

Methodological approaches to the functioning of the passenger transportation market: Airline, road and railway segments

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Abstract. Passenger transportation plays a critical role in ensuring efficient functioning of the economy, as it provides labour mobility, access to markets, cultural, and social services, and promotes the development of international tourism and social integration. Thus, the purpose of the research was to analyse methodological foundations of the functioning of the passenger transportation market and to assess the war impact on the condition and development of air, bus, and rail passenger transportation. With the help of the bibliographic method, key scientific papers have been analysed in the article to study the theoretical foundation and identify problematic issues, calling for improvement and development. Using the generalisation method, leading organisations, ensuring the functioning of the passenger transportation market, have been identified and summarised, and the general principles of its functioning have been formulated. Using comparative and grouping methods, methodological approaches to air, bus, and rail passenger transportation in the context of economic, regulatory, technological, ecological, and social foundations have been proposed. The necessary prerequisites for the effective functioning of the passenger transportation market have been determined by grouping the most significant aspects, such as liberalisation and competition, state regulation and standardisation, investments and innovations, as well as effective cooperation between stakeholders in the field of passenger transportation. Using tabular and graphical methods, the war impact on air, bus, and rail passenger transportation has been considered through the lens of the caused damage, the amount of destruction, and the necessary restoration and reduction of passenger traffic. The peculiarities of enterprise operation in wartime have been identified with the emphasis on strategically important features of functioning and development, and patterns in passenger transportation have been revealed with the help of the content analysis method. The results of the research can be useful for specialists in the field of passenger transportation and tourism when analysing the passenger transportation market, forming strategies, and considering development trends

Keywords: airline; digital technologies; information and communication technologies; strategy; tourism; tourist; transport connection

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● INTRODUCTION

The modern economy and society depend on an efficient and convenient system of passenger transportation, where their constant improvement and adaptation to transformations and new realities are crucial for ensuring sustainable development. The transformational changes that took place under the influence of the COVID-19 pandemic and the war in Ukraine significantly affected the passenger transportation market. The development of each type of transportation, particularly air, rail, and bus, affects the population mobility, the economic development of regions, and the overall transport infrastructure. The relevance of methodological approaches to each of these segments provides for efficient use of resources, ensuring passenger safety and reducing the impact on the environment.

The issue of passenger transportation is quite important: leading scientists in the field of tourism and transport connections highlight the impact of the pandemic on changes in passenger transportation in their scientific papers. V. Koba & O. Pylypenko (2021) considered the consequences of such an impact on the main resulting indicators of Ukrainian air carriers' operation by sectors. The authors proposed measures that, from the standpoint of the short- and long-term perspectives, should mitigate the impact of global events on air transportation and service providers. It is worth mentioning that, according to researchers, the growth in the number of passenger air transportation in Ukraine depends significantly on the available routes and price policy, where the introduction of low-cost carriers contributed to the growing popularity of air transportation. The work of T. Prymak *et al.* (2020) also gives evidence for the strategic nature of all stakeholders' actions related to charter transportation and external events, suggesting an action algorithm for all participants in the tourist services market for improving the effectiveness of marketing interaction and a methodology for identifying causes for the destabilisation of the charter air transport market in the tourism sector. The authors of the paper prove that the increase in passenger transportation was due to the dynamic growth of non-regular flights for the Ukrainian market, where state regulation and effective interaction can serve as incentives for such growth, or, on the contrary, the lack of proper regulation can lead to a failure to fulfil obligations and result in negative consequences.

The growth in the number of tourists and the formation of demand for tourist products is strongly influenced by bus transportation, where, as a result of the war, bus tours began to gain particular popularity; therefore, I. Krupenna (2023) sees the solution of transport problems in tourist offers for bus tours. According to the researcher, apart from financial savings, the use of bus tours creates opportunities for opening new tourist routes that previously were not very attractive or too expensive. V.A. Khudaverdiev (2022) believes that the transport component plays a significant role in tourism development and examines the features of four types of transport connections when selling basic and auxiliary services in tourism, as well as identifies the most significant factors when choosing each of them. It is worth mentioning the research of O. Matusevych *et al.* (2022), where attention is paid specifically to the methodology of managing rail passenger transportation by developing a unified change management

mechanism in this segment. From the authors' point of view, rail transportation in wartime can be improved by implementing better practices and using the optimal mechanism of rail transportation operation.

Thus, the issue of passenger transportation is quite important from the scientific perspective, although methodological issues are insufficiently reflected in scientific findings, mostly focusing on one type of transportation without considering the relationship between different types of passenger transportation and their impact on tourism development. The purpose of the study was to analyse methodological foundations of the functioning of the passenger transportation market, taking into account various segments, and to assess the war impact on the condition and development of air, bus, and rail passenger transportation. This purpose is achieved through the following objectives: to analyse the prerequisites and create a methodological basis for the functioning of the passenger transportation market, as well as to study the impact of the war in Ukraine on passenger transportation.

