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**THEORETICAL BASICS OF CITY  
LOGISTICS MANAGEMENT**

**TEORETYCZNE PODSTAWY ZARZĄDZANIA  
LOGISTYCZNEGO MIASTEM**

**Abstract:** Nowadays, in cities around the world changes are made to adapt the urban infrastructure to the needs of modern society. The functioning of the city's logistics management system is determined by the logistics processes taking place in its area. This article discusses the concepts of city logistics management and urban logistics. Logistic streams flowing through cities as well as definitions, goals and tasks of urban logistics have been described.

**Keywords:** logistics management, urban logistics, urbanization

**Streszczenie:** W dzisiejszych czasach w miastach na całym świecie dokonuje się zmian mających na celu dostosowanie infrastruktury miejskiej do potrzeb współczesnego społeczeństwa. Systemy logistycznego zarządzania miastem są determinowane przez procesy logistyczne zachodzące na jego terenie. W niniejszym artykule omówione zostały pojęcia dotyczące zarządzania logistycznego miastem oraz logistyki miejskiej. Opisane zostały strumienie logistyczne przepływające przez miasta, a także definicje, cele i zadania logistyki miejskiej.

**Słowa kluczowe:** zarządzanie logistyczne, logistyka miejska, urbanizacja

## Introduction

At the beginning of the 21st century, in the age of globalization, changes are being implemented in cities around the world to adapt the urban infrastructure to the needs of modern society. Urban centers require transformations in both the structural and transport spheres. Crowded roads, difficulties with commuting and poorly developed public transport are becoming a big obstacle for users and at the same time a challenge for the city authorities. Logistic processes that take place within the city, including transport economy and flows of goods, loads and people, determine the functioning of the city's logistics management system. Logistic management is becoming an important aspect of today's times, it not only does not negate existing important management concepts, such as quality management or marketing management, but integrates them in a specific way, and at the same time covers new spheres of management<sup>1</sup>.

### 1. City logistics management and urban logistics

Solving the problems of modern cities depends largely on the implementation of logistics principles - successfully used in today's business - to the city management system. It should be based on the use of a logistics system focused on residents, plants and institutions. This system should ensure appropriate coordination between enterprises and residents, as well as take into account the ecological and economic development of the region<sup>2</sup>. According to J. Szoltysek, „overcoming barriers to the development and functioning of cities can occur through the application of logistic concepts in improving the flow of people and cargo occurring in urban areas”<sup>3</sup>.

<sup>1</sup> A. Jezierski, C. Mańkowski, *Strategie logistyki miejskiej na przykładzie okręgu Bradford i miasta Leeds*, [in:] *Nowe wyzwania - nowe rozwiązania. Materiały konferencyjne Polskiego Kongresu Logistycznego*, Logistics, Poznań 2008, p. 331.

<sup>2</sup> J. Kaźmierski, *Zarządzanie logistyczne w rozwoju miasta i regionu – strategiczna rola centrów logistycznych*, „Zeszyty Naukowe Uniwersytetu Szczecińskiego. Problemy Usług” 2007, No. 8, p. 95.

<sup>3</sup> J. Szoltysek, *Logistyczne aspekty zarządzania przepływami osób i ładunków w miastach*, Wyd. Akademii Ekonomicznej, Katowice 2005, p. 13.

Logistics management concepts implemented in modern urban centers allow us to ensure the required efficiency and optimize costs and technical efficiency, leading to the proper development of urban areas, as well as to efficient service of city users<sup>4</sup>. Logistic management concepts used in practice are aimed at increasing the efficiency and streamlining of a given region, which in turn leads to increased competitiveness.

In the logistics management of the city the main role is played by the following processes<sup>5</sup>:

- freight transport,
- passenger transport,
- information flow,
- distribution,
- storing,
- environment.

