
Analysis and Operations of Passenger Rail Transport in Poland and Selected EU States

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Abstract:

Purpose: The aim of this study was to analyse and compare number of characteristics of passenger rail transport in Poland and selected European Union Member States in the period 2010-2018.

Design/Methodology/Approach: The research was performed on the basis of an analysis of statistic data and key performance indicators used in the field, number of passengers, performance (transport activity), train operations, density of railway lines, average number of journeys per one passenger, rail utilisation rate, rail transport demand rate, and passenger rail transport operations rate.

Findings: In the years 2010-2018, Polish railway operators transported, on average, 270 million passengers per year, which is close to the figures reported in Austria and Sweden, but much lower than in Germany, France, or Italy. In the year 2018, performance (transport activity) was significantly lower than in the leading EU states (Germany, France, Italy). The utilisation of the available population potential and density of railway lines in passenger rail transport is much higher in most of the analysed EU states than it is in Poland.

Practical Implications: The conducted studies demonstrate that passenger rail transport is dynamically developing both in Poland and in other European Union Member States. Given the fact that the market is an important alternative to road transport, powerful demand and supply potential create a compelling case for investment in safety, reliability, travelling comfort and service quality.

Originality/Value: This study discusses some timely and important issues associated with passenger rail transport development. The comparative analysis of passenger rail transport market potential in Poland and selected countries demonstrates that there are high reserve capacities in the field.

Keywords: Rail transport, mobility, transport activity, degree of rail utilisation.

JEL Code: N7, N70, R41, R42.

Paper type: Research article.

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1. Introduction

The transportation system, i.e., the technological process of movement covering road and rail networks, extended networks of inland waterways, sea harbours and airports, is one of the building blocks of national economies which warrants their good management (Jaworska and Nowacki, 2017; Kubala, 2017). Transport is responsible for industry and service sector competitiveness and transport development is requisite for smooth operation of any country.

For many years, the European transport policy has addressed several economic and societal challenges, including globalisation, which increase demand for transport and new standards of need satisfaction. Transport, the basis for social and economic development, determines the implementation of societal and economic policies and economic competitiveness (Sivilevicius and Maskeliunaite, 2010; Wojewódzka-Król, 2010; Sipus and Abramovic, 2017; Stoilova *et al.*, 2020).

The major advantage of rail transport is, above all, its geographic scope and spatial distribution of the network of tracks adapted to certain locations. Another benefit is that the means of transport are well-aligned with the multiple needs of freight. In addition, railway transport is time-efficient, systematic, and reliable, whereas service frequency is highest (Szczepaniak, 2002; Knapcikova and Konings, 2018).

Rail transport is one of the environment-friendly industry branches due to, among other things, relatively low energy consumption, low emissions, low area consumption, opportunities to considerably lower road congestion as a result of overtaking car transport, low external costs (Wojewódzka-Król, 2010; Janic and Vleuge, 2012; Guszczak, 2014). One more crucial feature of rail transport is high level of safety, a consequence of both the organisation of the track/course of the means of transport (determined by infrastructure) and the multi-stage management of rail traffic within one network. The system of rail transport is referred to as autonomic, smart, and adaptive (Kwaśnikowski *et al.*, 2010; Ziełńska, 2017; Luptak *et al.*, 2019).

There is a diversity in both passenger and freight rail transport utilisation across the EU states. This can be observed not only in the case of countries diversified in terms of settlement structure or rail transport infrastructure development, but also in the case of countries of similar specifications. The said differences are mainly due to demographic features, spatial development (population size or density), and total length of railway lines (or network density) in individual countries (Klemba, 2017). Due to its multiple advantages, the reinforcement of the role of rail transport in the integrated transport system in Poland is of strategic importance. The latest actions in this field have had a significant bearing on the image of the Polish railway, boosting Poles' interest in rail over other means of transport. Modernisation of the railway sector will have positive effects for the passengers and transport operators alike.

