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Agnieszka BARCZAK[1], Izabela DEMBIŃSKA[2], Sabina KAUF[3]

THE IMPACT OF COVID-19 ON PASSENGER SHIPPING ACTIVITIES IN SELECTED EU COUNTRIES: DIAGNOSIS AND LONG-TERM SCENARIOS

Summary. The article is devoted to the topic of passenger maritime transport in selected EU countries and the changes in the maritime passenger transport market resulting from the COVID-19 pandemic. The implemented restrictions on movement entailed a voluntary and temporary suspension of the activities of tourist companies using the maritime fleet. With the above in mind, the purpose of this article was to identify the consequences of changes in the mobility behavior of the population as a result of the COVID-19 pandemic on the operation of passenger maritime transport. The differences in the number of seaborne passengers served in selected EU countries between actual and projected values were indicated. Long-term forecasts were also made, which made it possible to develop scenarios of possible events, describing the potential development directions of the branch. We use a combined forecast method based on a weighted average of individual forecasts (weights inversely proportional to mean percentage absolute error

[1] Department of Logistics and Transportation Economics, Faculty of Maritime Technology and Transport, West Pomeranian University of Technology in Szczecin, Piastów 41, 71-065 Szczecin, Poland. Email: agnieszka-barczak@zut.edu.pl. ORCID: https://orcid.org/0000-0001-7584-7183
[2] Department of Management and Logistics, Faculty of Economics and Engineering of Transport, Maritime University of Szczecin, H. Pobożnego 11, 70-507, Szczecin Poland. Email: i.dembinska@pm.szczecin.pl. ORCID: https://orcid.org/0000-0001-7618-0018
[3] Department of Logistics and Marketing, Institute of Management and Quality, Opole University, Ozimska 46a, 45-058, Opole, Poland. Email: skauf@uni.opole.pl. ORCID: https://orcid.org/0000-0002-5978-4490

(MAPE)). We use such forecasting methods as Fourier spectral analysis, exponential smoothing models, and seasonality indices. We used time series models to build long-term forecasts. Combined forecasts for selected EU countries were determined. They were used to supplement long-term forecasts. This made it possible to assign the obtained results to ambient scenarios. Combined forecasts showed that in all quarters of 2020-2021, the number of passengers transported by sea transport was lower than forecast values in all EU countries analyzed. This confirms the negative impact of the COVID-19 pandemic on this branch of transportation as well. Long-term forecasts, built on the basis of combined forecasts and assumptions about the annual growth rate of passenger numbers, indicate that in most of the countries analyzed, the most likely scenario is an annual increase of 10% in passenger numbers. This means that by 2026 only Germany and Denmark will see the number of maritime passengers return to pre-pandemic levels.

Keywords: passenger shipping, transport, Covid-19, pandemic, combined forecasts, long-term forecasts

1. INTRODUCTION

In December 2019, a series of cases of severe pneumonia of unknown origin emerged in Wuhan, Hubei, China, in people associated with China's Wuhan Huanan Seafood Wholesale Market. Chinese authorities announced on January 7, 2020, that they had identified a new type of virus related to viruses such as SARS and MERS. It has been provisionally named “2019-nCoV” [16]. At the beginning of January 2020, cases of the disease appeared in Thailand and the United States, and in the second half of January, the first case of infection with the new coronavirus was recorded in Europe - in France. In February, the International Committee on Taxonomy of Viruses calls the new coronavirus the severe acute respiratory syndrome coronavirus SARS-CoV-2, and the World Health Organization (WHO) calls the new infectious disease caused by the newly recognized coronavirus, COVID-19. On March 11, 2020, WHO announced the COVID-19 pandemic [15, 30-31, 42, 45]. In order to control the extremely dynamic increase in infections, many countries have introduced unprecedented restrictive measures, ranging from bans on travel and social gatherings to the closure of many economic activities.

Although some time has passed since the outbreak of the COVID-19 pandemic, new analyzes and opinions are still emerging regarding its impact on various areas of social and economic life. This activity and inquisitiveness of researchers is justified. Firstly, COVID-19 was an unpredictable and sudden phenomenon, in retrospect even considered a shock. Secondly, COVID-19 was global, covering all continents. And thirdly, it spread at an extremely fast pace, which hampered decision-making processes regarding response or prevention, often leading to decision-making errors. All this has resulted in many different research orientations, embedded in both empirical and cognitive-theoretic analyzes.

The emergence of the COVID-19 pandemic has significantly developed research areas such as risk management, volatility management, uncertainty management, etc. By some researchers [23, 2, 1, 35] COVID-19 was identified as a black swan in the light of Taleb's theory [40] as an event with outsized effects, difficult to predict and even more difficult to calculate the probability of its occurrence. Taleb himself opposed this view of COVID-19 [10, 3], claiming that this pandemic did not meet the criteria he formulated for black swan phenomena because, for example, it was predictable.

The COVID-19 pandemic is often put into the framework of the VUCA paradigm [49, 29, 47]. Volatility in the context of COVID-19 refers to the rapid and unexpected increase in the number of cases since the outbreak of the epidemic. The COVID-19 pandemic has also created a situation of uncertainty. Almost all prediction models for disease transmission have almost failed. COVID-19 has also demonstrated the complexity of the situation. It has been associated with ambiguity regarding disease dynamics and control measures. The ambiguity of COVID-19 is understood in terms of unclear cause-and-effect relationships without available precedents, as a situation with many unknown unknowns, including the length of the lockdown.

The perspectives for analyzing the impact of the pandemic on various areas of life are different; many of them concern a sectoral approach. The pandemic was a strong determinant for transport. It affected both cargo and passenger transport, in both cases affecting all branches. Research in this area not only shows the diversity and scale of problems but also is a source of experience (management through experience) and practices that are important in building preventive strategies.

