European Research Studies Journal
Volume XXV, Issue 2B, 2022

pp. 173-183

The Number of Passengers Transported by Air in the World and the Impact of the COVID-19 Pandemic on Air Passenger Transport in the USA in Terms of Economic Security

Submitted 22/05/22, 1st revision 13/06/22, 2nd revision 12/07/22, accepted 30/07/22

Maciej Stajniak[1], Bartosz Kozicki[2], Beata Wenerska[3]

Abstract:

Purpose: *The ever-growing dynamics of life increases the demand for fast and safe means of transport. One of the most frequently chosen express means of transport is air transport. The aim of the study is to analyze the number of passengers transported by air in 153 countries in the world between 2010-2018 and the impact of the COVID-19 pandemic on passenger air transport in the USA in terms of economic security. The subject of the research is 153 countries of the world, and the object of the study is the number of passengers transported by air between 2010-2020.*
Design/Methodology/Approach: *One of the research methods used was literature analysis which concerns issues related to air transport, multidimensional analyzes and security. The research tools used for the study were: categorized line and bar charts and indices of dynamics with a constant base. The use of a multidimensional comparative analysis allowed for the evaluation of the number of passengers transported by passenger air in the continents under consideration, as well as in the USA before and during the impact of the COVID-19 pandemic.*
Results: *The world leader in terms of the number of passengers transported is the United States. In 2020, compared to 2019, in the USA, for the identical period from March 1 to October 17, a decrease in the number of passengers transported by 429 141 477 was observed. Thus, there was a decrease in passenger transport by 77,28 percentage points.*
Practical implications: *The results obtained from the conducted research indicate a significant weakening of the passenger air transport sector in 2020 and the need for action aimed at its gradual reconstruction.*
Originality: *The juxtaposition of many groups of dependent variables in identical time units allowed to observe (emphasize) the similarities and differences between the studied objects and indicated the trend phenomenon and its breakdown caused by the COVID-19 pandemic.*

Keywords: *Transport, passenger air transport, COVID-19 pandemic, multidimensional comparative analyzes, economic security.*

JEL codes: *C51, E31, E37, E64.*

Paper type: *Research article.*

[1]*Poznan School of Logistics, maciej.stajniak@wsl.com.pl;*
[2]*Military University of Technology, Warsaw, bartosz.kozicki@wat.edu.pl;*
[3]*Calisia University, b.wenerska@akademiakaliska.edu.pl;*

1. Introduction and Literature Review

The ever-growing dynamics of life increases the demand for fast and safe means of transport. One of the most frequently chosen express means of transport is air transport. Transport, as one of the main branches of the economy, is defined as activities that are undertaken to move people and things through the use of appropriate means (Karbowiak, 2009; Ioppolo *et al.,* 2016; Ersoy and Tanyeri, 2021). Other researchers believe that transportis the activity of moving the material resources of enterprises in the supply chain (Gołembska, Bendyn, and Gołembski, 2017).

From the point of view of the topic of the article, transport will be interpreted as the movement of passengers in time and space. One of the fastest modes of transport is air transport. It consists in the movement of people and cargo in the airspace. The transport is carried out with the use of aircraft, mainly airplanes, and it is a nexus in the global transport market (Nurzyńska, 2016).

Air transport plays an important role in the implementation of economic transactions by rapid movement of passengers and cargo between different remote geographic locations (Donohue and Shaver, 2008). It becomes one of the essential elements needed by people in any business where satisfaction is a factor in business development (Prabowo and Taufik, 2019).

Between 2010-2019, there was a strong global growing trend in the number of passengers transported by air. The United States is the country with the highest air transport rate annually. Since 2020, significant changes in the number of passengers transported by air can be noticed.

In December 2019, the first cases of the infectious disease COVID-19 were observed in Wuhan (Zhu, Zhang, Wang, Li, Yang, and Song, 2020). On March 11, 2020, the World Health Organization declares the COVID-19 pandemic (Satomi *et al.,* 2020).

The pandemic causes the closure of borders and the slowdown of global air traffic, especially passenger traffic (Manurung, 2020; Forebs, 2020). The COVID-19 disease has had a major impact on the aviation system. Since March 2020, a reduced number of passengers has been observed. Air travel after COVID-19 will need to change, according to researchers. A consolidation trend for airlines is possible, innovations in the business modelwill be necessary, including changes in safety and travel planning (Kluge, Paul, and Urban, 2020).

