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ASSESSMENT OF THE THROUGHPUT CAPACITY OF CHECKPOINTS FOR FREIGHT TRANSPORTATION ON THE *UKRAINE-EU* LAND BORDER AND PROSPECTS FOR ITS DEVELOPMENT

Analytical report

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Assessment of the throughput capacity of checkpoints for freight transportation on the Ukraine-EU land border and prospects for its development: analytical report (electronic edition) / edited by Khrystyna Prytula; SI "Institute of Regional Research named after M.I. Dolishniy of the NAS of Ukraine". Lviv, 2023. 133 p. (Series "Cross-border cooperation").

The analytical report presents the results of the study of international and transit cargo flows across the Ukraine-EU border section. An analysis of the development of transport (roads, railways, international transport corridors, including TEN-T) and border infrastructure (network of checkpoints, terminals for storage and transshipment of goods, logistics centers, airports, ports, etc.) along the Ukraine-EU border was carried out. The available capacity of automobile and railway checkpoints on the Ukraine-EU land border and their level of occupancy were studied. "Bottlenecks" in cargo transportation across the border have been identified. The prospects for the development of the capacity of border infrastructure along the Ukraine-EU border have been determined.

For representatives of state and local authorities, scientists and other persons interested in the development of freight transport markets and border infrastructure in the context of deepening European integration processes.

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ОЦІНКА ПРОПУСКНОЇ СПРОМОЖНОСТІ ПУНКТІВ ПРОПУСКУ ДЛЯ ВАНТАЖНИХ ПЕРЕВЕЗЕНЬ НА СУХОПУТНОМУ КОРДОНІ *УКРАЇНА-ЄС* ТА ПЕРСПЕКТИВИ ЇЇ РОЗВИТКУ

Аналітична доповідь

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Львів 2023

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Оцінка пропускної спроможності пунктів пропуску для вантажних перевезень на сухопутному кордоні Україна-ЄС та перспективи її розвитку: аналітична доповідь (електронне видання) / наук. ред. Х. М. Притула; ДУ «Інститут регіональних досліджень імені М.І. Долішнього НАН України». Львів, 2023. 133 с. (Серія «Транскордонне співробітництво»)

В аналітичній доповіді представлено результати дослідження міжнародних та транзитних вантажопотоків через ділянку кордону Україна-ЄС. Здійснено аналіз розвитку транспортної (автомобільні шляхи, залізничні колії, міжнародні транспортні коридори, включно з TEN-T) та прикордонної інфраструктури (мережі пунктів пропуску, терміналів для складування та перевантаження вантажів, логістичних центрів, аеропортів, портів тощо) вздовж кордону Україна-ЄС. Досліджено наявну пропускну спроможність автомобільних і залізничних пунктів пропуску на сухопутному кордоні Україна-ЄС, рівень їх завантаженості. Визначено «вузькі місця» під час здійснення вантажних перевезень через кордон. Визначено перспективи розвитку пропускної спроможності прикордонної інфраструктури вздовж кордону Україна-ЄС.

Для представників органів державної та місцевої влади, науковців та інших осіб, зацікавлених у проблематиці розвитку ринків вантажних перевезень та прикордонної інфраструктури в умовах поглиблення євроінтеграційних процесів.

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ЗМІСТ

INTRODUCTION

Global transformations in world trade caused by the Russian invasion of Ukraine have affected the configuration of existing supply chains. During 2019-2021, about 20-25% of cargo transportation by road transport in international traffic was carried out on the territory of Russia and Belarus; more than two-thirds of the goods passed (in physical terms) across the customs border of Ukraine were carried out through sea checkpoints. The processes of increasing the export of food products by land transport with the involvement of river ports, reorientation to European sales markets, the adoption of Regulation 2022/870 of May 30, 2022 on the temporary opening of the European market for goods originating from Ukraine, significantly increased the intensity of cargo flows across the Ukraine-EU borders. In the short- and long-term perspectives, a further increase in the volume of international and transit cargo flows in the direction of the EU is expected. During 2022, Ukrainian exports were completely reoriented towards the EU. The share of the EU in Ukraine's foreign trade is constantly growing: from 40.81% in 2019 to 53.35% in 2022 (taking into account that starting from 2021 Great Britain already belongs to the group of countries "other European countries"). At the same time, its neighboring countries play an increasingly important role in Ukraine's foreign economic activity. Their share increased from 13% in 2019 to 23% in 2022.

The rapid increase in the volume of rail and road freight transportation in the direction of Poland, Slovakia, Hungary and Romania significantly increases the load on the transport and border infrastructure of the border regions of the Western region of Ukraine. In such conditions, the existing throughput capacity of the transport and logistics infrastructure is insufficient: several-day queues form in front of checkpoints, deliveries are untimely and difficult to predict, environmental safety issues are exacerbated due to the lack of organized rest areas for truck drivers, etc.

The improvement of the state border crossing infrastructure, in particular in terms of increasing the capacity of border crossing points (hereinafter BCP), should include the diversification of border crossing locations by opening new automobile crossing points (ACP) for freight traffic; creation of service zones and their integration into the border crossing procedure, including the implementation of separate customs and/or border control procedures; establishment of an automated and impersonal regulation for the admission of vehicles to the ACP leaving the territory of Ukraine; provision of predicted border crossing; optimization and stimulation of railway freight transportation; restoration and increase of production capacities for cargo handling of railway terminals; development of a network of intermodal and transhipment terminals; introduction of joint control by representatives of neighboring countries at automobile and rail checkpoints; implementation of the provisions of the resolution of the Cabinet of Ministers of Ukraine dated 09.12.2021 No. 1393 "Issues of the implementation of

the experimental project on the organization of queue management in front of international checkpoints across the state border of Ukraine for road traffic "Electronic border crossing queue".

The Analytical report is prepared by a team of authors within the framework of ***the international project «Increasing the capacity of freight transportation infrastructure on EU-Ukraine borders» (№ 22220189) implemented under Visegrad Grant+ Programme***.

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I. GENERAL CHARACTERISTICS OF INTERNATIONAL AND TRANSIT FREIGHT FLOWS ACROSS *THE UKRAINE-EU* BORDER SECTION

The structure, volume and logistics of international and transit freight transportation across the Ukraine-EU border section

The economic prerequisite for the development of border infrastructure for freight transportation is the structure, volume and logistics of freight flows (primarily in international and transit traffic). The structure of the country's economy and its competitive advantages influence the formation of the commodity and, accordingly, the geographical structure of exports and imports. The analysis of routes, volume and structure of cargo allows to assess the needs of the domestic and foreign markets in the development of transport infrastructure, logistics infrastructure objects, the network of checkpoints (their localization, capacity, by type of transport, etc.).

During 2019-2022, the geography and structure of Ukraine's international trade underwent significant changes. The main factors of these changes were Covid-19 and the Russian invasion of Ukraine.

Covid-19 had a greater impact on the volume of imports of goods by Ukraine than on its exports (in 2020, the volume of imports fell by 10%, and exports - by 1.7%). In particular, strict quarantine measures in the EU countries affected the drop in foreign trade with Ukraine in 2020 by almost 4 billion dollars. In 2022, in the conditions of a full-scale war against Russia, the drop in the volume of foreign trade of Ukraine by 27% was primarily the result of a drop in the volume of exports by 35% (primarily due to the blockade of sea ports and active military operations in the east and south of the country). At the same time, the volume of Ukraine's trade in 2022 was commensurate with its volume in 2020.

During 2019-2022, two commodity groups accounted for about a third of Ukraine’s trade turnover: V. Mineral products and II. Plant products. The commodity structure of Ukraine's exports and imports is a reflection of the structure of its economy and the level of competitiveness in international markets. It has practically not changed over the past 4 years: the share of product groups has fluctuated within ±1%, only the share of product group XVI. Machinery and mechanical appliances; electrical equipment; parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles decreased from 16.09% to 12.47% (see Annex A, Table A.1).

The low dynamics of the development of the country's processing industry determines the raw material nature of its exports. Corn, sunflower oil, iron ores and concentrates, wheat, sunflower seeds, etc. remain unchanged in the top ten exported goods. They account for more than 50% of export revenue and more than 70% of the physical volume of exports (see Annex A, Table A.2).

In 2019-2021, the export/import ratio in Ukraine was 0.82-0.93. In 2022, it was 0.74. At the same time, in physical terms, exports exceeded imports by 2.2-2.6 times (see Fig. 1.1).

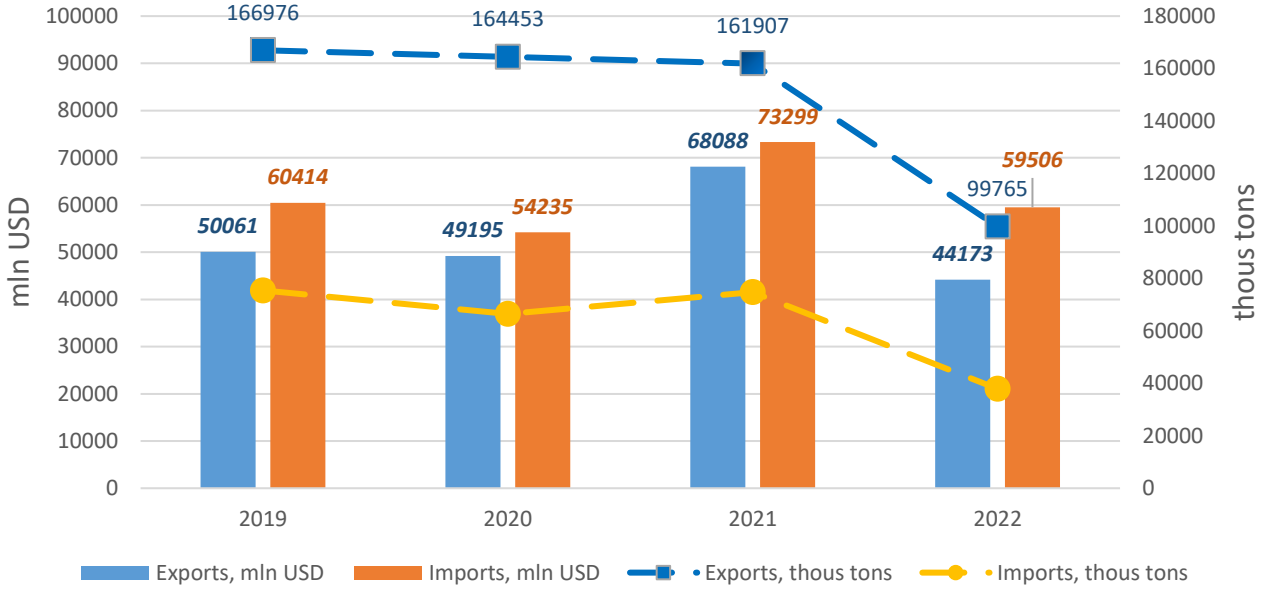


Fig. 1.1. Dynamics of export and import of Ukraine in value and physical equivalents

Source: Built on the basis of data from the State Statistics Service of Ukraine. URL: https://www.ukrstat.gov.ua/; Statistics and registers. URL: https://customs.gov.ua/statistika-ta-reiestri

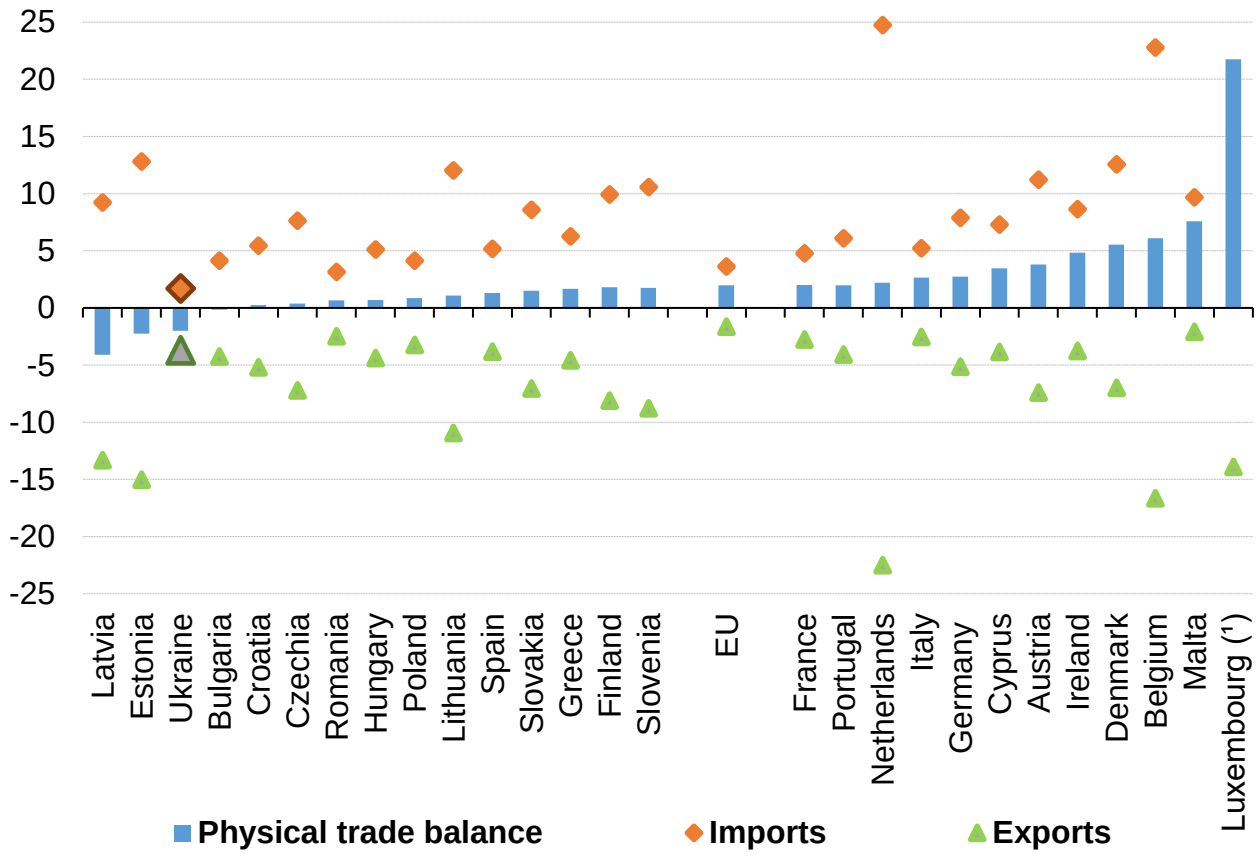
In the EU, the situation is the opposite. While the European Union's (EU) trade balance in monetary values is more or less even, its physical trade balance is clearly asymmetric. The EU imports more than two times more goods by weight from the rest of the world than it exports. Quantitatively the physical imports into the EU are dominated by fossil fuels and other raw products, which typically have low values per kilogram. On the other hand, the EU exports high-value goods such as machinery and transport equipment[1].

The EU's physical exports are dominated by finished products whereas the physical imports are dominated by raw products. The EU economy is specialised in the transformation of low-value raw products into high-value finished and semi-finished products. More than 58% of the EU's total physical imports are raw products. On the other hand, around 58% of the EU's total physical exports are finished products[2].

Physical imports are around 3.6 tonnes per capita while physical exports are around 1.6 tonnes per capita. In physical terms, most EU Member States import more than they export (i.e. net importers). There are only a few net exporting countries, namely Estonia (wood, fossil energy materials) and Latvia (wood)[3]. Ukraine is also a

[1] Physical imports and exports. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Physical_imports_and_exports
[2] ibidem
[3] ibidem

net exporting country. In 2021 its physical export was 3.7 tonnes per capita while physical import – 1.7 tonnes per capita (see Fig. 1.2).



(1) Physical imports of Luxembourg account for 35.7 tonnes per capita

Figure 1.2. Physical trade balance (imports minus exports) by country, 2021 (tonnes per capita)

Source: Physical imports and exports. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Physical_imports_and_exports; Statistics and registers. URL: https://customs.gov.ua/statistika-ta-reiestri

The EU economy is almost self-sufficient in the supply of non-metallic minerals (construction materials) and biomass with import dependencies just over 3 % and around 12 %, respectively. For metal ores as well as for fossil energy materials, the EU is highly dependent on imports from the rest of the world (around 52 % and more than 70 %, respectively)[4]. About 50% of Ukrainian imports (in physical terms) are hard coal, anthracite, oil and oil products, petroleum gases. The country's dependence on preparations for the prevention and protection of plants from pests and fertilizers is high. In the structure of international transportation of Ukraine, about 70% in physical volume is accounted for by exports.

[4] Physical imports and exports. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Physical_imports_and_exports

The EU exports in monetary values are around 7.69 thsd Euro per capita while imports are around 7.56 thsd Euro per capita. In Ukraine export is around 1.39 thsd Euro per capita while import is 1.49 thsd Euro per capita (see Fig. 1.3).

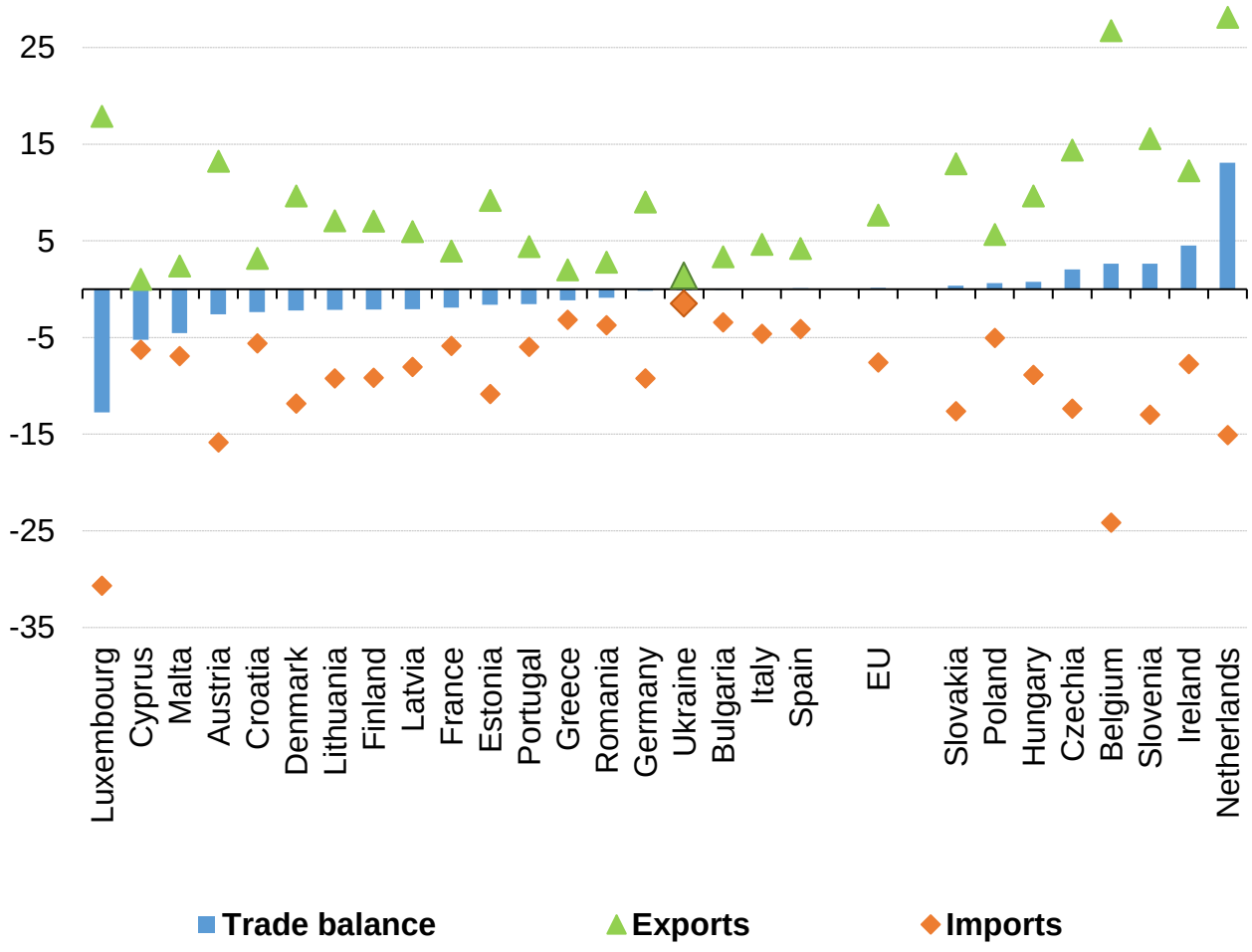


Figure 1.3. Trade balance (exports minus imports) by country, 2021 (thsd Euro per capita)

Source: Physical imports and exports. URL: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Physical_imports_and_exports; Statistics and registers. URL: https://customs.gov.ua/statistika-ta-reiestri

The commodity structure of Ukraine's trade also determines the geography of its trade. During the entire research period, EU countries dominate foreign trade with Ukraine. At the same time, their share is constantly increasing: from 40.81% in 2019 to 53.35% in 2022 (taking into account that starting from 2021 Great Britain already belongs to the group of countries "other European countries") (see Fig. 1.4, Table 1.1). At the same time, the neighboring countries of the EU play an increasingly important role in the implementation of Ukraine's foreign economic activities. Their share increased from 13% in 2019 to 23% in 2022.

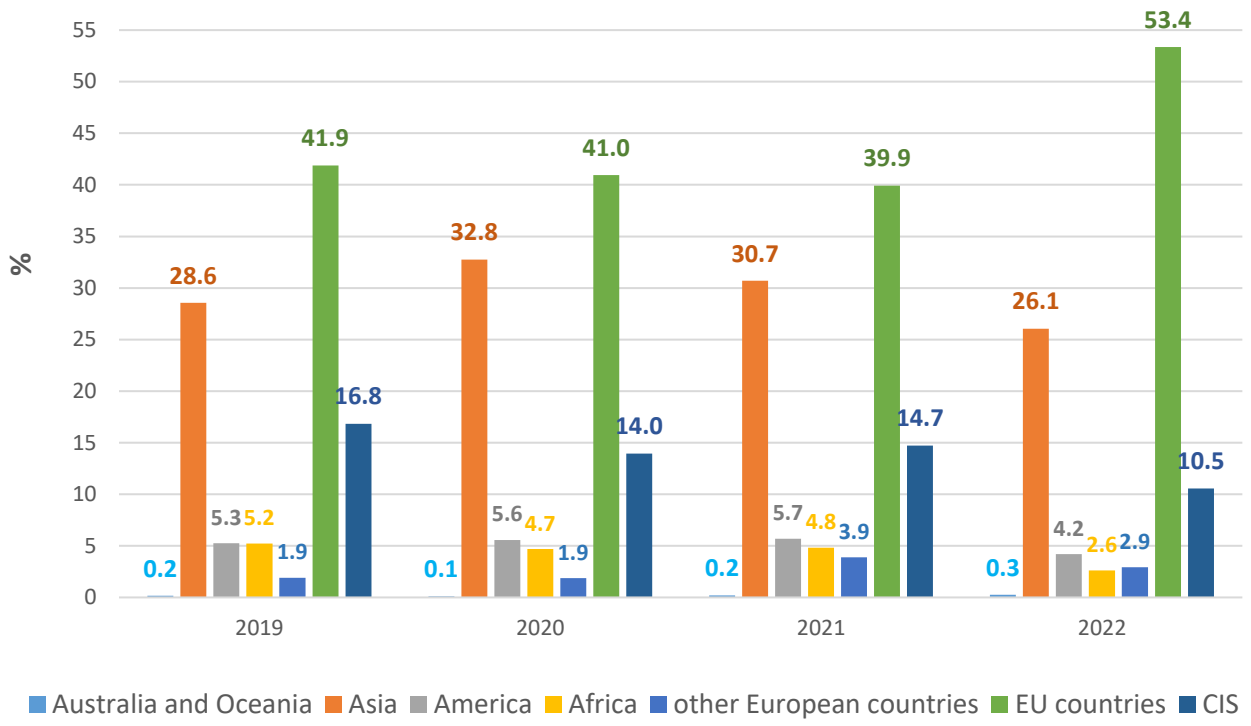


Fig. 1.4. Geographical structure of Ukraine's foreign trade
Source: Statistics and registers. URL: https://customs.gov.ua/statistika-ta-reiestri

The reorientation towards European markets has made it possible to significantly increase the volume of trade with certain countries: in particular, in 2022, the volume of trade with Bulgaria increased 2.5 times and amounted to 3.5 billion dollars (primarily due to food exports). Five neighboring countries of Ukraine made it to the top ten trade partners of the country. In 2022, Poland became Ukraine's main trading partner (see Table A.3).

Table 1.1

TOP-10 trade partners of Ukraine

2019		2020		2021		2022	
country	**%**	**country**	**%**	**country**	**%**	**country**	**%**
China	11.56	China	14.91	China	13.42	**Poland**	11.78
Russia	9.23	**Poland**	7.16	**Poland**	7.22	China	10.75
Germany	7.38	Russia	7.03	Russia	7.12	Germany	6.48
Poland	6.71	Germany	6.98	Germany	6.27	Turkey	6.08
Belorussia	4.77	Turkey	4.69	Turkey	5.22	Russia	5.82
Turkey	4.48	Belorussia	4.08	Belorussia	4.45	**Romania**	5.18
Italy	4.05	Italy	3.92	Italy	4.34	**Hungary**	3.43
USA	3.83	USA	3.91	USA	3.46	Bulgaria	3.36
Hungary	2.84	India	2.6	**Hungary**	2.86	Italy	3.33
India	2.49	**Hungary**	2.59	India	2.44	USA	2.93

Source: Calculated based on Statistics and registers. URL: https://customs.gov.ua/statistika-ta-reiestri

Analysis of the dynamics and structure of cargo flows across the Ukraine-EU border section

The commodity and geographical structure of export-import operations influence the choice of transport by which they will be transported. In 2022, the revenue from exports transported by maritime transport more than halved, while the share of road transport in international transportation increased from 35% to 52% (see Fig. 1.5).

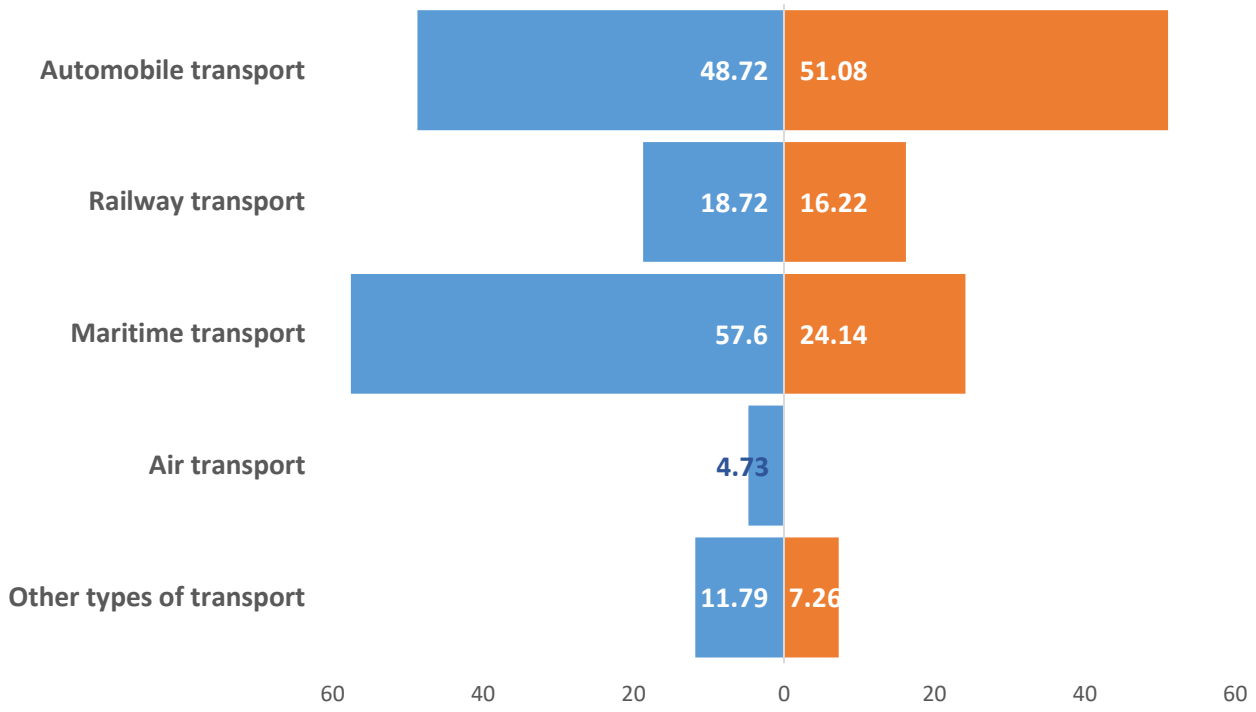


Fig. 1.5. Trade turnover of Ukraine in 2021 and 2022 by types of transport (in bln U.S. dollars)
Source: Built on the basis of data from Statistics and registers. URL: https://customs.gov.ua/statistika-ta-reiestri

International and transit freight transportation during 2014-2022 was characterized by variable development dynamics: in 2016, they decreased by about 15% primarily due to the weakening of foreign economic ties with Russia, during 2018-2020, freight transportation grew due to the increase in the volume of transportation by sea, and in 2022, they fell almost twice due to Russia's blockade of seaports. The sharp drop in the number of vehicles passing through the border in 2020 is explained primarily by the decrease in the number of crossings of passenger cars and buses due to quarantine restrictions during the period of high incidence of Covid-19. The dynamics of vehicles and goods passed through the customs border of Ukraine is shown in Fig. 1.6.

