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# **Progress in Economic Sciences**

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Państwowej Wyższej Szkoły Zawodowej im. Stanisława Staszica  
w Pile**

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# **Sustainable development of the region: the case of Logistic Centre Pirot**

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## **Introduction**

The Balkans area has a non-homogeneous level of development of transport infrastructures and a preponderance of road freight traffic flows, with current traffic having a great impact on the environment of the area. It also has a need for better connecting ports with landlocked countries.

Improving the accessibility of the Balkans involves better freight mobility, upgrading transport standards, developing unified models of sustainable mobility management and integrated logistics chains and attracting innovative investments. Integration requires better cooperation among the different countries and regions, combining physical and professional training investments through interregional transport networking and pre-feasibility studies.

The main activities envisaged are the assessment of existing transport standards and terminal supply, gap analysis, the development of "Corridor quality networks" and „Multimodal Development Centres", harmonisation of existing ICT tools for tracing rail transport and interface with customs, the establishment of „Green Transport Agreements" and common training modules.

Efforts should focus on contributing to prove the feasibility of better usage of the existing transport infrastructure, wider usage of multimodal transport and upgrading the transport infrastructure to support and facilitate certain interregional connections. Development of an intermodal node in the middle of the Balkans will facilitate further development of intermodality in the region.

---

\* Free Zone Pirot  
\*\* Free Zone Pirot  
\*\*\* Free Zone Pirot

## Logistic Centre Pirot – Setup of the analyses

The analyses carried out in the document intend to provide a preliminary answer to the following key question: which target market(s) may be potentially defined as attractive for the development of an intermodal centre in Pirot. In that respect, three main lines of potential development have been identified:

- ❑ Intercepting import/export and transit flows to/from ports;
- ❑ Offering regional distribution transport and logistics facilities within the Balkans;
- ❑ Supporting transit trade from Turkey along TEN-T corridor X branches.

In general, from the supply side, important infrastructure projects and plans are in progress and/or have been already financed both by the Serbian Government and the European Union, which will lead to a significant increase in national and international connections for the Pirot Free Zone. Notably, an accessibility analysis has been explicitly carried out, showing that the City of Pirot will benefit from a remarkable increase of rail and road connections with ports both in the Adriatic and in the Black Sea, with a reduction of the transit time by road and railway. Furthermore, its central location within the Balkans region will be significantly enhanced thanks to the general upgrade of the local and regional road networks. This context will provide an overall increase of the accessibility of Pirot Free Zone, meaning more effective and efficient possibilities of both international/inter-continental supply and of regional distribution in the Balkans area. In addition, the national and international transport and logistics operators active in the area exhibited a remarkable interest in consolidating their position and, if effectively supported, to support the growth of future traffic<sup>1</sup>.

### Accessibility analysis<sup>2</sup>

The first step refers to a comprehensive analysis of the accessibility of Pirot FZ for national and international destinations, as well as its competitiveness with respect to the transit trade in the area. In more detail, two main points have been taken into account:

- ❑ Euro-Mediterranean/worldwide accessibility. This analysis helps support the possibility of supplying industrial activities located into industrial zone Pirot from any feasible external location (for

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<sup>1</sup> Intermodal Logistic Center Pirot, Prefeasibility study, 2011, p. 12.

<sup>2</sup> [ITALBALK Report, 2011, p. 125].

instance, this currently happens for rubber provided to companies from Malaysia) as well as for distribution from LCP to international destinations;

- Balkans accessibility. This analysis also helps evaluate the possibility of LCP being chosen as an effective location for regional warehouses serving the Balkans area.

Both analyses have been carried out on the current situation, i.e. considering the actual physical and functional characteristics of the freight supply networks (road, rail, sea, inland waterways), and also on a future scenario, i.e. assuming a substantial implementation of EU transport policies in the Balkans area, with specific reference to the development of the Pan-European Corridors IV (from Dresden and Nuremberg to Istanbul, Constanța and Thessaloniki), VIII (Napoli-Varna) and X (from Salzburg, Graz and Budapest to Thessaloniki and Igoumenitsa) and their synergic or competitive integration with the national freight network of the Republic of Serbia.

