

## EVALUATION OF THE CROSS-BORDER AREA REGIONS POTENTIAL FOR THE DEVELOPMENT OF INTERMODAL TRANSPORT

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**Abstract:** The aim of the article is to assess the potential of regions of the cross-border area for the development of intermodal freight transport. The discussed cross-border area includes two voivodeships – Silesia and Opole. The choice of regions is dictated by research into the strategy of international freight transport development covering three countries – Poland, the Czech Republic and Slovakia. Separated territories (Moravian-Silesian Region, Silesia and Opolskie Voivodship, Local-government Country of Žilina) of these countries are part of the European Grouping of Territorial Cooperation – EGTC TRITIA. The analysis and assessment of potential is based on a series of reports, CSO data, expert opinions and a synthetic indicator of the potential assessment of the region, based on the taxonomic scope of development. To determine it, a model object (region) was used in relation to which the potential of the analyzed regions of the cross-border area was assessed.

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## 1. INTRODUCTION

Cooperation of border regions, defined as cross-border, is an important element of their development strategy. In accordance with the European Charter for cross-border regions, cross-border cooperation is defined as neighbourly cooperation between adjacent border regions or foreign cooperation of regional and local authorities, organizations or institutions representing these areas. An example of an institution supporting and promoting cooperation between the cross-border area of Poland, Slovakia and the Czech Republic is the European Grouping of Territorial Cooperation TRITIA (EGTC TRITIA), established in 2009. EGTC TRITIA covers the territory of: the Moravian-Silesian Region in the Czech Republic, the Silesian and Opole voivodships in Poland and the Local Government Region of Žilina in Slovakia. It covers an area of 24 566,09 km<sup>2</sup> and nearly 6.5 million inhabitants. Two large areas of the urban agglomerations of the region: Katowice and Ostrava, together with Žilina, combine intensive cooperation at the economic and social level, which is reinforced by the strategic location on the axis of the Baltic-Adriatic transport corridor. The most important goals of this cooperation include: facilitating the everyday life of the inhabitants of the Polish – Czech – Slovakian border; ensuring cross-border cohesion at the level of the whole area; implementation of strategic projects for joint development of regions. One of the main areas of activity of this association, alongside economic cooperation, tourism and energy directed towards renewable energy sources, is transport and infrastructure. In this area, the following global goal was assumed as: maximization of the geographical location of partner regions for their economic development, supported by the appropriate development of cross-border transport infrastructure and transport using endogenous potential of cooperating regions and taking into account the needs of accessibility and security, while respecting and friendly approach to natural environment. The specific objectives of this cooperation, i.e.: improvement of local and regional transport as well as support for low-emission forms of transport and greater efficiency of transport can be achieved through the use of intermodal transport. Intermodal transport is a concept that is widely analyzed in literature by many authors: (Jacyna, Pyza & Jachimowski, 2018), (Rokicki, 2018), (Monios & Bergqvist, 2017), (Konings, Priemus & Nijkamp, 2008) and others. This is mainly due to its impact on the reduction of external transport costs. Thanks to this advantage, intermodal transport is strongly taken into account in European, national and regional strategies. Therefore, the main objective of the article is to assess the poten-

tial of regions in the cross-border area, covering two voivodships: Silesia and Opole, related to the development of intermodal transport.

## 2. RESEARCH METHODOLOGY

The basis for the development of a research methodology for assessing the potential of regions in the cross-border area for the development of intermodal transport were research both in the statistical data defining the relevant dimensions being components of the assessment, and expert studies using the knowledge and experience of transport specialists and intermodal transport organization. The assessment of the intermodal transport market in the Śląskie and Opolskie voivodships was also indispensable in the research process. This assessment takes into account factors forming one of the groups of conditions competitiveness in Porter's diamond model. They are defined as so-called production factors or factor conditions that explain the emergence of an initial competitive advantage. These include the natural resources owned by the region.

