

CITY LOGISTICS OF BELGRADE WATERFRONT

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Abstract: *The importance of city logistics is increasing with urban areas' sprawling and development. Considering that logistics activities have a great influence on the system competitiveness and sustainability, it is necessary to pay special attention to their planning. The beginning of „Belgrade Waterfront” project realization requires defining the plan of logistics processes and activities. This paper shows the problems and gives some potential logistics solutions in both construction and planned facilities functioning phases.*

Keywords: *city logistics, construction logistics, supply logistics*

1. INTRODUCTION

Being a city situated on two rivers, the potential of Belgrade is underused. The bottomland value is priceless, but it is not properly exploited. In the past, the various projects were planned on this area and they were aimed at the development of more profitable business activities, modernization and attractiveness growth of the city. The „Belgrade Waterfront“ is current and adopted reconstruction project of a part of Sava's bottomland. On the location of outdated industry, where some of the national minorities found his harbourage, in the very heart of the city, Master plan envisages the construction of attractive residential and commercial facilities (<http://www.rapp.gov.rs>). Considering that Belgrade is a city with a rich history and beautiful architectural heritage, the certain number of buildings will be renewed within „Belgrade Waterfront“ project and will retain their original appearance.

The construction of the planned complex is a great challenge for the city logistics. The large construction site, with numerous contractors and subcontractors, will generate the intensive goods and material flows for a longer period. The lack of planning, management and control of supply flows and returnable and waste material extraction from this area could have serious consequences for the functioning of the whole city, especially of central and urban area of Belgrade. On the other hand, the construction by phases of planned residential-commercial facilities allows their settlement by phases. The activating of various urban functions (residential, trading, catering etc.) will increase the logistics demand heterogeneity and the problems of people and goods flow realization. By moving the people into buildings, the demand for their supplying, i.e. the various goods, material and freight delivery, will emerged. The dominant role of road transport in these flows' realization and their adverse environmental effects, especially in terms of noise, air pollution and traffic safety, will cause the decline of urban system efficiency and quality of life. In order to avoid this scenario, it is necessary to define the city logistics conceptions which will allow the undisturbed construction work and efficient

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functioning of newly constructed systems, provide the attractiveness of these part of the city and improve the quality of life in it. The conceptions should be defined in accordance with the interests of all participants, city logistics stakeholders (Zečević & Tadić, 2006; Tadić & Zečević, 2009; Tadić et al., 2014).

This paper aims to perceive the problems and goals, i.e. the importance of logistics in urban area construction and functioning. The problems related to „Belgrade Waterfront” construction logistics and the supplying of planned facilities, as well as the possible solutions of them, are presented.

2. BELGRADE WATERFRONT PROJECT

According to the project, “Belgrade Waterfront” (Figure 1) covers an area of 1.85 millions of squared meters and includes the space on right Sava’s riverside, from Railroad Bridge to Branko’s bridge. The project construction is planned to be implemented in four phases (<http://www.rapp.gov.rs>).

The first phase includes the construction of the space situated among Old Sava Bridge, river Sava and future Sava Boulevard. Two 170 m tall buildings and a shopping mall, as well as the other residential and business facilities, are planned to be constructed on this area.

The second phase includes the space between Branko’s bridge and Old Sava Bridge, as well as the space between Gazela Bridge and the Fair. At this site it is being constructed the facilities of cultural and historic importance, as well as the cycling bridge which also may have a role in supplying the city with easier shipments.

The third and fourth phases envisage the construction of space situated among Old Sava Bridge, Gazela Bridge, Sava Street and future Sava Boulevard. In this phase, the various purpose buildings are constructed, but the number of floors is significantly smaller compared to that in previous phases.



Figure 1. “Belgrade Waterfront” project (<http://www.beobuild.rs>)

This project will engage numerous Serbian construction companies, improve the economic development and the city and region attractiveness, and its realization requires a serious concept of city logistics.

