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RANKING OF STAKEHOLDERS INFLUENCING THE FLOW OF GOODS IN THE CITY

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Purpose: The main purpose of this paper is to identify the main stakeholders of freight flows in a city using an expert method. The research conducted will attempt to answer the following research question: Which stakeholders have the greatest influence on freight flows in the city?
Design/methodology/approach: The research on the city's stakeholders important for the city's freight flows started with the identification of typical city stakeholders based on a literature analysis. A survey questionnaire was then created to determine the strength and direction of influence of each stakeholder and distributed to 12 experts. The final stage of the research was to determine the average score for each stakeholder.
Findings: Based on the literature research, various stakeholders of the city that can influence the flows of goods in the city were identified. Following the research, four stakeholders were identified that, according to experts, are of key importance in the city's goods flows.
Research limitations/implications: The research was limited to a narrow group of experts. In the future, the research should be broadened to include the opinion of a wider group of respondents.
Originality/value: The paper shows the stakeholders that are important, not only in urban goods flows, but also in urban logistics in general. The paper can become a valuable source of information when modelling urban goods flows, but also provides a foundation for building urban goods flow management.
Keywords: city logistics, urban goods flows, city stakeholders.
Category of the paper: Research paper.

1. Introduction

Transport is one of the most important elements of a city's logistics. Freight transport reflects all aspects of a city's economic activity and for this reason its proper planning is of paramount importance. Freight transport permeates many spaces of city life and influences the development and marketing significance of a city. It is also very important from the perspective of the individual resident. In order to meet the challenge posed by the city's freight transport system, a reliable planning framework is needed to analyse and implement any measures aimed at increasing the efficiency of the city's freight transport system, while minimising external costs and environmental damage. For this reason, it is important to know the stakeholders of freight flows in the city's logistics system with a primary and secondary role. The research conducted will attempt to answer the following research question: Which stakeholders have the greatest influence on the flow of goods in the city?

The topic of this paper therefore focuses on identifying the main stakeholders in urban freight flows using the expert method. The research hypothesis was also formulated: “Identifying key stakeholders will enable their active involvement in the urban logistics planning process and the optimization of freight flows by improving collaboration, increasing social acceptance of implemented solutions, and making more efficient use of urban infrastructure”.

Undoubtedly, one factor in the continued growth in popularity of road transport is the development of cities and their infrastructure. The possibility of accessing places that were previously inaccessible is increasing (Krysiuk et al., 2015). The problems and determinants affecting urban freight flows are the subject of much debate. A study in the UK found that around 40%of traffic in London belongs to cars delivering products to businesses and courier deliveries. A study in Germany found that as much as 80% of all transport carried out in urban areas is done using road transport (Kijewska, Iwan, 2011). T. Crainic notes that 'city logistics was created to emphasise the need for the consolidation of the loads of different forwarding and transport companies using the same means of transport and the coordination of activities resulting from freight transport in a city' (Kiba-Janiak, 2018). Thus, the management of urban freight flows is one of the basic logistics activities in urban areas and directly affects its functioning.

2. Literature review

2.1. Freight transport system in the city logistics system

Freight transport plays an important role in cities, supporting industrial and commercial activities and contributing to the competitiveness of industry in a region. It influences economic strength, product availability and the quality of life and attractiveness of urban areas (Macharis, Melo, 2011). Freight flows in urban areas account for 20-30% of total vehicle kilometres (Dablanc, 2007). Cities need freight transport, but often underestimate its importance ((Macharis, Melo, 2011; Macharis, 2011). In the literature, many approaches can be found to define the structure of the freight logistics system. On the one hand, it can be defined from the point of view of the elements consisting of needs, structure and organisation (Jachimowski et al., 2011) and the links between these elements (Rodrigue, 2020). On the other hand, some studies (Rodrigue, 2020) include a network approach to determine the structure of the freight transport system.