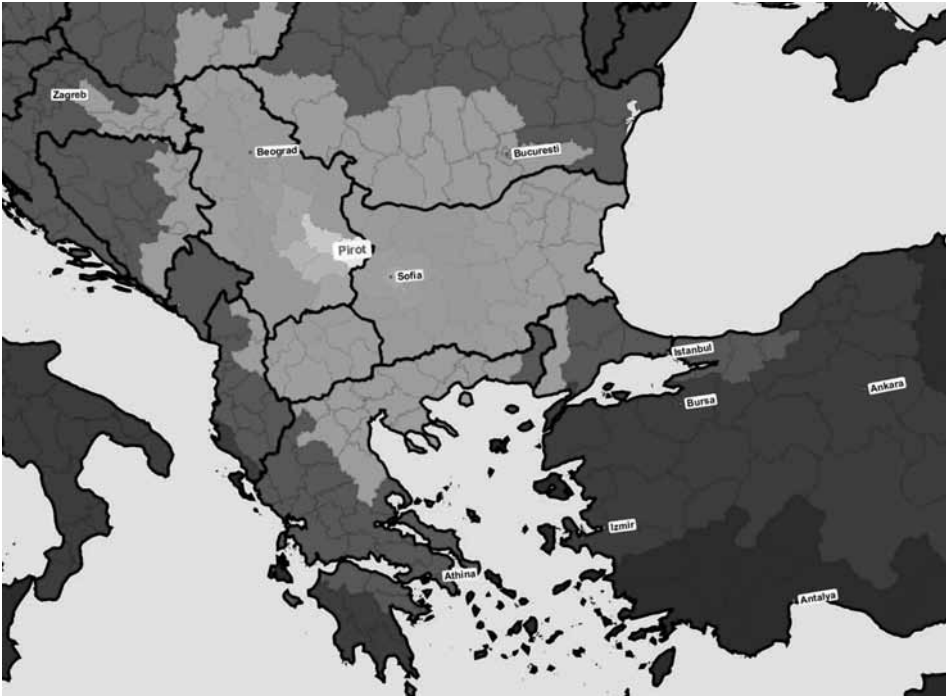
For this purpose, a quantitative methodology has been adopted, based on the application of a system of mathematical models reproducing the performances (e.g. times and costs) of the whole multimodal freight supply network. The system of models, developed by a research team at the Università di Napoli “Federico II” – Dipartimento di Ingegneria dei Trasporti on behalf of LOGICA, covers, in detail, the 1508 NUTS3 zones (approximately corresponding to the administrative county level) related to 57 countries in the Euro-Mediterranean basin. Notably, the model has been fine-tuned to provide a reliable simulation of the current situation, thanks to field data provided by Free Zone Pirot.

Furthermore, the impact analysis of the completion of the Pan-European corridors relevant for Free Zone Pirot can be easily performed through appropriate modifications of the supply network underlying the model, which can be then run again to predict the future performances of the freight supply system. In all scenarios, for the sake of simplicity, the model has been applied by considering an average 20 tons consignment not requiring specific assistance (e.g. refrigerated products, dangerous goods).

Then, on the basis of the travel times and costs calculated through the supply model, proper accessibility measures have been defined to synthesise the results of the analysis and provide an immediate and helpful picture of the situation in Figure 1.

This stage involves the analysis of the active accessibility of Pirot FZ with respect to NUTS3 zones in the Euro-Mediterranean area. For this purpose, it depicts the isochrones, measured in multiples of hours, representing freight travel time with the best available mode between Pirot and each NUTS3 zone in the Balkans Region.

**Figure 1. Active accessibility from Pirot: travel time [h] with the fastest mode from Pirot to NUTS3 destinations (general view)**



Source: [ITALBALK Report, 2011, p. 129].

## **Brief review of the infrastructure of freight transport networks in the Balkans**

The current structure of the road network in the Balkans area, defined by considering the actual configuration of infrastructures, is a main motorway axis running along the path of the future Pan-European Corridor X between Beograd and Nis, with two southbound branches going respectively towards the Former Yugoslavian Republic of Macedonia and to Bulgaria, with a good connection up to the Turkish border. The remaining road axes, also along the paths of future Corridors IV and VIII, do not exhibit exceptional performances, with a single carriageway and ineffective functional characteristics. Intra-national road connections are also substantially poor, with significant bottlenecks and capacity drawbacks in a remarkable amount of the network.

