Building a spatial participatory approach to locate urban logistics facilities, by eliciting experts' opinions

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Abstract

Urban logistics operations exert pressure on the city to which policy-makers cannot remain indifferent. They concur to increase traffic congestion, generated by vehicles used for the deliveries, which often have overlapping routes; their emissions contribute to the environmental contamination of city centres, both in terms of air and noise pollution; their space occupancy is often criticized, also due to the visual intrusion of these vehicles, generally of large dimensions, in the historic centres of the cities (Lachapelle et al., 2018). To mitigate the impacts of city logistics, various measures can be implemented: the main ones are certainly the consolidation of goods to reduce the driving distances, but also the use of new technologies which can be of benefit to the whole supply chain (Giuffrida et al., 2022).

In this respect, a proper location of the urban logistics facilities can play a fundamental role in improving the sustainability of deliveries, especially in the case of those associated with online purchases. A consolidation measure which efficiency might be influenced by a proper allocation is certainly one of the parcel lockers. Parcel lockers are automated boxes that allow users to a self-service collection of parcels. They can be used as a delivery address or as an alternative delivery location, and also used as a service by logistics operators in a customer return strategy (Lagorio and Pinto, 2020). Indeed, this measure helps in reducing the distances, avoiding also unnecessary trips associated with missing deliveries. Once arrived at the delivery destination, the vehicle could certainly benefit from a network of dedicated parking spaces, i.e., loading/unloading bays, to ensure efficient delivery and avoid illicit phenomena (such as illegal temporary double parking). Loading bays are physical spots within the urban area and road network where freight vehicles can stop to perform a delivery to a nearby receiver and conduct any necessary cargo handling activities, without disrupting traffic flow (Alho and de Abreu e Silva, 2014). The use of new technologies could improve the efficiency of these spaces, making them dynamic (i.e., allowing their booking and real-time knowledge of the occupancy status) and potentially virtual (i.e., allowing them to be used for other purposes during the off-peak hour of delivery demand).

The correct location of such provisions can take advantage of different traditional location-allocation methods that could be used to decide which area agrees with high technical standards. This choice cannot disregard the vision of the concerned stakeholders, who often assign a different weight to the criteria taken into consideration or even have divergent interests. A participatory method is essential to guarantee a location of the logistic facilities that are robust from a technical point of view but widely shared by the actors of the decision-making process, in order to guarantee their effective functioning.

Based on this premise, the aim of the work is to present a participatory method to identify the most suitable areas to locate logistic facilities. In particular, in this paper, we will present the results of a survey to involve a group of logistics experts in assigning different levels of importance to those spatial characteristics considered fundamental by the literature. From these considerations, a spatial compatibility index, that can be used within a GIS for a first scan of the most suitable locations, will arise. The method will be applied to the Dublin case study, where the problem of freight delivery in urban areas is the subject of the European research project SENATOR (Smart Network Operator Platform enabling Shared, Integrated and more Sustainable Urban Freight Logistics).