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Polish railways from the perspective of the European Green Deal

Abstract

In January 2020 the European Parliament approved a resolution on the Green Deal, which aims to ensure that the EU achieves climate neutrality by 2050. Crucial to achieving the strategy's goals is sustainable and green mobility. Rail transport as the most sustainable mode of transport is an important factor in achieving these changes.

This article presents a synthetic diagnosis of the position of railways on the passenger transport market in Poland, in the context of the Green Deal assumptions. The essential analysis was preceded by a discussion of the structure of external transport costs, which is one of the determinants of the Green Deal. Trends in passenger transport were then identified and attention was paid to the shift of inter-industry relations in favour of rail transport. An analysis of the structure of regional and agglomeration rail transport was also carried out. Developments in this market area show a revitalisation of agglomeration rail links, which fits in with the sustainable mobility strategy.

Keywords: European Green Deal, rail, public transport, Poland
JEL Classification: Q01, O18, O13, R40

Introduction

In December 2019, the European Commission published a communication on the new Green Deal and on 15 January 2020, the European Parliament approved the document [COM2019/640]. The Green Deal implies a fundamental transformation of the economy and society, aiming for a fair, green, and prosperous future. At the same time, the EU economy is to become modern, resource-efficient, and competitive. The adopted set of policy initiatives addresses climate, energy, transport, land use, and the taxation system, which aim to reduce greenhouse gas emissions by at least 55% by 2030, compared to the 1990 levels. Reducing emission levels over the next decade is an essential condition to make Europe the world's first climate-neutral continent by 2050 [Regulation 2021/1119 EU].

The war in Ukraine and Russia's gas and oil embargoes have sparked a renewed discussion in Europe about how dangerous fossil fuel dependence is. The new geopolitical reality has accelerated the transition to clean energy. The European Commission has prepared the REPowerEU plan, which is about making the EU independent from Russian fossil fuels and solving the climate crisis. The plan is based on: increasing energy savings, diversifying energy supply, and accelerating the substitution of fossil fuels with renewable energy. Financial and legal measures to build a new energy infrastructure and system are also identified.

Transport, while essential to the functioning of the economy and global supply chains, is responsible for about 25% of total greenhouse gas emissions in the EU and this figure has increased in recent years. Transport imposes costs on society: greenhouse gas emissions and pollution, noise, road accidents, and congestion. Therefore, sustainable transport and mobility are key to solving the climate crisis and achieving the objectives of the European Green Deal. Transport must undergo a transformation, with a greenhouse gas reduction of 90% by 2050. Of the different modes of transport, rail transport is the most sustainable. According to the European Environment Agency, in 2017 only 0.5% of the EU's total greenhouse gas emissions came from the rail sector. Further development of rail transport will be the most important driver of change in achieving climate targets. It is assumed that high-speed rail traffic is to increase by 100% by 2030, public transport journeys of less than 500 km should be carbon neutral, 100 European cities are to be climate neutral [Regulation 2021/1119 EU]. The strategy is to ensure healthy and sustainable inter-urban and urban mobility. It is worth emphasising at this point that the railway is the backbone of the transport system of cities and agglomerations, with the other modes of transport (bus, tram, trolleybus, metro) supporting its operation by playing a commuting role to interchanges. Thus, it determines the level of sustainable urban mobility. Only collective, public forms of transport are socially efficient and consistent with the smooth functioning and development of a city [European Mobility Atlas, 2021]. In addition, rail should increase its freight transport by 100 per cent by 2050, taking over a significant proportion of traffic from car transport. As part of the promotion of railways, 2021 was declared the European Year of Railways. Relevant events and campaigns were held

across Europe. The so-called 'Railway Conclusions' were also adopted, highlighting the need for further development of rail transport, both passenger and freight. They also highlighted the need to increase the resilience of railways to the crisis and to invest in the interoperability of national systems and in optimising connections [Report ST 8642/2021].

The main objective of the article is a synthetic analysis of the position of railways on the passenger transport market in Poland, in the aspect of the new challenges of the European climate policy. The actual analysis was preceded by a discussion of the structure of external transport costs, which is one of the determinants of the Green Deal. Given the complexity and broad scope of the issue, particular attention was paid to the structure of regional rail transport, including agglomeration transport. This sector is dominant in the rail transport market, with a share of 85%. In addition, rail is an essential element of urban logistics systems, which should ensure sustainable mobility, climate neutrality of cities, without limiting their functioning and development. Therefore, the following research hypothesis was formulated: passenger rail transport contributes to climate neutrality and railway is well positioned in the freight market and has the prospect of further expanding its share.