The structure of the passage of vehicles along the sections of the customs border of Ukraine is shown in Fig. 1.7 and in Table A.4. In 2022, EU countries accounted for 81.4% of all vehicles passed through the border.

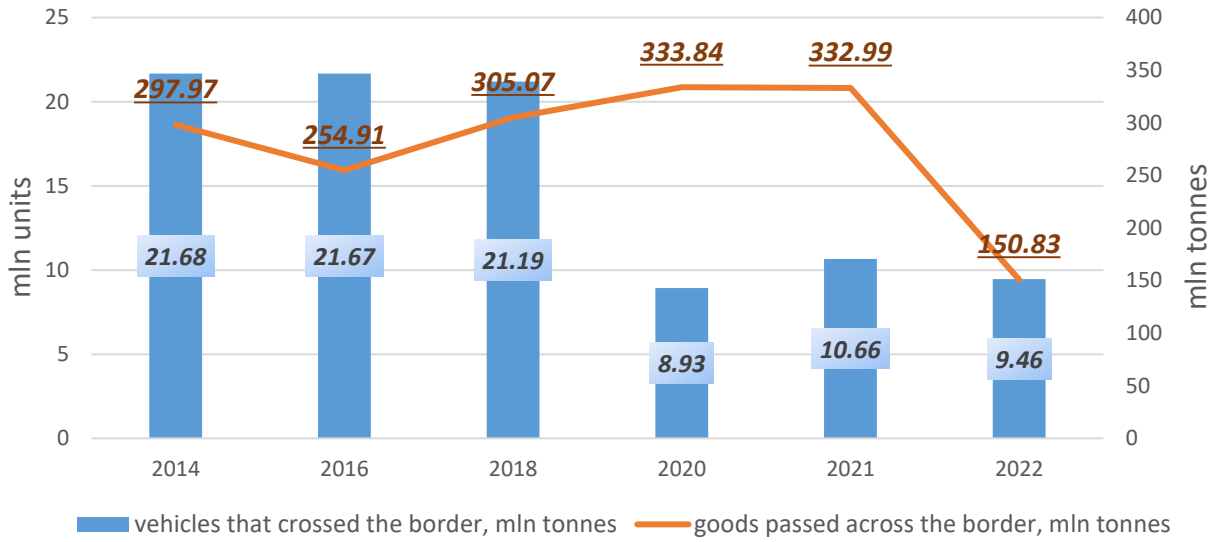


Fig. 1.6. Dynamics of vehicles and goods passed through the customs border of Ukraine
Source: Built on the basis of Statistics of declaration, movement of goods and vehicles. URL: https://customs.gov.ua/en/statistika-ta-reiestri

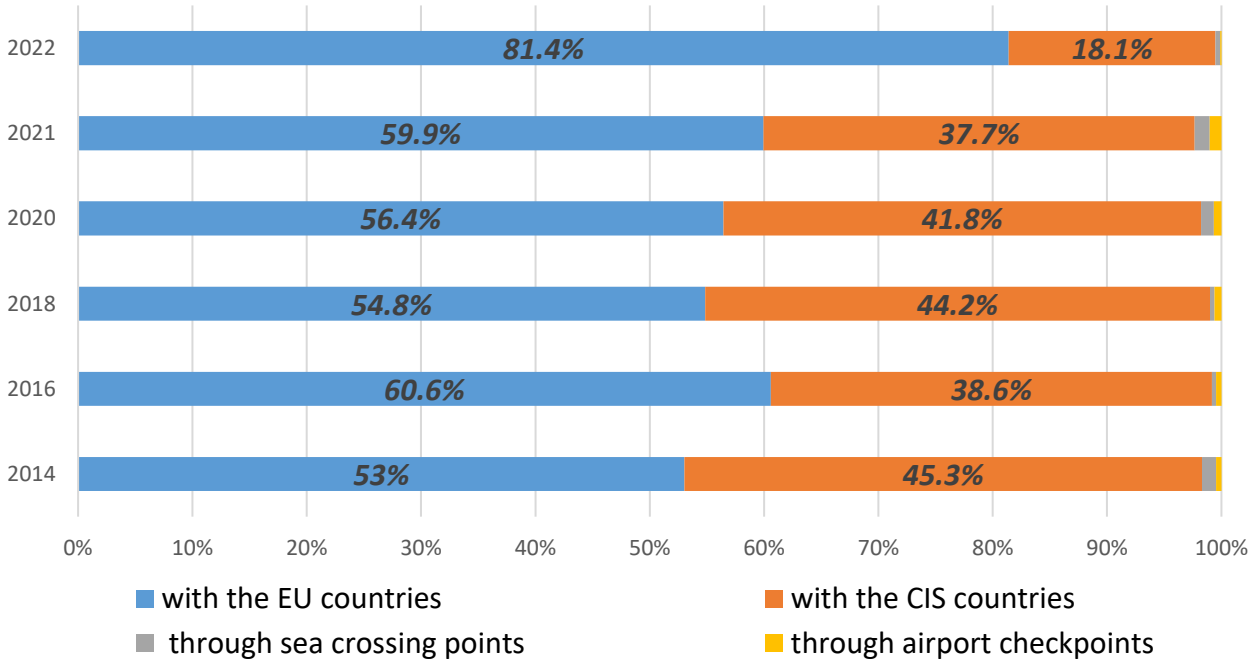


Fig. 1.7. The structure of the passage of vehicles along the sections of the customs border of Ukraine, %
Source: Built based on Statistics of declaration, movement of goods and vehicles. URL: https://customs.gov.ua/en/statistika-ta-reiestri

The increase in the volume of transportation by sea transport and the decrease in trade with Russia during 2014-2021 significantly increased the share of sea transport and EU countries in the structure of goods passed along the customs border of Ukraine (see Fig. 1.8).

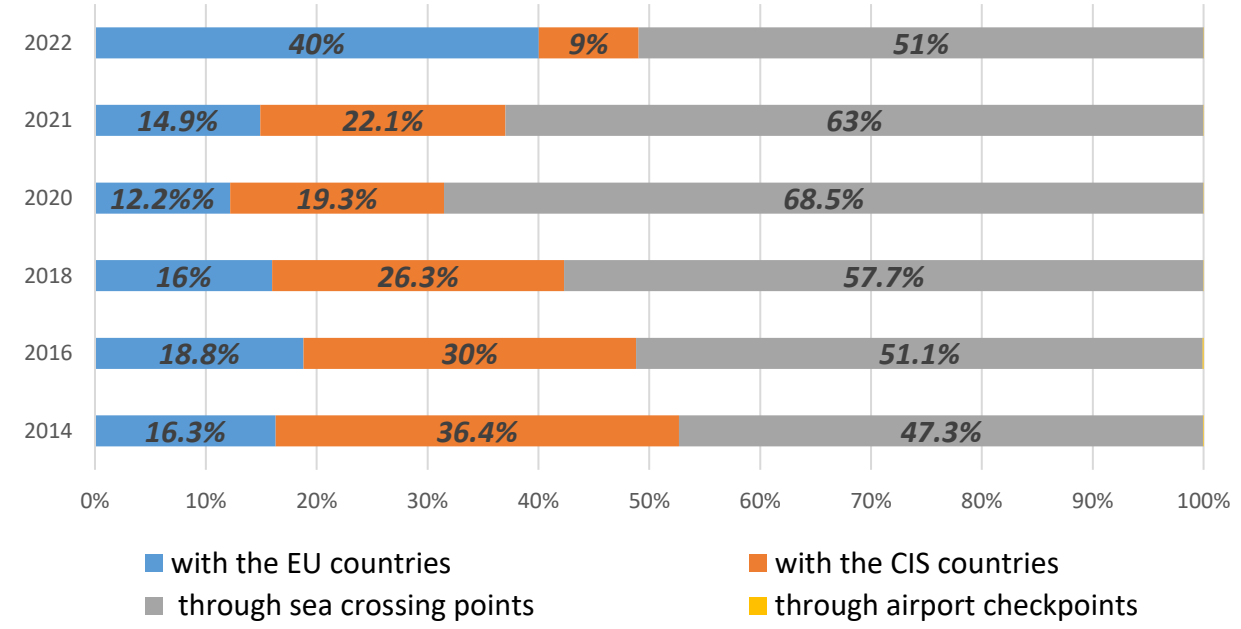


Fig. 1.8. The structure of goods passed across the border, by sections of the customs border of Ukraine, %

Source: Built on the basis of data from Statistics and registers. URL: https://customs.gov.ua/statistika-ta-reiestri

During 2018-2020, a downward trend was observed in the number of border crossings by trucks. At the same time, the volume of transported goods amounted to approximately 15.6 million tonnes. Similar trends were observed with transit transportation. In 2022 compared to the previous year, the number of crossings increased by 20%, and the volume of transported goods - by 34.5%. Cargo transit dropped almost 2.5 times (see Fig. 1.9).

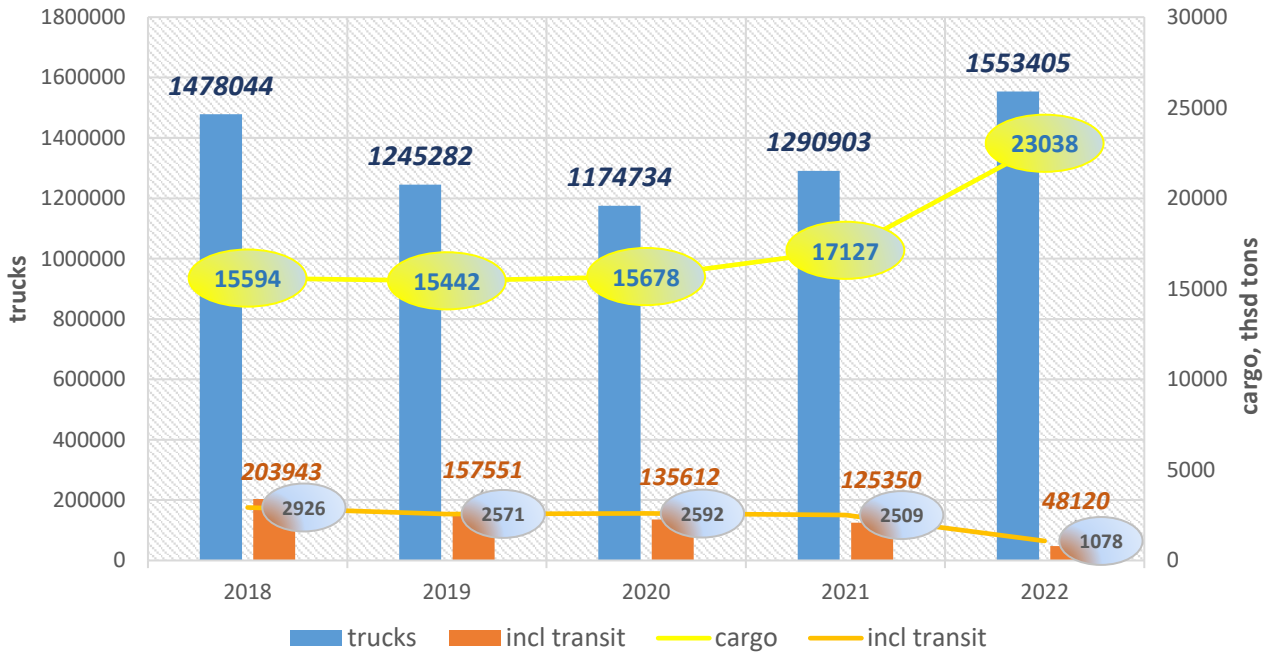


Fig. 1.9. Dynamics of crossing the border by trucks and the volume of transported goods

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

During 2018-2021, more than half of trucks crossed the Polish-Ukrainian section of the border. In 2022 the share of the Ukrainian-Polish and Ukrainian-Hungarian sections of the border decreased, and the share of the Ukrainian-Romanian section of the border increased significantly to 23.07%.

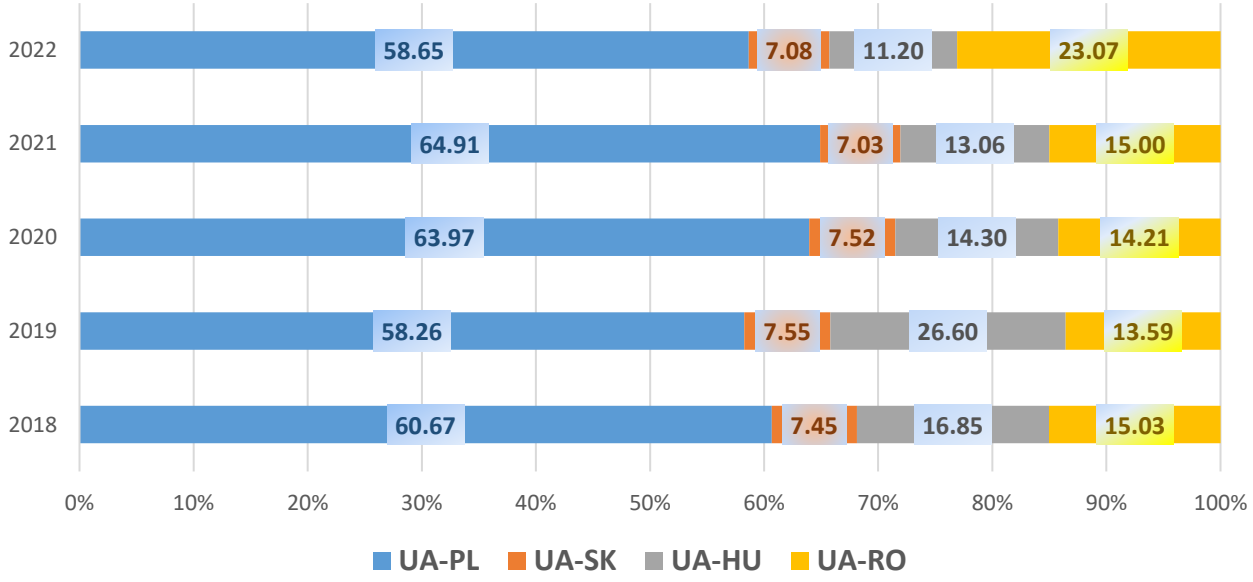


Fig. 1.10. The structure of border crossings by trucks, by sections of the Ukraine-EU border, %

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

Transportation of goods across border sections is almost identical to the structure of border crossing by trucks. The shares of the Romanian and Slovak sections of the border are somewhat higher (see Fig. 1.11).

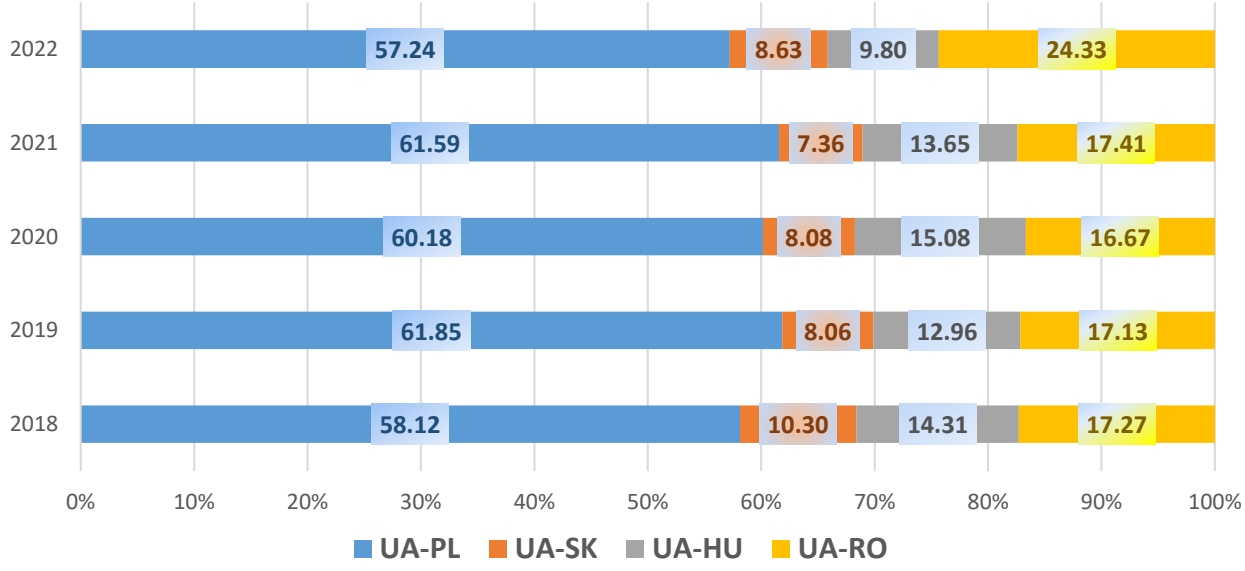


Fig. 1.11. The structure of cargo transportation by trucks, by sections of the Ukraine-EU border, %

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

Until 2022, the main share of transit traffic fell on the Ukrainian-Romanian section of the border. During the 2022, the share of the Ukrainian-Polish section increased by 2.24 times, and the share of the Ukrainian-Romanian section decreased by 2 times, respectively (see Fig. 1.12).

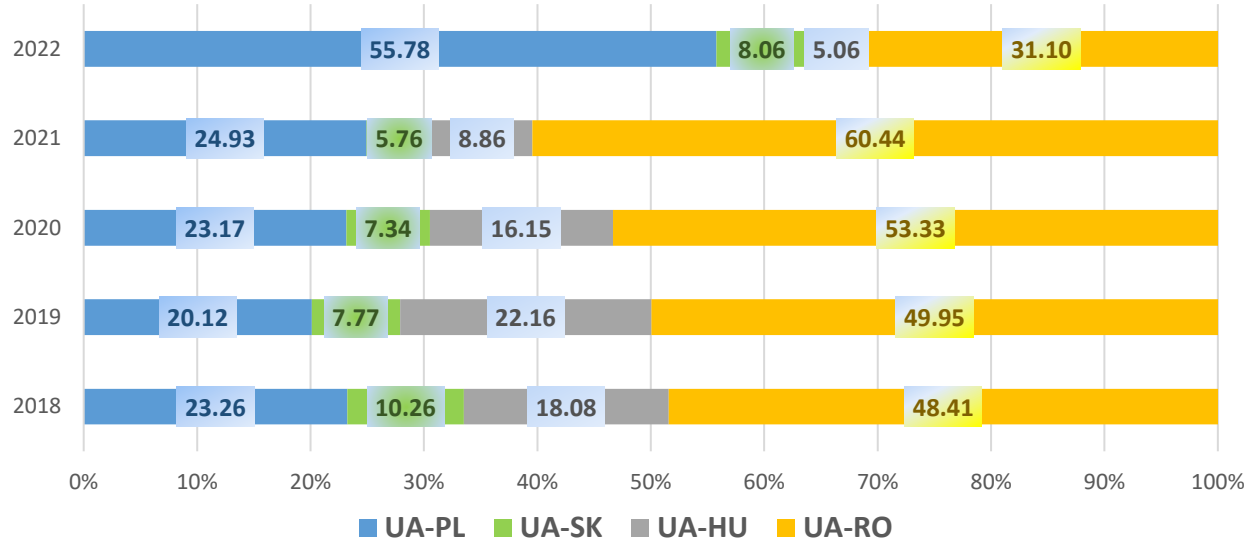


Fig. 1.12. The structure of border crossings by trucks that carry out transit transportation, by sections of the Ukraine-EU border

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

The dynamics of the passage of trucks by sections of the EU-Ukraine border during 2018-2022 is shown in Fig. 1.13.

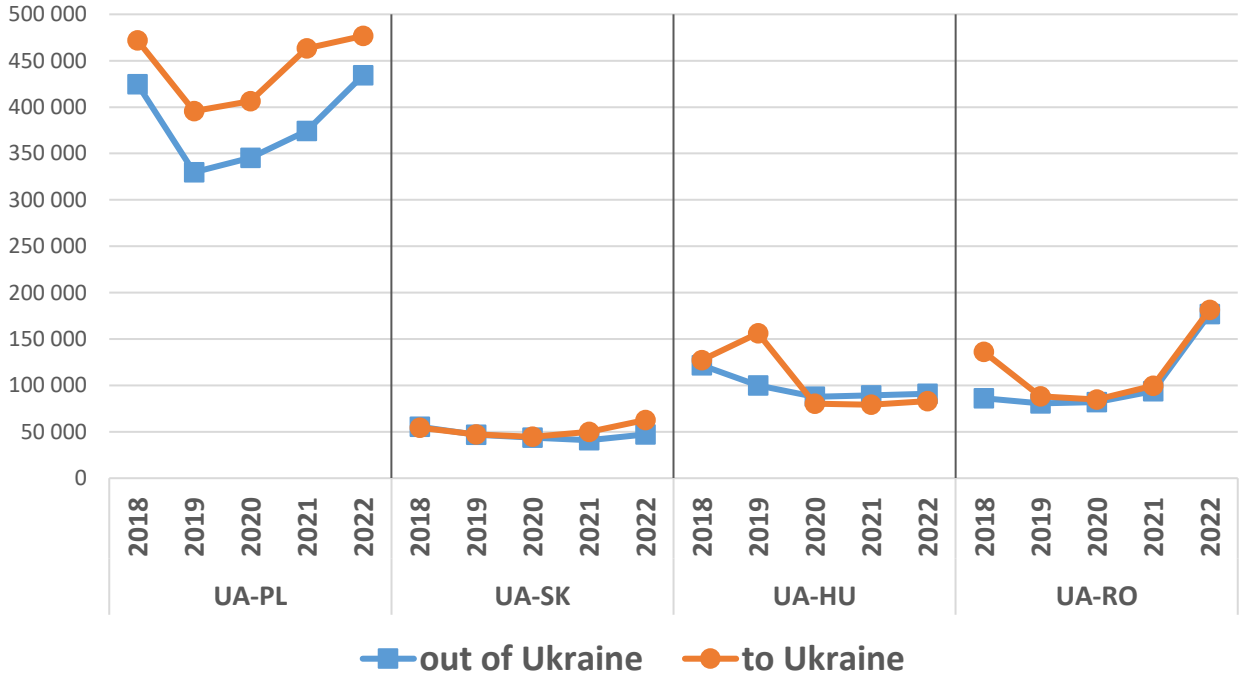


Fig. 1.13. Dynamics of the passage of trucks by sections of the Ukraine-EU border

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

Since 2020, an increase in the number of border crossings by trucks has been observed in most sections of the border. Freight transportation developed most dynamically on the Ukrainian-Polish and Ukrainian-Romanian sections of the border. At the same time, on all sections of the border, with the exception of the Ukrainian-Hungarian one, crossings in the direction "to Ukraine" prevailed.

In 2022, the increase in the number of crossings through the land section of the border did not correspond to the existing design capacity of the checkpoints. In particular, on the Ukrainian-Polish section of the border, the actual passage of trucks exceeded the project capacity of checkpoints by 41%, on the Ukrainian-Romanian section - by 16% (see Fig. 1.14).

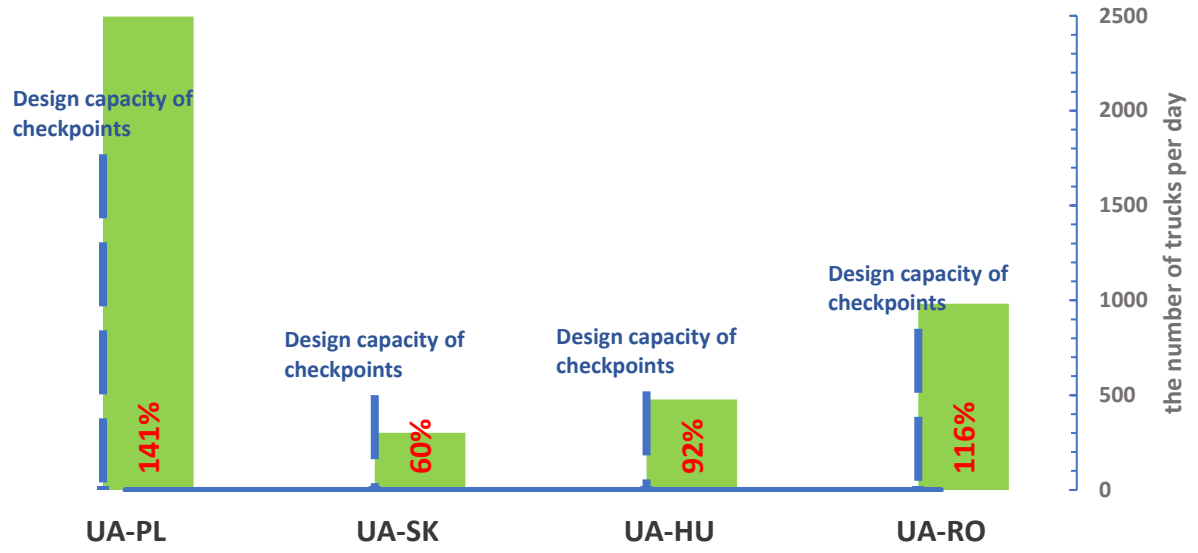


Fig. 1.14. Load level at checkpoints for road transport in relation to their design capacity in the section of the border

Source: calculations were made on the basis of data on the design capacity of checkpoints (State Customs Service. URL: https://map.customs.gov.ua/?locationTypes=1#71) and data received on the basis of a request to the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

This factor, not least, led to the emergence of huge queues at the border (see Fig. A.1-A.6). According to the theory of mass service (queuing theory), in real conditions, a system collapse is observed when the load is about 0.8-0.9. High flow intensity, non-uniformity of flows and insufficient throughput capacity cause queues to form.

The largest queues were observed in front of the checkpoints on the Ukrainian-Polish border section, in particular, the Yahodyn - Dorohusk BCP. Since the end of last year, an electronic queue has been introduced on it, which is designed to eliminate the factor of unevenness of flows. As of the end of 2022, queues continued to form in front of almost all checkpoints, they were especially long in front of the Porubne - Siret, Chop (Tysa) - Záhony, Orlivka - Isaccea BCPs.

The number of crossings by freight cars and the volume of transported cargo during 2018-2020 gradually decreased against the background of the increase in the

volume of transportation by sea transport. In 2021, due to the closure of Chinese ports and the restriction of transportation by sea in view of the Pandemic-19, transportation by both railways and cars increased significantly.

In 2022, compared to the same period last year, the number of crossings increased by more than 20%, transit fell by almost 3 times (tonnage) (see Fig. 1.15).

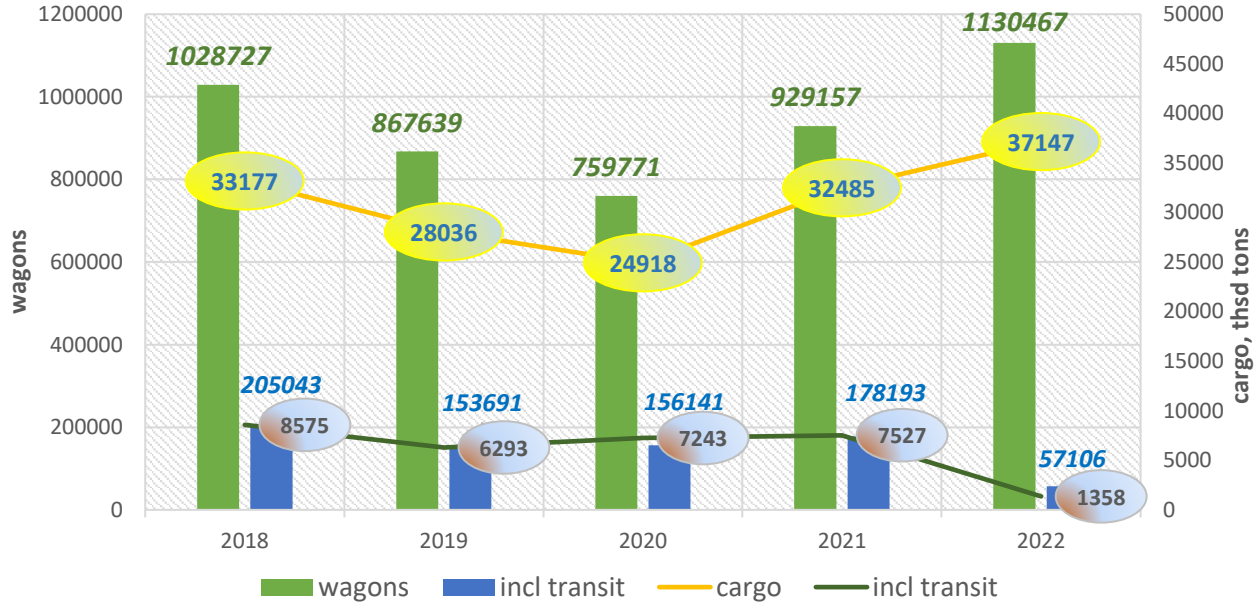


Fig. 1.15. Dynamics of crossing the border by freight railway cars and the volume of transported goods

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

In 2022, about 80% of all crossings were on the Ukrainian-Polish and Ukrainian-Slovak sections of the border. As in the case of road transport, the share of Ukrainian-Polish and Ukrainian-Romanian border crossings increased in 2022 (see Fig. 1.16).