● MATERIALS AND METHODS

A wide range of sources and materials, which are relevant and reliable, were used to conduct the research, which made it possible to ensure a high level of reliability of the results. The main sources of information were presented by the scientific works of leading scientists, official reports, statistical data, and information resources related to the market for passenger transportation. In particular, literature on air, road, and rail transport was analysed, as well as data on the impact of the military conflict on these sectors, which was studied in detail in the works of T. Prymak *et al.* (2020), I. Krupenna (2023), and V. Ishchenko & V. Kharuta (2024). In order to formulate the conceptual foundations of passenger transportation regulation and determine approaches to their functioning, information from international organisations, regulating the passenger transportation market – The International Air Transport Association (n.d.), The International Rail Transport Committee (n.d.), and the Ukrainian – Ministry for Communities, Territories, and Infrastructure Development of Ukraine (n.d.) – was used. To analyse the condition and war impact on the passenger transport market, statistical reports from Ukrainian and international organisations were used, which provided information on the volume of transportation, financial losses, and infrastructure restoration, in particular the State Statistics Service of Ukraine (Passenger traffic by means of transport, 2022), World Tourism Organisation (Impact assessment of the COVID-19 outbreak..., 2023), Kyiv School of Economics (\$155 billion..., 2024), and the World Bank (2024). The process of conducting the research included the stages of data collection and analysis, assessment of the war impact on the passenger transportation market, as well as the development of methodological approaches to improving the market's functioning with the authors' recommendations for improving the functioning of the passenger transportation market, taking into account the uncertainty of the operating environment and various perspectives, and being more realistic and better reflecting the complexity of the problem under investigation.

The work used a combination of scientific methods for an in-depth analysis of the functioning of the passenger transportation market, taking into account theoretical and practical aspects. To achieve the set goal and identified objectives of the research, a comprehensive approach was used in the paper based on a combination of: bibliographic method – for analysing modern scientific findings and identifying key problems in the passenger transportation market; generalisation method – for determining common features in the functioning of air, bus, and rail transportation and formulating problems; comparative method, which made it possible to compare the bases of legislative regulation, the level of damage caused in the transport infrastructure, and the dynamics of passenger transportation; grouping method – for formulating the methodological bases of the transportation market with economic, regulatory, technological, ecological, and social components as the most significant ones, as well as when highlighting the key aspects of this market functioning; graphic method, which made it possible to visualise the proposed recommendations and the obtained results; tabular method – for better information interpretation; and content analysis method – for quantitative and qualitative analysis of textual and statistical materials to identify patterns and trends. The complex use of various scientific methods enabled a comprehensive and detailed analysis of the passenger transportation market, providing both for considering various aspects of its functioning and identifying key problems and trends of further development.

● RESULTS

Modern transportation systems are focused on the integration of various types of transport, which provides more convenient access to various transport services and promotes the efficient use of infrastructure. The new generation of consumers has significant expectations and demands for convenience, speed, and personalisation of services. Accordingly, transport companies are forced to adapt to these demands, introducing new service models and improving customer interaction through mobile applications and digital platforms. In addition, global transformations, such as the transition to sustainable development and the integration of new forms of mobility, provide for the adaptation of existing approaches.

According to M. Rudenko (2024), transformations in the passenger transportation market suggest that modern carriers must adapt to new realities, look for innovative solutions, and adapt their business models for recovery and sustainable development in the conditions of post-pandemic and geopolitical instability. The introduction of travel restrictions, border closures, and business and tourism travel restrictions led to a sharp decrease in demand for air and other types of transportation, causing significant financial losses for airlines and other carriers (Impact assessment of the COVID-19 outbreak..., 2023). Therefore, post-pandemic recovery provides for both a review of routes and transportation networks to meet new conditions and changed needs, and methodological prerequisites for market functioning, taking into account different contingencies, including war with increased security issues and requirements for rest. Also, an important step towards the successful functioning and further development of the

passenger transportation market should be the introduction of digital technologies, where the most relevant are contactless registration, electronic tickets, automated security systems, and other new technologies that simplify the process of interaction with the consumer of transport services, ensure safety and comfort of passengers, reduce waiting time, and increase data accuracy. The active growth of the smart electronic ticket market, where the market volume in 2023 was estimated at 10.8 billion dollars, and already in 2024 it is expected to grow by 14.4% (Smart ticketing market size..., 2024) proves the idea above. These technologies contribute both to convenience and reduction of service costs, in particular through savings on ticketing systems and resource optimisation. That is, the implementation of digital initiatives in the field of passenger transportation has a significant potential for further development and modernisation of the global transport infrastructure.

Passenger transportation is within the competences of the following major international organisations: the International Air Transport Association, which is responsible for the regulation of international civil aviation, including safety standards, operating rules, and passenger rights; the International Rail Transport Committee, which is an association of railway companies engaged in development and standardisation of rail transport, including passenger transportation (Ukrzaliznytsia became a participant in 1992); and the International Maritime Organisation, which determines international standards and rules for maritime transport, including passenger ships. The European Aviation Safety Agency, which specialises in air traffic safety in Europe, including the coordination of passenger transportation. The European Aviation Safety Agency is responsible for regulating the safety and efficiency of the aviation industry in the European Union, including passenger transportation. In Ukraine, regulation of transport, including passenger transportation, is carried out by the Ministry for Communities, Territories, and Infrastructure Development as an executive body, shaping and implementing state policy in the field of road, rail, and other types of transport. Moreover, state authorities regulating and controlling passenger transportation functioning report to it, including the State Aviation Service of Ukraine, the State Service of Ukraine for Transport Safety, the State Agency of Auto-Roads of Ukraine, the State Service of Maritime and River Transport of Ukraine, and the State Agency for Infrastructure Projects of Ukraine.

