



Freight-on-Transit: A Systematic Review Centered on Freight Needs, Methods, and Real-World Implementation

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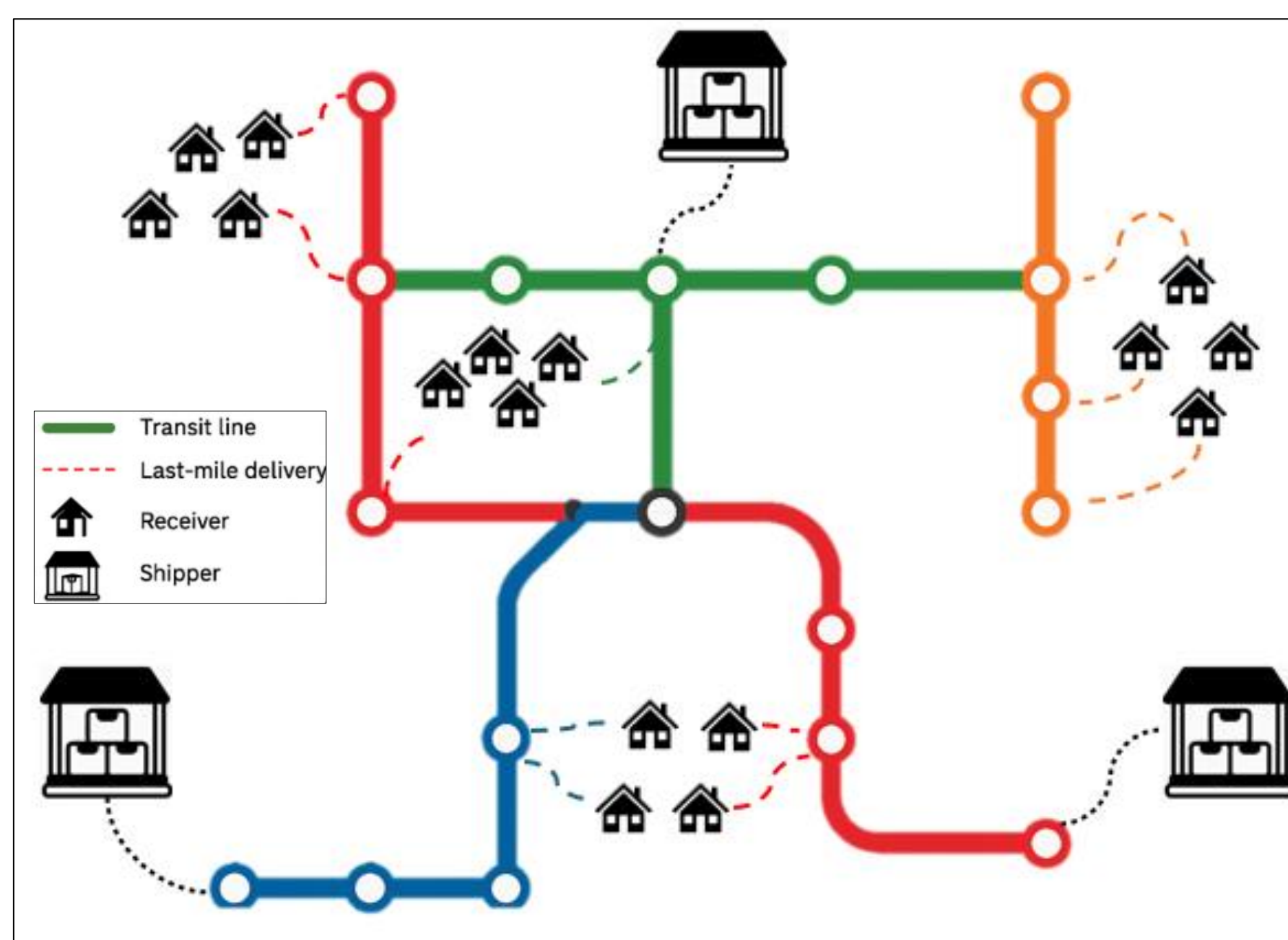
Motivation

- Freight transportation plays a critical role in sustaining the economic and social vitality of cities.
- Transportation systems face spatial constraints that limit infrastructure expansion and complicate freight movement in dense city centers.
- Freight on Transit (FOT) has emerged as a strategy to improve last-mile logistics, reduce congestion, and support environmental goals.
- Current literature has focused on how to optimize the public transit system, often ignoring freight considerations that are needed to assess feasibility and scalability.

