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THE ROLE OF STAKEHOLDERS IN A DEVELOPING REFERENCE MODEL OF CITY LOGISTICS VERSUS THE QUALITY OF CITIZENS' LIFE

Abstract

The main aim of the paper is to present the role of stakeholders in developing reference model of city logistics versus quality of life. Authors discussed different expectations of stakeholders in relation to the city logistics and introduced assumptions for a referential model of city logistics versus quality of life. The study covered selected results of survey conducted among 1600 residents of three medium sized cities in Poland. Based on the survey's results, the authors made attempts to work out the model of the behavior of residents in relation to different forms of transport.

Key words: city logistics, stakeholders, model of city logistics

1. INTRODUCTION

City logistics is a contemporary concept aimed at the integration of existing resources in order to solve difficulties due to the growth of motorisation rate and population in cities. These difficulties are especially noticeable in large cities, where the intensity of traffic has been observed for the last ten years. As a result, it takes longer to reach the destination.

The problem of congestion is not so noticeable in the cities of medium size. There are also low-input solutions which make people and goods move around faster and thus improve the quality of life of inhabitants [23].

Taking advantage of the best-known and popular definition of logistics, developed by members of CLM, due to which logistics is 'the process of planning, implementing, and controlling an efficient and effective flow and storage of goods, services and related information from point of origin to point of consumption for the purpose of conforming to a customer's requirements' [4], city logistics can be defined as urban planning, implementation and monitoring of economic efficiency and effectiveness of people, cargo and relevant information in urban areas in order to improve the quality of life.

Having in mind the definition of systems, whose essence according to general systems' theory is deliberately organised set of elements and relationships between them, the concept of urban logistics system can be interpreted. City logistics system should be understood as deliberately organized set of elements such as stakeholders, infrastructure, regulatory standards, tariff system and the relationship between them, which are involved in the integration process of products' flows, people and relevant information in urban areas.

This paper is the result of a research project financed from funds for science in 2010-2013 called 'A Reference Model of city logistics and quality of life'. The aim of the research project is to develop a reference model including the real city logistics flows and the sphere of controlling and interaction. The survey included three medium-sized cities: Jelenia Góra, Zielona Góra and Gorzów Wielkopolski. So far within the research project based on secondary data the diagnosis of logistics systems in cities and the evaluation of quality of life

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has been made. The surveys were also conducted on a sample of 1600 people in three surveyed cities. Based on the research a subjective opinion of respondents was obtained on urban logistics and the quality of life.
Studies have shown that an important role in the logistical system of the city plays stakeholders who usually have different expectations. Therefore, the main aim of the paper is to present the roles of stakeholders in developing a reference model of city logistics versus the quality of life of citizens.

2. DIFFERENT EXPECTATIONS OF STAKEHOLDERS IN RELATION TO THE CITY LOGISTICS

According to the economic trends in the world the metropolitan economic regions are the most dynamically developing areas of the world economy and gradually begin to dominate the world economy [13]. According to studies, city inhabitants represent over 75% of the population of the European Union [24] and forecasts indicate an increase in this ratio up to 83% by 2020 year [11]. As a result, many cities have a huge problem with congestion caused mainly by individual transport. This problem might be even bigger in 2050 when passengers' cars will contribute more than 60% to total passengers' transport [6]. Hence, more and more cities are struggling with problems such as: noise, pollution, congestion, loss of green areas for the development of transport infrastructure (car parks, roads), increased number of waste, etc. [14]. All the consequences of urban development lower the quality of life of inhabitants [2]. One can say that people become victims of the highly developed cities. However, so far the activities for improving the logistics of the city have concerned only single aspects. Nowadays, logistics requires a comprehensive approach that takes into account the involvement of all interested [21]. Among them we can distinguish [10]:

1. Freight carriers
2. Residents
3. Shippers
4. Administrators
5. Public transport operators.

Each of these stakeholders mentioned above has different expectations of urban logistics. Table 1 presents determination flow of the criterion for stakeholders. As the table shows the main objective of manufacturing companies, commercial and cargo carriers is to increase profit, which may be obtained, inter alia, by reducing costs and increasing sales. In the case of residents the main objective is to provide a good living environment, which can be achieved by reducing the congestion and thus reducing travel time through the city and the reduction of emissions of NOx and CO2. The main aim for administrators is to build a society with low environmental impact and high economic efficiency. Finally, public transport operators would like to ensure punctual and frequent public transport to increase the number of customers.

