Basics of justification for the construction of the "Sarajevo West" business and logistics zone through the valorisation of the Sarajevo bypass lot 2a for the development of the transport system

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Abstract

Over the next decade, transport and logistics companies will have to adapt to a number of challenges, given the impact of global crises and wars, the impact of the Covid-19 pandemic, as well as the development of artificial intelligence and the rapid expansion of e-commerce. For a long time, business zones were considered a place of centralization of the manufacturing sector, but recently there have been more and more investments in the services and trade area. Today, the modern business zone contains all these branches of the economy and as such should be designed as multifunctional and with developed logistics to meet demands. It is crucial for a successful business logistics zone to choose a location and infrastructure which will make it attractive to the economy.

***Keywords**: Business logistics zone, GTC (Goods Transport Center), Industrial interchange, transhipment terminal*

1. Introduction

The formation of business zones in wider urban zones is an important contribution to the economic development of the city. Due to their non-existence, businessmen are forced to organize themselves, and this cannot induce wider economic development and the development of much-needed supporting logistics at full capacity. Usually, such spontaneous business zones are an obstacle to the proper development of the city and their adequate integration into a meaningful whole. Cities must plan to determine the location and development of regulatory plans with all the contents that form a business zone.

One of the basic preconditions for the formation of these zones are traffic connections and infrastructure. The conducted research and analysis of business zones in the Federation of B&H and the wider region, as well as the analysis of traffic flows and literature used in the subject area, we believe that Sarajevo Canton probably has an ideal opportunity to form a modern business and logistics zone in Butila, given that in a very small radius there is the Motorway on Corridor VC, a railway with a marshalling yard, and an airport. It is important to mention that the railway has a direct connection with the port of Ploče, and in the near future the motorway will also be directly connected to it.

Also, the e-commerce business is developing at an unstoppable rate even before the unexpected recent world events. The time of epidemics and global crisis that are currently happening in the world represent a historic turning point. The number of online orders is the clearest and surest indicator of a completely new way of purchasing goods, and companies operating in the transport and logistics sector cannot ignore it.

The aim of this paper is to emphasize the importance of adapting the transport infrastructure that would give full potential to the development of the business and logistics zone, putting it in the focus of businessmen, both those already operating in Bosnia and Herzegovina and new large entities, whose attention can only be attracted by a modern and affordable business zone. Also, the importance of forming a new modern business and logistics zone in order to develop the Canton and the economy was emphasized.

Today, there are over 130 registered economic zones in the Federation of B&H [1]. Most of these zones are only registered as such and listed in regulatory plans. Also, a large number of active zones were formed rather spontaneously and do not contain all the elements that a business zone should contain.

2. Logistics centres

Logistics centres are one of the most important parts of the logistics network. Commodity flows are inconceivable without a logistics centre, whether it is a space in an urban, national or global area.

The logistics centre can be defined as part of the transport infrastructure, i.e. the focus of material flow in the logistics chain [2]. In other words, the logistics centre is a place of gathering and concentration of goods in which the initial, final and transhipment operations are performed, i.e. the logistics centre is a link in the process of distribution of goods, where the transformation of goods and transport flows takes place.

Logistics centres differ in macro and micro location, organization, technology, development, etc., but they all have a common function – providing complex logistics services.

In modern times, the logistics centre is a technologically equipped facility where goods are not only stored, but also processed and prepared for further distribution to the end consumer. It developed from the traditional warehouse function by increasing the number of functions by applying new techniques and technology and enabling high concentration and fast flow of goods in an increasingly efficient and effective way. It is the new technique and technology that has enabled the continuous optimization of processes in logistics.

Logistics centres are formed with the aim of providing complete logistics services. Although logistics centres are not standardized, they all have some common features, such as receiving and shipping goods, transhipment, warehousing, preparation of supporting documents and more.

Some of the key features for their successful functioning are multimodality, multifunctionality, open access to the location, cargo handling, electronic exchange of information, connectivity of different sectors in order to implement logistics activities and cost savings.

