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THE ROLE OF INLAND SHIPPING IN THE HANDLING OF SEA PORT HINTERLAND

Abstract

The research shows that in the Western European Countries due to many of its advantages inland shipping plays a significant role in total throughput of cargo in the sea ports. On the other hand, the marine ports significantly affect the supply of cargo mass imposed on the inland waterways. In Poland the inland waterways transport plays a significant role only in the handling of transport needs of the ports Szczecin-Świnoujście. This mode of transport is not used for the cargo transport in the relations with Gdańsk marine port, even though this port is located at the estuary of lower Vistula waterway. The European experience should lead to an implementation of infrastructural investments which would improve the land access to the Port of Gdańsk and an implementation of investments which would allow the adaptation of the port infrastructure to the handling of inland waterways barges.

Keywords: marine ports, port throughput, inland waterways transport, waterway, lower Vistula

Introduction

The competitiveness of a marine port is increasingly determined by the quality of the infrastructural relations of the port with its hinterland. The ports which do not have convenient connections with the hinterland lose part of their cargo, which is taken over by ports with better transport connections. The activities aimed at creating most convenient transport connections of the port with its hinterland for a safer, cheaper and faster carriage of large cargos, result in an improvement of the port competitiveness. These expectations are largely met by inland shipping. Inland waterways, unlike roads, are not congested and they have a high throughput. Out

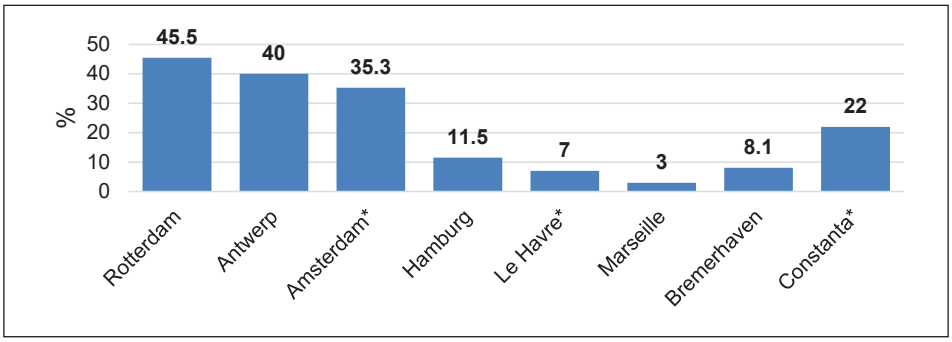
of the total of 40 thousand km of the European inland waterways, 20 thousand km is accessible for ships with tonnage of 1000 tonnes. The attractiveness of this mode of transport can also be proven by the fact, that the handling of an 18 thousand TEU vessel requires 9000 cargo vehicles or 225 trains (train capacity of 80 TEU) but only 60 river ships (INE, 2016).

The goal of the article is therefore to assess the position of inland shipping in total volume handled in the biggest marine ports in Western Europe and in Poland. The study used a method involving desk research based on the analysis, verification and consolidation of existing statistical data from various sources, including such as: analytical reports, Internet, press.

The results of this research can become the basis for the establishment of the infrastructure development directions, which would improve the access to marine ports in Poland from the side of the land. A thesis can be assumed that inland waterways should be included in this process.

1. The role of inland shipping in the hinterlands of European marine ports

In the Western Europe, the inland shipping plays the most vital role in total throughput of cargo in the ARA group sea ports (Amsterdam, Rotterdam, Antwerp). These ports are connected with the Netherlands inland waterways system, Belgium and with the Rhine waterway, which connect important economic centres, which supply a vast cargo mass. The share of inland shipping in the handling of this group of parts is: 35.3% in Amsterdam, 45.5% in Rotterdam and 40% in Antwerp (Figure 1).



* data for 2013

Figure 1. The share of inland waterways transport in the handling of chosen sea ports in 2016

Source: (Zentralkommission für die Rheinschifffahrt, 2014, 2017; INE, 2016)

In the largest European marine port – Rotterdam, 110 thousand (in 2015) and 100 thousand (in 2016) riverboats were handled (Zentralkommission für die Rheinschifffahrt, 2017). In the conditions of increasing congestion and throughput barriers of the road network, the use of inland waterways transport network

allow a significant decrease of the road traffic. On estimate, the Rotterdam port accessibility via waterway route allows a decrease of 100 thousand cargo vehicles of traffic daily (INE, 2016).