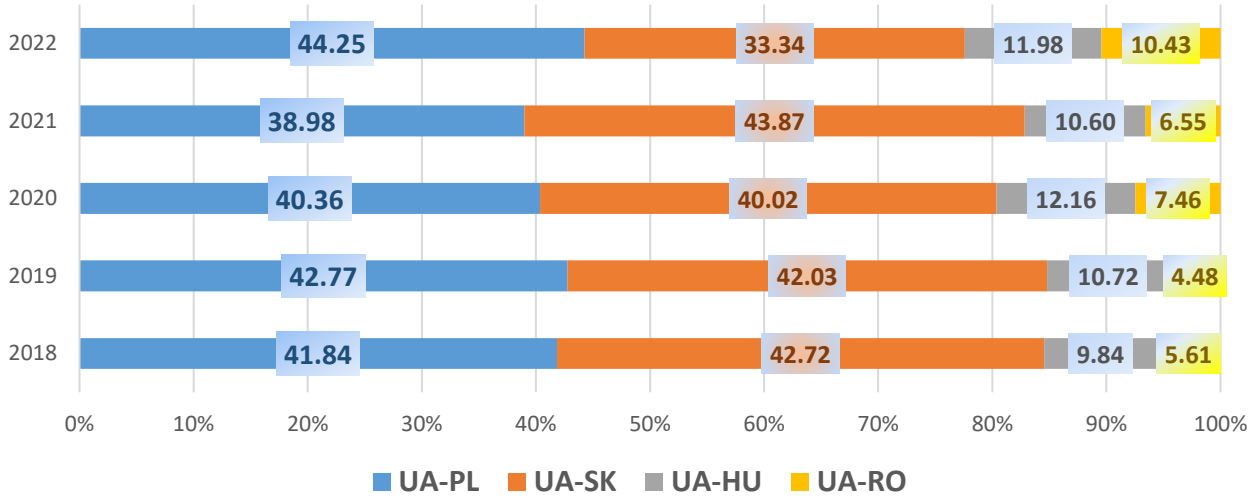


Fig. 1.16. The structure of border crossings by freight railway cars, by sections of the Ukraine-EU border

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

The main share of transit occurs on the Ukrainian-Slovak section of the border (see Fig. 1.17).

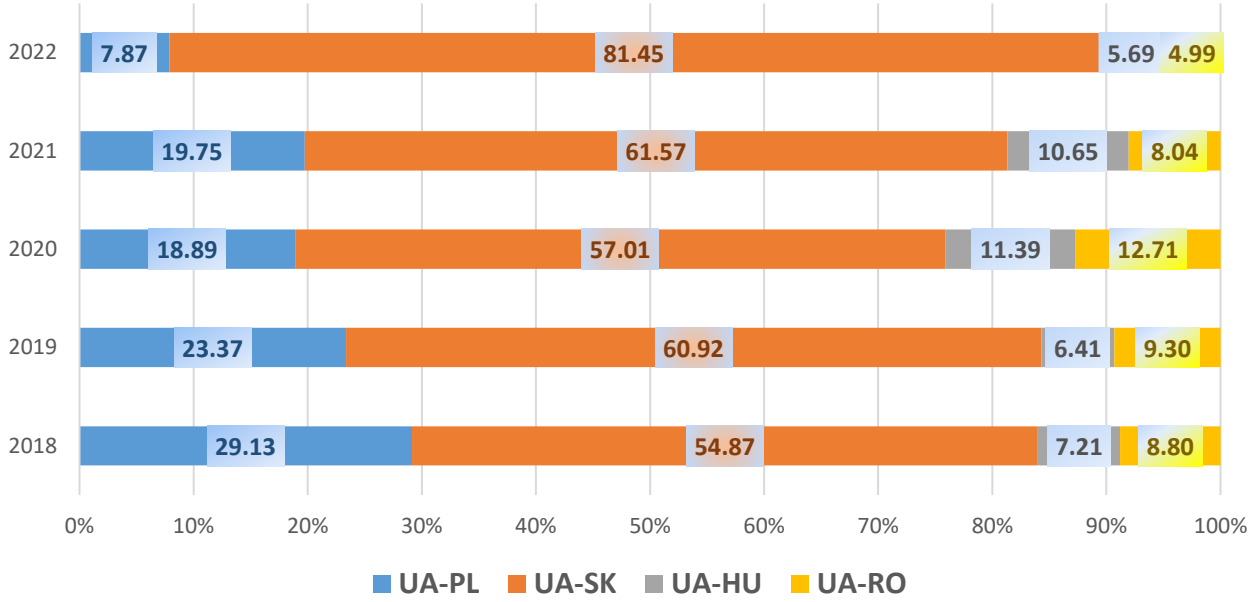


Fig. 1.17. The structure of border crossings by railway wagons that carry out transit transportation, by sections of the Ukraine-EU border

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

An analysis of the level of congestion at checkpoints in relation to their capacity in 2022 showed that, with the exception of the Ukrainian-Polish section of the border, railway checkpoints are loaded at 22-35% of their capacity (see Fig. 1.18).

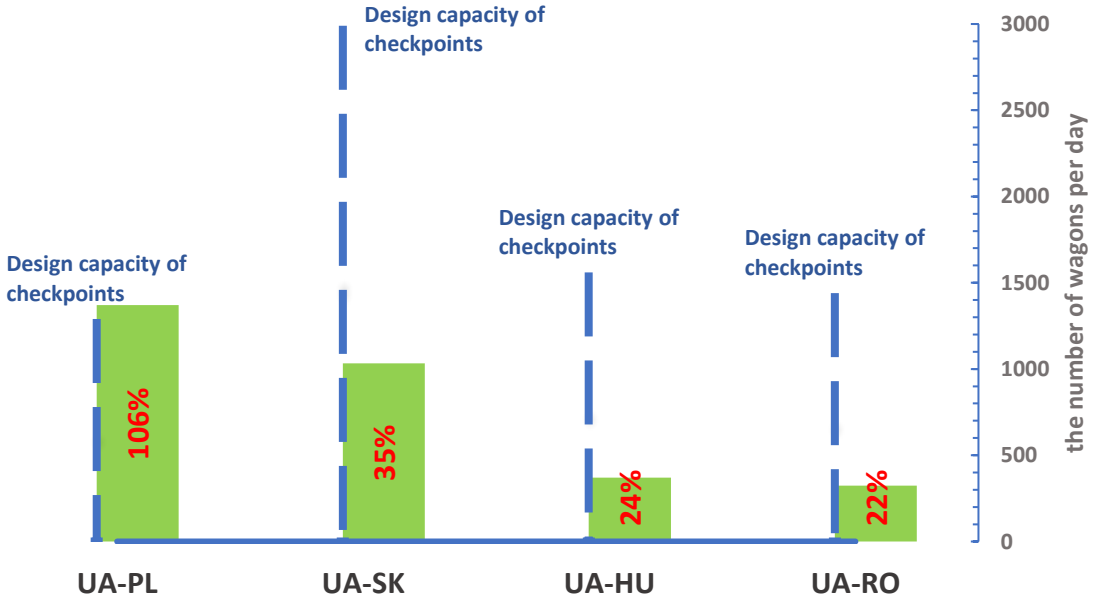


Fig. 1.18. Load level of railway checkpoints in relation to their design capacity, by sections of the Ukraine-EU border

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

In the structure of cargo transportation by road and rail, road transport accounts for about 32-38% of transported cargo. At the same time, in terms of value, this type of transport accounts for 52% of the total value of transported goods as of 2022 (see Fig. 1.19).

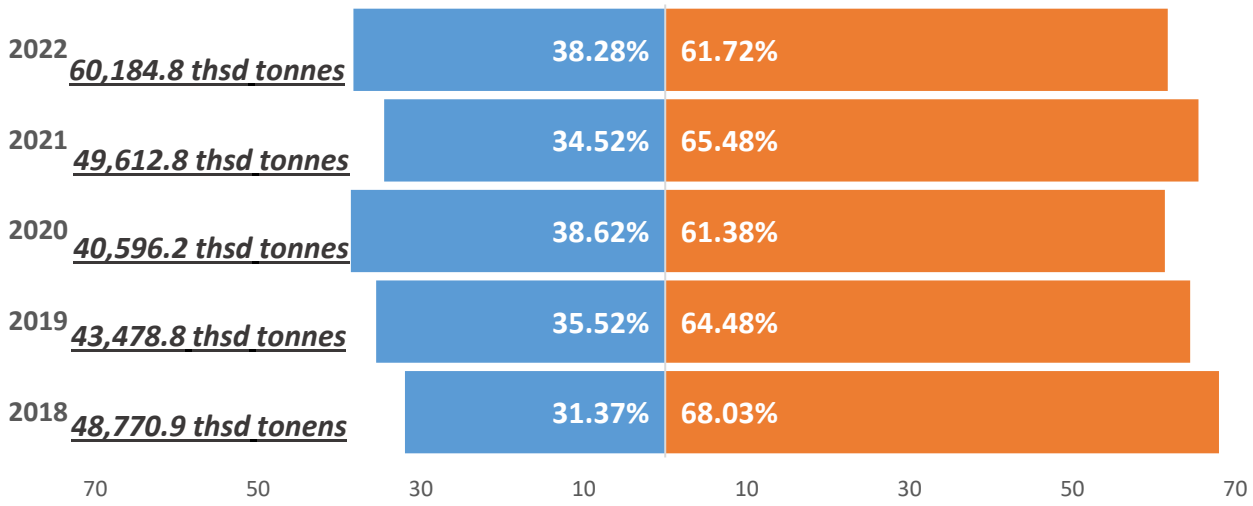


Fig. 1.19. Cargo transportation structure by road and rail transport, %

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

During 2018-2021, in the structure of freight transportation by road and rail transport, only a quarter of transit transportation was accounted for by road transport. At the same time, in 2022, automobile transport accounted for about 44% of all transit transportation along the land customs border of Ukraine (see Fig. 1.20).

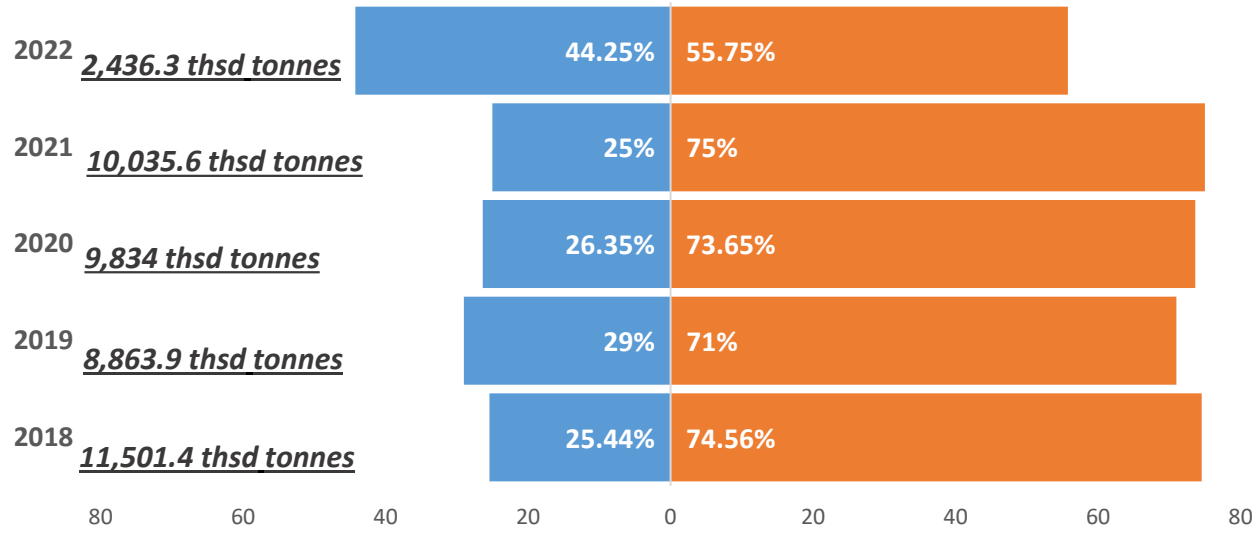


Fig. 1.20. Structure of cargo transit transportation by road and rail transport, %

Source: built on the basis of data received from the State Customs Service of Ukraine (letter of the Department of Customs Audit and Registration of Persons No. 19/19-02-03/14/622 dated February 15, 2023)

The share of the checkpoints for road transport in the total volume of trucks, cargoes and transit cargoes that have been passed is shown in Fig. 1.21.

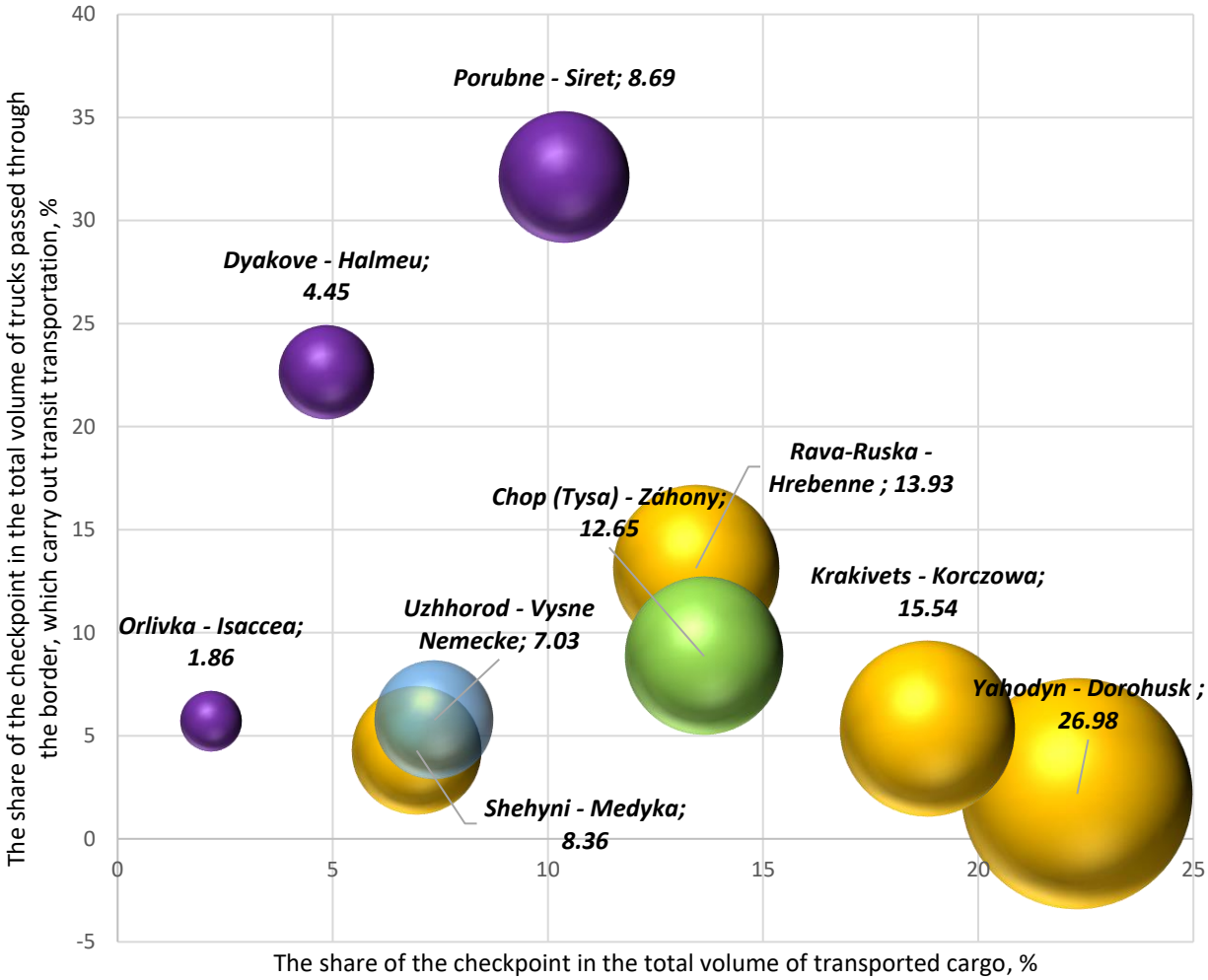


Fig. 1.21. Characteristics of automobile checkpoints on the Ukraine-EU border, 2021
The size of the bubble corresponds to the share of the checkpoint in the total volume of trucks passed across the border.

The checkpoints on the Ukrainian-Polish section of the border have the largest capacity and load. They mostly specialize in international cargo transportation. In total, as of 2021, about 65% of all trucks that crossed the Ukraine-EU border passed through these checkpoints. At the same time, at two checkpoints on the Ukrainian-Romanian section of the border: Porubne - Siret and Dyakove - Halmeu BCPs, about 55% of all crossings by trucks are transit.

The share of railway checkpoints in the total volume of wagons, goods and transit goods passed is shown in Fig. 1.22.

Among the railway checkpoints, three checkpoints are the largest in terms of carrying capacity and the actual passage of freight cars: on the Ukrainian-Polish border section – Volodymyr-Volynskyi (Izov) - Hrubieszów BCP; Ukrainian-Slovak border section - Chop - Cierna nad Tisou and Pavlovo - Matovska Vojkovce BCPs. At the same time, about half of all freight cars carrying transit goods pass through the Pavlovo - Matovska Vojkovce railway station.

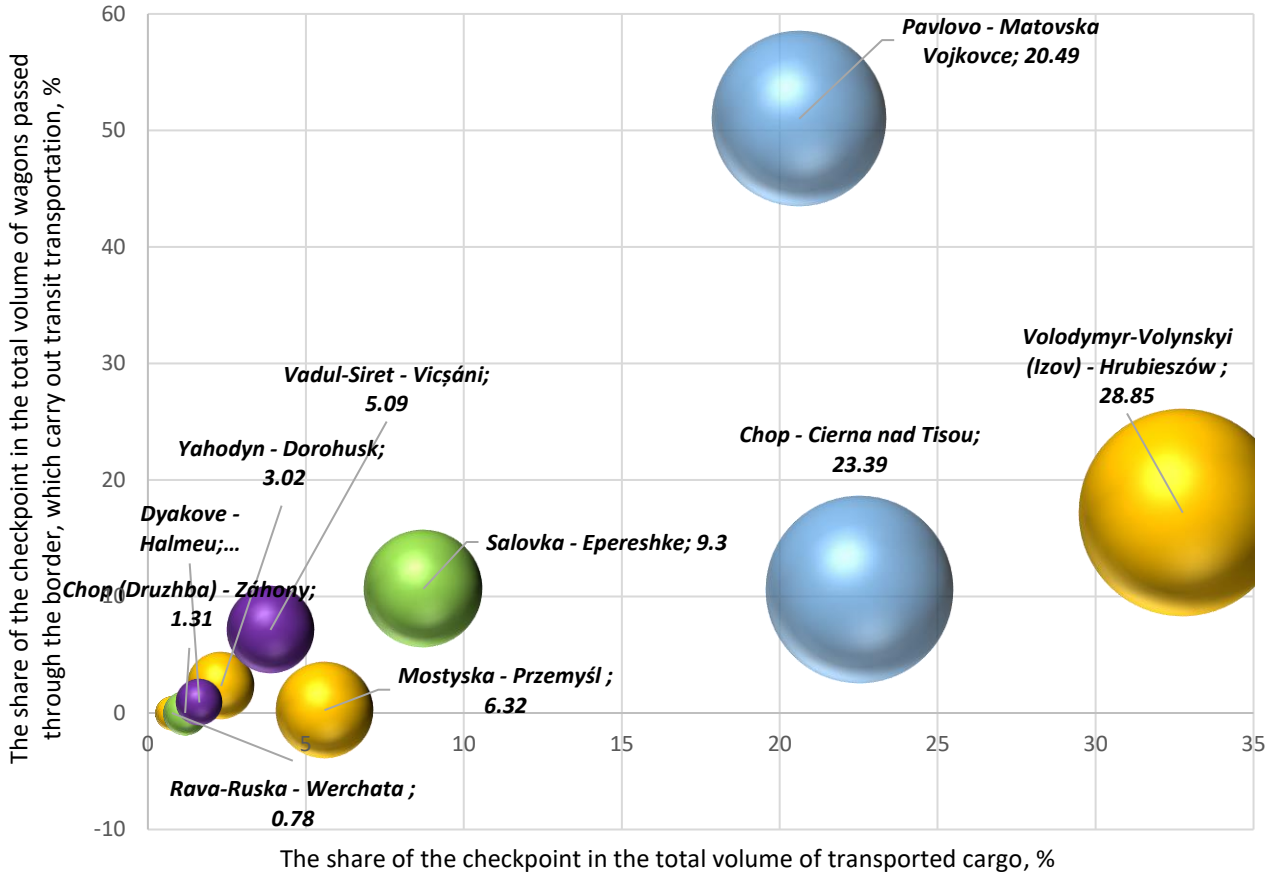


Fig. 1.22. Characteristics of railway checkpoints on the Ukraine-EU border, 2021

Conducted research and data analysis showed that, unlike most EU countries, Ukraine remains a net exporting country (in physical values) (see Fig. 1.2). Exports account for about 70% of Ukraine's international trade (in physical values). At the same time, the country is characterized by a fairly low level of foreign trade development in terms of exports and imports per person (both in physical and value terms). In the conditions of post-war recovery and intensification of international trade, oriented to the needs of the reconstruction of Ukraine, the volume of foreign economic operations will increase. This will also require proper development of the border infrastructure in conditions of increased load on the existing checkpoints for cargo transportation.

The trend of growth of cargo transportation across the Ukraine-EU border section relative to the rest of the border sections will continue in the future. During 2019-2022, the EU countries dominated in foreign trade with Ukraine. At the same time, their share is constantly increasing: from 40.81% in 2019 to 53.35% in 2022 (taking into account that starting from 2021 Great Britain already belongs to the group of countries "other European countries") (see Fig. 1.4, Table A.3). At the same time, EU neighboring countries are playing an increasingly important role in Ukraine's foreign economic activities. Their share increased from 13% in 2019 to 23% in 2022. Therefore, the further development of foreign economic cooperation, in particular with neighboring

countries, will be facilitated by the development of the carrying capacity not only of checkpoints for cargo transportation, but also pedestrian and bicycle crossings, checkpoints for passenger traffic.

The traffic on the Ukrainian-Polish section of the border is the most intensive (Fig. 1.13). The total number of border crossings by trucks exceeds the number of border crossings on the remaining three sections of the Ukraine-EU border.

In 2022, the increase in the number of crossings by trucks through the land section of the Ukraine-EU border exceeded the available design capacity of checkpoints. In particular, on the Ukrainian-Polish section of the border, the actual passage of trucks exceeded the project capacity of checkpoints by 41%, on the Ukrainian-Romanian section - by 16% (see Fig. 1.14).

This factor largely caused the appearance of huge queues at the border (see Fig. A.1-A.6). According to the theory of mass service (the theory of queues[5]), in real conditions, the collapse of the system (high probability of exponential growth of the queue) is observed when the load factor reaches 0.8-0.9. High flow intensity, non-uniformity of flows and insufficient capacity cause queues to form.

The largest queues of trucks are observed in front of checkpoints on the Ukrainian-Polish border, in particular at the Yahodyn - Dorohusk BCP. Since the end of last year, an electronic queue has been introduced on it, which is designed to eliminate the factor of unevenness of flows. As of the end of 2022, queues continued to form in front of almost all checkpoints, they were especially long in front of Porubne - Siret, Chop (Tysa) - Záhony, Orlivka - Isaccea BCPs. In conditions of growth of cargo flows, they are redistributed mainly between the largest checkpoints. Therefore, the development of traffic capacity on the Ukraine-EU border section will involve either the modernization of these checkpoints, which would increase their capacity, or the opening of new ones geographically close to these checkpoints. The throughput capacity of checkpoints should be more than 20% greater than the indicator of the intensity of cargo flow.

An analysis of the level of congestion at railway checkpoints in 2022 showed that, with the exception of the Ukrainian-Polish border section, railway checkpoints are loaded at 22-35% of their carrying capacity. The formation of queues in front of them occurs primarily due to certain technical and technological differences between the countries of railway freight transportation and the ability of the neighboring country to transport a certain volume of cargo in a given direction.

Capacity development planning should take into account existing trends in volumes, routes and types of cargo transportation, freight traffic prospects, deepening of Ukraine's cooperation with EU member states, formation of new trade corridors, etc.

[5] Leonard Kleinrock (1975). Queueing Systems. Volume 1: Theory. Wiley-Interscience. 417 p.; Saati, T.L. (1965) Elements of Queuing Theory and Its Application. Sov. Radio, 510.

II. THE UNDERLYING TRENDS IN ROAD AND RAIL FREIGHT TRAFFIC FLOWS ACROSS UKRAINE-POLAND AND UKRAINE-SLOVAKIA BORDER

Border infrastructure in Volynska, Lvivska and Zakarpatska oblasts

Several important transport corridors run through the border regions of Ukraine. For instance, TRACECA, Pan-European Corridors III and V, Go Highway and recently Trans-European Corridors. Such a corridor as Via Carpathia can be extended to the territory of Ukraine. Moreover, European Rail Freight Corridor 9 runs to Čierna nad Tisou (Slovakia/Ukraine border) and one of the branches of European Rail Freight Corridor 8 leads to Medyka (Poland/Ukraine border).

Railway network development

Regional branch "Lviv railway" of Joint stock company "Ukrainian railway" (hereafter UZ) operates within seven regions of Ukraine: Lvivska, Volynska, Rivnenska, Ternopilska, Ivano-Frankivska, Chernivetska and Zakarpatska oblasts. There are 354 railway stations, of which 252 are for cargo operations.

Kovel is one of the major rail nodes in Volynska oblast. From it railway tracks diverge in six directions: Sarny (to Kyiv), Kiverets (to Lutsk and Rivne), Volodymyr (previously known as Volodymyr-Volynskyi) and Lviv, to Chelm (to Warsaw and Berlin), Brest and Kamin-Kashirskyi. Main railway stations: shipment yard station - Kovel, freight station - Lutsk.

Narrow gauge track (1435 mm) extends eastwards to a shipment yard at Kovel near 60 km from the Yahodyn - Dorohusk BCP. The 1435 mm gauge track is electrified as far as Dorohusk. From Yahodyn - Dorohusk BCP 1520 mm gauge track extends 20 km to Chełm (Poland).

Yahodyn - Dorohusk BCP constitutes the shortest road connecting Gdańsk Pomerania and Mazovia region with Ukraine. With the modernisation of railway line No. 7 and plans to build new intermodal terminals, e.g. in Chełm, the capacity of this border crossing will increase significantly. The Rail Port transhipment terminal in Dorohusk is located nearby[6]

In addition, the broad-gauge line, which is called "Broad-Gauge Steel Line", runs between Sławków near Katowice and Volodymyr in Ukraine.

According to Antonowicz & Tracichleb (2020) this line is the longest broad-gauge railway line designed for freight transport in Poland. The length of it on Poland's territory is 394,650 km. The main attributes of this line are that it transports without handling the goods at the border and it can use heavy trains. Railway infrastructure

[6] Antonowicz, M & Tracichleb, Z. (2020) The Role of the Broad-Gauge Metallurgy Line PKP Linia Hutnicza Szerokotorowa Sp. z o.o. and the Belt and Road Initiative: Transportation in the Development of the Lublin Province. *Annales Universitatis Mariae Curie-Skłodowska*, sectio H – Oeconomia, Vol. 54, No. 2, 7-19. DOI: 10.17951/h.2020.54.2.7-19

consists of railways with stations, forwarding terminals and equipment such as power substations, communication centres, and command control and signalling equipment (see Fig. 2.1).

Fig. 2.1. The coverage of Broad-Gauge Steel Line
Source: retrieved from Antonowicz, M & Tracichleb, Z. (2020)

The main transport hub in Lvivska oblast is Lviv, through which the main railway tracks and road highways pass, as well as facilities for the transportation of passengers and freight are concentrated.

From the border with Poland the 1435 mm gauge track runs to the station "Mostyska-2". Ukrainian Railways operates broad gauge-track freight to yards at Żurawica (≈16 km from the border) where both the broad gauge-track (1520 mm) and standard track (1435 mm) are connected.

As of 2022 two terminals operate in Lvivska oblast - the "Mostyska" intermodal terminal" (N'UNIT) with a capacity of 4,000 TEU and the "Mostyska container terminal" with a capacity of 500 TEU. There is no information in open sources about terminals in Volynska oblast.

The broad-gauge line also runs from the Ukrainian border in Zakarpatska oblast to Haniska near Košice (Slovakia). After 8 km on Ukrainian territory, the single-track line runs 90 km from the Pavlovo - Matovska Vojkovce BCP along the standard gauge line from Veľké Kapušany. Later, it runs parallel to the standard gauge line, leading from the Chop - Cierna nad Tisou BCP and end up in Haniska[7].

The 1435 mm gauge single track line electrified at 3000V DC between Chop and Čierna nad Tisou (SK) and a non-electrified 1435 mm gauge double track line between Chop and Záhony (HU) with gauge transshipment at Chop. A non-electrified dual gauge single track line between Vynohradiv and Halmeu (RO). Also, a non-electrified single track line between Rakhiv and Valea Vișeului, Romania was reopened in

[7] Local Trains on the Broad-Gauge Line. URL: https://www.zscargo.sk/en/news/local-trains-on-the-broad-gauge-line [in English]

November 2022 after 15 years out of service. However, traffic on the cross-border link is now almost entirely 1520 mm gauge, with gauge transshipment at Halmeu (RO)[8].

The broad-gauge railway line does not end on the border of Ukraine. From some BCPs it runs inside the territory of EU border countries. On the other hand, a standard gauge (1435 mm) extends to the territory of Ukraine. Thus, some of the BCPs have both types of track lines.

Road network development

Road network of Ukraine is subdivided into four classes (by state significance): international roads (M roads), national roads (H roads), regional roads (P) and territorial roads (T).

