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DEVELOPMENT OF INTERMODAL TRANSPORT BY ORGANIZING GROUP PURCHASING OF TRANSPORTS

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Abstract – The purpose of the article is to recognize the contexts of intermodal transport development in Poland, with particular recognition of the factor of group purchases of this service. The aim of the research is to find out the opinions of the participants of the logistics-transportation processes on the opportunities and threats to the development of intermodal transport, and to seek opinions on the introduction of a new entity responsible for group purchasing to the market. The article is divided into four chapters. The first chapter discusses legal and financial factors supporting the development of intermodal transport in the European Union. Examples are given of countries that have made the most of this support and have good practices of their own for activating this multi-branch form of transportation. The second chapter, using secondary data, presents the dynamics of intermodal transport development in Poland. The third chapter presents the methodology of own research. Collecting and processing primary data, threats and opportunities for the development of the multi-branch form of transport in Poland were identified, and the results are presented in the four chapter. The results of own research clearly indicate the need to eliminate barriers to the development of multimodal transport in Poland (including by appointing bodies organizing transport purchases).

Key words – intermodal transport, group purchasing

JEL Classification – R41, R42

INTRODUCTION

Intermodal transportation is supported by legislative actions of the European Union. Actions, directives and financial support are the result of the provisions of the White Paper - "Plan for a Single European Transport Area". The development of intermodal transport is particularly evident in such EU countries as Germany, France and the Netherlands. Poland's railroads have been neglected for many years, making them slow and costly, and this has shifted a significant portion of transport from rail to road. Despite the infrastructure facilities it has, or the overall amount of freight carried, rail in Poland has become an unattractive mode of transport. Cargoes transported, are mainly raw materials (coal, metal ores and food products). The share of highly processed goods transported by Polish railroads is about 10 percent of the total volume. In Western European countries, this type of transportation accounts for about 40 percent of the total volume. Since 2016, intensive efforts are also underway in Poland to increase the use of intermodal transport (i.e. modernization of the railroad line and point infrastructure). What has been neglected is the information and IT infrastructure. The customer/shipper's choice of intermodal transport depends to a large extent on the availability of information about the possibilities, conditions and prices of this multi-branch form of transport, in which many service providers participate. It seems that the introduction of a group purchasing entity for intermodal transport services would accelerate its development.

The purpose of the article is to recognize the contexts for the development of intermodal transport in Poland, with particular recognition of the factor of group purchasing of this service. The aim of the research is to find out the opinions of participants in the logistics-transportation processes on the opportunities and threats to the development of intermodal transport and to seek opinions on the introduction of a new entity responsible for group purchasing to the market.

The article is divided into four chapters. The first

chapter discusses legal and financial factors supporting the development of intermodal transport in the European Union. Examples are given of countries that have made the most of this support and have good practices of their own for activating this multi-branch form of transportation. The second chapter, using secondary data, presents the dynamics of intermodal transport development in Poland. The third chapter presents the methodology of own research. Collecting and processing primary data, threats and opportunities for the development of the multi-branch form of transport in Poland were identified, and the results are presented in the four chapter.

1. INTERMODAL TRANSPORT IN THE EUROPEAN UNION

1.1. DEFINITIONS AND BASIC LEGISLATION ON INTERMODAL TRANSPORT IN THE UE

Intermodal transport is the carriage of one and the same integrated cargo unit by different modes of transport using technology that allows free transshipment (without interfering with the cargo inside the unit). (Economic Commission for Europe, 4th editions) Integrated cargo units such as containers, swap bodies, truck trailers are used to implement intermodal transport [1]. The main reason for the success of mass containerization was the standardization of technical parameters on a global scale. Work in this regard began in 1958 by the American Standards Association, however, the International Standards Organization (ISO) was the biggest contributor to this process. The ISO defined the term container in 1968. The inter-branch handling of containers takes place in so-called intermodal terminals. Intermodal terminals are spatial facilities with the right organization and infrastructure to enable the transhipment of intermodal transport units: containers, swap bodies and semi-trailers between modes of transport belonging to different branches of transport, and to perform operations on these units in connection with their storage and use. Determining the correct location of the terminal is an extremely important issue. A prerequisite is the location at the intersection of different modes of transport, trunk railroads and highways. Location considerations allow to divide terminals into three types: port terminals, rail terminals, intermodal terminals (perform the functions of a rail-road or rail-road-river terminal). They are most often located within a logistics center and their main task is to handle cargo streams to and from the logistics center) [2].

The United Nations Economic Commission for Europe (UN / ECE), together with the European Parliament, the European Commission and the European Conference of Ministers of Transport (ECMT), have looked into sanctioning international law for modal transportation.