Table 1. Determination Flow of the Criterion for the stakeholders

Stakeholders	Objective	Conditions for achieving objective	Criterion
Freight carriers	Growth in profit	Reduction of the transportation cost, Growth in sales,	Minimise transportation cost, maximise amount of sales minimise delay time at customers

Shippers	Growth in profit,	Reduction of the total cost, Growth in sales	Minimise transportation cost, maximise amount of sales
Residents	Ensuring good living environment	Reduction of negative impacts on living environment from the traffic; reduction of traveling time within the city	NOx, C02 emissions from the trucks vehicles, traveling time within the city
Administrators (local governments)	Revitalization of the city a) Society with low environmental impact b) Society with high economic efficiency	a) Achieving environmental standards b) Efficient use of urban road network	a) Total NOx emissions in the network b) Total number of complaints from the residents
Public transport operators	Ensuring punctual and frequent public transport, growth in amount of customers	improvement of service quality	Total numbers of complaints from customers, minimise delayed time of public transport

Source: own work based on Eiichi Taniguchi, Dai Tamagawa, Evaluating City Logistics Measures Considering the Behavior of Several Stakeholders, Journal of the Eastern Asia Society for Transportation Studies, Vol. 6, pp. 3062 - 3076, 2005.

While shippers, freight carriers and public transport operators will be interested in the implementation of financial goals, the authorities and residents of major cities most will achieve non-financial, social and environmental goals. Preventing congestion as well as the low level of safety, noise and pollution resulting from heavy traffic can be in the interests of all city logistics' stakeholders. In many cases, however, the phenomenon of competitive objectives occurs [22].

3. OVERVIEW OF CITY LOGISTICS MODELS

In literature you can find many models of city logistics [18], [19], [20], [1], [12]. In most cases there are mathematical models used to optimize routes based on the familiar method of planning transportation system, in particular passenger transport in the city [3], [5], [7] in [2].

According to A. Benjelloun and T. Crainic city logistics models have three main components: supply modeling, demand modeling and assignment of multicommodity flows (from the demand model) to the multimode network (the supply representation) (table 2).

Supply modeling includes transportation infrastructure, modes, capacities and congestion, service, criteria and performance measures. Demand modeling focuses mainly on the definitions of a product, companies included in city logistics, procedures and distribution capacity. The last component covers many methods and tools, which enable to simulate the behavior of the transportation system.

Table 2. Main components for city logistics models

No.	City logistics models' components	Specifications
1.	Supply modeling	It represents transportation infrastructure, modes, carriers, services, and lines; vehicles and convoys; terminals and intermodal facilities; capacities and congestion; economic, service, and performance measures and criteria;
2.	Demand modeling	It captures the product definitions, identify producers, shippers, and intermediaries, and represent production, consumption, and point-to-point distribution volumes, The determination of mode choices for particular products or origin-destination markets is also addressed here;
3.	Assignment of multicommodity flows (from the demand model) to the multimode network (the supply representation)	This procedure simulates the behavior of the transportation system and its output forms the basis for the strategic analyses and planning activities. A number of methods and tools complement the methodology for the analysis, fusion, validation, and updating of information, as well as for studies based on assignment results, e.g., cost-benefit, environmental impact, tolls and tariffs, and energy consumption policies

Source: Abderrahim Benjelloun, Teodor Gabriel Crainic, Trends, Challenges, and Perspectives in City Logistics, Simulating the Impact of New Australian "Bi-Modal" Urban Freight Terminals, Buletinul Agir Nr. 4/2009, Octombrie-Decembrie, P. 45

According to E. Taniguchii R.G. Thompsona and T. Yamady, city logistics' models can be divided into:

- optimisation
- simulation [17].

Optimisation models mainly concern the statistical analysis of traffic in time and space, while the simulation models allow you to analyze the behavior of the participants as a result of changes made to the system of urban logistics [22].

Some other classification of city logistics model is presented by G. Paglione. He distinguishes the following models of city logistics [12]:

- Econometrics and statistical models
- Spatial-Network models
- Demand models
- Emprical models

Econometrics and statistical models mainly are based on historical data. They allow to analyse the freight and passenger transport data as well as variables influencing the transport demand. Spatial-Network and demand models are based on simulation and operation models. Empirical models include pragmatic estimation based on research and allow to consider the characteristics of the city of reference [12].