Research Goal

- Systematically synthesize existing FOT research to identify dominant methods, analytical domains, and operational strategies used across studies.
- Highlight freight-relevant dimensions that condition the operational feasibility of FOT systems.
- Identify implementation barriers and gaps related to institutional coordination, regulation, and operations to inform future research and policy design.

FOT System



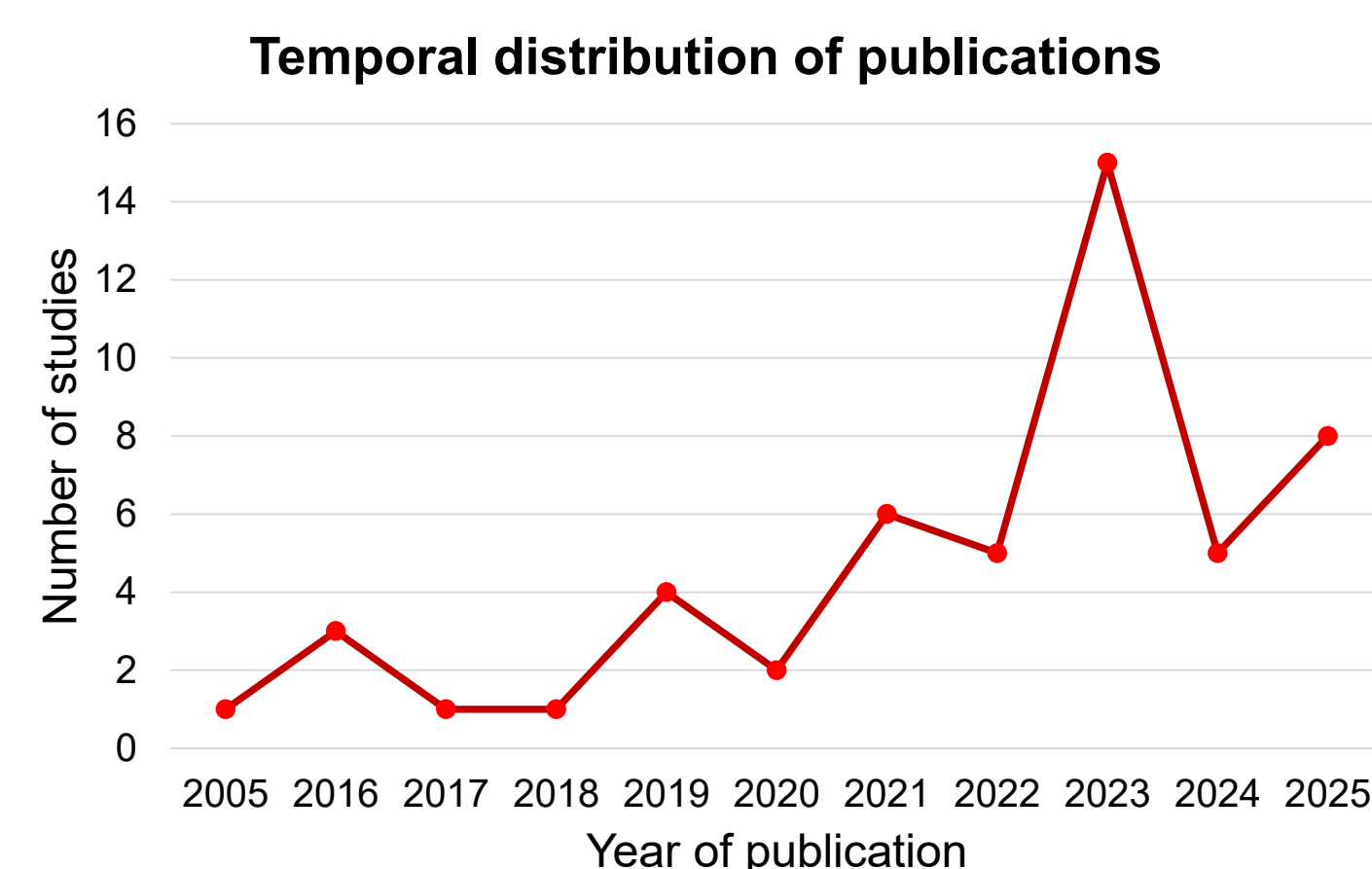
Goods are transferred from shippers to the public transit network at selected stops, transported along transit routes, and subsequently delivered to receivers through first- and last-mile distribution.