Since the 1950s, Europe has seen an increase in activities supporting the development of modal transportation. Distances of more than 500 kilometers were considered a profitable limit for rail transportation. The situation changed abruptly during the oil crisis caused by the embargo of OAPEC member states. and subsequent crises. As a result of these arrangements, customers/shippers began to return to rail transportation, which was considered more favorable as a result of the massive electrification of rail traction additionally financed by the states. Simultaneously, the negative effects of trucking such as noise, road accidents, air pollution from exhaust fumes and road capacity constraints by heavy motor vehicles began to be observed. As a result of these factors, since the late 1970s we have seen a reversal of transportation trends in Western Europe. As a result, many European countries began to pay more attention to other consequences of the massive use of automobile transportation. They began to impose restrictions or even stop truck traffic on Saturdays, Sundays as well as at night. Gradually, tolls for trucks to use highways were increased and some roads, especially in tourist-attractive areas, were excluded for heavy vehicles. The greatest restrictions were imposed by the Alpine countries, due to their transit location. As transit countries, the Alpine countries were relatively quick to emphasize shifting cargo from road to rail. In the 1970s, between Germany and Italy, only about 30 percent of freight was handled by rail-road transport. In this situation, a number of restrictions were introduced to force carriers to switch from road to rail:

- time restrictions for vehicles over 3.5 tons, the possibility of driving only on weekdays,
- bans on entering the area, some cities,
- installation of devices monitoring the content of harmful substances in exhaust fumes,
- at border crossings,
- thorough inspections of the technical condition of vehicles,
- lowering the permissible weight of trucks from 40 to 28 tons.

The development of intermodal transport has been fostered by successive favorable legal acts in force throughout the EU. The most important ones for intermodal transport are cited in Table 1.

The EU's archival and current legal acts indicate unequivocal support for the development of intermodal transport as the most environmentally beneficial.

Table 1. The most important legal acts of the EU concerning intermodal transport
Source: own compilation based on archival and current legal acts indicate support for the development of intermodal transport

UE law	– Directive 92/106/EEC on the establishment of common rules for certain types of combined transport of goods between Member States; – Regulation 913/2010/EU of 22 September 2010 on a European rail network for competitive freight transport; – White Paper. Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system of 28.03.2011; – Directive 2012/34/EU of the European Parliament and of the Council of 21.11.2012 establishing a Single European Railway Area; – Regulation 1316/2013 of the European Parliament and of the Council of 11.12.2013 establishing the Connecting Europe Facility; – Regulation 1315/2013 of the European Parliament and of the Council of 11.12.2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU (Article 51).

In 2001, the White Paper "European transport policy until 2010. Time for Decisions" (Brussels 12.09.2001) was the first EU-wide document that set the directions of transport policy. The assumptions of the White Paper became guidelines for individual member states and laid the foundation for future legislative action by the European Commission. It stated that achieving a sustainable transport system is possible by intensifying the development of rail, inland waterway and short sea shipping. Affirmed the goal (with a concomitant assumption for the new member) states to keep rail freight above 35 percent of other modes.

Projects implemented on the basis of the 2001 White Paper:

– opening the Single European Rail Market,
– adoption of new projects for the Trans-European Network (TEN),
– creation of the Single Sky project, a single post-airspace in the EU,
– creation of the Marco Polo program (2003 - 2006) and its continuation in the form of the Marco Polo II program (2007-2013),
– new technology projects: ERTMS, SESAME initiative,
– announcement of the GALILEO program,
– announcement of an intra-Community road safety plan,
– creation of the European Maritime Safety Agency (EMSA), the European,
– aviation Safety Agency (EASA) and the European Railway Agency (ERA),
– legislative packages Erika I and Erika II; providing for increased inland navigation safety and the phasing out of unsafe vessels.

Also noteworthy are the intermodal transportation financing programs: Marco Polo I and II. These were the first programs directly involving funds from the EU budget. The rationale for their introduction was the results of analyses carried out in September 2001, which showed that if no measures were taken, road freight transport would increase by 50 percent by the end of 2010. The very ambitious goals of the programs, i.e. modal shift, for MP I of 12 billion tkm and for MP II up to 20.5 billion ton-km, have not been realized, despite high financial outlays for: Marco Polo I - €102 million, for Marco Polo II - €450 million. (A report by the European Court of Auditors (ECA), Luksemburg 2013)

The programs failed to attract a sufficient number of applicants. Half of the projects proved unsustainable, and most would have been implemented regardless of EU funding. The ECA report made it clear that obtaining support under the Marco Polo programs was risky, lengthy, complicated and expensive. The average time to obtain funds was two years, which, with the changing market, was too long. In addition, the beneficiaries bore the total financial burden in terms of the development of auxiliary infrastructure, as the programs conditioned subsidies on the number of ton-miles moved, which could be estimated once the infrastructure was in place. Grant applications were overly complicated which forced grantees to rely on consultants to prepare documentation. As a result of the analysis, the ECA ordered the discontinuation of EU funding for Marco Polo programs and recommended that future actions be based on an assessment of the impact of the benefits of ongoing projects [3].

Due to the failure of previous EU programs related to the development of modalities on the territory of member states, the European Commission issued in 2010 another "White Paper 2010 Plan for a Single European Transport Area - Towards a competitive and

resource-efficient transport system", the assumptions of which are in line with into the adopted comprehensive strategy "Transport in 2050". Establish a competitive transport system with the goal of increasing mobility, stimulating job growth, as well as reducing Europe's dependence on oil imports while reducing carbon dioxide reductions in the transport sector by 60 percent by 2050. To achieve these goals, a profound transformation of existing transport in Europe is necessary.

The main goals for 2050 include: (White Paper. Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system, European Commission, Brussels 28.03.2011):

– remove barriers and bottlenecks in a number of key areas such as transportation infrastructure and investments in this sphere,
– by 2030, rail and inland waterway transport should take over no less than 30 percent of road freight transport over 300 km and by 2050 – 50 percent.
– launch of a fully operational EU network of transport corridors, in a way that allows efficient interconnection of different modes of transport (TEN-T network of special importance) by 2030 and by 2050 fully interconnected and computerized,
– connecting all airports of special interest with a high-speed rail network, which is suitable for high-speed connections with the most important ports,
– making full use of existing land and maritime transportation management systems such as ERTMS, ITS, RIS, SafeSeaNet and LRIT20.

