JOURNAL OF MODERN SCIENCE

1/61/2025

www.jomswsge.com

DOI: 10.13166/jms/202667

Paweł Lubiewski
WSB University in Dąbrowa Górnicza, Poland
ORCID iD: 0000-0001-5149-7908

Bartosz Kozicki
Military University of Technology, Poland
ORCID iD: 0000-0001-6089-952X

Łukasz Foryś
The Police Academy in Szczytno, Poland
ORCID iD: 0000-0003-1241-8722

Bogusław Kogut
WSB University in Dąbrowa Górnicza, Poland
ORCID iD: 0000-0003-4431-8283

THE IMPACT OF RAIL PASSENGER TRANSPORT, AS A COMPONENT LEADING TO THE INCREASE OF THE SECURITY AND MOVEMENT OF PEOPLE, ON TRAFFIC SECURITY IN TERMS OF THE COVID-19 PANDEMIC

Abstract

The article examines the impact of the use of rail passenger transport on the level of road security in the European Union. The research was conducted based on data on the spatial potential of rail transport (length of railway lines) and the intensity of passenger transport in selected six European Union countries, i.e., the Czech Republic, Spain, France, Germany, Poland and Italy. The dynamics of the most profound consequences of road accidents were also examined, i.e., the dynamics of the number of road accident fatalities in those countries. Such an approach was necessary to conduct a comparative analysis of changes in the dynamics of the use of passenger rail transport between 2010-2013. The research also took into account the impact of the Covid-19 pandemic on that phenomenon. To analyze fatal accidents, data from previously selected European Union countries for 2019-2023 were used. That made it possible, in both cases, to also examine the impact of the Covid-19 pandemic in the specified analytical area.

The research results showed that passenger rail transport does not play a decisive role in reducing the number of fatal road accidents. However, it seems that this is the result of incomplete use of the potential of such type of transport, which results in a slight reduction in road traffic intensity, and thus in shaping the level of road security.

Streszczenie

W artykule podjęto się zbadania wpływu wykorzystania kolejowego transportu pasażerskiego na kształtowanie poziomu bezpieczeństwa na drogach w Unii Europejskiej. Badania przeprowadzono w oparciu o dane dotyczące potencjału przestrzennego transportu kolejowego (długość linii kolejowych) oraz nasilenia przewozu osób w wybranych sześciu państwach Unii Europejskiej tj. Czechach, Hiszpanii, Francji, Niemczech, Polsce i we Włoszech. Badaniu poddano również dynamikę najpoważniejszych skutków wypadków drogowych, czyli dynamikę liczby śmiertelnych ofiar wypadków na drogach w tychże państwach. Ujęcie takie było niezbędne dla przeprowadzenia analizy porównawczej zmian w dynamice wykorzystania pasażerskiego transportu kolejowego w okresie 2010-2013. W badaniach uwzględniono również oddziaływanie na badane zjawisko pandemii Covid-19. Do analizy wypadków ze skutkiem śmiertelnym wykorzystano dane dotyczące wytypowanych wcześniej państw Unii Europejskiej za lata od 2019-2023. Dało to możliwość w jednym i drugim przypadku zbadania również odziaływania pandemii Covid-19 w zakreślonym obszarze analitycznym.

Wyniki badań pokazały, że pasażerski transport kolejowy nie ma decydującego znaczenia dla obniżenia liczby wypadków śmiertelnych na drogach. Wydaje się jednak, że jest to skutek niepełnego wykorzystania potencjału tego typu transportu, co wpływa na nieznaczne zmniejszenie natężenia ruchu drogowego, a tym samym na kształtowanie poziomu bezpieczeństwa na drogach.

Keywords: *public security, road traffic security, transformation of the transport system, integrated transport system, intermodal transport, COVID-19, rail passenger transport*

Słowa kluczowe: *bezpieczeństwo publiczne, bezpieczeństwo w ruchu drogowym, transformacja systemu transportowego, zintegrowany system transportowy, transport intermodalny, COVID-19, kolejowy transport pasażerski*

Introduction

The aim of the article is to demonstrate the impact of passenger rail transport on road traffic security, taking into account the Covid-19 pandemic.

For the purposes of the research, the following research problem was outlined as a question: to what extent does passenger rail transport influence the level of road security?

In order to develop a methodology for solving the research problem, the following hypothesis was outlined: it is assumed that passenger rail transport affects the level of road traffic security reducing its intensity partially.

The solution to the research problem was sought by examining, with the use of multidimensional comparative analyses, deviations in the lengths of railway lines and the number of passengers transported by rail in a selected period in six selected European countries, taking into account the duration of the COVID-19 pandemic and the analysis of the number of fatalities in road accidents. Multidimensional comparative analyzes of data regarding the passenger rail transport sector were used in the research.

The research period covered the following years: 2010-2023. Dependent variables from six European countries were analyzed: Poland, Germany, France, the Czech Republic, Italy and Spain. The research was based on observations of changes that occurred in rail transport in the considered European countries, mainly in terms of the impact of the COVID-19 pandemic on selected elements of that sector and in the field of fatal accidents. Spie Plot and other pie charts were used for the research, in which different scales were given to respective variables in order to observe their similarities and differences dynamically.