The subject and purpose of the research imply the use of qualitative and quantitative methods [Kuciński et al., 2000]. One of the basic tools of qualitative methods is document analysis (desk research), which involves searching for data and information in available sources. It has been applied to the study of the external costs of transport. Research work carried out on the initiative of the European Commission, by European research centres, made it possible to carry out a detailed analysis of the external costs of transport. Extensive use was made of quantitative methods, which show the figures in specific research topics and the links between them. Empirical indirect research, or secondary data analysis, consisted in the use of statistical data. With the help of statistical analysis, information was obtained regarding the passenger transport market, especially rail transport. Cause-and-effect analysis, including comparative analysis in time and space, was used to explain the processes taking place in the area of passenger rail transport. The methods used made it possible to increase the accuracy of the results obtained and the conclusions formulated on this basis.

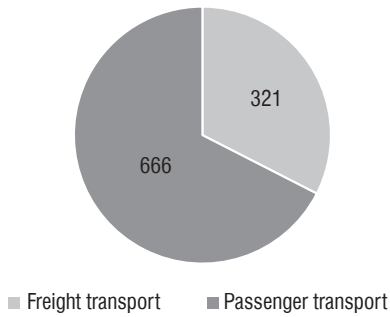
External costs of transport

The issue of the external costs of transport is well known, many publications have been devoted to it and it has been an area of particular interest to the EU for years. Therefore, only basic definitions and concepts can be given here. Thus, external costs are costs or part of costs which are not paid for by those who generate them, but by those who have nothing to do with them or even bear their negative consequences [de Palma et al., 2011]. They are costs borne by society as a whole and not just by the transport companies that generate them [Friedrich, Bickel, 2001]. The negative environmental impacts of transport include: air pollution, noise emissions, climate change, changes to nature and landscape (negative effects of transport

development, e.g., the occupation of areas for infrastructure), congestion and associated time losses, energy production (energy production for transport from different sources, leading to emissions) and, crucially, accidents. It is these categories of costs that are usually subject to estimates aimed at expressing them in monetary terms.

Studies on the quantification and expression of external transport costs in monetary terms are not carried out systematically, e.g., annually. They are also not published in the statistical material of the European Statistical Office (Eurostat). The research is initiated by the European Commission and carried out by research centres such as the IWW, INFRAS and CE Delft. Consultants from the INFRAS Institute in Zurich and the University of Karlsruhe IWW studied external costs in 17 Western European countries for 1995, with projections of their growth until 2010. This study was updated in 2000 and in 2003–2004 [External Costs of Transport, 2000; External Costs of Transport, 2004]. In another study by CE Delft, INFRAS and Fraunhofer ISI experts looked at 2008; it was published in 2011 [External Costs of Transport, 2011]. The most recent study was done for 2016 and was published by the European Commission in 2019 [Handbook on the external costs of transport, 2020]. To date, no further study has been produced, so the results are treated as up-to-date. Table 1 and graphically, Figures 1, 2, 3 show the main results of the study, concerning the external costs of transport.

Figure 1. Average external costs in transport in 2016 in the EU-28, by object of transport (bn euro/per year)



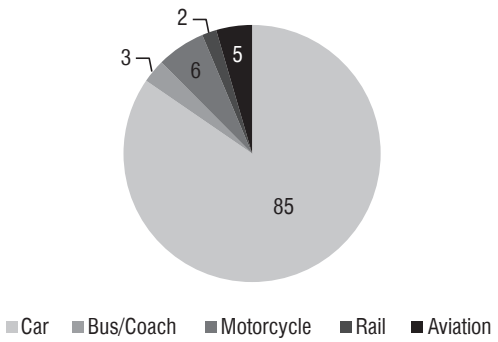
Source: *Handbook on the external costs of transport*, 2020.