Under the European Commission's findings, and as a result of the failure of the earlier Marco Polo I and II assistance programs, the main support measures have been ceded to EU member states, which, being more aware of local issues, can more effectively influence the development of intermodality.

Table 2. Support from governments of selected EU countries for intermodal transport
Source: own elaboration base on: Intermodal transport development directions to 2030 with an outlook to 2040, Centre for EU transport projects, pp. 38

Support	Germany	France	Austria	Switzerland	Netherlands
Subsidies for infrastructure	YES	YES	YES	YES	YES
Subsidies for suprastructure	YES	YES	YES	YES	NO
Subsidies for thermianal equipment (railcars, intermodal units)	NO	NO	YES	YES	NO
Co-financing of operating costs	NO	YES	YES	YES	YES
Average annual budget in million euros					
Year 2000	137	56	85	76	61
Year 2020	100	47	22	72	63

1.2. SUPPORT FOR INTERMODAL TRANSPORT IN SELECTED COUNTRIES IN WESTERN EUROPE

Support for intermodality in Germany [4-6]

The federal government has been promoting the construction and expansion of intermodal handling facilities of non-federal companies since 1998. Funding is up to 80 percent of eligible expenses paid as non-refundable grants for the construction and expansion of handling facilities. In 2012, legislative provisions were amended to make it easier to grant funds and licenses. Among the main changes were:

– abolition of the previously mandatory absolute bank guarantee,
– proportional consideration of the effects of shifting profitability calculations on routes, in other European countries, not just on German territory,
– horizontal handling equipment including trailer ramps was made eligible for financing,
– the response time to the application to the Federal, Railway Administration and the Directorate General of Waterways and Shipping has been reduced to 1 month,
– the period of financial support has been extended from 3 to 4 years so as to reduce the financial risk for applicants,
– a development concept until 2025 has also been developed and implemented so that local authorities can direct their activities in accordance with federal environmental guidelines.

Thanks to the measures taken, the increase in intermodal transport from 2004 to 2016 was 150%, and rail freight work by 38%. At the end of 2020, the European Commission, at the request of the German federal government, agreed to public support for freight transport. A pool of €350 million is to be distributed to industry players by 2023, with funds to be directed to cover up to 45% of the amount of rail infrastructure access fees. The subsidies are intended to influence lower freight rates which is expected to encourage companies to choose rail transport.

Support for intermodality in France [7]

The French state has been promoting intermodal transport for nearly a decade, with a particular focus on river transport. Measures are aimed at completing rail, road, inland waterway transport along with maritime cabotage (one efficient system). The amount of subsidies is divided according to whether they involve intermodal transport using the rail or river and maritime sectors. The total amount of the subsidy program in the form of preferential loans is €24.1 million, of which €16.5 million is to be allocated to the rail sector and the remaining €7.6 million has been allocated to intermodal transport performed by sea or river. The funds are to be used to modernize and restore the river system, develop the Atlantic rail route and preparation of new sea routes. A strong emphasis has been placed on supporting the national GSM-R rail network and programs to support safety in road and rail tunnels. In to 2020, 31 operators benefited from central funding.

Table 3. French state support for intermodal transport
Source: Ministere de la Transition Ecologique de la France

Support 2013 - 2017						**Support 2018 - 2022**		
Funding year	2013	2014	2015	2016	2017	2018	2019	2020
Allocated amount (EUR million)	19,5	25,5	24,3	25,8	25,9	27	27	47

Support for intermodality in Austria [8-9]

Austria has been supporting activities in the intermodal transport sector at various levels of activity for many years. The state provides financial support for terminal investments used for handling facilities and special equipment. Entrepreneurs using intermodal transport can count on preferential rail access rates as well as tax discounts and exemptions. From 2009 to 2014, the "Innovations in Freight Transport 2009-2014" program was carried out, which provided financial support of up to 30 percent of eligible investment costs for the implementation of technological innovations and machinery fleet (containers, trailers, special vehicles). From 2013 to 2017, the Austrian government carried out the "Support Program for sidings and terminals," which with its measure supported up to 50 percent of eligible costs for the construction, expansion and modernization of freight transshipment points at the interface of road, rail and inland waterways. Thanks to the support measures of 2004 - 2015, intermodal freight increased sharply by as much as 74 percent and rail freight increased from 22 percent to 30 percent. Between 2015 and 2020, Austria carried out a program to support innovation in transportation. The program was based on percentage funding for projects related to multimodality. A total of 81 projects were financially supported, amounting to €12.2 million with an average funding rate of 13.1 percent.