Taking the perspective of passenger sea transport, it is necessary to analyze the impact of the COVID-19 pandemic on transport and tourism, i.e., what was the impact of the pandemic on tourism and how it affected passenger sea transport. Some of the studies [48, 26, 43] carried out in this area focused on macroeconomic aspects, showing that the sharp decline in international travel caused by the pandemic and the restrictions introduced as a result of it had a strongly negative impact on the economies in many regions of the world, because tourism indirectly supports employment in other sectors of the economy. It has also been shown that restrictions on passenger transport introduced to prevent the spread of the epidemic not only negatively affect passenger transport and tourism directly related to the movement of people, as well as indirectly related sectors but have significant consequences for trade in goods and other services. By limiting the movement of people for business purposes, the possibilities of concluding new contracts are also reduced [9, 12]. Despite the development of various e-commerce platforms in many regions of the world, entrepreneurs still travel for transaction purposes, e.g., in the analyzed period, this concerned as many as 60% of small and medium-sized entrepreneurs from the Asia-Pacific region [38].

Other analyses, especially at the beginning of the pandemic, compared the situation in maritime passenger transport with past periods to indicate the losses it had caused in the transport sector. Millefiori et al. [22] showed that there was an unprecedented slowdown in global shipping mobility, which had been growing steadily since 2016, with a decline in activity for all ship categories in 2020 compared to forecasts based on the average growth rate of previous years. Importantly, they showed that the most affected traffic segment was passenger ships - from March to the end of June 2020, traffic fluctuations were between -19.57 and -42.77%. Moreover, to prevent the spread of the virus, many cruise ports have been closed. Silva [37] showed that Florida ports lost $22.2 billion in 2020.

The negative impact of the Covid-19 pandemic on the traffic of cruise ships, passenger ferries, and ferry-ro-pax vessels was also proven by other authors in their research on Danish waters [8], showing data including a significant reduction in the number of ships in traffic, a reduction in average speed, and average draft. Similar observations can be found in studies [21, 7, 41, 36].

Attention should be paid to yet another trend of research on the impact of the COVID-19 pandemic on passenger ship traffic. It concerns the analysis of the impact of the decline in passenger ship traffic on the natural environment. Overall, studies have shown that SOx emissions from passenger ships decreased during the pandemic, although the trends varied [8, 27, 24, 11, 20].

An interesting direction of research is the impact of the COVID-19 pandemic on the behavior of customers, i.e., passengers. Overall, the COVID-19 pandemic has had a negative impact on passengers' willingness to cruise, mainly due to risks related to passenger health safety [34, 14]. These results show that the cruise industry needs to put more effort into building confidence in cruise safety in the post-pandemic era, as passengers expected cruise lines to maintain not only higher cleanliness standards but even make changes to ship designs to improve ventilation in the future.

The literature review shows that many different perspectives can be identified to study the impact of the COVID-19 pandemic on maritime passenger transport. Each of these research directions enriches our knowledge of the impact of unpredictable, uncertain, complex, and at the same time global and common phenomena on transport activities in the maritime passenger transport sector. But the literature analysis also showed that there is a paucity of research on transport forecasts after the pandemic and when transport will return to normal (pre-pandemic) levels. This became the premise for undertaking the research in this study. The aim of the article is to identify the consequences of changes in population transport behavior as a result of the COVID-19 pandemic for the functioning of maritime passenger transport. Differences in the number of sea transport passengers served in selected EU countries between actual and forecast values will be indicated. Long-term forecasts will also be made, which will allow for the development of scenarios of possible events, describing potential directions of development of the industry.

This study has the following structure. Section 2 presents the research methodology. Section 3 then describes the research results, and Sections 4 and 5 present the predictions. The study is summarized with conclusions.

2. MATERIALS AND METHODS

Countries with more than 20,000 passengers carried in 2019 were selected for analysis (Fig. 1). In ascending order, these are: Germany (20,162 thousand people), France (22,685 thousand people), Spain (22,796 thousand people), Sweden (29,501 thousand people), Denmark (31,105 thousand people), and Greece and Italy, where 37,495 and 46,189 thousand passengers were carried, respectively.

Figure 2 illustrates the differences between the number of passengers served in selected countries using single-basis dynamic indexes. Compared to 2019, 2020 saw passenger declines of more than 60% (France - 61.42%), 50% (Spain - 57.65%, Sweden - 54.45%). The lowest decrease in the number of passengers this year was recorded for Italy - 36.20%. With respect to 2019, 2021 declines were slightly lower than in the previous year. Despite this, they exceeded 50% for France (55.95%), and 40% for Spain and Sweden (45.05% and 42.46%, respectively). Greece had the lowest passenger decline in 2021 at 29.46%.

The brief analysis above (Fig. 2) shows the tremendous impact of the COVID-19 pandemic on passenger maritime transport and confirms the validity of the stated goal of this study.

Combined forecasts based on a weighted average of individual forecasts (weights inversely proportional to mean percentage absolute error (MAPE)) obtained using such forecasting methods as Fourier spectral analysis (otherwise known as harmonic analysis), exponential smoothing models, and seasonality indices were used to forecast the volume of maritime passenger flows. The choice of methods is based on the graphical and quantitative analysis of the time series, which showed that the series are characterized by the presence of seasonality. Since these methods have been widely described in the literature - combinatorial forecasting, e.g. [46, 19]; Fourier spectrum analysis, e.g., [4, 28, 18]; exponential smoothing methods, e.g., [17, 44, 32-33, 25] seasonality indicators e.g., [5-6]; and the study focuses on analyzing the results obtained.