2. Material and Methods

The subject of this study was to analyse and compare number of characteristics of passenger rail transport in Poland and selected European Union Member States in the period 2010-2018. The sources of collected data were: Statistical Office of the European Union - EUROSTAT database (<https://ec.europa.eu/eurostat/data/browse-statistics-by-theme/>), Central Statistical Office's (GUS) data published in 2011-2019 by Polish Statistics Yearbook (<https://stat.gov.pl/obszary-tematyczne/roczniki-statystyczne/roczniki-statystyczne/rocznik-statystycznyrzeczypospolitej-polskiej/>), and Reports of the Rail Transport Office (UTK) in Poland published in 2011-2019 (<https://www.utk.gov.pl/pl/raporty-i-analizy/analizy-i-monitoring/analizy-i-opracowania/>).

The thematic scope of the collected data covered selected aspects typical of rail passenger transport operations in the years 2010-2018, number of passengers, performance (transport activity), train operations, length of railway network, population size in selected countries, and areas of selected countries. Based on the collected data, the following were calculated:

- density of rail lines (km/100 km²),
- average number of journeys per one passenger (performance/number of passengers),
- rail utilisation rate (number of passengers/1 inhabitant),
- rail transport demand rate (performance/1 inhabitant),
- passenger rail transport operations rate (train operations/ length of railway lines).

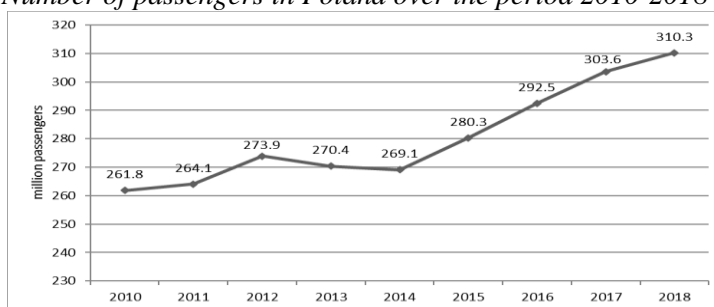
The level of data detail allowed the author to compare, evaluate, and draw conclusions regarding passenger rail transport operations in Poland and selected Member States (Austria, Bulgaria, Czech Republic, France, Spain, Germany, Romania, Italy, Slovakia, Sweden). The data collected were evaluated with the use of Microsoft Office, above all Excel spreadsheets.

3. The Transport of Passengers by Rail in Poland

The contemporary market of transport services is very demanding because customer expectations with respect to service quality are extremely high. Transport operators and carriers must increase the number of services and enhance their quality. Their operations should focus, above all, on gaining a competitive edge (Nowak and Zielaskiewicz, 2009). The system of passenger rail operations is enjoying a dynamic growth. Its development pertains to a continuously improving infrastructure and an increasingly modern rolling stock. Cutting-edge technologies of the system of railway traffic control, which affect the streamlining of rail transport operations and improve journey safety, are vital for the complicated organisation of passenger traffic in rail transport.

The analysis of Figure 1 demonstrates an upward tendency in passenger transport – in 2018 there were 48.5 million passengers more than in the year 2010. Over the last four years, the number of passengers increased by over 15%. Compared to the year 2014, it means a rise by 41 million passengers. Such performance rates are the result of better-quality rail transport in Poland. Ongoing modernisation of railways allow for a marked improvement of the technical condition of the railway network, which consequently leads to higher train speed. What is more, railway stations are becoming more and more functional and offer several attractive facilities. Another important factor of rail transport population growth is a modern rolling stock, which offers comfort and convenience, shorter journey times and more extensive Internet access. A rise in the number of passengers reflects the return of passengers to upgraded lines and a better offer, suited to their needs.

Figure 1. Number of passengers in Poland over the period 2010-2018



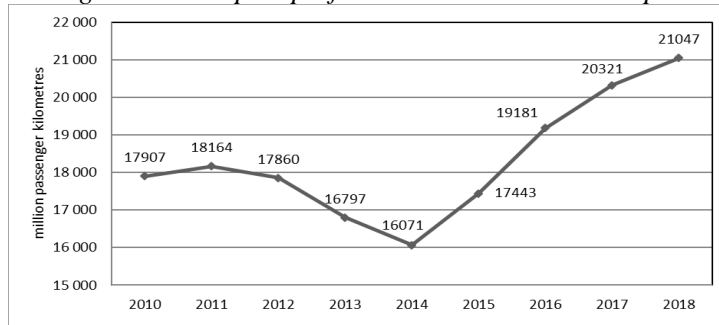
Source: Own study compiled based on Central Statistical Office's data (GUS).