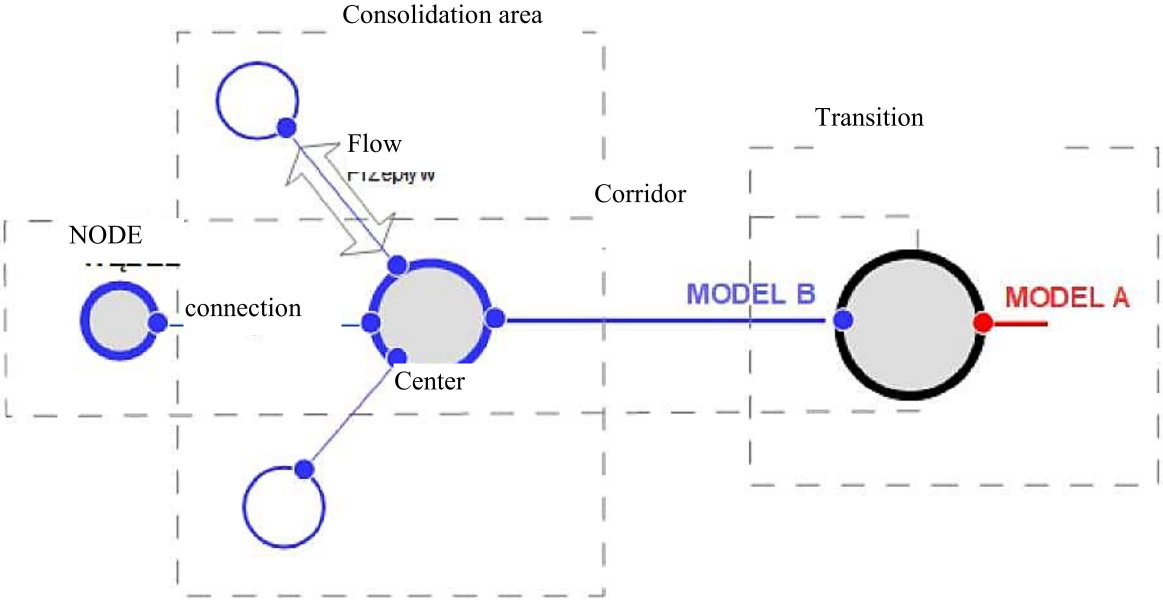

Figure 1. Structural elements of transport networks.

Source: Rodrigue, 2020, p. 643.

Transport networks, like many other networks, are generally shaped as a set of locations and a set of links representing connections between these locations (Figure 1). The layout and connectivity of a network is known as its topology, with each transport network having a specific topology. The most basic elements of such a structure are the geometry of the network and the level of connectivity. A freight transport system can also be defined as a technical[1], organisational[2] and economic/legal[3] system that operates under conditions shaped by its environment, its performance largely depends on the degree of integration of the system and the environment in which it operates. There is no single precise model of a logistic transport system, but certain elements and fixed tasks can be distinguished, which are present in most of them. These include: supply centre operations, inventory management, delivery performance and the infrastructure to perform these tasks. The transport system also includes the coordinated activities of those responsible for loading, storage, transport, unloading, labelling, packaging, picking, etc.

[1] This should include: rolling stock, roads, transport points and hubs, transhipment and transport facilities and technical facilities.
[2] It is constituted by the links and rules of intra-company transport cooperation, as well as the links and rules of cooperation between the transport contractor and the environment.
[3] It defines tariffs, legal and financial aspects.

In turn, D. Boyce (Boyce, 2016) states that a freight transport system is a three-element set, which may include:

- load handling facilities and their equipment,
- objects that enable the movement process,
- sets of procedures, enabling the movement of cargo and people in a safe and organised manner.

In line with the presented approaches to defining the freight transport system, most authors emphasise that an adequate infrastructure is an essential element of the system (Gołembska, 2010).

The listed set of elements of the freight logistics system significantly influences the functioning of freight flows in the city logistics system. The modernity of the elements and their good coordination allow for the smooth movement of freight in cities. However, in order to coordinate and strengthen the internal links between the system elements, it is necessary to use electronic information flow systems in parallel. The systems currently available and in use are developed independently of each other and work on the basis of many independent databases. There is therefore a need to create solutions that would contribute to greater coordination of activities in the freight logistics system, thereby reducing delays, avoiding excess inventory, or lowering the costs of operating such a system (Sungwon, 2001).

Urban freight transport, in order to perform its specific tasks, requires an appropriate technical environment, but also proper management. It has three important functions:

- consumption based on meeting transport needs,
- production to create an appropriate business environment,
- integration in the management of tangible and intangible resources (Koźlak, 2010).

