

## **FEATURES OF URBAN LOGISTICS FORMATION ON THE PRINCIPLES OF SUSTAINABLE DEVELOPMENT**

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City logistics is one of the most important factors in meeting the needs of its residents, which is based on a certain set of logistics solutions, actions and processes aimed at optimizing urban activities, considering the social, environmental, economic, financial and energy consequences of urban freight traffic. The development of urban logistics is very important as a tool for improving the quality of life of residents through the use of sustainable logistics functions, which will lead to efficient services for residents and city development.

It is worth noting that urban freight transport plays an essential role in the sustainable development of the city, but at the same time, urban freight transportation faces many specific challenges, including high levels of traffic congestion, negative environmental impact, high energy consumption, and labour shortages. Urban freight processes encompass not only economic considerations but also social and environmental aspects. These multifaceted dimensions can potentially lead to conflicts.

In a number of studies, much attention is paid to the identification of stakeholders involved in the process of urban freight logistics, subjects of urban logistics and studying the interests of each stakeholder: carrier, sender/receiver, end users, local authorities [1-5].

Freight transport also causes conflicts between various stakeholders who are located in urban areas but are not directly involved in freight transportation, including producers, shippers, transport operators, recipients, residents, and tourists. Shippers, producers are engaged in the business of shipping goods to other companies or individuals and are usually not located in the city; as a result, they do not feel responsible for urban freight traffic. They seek to maximize the level of service in terms of cost and reliability of transport. In most cases, the shipper is a participant using a hired carrier. Consignees are generally located in urban areas and are mostly the end point of the logistics chain. Consignees are usually not responsible for urban freight transport, as the shipments are organized and paid for by the shipper (therefore, for the consignee, the transportation cost is included in the price of the ordered goods). In many cases, recipients do not realize that they can influence urban freight transport, for example by setting time windows.

Residents who simply live and engage in certain activities in the city may also experience inconveniences, such as odours, noise and vibration from the UFT (Urban Freight Transport). For visitors and tourists, urban freight transport causes intrusion, destroys the visual image and quality of the city, so from a commercial point of view, tourists are also interested in minimizing the negative impact of urban freight transport. Conflicts between different stakeholder interests are inevitable, especially between residents and transport operators in urban areas, and public authorities are constantly intervening to balance the interests of both stakeholder groups. For example: introducing measures to restrict the access of trucks that do not meet certain emission standards to urban centres to improve air quality and protect the health of residents. This means that transport operators need to modernize their fleets to continue operating in restricted urban areas; not delivering at night in urban centres because of the noise that can be generated, which disrupts residents sleep. This forces transport operators to make deliveries during the day, when there is more traffic congestion.

Despite the fact that freight transport does play a fairly good role in economic well-being and supports the urban economy, we still have to point out several negative consequences:

- traffic congestion. The movement of freight vehicles in urban areas contributes to congestion, and the total number of passenger vehicles usually has a significant impact on the level of congestion. First and foremost, trucks contribute to congestion, which is caused by the following: traffic flow (passenger and freight vehicles) exceeds the capacity of the road network; space, public road networks are occupied by trucks waiting for delivery or loading and unloading.

- Air quality (almost all trucks run on diesel fuel, and these engines emit particulate matter that can be harmful to human health),
- Greenhouse gas emissions.
- Noise pollution (noise generated by trucks in urban areas at night is mostly perceived as a nuisance by residents because it disturbs their peace of mind).
- Intimidation and safety (city authorities sometimes view road freight vehicles, especially large ones, as intimidating to pedestrians and cyclists due to their size. The number of serious accidents involving trucks and cyclists is also a concern).

Analysing all the negative effects of freight transport, a number of existing urban logistics initiatives proposed by the by the European Logistics Association to promote sustainable urban development [6], we can distinguish the directions of urban logistics formation on the principles of sustainable development:

- minimise urban freight traffic, striking a balance between meeting the needs of the population and the beneficial use of freight transport. Rationalising home delivery services, as couriers make many deliveries in one area on behalf of many different customers.

- The introduction of low-emission vehicles is an good initiative. The conventional propulsion technologies used by MVT operators (diesel engines) result in the emission of particulate matter and other air pollutants, as well as noise pollution. Therefore, the wider use of low-emission vehicles will have a significant impact on air quality and noise levels in urban areas (thus facilitating the wider use of night deliveries) and will contribute to a reduction in particulate matter levels in the atmosphere. There is a risk that the widespread use of low-emission technology will be slow due to high capital costs, uncertainty about the maturity of the technology and the lack of availability of refuelling infrastructure. This is largely due to the lack of economies of scale that could reduce unit costs and improve the investment attractiveness of charging infrastructure.

- Night-time deliveries using electric vehicles can help relieve peak daytime loads on road infrastructure and thus make better use of road infrastructure capacity. However, to combat low noise levels, it is necessary that all equipment (not just drive systems) meet low noise standards. Currently, standard equipment used for loading and unloading operations does not meet the low noise standards for night-time operations. This means that UFT operators and their customers have to make additional investments in specialized low-noise equipment to be able to operate at night.

- The introduction of time windows is equally effective, since the main traffic in the city is carried out by freight transport, so it would be very expedient if we set a certain period of time on the routes for freight traffic, giving preference to urban transportation, which will ensure uninterrupted, timely movement of people to work and meet their cultural, domestic and other needs. Such an initiative should limit the access of trucks in some areas to also ensure passenger flows by destination and ensure that they are distributed in such a way that best ensures straightforward passenger travel, non-stop service, minimal travel time and full compliance with the traffic intensity of all sections of the transport network.

The experience of the European Union countries shows that the authorities are constantly working on the development and implementation of measures to plan for the urban mobility of the future. The most well-known projects are:

- ENCLOSE (2012). An analysis of energy efficiency and sustainable urban logistics issues in European cities, and opportunities for improvement through the introduction of effective measures, schemes and approaches specifically targeted at urban environments [7].

- NOVELOG (2015). The aim of the project is to provide knowledge and understanding of urban freight distribution so that cities can implement effective and sustainable measures and facilitate stakeholder cooperation to ensure sustainable urban logistics [8].

- SULPiTER (2016). The main idea of the project is to solve the problems of urban freight transport from the perspective of functional urban areas, paying attention to the functional transport and economic relations between inner city centres and surrounding areas [9].

Taking into account the peculiarities of forming urban logistics on the principles of sustainable development, measures to improve the quality of transport services should be based on digital technologies, in particular, last mile logistics solutions [10].

The implementation of such initiatives will help reduce traffic congestion by logistical regulation of the sustainable movement of all types of transport, improve the situation with passenger transportation and increase passenger traffic on established routes. By limiting the movement of freight transport, we will achieve certain other results, such as reducing noise pollution, reducing CO<sub>2</sub> emissions, and thus improving the environment in general. The use of these initiatives is important to reduce the negative impact of freight transport and ensure the effective implementation of urban logistics.

The identified problems that arise in cities in meeting the needs of the population in freight transportation and the existing approaches to solving these problems confirm the importance of developing an integrated approach to urban mobility and logistics planning in the context of sustainable urban development.

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