These processes are closely related to the diverse needs of residents. The main and most important needs include the need to move, study, develop, recreation and information. The needs of the inhabitants are one of the determinants for the direction of the city's development. From the point of view of the city's logistics management, the following factors should be taken under consideration<sup>6</sup>:

- characteristics of its population, i.e. age, health and professional characteristics of its inhabitants, and their numbers,
- characteristics of the urban area, including, inter alia resources, reserves, stocks, location, line infrastructure, point infrastructure and spatial infrastructure.

The above-mentioned factors influence the functioning of chains and logistic streams within the city. The efficiency of logistics chains in cities and agglomerations is in a sense an indicator of the efficiency of a given region and its management system. Both social structures and spatial structures characterizing a given region<sup>7</sup> have an impact on the organization and control of logistic. The main logistic streams running in cities include stream of cargo, people, energy and flows of information accompanying them<sup>8</sup>.

Streams of cargo flows within the city are caused by numerous reasons. The main premise is to meet the basic needs of residents; this is associated, among others, with access to urban infrastructure, access to public transport, the supply of all material goods, as well as the removal of waste. According to research on urban congestion, supply of industrial, commercial and service enterprises generates the largest share of these transports. One cannot ignore the fact that industrial production is often located in central

<sup>4</sup> B. Tundys, *Logistyka miejska*, Wydawnictwo Difin, Warszawa 2013, p. 61.

<sup>5</sup> Ibidem.

<sup>6</sup> B.Z. Szalek, *Miasto w świetle nowoczesnej logistyki*, „Gospodarka Materialowa i Logistyka” 1995, No.10, p. 216.

<sup>7</sup> I. Sagan, *Miasto – scena konfliktów i współpracy*, Wyd. Uniwersytetu Gdańskiego, Gdańsk 2000, p. 9.

<sup>8</sup> B. Tundys, *Logistyka miejska...*, p. 62.

parts of the city, which causes a high volume of traffic due to the demand for transport of raw materials. In addition, the city authorities do not have much influence on the course of freight transport, as it is carried out by private companies that are guided by their own premises, without taking into account the needs of other road users. The main reasons for the lack of coordination and management of cargo flows are<sup>9</sup>:

- no data on freight transport in cities - both completed and planned
- lack of statistical data available for decision-makers, resulting from too general studies of traffic organization models in the literature on the subject,
- using the same transport infrastructure line for the carriage of goods and passenger transport, which causes congestion.

The presence of delivery vans in urban traffic also adversely affects the image of the city itself, which primarily concerns urban areas developed for tourism, recreation and leisure. The need to constantly increase the area of transport infrastructure, often at the expense of green areas, as well as annoying noise and emissions of pollutants, which are not without impact on the facades of buildings, often historic, increase the scale of the problem. Freight transport in a given city also reduces its value as a space to perform both economic and life functions. The owners of shops and restaurants operating in city centers do not take into account the volume of traffic in a given place, because in the vast majority they do not deliver goods themselves. However, entrepreneurs should be aware that an increase in traffic means a decrease in the attractiveness of a given region as a place to shop, relax or socialize, and thus may mean a decrease in their income<sup>10</sup>.

Time restrictions are one of the reasons for the volume of freight traffic in cities. Time is of the essence in freight transport, as it is an important factor of competitive advantage. Proper planning of loading areas and appropriate selection of time zones is of great importance for entities providing transport services. It is important that the goods are delivered to the right place within a specified time. Time limits often force carriers to enter vans in the city during heavy vehicle traffic. Parking lots and unloading places are another problem, often not adapted to the quick and efficient receipt of goods<sup>11</sup>. A big dilemma arises in front of transport organizers in the city - how to organize the flow of cargo streams in cities efficiently so that on the one hand they do not hinder the functioning, and on the other that the delivery of goods is carried out in accordance with such strategies as: just in time, quick response or efficient consumer response (ECR)<sup>12</sup>.

The flow of people is another one of the city's logistics streams. The need for movement of residents is usually generated by other needs related to their daily lives. This applies to both individual transport and public transport, by which we

<sup>9</sup> J. Szoltysek, *Podstawy logistyki miejskiej*, Wyd. Akademii Ekonomicznej, Katowice 2007, p. 93.

