



Changes in the Passenger Sector in the COVID-19 Era

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Abstract. The article presents the changes that took place on the rail passenger transport market in 2020 – the first year of the SARS-CoV-2 pandemic, with particular emphasis on rail passenger transport in Poland. The considerations concern passenger transport segments represented by: PKP Intercity – a long-distance operator, SKM Warszawa, working as a agglomeration operator. The analysis of the available data shows that: regardless of the market segment, the year 2020 for railway companies was characterized by significant declines in the volume of transports which reached the lowest level in March and April. Those changes were correlated with the level of restrictions on the people’s movement. While preparing the article, the data and available sources were used and the methods of analysis and synthesis in addition. The results are presented in tabular form and the text is enriched with graphs.

Keywords: Transportation · Railway · Passenger sector · COVID-19

1 Introduction

The results of research on the impact of COVID-19 on the transport sector have been published since the beginning of 2020 by organizations representing urban transport, road, railway and aviation. COVID-19 is also of interest to worldwide researchers from a variety of research communities and research positions. Concerning mobility and transport, many papers were published describing the phenomena occurring in different countries, e.g. in France [1], in Germany [2] and in Sweden [3]. Research carried out in parallel on almost all continents provides a rare opportunity to observe the same phenomenon in different environments and contribute to understanding different aspects of the coronavirus impact (more generally) on society. Research conducted in the USA suggests that crowded spaces play a more important role than population density in the spread of COVID-19 and the type of occupation, while the patterns of commuting to work do not play a significant role [4]. When looking for ways to reduce the spread of SARS-CoV-2, attempts are made to identify the important growth factors, routes, and methods of its transmission. There are opinions among the authors pointing to the leading role of public transport systems [5], as well as denying them [6].

The German Koch Institute indicated that 0.2% of traceable outbreaks in Germany were linked to transport, and involved fewer people per outbreak than those infrequently

affected settings [7]. French Public Institute on Health Information showed that only 1.2% of Covid-19 clusters were linked to transport (land, air, and sea). They mainly come from workplaces (24.9%), schools and universities (19.5%), healthcare venues (11%), temporary public and private events (11%), and family gatherings (7%) [8]. In the UK, an analysis has shown that the risk of contracting Covid-19 while traveling by train is 1 in 11,000 journeys (equivalent to a chance of less than 0.01%, lower than the probability to die in a road accident). With a face covering, it's 1 in 20,000 journeys, or 0.005% [9].

2 Characteristics of the Transport Sector

2.1 The Situation in the EU27

Railway Transport. In early 2020 international railway traffic was stopped in almost all countries, and domestic one decreased by approximately 80% for all national rail services during lockdowns [10]. Passenger services suffered more than freight, but the pandemic affected both types of transport. The loss in the first half of 2020 a passenger rail transport level broke down to 40% in comparison to 2019, and at the end of 2020 – 41%. In 2020 railways lost € 26 billion in revenue in the European Union (EU27), including passenger service – € 24 billion and freight – € 2 billion [11]. Figure 1 presents the percentage of losses in the subsequent months of the second half of 2020 for passenger services.

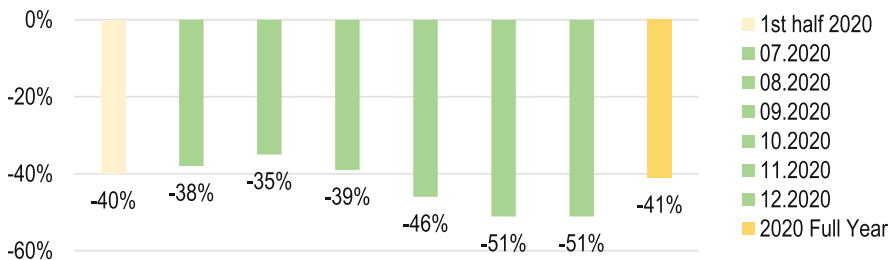


Fig. 1. Losses 2020/2019 in Passenger Services, Source: own elaboration based on [11].

In the transport of goods, the situation throughout 2020 was significantly better than in the transport of passengers, nevertheless in the period January-June the result was 15% lower than that obtained in the comparable period of 2019. The loss at the end of the year was 11%.