A very important activity of logistics centres is the storage of goods, which includes [3]:

1) storage of goods and cargo units,
2) transhipment of goods within the boundaries of the warehouse area,
3) packing and unpacking of goods,
4) treatment of goods,
5) processing of goods,
6) commissioning,
7) storage of special goods (heavy objects, live animals, frozen goods, etc.).

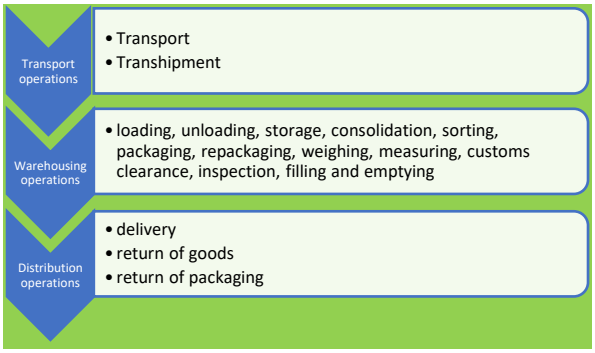

Fig. 1. Logistics centre operations

3. Criteria for choosing the location of the logistics centre

When choosing the location of the logistics centre, various complex procedures are applied. The criteria that need to be considered can be classified into different aspects [4]:

Table 1. Criteria for choosing the location of the logistics centre

TECHNOLOGICAL	ECONOMICAL	ORGANIZATIONAL
-intensity of goods and transport flows -availability of logistic centre -goods delivery time -availability of technologies and types of goods -connection to several modes of transport -availability of intermodal transport terminals, etc.	-logistics cost (transport, storage, supplies, etc.) -location activation costs; -investment in the construction of access roads and infrastructure, - net present value -payback period; -gravity of economically developed economy, etc.	-presence of logistics servers' providers -presence of intermodal transport operators; -possibility of organising line connections in railway/water transport -representative offices, associations, companies in the field of transport and logistics, etc.
TECHNICAL	**ENVIRONMENTAL**	**LEGISLATION**
- geological characteristics of the location -infrastructural network (electricity, water, sewerage, etc.) -technical possibilities of connection to transport infrastructure of railway, air, etc.	-pollution; -noise and vibration; -hazardous materials and goods; -the impact of the environment on the goods in the logistics centre; -the impact of goods and processes in the logistics centre on the environment, etc.	-inclusion and spatial and urban plans; -the possibility of ownership regulation of land and buildings; -harmonization with laws and regulations governing the presence, distance and protection of logistics centre, control and status of goods in the logistics centre; -dangerous goods, etc.

Determining the location of the logistics centre, as a place where services are performed in an optimal way, has a great impact on the

efficiency and cost-effectiveness of logistics services. Planning a new logistics centre is not a one-time process, but a long-term investment that needs to meet a number of different criteria, both at the macro and micro levels [5]. In determining the optimal location, among other things, future economic indicators should be used, but also historical factors. There is a great increase in economic activities at all levels, from local, through regional to international and intercontinental. A significant role in all this is played by supply chains that achieve service quality through their logistics centres. In this way, individual business systems do not have to be treated as competition, but through integration more favourable business results are achieved.

4. Construction and arrangement of business and logistics zone Sarajevo West

Today, there are over 130 registered economic zones in the Federation of B&H. Most of these zones are only registered as such and listed in regulatory plans. Also, a large number of active zones are more spontaneous and do not contain all the necessary elements.

4.1 Construction of business and logistics zone

The location selection of the business and logistics zone of Sarajevo Canton is not accidental. Analysing transport flows depending on the existing exploitation of transport infrastructure (table 2.) and taking into account the optimization of infrastructure exploitation for transport purposes, the proposed location was strategically chosen for the Sarajevo Canton and the Federation of B&H, or the whole of Bosnia and Herzegovina [6]. A location (figure 2) with plots of 55 and 28 hectares was proposed, which would be sufficient for the organization of a business zone. Both proposed plots are owned by CPC "PD Butmir" Ltd. Ilidža (KJP “PD Butmir” d.o.o.), which potentially facilitates the purchase, which would not be the case if it were private property or it had a larger number of owners. It should be noted that in the wider area of the selected location, there is a possibility to expand the business logistics zone up to 50%.

