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The role of maritime container terminals in the provision of logistics services
Rola morskich terminali kontenerowych w świadczeniu usług logistycznych

Abstract*:* A modern maritime container terminal must provide services within its area or in the nearby logistics centers. What is more,so as to adjust to changing market conditions marine terminals have to provide service packages for cargos (retail and distribution, handling, transportation and transshipment), vessels (supply, repair, towing, mooring or industrial and other auxiliary services) and a crew (social, health, hotel or information services). Since ports are forced to widen the range of their services to stay competitive in the global economy, in the article the role of maritime container terminals will be described in the provision of logistics services.

Keywords: sea port, maritime container terminal, logistics services

Streszczenie*:* Nowoczesny morski terminal kontenerowy musi oferować usługi bezpośrednio na swoim obszarze lub w tworzonych na terenach przyportowych centrach logistycznych. Dostosowanie działalności terminali portowych do zmieniających się warunków rynkowych związane jest z koniecznością tworzenia pakietów usług logistycznych na rzecz ładunków (usługi handlowo-dystrybucyjne, manipulacyjne, transportowo-przeładunkowe), statków (usługi przemysłowe, zaopatrzeniowe, naprawczo-remontowe, holowniczo-cumownicze i inne pomocnicze) oraz załogi pływającej (usługi socjalne, zdrowotne, hotelarskie oraz informacyjne). Ponieważ porty zmuszone są rozszerzać swoją ofertę obsługi na usługi pozostające dotychczas poza sferą ich działalności, w niniejszym artykule omówiona zostanie rola morskich terminali kontenerowych w świadczeniu różnego rodzaju usług logistycznych.

Słowa kluczowe: port morski, morski terminal kontenerowy, usługi logistyczne

Introduction

Sea ports attract a variety of economic and logistics activities and are attractive locations for central distribution and logistics centers with a multinational scope. They also have to face competition from inland locations for value added logistics services. For these reasons modern maritime container terminals have to offer logistics services in these aspects that had usually not been provided by sea ports. Since ports are forced to widen the range of their services to stay competitive in the global economy, in the article there the role of maritime container terminals in the provision of logistics services for cargos (retail and distribution, handling, transportation and transshipment), vessels

(supply, repair, towing, mooring or industrial and other auxiliary services) and a crew (social, health, hotel or information services) will be described.

Main types of logistics services

The main factors that determine the competitiveness of the sea port on the services market include[1]:

- frequency and number of ship departures;
- quality of transportation links between the port and its hinterland (e.g. time, cost and security of transportation);
- degree of development of port's main functions;
- competitive position of the port;
- prices and quality of port services.

Nowadays the increasingly important question is what activities in logistics can be attracted by sea ports. In most ports logistics activities generate more employment than terminal activities. What is more, activities in logistics are in most ports the most attractive growth options[2].

A maritime logistics chain consists of three large sections: the purely maritime activities, goods handling in the port and hinterland transport services[3]. The necessity of temporary storage in ports and the presence of efficient transport services (shipping and intermodality) make ports potentially attractive locations for logistics activities. On the one hand, the cargo handling system consists of such activities as pilotage, towing and stevedoring that facilitate the loading and unloading of cargos. On the other hand, cargo handling is strongly linked to the transport system[4].

The port is a cluster of organizations in which different logistics and transport operators are involved in bringing value to the final consumers. This value comes into play when a logistics supplier goes beyond the mere transportation of goods (which is a basic service) and provides a package of logistics services differentiated on the basis of customers' requirements. A value added activity is, therefore, an activity that adds value to the product or service the final customer is willing to pay for[5].

It appears that the current trend of port selection is shifting from prices (port dues/taxes, handling tariffs etc.) to product (services time, reliability and quality). Thus, ports skip from traditional services to value added services as they need to offer more to their customers than simply acting as a mooring facility[6].

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[1] H. Klimek, M. Nowicki, *Organizacja i eksploatacja portów morskich. Podręcznik do ćwiczeń*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 1998, p. 20.

[2] *See:* P.W. de Langen, *A framework for analysing seaport clusters,* Academic Paper, Erasmus University Rotterdam, Rotterdam 2001.

[3] OECD, *Competition in Ports and Port Services,* DAF/COMP(2011)14, Paris 2011, http://www.oecd.org/ regreform/sectors/48837794.pdf [access: 22.05.2014], p. 272.

