Externalities of urban logistics: challenges and opportunities for achieving smart and sustainable cities

Lorena Quidiello[1*] and Jose Manuel Montes[2]

[1] *International University of La Rioja, Spain*
[2] *University of Oviedo, Spain*

Meridia Press

JBTM 2025, Volume 1 (Issue 2): 19-43
ISSN (print): 3101-3260
ISSN (online): 3101-1950

Received: October 17, 2025
Revised: November 5, 2025
Accepted: November 17, 2025
Published: November 28, 2025.

Abstract

Although urban logistics is vital for cities, it is often provided inefficiently and current trends are unsustainable, creating an urgent need to find innovative ways to reduce its externalities. This article presents a systematic review of the literature with the aim of analysing in depth the negative externalities associated with urban logistics, such as traffic congestion, pollutant emissions, energy consumption, accidents and noise. In addition to analysing these and other challenges, the article offers technological, organisational and governance proposals to promote a transition towards smart and sustainable cities in line with the sustainability and efficiency challenges of the 2030 Agenda and the principles of Logistics 5.0.

Keywords: urban logistics; urban freight distribution; urban freight transport; city logistics; externalities; smart cities, sustainable cities.

*Corresponding author: Lorena Quidiello, *lorena.quidiello@unir.net* and Jose Manuel Montes, *jmmontes@uniovi.es*

https://doi.org/10.64976/jbtm.7

1. Introduction

Although urban logistics is vital to the prosperity of cities by providing the flows of materials, food and goods so necessary for the consumption and production sectors of urban economies, it is also responsible for generating a series of negative externalities that reduce the economic well-being of regions (Holguín-Veras et al., 2020a; Boussier et al., 2011; Browne and Gomez, 2011; Comi et al., 2024; Crainic et al., 2009; Savelsbergh and

Van Woensel, 2016; Rai et al., 2017; Galambos et al. 2024), by directly impacting the productivity and competitiveness of the private sector and damaging the quality of life of citizens.

The environmental problems of urban logistics are related to three main phenomena: greenhouse gas emissions (the main contributor to global warming), local pollution and noise emissions (Gonzalez-Feliu and Morana, 2010). Urban freight transport is thus one of the most significant contributors to environmental problems in cities (Quak and De Koster, 2009; Russo and Comi, 2016). Furthermore, in 2020 it was already expected that, without effective intervention, urban freight logistics would grow by more than 30% in the world's 100 largest cities over a 10-year period, up to 2030 (World Economic Forum, 2020). At the beginning of this decade, segments such as same-day and instant delivery were experiencing annual growth rates of 36% and 17%, respectively.

On the other hand, many business decisions are more focused on achieving economic efficiency, leaving environmental and social objectives aside, and therefore contribute more to these externalities (Österle et al., 2015). There is therefore a growing concern that environmental issues are being neglected in favour of economic aspects (Arvidsson et al., 2013).

The 2030 Agenda seeks to achieve more sustainable and resilient cities by 2030; therefore, while economic growth must be pursued, it must be accompanied by less environmental impact. It is also necessary to prevent the demand for freight transport from increasing substantially with economic growth, or congestion and environmental impacts from increasing with the growing demand for freight transport (Taniguchi and Van Der Heijden, 2000).

This article analyses, on the one hand, the main negative externalities and challenges generated and faced by urban logistics and, on the other hand, some lines of action and proposals that would improve its sustainability, thus moving towards smarter and more sustainable cities. The following research questions have been posed to guide the development of this article.

- What are the main externalities and challenges of urban logistics?
- What proposals are being put forward to achieve smart and sustainable cities?

2. Literature Review

Urban logistics, as the last link in the supply chain, is essential for the functioning, productivity and competitiveness of cities, both in their regional, national and global contexts. However, its impact on urban environmental problems is considerable, and sustainable improvements are therefore required to balance it with environmental protection, global economic development and social cohesion (Russo and Comi, 2010; Arvidsson et al., 2013). It is also essential for employment, as it is estimated that between 5% and 10% of jobs in large cities are associated with freight transport (Ragàs Prat, 2018).

Numerous studies refer to the negative externalities generated by urban goods distribution. Table 1 shows some examples of these references, with interesting excerpts:

Table 1: References from authors on the negative externalities generated by urban goods distribution

Allen et al. (2007)	They refer to the main economic, environmental and social externalities produced by urban goods distribution, citing the following: • Economic impacts: traffic congestion, inefficiencies and resource consumption. • Environmental impacts: pollutant emissions, use of non-renewable fossil fuels, land use and waste generation. • Social impacts: consequences of these externalities on people's health, whether due to pollution, traffic accidents, noise, visual intrusion, or other factors that may alter citizens' quality of life.
Akyol and De Koster (2013)	Urban transport contributes significantly to pollution, noise disturbance, traffic congestion and safety problems in urban centres.
Holguín-Veras et al. (2020b)	Although goods vehicles are the ones that physically produce the externalities, and transport operators appear to be directly responsible for these problems, quite often most of these externalities are caused by decisions made by other actors involved in supply chains, and even by city governments. Addressing these problems often requires collaborative approaches and changes in the behaviour of multiple actors, not just operators.
Iwan (2016)	Most transport processes in urban logistics favour road transport, which has many adverse effects associated mainly with: • Traffic congestion, which contributes to increased vehicle operating costs and infrastructure maintenance, more time wasted by transport users, and other losses related to the time and reliability required to make deliveries. • Environmental pollution, through the consumption of non-renewable energy and fossil fuels. • Reduction of green spaces versus the development of transport infrastructure. • Noise. • Traffic accidents. • Loss of attractiveness of the city while decreasing its functionality. • Increasing amount of waste products such as tyres, oil and other materials.
Jaller et al. (2016)	Identifies as negative externalities increased fuel consumption, traffic congestion levels, emissions and

	pollutants that affect people's health, among other aspects, which, if left unaddressed, deteriorate conditions as a result of the continuous growth in demand experienced in most cities.
Moutaoukil et al. (2015)	Although urban freight distribution plays an important role in supporting commercial activities and contributes to the dynamism of cities, it also generates some negative impacts, which can be classified as: • Economic impacts: congestion, inefficiency and waste of resources, damage to infrastructure. • Environmental impacts: pollutant emissions, global warming, excessive fuel consumption. • Social impacts: physical consequences of pollutant emissions on public health, traffic accidents, noise, etc.
Papoutsis and Nathanail (2016)	Due to its inherent characteristics and service objectives, urban road freight transport generates harmful atmospheric emissions to a greater extent than journeys made by car or motorbike. Its fuel consumption per kilometre is higher than that of passenger vehicles, and the traffic congestion it creates affects the level of mobility and road safety for drivers, pedestrians and cyclists. In this sense, urban freight distribution generates a wide range of direct impacts and secondary effects.
Quak (2008)	The dominant share and growing trend of road transport in urban freight distribution negatively affects sustainability, impacting human health, reducing quality of life, and affecting the economy in general due to the potential price increases it generates.
Ranieri et al. (2018)	They address innovative strategies for last-mile logistics, with a focus on reducing the costs of externalities such as congestion and pollution, which have increased in recent years due to the growth of freight transport, online sales and globalisation.
Savall-Mañó and Ribas (2024).	The boom in online sales, coupled with the speed of home deliveries, has a negative impact on cities, generating a series of externalities that municipal authorities are trying to mitigate. In this case, it is proposed that the authorities assess the impact of restricting freight traffic during specific time slots and formulate regulations based on scenarios that minimise negative externalities (congestion, emissions, etc.).