Support for intermodality in Switzerland [10]

Because of its transit location, Switzerland places special importance on environmental protection and the negative effects of transportation, so the central government is developing intermodal transportation. Congestion costs are included in road tolls and additional toll revenues are transferred to fund rail infrastructure and noise protection. Road tolls have also been removed for transportation to intermodal terminals, i.e. the first and last mile. A total ban on truck traffic at night, Sundays and holidays has been introduced. Rail transportation is under special state supervision and companies using it can count on a 30 percent discount on infrastructure access costs for freight trains, which can additionally be increased to 40 percent in the event of delays as well as a 40 percent discount on traction energy if transportation takes place at night. The measures taken brought a 29 percent increase in intermodal freight between 2008 and 2016, as well as an increase in the share of intermodal freight on the railroads from 40.5 percent to 50.7 percent. Rail's share of transport across the Alps increased to 77 percent. The emphasis on external transportation costs has brought tangible benefits in the form of a halving of road accidents involving trucks. Between 2016 and 2020, the Swiss Parliament introduced a CHF 250 million credit line for the promotion of freight transport infrastructure. For the next perspective of 2021 - 2024, the amount of support has been increased to CHF 300 million dedicated to investment in private freight transport. Applicants themselves must bear at least 40 percent of eligible costs.

Intermodality support in the Netherlands [11]

The Dutch Ministry of Transport has established a special intermodal team to plan policy directions and coordinate various initiatives in the field of legislation and financial assistance for intermodal transport. Above that, the state finances in the form of loans, loan guarantees or partial financing various types of work in the expansion, modernization and development

of intermodal transport, among others:
- investments at public terminals and logistics centers (construction and modernization),
- modernization of railroad lines and transshipment facilities at railroad stations,
- modernization of inland waterway connections and transshipment facilities of inland waterway ports,
- purchase of intermodal transport units on a very limited basis up to the operating costs of combined transport, including mainly for launching new connections.

Regional branches have also been set up to promote intermodal transport in the region within the allocated budgets. Financial assistance is available to public terminal operators, railroads, inland waterway companies, intermodal transport operators, freight forwarders and road carriers, as well as shippers and logistics companies. Despite the small area of the Dutch state and its proximity to ports, the share of intermodal transport using rail is one of the highest in the EU, at around 37.

2. INTERMODAL TRANSPORT IN POLAND - CURRENT STATUS

2.1. LEGISLATIVE ACTS ON INTERMODAL TRANSPORT IN FORCE IN POLAND

The development of intermodal transport has been favored by further favorable legal acts in force throughout the EU. The most important legal acts for intermodal transport are cited in Table 4.

Table 4. The most important Polish legal acts for intermodal transport

Source: own compilation based on archival and current legal acts indicate support for the development of intermodal transport and Master plan for rail transport in Poland until 2030, Warszawa 2008

Polish Law	- Transportation Law of November 15, 1984. - Master plan for rail transport in Poland until 2030 (Annex to Resolution No. 277 of the Council of Ministers of December 19, 2008). - Strategy for Responsible Development (SOR) until 2020 (with an outlook until 2030) - document adopted by resolution of the Council of Ministers on February 14, 2017. - Strategy for the development of transportation until 2020. (with an outlook to 2030) dated January 22, 2013.

Fig. 1. Locations of intermodal terminals in Poland in 2020

Source: intermodal transport in Poland in 2020, Statistical Office in Szczecin, https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-intermodalny-w-polsce-w-2021-roku,14,6.html

2.2. POLISH CONDITIONS OF INTERMODAL TRANSPORT OPERATION

The potential of intermodal transport in Poland is not properly exploited and has a peripheral importance in relation to developed countries in Western Europe. Its lack of development is influenced by the heavily dominant road transport. Road carriers, which have dominated the transport market in Poland in the last decade, defend their own position and interests. (Ulutas, Bulent, et.al. 2020), (https://pitd.org.pl/news/siec-terminali-intermodalnych-w-polsce-zageszcza-sie).

However our country's convenient location at the intersection of Europe's main transport arteries, both east-west and north-south, is conducive to the creation of a significant intermodal hub in this central and eastern part of Europe. Every year the number of intermodal terminals in Poland increases. In 2020, 44 terminals were located in the country, including 6 handling sea-rail and sea-road shipments and 38 handling rail-road transport. (Antonowicz, 2018) There are 9.19 thousand square kilometers area per 1 terminal. This places Poland far below the EU average. Terminals are located unevenly in the vicinity of the largest agglomerations - Warsaw, Poznan, Krakow and Katowice, as well as being present in all major seaports - Swinoujscie, Gdansk, Gdynia and Szczecin. They primarily handle container handling, swap bodies and trailers. A map of the location of intermodal terminals in Poland (effective in 2020) is shown in Figure 1.

Most of the terminals would not have been opened were it not for financial support from the European Union. Intermodal transport is seen as an unprofitable and risky investment. The risk is not only due to infrastructure barriers or the slight cost advantage over road transport, but also to the low environmental awareness of the entrepreneurs contracting the transport services. (Factors affecting the intermodal transport development in the Greater Poland region) In 2019, the length of loading berths at marine terminals increased by 46.3 per cent - compared to 2017 - to 10.4 km. Also in the year under review, there was a 50.3 per cent increase in the number of berths and manoeuvring yards compared to previous years, and the area of berths and manoeuvring yards remained at the 2017 level at 8.0 ha. Rail infrastructure saw an increase in the total length of track and number of rail tracks at terminals, up 72.6 percent and 48 percent respectively compared to 2017. The average yard length (number of wagons) handled simultaneously was 60.8m in 2019. The area of the storage yards totalled 171.8 ha and their capacity for containerised units was 96.3 thousand TEUs. The data for the terminals are shown in Tables 5, 6, 7 in turn.