The reduction of the number of air transport passengers affects economic security. In the literature, economic security is defined as the certainty of the survival and development of the state's economic system, including the guarantee of an adequate standard of living for people (Nurzyńska, 2016). Another interpretation of economic security is the undisturbed functioning of economies, the maintenance of basic

development indices and the ensuring of a comparative balance with the economies of other countries (Księżopolski, 2018). From the point of view of the topic of work, economic security will be interpreted as uninterrupted functioning of economies and the provision of an adequate standard of living for citizens.

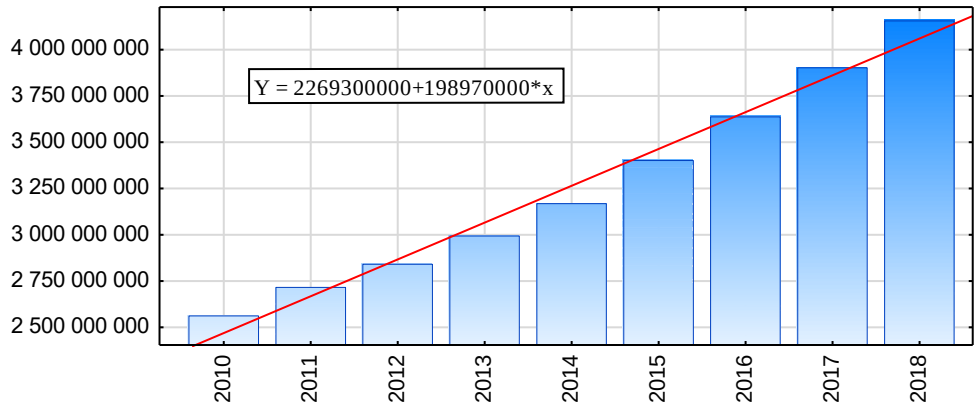
One of the main goals of the article is to investigate the impact of the COVID-19 pandemic on the number of passengers transported by air in a world-leader in this industry. Multidimensional comparative analyzes were used for the research. In the literature, multidimensional comparative analyzes denote groups of statistical methods that simultaneously analyze two variables describing each examined object / phenomenon (Łuniewska and Tarczyński, 2006). The number of multidimensional comparative analysis methods is large, and the clustering and selection methods were used in the research.

The research began with a multidimensional comparative analysis of the number of passengers transported by air in the world.

2. Multidimensional Analysis of the Number of Passengers Transported by Air in the World

The research began with the outline of a bar chart (Figure 1) of primary data on the number of passengers transported by air in 153 countries of the world between 2010-2018.

Figure 1. *Categorized bar chart of data on the number of passengers transported by air in153 countries of the world between 2010-2018*



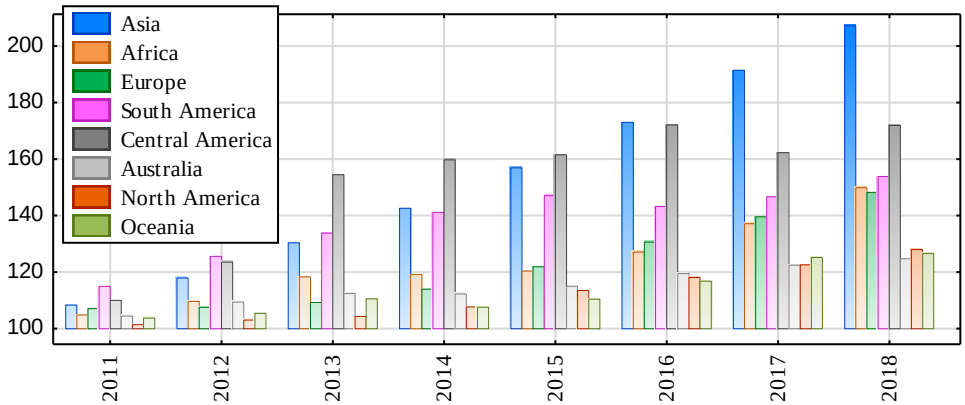
Source: *Own study based on data obtained from the website: https://databank.worldbank.org/ [as of 19.10.2020 r.]*

The data presented in Figure 1 shows that the total number of passengers transported by air in 153 countries of the world has been systematically increasing in consecutive years between 2010-2018. Since 2010, an upward trend in the number

of transported passengers has been observed. Every year, the increase was about 199 million people. In 2018, 4 156 063 703 passengers were transported in 153 countries around the world. From 2010 to 2018, the number of transported people increased by 1 594 455 439.