<sup>10</sup> M. Szymczak, *Logistyka miejska*, Wyd. Akademii Ekonomicznej, Poznań 2008, p. 55-56.

<sup>11</sup> J. Szoltysek, *Podstawy logistyki...*, p. 95.

<sup>12</sup> D.L. Gardner, *Supply Chain Vector: Methods for Linking the Execution of Global Business Models with Financial Performance*, J. Ross Publishing, Inc., United States 2004, p. 39.

mean passenger transport taking place within a city or in an agglomeration. The need for transport is the need to move from one point of the city to another at a certain time. The individual transport needs of residents determine the total transport needs, in other words the volume of transport demand in a given city is the sum of the transport needs of its inhabitants. By deciding to travel by public transport, they report the need for a public transport service - thus the need turns into demand<sup>13</sup>.

Flows of people within the city take place between infrastructure elements located in the city space. Urban transport infrastructure consists of a set of elements forming the city's transport network. It is built of such elements as<sup>14</sup>:

- roads, streets with permanent equipment used for traffic organization,
- railway, tram and subway tracks,
- power supply network: trams, trolley buses, railways, subways,
- transformers,
- stations, stops, interchanges,
- parking lots, bus, tram and trolley bus depots,
- garage spaces,
- loading areas occurring in the cargo transport process.

It should be remembered that building the transport infrastructure improperly results in negative consequences for the implementation of logistics processes<sup>15</sup>. When considering the movement of people in a city or agglomeration, we should consider the above infrastructure elements that occur in the urban area<sup>16</sup>. The movement of people in cities takes place as part of commuting to schools, shopping, commuting or recreational trips. Organizing proper transport requires taking into account the fact that travel often consists of a set of displacements, which ultimately form a chain of displacements<sup>17</sup>. Part of the journey can be done on foot, then by own car or public transport. The type of movement within the city depends on many factors such as urban structure, demographic aspects, mobility of residents, wealth of residents. There is no doubt that the increase in mass motorization in Poland definitely has an impact on public transport. At the same time, public transport is no longer just a way of moving people, but an important factor in improving environmental conditions, reducing transport congestion and spending on modernizing road infrastructure, as well-functioning public transport allows reducing the number of users using individual means of transport, and thus - reduce expenditure on new infrastructure investments. The development of public transport on the one

<sup>13</sup> M. Szymczak, *Logistyka miejska...*, p. 107.

<sup>14</sup> M. Matulewski, S. Konecka, P. Fajfer, A. Wojciechowski, *Systemy logistyczne*, Wyd. Instytut Logistyki i Magazynowania, Poznań 2008, p. 247.

<sup>15</sup> R. Kozłowski, S. Wiśniewski, A. Palczewska, *Możliwości rozwiązywania problemów logistyki miejskiej w obszarze infrastruktury drogowej na przykładzie Konstantynowa Łódzkiego*, „Studia Miejskie” 2018, No. 30, p. 10.

<sup>16</sup> J. Szołtysek, *Kreowanie mobilności mieszkańców miast*, Wyd. Wolters Kluwer, Warszawa 2011, p. 33.

<sup>17</sup> M. Matulewski, S. Konecka, P. Fajfer, A. Wojciechowski, *Systemy logistyczne...*, p. 246.

hand contributes to reducing the negative impact of the transport system on the environment, on the other - it reduces the level of congestion in cities<sup>18</sup>.

The next issue related to streams in urban space is the flow of energy. Nowadays, decentralization of energy production and distribution as well as the possibility of improving energy efficiency have completely changed the approach to this issue. The possibility of planning and controlling energy flows at both central, regional and local levels is increasingly being considered. The European Commission attaches great importance to energy planning, prioritizing it in energy policy and climate protection policy. The need for Member States to develop energy plans implies the need for such plans also at local level. The proper management of both top-down plans (at the state and international level) and bottom-up plans (at the regional level) is one of the most important tasks for which central and local authorities are responsible<sup>19</sup>.

