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ABSTRACT

The influence of the European Union (EU) on Ukraine can hardly be overestimated. Today, Ukraine's development directly depends on the country's integration into the EU and the adoption of European best practices. Of course, there are also imperfections in the EU. And where are they not? For countries like Ukraine (which are in their infancy), best practices are a chance for development. Such experience is invaluable. In order to adopt such a positive experience in the context of ensuring the safety of the transport system, it was decided to conduct additional research on this vector. The section discusses the main provisions for ensuring the safety of the EU transport system. A monographic review of research in the field of ensuring the safety of various modes of transport in the EU and in the world has been conducted. An assessment of safety indicators for different modes of transport in the EU has been realized. Impact indicators and safety measures for various modes of transport in the EU countries have been identified. Various safety management systems and EU programs, aimed at ensuring safety in rail, road, air and maritime transport have been described. New challenges to the security of the EU transport system through the COVID-19 pandemic and ensuring the competitiveness of different modes of transport, economic stability of market operators, compliance with environmental standards, etc. have been identified. The need to improve the infrastructure to ensure the safety of the transport system in the EU is pointed out. A combined safety management system for the EU transport system has been proposed and its key elements have been identified.

KEYWORDS

EU transport system, safety, rail transport, road transport, air transport, maritime transport, infrastructure, proactive safety management system, policy, strategy.

10.1 PROBLEMS OF ENSURING THE SAFETY OF THE TRANSPORT SYSTEM

The transport system is an important sector of the European Union (EU) economy and plays an important role in today's mobile society. The transport system and population mobility are central to the sustainable development of EU countries. EU transport policy promotes cleanliness, safety and efficiency by supporting the internal market for goods and the right of citizens to travel freely within the EU.

Ensuring the efficient functioning and safety of the EU transport system contributes to the overall well-being of the countries of the EU and socio-economic indicators. A well-balanced policy

for managing the EU's transport system, its resource potential and infrastructure achieves safety in various modes of transport and increases macroeconomic indicators, measures to combat climate change and draws human resources to other essential services, such as health and education.

The crisis, caused by the COVID-19 pandemic, has only exacerbated the need for and the importance of the EU transport system and identified new challenges for transport safety. During this period, the EU transport system played a significant role in attracting workers, sustaining the economy and launching the global distribution of vaccines. But the current situation has revealed vulnerabilities in the EU transport system, including the need to attract additional financial resources to cover losses from reduced traffic and ensure compliance with quarantine regulations, additional government support for operators due to loss of part of revenue, and so on.

Ensuring the safety of the transport system at different times is considered by a number of authors. In their works, researchers consider the theoretical foundations and methodology of ensuring the safety of the transport system, taking into account current trends, in particular the introduction of information technology and intelligent systems in road transport [1, 2]. Based on the perception data, the improvement of technology, management and institutions is proposed [3]. A reliable combination of vehicles is proposed through the introduction of ITS applications of the new generation of smart cities, the application of American and European ITS standards, elliptic curve cryptography algorithms to protect communication vehicles [4]. It is proposed to use ITS wireless communication technologies for the purpose of autonomous communication of vehicles with other transport nearby and road infrastructure and the use of a wide range of new opportunities for road safety and assistance [5–8]. Other authors propose the application of the process of analytical hierarchy in a combination of three areas: safety, environment and equipment performance [9]. To ensure the safety of land transport in the EU, the use of intelligent transport systems is proposed, which will increase the efficiency, comfort of transportation of people and goods, minimizing environmental damage and the contribution of transport to global warming [10]. Ensuring the safety of the EU transport system is seen in the context of its sustainable development; the role of European transport networks as integrated international ones *is considered* and the application of intermodal possibilities is evaluated [11]. The problems of introduction of intelligent transport systems and the need to develop a concept of integration of technologies into intelligent transport systems for different modes of transport are considered [12–14].

Important attention is focused on the management of international aviation safety, a comparative characterization of trends in the past and forecasting in the near future are realized, the current state of the aviation industry is studied [15, 16]. The practical safety measures, currently used in airports around the world, are studied, effective methods and basic principles for the development and implementation of the aviation safety system are studied [17]. The example of the United States addresses issues of transportation safety and risk minimization; the level of safety is determined depending on the type of transport [18].