Challenges of the country in terms of the security and transportation of people

The fundamental task of the country is to ensure the security of its citizens (Wiśniewski, 2013, p. 43), including shaping the desired level of security of their movement. One of the main challenges facing the modern country is to ensure that in terms of road transport, one of the most dangerous types also in terms of crime (Kubáňová, Kubasáková, 2021, s. 109-113), the dynamics of cases of threats to the health and life of citizens have a clear downward trend. It is also important that the intensity of road traffic has been increasing dynamically for many years (Pałęga, 2017, s. 332). Over a number of years, there has also been an increase in the number of motor vehicles registered in Poland, including passenger cars and trucks (KGP Road Traffic Office of the National Police Headquarters, 2024). Moreover, what should be added is the dynamically changing level of border traffic in Poland (Lubiewski, 2016, pp. 9-10). In addition to the development of domestic transport, road transit through the territory of the Republic of Poland has a significant impact and its annual increase is clearly noticeable (Road Traffic Office of the National Police Headquarters, 2024). That trend in the area of passenger and freight transport directly increases the security challenges on Polish roads.

Statistical data on road traffic accidents, whether related to freight or passenger transport, clearly indicate that several dozen thousand accidents occur on Polish roads every year. It is encouraging that for several years there has been a noticeable downward trend in the number of road accidents in Poland. However, the number of people killed and injured is still extremely high. In 2023, out of the total number of road accidents (almost 21 000), less than 1 900 people died and over 24 000 were injured to varying degrees.

Transformation of the transport system in the European Union towards the increase of human security

The indicated security problem has been visible for many years in the sphere of interest of the European Union's transport policy, which also aims to increase mobility, remove main barriers in key areas, accelerate economic growth and increase employment (Jaskólski, 2013, pp. 282-283). Its legal bases is specified in Art. 90-100 of the Treaty on the functioning of the European Union, and are further specified in the Strategy for Sustainable and Smart Mobility developed by the European Commission and an action plan covering 82 initiatives giving direction to the work conducted under the EU transport policy between 2021-2024. The strategy determines how the EU's transport system can undergo a green and digital transformation and become more resilient to future crises (Dyr, 2011, pp. 22-23). It is intended to reduce carbon dioxide emissions by 90% by 2050. That goal is to be achieved thanks to an intelligent, competitive, safe, accessible and affordable transport system (European Commission, Strategy…, 2023).

EU transport policy also concerns infrastructure planning, the use of information technology, security and safety, passenger rights and international cooperation (setting safety, security and environmental standards by international organizations). Improving road security and thus reducing the number of people killed and injured on roads, which is still too high, includes, among other things, encouraging road users to use other means of transport (so that they can move efficiently and safely in designated areas, including less developed ones). Additionally, the focus has been on the creation of an integrated European railway area, which also requires improved *interoperability* – that is, technical compatibility – of infrastructure, rolling stock, signaling and other subsystems of the rail system, as well as less complicated procedures for licensing rolling stock across European Union railway network.

Over many years, national railway networks have developed various technical specifications for infrastructure. Different track gauges, electrification standards, and security and signaling systems make travelling by train from one country to another more difficult and expensive. There is specific EU

legislation to promote interoperability and tackle such differences, and the European Railway Agency plays a key role in promoting interoperability and harmonization of technical standards, and cooperation between EU Member States and rail stakeholders is essential in that process. Over the last 25 years, the Commission has been actively suggesting changes to the European rail transport market to strengthen the position of rail in relation to other modes of transport. The activities focused on three key areas for a strong and competitive railway industry: opening the rail transport market to competition; improving interoperability and security; development of railway infrastructure (European Commission, Mobility…, 2023).

The main goal of Polish transport policy was presented in the Sustainable Transport Development Strategy until 2030 adopted by the Council of Ministers on September 24, 2019. It concerns increasing the country's transport accessibility and improving the security of road users and the efficiency of the transport sector by creating a coherent, sustainable, innovative and user-friendly transport system at national, European and global level. Achieving that goal will enable the development of conditions leading to the stable economic development of the country. The implementation of the main goal in the 2030 perspective requires the following actions:

- building an integrated and interconnected transport network serving a competitive economy;
- changes in individual and collective mobility (including the promotion of public transport);
- improving the organization and management of the transport system;
- improving the security of road users and transported goods;
- reducing the negative impact of transport on the environment;
- improving the efficiency of using public funds for transport projects.

The implementation of those activities results from the need to make up for the neglect of the past and to adapt to new technological and economic trends in Europe and around the world, as well as the need to avoid development traps. First of all, investment efforts will be focused mainly on catching up on infrastructure issues related to increasing transport accessibility in Poland (roads, railways, airports, inland waterways, sea and inland ports)

and organizing the basic infrastructure of an integrated transport system. The idea is to gradually increase the country's transport accessibility by 2030, ensure sustainable development of respective modes of transport and improve the conditions for the provision of services related to the transport of goods and passengers. The document includes specific strategic projects aimed at creating a coherent network of high-standard highways, expressways and railway lines, a developed network of airports, seaports, inland navigation and public transport systems. The document also points to modern solutions that facilitate the functioning of the entire transport sector, reducing its negative impact on the environment and climate, so that it is possible to create a sustainable transport system in the country by 2030 (Ministry of Infrastructure, Strategy…, 2023).