The next stage of the analysis is to examine the dynamics of changes in the number of passengers transported by air in the group of continents between 2010-2018. For this purpose, in Figure 2, a bar chart of the dynamics indices was outlined based on a constant number of passengers transported by air in the continents of the world (153 countries of the world) between 2010-2018 (constant basis - 2010).

Figure 2. *Categorized bar graph of dynamics indices based on a constant number of passengers transported by air transport in the continents of the world (153 countries of the world) between 2010-2018 (constant basis - 2010) in percentage points*



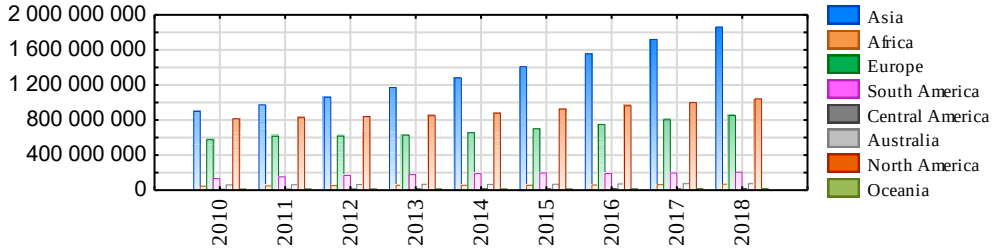
Source: *Own study based on data obtained from the website: https://databank.worldbank.org/ [as of 19.10.2020 r.]*

The highest growth dynamics in the number of passengers transported by air in the world between 2010-2018 was observed in Asia (Figure 2). From 2010 to 2018, there was an increase by 107,22 percentage points. Central America is second in the ranking of growth dynamics. There was an increase here from 2010 to 2018 by 72 percentage points.

The third place in the ranking of the highest dynamics index on a constant basis is taken by South America with an increase from 2010 to 2018 by 83,88 percentage points. Further places in this ranking are taken by: Africa (increase by 49,93 pp), Europe (increase by 48,28 pp), North America (increase by 27.98 pp), Oceania (increase by 26.57 pp) and Australia(increase by 24.78 pp).

Then, in Figure 3, a categorized bar graph of the number of passengers transported by air onthe continents of the world (153 countries of the world) between 2010-2018 was outlined.

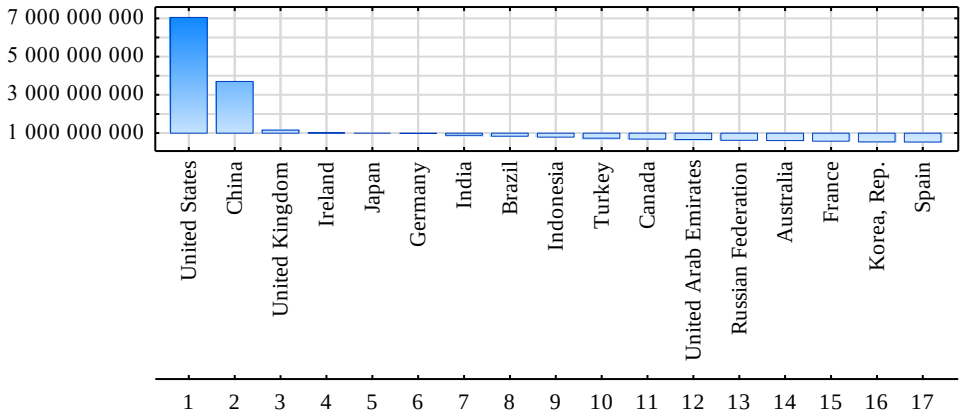
Figure 3. *Categorized bar graph of the number of passengers transported by air on thecontinents of the world (153 countries of the world) between 2010-2018*