The proposed location, with minimal investment in the organization of transport, integrates road, rail and air transport in one place. The area along the Motorway Corridor Vc near the Rajlovac railway junction and the road connection with Sarajevo International Airport is an ideal area for establishing a business and logistics zone of importance for the capital of our country and our country as a whole. It is important to note that the expressway continues to be built towards the city centre. The City of Sarajevo, as the administrative centre of Bosnia and Herzegovina and Sarajevo Canton, must take over the function of optimizing, channelling and managing transport flows, using internationally defined standards and control criteria, strategic and proper storage of raw materials, semi-raw materials and goods, its distribution with the obligation to control the formation of objective market prices depending on quality. Ultimately, the proposed model must take precedence over the multimodal transport in our country, and it must regulate and optimize transport flows in B&H. Centralized and direct communication with international transport flows is another benefit of the proposed site.

The business and logistics zone "Sarajevo West" in its primary content should include the following:

- Customs terminal - A customs terminal for road traffic with all the necessary accompanying facilities was recently built near the location. The function of this terminal should be extended to rail and possibly air traffic.
- Storage space - For the needs of all three transport branches it is necessary to plan storage capacities depending on existing and future quantities and types of goods. Storage spaces with their capacities will take precedence in the territorial occupation of the proposed space, because storage spaces must receive the storage of all types of goods in all weather conditions, for a longer period of time under specially defined storage conditions.
- Logistic space for receiving, sorting and sending international letters and shipments.
- Oil terminals - Construction of oil terminals in capacities that will satisfy the need for daily needs of distributors of oil derivates and products, but also the creation of commodity reserves of this energy source. The positioning of oil terminals in the area

of the proposed location must be directed towards the exploitation of railway infrastructure and the transport of oil and oil derivatives. However, it should be pointed out that it may be more important to put into operation the existing oil terminal in Blažuj, which already has a very good traffic infrastructure and is very close to this business zone.

- Container storage / loading / unloading terminal - Adapt the function of the container terminal to the needs of road and rail traffic, based on the simple and efficient unloading, loading, reloading and storage of container transport.
- Free zone - Provide all entrepreneurs with a free zone, i.e. without a customs zone and enable storage of imported goods (raw materials, semi-finished products or products) without the obligation to pay taxes until the moment of use of stored goods for final purposes.