The most urgent problems of the safety system of sea, land (rail and road transport), pipelines and air transportation are identified; the current legislation and institutions that provide regulation

and control of safety of each type of transport, the implementation of appropriate programs to improve the safety of a particular transport operation are analyzed [19–22]. Considerable attention is paid to ensuring the safety of maritime transport and ports in the field of comparative analysis of the main approaches and methods, used in the United States and the EU; emphasis is placed on raising safety standards, countering the terrorist threat, maximizing internal safety, strategies for balancing safety needs with protection of confidentiality and trade protection, etc. [23].

10.2 THE RESULTS OF THE STUDY OF THE SAFETY OF THE EUROPEAN UNION TRANSPORT SYSTEM

The EU transport system aims to promote environmentally friendly, safe and efficient travel, while supporting the rights of citizens, goods and services to free circulation within the single market. However, various circumstances can occur in transport, which can lead to harm to human health, crime and terrorism, damage to transport, disruption of transport infrastructure, etc., leading to serious socio-economic and environmental problems in the EU.

Ensuring the safety of the transport system in the EU is aimed at avoiding deaths and injuries in transport. Road safety depends on the driver's behavior, the quality of the transport infrastructure and the technical condition of a vehicle. Safety on railway transport is directly dependent on compliance with the rules of crossing the railway by pedestrians and road transport. Safety in maritime transport often depends on ship overload, design and the lack of appropriate safety measures; particular attention is paid to the safety of the transport of dangerous goods, as they pose serious risks to the general population, property and the environment. Aviation safety is aimed at eliminating mistakes of pilots, ensuring their high qualification through training, countering organized terrorist acts, providing proper infrastructure, etc.

In the spring of 2020, in the first months of the COVID-19 pandemic in the EU, virtually all EU Member States introduced containment and restriction measures for minor travel within a country and/or abroad, some partially or completely closed borders, thus enhancing safety. These restrictions were applied to almost all modes of transport, especially on passenger traffic. Commercial transport services, operated during the pandemic, implemented initiatives, aimed at protecting transport workers and travelers, as well as ensuring trade (especially essential goods) within and between EU Member States, as well as between the EU and non-EU countries.

In order to monitor events and policies for the development of further strategies for ensuring the safety of the EU transport system, the European Commission analyzes a number of statistics on different modes of transport. Eurostat statistics in this area describes the most important features of different modes of transport in terms of injuries and infrastructure indicators, as well as the contribution of transport services to the economy. Data collection is supported by a number of legal acts, requiring EU Member States to report statistics, as well as by voluntary agreements on the provision of additional data.

10.2.1 THE SAFETY OF EU RAIL TRANSPORT

Characterizing the number of railway accidents in the EU, it should be noted, that during the period 2015–2019 they decreased (**Fig. 10.1**). In 2019, the number of railway accidents in the EU decreased by 14 % compared to 2019 and by 9 % compared to 2018. During the study period, the EU implemented a number of projects and measures for safety in railway transport, which led to a reduction in the number of accidents, in particular, the introduction of innovative traffic technologies, the improvement of regional railway policy on the EU's participation in relations with neighboring countries.

Despite the reduction of railway accidents, their number has increased in some EU countries (**Table 10.1**). Thus, during the period 2015–2019, an increase in the number of railway accidents was observed in Spain, Norway, and Sweden.

The regional distribution of the EU's railway infrastructure is determined by historical and economic development, geographical characteristics of the regions. For example, several eastern EU member states have longer rail networks than their western neighbors, reflecting the legacy of the communist or Soviet era, when they were often more dependent on rail (compared to road) to transport passengers and goods [26].

Railway safety in the EU is achieved through high-quality track construction with the use of accident-free technology, improved technical characteristics and increased use of railways. The EU has rules and regulations on rail transport that are constantly being improved and aimed at the effective operation of the infrastructure management system, railway operators or service providers and contractors, operating on the railway.

Effective safety management is a prerequisite for maintaining and improving the safety of railway systems in the EU, especially for the technical, organizational and human factors that affect the internal functioning of railway systems. The railway safety management system in the EU identifies hazards, assesses risks and takes measures to reduce them, provides for ongoing inspections and timely detection of new hazards [27–29].