[4] V. Carbone, M. de Martino, *The changing role of ports in supply-chain management: an empirical analysis,* "Maritime Policy & Management" Vol. 30, no 4/2003, p. 310.

[5] *Ibidem*, p. 306.

[6] The range of value-added services provided in or near ports has increased substantially in recent years as a result of the outsourcing of logistics management to specialist organizations and the use of IT. But still many ports are reluctant to provide value-added services themselves, or even to facilitate private sector provision of such services at locations in or near the port. *See:* PwC & Panteia, *Meas-*

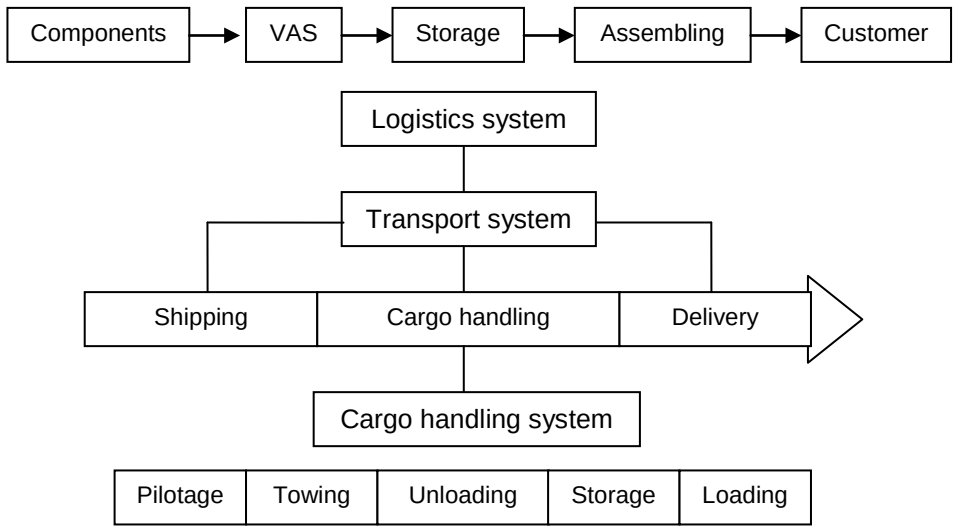

Fig. 1. The relation between cargo handling, transportation and logistics
Source: V. Carbone, M. de Martino, *op. cit.*, p. 310.

Table 1. Difference between core and value-added services

Core services	**Value-added services**
Marine services (towage, pilotage)	General logistics services (stripping, stuffing, warehousing, distribution)
Terminal services (stevedoring, marshalling)	Logistics chain integration services (quality control, packing and repacking, customizing, repair)
Ship repair services	Value-added facilities (parking, container repair and maintenance, tanking, social services)
Real-estate management (infrastructure provision and maintenance)	
Information management (planning, marketing, promotion)	

Source: H. Meersman, E.V. de Voorde, T. Vanelslander, *Competition concerns in ports and port services,* University of Antwerp, Antwerp 2012, http://fsr.eui.eu/Documents/Presentations/Transport/1EMaritimeTRF/121109VanelslanderThierry.pdf [access: 27.05.2014], p. 6.

ures to enhance the efficiency and quality of port services in the EU, Final Report submitted to European Commission Directorate-General for Mobility and Transport Unit B3 Ports & Inland Navigation, July 2013, http://ec.europa.eu/transport/modes/maritime/studies/doc/2013-07-ia-port-services.pdf [access: 15.05.2014], p. 12.

Core competencies are basic traditional functions of ports while value added services include logistics services in the developed market. The main functions of most sea ports are cargo-handling, pilotage and tug services, sometimes agency and forwarding services operated either by the same company or a separate government owned company.

It seems that currently most ports provide only a narrow range of logistics services[7] (see columns A and B of Table 2).

Table 2. The range of logistics services by groups of activities

Logistics services			
Storage and handling of supplies	**Transportation and handling of goods**	**Market research and marketing information system**	**Financial transactions, bank and insurance services**
A	**B**	**C**	**D**
Storage of goods	Transportation of goods	Market research	Leasing
Warehouse ramp service	Intermodal transportation	Marketing information system	Credits
Distribution of goods	Multimodal transportation	Demand forecasts	Trade credit
Location of depots	Bimodal transportation	Sales report, barcodes	Audit
Disassembly of cargo	Securing cargo during the transport	Sales volume planning	Controlling
Creation of loading units	Labeling cargo during the transport	Competition testing	Bookkeeping
Packaging	Loading point service	Public relations	Collection of charges
Warehouse planning	Vehicle routing	Promotion	Factoring
Cold rooms services	Planning a payload of vehicles	Advertisement	Cargo insurance
Warehouse services	Handling services	Statistical quality control	Carrier/operator insurance

Source: A. Łapko, *Porty morskie w nowej roli*, „Magazyn portowy" nr 10(85)/2008.