Source: own elaboration.

Although there is a clear diagnosis of the ills of the modern city, what is much less clear is the formula for moving from current unsustainable urban transport trends to a more sustainable future, especially given the numerous stakeholders involved, the complexity of urban systems and the fragmented nature of decision-making. Furthermore, in most cases, authorities probably do not have the mandate, responsibility, power or support to make decisions that are consistent with sustainable development (Kennedy et al., 2005).

Urban logistics is a field characterised by strong technological and digital dynamism and by the urgent need to consolidate more sustainable models in the face of the growing economic, social and environmental challenges set out in the 2030 Agenda (Russo and Comi, 2024).

It has thus become a major challenge for cities, and several articles have paid special attention to how to improve urban mobility from the perspective of smart cities (Asuncion del Cacho Estil-Les, 2025; Cassiano et al., 2021; Ismael and Holguin-Veras 2025; Golinska-Dawson and Sethanan, 2023; Yu et al., 2025; Pan et al., 2021; Zhang et al., 2025).

Table 2 provides some examples of references to innovative initiatives and technologies that can help in the transition to smart and more sustainable cities.

Table 2: References from authors on innovative initiatives and technologies to promote a transition to more sustainable cities

Barbosa et al. (2018); Golinska-Dawson and Sethanan (2023); Liu et al. (2023); Rubino et al. (2025)	Developments in information and communication technologies (ICT), such as sensor networks, the Internet of Things (IoT), Big Data, artificial intelligence, cloud computing, cyber-physical systems and digital twins, enable organisations and individuals to interact dynamically and intensively and are changing the demands and requirements of urban logistics. Smart city developments are driving the integration and convergence of urban infrastructures based on the integration of technological resources, creating real opportunities for supply chain management.
Russo and Comi (2023)	The introduction of ICTs, such as the Internet of Things (IoT), Big Data, blockchain and artificial intelligence, helps to improve the learning process in route optimisation problems in smart cities. By providing real-time data, it reduces both driving and walking costs for delivery personnel and allows them to reserve delivery areas in advance, which improves delivery times.
Golinska-Dawson and Sethanan (2023)	They consider the use of drone-based modes of transport, autonomous delivery robots, autonomous vehicles, cargo bikes (including electric cargo bikes and electric tricycles), electric vehicles (mainly vans) and combined rapid passenger and freight transport systems to be an important factor in achieving more energy-efficient smart cities.

Faiçal et al. (2023)	Propose a roadmap for cyber-physical systems applied to unmanned aerial vehicles (drones) to reduce costs and increase speed in last-mile deliveries in smart cities.
Kwasiborska et al. (2023)	Address zero-emission transport policy, analysing the energy efficiency of using drones versus electric scooters for delivering food from restaurants to consumers.
Melo et al. (2017)	They analyse traffic management systems to help achieve smart cities, relying in this case on redirection systems, i.e. guides for vehicle routes that could reduce travel times and improve traffic efficiency and performance.
Asuncion del Cacho Estil-Les (2025)	Addresses two very relevant problems in smart cities, namely postal delivery and waste collection, applying route optimisation strategies and considering smart charging to minimise peaks in demand on the electricity grid.
Kłodawski et al. (2024)	They address the importance of optimising operations and improving the energy efficiency of intermodal terminals in smart cities by focusing on the strategies and operations of crane loading.
Ismael and Holguin-Veras (2025)	They propose reducing congestion, the social costs of parking and driving, and emissions, based on a model of optimal parking space allocation according to attributes such as vehicle type or parking time, which could support policy interventions to manage high parking demand.
Aloui et al. (2021)	They address collaboration between companies as a possible solution to improve the efficiency of freight transport in cities, and their case study of four small and medium-sized enterprises in the agri-food sector shows positive results in reducing CO_2 emissions, logistics costs and the accident rate caused by urban freight transport.
Oliveira et al. (2022)	They propose integrating the public transport and freight transport structures with the aim of reducing the externalities associated with freight transport, proposing the use of a network of lockers in the public transport infrastructure, through which residents actively participate in last-mile deliveries. This also encourages the use of public transport, contributing to more sustainable cities.
Leyerer et al. (2020)	They analyse the optimisation of urban logistics in e-grocery operations through a network of refrigerated lockers that allow products to be temporarily stored in urban areas for direct collection by customers, and route planning using bicycles to transport the product from the lockers to customers' homes.

Zhang et al. (2025)	They propose a route planning model that integrates lockers for the collection of parcels by citizens, but considering not only operational optimisation, but also the analysis, behaviour and preferences of consumers, who sometimes do not seem to use such lockers because they are not located on their regular routes.
Cassiano et al. (2021)	They promote sustainable urban freight transport by integrating freight transport planning with urban planning to develop it.
De Oliveira et al. (2024)	They propose, with the aim of promoting sustainable cities, developing integrated freight and passenger transport systems, as these allow for the optimisation of urban space, a reduction in freight vehicle movements and operating costs, and an increase in the efficiency of the transport system.
Yu et al. (2025)	They address the optimisation of the design of a network of underground spatial logistics systems for smart cities that seeks to balance economic efficiency and robustness for the planning of underground logistics space, contributing to the sustainable urban development of densely populated regions.

Source: own elaboration.

3. Methodology

3.1 Systematic review approach

In this article, we have chosen to follow a systematic review of the literature as the main research methodology, with the aim of offering a rigorous and replicable analysis of knowledge related to the externalities of urban logistics and its challenges and opportunities in the transition to smart and sustainable cities.

Compared to narrative reviews, this methodology establishes very precise questions and follows a structured process that increases the traceability of the procedure, guarantees a comprehensive synthesis of the existing academic literature, and presents the most relevant findings (Lagorio et al., 2016; De Oliveira et al., 2017).

Using internationally renowned databases such as Web of Science, Science Direct and Google Scholar, which integrate multidisciplinary literature covering areas ranging from transport engineering and supply chain management to urban public policy and environmental sciences, and applying advanced search strategies that have made it possible to link keywords such as "externalities" with "urban logistics" or "urban freight transport" or "last-mile deliveries", and also with terms such as "sustainable cities" or "smart cities". In the first phase, we have managed to identify articles that relate all these keywords, thus focusing the research on the transition to smart and sustainable cities.

Table 3. Keywords and search criteria (inclusion/exclusion) used in Web of Science

Topic
“Externalities” OR “Costs”
And
"Urban Freight Solutions" OR "Urban freight distribution" OR "Urban freight transport" OR "Urban freight" OR "Urban logistics" OR "City logistics" OR "Last mile delivery" OR "Last mile supply chains"
And
“Smart cities” OR “Sustainable cities”

Source: own elaboration.

On the other hand, in order to guarantee the quality of the results, increase the number of publications reviewed and delve deeper into the analysis of the externalities and challenges facing urban logistics, in a second phase, other publications located in other databases and search engines such as Science Direct or Google Scholar were considered, taking into account criteria such as the relevance of the publications analysed and the soundness and empirical rigour of the studies.

In these two phases, some articles were discarded, either because they were too specific or because they had methodologies and results that did not fall within the scope of this article. This made it possible to carry out a quality assessment process of the articles identified and reviewed.