Table 1. Average external costs in transport in 2016 in the EU-28, by cost category and transport mode (bn euro/per year)

Cost category	Pass car	Bus/Coach	Motorcycle	Rail	Aviation	Total
Accidents	210	5.3	21	2	0.1	238.4
Air pollution	34	4	2	0.5	1	41.5
Climate Change	56	2.5	1.5	0.2	20	80.2
Noise	26	2	15	4	1	48.0
Congestion	196	4.5	0	0	0	200.5
Well-to-Tank	18	1	1	3	8	31.0
Habitat damage	26	0.5	0.5	2.5	0.05	29.55
Total	566	19.8	41	12.2	30.15	666.15

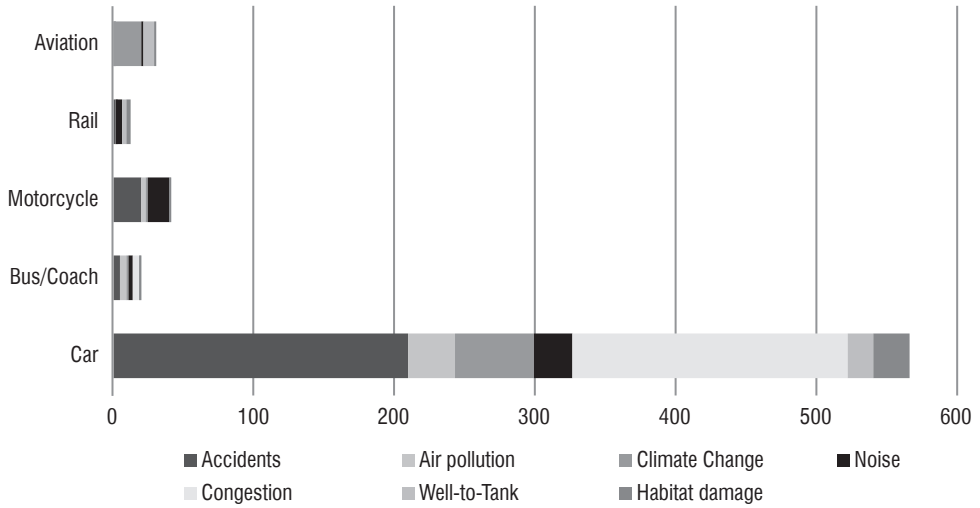
Source: own work based on *Handbook on the external costs of transport*, 2020.

Figure 2. Structure of external costs in passenger transport in 2016 in the EU-28, by mode of transport (%)



Source: own work based on *Handbook on the external costs of transport*, 2020.

Figure 3. Average external costs in transport in 2016 in the EU-28, by cost category and transport mode (bn euro/per year)



Source: own work based on *Handbook on the external costs of transport*, 2020.

The total external costs of road, rail, inland waterway, air, and maritime transport, including congestion costs for those modes where they occur, amounted to € 987 billion in 2016, representing 6.6% of GDP from 28 EU countries. These costs are generated in 2/3 by passenger transport and in 1/3 by freight transport (Figure 1). These relationships mean that the main contributor to external costs – passenger transport – will be the subject of further analysis.

Passenger movements are carried out by various modes of transport: cars, motorbikes, buses, railway, air. The largest external costs are generated by passenger car travel, accounting for as much as 85% of the total costs. This has been a steady trend for several decades as a consequence of high motorisation rates, the general high mobility of society and travellers' preferences. Other modes of transport have much lower costs: motorbikes account for 6%

of costs, buses for 3%. Thus, external costs generated by all modes of road transport account for as much as 94% of costs. In comparison, air transport costs are 5% of total costs and rail transport only 2% (Figure 2).

The most important cost category in passenger transport is accident costs, accounting for 36% of the total costs (Table 1). This is due to the methodology for estimating the value of human life, which is commonly referred to as 'priceless.' These are primarily the costs of car and motorbike accidents, where the latter mode of transport has the highest value of accident costs per passenger-kilometre, i.e., it is the most dangerous means of travel. Another category of relatively high costs is congestion, which accounts for 30% (Table 1). Congestion is mainly caused by private transport, i.e., cars, and to a very small extent by buses. It is worth noting, at this point, that congestion is not caused by motorbikes, rail, and air transport. The costs of climate change and air pollution account for 18% of the total costs and are generated by individual and air transport (Table 1). The environmental damage of air transport is mainly climate change. The other cost categories are noise, which accounts for 7%, atmospheric emissions of gases and other substances related to energy production and distribution, with 5% of the costs, and negative changes to nature and landscape, with 4% (Table 1).

