Location Conditionings of Logistics Centers as Central Units of National Logistics Network

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Next to sea ports, logistics centers constitute central units of national logistics network, which enable its connection to the networks of neighbouring countries and allow its incorporation into the logistics macrosystem of Europe. Logistics centers can be realized after various implementation models, which were discussed. This paper presents the nearest similar assemblies of logistics infrastructure outside Polish borders which can be used as joining elements with the national logistics network. An opinion was formulated on the function of logistics centers in the aspect of the growth of transport comodality, as stipulated by the EU, and restrictions resulting from the structure of national logistics network were pointed out.

1. INTRODUCTION

The effective use of various means of transport operating autonomously or integrated intermodally, requires the possibility for their qualities and transportation capabilities to be used efficiently. Therefore logistics networks central units should possess such an infrastructure and organization, so the means of transport and transport-forwarding solutions could reveal their potential thoroughly[1]. Logistics centers[2], next to sea ports, meet this requirement completely among other constituting elements of logistics infrastructure. However, when various circumstances make it impossible to build a logistics center, or make it pointless as regards economics, one must also consider solutions created by the use of other elements of logistics networks. They include autonomous container terminals, warehousing centers and specific economic zones. This sort of functional solution can be treated conventionally as a virtual logistics center within which a users has at their disposal elements of logistics infrastructure similar to the ones present in a real logistics center, though functioning over a wider area and requiring additional transportation links.

The aim of this paper is to point out the role of the logistics centers in the making of the national logistics network under particular structural conditions. Due to the lack of systematic approach to the establishing of logistics centers network in Poland, as noted by many researchers[3], recommendations are formulated in the paper which concern the use of existing logistics centers and other key elements of the logistics infrastructure, which may fill up the present gaps. As an alternative to the logistics centers network, it is possible to establish a structure of a national logistics network which uses various available key

[1] Mindur M., *Wzajemne związki i zależności między rozwojem gospodarki a transportem.* IteE, Warsaw 2004.

[2] Logistics center – a spatial facility with its own organization and infrastructure which allow various independent enterprises to perform operations on goods as regards storing and transporting between shipper and consumer, including intermodal transportation and performing operations on supplies used.

[3] Mindur L. *Założenia teoretycznego zorganizowania Centrów Logistycznych w Polsce*. Materiały Konferencji Naukowo-Technicznej Centra Logistyczne na Mazowszu. Warszawa 2003.

elements such as container terminals and warehousing centers existing outside of logistics centers[4].

2. LOGISTICS CENTERS AS CENTRAL UNITS OF TRANSPORTATION PASSAGEWAYS

In perfect conditions, that is when there are no restrictions for forming the national logistics network[5] according to best practices, in order for the transport comodality requirement[6] to be met, it is necessary to create logistics centers network operating as central units of a network located in transportation passageways. Logistics centers should be situated in places with a substantial demand for logistic services due to economic or social factors. Such places are conurbations and industrial areas. In the optimal form of the national logistics network it is assumed that the linear infrastructure of transport is fully available.

With transportation conditionings assumed, the most practical areas for logistics centers localization are:

1. Main urban complexes whose supply demands for economic and social purposes will provide economic basis for a logistics center to operate efficiently (fig. 1).
2. Areas from where a logistics center can satisfy economic and social demands of several voivodeships together with their conurbations (fig. 2).
3. Industrial and logistic services concentration areas: specific economic zones, industrial and technological parks, industrialized regions, warehousing centers etc. (fig. 3).

In the case of conurban and inter-voivodeship layout, the centralizing factor is their logistic potential. A logistics center emerges as a by-element, using already existing circumstances which support its functioning. With an alternative layout a logistics center can occur as an originating factor, that is an initiating and stimulating agent for the development of a dynamic business activity zone which makes the logistics center environment an attractive location for other business areas: production, trading, and services. In order for a logistics center to operate as an originating agent, which initiates the emergence of a dynamic business activity zone, it must receive support from the public sector in the area of planning, legislation, finances, and organization; similar to the formation of specific economic zones.