Additional functions, considered as complementary, can be divided into two groups: economic and social. Goods flows in the city's logistics system and their impact on the ecology In recent years, there has been an increase in the use of road transport. One of the reasons for this is the increasing use of the just-in-time strategy, according to which delivery should be fast and reliable.

However, the main disadvantage of the transport system as a whole is that it generates high external/social costs, which include:

- air pollution through exhaust emissions,
- accidents and catastrophes in land, water or air traffic,
- high infrastructure maintenance costs,
- noise emissions,
- occupation of greenfield sites for the construction of transport infrastructure (Kempa, 2014).

However, considering the needs of society in terms of demand for transport services, it should be emphasised that the importance of urban freight transport is increasing, and stopping freight traffic in the city could result in large consequences, as also highlighted by McKinnon in his research (McKinnon, 2006). A similar study was carried out by S. Åkeriföretag (Åkeriföretag, 2020), who only confirmed McKinnon's thesis that stopping basic transport functions in the city, i.e. food supply, rubbish collection, would cause chaos on all social levels. Increasing consumer expectations mean that the transport system of the 21st century should be characterised by a high degree of flexibility and frequency of delivery, while maintaining a high quality of service and safety of the goods transported. Short delivery times and low transport costs are also important. All these features imply the need for continuous change in the transport system. The development of e-commerce is also not without significance, which contributes to the high volume of groupage shipments delivered to city centres. This transport is carried out to the greatest extent using road transport due to the dispersion of consignees and senders within the city (Mężyk, Zamkowska, 2016).

A negative factor affecting the city's logistics system is congestion, i.e. congestion on transport routes. This is a concept most often used in relation to road transport, but it can be applied to any other transport mode. A. Altshuler defines congestion as a situation in which the demand for use of an infrastructure facility prevents free flow at the maximum permitted traffic speed (Mucha, 2010). One of the most troublesome effects of congestion is the loss of time, which directly affects most of the participants in the transport process and prevents the delivery of a good within a certain timeframe. Another negative factor affecting the functioning of the city's logistics system is traffic noise emitted from transport means and road, rail, air and water infrastructure. The noise problem is increasing year on year, especially in densely populated cities. In the literature, noise is defined as "any unwanted, unpleasant, annoying or harmful mechanical vibration of an elastic medium acting through the air on the organ of hearing and other senses and elements of the human body" (Szołtysek et al., 2012).

The negative impact of road transport on the functioning of the city's logistics system can also include damage to the infrastructure by heavy goods vehicles. Although Poland's road infrastructure covers about 3% of the country's area, about 50% of Poland's area is within the direct influence of traffic pollution. Soils and vegetation even 50m away from the road are exposed to heavy pollution, which reduces its ability to graze animals (Badyda, 2010).

Compared to any other mode of transport, road transport has a major impact on the environment and on the lives of residents. It is one of the biggest generators of air pollution in the city.

2.2. Stakeholders in freight flows in the city's logistics system

There are many shipment and receipt operations within the city, and it happens that entities located outside the city are responsible for freight flows within the city. Most of the transport is carried out in a chaotic and uncoordinated way, as it is the responsibility of different actors, who are mainly driven by their own interests. It is therefore worth analysing which links in supply chains determine how and when a transport service order is fulfilled. One of the actors influencing the freight flow process in a city is the logistics centre, which is a stop for many transported goods. It is one of the most popular ways to reduce costs associated with the procurement, storage, distribution and forwarding of goods. Logistics centres are an important part of the supply chain, providing its members with logistics services (Ying, Dayong, 2005) and fostering relationships between them that depend on mutual commitment to end-customer satisfaction, common goals, trust, interdependence, good communication to look after the interests of the other partners (McQuiston, 2001). Further actors influencing the movement of goods in the city are freight forwarding and transport companies. Forwarding is an integral part of the transport process in the TSL industry. A key characteristic of many forwarding companies is good organisation and planning. Freight forwarders are usually responsible for all formal and legal issues. They are also obliged to react quickly in the event of problems along the route or breakdowns.