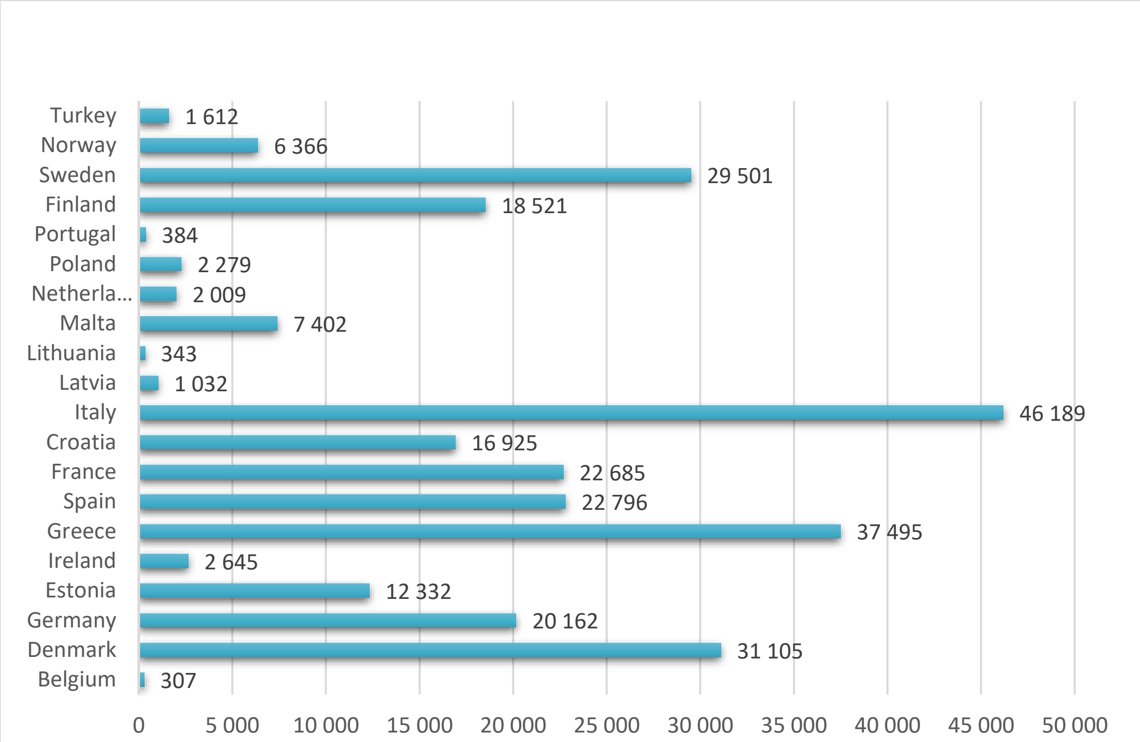

Fig. 1. Number of passengers in maritime transport in 2019 (in thousands)

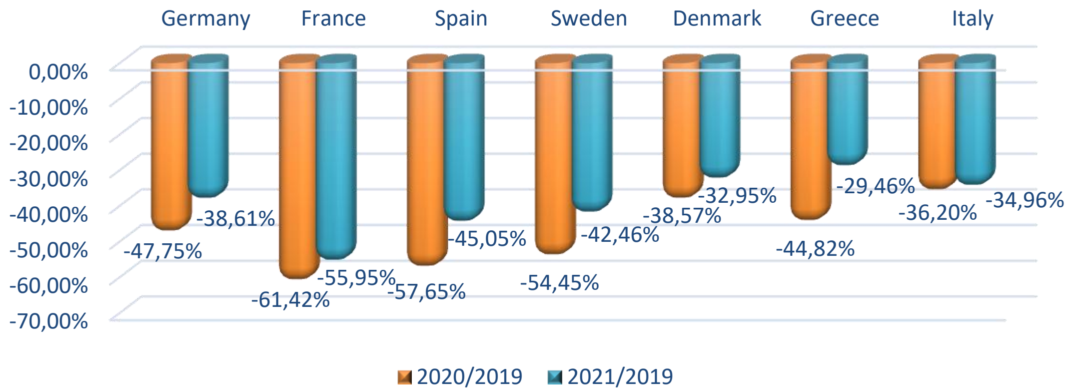

Fig. 2. Number of passengers in maritime transport in 2019 (in thousands)

All analyses conducted were based on quarterly data from 2013 to 2019. The results of the combined forecasts were compared with actual quarterly data from 2020-2021. This allowed the relative error of the ex-post forecast to be used to indicate differences in marine passenger transport resulting from the restrictions introduced as a result of the COVID-19 pandemic.

The next step was to produce annual long-term forecasts through 2026 using three different data sets used for forecasting. The first set is based on actual data for 2013-2019 and combined forecast values for 2020-2021. Time series models with the best fit to the data were used here.

The second forecast is built on the assumption that until 2026 the number of passengers will grow year by year at the rate of the actual average passenger growth that was recorded in the pre-pandemic years 2013-2019. The last forecast is based on the assumption that the number of passengers will grow 10% year by year compared to the previous year.

Table 1 shows the MAPE forecast error values obtained for each country and forecasting method. As previously mentioned, the weights needed to calculate the weighted average of individual forecasts were determined from the MAPE values. This allowed the calculation of combined forecasts for individual countries.

Tab. 1

Mean absolute percentage error (MAPE) for the individual forecasting methods included in the combined forecast

Country	**Mean absolute percentage error (MAPE)**		
	Fourier spectral analysis	Exponential smoothing method	Method of seasonality indicators
Germany	2,0036	1,1379	1,4821
France	2,3967	1,5416	1,9144
Spain	2,3156	1,7409	1,9725
Sweden	1,5651	1,2322	1,2322
Denmark	1,1436	0,7169	0,9080
Greece	1,6479	0,7867	0,8808
Italy	1,4606	0,7788	0,8249

Table 2 summarizes the quarterly values of actual passengers carried in 2020 and 2021, along with the combined forecast values for these periods and the relative differences between actual and forecast values using the relative error of the ex-post forecast.