Finally, although the results obtained after applying this methodology can help public decision-makers and other stakeholders to understand the externalities and challenges facing urban logistics and can assist in the transition to smarter cities, its application has revealed research gaps that could be of great interest to all stakeholders in urban logistics management, such as, for example the lack of specific policy capacities that consider urban freight transport issues (Cui et al., 2015); the lack of consensus between national and local authorities and private actors, and in many cases, the absence of policies and guidelines for efficient urban transport system planning (Sdoukopoulos et al., 2016); or the lack of fundamental data and knowledge on the part of local governments for organising freight transport in cities (Holguín-Veras et al., 2020a).

4. Results and Analysis

4.1 Negative externalities generated by urban logistics

The main negative externalities associated with urban logistics are described and analysed below.

Table 4. Negative externalities generated by urban logistics

Excessive consumption of energy resources.
Polluting emissions.

Traffic congestion.
Noise.
Road safety.

Source: own elaboration.

4.1.1 Excessive consumption of energy resources

Fuel consumption per kilometre in urban logistics is higher than for passenger vehicles. However, growing awareness of environmental issues and related policy objectives and tax reduction measures (e.g. to promote biofuels), together with declining availability and rising prices of fossil fuels, may promote more optimal use of vehicles, as well as new opportunities for environmental businesses, thus having a decreasing effect on average fuel consumption. Energy and environmental concerns could also add value to modal shift in urban transport (Liimatainen et al., 2015), and increasingly stringent environmental protection regulations could increase the attractiveness of other modes of transport such as rail or maritime (Von der Gracht and Darkow, 2010).

It is also important to note that in recent years there has been rapid growth in the trend towards sharing freight journeys in private cars, vans and light trucks, especially in the construction and service sectors, which may complicate the assessment of the impacts attributable to freight transport (Himanen et al., 2004).

On the other hand, volatile oil prices could encourage logistics service providers to research and implement alternative fuels (Tacken et al., 2014).

4.1.2 Pollutant emissions

Air pollution continues to have a significant impact on the health of the European population, particularly in cities, with transport being one of the main sectors contributing to such pollutant emissions (Himanen et al., 2004).

The most serious pollutants in Europe, in terms of damage to human health, are PM (particulate matter), NO2 and O3 at ground level. In general terms, they can cause more than 230,000 premature deaths per year in the European Union (according to data from the European Environment Agency (EEA) in 2022). Poor air quality is therefore one of the main causes of premature death related to the environment in the European Union.

The World Bank estimates that 0.5 million people in developing countries die each year from transport-related emissions, with a similar number dying from traffic accidents. Thus, the pressure to develop sustainable transport systems is particularly intense in urban areas (Kennedy et al., 2005).

In this context, where GHG emissions undoubtedly pose the greatest threat to society in the medium and long term (Whiteing, 2010), the European Union has set the ambitious target of reducing them by 55% by 2030 (European Commission, 2021), as it contributes significantly both to local emissions (i.e. NOx, elemental carbon and organic carbon) that affect urban air quality, disrupting citizens' health and life expectancy, and to global emissions (i.e. CO2) that affect global warming (Quak et al., 2016).

Furthermore, some studies argue that emission reductions of less than 1% produce significant health benefits (Jaller et al., 2016).

Urban transport is more polluting than long-distance transport due to the frequency of short trips and stops. Fuel consumption increases considerably if the vehicle has to stop very often: with five stops in 10 km, fuel consumption can increase by up to 140% (Filippi et al., 2010).

Therefore, operations involving a large number of short journeys and a large number of stops make urban freight transport less sustainable than long-distance transport (Tadić et al., 2015).

In addition, urban logistics is more polluting than long-distance freight transport because delivery vehicles are generally older, vehicles accelerate and decelerate continuously, and idling vehicles are less energy efficient (Ragàs Prat, 2018).

4.1.2.1 Some factors that influence pollutant emissions

In terms of urban logistics, pollutant emissions depend on several factors, such as the weight and size of vehicles, the type of fuel used (Cui et al., 2015), the technical specifications of the vehicle, the load capacity used, the distance travelled, traffic and road conditions, and the average speed, which will depend, among other things, on the urban route itself. However, some studies indicate that CO2 emissions are not directly related to the weight of the load, but rather to the actual weight of the vehicles used, including their load and unladen weight. This means that the use of appropriately sized vehicles reduces CO2 emissions. The incorporation of a lighter vehicle would, however, mean a reduction in its payload (Moutaoukil et al., 2015).

Behnke and Kirschtein (2017) argue that alternative routes and heterogeneous vehicles must be taken into account when planning urban freight transport with an environmental focus. This could lead to potential emissions savings of more than 4%. They therefore propose a vehicle routing model that seeks to minimise the total GHG emissions of all vehicles used to serve all customers from a central depot. Traditional approaches seek routes that minimise travel distance or travel time, but as environmental issues become additional objectives in almost all business management processes, the most current approaches address environmental aspects by focusing, for example, on minimising fuel consumption, GHG emissions, noise, or similar measures.

Zhang et al. (2025) also address the importance of operational efficiency in delivery and environmental sustainability as relevant aspects in achieving sustainable development in smart city distribution logistics, proposing specific goods distribution routes using electric vehicles.

And Azad et al. (2023) assess how the use of electric tricycles can reduce pollutant emission costs, thereby improving the sustainability of urban logistics.

4.1.2.2 Percentage of pollutant emissions generated by freight transport

Numerous studies refer to the percentage of pollutant emissions generated by freight transport. Table 3 shows some examples of these references:

Table 5: Polluting emissions generated by freight transport

Cagliano et al. (2017)	Approximately 8% of global energy-related CO2 emissions are derived from freight transport, 92% of which is due to road transport.
Dablanc (2007)	Although freight transport accounts for only 20-30% of road traffic in cities, it can generate between 16 and 50% (depending on the pollutant considered) of the atmospheric pollutant emissions derived from transport activities in a city. so although urban freight transport operations constitute a small proportion of road traffic in cities, they are one of the main emitters of air pollutants.
De Marco et al. (2018)	The share of CO2 emissions from goods vehicles in relation to total urban traffic is approximately 20 to 30%, while for PM particles it can reach 50%.
Kin et al. (2016)	Pollutant emissions from transport-related activities within cities can account for up to 50%, depending on the pollutant considered.
Ragàs Prat (2018)	Urban freight distribution in European cities accounts for 25% of transport-related CO2 emissions, 33% of NOx emissions and 50% of particulate emissions.

Source: own elaboration.

4.1.3. Traffic congestion

Traffic congestion is a common phenomenon in major cities around the world (Figliozzi, 2007) and its levels on urban roads are constantly increasing due to growing traffic demand as cities become more populated (Taniguchi et al., 2003). Increasing levels of congestion are also likely to be related to the increased frequency of delivery vehicle use and longer transport distances (Pawlak and Stajniak, 2011).

Therefore, as population and income (and thus total consumption) grow, and as global trade expands, congestion is likely to worsen unless effective solutions are found, and its effects will be most noticeable in urban areas, where, in the case of the EU, this problem is expected to worsen in the future (Whiteing, 2010).