According to sea carriers, however, a sea port should provide[8]:

- timely delivery and loading of goods;
- fast transportation through the port;
- low prices for services;
- wide range of services;
- accurate invoicing.

As a result, adaptation of port operations to changing market conditions forces sea ports to create special packages of logistics services the examples

[7] E. Gołembska, *Kompendium wiedzy o logistyce*, PWN, Warszawa 2006, p. 270.
[8] S. Szwankowski, *Funkcjonowanie i rozwój portów morskich,* Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2000, p. 115.

of which are listed in Table 2. The logistics strategy in relation to port operations should therefore concentrate on offering logistics services in these aspects that had usually not been provided by sea ports[9]. Within port areas or nearby there are built logistics centers which include warehouses, railway sidings, container repair services, gas stations and hotels[10]. They provide not only such services as transportation, handling, storage, distribution or completion of cargos but also satisfy a client's need for marketing, financial or social services.

Unfortunately, many ports are unable to provide potential customers with the right combination or standard of services because they do not have the right mix of infrastructure. The main criticisms of quality of service focus on[11]:

- availability: firstly the customer's ability to define the cargo handling services to be provided by the port and secondly the ability of the port to provide or facilitate value-added logistics services;
- speed: time taken to service ships and cargo;
- reliability: consistency of port performance;
- flexibility: ability to provide alternative solutions when things go wrong.

Logistics services provided by maritime container terminals

Ocean carriers have been increasingly using regional hubs for transshipment of containers. This is accomplished via a network of regional and sub-regional hubs with onward service to outlying locations, in this way major ports developed so called feeder services. The largest ports have become key logistics centers, while smaller ports started to play the role of feeder ports for them. Feeder vessels transport cargo to the port, where it is placed onto large vessels to be taken to its final destination[12].

The growth in container volumes and the concentration of container flows on a limited number of hubs, which partially derives from the increasing vessel size, requires the development of new terminal infrastructure at maritime terminals. In addition to the pressure that such vessels impose on the terminal cargo handling capabilities, those larger vessels also require higher capacity in hinterland transportation or a rationalization and better use of existing transport alternatives. Facilities for devanning, clearing, staging and storing containers are increasingly shifting inland, thereby becoming more decentralized. These

[9] H. Salmanowicz, *Systemy transportowe w obsłudze obrotu portowego,* Zeszyty Naukowe Politechniki Warszawskiej no 71, Warszawa 2009, p. 210.
[10] J. Fijałkowski, *Transport wewnętrzny w systemach logistycznych. Wybrane zagadnienia*, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000, p. 246-249.
[11] PwC & Panteia, *op. cit.*, p. 11-13.
[12] Deloitte, *Porty morskie jako ogniwa międzynarodowych multimodalnych ciągów transportowych w obrocie lądowym i lądowo-morskim ze szczególnym uwzględnieniem zagadnień konkurencji międzygałęziowej oraz substytucyjności poszczególnych rodzajów transportu,* projekt 2004/016-829.02.03 Ochrony Konkurencji, Warszawa 2007, ftp://ftpf.uokik.gov.pl/analizy/rezultat5_v2.pdf [access: 14.05.2012], p. 19; OECD, *Competition in Ports and Port Services,* DAF/COMP(2011)14, Paris 2011, http://www.oecd.org/regreform/sectors/48837794.pdf [access: 22.05.2014], p. 25; The International Bank for Reconstruction and Development/The World Bank, *The Evolution of Ports in a Competitive World* [in:] *Port Reform Toolkit 2ed.,* Washington 2007, p. 52.

developments are creating a hierarchy of ports and changing traditional terminal operations[13].

Regardless of the above mentioned tendencies, in order to use a maritime container terminal a range of intermediary services is often required, which can be provided by the terminal itself or by independent intermediary parties. Most important terminal services include[14]:

- pilotage;
- towage;
- cargo-handling that includes:
  - marshalling services;
  - stevedoring services.