**Table 1.** Selection of factors affecting the region's potential for the development of intermodal transport; own preparation

No.	Factor	Weight
1.	number of intermodal logistic centers	78
2.	number of available storage areas	82
3.	number of inter-branch transshipment terminals	89
4.	number of production and trade companies	69
5.	number of employees in transport and storage (according to PKD 2007, section H)	68
6.	number of logistic operators, including operators with the potential to carry out intermodal transport	74
7.	number of enterprises of section H according to PKD 2007	83
8.	length and quality of roads: rail, water, car	85
9.	the number and condition of cars for container transport	55
10.	number and condition of trailers, semi-trailers	42
11.	number of transport and logistics higher schools and the related number of graduates	26
12.	number and status of available water fleet	31
13.	the number and condition of platform wagons for container transport	36
14.	modern ro-ro transshipment systems	48
15.	infrastructure and capacity of transshipment terminals	58
16.	the number of innovations in transport and logistics companies	35
17.	number of intermodal logistic centers	34

However, M.E. Porter in his analysis proposed to go beyond and focus primarily on resources created in a given region (Obłój, 2007, pp. 211–212). On the basis of the initial list of factors, significant determinants influencing the potential of regions of the cross-border area for the development of intermodal transport were determined. Next, experts were asked to organize them according to the degree of their impact on the development of intermodal transport (validity of factors in the range from 0 to 100). The selection of factors for further research was made on the basis of the identification of those factors whose average grade was not less than 60 points. The results of factor selection are presented in Table 1.

Based on the factors distinguished as a result of the expert assessment, a synthetic index of the region's potential for intermodal transport was determined (IR-PIT). The IRPIT factor was calculated in accordance with the taxonomic development model. Taxonomic methods used to classify objects in literature are described by: (Antczak, 2013), (Gatnar, 1998), (Grabiński, Wydymus & Zeliaś, 1989), (Jajuga, 1993), (Szwabowski, Deszcz, 2001), (Zajac, 1994) and others. First, an observation matrix was developed, the elements of which are expressed in units characteristic for each factor. Then standardization of variables was carried out for the purpose of their mutual comparison and further analysis. The next stage was the construction of a development pattern (a model cross-border region). Unfortunately, both literature and standards or economic practice do not indicate and do not describe such a cross-border reference model. In connection with the above, an ideal, non-existent region characterized by the best parameters in the area of the analyzed factors of potential evaluation was adopted as a model. Therefore, in the following description, apart from the analysis of the Śląskie and Opolskie voivodships, the ideal level of the given factor will be indicated. The values of the standard (desirable values of indicators characterizing the reference object) were determined on the basis of reports and quantitative data contained in the CSO's studies.

In the studied case, all factors are stimulants, thanks to which the point  $P_0$ , with variables  $(z_{01}, z_{02}, \dots, z_{0s}, \dots, z_{0m})$ , which is the development pattern, proceeds according to the formula:

$$z_{0s} = \max z_{rs}, s \in I$$

where:

$I$  – a collection of stimulants,

$z_{rs}$  – s-standardized value for the variable  $r$  of the object.

Then the distance between the point was calculated  $P_0$ , and individual factors characteristic for the province Silesia and Opole according to the following formula:

$$c_{i0} = \left[ \sum_{s=1}^m (z_{is} - z_{0s})^2 \right]^{\frac{1}{2}}$$

where:  $i = 1, 2, 3, \dots, n$  (number of cases).