Rail transport development in Poland is also represented by the performance indicator. Performance (transport activity) in passenger transport is the product of the length of the journey of the means of transport and the number of transported passengers. Rail transport passenger performance in the period 2010-2018 is shown in the Figure 2. There was a considerable variation in performance volumes in the period 2010-2018. In 2010, the performance rate was 17 907 million passenger kilometres.

Next, the rate was steadily dropping until the year 2014. The lowest performance rate was reported in 2014, when it equalled 16 071 million passenger kilometres. Over subsequent years the rate followed an upward trend, to reach 21 047 million passenger kilometres in 2018. The greatest growth dynamics of performance could be observed at the end of 2016 and beginning of 2017.

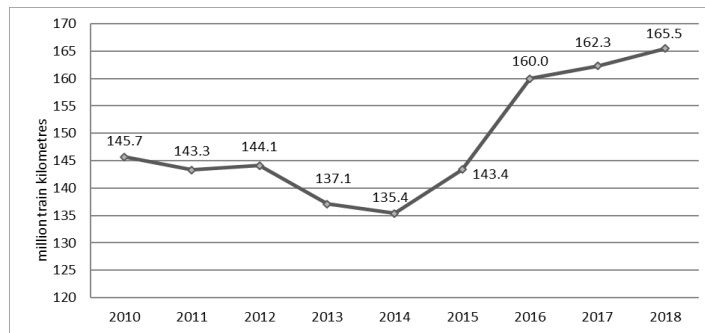
As shown in Figure 3, in 2010 passenger rail operators delivered 145.7 million train kilometres. The lowest train operation volume was noted in 2014 (135.4 million train kilometres). Since 2014 the output has risen to 165.5 million train kilometres. In the same period, passenger operator trains have covered approximately 30.1 million kilometres more. One reason of the above increase in train operations may be an introduction of the so-called Joint Ticket and integrated rail-bus services.

Figure 2. Passenger rail transport performance in Poland in the period 2010-2018



Source: Own study compiled based on a reports of the Rail Transport Office (UTK) in Poland.

Figure 3. Train operations in passenger rail transport in Poland in the period 2010-2018



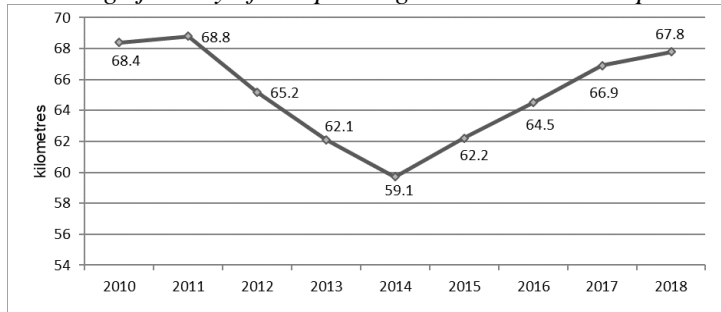
Source: See, Figure 2.

As shown in Figure 4, in 2010 the journey of one passenger had, on average, 68.4 kilometres. The distance covered kept shortening until the year 2014 (59.7 km). Between 2014 and 2018 it grew by approximately 12%.

Figure 5 shows that in the period 2010-2018 the rail utilisation rate was on the rise. As reported by the UTK (2011-2019), two provinces – pomorskie and mazowieckie – featured outstanding utilisation rates (23.2 and 18.9, respectively). High efficiency of rail use in the above provinces coincides with their extensive systems of commuter rail. A journey by train is an alternative to congested roads in big cities.