3. CONSTRUCTION AND SUPPLY LOGISTICS OF BELGRADE WATERFRONT

The all kinds of goods, freight and material flows are present in the city. Depending on the type of generator running the flow, the quantities and forms of appearance vary and the flows are present permanently, once or several time during a day or occasionally. During the realization, the flows are passing through the various systems and require various services (Zečević & Tadić, 2006).

Due to the high concentration of urban functions, the central urban areas generate the significant part of logistics activities, primarily the freight transport. In the current situation, the generators from the central area of Belgrade initiate the running of several thousands of road freight vehicles of various types, on a daily basis (Tadić et al., 2014). Their presence induces a series of effects on both business performance of participants and environment and quality of life. In the attractive part of Sava's bottomland, the "Belgrade Waterfront" project envisages the development of various residential and business-commercial facilities with architecturally and visually modern buildings. The project realization and the new plan require new logistics solutions. On the one hand, the demand for providing the sites with construction materials is emerging, and along with this, the supplying the facilities that will be activated by phases.

3.1 Construction logistics of "Belgrade Waterfront"

The construction logistics includes planning, organization, coordination and control of flows and logistics activities that are related to construction project realization (Duiyong et al., 2014). The scope of envisaged works and the site of "Belgrade Waterfront" project indicate the additional complexity and problems of logistics in both narrow and broader areas of the construction site.

In the current situation, the high traffic density in this urban area causes huge problems from the aspects of both congestion and road safety and ecology etc. The street network is not adjusted for the efficient freight vehicle management. This problem is particularly present in the morning hours when the transport flows overlaps the people flows, thus resulting in their mutual disturbance. The requests for construction material delivery will significantly worsen the situation by running the additional heavy duty vehicles. A special problem is JIT (Just in Time) deliveries, which are dominant in the construction industry. In addition, it will emerge the problems of the material disposal, i.e. of its storage at the site. Due to the high traffic congestion and with aim to deliver the goods timely, the vehicle comes earlier to the delivery point and wait for unloading, thus worsening the congestion and disturbing other road users. The efficient distribution of the construction material requires the supply chain management and the cooperation between construction companies and suppliers and their adaptability to various changes that may occur (Ahmetasevic & Samuelsson, 2014). The lack of the planning, cooperation and coordination of the logistics flows and activities generated by future construction site may have serious consequences for the functioning of Belgrade's urban area and for the project realization efficiency.

In order to reduce the number of vehicle runs and traffic jams generated by freight vehicles during a construction material delivery to the construction site and to improve living and working conditions, it is proposed to introduce the city logistics terminal for the consolidation of smaller material deliveries. The participation of numerous contractors and subcontractors in project realization involves the numerous daily deliveries of various materials at different locations within a construction site. The city terminal has to be able to accept all small deliveries, to consolidate them and delivery to a specific location according to the work schedule, as well as to provide the temporary storage of the construction material. In order to avoid traffic jams, the supplier or construction manager has to announce the vehicle arrival and the delivery which is not taking place through the city terminal. Based on the delivery plan, each supplier is provided with a time interval within which the delivery should be realized (Zečević & Tadić, 2006).

This system allows the coordinated delivery flows management and timely supply of construction sites, without the additional congestion within and near the construction site.

There are numerous examples of city terminals supplying a construction site, e.g. in London (Transport for London, 2008) and Stockholm (Ottosson, 2005). The stated advantages of the consolidation centre involve (Transport for London, 2008):

- Reduction in goods and vehicle movements at the construction site
- Reduction in deliveries realized by smaller vehicles; the higher-capacity vehicles are used
- Absorption of CO₂, noise and vibrations
- Increase of the supply network capacity
- Delivery reliability improvement
- Savings for drivers; they deliver the goods to the consolidation centre rather than to the construction site
- Savings for contractors waiting for the delivery
- Reduction in the waste material
- Waste material and packaging are collected in the centre
- Centre provides the opportunity for repairs and recycling services etc.