A high significance of the inland shipping in the handling of the Rotterdam port is further proven by the fact that approximately 70% of the cargo volume transported between Germany and Rotterdam is carried on the inland waterways, especially the Rhine waterway. The share of rail transport is estimated at around 10% and share of road transport at less than 20%. (Te mann, 2017).

The research shows that the role of inland shipping cargo transport in the hinterland of the Rotterdam port is increasing. It amounted to 147.1 million tonnes in 2010 and increased to 158.1 million tonnes in 2016 (Figure 2).

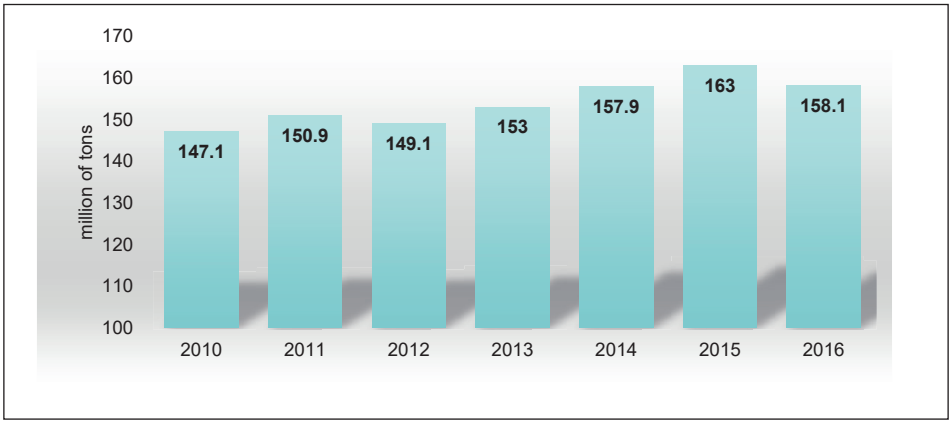


Figure 2. The inland shipping cargo transport in the hinterlands of the Rotterdam port in 2010-2016 [million tonnes]
Source: (Zentralkommission für die Rheinschifffahrt, 2017)

Inland shipping also plays a significant role in the handling of the Antewerp sea port hinterland. In 2016, 58 thousand riverboats were handled in this port and the inland shipping in the hinterland amounted to 97.3 million tonnes (Figure 3), 55% of which were bulk liquid cargo and 25% were machine and container cargo (Zentralkommission für die Rheinschifffahrt, 2017). A high share of the inland shipping in the transport of liquid cargo in relation with the hinterland results from the fact that the Antwerp port specialises in the handling of this type of cargo, especially the chemicals (Zentralkommission für die Rheinschifffahrt, 2014).

On the other hand, the Port of Hamburg is connected with the Elbe system waterways (Elbe, Elbe Side Canal, Elbe-Lubeck Canal, Elbe-Havel Canal) and the Port of Bremerhaven – with the Weser inland waterway. These routes have far lower parameters than the Rhine and they do not connect industrial centres and regions which would have comparable economic significance as the regions connected by the Rhine. As a result, the share of inland shipping in the handling is far lower than it is in the case of the ARA group ports. As, the Figure 1 shows, in 2016 this share was at a level of 11.5% for the Port of Hamburg and 8.1% for the Bremerhaven port.

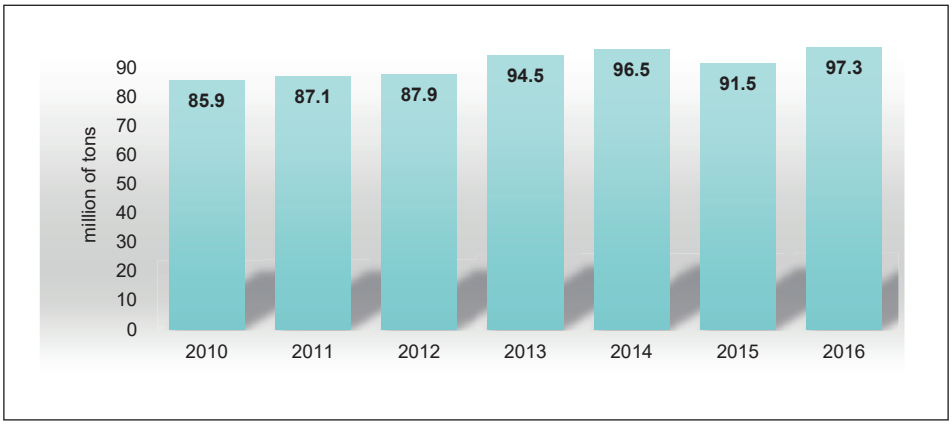


Figure 3. The inland shipping cargo transport in the hinterland of the Antwerp port in 2010–2016 [million tonnes]
Source: (Zentralkommission für die Rheinschifffahrt, 2017)