Road Transport. Global road transport activity was almost 50% below the 2019 average by the end of March 2020 [24]. During the March/April lockdown, some European toll operators lost up to 90% of traffic and 80% of revenue [12]. The decrease in road traffic reduction compared to the previous year in individual cities around the world differed significantly depending on the severity of infections and the adopted regulations helpful in limiting the spread of the virus. Sweden was the least restrictive of mobility,

not introducing travel bans, but only recommending behaviours limiting the spread of the virus. In comparison of presented periods of time, the decrease in traffic in Stockholm is lower than in others cities. Weekly mobility patterns in the week to the average traffic figures from the same week one year earlier are presented in Table 1.

Table 1. Road traffic reduction related to SARS-CoV-2 in selected cities in selected periods of national emergency, year-on-year.

City	16–22.03.20	11–17.05. 20	6–12.07.20	31.08–6.09.20	19–25.10.20
Barcelona, Spain	–73%	–65%	–31%	–38%	–35%
Manchester, UK	–67%	–53%	–53%	–42%	–42%
Stockholm, Sweden	–48%	–29%	–39%	–10%	–3%
Madrid, Spain	–86%	–73%	–59%	–59%	–32%
Milan, Italy	–74%	–61%	–42%	–35%	–29%

Source: own elaboration based on data [13] [accessed 20.05.2021].

Ban of public transport and international movements across Europe, with the highest impact on the tourism sector, caused significant drops in turnover in road transport: bus & coach urban/local –42%, bus & coach intercity –70%, bus & coach tourism –82%, taxi –60% [10, 14]. The total loss in freight and passenger transportation in 2020 was almost \$ 1 trillion [15].

Air Transport. Since 2019, total air connectivity has declined by 68% in Frankfurt, 67% in London, 67% in Paris, 66% in Istanbul, 64% in Moscow, and 53% in Amsterdam [16]. Aviation has been in its gravest moment in history with a collapse in air travel demand globally. Its recovery will be vulnerable and volatile, severely hampered by the resurgence of the outbreak across regions alongside stricter travel restrictions with:

- Overall reduction of 50% of seats offered by airlines.
- Overall reduction of 60% passengers (–2,699 million).
- Approx. USD 371 billion loss of gross passenger operating revenues of airlines.
- Airport revenue USD 125 billion [17].

In all regions passenger revenue losses were recorded: Africa – USD 14 billion, Asia/Pacific – USD 120 billion, Europe – USD 100 billion, Latin America/Caribbean – USD 26 billion, Middle East – USD 22 billion, North America – USD 88 billion [17].

2.2 The Situation in Poland

In Poland, road and air transport almost was frozen, carrying in the weakest month – May 2020 – only 4,986 and 7,000 passengers, respectively. In the rail sector, the worst month was April 2020, when 6,097 people were transported [18].

Significant decreases were recorded in all branches as compared to the corresponding period of the previous year. In aviation, in the worst month, the volume of transport was only half a percent of the result achieved in 2019, in rail –23%, and in the road –21.7%. The comparison every month is shown in Fig. 2.

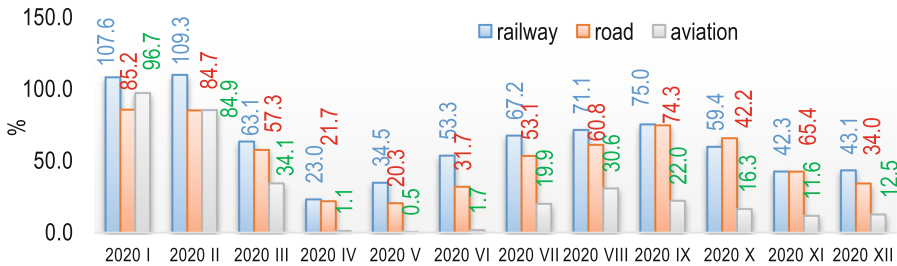


Fig. 2. Change in the number of passengers in relation to the corresponding period of the previous year, Source: own elaboration based on data [18].

Modal Share in Poland. The year 2020 brought changes not only in the number of passengers but also in the inter-industry division. There has been a decline in the share of road and air transport and an increase in the share of rail in the transport market. Although the number of passengers traveling by trains decreased significantly - exceeding 207 million, the share of railways increased by 5% compared to the previous year, and by 10% compared to 2018. In road transport, the reduction in the number of travelers in 2020 by over 125 million resulted in a decrease in the share by 3.2% compared to 2019. The biggest losses were recorded in the aviation sector, whose share, with the number of passengers of 4 million passengers, decreased by 2/3. Figure 3 shows the changes in modal split in Poland in 2020 compared to the previous years.

