

Dariusz Bernacki,¹ Christian Lis²

¹ Maritime University in Szczecin
Engineering and Economic Faculty on Transport
Transport Management Institute
e-mail: dariusz.bernacki@o2.pl

² University of Szczecin
The Faculty of Economics and Management
Institute of Statistics and Econometrics
e-mail: chrislis@wneiz.pl

Port logistic park – a case study

JEL codes: M21, L91

Keywords: port logistic park, analytical study

Abstract: In the port management, apart from logistic centers, warehouse and storage centers and distribution centers there appear new organizational forms of logistic activity in the form of warehouse-production centers called logistic parks. The aim of this paper is to present issues connected with the development of activities performed at port logistic parks, to determine quantitative aspects of development of business activities, to point at problems related to transport services to logistic parks. For the descriptive part the comparative method was used, and for the quantitative aspects of a logistic park's activities statistical methods were used, which allowed for assessment of storage turnover and of traffic volumes. The analytic studies were conducted on the example of a logistic park that was being under development within the area of the maritime port in Szczecin.

Introduction

From the logistics point of view a sea port constitutes an intermediary node in the handling of streams of goods' shifted within the sea-land chains of supply. From the sea side deliveries of goods are carried out in big single consignments. Across seas goods are moved by a fleet of merchant vessels of large individual load capacity and ships call

ports with a lesser frequency. At sea ports there comes into effect a change of movement of cargo streams towards means of transportation with a lesser, as compared to sea vessels, load capacity, and thus respectively to inland waterway navigation barges, wagons/train formations, trucks. Cargo streams in sea port-consignees relations are transferred in smaller individual consignments, however with a greater frequency. In sea ports, at the contact point of the maritime and the land section of the supply chain, there occur objective logistic gaps connected with the differences that come into being against the large-scale of deliveries and dissimilar frequency of their movement to/from a sea port. The limitation of logistic gaps in sea ports ensues as the result of the separation of cargo handling operations into two relations: sea vessel-depo/storage and depo/storage-hinterland means of transportation. As the result of using indirect relations for cargo handling, goods are stored/warehoused, which creates possibilities for development of logistic services in sea ports (Bernacki, 2012b).

Same time the importance of a sea port as the key element of transportation and logistics networks has substantially increased which within the port's area contributed to the emergence of favorable conditions for the development of logistic activity (Bernacki, 2012a). Sea ports develop distribution and logistics functions which in turn are characterized by the diversity of organizational solutions and scope of logistic services (Montwiłł, 2013; Grzelakowski, 2012).

Logistic services may be supplied by terminal operators/forwarders by their own assets and that, most of all, relates to handled capital goods and consumer durables and non-durables (in the transportation nomenclature those are break bulk cargo, especially including containerized break bulk) and supply goods (bulk cargo). The issues of logistic activity in sea ports may also be considered from the point of view of the development of institutionalized and independently from trans-shippers organized various types of logistic activities situated in ports or port adjacent areas. In the latter case port/port adjacent logistic centers and warehouse centers are enumerated (Pluciński, 2013, p. 151). Logistic center constitutes a spatial facility with the appropriate organization and infrastructure enabling various independent enterprises to perform operations on goods in relation with their storage and transshipment between sender and receiver, including handling of intermodal transports, and making accessible to them various additional services. Warehousing center constitutes a spatial facility with the appropriate organization and infrastructure enabling various independent enterprises to perform operations on goods in relation with their storage and transshipment between sender and receiver, including handling of intermodal transports, and making accessible to them various additional services (Fechner, 2008). They may be performed under various organizational-legal forms as private, public or mixed (public-private) enterprises.

The phenomenon of the logistic function in sea ports is in its initial phase of academic research. Enquiry issues connected with the modeling of port logistic centers encompass a number of problems of multidisciplinary character (Christowa, 2012). The problem of the development of port logistic activity require research, especially from

a positive perspective, and empiric analyses. The port logistic centers' development based on services to cargo streams moved through a port, the organizational-ownership means of development and functioning of port logistic centers, verification of forms and scopes of logistic activity (port distribution centers, logistic centers, warehousing centers, warehouses) require in-depth analysis. Not less important are empirical research on the development of port logistic activity and its transportation aspects within the context of direct port environs.

1. Characteristics of the port logistic park

The investment being under the discussion here is a private enterprise. The investor is Waimea Holding SA – a development company specializing in the construction of warehouse-production complexes, warehouse-transportation terminals and BTS (built-to-suit) storage objects created to needs of a dedicated customer. The investor has experience in the field of property market. It has built or is building production-warehouses and logistic centers in Szczecin (North-West Logistic Park, 8 high storage warehouses with the total surface of 80 thous. m²) and in the nearby Stargard (as a target 6 warehouse halls with the total area of 80 thous. m²), in Korczów at the border crossing with Ukraine (a TIR drivers' service center including warehouse-production and office-social objects with the total area of 50 thous. m²), in the special economic zone in Bydgoszcz (the total warehouses' area of 90 thous. m²), in Rzeszów-Jesionka (warehouses and a truck servicing terminal with the total area of 4.7 thous. m²). In the period of 2017–2019 it plans to build and commercialize over 200 thous. m² of warehouse and production area in Szczecin, Stargard, Bydgoszcz and Rzeszów.