Similarly, the rail and inland waterways network structures are taken into account for the definition of the current scenario. Notably, Serbian and Bul-

garian networks are substantially electrified, with some remarkable 2-track branches, while the remaining of the network is mostly characterised by single non-electrified links, leading to inadequate performances for effective freight traffic.

**Figure 2. Main rail (green lines) and inland waterways (blue lines) networks in the Balkans region (situation at 31/12/2009)**



Source [ITALBALK Report, 2011, p. 18].

As a consequence, in general the area needs substantial improvement of the road and rail networks, in terms of both upgrading the existing links and construction of new possibly intermodal axes, devoted to intra-regional and international passenger and freight traffic.

This is actually the main aim underlying the Pan-European corridors network in the Balkans, reported in Figure 2, whose structure is intended to provide for reliable north-south (namely Corridors X and IV) and east-west (namely Corridors V, VIII and the Egnatia route) connections.

Starting from this premise, a number of both EU and nationally funded projects have been carried out and/or are under implementation, with expected significant impacts on freight accessibility in the Balkans. A thorough review of such implementations is covered by the SEETO (South East Europe Transport Observatory).

**Figure 3. Network of Pan-European corridors**

Source: Wikipedia, [https://commons.wikimedia.org/wiki File:Paneuropetransport.png](https://commons.wikimedia.org/wiki/File:Paneuropetransport.png).

### **Desk review of trade flows across Europe and Balkans<sup>3</sup>**

In order to draw preliminary indications about the scenarios, a demand analysis has firstly been carried out which investigates the main characteristics of trade flows across Europe and the Balkans, in terms of both o-d matrices and network flows and depicts the import/export performances of the Republic of Serbia in the 2000–2009 reference period, with a specific focus on trade to/from Italy and the rest of Europe. Finally, in order to understand the context in which the intermodal platform will operate, model forecasts of demand trends in future scenarios were carried out, characterised by improvements of the infrastructural networks (e.g. completion of the Pan-European Corridors). Notably, the crude petroleum, electricity and natural gas trades were not taken into account because their transport modes usually involve the use of pipelines and other specific transport chains of no interest to the current feasibility study. The Republic of Serbia plays a major role in the area, with a remarkable amount of import/exports towards the Euro-Mediterranean basin.

<sup>3</sup> Intermodal Logistic Center Pirot, Prefeasibility study, 2011, p. 12.

The results of the assignment can be then compared with existing counts on some links, and specific correction procedures adopted for enhancing the goodness of fit of the analysis. Results of the assignment of the current demand matrix to the current supply network are reported in Figure 3, which has been derived under the assumption of competitiveness of the Corridor X, i.e. hypothesising the removal of all barriers to transit trade through Serbia. Clearly, the route of Corridor X is one of the main axes for northbound-southbound Balkan crossing, with a strategic relevance in capturing and supporting trade to/from Eastern Greece and Turkey.

In more detail, the total Turkish trade with the 57 Euro-Mediterranean countries comes to about 42 million tons/year in export and 75 million tons/year in import<sup>4</sup>. With respect to this total amount, the transit trade potentially attractable from Serbia is represented by the flows approximately related to/from Central European countries (e.g. France, Germany), which adds up to 14.66 million tons/year, subdivided into 8.37 million tons/year northbound and 6.29 southbound. These overall flows should be firstly be disaggregated into the sea and road mode alternatives respectively; in turn, road flows should be further divided into flows crossing Serbia and flows crossing other countries (e.g. Bulgaria): a summary of the situation is reported in Table 1.

**Table 1. Potential transit Turkish trade for Pirot area in the current scenario (model estimates)**

trade to/from Turkey of interest for Serbia (tons/year)	direction	
	northbound	southbound
<b>overall</b>	<b>8,374,246</b>	<b>6,289,727</b>
<b>sea mode</b>	<b>4,938,204</b>	<b>2,986,133</b>
Ro-Ro Adriatic sea (Trieste Port)	2,706,430	1,656,998
Ro-Ro France (Marseille Fos Tolone)	2,231,774	1,329,135
<b>road mode</b>	<b>3,436,042</b>	<b>3,303,594</b>
through Serbia (Dimitrovgrad)	1,659,928	1,396,312
Through other countries (mainly Bulgaria)	1,776,114	1,907,282
Actual Serbian market share	48%	42%

Source: Intermodal Logistic Centre Pirot, Prefeasibility study, November 2010.