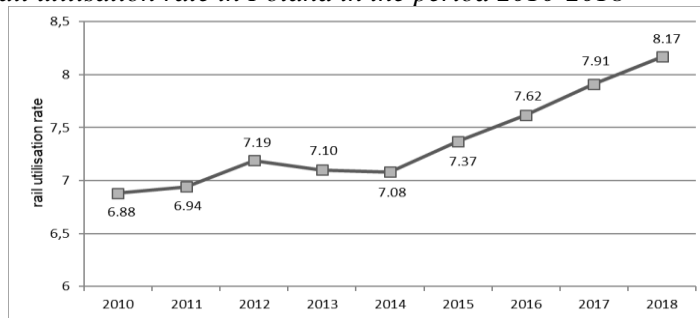
The rail network is relatively well developed both within and around both agglomerations, and it is expanded through the modernisation and construction of new rail lines and stops. These networks present the best commuter rail opportunities in Poland. At the other extreme is the podlaskie province, where the utilisation rate is the lowest (1.5 trip per inhabitant).

Figure 4. An average journey of one passenger in Poland in the period 2010-2018



Source: See, Figure 2.

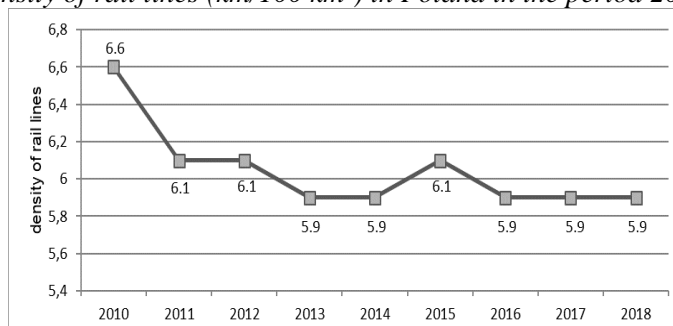
Figure 5. Rail utilisation rate in Poland in the period 2010-2018



Source: See, Figure 2.

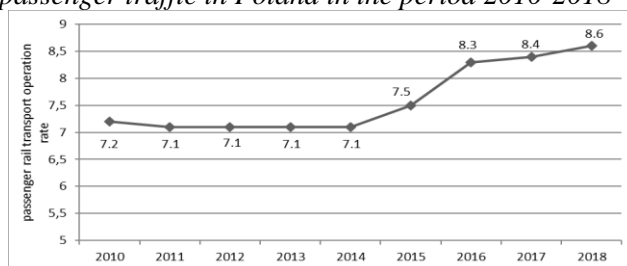
Figure 6 suggests that the rate of density of rail lines in Poland dropped from 6.6 in 2010 to 6.1 in 2011. Between 2011 and 2018, the figures were similar and largely unchanged. Rail networks and their densities have a direct impact on the development of connections and volumes of passenger and freight transport, which is a relief for the overblown and energy-intensive road transport. The maintenance of high-density rate, given some properly implemented transport policy, creates an opportunity for collective transport to note an increase in its share in passenger services and a rise of railway importance in the structure of freight services.

Figure 6. Density of rail lines (km/100 km²) in Poland in the period 2010-2018



Source: See, Figure 2.

Figure 7. Rail passenger traffic in Poland in the period 2010-2018



Source: See, Figure 2.

The highest passenger traffic in the period 2010-2018 (Figure 7) was observed in the year 2018 (8.6 train kilometre/km), while the lowest – in the years 2011-2014 (7.1 train kilometre/km). The analysed rate had an overall upward tendency in the analysed time frame.

4. The Transport of Passengers by Rail in Selected European Union Member States

In 2018, the total number of people who used rail transport fluctuated between 21.3 million (Bulgaria) and 2880.6 million (Germany) (Table 1). Across all the analysed EU countries we could observe a growth in the number of passengers in comparison to 2010, on average by 27.5% (with the exception of Bulgaria where a 29.8% drop was noted). With respect to the dynamics of the changes in the number of passengers in comparison with the year 2010, the studied countries can be aligned in the following decreasing series: Slovakia (66.1%) > Italy (39.3%) > Sweden (37.4%) > Austria (31.3%) > Bulgaria (29.8%) > Germany (21.6%) > France (16.0%) > Czech Republic (15.0%) > Romania (12.2%) > Spain (8.3%).