Methodology: PRISMA

This research adopts the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology to ensure procedural rigor and transparency. Using Boolean operators, 455 initial records were identified. After the screening process, 51 studies were included in the review.

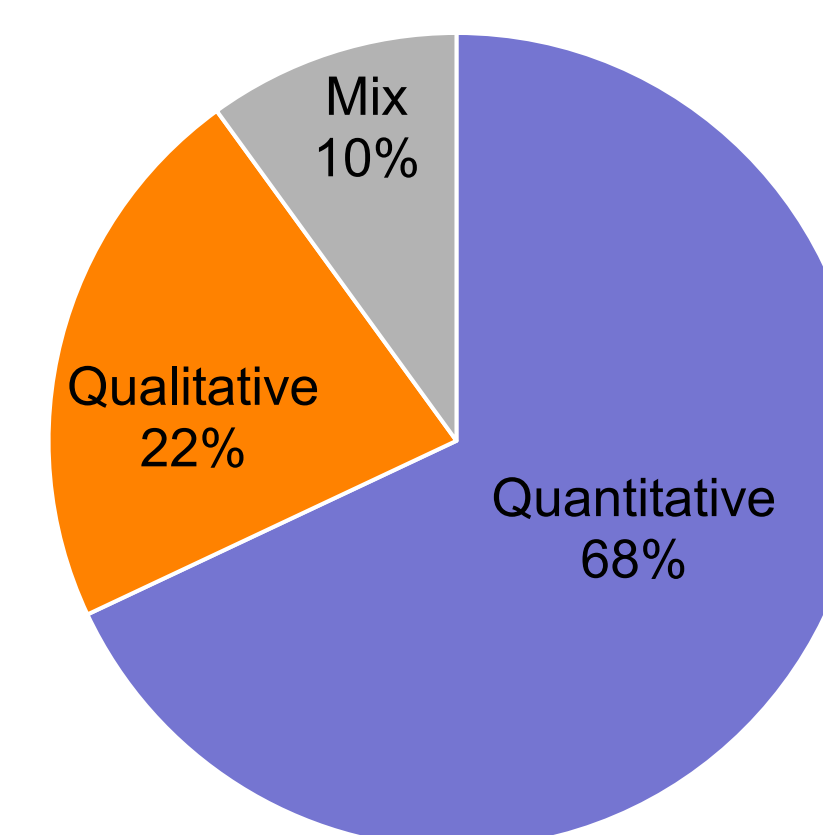
- Inclusion criteria:**
 - Relevance to FOT.
 - Impact Evaluation.
 - Publication Quality.
- Exclusion criteria:**
 - Language.
 - Irrelevant Focus.
 - Incomplete Documentation.
 - Duplicated records.
 - Non-peer-reviewed Sources.

Results: Study year and Methods



This pattern reflects the growing academic and practical interest in FOT as an innovative solution to the spatial constraints.