The investment in the port in Szczecin is financed with the investor's own financial recourses and a bank credit and the business plan is based on the commercialization of warehousing space by its lease to business entities. The indicative conditions for the lease of warehouse space in the storage complex in the port in Szczecin are as follows: the total area of warehouses to lease is 48,181 m², the monthly effective lease rate is 3.56–3.66 EUR/m², the office space lease rate is 9.50 EUR/m², the required length of lease is 5 years.

The under construction warehouse-production center with its marketing name "Waimea Logistics Park Port Morski Szczecin" (thereinafter presented as the logistic park), is designated to the distribution of goods, logistic and forwarding activities, light production based on packaging-customizing and assembly. The logistic park with the total constructed warehouse area of 48,000 m² comes into being on the leased from the Port Authority 9.5 ha land parcel situated within the area of the port in Szczecin between the Hryniewieckiego and the Kujota streets. The area is situated in the South-Eastern part of Łasztownia. From the East it borders with the Przemysłowy (Wrocławski) Canal, from the South with the Kujota Street, from the West with the Hryniewieckiego Street, and from the North with the Logistyczna Street leading towards the Ostrów Grabowski.

The investment is under realization. The handing over of the logistic park for exploitation is planned for the beginning of 2019. The logistic park will consist of four modern class A warehouses with storage height of 10 m net and the load bearing capacity of the floor of 5 t/m². The storing capacity of the logistic park amounts to: hall no. 1 with its area of 12,340 m², hall no. 2 and no. 3 with their storage areas of respectively 9,460 m² and 8,640 m², hall no. 4 with 12,640 m².

The logistic park will be equipped with a truck and private car parking and vast manoeuvre yards. In direct vicinity of the logistic park, from the Kujota Street, there will be situated a railroad siding enabling railway transportation. The road accessibility of the logistic park will be secured by the constructed Logistyczna Street, the Hryniewieckiego and the Logistyczna street crossing, and then by the Przeprawa Parnicka (Parnicka Bridge Crossing) and the entrance/exit to/from the national road no. 10. The truck traffic will flow in the direction towards the S3 express road and the A6 highway and also in the direction of the town's left river bank.

2. Comparative study of the logistic activities

The same investor has constructed, beyond the port area but in its direct environ, the warehouse-production center "North-West Logistics Park". On the 18 ha land parcel there was created a complex of warehouses, expanded in 2012–2016 from the initial 4 warehouse halls with their total area of 64 thous. m² up to 8 warehouse halls with their total area of 80 thous. m². The cost of investment amounted to 150 mln PLN. All warehouses are the A class objects enabling storage up to the height of 10 m. It has been the first A class logistic park situated in the South-Eastern part of Szczecin in the vicinity of the road node with the access to the A6 highway and the S3 express road. The first warehouse halls had been delivered to exploitation in mid-2013 and after three years the total warehouse area was leased by users. By the end of 2016, the logistic park was sold by the owner of Waimea Holding. The buyer is Exeter Property Group,¹ an American company specializing in acquisitions, leasing and management of logistic and industrial properties.

The analysis of the tenants of the warehouses at the North-West Logistics Park and their types of business activity is presented in Table 1.

¹ In the first half of 2016 Exeter Property Group purchased six logistic and production properties situated in various parts of Poland. Exeter Property Group was established in 2006 and specializes in investments and management in the warehouse sector. Presently Exeter manages the funds with the total value of almost 5 billion USD and over 10 million square meters of warehouse space. The Exeter's head Office is located in Philadelphia. In the USA there also operate 11 regional offices. In Europe the Exeter offices are situated in London, Warszawa, Frankfurt, Paris and Dublin.

Table 1. Tenants of the storage space and type of their business activity at the North-West Logistics Park

Number of business entities	Sector	Type of business activity	Remarks
Production			
2	wind power stations	production and assembly of steering systems and other components for sea and land wind power stations	products distributed internationally
1	sun power stations	production and packaging of sun protection elements for sun power stations	
1	steel works	production of steel components and sub-assemblies for industries, designing and laser cutting and bending of steel plates	the biggest tenant at the logistic park
3	production-services activity	multi section production and services activity	small and medium size companies
Distribution			
1	food industry	distribution of food products to the network of small area shops	servicing the network of grocery shops situated within the area of Szczecin and its neighborhood
1	food industry	distribution of brewery products to the retail network	
1	food industry	distribution of meat products to the retails networks	
1	IT	components for cellular telephony	
Transport-Forwarding-Logistics (TFL)			
1	Transport-Forwarding-Logistics	transportation, forwarding and logistics services for freight road	logistic operator on the market of freight road transport
1	Transport-Forwarding-Logistics	contract logistics (third party logistics)	logistic operator managing supply chains
1	Transport-Forwarding-Logistics	integrated transport and forwarding services	logistic operator for frozen and perishable goods deliveries

Source: own elaboration.