In 2019, we are seeing a decrease in parking and manoeuvring space at inland terminals by 20.1 percent compared to 2017, while the number of spaces increased by 14.2 percent. In the year under review, the length of rail track increased by 21.6 percent (compared to 2017) and amounted to 79.5 km, while maintaining the average maximum length of trainsets served at the same time, which was 34.9 (number of wagons). 2019 also saw an increase in yard area of nearly 44.3 percent compared to 2017, resulting in an increase in yard capacity for containerised units expressed in thousand TEUs of 73.3 percent compared to 2017.

Table 5. Infrastructure of maritime intermodal terminals

Source: GUS: https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-intermodalny-w-polsce-w-2021-roku,14,6.html

Specification	2017	2018	2019
Maritime infrastructure			
Length of transhipment quays in km	7,1	7,1	10,4
Including in the lo-lo system	5,4	6,3	8,4
Vehicle infrastructure			
Parking and manoeuvring area in ha	8,0	7,1	8,0
Number of spaces in parking and manoeuvring areas	318	318	478
Rail infrastructure			
Total length of rail track at the terminal in km	13,5	13,5	23,3
Designed directly for the loading and unloading of intermodal units	9,2	9,2	18,0
Average maximum length of trainset operated simultaneously	60,8	65,8	60,8
Number of rail tracks at the terminal	25	25	37
Designed directly for the loading and unloading of intermodal units	19	19	31
Storage area			
Total surface area of storage yards in ha	170,0	162,0	171,8
Dla jednostek skonteneryzowanych w tys. TEU	95,7	93,2	93,6

Table 6. infrastructure of land-based intermodal terminals

Source: GUS, https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-intermodalny-w-polsce-w-2021-roku,14,6.html

Specification	2017	2018	2019
Vehicle infrastructure			
Parking and maneuvering area in ha	20,4	22,4	17,9
Number of spaces in parking and maneuvering yards	459	503	524
Railroad infrastructure			
Total length of rail track at terminals in km	65,4	78,2	79,5
Designed directly for loading and unloading of intermodal units	29,0	40,0	37,1
Average maximum length of the composition operated simultaneously	33,1	34,5	34,9
Number of rail tracks at the terminal	135	176	173
Total area of storage yards in ha	91,6	124,3	132,1
Capacity of storage yards			
For containerized units in thousands of TEUs	76,0	90,7	131,7
For other intermodal units (trailers, bodies in units).	2 414	1 814	7464

Table 7. Growth of intermodal shipments in Poland [**TEU**]

Source: GUS, https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-intermodalny-w-polsce-w-2021-roku,14,6.html

Year	QI	QII	QIII	Q IV	Total	Change to 2010 (percent)
2019	513 065	511 300	540 579	572 178	2 137 122	266,18
2018	420 750	449 889	486 211	536 674	1 893 524	224,44
2017	393 702	406 479	416 855	448 143	1 665 179	185,32
2016	309 470	342 802	368 887	415 169	1 436 328	146,11
2015	284 399	263 020	281 173	323 161	1 151 753	97,35
2010	132 412	152 255	152 588	146 368	583 623	

Table 8. Percentage share of various integrated cargo units

Source: https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-intermodalny-w-polsce-w-2021-roku,14,6.html

Integrated cargo unit Percentage share	Percentage
Conteners 20’ ft	45,8
Conteners 40’ ft	43,1
Conteners 45’ ft	3,7
Conteners 35’ ft	1,7
Conteners 30’ ft	1,7
Semi-trailers and truck trailers	1,6
Swap bodies	1,1
Conteners 25’ ft	0,3

The intermodal transport market in Poland is growing year on year. Data on this subject is provided in Table 8, Figure 2 and Figure 3.

In 2019, the weight of cargo transported was 2.5 million tons higher than in 2018, amounting to 19.5 million tons of cargo, an increase over the previous year of 14.7 percent.

The year 2019 was also a record year for intermodal freight work, with 7.1 billion ton-miles, an increase of 0.9 billion ton-miles - up 14.5 percent on 2018.

Intermodal transport in Poland is primarily the carriage of containers, whose share at the end of 2019 was 96.4 percent of all cargo units. The percentage distribution of integrated cargo units is as follows (Table 9).

Information obtained from the Railway Transport Office and the Ministry of Infrastructure indicates that despite the almost regular development of point infrastructure in Poland, intermodal transport is further less competitive than in other EU countries. This state

of affairs is influenced by the low technical condition at terminals, the lack of adequate saturation with handling equipment, and above all the low transport speed of about 28.6 km/hr. (Office of Rail Transport). (Report on consultations with organisations representing users of rail freight services, Warsaw 2019) The currently existing terminals require expansion and modernization, carriers operating in this branch of transport complain about the lack of capacity for point infrastructure. A major problem is the limitations in the form of shortage of stop tracks on the access to the actual terminal, which affects the time of transport execution and consequently increases costs on the part of carriers as well as terminals, and discourages potential customers from using this solution. (Barcik, Bylinko, 2018). The main barriers to development are the cost of building special wagons, intermodal terminals and the lack of knowledge among potential customers. The Polish market is dominated by small and medium-sized road carriers, and Poland has the largest tractor-trailer fleet in the EU. Intermodal transport is consciously chosen only by entrepreneurs who emphasize CSR. It is necessary to develop regional and state policies and a model for supporting intermodal terminals with EU funds.