The issue of the functioning of the passenger transportation market in Ukraine is regulated by a number of regulatory documents; among the most significant ones are the following: Order of the State Aviation Service of Ukraine No. 1239 “On Approval of the Aviation Rules of Ukraine ‘Rules of Air Transportation and Service of Passengers and Baggage’” (2018); Law of Ukraine No. 2344-III “On the Road Transport” (2001), which determines the general principles of the organisation and functioning of road transport in Ukraine, including rules related to passenger transportation; Law of Ukraine No. 273/96-BP “On the Railway Transport” (1996); Resolution of the Cabinet of Ministers of Ukraine No. 176-97-p “On Approval of the Rules for the Provision of Passenger Road Transport Services” (1997); Order of the Ministry of Transport and Communications of Ukraine No. 1196 “On Approval of the Rules

for the Carriage of Passengers, Baggage, Cargo and Mail by Railway Transport of Ukraine” (2006), etc. These legislative acts are aimed at ensuring passengers’ safety and comfort, regulating transportation conditions, and establishing responsibility for violating requirements. They include the rights and obligations of carriers and passengers, as well as conflict resolution mechanisms.

From the perspective of comprehensiveness and strategic nature of passenger transportation, it is worth mentioning the National Transport Strategy of Ukraine, which identified the increase in demand for transportation, the implementation of environmental and social initiatives, as well as ensuring the efficiency of passenger transportation, as priority tasks (Order of the Cabinet of Ministers of Ukraine No. 430-p, 2018). Therefore, taking into account the environmental variability and different contingencies, the regulation and functioning of the passenger transportation market must be supervised constantly by both central and local authorities with the involvement of major business representatives in this area. Methodological approaches, covering a wide range of aspects, where economic, regulatory, technological, ecological, and social aspects are among the most important components, should be of great significance in the functioning of the passenger transportation market. These methodological approaches often interact with each other and may vary depending on the country, regional characteristics, and type of passenger transportation (air, bus, rail, etc.). Their integration contributes to ensuring efficient and stable functioning of the passenger transportation market with maximum comfort and safety for passengers.

From the perspective of economic methodological foundations of passenger transportation market functioning, it is expedient to single out two main approaches to the analysis of the passenger transportation market. The neoclassical approach, which is based on the principles of classical economic theory, in particular ideas about the rationality of market participants actions, competition, and making choices based on utility maximisation. Within the framework of this approach, market efficiency, the role of prices in the coordination of supply and demand for passenger transportation, emphasised by the research of V. Druzhinina & O. Chernikhova (2024), as well as the impact of various forms of competition on prices and service quality, reflected in the work of J. Chen *et al.* (2023), are in the focus of the research. The institutional approach, which determines the importance of institutional rules, regulating the passenger transportation market, is applied by S. Dombrovska (2020). Studies, conducted within this framework, pay attention to the influence of regulation, monopolies, or state-owned enterprises on market functioning, as well as to the role of legal institutions in protecting consumer rights and stimulating competition. It is worth mentioning that the study of the economic aspects of the passenger transportation market’s functioning is a prerequisite for the analysis of political measures effectiveness in this field. From the scientific perspective, the analysis of the rationality of market participants actions in terms of the segmental division of the passenger transportation market made it possible to formulate the key methodological foundations of its functioning (Table 1).

Table 1. Approaches to the functioning of passenger transportation

Division by characteristics Type of transportation	Methodological foundations				
	economic	regulatory	technological	environmental	social
Air	airlines pricing policy, market competitiveness, income from additional services, economic efficiency of routes	aviation safety, regulatory requirements for the technical condition of aircraft, rules for passengers and baggage transportation, international regulations (standards) on international flights	modern navigation and communication systems on aircraft boards, introduction of flight automation systems, innovative developments in safety and energy efficiency, “smart” electronic tickets, registration and baggage handling systems, innovative technologies for passengers	reduction of CO ₂ emissions and other pollutants, biofuel use, efficient engines, reduction of noise during take-offs and landings	accessibility for disabled, delay management and passenger service policies, safety and comfort initiatives
Railway	ticket prices, pricing strategies, seasonal and group discounts, revenues from commercial services, efficiency of logistics solutions, and transportation management	train traffic safety, transportation rules, vehicle and personnel certification standards	modernisation of electrified networks, implementation of train traffic control systems, use of information technologies for managing schedules and ticket systems, e-tickets, mobile applications	use of electric or hybrid locomotives, energy efficiency of power flow management, waste and noise management	accessibility for people with reduced mobility, passenger comfort and safety management policy, integration with infrastructure
Bus	tariff management, discounts for different categories of passengers, vehicle efficiency, routes optimisation	route regulation, passenger and staff safety requirements, time and safety regulations	innovative systems for monitoring routes, implementation of information technologies for creating routes, security, integration of mobile applications to improve passenger service	replacing diesel buses with electric or hybrid ones, introducing energy recovery technologies, reducing congestion and emissions	accessibility for all population categories, including youth, the elderly, and the disabled, road safety initiatives and improved service quality

