alice

Alliance for Logistics Innovation through Collaboration in Europe

World Conference on transport research Toulouse 2026

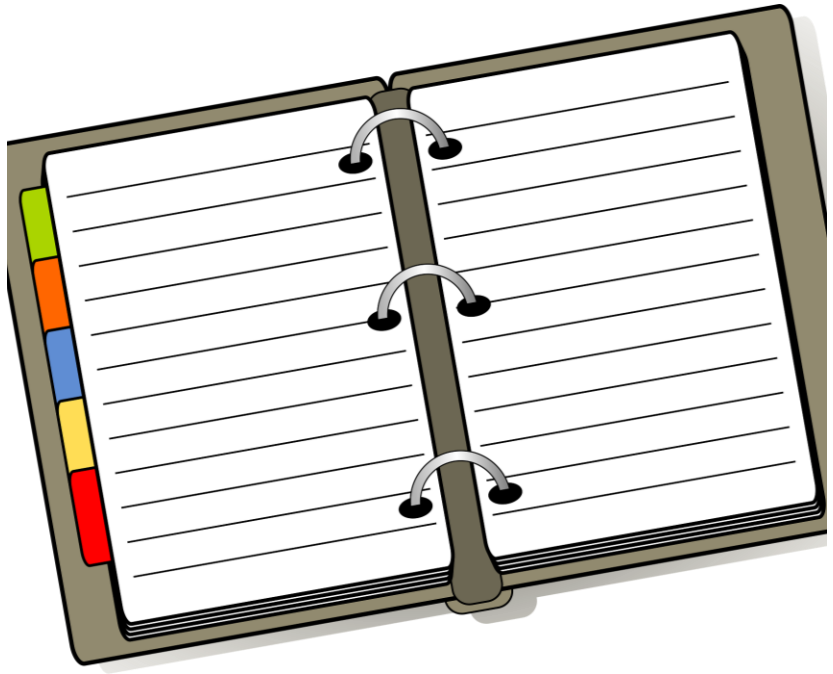
LogE-Hubs Urban Radar

eit Urban Mobility

Optimizing Micro-Hub Site Selection: A Data-Based Framework for Sustainable Urban Freight

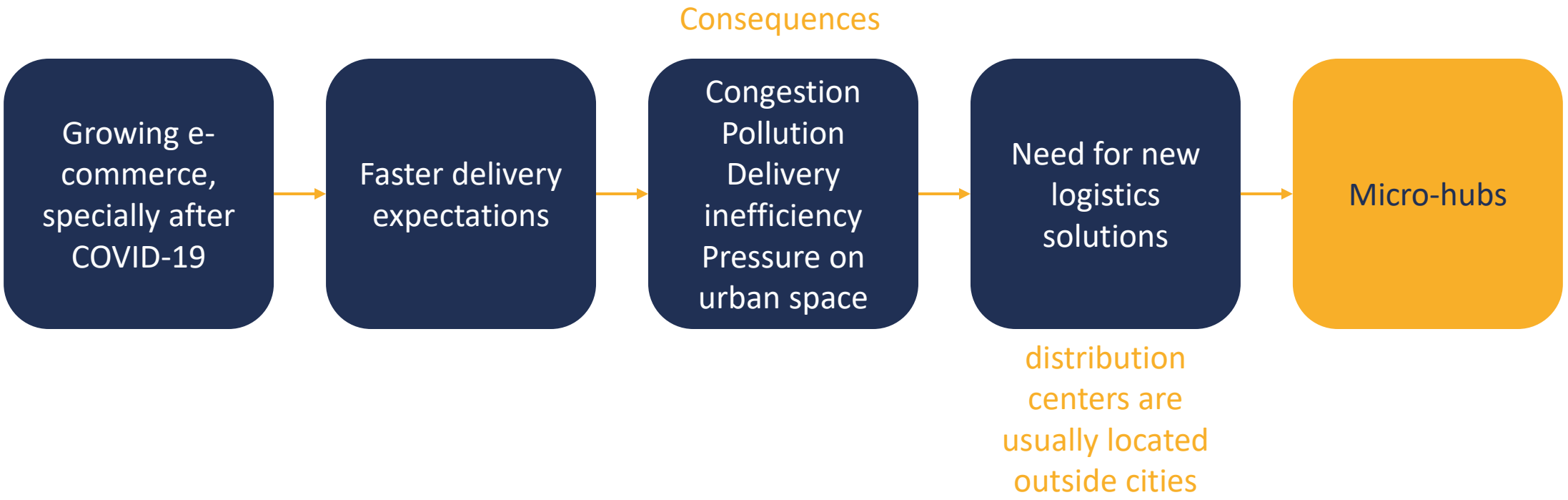
Yanying Li, Mathieu Neveau, Philippe Rapin and Liz Araceli Cristaldo

Agenda



1. Context of the Study
2. Research Gap & Objectives
3. Proposed decision support framework
4. Case study
5. Contribution and conclusion

Context – Why are micro-hubs becoming important?