The importance of rail transport in the integrated transport system of the country

In rail transport, the basic criterion for evaluating the functioning of the railway transport system is its security, which determines its efficiency as well as the quality of the transport service offered (Lubiewski, Foryś, 2022, p. 41). The goals of the rail transport system determined in the Sustainable Transport Development Strategy until 2030 have been divided into passenger and freight transport. In passenger transport, the first goal was to build a national passenger transport system covering all regions of Poland, based on tariff integration within the industry and within regional/agglomeration transport systems, constituting an attractive alternative to respective road transport. Its main hub was to be the Central Communication Port. The second goal is to build voivodeship and inter-voivodeship passenger transport systems ensuring direct connections with voivodeship capitals and between voivodeship cities, the most important centers in the regions and tourist areas, as well as a radical reduction in the number of cities and areas without rail transport, ensuring coherent railway infrastructure between voivodeships . Another goal concerned the construction of daily commuting systems integrating urban centers into agglomeration systems and increasing the scope of impact and functional area of cities, as well as creating network connections between existing urban centers in peripheral areas at risk of

marginalization, including the improvement of the capacity of urban nodes. The last goal is to build international connections between the most important areas of communal residence in Poland and the largest areas of this type in the neighboring countries of Central Europe, in particular connecting the regions of Warsaw-Łódź, Małopolska-Silesia-Moravia and the Danube region including the agglomerations of Vienna, Bratislava and Budapest, in order to integrate Central European macroregion with a population of over 30 million inhabitants and an area of approximately 130-160 thousand km^2, which will become the economic engine of Central Europe (Ministry of Infrastructure, Strategy…, 2023).

On the other hand, in freight transport, the first goal was to launch processes influencing the construction of an intranational intermodal freight transport system covering all regions of Poland and the integration of this system with international freight transport systems in order to transfer part of the cargo stream from road transport to rail. Ensuring processes of defense needs in terms of the rapid transport of NATO troops due to the importance of Poland on NATO's eastern flank is another goal specified in the Strategy. The last step was to shape the conditions for the increased importance of Poland in transport and international trade by strengthening the main intercontinental Europe-Asia land transport corridors running through the Republic of Poland and trans-European meridional corridors (complementary to the existing latitudinal connections), building intermodal international transshipment hubs, as well as ensuring connections between main national transport hubs, including ports, with neighboring countries (Ministry of Infrastructure, Strategy…, 2023). Strengthening the role of rail transport in the integrated transport system of the country was indicated in the document as a strategic task for the adopted time horizon. For this purpose, it will be necessary to continue activities that will have a positive impact on increasing the competitiveness of railways in relation to other types of transport, measured by travel time and cost, travel comfort and the level of security. That task is to be implemented due to investments and technological and organizational changes. Possibilities are to be created to increase the supply of competitive services, as well as to ensure the implementation of the process of successively increasing the degree of interoperability of the Polish rail transport system within the rail transport system in the EU (Ministry of Infrastructure, Strategy…, 2023).

The impact of COVID-19 on the use of passenger rail transport

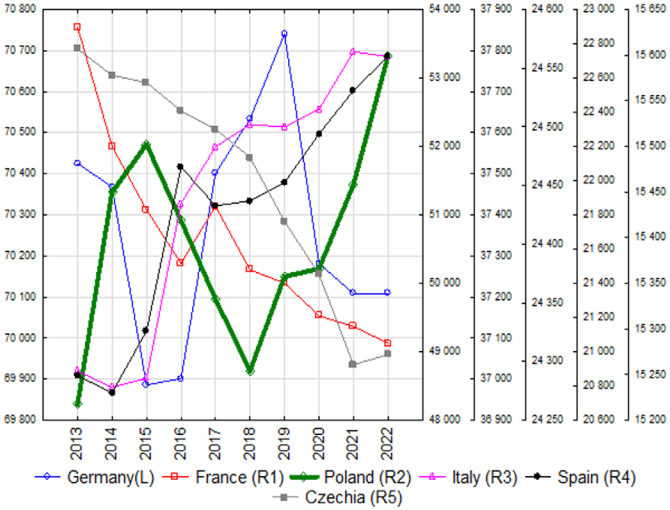
The term *security* (Kozicki, 2022, pp. 13-18, Mitkow, Tomaszewski, Kozicki, 2021, pp. 11-30, Huzarski, 2009, p. 11, Kitler, 2011, p.22, Stańczyk, 1996, p. 18, Ficoń, 2011, p. 83, Nowak, 2011, p. 16) is identified with the continuity of activities of various national or international entities, including economic sectors (Kozicki, Bryczek-Wróbel, 2020, pp. 201-212; Kozicki, Górnikiewicz, 2020, pp. 187-200), to achieve the assumed condition (Jakubczak, Flis, 2006, p. 15). One of the examples considered in the study is the rail passenger transport sector. Its task is to transport people over various distances within a strictly defined time. It is characterized by a fine network of connections as well as wide availability of the service provided dynamically with relatively low service rates compared to, for example, air passenger transport.

Since 2020, Europe and the world have seen a collapse of various economic sectors, including rail passenger transport, due to the impact of the COVID-19 pandemic. There have been huge declines in the number of people transported compared to pre-pandemic periodFs. That undoubtedly affects the level of diverse types of security, also in the economic dimension. Long-term changes lead to deviations that disrupt the level of economic security of economic entities or sectors of the economies of various countries.

The above-mentioned deviations will be highlighted by a multidimensional comparative analysis (Nermend, 2017, p. 8-21; Panek, Zwierzchowski, 2013, p. 15) of the dependent variables selected for the research, which will indicate the changes that have taken place dynamically in six selected European countries in the transport sector under consideration.