Table 6. Some consequences of traffic congestion

• Traffic congestion, caused mainly by increased population concentrations, together with greater use of motor vehicles (Himanen et al., 2004), means that citizens and transport operators have to spend more time travelling, causing a serious loss of productive time. • Some studies refer to the cost of time lost due to traffic congestion and inefficiencies in urban logistics management, which accounts for approximately 2% of the GDP of any OECD country (Sanz and Pastor, 2009). • Other studies argue that, as a result of traffic congestion, Europe loses approximately more than €80 billion per year (Sdoukopoulos et al., 2016), approximately 1% of the European Union's GDP (Savelsbergh and Van Woensel, 2016). • The increase in travel time and uncertainty caused by congestion affects the efficiency of logistics operations. As congestion increases, the number of vehicles needed to complete the journey also increases. This is accompanied by an increase in the percentage of total driving time, as well as the average distance travelled per customer (Figliozzi, 2007). • Congestion increases the operating costs of carriers, who will need more fuel and will have to bear higher labour costs due to the need for overtime (Figliozzi, 2007). • Goods arrive late to their final recipients, thus increasing delivery costs (Tadić et al., 2015), which will have an impact on the final price of the products and, consequently, on the competitiveness of companies. • Traffic congestion often leads to the use of alternative routes, which may be longer and less safe, thereby increasing transport costs and risk. These costs and risks are transferred through the supply chain to the end user and also result in an overall loss for society (Tadić et al., 2015). • Traffic congestion encourages fuel consumption, pollution and accidents. Collisions involving large lorries cause great trauma to communities, so that both the social and environmental impacts of goods transport become a major problem for residents (Taniguchi et al., 2003). • Goods vehicles reduce road capacity more than other types of vehicles when they park, for example, to carry out loading and unloading operations (Kin et al., 2016). • When comparing passenger vehicles with commercial goods delivery vehicles, although the latter are fewer in number, they are larger in size and noisier, and therefore cause greater road safety issues (Anand et al., 2015).

Source: own elaboration.

Table 7. Some solutions to traffic congestion

• Traffic congestion is a major problem that affects all stakeholders today. According to the European Commission, 9 out of 10 Europeans believe that the traffic situation in their city could be improved, which is why many cities are trying to optimise their traffic situation by setting up traffic control management, responsible for monitoring and controlling the city's traffic infrastructure to ensure safe, efficient and effective flows that minimise congestion (Köster et al., 2015).

• One measure that could reduce traffic congestion in cities would be night-time deliveries, which, although they could provide advantages for logistics service providers and citizens, could harm both recipients, by increasing their operating costs, and local residents, due to the noise nuisance they may cause (Verlinde and Macharis, 2016).

Source: own elaboration.

4.1.4 Noise

In the European Union, 80% of noise in cities comes from traffic and interferes with people's basic activities such as communication, sleep and rest, causing physical and psychological disorders in many cases.

Research carried out by the World Health Organisation (WHO) shows that more than 34 million EU citizens are exposed to noise levels exceeding 50 decibels at night, when the limit should be less than 30 decibels. This leads to health problems and dysfunctions in the human body (Kauf, 2016).

Although noise is mainly taken into account in zoning policies, the evolution of its impacts does not seem to have progressed very far and in many cases it is still treated as a nuisance (Himanen et al., 2004).

4.1.5 Road safety

With the increase in the number of goods vehicles, road safety is declining. Furthermore, road characteristics, vehicle types, driver training and traffic management are often not taken into account in the route planning process for goods vehicles, and these weaknesses are leading to an increase in the number of accidents and damage to infrastructure, i.e. roads (Tadić et al., 2015).

Urban logistics affects road safety in multiple ways (Ragàs Prat, 2018):

- If goods vehicles park near pedestrian crossings, they can block direct visibility between pedestrians and other traffic.
- Logistics corridors generally run along the main roads of cities, affecting pedestrians and other smaller vehicles.
- On other occasions, larger vehicles, due to their size, do not take pedestrians and smaller vehicles into account, unconsciously ignoring their presence.
- In addition, they need more space to turn, sometimes occupying lanes and spaces intended for pedestrians and cyclists.

4.2 Challenges and proposals for improving the sustainability of urban logistics

Important challenges in urban logistics and possible proposals to promote a transition towards smart and sustainable cities are described and analysed below.

Table 8. Sustainability challenges and proposals

Challenges	Proposals
Heterogeneous preferences of different stakeholders	Integration/collaboration
Lack of efficient transport policies	Incorporation of sustainability into governance and urban freight transport policy-making
Lack of knowledge of international norms and standards	Improvement of logistics and freight transport quality
Poor environmental performance of companies	Integration of sustainable development into supply chains
Need to promote technological development and logistics 5.0	Smart cities.

Source: own elaboration.

4.2.1 Heterogeneous preferences of different stakeholders. Proposal for integration/collaboration

The sustainability/unsustainability of urban freight transport often depends on the specific stakeholders involved and their perception of their activity/role in urban logistics. A possible solution from one actor's point of view may represent a new and insurmountable problem for another, which exacerbates the complexity of the system. In this regard, local policymakers, in addition to being effective in achieving economic, environmental and social objectives, have to deal with this complex framework of heterogeneous stakeholders in order to gain their acceptance of such policies. That is why conducting comprehensive ex ante policy assessments, acquiring specific data from each of the stakeholders (even though this data acquisition process is critical and costly), becomes essential for forecasting the likely effects and reactions of these policies on the different stakeholder groups affected (Comi et al., 2024; Gatta and Marcucci, 2016; Nuzzolo and Comi, 2014).

However, while city administrators make great efforts to develop ex post evaluation methodologies to understand results, draw lessons for other implementations, and compare best practices in city logistics, unfortunately, ex ante estimates of these urban logistics measures are rarely carried out. Cause-and-effect relationships are not studied, and there is no estimation of the conditions required to ensure that objectives are achieved (Estrada and Roca-Riu, 2017).

On the other hand, transport sustainability, from a policy perspective, is often treated in isolation, and policymakers should reconcile sustainability with other public objectives (Himanen et al., 2004).

4.2.2 Lack of efficient transport policies. Proposal to incorporate sustainability into the governance and formulation of urban freight transport policies

The growing popularity of the concept of sustainable development in recent years has led public bodies to incorporate sustainability issues into urban freight transport policy considerations, with the aim of developing sustainable urban freight transport that takes into account social, economic and environmental dimensions (Akyol and De Koster, 2013).

The basis for this sustainable development of urban freight transport are solutions that could support the implementation of the transport process in terms of its optimisation and reduction of negative impacts, solutions that are based on the integration of many different subsystems and require effective information flows and modern technologies for their operation (Iwan, 2016).

The Transport Policy Agenda of the European Union and Member States has also been considering the sustainability of transport systems for a long time, and its development has been strongly driven by policies supported mainly by research, funded by various national (government institutions and private companies) and international (European Union Framework Programmes) sources (Janic, 2006).

Table 9. Objectives of the European Union's Research Programmes

• To understand the problems and develop solutions to mitigate the impacts that transport systems have on society and the environment. • Disseminate existing knowledge and exploit research results to support the EU's Common Transport Policy and the national policies of Member States. • Develop and integrate innovative transport technologies for introduction into more sustainable future transport systems.

Source: own elaboration.

4.2.3 Lack of knowledge of international norms and standards. Proposal to improve logistics and freight transport quality

The European Committee for Standardisation (CEN) provides a platform for the development of European standards and other specifications and is the only recognised European organisation authorised to plan, draft and adopt European standards in almost all areas of economic activity.

Table 10. European international norms and standards that exist to promote logistics and freight transport quality

UNE - EN 13011:2001: Transport services. Freight transport chains. System for declaring service conditions. UNE - CEN / TR 14310: 2003: Freight transport services. Declaration and information on environmental performance in the freight transport chain. UNE - EN 13876: 2003: Transport. Logistics and Services. Freight transport chains. Code of good practice for the provision of freight transport services. UNE - EN 12507: 2006: Transport services. Guide for the application of Standard EN ISO 9001:2000 to road and rail transport, storage and distribution companies. UNE - EN ISO 9001: 2015: Quality management systems. Requirements (ISO 9001:2015). UNE - EN 12798: 2007: Transport quality system. Road, rail and inland waterway transport. Quality system requirements complementary to EN ISO 9001 with regard to the safety of the transport of dangerous goods. UNE - EN 15696: 2009: Self-storage. Specifications for self-storage services.