National logistics network comprises a limited number of logistics centers. The size of the warehousing space enclosed in all existing logistics centers in Poland is over 56 times smaller than a similar space in warehousing centers[7]. Therefore next to logistics centers which possess railway infrastructure and devices to handle intermodal transportation units, intermodal transport solutions should be created by means of autonomous container terminals (i.e. located outside the logistics centers) and, remaining at a certain distance from them, storage centers and large-area warehousing facilities. Figure 4 presents an alternative solution for a logistics center of an intermodal logistic central unit which is comprised of autonomous container terminals and existing warehousing centers and warehouses within the Specific Economic Zone. In this type of solution the key element is the accessibility and quality of the local transport infrastructure which allows to

[4] Fechner I., *Role of Logistics Centers in National Logistics System.* LogForum 2010 Vol.6 Issue 2 No 2. www.logforum.net.

[5] Logistics network – infrastructural network which is comprised of transportation points along with linear infrastructure. Wojewódzka-Król K., Rolbiecki R., *Infrastruktura transportu*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2008, str. 246.

[6] 'Comodality' means an effective use of the forms of transport operating autonomously or integrated intermodally within the European transportation system in order to use supplies in best and balanced manner. Source: Attachment Reference to the announcement of the Commission to the European Parliament Council, European Socioeconomic Committee, and Regions Committee – Logistics of freight traffic in Europe – Key to a balanced mobility – Influence Evaluation – Points to consider {COM(2006) 336 final} {SEC(2006) 818}/* SEC /2006/0820 final * in (Source: http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri= CELEX:52006SC0820:PL:HTML).

[7] Storage center - a spatial facility with its own organization and infrastructure which allow various independent enterprises to perform operations on goods as regards storing and transporting between shipper and consumer

merge warehousing and industrial facilities with container terminals.

The use of the existing key logistic infrastructure in the form of storing centers and container terminals does not exclude the possibility to establish a logistics center. Instead, it requires an alternative explanation besides the economic one which results from e.g. the need for balanced region development, canceling business activity within urban complex, protection of environmentally valuable areas, easing the results of congestion within cities, etc. These arguments require support from the public sector for creating logistics centers in the form of an appropriate governmental program and means for its realizatio[8].

When it is possible to use various localization solutions for logistics centers and alternative solutions as well, the national logistics system can be related to logistic macrosystem of the EU through different elements of key infrastructure of logistics networks:

- logistics centers
- sea ports
- autonomous container terminals
- warehousing centers
- airports
- ports and harbours

3. LOGISTICS CENTERS IN REFERENCE TO THE CONNECTIONS OF POLISH LOGISTICS SYSTEM WITH THE EUROPEAN LOGISTICS MACROSYSTEM

Logistics centers encourage international exchange in the logistic sense due to diverse linear and key transport infrastructure which allows the use of international transportation passageways in long distance traffic of goods. As regards railway transport, the same elements of logistics centers are constituted by container terminals allowing forwarders and carriers to organize and conduct intermodal transport with which higher transport distance (international scope) increases its competitiveness towards heavy goods motor transportation. As for motor transportation, these elements are logistics enterprises warehouses where logistics operators accumulate loads acquired from enterprises which commission international transport, combine them in batches which allow to fill up loading space, and organize transport to buyers or to a similar storehouse in the place from where, after sorting out, they are delivered to their destinations. With inland water transport the elements of key infrastructure of logistics centers are constituted by ports and harbours, while the capability to transfer containers by water is an additional advantage of a logistics center[9]. Air transport, which can also be a part of intermodal transport solutions, and airports should be regarded as an important point of intermodal transportation system[10].

When there are no logistics centers, and parallel to already existing ones which possess container terminals, intermodal transportation is conducted with the use of autonomous container terminals (occurring outside of logistics centers), whereas vehicle carriages are realized between storing centers and large-area warehousing facilities. The very existence of autonomous container terminals does not solve the problem of the lack of logistics centers because it extends the distance between the terminal and recipient storehouse. It also results in the necessity to expand storage zones with areas for full containers.

There are four transportation passageways running through Poland which belong to TEN-T network (fig. 5).

Passageway no I: by convention from the country's south border with Slovakia via Piotrków Tybunalski, Masovian voivodeship, Podlaskie voivodship to the border with Lithuania.

Passageway no II: by convention from the country's west border with Germany in Świeck via Great Poland, Masovian and Lublin voivodeship to the east border with Belarus in Terespol.