The research began by outlining data on the length of railway lines in kilometers in the six considered European countries between 2013-2022 as a variable determining the spatial possibilities (transport distances) in the use of rail transport.

Figure 1. *Categorized line chart of the length of railway lines in km in six European countries between 2013-2022*

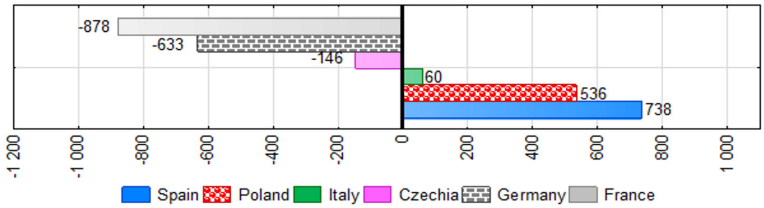


Source: own study based on data obtained from: https://ec.europa.eu/eurostat/databrowser/view/rail_if_tracks/default/table?lang=en&category=rail.rail_if; as of 11.03.2024

The data presented in Figure 1 show that, especially in three European countries out of the six considered, there was a visible decreasing trend in the length of railway tracks between 2013 and 2022. The largest trend, analyzing the dynamics indices on a constant basis (constant: 2013), was in France and amounted to -8,59% (a decrease of 4641 km of railway lines), then in the Czech Republic (-2,15%, i.e. a decrease of 335 km of railway lines) and Germany (-0,45%, i.e. a decrease of 317 km of railway lines). In other countries, increases were visible. The ranking of increases is as follows: Spain (increase by 8,94%, by 1865 km of railway lines); Poland (increase by 2,29%, by 847 km of railway lines) and Italy (increase by 1,10%, by 268 km of railway lines). It is worth emphasizing that in Poland, Spain and Italy, since 2021, i.e., during the period of impact of the COVID-19 pandemic, there have been significant increases in the length of railway lines, while in the remaining three countries there have been decreases.

For research purposes, Figure 2 shows the difference in the length of railway lines in km in six surveyed European countries between 2019 and 2022.

Figure 2. *Categorized bar chart of the difference in the length of railway lines in km in six respective European countries between 2019 and 2022*

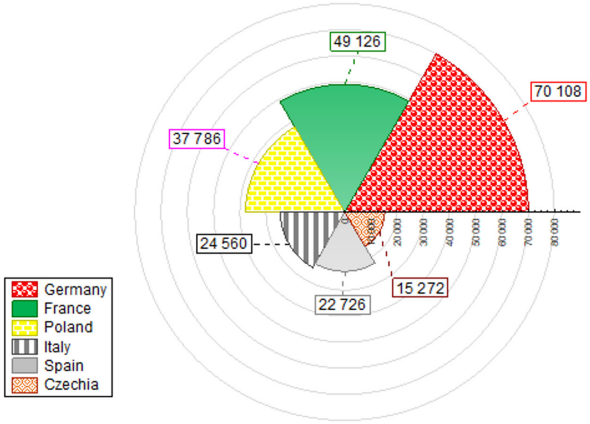


Source: own study based on data obtained from: https://ec.europa.eu/eurostat/databrowser/view/rail_if_tracks/default/table?lang=en&category=rail.rail_if; as of 11.03.2024

The data presented in Figure 2 indicate that increases in the length of railway lines between 2019 and 2022 occurred in three of six countries considered: Spain (an increase of 738 km), Poland (an increase of 536 km) and Italy (an increase of 60 km). In the remaining three countries, a decreasing trend was visible. In the Czech Republic, a decrease of 146 km in the length of railway lines was recorded. In Germany by 633 km and in France by 878 km.

Then, for research purposes, the total length of railway lines in the six analyzed European countries was ranked in Figure 3.

Figure 3. *Spie Plot pie chart of the total length of railway lines in km in six respective European countries in 2022*