Table 1. Total number of passengers in rail transport (in millions of passengers) in selected European Union countries

Country	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	207.7	206.9	224.8	235.4	232.6	240.6	253.2	254.5	272.6
Bulgaria	30.1	29.3	26.5	26.1	24.6	22.5	21.4	21.2	21.3
Czech Republic	164.6	167.8	172.6	174.2	175.7	176.1	178.8	182.7	189.3
Germany	2368.4	2530.3	2564.5	2612.8	2693.1	2684.9	2813.8	2831.4	2880.6
France	1075.2	1125.3	1150.3	1164.8	1157.7	1204.2	1236.5	1277.5	1246.8
Italy	622.3	810.0	815.6	814.5	821.7	829.5	852.2	848.8	866.6
Romania	57.7	60.2	56.4	56.4	64.8	61.2	58.9	67.3	64.7
Slovakia	46.5	47.5	44.6	45.9	49.1	60.3	69.2	74.9	77.3
Spain	550.2	566.4	555.4	558.6	559.3	562.0	569.8	593.4	596.1
Sweden	179.3	187.1	193.2	200.7	207.3	214.4	220.9	229.8	246.5

Source: Own study based on Database-Eurostat.

Passenger rail performance (transport activity) in the year 2018 varied significantly across the selected EU states, from 1,476 million passenger kilometres in Bulgaria to 98,161 million passenger kilometres in Germany (Table 2). In the majority of the studied countries, there was an average growth in performance compared to 2010 by 28.5%. The highest increase was reported in Slovakia (64.2%) and Czech Republic (55.8%), whereas the lowest in Romania (3.4%) and France (7.1%). A drop in performance was observed only in Bulgaria (by 29.4%).

Table 2. Performance (transport activity) (in millions of passenger kilometres) in selected European Union countries

Country	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	9713	10172	10606	11188	11345	11433	12021	12077	12681
Bulgaria	2090	2059	1870	1821	1698	1549	1455	1434	1476
Czech Republic	6559	6669	7196	7512	7644	8125	8738	9403	10220
Germany	82837	89316	93918	89450	90978	91050	95465	95529	98161
France	87231	91298	91205	90485	89499	91377	90612	96690	93387
Italy	43349	45944	45753	47707	48881	51121	51716	52778	55037
Romania	5248	5044	4518	4352	4971	4910	4731	5556	5426
Slovakia	2309	2431	2459	2485	2583	3411	3484	3754	3792
Spain	22044	22645	22170	23660	24915	26018	26532	27374	28317
Sweden	11155	11379	11792	11842	12121	12741	12800	13331	13547

Source: See, Table 1.

In the year 2018, train operations in passenger rail transport in the analysed EU states was diversified and was comprised between 30.6 and 1,096.5 million train kilometres (Table 3). In the majority of the countries within the scope of the study, there was an average growth in train operations compared to 2010 by 5.9%. The highest increase was reported in Sweden (17.4%), whereas the lowest – in Austria (2.1%), Spain (2.4%) and Bulgaria (4.4%). The dynamic in the remaining countries ranged from 7.5% to 10.5%. A drop in train operations in the studied period was seen only in Romania.

Table 3. The volume of train operations (in millions of train kilometres) in selected European Union countries

Country	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	151.8	150.7	145.7	146.8	151.0	153.4	153.7	156.4	155.0
Bulgaria	29.3	29.5	25.7	26.6	27.3	28.6	29.5	29.0	30.6
Czech Republic	155.1	154.2	162.7	156.9	155.4	157.3	159.4	163.6	169.1
Germany	992.4	989.0	1024.2	1025.1	1025.9	1032.6	1037.4	1085.5	1096.5
France	458.0	477.2	473.9	473.3	452.9	460.0	444.8	458.3	n.d.
Italy	356.1	350.8	345.1	358.6	358.7	366.4	375.2	377.6	388.1
Romania	86.3	92.6	90.1	82.4	77.8	79.9	80.8	81.1	77.3

Slovakia	44.0	42.7	43.9	43.3	43.1	46.0	46.8	45.3	47.3
Spain	206.0	202.0	208.7	207.9	213.0	209.1	205.0	212.5	211.0
Sweden	140.6	147.2	145.7	151.2	153.0	152.7	157.7	160.4	165.1

Note: n.d. - no data

Source: See, Table 1.