Source: created by the authors

The functional aspects of the passenger transportation market from the standpoint of regulatory frameworks include price regulation as the most significant aspect, which is a part of economic prerequisites and is closely related to government regulation, where, following the experience of the United States, the passenger air transportation market changed radically after the weakening of air travel prices. One of the key stages was the deregulation of air transport in the USA in 1978 under the Aviation Deregulation Act, which abolished price and route fixing, studied in detail by S. Smerichevskiy & I. Mykhalchenko (2015), and allowed airlines to set prices on flights depending on market conditions and competition. Airlines became more flexible in managing their resources and capabilities, which has contributed to the overall improvement of service and availability of air transportation. The price weakness of air travel resulted in a significant development of the passenger air transportation market in the USA, and subsequently, it was reflected in other markets as well. It is worth mentioning

that increased competition among airlines has spurred innovations in service, including more convenient schedules, new routes, and improved passenger service. It was deregulation in the US that became a transformative stage in air transportation, which enabled the market to undergo radical changes and adapt to new conditions, reducing prices and increasing the competitiveness of the main market players.

Based on the information presented in Table 1, it is worth mentioning that for a successful functioning of the passenger transportation market, a complex combination of all components is important, since without a proper regulation of the state and other relevant authorities, normal transportation is impossible, as well as with unsubstantiated economic grounds, passenger transportation will not be profitable, or without sufficient funding, it is impossible to implement innovations or social initiatives. Thus, when developing a methodology for the functioning of the passenger transportation market, the basic components should be taken into account (Fig. 1).

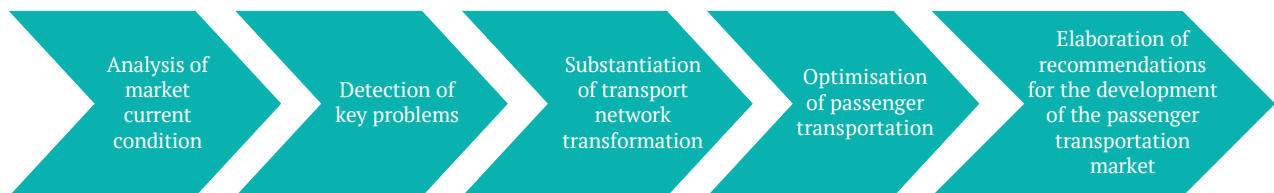


Figure 1. Suggested components of methodological foundations for the passenger transportation market

Source: created by the authors

Therefore, the effective functioning of the passenger transportation market in Ukraine, like in any other country, should be based on key aspects, such as: ensuring free access to the market for various carriers, i.e., liberalisation and competition; clear regulation and standardisation of safety, service quality, passenger rights, and other aspects of carrier activity; investments in the development and maintenance of infrastructure (roads, railways, airports) and the introduction of modern technologies (e-tickets, monitoring systems, etc.); cooperation between state authorities, private companies, and the public, that is, all stakeholders in the field of passenger transportation. In comparison with the world Transportation industry standards (2024), Ukraine is actively carrying out reforms in the field of transport infrastructure and transportation, in particular bringing its practices closer to European standards (Order of the State Aviation Service of Ukraine No. 1239, 2018). However, there are certain challenges, such as the need for further infrastructure modernisation and optimisation of traffic flow management, which remain relevant for the further development and improvement of the passenger transportation system in Ukraine.

The pandemic and the war in Ukraine significantly affected the transportation market, where air flights were completely suspended with the start of hostilities and rail and bus transportation underwent significant transformations. According to a study conducted by the Kyiv School of Economics, the total amount of damage caused to Ukraine was estimated at 155 billion dollars, 3.1 billion of which fell on transport in January 2024 (\$155 billion..., 2024). According to the Kyiv School of Economics, aviation infrastructure suffered the most damage; first of all, 19 out of 35 airfields were destroyed, followed by the destruction of transport highways and railway tracks (Report on damages..., 2024). The preliminary estimated number of damages to the aviation industry (in particular, airports, runways, planes, and equipment) is estimated at 2.04 billion dollars, the automobile industry – 26.7 billion dollars, and the railway industry at direct costs of more than 4.3 billion dollars. The war in Ukraine led to an increase in the cost of passenger transportation, where rail fares increased by almost 20% in certain periods (Economic forecasts..., 2024). Table 2 presents a summary of losses for each segment by region of Ukraine.