Source: own elaboration.

In addition to the above standards, there are key ISO management standards: ISO 9001 (quality management system requirements), ISO 14001 (environmental management system requirements) and ISO 28000 (supply chain security management system).

On the other hand, by way of example, ISO 14064 provides governments, companies, countries, regions and other organisations with an integrated set of tools aimed at guiding the measurement, quantification and reduction of greenhouse gas emissions, with ISO 14064-1 clarifying the principles and requirements at company level for measuring and reporting greenhouse gas emissions and removals (GHG) (Tacken et al., 2014).

There is also a draft UNE 178304 standard, "Smart cities. KPIs for the characterisation, monitoring and improvement of urban logistics or last-mile distribution", which aims to define and establish key performance indicator (KPI) requirements for the characterisation, monitoring and improvement of urban logistics or last-mile distribution, from the point of view of reducing the impact of the activity, energy efficiency and cost reduction.

For its part, the International Organisation for Standardisation's ISO 37120: 2018 standard: Sustainable cities and communities - Indicators for city services and quality of life proposes a series of indicators that measure service provision and quality of life in cities. These types of standards make it possible to analyse the effects of urban transport (Hajduk, 2017).

In this regard, as environmental management standards become increasingly common and certifications such as ISO 14001 and corresponding environmental management systems are increasingly valued, many companies are planning to obtain certification if they do not already have it, in addition to measuring their carbon footprints, energy consumption, noise, empty trips, or having ecological KPIs (Tacken et al., 2014).

It also appears that carbon footprints are often the measurement technique chosen by logistics service providers. However, different standards are used, indicating a lack of general agreement on measurement, so standardisation at the sectoral level would be desirable in terms of the effectiveness of the application of different certification schemes (Tacken et al., 2014).

Some studies argue that, in general terms, these standards are little known except for ISO 9001 and ISO 14001, so an effort is needed to disseminate them and make them known to all users (Islam and Zunder, 2014).

4.2.4 Poor environmental performance of companies. Proposal to integrate sustainable development into supply chains

In today's complex and uncertain business environments, where companies are increasingly subject to external pressures from both legislation and public opinion, the pursuit of sustainable development is imperative, and companies must reconfigure their supply chains to combine economic prosperity, social equity and environmental quality. In this context, environmental analysis is a strategic activity that is becoming increasingly important, although there is still insufficient knowledge about how to create sustainable supply chains, and companies lack the knowledge they need to address the challenges posed by the need to adhere to the principles of sustainable development (Fabbe-Costes et al., 2014).

Thus, growing economic, political and social pressures are causing companies to prioritise their efforts to reduce their environmental impact (Tacken et al., 2014), and both innovation and resilience are becoming necessary traits that they must acquire in order to compete in the dynamic and turbulent environments that characterise today's markets, as they show that they are receptive to change; they are always ready to face new challenges, actively seeking innovative and creative ideas; they can respond quickly to sudden disruptions; and they can better meet customer needs.

In this regard, organisations are increasingly investing in innovative capabilities related to logistics, with the aim of increasing their service levels. This is being demonstrated, for example, by companies such as DHL, which is innovating in environmental sustainability and urban logistics to anticipate possible disruptions that may occur in the urban distribution environment (Golgeci and Ponomarov, 2013).

On the other hand, sustainable development has an impact on operations and supply chain management, modifying product design, sourcing, production, transport models, stock policies, distribution and waste networks, and partner relationships. However, companies should not simply be reactive, aimed at complying with legal requirements, but rather proactive. As companies face the challenges of integrating sustainable development into their supply chains, they will discover the strategic benefits that can be accumulated, which may be related to better financial performance, improved corporate reputation, and greater competitive advantage (Fabbe-Costes et al., 2014).

Sustainability is therefore considered a key factor that can help companies improve both their operations and strategic growth, while gaining a competitive advantage and delivering sustainable value to society at large (Mangiaracina et al., 2015).

Some studies have argued that the environmental performance of transport is a value-added service for some segments of shippers, and some of the largest logistics service providers (LSPs) offer services with excellent environmental performance (Arvidsson et al., 2013).

4.2.5 Need to promote technological development and logistics 5.0. Smart city proposal.

Organisations need to invest in Logistics 5.0 systems in order to optimise processes and achieve greater operational efficiency in today's competitive environments. The use of advanced technologies such as artificial intelligence can also have a major impact on the environment, contributing significantly to green logistics (Nicoletti and Appolloni, 2024).

The concept of a smart city proposes a holistic view of all aspects related to city management, such as construction, energy, the environment, government, housing, mobility, education, health, and urban logistics, from an integrated and optimised approach to all freight transport systems within the city in terms of efficiency, safety, viability, and environmental sustainability. Within this framework, smart technological tools, services, and applications are integrated into a single platform, which provides interoperability and coordination between the various sectors (Perboli et al., 2014).

Reyes-Rubiano et al. (2021) consider a smart city to be a city in which technology is applied to improve urban operations, infrastructure, strategies and policies, emphasising the dimensions of technology and sustainability as key elements in achieving the transition to smart cities.

These are modern cities that use innovative technologies in all areas of their operations and comply with the environmental protection requirements demanded by the European Union, improving the quality of life and competitiveness of businesses located in their urban areas (Kauf, 2016). They provide businesses with the necessary infrastructure to perform Big Data analysis, facilitate governance mechanisms based on collaboration between various stakeholders (businesses, end users and local stakeholders), and information and communication technology-based infrastructures that enable the dissemination of big data and the implementation of initiatives and solutions that provide a better quality of life, making a city more attractive. In addition, they have potential workers with the necessary skills to manage them (Tachizawa et al., 2015).

5. Discussion. The need to improve the sustainability of urban logistics and achieve sustainable cities

Freight transport is caught in a constant tension between efficient logistics and sustainable development (Tadić et al., 2015), the latter being considered as development that meets present needs without compromising the ability of future generations to meet their needs (Janic, 2006; Mangiaracina et al., 2015).

Therefore, logistics managers face the challenge of designing sustainable supply chains for the future, as well as ensuring the continuous development of the capacity of sustainability management professionals (Von der Gracht and Darkow, 2016).

Some studies argue that the process that regions must follow to move towards more sustainable urban transport development should consider the four pillars in the order presented here: governance, financing, infrastructure and neighbourhoods, with Greater London providing a good example in this regard. However, even if a city meets the requirements for sustainable urban transport, it would still need to adapt its governance structure to the growth of the region (Kennedy et al., 2005).

Although in recent years urban logistics initiatives have focused on improving the efficiency, safety, viability and environmental sustainability of urban transport systems, and although several projects have been developed for this purpose, transport is still considered an important sector that needs further improvement (Perboli et al., 2014).

In order to overcome the challenges of urban logistics and achieve modern, smart and sustainable cities, it is necessary to implement proposals that integrate a technological, organisational and governance approach to help build more sustainable urban logistics ecosystems, characterised by collaboration between public and private actors, enabling not only the digital evolution of cities, but also a structural transformation of urban logistics, thus turning it into a lever for resilience, efficiency and cohesion (Rubino et al., 2025).