City logistics models developed on the basis of formal mathematical assumptions often fail to solve poorly structured and are burdened with a high level of risk and uncertainty of strategic decision problems. Therefore, more and more effective for the city authorities are diagnostic and decision-making models based on heuristic knowledge and the intuition of experts. These models are fairly simple tools for efficient communication between

stakeholders and a decision-making process to assist in the city logistics area [22]. Figure 1 shows a simplified classification of the models of urban logistics.

The first type includes formal mathematical models, which are divided into simulation and operational ones. The second type consists of heuristic models which are built based on the description and diagnosis indicating the purpose, accuracy and impact of development. These are the diagnostic and decision-making models both supporting local authorities in making decisions and making the communication between all stakeholders in city logistics easier.

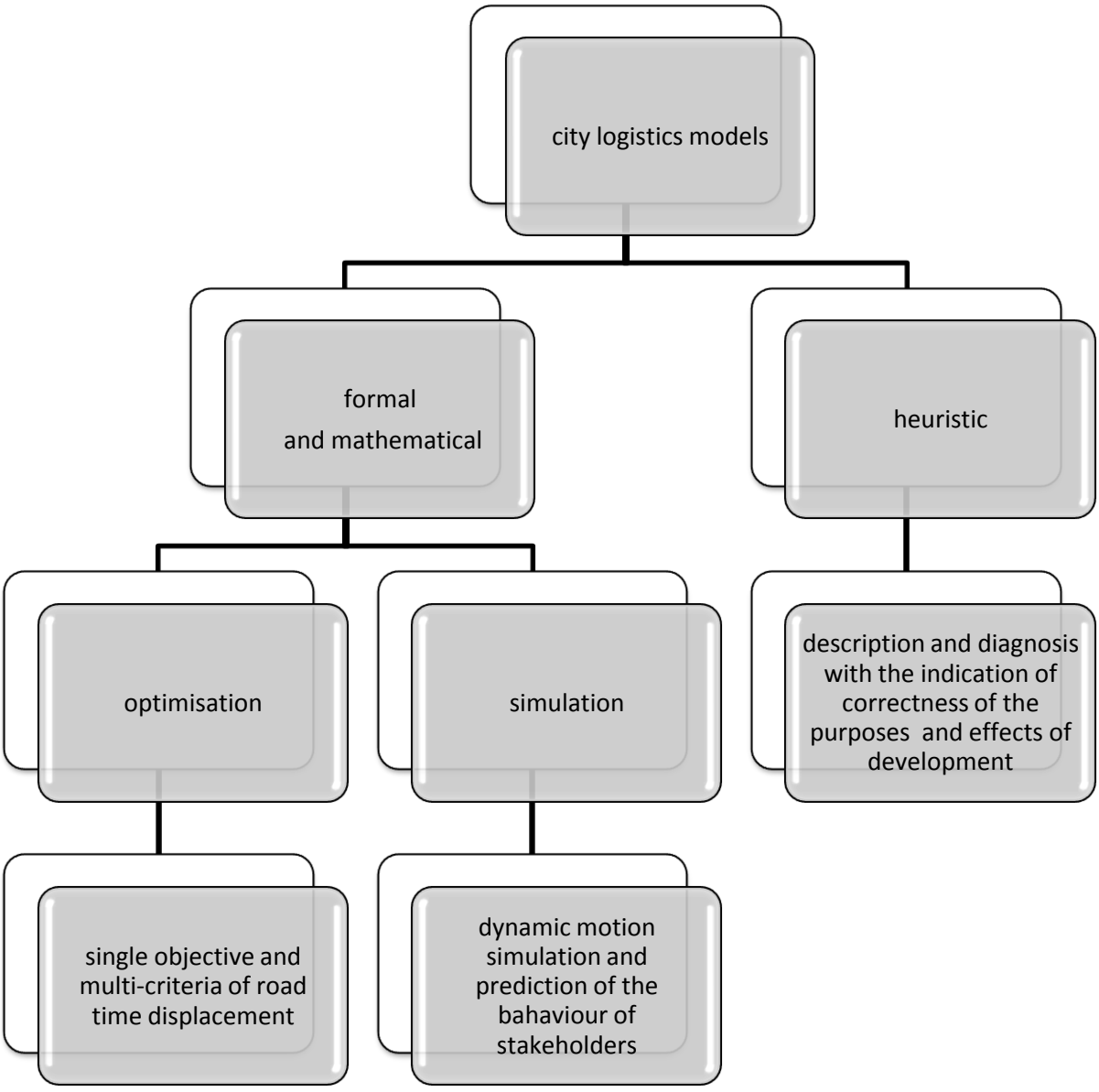


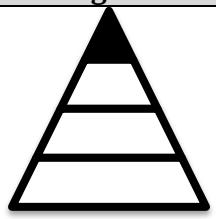
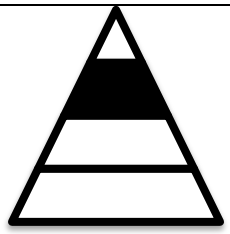
Figure 1: Typologia modeli logistyki miejskiej według dominującej techniki modelowania
Source: J. Witkowski, Modelowanie logistyki miejskiej. W poszukiwaniu celów i kryteriów oceny modelu. Konferencja Naukowa Strategie i Logistyka s sektorze usług, UE we Wrocławiu, Wydział Gospodarki Regionalnej i Turystyki w Jeleniej Górze, 16-18.10.2011, Kowary 2011r.

The above models illustrate different approaches to solving problems associated with the movement of people and cargo in the city. Certainly each of these models can bring benefit in the field of urban logistics as long as it is implemented in practice. It seems that the best solution, especially for the city authorities, is a combination of heuristic model with selected formal-mathematical models (which are complementary to the heuristic model).

4. STAKEHOLDERS FUNCTIONS IN A HIERARCHICAL MODEL OF CITY LOGISTICS

Various expectations of stakeholders in relation to transport logistics bring partial solutions that improve the organisation of activities related to city logistics in a narrow area. Currently, the majority of stakeholders organise in an individual way the supply chain not taking into account the logistical problems that affect other companies. Therefore, the increasing role is played by local governments which coordinate activities in the field of city logistics [14].