Pilotage is a service provided by a pilot with local knowledge and skills which enable him to conduct the navigation and maneuvering of a vessel in and approaching the harbour. Towage is provided by tug boats which move larger ships that either should not or cannot power themselves. The main problem concerning pilotage and tug services is usually price. Pilotage and towage are examples of choke points. If pilot boats or tugs are not available for ship assist, the port may continue to function but not necessarily at the normal level of efficiency[15].

Finally, cargo-handling involves the movement of cargo in and around a port. These activities are conducted in a facility or port terminal constructed on the port surface, according to the types of goods to be handled, e.g. containers. Marshalling services involve the receipt, storage, assembly and sorting of cargo in preparation for delivery to a ship's berth, while stevedoring may be defined as the loading of cargo onto and discharging cargo from ships[16].

The set of services offered by a maritime terminal can also be classified into ship's services and good's services[17]:

- ship's services:
  - services for the use of port infrastructure;
  - services to perform internal navigation;
  - general services for ships.
- good's services related to the handling of goods.

Ships require different services to access a port, these are referred to as infrastructure services, and assistance to ships for reaching a dock – so called

[13] M. Acciaro, A. McKinnon, *Efficient Hinterland Transport Infrastructure and Services for Large Container Ports,* OECD/ITF, Santiago 2013, p. 3.
[14] M. Christowa-Dobrowolska, *Konkurencyjność portów morskich basenu Morza Bałtyckiego,* Studia no 48 Akademii Morskiej w Szczecinie, Szczecin 2007, p. 16.
[15] The choke point is an activity in the port without which the port cannot function effectively. The choke point can also be trucking to and from the port, warehousing operations or other services where a slowdown for whatever reason can quickly stall operations in the port. Service providers in these types of activities have considerable bargaining power in dealing with port management. *See:* The International Bank for Reconstruction and Development/The World Bank, *The Evolution of…*, p. 35.
[16] OECD, *Competition in Ports…*, pp. 156-157.
[17] K. Misztal, S. Szwankowski, K. Wasilewska, *Problemy kształtowania lądowo-morskiej infrastruktury transportowej w obsłudze polskiego handlu zagranicznego i tranzytu,* Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 1997, p. 10.

technical-nautical services. The infrastructure services refer to the use of means created in a terminal so that vessels can access it and remain there while loading or unloading goods (berthing, dockage and wharfage). Services for the ship's internal navigation are those that allow the ship to access, under the best security conditions, the docking area. These services need the guidance of a marine area expert, who should lead the ship to the dock and a boat (trailer) to aid the ship perform the maneuvers ordered by the pilot[18]. Once the ship is in the berthing area it should be ready for cargo maneuver activities that requires the ship to be secured to the dock (mooring, tying). Additionally, there are a number of services offered to the ship and its crew known as general services. They include fuel, food, drinking water, equipment and electric power supply , waste/sewage gathering and disposal, security, maintenance, cleaning and repair of the ship or disinfection services.

Good's services related to the handling of goods include loading, unloading, storage, haulage, consolidation and processing of cargo. It is important to consider that in sea ports diverse services are carried out and different port terminals are available which feature specific facilities, according to the goods they handle. For example, container terminals tend to have gantry cranes and require space (patio); grain terminals have silos or storage facilities, fluid terminals have storage tanks and pipelines at dockside; mineral storage terminals are usually equipped with a mineral deposit area and a special location, in respect to other port terminals, to avoid the potential harm of mineral waste in other cargo. Is should be also noted that unlike technical-nautical services, cargo-handling is typically provided in a competitive environment. In three out of four core ports in Europe there is more than one operator inside the port providing this type of service[19].

Types of services provided by maritime container terminals not mentioned above are as well[20]:

- container services;
- inspection services;
- public services;
- social services;
- information services;
- miscellaneous.

Container services may include leasing, trading, packing, repairing and cleaning of boxes. Inspection services apply to goods. They consist of checking the quantity, volume or weight of the cargo and taking its samples in order to conduct appropriate analyzes in laboratories. People counting cargo are called

[18] It should be noticed that a port's fleet is divided into a production and auxiliary one. Production vessels perform services for the ship and its cargo, provide transportation within the port's area and bunker the ship (tugs, pilot boats, storage vessels, lighters, barges, floating cranes, tankers). The auxiliary fleet is used for business purposes (fireboats, dredgers, hopper barges, oil catch tanks). *See:* J. Żaboklicka, H. Przybylska, *Ekonomika portów śródlądowych. Wybrane zagadnienia,* Wyższa Szkoła Morska w Szczecinie, Szczecin 2001, p. 65.