Based on the calculated distances, a taxonomic measure of development was determined - the IRPIT indicator:

$$IPRIT = 1 - \frac{c_{i0}}{c_0}$$

where:

$$c_0 = \bar{c}_0 + 2 \cdot s_0$$

$$s_0 = \left[ \frac{1}{n} \cdot \sum_{i=1}^n (c_{i0} - \bar{c}_0)^2 \right]^{\frac{1}{2}}$$

$$\bar{c}_0 = \frac{1}{n} \cdot \sum_{i=1}^n c_{i0}$$

The IRPIT indicator value is calculated according to the formula. Assuming the value of the model indicator at the level of 100% and subtracting the IRPIT value obtained from it, we get information on the extent to which the analyzed region differs from the standard and whether it really has potential in the development of intermodal transport. Experts have also been subjected to determine the ranges of values of IRPIT, below which we can talk about a weak potential of the region in the development of intermodal transport. So, in the range:

- from 0–25% - the region has no potential for the development of intermodal transport;
- from 26–50% – the region has a low potential for the development of intermodal transport, they required a fairly substantial investment funds to strengthen the factors identified;
- from 51–75% – the region is characterized by a significant potential for the development of intermodal transport;
- from 76–100% – the region has strong potential for the development of intermodal transport.

### 3. CHARACTERIZATION OF THE REGIONS POTENTIAL IN THE CROSS-BORDER AREA FOR THE DEVELOPMENT OF INTERMODAL TRANSPORT

The key factors that make up the potential of the Silesian and Opolskie Voivodships identified for the development of intermodal transport are discussed below. This analysis will constitute the entrance to the determination of the synthetic index of potential assessment of regions (IRPIT).

1. Number of intermodal logistic centres

The Silesian Logistics Center, located in Gliwice, operates in the Silesia Voivodeship. It has the character of an intermodal facility, under which road, rail and inland waterway transport are used. There is no intermodal logistic center in the Opolskie Voivodeship. There is a so-called Opole Logistic Center, however, it does not offer comprehensive services in the field of various modes of transport, therefore it is not able to carry out intermodal transport. The pattern was assumed as sufficient existence of one inter-branch logistics center in the region. In connection with this, the Silesian Voivodeship fully meets the assumed level of the parameter, while Opole does not meet this condition.

2. The number of warehouse spaces, including distribution centres

In the published reports there is no separation between storage facilities and distribution centers, hence the supply of warehouse space also covers the areas occupied by distribution centers. Silesian province is indicated as a region with a highly developed warehouse size, it ranks second in the country in terms of both demand and supply of warehouse space. One can particularly point here the cities of Katowice, Mysłowice, Gliwice, Chorzów, and Sosnowiec. The amount of warehouse space and distribution centers has been growing over the years. At the same time, the region is still indicated as one of the most competitive for new logistics investments.

A different situation is in the case of the Opolskie Voivodeship, which is located at distant places in terms of available warehouse space. In the annual rankings prepared by JLL (Warehouse market), there is only a general reference to the Opolskie Voivodeship and its warehouse space, located mainly in the vicinity of Opole. The so-called Opole Logistic Center, however, if it is available storage space, it is difficult to classify it as classic and developed logistics centers.

**Table 2.** Supply of warehouse space (2016); own preparation based on (JLL, 2017, pp. 1–2)

	Silesian Voivodeship	Opole Voivodeship	Masovia Voivodeship	Pattern – Silesian Voivodship
Supply of warehouse space (A) (thous. m <sup>2</sup> )	1 955 000	about 80,000 (no precisely defined size - estimated data from the chart)	2 511 000	1 955 000
A / total area of	158.52	8.50	70.62	158.52

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**the region ( $P_{cr}$ )**  
**(thou. m<sup>2</sup>**  
**/km<sup>2</sup>)**

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The largest warehouse space is disrupted by the Mazowieckie Voivodeship, however, the parameter of density of warehouse space in a given region is more reliable. Therefore, the province was accepted as a reference value Silesia region due to more than twice the value of the indicator in relation to the Mazowieckie Voivodeship.