Figure 2 presents the role of stakeholders in a hierarchical model of city logistics. Development and implementation of urban logistics model can be included, just as in the case of the SCOR model in four stages. The first level is associated with the identification of the main purpose of the reference model of urban logistics. At this stage the diagnosis is made to reveal the needs of residents, the size of cargo flows in cities is analysed and the major stakeholders of urban logistics are determined. This stage should be initiated and coordinated by local authorities. Here, the roles of other stakeholders should be defined as well. The second level includes configuration of city logistics model. Local government in cooperation with shippers, freight operators and public transport operators configures process categories which should be included in reference model of city logistics. The next level is based on decompose processes. At this stage, each stakeholder identifies the ability to change the reference model proposed in city logistics. This level includes processes' reorganisation, application of best practices, implementation of new technology, tools, etc. The last one, the implementation level covers all activities, which are taken by stakeholders (local government, shippers, freight operators and public transport operators) in order to implement city logistics solutions.

Level		**Main aim of the level**	**Stakeholders' roles at each level**
Figure	**description**		
	Top level (process type)	Identification of the main scope for the reference model of city logistics versus quality of life.	Local government is responsible for setting main targets including residents needs, capacity of flow goods, etc. A this stage city logistics' stakeholders are defined.
	Configuration level (Process categories)	Configuration of the reference model of city logistics including citizens needs	Local government in cooperation with shippers, freight operators and public transport operators configures process categories which should be included in reference model of city logistics. On these level best practices could be helpful.

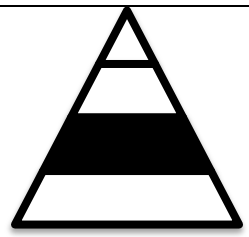
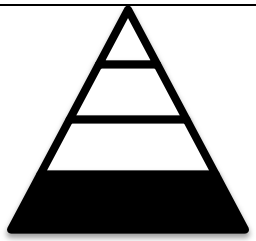
	Process element level (decompose processes)	Determination of ability to adapt to the changes included in the reference model of urban logistics.	Stakeholders, like local government, shippers, freight operators and public transport operators, define their abilities do changes proposed in reference model of city logistics. This level includes processes' analyses and then reorganisation of these processes, application of best practices, implementation of new technology, tools, etc.
	Implementation level (decompose process elements)	Stakeholders implement specific design city logistics practices.	At this level local government, shippers, freight operators and public transport operators implement city logistics solutions.

