Role and significance of inland waterway transport in container logistic chains, based on example of river-sea port in Szczecin

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ABSTRACT

Current forecasts related to container turnover in ports suggest that it will be a hard task in a long run to effectively meet the growing demand for container transport just by road and rail transport within feeder systems, shipping to and from ports. The presented article regards the concept of container logistic chains, where a basic component is a river-sea port of Szczecin. Its purpose is to analyze the existing opportunities and directions for development of inland waterways transport, and its inclusion in containers handling within the port’s facilities.

Keywords: container logistic chain; inland water transport; river-sea Port of Szczecin; Oder river

1. INTRODUCTION

The river-sea Port of Szczecin is the westernmost port, with the shortest distances to ports of the Western Europe. The neighboring German ports pose a great competition, but it operates feeder ships for the largest sea port - hubs in Europe. It is the only port connected to European inland waterways, which constitutes its enormous asset. However, it is less accessible than the ports located on the seaside, in Gdańsk, Gdynia and Świnoujście,
regarding the limitations of the Szczecin-Świnoujście waterway. There is a container terminal in the Szczecin port, whose cargo handling potential reaches about 120,000 TEU. The existing infrastructure allows to operate unit up to 1400 TEU, what in comparison to other Polish container terminals is a quite weak result.

Realization of the Port of Szczecin development plans, i.e. deepening of channels, modernization of roads and railway lines running in the port vicinity, and reinstitution of regular operation of container ships in the Świnoujście terminal, provides circumstances for improvement of the current situation. Moreover, expansions of the warehouse infrastructure within the container terminal, which offers large spatial reserves, provides basis for realization of inland transport from the port to both Western European countries and locally. Infrastructure improvement of the river-sea Port of Szczecin may contribute to significant structural and strategic changes in supply chains management of various goods, especially the container supply chains.

The article present the role played by the Port of Szczecin in handling the container logistic chains, based on inland connections.

2. ESSENCE AND FUNCTIONING OF CONTAINER LOGISTIC CHAINS

The container logistic chains pose a technological connection of handling and warehouse points for containers with their transportation routes, within which certain coordinated actions and financial, documentation and organizational, etc. operations are coordinated. Their task is to connect the entities operating within the port with other participants (entities) functioning, among others, in the supply or distribution areas.

Container logistic chains should:

- ensure quick and efficient flow of container goods, in order to guarantee a high level of services provided at a given place and time;
- be flexible towards the changing market conditions;
- ensure a proper technical level for the realized transport, handling and warehouse processes related to containers at all stages of the logistic chain;
- employ modern techniques, ITC and IT technologies, to provide a proper flow of goods and information.

The international container supply chains are becoming more complex because of the logistic operators undertaking actions on a greater scale. It is strictly connected to clients’ preferences and requirements, who expect the ports to provide integrated services within the container supply services. It is possible thanks to implementation of IT systems in the port, integrating all participants of the chain, and providing them with stable and certain flow of information about the condition and localization of the container goods. Technological progress taking place in the port changes their role and strategic position within the container logistic chains. The previous potential of the river-sea Port of Szczecin provides all possibilities for establishment of a hub - a logistic center within its area, where the inland waterway transport could play a significant role.
Figure 1. Integration role played by the river-sea port within the container logistic chains [own work]

3. POTENTIAL OF THE CONTAINER TERMINAL IN SZCZECIN IN TERMS OF CONTAINER GOODS HANDLING

The Port of Szczecin is on the third place when it comes to container cargo handling realized in Polish sea ports (Borkowski 2015). However, its potential to occupy the leading place in operation of the inland waterway transport in the country is way greater. It is predisposed to this role by the fact that, among others, it combines two functions - of a sea port and of a river port.

Furthermore, it seems that future may bring increased handling of container loads in Szczecin what - after realization of few investments, crucial and strategic for state transport policy - will improve competitiveness of this port. Currently, the container terminal functioning in Szczecin, operated by DB Port Szczecin Sp. z o.o., exploits slightly more than 70% of the cargo handling capacity (handling in 2015 amounted to 87,110 TEU). The terminal provides cargo handling services in the area of Dębice Basin (Basen Dębicki) at the Finnish quay (Nabrzeże Fińskie), 300 m long, and if there is such a need, also at the Czech quay (Nabrzeże Czeskie, 614 m long).