Between 2010 and 2018, the average passenger rail journey varied across different countries (Table 4). In 2018, the average distance covered ranged from 34.1 to 83.8 km. An increase on the year 2010 was reported only in the Czech Republic (35.5%) and Spain (18,6%). In other EU countries within the scope of the study, there was an average decrease by 5.1%. The most significant declines took place in Sweden (11.6%), Italy (8.8%), Romania (7.8%), France (7.7%), Germany (2.6%), Slovakia (1.1%), and the least significant –in Bulgaria (0.2%) and Austria (0.6%). The rate is affected by the area and spatial development, including the level of urbanisation and industrialisation, of a given country.

Table 4. Average passenger journey by rail (in km) in selected European Union countries

Country	Year									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Austria	46.8	49.2	47.2	47.5	48.8	47.5	47.5	47.5	46.5	
Bulgaria	69.4	70.3	70.6	69.8	69.0	68.8	68.0	67.6	69.3	
Czech Republic	39.8	39.7	41.7	43.1	43.5	46.1	48.9	51.5	54.0	
Germany	35.0	35.3	36.6	34.2	33.8	33.9	33.9	33.7	34.1	
France	81.1	81.1	79.3	77.7	77.3	75.9	73.3	75.7	74.9	
Italy	69.7	56.7	56.1	58.6	59.5	61.6	60.7	62.2	63.5	
Romania	91.0	83.9	80.1	77.1	76.8	80.2	80.4	82.5	83.8	
Slovakia	49.6	51.2	55.1	54.1	52.6	56.6	50.4	50.1	49.1	
Spain	40.1	40.0	39.9	42.4	44.5	46.3	46.6	46.1	47.5	
Sweden	62.2	60.8	61.0	59.0	58.5	59.4	57.9	58.0	55.0	

Source: See, Table 1.

In the period 2010-2018, there was an average 24.7% increase in the number of journeys in the selected EU countries, with the exception of Bulgaria with a decrease by 25.5%. In 2018, the average number of rail journeys per 1 inhabitant ranged between 3.0 and 34.8 across various EU states (Table 5). This indicator demonstrates rail transport popularity, in particular in high population density countries. The highest increase of the indicator was reported in Slovakia (64.5%); the lowest was seen in Spain (7.9%). In other EU states, the following growth dynamics was observed: 36.3% - Italy, 26.9% - Sweden, 24.3% - Austria, 20.2% - Germany, 16.6% - Romania, 13.4% - Czech Republic, 12.0% - France.

Passenger rail transport performance per one inhabitant allowed parameter comparison irrespective of the country size. In 2018, performance rate ranged from 209.4 to 1437.4 million passenger kilometres/ inhabitant (Table 6). In the majority

of the countries within the scope of the study, there was an average growth in performance rate per 1 inhabitant compared to 2010 by 25.8%. The highest increase was reported in Slovakia (62.6%) and Czech Republic (53.6%), whereas the lowest in France (3.4%) and Romania (7.4%). In other EU states, the growth dynamics could be aligned in the following decreasing series: Spain (28.0%) > Italy (24.2%) > Austria (23.6%) > Germany (17.1%) > Sweden (12.1%). A drop in performance per one inhabitant was observed only in Bulgaria (by 23.6%).