In 2016, in Hamburg 20.3 thousand riverboats were handled and the share of inland waterways in total throughput of cargo of this port amounted to 11.5%. This mode of transport has a high share in the processing of the bulk cargo. In relations with the hinterland, inland shipping carries 40% of liquid bulk cargo and 20% of dry bulk cargo (Zentralkommission für die Rheinschifffahrt, 2017; Port of Hamburg, 2017).

On estimate, the carriage on the Elbe in the handling of the Port of Hamburg amounts to more than 10 million tonnes yearly and constitute more than 60% of total carriage on this waterway (Figure 4). The carriage on the Weser waterway had a similar share in the handling of the Port of Bremerhaven. Whereas the total carriage are estimated at 8.4 million tonnes, the carriage in the handling of the Bremerhaven marine port are estimated at 5.1 million tonnes (Figure 5). These results prove that the demand on the inland waterways cargo transport is heavily determined by the handling of the marine ports located at the estuaries of these waterways.

Sea ports have an especially high share in the demand generation for the container inland shipping transport. On estimate 2/3 of the container transport carried out on the Rhine waterway is the result of the connections between this waterway with the marine ports. In relation to the Elbe waterway system, the container transport is nearly totally connected with handling of the the Port of Hamburg (Figure 6). In 2015 it amounted to 89.3% and in 2016 to 90.1% of the whole container transport volume on the Elbe.

In the case of the Weser waterway in years 2010–2016, the average share of container transport in the handling of the Port of Bremerhaven in the total container transport in this route was a bit lower and amounted to around 60%, whereas it decreased to 42% in 2016. As the Figure 7 shows the container transport on this inland waterway amounted to 147 thousand TEU, 62 thousand of which was in relation with the Bremerhaven port.

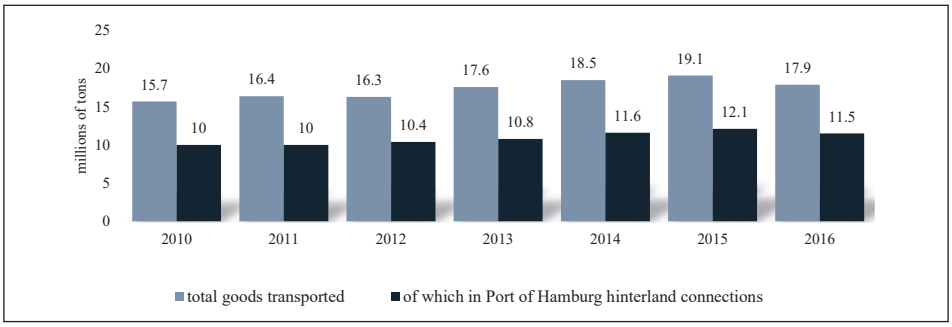


Figure 4. Elbe cargo transport, including the transport connected with the handling of the Hamburg port [million tonnes]
Source: (own elaboration based on: Bundesverband der Deutschen Binnenschifffahrt e.V., 2017; Zentralkommission für die Rheinschifffahrt, 2017)