[8] Fechner I., *Conditions Determining the Developing of Polish Logistics Network*. Log Forum 2005 Vol. 1 Issue 3 No 1. www.logforum.net.

[9] Rydzkowski W., Rolbiecki R., *Możliwości rozwoju portów śródlądowych w Polsce jako centrów logistycznych*. LogForum 2005, Vol.1 Issue 2 No 4 str. 1-10. www.logforum.net.

[10] Huderek-Głapska S., *Port lotniczy w systemie transportu intermodalnego*. LogForum 2010 Vol. 6 Issue 1 No 5. www.logforum.net.

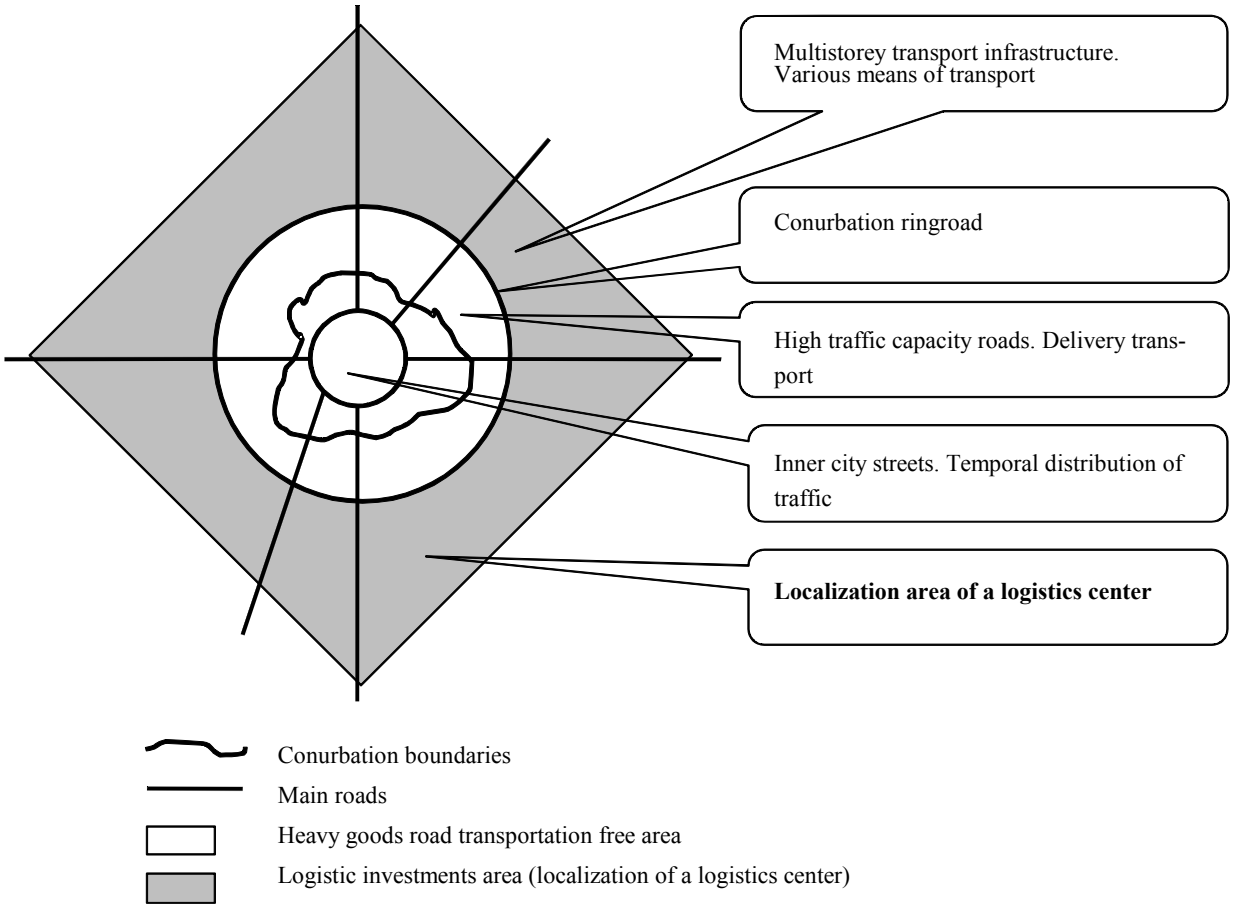

Fig. 1. Logistics center localization– conurbation layout
Source: own analysis

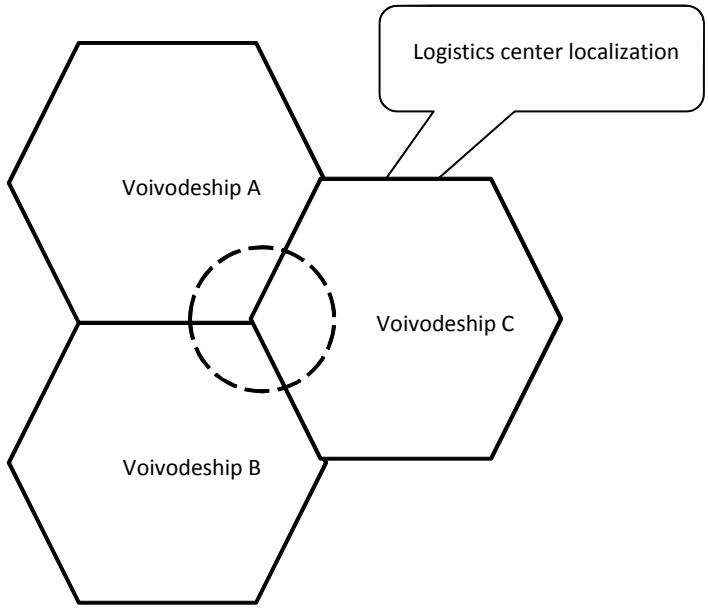

Fig. 2. Logistics center localization – inter-voivodeship layout
Source: own analysis