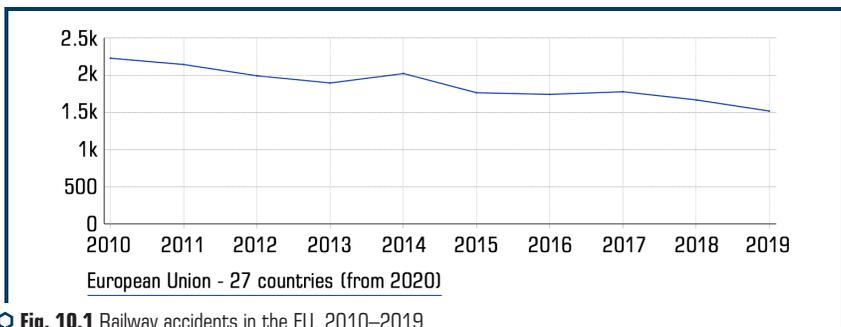


Fig. 10.1 Railway accidents in the EU, 2010–2019
Source: Eurostat [24]

● **Table 10.1** The number of railway accidents in some EU countries, 2010–2019

Country	2015	2016	2017	2018	2019
Belgium	21	22	33	31	27
Bulgaria	48	40	47	42	39
Czechia	94	87	97	89	91
Denmark	13	13	12	10	10
Germany	306	310	346	302	298
Estonia	12	15	19	21	5
Ireland	1	0	4	6	2
Greece	25	13	22	24	18
Spain	42	45	52	47	49
France	150	146	151	119	123
Croatia	27	23	33	25	28
Italy	97	99	104	109	76
Latvia	25	18	24	20	19
Lithuania	13	20	27	15	9
Luxembourg	0	2	1	2	0
Hungary	156	162	160	162	142
Netherlands	31	28	26	29	25
Austria	77	87	60	42	47
Poland	307	265	252	275	214
Portugal	23	38	29	37	51
Romania	141	184	145	132	112
Slovenia	14	11	11	14	10
Slovakia	87	60	65	63	62
Finland	13	18	17	15	14
Sweden	40	36	40	35	45
Channel Tunnel	1	0	0	5	0
Norway	19	16	16	25	27
Switzerland	33	37	47	39	35
United Kingdom	40	53	71	50	36

Source: [24, 25]

Rail accidents in the EU are rare compared to road accidents: monitoring even less serious consequences is an extremely important tool for a proactive safety management system. An example of such an approach is the EU's proactive rail safety monitoring system, where national safety authorities report general safety indicators to the European Railway Agency [30]. One such measure is the investigation and reporting of «accident precursors», indicators of incidents that, in other circumstances, ie if not monitored and mitigated, can lead to accidents. These indicators were determined by studying the causes of major incidents (derailment; train collisions; collisions with obstacles; accidents at the crossing; accidents with people, caused by rolling stock (excluding suicide); fires in rolling stock) [31].

The EU uses two methods of assessing and managing the risk of rail accidents:

- 1) use of historical data on accidents to determine the types of accidents with the highest risk or frequency on the railway;
- 2) modeling the study of potential causes or accidents [32].

10.2.2 THE SAFETY OF EU ROAD TRANSPORT

Roads in the EU are the most common mode of transport for passenger and domestic freight. The EU road safety policy includes a number of tasks related to:

- ensuring mobility in an increasingly busy road network;
- reduction of road deaths;
- reduction of air pollution (emissions of carbon dioxide and other pollutants);
- reducing dependence on the use of traditional fuels and promoting the use of electric vehicles;
- revision of working conditions of professional drivers [29].

European roads are the safest in the world, and road safety has improved significantly in recent decades. However, the number of deaths and injuries is still too high and progress has slowed (**Fig. 10.2**). In 2019, the number of fatalities in road accidents in the EU decreased by 7 % compared to 2010 and by 2 % compared to 2018.

Despite the decrease in the number of fatalities in road accidents, in some EU countries their number has increased (**Table 10.2**). Thus, during the period 2015–2019, an increase in the number of fatalities in road accidents took place in Belgium, Croatia, Portugal, Spain, Sweden and Switzerland.

Factors, influencing road accidents in EU countries, include:

- drunk driving;
- speeding;
- no use of seat belts and helmets;
- use of mobile phones while driving [25].