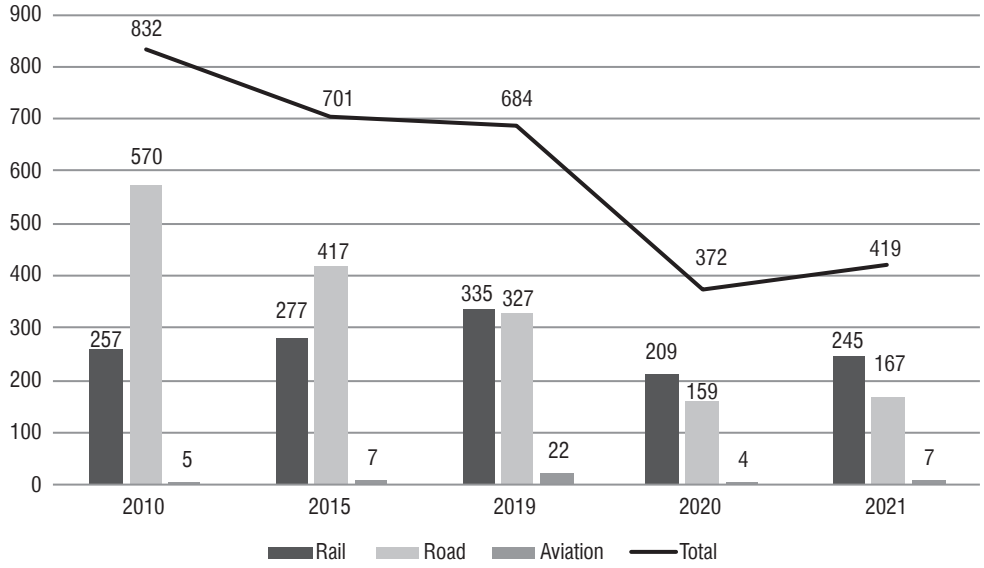
The analysis of the presented research results reinforces the conclusion, which has been formulated for years, that railways are the most climate-neutral mode of transport. It is a safe form of transport, resistant to urban congestion, both between conurbations and within conurbations and their suburbs. Compared to other modes of transport, its use for transport services is low in air pollution and contributes to negative climate change. Further development of the railways is, therefore, an important factor in achieving the climate objectives of the European Green Deal.

Fundamental trends in passenger transport

Passenger transport needs in Poland, similarly to other EU countries, are mainly satisfied by private individual transport – cars, followed by rail and bus transport and public transport –metro and trams. Individual transport has the largest market share, expressed in terms of transport work done (pkm), with 72%, followed by bus transport with 8% and rail with 7% [Statistical pocketbook, 2021]. If we consider only the public transport system without cars it is served by bus and rail transport, in various forms of transport modes.

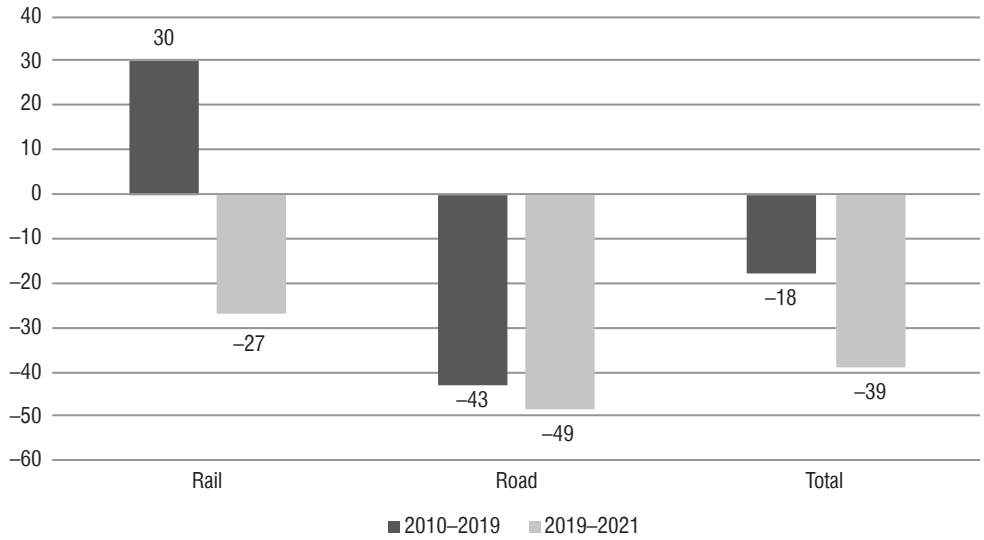
The study of the national public passenger transport system (excluding cars), with an extended analysis of rail transport, covers the period 2010–2021. This period includes the COVID-19 pandemic, which was accompanied by major restrictions and administrative restrictions on mobility. Therefore, two analysis intervals have been distinguished: 2010–2019 and 2019–2021. The general trends occurring in the national system and the distribution of transport tasks are presented graphically in Figures 4 and 5.