Local authorities have an important role to play in seeking ever newer solutions to energy problems in cities. Acting in cooperation with residents and entities responsible for the distribution of electricity, they are able to make practical decisions regarding energy development in a given region<sup>20</sup>.

The last of the issues discussed regarding logistics flows in cities is the flow of information streams. The need for information is associated with every manifestation of human activity, and especially with satisfying the basic needs of urban residents. The municipal information system includes such components as<sup>21</sup>:

- city marking system - consisting of boards enabling identification of the address or containing information about tourist attractions, urban transport or information addressed to drivers;
- urban internet guide - constituting a database of information on all aspects related to the city's activities, through which residents can do many things online;
- municipal tourist information offices;
- offices and offices - providing information needed by city residents.

The occurrence of disturbances in any of the given flow streams causes an immediate extension of the duration of logistics processes. Logistic management of an urban area, which is also a place of residence, work and leisure, must have both an economic and social dimension, including environmental aspects.

## 2. Definition, goals and tasks of urban logistics

The emergence of the concept of „urban logistics” is a consequence of attempts to solve urban management problems, in particular those related to traffic in urban

<sup>18</sup> J. Szoltysek, *Podstawy logistyki...*, p. 63.

<sup>19</sup> Z. Genchev, P. Manchev, K. Nakowa, D. Dukov, *Planowanie energetyczne w miastach i gminach (przewodnik dla miejskich i gminnych decydentów oraz ekspertów)*, Centrum efektywności energetycznej, Bułgaria 2010, p. 8.

<sup>20</sup> Ibidem, p. 3.

<sup>21</sup> M. Matulewski, S. Konecka, P. Fajfer, A. Wojciechowski, *Systemy logistyczne...*, p. 244.

areas, such as cities, urban agglomerations, metropolises and megalopolis (megacity - a characteristic form of spatial organization of 21st century societies<sup>22</sup>). The concept of urban logistics is associated with the city's development trends<sup>23</sup>. Urban logistics has a macroeconomic dimension, and at the same time it is precisely defined and focused in specific spheres and limited to a specific micro region. Urban logistics covers virtually the same processes that take place in logistics, i.e. transport, information processes, storage and customer service. All these processes in urban conditions have their new dimension and take on a new meaning, such as, for example, logistic customer service, which in the case of urban logistics concerns urban residents and entities operating in urban areas<sup>24</sup>. The definitions of urban logistics can therefore be expressed by paraphrasing the existing definitions of logistics, specifying only its scope. The definitions of urban logistics presented below relate to a large extent to the area of transport.

Definition analysis (Table 1) contributes to a better understanding of logistic models and tasks that take place in urban areas.

Table 1. Selected definitions of urban logistics

Tabela 1. Wybrane definicje logistyki miejskiej

Author	Characteristics of the definition
Th. Wagner	Urban logistics deals with the consideration of logistics problems in a geographically defined and limited area of urban space. It is a tool for solving them, while looking for effective ways to reduce costs and focusing on flows within cities.
R. Muller, Ch. Vornholt	Looking at urban problems through the prism of structure, space, and aspects related to supply, delivery and distribution in urban areas.
L. Thoma	The base of economic concepts that are to contribute to the relief of urban infrastructure and lead to an increase in the economy of freight transport in cities. In a narrow sense - it includes delivery, coordination of streams of goods, as well as servicing of inhabited urban areas. In broad terms - it covers the transport and delivery of goods throughout the agglomeration.

<sup>22</sup> P. Korcella, *Megamiasta*, Wyd. Polska Akademia Nauk, Warszawa 2008, p. 3.

<sup>23</sup> A. Szczepańska, A. Budzik, I. Petryczka, *Logistyka miejska – jakość przewozów miejskim transportem zbiorowym w Częstochowie*, „Logistyka” 2014, No. 6, p. 12051.

<sup>24</sup> M. Szymczak, *Logistyka miejska...*, p. 25.