Table 2. Indicators of the level of economic security of Ukraine by components (percentage of the optimum value)

Damage	Region	Roads, %	Bridges, %	Railways, %
	Zhytomyr	< 1	3	< 1
	Kyiv	6	11	< 1
	Chernihiv	6	9	< 1
	Sumy	6	3	1
	Kharkiv	22	12	15
	Luhansk	11	10	9

Table 2, Continued

Damage Region	Roads, %	Bridges, %	Railways, %
Donetsk	14	11	36
Zaporizhzhia	17	4	23
Kherson	12	28	10
Mykolaiv	7	7	1

Source: created by the authors based on Report on damages to infrastructure from the destruction caused by Russia's military aggression against Ukraine as of January 2024 (2024)

As of 2024, it is difficult to estimate the cost of damage to vehicles, which are accounted for by corresponding authorities; however, as the airline industry reports, the cost of the "Mriya" aircraft is 300 billion dollars, and according to experts, the cost of a new aircraft will be much higher (Report on damages..., 2024). According to the research conducted by the World Bank (2024), the development rate of Ukraine's economy is expected to slow down to 3.2 in 2024 (for comparison, in 2023, the growth rate was 4.8%), and the number of damages and necessary needs during 2024-2033 is estimated at 486 billion dollars, 33.6 billion dollars of which is for transport infrastructure (The World

Bank in Ukraine, 2024). At the same time, work is constantly being carried out on the restoration of transport connections, and road and railway connections were repaired in Kharkiv, Chernihiv, Kyiv, and Sumy regions during 2022-2023. During this time, 115 roads were reconstructed, almost 30 roads, and more than 45 railway bridges were built. According to the World Bank (2024), although Ukrainian enterprises have suffered serious losses, they remain quite resistant to the war impact on business activity (Table 3). In order to objectify the war impact in Ukraine on the passenger transportation market, we will analyse and compare the passenger flow before and during the war (Fig. 2).

Table 3. Enterprise operation in wartime

Characteristics	Performance, %			
	Not operating	Temporarily not operating	Partly operating	Constantly operating
Stability	3	18	20	59
Use of information and communication technologies, %				
Adaptability	Improved the quality of goods/services	Created a new product/service	Work with new clients	Greater use of ICT
	17	17	34	39
Repair and restoration of critical infrastructure and services, country/association				
International cooperation	Administrative and fiscal support	Restoration of critical infrastructure and services	Administrative and fiscal support and restoration of critical infrastructure	Support of private business
	Finland, Denmark, Great Britain, the USA	Canada, Republic of Korea	Belgium, Iceland, Latvia, Lithuania, Austria, Sweden, Switzerland, Germany, Spain, Netherlands, Norway, Japan	The EU, World Bank, Switzerland, Netherlands, Norway

Source: created by the authors based on World Bank (2024)

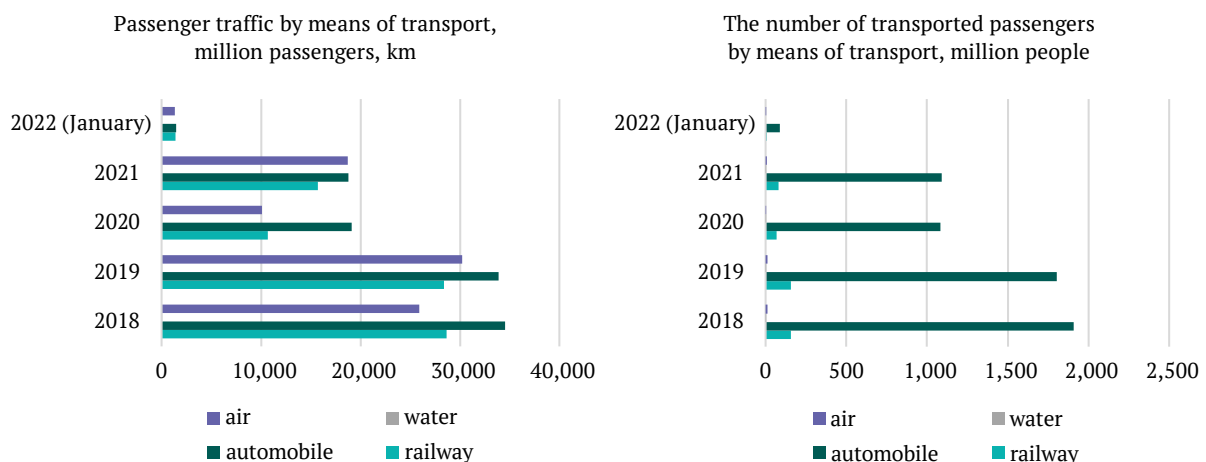


Figure 2. Dynamics of passenger transportation in Ukraine, 2018-2022

Source: created by the authors based on The number of transported passengers by means of transport (2022)

In 2022, the total number of passengers transported by all means of transport amounted to 1,600.6 million people; in 2023, this number reached 2,039.4 million people. Regarding the final data, it is appropriate to take into account the fact that due to the war, a significant number of people were forced to leave, using various types of transport, so the statistical data may vary at the moment. The war led to negative consequences in all spheres of the economy and people's lives, including the reduction of transportation. During the war in Ukraine, rail transportation turned to be relevant and enabled people to leave the territories where hostilities were taking place. Although the final statistical

data for the first half of 2024 have not been published for all segments of passenger transportation, it is advisable to build relationships between air, bus, and rail passenger transportation in the conditions of war in Ukraine to understand the real situation. Their construction, from the perspective of a methodological approach, provides for a comprehensive approach, which should include an analysis of the war impact on each of these types of transport, their interaction, and statistical information on changes in passenger traffic. A visual representation of the relationships between the three types of passenger transportation is presented in Figure 3.