Tab. 2

Actual value and combined forecast of passenger volume with relative ex-post forecast error, assuming that there was no COVID-19 pandemic in the years 2020 and 2021 (in thousands of people)

	Actual number of passengers		**Value of combined forecast**		**Relative *ex post* forecast error**	
	2020	2021	2020	2021	2020	2021
Germany						
IQ	2 222	826	3 314	3 293	-32,95%	-74,91%
IIQ	1 517	2 206	6 230	6 209	-75,65%	-64,47%
IIIQ	4 904	6 258	7 351	7 329	-33,28%	-14,62%
IVQ	1 891	3 087	3 360	3 338	-43,72%	-7,53%
France						
IQ	2 207	1 111	3 679	3 621	-40,01%	-69,32%
IIQ	1 151	1 822	6 685	6 628	-82,78%	-72,51%
IIIQ	4 691	4 920	9 076	9 018	-48,31%	-45,44%
IVQ	1 703	2 139	3 367	3 309	-49,41%	-35,36%

Spain						
IQ	3 073	1 353	5 424	5 818	-43,34%	-76,74%
IIQ	881	2 478	7 044	7 438	-87,49%	-66,68%
IIIQ	3 957	5 355	7 592	7 986	-47,88%	-32,94%
IVQ	1 744	3 341	4 465	4 859	-60,94%	-31,24%
Sweden						
IQ	4 118	1 753	5 570	5 656	-26,07%	-69,01%
IIQ	2 126	3 303	8 174	8 260	-73,99%	-60,01%
IIIQ	4 700	7 340	10 100	10 185	-53,46%	-27,94%
IVQ	2 494	4 578	4 078	4 164	-38,84%	9,95%
Denmark						
IQ	4 173	2 282	7 146	7 224	-41,61%	-68,41%
IIQ	3 208	4 270	9 776	9 853	-67,18%	-56,66%
IIIQ	8 372	9 040	9 246	9 324	-9,46%	-3,04%
IVQ	3 356	5 264	5 585	5 663	-39,91%	-7,04%
Greece						
IQ	3 739	1 999	5 980	6 159	-37,47%	-67,54%
IIQ	3 162	5 395	10 181	10 360	-68,94%	-47,93%
IIIQ	10 745	14 447	15 009	15 188	-28,41%	-4,88%
IVQ	3 045	4 607	5 683	5 863	-46,42%	-21,42%
Italy						
IQ	5 411	2 947	7 723	8 175	-29,94%	-63,95%
IIQ	4 628	5 926	13 348	13 800	-65,33%	-57,06%
IIIQ	14 991	15 952	18 134	18 586	-17,33%	-14,17%
IVQ	4 439	5 216	7 529	7 980	-41,04%	-34,64%

In all quarters in both 2020 and 2021, the number of passengers carried by sea transport was lower than forecast values in all countries. The exception to this is the fourth quarter of 2021 in Sweden, where the actual value was 9.95% lower than the forecast value. The biggest differences were in the second quarter of 2020 and in the first and second quarters of the following year.

2. RESULTS - MARITIME PASSENGER FORECAST TO 2026

As mentioned earlier, the next step is to produce three variants of forecasts up to 2026. The best-fit trend functions to the data were used to build forecasts based on real data combined with combined forecast values. The estimated models, along with basic measures of fit to real data, are shown in Table 3. Table R^2 shows the coefficient of determination - a statistical measure of how well a model reflects real data. That is, it illustrates what proportion of the variation in the dependent variable is explained by the model. V_s is the coefficient of variation and a measure of the relative variability of data, expressed as the ratio of the standard deviation to the mean, most often reported as a percentage. It is used to compare variability in different data sets.

In the case of Germany, the function that best describes real values is the exponential trend function, and it was chosen to build the first forecast. During the period under study (2013-2019), the number of maritime passengers, compared to the previous year, declined from year to year. Growth was recorded only in 2014 and 2019. As assumed, the second forecast was made considering an average annual decline of 0.68%. Assuming an annual increase of 10%, the number of passengers in 2026 will reach pre-pandemic levels (Fig. 3).

Tab. 3

Trend functions with measures of fit to real data

Country	Function	R^2	Vs
Germany	$y_t = 21598,5639e^{-0,0092t}$	0,6240	2,12%
France	$y_t = 24851,7480e^{-0,0115t}$	0,7526	1,95%
Spain	$y_t = 1198,4266t + 13242,8513$	0,8839	6,61%
Sweden	$y_t = -36,9609t^3 + 505,7082t^2 - 1767,7082t + 29644,4235$	0,5683	2,03%
Denmark	$y_t = 233,5479t + 29664,0325$	0,8728	0,85%
Greece	$y_t = 150,5450t^2 - 918,1738t + 34750,3142$	0,6714	3,98%
Italy	$y_t = 34002,1332e^{0,0389t}$	0,8127	5,59%