However, the successful implementation of the consolidation centre concept requires (Transport for London, 2008):

- Trained and informed labour force; tendency to the error elimination
- Control of delivered goods from the consolidation centre to the construction site
- Insurance of goods if it is profitable
- Temporary warehouse construction

By studying the disadvantages, the clearer picture of the opportunity to implement a consolidation centre concept for the construction logistics realization is obtained. These disadvantages are manifested by the lack of knowledge in people that will be the work leaders at the construction site. Considering that aspect, it should emphasise how it is necessary to involve the logistics thinking (Transport for London, 2008).

3.2 Supply logistics of “Belgrade Waterfront”

As a capital city, Belgrade is an administrative and economic centre which makes it the largest generator of goods flow. Although, the problems of logistics activities and goods flows are solving partially and individually, without considering the entire city logistics system and plan. The increase in the number of generators in the urban area of the city and the construction of “Belgrade Waterfront” will result in significant worsening of the logistics problems and adverse effects on the environment and quality of life.

Supply and extraction logistics is essential for the urban area prosperity, but simultaneously it is a source of problems from the aspect of the environmental protection, traffic safety and availability. Increasing requirements in terms of the speed, flexibility, reliability and diversity of logistics services and the lack of planning activities and long-term logistics plans influence the increase of commercial vehicle volume and the loss of urban vitality. Without appropriate city logistics solutions, the supplying of new “Belgrade Waterfront” facilities will worsen the current situation. On the other hand, the modern urban concept of the urban riverside area development requires the modern logistics concept. Herein defined conceptions are compatible with the development plan of this attractive urban area and involve the implementation of new, old solutions for the logistics chains realization in the city. In order to meet the new demand, i.e. planned business-commercial facilities in the attractive part of central urban areas, but also the solutions of the current problems, two logistics conceptions are defined:

Conception 1: Construction of a city logistics terminal for consolidated supply of generators in the gravitation area. The goods delivery from logistics centres, situated at other locations, to the city logistics terminal would be realized by implementation of cargo tramway, while distribution to the generators in the gravitation area would be realized by electric vehicles. The main advantages of this conception involve (Tadić & Zečević, 2009): delivery consolidation and minimum of vehicle movements; cargo tramway implementation for reducing the urban street network congestion, thus having a positive impact on traffic safety, air pollution and road maintenance costs; the use of electro vehicles significantly reduce the adverse environmental effects. Besides these significant advantages, this conception has some disadvantages. First, a part of goods (perishable groceries, daily newspaper etc.) has to be delivered in the conventional manner, by conventional road delivery vehicles without transshipment and consolidation (Tadić & Zečević, 2009). In addition, the cargo tramway implementation impairs the flexibility of a “Just In Time” delivery due to the use of existing fixed infrastructure (Robinson & Mortimer, 2004).

Conception 2: Construction of underground logistics system for supplying “Belgrade Waterfront”. The goods would be delivered to the logistics centre at the edge of this urban area according to the city logistics conception of the whole city. The logistics centre is a link with the environment and offers the storage, sorting and commissioning services as well as the preparation of units for the underground system and delivery to the generators. The system would have several stations for accepting/shipping the goods. The flows between the station and generator would be realized by non-motorized transport modes (by walking, cycling or by handcarts). The environmental advantages of undergrounding freight transport are numerous: street network clearing, reduction in traffic congestion, energy consumption, hazardous gases emissions, noise, traffic safety improvement and more rational use of the existing space. In addition, there are significant advantages for the logistics: faster delivery, less damage to the goods, weather conditions not undermining flow realization. Besides all the advantages, this system implementation requires a long construction time and large investments, so it is necessary to determine its justifiability.

Considering that both conceptions have some advantages and disadvantages, the final choice requires more detailed analysis and estimation from the aspect of numerous criteria. The criteria should be defined in accordance with economic, environmental and social sustainability indicators.

4. CONCLUSIONS

A city is a concentration point of various functions and social-economic systems. The successful functioning requires planning of logistics systems and activities and defining city logistics plans. The city logistics should provide an efficient and environment-friendly realization of the goods flows. “Belgrade Waterfront” generate new logistics demand in both construction and planned facilities’ activation phases and requires solving numerous logistics problems. Inadequate logistics organization will lead to the serious disturbances in the functioning of this area and the whole city.

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