Figure 2. The role of stakeholders in a hierarchical model of city logistics
Source: modified on the example of SCOR – Supply Chain Operations Reference Model, Supply Chain Council, 2008, www.supply-chain.org

Above a hierarchical model of city logistics is presented, which similarly to SCOR model a particular emphasis puts on the processes occurring in the area of urban logistics. However, an important role in the implementation of measures to improve transport logistics play stakeholders. A proper assignment of functions and activities to individual stakeholders can improve implementation of city logistics practices.

5. RESIDENTS BEHAVIORS IN THE AREA OF CITY LOGISTICS. SURVEY RESULTS.

The survey was the first part of the second step of the research conducted between January and March 2011 among 1600 residents of three medium sized cities in Poland (Gorzów Wlkp., Zielona Góra i Jelenia Góra). Cities selected to the study are located in the west part of Poland. The sample was a stratified quota sample selected with the following criteria:

1. gender (male, female);
2. age (up to 35, 35-60, 60 plus);

The survey research provides information about the correlation between city logistics and the quality of life and also assesses these both aspects. In this paper authors present only a small part of survey research results [9].

The results of the survey confirm the statistics, which indicates the constant increase in the automotive industry. In all surveyed cities about 50% of respondents moved through the city by car. Public transport among respondents is used in Gorzów Wlkp. by 24.2%, in Zielona Góra by 22.6% in Jelenia Gora only by 16.3% (table 3).

Table 3: Daily using various types of transport

Transportation means	Gorzów Wlkp.	Zielona Góra	Jelenia Góra
Public transport	24,2%	22,6%	16,3%
A car	49,2%	51,7%	46,3%
A motorcycle	0,2%	1,4%	0%
A bicycle	0,5%	1,7%	2,6%

Research shows that the biggest number of respondents (53,7% in Gorzów Wielkopolski, 47,9% in Zielona Góra and 41,7% in Jelenia Góra) go straight to work. In Gorzów Wielkopolski and Jelenia Góra every fourth respondent sometimes goes straight and sometimes does something on the way to work. Less than 10% of respondents usually take care of other things on their way to work. In Jelenia Góra and Zielona Góra over 20% of respondents do not have to move to work while in Gorzów Wielkopolski in similar situation are only 10% of respondents (figure 3).