Source: *Own study based on data obtained from the website: https://databank.worldbank.org/ [as of 19.10.2020 r.]*

Figure 3 shows that most passengers were transported by air between 2010-2018 in Asia – 11 945 593 071. North America is second in the ranking with the result of 8 149 799 213. The third place in terms of the largest number of air transport passengers between 2010- 2018 is occupied by Europe. In the period under consideration, 6 209 771 056 people were transported in Europe. South America is fourth with 1 620 906 591. Further places are taken by: Australia - 618 828 428, Africa - 515 755 518, Oceania - 164 847 251 and Central America - 152 013 944. The next stage of the study was the ranking of countries in terms of the analysis of thelargest number of passengers transported by air between 2010-2018 (Figure 4).

Figure 4. *Categorized bar chart and ranking of countries with the largest number of passengers transported by air between 2010-2018 (17 leaders are outlined where thenumber of passengers transported between 2010-2018 exceeds 500 000 000)*



Source: *Own study based on data obtained* from the website*: https://databank.worldbank.org/ [as of 19.10.2020 r.]*

The world leader in terms of the number of passengers transported by air between 2010- 2018 is the United States. During the period under consideration, 7 054 559 000 passengers were carried by air in the United States. China is in the second place

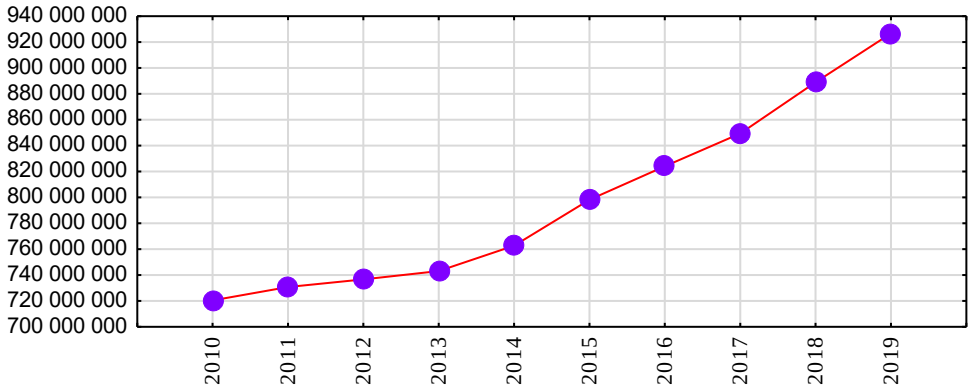
where 3 707 421 967 passengers were transported between 2010-2018. The third place in the ranking is taken by Great Britain where 1 163 884 114 passengers were transported by air between 2010-2018. Ireland ranks fourth with the score of 1 030 771 887. Each country out of the remaining 13 world leaders carried less than 1 000 000 000 passengers between 2010-2018.

The next stage of the study was the analysis of the number of passengers transported by the world leader, the United States, between 2010-2018.

3. Multidimensional Analysis of the Number of Passengers Transported by Air inthe USA

The first stage of the research was to outline a line graph showing the time series of the number of passengers transported by air in the USA between 2010-2019.

Figure 5. *Time series of the number of passengers transported by air in the USA between 2010-2019*

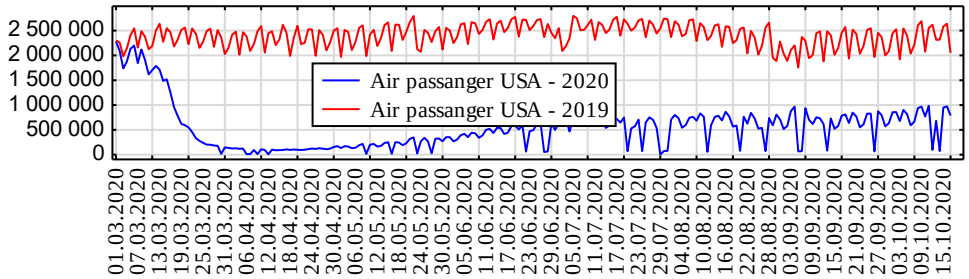


Source: *Own study based on data obtained from the website: https://databank.worldbank.org/;https://www.bts.gov/table-1a-annual-passengers-us-airlines-and-foreign-airlines-us-flights-2018-2019 [as of 19.10.2020 r.]*

Figure 5 shows that in the United States between 2010-2019, a growing linear trend in the number of passengers transported by air is visible. The increase in the number of passengers in the United States from 2010 to 2019 was 206 203 000.