Two international roads run through Volynska oblast - M-07 "Yahodyn (border with Poland) - Kovel – Kyiv" which is also a part of European route E373 and M-19 "Domanove (border with Belarus) - Kovel - Chernivtsi – Porubne" (direction to Romania) which is a part of European route E85 (Annex B, Fig. B.1).

Five international roads run through Lvivska oblast:

- M-06 "Kyiv-Chop" (border with Slovakia and Hungary);
- M-09 "Lviv – Rava-Ruska" (border with Poland);
- M-10 "Lviv – Krakivets" (border with Poland) which is also a part of European route E40;
- M-11 "Lviv – Shehyni" (border with Poland);
- M-12 "Stryi-Ternopil-Kropyvnytskyi-Znamyanka" (Annex B, Fig. B.2).

Six international roads run through Zakarpatska oblast:

- M-06 "Kyiv-Chop" (border with Slovakia and Hungary);
- M-08 connects Uzhhorod city with Uzhhorod - Vysne Nemecke BCP (border with Slovakia);
- M-25 – "Solomonovo – Chop" to Yanoshi;
- M-24 – "Mukachevo - Berehove - Luzhanka" (border with Hungary);
- M 23 – "Berehove – Vylok";
- M-26 – "Vylok - to the border checkpoints with Hungary and to the Dyakove (border with Romania)" (Annex B, Fig. B.3).

Uzhhorod, Chop and Mukachevo are the largest transport hubs of Zakarpatska oblast.

Important transport corridors pass through the territory of Zakarpatska oblast, among which, in particular, the European routes E-50, E-58, E-573, E-81 as well as Pan-European Corridor V.

[8] Railways in Ukraine. URL: https://www.sinfin.net/railways/world/ukraine.html [in English]

Weigh-in-Motion complex on roads

Since October 1, 2021 in Ukraine laws have entered into force introducing automatic recording of violations of weight-in-weight standards by Weigh-in-Motion complexes. From that day on, participants in the transportation market began to receive fines for violating weight norms. In 2021, 102 automatic Weigh-in-Motion complexes should be operated on Ukrainian roads (hereafter WiM). However, on August 2, 2022, only 28 WiM in 14 regions of Ukraine were operating normally. All of them are located in territories controlled by Ukraine. Three of them are in border regions on roads M-19 (Volynska oblast), H-09 (Lvivska oblast); M-25 (Zakarpatska oblast)[9].

Lvivska oblast has the highest indicator of density of paved public roads compare to Volynska and Zakarpatska oblast as well as the average indicator of roads category. Four TEN-T Corridors cross near Lviv city (Lvivska oblast). Two TEN-T Corridors run through the territory of Zakarpatska oblast. None of TEN-T Corridors run through the territory of Volynska oblast.

Logistics and warehouses infrastructure of Volynska, Lvivska and Zakarpatska oblasts

There are few industrial parks in Volynska oblast. Industrial park NOVO in Novovolynsk town was opened in 2022. The ownership is municipal and the main activities are automotive, goods and instrument manufacturing, agricultural industry and IT cluster (outsourcing).

"Volodymyr" Industrial Park in Volodymyr city which was included into the Register of industrial parks of Ukraine by Order of the Cabinet of Ministers of October 8, 2022 No. 889-r.

Kovel City Council and the American company A.M. GELLER INTERNATIONAL, INC. signed a memorandum on cooperation in the establishment of an industrial park on the territory of the community in 2022[10].

Moreover, the development of transport and logistic infrastructure of the region have been debated extensively by local authorities, international organizations, local NGOs, etc. For instance, during the regional economic forum "Cluster development of Volyn" which was held in Kovel in January, 2023, the establishment of innovative agrocluster "Western Polissya" (Zahidne Polissya) was introduced. The initiators of the project are the Regional Development Agency and the Shatsk Town Council[11].

[9] WIM-complexes have resumed operation in Ukraine — where they are installed. URL: https://www.autocentre.ua/ua/news/v-ukraine-vozobnovili-rabotu-wim-kompleksy-gde-oni-ustanovleny-1406269.html [in Ukrainian]

[10] A memorandum about establishment of an industrial park was signed in Kovel. URL: https://kovel.media/u-koveli-pidpysaly-memorandum-pro-stvorennya-industrialnogo-parku/ [in Ukrainian]

[11] The Volyn Oblast Council. URL: https://new.volynrada.gov.ua/2023/klaster-zahidne-polissya-vygoda-dlya-biznesu-i-gromad/ [in Ukrainian].

9 clusters have been established in *Lvivska oblast* (IT-cluster, woodworking, publishing and printing, agro-recreational, rural green tourism, development of education and creativity, medical tourism, West Ukrainian Fashion Industry, Biotech & Pharma Cluster).

As of 2022, *10 industrial parks* were registered in Lvivska oblast ("Ryasne – 2", Zahid Resource, Kamyanka-Buzky industrial park, Business Prime, Yavorivsky industrial park, Sparrow Park Lviv, Novorozdilsky industrial park, Sigma Park Yarychiv, "Mostyskyi Dry Port", Eco Smart Industry Park «GALIT»). In addition, according to the "Development Strategy of the Lviv Region for the period 2021-2027", 107 land areas within and outside the boundaries of settlements in Lvivska oblast have been identified as places for the development of industrial parks. 19 land areas for logistics complexes (among them 4 located up to 30 km near the border with Poland, in particular 2 areas located next to Mostyska - Przemyśl and Krakivets - Korczowa BCPs, in radius from 30 to 100 km to the border - 6, over 100 km - 9), industrial facilities (72 land areas).

There are 2 large logistics complexes in Lvivska oblast. Warehouse complex "Protec Zymna Voda" was opened in 2020 and located near Lviv. It is expected that the warehouse complex will become part of the GO Highway corridor. Lviv logistic center PORT located in Lviv city, which was completed by the Alterra Group at the beginning of 2023.

Lviv Danylo Halytskyi International Airport is situated 6 km west of the Lviv city center. Before the full-scale invasion Russia of Ukraine on 24th Feb 2022, major airlines operated in the airport such as LOT (Polish Airlines), Ryanair, Austrian Airlines, Turkish Airlines, Ukraine International Airlines, SkyUp, Lufthansa, Wizz Air etc.

The share of business entities in "warehousing and support activities for transportation" in the total number of such entities in Ukraine varies among border regions. Lvivska oblast accounts for 5% of all business entities in the field of "warehousing and support activities for transportation" of Ukraine in general, Zakarpatska oblast accounts for 3% and Volynska oblast accounts for 2%. However, in regional dimension the share of business entities in "warehousing and support activities for transportation" among enterprises of the section H "Transporting and Storage" in Lvivska oblast was 18%, in Volynska oblast – 16% and in Zakarpatska oblast – 20% (2020) (see Fig. 2.2-2.4).

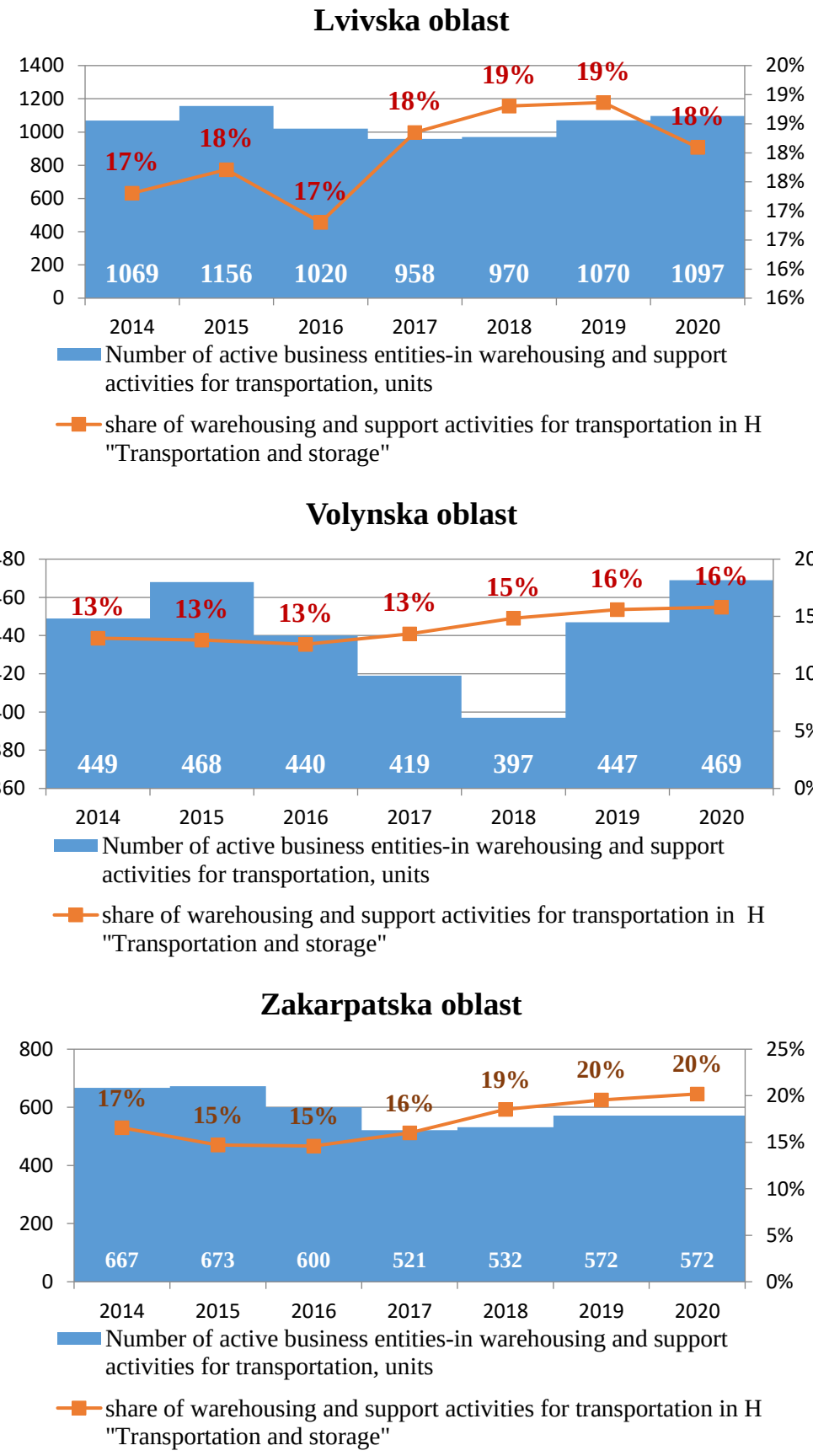


Fig. 2.2-2.4. Number and share of business entities in warehousing and support activities for transportation in Lvivska, Volynska and Zakarpatska oblasts, 2014-2020

Kovel, Lutsk, Novovolynsk, Lyuboml, Kamin-Kashirskyi, Ustyluh are the major towns in terms of logistics in Volynska oblast.

In 2021 in the Volynska oblast, there were 35 grain elevator complexes and grain warehouses with a storage capacity of 5,000 tonnes or more, the total volume of which could be stored at the same time is near 1.2 MM tonnes[12]. However, two more facilities with a total capacity of 150,000 tonnes are under construction in 2023[13].

According to the "Development Strategy of the Lviv Region for the period 2021-2027" Lvivska oblast had 26 grain silos with the capacity near 726.6 thousand tonnes.

In Zakarpatska oblast grain silos capacity were 111,450 tonnes. There were only three of them.[14.] Zakarpatska oblast is one of the regions, which is the least equipped with grain silos.

Thus, transport and logistics infrastructure development in the border regions of the Western Ukraine is actively ongoing even in the conditions of the war. Local and central authorities and other stakeholders are working on the development of transport as well as logistic infrastructure of these regions, preparation of new investment projects, encouraging the establishment of industrial parks, etc.

Development of a network of checkpoints on the border with Poland and Slovakia

Main trends in freight traffic transportation in 2018-2021

Automobile border crossing points

There are five automobile border crossing points for freight on the border with Poland and one BCP on the border with Slovakia (Annex B, Table B.1).

- Split of trucks (%) in the total volume of road transport (car, bus, truck) varies across BCPs. In 2021 the share of freight transport in Yahodyn - Dorohusk BCP was 43%, in Rava-Ruska - Hrebenne BCP – 32%, in Krakivets - Korczowa BCP – 25%. The least share of freight transport was in Smilnytsia-Krostsenko BCP. It is worth noting the share of trucks in the total volume of road traffic crossing the border with Poland as well as Slovakia has grown since 2020. It was due to the fact that the number of cars and buses decreased because of COVID-19 restrictions and quarantine measures.
- Among the five BCPs on the border with Poland: Yahodyn - Dorohusk, Rava-Ruska - Hrebenne, and Krakivets - Korczowa BCPs are the major in terms of freight traffic crossing. The share of Smilnytsia-Krostsenko BCP in passage of trucks through the border with Poland was insignificant and, as of 2019, was less than 1%.

[12] The largest grain market operators in Volyn are named. *AgroPortal*. URL: https://agroportal.ua/news/ukraina/nazvany-krupneishie-operatory-rynka-zerna-na-volyni [In Ukrainian]

[13] Work on the construction of two new grain silos has begun in Volynska oblast. URL: https://landlord.ua/news/na-volyni-rozpochaly-roboty-po-zvedenniu-dvokh-novykh-elevatoriv/ [In Ukrainian]

[14] Rating of grain elevators' capacities by region. URL: https://uga.ua/news/rejting-elevatornih-potuzhnostej-po-oblastyam/ [In Ukrainian]

- The share of transit trucks in Yahodyn - Dorohusk BCP was nearly 1% of the passage of all freight transport (2021). The highest share was in Rava-Ruska - Hrebenne BCP in 2018 - 12%. It dropped down to 9% in 2021. It can be concluded that export-import goods are transported by trucks through the Poland-Ukraine border. Transit direction "to Ukraine" prevails (inbound flow) at all border crossing points with Poland with the exception of Shehyni - Medyka BCP where outbound transit flow accounts 54%, inbound – 46%.
- In Uzhhorod - Vysne Nemecke BCP the share of transit freight vehicles in all freight transport decreased from 19% in 2018 to 8% in 2021. Transit flow in the direction "to Ukraine" prevails. In 2021 it exceeded 4 times the transit flow "from Ukraine" (1,397 transit trucks in direction "out of Ukraine", 5,825 transit trucks in direction "to Ukraine").
- In general, the number of transit trucks crossing the Poland-Ukraine border decreased as well as the Slovakia-Ukraine border.
- If average load coefficient equals 100% it means that BCP passage of freight vehicles the same as designed capacity of checkpoint. For instance, designed capacity of Uzhhorod - Vysne Nemecke BCP - 500 freight vehicles per day. In 2021, an average of 249 freight vehicles per day crossed the Uzhhorod - Vysne Nemecke BCP. So, average load coefficient is 50%. Average load coefficient of Uzhhorod - Vysne Nemecke BCP varied from 60% to 50% in 2018-2021. However, four out of five BCPs with Poland were characterised by an average load coefficient more than 100% (2018-2021) (Annex B, Table B.3).

In terms of freight Yahodyn - Dorohusk, Krakivets - Korczowa and Rava-Ruska - Hrebenne are the major automobile BCPs on the border with Poland. However, Yahodyn - Dorohusk BCP slightly dominated as 34-46% of all trucks crossing the border with Poland moved through this BCP in 2018-2021. The share of transit freight vehicles in the flow of trucks is insignificant. In Uzhhorod - Vysne Nemecke BCP the passage of trucks was characterised by unsteady dynamics as well as the volume of cargo in 2018-2021. The share of transit freight vehicles in Uzhhorod - Vysne Nemecke BCP decreased from 2018 to 2021. In 2021, it was 8% of the total number of crossing trucks.

Rail border crossing points

There are four rail border crossing points for freight on the border with Poland and two border crossing points on the border with Slovakia (Annex B, Table B.2).

- The annual number of wagons that crossed all four BCPs with Poland decreased in 2018-2020. For example, in Mostyska - Przemyśl BCP - wagons and cargo halved in 2020 compared to 2018. In Volodymyr-Volynskyi (Izov) - Hrubieszów BCP the passage of wagons decreased by 20%, and cargo by 12%.

- In 2021 the number of wagons slightly increased with the exception of Rava-Ruska - Werchata BCP where the number of wagons decreased.
- Volodymyr-Volynskyi (Izov) - Hrubieszów BCP is the major BCP by volume of freight transportation. ⅔ of all wagons pass through it. Similarly, the Volodymyr-Volynskyi (Izov) - Hrubieszów BCP dominated (70%-79%) in terms of cargo volume in 2018-2021 at the border with Poland.
- Loaded freight trains prevail in outbound traffic. In 2018-2020 more than 90% of all cargo that crossed the border moved "from Ukraine". In 2021 the volume of inbound cargo increased. So, the share of cargo in outbound traffic decreased but still prevailed (77%-98%).
- The share of transit wagons has not exceeded 20% in each BCP (from the total flow of freight wagons on the border with Poland) and has decreased until 2021.
- The annual number of wagons having crossed two BCPs with Slovakia decreased in 2018 - 2020. The volume of cargo decreased during this period too.
- In 2020, 60% of traffic crossed Chop - Cierna nad Tisou and Pavlovo - Matovska Vojkovce BCPs accounted for 40% of wagons.
- The distribution of wagons in outbound and inbound traffic is the same (50% to 50%) at both BCPs.
- In cargo structure dominates outbound traffic in Chop - Cierna nad Tisou BCP as well as Pavlovo - Matovska Vojkovce BCP (> 90% of cargo volume moved in the direction "out of Ukraine").
- Share of transit wagons in total flow of freight wagons in Pavlovo - Matovska Vojkovce BCP was between 40-59%, in Chop - Cierna nad Tisou BCP it did not exceed 10% (2018-2021).

The annual number of wagons that crossed all BCPs with Poland as well as all BCPs on the border with Slovakia decreased in 2018-2020. More than 70% of all volume of freight wagons as well as cargo crossed the Volodymyr-Volynskyi (Izov) - Hrubieszów BCP (Poland). On the border with Slovakia, the distribution of freight wagons that crossed Chop - Cierna nad Tisou BCP and Pavlovo - Matovska Vojkovce BCP varied in 2018-2021. Loaded freight trains prevail in outbound traffic on both sections of the state border. The share of transit wagons has not exceeded 20% in each BCP on the border with Poland. However, transit wagons accounted for 40-59% of the total number of wagons that crossed Pavlovo - Matovska Vojkovce BCP.

How have the freight traffic transportation changed in 2022 compared to 2021?

- The passage of freight wagons increased in 2022 compared to 2021 at all checkpoints on the border with Poland. The largest increase in the number of wagons at the Yahodyn - Dorohusk BCP was 2.7 times.

- The volume of cargo also increased. In total, 13.5 million tonnes of cargo crossed the border with Poland through four checkpoints in 2021, while 16.8 million tonnes – in 2022.
- Predominance of loaded trains in the direction "out of Ukraine" remains a characteristic trend. In total, the volume of exported goods (out of Ukraine) exceeded imported goods by 4.3 times for four BCPs on the border with Poland.
- The number of transit wagons decreased sharply in 2022 and was only 13% of the number of transit wagons in 2021.
- On the border with Slovakia. In the Pavlovo - Matovska Vojkovce BCP, the number of wagons and cargo decreased, on the other hand, in Chop - Cierna nad Tisou BCP both the number of wagons and cargo increased in 2022 compared to 2021. In total, 14 million tonnes crossed the Slovak section of the border in 2021, and 12.4 million tonnes in 2022.
- On the border with Slovakia, the number of trucks crossing the border through the Uzhhorod - Vysne Nemecke BCP increased by 1.2 times and the volume of cargo by 1.6 times. By volume, the inbound flow prevailed (57%).
- On the border with Poland. Yahodyn - Dorohusk BCP remains dominant in the passage of freight vehicles and cargo. In 2022, this checkpoint accounted for 39% of the entire flow of trucks as well as cargo. The number of crossings by freight vehicles at Smilnytsia-Krostsenko BCP increased by 3 times. The flow of trucks in Shehyni - Medyka and Rava-Ruska - Hrebenne BCPs also increased. On the other hand, the number of trucks that crossed the border at the Yahodyn - Dorohusk and Krakivets - Korczowa BCPs was almost the same as in 2021. In fact, the amount of freight transport increased by no more than 2% and 8%, respectively.
- The volume of cargo has also increased at all checkpoints, but the largest one was at "Smilnytsa" – by 5 times. Moreover, in 95% of cases, it travelled in the direction "to Ukraine". Most likely, this was humanitarian aid. For Yahodyn - Dorohusk, Rava-Ruska - Hrebenne and Krakivets - Korczowa BCPs, the volume of cargo was also larger in the inbound flow (to Ukraine). Moreover, the tendency of the ratio of cargo "to Ukraine" and "out of Ukraine" in favour of a larger volume in the inbound direction was also characteristic in 2021.

Barriers and bottlenecks to efficient flow across the BCPs

Checkpoints are bottlenecks for the constant, uninterrupted flow of goods within international transport corridors. Queues and jams are formed at all borders and checkpoints. Congestions have an adverse effect on internal traffic, road safety, increase transport and logistics costs, and in the case of road transport, they also exert additional environmental pressure. Automobile and rail checkpoints are characterized

by the specifics of their functioning, and accordingly the reasons for the queueing in front of them are of a different nature.

The Alpine-Western Balkan Rail Freight Corridor 10 (2020) report[15] states that inefficient border crossing processes and procedures are among the main reasons for significant delays, increased transport costs, as well as undermining the relative competitive advantages of rail transport. Many border procedures are duplicated at checkpoints on both sides of the border.

In general, queues and congestions in front of checkpoints are caused by physical and non-physical barriers.

Physical barriers:

- the infrastructure and equipment of the checkpoint does not meet the needs of the flows that pass through it;
- inappropriate border transport infrastructure connecting the checkpoint with transport networks (lack of parking spaces, layover sites, road width);
- difference in track width (rearrangement of wagons, replacement of locomotives);
- non-electrified railway lines;
- different technological standards for the power system, signalling and communication, rolling stock, vehicle dimensions, maximum weight, axle load, etc.;
- unstable operation of the electronic control system and servers (due to weather conditions, power outage, technical malfunctions, etc.);
- infrastructure damage (for example, due to floods, earthquakes, etc., as well as other disasters caused by anthropogenic factors).

Non-physical barriers:

- differences in legislation and regulatory acts (export-import documents, requirements for transit, waybills, permits for carriers, inspection of vehicles and rolling stock, requirements for locomotives/wagons, change of teams (brigades), additional requirements for vaccination, self-isolation related with COVID-19, etc.);
- inefficient processes and procedures. Border and customs formalities carried out on both sides of the border (lack of cooperation algorithm and exchange of documents, information);

[15] Alpine-Western Balkan Rail Freight Corridor No. 10 “Capacity Improvement and Operational Bottleneck Study”. Final version. Ljubljana, Prometni Institut Ljubljana, November 2020. p.219 URL: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwi07oPo4Pb8AhVBzqQKHRHxA7oQFnoECBMQAQ&url=https%3A%2F%2Fwww.rfc-awb.eu%2Fwp-content%2Fuploads%2F2019%2F02%2FAWB-RFC_Bottleneck-study_final.pdf&usg=AOvVaw2B-C7iXo5wuAmF71dvWtEw

- other types of control (sanitary and epidemiological, radiation, environmental, immigration, etc.);
- systematic and frequent physical checks (inspections) of shipments and cargoes at the BCP itself (due to mistrust of carriers' documents);
- seasonality and irregularity of traffic (peak periods during the day or year);
- risks of illegal border crossing (e.g. migrants);
- uncoordinated supply of locomotives (lack of locomotives, delays in the schedule, untimely arrival at the checkpoint)[16];
- insufficient number of employees of the border and customs, as well as other services[17];
- unsynchronized work of different services within the competence of one country (e.g. asynchronous shift rotation, duplication of inspection, lack of communication and information exchange)[18];
- corruption and fraud, unofficial payments during control;
- protests in front of the checkpoint, blocking roads by protesters, etc.

Ways of managing flows before and at BCPs

- ✓ *Cooperation of border guards and traffic police.* If queues form in front of the checkpoint, the border guards inform the police, who in turn inform the drivers and recommend that trucks stop for layover before reaching the border. Monitoring by the traffic police of the influx of trucks in the direction of the border. It should result in informing the border guards and increasing the number of employees at the BCP, or opening an additional lane for the movement of vehicles during peak hours.
- ✓ *Parking lots.* Parking lots near the BCPs, which allow removing the flow of trucks from the roads near the border, partially solve the problem of traffic management. Construction of parking lots has certain risks. If such a lot has no restrictions on the presence of a truck or parking fees, then vehicles can stand there and wait for a corresponding change at the border, thereby strengthening the corruption component and manipulations at the checkpoints.
- ✓ *Pre-arrival information.* Information about traffic at the BCP should be available to users using various sources of information. For example, signboards on the roads, on the official websites of the relevant services, etc. The availability

[16] Miltiadou, M. et al. (2017) Analysis of border crossings in South East Europe and measures for their improvement. *Transportation Research Procedia,* 25, 603-615

[17] UTICAD (2021) Kapikule-Kapitan Andreevo BCP Report. İstanbul, 29.03.2021. URL: https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjf1KmsyuX8AhVIDuwKHUatARsQFnoECAoQAQ&url=https%3A%2F%2Fwww.utikad.org.tr%2FImages%2FDosyaYoneticisi%2F05082021problemsatkapitanandreevobcp.pdf&usg=AOvVaw2AmCWgLtiQl3dJundCmkuv

[18] Study for border crossing facilitation and improvement of the cross-border road transport on the indicative extension of TEN-T Road Core/Comprehensive Network in the Western Balkans. Final Report. 5 June 2019. 74 p.

of current information about queues at the BCP will enable carriers to plan a route, adjust rest and driving time, and, if necessary, change the route or a BCP, without creating additional queues on the roads adjacent to the BCP.

- ✓ *Management of flows at the very BCP.* For example, this is lane management. The possibility of removing a freight transport that needs a more detailed inspection to a separate lane from the general flow, which will not create congestions for other vehicles in the queue. A joint system of primary and secondary control, detours and additional connecting lines, especially between customs and border control, which will make it possible to change lanes depending on the accumulation of the vehicles. One free lane should be always available[19].
- ✓ *Risk management system.* Typification of cargo and vehicles depending on the risk. High- and medium-risk cargo and vehicles can be inspected in more detail. Other cargo and vehicles pass customs procedures faster without physical inspection[20]. The quickest possible identification of various types of traffic – local, priority, pre-authorized (declared) and others with a low level of risk and directing it according following a fast border crossing scheme. This allows as many vehicles as possible to be removed from the waiting area.
- ✓ *Use of ICT technologies and automation of procedures.* Many operations at the BCPs are carried out by human personnel in manual mode. For example, one of the most time-consuming procedures is the weighing of freight vehicles, recognition of vehicles, and radiation control. The introduction of automated systems at the entrance to the checkpoint can significantly reduce the time needed to cross the border. For example, implementation of the Weight in Motion system.
- ✓ *Electronic queue management system (e-QMS).* Queues can be moved into the virtual space by introducing e-services, when vehicles reserve a suitable time slot to cross a specific checkpoint. GoSwift is an example of such a service.
- ✓ *Development of infrastructure and equipment of the checkpoint*. Installation of technical devices for inspections (weighbridges, X-rays, scanners, license plate readers). Use of state-of-the-art information and communication technologies. For example, electronic window; introduction of the RFID system (Radio Frequency Identification System), automatic license plate recognition – ALPR, etc[21]. Design of the BCP, or its modernization according to the needs. For

[19] Zarnowiecki, M. Chapter 4. Borders, their design, and their operation *In Border Management Modernization*. Editors McLinden, G., Fanta, E., Widdowson, D., Doyle, T. The International Bank for Reconstruction and Development/The World Bank, 2011. 400 p.

[20] Identification of cargo flows on the Euro-Asian transport links. Transmitted by the "Scientific and Research Institute of Motor Transport" (NIAT), 2016, p. 246

[21] Pencheva, V., Asenov, A. Grozev, D., Angelova, R., Georgiev, I. (2018) Analysis of the Traffic Intensity of Cargo Vehicles in the Border Points. *TRANSPORT PROBLEMS*, 13 (4), 23-36. DOI: 10.20858/tp.2018.13.4.3

instance, if the BCP is identified as a profile for freight traffic flows, then it should be equipped accordingly.

- ✓ *Specialization of checkpoint,* or segmentation. That is, the distribution of passenger and freight traffic, the allocation of separate lanes for transit vehicles. The BCP must provide check-in and check-out functions. Import and export registration should be carried out at registration points within the country, distant from the BCP.
- ✓ Introduction of joint operations at checkpoints, implementation of the *"One Stop Shops"* concept. It is especially relevant for the movement of goods and vehicles across several countries and customs borders.
- ✓ *Human resources.* Increasing the number of service employees, synchronizing the activities of services and their shifts operating at the checkpoint (in the case of 24-hour checkpoints). Personnel training.
- ✓ *International cooperation.* Harmonization of legislation between countries, signing of international agreements, joint conventions (TIR, CIM, SMGS, NCTS). Harmonization of documents and procedures.