The ex post analysis of an investment constituting a twin to the port logistic park leads to the following conclusions:

- private investors concentrate on the construction of warehouse-production centres and adapt their size to market needs and possibilities to commercialize a storage space; the experience indicates that the full lease of a given storage space is achieved within the period of three years,

- the term “logistic park” does properly reflect the characteristics and the type of business activities run in warehouse-production centres,
- logistic parks are used in equal shares for conducting production activity as well as for development of logistic activity,
- logistic activity run in logistic parks encompass most of all the distribution of consumer goods, equipment and components, integrated transport-logistic services and services provided within the third party logistics.

3. Forecasting of the port logistic park’s performance

In the logistic park, the warehouse turnover, production and logistic services relate to various goods which in the transport nomenclature are referred to as the general cargo. Stowing factors and densities for conventional general cargoes are presented in Table 2.

To calculate logistic park’s warehouse turnover the average value of the cargo density factor (d) amounting 0.75 t/m^3 was used. It was assumed that the average storage time in the logistic park’s warehouses will amount (D) 30 days. The goods storage height in the warehouses (H) will amount 10 meters. The reserve storage space factor (r) encompassing the areas intended for goods consignment separation, for technological-communication pathways and for office-social compartments was for the warehouses assumed at the level of 1.2. The goods flow irregularity factor (p), caused by unevenness of supplies and fluctuation of their volumes was assumed at the level of 30% (Bernacki, Lis, 2017).

Table 2. Stowing factors and densities for general cargoes

Cargo	Stowing factor (m^3/ton)	Cargo density (tons/m^3), $d = 1/\text{Stowing factor}$
General cargoes		
Cement	1.00	1.00
Gypsum	1.20	0.83
Sand	0.50	2.00
Feeding stuff	1.50	0.67
Coffee	1.80	0.56
Citrus fruit	2.50	0.40
Flour	1.30	0.77
Other general cargo		
Cotton bales	2.70	0.37
Paper Rolls	2.50	0.40
Frozen fish in cartoons	2.10	0.48
Average value	1.71	0.75

Source: Tsinker (2004), p. 34.

The maximum yearly cargo turnover in the logistic park's warehouses (Q) was calculated in tons using the following formula (Tsinker, 2004):

$$Q = \frac{365 \times AdH}{rD \left(1 + \frac{P}{100}\right)}$$

The calculations indicate that the maximum yearly warehouse turnover in the port logistic park may amount close to 2,520 thous. tons. It has been assumed that in the first year of operation (2019) the warehouse turnover will amount 30% of the maximum yearly volume of turnover of goods. That means that the warehouse turnover may assume the level of 760 thous. tons. In the second year of exploitation (2020) the warehouse turnover will increase up to 60% of the maximum yearly cargo mass turnover and will amount 1,512 thous. tons. In the third year of operation (2021) the goods mass will reach the predicted maximum yearly turnover.

It has been assumed that the cargo unit in the transport to/from the logistic park will be a container and that the modal split of the container carriage will take form as follows (Bernacki and Lis, 2017):

- maritime transport (and supplementary railroad transport) 50% of goods mass,
- road transport (tractor plus road semi-trailer) 50% of goods mass, and the average weight of cargo per 1 truck of 2 TEU (40' container) will amount 18.8 tons.

The predicted intensity of road traffic in the relation to/from the port park logistic is presented in Table 3.

Table 3. Forecasted intensity of trucks' traffic in servicing the port logistic park

Years	Number of trucks (2 × number of trucks, pcs.)
2019	40,268
2020	80,536
2021	134,226

Source: own elaboration.

The truck traffic in the direction to and from the port logistic park will follow in the relations with the national road no. 10 in the route of the Logistyczna Street – Hryniewieckiego Street – Przepawa Parnicka, and subsequently and primarily in the direction of the road junction S3 and A6.

Conclusion

In the port industry, alongside logistic centers, warehouse centers and distribution centers there appear new organizational types of logistic activity in the form of

warehouse-production centers. A private investor builds modern warehouses with the intention to lease them to entities running light production activity and to entities supplying TFL sector services. In the conceptual and taxonomic issues' layer the logistic park constitutes the right name for the conducted activity based on warehouse-production centers.