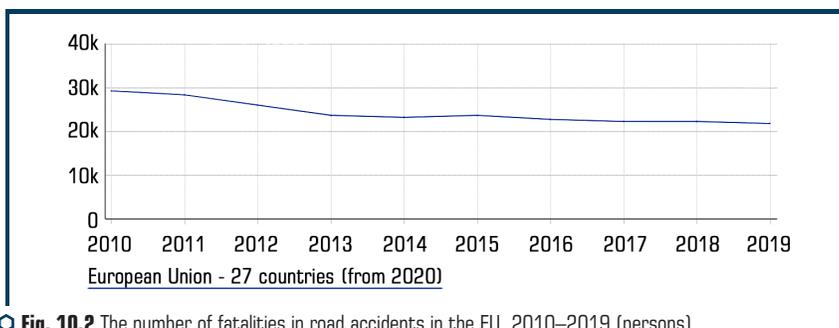


Fig. 10.2 The number of fatalities in road accidents in the EU, 2010–2019 (persons)

Source: Eurostat [24]

● **Table 10.2** The number of fatalities in road accidents in individual EU countries, 2010–2019 (persons)

Country	2015	2016	2017	2018	2019
Austria	77	87	60	42	47
Belgium	21	22	33	31	27
Bulgaria	48	40	47	42	39
Croatia	27	23	33	25	28
Czechia	94	87	97	89	91
Denmark	13	13	12	10	10
Estonia	12	15	19	21	5
Finland	13	18	17	15	14
France	150	146	151	119	123
Germany	306	310	346	302	298
Greece	25	13	22	24	18
Hungary	156	162	160	162	142
Ireland	1	0	4	6	2
Italy	97	99	104	109	76
Latvia	25	18	24	20	19
Lithuania	13	20	27	15	9
Luxembourg	0	2	1	2	0
Netherlands	31	28	26	29	25
Norway	19	16	16	25	27
Poland	307	265	252	275	214
Portugal	23	38	29	37	51
Romania	141	184	145	132	112
Slovakia	87	60	65	63	62
Slovenia	14	11	11	14	10
Spain	42	45	52	47	49
Sweden	40	36	40	35	45
Switzerland	33	37	47	39	35

Source: Eurostat [24]

To address road safety, the EU has adopted Vision Zero, which aims to reduce the number of deaths on EU roads to almost zero by 2050. Vision Zero provides a strategic plan and monitoring of key safety indicators, such as car safety, level of seat belts, speed or car care after an accident. The strategy set an initial goal of halving the number of deaths and serious injuries by 2030 [33].

The EU works closely with the authorities of its member states for road safety. It seeks to build on national initiatives, set targets and take into account all factors that play a role in road accidents (infrastructure, car safety, driver behavior, emergency response, etc.). This is achieved by passing laws, supporting education campaigns, helping member states and other road safety actors to share relevant experiences and providing appropriate funding [29].

In July 2020, the European Parliament and the Council adopted some important elements of the so-called «Mobility Package I» – a set of legislative proposals, presented by the European Commission in May 2017 to modernize and improve the legal framework, governing the European road transport market. The new rules provide for improved working conditions for drivers and fairer competition between carriers [33–37].

Road safety in EU countries poses new challenges, which include:

- ensuring the safety of road transport to reduce the number of fatalities and/or injuries on the roads due to the rapid growth of economic development and the level of motorization of individual EU countries;
- exacerbating the growing problem of motorcyclist safety, especially in developed EU countries, where the number of fatalities is growing;
- an increase in the number of electric vehicles and the use of bicycles increase the risk of accidents for the elderly and visually and/or hearing impaired;
- ensuring the safety of children on roads. Children are less experienced and often difficult to spot on the road, so they face an increased risk of accidents. Early learning of road safety rules, blind spots and the safety of cycling and walking habits are important to reduce such risks. Many accidents occur, in particular road sections («black spots») due to problems with road design/maintenance, such as sharp corners, reduced visibility, missing signs or other causes [38].

10.2.3 THE SAFETY OF EU AVIATION

Aviation is one of the safest and fastest growing modes of transport. The EU aviation safety policy ensures a high level of passenger safety by using cost-effective rules and facilitating the free movement of products, services and persons, involved in civil aviation.

Given the unprecedented growth of air transport and the significant number of market operators that have resulted from the successful implementation of the single aviation market, the EU has given priority to effective aviation safety standards. Therefore, in the period 2010–2019, there were a small number of casualties in plane crashes in the EU, with the exception of the terrorist attack in France in 2015, where the death toll was 150 people (**Fig. 10.3**).

Liberalization measures in recent years have led to an increase in airline budgets and the expansion of smaller regional airports in the EU, which tend to be less congested and charge lower fares than major international airports. Air transport has been particularly hard hit by the COVID-19 crisis: the direct impact of the crisis is not yet visible in regional air transport statistics due to the lack of data for 2020.