[19] PwC & Panteia, *Measures to enhance…*, p. 59.

[20] ESCAP, *Commercial Development of Regional Ports as Logistics Centres,* United Nations, Bangkok 2003, p. 20-22.

tallymen, weighting goods - weighters and those who take samples are samplers[21].

A public service is usually provided by the government to people living within its jurisdiction. Examples of public services in container terminals are customs, fire brigade, water police, watch keeping or traffic control. Social services are a range of public services provided for crews and terminal personnel including such things as health care, housing, social security or catering services.

A real-time exchange of information is the most useful type of service included in terminal's ITS (Intelligent Transportation System) and IT/ICT (Information/ Information and Communication Technology) systems. Computer systems that streamline and facilitate trade of goods, supply logistics and customs practice should be introduced in all marine terminals. Such systems may use cargo tracking modules, chip cards, non-intrusive cargo inspection systems, smart charging systems, multi-modal information about the movement of people and planned vehicle routes, traffic information and the system of delivery notification. Additionally, management systems manage operations associated with the navigation of the vessel in the area of roadstead (anchorage areas), approach channels (pilot area), operations during the approach to the wharf and ship berthing or cargo handling. What is more, a vessel traffic surveillance system VTS (Vessel Traffic Services) or VTMIS (Vessel Traffic Management and Information System) are systems that are commonly used in maritime container terminals to collect and consolidate information on arrivals of ships, cargo current status or condition of local roads[22].

Operators of marine container terminals provide other services to ships and port users too. For example, in a relevant number of European ports dredging is directly provided by the port managing body, thus preventing other providers from entering the market. As a result, the level of competition in such services is quite low both in small and large ports. In some cases weather may determine the demand for special types of service. A long winter with freezing seas generate a specific need for ice breaking in the Finnish shore and ports. Finally, in many marine container terminals throughout the world cable television providers are increasingly offering telecommunication services, as are Internet service providers[23].

Conclusions

So to adjust to changing market conditions a modern maritime container terminal must provide a wide range of services within its area or in nearby logistics centers. The worldwide market for port services is estimated to generate available revenues of $50–55 billion annually. This is a large available market that should be of interest to a wide variety of port service providers. Terminal operations is the most advanced area in terms of the private operation of

[21] Z. Chuchla, *Morski statek transportowy. Eksploatacja i elementy zarządzania,* Akademia Morska w Gdyni, Gdynia 2009, p. 108.
[22] T. Abramowicz-Gerigk, Z. Burciu, *Systemy bezpieczeństwa i obsługi autostrady morskiej,* Prace Naukowe Politechniki Warszawskiej no 70, Warszawa 2009, p. 6-7; 10.
[23] OECD, *Competition in Ports…*, p. 225; PwC & Panteia, *Measures to enhance…*, pp. 41-42, 54.

port services. Although port authorities often own and operate the harbour tugs used for ship assistance, dredging has traditionally been performed by commercial dredging contractors or port authority personnel using publicly owned dredgers. What is more, increasingly sophisticated IT is spreading throughout the port sector as users demand more timely information to support their logistics systems. This is producing a variety of opportunities to design, install and operate IT systems in ports throughout the world. Environmental facilities and ship safety can also be performed by the private sector (e.g. operating a ballast water treatment plant in the port or vessel management system). Finally, warehousing and storage, container freight station operation, port security and equipment maintenance are all activities that can be operated by the private sector[24].

Literature references

Abramowicz-Gerigk T., Burciu Z., *Systemy bezpieczeństwa i obsługi autostrady morskiej,* Prace Naukowe Politechniki Warszawskiej no 70, Warszawa 2009.

Acciaro M., McKinnon A., *Efficient Hinterland Transport Infrastructure and Services for Large Container Ports,* OECD/ITF, Santiago 2013.

Antonowicz M., *Rozwiązania informatyczne dla transportu morskiego w koncepcji autostrad morskich*, VI Międzynarodowa Konferencja Naukowa Porty Morskie 2006, http://www.portymorskie.pl/2006/01.pdf [access: 10.03.2012].