6. Conclusions

Although urban logistics is an indispensable element for the functioning of modern cities, it is also accompanied by a series of negative externalities that need to be understood and well managed in order to improve the quality of cities.

The aim of this study was, firstly, to identify the main externalities generated by urban logistics and, secondly, to understand the main challenges and propose actions that would enable progress towards smarter and more sustainable city models. To this end, a literature review was conducted with the aim of first identifying the main negative externalities generated by urban logistics and, secondly, the challenges and proposals for action that could be implemented to achieve more sustainable cities.

Various authors refer to these externalities in their publications, which can be summarised in the following five categories: excessive consumption of energy resources, polluting emissions, traffic congestion, noise and road safety. In addition to these externalities, companies prioritise economic efficiency to the detriment of environmental and social objectives, which reinforces their persistence.

With the aim of assisting in the transition to smart cities and improving the sustainability of urban logistics, a series of proposals are put forward that could mitigate the externalities and challenges it faces. The analysis shows that the heterogeneity of stakeholders and their divergent perceptions constitute a structural challenge to the viability of sustainable policies in urban logistics. It is critical to implement rigorous ex ante assessments that allow impacts to be anticipated, rather than focusing solely on ex post assessments. There is also a lack of clear and integrated urban transport policies, which requires greater incorporation of sustainability into public governance and the formulation of urban freight transport policies. The lack of knowledge of international norms and standards also creates a need to improve logistics quality and freight transport. The adoption of international standards in logistics and transport could contribute to standardising practices, improving the efficiency and quality of the system. In addition, companies must face the challenges of integrating sustainable development into their supply chains. Finally, smart city proposals show great potential for harmonising mobility, technology and sustainability, favouring the reduction of externalities generated by urban logistics. Digitalisation and the use of technologies such as IoT, Big Data, AI, drones and autonomous vehicles represent new opportunities for operational and energy efficiency. At the same time, companies must restructure their supply chains to integrate sustainability as a strategic focus, generating competitive advantages and strengthening their resilience.

All of this suggests that, in order to support the transition to a sustainable urban logistics model, both technological innovation and cooperation between the different agents are required, under a systemic and long-term approach.

The results of this study can help decision-makers and transport and logistics managers in various sectors, both public and private, to understand the current priorities and approaches in this transition towards sustainable urban logistics and a model of resilient, inclusive and smart cities that inspire the guidelines of the 2030 Agenda.

Acknowledgements
N/A

References

Akyol, D.E. and De Koster, R.B.M. (2013). Non-dominated time-window policies in city distribution. *Production and Operations Management, 22* (3), 739-751.

Aloui, A., Hamani, N., & Delahoche, L. (2021). An integrated optimisation approach using a collaborative strategy for sustainable cities freight transportation: A Case study. *Sustainable cities and society, 75*, 103331.

Allen, J., Thorne, G., & Browne, M. (2007). *Good practice guide on urban freight transport*. Rijswijk: Best Urban Freight Solutions (Bestufs).

Anand, N., Van Duin, J.R., Quak, H., & Tavasszy, L.A. (2015). Relevance of city logistics modelling efforts: a review. *Transport Reviews, 35* (6), 701-719.

Arvidsson, N., Woxenius, J., & Lammgård, C. (2013). Review of road hauliers' measures for increasing transport efficiency and sustainability in urban freight distribution. *Transport Reviews, 33*(1), 107–127.

Asuncion del Cacho Estil-Les, M., Marcello Mangini, A., Roccotelli, M., & Fanti, M. P. (2025). Electric Vehicle Routing Optimisation for Postal Delivery and Waste Collection in Smart Cities. *IEEE Transactions on Intelligent Transportation Systems, 26*(3), 3307-3323.

Azad, M., Rose, W. J., MacArthur, J. H., & Cherry, C. R. (2023). E-trikes for urban delivery: An empirical mixed-fleet simulation approach to assess city logistics sustainability. *Sustainable Cities and Society, 96*, 104641.

Barbosa, M.W., de la Calle Vicente, A., Ladeira, M.B., & de Oliveira, M.P.V. (2018). Managing supply chain resources with big data analytics: a systematic review. *International Journal of Logistics Research and Applications, 21* (3), 177-200.

Behnke, M., & Kirschstein, T. (2017). The impact of path selection on GHG emissions in city logistics. *Transportation Research Part E*, 106, 320–336.

Boussier, J.M., Cucu, T., Ion, L. and Breuil, D. (2011). Simulation of goods delivery process. International *Journal of Physical Distribution & Logistics Management, 41* (9), 913-930.

Browne, M. and Gomez, M. (2011). The impact on urban distribution operations of upstream supply chain constraints. *International Journal of Physical Distribution & Logistics Management*, 41 (9), 896-912.

Cagliano, A.C., Carlin, A., Mangano, G., & Rafele, C. (2017). Analysing the diffusion of eco-friendly vans for urban freight distribution. The International Journal of Logistics Management, 28, 1218-1242.

Cassiano, D. R., Bertoncini, B. V., & de Oliveira, L. K. (2021). A conceptual model based on the activity system and transportation system for sustainable urban freight transport. *Sustainability, 13*(10), 5642.

Comi, A., Fancello, G., Piras, F., & Serra, P. (2024). Towards more sustainable cities: tools and policies for urban goods movements. *Journal of Advanced Transportation*, (1), 1952969.

European Commission. (2021). "Target 55" package for a just transition. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/delivering-european-green-deal/fit-55-delivering-proposals_es

Crainic, T.G., Ricciardi, N., & Storchi, G. (2009). Models for evaluating and planning city logistics systems. *Transportation Science, 43*(4), 432–454.

Cui, J., Dodson, J. and Hall, P.V. (2015). Planning for urban freight transport: an overview. *Transport Reviews, 35* (5), 583-598.

Dablanc, L. (2007). Goods transport in large European cities: difficult to organise, difficult to modernise. *Transportation Research Part A: Policy and Practice, 41* (3), 280–285.

De Marco, A., Mangano, G., & Zenezini, G. (2018). Classification and benchmark of city logistics measures: an empirical analysis. *International Journal of Logistics Research and Applications*, 21 (1), 1–19.

de Oliveira, C.M., Albergaria De Mello Bandeira, R., Vasconcelos Goes, G., Schmitz Gonçalves, D.N., & D'Agosto, M.D. (2017). Sustainable vehicles-based alternatives in last mile distribution of urban freight transport: a systematic literature review. *Sustainability*, 9, 1324.

de Oliveira, I. K., Meira, L. H., & Oliveira, L. K. (2024). Key factors for developing freight and passenger integrated transportation systems in Brazil. *Research in Transportation Economics*, 104, 101425.

Estrada, M., & Roca-Riu, M. (2017). Stakeholder`s profitability of carrier-led consolidation strategies in urban goods distribution. *Transportation Research Part E: Logistics and Transportation Review*, 104, 165-188.

Fabbe-Costes, N., Roussat, C., Taylor, M., & Taylor, W.A. (2014). Sustainable supply chains: a framework for environmental scanning practices. International *Journal of Operations and Production Management, 34* (5), 664-694.

Faiçal, B. S., Marcondes, C. A., Loubach, D. S., Sbruzzi, E. F., Verri, F. A., Marques, J. C., ... & Curtis, V. V. (2023). A Cyber-Physical System's Roadmap to Last-Mile Delivery Drones. *IEEE Aerospace and Electronic Systems Magazine, 38*(5), 6-16.