First of all, any of the measures listed above on the reduction of queues in front of the BCP will not bring the desired result if applied on a single-time basis and unsystematically. The issue of queues and flows is a complex challenge. Therefore, its solution requires a strategic vision of the development of the BCP network, a systemic approach (determining the role and place of each BCP in the network) and complex implementation of various measures. Secondly, modernization and development of BCP is impossible without the interest, intentions and approval of the adjacent party. An increase in traffic capacity within the competence of one state and, consequently, the flow increase on one side of the border will still face the inappropriate infrastructure and traffic capacity of the BCP of another state. This will inevitably lead to kilometre-long queues and congestions. Development of a network of checkpoints is the subject of agreements between at least two neighboring countries. The capacity of border infrastructure should be complementary and comparable to both sides of the border.

III. THE TRANSPORT AND LOGISTICS INFRASTRUCTURE OF UKRAINE ON THE BORDER WITH HUNGARY AND ROMANIA: ANALYSIS OF THE CURRENT STATE AND BOTTLENECKS

Development of the transport network in Ivano-Frankivska, Chernivetska and Odeska oblasts

Road network

All checkpoints for freight transport on the Ukrainian-Hungarian section of the border on the Ukrainian side have international level access roads. In particular, the international highway M06 (Chop – Kyiv), which passes through the regional centers of Zakarpatska, Lvivska, Rivnenska, Zhytomyrska and Kyivska oblasts, leads to the Chop (Tysa) - Záhony BCP. Also on M06 runs the international transport corridor Pan-European transport corridor V. Another branch of the corridor passes through the international highway M25 (Solomonovo — Jánosi), which is located at a 5-kilometer distance from the Chop (Tysa) - Záhony BCP, and leads to the passenger Koson–Barabás BCP. At the same time, M25 runs near the railway station "Batyovo" and through the international highway M24 is connected with the city of Mukachevo, Berehove and the other checkpoint on this section for freight road transport Luzhanka - Beregshuran.

At the Ukrainian-Romanian section of the border, access roads to the checkpoints for trucks are also of international significance, apart from the checkpoint for passenger and empty trucks Krasnoilsk - Vikovu de Sus BCP, which was opened at the end of 2022. The road of territorial significance T 2608 leads to it. At the same time, Dyakove - Halmeu BCP through the international highway M26 (Vylok — Dyakove - Halmeu BCP) is connected to the passenger checkpoint on the Ukrainian-Hungarian section of the border Vylok - Tisabech and the international highway M23 (Berehove — Velyka Kopanya). The international highway M19 (Domanove – Terebleche) runs from Porubne - Siret BCP, which goes through such important transport hubs as Chernivtsi, Ternopil, Lutsk and Kovel.

In addition, the international transport corridor of the TEN-T network "Baltic-Black Sea-Aegean Corridor" was extended through the territory of Ukraine through the Porubne - Siret BCP. It connects the following significant EU city nodes: Helsinki, Tallinn, Riga, Vilnius, Warsaw, Bucharest, Sofia and Athens. On the territory of Ukraine, it will run through Chernivtsi, Ternopil and Lviv and will connect on the Ukrainian-Romanian section of the border the Porubne-Siret BCP and on the Ukrainian-Polish section of the border the Krakivets - Korczowa BCP. Also, Porubne-Siret BCP may be reached by the international transport corridor "Baltic Sea - Black Sea".

In February 2023 at a distance of about 17 km from Porubne - Siret BCP a new international automobile checkpoint between Ukraine and Romania Dyakivtsi –

Rakovets BCP was opened, through which it is planned to first pass empty trucks and tanks, and later it will become a round-the-clock passenger one[22].

Rail network

Zakarpatska oblast is connected by railway network with neighboring European countries Slovakia, Hungary and Romania, as well as with the Ukrainian state railway network. The operational length of public railway track in the Zakarpatska oblast at the end of 2021 was 601 km. On the Ukrainian-Hungarian section of the border there are two checkpoints for railway transport: Chop (Druzhba) - Záhony BCP and Salovka - Epereshke BCP.

There is a 1435 mm gauge coming to Chop (Druzhba) - Záhony BCP, which goes farther in Ukraine to the station of Mukachevo. At this station there is a transshipment of transit cargo to Romania (Dyakove - Halmeu BCP). Transshipment is also carried out at the "Chop" freight distribution station. The main destination countries are Hungary, Italy, Austria, Serbia, Croatia, Bosnia and Herzegovina, Slovenia, Macedonia, Montenegro, Germany, France and Switzerland[23].

At the Salovka - Epereshke BCP there is international rail freight traffic to the same EU member states as from the Chop (Druzhba) - Záhony BCP. Reception and transmission on a 1520 mm gauge takes place at the station "Batyovo". The 1520 mm gauge goes farther in Hungary and connects with the stations of Eperjeske, Tornośpalci, Komoró and Záhony.

Along the 1435 mm gauge from the Chop (Druzhba) - Záhony BCP there is an international Pan-European transport corridor V, which runs near Salovka - Epereshke BCP through the station "Batyovo". Also, Chop (Druzhba) - Záhony BCP is part of the international transport corridor "Baltic Sea – Adriatic Sea", which in Chop is combined with the international transport corridor "Rhine – Danube" and goes to the city of Lviv.

On the Ukrainian-Romanian section of the border in the Zakarpatska oblast there is a railway Dyakove - Halmeu BCP, which receives and transfers goods along the gauges of 1520 mm and 1435 mm. The 1520 mm gauge goes 6 km deep into the territory of Romania, and the 1435 mm gauge goes deep into the territory of Ukraine and is used for transit traffic[24]. At the same time, two types of gauges are superimposed on each other, which allows transportation without usage of transshipment terminals, but the passage of trains is possible only alternately[25]. The main transportation

[22] Na kordoni Ukrayiny z Rumuniyeyu rozpochynaye robotu KPP «Dyakivtsi» ["Dyakivtsi" checkpoint begins work on the border of Ukraine with Romania]. Ukrinform website. URL: https://www.ukrinform.ua/rubric-regions/3668354-na-kordoni-ukraini-z-rumunieu-rozpocinae-robotu-kpp-dakivci.html [In Ukrainian]

[23] Cpetsializatsiya prykordonnykh stantsiy zaliznyts′ Ukrayiny na prykordonnykh perekhodakh z zaliznytsyamy tretikh krayin [Specialization of border stations of Ukrainian railways at border crossings with railways of third countries]. Ukrzaliznytsia website. URL: https://uz.gov.ua/cargo_transportation/general_information/border_stations/ In Ukrainian]

[24] Ibid

[25] Otsinka funktsionuvannya merezhi punktiv propusku cherez derzhavnyy kordon u Zakarpat·s′kiy oblasti : naukovo-analitychna dopovid′ [Assessment of the functioning of the network of checkpoints across the state border in the

destinations are Romania, Serbia, Croatia, Bosnia and Herzegovina, Slovenia, Macedonia, Montenegro and Bulgaria.

The operational length of general railway tracks at the end of 2021 in Ivano-Frankivsk and Chernivtsi regions was 494 km and 413 km respectively. Chernivtsi and Ivano-Frankivsk regions carry out international freight rail transportation through the Vadul-Siret - Vicșáni BCP in the direction of Romania, Bulgaria, Serbia, Croatia, Bosnia and Herzegovina, Slovenia, Macedonia and Montenegro. Acceptance and transfer of goods occurs on two types of gauges 1520 mm and 1435 mm. The 1435 mm gauge goes 6.6 km deep into the territory of Ukraine to the "Vadul-Siret" station, and the 1520 mm track – to the Dornesti station in Romania.[26].

The international TEN-T network transport corridor "Baltic Sea - Black Sea - Adriatic Sea", running to Ivano-Frankivsk and Lviv, will go through the Vadul-Siret - Vicșáni BCP. Another branch of this corridor will run through Odesa region in the direction of the Black Sea ports and the border with Moldova.

In 2022, the Ukrainian-Romanian section of the border started restoration of the railway infrastructure to two checkpoints for passenger and freight transportation Teresva-Campulung la Tisa and Dilove – Valya Vysheului BCPs. At the beginning of 2023 they were already in operation for passenger traffic. At the same time, the operation of these checkpoints for cargo transportation with the possibility of transshipment of goods on the territory of Romania will reduce the workload on existing checkpoints on the Ukrainian-Romanian section in the near future[27].

Inland waterway network

In the Odeska oblast there is an international checkpoint between Ukraine and Romania, cargo transportation including, Orlivka - Isaccea BCP. Here there is a ferry complex, equipped with a multifunctional, two-level berth. It is located 900 m from the Romanian transshipment terminal "Isaccea". The berth can receive transport every 15 minutes, and the ferry can accommodate 30 cars and 6 trucks[28]. The international highway M15 runs from the checkpoint in the direction of Odesa. The international TEN-T network transport corridor "Rhine – Danube" runs along the Danube River, where Orlivka - Isaccea BCP is located.

Zakarpatska oblast: scientific and analytical report]. IRR NAS of Ukraine. URL: https://ird.gov.ua/irdp/p20190041.pdf [In Ukrainian]

[26] Cpetsializatsiya prykordonnykh stantsiy zaliznyts′ Ukrayiny na prykordonnykh perekhodakh z zaliznytsyamy tretikh krayin [Specialization of border stations of Ukrainian railways at border crossings with railways of third countries]. Ukrzaliznytsia website. URL: https://uz.gov.ua/cargo_transportation/general_information/border_stations/ [In Ukrainian]

[27] Rumuniya vidnovyla chastynu shyrokokoliynoyi zaliznytsi do Zakarpattya [Romania has restored a part of the broad-gauge railway to Zakarpattia]. Karpat·s′kyy ob″yektyv [Carpathian lens]. URL: http://ekonomika.ko.net.ua/?p=26686 [In Ukrainian]

[28] Poromnyy kompleks Orlivka – Isakcha [Ferry complex Orlivka – Isakcha]. Porom.org. URL: https://www.porom.org [In Ukrainian]

Development of economic nodes / economic centers in Zakarpatska, Ivano-Frankivska, Chernivetska and Odeska oblasts

The unique location of the Zakarpatska oblast not only makes it relatively safe under current war conditions, but also creates all the prospects for it to become the largest transport and logistics hub in Ukraine. However, this requires a developed transport and logistics infrastructure that would effectively ensure the movement of passengers and cargo flows.

Nowadays the region has three industrial parks, which are located near the borders with Romania, Hungary and Slovakia. Two of them have already been created in the conditions of a full-scale war of the russian federation against Ukraine. Before that, there was industrial park "Solomonovo", which was registered on June 6, 2014 and is a high-tech platform for automotive production, which houses enterprises of medium and precision engineering industries. The management company is "Sezparkservis", which specializes in the construction of residential and non-residential buildings[29].

The industrial park "Solomonovo" belongs to the industrial parks of Ukraine, which have a highly developed engineering and transport infrastructure[30]. In particular, the industrial park is located within a radius of 2 km to the railway checkpoints on the border with Slovakia (Chop (Strazh) – Čierna nad Tisou) and Hungary (Chop (Druzhba) - Záhony). Nearby there are also 2 checkpoints for road freight traffic: Chop (Tysa) - Záhony – on the border with Hungary; Uzhhorod – Vyšné Nemecké – on the border with Slovakia; at 65 km distance is the Pan-European transport corridor V. The industrial park covers an area of 66,2 hectares and is provided with electricity, water and gas supply, sewage treatment plants, fire protection, internal roads and railway tracks (4 tracks (1435/1520 mm) - EU and CIS). The park has its own railway terminal.

The second industrial park in the Zakarpatska oblast "Maramures" is included in the Register of Industrial Parks on June 3, 2022[31]. The industrial park is located on the area of 33.2063 hectares in the village of Bila Tserkva, Solonkivska territorial community, near the border with Romania. It is 4.7 km to the nearest checkpoint Solotvyno - Sighetu Marmației; 19.5 km – to the nearest cargo checkpoint Teresva - Campulung la Tisa and 25.7 km – to Dilove - Valya Vysheului BCP. Transportation can be carried out on the highway of national significance H09, which runs at a distance of 1 km from the industrial park "Maramures". Also, the railway station "Solotvyno"

[29] Industrial′nyy park Solomonovo. Pro nas [Solomonovo Industrial Park. About us]. Solomonovo Industrial Park website. URL: https://www.solomonovoindustrialpark.com/portfolio-2 [In Ukrainian]

[30] Industrial′ni parky v Ukrayini - 2022 rik [Industrial parks in Ukraine – 2022]. Ministry of Economy of Ukraine website. URL: https://www.me.gov.ua/Documents/Detail?lang=uk-UA&id=47454ed4-b60a-4f37-bb77-b7f3127742f8&title=Industrialni ParkiVUkraini2022-Rik [In Ukrainian]

[31] The Cabinet of Ministers of Ukraine. Rozporyadzhennya vid 3 chervnya 2022 r. № 453-p [Order of June 3, 2022 № 453-p]. Legislation of Ukraine website. URL: https://zakon.rada.gov.ua/laws/show/453-2022-p#Text [In Ukrainian]

is located nearby (the distance is 3 km). The main entrepreneurship areas in the industrial park are woodworking, furniture and machine-building industries[32].

At the end of 2022 another industrial park “Uzhhorod” was registered, which is located within the city of Uzhhorod and occupies an area of 10.1907 hectares. Its main specialization is the processing industry[33]. As it is known, Uzhhorod is located near the border with Slovakia, which in the future will also contribute to the establishment of foreign economic activity in the processing sector for participants of the industrial park.

Also in 2023 it is planned to create an industrial park in the Tyachiv territorial community, near the border with Romania. In particular, a memorandum of cooperation was signed with ten Ukrainian, Polish, German and Turkish enterprises; permit was received from Ukrzaliznytsia to create a separate railway branch to the territory of the future industrial park; an access road was built and gas and electricity supply was provided[34].

The important transport hubs in the region are Chop, Uzhhorod, Mukachevo and Batyovo, and a potential transport hub may be the town of Rakhiv. In 2021 the design documentation was developed for the restoration of the previously dismantled a 1435 mm Eurogauge from the Chop station to Uzhhorod[35]. The road was also restored in the village of Batyovo.

The logistics hub “Chop” of “Agroenergoinvest” operates at “Chop” railway station, reloading various types of cargo from wide-gauge carriages to European gauge cars and vice versa; trucks to rail cars and vice versa; rearranging '20' and '40' feet containers from wide-gauge platforms to European platforms and vice versa. On average, the logistics hub serves 50 freight cars and 100 containers per day[36].

Also in the city of Chop there is a transshipment terminal “PAKOBO” (EXPORTTRANSBUD company), which carries out transshipment of various types of cargo, in particular, in containers, bags, on pallets, bulk, from euro cars to motor vehicles and vice versa.

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[32] Kontseptsiya industrial′noho parku «Maramuresh», Zakarpat·s′ka oblast′, Tyachivs′kyy rayon, Solotvyns′ka terytorial′na hromada, selo Bila Tserkva [Concept of industrial park "Maramuresh", Zakarpatska oblast, Tyachiv district, Solotvy territorial community, Bila Tserkva village]. Solotvyn settlement council website. URL: https://solotvino-rada.gov.ua/industrialnij-park-10-36-55-15-09-2022/ [In Ukrainian]

[33] «Uzhhorod» stav 60-m industrial′nym parkom v ukrayins′komu Reyestri novykh promyslovykh maydanchykiv ["Uzhhorod" became the 60th industrial park in the Ukrainian Register of new industrial sites]. Government portal. URL: https://www.kmu.gov.ua/news/uzhhorod-stav-60-m-industrialnym-parkom-v-ukrainskomu-reiestri-novykh-promyslovykh-maidanchykiv [In Ukrainian]

[34] Industrial′nyy park planuyut′ stvoryty u 2023 rotsi v Tyachevi [An industrial park is planned to be created in 2023 in Tyachevo]. Ekorayon [Ecoregion]. URL: https://eco.rayon.in.ua/news/574109-industrialniy-park-planuyut-stvoriti-u-2023-rotsi-v-tyachevi [In Ukrainian]

[35] Uzhhorod stane pryvablyvym transportnym khabom i lohistychnym tsentrom na kordoni z YES [Uzhhorod will become an attractive transport hub and logistics center on the border with the EU]. The website of the city of Uzhhorod. URL: https://www.0312.ua/news/3283005/uzgorod-stane-privablivim-transportnim-habom-i-logisticnim-centrom-na-kordoni-z-es [In Ukrainian]

[36] Lohistychnyy khab «Chop» kompaniyi «Ahroenerhoinvest» [Logistics hub "Chop" of the company "Agroenergoinvest"]. URL: http://agroenergoinvest.com/#rec444214484 [In Ukrainian]

At the station Batyovo there is a terminal for the transshipment of liquefied gas under the management of the GT Group company[37].

At the same time, several logistics hubs for the delivery of humanitarian goods have been created in the Zakarpatska oblast[38]. In particular, this is a logistics humanitarian hub on the basis of the "Eurocar" plant, which is the official manufacturer of Škoda cars in Ukraine and, together with the 'Solomonovo" industrial park, is part of the Transcarpathian Automobile Cluster.

Transcarpathian Automobile Cluster has 14 enterprises of the automotive industry (among them, the Ukrainian-Austrian enterprise "Fischer-Mukachevo", the Singapore company Flex, Jenterm Ukraine, Yazaki Ukraine, etc.), which, together with the educational institutions and local authorities are working to create a competitive environment for the development of the automotive industry in Zakarpatska oblast[39].

Zakarpatska oblast has about 6.5 thousand enterprises. At the same time, in the first half of 2022, about 400 enterprises were relocated here. Most of the relocated enterprises are IT companies (52%), but there are also enterprises for the production of furniture, construction, electronic and optical products, machinery and equipment, computer equipment, textile industry, recycling, provision of services, etc. Some of them are engaged in the export of products. About 20% of relocated enterprises are ready to work in industrial parks[40].

There are eight industrial parks near the Ukrainian-Romanian border, which are included in the Register of Industrial Parks: one in the Zakarpatska oblast, two in the Ivano-Frankivska oblast, three in Chernivetska oblast and two in Odeska oblast. Several of them were registered only in 2022 (see Annex C, Table C.1).

At the same time, the number of industrial parks may increase in the near future. In particular, in Ivano-Frankivsk region in 2022 Kalush City Council decided to create the industrial park "Bodnariv", and in early March 2023 – the industrial park "Galicia"; also in the second half of 2022 Horodenka City Council decided to create the industrial park "CORN Claster", which will specialize in corn processing. In addition, there is a private industrial park "Arkan" in the region. In 2023 Chernivtsi City Council decided to create the industrial park "Chernivtsi". Also, the following industrial parks are

[37] GT Group bere v orendu zaliznychnu perevalku na Zakarpatti. [GT Group leases a railway transshipment in Transcarpathia]. DP "DERZHZOVNISHINFORM". URL: https://dzi.gov.ua/press-centre/news/gt-group-bere-v-orendu-zaliznychnu-perevalku-na-zakarpatti/ [In Ukrainian]

[38] UZ vidkryla «haryachu» liniyu dlya transportuvannya humanitarnoyi dopomohy [UZ opened a "hot" line for the transportation of humanitarian aid]. Rail.insider. URL: https://www.railinsider.com.ua/uz-vidkryla-garyachu-liniyu-dlya-transportuvannya-gumanitarnoyi-dopomogy/ [In Ukrainian]

[39] Zakarpat·s′ka avtoklasterna initsiatyva [Zakarpattia Autocluster Initiative]. Zakarpattia automotive cluster website. URL: http://aczak.com.ua [In Ukrainian]

[40] Relokatsiya: zdobutky zavdyaky spivpratsi z mistsevoyu vladoyu [Relocation: gains through cooperation with local authorities]. Government Courier website. URL: https://ukurier.gov.ua/uk/articles/relokaciya-zdobutki-zavdyaki-spivpraci-z-miscevoyu/ [In Ukrainian]

planned to be created in the territorial communities of the Odesa region: Znamianskyi (Znamianska TC[41]), Budzhak (Suvorivska TC), Kremidivka (Dobroslavska TC).

Odesa region concentrates large logistics centers, in particular, the transport and logistics center "Bilgorod-Dniestrovskyi Sea Trade Port", "Chornomorskyi Logistics Center", "Odesa Transport and Logistics Center"; in Chernivtsi region – the logistics hub "Agromarket Fruktovyi". In the regions bordering Romania there are also several logistics centers for humanitarian goods.

Transshipment and container terminals, dry port exists only in Odesa region, among them: in Odesa seaport there are two container terminals and there is a "Dry Port"; cargo complex "Greenline Transshipment" for agricultural products transshipment, storage and stuffing; Container Terminal "Viking Alliance" in Reni; SE "Container Terminal Odesa"; LLC Grain transshipment terminal "Borivage".

In addition, the construction of the second stage of the Vadul-Siretsky grain terminal in the Chernivtsi region is underway[42], and the construction of a terminal for grain cargo transshipment in the city of Izmail of Odesa region is also being completed[43]. There are plans to build a cargo terminal near Orlivka - Isaccea BCP [44].

Development of the network of checkpoints on the sections of the state border Ukraine-Hungary and Ukraine-Romania

The Ukrainian-Hungarian section of the border over the past five years passes an average of 11.1% of all freight carriages across the Ukraine-EU border, while the Ukrainian-Romanian section of the border accounts for 6.9%. Among the four railway checkpoints on these sections of the border, the largest share of freight cars on average over the past five years fell on the Salovka - Epereshke BCP – 9.4% of the total number of freight cars from / to the EU member states. In 2022, in absolute and relative terms, almost all railway checkpoints increased the passage of freight cars to the maximum value over the past five years. Only in Salovka - Epereshke BCP the peak in relative terms was in 2020 (10.6%). In 2022, compared to 2021, the share of these crossing points in the total passage of cars at the Ukraine-EU border increased from 1.1 to 2.2% (see Fig. 3.1).

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[41] Znamianska TC (TC – territorial community, one of the administrative units of Ukraine)

[42] Piv mil′yona podatkiv i potreba stoyanky: yak pratsyuye zernovyy terminal u hromadi na Bukovyni [Half a million taxes and the need for a parking lot: how a grain terminal works in a community in Bukovyna]. Suspil′ne novyny [Social news]. URL: https://suspilne.media/404387-piv-miljona-podatkiv-i-potreba-stoanki-ak-pracue-zernovij-terminal-u-gromadi-na-bukovini/ [In Ukrainian]

[43] V Odes′kiy OVA, popry viynu, pratsyuyut′ nad rozvytkom rehionu iz zaluchennyam dlya ts′oho neobkhidnykh resursiv ta investytsiy [In Odesa OMA, despite the war, they are working on the development of the region, attracting the necessary resources and investments for this]. Odesa State Administration website. URL: https://oda.od.gov.ua/v-odeskij-ova-popry-vijnu-praczyuyut-nad-rozvytkom-regionu-iz-zaluchennyam-dlya-czogo-neobhidnyh-resursiv-ta-investyczij/ [In Ukrainian]

[44] Viyna zmusyla pryshvydshytys′: Yak poromna pereprava Orlivka-Isakcha peretvoryuyet′sya na port na Dunayi [The war forced to speed up: How the Orlivka-Isakcha ferry crossing turns into a port on the Danube]. ЦТС. URL: https://cfts.org.ua/articles/viyna_zmusila_prishvidshitis_yak_poromna_pereprava_orlivka_isakcha_peretvoryuetsya_na_port_na_duna_1953 [In Ukrainian]

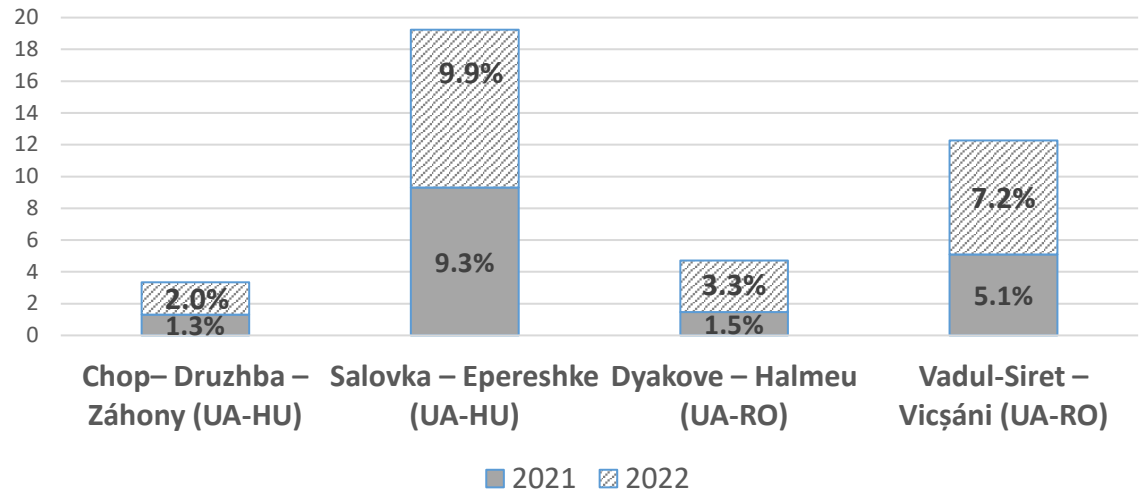


Fig. 3.1. The share of passed freight cars on the Ukrainian-Hungarian and Ukrainian-Romanian sections of the border in the total flow of freight cars across the Ukraine-EU border in 2021-2022

Source: own elaboration based on data from the State Customs Service of Ukraine (2023).

In 2022, compared to 2021, Chop (Druzhba) - Záhony BCP increased the passage of cars by 89.7%, Salovka - Epereshke BCP - by 30.1%, Dyakove - Halmeu BCP - by 171.1%, Vadul-Siret - Vicșáni BCP - by 71.7%. It should be noted that a significant share of freight cars crosses the Ukrainian-Hungarian section of the border at Salovka - Epereshke BCP (83% in 2022), and the Ukrainian-Romanian section of the border at Vadul-Siret - Vicșáni BCP (68.8% in 2022). The same trends remain with respect to the volumes of cargo that went through these checkpoints.

On average, over the past five years the Ukrainian-Hungarian section of the border accounts for 15.2% of controlled trucks from / to neighboring EU member states. At the Ukrainian-Hungarian automobile border crossing points, more than 95% of vehicles go to the EU through the Chop (Tysa) - Záhony BCP. The Ukrainian-Romanian section for the above-mentioned period on average passes 16.2% of trucks in relation to the total pass capacity through the Ukraine-EU border. In this area, Porubne - Siret BCP passes more than 60% of trucks. Among all the checkpoints on the Ukrainian-Hungarian and Ukrainian-Romanian sections of the border, the largest share of the contolled trucks in 2022 fell on Porubne-Siret BCP – 14.7% in relation to the total border control between Ukraine and the EU. However, the largest value of this indicator fell on 2019 for Chop (Tysa) - Záhony BCP and amounted to 20.6%.

In 2022, compared to 2021, the passage of freight transport in the Ukrainian-Hungarian section decreased in relation to the general passage from / to the EU member states, while in the Ukrainian-Romanian section of the border it increased, except for the Dyakove - Halmeu BCP. The decrease in the Ukrainian-Hungarian border crossing is primarily caused by a reduction in transit flows due to military aggression, especially in the first half of 2022. The share of passed trucks in transit fell 4.6 times at Chop (Tysa) - Záhony BCP (in 2021, the share of transit traffic through the checkpoint was

6.8% against 1.4% in 2022), and in Dyakove - Halmeu BCP – 5.1 times (49.4% in 2021 against 8.6% in 2022). It should be noted that the transit direction of entry "to Ukraine" prevails at all checkpoints in 2018 – 2022, except for 2018 and 2019 when transit in the direction 'from Ukraine" prevailed in the Chop (Tysa) - Záhony BCP, and in 2021 in the Dyakove - Halmeu BCP. At the same time, Dyakove - Halmeu BCP refers to checkpoints with high load, which also does not allow it to significantly increase cargo flows. However, such a reduction did not affect other checkpoints due to a significant increase in non-transit flows.

Figure 3.2 shows changes in the passage of trucks through the crossing points of the Ukrainian-Hungarian and Ukrainian-Romanian sections of the border for 2021-2022.

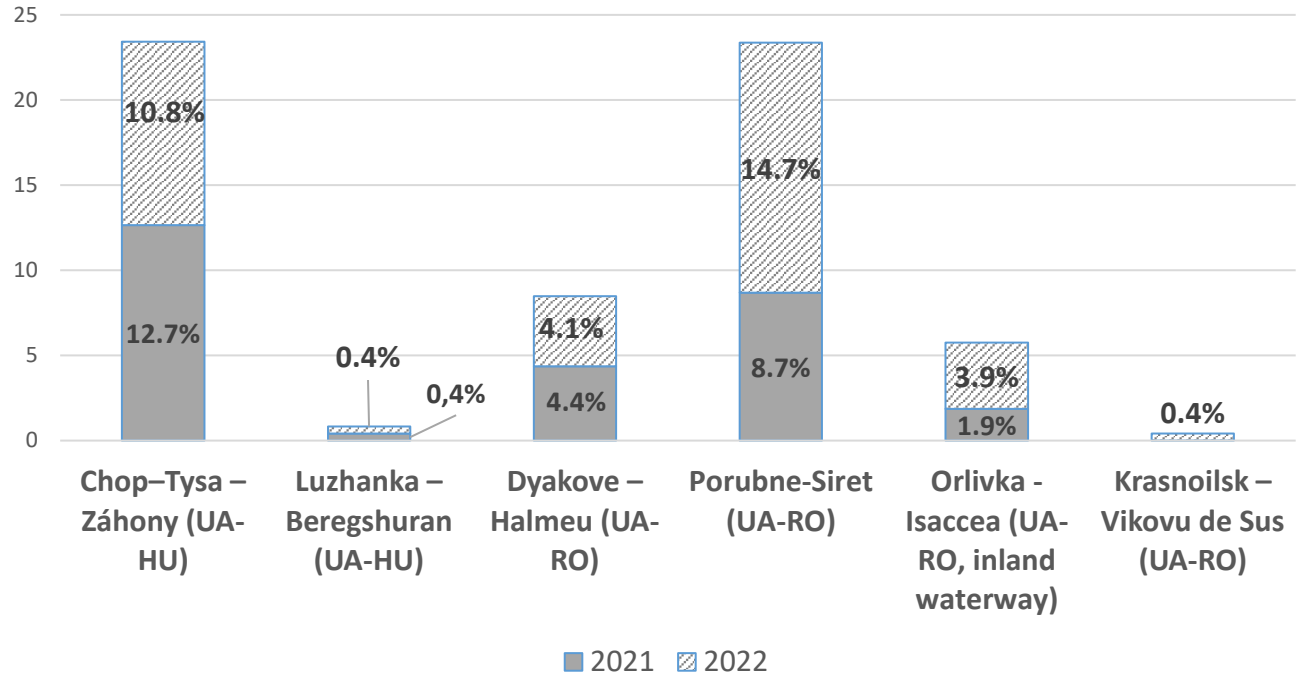


Fig. 3.2. The share of passed trucks on the Ukrainian-Hungarian and Ukrainian-Romanian sections of the border in the total flow of freight vehicles across the Ukraine-EU border in 2021-2022

Source: own elaboration based on data from the State Customs Service of Ukraine (2023).