On March 11, 2020, the global COVID-19 pandemic was announced. The infectious disease has led to a decrease in the number of air passengers transported in each country. This became the premise for the outline of a line chart of the time series of air transport passengers in the USA on a daily basis in the identical period from March 1 to October 17in 2019 and 2020.

Figure 6. *Line chart of the time series of air transport passengers in the USA on a daily basisin the identical period from March 1 to October 17 in 2019 and 2020*

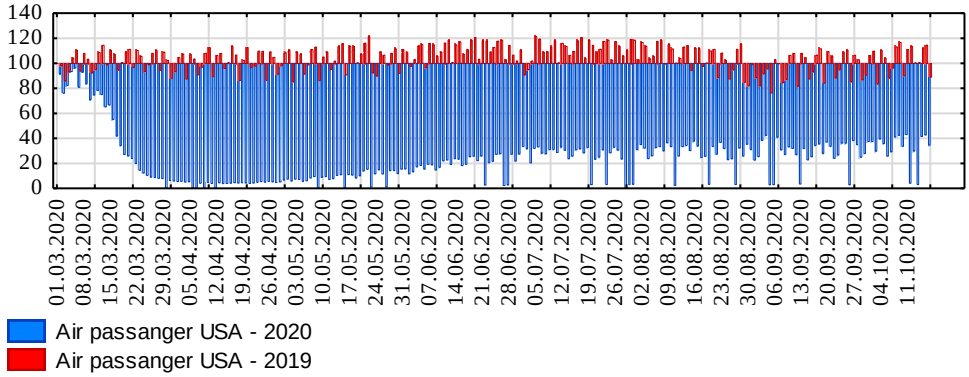


Source: *Own study based on data obtained from the website: https://www.tsa.gov/coronavirus/passenger-throughput [as of 19.10.2020 r.]*

Figure 6 shows that the COVID-19 infectious disease has led to a decrease in the number of passengers transported by air in the US from March 1, 2020 to October 17, 2020 compared to the same period in 2019. In 2019, in the analyzed time period, the most frequent number of passengers per day in the USA (median) was 2 455 410 while in 2020 this result droppedto 540 268.

Then, for illustrative purposes, a bar chart of dynamics indices on a constant basis of data on passengers transported by air in the USA on a daily basis in the identical period from March 1 to October 17 in 2019 and 2020 (base day March 1, 2019 and 2020) was outlined in Figure 7.

Figure 7. *Bar chart of dynamics indices on a constant basis of data on passengers transported by air in the USA on a daily basis in the identical period from March 1 to October 17 in 2019 and 2020 (base day March 1, 2019 and 2020) in percentage points*



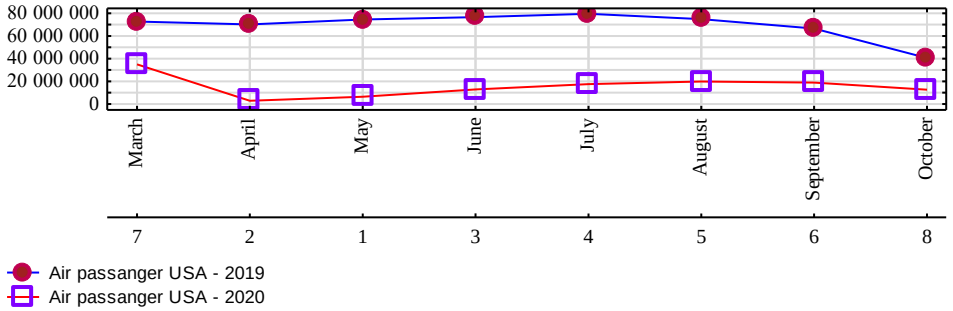
Source: *Own study based on data obtained from the website: https://www.tsa.gov/coronavirus/passenger-throughput [as of 19.10.2020 r.]*

The data presented in Figure 7 shows that in 2020, compared to 2019, in the

identical time period, the dynamics indices on a constant base were at a lower level and the most frequently recurring value in 2019 was 23,69 percentage points. In 2020, the median was 106,69 percentage points.