The latter was the main spot for container goods handling in the Port of Szczecin for many years (until the Finnish quay was put into service in 2012).
Currently, the container terminal occupies the area of 14 ha, offering a warehousing capacity for containers at the level of about 3,500 TEU. Two STS cranes are used for handling the cargo at the Finnish quay, with a load capacity of 45 t each, while the Czech quay employs two Gottwald cranes, with the load capacity of up to 100 t. The terminal is also equipped with a station dedicated to refrigerated containers services, with 157 connectors and two ramps for ro-ro loads (21 and 25 m wide). There are 3 sidings for the purposes of rail cargo handling (2 x 433 m and 1 x 614 m)\(^1\). There is a car park for 88 heavy vehicles located in the direct neighborhood of the terminal.

Cargo handling capacity of the container terminal is on the continuous increase. The size of container handling in the Ports of Szczecin and Świnoujście between 2000-2014 are presented in Figure 2.

\[\text{Figure 2. Container handling in the Ports of Szczecin and Świnoujście (TEU)}\]
[own work on the basis of data from ZMPSiŚ S.A.]

Analysis of handling in the terminal, within the export-import relation, the numbers of containers are distributed almost equally. The major import and export directions are Scandinavia, Germany, England, Western European countries, and further to China. The shipowners, who realize the container sea connections, connect Szczecin with the following ports: Rotterdam, Hamburg, Bremerhaven, Helsingborg, Aarhus, Klaipeda, Riga, Helsinki, St. Petersburg, Immingham, Felixstowe, Teesport, as well as with Gdynia and Gdańsk.

The container terminals operating within the ports support integration of all transport branches, both in the land (road and rail) - water (sea and inland) and sea-inland relations. Leaning on the experience of such ports as Antwerp or Rotterdam, we may create a concept of container supply chains that adopt inland waterways transport in operation of the Port of Szczecin.

\(^1\) According to the data published by DB Port Szczecin Sp. z o.o.,
4. SIGNIFICANCE OF INLAND WATERWAY TRANSPORT IN CONTAINER LOGISTIC CHAINS TO/FROM THE TERMINAL IN SZCZECIN

Economic respect is the basic determinant that decided on inclusion of the inland waterways transportation into handling of container loads in Europe. The inland waterways transport belongs to the most economic and at the same time the most environmentally friendly branches of transportation (EECTM 2007). Its low energy consumptions, no congestion, and low external costs in the form of emission of contaminants, as well as a scarce amount of accidents, contribute to application of this transportation branch to an increasingly broader scale (DOC 2014: 25). The possibility to realize the inland transport of container loads requires proper parameters of inland waterways, which according to the AGN requirements, adopted in Europe, should meet the standards of classes from IV to VII (COM 2013). It is necessary for realization of long-range container transport, and for relatively sizable sets.

Currently, there are about 750 inland ports located within the European Union - 389 of which operates in the Netherlands. In more than 50 ports, annual handling exceeds 1 mln tons, and almost 40 is at the same time an inland and a sea port. There are container terminals functioning in case of more than 100 ports, while this number is on a continuous increase.

The existing potential of the container terminal in Szczecin, in terms of the container loads handling is first of all related to the fact of its convenient location in comparison to other inland and water terminals. The port in Szczecin is the only Polish sea port that has a direct connection thanks to the Oder Waterway (ODW, Odrzańska Droga Wodna), with the system of Western European network of inland waterways (Kulczyk and Skupień 2010). The Oder-Sprewa and Oder-Hawela channel connect Szczecin to Berlin, to the areas of Mecklenburg and Brandenburg, what constitutes an additional asset for development of this transportation branch in the international goods exchange.