In 2022, compared to 2021, the number of trucks that passed through Chop (Tysa) - Záhony BCP increased by 2.5% (absolute value), Luzhanka - Beregshuran BCP by 25.7%, Dyakove - Halmeu BCP - 13.1%, Porubne - Siret BCP - 103.2%, Orlivka - Isaccea BCP - 151.4%. Also, at the end of 2022, the Krasnoilsk - Vikovu de Sus BCP started operating, the share of which for this period in the total flow of trucks is 0.4%.

The structure of the flows of trucks and freight cars "from Ukraine" and "to Ukraine" is mainly distributed 50/50. Only in 2018, the distribution of freight transport was: 29.7% in the direction "to Ukraine" against 70.3% - "from Ukraine" in Chop (Druzhba) - Záhony BCP and 64.2% "to Ukraine" against 35.8% "from Ukraine" in Luzhanka - Beregshuran BCP.

The volume of cargo at all checkpoints also increased. In 2022, the largest increase in cargo volume by 3.9 times was observed in the Orlivka - Isaccea BCP.

The workload level at the checkpoints on the Ukrainian-Hungarian and Ukrainian-Romanian sections of the border is characterized by a variable trend, which depends on the volume of cargo traffic and the infrastructure capabilities of the checkpoint to handle this cargo traffic. The busiest among the points for railway transport are Salovka - Epereshke and Vadul-Siret - Vicșáni BCPs. However, their actual average daily load does not exceed the planned load and is 30-35% (see Annex C, Table C.2). However, in 2022, there was a significant accumulation of freight cars in front of the checkpoints, for example, on October 31, the queue in front of Salovka - Epereshke BCP was 3,247 freight cars, and in front of Vadul-Siret - Vicșáni BCP – 1,239 cars. Some freight cars have been waiting for delivery since spring. The accumulation of cars at the border of Ukraine occurs due to certain technical restrictions, in particular, weight restrictions on the axis. One of the reasons for the accumulation of rolling stock at the railway station Solovka- Eperjeske were the cars of carriers of the russian federation and belarus (about 480 units).

The busiest checkpoints are on the Ukrainian-Hungarian section of the border. The average daily load of Chop (Tysa) - Záhony BCP was more than 130% in 2018 and 2019, in 2020-2022 the average daily load decreased to 90%. In 2022, the actual average daily load of the Porubne - Siret and Orlivka - Isaccea BCPs exceeded the planned one, although in previous years these checkpoints could not be loaded by half (see Annex C, Table C.2).

The bottlenecks in *Hungary-Ukraine* and *Romania-Ukraine* rail/road connectivity

The main obstacles to the effective operation of checkpoints and preventing the accumulation of vehicles in front of them are the underdevelopment of the border infrastructure and the lack of technical equipment:

- Insufficient capacity of existing checkpoints on both sides of the border (Chop–Tysa – Záhony BCP, Orlivka – Isaccea BCP);
- Insufficient number of checkpoints for cargo transport, especially on the Ukrainian-Romanian section of the border;
- Unpreparedness of the logistics system of neighboring countries to accept such a quantity of cargo;
- Not enough transshipment capacity in Ukraine and EU (insufficient transshipment capacities in Zakarpatska and Chernivtsi oblasts, and also there are no transshipment terminals near the Orlivka - Isaccea BCP);
- Different track widths;
- Outdated technical support of checkpoints (for example, Chop (Druzhba) – Záhony BCP - required by electronic scales (in dynamics and statics) with

tracking (recognition) cameras, reading with subsequent transmission of information, regarding the number of the freight car and its weight[45]);

- Lack of scanning equipment (Dyakove – Halmeu BCP (rail), Dyakove – Halmeu BCP (automobile));
- Undeveloped transport and logistics infrastructure in Chernivetska and Ivano-Frankivska oblasts;
- Not enough trolleys to change the wagons;
- Delays in returning empty rolling stock;
- Inadequate awareness of the conditions of customs border crossing;
- Power outage in the second half of 2022.

Recommendations on the ways of increasing the capacity of border infrastructure for freight transportation

The uninterrupted and uniform passage of passengers and cargo flows primarily requires the effective functioning of border crossing points, which depends on the institutional, infrastructural and organizational support of their activities. Over the past year Ukraine made some progress at the institutional level which has greatly simplified the crossing of freight transport across the Ukraine-EU border. Support of the European Union, in particular through the "Ways of Solidarity" initiative, the accession of Ukrainian routes to the TEN-T network logistics routes maps, signing of the "transport visa-free" agreement with Ukraine for automobile transport, etc., and bringing a number of documents in line with the European standards by Ukraine contributes to the integration of the Ukrainian transport system with the EU transport system. At the same time, Ukraine should make efforts to implement the Association Agreement between Ukraine and the EU in the transport sector, as at the end of 2022, the overall progress of implementation in the field of transport, transport services, postal and courier services is only 53%[46]. In addition, it is necessary to implement the following measures that would increase the efficiency of checkpoints:

- ***Monitoring and evaluation of checkpoints.*** It is necessary to periodically assess the work of each checkpoint, and based on the assessment determine the specifics, advantages and disadvantages of the process of implementing border and customs procedures, as well as the state of the existing and the need for new technical equipment. Based on this, plan and implement plans to increase the efficiency of each individual checkpoint.
- ***Construction of perspective checkpoints.*** In cooperation with the state authorities of the neighboring countries identify potential checkpoints at each section of the

[45] State Customs Service website. URL: https://map.customs.gov.ua/?locationTypes=1#712 [In Ukrainian]

[46] Oprylyudneno shchorichnyy Zvit pro vykonannya Uhody pro asotsiatsiyu Ukrayina-YES [The annual Report on the Implementation of the Ukraine-EU Association Agreement was published]. Government portal. URL: https://www.kmu.gov.ua/news/opryliudneno-shchorichnyi-zvit-pro-vykonannia-uhody-pro-asotsiatsiiu-ukraina-ies [In Ukrainian]

border and agree on the action plan for their construction based on the modeling of traffic flows through the checkpoint.

- ***Increase motorists' awareness of the conditions of crossing checkpoints.*** It is possible to increase the motorists' awareness by sending an e-mail to exporting companies or other stakeholders who sign up for the newsletter, with the information about the changes in the work of checkpoints and the basic rules for border crossing and the list of documents necessary for this.
- ***Electronic queue.*** The electronic queue should be formed in an automated mode and take into account the priority of crossing the border. The introduction of an electronic queue for crossing the border by freight transport at each checkpoint will allow unloading the roads in front of them and free up time for carriers to perform other tasks.
- ***Control of cargo traffic by reverse movement.*** One can control cargo traffic through reverse traffic, that is, depending on the availability of cars at the entrance or exit one can open additional lanes for more cars and, at the same time, close lanes for fewer cars.
- ***The interaction of border crossing points management bodies*** will contribute to the improvement of their activities through the exchange of technologies and the introduction of better ones on both sides of the border.
- ***Technical equipment.*** Checkpoints on the Ukrainian-Hungarian and Ukrainian-Romanian sections of the border require the purchase of scanning equipment (Dyakove - Halmeu BCP (automobile and rail)); weighing equipment (Dyakove - Halmeu BCP (railway), Vadul-Siret - Vicșáni BCP, Chop (Druzhba) - Záhony BCP); X-ray unit (Chop (Druzhba) - Záhony BCP); unloading and loading equipment for cargo inspection (Vadul-Siret - Vicșáni BCP); introduction of a new technology for cargo transportation using the system of automatic change of distance between the wheels of the carriage — SUW 2000 (Chop (Druzhba) - Záhony BCP); high-quality lighting for customs control (Salovka - Epereshke BCP, Vadul-Siret - Vicșáni BCP)[47].
- ***Ensuring proper working conditions for customs and border services***. Employees of checkpoints should have safe and comfortable working conditions. In particular, Dyakove - Halmeu BCP (automobile) requires reconstruction of the premises, and a high covered cargo platform (ramp) for the inspection of goods shipped in covered freight cars is in an emergency condition[48].
- ***Development of transshipment terminals and warehouses near checkpoints.*** The development of the border infrastructure should be systemic. The initiative can come both at the oblast level and at the community level. There is a need for

[47] State Customs Service website. URL: https://map.customs.gov.ua/?locationTypes=1#712 [In Ukrainian]
[48] Ibid

transshipment terminals and warehouses near Orlivka - Isaccea BCP, as well as at the BCP in Chernivtsi region.

- ***The development of border infrastructure***. In particular, there is only one road leading to the Orlivka - Isaccea BCP, it is necessary to build an additional road to make the existing one less busy. In Dyakove - Halmeu BCP (railway) it is possible to repair the seventh-eighth track of the railway station for the cars to be able to go to the observation deck. Salovka - Epereshke BCP has a need for cargo inspection platform[49].
- ***A sufficient number of qualified personnel.***

[49] Ibid

IV. CURRENT SITUATION AT POLISH-UKRAINIAN BORDER CROSSING POINTS

The Russian invasion of Ukraine, which actually began in 2014, is a flagrant violation of international law and fundamental values for the peace and sovereignty of an independent state. The scale of Russian crimes against the people of Ukraine is a violation of the UN Charter and is a brutal manifestation of Russia's revisionism in its purest form. The restoration of Ukraine's independence in 1991 and the establishment of a pro-Western geopolitical policy were years of political division, which was unquestionably exploited by Russia. Ukraine today is at war with the biggest aggressor and political criminal that is Putin. Ukraine is not alone. Most countries in the modern world that respect the values of freedom, sovereignty and peace are united with Ukraine. Poland, as well as other EU countries, are involved in humanitarian and military aid, which is most needed by Ukraine today.

To this end, joint solutions are being undertaken with the Ukrainian side in order to effectively create the best possible network of road, rail and air transport infrastructure to facilitate all types of transport between EU countries and Ukraine. Ukraine's accession to EU membership as soon as possible will unquestionably facilitate this process. However, for the process of building a good road, rail and air transport infrastructure to be completed in full, the war must come to an end. The time of today's activities by the EU countries is to be used analytically and strategically to work out the best possible transport solutions both in the current political situation resulting from the provision of mainly humanitarian and military aid, and in the situation that is to come, namely the economic one, related to the rapid reconstruction of Ukraine damaged by the war.

Analysis of the existing border infrastructure on the Polish-Ukrainian border

The war in Ukraine has shown that the east-west connection requires continuous modernisation. Today, it can be said that the construction of the A-4 motorway has practically connected the western border with the well-developed infrastructure of the border crossings of the Podkarpackie Voivodeship. The two large border crossings in Medyka and Korczowa, which handle freight, rail and passenger traffic, are today best prepared to handle the international transport of EU and Ukrainian countries for entry and exit. As the capital of the province, Rzeszów acts as the logistics centre for humanitarian aid in the province. It is at Rzeszów-Jasionka airport that military equipment from all over the world is transshipped, which is then transported to Ukraine by road. The Podkarpackie Voivodeship has become a capital and logistics hub for global humanitarian and military aid. The border clearance policy in the Lubelskie and Podkarpackie Voivodeships is primarily geared towards building solutions to facilitate border clearance as quickly as possible, in particular for goods clearance above 7.5

tonnes. The mode of clearance for pedestrian traffic into the Poland is still maintained at all crossing points, which is intended to relieve passenger vehicle traffic of up to 3.5 tonnes and thus not generate queuing times for border checks. In addition, this check-in model targets refugees from Ukraine without means of transport.

Tens of kilometres of trucks can be seen at most Ukrainian checkpoints on the border with Poland. Such a situation became usual after Russia's invasion of Ukraine. In order to reduce truck queues at the border, the Ukrainian government has initiated the 'Open Border' programme, which is dedicated to improving the infrastructure of eight automobile border crossings points. First of all, the action plan includes the creation of more opportunities to separate different types of vehicles (cars, buses, trucks). This means that more gates dedicated to lorries will be put in place at the crossings and some of them will be focused on handling specific types of vehicles: cars or lorries. Such solutions have already been introduced at Polish border crossings. The border crossings at Krościenko and Budomierz have been dedicated to the clearance of vehicles up to 7.5 t. As part of the "Open Border" project the infrastructure of the newly constructed Malhovice - Nizhankovice border crossing point was made and the checkpoint was opened for the movement of empty vehicles over 7.5 tonnes (TIR) in both directions. On the other hand, the clearance of vehicles above 7.5 t was directed to the border crossings in Korczowa and Medyka[50]. The Krakowec - Korczowa checkpoint was modernised and its capacity increased. In addition, an infrastructural solution was implemented to reduce queues at the Yahodyn - Dorohusk BCP.

These activities are primarily aimed at improving freight traffic for vehicles above 7.5 t. In addition, the possibilities of the infrastructure of the border crossing in Korczowa were used to improve the traffic of passenger vehicles, with the implementation of a highway terminal at check-in. The measurability of these activities can be seen in the waiting time for clearance in the direction of entry into the Poland, which has significantly decreased. Similar solutions have been introduced in the Lublin Voivodeship at the largest border crossing point Dorohusk-Yagodyn. However, due to the conditions and location of the crossing and the available infrastructure, designated border clearance lanes were put in place, exclusively for the clearance of vehicles above 7.5 t. In addition, passenger vehicle traffic excluding coaches and heavy goods vehicles up to 7.5t is directed to clearance at the Budomierz and Zosin border crossings. At the border crossing point in Hrebenne, only clearance of passenger vehicles and trucks over 7.5 t is applied.

In order to meet the challenge of exporting agricultural products in particular, over the past year Poland has taken a number of measures aimed at improving the flow of goods across the border with Ukraine. These included, inter alia, separating passenger

[50] Yermolenko, H. Ukraine has restored two railway sections on the border with Poland. *GMK.Center*. Published on 17 February 2023. URL: https://gmk.center/en/news/ukraine-has-restored-two-railway-sections-on-the-border-with-poland/

and freight traffic at the Korczowa-Krakowiec (Podkarpackie Voivodeship) road PL/UA A4/94 – M10 border crossing, transforming the Dorohusk-Jagodzin crossing (Lubelskie Voivodeship) road PL/UA S12 – E373 into a freight border crossing, and launching, as of 13 February this year, at the Malhowice-Nizankowice (Podkarpackie Voivodeship) road PL/UA 885 – T1418, border crossing in the Przemyśl district, the clearance of unloaded trucks with a permissible gross weight of over 7.5 tonnes. Vehicles carrying humanitarian aid to Ukraine were exempted from tolls[51].

Two TEN-T corridors (North Sea - Baltic and Baltic Sea-Black Sea-Aegean Sea) passing through the territory of Poland have been extended to the territory of Ukraine since 2022. TEN-T is funded by the likes of the Connecting Europe Facility (CEF). In December 2022 the Council of the European Union adopted a project to include a new corridor in the Trans-European Transport Network.

The idea of the Via Carpatia route is therefore being developed. For the Podkarpackie voivodship, the most important project is the construction of the S19 expressway, which is part of this route. An expressway has been built, allowing convenient and fast access from Warsaw via Lublin to Rzeszów. There is a prospect of sections of this route being built between Rzeszow and the Polish-Slovakian border. The transport corridors included in the new TEN-T regulation should facilitate transport throughout Europe and reduce regional, economic and social disparities by developing high-quality air, road, rail and maritime transport infrastructure[52].

An agreement between the Centralny Port Komunikacyjny and Ukrainian Railways (Uz) aimed at the development of a railway line connecting Poland and Ukraine was reached at the Railway Direction Days conference held in Warsaw at the end of January 2023. The conference was aimed at facilitating joint investment in the Three Seas region, which includes countries such as the Baltic, Poland, Ukraine, Hungary, Slovakia and the Czech Republic. "Plans include the construction of 4,500 km of railway lines, and the Warsaw-Kyiv line will be one of the most important and "shortest between Ukraine and the EU" - Mikołaj Wild, president of the CPK, commented. Most importantly, it will run through the emerging Polish hub: the CPK, which will be an airport that also serves roads and rail for both passengers and cargo. The importance of Poland to the rail freight industry cannot be denied. It plays a key role in Europe, with connections to almost every corner of the continent"[53].

[51] Transportowe korytarze solidarnościowe między UE a Ukrainą. URL: https://www.gov.pl/web/infrastruktura/transportowe-korytarze-solidarnosciowe-miedzy-ue-a-ukraina)

[52] Pawlak, M. Nowy korytarz transportowy: Bałtyk - Morze Czarne - Morze Egejskie szczególnie ważny. Published on 27 February 2023. URL: https://filarybiznesu.pl/nowy-korytarz-transportowy-baltyk-morze-czarne-morze-egejskie-szczegolnie-wazny/a19251

[53] New Poland-Ukraine railway connection via emerging hub will be the fastest. *RailFreight.com*. Published on 13 February 2023. URL: https://www.railfreight.com/railfreight/2023/02/13/new-poland-ukraine-railway-connection-via-emerging-hub-will-be-the-fastest/?gdpr=accept).

The Three Seas Initiative's (3SI) brings together 12 EU Member States between the Baltic, Black and Adriatic seas: Austria, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.
The Objectives of the 3SI in 2022 included:

- Economic growth and resilience of the 3SI region**.** The primary goal of the Initiative is to boost economic growth and resilience of the region by developing transport, energy and digital infrastructure through the modernization of the existing, and creation of new infrastructure networks;
- Geopolitics. it is important to develop practical linkages among the nations located between the Adriatic, Baltic and Black Seas that complement EU goals, reinforce the overall resilience of the region and strengthen the transatlantic link;
- Greater interest among investors**.** By working together and pursuing similar policies, the Three Seas countries make the region more attractive on the global financial market;
- Energy security and the diversification of routes and sources of energy supply across the region;
- Reliable, sustainable and inclusive connectivity**.** It is applying digital solutions and development of digital infrastructure. Moreover, the creation of smart solutions for data exchange and a more efficient and secure use of connectivity networks in the transport, energy and digital sectors[54].

What can bring the cooperation in the 3SI to Ukraine?

- Ukraine received participating partner status in 2022[55];
- The countries of 3SI declared their support for Ukraine's efforts to join the EU;
- Strengthen the cooperation with CEE countries. For instance, Ukraine is already a participant of the 3SI Viking Train logistics, an initiative launched in 2015 that connected the port of Odesa with the Baltic States. In future Ukraine could also connect with the Trans-European Corridor through the Carpathians, acting as a logistical centre in the connection of northern and southern Europe and possibly lessening the pressure on the Romanian port of Constanta[56];
- Development of preliminary plans for post-war reconstruction of Ukraine as well as attract investments.

An important and essential element in the development of passenger and freight transport infrastructure to Ukraine from EU countries including Poland is the utilisation of the potential and development objectives of the CPK. The Central Communication

[54] Three Seas Initiative. URL: https://3seas.eu/about/objectives
[55] Krzysztoszek, A. Ukraine becomes 'participating partner' of Three Seas Initiative. *EURACTIV*.pl. Published on 21 June 2022 URL: https://www.euractiv.com/section/politics/short_news/ukraine-becomes-participating-partner-of-three-seas-initiative/
[56] Tsonev, B. The Three Seas Initiative aims to expand with Ukraine. *LONDON POLITICA*. URL: https://londonpolitica.com/ukraine-watch-blog-list/the-three-seas-initiative-aims-to-expand-with-ukraine

Port is a government concept adopted by the Polish Government on 7 November 2017 and envisages extensive investments until 2040. This concept not only includes assumptions for the infrastructure of the central expansion, with land and air transport, but also rail transport. The Central Communication Port is intended to become the most important transport hub connecting Poland with countries in Europe and Asia[57].

CPK is a planned transfer hub between Warsaw and Łódź, which will integrate air, rail and road transport. The development envisages the construction of CPK located 37 km west of Warsaw and covering the space of 3,000 ha**.** During the first stage, the airport will handle 40 million passengers a year[58].

As a result of the tender, the final outcome for the Master Civil Engineer (MCE), CPK signed the agreement with the winner of the proceedings: Dar Al-Handasah Consultants. The Dar Al-Handasah will focus on multi-discipline the development of design plans and specifications for the technical infrastructure of the CPK Airport, including runways and taxiways, hangar aprons, utilities and service lines, as well as civil structures. So far, as part of the airport component, the CPK company has announced four key tenders for the design works and design-related services: the Master Architect (MA), in which the offer of Foster + Partners and Buro Happold has been selected; the Master Civil Engineer (MCE), the Airport System Infrastructure Designer (ASID), and the Support Infrastructure Engineer (SIE). The first preparatory construction work on the CPK Airport is planned to begin in 2023[59].

The complete implementation of the planned transport infrastructure solutions will unquestionably improve passenger and freight transport from the centre of Poland to all European countries and above all to Ukraine. The common position of EU countries as well as NATO member states clearly indicates that the modernisation and construction of new transport infrastructure is necessary in many countries. Planners are analysing potential routes for military and humanitarian support in the Baltic States as far north as Romania. All possible uses of existing transport potential are being considered. Civilian airports are being given military functions for military transport, an example of which is Rzeszów-Jasionka airport. Bridge fortifications are also planned. Russia's invasion of Ukraine has increased the need to adapt the transport infrastructure in the EU, not only the civilian and defence infrastructure, but especially that aimed at speeding up the financing of projects supporting military mobility. The financial support allocated by Brussels in the amount of USD 1.67 billion is mainly intended to ensure greater military mobility. Poland has been working on improving its transport infrastructure, so making the Central Transport Port fully operational is a

[57] STRATEGIA ROZWOJU OBSZARU OTOCZENIA CPK. URL: https://www.cpk.pl/pl/strategia-rozwoju-obszaru-otoczenia-cpk

[58] Centralny Port Komunikacyjny. URL: https://www.cpk.pl/en/

[59] Partner Content: CPK awards contract for a Master Civil Engineer. *AIRLINES.IATA*. Published on 28 October 2022. URL: https://www.airlines.iata.org/reports/partner-content-cpk-awards-contract-for-a-master-civil-engineer

priority for these efforts and is one of the most important projects being carried out in Poland with a wax-civilian purpose. According to Polish government plenipotentiary Marcin Horala, it will be a place from which large tactical links, large quantities of ammunition, supplies and logistics can be brought to Poland very quickly[60].

Data containing trucks number by year and direction on various cross border points and waiting time of trucks and wagons are presented on Figures 4.1-4.12[61]. The data were obtained kindly by: Analysis Department of the Bieszczady Border Guard Unit and for the Lublin Voivodeship crossings the Analysis Department of the Nabuzhany Border Guard Unit.

From the graphs shown, it can be seen the largest number of vehicles crossed the Korczowa border crossing, but the lowest number of vehicles was recorded at the checkpoint in Krościenko – Smolnica (Fig. 4.3), and in each case the number of vehicles entering Poland was higher.

Fig. 4.1. Trucks number out/in Poland

[60] Siebold, S., Deutsch, A. & Sytas, A. Red tape, potholes and politics hamper NATO's defence efforts as the Russia threat rises. *REUTERS*. Published on 21 November 2022. URL: https://www.reuters.com/investigates/special-report/ukraine-crisis-europe-defence/
EU-Ukrainian border check points: First field observations. *EU Agency for Fundamental Rights.* Published on 23 March 2022. URL: https://fra.europa.eu/pl/publication/2022/eu-ukrainian-border-check-points-first-field-observations
Official Website of the International Trade Administration. Published on 1 November 2022. URL: https://www.trade.gov/country-commercial-guides/ukraine-distribution-and-sales-channels
War in Ukraine: The Railway monitoring. *RAILTARGET*. URL: https://www.railtarget.eu/technologies-and-infrastructure/war-in-ukraine-railway-monitoring-1888.html
[61] Analysis Division of the Bieszczady Border Guard Unit and Lublin Voivodeship the Analysis Division of the Nabuzhany Border Guard Unit.

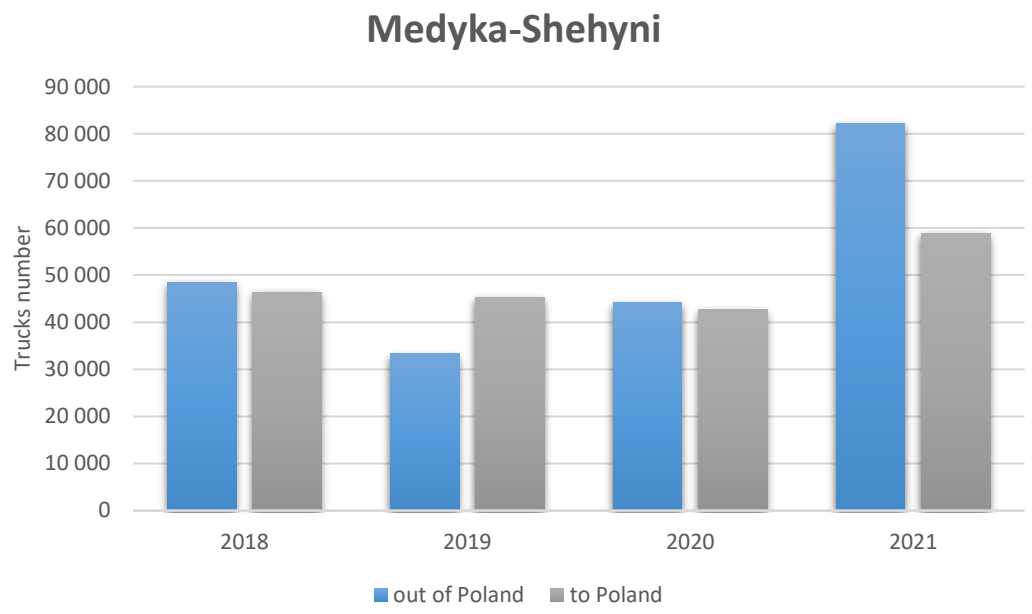


Fig. 4.2. Trucks number out/in Poland

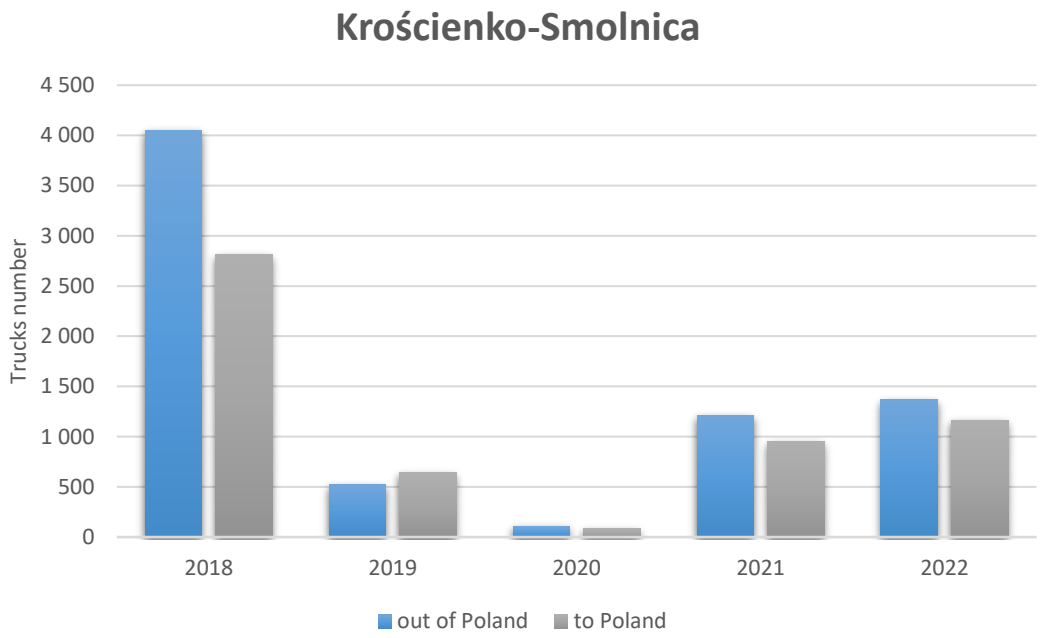


Fig. 4.3. Trucks number out/in Poland

In case the Hrebenne-Rava Ruska and Dorohusk cases, higher numbers of vehicles were recorded at the Dorohusk border crossing (Fig. 4.5). Data for 2022 includes only the first half of this year.