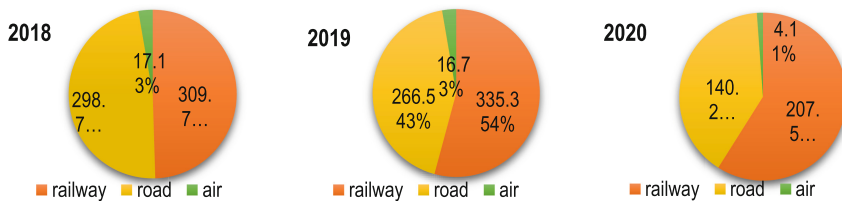


Fig. 3. Modal split in Poland in 2018–2020; number of passengers in M, Source: own elaboration based on data [18].

Changes in Mobility. The regulations introduced in the early stages of COVID-19 development were aimed at stopping the spread of the pathogen. They are mainly concerned with increasing the social distance, limiting the number of people gathering in place, and the movement of people. During the first wave of disease, the most significant decrease in mobility was recorded in places such as restaurants, shopping centers, museums, libraries, and cinemas. However, in the following weeks, there was an increased chance in the mobility of Poles. Since April 20, Poland has started the phase of lifting some of the restrictions related to the coronavirus epidemic, which has resulted in increased mobility in shops and parks. Table 2 shows changes for each day compared to a baseline value which is the median value, for the corresponding day of the week, during the 5-weeks 03.01–06.02 in 2020.

Table 2. Community mobility changes due to the coronavirus (COVID-19) outbreak in Poland from February to June 2020.

29.03.2020	11.04.2020	30.04.2020	7.05.2020	21.05.2020	23.06.2020
Retail and recreation					
–78%	–76%	–28%	–32%	–16%	1%
Parks					
–59%	–57%	25%	16%	47%	89%
Transit points, incl. Railway/metro station, bus/taxi stop, motorway parking space, car rental					
–71%	–64%	–44%	–46%	–38%	–23%
Workplaces					
–36%	–48%	–38%	–32%	–27%	–21%
Residential					
13%	17%	10%	12%	9%	4%

Source: own elaboration based on data [13].

Throughout the year, changes in the average travel distance of passengers in rail transport were observed compared to 2019. The highest difference – nearly 30% was in April 2020, when Poland was subject to the travel ban. The following months brought a gradual improvement in the situation. The following months brought a gradual improvement in the situation. In August 2020, the average length of a train journey was 4.5% lower than in the corresponding month in 2019. The data on different months is presented in Fig. 4.

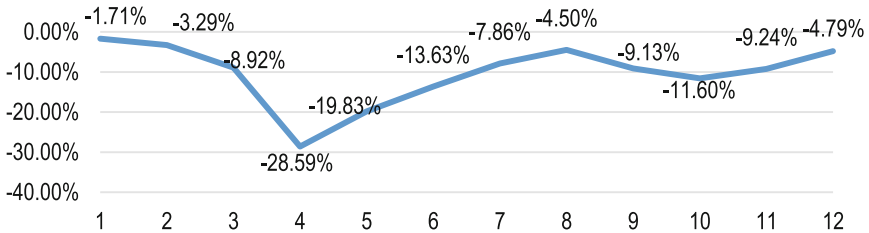


Fig. 4. Average distance changes 2020/2019, Source: own elaboration based on data [19].

As is seen in Fig. 4, the arrival of the autumn (second) Covid-19 wave shortened the trips: in October by over 9%, and in November by 11.6% compared to 2019.

3 Anti-covid-19 Regulations in Poland

The specificity of SARS-CoV-2 is, among others elements, is related to its easily penetration of the human body and quick replication. In the first period of the epidemic, there was no verified information on what type of remedial actions would bring the most reliable results. Governments of countries affected by COVID-19 made decisions aimed at limiting the development of the epidemic and protecting the population based on the experiences of others regions and recommendations of international organizations. In Poland, the restrictions, introduced for the first time in March, generally concerned reducing crowds of people in public spaces, lowering social mobility, and increasing the possibility of keeping distance between people. The introduction and subsequent elimination of restrictions were associated with an increase of infections during the first and second waves of Covid-19. From 04.03.2020 till the end of 2020, the total number of cases in Poland reached over 1,295 million (number of tests taken 7,204 million). According to the Ministry of Health, more than 28,5 thousands infected patients died and most of them had been suffering from concurrent diseases [20].