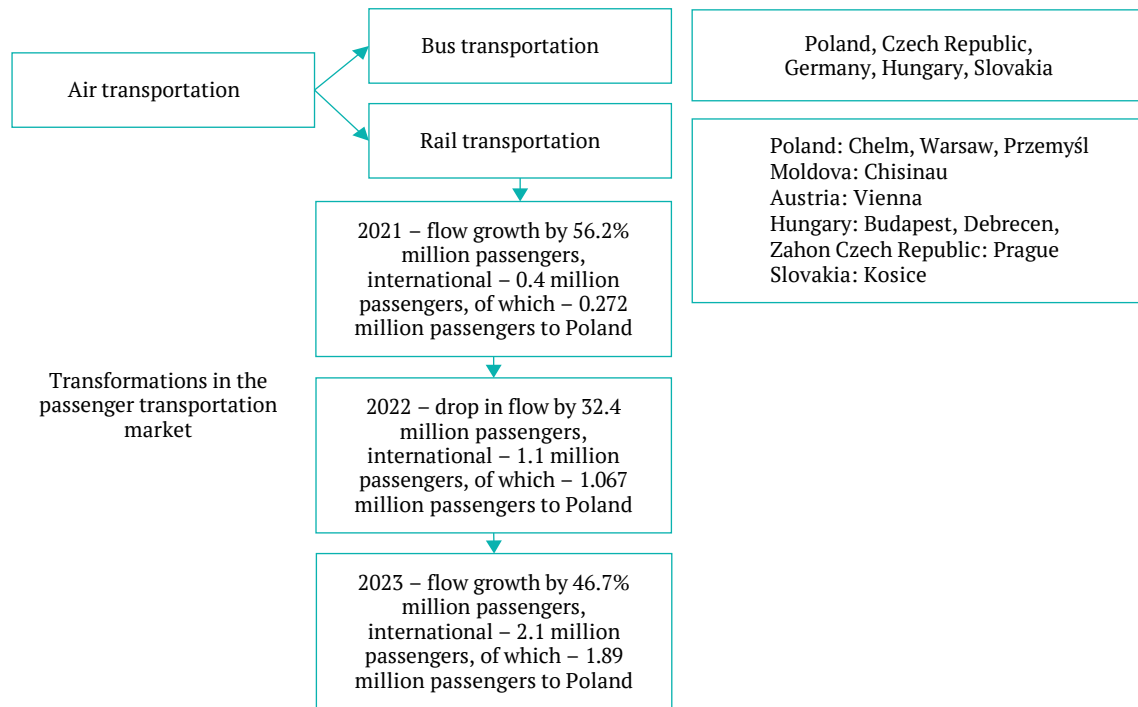


Figure 3. Transformations in the market of passenger transportation in Ukraine

Source: created by the authors

Due to restrictions on air travel, the demand for bus and rail transportation has increased significantly, particularly for international routes that cannot be covered by

airline service. Table 4 reveals changes in Ukrainians' visits to other countries, giving evidence for tourism in 2021 and dominance of tourist destinations.

Table 4. Peculiarities of passenger transportation, 2021 – H1 2024

Type	2021	2022	2023	H1 2024
Air	Turkey, Egypt	suspended	suspended	suspended
Bus	Turkey, Bulgaria, Montenegro	Poland, Moldova	Germany, Poland, Czech Republic, Austria, Netherlands	Poland, Czech Republic, Germany, Hungary, Slovakia
Railway	EU countries	Poland	Poland	EU countries
Peculiarities	65% of air transportation	over 95% of rail and bus transportation	100 % of rail and bus transportation	100 % of rail and bus transportation

Source: created by the authors

If to consider global trends, the most significant negative impact was caused by the pandemic, for example, the reduction of global passenger traffic by 65.8% in 2020; however, already the following year there was an increase

in the flow by 64.3% (Annual growth..., 2024). Bus transportation has also undergone changes under the influence of COVID-19. However, the war in Ukraine also contributed to the reduction in the number of passengers travelling by

bus. With a 1% reduction in the volume of passenger traffic in 2022, demand is forecast to grow by 18.32% in 2024 with an increase in the number of passengers to over 620 million people in 2030 (Number of users..., 2024). As far as rail passenger transportation is concerned, a stable upward trend has been observed since 2017, with 970 million passengers using this type of transport around the world in 2023 (Worldwide number..., 2024).

In view of the rapid development of technologies in the world, such as electronic platforms for transportation management and innovations in vehicles, as well as the devastating impact of the war in Ukraine on passenger transportation, arises the need to constantly review and update management strategies. To improve the functioning of the passenger transportation market, it is firstly necessary to strengthen the adaptability of transport systems to crisis situations by developing flexible management models and preserving critical transport routes. Second, it is important to invest in infrastructure modernisation and the introduction of new technologies, such as autonomous vehicles and traffic management systems, to increase the efficiency and safety of transportation and reduce risks, including the implementation of additional security measures and evacuation plans. Third, the focus should be on integration of different means of transport into a single digital platform to improve accessibility and coordination of transport, which will be particularly relevant after the end of the war. Moreover, it is necessary to develop strategies to reduce the environmental impact, including the transition to electric and hybrid vehicles. Equally important is the creation of support programs for conflict-affected regions, which will ensure the continuous maintenance and restoration of transport services. Finally, it is necessary to take into account new consumer preferences, focusing on the service customisation and the improvement of communication through digital channels in order to respond to modern challenges and needs.