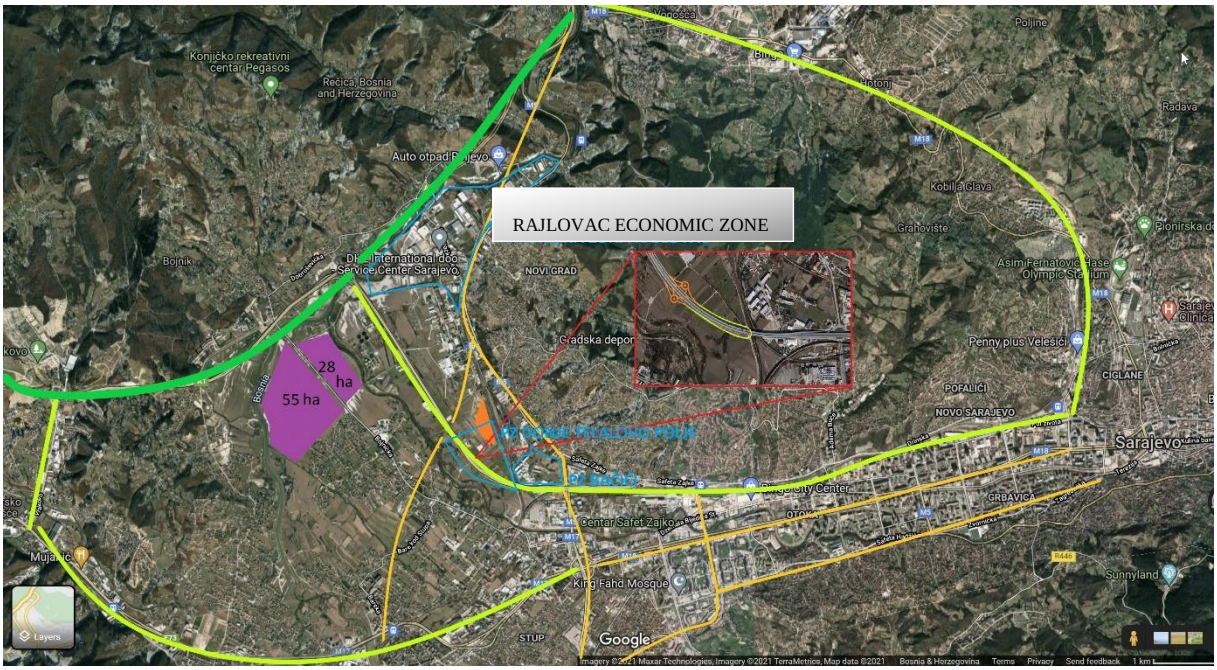

Fig. 2. Overview of the position of the planned business and logistics zone with an overview of existing and planned roads

Table 2. Traffic connection of existing and planned business zones of Sarajevo Canton

Road infrastructure	**Corridor Vc (E73)** as part of TE Corridor V : Kyiv (Ukraine) - Budapest (Hungary / EU) - Osijek (Croatia / EU) - Sarajevo (B&H) - Ploče (Croatia / EU) connecting Central and Eastern Europe with the Adriatic sea and the future Adriatic-Ionian Corridor, ie through Kyiv (Ukraine) and the connection to TE Corridor 9 connects the Black Sea and the Baltic with the Adriatic Sea. TE Corridor Vc also intersects with TE Corridor X, which connects Western Europe with Central and Southern Europe. **M-5 -** (border with Croatia / EU) - B&Hać - Bosanski Petrovac - Ključ – Mrkonjić grad - Jajce - Donji Vakuf - Travnik - Vitez - Lašva - Kakanj - Blažuj - Pale - Rogatica - Ustiprača - Višegrad (border with Serbia) **M-17** – (border with Croatia/EU) – Šamac – Modriča – Doboj – Maglaj – Žepče – Zenica – Kakanj – Sarajevo – Konjic – Mostar – Čapljina – Dračevo – (border with Croatia/EU) **M – 18** – (border with Serbia) – Rača – Bijeljina – Simin Han – Tuzla – Živinice – Kladanj – Olovo – Sarajevo – Trnovo – Foča – (border with Monte Negro)
Railway infrastructure	Railway 11 – Sarajevo – Čapljina Railway 12 – (border with Croatia/EU) Šamac – Sarajevo *Both railways are under category D4:* *- axle load 22.5 tons* *- load per running meter 8 t / m*
Airport	Sarajevo International Airport for passenger and cargo transport *Sarajevo International Airport with a traffic of more than one million passengers a year and a transport of more than two million kilograms of cargo.*
Seaports	Ploče (Croatia/EU) 197 km Bar (Monte Negro) 302 km
River ports	Šamac (Sava river) 212 km Brčko (Sava river) 184 km

4.2 Arrangement of the business logistics zone

The planning of the business and logistics zone of the Sarajevo Canton should be modelled on modern zones of this type in developed cities in

Western Europe. A very important detail in the preparation of the zone area is the continuation of the Miljacka and Bosna riverbeds arrangement due to the protection of the Sarajevo business and logistics zone (this would also protect populated areas in the danger zone from flooding).

When designing a modern business and logistics zone, in addition to the location, the following elements should be taken into account [7]- [9]:

- **Energy independence -** is achieved when the facility produces as much energy as it needs for overall operation. Logistics centres take up a lot of space, and therefore large roof areas are great locations for solar panels. It should be noted that along the zone there are large water capacities (rivers Bosna, Miljacka, Željeznica and Dobrinja), and the proximity of Sarajevogas and CNG Refuelling Stations.
- **Intelligent Building Management Systems** - the installation of various measuring devices and software for building management monitors the use of energy, electricity, gas, water, various utilities; the buildings themselves are getting smarter and enable comprehensive analysis and more efficient energy management, as well as fault detection and timely elimination.
- **Lighting -** lighting participates in the energy consumption of the building with over 30% of costs, and this factor is also taken into account in the design of modern logistics centres; In addition to savings, natural light has a very positive impact on employees, achieving greater efficiency and concentration of employees
- **Automation of warehousing operations** - it is getting more and more difficult nowadays to find a sufficient number of quality workers for this type of work. Duration of warehousing operations is not always predictable, so it is difficult to plan shifts and the required number of employees. In response to the growing shortage of manpower in logistics centres, the use of automation is necessary. Automated systems can perform their operations 24 hours a day, 7 days a week, without the cost of manual manipulation. This approach allows significant savings and a quick return on investment in this technology