In 2004, the EU launched the Single European Sky initiative, which aimed to address the challenges of air congestion and increased load on airport and airspace capacity [39]. In 2009, as part of the second package of measures «Single European Sky II», the EU paid more attention to the environment and economic efficiency [40]. However, the pace of change was considered slow, and in June 2013 the European Commission made further proposals to accelerate the implementation

of the Single European Sky 2+, which includes further initiatives to improve safety and supervision, as well as greater consumer focus [41]. The ultimate goal of these initiatives is to improve the economic, financial and environmental performance of air navigation services, while eliminating the fragmentation of the European air traffic management system.

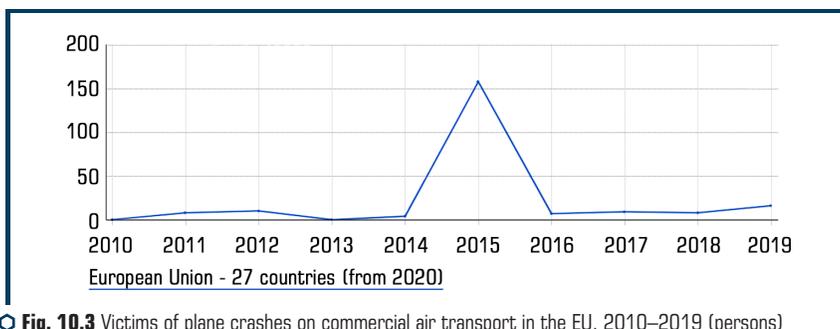


Fig. 10.3 Victims of plane crashes on commercial air transport in the EU, 2010–2019 (persons)
Source: Eurostat [24, 39–41]

In December 2015, the European Commission adopted an Aviation Strategy for Europe (COM (2015) 598) to ensure the competitiveness of the European aviation sector. The main priorities of this strategy include:

- engaging in emerging markets by improving services, market access and investment opportunities with non-EU countries, while ensuring a level playing field;
- overcoming growth constraints in air and on the ground by reducing capacity constraints and improving efficiency and communication;
- maintaining high EU safety standards by moving to the risk-based approach [42].

10.2.4 THE SAFETY EU MARITIME TRANSPORT

In maritime transport, the safety of both passenger and merchant ships is paramount in the EU. The EU maritime policy is about ensuring the competitiveness of maritime transport, implementing safety rules, reducing the risk of serious maritime accidents and the impact of maritime transport on the environment. The European Commission develops and implements various measures to protect citizens as users of maritime transport services, create safe and secure conditions, respect the rights of passengers, study the adequacy of civil transport connections and reduce the administrative burden by simplifying the procedure.

The level of safety of maritime transport in the EU is evidenced by the data in **Table 10.3**. During the period 2011–2019, the largest number of victims of maritime accidents was observed in the Mediterranean Sea (in 2012 – 35 people), the smallest – in the Black Sea. A positive trend

is the reduction or absence (Baltic, Black Sea, English Channel) of victims of maritime accidents in all types of regions of the seas, oceans, canals.

● **Table 10.3** Victims of maritime accidents by regions of occurrence and country of registration of vessels, 2011–2019 (persons)

Region	2011	2012	2013	2014	2015	2016	2017	2018	2019
Baltic Sea	2	2	2	3	1	4	2	1	0
North Sea	1	15	1	2	2	3	1	2	3
English Channel	0	2	0	2	1	0	2	0	0
Atlantic Ocean	3	7	7	22	10	6	1	6	3
Black Sea	:	0	0	0	0	0	0	1	0
Mediterranean Sea	2	35	15	13	12	4	3	3	3
Other sea basins	6	12	2	1	12	4	6	8	15

Source: Eurostat [24]

In order to ensure the safety of maritime transport, its development and competitiveness in the EU, the following programs have been adopted:

– Regulation (EU) 2017/352, which establishes the framework for the provision of port services and common rules on the financial transparency of ports. Its implementation contributes to the development of short sea shipping and strengthening the integration of maritime transport with rail, inland waterway and road transport [43];

– Regulation (EU) 2019/1239, which establishes a «European Single Window Environment at Sea» by August 2025, and then replaces the existing framework, provided for in Directive 2010/65/EU on reporting formalities for ships, arrivals and/or departures from EU ports. The main purpose of the new Regulation is to harmonize the various national single windows, operated by the EU Member States by adopting a common data set, harmonized interfaces and applying the «once only» principle through new data reuse mechanisms. The provision will help reduce the administrative burden on market operators, as well as increase the competitiveness and attractiveness of maritime transport and infrastructure [44];

– the new maritime initiative FuelEU, which promotes the adoption of sustainable alternative fuels and electrification in the maritime sector, continuing the approach, already promoted by the European strategy for low-emission mobility in 2016 [45].