Interestingly, approximately half of Turkish road transit trade crosses Serbian boundaries northbound. Model estimates suggest the total trade along the M1 branch between Pirot and Nis to be approximately 6.85 million tons/year (4.11 northbound and 2.74 southbound), therefore the weight of Turkish transit trade on the Pirot road axis is approximately the 40% northbound and 50% southbound.

<sup>4</sup> [ITALBALK Report, 2011, p. 79].



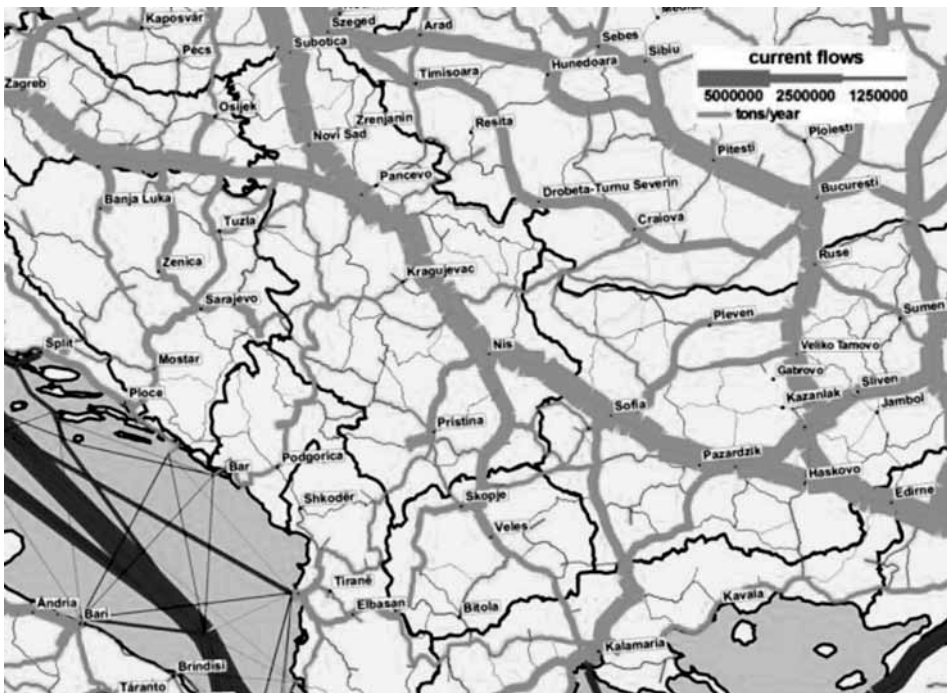
Notably, a prospective increase in the effectiveness of Corridor IV should be taken into account and supported by the Government of Serbia in order to make the route more attractive (e.g. reduction of transit fees). Indeed, the completion of Corridor X is a real priority for the Government of the Republic of Serbia and the Government of the Republic of Bulgaria, witnessed by the agreement signed on 27/04/2010 between the Prime Minister of the Republic of Bulgaria and Prime Minister of the Republic of Serbia. In this way, Corridor X will be crucial in the northbound-southbound directions, allowing for the achievement of higher rates of traffic flows.

This aspect can also be easily stressed when looking simply at distances. For instance, a consignment between Istanbul and Munich would require:

- ❑ 2154 km on Corridor IV;
- ❑ 2016 km on Corridor X in the Serbia-Hungary direction;
- ❑ 1928 km on Corridor X in the Serbia-Croatia direction.

Notably, the last option means reaching, in practice, a 10.5% saving in the distance for each trip and, taking into account that the daily traffic at the Gradina (Serbian-Bulgarian) border crossing is about 900 trucks, this leads to a saving of 41 million tons/km per day.

**Figure 4. Yearly flows marked green (tons/year) in the current demand scenario under the hypothesis of effective of Corridor X**



Source: Intermodal Logistic Centre Pirot, Prefeasibility study, 2011.

## **Logistic Centre Pirot project**

National and local, legal and policy frameworks allow for the development of logistic centres within defined industrial areas.