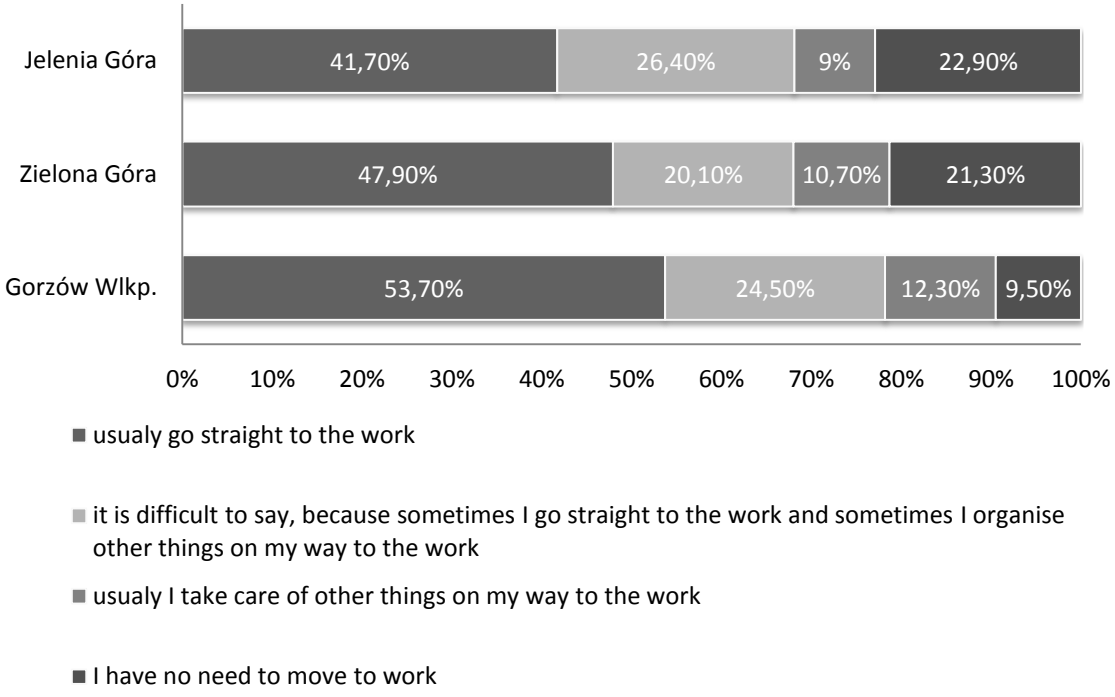


Figure 3: The most common way to work

Based on the survey's results, the authors made attempts to work out the model of the behavior of residents in relation to different forms of transport (figure 4).

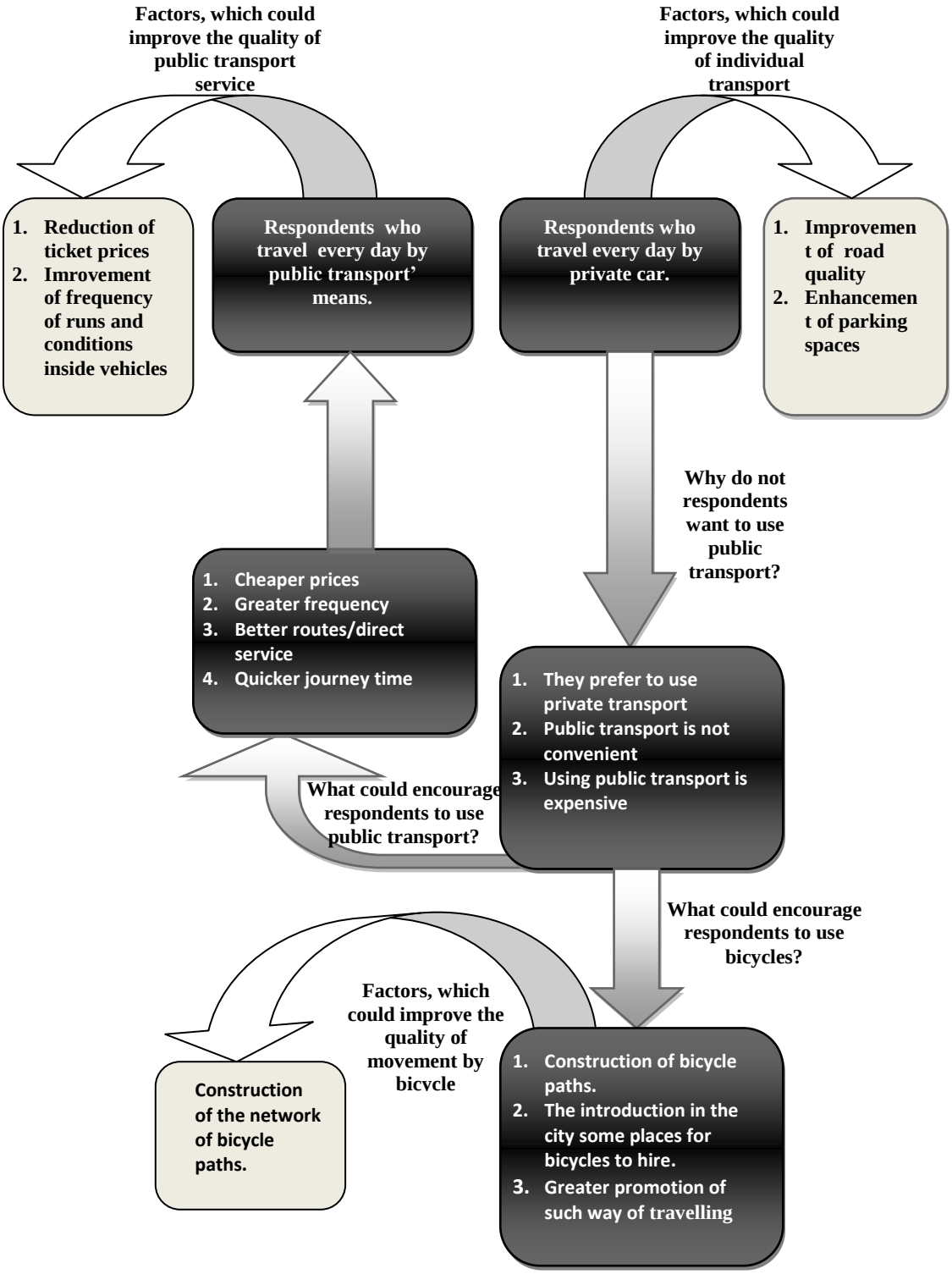


Figure 4. Residents' behavior model in relation to different types of movement within the city
Source: own work based on survey results.