The safety of the EU transport system is significantly influenced by its infrastructure. In 2013, the EU and the European Parliament agreed on a new framework for transport infrastructure, formulating guidelines for the development of the Trans-European Transport Network (TEN-T) and the Connecting Europe Facility. It is an ambitious package that aims to provide businesses and passengers with a fully functional transport network, combining different modes of transport through high-speed services, uniting Europe from north to south and from west to east, creating a network infrastructure that can serve as a basis for the development of economic growth. The TEN-T guide-

lines provide for the development of a multimodal and intelligent core transport network by 2030. In addition, by 2050, a comprehensive network should be developed to ensure the accessibility of all regions. TEN-T's strategic direction is nine core network corridors and two horizontal priorities, namely: the European Rail Traffic Management System and the Motorways of the Sea. TEN-T's policy is to develop a more efficient transport network, simplify cross-border transport operations for passengers and businesses, improve links between different modes of transport and contribute to the EU's climate change goals. For the period 2014–2020, the € 24 billion budget was allocated to the transport sector under the Connecting Europe Facility [46].

The conducted studies show that the safety [47] of the EU transport system is carried out through the formation of appropriate conditions for the operation of various modes of transport and infrastructure, the creation of a system for monitoring and preventing accidents, injuries and fatalities in transport, compliance with technical rules for passenger transport, cargo, transport services, greening of transport. The assessment of the safety indicators of the EU transport system for the period 2010–2019 in terms of modes of transport shows a decrease in the number of railway accidents, fatalities in road accidents, victims of plane crashes, victims of maritime accidents. For each mode of transport, a number of measures, procedures, policies and strategies are developed in EU regions to ensure the proper safety of the transport system. The new challenges, posed by the COVID-19 pandemic, require additional financial resources to ensure transport safety, manpower to control the movement of passengers and transport within the EU and abroad, regulation of procedural issues to support market operators, compliance with environmental standards and more. Rapid response to changes in the changing environment to ensure the safety of the EU transport system encourages the consolidation of efforts and directing resource potential to improve transport policy, introduction of innovative technologies and technical controls, modern financial instruments, implementation of EU transport legislation and increase competitiveness and development of operators market, including outside the EU. Given the above, in order to mitigate the negative impact of the external environment and ensure the safety of the transport system as a whole in order to implement it in Ukrainian realities, a combined safety management system «behavior + transport status + infrastructure + permanent monitoring + post-accident services» is proposed. The key elements of the management system should be:

- information environment of transport safety and its improvement;
- application of effective means of safety management of the transport system through strengthening the role of regional and general regulatory framework agreements and increasing funding for the transport safety program;
- construction of safe transport infrastructure;
- adaptation of traffic rules to the local environment;
- monitoring of technical condition of all types of transport, periodic maintenance;
- formation of statistical information on road safety in accordance with international standards;
- development of insurance coverage;
- improving medical care for injuries after an accident, etc.