### 3. The number of inter-branch transshipment terminals

The Silesian Voivodeship can be considered as well developed in terms of available inter-branch transshipment terminals. In its area, mainly four railway intermodal terminals are mentioned. These are (UTK, 2016, pp. 5-6): Cargosped Container Terminal (Gliwice), Euroterminal Sławków sp. O.o., PCC Intermodal – Terminal PCC Gliwice, Polzug Terminal Dąbrowa Górnicza. In addition, you should also indicate Port Gliwice, which is managed by ŚCL SA and Katowice International Airport in Pyrzowice, which acts as an air freight hub for the south of the country. In the Opolskie Voivodeship, one can name the water port of Kędzierzyn Koźle, which has plans for investments aimed at creating a modern logistics base. The Pomeranian Voivodeship (4 railway terminals, 1 air terminal, 6 waterways) was accepted as a model.

**Table 3.** The number of inter-branch transshipment terminals; own preparation

	<b>Silesian Voivodeship</b>	<b>Opole Voivodeship</b>	<b>Pattern – Pomerania Voivodeship</b>
<b>The number of inter- branch transshipment terminals (B)</b>	6	1	11
<b>B / <math>P_{cr}</math> in km<sup>2</sup></b>	0.000486	0.000106	0.000601

### 4. Number of production and trade companies

The production and commercial entities were included in the evaluation of the region's potential due to the fact that they are the most basic group being the transport client. They represent sections C and G in the PKD 2007 classification. Their number affects the level of market demand for transport services, including those of an intermodal nature, and thus the level of absorption of the transport market. As the table in the Silesian Voivodeship shows, there is a very large number of production and trade companies, whereas in the Opole Voivodeship the situation is definitely different. The Opole Voivodeship is to a large extent agricultural in nature, rather than industrial. Its future is also unfavorable in this respect due to the

low investment attractiveness of both an industrial and service nature of the region. In the Silesian Voivodship, the same parameter is at the highest level (first place in the country in terms of total investment attractiveness) (Instytut Badań nad Gospodarką Rynkową, 2016). This gives rise to the assumption that the region will continue to grow strongly in this respect, which will also interpret into the number of companies operating on the market.

**Table 4.** Number of production and trade companies (2016); (www.bdl.stat.gov.pl)

	Silesian Voivodship	Opole Voivodship	Pattern – Silesian Voivodship
<b>Number of entities - sections C and G in PKD 2007 (C)</b>	170 552	33 070	170 552
<b>C / P<sub>cr</sub> in km<sup>2</sup></b>	13.83	3.51	13.83

#### 5. Number of employees in transport and storage

The Śląskie Voivodship is characterized by a very high total employment as well as employment in the transport and storage sector (section H in PKD 2007). In contrast, the Opole Voivodship, as the smallest voivodship in the country, has the lowest level of both total employment as well as employment in section H. The share of employment in the transport sector and warehouse management in the total employment in the Silesian Voivodship is higher than in the whole country – amounts to 5.91 %, while in Poland it is 5.49%; accordingly, for the Opolskie Voivodship it amounts to 5.16%. Employment in section H of the Śląskie Voivodship in relation to total employment in this section is 12.17%. It is the second place in the country after the Mazovia Voivodship (19.02%). However, for the Opole Voivodship, this parameter is only 2.06%. As a model, the province was accepted Silesian.

**Table 5.** Number of employees in section H PKD 2007 (condition as of 31/12/2016); own study based on (Rocznik statystyczny województw, 2017, p. 268)

	Silesian Voivodship	Opole Voivodship	Pattern – Silesian Voivodship
<b>Number of employees in section H (D)</b>	100 788	16 951	100 788
<b>D / P<sub>cr</sub> in km<sup>2</sup></b>	8.17	1.80	8.17

#### 6. The number of logistic operators, including operators with the potential to carry out intermodal transport

Silesian region is very well developed in terms of its functioning in the area of logistics operators. The region is distinguished in this respect on the map of the country. The largest global logistics operators operate in this region, e.g. DB Schenker, DPD Polska, Rohlig Suus Logistics SA, JAS FBG SA, Raben Group,



Kuehne & Nagel, DHL, Dachser, and many others. In the region there are also carriers with the largest share in intermodal transport, eg: PKP Cargo, Lotos Kolej, DB Cargo Polska. There are definitely fewer logistic operators operating in the Opole Voivodeship. This is reflected in a small amount of all the transportation and logistics companies, the low level of employment in the TSL sector, low supply of available warehouse space and a small number of terminals. The number of logistic operators is an important factor proving the region's potential for the development of intermodal transport. However, it will not be included in the IRPIT indicator, due to the lack of precise data. This is due to the fact that the notion of a logistic operator is a relatively new category not distinguished separately in the PKD classification, but included in the existing sections of Section H. In the further part of the article, the number of entities in this section will be discussed.