Figliozzi, M.A. (2007). The impacts of congestion on commercial vehicle tours and costs. Transportation *Research Part E: Logistics and Transportation, 46* (4), 496-506.

Filippi, F., Nuzzolo, A., Comi, A., & Delle Site, P. (2010). Ex-ante assessment of urban freight transport policies. *Procedia - Social and Behavioural Sciences, 2*(3), 6332-6342.

Galambos, K. J., Palomino-Hernández, A. B., Hemmelmayr, V. C., & Turan, B. (2024). Sustainability initiatives in urban freight transportation in Europe. *Transportation Research Interdisciplinary Perspectives, 23*, 101013.

Gatta, V., & Marcucci, E. (2016). Stakeholder-specific data acquisition and urban freight policy evaluation: evidence, implications and new suggestions. Transport Reviews, 36 (5), 585-609.

Golgeci, I., & Ponomarov, S. (2013). Does firm innovativeness enable effective responses to supply chain disruptions? An empirical study. Supply Chain Management*: An International Journal, 18* (6), 604-617.

Golinska-Dawson, P., & Sethanan, K. (2023). Sustainable urban freight for energy-efficient smart cities—systematic literature review. *Energies, 16*(6), 2617.

Gonzalez-Feliu, J., & Morana, J. (2010). Are city logistics solutions sustainable? The Cityporto case. *Territorio Mobilità e Ambiente, 3* (2), 55–64.

Hajduk, S. (2017). Bibliometric analysis of publications on city logistics in international scientific literature. *Procedia Engineering, 182,* 282–290.

Himanen, V., Lee-Gosselin, M. and Perrels, A. (2004). Impacts of transport on sustainability: towards an integrated transatlantic evidence base*. Transport Reviews, 24* (6), 691-705.

Holguín-Veras, J., Amaya Leal, J., Sánchez-Diaz, I., Browne, M., & Wojtowicz, J. (2020a). State of the art and practice of urban freight management: Part I: infrastructure, vehicle-related, and traffic operations. *Transportation Research Part A: Policy and Practice, 137*, 360-382.

Holguín-Veras, J., Amaya Leal, J., Sanchez-Diaz, I., Browne, M., & Wojtowicz, J. (2020b). State of the art and practice of urban freight management: Part II: financial approaches, logistics, and demand management. *Transportation Research Part A: Policy and Practice, 137*, 383–410.

Islam, D.M.Z. and Zunder, T.H. (2014). The necessity for a new quality standard for freight transport and logistics in Europe. *European Transport Research Review, 6* (4), 397-410.

Ismael, A., & Holguin-Veras, J. (2025). Optimal parking allocation for heterogeneous vehicle types. *Transportation Research Part A: Policy and Practice, 192*, 104357.

Iwan, S. (2016). Implementation of telematics-based good practices to support urban freight transport systems, applying a city's adaptability level. *International Journal of Shipping and Transport Logistics, 8* (5), 531-551.

Jaller, M., Sánchez, S., Green, J., & Fandiño, M. (2016). Quantifying the impacts of sustainable city logistics measures in the Mexico City Metropolitan Area. *Transportation Research Procedia,* 12, 613-626.

Janic, M. (2006). Sustainable transport in the European Union: a review of past research and future ideas. *Transport Reviews, 26* (1), 81–104.

Kauf, S., (2016). City logistics - A strategic element of sustainable urban development. Transportation *Research Procedia 16*, 158-164.

Kennedy, C., Miller, E., Shalaby, A., Maclean, H., & Coleman, J. (2005). The four pillars of sustainable urban transportation. *Transport Reviews, 25* (4), 393-414.

Kin, B., Verlinde, S., van Lier, T., & Macharis, C. (2016). Is there life after subsidy for an urban consolidation centre? An investigation of the total costs and benefits of a privately-initiated concept. *Transportation Research Procedia,* 12, 357-369.

Köster, F., Ulmer, M.W., & Mattfeld, D.C. (2015). Cooperative traffic control management for city logistic routing. *Transportation Research Procedia, 10*, 673–682.

Kwasiborska, A., Stelmach, A., & Jabłońska, I. (2023). Quantitative and comparative analysis of energy consumption in urban logistics using unmanned aerial vehicles and selected means of transport. *Energies, 16*(18), 6467.

Kłodawski, M., Jachimowski, R., & Chamier-Gliszczyński, N. (2024). Analysis of the overhead crane energy consumption using different container loading strategies in urban logistics hubs. *Energies, 17*(5), 985.

Lagorio, A., Pinto, R., & Golini, R. (2016). Research in urban logistics: a systematic literature review. *International Journal of Physical Distribution and Logistics Management, 46* (10), 908-931.

Leyerer, M., Sonneberg, M. O., Heumann, M., & Breitner, M. H. (2020). Shortening the last mile in urban areas: Optimising a smart logistics concept for e-grocery operations. *Smart Cities, 3*(3), 585-603.

Liimatainen, H., Hovi, I.B., Arvidsson, N., & Nykänen, L. (2015). Driving forces of road freight CO2 in 2030. *International Journal of Physical Distribution & Logistics Management, 45*, 260–285.

Liu, Y., Pan, S., Folz, P., Ramparany, F., Bolle, S., Ballot, E., & Coupaye, T. (2023). Cognitive digital twins for freight parking management in last mile delivery under smart cities paradigm. *Computers in Industry, 153*, 104022.

Mangiaracina, R., Marchet, G. Perotti S., & Tumino A. (2015). A review of the environmental implications of B2C e-commerce: a logistics perspective. *International Journal of Physical Distribution & Logistics Management, 45* (6), 565-591.

Melo, S., Macedo, J., & Baptista, P. (2017). Guiding cities to pursue a smart mobility paradigm: An example from vehicle routing guidance and its traffic and operational effects. *Research in transportation economics, 65*, 24-33.

Moutaoukil, A., Neubert, G., & Derrouiche, R. (2015). Urban Freight Distribution: the impact of delivery time on sustainability. *IFAC-PapersOnLine, 48* (3), 2368-2373.

Nicoletti, B., & Appolloni, A. (2024). Green Logistics 5.0: a review of sustainability-oriented innovation with foundation models in logistics. *European Journal of Innovation Management, 27*(9), 542–561.

Nuzzolo, A., & Comi, A. (2014). Urban freight demand forecasting: a mixed quantity/delivery/vehicle-based model. *Transportation Research Part E: Logistics and Transportation Review, 65*, 84-98.

Oliveira, L. K. D., Oliveira, I. K. D., França, J. G. D. C. B., Balieiro, G. W. N., Cardoso, J. F., Bogo, T., ... & Littig, M. A. (2022). Integrating freight and public transport terminals infrastructure by locating lockers: analysing a feasible solution for a medium-sized Brazilian cities. *Sustainability, 14(*17), 10853.

Österle, I., Aditjandra, P.T., Vaghi, C., Grea, G., & Zunder, T.H. (2015). The role of a structured stakeholder consultation process within the establishment of a sustainable urban supply chain. *Supply Chain Management: An International Journal, 20* (3), 284-299.

Pan, S., Zhou, W., Piramuthu, S., Giannikas, V., & Chen, C. (2021). Smart city for sustainable urban freight logistics. *International Journal of Production Research, 59*(7), 2079-2089.

Papoutsis, K., & Nathanail, E. (2016). Facilitating the selection of city logistics measures through a concrete measures package: a generic approach. *Transportation Research Procedia, 12*, 679-691.

Pawlak, Z., & Stajniak, M. (2011). Optimisation of transport processes in city logistics. *Electronic Scientific Journal of Logistics, 7* (1), 15–22.