REFERENCES

1. Andriushchenko, K., Stefanyshyn, D., Sahaidak, M., Levchenko, I., Smyrnova, I., Zhytomyrska, T. (2018). Process of resources provision management of the enterprise's activity with consideration of gender factor. *Eastern-European Journal of Enterprise Technologist* this link is disabled, 6 (3 (96)), 6–19. doi: <http://doi.org/10.15587/1729-4061.2018.150799>
2. Tonhauser, M., Ristvej, J. (2021). Implementation of New Technologies to Improve Safety of Road Transport. *Transportation Research Procedia*, 55, 1599–1604. doi: <http://doi.org/10.1016/j.trpro.2021.07.149>
3. Joewono, T. B., Kubota, H. (2006). Safety and security improvement in public transportation based on public perception in developing countries. *IATSS Research*, 30 (1), 86–100. doi: [http://doi.org/10.1016/s0386-1112\(14\)60159-x](http://doi.org/10.1016/s0386-1112(14)60159-x)
4. Javed, M., Ben Hamida, E., Znaidi, W. (2016). Security in Intelligent Transport Systems for Smart Cities: From Theory to Practice. *Sensors*, 16 (6), 879. doi: <http://doi.org/10.3390/s16060879>
5. Hamida, E., Noura, H., Znaidi, W. (2015). Security of Cooperative Intelligent Transport Systems: Standards, Threats Analysis and Cryptographic Countermeasures. *Electronics*, 4 (3), 380–423. doi: <http://doi.org/10.3390/electronics4030380>
6. Laskowski, J. (2017). Evolution of the civil aviation security standards in the European Union. *Transportation Overview – Przegląd Komunikacyjny*, 11, 25–31. doi: http://doi.org/10.35117/a_eng_17_11_03
7. Chang, A., Kalawsky, R. (2017). European transport sector intervention for smart city. Conference contribution. Available: <https://hdl.handle.net/2134/27617>
8. Zhangisina, G., Yessetov, C. (2014). About the Security System in Air Transportation. *Journal of Computer Networks*, 2 (2), 6–9.
9. Santarremigia, F. E., Molero, G. D., Poveda-Reyes, S., Aguilar-Herrando, J. (2018). Railway safety by designing the layout of inland terminals with dangerous goods connected with the rail transport system. *Safety Science*, 110, 206–216. doi: <http://doi.org/10.1016/j.ssci.2018.03.001>
10. McDonald, M., Hall, R., Keller, H., Hecht, C., Fakler, O., Klijnhout, J. et. al. (Eds.) (2006). *Intelligent Transport Systems in Europe*. World Scientific Publishing Co Pte Ltd, 336. doi: <http://doi.org/10.1142/6281>
11. Golinska, P., Hajdul, M. (2012). *Sustainable Transport. New Trends and Business Practices*, Springer, 346. doi: <http://doi.org/10.1007/978-3-642-23550-4>
12. Sladkowski, A., Pamula, W. (2016). *Intelligent Transportation Systems – Problems and Perspectives*. Vol. 32. Springer, 303. doi: <http://doi.org/10.1007/978-3-319-19150-8>
13. Flammini, F. (2012). *Railway Safety, Reliability, and Security: Technologies and System*. IGI Global, 487. doi: <http://doi.org/10.4018/978-1-4666-1643-1>
14. Joseph, S., Szyliowicz, Zamparini, L., Genserik, L.L. Reniers, Dawna, L., Rhoades (2016). *Multimodal Transport Security: Frameworks and Policy Applications in Freight and Passenger Transport*. Edward Elgar Publishing, 328.

15. Thomas, A. R. (2008). *Aviation Security Management*. Vol. 3. ABC-CLIO, 804.
16. Pagano, P. (2016). *Intelligent Transportation Systems: From Good Practices to Standards*. CRC Press, 205.
17. Price, J. C. (2012). *Practical Aviation Security: Predicting and Preventing Future Threats*. Vol. 2. Butterworth-Heinemann, 520.
18. Bragdon, C. (2011). *Transportation Security*, Butterworth-Heinemann, 456.
19. Hoerber, T., Stephenson, P. (Eds.) (2015). *European Space Policy: European integration and the final frontier*. Routledge, 300. doi: <http://doi.org/10.4324/9781315675916>
20. Janić, M. (2014). *Advanced Transport Systems: Analysis, Modeling, and Evaluation of Performances*. Springer Science & Business Media, 408. doi: <http://doi.org/10.1007/978-1-4471-6287-2>
21. Weintrit, A., Neumann, T. (Eds.) (2013). *Marine Navigation and Safety of Sea Transportation: Maritime Transport & Shipping*. CRC Press, 320. doi: <http://doi.org/10.1201/b14960>
22. Sweet, K. M. (2006). *Transportation and Cargo Security: Threats and Solutions*. Pearson/Prentice Hall, 398.
23. Papa, P. (2013). US and EU strategies for maritime transport security: A comparative perspective. *Transport Policy*, 28, 75–85. doi: <http://doi.org/10.1016/j.tranpol.2012.08.008>
24. Rail accidents by type of accident (ERA data) (2021). Available at: https://ec.europa.eu/eurostat/databrowser/view/tran_sf_railac/default/table?lang=en
25. Road Safety Annual Report 2020 (2020). IRTAD – ITF/OECD. ITF Available at: https://www.itf-oecd.org/sites/default/files/docs/irtad-road-safety-annual-report-2020_0.pdf
26. Transport statistics at regional level. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Transport_statistics_at_regional_level
27. Transport safety. EU policies on safe and secure transport, banned and restricted airlines. Available at: https://ec.europa.eu/info/business-economy-euro/transport-safety_en
28. Transport statistics introduced (2020). Available: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Transport_statistics_introduced
29. Security & Safety. What is the EU doing to improve security and safety of transport in the EU? Available at: https://ec.europa.eu/transport/themes/security_en
30. Sustainable & Smart Mobility Strategy. Putting European transport on track for the future. Available at: <https://www.transport-community.org/wp-content/uploads/2021/01/Smart-and-Sustainable-Mobility-Strategy-presentation.pdf>
31. European Transport Safety Council. Available at: <https://etsc.eu>
32. ITF Transport Outlook 2021 Available at: <https://www.oecd-ilibrary.org/sites/801f7dba-en/index.html?itemId=/content/component/801f7dba-en>
33. EU Road Safety Policy Framework 2021-2030 – Next steps towards «Vision Zero» (2019). European Commission Available at: https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/move-2019-01178-01-00-en-tra-00_3.pdf