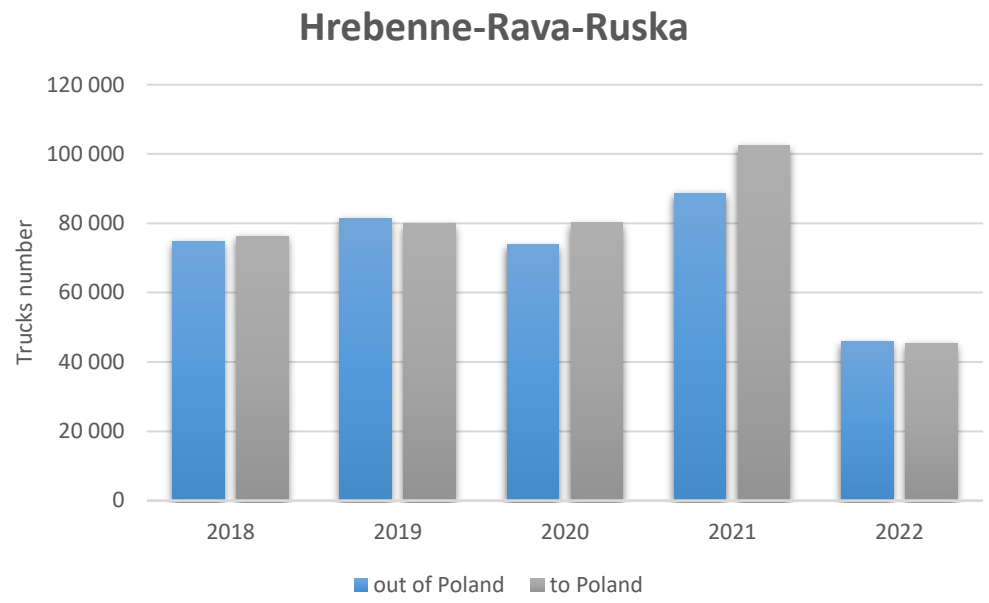


Fig. 4.4. Trucks number out/in Poland

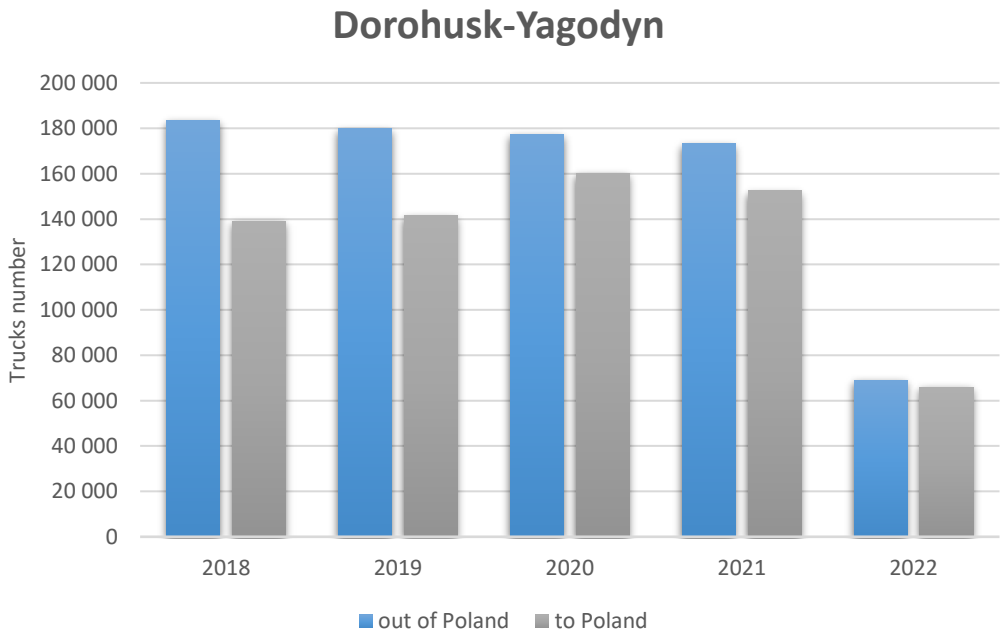


Fig. 4.5. Trucks number out/in Poland

Graphs on Figures 4.6 and 4.7 were presented a comprehensive overview of all data from border crossings in the direction out of Poland.

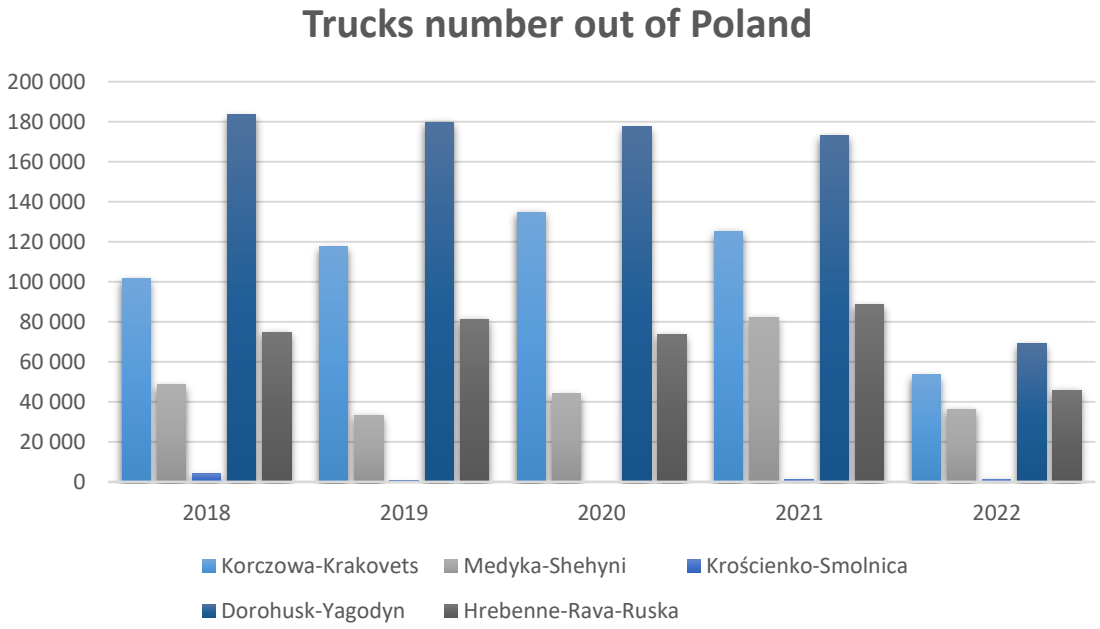


Fig. 4.6. Trucks number out of Poland

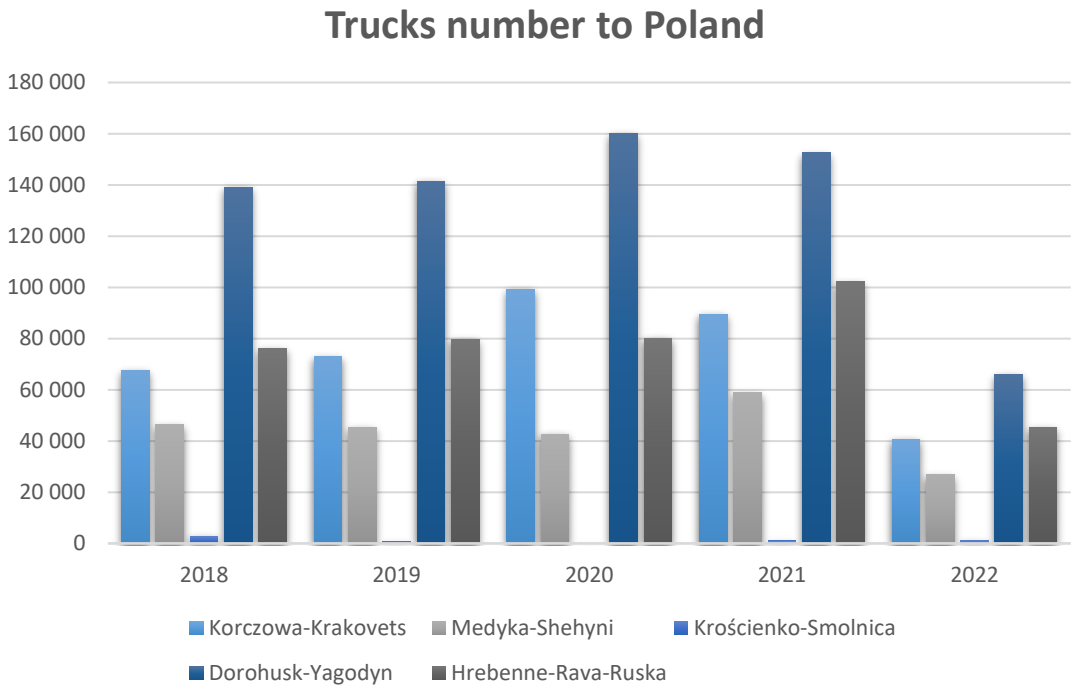


Fig. 4.7. Trucks number to Poland

The charts show rail wagons numbers for years 2018 to 2022 at various border crossings and the direction of entry/exit. From the graphs shown, it can be seen the largest number of rail wagons crossed the Hrubieszów (Fig. 4.9) border crossing point and the lowest number of rail wagons crossed the Dorohusk (Fig. 4.10) border crossing point.

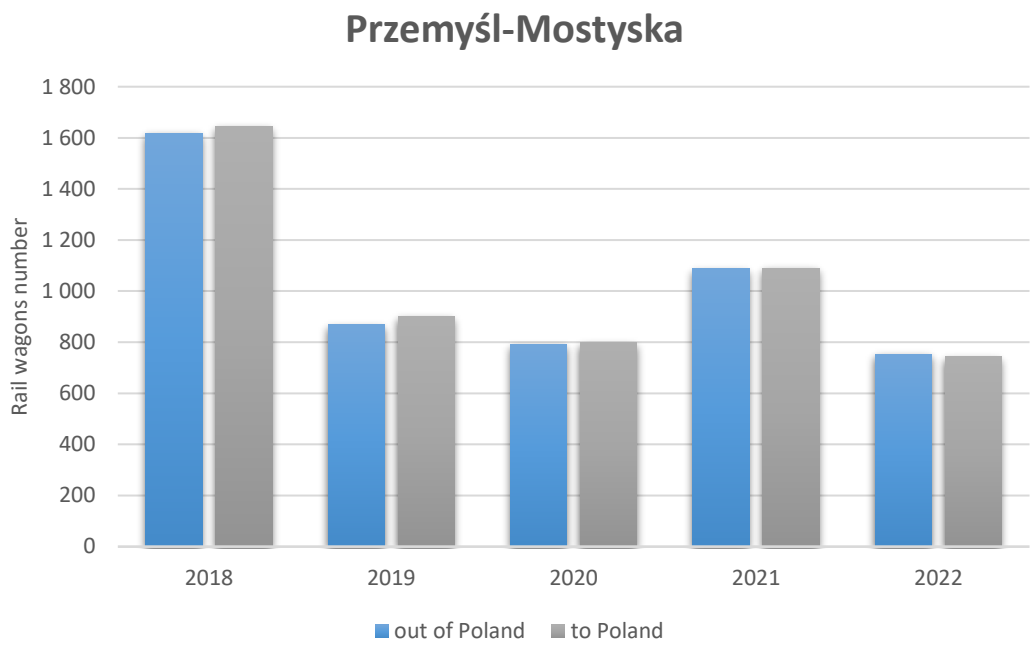


Fig. 4.8. Rail wagons number out/in Poland

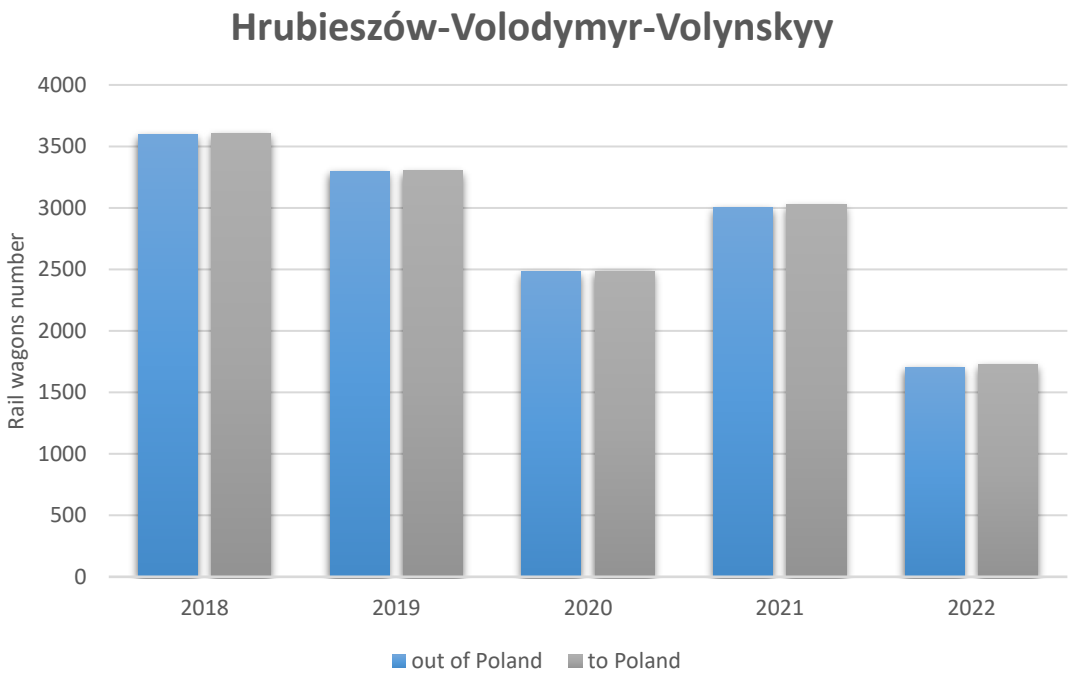


Fig. 4.9. Rail wagons number out/in Poland

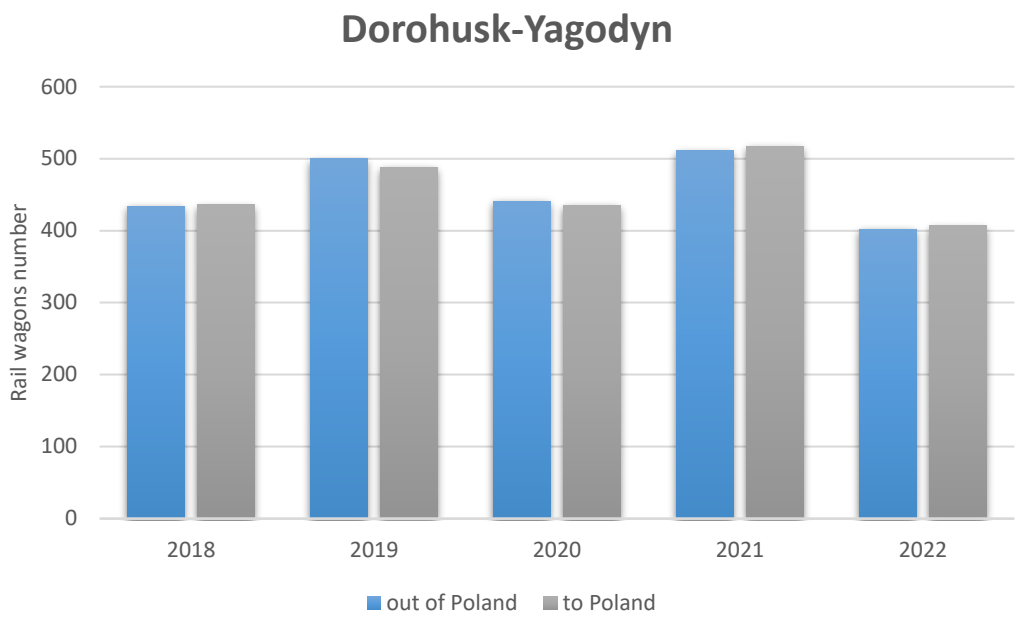


Fig. 4.10. Rail wagons number out/in Poland

Data containing waiting times at the dpg in Korczowa, Medyka and Kroscienko for 2022 trucks by day and direction (Figure 4.11 to 4.13).

From the graphs shown, it can be seen the highest average waiting times of 36h were in May and June. At the beginning of the war, the data was unrepresentative, due to the ongoing chaos, waiting times were not recorded.

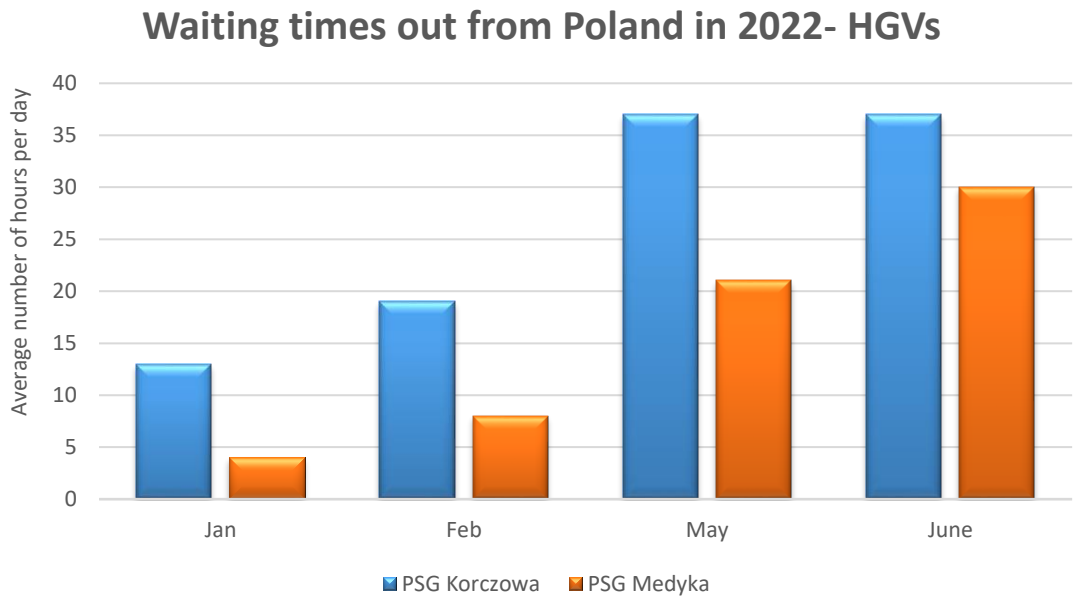


Fig. 4.11. Waiting times out from Poland in 2022

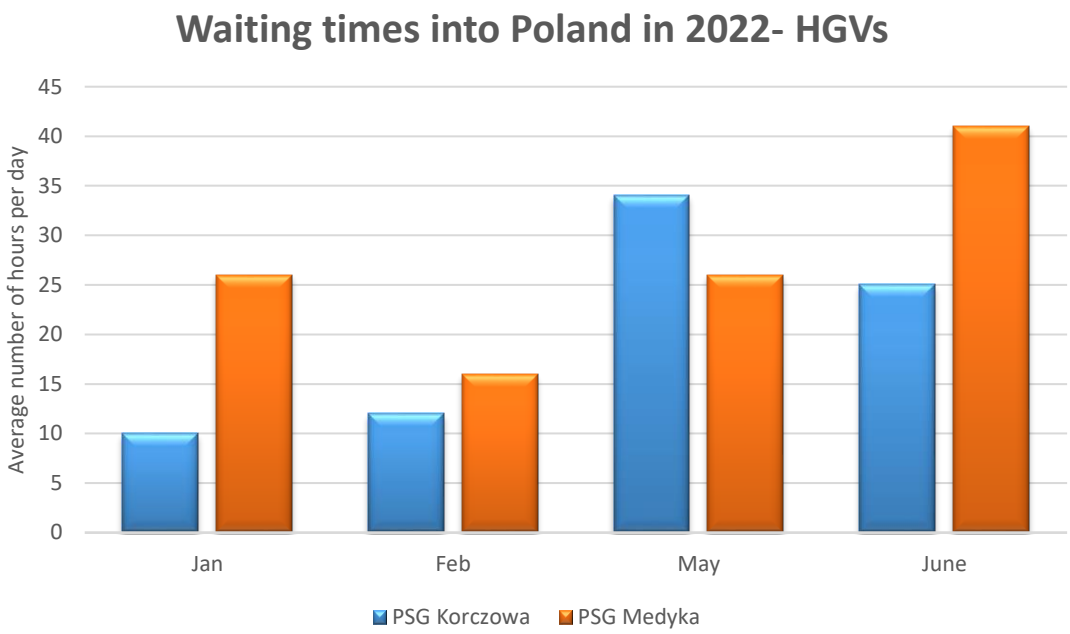


Fig. 4.12. Waiting times out from Poland in 2022

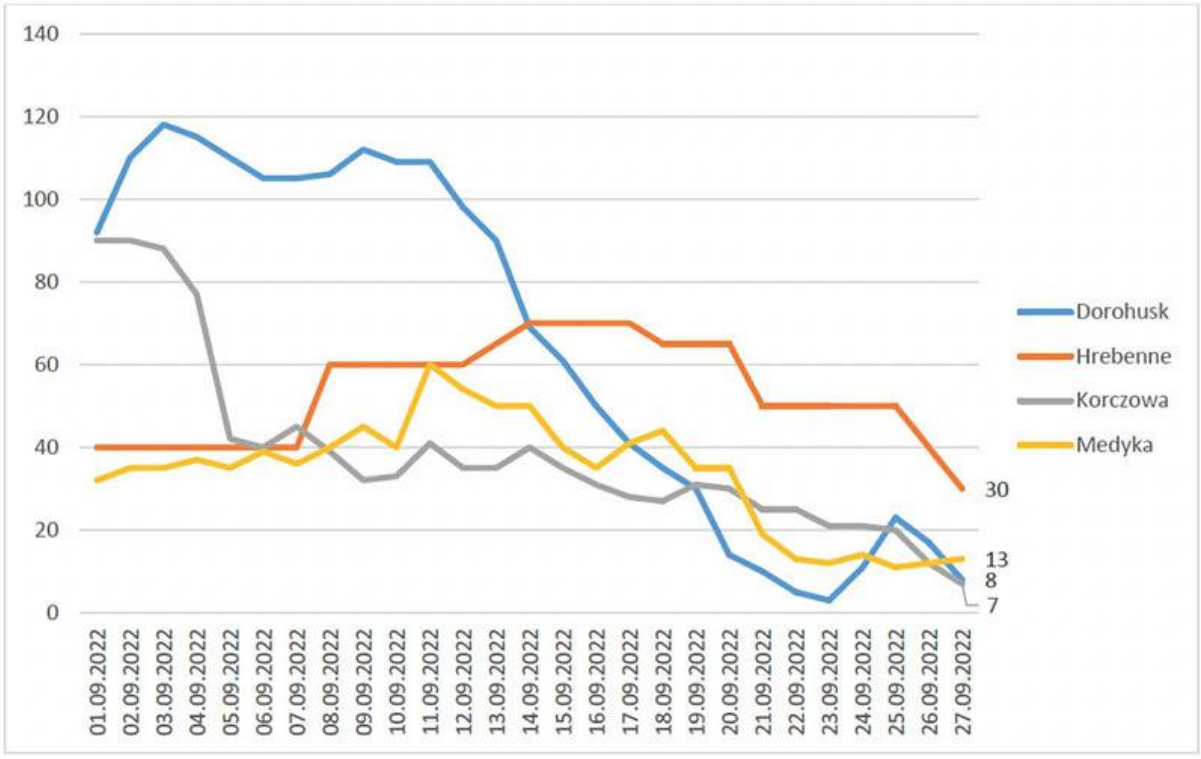


Fig. 4.13. Waiting times at the border crossing points

The graph on Fig. 4.13, shows that waiting times decreased significantly in September this year (2022)[62].

[62] Polish-Ukrainian Border Crossing Coordination Team, Undersecretary of State in the Ministry of Interior and Administration

Analysis of the bottlenecks in Poland-Ukraine rail/road connectivity

At the beginning of the war[63]:

- the lamination of the Ukrainian Black Sea ports and their consequent blockade has caused a significant increase in the volume of traffic of cargo transporting goods.
- there are subject to obligatory border inspection controls, i.e. mainly cereals exported from Ukraine as feed components, oils, as well as foodstuffs of animal origin.
- the partial unblocking of the Ukrainian Black Sea ports has not significantly affected the decrease in traffic at road border crossing points on the Polish-Ukrainian section of the state border until now.

In 2022, rail links to Poland were improved. At the Polish-Ukrainian border crossings, train queues of 15,000 carriages were waiting. Unfortunately, border crossing opportunities are limited. There is a high concentration of train traffic towards certain terminals and therefore problems have arisen with a lack of rolling stock. Attempts were made to solve this problem by evenly distributing traffic to the terminals.

Nowadays, with the help of logistics companies, it is possible to organise freight traffic despite the congestion at the border. A large number of containers have been diverted from other European ports to Poland and are being delivered to Ukraine, and capacity at the border is limited, as is storage space. Ukrainian companies are also looking for new export opportunities in countries such as the USA and Canada. Exports are growing, however, which creates congestion at the borders and increases the price of shipping containers[64].

In order to defuse the volume of vehicles queuing at the border, there should be joint clearance. Sanitary and veterinary clearance can be done at locations other than border crossings, which would allow truck traffic. The development of terminals and the construction of new logistics centres near border crossings would respond to the storage and warehousing of goods. The creation and opening of new border crossings between Poland and Ukraine is also a solution (Malhowice-Niżankowice).

[63] Polish-Ukrainian Border Crossing Coordination Team, Undersecretary of State in the Ministry of Interior and Administration

[64]Kuś, L. Przejścia graniczne wąskim gardłem dla transportu towarowego między Polską a Ukrainą. *INTERMODALNEWS.PL.* Published on 30 May 2022. URL: https://intermodalnews.pl/2022/05/30/przejscia-graniczne-waskim-gardlem-dla-transportu-towarowego-miedzy-polska-a-ukraina/

Recommendations on the ways of increasing the capacity of border infrastructure for freight transportation

Many tasks and activities were undertaken, and the most important of these are[65]:

- In the period from 1th of September to 30th of November this year, a pilot project was implemented.
- It consists in restricting cargo traffic to vehicles with a gross vehicle weight rating of over 7.5 t at the road border crossings in Hrebenne, Korczowa and Medyka.
- HGVs (Heavy Goods Vehicle) with a GVW (Gross Vehicle Weight) over 7.5t are checked at the crossings: Hrebenne/Rawa Ruska; Korczowa/Krakowiec; Medyka/Szeginie; Dorohusk/Jagodzin (where such an organisation has already been introduced on 27th of June 2022).
- HGVs with GVW rating up to 7.5 t are only checked in at the crossings: Zosin/ Ustiług, Dołhobyczów/ Uhrynów, Krościenko/ Smolnica, Budomierz/ Hrushev.
- An exception is made for HGVs with GVW rating up to 7.5 t transporting goods requiring control of individual inspections.
- HGVs which may cross the national border as usual, i.e. at crossings where such control is possible.
- New organisational solutions were implemented from 9th of September, permitting clearance of empty trucks at the border crossing Zosin -Ustiług, in the entry direction.
- In consultation with the Ukrainian side, an additional lane was opened at the Korczowa - Krakowiec border crossing in the direction of entry to Poland for the passage of unloaded trucks.
- On the area of border crossings Dorohusk - Jagodzin and Korczowa - Krakowiec traffic separation for unloaded trucks with a GVW rating above 7.5 t in the direction of entry to Poland.
- Request to the Ukrainian side to separate the unloaded heavy goods vehicles traffic also on the access roads.
- Analysis of the possibility of introducing clearance for unloaded heavy goods vehicle at the other border crossings, i.e. Dolhobyczow - Uhrynow, Budomierz – Hrushev are positive, at the other border crossings, Kroscienko - Smolnica – negative.
- Ensuring 24-hour operation all checkpoints.
- Ensuring order on national roads leading to border crossings is carried out by the General Directorate for National Roads and Motorways, which is responsible for

[65] Udrożnić przejścia z Ukrainą! *TRUCK.PL*. Published on 6 October 2022. URL: https://www.truck.pl/pl/article/1445/udro%C5%BCni%C4%87-przej%C5%9Bcia-z-ukrain%C4%85!-apel-zmpd-i-odpowied%C5%BA-mswia%2C1

cleaning the road lane and setting up portable toilets for drivers waiting to be checked in.

- To ensure the safety of drivers and public order on access roads to border crossings, the situation is constantly monitored on an up-to-date basis by all types of Police, also in cooperation with the Border Guard.
- Access roads to border crossings are constantly monitored by patrols of the traffic departments whose tasks include checking the technical condition of vehicles, the sobriety of drivers, checking the legality of the cargo transported.
- Over the last few years, new scanning equipment - stationary and mobile - has been successively added to the largest border crossings.
- Large-size X-ray machines are used at all road freight traffic crossings to ensure efficient and effective checks.

Results of these activities were the implementation of organisational and infrastructural solutions contributed to a significant (more than 50%) increase in the capacity of border crossings on the Polish-Ukrainian border in goods traffic in the direction of entry to Poland. The road border crossing in Hrebenne is a smaller crossing than the border crossing points in Dorohusk and Korczowa and supports passenger traffic with the same infrastructure[66].