● DISCUSSION

The condition and development of the passenger transportation market is a topical issue, requiring new approaches both to its functioning and consideration of new trends and changes taking place in the external environment. It is particularly worth mentioning that in the conditions of constant changes resulting from technological progress and global challenges, such as war and climate change, the implementation of strategic development and interaction of all stakeholders in the field of passenger transportation market functioning is an important issue of scientific findings. The conducted analysis of the war impact on passenger transportation makes it possible to understand the overall situation on the corresponding market. However, in the future, it is expedient to establish economic dependencies of the war impact on passenger transportation. R.K. Akamavi *et al.* (2023) made attempts to conduct such an analysis, thoroughly examining the impact of wars, terrorism, and political instability on tourism. In this study, the authors assess both direct threats and consequences of negative events, as well as analyse indirect and derivative consequences of such effects. According to the research carried out by A.M. Martins & S. Cró (2024), whose approach is supported in the study on the war impact on all

participants in passenger transportation, the war in Ukraine has quite significantly transformed market participants in the field of air transportation, where, from an economic point of view, quite serious losses have been incurred by airlines, whose market value was significantly reduced.

The destruction of the transport infrastructure in Ukraine led to the redistribution of the tourist flow, which is revealed by C. Chu *et al.* (2024). The authors fairly and reasonably point out that many participants were affected, some of whom were even forced to completely suspend flights, while others saw an increase in the cost of transportation, which also negatively affected tourists. At the same time, in some airports, which are the closest to the war territory or military conflicts, the situation with air transportation is improving, which was reflected by Á. Kovács *et al.* (2024) in their scientific paper. Agreeing with A. Borucka & E. Kozłowski (2024) approach regarding the need to quantify the war impact on transportation, further work in this direction is required. After all, using mathematical tools, the authors of this research draw attention to the validity of the obtained results, which can be used when making forecasts and taken into account when determining and implementing the appropriate strategy. Comparing the conducted research with the scientific papers mentioned above, it is worth pointing out that all of them are aimed at determining the war impact on the passenger transportation sector, since the understanding of these processes can be useful for developing recommendations that will be important from a practical perspective.

The issues of the dependence of the country's economic growth on the level of transport infrastructure development provide for further investigation and are within the focus of F. Zhang & D.J. Graham (2020) work, where the interaction channels of air transport with the economy of the region have been summarised. A. Raihan *et al.* (2024) point out in their study it is airlines that have a significant impact on the economy both through population employment and provision of tourist demand through the introduction of new flight programs. To support the idea of transport impact on the tourism development, A. Papa-theodorou (2021) provides information of a tourist choosing a flight program not to fly but to get to a tourist destination. At the same time, the issue of the environmental aspect in the vehicle operation is strongly highlighted in the scientific literature, in particular in M.Y. Salman & H. Hasar (2023) research, which should become a part of the strategic activity of both airlines and providers of bus, rail, or sea transportation, which was also emphasised in the work through the lens of methodological foundations and necessary components. Emphasis on strategic importance through the lens of environmental sustainability for the transportation sector is also carried out by A. Aytekin *et al.* (2024), believing that identifying factors, affecting demand in the field of transportation and creating an appropriate strategy, providing for compiling the necessary components, are among the most important issues.

The integration of digital technologies into all aspects of the passenger transportation market deserves special attention, as these technologies have a significant potential to significantly improve the efficiency, safety, and convenience of transportation, in particular through the introduction of modern traffic management systems, the

development of mobile applications for convenient travel planning and ticket purchase, as well as using big data analytics to optimise routes and schedules. Since transportation is a part of the tourism sphere, the issues of their interaction, state support, and implementation of innovative digital solutions become relevant, as highlighted by F. Ekici *et al.* (2022). The use of modern digital solutions makes passenger transportation efficient, where, according to V. Ishchenko & V. Kharuta (2024), as the comparative analysis of projects in the field of passenger transportation suggests, the introduction of innovations plays a significant role. The importance of implementing digital solutions in the field of tourism and transportation is highlighted by G.G. Şahin (2024), considering the integration between these areas as a key to success. It is also worth considering A.A. Yilmaz (2024) work, suggesting the development of transport connections for a successful functioning of the tourism sector and the implementation of a digital strategy as a necessary component for their efficiency.

Within the framework of the conducted research, the issues of digital solutions were only partly considered, in particular from the standpoint of their importance in this area, however, the main attention was paid to the development of methodological approaches to the functioning of the passenger transportation market, the interpretation of war consequences for Ukraine, and the development of authors' proposals for the functioning of this market, taking into account management. Comprehensiveness in the functioning and development of the passenger transportation market provides for in-depth scientific research with actualising the key problems of air, bus, rail, and other types of transportation with the development of effective mechanisms for solving them and effective proposals to strengthen the competitiveness of interested parties.