4 Changes in the Polish Passenger Rail Transport Market in 2020

The need to contain the spread of SARS-CoV-2 coronavirus infections has resulted in significant restrictions on the movement of people on almost all continents. The passenger transport sector was severely affected and all Polish operators suffered as a result of the restrictions introduced and the stay-at-home order. The transport performance measured in the pass-km decreased by 42.65% compared to 2019, and the operational performance measured in the train-km by 6.29%. The drastic drops in the volume of transport, especially during the first wave of diseases, had influence on the results obtained by transport companies. The impact of measures to prevent the spread of SARS-CoV-2 appeared as early as mid-March. Also, others limitations were introduced in the operation of international connections, and in consequence, operators providing services only in the field of international connections, i.e. Leo Express and UBB, suspended their performance in the second quarter of 2020.

4.1 Long-Distance Transport

Since 2015 PKP Intercity, the largest Polish carrier operating long-distance transport, has been constantly improving its offer, which resulted in a stable increase in operational performance and transport performance. In 2020 the decrease was related to the suspension or the shortening of train runs. The performances decreased by 9.45% and 47.2%, respectively. The significant difference is related to the drastic reduction in the number of passengers with a slight reduction in the number of trains launched. Due to the introduced administrative restrictions on the permissible number of passengers on board the train, the transport performance decreased by nearly 50%: from almost 11,650 million pass-km to only 6,150 million pass-km. The comparison of the operating performance in 2015–2020 is shown in Fig. 5, and the transport performance in Figure 6.

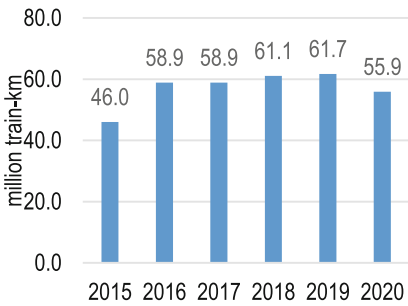


Fig. 5. PKP Intercity operational performance changes in 2015–2020. Source: own elaboration based on data [21].

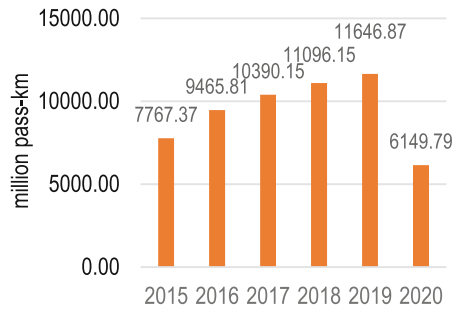


Fig. 6. PKP Intercity transport performance changes in 2015–2020. Source: own elaboration based on data [21].

The number of PKP Intercity passengers in April was over 90% lower than in the same month of 2019. In May, a slight increase in the total number of passengers (9,802,624) was recorded, which initiated a slow improvement in the situation and a relative stabilization during the holiday season. In the fall, the number of travelers again fell significantly due to the development of the second wave of the epidemic. In November and December, they exceeded 50% concerning the respective periods of the previous year. In the passenger rail transport market, the share of PKP Intercity fluctuated and depended mainly on periodic travel bans, restrictions on the activities of entities providing accommodation services and restrictions on access to recreation and sports areas. In early 2020, the share of PKP Intercity was comparable in the share in January and February 2019: the difference was 0.36% and 0.27%, respectively. In March (the first month of the disease in Poland and the introduction of restrictions in movement), there was a decrease by 0.7%. Changes in the share of this company compared to 2019 are shown in Fig. 7.

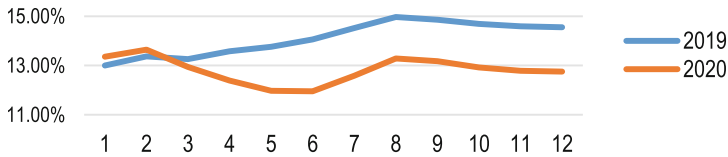


Fig. 7. PKP Intercity share in terms of number of passengers in 2019–2020. Source: own elaboration based on data [21].

As is seen in Fig. 7, the following months, usually characterized by an increase in PKP Intercity's market share, in 2020 were characterized by a decrease in the share of this company: in April by 1.19%, in May by 1.79%, in June by 2.10%, in July by 1.93%, in August and in September by 1.68%, in October by 1.77 and in November and December by 1.8%.