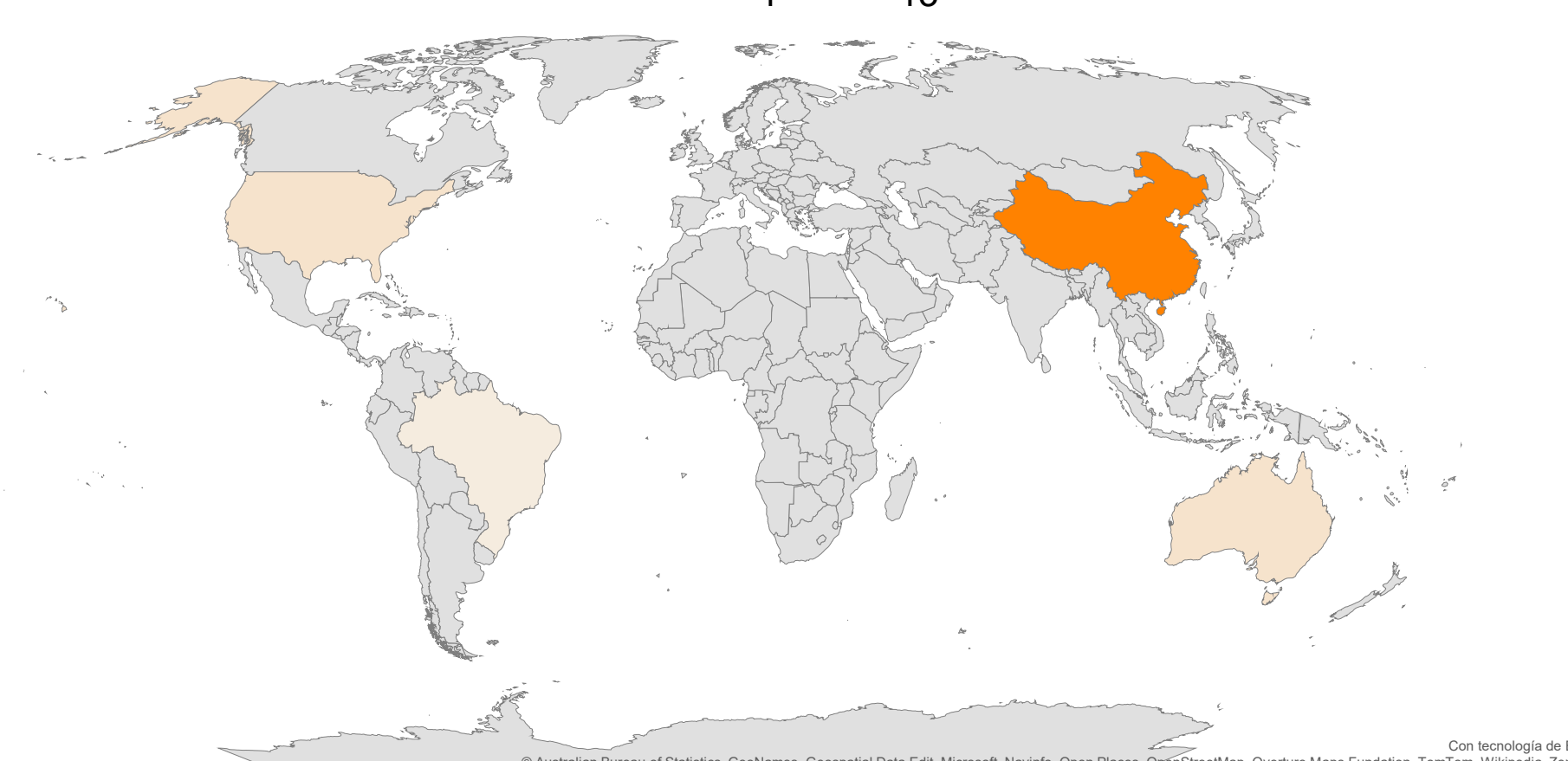
Methodological approach



Quantitative research on FOT predominantly relies on mathematical programming frameworks to model resource allocation, routing, scheduling, and network design problems