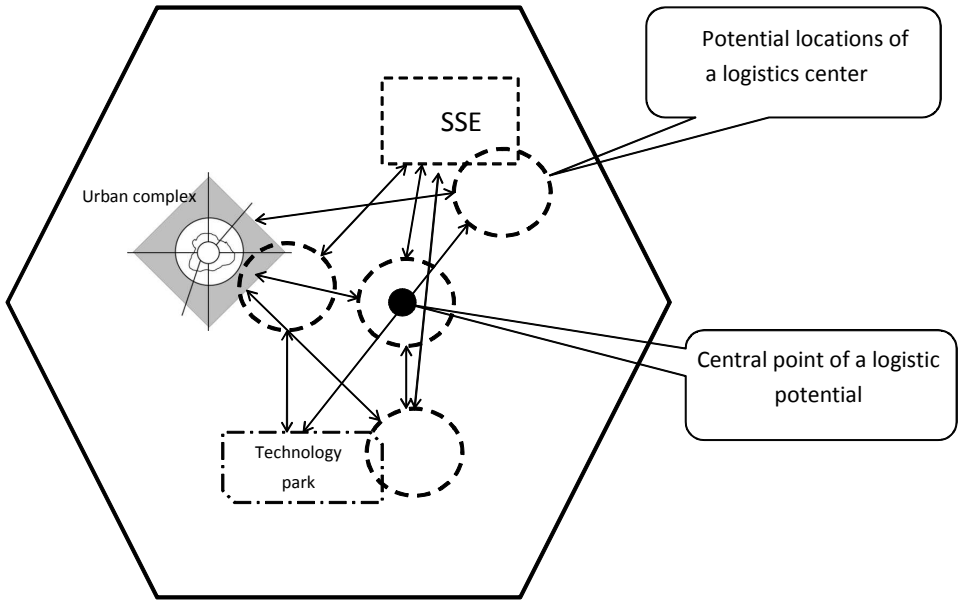

Fig. 3. Logistics center localization – alternative layout

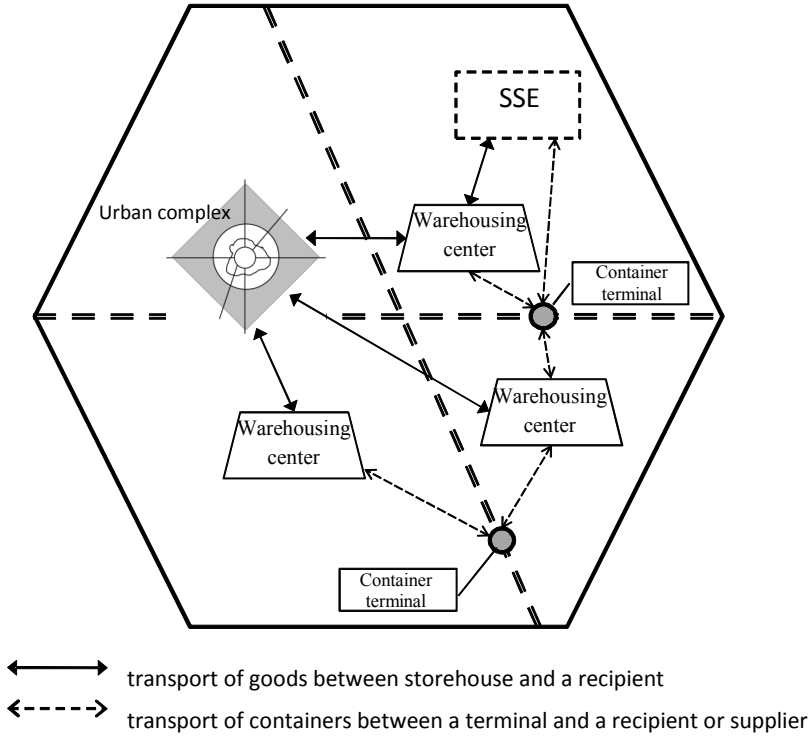

Fig. 4. Alternative solution for a logistics center using the existing point logistic infrastructure within the region

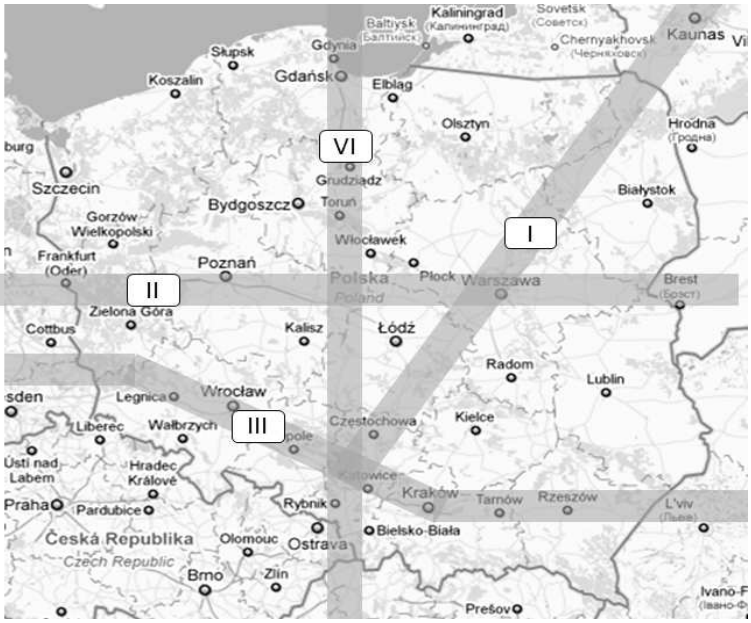

Fig. 5 International transportation passageways of TEN-T network running through Poland
Source: own analysis. Map: http://maps.google.pl/maps?hl=pl&tab=wl 2010-05-24.

Table 1.Central logistics units in international transportation passageway no I, TEN-T network:

Logistics center		**Autonomous container terminal**		**Warehousing center**	
Site	Subject	Site	Subject	Site	Subject
Gliwice	Śląskie Centrum Logistyki S.A.	Warszawa Główna Towarowa	SPEDCONT Spedycja Polska Sp. z o.o.	Pruszków	Millenium Logistic Park Pruszków I i II, Panattoni Park Pruszków, Pruszkowskie Centrum Dystrybucyjne
Sławków	Międzynarodowe Centrum Logistyczne Euroterminal Sławków	Pruszków	POLZUG Intermodal Polska Sp. z o.o.	Piaseczno	ROHLIG SUUS Logistics SA, Diamond Business Park Piaseczno
		Sosnowiec Południowy	SPEDCONT Spedycja Polska Sp. z o.o.	Błonie	Metropol Park Błonie, Prologis Park Błonie I i II, Panattoni Park Błonie
		Sławków	POLZUG Intermodal Polska Sp. z o.o.	Warszawa	City Point Warsaw, Prologis Park Warszawa I i II, Żerań Park I i II, Tulipan Park Warszawa
		Sławków	Euroteminal Sławków.	Mszczonów	Point Park Mszczonów, Europa Park
		Gliwice kontenerowa	PKP CARGO S.A.	Piotrków Trybunalski	Prologis Park Piotrków, Logistic City - Piotrków Distribution Center
		Kraków Krzesławice	SPEDCONT Spedycja Polska Sp. z o.o.	Mysłowice	Panattoni Park Mysłowice
				Sosnowiec	Prologis Park Sosnowiec
				Tychy	Millenium Logistic Park Tychy