● CONCLUSIONS

In the course of the research, it was discovered that transformational processes in the world and in Ukraine led to significant changes in the passenger transportation market, where the COVID-19 pandemic and the war in Ukraine were the most significant factors of change. The analysis of the fundamentals of the functioning of the transportation market made it possible to identify key issues that need to be settled and improved. For a successful functioning of the passenger transportation market, it is proposed to take into account the economic, regulatory, technological, ecological, and social components, indicating the methodological bases of each for air, bus, and rail transportation. It was found out that for a successful functioning of the passenger transportation market, it is necessary to analyse the current state for each type of transport, identify key problems in the relevant segment, and, as a whole, carry out transformation and optimisation of passenger transportation with further elaboration of recommendations for improving the condition, as well as the development,

given changes in the external environment and the impact of digital technologies. The key aspects that should be taken into account when making changes in the functioning of the passenger transportation market have been suggested, in particular the issues of effective pricing policy, security of both passengers and personal data, technological capabilities of each type of passenger transportation, mobility, and availability, for people of different categories, where sustainability, adaptability and international cooperation should also play a significant role.

The regional analysis of damage and destruction made it possible to identify the most affected regions, such as Kharkiv, Kherson, Zaporizhzhia, Luhansk, and Donetsk regions, specifying losses incurred by each means of transport. The highest percentage of destroyed roads is observed in Kharkiv Region, destroyed bridges are in Kherson Region (28%), and railways are in Donetsk Region, which accounts for 36% of their total number. To assess the impact of the war in Ukraine on air, bus, and rail passenger transportation, their dynamics during 2018 and the first half of 2024 were analysed, and the main structural changes in each type of transportation were determined. The transformational changes that took place in the passenger transportation market and the main countries to which Ukrainians travelled from 2021 to the first half of 2024 have been presented. Under the influence of the war, the flow of passengers from the airline segment in Ukraine was distributed mostly between bus and rail transport, with Poland, Moldova, and Hungary being the most popular countries. This can be explained by the availability of airports in these countries, which makes them attractive for vacation among Ukrainian tourists. Comparing the main destinations of the Ukrainians in 2021, such countries as Turkey, Egypt, and Montenegro were among the vacation favourites, whereas from 2022 the focus of choosing a country was shifted to Poland, Moldova, Germany, the Czech Republic and Slovakia. Global trends in the passenger transportation market have been considered. The closure of airspace and the destruction of airports, highways, and railway connections require effective efforts and investments for the development of transport infrastructure, which is a part of the economy and a significant component of the tourism sector. Therefore, the prospect of further scientific research will be the study of the economic and socio-ecological impact of the war on the development of passenger transportation and tourism with the construction of corresponding mathematical forecasts and models, as well as the issue of implementing digital technological solutions for the development of passenger transportation.

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● CONFLICT OF INTEREST

None.

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Методологічні підходи до функціонування ринку пасажирських перевезень: авіаційний, автобусний та залізничний сегменти

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Анотація. Пасажирські перевезення відіграють критичну роль у забезпеченні ефективного функціонування економіки, оскільки вони забезпечують мобільність робочої сили, доступ до ринків, культурних та соціальних послуг, розвитку міжнародного туризму та сприяють соціальній інтеграції. Відповідно метою дослідження був аналіз методологічних основ функціонування ринку пасажирських перевезень та оцінка впливу війни на стан і розвиток авіаційного, автобусного та залізничного пасажирських перевезень. За допомогою бібліографічного методу в роботі проаналізовані ключові наукові праці з метою дослідження теоретичного базису та визначення проблемних питань, які потребують удосконалення та розвитку. Використовуючи метод узагальнення, було визначено та узагальнено провідні організації, які забезпечують функціонування ринку пасажирських перевезень, сформульовано загальні принципи його функціонування. Запропоновано методологічні підходи до авіаційного, автобусного та залізничного видів пасажирських перевезень у контексті економічних, регуляторних, технологічних, екологічних і соціальних основ, для чого було використано методи компаративних зіставлень і групування. Встановлено необхідні блоки ефективного функціонування ринку пасажирських перевезень із групування найбільш значимих аспектів, таких як лібералізація та конкуренція, державне регулювання та стандартизація, інвестиції й інновації, а також результативна співпраця між стейкхолдерами у сфері пасажирських перевезень. Розглянуто вплив війни на авіаційні, автобусні та залізничні пасажирські перевезення через призму завданих збитків, обсягів руйнувань, необхідного відновлення та скорочення пасажиропотоку зі застосуванням табличного та графічного методів. Сформульовано особливості роботи підприємств в умовах війни з виділенням стратегічно важливих ознак функціонування та розвитку, а також виявлено патерни в пасажирських перевезеннях через призму застосування методу контент-аналізу. Результати дослідження можуть бути корисними фахівцям у сфері пасажирських перевезень та туризму під час аналізу ринку пасажирських перевезень, формування стратегій та врахування тенденцій розвитку

Ключові слова: туризм; транспортне сполучення; авіакомпанія; турист; цифрові технології; інформаційно-комунікаційні технології; стратегія