The further stage of the research was to compare the two considered time series by grouping them into identical months (Figure 8).

Figure 8. *Line charts of time series for passengers transported by air in the USA on a monthlybasis in the identical period from March 1 to October 17 in 2019 and 2020*

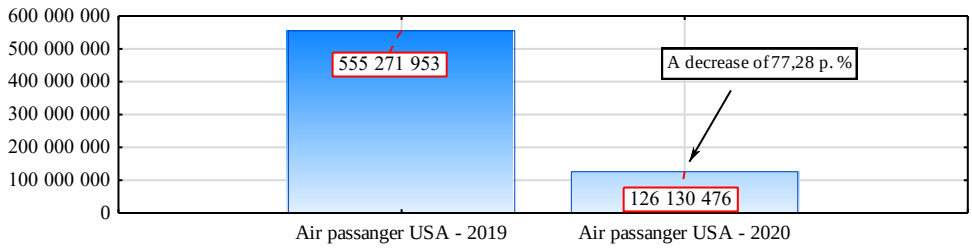


Source: *Own study based on data obtained from the website: https://www.tsa.gov/coronavirus/passenger-throughput [as of 19.10.2020 r.]*

Figure 8 shows that the largest difference in the number of passengers was recorded in May: 68 122 976. The second place in the ranking is April with the result of 67 197 619 and, then, June: 63 746 992. The further places are taken by: July (61 953 812), August (54 915 513), September (47 584 118), March (37 679 235). The smallest difference was recorded in October: 27 941 212.

The further stage of the analyzes was the preparation of a categorized bar chart of data on the decrease in the number of passengers in percentage points in 2020 compared to 2019 forthe identical period from March 1 to October 17.

Figure 9. *Categorized bar chart of data on the decrease in the number of passengers in percentage points in 2020 compared to 2019 for the identical period from March 1 to October 17*



Source: *Own study based on data obtained from the website: https://www.tsa.gov/coronavirus/passenger-throughput [as of 19.10.2020 r.]*

In 2020, compared to 2019, for the identical period from March 1 to October 17, a decrease in the number of passengers transported was observed by 429 141 477. Thus, there was a decrease in passenger transport by 77,28 percentage points.

4. Summary and Conclusions

The research shows that the total number of passengers transported by air in 153 countries around the world is systematically increasing in consecutive years 2010-2018. Since 2010, there has been a growing trend in the number of passengers transported by air. Every year, the increase was about 199 million people. In 2018, 4 156 063 703 passengers were transported in 153 countries around the world. From 2010 to 2018, there was an increase in the number of people transported by air in the world by 1 594 455 439.

The highest growth dynamics in the number of passengers transported by air in the world between 2010-2018 was observed in Asia (Figure 2). From 2010 to 2018, there was an increase by 107,22 percentage points. Central America is second in the ranking of growth dynamics. There was an increase here from 2010 to 2018 by 72 percentage points. The third place in the ranking of the highest dynamics index on a constant basis is taken by South America with an increase from 2010 to 2018 by 83,88 percentage points.

On the other hand, most passengers were transported by air between 2010-2018, also in Asia – 11 945 593 071. North America is second in the ranking with the result of 8 149 799 213. Third place in terms of the largest number of passengers by air transport between2010-2018 is occupied by Europe.

The world leader in terms of the number of passengers transported by air between 2010- 2018 is the United States. During the period under consideration, 7 054 559 000 passengers were carried by air in the United States. The conducted research shows (Fig. 5) that in the United States, between 2010-2019, a linear growing trend in the number of passengers transported by air is visible. The increase in the number of passengers travelling by air in the United States from 2010 to 2019 was by 206 203 000.

The infectious disease COVID-19 has led to a decrease in the number of passengers in the USA transported by air from March 1, 2020 to October 17, 2020, compared to the identical period in 2019. In 2019, in the analyzed time period, the most frequent number of passengers per day in the USA (median) was 2 455 410 while in 2020 this result dropped to the level of 540 268. In 2020, compared to 2019, in the identical time period, dynamics indices on a constant basis were at a lower level and the most frequently recurring value in 2019 was 23,69 percentage points. In 2020, the median was 106,69 percentage points.