Logistics center		**Autonomous container terminal**		**Warehousing center**	
				Będzin	Prologis Park Będzin
				Chorzów	Prologis Park Chorzów
				Gliwice	Diamond Business Park Tulipan Park Gliwice
				Dąbrowa Górnicza	Parkridge Felizja, Prologis Park Dąbrowa

Source: Own analysis IL&W 2009

Table 2: Central logistics units in international transportation passageway no II, TEN-T network:

Logistics center		**Autonomous container terminal**		**Warehousing center**	
Site	Subject	Site	Subject	Site	Subject
Swarzędz-Jasin	Centrum Logistyczno-Inwestycyjne Poznań Sp. z o.o.	Kobylnica	CARGOSPED,	Tarnowo Podgórne	Prologis Park Poznań I i II
Modła Królewska	Wielkopolskie Centrum Logistyczne Konin-Stare Miasto S.A.	Gądki	POLZUG Intermodal Polska Sp. z o. o.	Gądki/Robakowo	Panattoni Park Poznań I i II, Point Park Poznań, Raben, Kuehne&Nagel
		Warszawa Główna Towarowa	SPEDCONT Spedycja Polska Sp. z o.o.	Komorniki	Tulipan Park Poznań I i II
		Pruszków	POLZUG Intermodal Polska Sp. z o.o.	Warszawa	City Point Warsaw, Prologis Park Warszawa I i II, Żerań Park I i II, Tulipan Park Warszawa
		Małaszewicze	PKP CARGO S.A.	Błonie	Metropol Park Błonie, Prologis Park Błonie I i II, Panattoni Park Błonie
				Piaseczno	ROHLIG SUUS Logistics SA, Diamond Business Park Piaseczno
				Pruszków	Millenium Logistic Park Pruszków I i II, Panattoni Park Pruszków, Pruszkowskie Centrum Dystrybucyjne
				Paprotnia	Prologis Park Teresin
				Janki	Prologis Park Janki
				Sochaczew	Prologis Park Sochaczew
				Nadarzyn	Prologis Park Nadarzyn
				Mszana	Panattoni Park Teresin

Source: Own analysis IL&W 2009

Table 3. Central logistics units in international transportation passageway no III, TEN-T network:

Logistics center		**Autonomous container terminal**		**Warehousing center**	
Site	Subject	Site	Subject	Site	Subject
Gliwice	Śląskie Centrum Logistyki S.A.	Gliwice kontenerowa.	PKP CARGO S.A.	Wrocław	Hammilton Centrum, Prologis Park Wrocław II i III.
Sławków	Międzynarodowe Centrum Logistyczne Euroterminal Sławków	Kraków Krzesławice	SPEDCONT Spedycja Polska Sp. z o.o.	Bielany Wrocławskie	Prologis Park Wrocław, Panattoni Park Wrocław.
		Sosnowiec Południowy	SPEDCONT Spedycja Polska Sp. z o.o.	Kąty Wrocławskie	Prologis Park Wrocław IV
		Sławków	Właściciel: POLZUG Intermodal Polska Sp. z o.o.	Gliwice	Diamond Business Park Gliwice Tulipan Park Gliwice
		Sławków	Właściciel: Euroteminal Sławków.	Chorzów	Prologis Park Chorzów
				Będzin	Prologis Park Będzin
				Tychy	Millenium Logistic Park Tychy
				Sosnowiec	Prologis Park Sosnowiec
				Mysłowice	Panattoni Park Mysłowice:

Source: Own analysis IL&W 2009.