The comparative analysis is an important method of scientific recognition of issues connected with the development of logistic activity. In the analyzed case the comparative analysis allowed for identification of manners and types of activities run in port logistic parks. In parallel with the production activity there, there comes into effect the development of services consisting in distribution, transportation-forwarding services and services supplied within the contractual logistics.

Statistical analyses make it possible to predict quantitative aspects of the activity run at logistic parks. In this case, the methods that allow for the assessment of volumes of warehouse turnovers are useful. A critical analyses of break bulk cargo types and conditions of their storage/warehousing constitute the key issues for predictions of the size of activity run in the port logistic parks.

To service port logistic parks a great participation of truck transport is required. While situating a logistic park on port areas one needs to bear in mind the increased intensity of truck traffic. That does not remain without an influence on the efficiency of road transport in a direct vicinity of a port. Heavy density of road traffic, decreasing transport reliability, congestion of road networks and increasing external costs, those are the factors co-defining the decisions on location of logistic parks on port areas or on direct port environs. The analytic studies allow for prediction of road traffic intensity in connection with the transportation services to logistic parks.

The determination of relations and synergy effects which occur between the development of logistic parks and the volume and cargo type structure of port turnover and the analysis of the influence which the development of port logistic activity has on sea ports' competitiveness, are the most important issues requiring further analytical studies. It seems that the basis for that type of studies, first of all, consists in the determination of cargo types and volumes of port-sea turnovers that are the subject of logistic parks' services. In the analyzed case it has been assumed that that is going to be the general cargo, and the share of the port-sea turnover in the total port logistic park turnover has been determined at the level of 50%.

References

- Bernacki, D. (2012a). Port morski w systemie zarządzania łańcuchem dostaw. *Logistyka*, 5, 290–298.
- Bernacki, D. (2012b). Usługi wartości dodanej jako element koncepcji logistycznej portu morskiego. *Logistyka*, 4, 25–28.
- Bernacki, D., Lis, Ch. (2017). *Modernizacja dostępu drogowego do portu w Szczecinie: przebudowa układu komunikacyjnego w rejonie Międzyodrza*. Szczecin.

- Christowa, C. (2012). *System zarządzania procesem badań naukowych w zakresie modelowania portowych centrów logistycznych*. In: H. Salmonowicz (ed.), *Transport morski w międzynarodowych procesach logistycznych* (pp. 21–33). Szczecin: Wydawnictwo Zapol.
- Fechner, I. (2008). Miejsce centrum logistycznego w warstwie pojęciowej infrastruktury logistycznej. *Logistyka*, 3.
- Grzelakowski, A.S. (2012). *Porty morskie w międzynarodowych procesach logistycznych oraz logistycznych łańcuchach dostaw*. In: H. Salmonowicz (ed.), *Transport morski w międzynarodowych procesach logistycznych* (pp. 97–111). Szczecin: Wydawnictwo Zapol.
- Montwiłł, A. (2013). *Port morski jako kluczowy element system logistycznego łańcuchów dostaw*. In: H. Salmonowicz (ed.), *Systemy zarządzania logistycznego w transporcie morskim* (pp. 151–164). Szczecin: Wydawnictwo Zapol.
- Pluciński, M. (2013). *Polskie porty morskie w zmieniającym się otoczeniu zewnętrznym*. Warszawa: Wydawnictwo CeDeWu.Pl.
- Tsinker, G.P. (2004). *Port engineering. Planning, construction, maintenance and security*. Hoboken: John Wiley and Sons.
- Waimea Holding SA.

PORTOWY PARK LOGISTYCZNY – ANALIZA PRZYPADKU

Słowa kluczowe: portowy park logistyczny, badania analityczne

Streszczenie: W gospodarce portowej, obok centrów logistycznych, centrów magazynowych i centrów dystrybucyjnych pojawiają się nowe formy organizacyjne działalności logistycznej w postaci centrów magazynowo-produkcyjnych, zwanych parkami logistycznymi. Celem artykułu jest przedstawienie zagadnień związanych z rozwojem działalności prowadzonej w portowych parkach logistycznych, ustalenie ilościowych aspektów rozwoju działalności, wskazanie na problem dotyczące transportowej obsługi parków logistycznych. W części opisowej wykorzystano metodę porównawczą, a w zakresie ilościowych aspektów działalności parku logistycznego posłużono się metodami statystycznymi, co pozwoliło na oszacowanie wielkości obrotów magazynowych i natężenia ruchu drogowego. Badania analityczne przeprowadzono na przykładzie parku logistycznego powstającego na terenie portu morskiego w Szczecinie.

Cytowanie

Bernacki, D., Lis, Ch. (2017). Port logistic park – a case study. *Ekonomiczne Problemy Usług*, 3 (128), 37–45. DOI: 10.18276/epu.2017.128-03.