Figure 4. Passenger transport in 2010–2021 in Poland, by mode of transport (in m passengers)



Source: Statistics Poland, 2022.

Figure 5. Dynamics of the changes in passenger transport in Poland (%)



Source: Statistics Poland, 2022.

Passenger transport by collective public transport has observed a downward trend for years, decreasing by 18% between 2010 and 2019, with the trend being generated only by car transport, and in practice by bus transport. This form of transport is experiencing a massive regression, with a decline of 43%. In contrast to bus transport, a progressive year-on-year increase in the number of passengers carried can be seen in rail and air transport. Between 2010 and 2019, rail transport grew by 30%. In 2019, railways, for the first time in many years,

carried more passengers than bus companies (Figures 4, 5). There has been a trend reversal, with passengers choosing rail transport more often.

Between 2020 and 2021, there was a collapse in transport, caused by the restrictions accompanying the COVID-19 pandemic. The reduction in occupational and social mobility enforced by the pandemic naturally resulted in a decline in transport. With rail transport down 27% compared to 2019, and bus transport down 49%. Despite the difficult freight market, rail carried 47% more passengers than bus transport in 2021 (Figure 4). This shows the resilience and reliability of railways in crisis conditions.

Passenger rail market

The passenger rail transport market can be divided into several segments:

- regional services;
- interregional and inter-agglomeration transport;
- international services.

Regional services are mainly provided by passenger and express trains, within a single province. They include traditional regional transport and agglomeration transport. Transport services are provided by the following public companies: Polregio (until 23.01.2020 Przewozy Regionalne), Mazowieckie Railways (Koleje Mazowieckie), PKP SKM in Tricity (PKP Szybka Kolej Miejska), SKM in Warsaw (Szybka Kolej Miejska), Silesian Railways (Koleje Śląskie) and smaller local government companies operating in the area of urban agglomerations.

Another category of transport – inter-regional and inter-agglomeration – is mainly operated by the company PKP Intercity (PKP IC). The company offers connections between large cities by express trains under the Express InterCity (EIC) and Express InterCity Premium (EIP) trademarks operated by Pendolino trains. PKP IC's share in this market segment is 97%. Apart from that, transport services by express and passenger trains are provided by companies such as Polregio and Mazowieckie Railways.

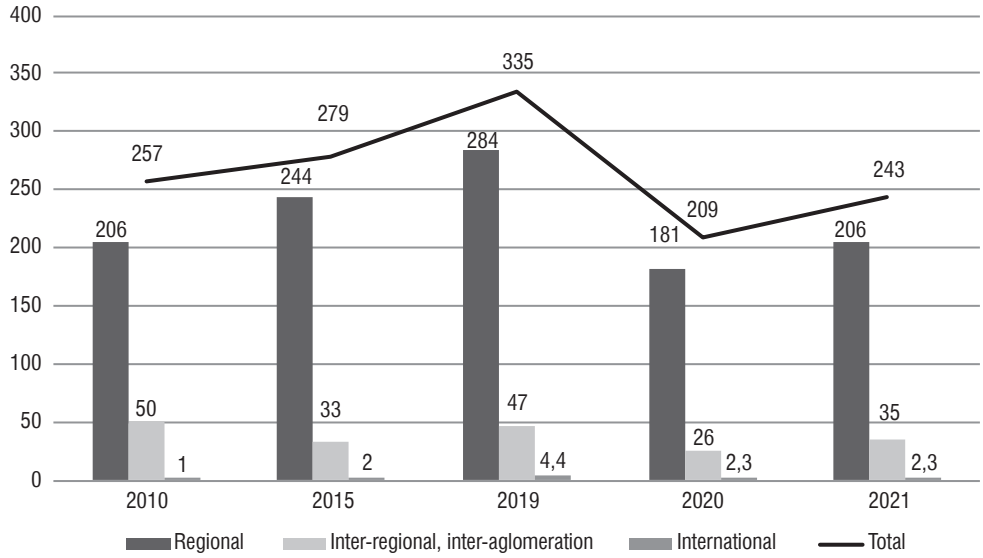
International transport is also the domain of the PKP IC company, where it offers long-distance, express, and fast trains – IC, EIC, EN. PKP IC trains run to: Berlin, Prague, and Ostrava, Vienna, Bratislava, Budapest, Lviv, Kiev, Rivne, Brest, Grodno and Minsk, and Moscow.