The location of the Port of Szczecin and inland connections with the Southern part of Poland, as well as the trans-boundary character of the Oder river, are the biggest asset of the container terminal (www1b), (www1c). In relation to the policy of sustainable transport development, assuming that loads transported on roads should be moved to the rail and water transport, including the inland waterways (COM 2011), it seems that the Oder, as a transport route, would be - after rendering its navigable along its whole course - one of the crucial inland waterways in this part of Europe.

Countries such as the Netherlands, Germany and Belgium, which have a network of waterways with high technical parameters (Quispel 2011) (BVB 2013), record a permanent increase in the share of inland waterways transport within containers handling to and from sea ports (www1). There are distribution and logistic centers created within their territories, nearby thriving inland ports, enabling operation of containers and their transportation into land. Therefore, the ports transformed into multi-functional logistic centers, which are crucial components of container logistic chains.

Another asset supporting the inland waterways transport in handling the container loads is the concept of establishment of the West-Pomerania Logistic Center (ZCL, Zachodniopomorskie Centrum Logistyczne) at the container terminal in the Port of Szczecin. It will offer at least 40 thousand m² of warehouse space, where - apart from temporary goods storage - also other operations are assumed, such as light manufacturing, conditioning, repackaging of goods. This added value of port services may also attract loads - triggered by
the ZCL and container terminal operation - which previously could not undergo such logistic processes (www1d).

Location of the Port of Szczecin and the trans-boundary character of the Oder river are the greatest asset of the container terminal, and they provide proper conditions for receipt and handling of a greater number of containers than previously. Therefore, it provides solid basis for handling container logistic chains, based on inland waterways transport.

5. CONCEPT OF CONTAINER LOGISTIC CHAINS WITH PARTICIPATION OF THE INLAND WATERWAYS TRANSPORT

Currently, the containers from the Port of Szczecin reach the container terminal almost only via road transport. It may be assumed that in case of reaching class IV of navigability conditions in the Oder river, allowing to realize international water transport, new cargo streams will be generated, or proneness to containerization of the existing ones will improve. In case of the Port of Szczecin, an average time for container clearance (if of course there are no premises to control it or to undertake other actions), is the shortest among all Polish sea ports: so-called transit clearance lasts about 30 minutes, while the procedure of approval for trading only 15 minutes. The standards mentioned above allow to shorten the clearance time significantly and reduce the associated costs, thus enabling operation of a greater volume of containers, which would be transported via inland waterways. Figure 3 presents a scheme of an elaborated container chain in the Port of Szczecin, considering the shipment costs via inland and rail transport.

![Diagram of container chain](image)

**Figure 3.** A scheme of an elaborated container chain in the Port of Szczecin, considering the shipment costs via inland and rail transport [own work]

Shifting part of the loads from road to inland waterways or railway transport, and taking over new streams of containers, will bring numerous positive effects. The safety level on roads will improve as a result of relieving road transport and reducing congestion. It allows to
realize an ecological strategy of transport development, pursuant to the transport policy. External costs of transportations will be reduced, among others in relation to a lower number of road accidents and their consequences, or lower emission of harmful substances to the natural environment.

6. CONCLUSIONS

Development of transportation techniques and technology brought changes to the significance and role of particular branches of transport in cargo handling. An increase in size of sea ships leads to greater demand for transportation of large amounts of container loads at once at the ports’ facilities, which may turn out insufficient for operation of growing container turnover (Statistical Pocketbook 2014). The inland waterways transport is predisposed to a transport function in the container logistic chains, handling the transportation needs for the sea ports’ facilities, by: incomparably greater transportation capacity of the inland waterway vessels in comparison to road or railway transport; a low level of costs; relatively high safety and the lowest harmful influence on the natural environment. Location of the Port of Szczecin at the Oder river contributes naturally to the role of a logistic hub in handling of container cargo, from east to west and from north to south, fully integrating all transport branches. Establishment of a network of connections between inland and sea European ports, where the river-sea Port of Szczecin may play a key role in the container logistic chains, should be one of priority directions intensifying development of the Container Terminal in Szczecin.

References


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