Carbone V., Martino de M., *The changing role of ports in supply-chain management: an empirical analysis,* "Maritime Policy & Management" Vol. 30, no 4/2003.

Christowa-Dobrowolska M., *Konkurencyjność portów morskich basenu Morza Bałtyckiego*, Zeszyty Naukowe Akademii Morskiej w Szczecinie no 48, Szczecin 2007.

Chuchla Z., *Morski statek transportowy. Eksploatacja i elementy zarządzania,* Akademia Morska w Gdyni, Gdynia 2009.

Deloitte, *Porty morskie jako ogniwa międzynarodowych multimodalnych ciągów transportowych w obrocie lądowym i lądowo-morskim ze szczególnym uwzględnieniem zagadnień konkurencji międzygałęziowej oraz substytucyjności poszczególnych rodzajów transportu,* projekt 2004/016-829.02.03 Ochrony Konkurencji, Warszawa 2007, ftp://ftpf.uokik.gov.pl/analizy/ rezultat5_v2.pdf [access: 14.05.2012].

ESCAP, *Commercial Development of Regional Ports as Logistics Centres,* United Nations, Bangkok 2003.

Fijałkowski J., *Transport wewnętrzny w systemach logistycznych. Wybrane zagadnienia*, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000.

[24] PwC & Panteia, *Measures to enhance…*, pp. 61-63.

Franc P., Horst van der M., *Understanding hinterland service integration by shipping lines and terminal operators: a theoretical and empirical analysis,* "Journal of Transport Geography" no 18(4)/2010.

Gołembska E., *Kompendium wiedzy o logistyce*, Wydawnictwo PWN, Warszawa 2006.

Klimek H., Nowicki M., *Organizacja i eksploatacja portów morskich. Podręcznik do ćwiczeń*, Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 1998.

Kubicki J., Kuriata A., *Problemy logistyczne w modelowaniu systemów transportowych,* Wydawnictwa Komunikacji i Łączności, Warszawa 2000.

Langen de P.W., *A framework for analysing seaport clusters,* Academic Paper, Erasmus University Rotterdam, Rotterdam 2001.

Łapko A., *Porty morskie w nowej roli*, „Magazyn Portowy" no 10(85)/2008.

Meersman H., Voorde de E.V., Vanelslander T., *Competition concerns in ports and port services,* University of Antwerp, Antwerp 2012, http://fsr.eui.eu/Documents/Presentations/Transport/1EMaritimeTRF/121109 VanelslanderThierry.pdf [access: 27.05.2014].

Misztal K. Szwankowski S., Wasilewska K., *Problemy kształtowania lądowo-morskiej infrastruktury transportowej w obsłudze polskiego handlu zagranicznego i tranzytu,* Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 1997.

OECD, *Competition in Ports and Port Services,* DAF/COMP(2011)14, Paris 2011, http://www.oecd.org/regreform/sectors/48837794.pdf [access: 22.05.2014].

PwC & Panteia, *Measures to enhance the efficiency and quality of port services in the EU,* Final Report submitted to European Commission Directorate-General for Mobility and Transport Unit B3 Ports & Inland Navigation, July 2013, http://ec.europa.eu/transport/modes/maritime/ studies/doc/2013-07-ia-port-services.pdf [access: 15.05.2014].

Salmanowicz H., *Systemy transportowe w obsłudze obrotu portowego,* Zeszyty Naukowe Politechniki Warszawskiej no 71, Warszawa 2009.

Stank T.P., Keller S.B., Daugherty P.J., *Supply chain collaboration and logistics service performance,* "Journal of Business Logistics" Vol. 22, Issue 1/2001.

Szwankowski S., *Funkcjonowanie i rozwój portów morskich,* Wydawnictwo Uniwersytetu Gdańskiego, Gdańsk 2000.

The International Bank for Reconstruction and Development/The World Bank, *The Evolution of Ports in a Competitive World* [in:] *Port Reform Toolkit 2ed.,* Washington 2007.

Woodburn A., *An Investigation of Container Train Service Provision and Load Factors in Great Britain*, "European Journal of Transport Infrastructure Research" Vol. 11, no 2/2011.

Żaboklicka J., Przybylska H., *Ekonomika portów śródlądowych. Wybrane zagadnienia,* Wyższa Szkoła Morska w Szczecinie, Szczecin 2001.