Table 4. Central logistics units in international transportation passageway no IV, TEN-T network

Logistics center		**Autonomous container terminal**		**Warehousing center**	
Site	Subject	Site	Subject	Site	Subject
Modła Królewska	Wielkopolskie Centrum Logistyczne Konin-Stare Miasto S.A.	Gdynia	Bałtycki Terminal Kontenerowy Sp. z o.o. (BCT)	Gdańsk	Prologis Park Gdańsk
Gliwice	Śląskie Centrum Logistyki S.A.	Gdańsk	Gdańsk Port Północny: DTC Gdańsk S.A	Łysomice	Crystal Park Toruń
		Łódź Olechów	SPEDCONT Spedycja Polska Sp. z o.o.	Łódź	Diamond Business Park Łódź, Tulipan Park Łódź, Panattoni Park Łódź East.
		Sosnowiec Południowy	Właściciel: SPEDCONT Spedycja Polska Sp. z o.o.	Stryków	Tulipan Park Stryków, Panattoni Park Stryków, Centrum logistyczne Stryków.
		Sławków	Właściciel: POLZUG Intermodal Polska Sp. z o.o.	Dąbrowa Górnicza	Parkridge Felizja, Prologis Park Dąbrowa
		Sławków	Właściciel: Euroteminal Sławków.	Będzin	Prologis Park Będzin
				Sosnowiec	Prologis Park Sosnowiec
				Mysłowice	Panattoni Park Mysłowice
				Tychy	Millenium Logistic Park Tychy
				Bielsko-Biała	Panattoni Park Bielsko-Biała

Source: Own analysis IL&W 2009

Passageway no III: by convention from the west border with Germany in Zgorzelec via Lower-Silesian, Silesian, Lesser Poland and Subcarpathian voivodship to the east border with Ukraine in Żurawica-Medyka.

Passageway no IV: by convention from the seaports in Gdynia and Gdansk via Kuyavian-Pomeranian, Lodz, Silesian voivodeship to the south border with Slovakia.

Tables 1-4 present, in reference to the transportation passageways mentioned, logistics centers existing in Poland, autonomous container terminals and warehousing centers constituting central units which, by means of transport solutions, are capable to connect the national logistics network with logistics networks of the neighbouring countries and other states[11].

4. CONCLUSIONS

The evaluation of infrastructural, technical and organizational conditionings of the key elements of the national logistic infrastructure leads to the following conclusions:

Out of four logistics centers, according to the trade law existing in the form of partnerships, two i. e. Great Poland Logistics Center Konin-Stare Miasto and Logistics-Investment Center Poznan CLIP Ltd. do not meet comodality requirements as regards railway transport due to the fact that the container terminal near the station in Konin and similar terminal on CLIP area in Swarzedz-Jasin are under planning stage (Konin) or under preparation stage (Swarzedz-Jasin).

Out of 26 existing national land autonomous container terminals only 11 meet comodality requirements which, in terms of intermodal transportation, means the capability to take full-size modular trains carrying intermodal loading units with an immediate transshipment to motor transport, without the necessity of dividing the train set, shunting operations, distribution actions etc.

In terms of international transportation, railway conveyance in Poland has many technical, organizational, and legal restrictions which make it impossible to use its potential as regards competition between various industrial branches and the increase of comodality since in the European logistics network there 'occur differences in the consignment letters' (SMGS, CIM), the technical quality of railway infrastructure is diversified, there are 4 systems for powering the electric traction and different voltage in traction networks as well as varying systems for traction protection. There are 5 different track widths, 14 safety systems as regards controlling the railway traffic, 5 types of gauge for a track width 1435mm, and 11 pantograph widths'[12]. These obstacles impair the competitive character of railway transport with relation to motor transport.

5. SUMMARY

National logistics and warehousing centers as localizations of service storages and central units with substantial transport connection with international transportation passageways fulfill their supportive role mainly in relation to motor conveyance. Whereas the greatest advantage of logistics centers i.e., supporting intermodal transportation solutions is, with the national logistics centers, limited as there are too few to operate as central intermodal units evenly distributed within the national logistics centers. Furthermore, container terminals which are present in their structure do not thoroughly meet the requirements of intermodal conveyance because of their limited size. Similar limitations occur in container terminals operating outside logistics centers. It constitutes one of the barriers that constrains intermodal carriages, which in the face of increasing loads containerization should be regarded as a missed opportunity to use them effectively.

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