M. Antonowicz, H. Zielaskiewicz	A team of harmonized activities organizing flows of people, loads and information streams, using appropriate technologies and taking into account all costs (social and economic). It covers all processes of managing goods, cash and information flows in order to develop the city, taking into account environmental problems, assuming that the city is a social organization whose primary goal is to meet the needs of its users.
S. Strausch	The combination of transport streams within the agglomeration, which aims at efficient and compatible with the functions of the city transport of goods, including all the necessary components such as organizational, infrastructure, information and technical components, as well as human ones. As a consequence, this system contributes to the increase of transport efficiency in the city.
P. Wittenbirk	Includes those activities that improve the transport of goods within the city and agglomeration, taking into account the factor of time, space, quantity and type of goods, not ignoring aspects related to environmental protection and waste management. In addition to transport and logistics functions (efficient reloading, quantity balancing, minimizing delivery time) it includes problems related to environmental pollution, with the participation of local government institutions, transport, commercial and forwarding companies.
M. Sołtysik	The logistics sub-area, which examines the processes determining the flow of goods and information, provides appropriate methods and tools for shaping this flow in urban logistics systems, in accordance with specific and clearly defined goals.
Engerzinger	It covers the economic organization of goods transport, which is to lead to a reduction in the number of transports in urban areas and relieving city centers of unnecessary transport.
J. Szoltysek	All processes of managing the flow of goods, people and information within the city's logistics system, in accordance with the needs and development objectives of the city, respecting the natural environment, taking into account that the city is a social organization whose primary purpose is to meet the needs of the residents.
J. Zentes	An economically oriented model covering distribution logistics and redevelopment, where the issue of environmental protection and cost-effectiveness of data concepts are highlighted.
K. Grzelec O. Wyszomirski	It boils down to controlling the flow of all goods within the city and agglomeration.



B. Rzeczyński	„It provides assumptions for optimizing urban areas in terms of planning, controlling all displacements that operate in this system of processes in the economic, technological and social dimensions”.
European Union directives	It deals with operations and logistics processes in urban space, taking into account market, operational, infrastructural and legal characteristics of the urban area, forming an integral part of intercity, but also international logistics chains.

Source: based on: B. Tundys, *Logistyka miejska*, Wydawnictwo Difin, Warszawa 2013 p. 83-84; C. Eberhart, *City-Logistik - Kooperation von Speditionen*, „Internationales Verkehrswesen” 1995, No. 3, p. 116-112; R. Junemann, *Neue verkehrslogistische Konzepte für eine ökologisch verantwortbare Transportwirtschaft*, „Zeitschrift für Logistik” 1995, Oktober-spezial, p. 69-79; P. Wittenbrink, *Betriebliche und kommunale Maßnahmen im Rahmen einer verbesserten City-Logistik*, „Internationales Verkehrswesen” 1993, No. 5, p. 252-258; I. Zahle, *City Logistik: Chancen der koordinierten Versorgung von Städten*, Pro Universitate Verlag, Sinzheim 1997, p. 43; M. Szymczak, *Logistyka Miejska*, Wyd. Akademii Ekonomicznej, Poznań 2008, p. 28; B. Rzeczyński, *Racje i ogólne cele logistyki miejskiej*, „Logistyka” 1999, No. 4, p. 11; R.H. Ballou, *Business Logistics/Supply Chain Management*, 5th Ed., Pearson Education, Upper Saddle River, NJ, 2004, p. 4.

Urban logistics is trying to find optimal solutions to existing problems in cities. Appropriate goals and tasks must be set, which should be reflected in a sustainable urban center development strategy<sup>25</sup>. The overall goal of urban logistics is to connect all forms of transport and transportation, both residents and businesses operating in cities, and to manage this flow network in a way that ensures an adequate level of quality of life and farming, with a minimum level of costs, taking into account the assumptions of sustainable urban development. The general purpose of urban logistics formulated in this way can be distinguished<sup>26</sup>:

- economic goal - is associated with lowering the costs associated with the functioning of the city,
- environmental goal - it consists, among others, in reducing the negative effects of transport activity on the natural environment in the city, which has a direct impact on the quality of life of residents,
- social goal - it is directly related to satisfying the needs of residents and improving their quality of life.

