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Actions Beyond Words

PSG 3

NEUTRAL CITIES? FINE TUNE THE EXPERIMENTATIONS TO ACHIEVE ZERO EMISSION/ ZERO WASTE IN THE LAST MILE DELIVERY OF FOOD

The rise of e-commerce has seen remarkable growth worldwide, and Italy is no exception. In the US, the market share of online shopping has increased from about 3.7% in 2008 to 9.5% in 2018 and 13.5% in 2021 (Giuliano, 2023). In Italy, e-commerce in 2018 was at 6,5% of products sold, in 2022 it grew to 12% (Osservatorio eCommerce B2c, 2023).

This increased demand for e-commerce has given rise to a twofold challenge, presenting itself in different forms and spaces. On one hand, logistics and large-scale distribution have a great responsibility in terms of soil land-use outside the cities' borders. In the last three years, in Lombardy, logistics nodes occupied 140 hectares (Osservatorio eCommerce B2c, 2023).

On the other hand, the last-mile delivery is responsible for many environmental and social issues in the city centres as outlined in table 1 and table 2.

One can witness the presence of trends that pertain to city logistics. For instance, the number of last-mile deliveries is expected to rise significantly globally due to urbanization, a growing customer base and new categories of products shifting to digital distribution (World Economic Forum, 2020). Moreover, parcels are increasingly expected to be delivered faster with the growth of instant and same day deliveries (World Economic Forum, 2020). On the other hand, some trends such as decarbonization and zero-waste movement seek to tackle environmental issues and can seem to be in contradiction with the trends previously considered.

Addressing the challenges of last-mile delivery requires the implementation of effective solutions. Based on the current literature review, we have identified several possible strategies, ranked in order of maturity, to optimize last-mile delivery, particularly in the B2C context:

- **Parcel lockers:** Implementing secure and automated parcel lockers with QR code access can reduce failed deliveries and improve customer convenience (Wang et al., 2014; Giuffrida et al., 2012; Wen & Li, 2016; Chen et al., 2018).
- **Pickup points:** Utilizing existing stores or designated locations as pickup points can streamline deliveries (Wang et al., 2014).
- **Crowdsourcing logistics:** Involving common people that would have to drive anyway to a certain location to bring some parcels with them, under compensation (Carbone et al., 2017; Wang et al., 2016; Devari et al., 2017).
- **Drones:** Leveraging drone technology can overcome obstacles in dense urban areas and enable faster and more efficient deliveries (Murray & Chu, 2015).
- **Dynamic pricing:** Introducing dynamic pricing models that incentivize greener and slower deliveries, optimizing delivery routes to reduce emissions and costs (Asdemir et al., 2009; Klein et al., 2017; Yang et al., 2014).
- **Mapping customer behavior:** Using electricity data to understand customer availability at home can reduce failed delivery attempts (Pan et al., 2017).
- **Robotization of delivery:** Introducing automated delivery systems can improve delivery efficiency and reduce labor-related challenges (Slabinac, 2015; Boysen et al., 2015).

- **Underground deliveries:** A futuristic concept involving dedicated underground channels for efficient delivery operations (Slabinac, 2015).

To realize the above, it seems evident that there is a strong need for an integrated delivery ecosystem moving forward, which will yield many benefits, but which also needs a concerted, multi-stakeholder effort to be achieved. Indeed, reducing emissions and traffic congestion are top priorities for municipalities, whereas interventions that decrease delivery costs and minimize disruptions in current business models are more appealing to logistics players. Additionally, customers play a pivotal role in shaping the demand for specific delivery options and technologies. Factors such as technology acceptance, delivery locations and delivery timeframes significantly influence customer preferences. Thus, a compromise must be reached among all parties involved, namely policymakers, delivery companies, retailers and consumers (Accenture, 2021; BCG, 2021).

We have identified the following questions, that require discussion among stakeholders to create a sustainable, efficient, and customer-centric last-mile delivery ecosystem:

- How to decouple the increasing number of deliveries and the resulting carbon emissions?
- How to manage the different trade-offs (cost, environmental and social impact, customer convenience and preference)?
- How to organise the different stakeholders to support the development and implementation of solutions?

TABLE 1. MAIN ENVIRONMENTAL ISSUES RELATED TO LAST-MILE DELIVERY

<i>Environmental Issue</i>	<i>Description</i>	<i>Main references</i>
Climate change	Climate change can be described as long-term alterations in temperatures and weather patterns driven by human activities generating greenhouse gases. Transport means still heavily rely on fossil fuels and thus generate a big share of global greenhouse gases. Indeed, transport transformation was described as a critical element to address climate change by the UN.	(United Nations, n.d.; Yinuo, 2021)
Air pollution	Air pollution represents a significant contributor to environmental degradation and harms both human health and ecosystems. It is a major issue for cities. Transport, including urban freight transport, is the main source of air pollution in a city.	(OECD 2023; Mesjasz-Lech, 2016)
Waste generation	Around 2 billion tonnes of municipal solid waste are generated every year and at least one third of this amount is not handled in a proper and environmentally safe way. The increasing share of online retail is expected to worsen the situation as a study found that e-commerce generated about 4.8 times more packaging waste than physical stores.	(The World Bank, n.d.; Chun et al., 2022)

TABLE 2. MAIN SOCIAL ISSUES RELATED TO LAST-MILE DELIVERY

<i>Social issue</i>	<i>Description</i>	<i>Main references</i>
Poor working conditions	The work environment of employees along the last-mile delivery supply chain is far from optimal. Indeed, the sector is characterized by low wages, lack of transparency, and high rate of worker turnover. More importantly, these working conditions have a direct impact on employees' physical safety due to high-risk exposure and on their mental health due to work-induced stress. Furthermore, the situation is aggravated by managerial silencing of worker voice which is amplified by the online apps and algorithms typically used by food delivery companies.	(Verheyen et al., 2022; Shapiro, 2017; Chen, 2022; Kougiannou, 2021)
Food waste paradox	This paradox denotes the fact that huge quantities of food are wasted every day while many individuals are experiencing food insecurity. Indeed, about 30% of food produced in the world is wasted every year while almost 10% of the global population was affected by hunger in 2021. Online food delivery is aggravating the issue of food waste.	(UNEP, n.d.; WHO, 2022; Zhang et al., 2022)

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