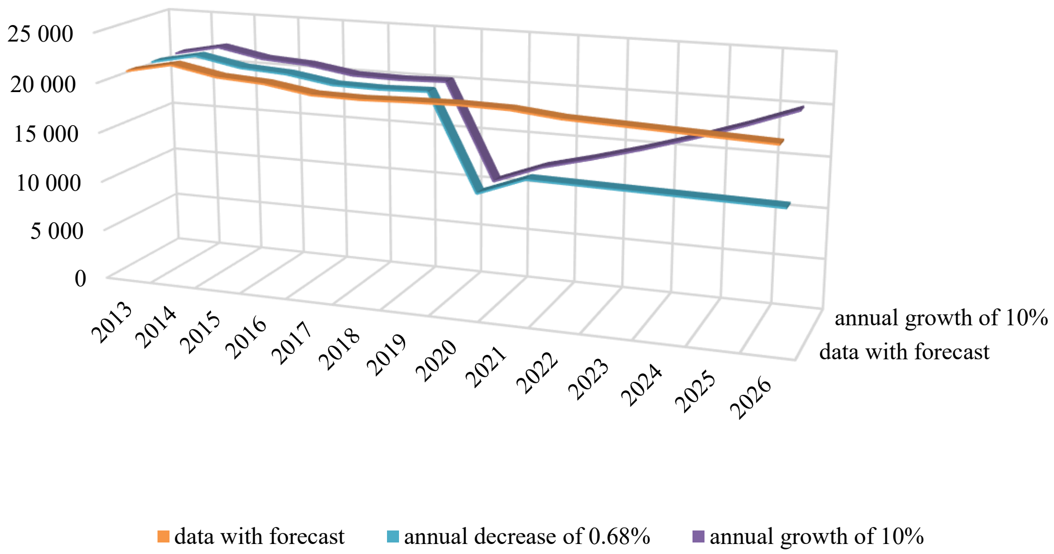

Fig. 3. Forecasts for Germany up to 2026 (in thousands of people)

In France, the function that best describes the actual data is the exponential trend, which was used to make the first forecast. Between 2013 and 2019, the number of maritime passengers, compared to the previous year, increased only in 2014 and 2017. The other periods recorded declines. Therefore, the second forecast was made assuming an average annual decline of 1% in the number of passengers. The third forecast, which assumes an annual 10% increase in the number of passengers, indicates that even at this rate of growth, the number of maritime passengers will not catch up to pre-pandemic levels by 2026 (Fig. 4).

Figure 5 shows three forecasts for Spain. The first is based on a linear trend function. The second assumes an annual increase of 7.93% in the number of passengers, while the third assumes an annual increase of 10%. However, in both cases, passenger numbers will not reach pre-pandemic COVID-19 levels until 2026.

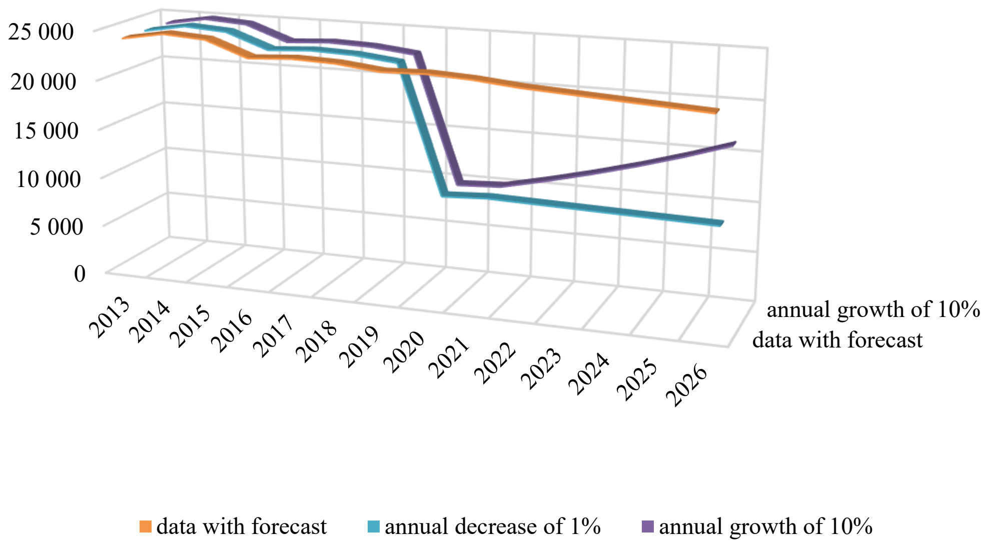

Fig. 4. Forecasts for France up to 2026 (in thousands of people)

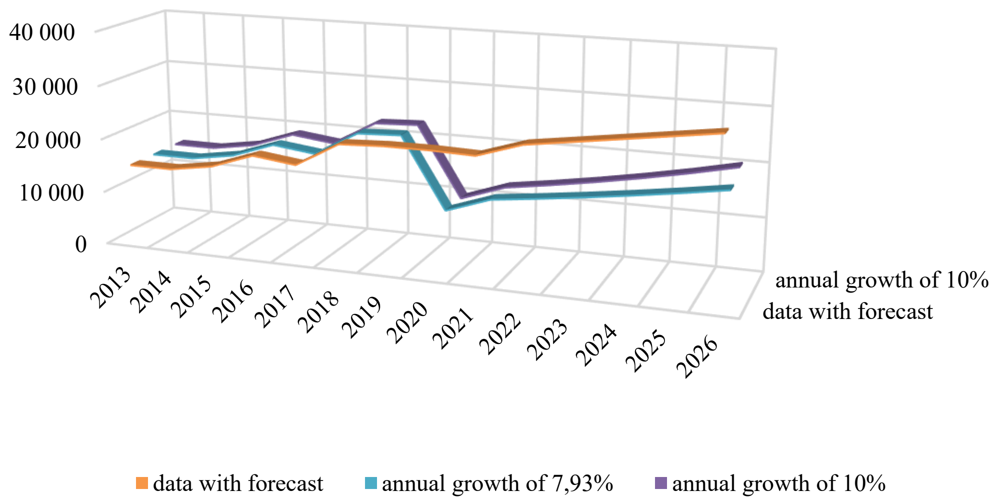

Fig. 5. Forecasts for Spain up to 2026 (in thousands of people)

As the combined forecasts for Sweden in 2020 indicate a decrease in the number of passengers carried (compared to 2019, this is a decrease of 5.35%), and an increase of only 1.23% the following year, the modeling resulted in forecasts with a decreasing trend (forecast one). Forecast two assumes an annual increase of 0.56% in the number of passengers. Forecast three, which assumes an annual 10% increase in the number of passengers, outperforms forecasts built with combined forecasts in 2024. However, if the pre-pandemic trend remains unchanged, passenger numbers will not reach the same level as before COVID-19 until 2026 (Fig. 6).