Geographic Scope

Number of Studies: 1 to 13

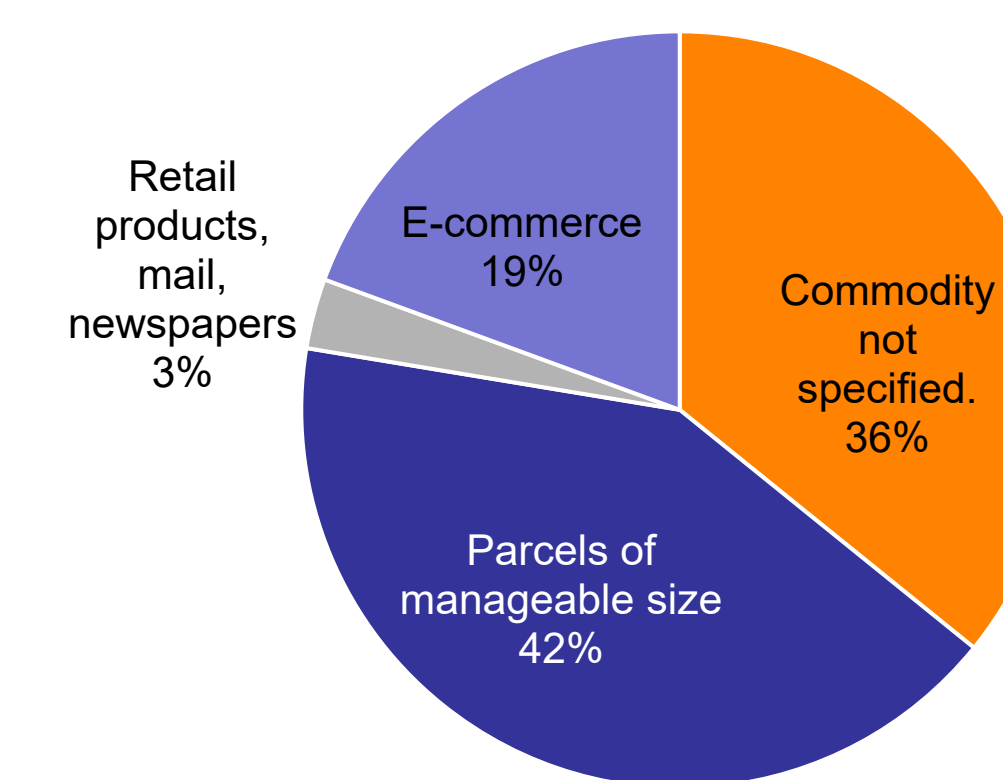


Results

Key Findings:

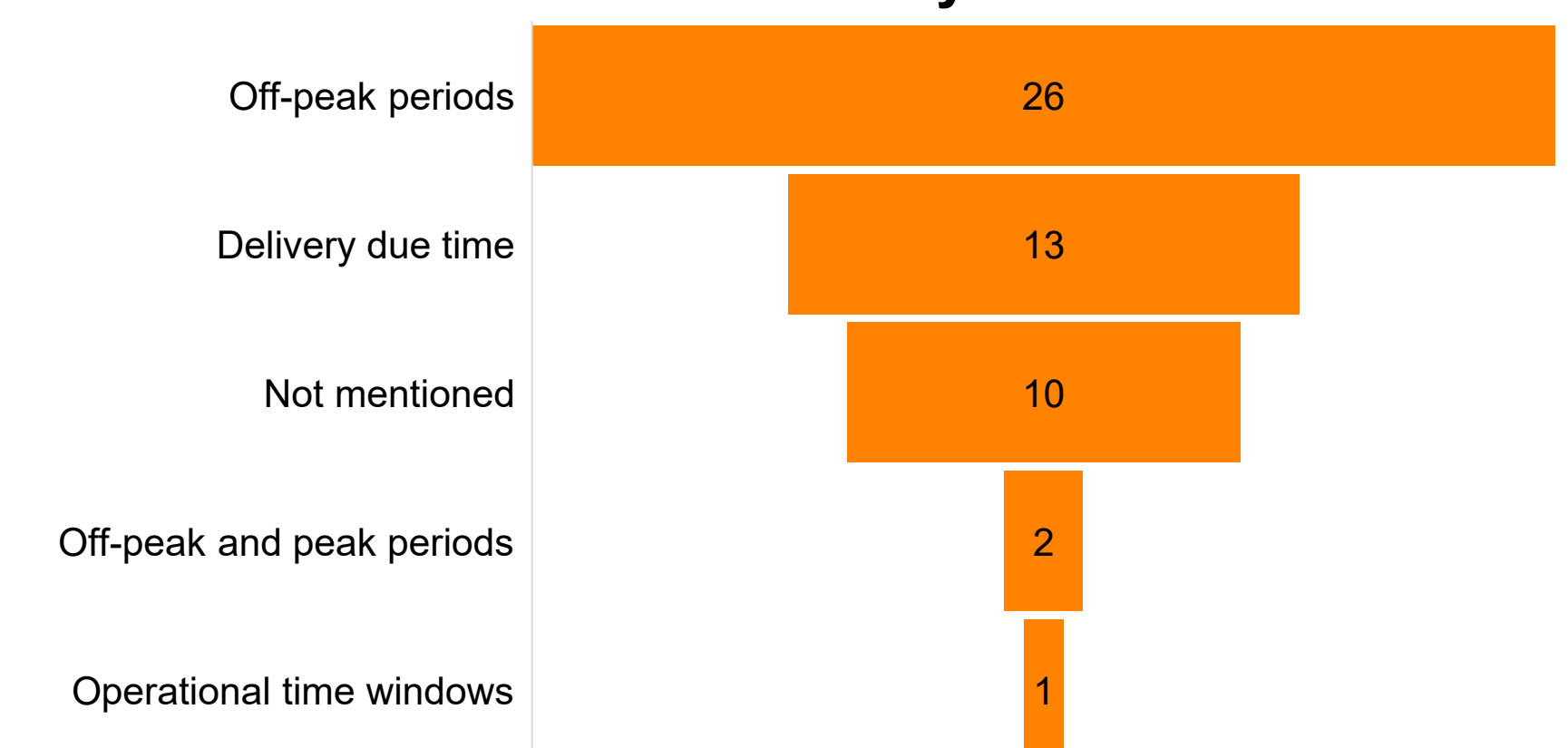
- Technical feasibility is well established, particularly when operational conditions are carefully managed.
- Shared-use strategies deliver the strongest operational gains, especially off-peak freight use of metro systems and mixed passenger–freight bus services, yielding cost reductions, improved vehicle utilization.
- Benefits remain highly sensitive to capacity allocation, station constraints, coordination mechanisms, and infrastructure design, with institutional and operational risks limiting scalability without targeted planning.

Commodity Type



Even when “parcels” is the most common term used to describe the transported goods, there is no commodity specification in 78% of the studies.

Time of day



Conclusions

- FOT systems are operationally feasible and beneficial, delivering cost, congestion, and emissions reductions while preserving passenger service when capacity, scheduling, and routing are properly managed.
- Current research emphasizes technical optimization, but real-world scalability depends on institutional coordination and explicit treatment of freight-specific parameters such as commodity type and delivery timing.
- Context-sensitive policies are essential, particularly those supporting off-peak freight operations, standardized parcels, stakeholder collaboration, and infrastructure adaptation in high-density environments.

Ignoring freight-related constraints can compromise safety, capacity, and passenger service reliability, whereas clearly defined parcel eligibility and off-peak delivery windows enable feasible, scalable, and context-sensitive FOT implementation.