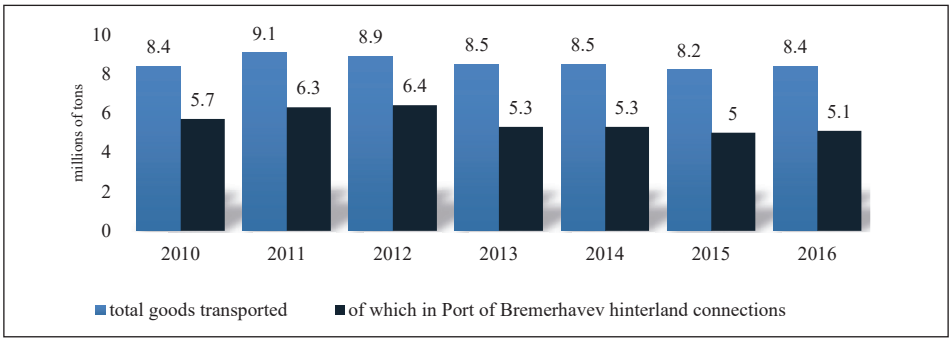
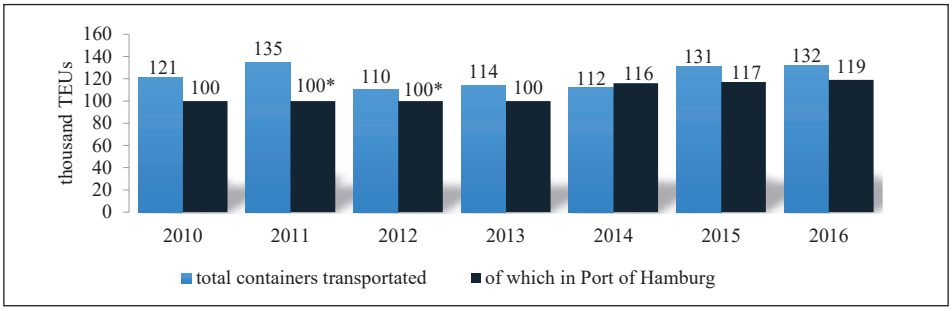


Figure 5. Weser cargo transport, including the transport connected with the handling of the Bremerhaven port [million tonnes]
Source: (own elaboration based on: Bundesverband der Deutschen Binnenschifffahrt e.V., 2017; Ports of Bremen/Bremerhaven, 2017)



* estimate container transport volume

Figure 6. Container transport in the Elbe system inland waterways and the handling of the Port of Hamburg [thousand TEU]
Source: (own elaboration based on: Bundesverband der Deutschen Binnenschifffahrt e.V. 2017; Zentralkommission für die Rheinschifffahrt, 2017; Port of Hamburg, 2012, 2017)

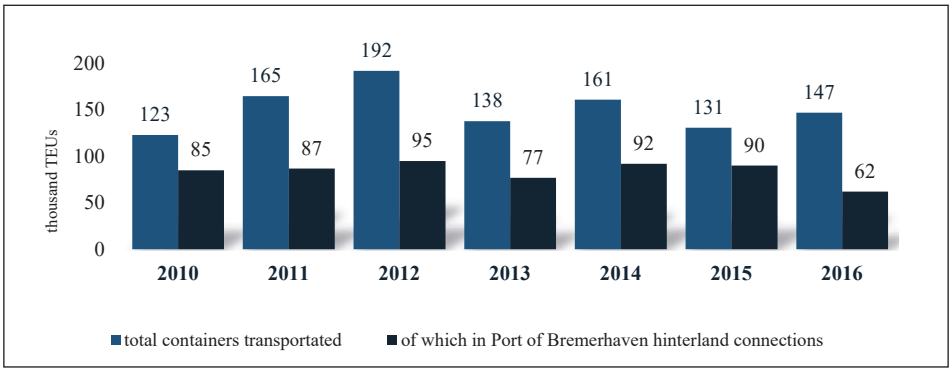


Figure 7. Container transport in the Weser waterway and the handling of the Port of Bremerhaven [thousand TEU]
Source: (own elaboration based on: Bundesverband der Deutschen Binnenschifffahrt e.V. 2017; Ports of Bremen/Bremerhaven, 2017)

The increase of the volume of cargo transport, including the container transport in the inland waterways handling of the Bremerhaven port is mostly a result of the adaptation of the middle part of the Weser between Bremen and Minden to the requirements posed by the modern great motor barges (Gromotorschiff – GMS) which have the length of 110 m, the width of 11.4 m, the tonnage of 2100 tonnes and the draft of 2.5 m[1].

Currently on the 55 km long middle part of the Weser the navigation with the use of GMS is only possible in one direction, on the 16 km long stretch – only the "Europaschiff" ships, which are 85 m long can navigate. On these stretches it is important to widen the riverbed on the bends and to modernise the existing locks. Higher possibilities of GMS motor barges operation would allow a significant increase of the throughput on the Weser waterway. This is due to the fact that the capacity of the GMS barges is significantly higher than the capacity of Europe type barge. Whereas a Europe type ship can carry 54 TEU, a GMS barge can carry 96 TEU (Wasserstraßen- und Schifffahrtsverwaltung des Bundes, 2017). On estimate, due to the modernisation of this stretch of the Weser, the demand for the container transport in the relation between e.g. Bremen and East Westfall would increase do 250 thousand TEU (Reckleben, 2017), which would significantly decrease the road traffic in the region.