Table 5. Average number of journeys by rail per one inhabitant in selected European Union countries (million passengers/inhabitant) rail utilisation rate

Country	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	24.9	24.7	26.7	27.9	27.3	28.0	29.1	29.0	30.9
Bulgaria	4.1	4.0	3.6	3.58	3.4	3.1	3.0	3.0	3.0
Czech Republic	15.7	16.0	16.4	16.6	16.7	16.7	16.9	17.3	17.8
Germany	29.0	31.5	31.9	32.5	33.3	33.1	34.2	34.3	34.8
France	16.6	17.3	17.6	17.8	17.5	18.1	18.6	19.1	18.6
Italy	10.5	13.7	13.7	13.7	13.5	13.6	14.1	14.0	14.3
Romania	2.8	3.0	2.8	2.8	3.3	3.1	3.0	3.4	3.3
Slovakia	8.6	8.8	8.3	8.5	9.1	11.1	12.7	13.9	14.2
Spain	11.8	12.1	11.9	12.0	12.0	12.1	12.3	12.8	12.8
Sweden	19.2	19.9	20.4	21.0	30.0	22.0	22.4	23.0	24.4

Source: See, Table 1.

Table 6. Rail transport passenger performance per one inhabitant in selected EU countries (million passenger kilometres/inhabitant)

Country	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	1163.0	1214.5	1261.4	1323.7	1333.5	1331.8	1381.6	1376.6	1437.4
Bulgaria	281.6	279.4	255.2	250.0	234.3	215.1	203.4	201.9	209.4
Czech Republic	626.9	635.9	685.0	714.3	727.1	771.0	827.9	888.9	963.2
Germany	1012.6	1113.4	1169.2	1110.9	1126.4	1121.3	1161.7	1157.6	1185.6
France	1349.1	1405.0	1397.2	1379.3	1352.6	1375.0	1359.8	1447.2	1395.5
Italy	732.4	773.9	770.3	799.3	804.2	840.9	852.5	871.1	909.9
Romania	258.6	249.7	224.8	217.4	249.2	247.1	239.4	282.8	277.8
Slovakia	428.4	450.8	455.0	459.3	476.9	629.2	642.1	690.7	696.7
Spain	474.2	485.2	473.5	506.3	535.7	560.1	571.3	588.3	606.9
Sweden	1194.2	1208.5	1243.5	1239.2	1256.7	1307.1	1299.4	1333.7	1338.6

Source: See, Table 1.

Density of railway lines across selected EU states in the year 2018 was diversified and ranged between 2.4 and 12.1 km/100 km² (withing the scope of available statistical data). No sudden shifts in line density were seen in the period 2010-2018 (Table 7). An increase in the rate value was reported in Spain (14.8%) and Germany (1.9%), and a decrease was observed in France (9.0%), Austria (4.3%), Spain (4.0%)

and Bulgaria (2.7%). In the Czech Republic, Romania, and Slovakia railway lines density did not change in comparison with the year 2010. This variable is crucial for passenger rail transport output because the higher the space saturation with railway infrastructure, the higher availability and opportunities of railway transport use to meet transport needs across populations (in theory, at least).

Table 7. *Railway line density in selected European Union countries (km/100 km²)*

Country	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	6.9	6.6	6.6	6.6	6.6	6.6	6.5	6.6	6.6
Bulgaria	3.7	3.7	3.7	3.6	3.6	3.6	3.6	3.6	3.6
Czech Republic	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1	12.1
Germany	10.6	10.6	10.6	10.6	10.6	10.8	10.8	10.8	10.8
France	5.6	5.6	5.6	5.6	5.4	5.3	5.2	5.2	5.1
Italy	5.5	5.6	5.6	5.5	n.d.	n.d.	5.6	n.d.	n.d.
Romania	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Slovakia	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Spain	2.7	2.8	2.8	3.0	3.0	3.0	3.2	3.2	3.1
Sweden	2.5	2.5	2.5	2.5	2.5	2.4	2.4	2.4	2.4

Note: n.d. - no data

Source: See, Table 1.