-
34. Road Safety Statistics 2019 (2019). European Commission Available at: <https://ec.europa.eu/commission/presscorner/api/files/attachment/865955/Graph%20-%20Road%20Safety%20Statistics>
 35. Road safety: Europe's roads are getting safer but progress remains too slow (2020). European Commission Available at: https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1003
 36. Research Theme Analysis Report. Transport Security (2017). Available at: https://trimis.ec.europa.eu/sites/default/files/TRIP_Report_Transport_Security.pdf
 37. Transport for Sustainable Development. The case of Inland Transport, Transport Trends and Economics Series (2016). United Nations Economic Commission for Europe, 282.
 38. Logistics and multimodal transport. Road. Mobility Package I: European Commission publishes study results (2020). Available at: https://ec.europa.eu/transport/modes/road/news/2021-02-mobility-package-i-studies_en
 39. Air. Single European Sky (2004). Available: <https://www.europarl.europa.eu/factsheets/en/sheet/133/air-transport-single-european-sky>
 40. Air. Single European Sky II (2009). Available: [https://www.skybrary.aero/index.php/Single_European_Sky_\(SES\)_II](https://www.skybrary.aero/index.php/Single_European_Sky_(SES)_II)
 41. Single European Sky 2+ package: Amended Commission proposal (2013). Available at: [https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/659421/EPRS_BRI\(2020\)659421_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/659421/EPRS_BRI(2020)659421_EN.pdf)
 42. An Aviation Strategy for Europe COM(2015)598 (2015). Available at: [https://ec.europa.eu/transparency/documents-register/detail?ref=COM\(2015\)598](https://ec.europa.eu/transparency/documents-register/detail?ref=COM(2015)598)
 43. Regulation of the European Parliament and of the Council (EU) 2017/352 (2017). Available at: [https://www.eumonitor.eu/9353000/1/j4nvke1fm2yd1u0_j9vvik7m1c3gyxp/vkfhfv0etxve/v=s7z/f=/com\(2017\)352_en.pdf](https://www.eumonitor.eu/9353000/1/j4nvke1fm2yd1u0_j9vvik7m1c3gyxp/vkfhfv0etxve/v=s7z/f=/com(2017)352_en.pdf)
 44. Regulation (EU) 2019/1239 establishing a European Maritime Single Window environment (2019). Available: <https://www.europeansources.info/record/regulation-eu-2019-1239-establishing-a-european-maritime-single-window-environment>
 45. FuelEU Maritime Initiative (2021). https://ec.europa.eu/info/sites/default/files/fueleu_maritime_-_green_european_maritime_space.pdf
 46. Trans-European Transport Network (TEN-T) (2013). Available at: https://ec.europa.eu/transport/themes/infrastructure/ten-t_en
 47. Bezpatochnyi, M., Britchenko, I., Bezpatochna, O. (2021). Ensuring the financial safety of Ukrainian agricultural enterprises in the context of export products and the impact on macroeconomic indicators. *VUZF Review*, 6 (3), 186–195. doi: <http://doi.org/10.38188/2534-9228.21.3.20>
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