Urban freight transport typically accounts for around a quarter of the value of road space use. It is estimated that freight tonne-kilometres will increase by 63% by 2030 and, that freight transport will reach an energy consumption of 45% in 2030 in the context of total transport (Civitas, Cities, 2019).

3. Results

3.1. Assumptions and description of the method

A group expert appraisal method was used to detail the stakeholders with the greatest influence on the flows of goods in the city. Group expert assessment uses the idea that the collective opinion of many experts is more accurate than that of a single individual. The diversity of experience and knowledge of the group allows for more objective and comprehensive assessments.

The method was applied in terms of determining the relative importance of the individual experts' assessments of the sites. The appropriate selection of the expert team influences the outcome of the study; it should be competent and consist of high-level experts with moderately concordant opinions. The expert competence index can be defined as the arithmetic mean of the coefficient of the expert's degree of familiarity with the given problem and the argumentation coefficient obtained on the basis of the self-assessment included in the questionnaire (formula 1) (Żebrucki, 2012).

$$K_k \frac{k_z+k_a}{2} \qquad (1)$$

where:
K_k - expert competence coefficient,
Kz - coefficient of the expert's degree of familiarity with the problem, taking a value in the range <0.1>, based on the self-assessment carried out,
Ka - argumentation coefficient, taking a value in the range <0.1> based on the self-assessment carried out.

In this research, the potential stakeholders of the city who influence the flows of goods in the city were taken as the object of the assessment. A team of 12 experts was appointed for the assessment. The questionnaire sent out to the experts consisted of two parts. The first, necessary to determine the expert's competence coefficient, and the second, in which the importance of individual city stakeholders was assessed. The coefficient for the expert's degree of familiarity with the problem was determined on the basis of the expert's self-assessment on a six-point scale (Table 1). The respondent was asked to objectively indicate his or her own familiarity with the problem.

Table 1.
Expert self-assessment scale

Item	Expert self-assessment table	pt.
1.	Expert does not know the problem	0
2.	Expert knows little about the problem	1
3.	Expert has a satisfactory knowledge of the problem, but it falls within his sphere of interest	2
4.	Expert is sufficiently familiar with the problem, but not involved in practical problem solving	3
5.	Expert knows the problem well, participates in practical problem solving	4
6.	Expert knows the problem very well and it belongs to the expert's narrow specialisation	5

Source: Own work based on: Sorychta-Wojszczyk, 2010, p. 95.

The expert's familiarity factor K_z is calculated as the product of the points indicated by the respondent and a value of 0.1. The argumentation factor K_a is determined taking into account the structure and sources of arguments used by the expert. During the survey, respondents should indicate the way in which they argue for individual objects or the whole group of surveys. The argumentation coefficient is determined as the sum of the values indicated by the expert in Table 2.

Table 2.
Degree of influence of the argumentation on the expert's opinion

Source of argumentation	Argumentation		
	high	average	low
Expert's theoretical analysis	0,5	0,3	0,2
Practical experience of Expert	0,5	0,35	0,15
Generalisation of the work of indigenous authors	0,05	0,05	0,05
Expert intuition	0,1	0,1	0,1

Source: Own work based on: Żebrucki, 2012, p. 147.

The following assumptions were taken into account in constructing the argumentation degree table (Męczyńska, 1999):

- argumentation factor Ka < 1,
- argumentation factor increases when moving from theoretical analysis to practical experience,
- certain threshold value for the competence factor ε is set (e.g. ε = 0.5). If Kk ≥ε, the expert concerned is appointed to the team.

1.1. Research results

The team of 12 experts was presented with an initial list of city stakeholders who might influence the flows of goods in the city, selected on the basis of literature research. The experts were then asked to identify their competences, according to an expert self-assessment table, to state the influence of the argumentation source on the expert's description and to evaluate the stakeholders on the list. A summary of the argumentation coefficients (k_a), the expert's degree of familiarity with the problem (k_z) and competence (K_k) is provided in tab 3.

Table 3.
Summary of coefficients of the expert's degree of familiarity with the problem, argumentation, competence.

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12
kz	0.5	0.3	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.6	0.2	0.3
ka	0.5	1.15	1.15	1.15	1	0.8	1.15	0.7	0.7	0.8	0.8	0.8
Kk	0.5	0.725	0.825	0.825	0.65	0.55	0.725	0.5	0.5	0.7	0.5	0.55

Source: own work.