Perboli, G., De Marco, A., Perfetti, F., and Marone, M. (2014). A new taxonomy of smart city projects. *Transportation Research Procedia, 3*, 470–478.

Quak, H.J. (2008). Sustainability of urban freight transport: retail distribution and local regulations in cities. Ph.D. thesis, Erasmus University Rotterdam, the Netherlands.

Quak, H.J. and De Koster, M.B.M. (2009). Delivering goods in urban areas: how to deal with urban policy restrictions and the environment. *Transportation Science, 4*3 (2), 211-227.

Quak, H., Nesterova, N. and van Rooijen, T. (2016). Possibilities and barriers for using electric-powered vehicles in city logistics practice. *Transportation Research Procedia, 12*, 157-169.

Ragàs Prat, I. (2018). Urban logistics. Manual for logistics operators and public administrations. Barcelona: Editorial Marge Books.

Rai, H.B., Verlinde, S., Merckx, J., & Macharis, C. (2017). Crowd logistics: an opportunity for more sustainable urban freight transport? *European Transport Research Review*, 9, 39.

Ranieri, L., Digiesi, S., Silvestri, B., & Roccotelli, M. (2018). A review of last mile logistics innovations in an externalities cost reduction vision. *Sustainability, 10*(3), 782.

Reyes-Rubiano, L., Serrano-Hernandez, A., Montoya-Torres, J. R., & Faulin, J. (2021). The sustainability dimensions in intelligent urban transportation: a paradigm for smart cities. *Sustainability, 13*(19), 10653.

Rubino, G., Gattuso, D., & Gronalt, M. (2025). Modelling the interactions between smart urban logistics and urban access management: a system dynamics perspective. *Applied Sciences, 15*(14), 7882.

Russo, F., & Comi, A. (2010). A classification of city logistics measures and connected impacts. *Procedia - Social and Behavioural Sciences, 2*(3), 6355-6365.

Russo, F. and Comi, A. (2016). Restocking in touristic and CBD areas: deterministic and stochastic behaviour in the decision-making process. *Transportation Research Procedia, 12*, 53–65.

Russo, F., & Comi, A. (2023). Urban courier delivery in a smart city: the user learning process of travel costs enhanced by emerging technologies. *Sustainability, 15*(23), 16253.

Russo, F., and Comi, A. (2024). New challenges for city logistics: a unified view of energy and transport systems for addressing sustainability. *Transportation Research Procedia, 79*, 313-320.

Sanz, G., & Pastor R. (2009). Methodology for defining a logistics system that seeks to achieve efficient urban distribution of goods. *Management and Organisation, 37*, 60-66.

Savall-Mañó, M., & Ribas, I. (2024). How effective is the introduction of freight distribution time windows in reducing congestion, externalities and transport costs? The case of Barcelona. *Transportation Research Procedia, 78*, 311-318.

Savelsbergh, M., & Van Woensel, T. (2016). City logistics: challenges and opportunities. *Transportation Science, 50* (2), 579-590.

Sdoukopoulos, E., Kose, P., Gal-Tzur, A., Mezghani, M., Boile, M., Sheety, E., & Mitropoulos, L. (2016). Assessment of urban mobility needs, gaps and priorities in Mediterranean partner countries. *Transportation Research Procedia, 14*, 1211-1220.

Tachizawa, E.M., Alvarez-Gil, M.J., & Montes-Sancho, M.J. (2015). How "smart cities" will change supply chain management. *Supply Chain Management: An International Journal, 20*, 237–248.

Tacken, J., Sanchez Rodrigues, V. and Mason, R. (2014). Examining CO2e reduction within the German logistics sector. *The International Journal of Logistics Management, 25* (1), 54–84.

Tadić, S., Zečević, S. and Krstić, M. (2015). City logistics-status and trends. *International Journal for Traffic and Transport Engineering, 5* (3), 319-343.

Taniguchi, E. and van der Heijden, R.E.C.M. (2000). An evaluation methodology for city logistics. *Transport Reviews, 20* (1), 65-90.

Taniguchi, E., Thompson, R.G., & Yamada, T. (2003). Predicting the effects of city logistics schemes. *Transport Reviews, 23* (4), 489-515.

Verlinde, S. and Macharis, C. (2016). Who is in favour of off-hour deliveries to Brussels supermarkets? Applying Multi Actor Multi Criteria analysis (MAMCA) to measure stakeholder support. *Transportation Research Procedia, 12*, 522-532.

Von der Gracht, H.A. and Darkow, I.-L. (2010). Scenarios for the logistics services industry: a Delphi-based analysis for 2025. *International Journal of Production Economics, 127*, 46-59.

Von der Gracht, H.A. and Darkow, I.-L. (2016). Energy-constrained and the low-carbon scenarios for the transportation and logistics industry. *The International Journal of Logistics Management, 27*, 142-166.

Whiteing, A. (Institute for Transport Studies, University of Leeds, UK). (2010). The future of sustainable freight transport and logistics. Retrieved from https://www.europarl.europa.eu/RegData/etudes/note/join/2010/431578/IPOL-TRAN_NT(2010)431578_ES.pdf

World Economic Forum. (2020). The future of the last-mile ecosystem. https://www3.weforum.org/docs/WEF_Future_of_the_last_mile_ecosystem.pdf

Yu, H., Shi, A., Liu, Q., Liu, J., Hu, H., & Chen, Z. (2025). Immune-Inspired Multi-Objective PSO Algorithm for Optimising Underground Logistics Network Layout with Uncertainties: Beijing Case Study. *Sustainability, 17*(10), 4734.

Zhang, H., Lin, P., & Zou, L. (2025). Optimising Parcel Locker Selection in Campus Last-Mile Logistics: A Path Planning Model Integrating Spatial–Temporal Behaviour Analysis and Kernel Density Estimation. *Applied Sciences, 15*(12), 6607.

Zhang, Y., Zhang, M., Jiang, P., Cao, P., & Fang, X. (2025). Mechanism of sustainable logistics distribution operation path in smart cities based on improved CS algorithm. *Journal of Computational Methods in Sciences and Engineering*, 14727978251364459.

(Title, Abstract and Keywords in Spanish)

Externalidades de la logística urbana: retos y oportunidades para lograr ciudades inteligentes y sostenibles

Lorena Quidiello[1*] y Jose Manuel Montes[2]

[1] *International University of La Rioja, Spain*
[2] *University of Oviedo, Spain*

Publicado el 28 de noviembre de 2025.

Resumen

Si bien la logística urbana constituye un eje vital para las ciudades, a menudo se presta de forma ineficiente y las tendencias actuales más habituales son insostenibles, lo que genera una necesidad urgente de encontrar formas innovadoras de reducir sus externalidades. Este artículo presenta una revisión sistemática de la literatura con el objetivo de analizar en profundidad las externalidades negativas asociadas a la logística urbana, como la congestión vehicular, las emisiones contaminantes, el consumo energético, los accidentes y el ruido. Además de analizar estos y otros desafíos, el artículo ofrece propuestas tecnológicas, organizativas y de gobernanza para promover una transición hacia ciudades inteligentes y sostenibles, en línea con los retos de sostenibilidad y eficiencia de la Agenda 2030 y los principios de la Logística 5.0.

Palabras clave: logística urbana; distribución urbana de mercancías; transporte urbano de mercancías; logística de la ciudad; externalidades; ciudades inteligentes, ciudades sostenibles.

https://doi.org/10.64976/jbtm.7