The research shows that every second respondent moves through the city every day by car and only one in five uses public transport. Over 60% of respondents believe that they

do not use public transport because they prefer their own private car. In addition, factors discouraging the use of public transport are: high ticket prices and the fact that public transport is inconvenient. The factors that could encourage respondents to use public transport are: the price (about 30% of respondents) as well as: higher frequency, better routs, quicker journey time. According to the respondents the above factors would also contribute to improving the quality of services provided by carriers engaged in public transport. The quality of going through the city by private car would contribute to such activities as: improving the quality of roads and creating more parking spaces.

Only a small percentage of respondents ride bikes around the city every day. According to the respondents, in order to motivate them to use this form of transport, a network of bicycle paths should be created and one could introduce some places for bicycles to hire.

According to most respondents (about 70%) solutions such as: the ban on the movement for trucks or the restricted hours to enter the city center, night-time delivery organisation or preferences for public transportation such as bus-lanes would improve considerably the quality of life in the area of city logistics. The survey results also shows that the respondents are not willing to personal commitment to improve transport logistics.

Solutions that affect citizens (the introduction of entry fee to the city center and prohibition on the movement of all vehicles through the city center) support only a few respondents in Gorzów Wielkopolski (15,5%) and Zielona Góra (18,9%).

The presented model is only a schematic attempt to approach the behavior of respondents in relation to various forms of personal transportation in the city. This model could be one of the tools supporting local governments in making decisions about how make people who use cars choose alternative forms of transportation, such as public transport or bicycle.

6. CONCLUSION

City logistics is indispensably connected with quality of life of city dwellers. On the one hand it can be said that an effective organisation of human and freight movement within the city limits has an influence on societal quality of life. On the other hand, however, it might be claimed that it is the quality of dwellers' lives that affects logistics. A rise in general wealth, closely followed up by a rise in individual transport in town causes more and more aggravated problems resulting for instance from congestion [24].

In 1990s European Commission mostly supported development of large cities like London, Berlin, Vienna. These metropolitan areas became interesting for many politicians. For a long time medium sized-towns were in the shadow of large metropolitan cities. Recently more and more countries increasingly have drawn attention to small and medium-sized towns. In 2006 American Newsweek, asserted that 'the last century was the age of the mega-town. The next will belong to their smaller humbler relations' [25].

A referential model of city logistics for medium sized towns could provide a solution facilitating an efficient movement of humans and freight including residents' quality of life. Such a model will account for real flows, control and cooperation. Therefore, all stakeholders play an important role within developing and implementing city logistics' model.

Both the research and observations [26] show that the local government should play the role of a coordinator and an in initiator of actions to improve urban logistics. A behaviour's model of residents in relation to different forms of transport could provide a tool for implementing above actions. One should remember however, that without the

participation of other stakeholders, especially transport, production and trade companies dealing with public transport implementation the model of city logistic is not possible.

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ROLA INTERESARIUSZY W OPRACOWYWANIU MODELU REFERENCYJNEGO LOGISTYKI MIEJSKIEJ W ASPEKCIE JAKOŚCI ŻYCIA MIESZKAŃCÓW

Streszczenie

Głównym celem referatu jest przedstawienie roli interesariuszy w opracowywaniu modelu referencyjnego logistyki miejskiej w aspekcie jakości życia mieszkańców. Autorzy poddali dyskusji zróżnicowane oczekiwania interesariuszy w relacji do logistyki miejskiej oraz zaproponowali założenia do budowy modelu referencyjnego logistyki miejskiej. W pracy zaprezentowano wybrane wyniki badań ankietowych przeprowadzonych wśród 1600 mieszkańców trzech polskich miast średniej wielkości. Na podstawie wyników badań autorzy dokonali próby opracowania modelu zachowań mieszkańców w relacji do korzystania z różnych form transportu.

Słowa kluczowe: Logistyka miejska, akcjonariusze, model logistyki miejskiej