The first forecast for Denmark was made based on a linear trend function. The second forecast assumes an annual increase of 0.53% in the number of passengers, while the third forecast assumes a 10% increase. If the passenger growth rate remains at the average annual level of 2013-2019, passenger numbers will not return to pre-pandemic levels until 2026.

Assuming a 10% increase (the third forecast), the number of passengers carried by sea transport will reach pre-COVID-19 levels in 2026 (Fig. 7).

For Greece, the first forecast was determined based on a parabolic trend. The second forecast assumes an annual increase of 1.04% in the number of maritime passengers, while the third forecast assumes a 10% increase. The analysis showed that, in this case, the number of passengers carried will not return to its pre-pandemic state by 2026 (Fig. 8).

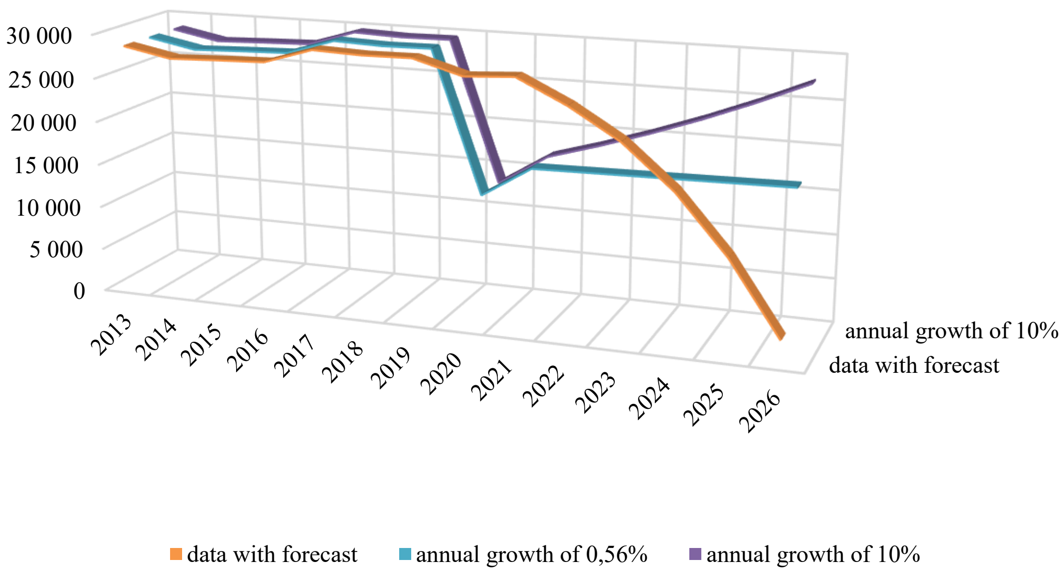

Fig. 6. Forecasts for Sweden up to 2026 (in thousands of people)

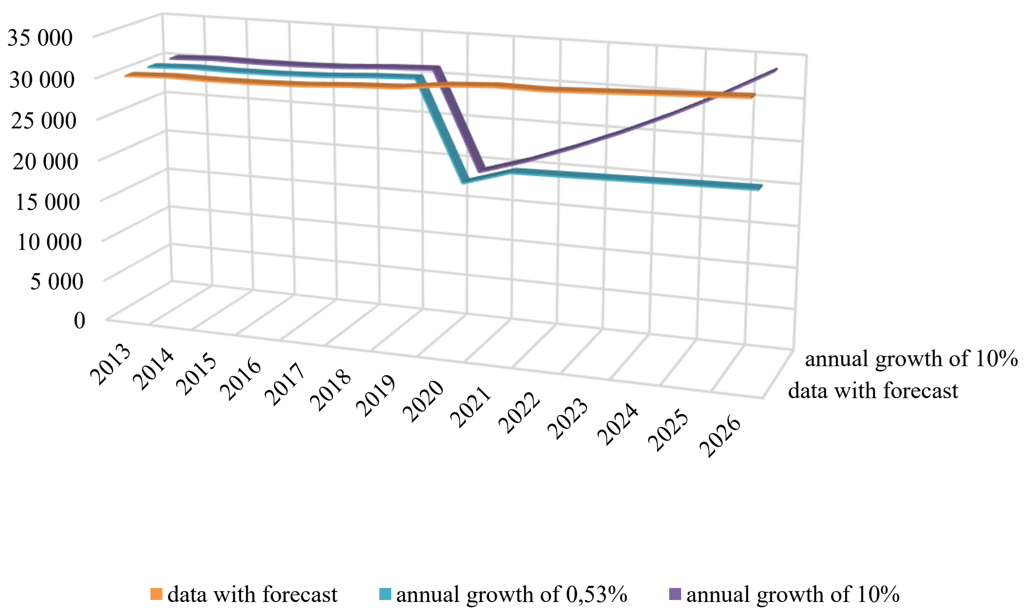

Fig. 7. Forecasts for Denmark up to 2026 (in thousands of people)

For Italy, the function characterized by the best fit to the data is the exponential trend. Based on it, the first forecast was determined. The second forecast assumes an annual increase of 4.30% in the number of passengers transported, while the third forecast assumes a 10% increase. As in the case of Greece, the number of passengers transported by sea will not return to its pre-pandemic state until 2026.