#### 7. The number of transport and logistics companies

The possibilities of intermodal transport are largely connected with the existence of transport and logistics entities representing various branches of transport, which will cooperate with each other in the implementation of transport tasks. For this reason, the number of entities representing particular branches of transport is presented in Table 6.

**Table 6.** Transport and logistics companies (2016); (www.bdl.stat.gov.pl)

	Silesian Voivodeship	Opole Voivodeship	Pattern – Silesian Voivodeship
<b>Number of entities – section H PKD 2007 (E)</b>	28 893	5 087	28 893 (Silesian)
<b>number of entities: land and pipeline transport (division 49 section H) (F)</b>	26 002	4 581	26 002 (Silesian)
<b>number of entities: water transport (division 50 section H) (G)</b>	16	58	294 (Małopolska)
<b>number of entities: air transport (division 51 of section H) (H)</b>	36	8	393 (Mazovia)
<b>E / P<sub>cr</sub> in km<sup>2</sup></b>	2.34	0.54	2.34 (Silesian)
<b>F / P<sub>cr</sub> in km<sup>2</sup></b>	2.11	0.49	2.11 (Silesian)
<b>G / P<sub>cr</sub> in km<sup>2</sup></b>	0.0013	0.0062	0.0193 (małopolskie)
<b>H / P<sub>cr</sub> in km<sup>2</sup></b>	0.0030	0.0008	0.11 (Mazovia)

#### 8. Length and quality of roads: rail, water, car Road infrastructure

The distinctive feature of the Silesian Voivodeship compared to other regions of Poland are undoubtedly its transport routes. Not only the main routes decide about the very good transport accessibility of the region, but also the very high density of road infrastructure (in the ranking of transport accessibility of voivodeships, Silesian Voivodeship took 6th place). An important role in the communication system is played by the Silesian Agglomeration, in which the A1 and A4 motorways intersect and are supplemented by the Drogowa Trasa Średnicowa route (DTŚ). The transit location of the region, where pan-European transport corridors guarantee the development of the motorway network (corridors III and IV), is also noteworthy. The Opole Voivodeship is assessed as an area with average transport accessibility (9th position in the ranking). The central axis of the circular transport of the Opole Voivodeship is definitely the A4 motorway, which is part of the 3rd pan-European transport corridor.

Comparing the technical condition of the surface of national roads of both voivodeships, the Opole Voivodeship is better in this respect, in which as much as 60% of roads are rated as good, 25.5% as unsatisfactory and 14.5% as bad, while in Silesia it is respectively: 2%, 41.2% and 13.6% (Council, 2014; The Marshal Office 2016).

**Table 7.** Number of public roads with a hard surface (2016, 2015); own study based on (Rocznik statystyczny województw, 2017, p. 450); (Transport wyniki działalności w 2016, 2017, p. 135)

	<b>Silesian Voivodeship</b>	<b>Opole Voivodeship</b>	<b>Pattern</b>
<b>Total number of roads (I) (km)</b>	21762	8410	37092 (Mazovia)
<b>Motorways and expressways (J) (km)</b>	307.30	88.10	360.70 (Wielkopolska)
<b>I / P<sub>cr</sub> (km/km<sup>2</sup>)</b>	1.76	0.89	1.76 (Silesian)
<b>J / P<sub>cr</sub> (km/km<sup>2</sup>)</b>	0.02491	0.00936	0.02491 (Silesian)