The long-term goal of urban logistics should be to provide conditions for city development in a system of all three dimensions.

<sup>25</sup> Ł. Hadaś, *Logistyka miejska w strategii rozwoju miasta*, [in:] *Logistyka a Infrastruktura miejska*, I Konferencja Naukowo-Techniczna, CL Consulting i Logistyka, Oficyna Wydawnicza „Nasz dom i ogród”, Wrocław 2004, p. 26.

<sup>26</sup> M. Szymczak, *Logistyka miejska...*, p. 34.

Urban logistics can be considered from the point of view of three groups of users:

- business entities,
- city dwellers,
- public administration.

The objectives of urban logistics will be different for all these groups. Economic goals will be the most important for business units, social and environmental goals will play the most important role for administration and residents<sup>27</sup>.

The scope of urban logistics is therefore very wide. The residents' requirements for fast and uninterrupted supply of urban areas are as high as for the increase in the quality of life in the city. However, it is difficult to meet both demands, because the increasing freight flows and the increasing mobility of residents cause an increase in environmental pollution, noise and congestion, which negatively affects the quality of life<sup>28</sup>. The implementation of urban logistics solutions requires an in-depth analysis of the current situation in the city and the operation of freight transport. This is the basis for implementing policies and strategic plans enabling the development of a sustainable transport system<sup>29</sup>.

The tasks set for specialists in the field of urban logistics are considered on many levels. They are presented in the form of organizational and technical tasks and economical ones<sup>30</sup>.

Table 2. Tasks for specialists in urban logistics

Tabela 2. Zadania stawiane przed specjalistami z zakresu logistyki miejskiej

Organizational tasks	Shaping logistics processes and structures. Generation, formulation and implementation of logistics strategies. Links and connections of transport systems.
Technical tasks	Selection of technical elements of road infrastructure. Improvement and modern constructions of devices and means of transport. Shaping spatial systems. The use of IT techniques to control and communicate.
Economic tasks	The right choice of services: own or external. Cooperation in the use of logistic hubs. Controlling in cost optimization. Pricing and tariffs. Use of financial tools (e.g. discounts).

Source: J. Szołtysek, *Podstawy logistyki miejskiej*, Wyd. Akademii Ekonomicznej, Katowice 2007, p. 60.

<sup>27</sup> B. Tundys, *Logistyka miejska...*, p. 93.

<sup>28</sup> S. Kauf, A. Tłuczak, *Projekty logistyki miasta – metoda szacunkowa oceny ryzyka*, „Problemy Transportu i Logistyki” 2017, No. 3 (39), p. 95.

<sup>29</sup> A. Zając, K. Kijewska, S. Iwan, *Świadomość mieszkańców miast w zakresie problemów logistyki miejskiej w kontekście budowania planów zrównoważonej mobilności miejskiej*, „Prace Naukowe Uniwersytetu Ekonomicznego we Wrocławiu” 2018, No. 505, p. 490.

<sup>30</sup> J. Szołtysek, *Podstawy logistyki...*, p. 60.

When defining tasks, it is not without significance to supervise and coordinate the course of designated logistics processes, especially those processes that involve flows in the city. It is important to define the actions that should be implemented by the city authorities, among others, for changing the infrastructure and adapting it to the current transport needs. Modernization plans should be based on the principle of economic efficiency and a realistic financing concept, while taking into account all available information sources.

## Conclusions

Urban logistics is an interdisciplinary field, covering a very wide range of diverse issues. It fulfills many tasks that are necessary for proper functioning as well as further development of urban areas. Implementing the concept of logistics management in modern cities is very important. It allows optimizing costs, increasing efficiency and improving a given region, which can lead to an improvement in its competitiveness. It should also be emphasized that nowadays the concept of sustainable urban development forces public transport organizers to adapt to the highest world standards when it comes to exhaust emissions, environmental protection and minimizing transport congestion in cities.

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