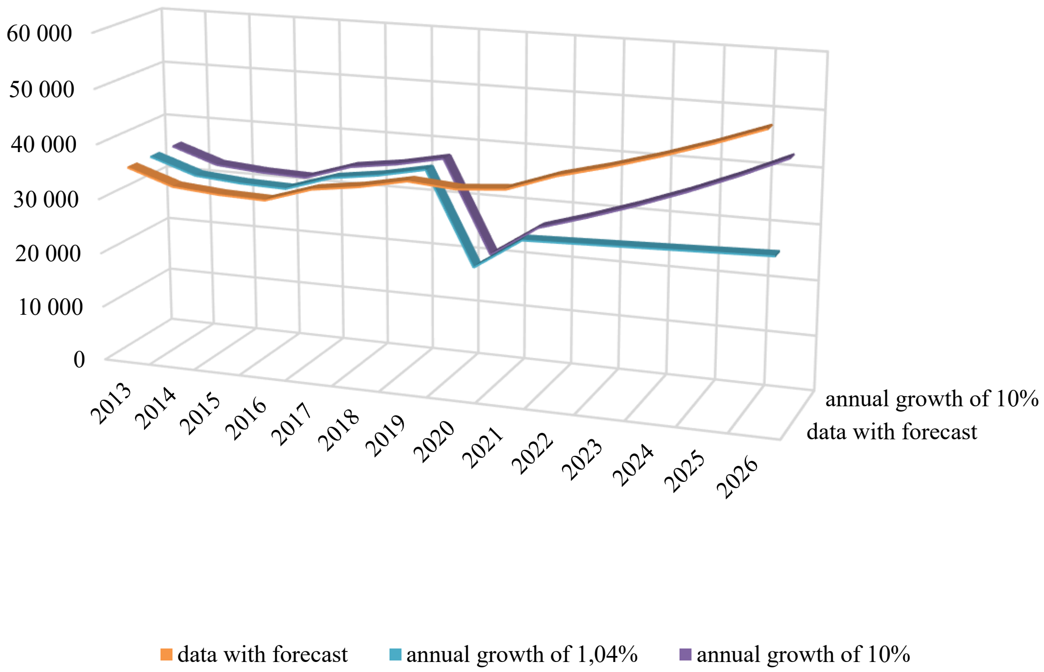

Fig. 8. Forecasts for Greece up to 2026 (in thousands of people)

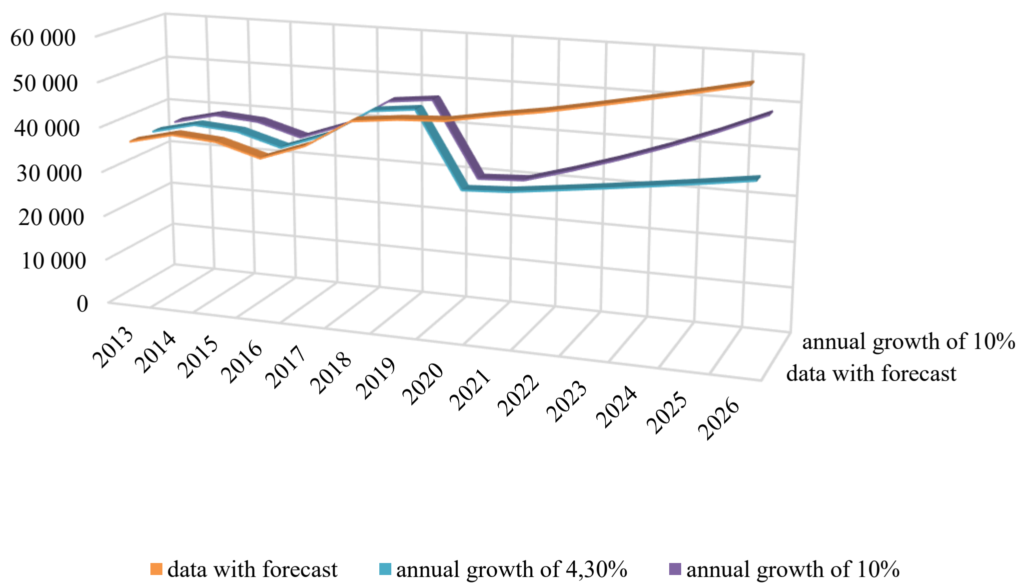

Fig. 9. Forecasts for Italy up to (in thousands of people)

4. DISCUSSION - SCENARIOS OF AMBIENT STATES FOR PASSENGER MARITIME TRANSPORT

One of the methods of predicting the future involves creating scenarios of possible events. They present an anticipated picture of the future situation and possible behavior resulting from the impact of external factors. Scenario methods are used to analyze discontinuous changes, that is, changes that are not a simple extrapolation of processes occurring in the environment. Scenarios are not static, single images of the future but consist of a whole series of them, forming a dynamic history. As a result, scenarios should describe not only the end state but also the path leading to the future.

Recent years have been fraught with a number of what are referred to as "black swan" events, i.e., rare and unpredictable events with a huge impact on the future, and the COVID-19 pandemic was certainly one such event. This period also coincided with fundamental changes in maritime transportation, including the energy transition and the need to decarbonize shipping, the digitization of global supply chains, and the continuing trend toward vertical and horizontal integration in shipping and ports. The pandemic revealed systemic failures, but it also showed the potential and need for change. Such change is possible if we understand the systemic causes of the situation and if we can envision ways to solve systemic problems. For those involved in maritime transportation, this means assessing how maritime management can respond to current challenges and better prepare for similar events in the future.

In this context, the formulation of scenarios of possible events for passenger maritime transport seems eminently reasonable. Without going into a broader discourse on the types and classification of scenarios, we will use scenarios of environmental states, which are qualitative in nature. They assess the potential impact of particular factors or processes on a given entity and estimate the probability of their occurrence. Each factor is considered from the perspective of the trend of change, i.e., increasing, decreasing, or stabilizing. Then, the (1) optimistic, (2) pessimistic and (3) most probable scenarios are then developed.

It is important to point out that population growth and population density are driving demand for transportation, changing its distribution. Populations around the world are becoming more urbanized, even though overall demographic growth is slowing in most regions. The average distance traveled by people increases as disposable income rises, and this increases demand for passenger transportation. The interdependence between economic activity and transportation activity has resulted in a strong statistical correlation between GDP and transportation demand. Demand for passenger transportation is projected to grow in all regions of the world. It will triple by 2050, from 44 trillion in 2020 to 122 trillion passenger kilometers, according to ITF projections [49]. The distribution of demand will change significantly. OECD countries were responsible for 43% of global passenger transport in 2020, but their share will drop to 24% in 2050. The reason is that demand for passenger transport is growing relatively fast in other countries, especially China and India.