The logistic centre development project inside Free Zone Pirot is justified for the community as the City of Pirot had a strong industrial background before the crisis of 90s since when it has been facing serious socio-economic stagnation.

The industrial zone has been recognised as a potential opportunity to mitigate negative economic and social trends in not only the municipality of Pirot but also in the surrounding municipalities. Fresh investment injections are needed to mitigate strong economic decline and impoverishment, resulting in a high unemployment rate and consequent depopulation trends affecting the entire region.

Free zone development and its modernisation through the establishment of the logistic centre may have different benefits for the communities in Pirot region, and to a certain extent, may boost their socio-economic development. This might happen through an increased chance of attracting future investors.

The arrival of new companies, in addition to various incentives provided at central government and municipal levels, may also be attracted by improved services provided by the logistic centre, and will have a positive impact on employment in the region (both direct and indirect).

For this purpose, a public private partnership was established between Municipality Pirot and Free Zone Pirot to cooperate on the development of the Logistic Centre Pirot (hereinafter LCP). The role of the City of Pirot is to provide land for the construction of the LCP and the role of Free Zone Pirot is to provide the knowledge and effort to realise this project. Relevant national government ministries were involved with the project to provide support for access and the provision of national and international funds necessary for the project which aims to attract investment and reduce unemployment in the wider Pirot district and South-eastern Serbia.

An employment boost is the ultimate goal of the establishment of the industrial zone and its development through the logistic centre. It is expected that employment will happen at three levels.

1. Temporary employment of workers during project implementation (persons who will prepare project documentation, as well as experts, qualified and mid qualified workforce who will participate in the construction work of the logistic centre.) Estimated number of people employed in this phase is 400.
2. Employment within companies already in the zone and also in these companies which are expected to enter into the free zone regime in the next period, is around 4,000 new workers.

3. Permanent employment of workers who will provide services on behalf of the Logistic Centre. Some of these workers will be in charge of the proper functioning of public parking, basic infrastructure services, and mechanisation and maintenance inside entire industrial zone. The estimated number of employees for operating the terminal is 40.
4. Indirect employment through SMEs which will serve the companies in the zone. The scope of the employment process will depend on the size and type of industries which will be installed inside the zone. Pirot is well-known for textile, food and rubber industries, therefore it is expected that these sectors will continue to grow in the future.

Logistics Centre Pirot (LCP) will give current users and future investors access to infrastructure-equipped land and more efficient transport and transshipment of goods from truck to rail and vice versa, by reducing transport costs and environmental pollution. Technical specification of the construction of LCP<sup>5</sup>:

- ❑ Railway terminal with three railway tracks: 304 m, 304 m and 548 m in the first phase, projected track length of 650–680m in the second stage.
- ❑ Development and infrastructure equipment of around 36 hectares of land (3.2 km of roads, 500 m long dike for flood length, 10 new transformer stations 10/0.4 kV 630 KVA and 8.5 km long 10 kV underground cable network, setting the street lightning in the designated land, setting of a 3.2 km channel for a telecommunication system, the construction of 3.5 km of water supply network, 3.7 km drainage system, a 2.7 km sewer system).

Completed project documentation includes the conceptual design of LCP with a maximum capacity of 25,000 TEU/year, the pre-feasibility study, the feasibility study for the construction of LCP, and the detailed regulation plan. After construction of the terminal, investors will be offered 36 ha of land equipped with infrastructure for operation.