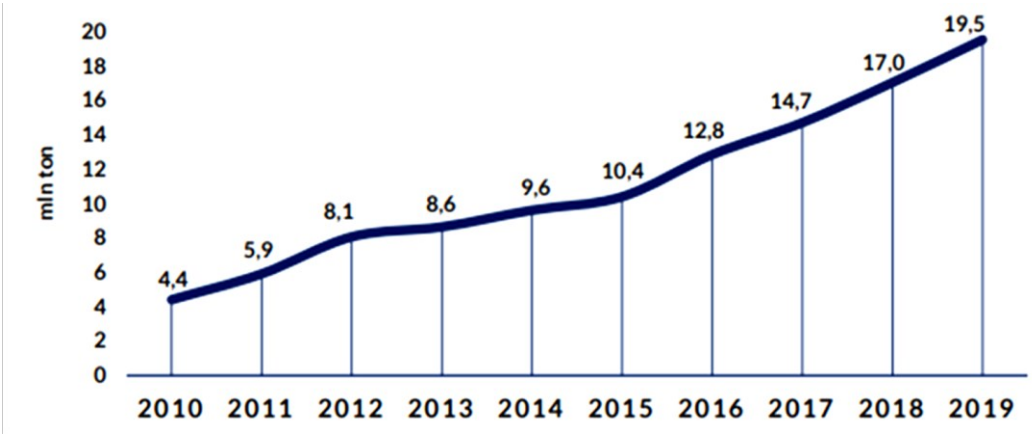


Fig. 2. Railway intermodal transport in Poland (**in million tons**)
Source: Office of Rail Transport, https://utk.gov.pl/pl/raporty-i-analizy/analizy-i-monitoring/statystyka-przewozow-to/16463, Przewozy-intermodalne-w-2020-r.html

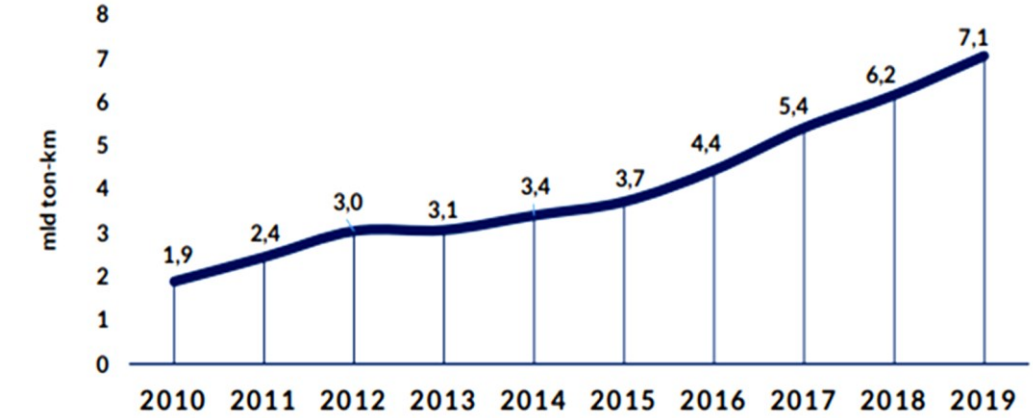
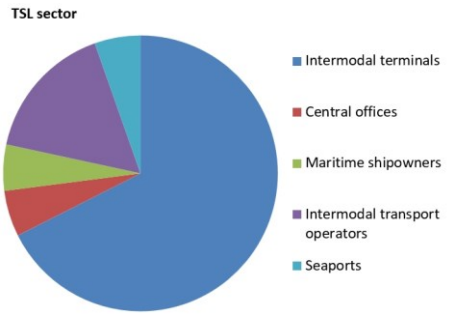
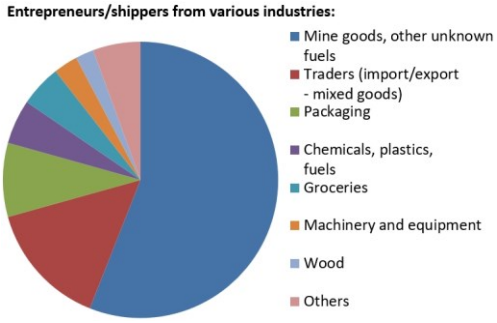


Fig. 3. Railway intermodal freight in Poland (**in billion ton-km**)
Source: Office of Rail Transport, https://utk.gov.pl/pl/raporty-i-analizy/analizy-i-monitoring/statystyka-przewozow-to/16463, Przewozy-intermodalne-w-2020-r.html

Table 9. Contexts of intermodal transport development - research results

Source: own compilation based on primary data

Results of a survey of those involved in organising intermodal transport	**Results of surveys conducted among entrepreneurs/shippers**
Type of entity involved in organising intermodal transport Source: own survey 	Companies/shippers participating in the survey by industry Source: own survey 
Main barriers to organising intermodal transport (the position in the list/result is the product of the importance of the selected answer and the number of companies/organisations indicating the specific barrier)	
1. Lack of standardisation of the intermodal transport process 2. Lack of a uniform consignment note and related system computerisation 3. Lack of technical solutions dedicated to intermodal transport 4. Lack of legal and financial support by the government 5. Insufficient railway infrastructure	1. Time-consuming freight transport (compared to traditional road transport) 2. Lack of standardisation of the intermodal transport process 3. Small number of intermodal transport organisers 4. Problems of access to transshipment terminals 5. Insufficient rail infrastructure
Main barriers to organising intermodal transport lying on the side of rail service providers (position in the list / score is the product of the importance of the selected answer and the number of undertakings/organisations indicating the specific barrier)	
1. Low number of railway border crossings 2. Lack of new high-speed rail routes 3. Small number of new intermodal terminals 4. Low speed of intermodal trains 5. Errors in the Government's Rail Plus Programme	1. Low number of new intermodal terminals 2. Low speed of intermodal trains 3. Limited access to wagons 4. Problems with ordering rail transport 5. High charges for access to rail infrastructure and high tariffs
Actions that could influence the standardisation of intermodal transport processes (position in the list / result is the product of the importance of the selected answer and the number of companies/organisations indicating the specific action)	
1. Introduction of systems for the automatic identification of rolling stock 2. Introduction of systems to improve work at transhipment points 3. Introduction of electronic waybills 4. Introduction of systems to improve the transfer of information between participants in intermodal transport 5. Updating information to IOUs	1. Establishment of a rolling stock exchange for intermodal transport 2. Updating of information to IOUs 3. Introduction of electronic waybills 4. Introduction of systems to improve work at transhipment points 5. Establishment of a single coordinator for transport process activities