4.3 Transhipment Terminal

A freight transport centre should be planned on the marked area, which can be smaller or larger, depending on the needs. This centre is of great importance for the Business and Logistics Zone, given that the location is in an ideal position, primarily in relation to the city, and then to the most important hub of road and railway infrastructure. The Sarajevo bypass on Corridor Vc, together with the proximity of the railway, are very important for the transport of goods from the north, west and south of the country, where the largest exchange of goods takes place. Sarajevo, primarily as the capital and due to its geographical position in the centre of B&H, is a significant hub and start and end destination for the transport of goods. Good traffic connection with the port of Ploče, especially after the construction of Corridor Vc, will make this GTC especially important.

Fig. 3. Location of the freight transport centre

This would significantly improve the competitiveness of RFB&H in the transport market and make a significant contribution to the development of the business and logistics zone, especially if newer multi-modal transport technologies were used.

The technical base of the GTC consists of the existing infrastructure, industrial tracks, roads, access roads, transhipment machinery, means of transport encountered in the GTC, storage systems, etc. Within the freight transport centre functions of receiving, preparing, handling

and shipping goods with all applicable transport technologies would be performed, such as:

- Palletizing
- Containerization
- Transport of road vehicles by rail

Fig. 4. GTC Operations

5. Construction of an industrial interchange for the business and logistics zone

The Butila interchange, as the largest intersection in FB&H on Corridor Vc, with its constructive elements does not allow connection to the motorway of the existing economic zone Rajlovac and the planned zone Donje Telalovo polje. The proximity of the motorway is largely responsible for their origin and development. The Rajlovac economic zone, and especially the customs terminal that moved to this zone from Halilovići, attracts trucks that supply logistics centres and provide transport for industry. In any case, they generate additional traffic, and in the future, with the growth of the business zone, it is to be expected that there will be more and more of it.

5.1 Description of traffic problems

The Briješće interchange, serves the existing business zone Bačići. However, due to the railway that passes under BC1 and intersects road flows, it cannot be used to serve the existing economic zones (Rajlovac and Telalovo polje) nor the proposed business logistics zone "Sarajevo West". The current traffic route for the existing Rajlovac economic zone is from the motorway and vice versa via the Briješće interchange, then via the M17 main road towards Rajlovac and local roads towards the economic zone.

This traffic is additionally congested by excessive traffic on the section Stup - Briješće - Rajlovac (especially in the morning and in the afternoon). According to the latest reports, on BC1 alone, AADT (Average Annual Daily Traffic) reached 22,500 vehicles per day with a growth tendency.

In the zone of the Butila and BC1 interchange, there are the settlements of Azići, Doglodi, Bojnik, Ahatovići, Dobroševići and potentially Otes, which are no longer as small as they used to be. After the war, these settlements experienced an expansion of growth. The reasons are the war migration of the population and the unstoppable growth of the city of Sarajevo, which was to be expected. The usage of motor vehicles and their supply by the population is currently solved by longer local roads towards these settlements, which are mostly connected in the Stupa zone. This additionally clogs up the congested traffic in this part of the city of Sarajevo.

Heavy goods vehicles and traffic from the motorway and these settlements, which is generated especially on the section M17 Stup - Briješće - Rajlovac, in addition to congestion, has a great impact on deteriorating traffic safety in this part of the city, both on the motor vehicle users and especially on the vulnerable users in traffic (pedestrians and cyclists), since these are populated places, with accesses to shopping malls and school zones.