4.2 Agglomeration Transport

Local government company - SKM in Warsaw (SKM) serves four lines in the Warsaw agglomeration. In 2020, the distance of travel of SKM trains was over 15 million km, and number of passengers was over 14.9 million. In 2019, over 22 million passengers used the services of this agglomeration railway, which means a decrease of 32% [22]. The worst months in terms of the number of passengers were April and May, when only 580,847 and 851,472 travelers, respectively, used the services of SKM. These numbers show a decline in the number of SKM train users by 67.6% in April and 53% in May. In the following months, along with the elimination of the restrictions of the first wave of COVID-19, the number of travelers became to increase slowly just to second wave of pandemic. In August, the number of passengers amounted to just over 1,300 thousand. Which means a decrease by 18% compared to the same month of the previous year. In the following months, the situation worsened along with the administrative introduction of mobility restrictions and the number of cases. It is true that in September the number of passengers increased to almost 1.5, but the decrease compared to September 2019 was 21.5%. In October, the drop in the number of travelers amounted to nearly 38%, and in November to over 53%. A comparison of the number of SKM Warszawa passengers in the subsequent months of 2019 and 2020 is shown in Fig. 8.

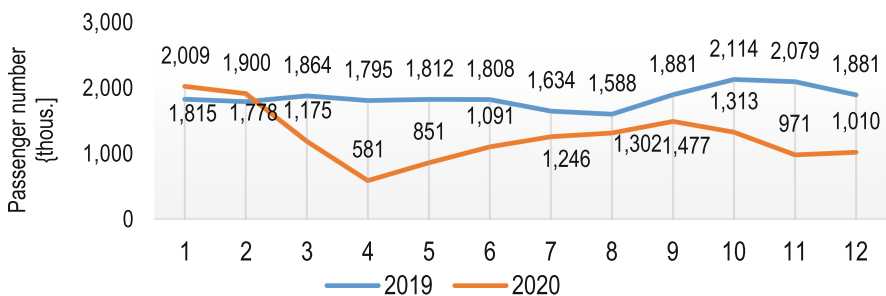


Fig. 8. Comparison of SKM Warszawa passengers number in 2019 and 2020. Source: own elaboration based on data [22].

Changes in the number of passengers influenced the volume of transport performance, which decreased by 32.3% compared to 2019. The change in the number of trains launched and the length of the routes in which they ran affected the size of operational performance. The change was slightly more than 15% (a decrease from 4.1 million train-km in 2019 to 3.5 million train-km in 2020). The difference between transport performance and operational performance is mainly related to the reduction in the total capacity of trains to 50% in the most restrictive period of the pandemic. Figure 9 shows the changes in the volume of transport performance expressed in pass-km in the period 2015–2020 and Fig. 10 - the comparison of the operational work volume.

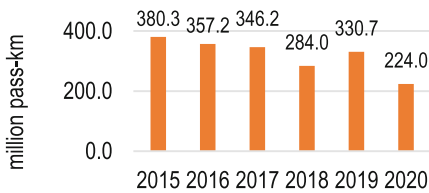


Fig. 9. SKM Warszawa transport performance changes in 2015–2020. Source: own elaboration based on data [21].

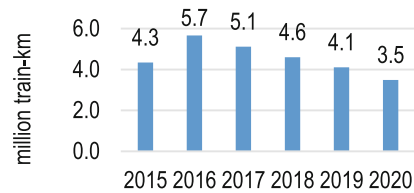


Fig. 10. SKM Warszawa operational performance changes in 2015–2020. Source: own elaboration based on data [21].

5 Conclusion

The crisis that followed the appearance of the SARS-CoV-2 coronavirus also manifested itself in transport, particularly affecting the passenger sector. Mobility restrictions imposed on society due to the need to prevent the spread of the pathogen drastically reduced travel. The aviation sector was the most affected. In Poland, COVID-19 influenced the modal split, the share of railways increased by 5% compared to 2019. The year 2020 for railway companies was characterized by significant declines, which reached the lowest level during the first wave of COVID-19. The volumes of transport are correlated with the level of applicable restrictions on the people's movement. The sudden introduction of restrictions resulted in a sharp reduction in the number of travelers and the number of transports. During the first wave, both long-distance and agglomeration carriers recorded a significant drop in passengers. Later on, i.e. in the summer months, the stability of transport increased. The autumn wave affected more long-distance than agglomeration transport.

From the first days of the epidemic, public transport was identified as a potential source of infection. Although rail operators have reduced the risk of transmission of infection, and studies conducted in various countries have shown that public transport does not have a particular impact on the spread of COVID-19, the negative opinion about transport in this regard does not change. There seems to be no good information campaign to show that carriers have taken steps to limit virus transmission and that travel is safe.

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