Anticipated effects of the introduction of an intermodal groupage service (list item / result is the product of the importance of the selected answer and the number of companies/organisations indicating the specific effect)	
1. increasing shippers' interest in intermodal transport 2. A reduction in rail/terminal infrastructure access charges 3. Reduction of transport tariffs 4. Development of infrastructure for intermodal transport 5. Reduction of carbon footprint	1. Increasing shippers' interest in intermodal transport 2. A reduction in rail/terminal infrastructure access charges 3. Reduction of transport tariffs 4. Opportunity to demonstrate corporate environmental responsibility 5. Formation of business groups
The appointment of certified service providers responsible for organising group purchasing of intermodal transport will result in: (list item / result is the product of the importance of the selected answer and the number of companies/organisations indicating a specific effect)	
1. Reduced problems associated with handling individual transport orders 2. Possibility to organise industry dedicated charter services 3. Reduced organisational chaos and disinformation 4. Financial responsibility resting with one entity 5. Other	1. Minimising transport risks (including disinformation risks) 2. Saving time and money for shippers 3. Access to know-how 4. Access to professionals to help in case of trouble 5. Other
Anticipated effects of a rolling stock exchange on intermodal transport would improve the intermodal transport process (list item/score is the product of the importance of the selected answer and the number of companies/organisations indicating a specific effect).	
1. Unification of requests for tenders 2. Ease of identifying the entity responsible for the rolling stock 3. Transparency of transactions 4. Streamlining the process of controlling those involved in the intermodal transport process 5. Other	1. Streamlining the intermodal transport process 2. Possibility of verifying trading partners 3. Possibility of participating in online tenders 4. Possibility to send a request for proposal to any subcontractor on the market 5. Other

3. RESEARCH METHODOLOGY

The aim of the research is to find out the opinions of participants in the logistics-transport processes on the opportunities and threats to the development of intermodal transport and, above all, to obtain opinions on the introduction of a new entity responsible for groupage on the market.

The research used a purposive sampling method (companies participating in logistics-transport processes were surveyed) and shippers and companies from different industries commissioning transport of goods. The sample size was 137 entities, and included:

- Intermodal terminals: 25,
- Central offices *Office of Rail Transport, Regional Branches*: number of respondents 2,
- Maritime shipowners: number of respondents 2,
- Intermodal transport operators/shippers: number of respondents 6,
- Seaports: number of respondents 2,
- Entrepreneurs/shippers from various industries: number of respondents 100.

The research method was a diagnostic survey, the research technique was a questionnaire, the research tool was a survey questionnaire, containing 11 closed and open questions. The survey was carried out in November 2021 via email correspondence, telephone interviews and a paper mailed survey.

The research hypothesis was: "It is presumed that the introduction of a new entity responsible for group purchasing in intermodal transport will increase interest in this transport by shippers, and that companies involved in logistics-transport processes will want to cooperate with such an entity".

4. OPPORTUNITIES AND THREATS TO THE DEVELOPMENT OF INTERMODAL TRANSPORT IN POLAND - RESEARCH RESULTS

The following part of the article presents the results obtained from the research on intermodal transport, presenting the barriers to its development in a contextualised manner. Analysing the respondents'

answers (without dividing into Transport Spedition Logistics organisers and shippers), the following factors limiting the development of intermodal transport were distinguished [12-13], [11]:

- human factors,
- technical factors,
- information factors,
- political and legal factors,
- organisational factors.

Among the most frequently mentioned human factors were:

- lack of qualified staff with the specialised knowledge needed to organise intermodal transport,
- lack of competence among decision-makers of companies/shippers, such as: unfamiliarity with the law and procedures regarding intermodal transport e.g. INCOTERMS,
- fears among decision-makers of companies/shippers such as loss of competitiveness due to long delivery times, the risk of third parties interfering with the know-how of the company's procurement and distribution processes, lack of understanding of the need to protect the environment by shifting freight transport to rail.

Among the most frequently mentioned technological factors were:

- excessive waiting time for a freight offer from the rail carrier,
- lack of rolling stock or non-allocation of a route to the carrier by the infrastructure manager,
- low speed of rail transport and long procedures for organising and carrying out transport processes (infrastructure constraints),
- tracks that are too short to handle the entire trainload at transshipment terminals,
- lack of appropriate software to effectively manage the organisation of the transport process.