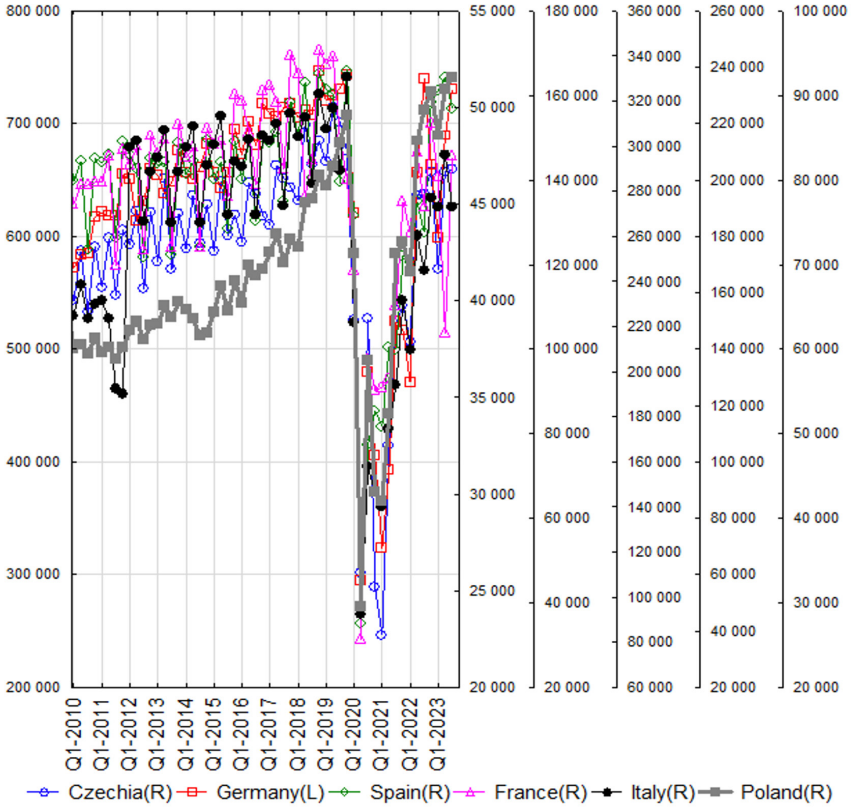


Source: own study based on data obtained from: https://ec.europa.eu/eurostat/databrowser/view/rail_if_tracks/default/table?lang=en&category=rail.rail_if; as of 11.03.2024

In 2022, the longest railway lines were in Germany: 70 108 km. France was the second: the total length of railway lines in 2022 is 49 126 km. The following places were taken by: Poland (37 786 km), Italy (24 560 km), Spain (22 726 km) and the Czech Republic (15 272 km).

Then, for research purposes, Figure 4 presents data on the number of passengers transported by rail in six European countries from the first quarter of 2010 to the third quarter of 2023.

Figure 4. *Categorized line chart of rail passenger data in six European countries from the first quarter of 2010 to the third quarter of 2023*

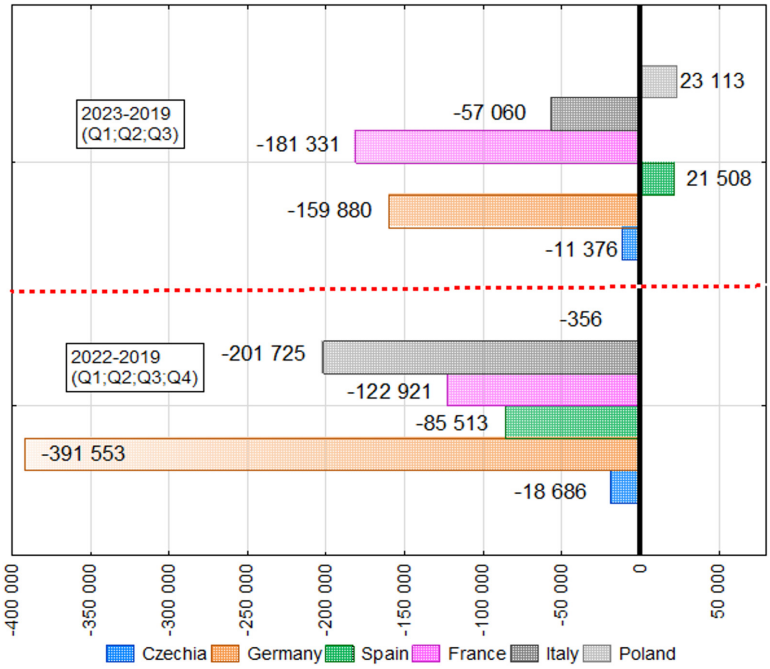


Source: own study based on data obtained from: https://ec.europa.eu/eurostat/databrowser/view/rail_pa_quarteral__custom_10324119/default/table?lang=en; as of 11.03.2024

The observation of the data presented in Figure 4 shows that from the first quarter of 2010 to the fourth quarter of 2019, an increasing trend in the number of passengers transported by rail was visible in all European countries considered. In 2020, due to the COVID-19 pandemic, huge declines were visible in each of the analyzed countries in the passenger rail transport sector. From 2021 to 2023, there is an increasing trend.

For illustrative purposes, Figure 5 presents data on the difference in the number of passengers transported in six respective European countries in the following periods: 2019-2022 and 2019-2023 (the difference in 2023 and 2019, excluding the fourth quarter).

Figure 5. *Categorized bar chart of the difference in the number of passengers in six respective European countries in: 2019–2022 and 2019–2023 (difference in 2023 and 2019 excluding the fourth quarter)*



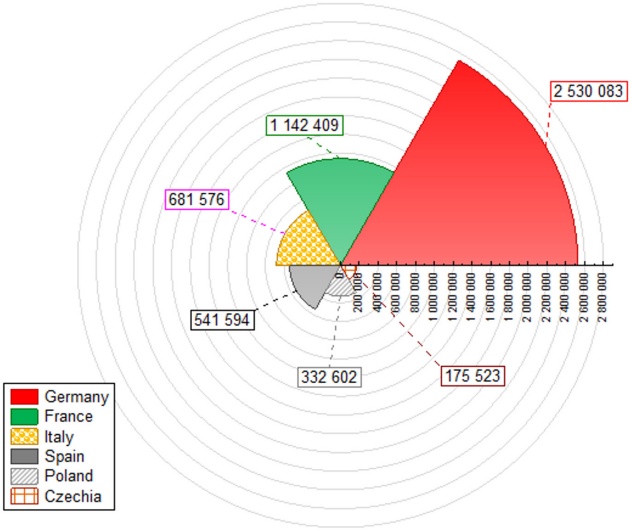
Source: own study based on data obtained from: https://ec.europa.eu/eurostat/databrowser/view/rail_pa_quarteral__custom_10324119/default/table?lang=en; as of 11.03.2024

In 2022, compared to 2019, there was a decrease in the number of passengers transported by rail in each of the six analyzed European countries. The largest declines in this period were recorded in Germany: 391 553 passengers. Then, in Italy: 201 725 passengers. The next places in the ranking were taken by: France (down by 122 921); Spain (down 85 513); Czech Republic (down 18 686) and Poland (down 356 passengers).