In line with previous assumptions, 12 experts were appointed to the team with a competence coefficient value of Kk ≥ 0.5. The research on the city's stakeholders important for freight flows in the city started by identifying typical city stakeholders based on a literature analysis.

A list of typical stakeholders (primary - i.e. those with a direct impact on freight flows in the city's logistics system and secondary - their importance in the decision-making process is not crucial, they are not directly affected by freight flows in the city's logistics system) divided into four categories: government, business, community and others is presented in Table 5.

Table 4.
List of typical stakeholder groups involved in freight flows in the city's logistics system

Government/Authorities	Companies/operators	Local communities	Other
Local governments	National business associations	Associations	Business environment institutions
Neighbouring cities	International/national companies	Trade unions	Experts
Organisations responsible for transport development	Regional/local companies	Local community organisations	Media
Other local transport authorities	Local business associations	Local interest groups	
Other local authorities	SME	Society	
Politicians	Logistics operators		
Other decision-makers	Transport service providers		
	Transport companies		
	Carriers		

Source: own work based on: Dohn, Knop, Kramarz, Przybylska, 2019, p. 90.

Next, using the expert method, the strength of influence of the identified stakeholders on freight flows in the city's logistics system was determined. The prepared strength of influence assessment sheet for the identified stakeholders was critiqued by expert judges. The group of experts included a total of 12 persons. Three representatives of the local government, seven people associated with the city logistics research community and two people involved in the city's transport systems. The questionnaire was sent out electronically to the experts invited to the study. In addition to questions regarding their direct knowledge of the influence of stakeholders on freight flows in the city, they were also asked about the role of the stakeholders concerned in the city and their impact and influence on the city's functioning. The questionnaire ended with questions taking into account the expert's self-assessment of their knowledge of the issues under study. The following rating scale was adopted:

- Role of the stakeholder:
  - Foreground 2 pt.
  - Secondary 1 pt.
- Impact and influence (direction and strength of influence):
  - Positive strong 2 pt.
  - Positive weak 1 pt.
  - Neutral 0 pt.
  - Negative weak 1 pt.
  - Negative strong 2 pt.
- Stakeholder interest (impact of commodity flows on stakeholder interests):
  - Very strong impact 2 pt.
  - Strong impact 1 pt.
  - Neutral 0 pt.
  - Weak impact 1 pt.
  - Very weak impact 2 pt.

Each expert assessed all stakeholders in terms of their role, impact and influence on the flows of goods in the city and, the impact of the flows on the stakeholder's interest. The results obtained were analysed and summarised in a table (Appendix 1). For each stakeholder, the average of the scores obtained was calculated taking into account all three aspects examined. The results are presented in Table 4.

Table 4.
Average ratings from exert reviews

Stakeholder	Average stakeholder rating
Local governments	**1**
Neighbouring cities	0.527778
Regional/local companies	**0.972222**
Other local transport authorities	0.583333
Other local authorities	0.75
Other decision-makers	0.444444
National business associations	0.583333

Cont. table 4.

International/national companies	0.694444
Organisations responsible for transport development	0.916667
Local business associations	0.777778
SME	0.777778
Logistics operators	0.916667
Transport service providers	0.833333
Transport companies	0.75
Carriers	0.833333
Associations	0.583333
Trade unions	0.527778
Local community organisations	0.666667
Local interest groups	0.694444
Society	**0.972222**
Business environment institutions	0.583333
Experts	0.555556
Media	0.416667

Source: own work based on surveys conducted.

According to the experts, the most important stakeholder influencing freight flows in the city is the local government, as shown in Table 4. In second place were the public and local businesses (mean approx. 0.97). This was followed by logistics operators and organisations responsible for transport development. The least influence on freight flows in the city, according to experts, is the media.

4. Discussion

Despite numerous scientific articles highlighting the significant role of stakeholders in urban logistics, most focus on using their opinions to study specific phenomena (Szmelter-Jarosz, Rześny-Cieplińska, 2020). In research on stakeholder analysis related to urban freight transport, stakeholders are typically treated as individuals, organizations, or companies acting as respondents and opinion providers (Matusiewicz, Rolbiecki, 2021). However, few studies analyze stakeholders in the context of urban freight flows. The author of this article emphasizes the importance of classifying stakeholders and determining their influence on urban freight flows.