Table 8. *Rail passenger traffic in selected European Union countries*

Country	Year								
	2010	2011	2012	2013	2014	2015	2016	2017	2018
Austria	26.1	27.4	26.2	26.5	27.3	27.8	28.0	28.3	28.1
Bulgaria	7.2	7.3	6.3	6.6	6.8	7.1	7.3	7.2	7.6
Czech Republic	16.2	16.1	17.0	16.4	16.3	16.4	16.7	17.1	17.7
Germany	26.2	26.1	27.0	27.1	27.2	26.8	26.9	28.1	28.5
France	15.1	15.7	15.5	15.6	15.4	15.9	15.7	16.3	n.d.
Italy	21.3	21.0	20.6	21.4	n.d.	n.d.	22.3	n.d.	n.d.
Romania	8.0	8.6	8.4	7.7	7.2	7.4	7.5	7.5	7.2
Slovakia	12.2	11.8	12.1	11.9	11.9	12.7	12.9	12.5	13.0
Spain	14.9	14.5	14.9	13.6	14.0	13.6	12.7	13.3	13.7
Sweden	12.6	13.1	13.1	13.8	14.1	14.0	14.5	14.7	15.1

Note: n.d. - no data

Source: See, Table 1.

The most significant rail passenger traffic in the period 2010-2018 was found Germany, Austria, and Italy (21.0-28.5 train kilometre/km). Slightly lower traffic was observed France, Czech, Spain, Sweden, Slovakia (11.9-17.7 train kilometre/km), and the lowest was seen in Bulgaria and Romania (6.3-8.6 train kilometre/km) (Table 8). In 2018, traffic ranged from 7.2 to 28.5 train kilometre per one kilometre of rail line. The greatest dynamics compared to 2010 was reported in Sweden (19.8%) and Romania (-10.0%), and the smallest – in Bulgaria (5.6%),

Slovakia (6.7%) and Austria (7.7%). This index allows assessment of the degree of utilisation of railway network infrastructure in the performance of passenger operations.

5. Conclusions

The European Union's transport policy assumes commitment to increase the share of rail transport in the market of transport services as a means of transport with low environmental impact. Rail transport continues to be one of the most crucial types of transport in Poland, which confirms the rising number of passengers travelling by trains. As far as the volume of traffic is concerned, only car transport is more significant. Rail transport is a vital part of the Polish systems of logistics and its development and meaning are reinforced by rail infrastructure modernisation and development. The market of passenger rail transport is under strong development not only in Poland but also in other EU countries described in the study, as represented by the results of the analysis of figures and rates. On the basis of the research findings, we can evaluate selected aspects of the supply and demand of the market.

The conversion of performance (transport activity) and the number of journeys per one country inhabitant permits a comparison between the demand for transport services irrespective of the country size. Rail transport is most advanced in countries which are well-developed in terms of their economies (Germany, France, Italy, Austria). The rate of changes is diversified due to a number of external and internal factors preconditioning the supply and demand of such services. In EU countries, the majority of train operations are performed by passenger trains. Rail passenger services are key both for commuting purposes and for business or holiday trips.

In the years 2010-2018, Polish rail operators transported on average 270 million passengers per year, which is close to the numbers reported in Austria and Sweden, but much lower than in Germany, France, and Italy. However, in the year 2018, performance (transport activity) was significantly lower than in the leading EU states (Germany, France, Italy). The majority of the EU countries exceeds Poland in terms of utilisation of available population potential and railway network density in passenger rail transport.

The presented study findings demonstrate that the Polish market of passenger rail transport has a high potential for increasing its share in passenger transport operations. It is the result not only of a growing need to satisfy private and professional social mobility but also of Poland's demographic potential and geographic location. There are quite a lot of opportunities for passenger rail transport development in Poland in comparison with other EU countries, as demonstrated by the following rates, rail transport demand, rail utilisation, railway traffic and network density. Investment in rail infrastructure should ensure a regular increase in the availability and utilisation of rail transport and, consequently, stimulate social

and economic development of the region. Furthermore, it may contribute to a rise in professional activity and mobility of communities.

The development of the rail services market ought to account for top quality standards in terms of the state-of-the-art technology, safety, and reliability, which will generate more social trust and service demand. The level of demand for rail transport services is determined, among other things, by the way in which transport is perceived by its users. One crucial factor of development of the passenger transport market is the ability of transport undertakings to create high quality services for their users. The most important offer is suited to the specific needs of a given region. The major elements of the offer are, above all, journey time and cost, well-adjusted timetable (suitable departure times and running frequency), comfort, reliability, high level of services, and intermodal integration.

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