Considering the difference between 2019 and 2023 (excluding the fourth quarter), it was observed that in two of the six countries considered there were increases in the number of passengers transported by rail. The largest increase was recorded in Poland: by 23 113. Spain was in the second place (an increase by 21 508). The ranking of declines was as follows: Czech Republic (down by 11 376); Italy (down 57 060); Germany (down 159 880) and France (down 181 331).

Then, Figure 6 presents data on the total number of passengers transported by rail in six respective European countries in 2022.

Figure 6. *Spie Plot pie chart of the total number of passengers transported by rail in six respective European countries in 2022*

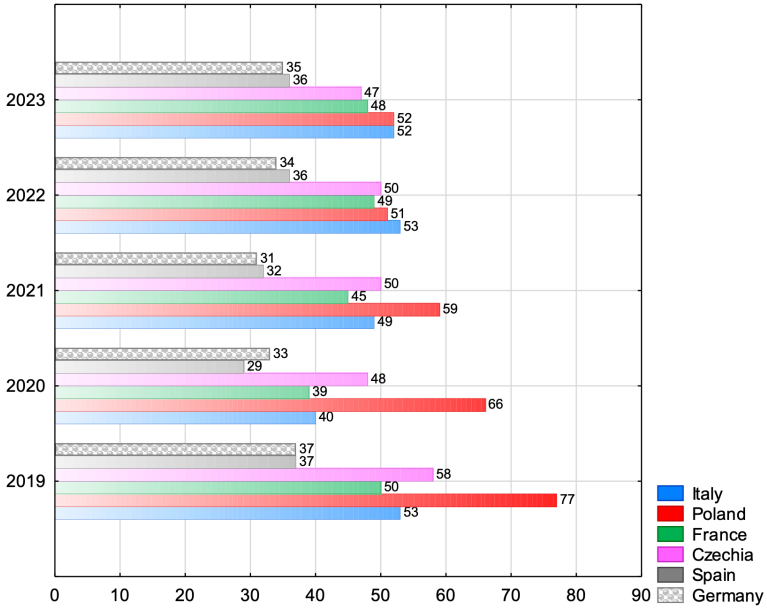


Source: own study based on data obtained from: https://ec.europa.eu/eurostat/databrowser/view/rail_pa_quarteral__custom_10324119/default/table?lang=en; as of 11.03.2024

The leader in the use of rail passenger transport in the six European countries considered in 2022 is definitely Germany, where 2 530 083 people were transported. France is in the second place (1 142 409 passengers). The third place is taken by Italy (681 576 passengers), followed by: Spain (541 594 passengers), Poland (332 602 passengers) and the Czech Republic (175 523 passengers).

Figure 7 presents, for comparative purposes, the dynamics of changes in the number of the most serious consequences of road accidents, i.e., fatal accidents. According to the analysis of the data obtained during the peak of the Covid-19 pandemic, the number of road accident fatalities decreased significantly, which should be explained by a significant reduction in social mobility as a result of the restrictions introduced. Interestingly, despite the end of restrictions, this index has not returned to the level from before 2019.

Figure 7. *Number of fatalities in road accidents in selected EU countries between 2019-2023 (index: number per million inhabitants)*



Source: own study based on data from: https://poland.representation.ec.europa.eu/news/bezpieczenstwo-na-drogach-ue-rowerzysci-zagrozeni-2023-02-22_pl; as of 30.04.2024

From 2019 (77 fatalities) to 2023 (52 fatalities), the largest decrease in the number of fatalities in road accidents in selected European Union countries per million inhabitants was observed in Poland and occurred by 25 people.

The evaluation of the data presented in Figure 7 is the statement that from 2022, the indices of the number of accidents per million inhabitants in the six European countries considered were at a similar level, taking an oscillatory shape in the respective European countries. It was observed that in two countries, in 2023 compared to 2022, there was a visible increasing trend of the analyzed index. In Poland and Germany there was an increase by 1 person. In Spain, no trend was observed. However, a decreasing trend was visible in three remaining European countries. In Italy and France, the number of road accident deaths per million inhabitants decreased by 1 person, and in the Czech Republic the decrease increased to 3 people.

The lowest number of fatalities in road accidents in selected European countries per one million inhabitants in 2023 is in Germany and amounts to 35 people, and the highest in Italy – 53 people.

Summary and conclusions

The COVID-19 pandemic has led to a huge reduction in demand for rail transport. The decline was significantly influenced by restrictions introduced in European Union countries aimed at radically reducing the incidence of Covid-19. The result was many changes in different sectors of the economy and large variations in diverse groups of dependent variables.

The research shows that in three of six European countries analyzed (Poland, Spain and Italy) since 2021 there have been significant increases in the length of railway lines, and in the remaining three countries there have been decreases. Additionally, an increase in the length of railway lines was observed between 2019 and 2022 in the same countries: Spain (an increase of 738 km), Poland (an increase of 536 km) and Italy (an increase of 60 km). In other countries there was a decreasing trend. In the Czech Republic, a decrease of 146 km in the length of railway lines was recorded. In Germany by 633 km and in France by 878 km.

