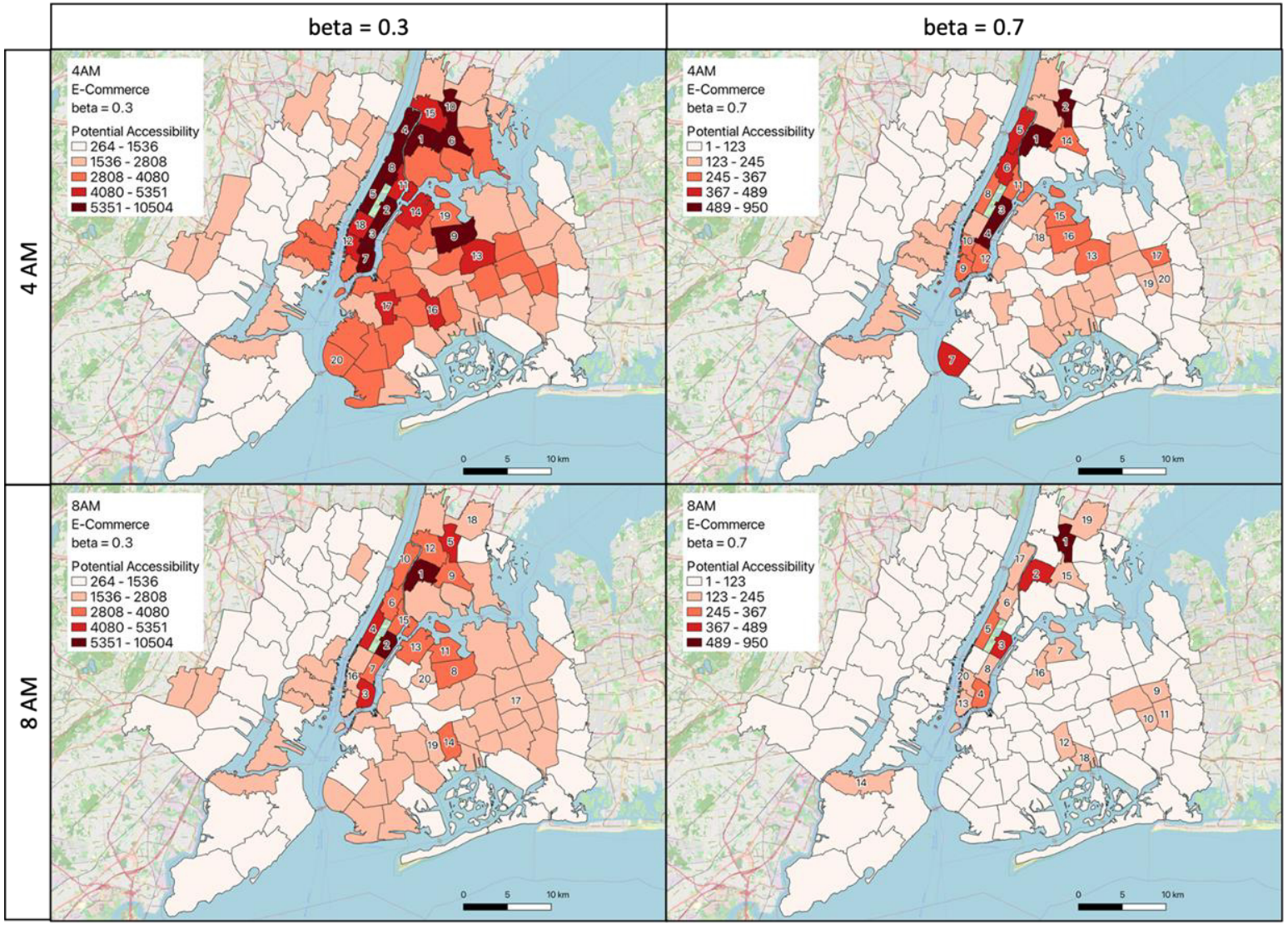
V = value of time

β = parameter of the impedance function

- **The impedance parameter β captures the impact of the generalized cost (GC) function on trip distribution**
- **Large β→ larger weight for the GC function**
- **Small β→ lower weight for the GC function**

Calibration of β is a challenge and would require observed trip distribution data

Gravity-based Accessibility NYC Example



Concluding Remarks

- **Logistics considerations cannot be overlooked in the 15-min city**
  - Land use considerations (e.g., space for logistic activities within the city)
  - Demand management strategies (e.g., freight transport in the off-hours)
- **Integrated mobility-logistics hubs could help reduce the impact of freight and service vehicles traffic**
  - Enhance synergies between mobility and logistics activities
- **Accessibility measures provide insights to locate these hubs and promote more compact supply chains**


Thank you!
julia.amaral@uantwerpen.be
LinkedIn