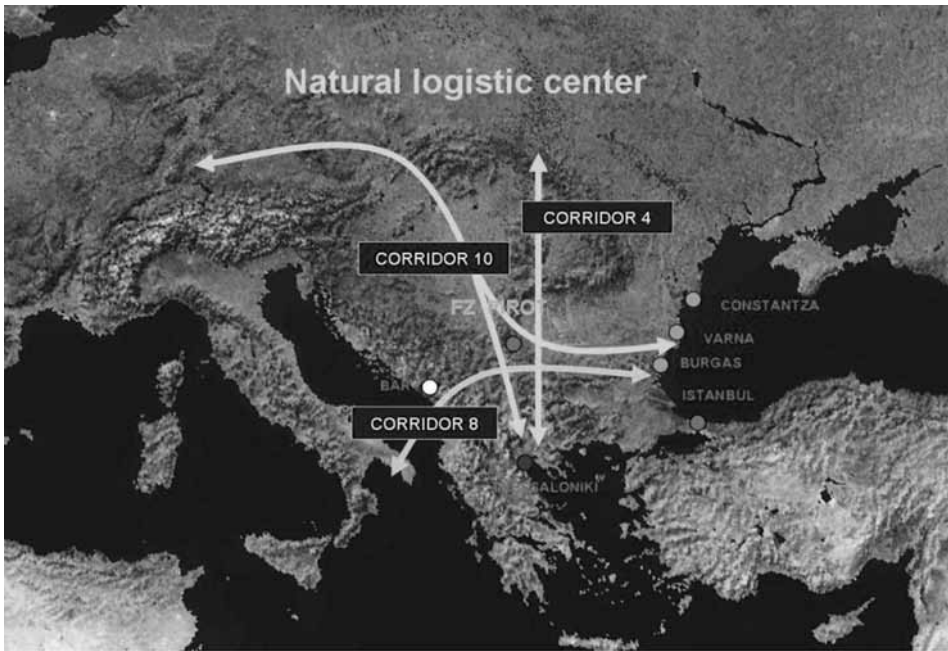
The distance from LCP to the future highway (Corridor 10X) is about 1 km and the direct connection of the intermodal terminal is with the Nis-Bulgarian border railway route. It is located close to the airport in Sofia and Nis.

Regarding the time frame, the completion of construction works will be by the end of 2020, and the location of the project is Free Zone Pirot. The total value of the project is EUR 12.8 Million.

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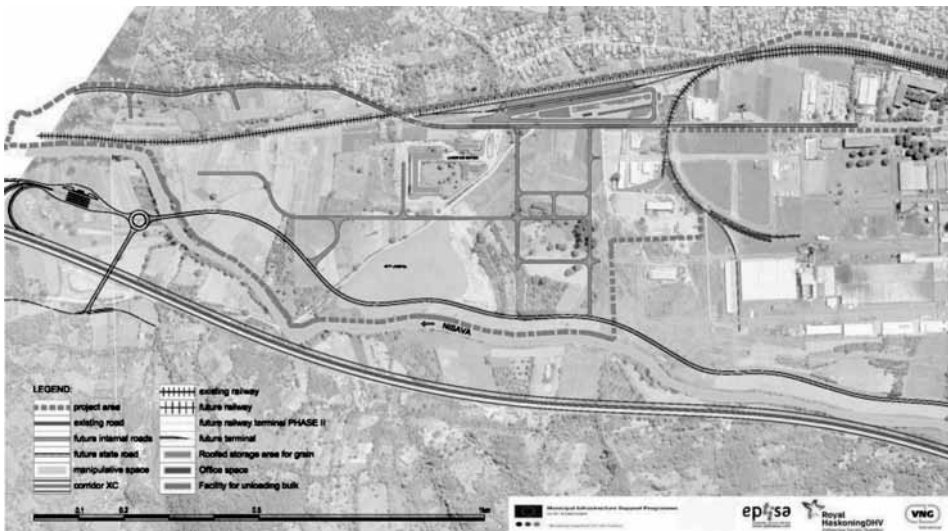
<sup>5</sup> [MISP, 2014, p. 11].

**Figure 5. Illustration of the location of the Logistic Centre Piro on Balkan Peninsula on Corridor X, between Corridors IV and VIII**



Source: Intermodal Logistic Centre Piro, Prefeasibility study, November 2010.

**Figure 6. Layout of the location of Logistic Centre Piro, showing proposed infrastructure (project area, intermodal terminal, existing and future roads, existing and future railway legs)**



Source: [MISP, 2014, p. 44].

## SWOT analyses of Logistic Centre Pirot<sup>6</sup>

The SWOT analysis within this document discusses the potential future location intended for the construction of Logistic Centre Pirot. The aim of the analysis is to detect all potential advantages and disadvantages of the existing site as well as to determine the opportunities and threats to the work of the terminal.

This analysis summarises the results of previous chapters and previous analyses, highlighting the most important characteristics below.