It is worth emphasizing that in 2022, Germany was the leader in terms of the longest railway lines (70 108 km). France is in the second place with the total length of railway lines in 2022 amounting to 49 126 km. The next places were taken by: Poland (37 786 km), Italy (24 560 km), Spain (22 726 km) and the Czech Republic (15 272 km). Therefore, the Covid-19 pandemic does not seem to have any significant impact on shaping the spatial possibilities of passenger rail transport. That potential is shaped (reduced, increased) according to the strategies of the respective countries.

Analyzing the second group of dependent variables, it was observed that in 2020, due to the pandemic, there were huge declines in the passenger rail transport sector in each of the analyzed countries. In this respect, the pandemic had a decisive impact on the dynamics of the number of people transported. That was undoubtedly influenced by restrictions on social mobility, but also by the fear created by the rapidly developing pandemic, which had a significant impact on individual restrictions on movement. It should be noted that from 2021 to 2023 the trend changed to the increasing one.

In 2022, compared to 2019, there was a decrease in the number of passengers transported by rail in each of the six analyzed European countries. The largest declines in the above-mentioned period were recorded in Germany: 391 553 passengers. Then, in Italy: 201 725 passengers. The next places in the ranking were taken by: France (down by 122 921); Spain (down 85 513); Czech Republic (down by 18 686) and Poland (down by 356).

However, when analyzing the difference between 2023 and 2019 (excluding the fourth quarter), it was observed that in two of the six countries considered, there were increases in the number of passengers transported by rail: Poland (an increase of 23 113) and Spain (an increase of 21 508). The leader in rail passenger transport in six European countries considered in 2022 is definitely Germany, where 2 530 083 people were transported. Poland ranks fifth with 332 602 passengers transported.

The above-mentioned conclusions should be compared with the downward trend starting in 2019, which can be explained by limited social mobility. After the Covid-19 pandemic, the use of passenger rail potential continued to a varying extent in the respective countries, with a significant increase in most of those countries by 2023. The level achieved in 2023 can be considered

comparable to that before the pandemic. However, the death toll rate from 2020 to 2023 remained significantly lower than before the pandemic. Based on the above-mentioned conclusions, it cannot be denied that passenger rail transport has an impact on road safety, however, as the analyzed data show, the dynamics of its use does not explain the significant drop in the number of fatalities in the examined countries, and a clear upward trend in terms of the use of this type of transport does not coincide with the dynamics of the number of fatalities. Therefore, it can be concluded that passenger rail transport has no significant impact on the reduction of the number of fatal road accidents.

Despite that conclusion, it should be emphasized that this type of transport has an impact on road security due to its significant transport potential and, therefore, the possibility of reducing the basic threat to road safety, which is the increasing traffic congestion.

There is no doubt that the complex nature of modern road transport generates a number of challenges also in terms of road security. Hence, the demand that building an integrated transport system should be done in a holistic way, taking into account a strategic approach, in line with future development trends, conditions and threats in the field of road transport, but also in accordance with the potential of rail transport. It seems, based on the research results, that passenger rail transport has much greater potential for reducing road traffic than has been used in recent years.

The viewpoint on the challenges that determine modern road transport presented in this article is a contribution to broader discussions on that topic, which is so important from the point of view of the development of modern society.

References

Dyr, T., (2011). Polityka transportowa a strategia zrównoważonego rozwoju Unii Europejskiej [Transport policy and the European Union's sustainable development strategy], [w:] J. Hawlena (red.). Transport a strategia zrównoważonego rozwoju Unii Europejskiej [Transport and the sustainable development strategy of the European Union], Radom-Katowice, SPATIUM, pp. 22–23.

Eurostat. (2024). *Length of railway tracks by electrification of tracks*, https://ec.europa.eu/eurostat/databrowser/view/rail_if_tracks/default/table?lang=en&category=rail.rail_if; as of 11.03.2024

Eurostat. (2024). *Passengers transported* (detailed reporting only). https://ec.europa.eu/eurostat/databrowser/view/rail_pa_quartal__custom_10324119/default/table?lang=en; as of 11.03.2024

Ficoń, K. (2011). Logistyka kryzysowa. Procedury. Potrzeby. Potencjał, [Crisis logistics. Procedures. Needs. Potential], Bel Studio, Warszawa, p. 83.

Huzarski, M. (2009). Zmienne podstawy bezpieczeństwa państwa [The changing foundations of state security], AON, Warszawa, p. 11.

Jakubczak, R., Flis, J. (red.). (2006). Bezpieczeństwo narodowe Polski w XXI wieku. Wyzwania i strategie [Polish national security in the 21st century. Challenges and strategies], Bellona, Warszawa, p. 15.

Jaskólski, A., (2013). Założenia polityki transportowej Unii Europejskiej w XXI wieku. Uwarunkowania, wyzwania, strategie działania [Assumptions of the European Union transport policy in the 21st century. Determinants, challenges, strategies for action], *Rocznik Integracji Europejskiej*, 7/2013, s. 282-283).

Kiryk, A., (2022). Правові аспекти політики декарбонізації ранспортного сектору економіки країн-членів ЄС [Legal aspects of the policy of decarbonization of the transport sector of the EU Member States], *Університетські наукові записки*, 4(88). pp. 74-76.

Kitler, W. (2011). Bezpieczeństwo narodowe RP. Podstawowe kategorie. Uwarunkowania. System, [National security of the Republic of Poland. Basic categories. Conditions. System], Akademia Obrony Narodowej, Warszawa, p. 22.