Among the most frequently mentioned information factors were:

- lack of a knowledge base on the potential to organise intermodal transport,
- lack of comprehensive and publicly available information on the potential for organising intermodal transport,
- lack of information on commercial offers to companies/shippers,
- lack of information on similar transport orders, which companies could combine to achieve economies of scale.

Among the most frequently mentioned political and legal factors were:

- problematic (difficult and expensive) acquisition of certificates allowing companies and employees to work in the organisation of intermodal transports,
- high charges for access to rail infrastructure (higher than road charges),
- lack of regulations to support entrepreneurs in transferring cargo from road to rail,
- outdated regulations for providing rail infrastructure facilities.

Among the most frequently mentioned organisational factors were:

- lack of a recommended central entity responsible for intermodal transport in Poland,
- lack of organisers for intermodal transport in the region.

Organisational barriers can be overcome. According to the respondents, the introduction of a new entity in charge of group purchasing in intermodal transport will increase public awareness and support the development of this transport. The emergence of another player in the service market will influence the development of new technological solutions that will force participants to have a more flexible pricing and discounting policy. Entrepreneurs/shippers through it will be able to join together and make group purchases of transport. By applying economies of scale, they will be able to influence intermodal transport service providers (forwarders, owners terminals and ports) as well as state authorities to introduce effective system solutions.

CONCLUSIONS

The competitiveness of intermodal transport depends on the development of methods that guarantee proper cooperation between partners involved in the logistics and transport process. Cooperation between traders/shippers and logistics service providers must be based on mutual trust in the exchange and protection of information. Cooperation must go beyond the usual patterns of behaviour and introduce a new standard of cooperation. The key for to efficient process execution must be found in overcoming the various barriers that interfere with the smooth running of logistics and transport processes. Indicative of the above studies, it appears that the establishment of a new group purchasing entity (and in the future a rolling stock exchange) will overcome some of the developmental difficulties.

In order to overcome the barriers mentioned by the respondents, it is also necessary to introduce a number of solutions, which were grouped as follows [14-16]:

1. Educational measures to overcome barriers related to the human factor, e.g:
   - introduction of university courses specialising in intermodal transport,
   - introduction of specialised courses in vocational

schools related to intermodal transport,
- professional training aimed at deepening knowledge in the field of international and European, transport law, or regarding forwarding in crisis conditions (pademic, war).

2. Infrastructure measures to overcome barriers related to technical factors e.g:
   - replacement of obsolete rolling stock on the railways,
   - introduction of modern rail platforms for the transport of semi-trailers and containers e.g: Modalohr, Cargobeamer, Flexiwaggon,
   - modernisation of existing and construction of new railway lines,
   - increasing the permeability of access infrastructure to ports,
   - construction of new container terminals, in locations ensuring their even distribution across Poland, in the vicinity of cities such as Konin, Kraków, Bydgoszcz, Białystok, Skarżysko-Kamienna, Kędzierzyn-Koźle, Ostrów Wielkopolski, Legnica, Olsztyn and Ełk,
   - interventionism / support for intermodal infrastructure in non-member countries that are Poland's trading partners (e.g. war-torn Ukraine).
3. Information activities to overcome barriers related to information factors e.g:
   - creation of a generally accessible knowledge base on intermodal transport, which will allow various operators to acquire practical knowledge in this field,
   - creation of a detailed knowledge base on logistics and transport opportunities along all transport corridors in Poland, the European Union and beyond,
   - introduction of information exchange platforms and blockchain in logistics and transport processes,
   - introduction of the Internet of Things (IoT) into logistics and transport processes,
   - introduction of an automated container locating system,
   - introduction of a rolling stock exchange,
   - introduction of an electronic consignment note.
4. legal and legislative measures to overcome barriers related to political, legal and organisational factors e.g:
   - development of aid programmes to support the development of infrastructure for intermodal transport and IT systems,
   - development of provisions for obtaining certificates authorising the operation of logistics and transport processes,
   - establishing a central entity responsible for intermodal transport in Poland, the European Union and beyond,
   - initiating the work of entities organising intermodal transport in the regions.

ROZWÓJ TRANSPORTU INTERMODALNEGO PRZEZ ORGANIZOWANIE ZAKUPÓW

Celem artykułu jest rozpoznanie kontekstów rozwoju transportu intermodalnego w Polsce, ze szczególnym rozpoznaniem czynnika jakim są zakupy grupowe tej usługi. Celem badawczym jest poznanie opinii uczestników procesów logistycznego – transportowego na temat szans i zagrożeń dla rozwoju transportu intermodalnego i zasięgnięcie opinii na temat wprowadzenia na rynek nowego podmiotu odpowiadającego za zakupy grupowe.

Artykuł podzielono na cztery rozdziały. W pierwszym rozdziale omówiono czynniki prawne i finansowe wspierające rozwój transportu intermodalnego w Unii Europejskiej. Podano przykłady krajów, które najpełniej wykorzystały to wsparcie i mają dobre własne praktyki aktywizowania tej wielogałęziowej formy transportu. W drugim rozdziale wykorzystując dane wtórne przedstawiono dynamikę rozwoju transportu intermodalnego w Polsce. Rozdział trzeci przedstawia metodykę badań władnych. Gromadząc i przetwarzając dane pierwotne zidentyfikowano zagrożenia i szanse dla rozwoju wielogałęziowej formy transportu w Polsce, a wyniki zaprezentowano w rozdziale czwartym.

Słowa kluczowe: transport intermodalny, zakupy grupowe

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