Congestion-Aware Pick-Up and Drop-Off (PUDO) Network Design

(Autonomous) **Mobility-on-Demand** (**AMOD**) vehicles frequently stop to pick up/drop off passengers, either by double-parking or using designated curbside spaces—each with different effects on the surrounding traffic. **Dynamic Curbside Management (DCM)** zones are promising locations to accommodate these stops. This metaInnovation supports policy makers to **plan a DCM city network** so that (i) the number of DCM areas is limited, (ii) traffic disruptions are minimized, and (iii) walking distances for AMOD users are reduced.

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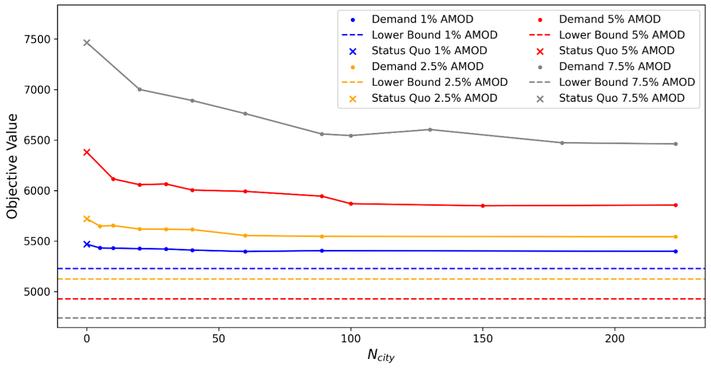
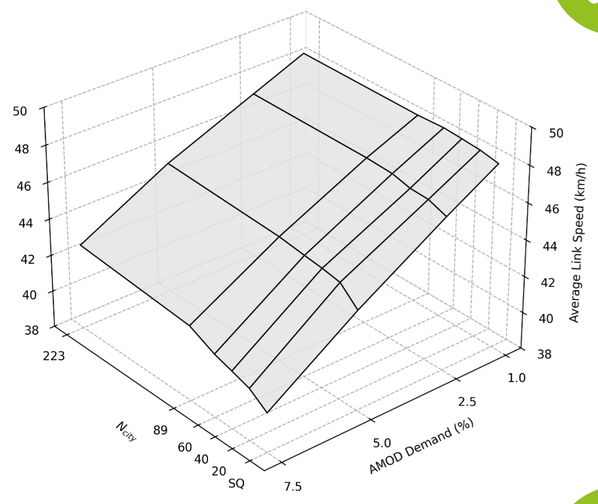
Data Requirements

- Private vehicle and AMOD demands
- Street network: $G = (N, L)$
- Assumed Values of Time for driving and walking
- Basic Policy constraints:
  - Max. available space per street l ($n_l^{\max}$)
  - Planning priorities (e.g., streets without PUDOs)

Curbside stop

Double-parking stop



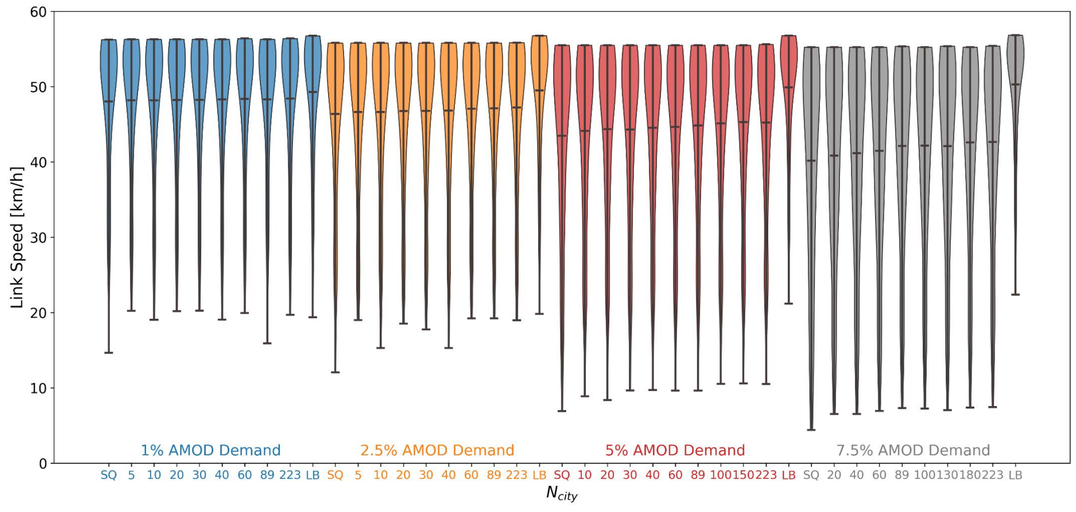


Methods

- Multi-objective optimization problem
- Solution approach based on a three-module framework:
  - MOD model
  - Static traffic assignment
  - Upper-level optimization using Adaptive Large Neighbourhood Search (ALNS) metaheuristic

Decisions

- Total DCM zones to place in the network? (N_{city})
- Where to allocate these zones? ($n_l \; \forall \; l \in L$)
- In which streets should PUDOs be totally forbidden, both as double parking ($x_l = 0$) and curbside ($n_l = 0$)?



Scalability

- In a case study conducted on a small urban network, results were obtained within a few hours (<12 h) using a high-performance computer.
- The framework still needs to be evaluated on larger, real-world networks.

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