5.2 Proposed solution

The construction of interchange (figure 2) for the business logistics zone on the BC 1 expressway on the Butila - Briješće section would have multiple benefits. The construction of this interchange would create one of the important preconditions for a modern, fast and efficient approach to the business and logistics zone "Sarajevo West".

In addition to this, the interchange would already make a significant contribution to the existing situation, connecting the existing, spontaneously formed economic zones, the existing settlements that gravitate to this part of the city.

The interchange would generate most of the traffic from populated areas around the Butila and BC1 interchanges (Azići, Doglodi, Bojnik, Ahatovići, Dobroševići and potentially Otes) and thus reduce congestion in the municipalities of Ilidža and Novi Grad (Stup interchange approaches).

The construction of the interchange would significantly reduce traffic at unsafe road crossings over the railway, which has been a problem since the construction of the railway. Through this project, they could also be fixed. The interchange itself would attract traffic to the expressway and relieve the area of Rajlovac.

6. Action plan

Given the complexity of the state system as well as the political situation, it would be desirable for as few institutions as possible to be involved in this project. With the necessary support of the competent institutions, this project could be implemented relatively quickly with the following holders:

- Sarajevo Canton
- PC Motorways of FB&H Ltd. Mostar
- Municipality of Novi Grad Sarajevo
- Municipality of Ilidža

Project financing:

- Given that this is a development project that should be sustainable and environmentally friendly, there is a great chance to receive a grant from international financial institutions (IFI)
- EBRD granting, EIB, European Commission, etc.
- Own funds

The BC 1 motorway project already had the construction of an industrial interchange on the Butila - Briješće sub-section in the project documentation. We do not know why it was abandoned and why it was not built. In any case, any existing project documentation should be reviewed. If it does not exist, the following is required [10]:

- Study documentation (traffic, environmental and feasibility study)
- Amendments to urban and regulatory plans
- Development of conceptual designs
- Development of major projects
- Execution of works

7. Conclusion

We live in a time of globalization which brings various challenges but also opportunities. Put simply, if you want to be a part of the global game, you have to play by the rules that have already been established, and if not, then someone else will do it. Bosnia and Herzegovina can finally start thinking about tackling the big players, given that in the near future the entire Motorway on Corridor Vc can be seen as one of the basic preconditions for bringing in large economic entities in the field of production, trade and services.

The corridor itself should not and must not be the end of a cycle, but the beginning of stronger economic development both in the country and abroad. With the formation of the business and logistics zone in Sarajevo as the capital and geographical centre of the country and the mentioned corridor, it has an ideal geostrategic position on the north-south section, connecting the Port of Ploče with Central Europe. It is inadmissible to leave one such geostrategic position and potential to the spontaneous creation of business zones that cannot create for themselves what the state, canton or municipality must create as a precondition for stronger economic development. The proposed location, with minimal investment in the organization of transport, integrates road, rail and air transport in one place. The area along the Motorway Corridor Vc near the Rajlovac railway junction and the road connection with Sarajevo International Airport is an ideal area for establishing a business and logistics zone of importance for the capital of our country and our country as a whole. The City of Sarajevo, as the administrative centre of Bosnia and Herzegovina and Sarajevo Canton, must take over the function of optimizing, channelling and managing transport flows using internationally defined standards and control criteria, strategic and proper storage of raw materials, semi-raw materials and goods, its distribution with the obligation to control the formation of objective market prices depending on quality.

A logistics centre is a system that represents a significant infrastructural element and an organizational and physical link from production to consumption. At the very centre of the system

is the supply chain, i.e. the optimal organization of the unhindered flow of goods from raw materials, through production, distribution to the final consumer, with as little delay and with all the necessary information. The creation of a business and logistics zone will improve the quality of services, reduce transport and storage costs, improve the efficiency of the entire distribution system, especially the city, and relieve the roads and integrate transport carriers (roads, railways, airports) [11].

The construction and establishment of the business and logistics zone "Sarajevo West" and the construction of an industrial interchange on BC1 Butila - Briješće are strategic steps for the development of Sarajevo Canton. This is primarily reflected in the infrastructural, traffic (multimodal), administrative and logistical arrangement of the business zone as a precondition for attracting business entities.

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