Urban logistics contributes between 10% and 20% of vehicle kilometers travelled (VKT) and two of five percent of the employed urban workforce Eurostat (2020).

Context - What is a micro-hub?

Functions of a micro-hub:

1. Temporary depot
2. Transshipment point
3. Cargo-bike base
4. Parcel collection point

Benefits

- Shorter delivery routes
- Fewer trucks in city centers
- Lower emissions
- Better delivery efficiency

Context - The real challenge

The problem is not whether cities need micro-hubs.
The real challenge is where to locate them.

Poor locations may cause

- More congestion
- Noise
- Low accessibility
- High operational costs
- Conflicts with residents

Good locations should balance

- Logistics efficiency
- Accessibility
- Urban planning
- Sustainability

Context - Existing European examples

	City	Innovation
	Madrid	Underground parking beneath Plaza Mayor converted into a micro-hub. EMT Madrid*/CITYLogin . LEAD Project (1)
	Oslo	Network of multimodal micro-hubs integrated with public transport. MOVE21 Project (2)
	Paris	Bus depots reused as logistics hubs. Amazon/RATP (3)

Common lessons

- ✓ Reuse existing infrastructure
- ✓ Integrate sustainable mobility (accessible through cargo bikes, walking)
- ✓ Work with cities
- ✓ Reduce emissions

BUT...

None of them proposes **a systematic method for selecting locations**

1. LEAD project (from European Union's Horizon 2020 research and innovation programme under grant agreement No 861598). *Empresa Municipal de Transporte de Madrid
2. MOVE21 project (from European union's Horizon 2020 research and innovation programme under grant agreement No 953939).
3. https://www.aboutamazon.eu/news/operations/amazon-expands-zero-emission-deliveries-for-customers-in-paris (December 2021)

Research Gap and Objectives

Existing studies demonstrate that micro-hubs work well once they are implemented

Missing element

How can cities objectively identify the best locations for new micro-hubs?

In practice, many location decisions are still based on expert judgement, available land or political opportunities rather than objective data.

Objective of this paper

Develop a **data-driven decision-support framework** that helps cities identify suitable locations for different types of urban micro-hubs.

Proposed decision support framework

Urban context → Location of warehouses, pickup points, loading zones

Mobility information → Floating vehicle data (FVD)

GIS* analysis → Accessibility & congestion assessment

Logistics KPIs: delivery demand & service coverage.

The framework progressively combines different sources of information

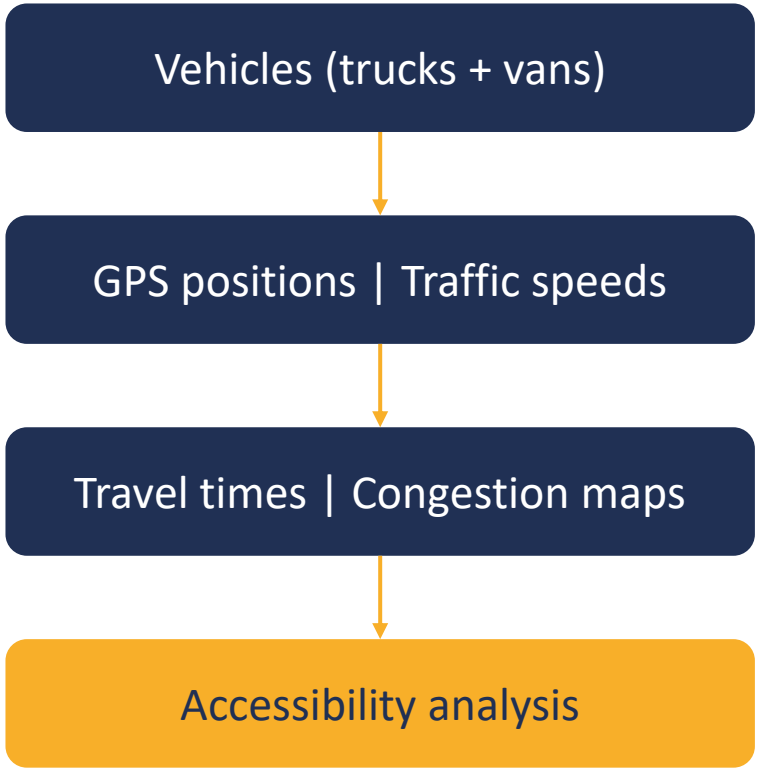
Multi-criteria decision analysis (MCDA).
Balance operational efficiency, environmental sustainability, and social acceptability.

Candidate locations for micro-hubs

*Geographic Information Systems

Why Floating Vehicle Data (FVD) ?

Process



The methodology is adapted to the actual functioning of the city

Information obtained

- Average speed
- Congestion
- Travel times
- Road accessibility
- Vehicle movements

Why is it useful?

Instead of asking *Where do we think congestion exists?* the framework measures it using **real mobility behavior.**

Types of micro-hubs

Based on operational characteristics and service scope, two types of urban micro-hubs are considered:

Type A	Type B
Logistics operators	Logistics operators + end users
Truck → cargo bike	Parcel pickup
Large transfers	Customer services
Near highways	Near residential areas
Truck accessibility	Pedestrian accessibility

Their main role is to receive goods from trucks before transferring them to cargo bikes or electric vehicles.