The purpose of such research is to identify the most critical stakeholders regarding freight flows, enabling their participation in balancing these flows in the future. According to M. Matusiewicz and R. Rolbiecki, an integrated approach involving stakeholder consultations and consideration of their perspectives is essential before implementing specific urban logistics solutions (Matusiewicz, Rolbiecki, 2021). Taniguchi observed that urban logistics could create more efficient and eco-friendly urban freight transport systems when modern information and communication technologies (ICT) and intelligent transport systems (ITS) are utilized (Taniguchi, 2014). One significant challenge for smart transport is last-mile deliveries, which typically involve transporting goods from a warehouse or distribution center to the end customer (Boichuk, 2022). The research conducted identified stakeholders who, according to the author, should be involved in building sustainable urban freight flows, especially for last-mile logistics. Each stakeholder group has different expectations of urban logistics systems. Entrepreneurs and operators aim to expand offerings and increase profits through cost reduction and higher sales. Local communities prioritize ensuring a good living environment by reducing congestion and emissions (NOx and CO2). Local authorities focus on creating transportation systems that minimize environmental impact and maximize economic efficiency. Meanwhile, logistics operators aim to provide high levels of customer service, characterized by timeliness, frequency, flexibility, reliability, and order completeness. Although shippers, freight carriers, and logistics operators focus on financial goals, authorities and local communities prioritize non-financial, social, and environmental objectives. Preventing congestion, ensuring safety, and reducing noise and pollution are shared concerns among all stakeholders involved in urban freight logistics systems (Dohn et al., 2019). As Russo and Comi (2010) and Lindholm (2014) point out, compromises among key city stakeholders are vital for success. It is also worth noting that while businesses are among the city's most important stakeholders (Dohn, Knop et al., 2019), they are often excluded from developing intelligent transport systems (Kmiecik, Wierzbicka, 2024). In 2017, it was observed that "one of the major challenges in selecting urban freight transport solutions is choosing those aligned with the key requirements and goals of stakeholders, who are often overlooked". Therefore, identifying stakeholders with the greatest impact on urban freight flows is a critical step.

5. Summary

Urban freight flows are a key element in the functioning of the urban economic ecosystem and their effective management requires the involvement of a variety of stakeholders. In this context, according to the study, the main actors influencing goods flows are city authorities, entrepreneurs, logistics operators and residents. Municipal authorities play a central role in regulation and spatial planning, which directly influence the efficiency of freight flows. Through transport policies, authorities can shape transport networks, set delivery rules in city centres and designate restricted zones for trucks. Such decisions aim to balance the need for efficient freight transport with the requirements of environmental protection and quality of life for residents. Traders and logistics operators are key stakeholders responsible for the organisation and execution of freight flows. Decisions on the location of warehouses, the choice of delivery routes and strategies on when and how to deliver have a direct impact on the urban transport infrastructure and the environment. Businesses seek to minimise transport costs and maximise efficiency, which often leads to conflicts with the objectives of municipal authorities, especially in the context of emission and noise restrictions. In this case, public-private partnerships can be an effective solution to work together to optimise freight flows while respecting environmental requirements. Residents have an important influence on decisions concerning goods flows, although this influence is often indirect. Through their daily consumption choices, residents influence the demand for goods and thus the intensity and frequency of supply. In addition, increasing expectations of the quality of urban life, such as the reduction of noise or pollution, put pressure on city authorities and logistics companies to seek more sustainable transport solutions.

Key stakeholders, including logistics operators, entrepreneurs, residents, and municipal authorities, have diverse, often conflicting needs and expectations regarding urban logistics. Including them in the decision-making process and collaboratively developing solutions can reduce resistance to change, align actions with local needs, and contribute to better urban space management. This approach can also support the creation of innovative solutions, such as night delivery zones or the use of Intelligent Transport Systems (ITS), which are more effective when accepted by all stakeholders.

In summary, urban freight flows are the result of complex interactions between different stakeholders, each bringing unique perspectives and objectives. Achieving harmony between logistical efficiency, environmental protection and quality of life for residents remains a key challenge, which requires an integrated approach to managing the urban transport system.

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