Passenger movements by the transport categories discussed above are shown in Figure 6.

In general, rail transport is characterised by an annual increase in passenger numbers, which amounted to 30% between 2010 and 2019. This trend is particularly evident in the subsystem of international and regional transport. In the former transport category, the increase was the highest, with the number of passengers carried increasing 4.5 times. In the regional transport subsystem, on the other hand, the increase was 38% (Figure 6). However, fluctuations in the number of passengers carried in the category of inter-regional and inter-agglomeration transport were caused by the modernisation of railway lines, which meant numerous track works and traffic restrictions on some sections. At the same time, the lines that were put into

operation after the modernisation are attracting passengers, as is evident in 2019. Thanks to the modernisation, journey times are being reduced, railway companies are investing in the purchase of rolling stock, and this is improving the quality of the offer and returning passengers.

Figure 6. Passenger transport by rail from 2010 to 2021, by transport category (m passengers)



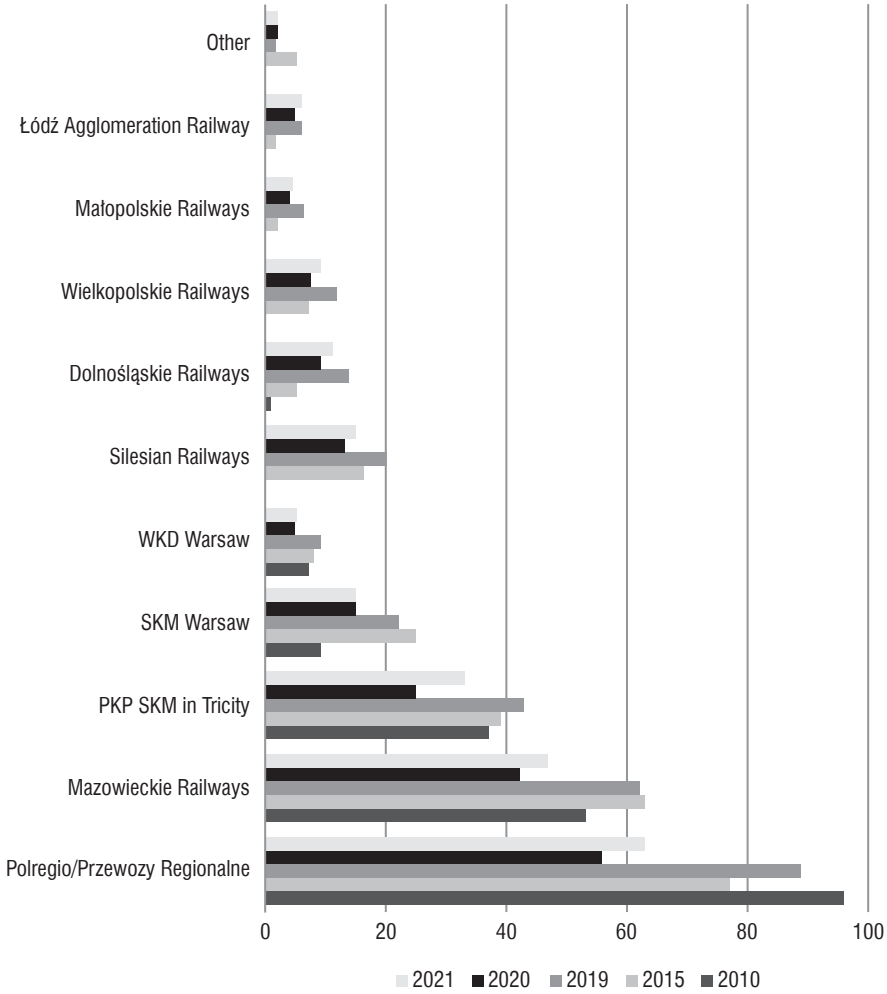
Source: own work based on UTK, 2022.