Among the major factors driving the growth of the global maritime passenger transport market are (1) the increasing number of travelers, a derivative of the growth of the world's population, as well as the increase in the wealth of the middle classes, and (2) the dynamic growth of tourism, which has made travel an important part of the lifestyle. Maritime tourism is becoming increasingly popular due to the attractiveness of coastal destinations, the opportunity to explore different regions and access to a variety of onboard attractions, (3) the increase in demand for luxury leisure activities, which for some people are a symbol of prestige and social status, (4) the development of port infrastructure to handle larger ships, increase capacity, and improve the quality of passenger service.

The above forms the basis for an attempt to identify scenarios of environmental states for passenger shipping (Tab. 4).

Tab. 4

Scenarios of ambient states

Aspect	Optimistic scenario	Pessimistic scenario	Most likely scenario
Number of passengers	Significant increase in passenger numbers, increased demand for sea travel	Decline in passenger numbers, reduction in travel due to health or economic factors	Gradual increase in passenger numbers, recovery in demand after period of restrictions
Tourism development	Dynamic growth of the tourism sector, increased interest in travel and coastal attractions	Collapse in the tourism sector, travel restrictions and health concerns reducing demand	Gradual return to growth of tourism sector, increased interest in local destinations
Development of port infrastructure	Investment in port expansion and modernization, increasing capacity, and improving passenger service	Lack of investment in port infrastructure, restrictions on passenger port development	Gradual development of port infrastructure, adapting to changing needs and increasing demand
Increase in demand for luxury leisure activities	Increased demand for luxury sea cruises, unique attractions, and services on board ships	Demand for luxury travel declines, less interest in exclusive experiences	Gradual increase in demand for luxury travel, increased interest in comfort and unique attractions
Traveler preferences	Increased interest in sea travel, greater demands on service quality, safety, and flexibility	Travel restrictions, health concerns changing traveler preferences	Gradual recovery of travelers' confidence, greater interest in local travel, flexible booking and return options
Travel policy	Open borders, visa facilitation, and reduced bureaucracy	Tightening border controls, difficulties in obtaining visas, and travel restrictions	Controlled border opening, harmonization of travel procedures

The optimistic scenario for the development of passenger maritime transport assumes dynamic growth in this sector, taking into account a number of positive factors and trends. In this scenario, the development of passenger maritime transport goes hand in hand with the growing demand for sea travel. The industry is taking steps to meet the diverse preferences of travelers and adapt to changing trends. Investments in port infrastructure and technological innovations are enriching the traveler experience, while tourism development and destination appeal are attracting more and more passengers. The pessimistic scenario describes a situation in which the sector faces a number of challenges and constraints that could affect its development. In this scenario, it is important to take appropriate actions and adapt to changing conditions in order to meet challenges and survive in difficult times. Key actions include adapting to changing demand by offering flexible, booking options, promotions, attractively priced packages and special offers. Diversifying markets and offerings, focusing on local tourists, promoting smaller and closer destinations, and looking for other market segments can also help. Offering flexible booking terms, refunds, and cancellations can also boost traveler confidence. On the other hand, introducing refund policies for sudden changes in plans, offering credits for future trips or the ability to change travel dates may contribute to the attractiveness of sea travel. In the pessimistic scenario, adaptation, flexibility and, innovation are essential.

The most likely scenario includes stable growth for the sector, which assumes steady but moderate passenger growth. The industry is focused on tailoring its offerings to the diverse preferences of travelers, continuing to invest in port infrastructure, developing luxury travel options, promoting sustainability, and ensuring safe and sanitary travel conditions.

Tab. 5

Matching the obtained forecasts with the environmental scenarios

Country	Optimistic scenario	Pessimistic scenario	Most likely scenario
Germany	annual increase of 10%	annual decrease of 0,68%	data with forecast
France	-	data with forecast/annual decrease of 1%	annual increase of 10%
Spain	data with forecast	-	annual increase of 7,93% / annual increase of 10%
Sweden	-	data with forecast/annual increase of 0,56%	annual increase of 10%
Denmark	data with forecast	annual increase of 0,53%	annual increase of 10%
Greece	data with forecast	annual increase of 1,04%	annual increase of 10%
Italy	data with forecast	annual increase of 4,30%	annual increase of 10%

Given the long-term passenger forecasts made, an attempt can be made to assign them to the scenarios presented (Tab. 5). The probable scenarios include those in which demand will grow and passenger numbers will return to their pre-pandemic state. To the pessimistic scenarios were assigned forecasts that indicate a decline in the number of passengers or its very slow growth, preventing a return to the pre-pandemic state. It should be noted, however, that the assignments to the scenarios are not clear-cut. In summary, it can be seen that in most of the countries analyzed, the most likely scenario is an annual increase of 10% in the number of passengers. This means that by 2026 only Germany and Denmark will see the number of maritime passengers return to pre-pandemic levels.

5. CONCLUSIONS

The authors' intention was to identify the consequences of changes in passenger communication behavior as a result of the COVID-19 pandemic for the functioning of maritime passenger transport. The study is not cognitive in nature but is an empirical study. Therefore, the literature review was only intended to show the directions of current research in the field of the relationship between the pandemic and maritime passenger transport. Differences in the number of sea transport passengers served between actual and forecast values were indicated in the example of selected EU countries. The research can be used as comparative material in comparative analyses. They are cognitive in nature. The presented long-term forecasts may, however, constitute material for decision-makers in the tourism and transport sectors. They can also serve as cognitive material in the process of formulating a strategy or policy for the maritime transport sector.

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