#### Railway infrastructure

The Silesian Voivodeship can be considered as very well developed in terms of exploited railway lines. The average network density is 15.9 km/100 km<sup>2</sup> (the highest in the country) and 2.5 times higher than the average in Poland, which is 6.12 km/km<sup>2</sup>. In the Opole Voivodeship, the network density is 8.29 km/km<sup>2</sup> and exceeds the national average and places the region in third place in the country. The share of electrified lines in the Silesian Voivodeship is high and amounts to 84.3%, while in the Opole Voivodeship it is definitely lower – 55% (the national average is 62.06%). The share of double-track lines is also significant, which in the Silesian Voivodeship is 54%, and in Opole 56%. In Silesia, there is one of the largest railway junctions in Europe – Tarnowskie Góry. Transport between Bielsko,

Katowice and Warsaw is organized by the Central Railway Main Line (CMK), and between Katowice and Gdańsk by the Port Main Line. The end section of the non-electrified Wide-gutter Broadway Line (LHS) is located in the Silesia Voivodeship. This line through the Ukrainian railway system has direct access to the Trans-Siberian Railway, which gives the opportunity to connect with the railway system of Ukraine and Russia and create a Pan-European Europe-Asia land transport corridor. The railway region of significant importance for domestic and foreign transport runs through the region of the Opole Voivodeship (routes Dresden-Moscow, Malmö-Bratislava).

There are a large number of speed limits in the railway network of the Śląskie Voivodeship, which are caused by: general poor technical condition of tracks, inadequate geometric layout of tracks and poor condition of turnouts. The lines with unsatisfactory technical condition constitute 54.5% of all railway lines in the Silesian Voivodeship, while lines with poor technical condition – 0.8% (according to PKP PLK SA data) (The Marshal Office, 2012).

**Table 8.** Used railway lines (31/12/2016); own preparation based on (Transport wyniki działalności w 2016, 2017, p. 64)

	Silesian Voivodeship	Opole Voivodeship	Pattern
<b>Total number of railways (K) (km)</b>	1964	780	1964
<b>K / P<sub>cr</sub> (km/km<sup>2</sup>)</b>	0.16	0.08	0.16

#### Inland waterways infrastructure

In the Silesian Voivodeship (Gliwice) the Odra Waterway connects Upper Silesia with the ports of Szczecin and Świnoujście. The first 41 km of Odrzańska Droga Wodna is the Gliwicki Canal (3rd class of waterways according to international classification). The Odra Waterway is a decisive asset of the Opolskie Voivodeship, which is its untapped and very future-proof potential. In Poland (including in the cross-border area) there are many problems with waterways and inland navigation, at the same time transport policy puts a lot of emphasis on their use in cargo transportation. The layout and length of inland waterways in Poland has remained at a similar level for years. Their length, broken down into classes in the Śląskie and Opolskie voivodships, is presented in Table 9.

**Table 9.** Inland waterways; own preparation based on (Frydek, 2008, p. 20)

	Silesian Voivodeship	Opole Voivodeship	Pattern
<b>Gliwice Canal (III class) (km)</b>	21.80	18.80	-
<b>Kędzierzyński Canal (II class) (km)</b>	0.00	5.90	-

<b>Odra (Racibórz – Kędzierzyn Koźle; Ia class) (km)</b>	29,20	15.20	-
<b>Odra (Kędzierzyn-Koźle - Brzeg Dolny, III class) (km)</b>	0.00	187.10	-
<b>Lenght of inland waterways (L) (km)</b>	51.00	227.00	227.00
<b>L / P<sub>cr</sub> (km/km<sup>2</sup>)</b>	0.004	0.23	0.23

#### 4. RESEARCH RESULTS

As a result of the study, the following results of the IRPIT indicator were obtained for the province of Silesian and Opole Voivodeship (Table 10).