The largest number of passengers use regional connections, which accounted for 85% in 2021 (Figure 6). The development of regional and agglomeration railways was linked to the creation of local government companies: Mazowieckie Railways (2004), SKM in Warsaw (2004), Silesian Railways (2010), Łódź Agglomeration Railway (2010), Małopolskie Railways (2013). In 2004, as a result of new legal regulations, provincial governments became responsible for the organisation of rail transport on their territory, including the financing of transport and the preparation of the transport offer. At the same time, there was an increase in railway funding, including from EU funds. At the same time, local authorities, especially in the case of large urban agglomerations, faced a serious problem of congestion. The individual motorisation rate exceeded 500 cars/1,000 inhabitants, e.g., in Warsaw, Gdansk, Katowice, Cracow, Poznan, Wroclaw. These factors have led local authorities to start restoring the role of railways as the 'backbone' of the transport system. The place of the railway companies on the regional and agglomeration transport market is shown in Figure 7, where the number of passengers transported between 2010 and 2021 is summarised.

Regional and especially agglomeration transport is characterised by a very dynamic increase in passenger numbers. Local authority railway companies are taking over passengers previously served by Polregio and acquiring new customers. The development of the agglomeration transport market is very visible in the case of Warsaw, where services are provided by Mazowieckie Railways, SKM and WKD (Szybka Kolej Miejska, Warszawska

Kolej Dojazdowa). The agglomeration transport system is also developing intensively in the Tricity (PKP SKM), Silesia (Silesian Railways), Wroclaw (Dolnośląskie Railways), or Poznan (Wielkopolskie Railways). Agglomeration railways have great potential, as they provide a convenient and fast connection of suburbs and satellite cities with agglomeration centres. They enable the efficient and safe movement of large streams of travellers. They satisfy transport needs within the agglomeration and are a fast and reliable means of transport, independent of traffic congestion.

Figure 7. Passenger transport by regional and agglomeration rail from 2010 to 2021, by carrier (m passengers)



Source: own work based on: UTK, 2022.

Summary

Rail passenger transport is growing rapidly, which has led to a shift in intermodal relations. In 2019, railways transported more passengers than bus transport. In the following years, namely 2020–21, difficult due to pandemic mobility restrictions, this trend is even more pronounced. The dynamic growth in passenger numbers was mainly in international and regional, including agglomeration services. Qualitative changes in infrastructure and rolling stock have contributed to a significant improvement in the competitiveness of railways in international and inter-agglomeration relations. The modernisation of the E-65 line between Warsaw and Gdynia or the purchase of Pendolino electric multiple units may serve as well-known examples. The investments have significantly improved travel comfort, and railways have become competitive in relation to car or air transport. Revitalisation has also extended to agglomeration and, in part, regional railways. Cities have rediscovered the potential of rail as a fast and reliable means of transport, independent of traffic congestion.

The increasing number of inter-agglomeration and international passengers, the progressive revitalisation of agglomeration railways, which contributes to improving the climate neutrality of cities, and the shift in the branch structure create a very good starting position for Polish railways from the perspective of the European Green Deal. In addition, 84% of the public believe that transport emissions are a serious problem in our country and are willing to switch to rail transport [Ministerstwo Klimatu i Środowiska RP, 2020]. Also, more and more companies want to manage their carbon footprint responsibly and have a climate-neutral supply chain. The environmental awareness of society is an important positive determinant for the further development of Polish railways.

The study provides a diagnosis of the market position of railways, in particular regional and agglomeration railways, in the context of the implementation of the principles of the European Green Deal. Conclusions formulated on the basis of the analysis can be helpful for decision-makers at various levels who identify problems and shape transport policy directions. The subject of further research may be the monitoring of trends in the rail passenger transport system and the identification of challenges arising in the implementation of the new climate policy.

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