In addition to logistics operations, they provide direct services such as parcel collection and returns.

Not All Micro-Hubs Have the Same Purpose

The best location depends on the operational function of the micro-hub.

Case study: Braga

Objective: Test whether the proposed framework can identify suitable locations for micro-hubs.

Traffic intensity map in Braga and isochrone of 10 minutes travel by bike

Characteristics

- Medium-sized Portuguese city. Approx. 200,000
- Historic city center
- Narrow streets | Congestion

Data used

- Commercial Floating Vehicle Data provided by the Urban Radar platform*
- June – August 2025 (3 months)
- Data representing ≈10% of vehicles on the network

*https://urbanradar.io/

Step 1 – Understanding Braga Traffic Patterns

Objective: Identify where freight vehicles experience delays.

	CI	AS of LCVs	AS of Trucks
Avenue Central	0.59	16km/h	9km/h
Rua do Raio	0.57	12km/h	12km/h
Avenida da Liberdade	0.58	9km/h	10km/h
Rua 25 de Abri	0.48	14km/h	11km/h

Fig. 1. Congestion map and speed of freight vehicles

Floating Vehicle Data revealed:

Inside Braga:

🚚 Trucks move at approximately **10 km/h**

🚐 Vans around **12 km/h**

Outside the city:

Much higher speeds.

The last mile is where most inefficiencies occur.

$$CI = (V_f - \bar{v}) / V_f$$

Variables:

CI is the Congestion Index (%)

V_f is the free flow speed

$\bar{v}$ is the average speed (AS) of all types of vehicles

Step 2 – Locating Type A & Type B Micro-Hubs

	CI	AS of LCVs	AS of Trucks
Avenida João Paulo II (N103)	0.32	58km/h	46km/h
Avenida João Paulo II (N103) close to Brage	0.54	24km/h	20km/h
Avenida João Paulo II inside the ring	0.69	9km/h	7km/h

Congestion from N103 to Braga

Criteria

- ✓ Near highways
- ✓ Easy truck access
- ✓ Commercial activities
- ✓ Good connection to cargo-bike routes

Candidate locations

- N103 corridor
- Rua da Fábrica area

Why?

Intercept trucks **before** they enter the congested center.

Rua da Fábrica is located approximately 6 km from Braga's historic city center

Step 2 – Locating Type A & Type B Micro-Hubs

	CI	AS of LCVs	AS of Trucks
Avenue Central	0.59	16km/h	9km/h
Rua Professor Machado Vilela	0.26	25km/h	19km/h
Rua do Fujacal	0.3	24km/h	22km/h

Traffic congestion map in Braga city center

Criteria

Serve end users → Closer

Selection considers

- Residential density
- Commercial activities: Hotels | Universities
- Walking accessibility

Light commercial vehicles in these areas maintain an average speed of approximately 25 km/h, and are situated only 1.5 km from the historic city center

Step 3 - Origin–Destination Analysis

Rather than only analyzing congestion, we analyzed where freight vehicles come from

Inbound comparison made with floating car data

	Number of vehicles captured	Percentage
North of Braga	844	16,88%
South of Braga	4156	83,12%

Activity zone of Lomar

Isochrone of 10 minutes travel time by bike from the activity zone of Lomar

Traffic intensity map in Braga and isochrone of 10 minutes travel by bike

Key finding

Approximately 83% of freight vehicles enter Braga from the south.

Why important?

Micro-hubs should intercept freight before congestion occurs

Main contributions and final conclusion

Contributions

1. **Practical decision-support framework municipalities can apply.** Rather than relying on intuition, it combines real mobility data, logistics, and urban planning.
2. **Recognizes not all micro-hubs serve the same purpose.** Distinguishing between Type A and Type B facilities allows locations to be selected according to their operational function.
3. The Braga case study demonstrates that Floating Vehicle Data can support evidence-based urban logistics planning.

Limitations

- It does not evaluate investment costs or operational performance after implementation.
- The validation relies on a single case study.

alice | Alliance for Logistics Innovation through Collaboration in Europe

MULTIFUNCTIONAL URBAN SPACE COMMUNITY

Join the ALICE Multifunctional Urban Space Community!

Join the community and:

- ✓ Access benchmarks & best practices
- ✓ Connect with key stakeholders
- ✓ Gain visibility for your projects
- ✓ Contribute to future solutions
- ✓ Build partnerships & collaborations

alice | Alliance for Logistics Innovation through Collaboration in Europe

Thank you

Optimizing Micro-Hub Site Selection: A Data-Based Framework for Sustainable Urban Freight

Yanying Li: yanying.li@etp-alice.eu

Liz Araceli Cristaldo: liz.cristaldo@etp-alice.eu

LogE-Hubs: https://www.eiturbanmobility.eu/projects/loge-hubs/