**Table 10.** The calculation of IRPIT for the Silesian and Opole Voivodeship; own preparation

No.	Factor	The difference between the factor value and the standard for Silesian Voivodeship ( $z_{ij}$ ) - ( $z_{0ij}$ )	The difference between the factor value and the standard for Opole Voivodeship ( $z_{ij}$ ) - ( $z_{0ij}$ )
1.	Number of intermodal logistic centers	0	-1
2.	Supply of warehouse space in relation to the total area of the region [thous. m <sup>2</sup> / km <sup>2</sup> ]	0	-0,946379006
3.	Number of inter-branch transshipment terminals / area of the region in km <sup>2</sup>	-0,191347754	-0,823627288
4.	Number of entities - sections C and G in the classification of PKD 2007 / area of the region in km <sup>2</sup>	0	-0,746203905
5.	Number of employees in transport and storage (according to PKD 2007 section H) / area of the region in km <sup>2</sup>	0	-0,779681763
6.1.	Number of entities section H / area of the region in km <sup>2</sup> section H	0	-0,769230769
6.2.	Division 49 of section H - land and pipeline transport	0	-0,767772512
6.3.	Division 50 section H - water transport	-0,932642487	-0,678756477
6.4.	Division 51, Section H - air transport	-0,972727273	-0,992727273
7.1.	Road length / area of the region [km / km <sup>2</sup> ]	0	-0,494318182
7.2.	Motorways and express roads / area of the region [km / km <sup>2</sup> ]	0	-0,62424729
7.3.	Length of rail roads / area of the region [km / km <sup>2</sup> ]	0	-0,5
7.4.	Length of waterways / area of the region [km / km <sup>2</sup> ]	-0,982608696	0
<b>IRPIT</b>		<b>0,77</b>	<b>0,42</b>

The research shows that the Silesian Voivodeship is characterized by a significant potential for the development of internodal transport. In principle, in the majority of factors, the province Silesia is a model region, which confirms that it is the region with the greatest potential for the development of intermodal transport. An exception are those factors that directly affect inland waterway transport and its inclusion in the implementation of intermodal transport. This state is also confirmed by numerous regional, national and European documents of a strategic nature, which emphasize the need to strengthen this mode of transport. The factor regarding the assessment of air transport was also low in the assessment of factors determining the voivodship's potential for the development of intermodal transport. However, due to its specificity, it is rather an important link in combined transport, and less in intermodal transport, especially as regards the cross-border area (due to proximity to one another). A different situation applies to the Opole Voivodeship. The IRPIT indicator has reached the value of 0.42, which means that the region has

a weak potential for the development of intermodal transport. The strongest aspect of this province is the length and accessibility of inland waterways, which was also confirmed by the adoption of this region as a model. According to the White Paper of Transport, it will be necessary to modernize and adapt the E30 Water Road Odra to the standards of European waterways in the near future. Thus, it will become an important element of the intermodal transport system in the cross-border area.

## 5. CONCLUSION

Increasing external costs of transport, borne mainly by the environment of transport systems, not by transport operators and their customers (users), make the necessity to reduce them much more important. This is, among others, due to the fact that in Poland the biggest problems related to the increase of external costs of transport create a large scale of activity of the broadly understood road transport. In connection with this, the necessity to use the possibilities of intermodal transport is becoming more and more emphasized. These problems are even stronger in cross-border areas, where the importance of international freight transport is increasing. The article elaborates a methodology for assessing the potential of the region for the development of intermodal transport, determining the value of the IRPIT index (Index of the Region's Potential for Intermodal Transport), based on a taxonomic measure of development. Determining the value of this indicator is the more important because its construction was based on factors selected by experts in the field of logistics and transport, developing a strategy for the development of freight transport in cross-border areas (the TRANS TRITIA project). Taking into account the Polish area of TRITIA (including Silasian and Opole Voivodships), it can be assumed that it has a significant potential for the development of intermodal transport. However, it will be necessary to take into account the existing provisions in the strategic documents of an European, national and regional character in the tasks carried out by state and local government institutions and their financial support.

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