Komenda Główna Policji [Police Headquarters]. (2023). *Wypadki drogowe w Polsce w 2023 roku, Komenda Główna Policji Biuro Ruchu Drogowego* [*Road accidents in Poland in 2023, Police Headquarters, Road Traffic Office*], https://statystyka.policja.pl/st/ruch-drogowy/76562,wypadki-drogowe-raporty-roczne.html as of 30.04.2024

Komisja Europejska [European Comission]. (2020). *Strategia na rzecz zrównoważonej i inteligentnej mobilności* [*Strategy for sustainable and smart mobility*], https://data.consilium.europa.eu/doc/document/ST-14012-2020-INIT/pl/pdf, as of 20.12.2023

Komisja Europejska [European Comission], (2023). *Mobility and transport*, https://transport.ec.europa.eu/transport-modes_en, as of 21.12.2023

Kozicki, B. (2022). Model planowania potrzeb Sił Zbrojnych RP wobec aktualnych wyzwań bezpieczeństwa narodowego w XXI wieku [A model for needs planning of the Polish Armed Forces in terms of current national security challenges in the 21st century], Warszawa, pp. 15-25.

Kozicki, B., (2022). Planowanie potrzeb Sił Zbrojnych RP w aspekcie zapewnienia bezpieczeństwa militarnego Polski [Needs planning of the Polish Armed Forces in terms of military security in Poland], Warszawa, pp. 13-18.

Kozicki, B., Bryczek-Wróbel, P. (2020). The Impact of Covid-19 Pandemic on Energy Security by Demand Analysis for Oil and Air Passengers in European Countries, *European Research Studies Journal*, Volume XXIII, Special Issue 3, pp. 201-212.

Kozicki, B., Górnikiewicz, M. (2020). Unemployment Rate in Poland and USA during COVID-19 Pandemic: A Case Study, *European Research Studies*, Journal , Volume XXIII, Special Issue 3,, pp. 187-200.

Kubáňová, J., Kubasáková, I., (2021). Transport risk identification and assessment, *Safety and Security Engineering in Transport*, 23(3). pp. 109-113.

Lubiewski, P., (2016). Nielegalna imigracja. Zagrożenia bezpieczeństwa [Illegal immigration. Security threats], WSPol, Szczytno, pp. 9-10.

Lubiewski, P., Foryś, Ł, (2022). Wyzwania dla bezpieczeństwa w kontekście rozwoju transportu intermodalnego i multimodalnego w Polsce [Challenges for security in terms of the development of intermodal and multimodal transport in Poland], [w/in:] Stelmach J., Bezpieczeństwo terrorystyczne budynków użyteczności publicznej. Tom 4. Bezpieczeństwo w cyberprzestrzeni oraz praktyczny wymiar zabezpieczeń technicznych [Terrorist security of public buildings. Volume 4. Security in cyberspace and the practical dimension of technical security], Difin, Warszawa, p . 41.

Ministerstwo Infrastruktury [Ministry of Infrastructure]. (2023). *Najlepszy wynik polskiej kolei pasażerskiej w XXI wieku* [*The best result of Polish passenger railways in the 21st century*], https://www.gov.pl/web/infrastruktura/najlepszy-wynik-polskiej-kolei-pasazerskiej-w-xxi-wieku, as of 7.12.2023

Ministerstwo Infrastruktury [Ministry of Infrastructure]. (2023). *Strategia Zrównoważonego Rozwoju Transportu do 2030 roku* [*Sustainable Transport Development Strategy by 2030*], https://www.gov.pl/web/infrastruktura/projekt-strategii-zrownowazonego-rozwoju-transportu-do-2030-roku2, as of 21.12.2023

Mitkow, Sz., Tomaszewski, J., Kozicki, B., (2021). Bezpieczeństwo militarne a potencjał osobowy Sił Zbrojnych RP [Military security and the personnel potential of the Polish Armed Forces], WAT, Warszawa, p.11-30.

Nermend, K. (2017). Metody analizy wielokryterialnej i wielowymiarowej we wspomaganiu decyzji [Methods of multi-criteria and multidimensional analysis in decision support], PWN, Warszawa, p.8-21.

Nowak, E., Nowak, M. (2011). Zarys teorii bezpieczeństwa narodowego [Outline of the theory of national security], Difin, Warszawa, p. 16.

Pałęga, M. (2017). Bezpieczeństwo ruchu drogowego w Polsce w świetle wypadków drogowych i ich skutków [Road safety in Poland in the light of road accidents and their consequences], *Bezpieczeństwo i ekologia*, 12/2017, s. 332

Panek, T., Zwierzchowski, J. (2013). Statystyczne metody wielowymiarowej analizy porównawczej. Teoria i zastosowanie [Statistical methods of multidimensional comparative analysis. Theory and application], SGH, Warszawa, p. 15.

Smolarski, M., Szuszczewicz, M. (2021). The impact of the COVID-19 pandemic on the operation of regional rail transport in border areas – on the example of Lower Silesia (PL) and Liberec Region (CZ). *Czasopismo Geograficzne*, 92(6). pp. 128-131.
Stańczyk J., (1996). Współczesne pojmowanie bezpieczeństwa [Contemporary understanding of security], ISP PAN, Warszawa, p. 18.
Wiśniewski, B. (2013). System bezpieczeństwa państwa. Konteksty teoretyczne i praktyczne [State security system. Theoretical and practical contexts], WSPol, Szczytno, p.43.