*Strengths:* Located on Corridor 10, between Corridors 4 and 8; accessible place (time, costs) with respect to the amount of influence of its road and rail transports in the Balkans, Greece, and northern Turkey; the Istanbul-Munich route is shorter via Corridor X than via Corridor IV; the synergy of Free Zone and Industrial Park allows very flexible operation modes suitable for the users of Free Zone Pirot; the existence of the container stacking lanes in the FZP; firmly established connections of the future intermodal centre with maritime transport in Cyprus, Burgas, Bar, and Durres.

*Weaknesses:* The lack of development financing programmes; incomplete infrastructure and logistics equipment; the lack of project documentation that would demonstrate cost-effectiveness of the intermodal terminal; underdeveloped marketing services; insufficiently equipped container stack lane.

*Opportunities:* Clear and strong support from the local authorities and state institutions; available manpower of different profiles which can be included in the revival of the existing facilities and development of new activities; presence of big companies, e.g. 'Tigar Tyres' (part of the Michelin group); provision of subsidies for business development by the state; the completion of the road section of Corridor X should take place by 2018.

*Threats:* Inefficient railway system (low transport speed and unreliability of delivery); possible postponement of the EU aid to transport infrastructure; investors' distrust of the institutions; either accelerated migration or aging of the work-capable population; the gap between the education system and the demands of industry; uncertainty about the duration of the benefits provided by the state.

## Conclusion

From a general standpoint, as a logistics base, due to its position, Serbian Logistic Centre Pirot is a good place for a company to locate its operations if wanting to closely and efficiently serve its EU, South-East Europe (SEE) or Middle Eastern customers. It borders the EU, at the Hungarian state line, offer-

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<sup>6</sup> [KOSTIĆ Č., 2016, p. 247].

ing the possibility of production outside the European Union. Businesses can enjoy all the benefits of working outside the EU, while being able to provide services and transport goods in projected and flexible time frames. Externally, it can serve as a manufacturing hub for duty-free exports to a market of 1 billion people which includes the EU, the United States of America, Russia, SEE, and Belarus.

Therefore, the following key aspects have been identified with reference to the preceding target markets:

- ❑ connection with ports: Pirot FZ can be effectively served by rail from the Black Sea ports, especially Burgas, which is exhibiting significant trade increases in recent years. Furthermore, Thessaloniki can be also reached by rail, with a slightly less effective connection, and the resolution of the current issues in the Nis and Beograd railway stations will lead to effective rail connections with the Adriatic ports (e.g. Rijeka, Koper). This might have importance in increasing the supply of future regional distribution centres (see next point);
- ❑ regional distribution centre: the previous point clarifies that the possibilities of intercontinental and international supplying of the Pirot intermodal centre will increase in the future, together with a substantial increase in its accessibility in the Balkans. Therefore, Pirot can be an ideal candidate for regional distribution in the area. This possibility will be explored subsequently in a detailed feasibility study which will identify potential customers, starting from the supply chains of the customers already established in the free zone;
- ❑ transit trade: the possibility of scale economies in the transit trade will benefit from the substantial increase of the overall traffic along Corridor X.

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## **Zrównoważony rozwój regionu: przypadek Centrum Logistycznego w Pirot**

### **Streszczenie**

Szukając zrównoważonego rozwiązania dla rozwoju lokalnego obszaru, miasto Pirot, Republika Serbii oraz firma Wolna Strefa Pirot stworzyły publiczno-prywatne partnerstwo w celu rozwoju Centrum Logistycznego w Pirot. Obejmuje to bimodalny terminal transportowy z parkiem przemysłowym, który umożliwi przyciąganie nowych inwestorów, zmniejszy poziom zanieczyszczenia środowiska, zwiększa zastępowanie paliw kopalnianych, redukuje koszty transportu i łączy się z multimodalną siecią transportową.

**Słowa kluczowe:** terminal towarowy, sieć multimodalna

## **Sustainable development of the region: the case of Logistic Centre Pirot**

### **Abstract**

Looking for a sustainable solution for the development of the regional area, the City of Pirot, Republic of Serbia and Free Zone Pirot company established a public private partnership for the purpose of developing the Logistic Centre Pirot. This consists of a bimodal transport terminal together with an industrial park which will enable the attraction of new investors, decrease the level of environmental pollution, increase substitution of fossil fuels, decrease transportation prices and connect to the multimodal transport network.

**Key words:** Freight Transport Terminal, Multimodal Network

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