The performed analysis shows that the inland waterways transport plays a vital role in the total volume handled in sea ports. On the other hand, the marine ports significantly affect the supply of the cargo mass imposed on the inland waterways. Marine ports play an especially significant role in the creation of demand for the container transport. The container transport which is carried out on the inland waterways, despite its low share in the total inland waterways transport (10% of total transport), is mostly the result of the cooperation between the inland waterways transport and the marine ports.

[1] GMS can be operated at a draft of 2.8 m, in which the capacity is equal to 2300 tonnes.

2. The position of inland shipping in the hinterland of the Polish marine ports

In Poland, inland shipping plays a significant role only in the handling of transport needs of the ports Szczecin-Świnoujście. On estimate, the share of this mode of transport amounts to around 8%. From the point of view of different cargo groups, this mode of transport is important in the handling of bulk cargo. In this group the share is estimated at 11%. In the case of the general cargo the inland waterways share amounts to 3.8%, but these is the non-container cargo (Kulczyk, 2010).

On the other hand, in the hinterland of the Port of Gdańsk, inland shipping works only incidentally, whereas the Port of Gdynia has no direct connection with the Vistula waterway. The use of this waterway in the handling of this port would require the use of river-marine boats or organising the transport in a mixed system, which would result in an increase of the handling costs and a decrease of the inland waterways transport competitiveness.

Currently, the restricted spectrum of the multimodal transport connections between Polish sea ports and the hinterland result in some of the cargo owners benefiting from the competitive offer of the Port of Hamburg. As a result, on estimate, the Polish marine ports lose 4.5 million tonnes of cargo per year (Hamburgisches WeltWirtschaftsInstitut, 2015). The scale of the loss can be proven by the decrease of the sales revenue and the net profit generated on average from the handling of 1 million tonnes of cargo. In 2016, the marine ports in Poland handled 72.9 million tonnes of cargo, the revenues on the services of handling and storage of cargo amounted to 7127.2 million PLN and the net financial result on this activity amounted to 183.1 million PLN (GUS, 2017). This means that the handling of 1 million tonnes in 2016 resulted in a revenue of 97.8 million tonnes and a net financial result of 2.5 million tonnes for the handling and storage enterprises.

3. The determinants of including the lower Vistula inland waterway in the handling of the Port of Gdańsk

An improvement of the competitiveness of the Polish marine ports is strongly determined by the infrastructure investments, which improve the shore-side accessibility of the sea ports. An increase in the multimodal connections between the ports and the hinterlands play a vital role in this process.

Due to the dynamic increase of the Port of Gdańsk throughput, the Vistula waterway between Gdańsk and Warsaw (401.2 km), should be an important link link of the transport system in this port hinterland. This is the lower and middle part of this waterway. The concept of the barraging of this route was prepared in 2014 and it involved the construction of nine new barrages located in: Warsaw, Wyszogród, Siarzewo, Solec Kujawski, Chełmno, Grudziądz, Gniew, Tczew (Szymkiewicz, 2017). The implementation of this concept would allow to create an international waterway of class Va parameters. This means that the Vistula waterway

between Gdańsk and Warsaw would be accessible to pushtows and motor barges of up to 3000 tonnes of tonnage.

The inclusion of inland waterways transport in the handling of the Port of Gdańsk would also require an adaptation of this port to the handling of inland waterway barges. Currently, this port is not sufficiently adapted to cooperate with the inland shipping.

Conclusions

Inland waterways are perceived to be a vital part of the transport systems in the hinterland of the marine ports in many European countries. In Poland the role of the inland shipping in total throughput of cargo in the sea ports is insignificant.

Currently, the underdeveloped spectrum of multimodal connections between the marine ports and the hinterland results in cargo gestors choosing the service offered by competitive ports. The loss of cargo to the benefit of the competitive ports results in the loss of significant financial profits. Hence, the European experience should compel the policymakers to implement investments which would improve the shore-side accessibility of the marine ports, also through the economisation of inland waterways. Given the dynamic growth of the largest Polish marine Port of Gdańsk, these actions should be firstly carried out on the lower Vistula waterway at the Gdańsk-Warsaw stretch.

The infrastructure of the Port of Gdańsk is currently not adapted to the handling of the river barges. Hence, apart from the economisation of the lower Vistula, it would be necessary to adapt the port to the handling of inland waterways barges.

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