Considering the identical time units (months: March-October) between 2019 and

2020, it was observed that the greatest difference in the number of passengers is in May: 68 122 976. The second place in the ranking is April with the result of 67 197 619, followed by June: 63 746,992. The following places are occupied by: July (61 953 812), August (54 915 513), September (47 584 118), March (37 679 235). The smallest difference was recorded in October 27 941 212.

In 2020, compared to 2019, in the USA for the identical period from March 1 to October 17, a decrease in the number of passengers transported was observed by 429 141 477. Thus, there was a decrease in passenger transport by 77,28 percentage points.

The studies conducted indicate that the COVID-19 pandemic caused a large reduction in the number of passengers transported by air in the USA. This, in turn, results in a reduction in the demand for crude oil, low prices of natural resources, a slowdown and weakening of individual sectors of the economy. The situation may be the reason for the global financial crisis and lead to irreversible changes both in the transport sector and others. The aftermath of such a long-term pandemic could be the bankruptcy of many transport companies.

Modern solutions must be developed by states, organizations whose goal should be torestore and maintain the conditions of pre-pandemic economies.

References:

Bureau of Transportation Statistic. Retrieved October 19 2020. from: https://www.bts.gov/table-1a-annual-passengers-us-airlines-and-foreign-airlines-us-flights-2018-2019.

Donohue, G.L., Shaver, R. 2008. Terminal chaos: Why U.S. air travel is broken and howcan we fix it. AIAA, Washington, D.C.

Ersoy, P., Tanyeri, M. 2021. Inclusive workplace, social mobility and logistics. Logforum. DOI: 10.17270/J.LOG.2021.631.

Gołembska, E., Bendyn, Z., Gołembski, M. 2017. Logistyka usług. Wydawnictwo Naukowe PWN SA, Warszawa.

Ioppolo, G., Szopik-Depczyńska, K., Stajniak, M., Konecka, S. 2016. Supply chain and innovation activity in transport related enterprises in Eastern Poland. LogForum. DOI: 10.17270/J.LOG.2016.4.4.

Karbowiak, H. 2009. Podstawy infrastruktury transportu. Wydawnictwo Wyższej Szkoły Humanistyczno-Ekonomicznej w Łodzi, Łódź.

Kluge, U., Paul, A., Urban, M. 2020. Resilience due to Diversity: Academic Concepts for reorganizing post- COVID-19 Air Travel. DOI:10.13140/RG.2.2.10241.28008/1.

Łuniewska, M., Tarczyński, W. 2006. Metody wielowymiarowej analizy porównawczej na rynku kapitałowym. Wydawnictwo Naukowe PWN, Warszawa.

Nurzyńska, A. 2016. Bezpieczeństwo usług w międzynarodowym transporcie lotniczym przewozów pasażerskich. Wydawnictwo Naukowe SOPHIA, Katowice.

Manurung, H. 2020. Russia – ASEAN relations during COVID-19 pandemic. https://www.researchgate.net/publication/342499986

Prabowo, H.E., Taufik, N. 2019. Decreasing satisfaction of urban transport passangers.

Jurnal Ekonomi Manajemen & Bisnis, 20(2). P-ISSN: 1412–968XE-ISSN: 2598-9405.

Satomi, E., et al. 2020. Alocação justa de recuros de saúde escassos diante da pandemia de COVID-19 Considerações éticas, Einstein São Paulo, 18(2), 1-5. DOI: 10.31744/einstein_journal/2020AE5775.

Zięba, R. (red.). 2018. Bezpieczeństwo międzynarodowe w XXI wieku. Warszawa, Poltext Sp. z o. o.

Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., et al. 2020. A Novel Coronavirus from Patients with Pneumonia in China. New England Journal of Medicine.

The World Bank. Retrieved October 19 2020. From: https://databank.worldbank.org. Forbes. Retrieved October 12. 2020, from: https://www.forbes.pl/gospodarka/koronawirus-zamkniecie-granic-od-15-marca-zamkniecie-galerii-handlowych-i-restauracji/n5nl3g1.

Transportation Security Administration. Retrieved October 19. 2020. From: https://www.tsa.gov/coronavirus/passenger-throughput.