The plans and recommendations for these actions to be or may be taken include:

- The draft concept for the construction and expansion of truck clearance terminals at border crossings is designed to solve the problem through the construction and expansion of HGV clearance terminals[67].
- The investments would involve transforming the organisation of clearance at border crossings with stream traffic into terminal-type clearance, as well as increasing the number of parking spaces for trucks and creating new check-in desks at border crossings where clearance is already terminal-type.
- In combination with the implementation of the SATOS (pl. system archiwizacji towarów i osób, ang. archiving system for goods and persons) check-in advisory system, this will eliminate queues of vehicles waiting to be cleared on the road lane.
- In some cases, it has been agreed to build enlarged car parks at points of traveller service (pl. MOPs – Miejsca Obsługi Podróżnych – place of traveller services) located last on the outbound direction from Poland.
- As agreed, it is planned to build a truck terminal in Okopy functionally connected to the border crossing in Dorohusk, a terminal in front of the border

[66] Udrożnić przejścia z Ukrainą! *TRUCK.PL*. Published on 6 October 2022. URL: https://www.truck.pl/pl/article/1445/udro%C5%BCni%C4%87-przej%C5%9Bcia-z-ukrain%C4%85!-apel-zmpd-i-odpowied%C5%BA-mswia%2C1

[67] ibidem

crossing in Hrebenne and to transform the existing border crossing in Korczowa into a customs terminal[68].

- In both cases, this would allow a change in the technology for border clearance of freight transport from stream clearance, which is inefficient with the current volume of traffic, to terminal clearance giving the possibility to increase the number of vehicles cleared.
- The project concerning the construction of a car terminal in Okopy currently has a programmatic and spatial concept, which has been approved by the Ministry of Interior and Administration and will form the basis for activities in the coming years (land acquisition, design, construction works).
- The project concerning the construction of a car terminal in front of the border crossing in Hrebenne is at the level of the comparative analysis currently being developed, which will be the basis for indicating as the target one of the two variants for the location of the terminal.
- It will then be possible to proceed to the next stages of the investment process. The Podkarpackie Voivode has been allocated 230 thousand for 2022 to develop an architectural concept for the reconstruction of the border crossing in Korczowa in order to adapt the existing crossing into a cargo clearance terminal[69].

[68] ibidem

[69] Udrożnić przejścia z Ukrainą! *TRUCK.PL*. Published on 6 October 2022. URL: https://www.truck.pl/pl/article/1445/udro%C5%BCni%C4%87-przej%C5%9Bcia-z-ukrain%C4%85!-apel-zmpd-i-odpowied%C5%BA-mswia%2C1

V. TRANSPORT INFRASTRUCTURE IN SLOVAKIA AS A PRECONDITION FOR THE DEVELOPMENT OF FREIGHT TRANSPORT FLOWS BETWEEN SLOVAKIA AND UKRAINE

Introduction and theoretical backgrounds

Transport and transport infrastructure play an important role in the development of regions and centres. Infrastructure is only one of the instruments for improving the development of a particular region, but it is very important because it is the base of many other socio-economic activities in a country or region (Nijkamp 1986)[70]. Transport by itself is not a sufficient prerequisite for development. However, the lack of transport infrastructures can be seen as a constraining factor for development. A poor level of transport service can negatively affect the competitiveness of regions and corporations and thus have a negative impact on regional added value and employment (Rodrigue et al. 2013)[71]. Regions and locations with poor-quality transport are at a competitive disadvantage. Transport infrastructure is only one of the factors which influence regional development. For the successful economic development of a region, good economic and political conditions are also necessary (Banister & Berechman 2001)[72].

Transport infrastructure has been the cornerstone of EU regional development policy for a long time. The EU has placed a huge emphasis on transport infrastructure investment, with the aim of promoting territorial cohesion, reducing economic disparities, and promoting economic development (Crescenzi & Rodríguez-Pose 2012)[73]. Transport policy is one of the EU's common policies. Its important aims are the opening up of transport markets and the creation of the Trans-European Transport Network and development of sustainable mobility. Important documents for EU transport policy are *White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system'* (EC 2011)[74] and *Regulation (EU) No 1315/2013*[75].

A new dimension of the EU transport policy is the movement of military forces. Facilitating the movement of military troops and assets is essential for the security of European citizens and for building a more effective, responsive and joined-up Union

[70] Nijkamp, P. (1986). Infrastructure and regional development: A multidimensional policy analysis. Empirical Economics, vol. 11, no. 1, pp. 1-21.
[71] Rodrigue, J.P., Comtois, C., Slack, B. (2013). The geography of transport systems. New York: Routledge
[72] Banister, D., Berechman, Y. (2001). Transport investment and the promotion of economic growth. Journal of Transport Geography, vol. 9, no. 3, pp. 209-218.
[73] Crescenzi, R., Rodríguez-Pose, A. (2012). Infrastructure and regional growth in the European Union. Papers in Regional Science, vol. 91, no. 3, pp. 487-513
[74] EC (2011). White Paper 'Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system'. Brussels, European Commission, COM(2011) 144 final
[75] EU (2013). Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU Text with EEA relevance

as identified in the Joint Communication on improving military mobility in the EU (EC 2017)[76]. Action Plan on military mobility: EU takes steps towards a Defence Union identifies a series of operational measures to tackle physical, procedural or regulatory barriers which hamper military mobility. To overcome these barriers, dual-use (civilian-military) co-funding of transport infrastructure projects has been proposed within the next Connecting Europe Facility (CEF). This dimension of the EU transport policy gained more importance after Russia's invasion of Ukraine.

The aims of this research (1) Analysis of the existing border infrastructure along the border of Slovakia-Ukraine, (2) Analysis of the bottlenecks in Slovakia-Ukraine rail/road connectivity and (3) Recommendations on the ways of increasing the capacity of border infrastructure for freight transportation.

Development of the transport network (road and rail, transport corridors, incl. TEN-T corridors)

The Slovak-Ukrainian border, with a length of 97.8 kilometres, is the shortest of all of Slovakia's borders. Mountainous relief in the northern part of the borderland (Bukovské vrchy Mts. and Vihorlatské vrchy Mts. and state border (within various political systems) have been barriers to the development of cross-border transport infrastructure.

From the point of view of international transport, Eastern Slovakia (Prešov and Košice regions) has an important location in the north-south direction, as well as east-west. Through it passes the important main Slovak northern road and rail corridor Bratislava – Žilina – Košice (D1 motorway), in the direction north–south from Poland through Prešov and Košice to Hungary along the eastern border of the EU (Via Carpathia).

The most important rail and road transport corridors in Slovakia are included to the Trans-European Transport Network. TEN-T comprises two network 'layers'. The Core Network includes the most important connections, linking the most important nodes, and is to be completed by 2030. The Comprehensive Network covers all European regions and is to be completed by 2050.

Several transport corridors of the TEN-T network pass through the territory of Slovakia (see Fig. 5.1): the Baltic–Adriatic Corridor (Poland – Czechia/Slovakia – Austria – Italy); the Orient/East – Med Corridor (Germany – Czech Republic – Austria/Slovakia – Hungary – Romania – Bulgaria – Greece – Cyprus); the Rhine–Danube Corridor (Germany – Austria – Slovakia – Hungary – Romania with branch Germany – Czechia – Slovakia). The major transport hub in Slovakia is Bratislava. Three corridors of the TEN-T network Rhine-Danube, Baltic-Adriatic and Orient-East-

[76] EC (2017). Joint Communication to the European Parliament and the Council Improving Military Mobility in the European Union. Brussels, European Commission. JOIN(2017) 41 final

Med intersect here. The road and railway tracks of two corridors "Rhine-Danube" and "Baltic-Adriatic" on the territory of Slovakia cross in the city of Žilina.

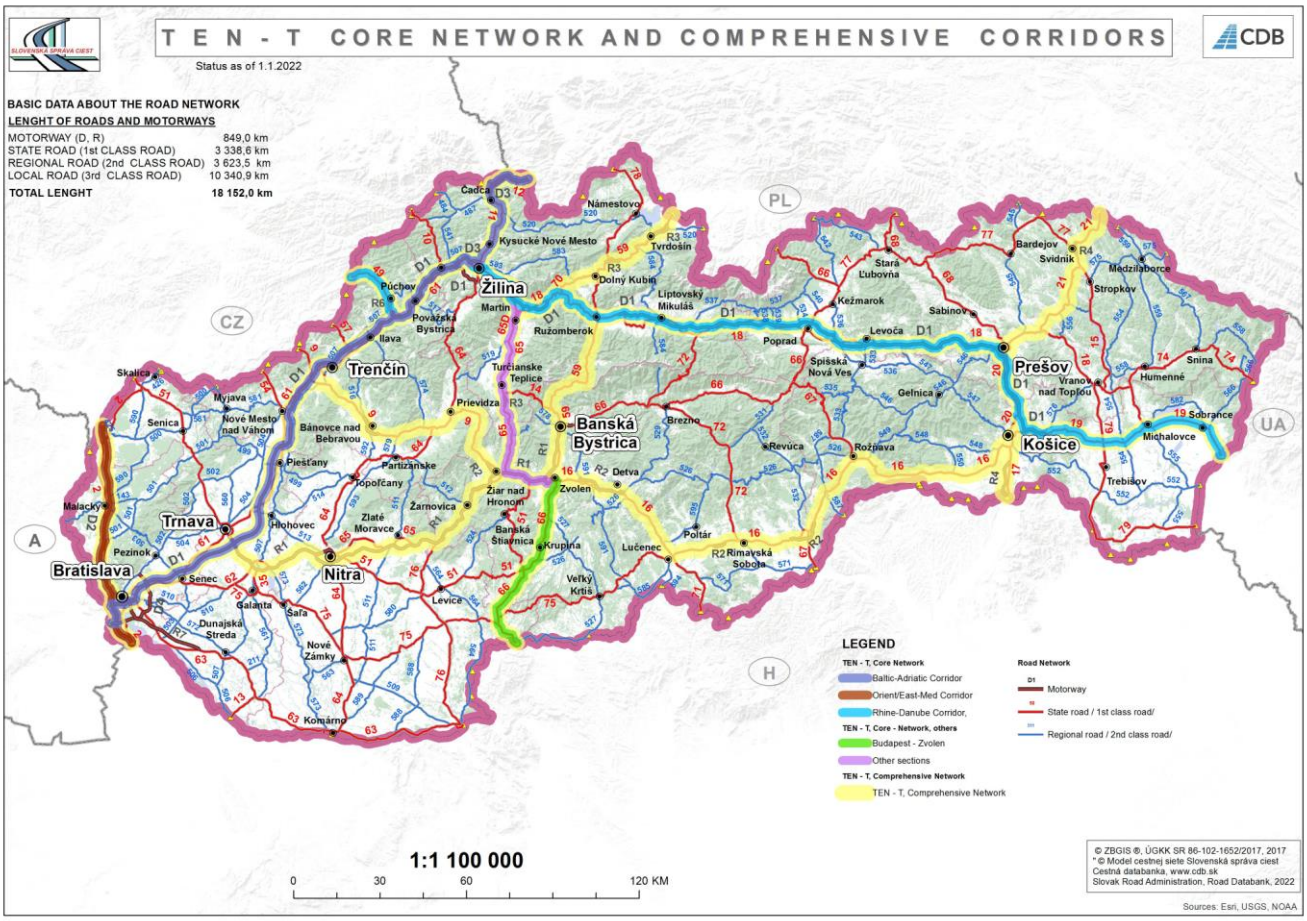


Fig. 5.1 TEN-T core network and comprehensive corridors in Slovakia
Source: SSC (2022)[77]

The Rhine-Danube corridor (see Fig. 5.2) provides the main connection between east and west across continental Europe. It runs its route along the Danube River, connecting Strasbourg and southern Germany with the central European cities of Vienna, Bratislava and Budapest before passing through the Romanian capital of Bucharest and ending in the Black Sea port of Constanta. The second branch of the corridor follows the route from Frankfurt to the Slovak-Ukrainian border, which connects Munich, Prague, Žilina and Košice.

To the territory of Ukraine, there is a tangential Rhine-Danube corridor. Its automobile branch is suitable for the Uzhhorod - Vyšné Nemecké checkpoint, and the railway line in the Čierna nad Tisou - Chop checkpoint. On 27 July 2022, the European Commission amended its December 2021 proposal, under discussion by the European

[77] SSC (2022). TEN-T core network and comprehensive corridors in Slovakia. Slovenská správa ciest/Slovak Road Administration. https://www.cdb.sk/en/maps-and-statistical-outputs-of-road-databank/Maps-of-Road-Network/Slovakia.alej

Parliament and the Council, to revise the TEN-T Regulation[78] in order to reflect the impact of Russia's war of aggression against Ukraine, which has redefined the geopolitical landscape. A high-level understanding was signed between the EU and Ukraine on 12 May 2022 on the 'indicative maps of the Trans-European transport network in Ukraine'. With this agreement, the parties reaffirmed the high importance they attach to the extension of the trans-European transport network to Ukraine as part of the European Neighbourhood Policy (ENP), a policy that was initially adopted in 2018.

Fig. 5.2. Rhine-Danube core network TEN-T corridor in Slovakia
Source: https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t_en

Development of a network of checkpoints

In 2023, there have been five border crossings between Slovakia and Ukraine listed from the north to the south: (1) Ubľa – Malyj Bereznyj (road), (2) Vyšné Nemecké – Uzhhorod (road), (3) Maťovské Vojkovce – Pavlovo (railway), (4) Veľké Slemence – Mali Selmenci (road), and (5) Čierna nad Tisou – Chop (railway).

(1) Ubľa – Malyj Bereznyj is a road border crossing for passenger transport (including regular and irregular buses, pedestrians and cyclists) and freight transport up to 3.5 tonnes. It was opened in June 1995.

[78] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on Union guidelines for the development of the trans-European transport network, amending Regulation (EU) 2021/1153 and Regulation (EU) No 913/2010 and repealing Regulation (EU) 1315/2013: Website. Retrieved from https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM%3A2021%3A812%3AFIN

(2) Vyšné Nemecké – Uzhhorod is a road border crossing for unlimited passenger and freight transport. This crossing is located on the first class road I/19 and was put into operation in 1992.

(3) Maťovské Vojkovce – Pavlovo is a railway border crossing on the Uzhhorod – Haniska railway track. This broad-gauge railway track (1,520 mm) from Uzhhorod to Haniska near Košice was designed mainly to transport iron ore to the East Slovak ironworks. Its operation started in 1966.

(4) Veľké Slemence – Mali Selmenici is a road border crossing for pedestrians and cyclists from Slovakia, Ukraine and countries of the European Economic Area. It is open daily between 8:00 a.m.-8:00 p.m. The border crossing connects the villages divided after the Second World War and was opened in December 2005.

(5) Čierna nad Tisou – Chop is a railway border crossing. Operation of the standard-gauge track (1,435 mm) Chop – Čierna nad Tisou – Slovenské Nové Mesto started in 1872. The broad-gauge track was built on the basis of the agreement on the mutual connection of railways between the former Czecho-Slovak and the Soviet Union, adopted in 1946 in Moscow. With this agreement, Czechia-Slovakia undertook to build a transhipment station in Čierna nad Tisou.

Level of loading of Slovak-Ukrainian freight transport checkpoints

Analysis of the loading of border checkpoints is based on data from Customs Office in Michalovce for the period 2018-2022.

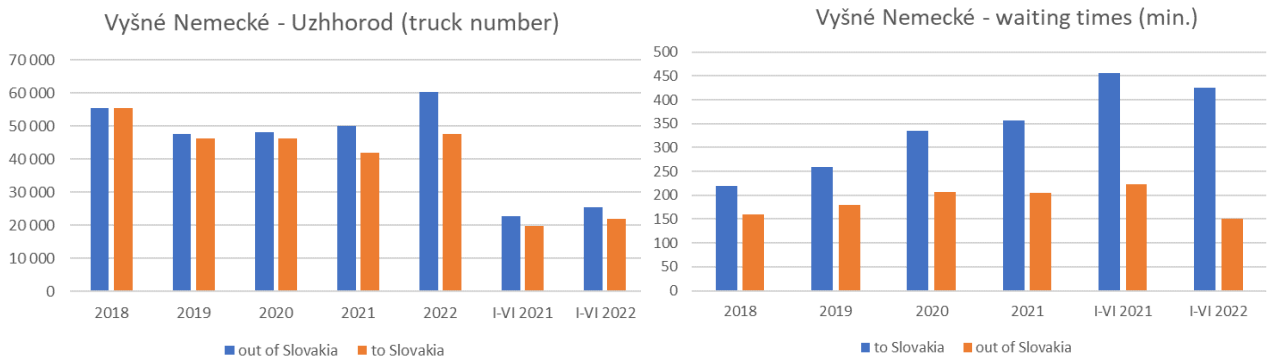


Fig. 5.3. Number of trucks and waiting times at the Vyšné Nemecké – Uzhhorod checkpoint
Source: own elaboration based on data from Customs Office Michalovce (2023).

The number of trucks at the Vyšné Nemecké – Uzhhorod checkpoint (Fig. 5.3) during the 2018-2022 period reached approximately 50 thousand trucks in each direction. The largest number of trucks from Slovakia to Ukraine was observed in 2022 (60 thousand). On the other side, waiting times (Fig. 5.4) increased in both directions and waiting times to Slovakia were longer than in the direction to Ukraine. For example, waiting times in the direction from Slovakia to Ukraine were on average 200 min., while in the reverse direction 350 min. The capacity of a checkpoint is 125 trucks per day.

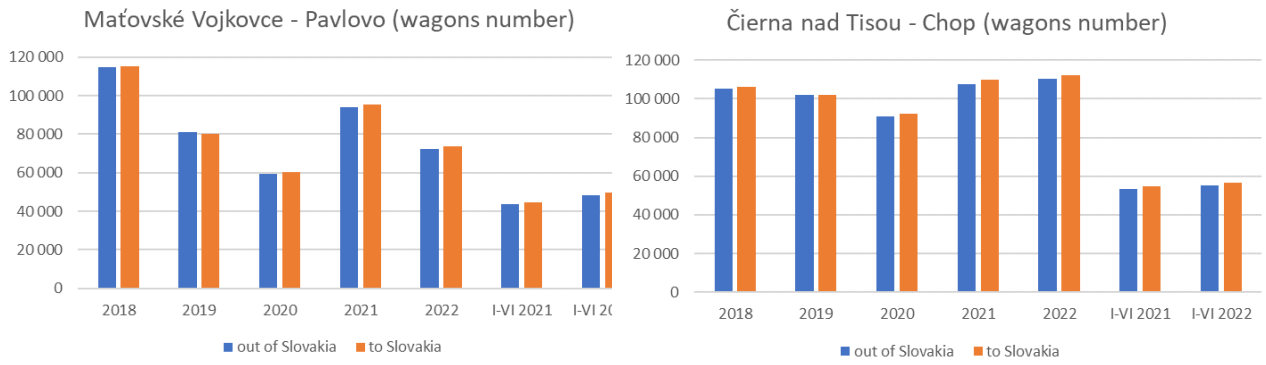


Fig. 5.4. Number of wagons at the Maťovské Vojkovce – Pavlovo and the Čierna nad Tisou – Chop checkpoint
Source: own elaboration based on data from Customs Office Michalovce (2023).

The number of wagons at the Maťovské Vojkovce – Pavlovo checkpoint (Fig. 5.4) has not stable evolution (varied from 60 to 120 thousand wagons in each direction) because of its orientation to transport for the East Slovak ironworks. The number of wagons at the Čierna nad Tisou – Chop checkpoint (Fig. 5.4) reached approximately 100 thousand wagons in each direction, with a growing tendency from 2020.

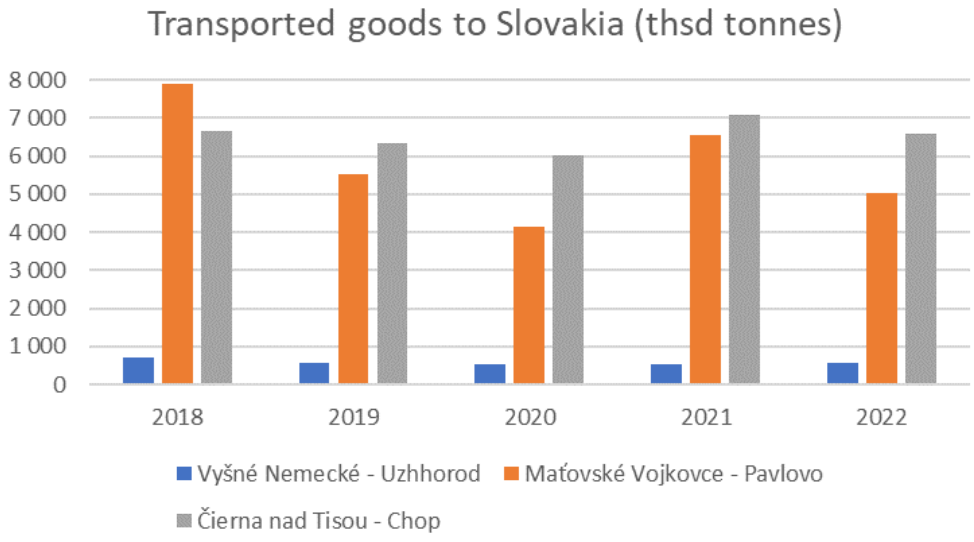


Fig. 5.5. Transported goods to Slovakia
Source: own elaboration based on data from Customs Office Michalovce (2023).

Fig. 5.5 shows that rail freight transport from Ukraine to Slovakia (based on transported goods) dominates over road freight transport. Road freight transport reached 500-700 thousand tonnes while rail freight transport was 10-14.5 million tonnes.

Development of economic nodes/economic centres

The development of transport infrastructure (freight transport flows) is partially dependent on the demand for transport. Demand for transport is located in the main population and economic centres (e.g. industrial parks and logistics centres).

On the territory of Slovakia there is a network of industrial parks. As seen from Fig. 5.6, industrial parks are concentrated in the east or west of the country, and a small part is concentrated in the central part. In total, as of 2020, 77 industrial parks were registered in Slovakia.

Fig. 5.6. Industrial parks in Slovakia (number of employees in 2018)
Source: Source: Preťo (2018)[79]

There are 12 industrial parks in the Košice region (4 of the "greenfield" type and 8 of the "brownfield" type), in the Prešov region there are 14 industrial parks (10 of the greenfield type and 4 of the brownfield type). In the Košice region, there are the largest (IP Kechnec, Košice - 332 ha) and the smallest (Gelnica - 0.19 ha) industrial parks in Slovakia.

The closest to the border with Ukraine (Fig. 6) is the Sobrance industrial park (area 73.37 hectares; 70 km from the city of Košice and 20 km from the railway station in the city of Michalovce; to the border with Ukraine (Vyšné Nemecké - Uzhhorod checkpoint) - 13 km). Currently, it does not have economic activity, as well as state support.

Instead, an industrial park with an area of 0.47 hectares is located in Snina[80]. This

[79] Preťo, A. (2018). Analýza priemyselných parkov v Slovenskej republike. Bratislava: Centrum pre hospodárske otázky MH SR

[80] Major investors include DEL Casting a.s., Snina (injection molding machines, low pressure casting machines), Elektron, s.r.o., MOPS Press, RMR Slovensko, s.r.o. (maintenance and production of hydraulics).

park has been operating since 2006 and is located 29 km from the Ubľa - Malyj Bereznyj checkpoint. The industrial park "Humenné – Guttmanovo[81]" in Humenné (Prešov region) has been functioning since 2010. The nearest checkpoint on the territory of Ukraine is " Vyšné Nemecké – Uzhhorod (59 km). 6 km from Humenné in the village of Myslina is an industrial zone[82].

Near Košice, there are several industrial parks. Since 2006 the village of Kechnec has been an industrial park[83]. In Košice – Košice IMMOPARK[84] since 2011 in Veľká Ida[85]

New investment near Košice in Valaliky industrial park was announced in 2022. The Swedish car manufacturer Volvo Cars will build a plant for producing electric cars for 1.2 billion euros. The start of the construction of the plant is planned for 2023 and series production of the next generation of pure electric Volvo Cars is planned for 2026.

Logistics centres (LC) and parks (LP) are located in Slovakia quite unevenly. Both current and planned logistics centres and parks are mainly located in south-western Slovakia, which is a consequence of good transport connections in this area and, therefore, good access to production centres. A significant factor is primarily the built highways and expressways in this territory (D1, R1, D2), as well as the crossing of international roads. An important concentration of logistics facilities is in eastern Slovakia between Prešov and Košice. Since the transport infrastructure in eastern Slovakia is not sufficiently developed, this is also reflected in the number of logistics centres located in this area. The reason for the smaller number of LCs in the east is also the fact that Ukraine is not a member of the European Union, which complicates the situation in the field of trade. If the D1 expressway and rail corridors were completed and Ukraine was admitted to the EU in the future, this could significantly change the situation, especially from the point of view of eastern Slovakia.

Operating **combined transport terminals** in Slovakia are located in Bratislava, Sládkovičovo, Dunajská Streda, Žilina, Košice, and Dobrá. In 9 km from the border with Ukraine, there is the nearest transport terminal in the village of Dobrá in the Trebišov district of the Košice region (direction from the Chop (Strazh) – Čierna nad Tisou checkpoint). The terminal in Dobrá village is an important point on the way of

[81] The main investor is TYTEX Slovakia s r. o. (textile production).
[82] For the production of technical textiles and textiles for cars (Műller Textilles Slovakia s r. o.)
[83] , Main investors are Molex Slovakia a.s., Magneti Marelli Slovakia s r. o., GETRAG FORD Transmissions Slovakia s r. o. (production of electrical components for the automotive industry, components, gearboxes), Gilbos Slovensko s.r.o. (production of printing equipment), KUENZ-SK s r. o., SCHELLING Slovakia s.r.o. (production of steel structures), GEFCO Slovakia s r. o. (logistics and transport services), SWEP Slovakia s r. o. (heat exchanger production), CROWN Bevcan Svovakia s.r.o, EVANS spol. Ltd.. (production of containers, plastic packaging), AVE SK waste management s r. o., ČAMAJ Transport s r. o., Promt SR s r. o., JISIMEX s r. o. (industrial production of alcohol).
[84] Investors (HOWE SLOVENSKO s r. o., U-shin Slovakia s r. o., Faurecia Slovakia s r. o. - automotive industry enterprises; Gefco, s r. o., Raben Logistics Slovakia s r. o. - logistics and transport services, DACHSER Slovakia a.s. - freight, road and air transport, PKZ-Coca Cola).
[85] enterprises as IEE Sensing Slovakia s r. o. have been operating in the village of Veľká Ida (sensor manufacturing), Oerlikon Balzers (plasma processing of components), ENERGYCO s r. o. (production of equipment and equipment).

railway freight transport, as it is located at the crossroads of two railway tracks (1,520 mm wide and 1,435 European standard). Transit cargo flows mainly through the terminal, which is heading from China to Central and Western Europe.

Analysis of the bottlenecks in Slovakia - Ukraine rail/road connectivity

The analysis of the current state of development of the network of checkpoints across the state border allowed us to conclude that the main problems are connected with road freight transport at the Vyšné Nemecké – Uzhhorod checkpoint. There is insufficient infrastructure and long border crossing times. Average waiting times are 200-350 min.

What concerns rail freight transport, the main problem is a technological incompatibility of transport systems. While in Slovakia prevail standard-gauge tracks (1,435 mm), in Ukraine there is a broad-gauge system (1,520 mm). This requires the railway operators to replace the wagon carts or to reload cargo from the wagons of one width to another. Building transhipment stations or terminals of combined transport are necessary to overcome mentioned incompatibility. Slovakia and Ukraine use different wagon widths. Ukrainian wagons are usually wider because the gauge is also broader. Therefore, their usage in Slovakia can damage railway infrastructure, such as tunnels, bridges, and platforms. Ukrainian wagons can also carry more load. The axle load of Ukrainian wagons is up to 23.5 tonnes, with the maximum allowable load being 18 to 20 tonnes in many neighbouring EU countries. Therefore, only European wagons can be used in Hungary, Slovakia, and Poland (Kosse 2022)[86]. Slovak railways have a lower capacity. Slovak railway carriers have fewer locomotives, wagons, locomotive brigades, customs officers, and phytosanitary inspectors, to name a few, compared to the volume that Ukraine currently wants to transport through Slovakia. It was visible e. g. at the end of July 2022, more than six thousand wagons were waiting at the Chop station and around 900 wagons at the Uzhhorod station in Ukraine. This congestion created delivery delays and decreased the stations' ability to move wagons inside the station due to limited space (Kosse 2022).

Recommendations on the ways of increasing the capacity of border infrastructure for freight transportation

One of the most important steps for the improvement of Slovak-Ukrainian freight transport is building the motorway connection between Slovakia and Ukraine using the D1 route. This will help solve the situation with waiting times for trucks from one and the other side of the border and speed up the movement of goods. Slovakia plans to speed up the completion of the construction of the D1 highway to connect with Ukraine. The section of the highway from the border with Ukraine to Sobrance or

[86] Kosse, I. (2022). Is there a solution for increasing the efficiency of the railway freight between Slovakia and Ukraine? Globsec Commentaries 07.11.2022. https://www.globsec.org/what-we-do/commentaries/there-solution-increasing-efficiency-railway-freight-between-slovakia-and

Michalovce was identified as a priority. The connection point of the Ukrainian highway to the D1 highway also was agreed. However, the construction terms of new road sections are currently not announced. According to the plan for the extension of the D1 motorway to the border with Ukraine, the construction of five sections with a length of 74 kilometres is planned: Bidovce – Dargov (12.6 km), Dargov – Pozdišovce (18.2 km), Pozdišovce – Michalovce (12 km), Michalovce – Sobrance (15.8 km) and Sobrance – the state border of the Slovak Republic with Ukraine (15.5 km) (Fig. 5.7).

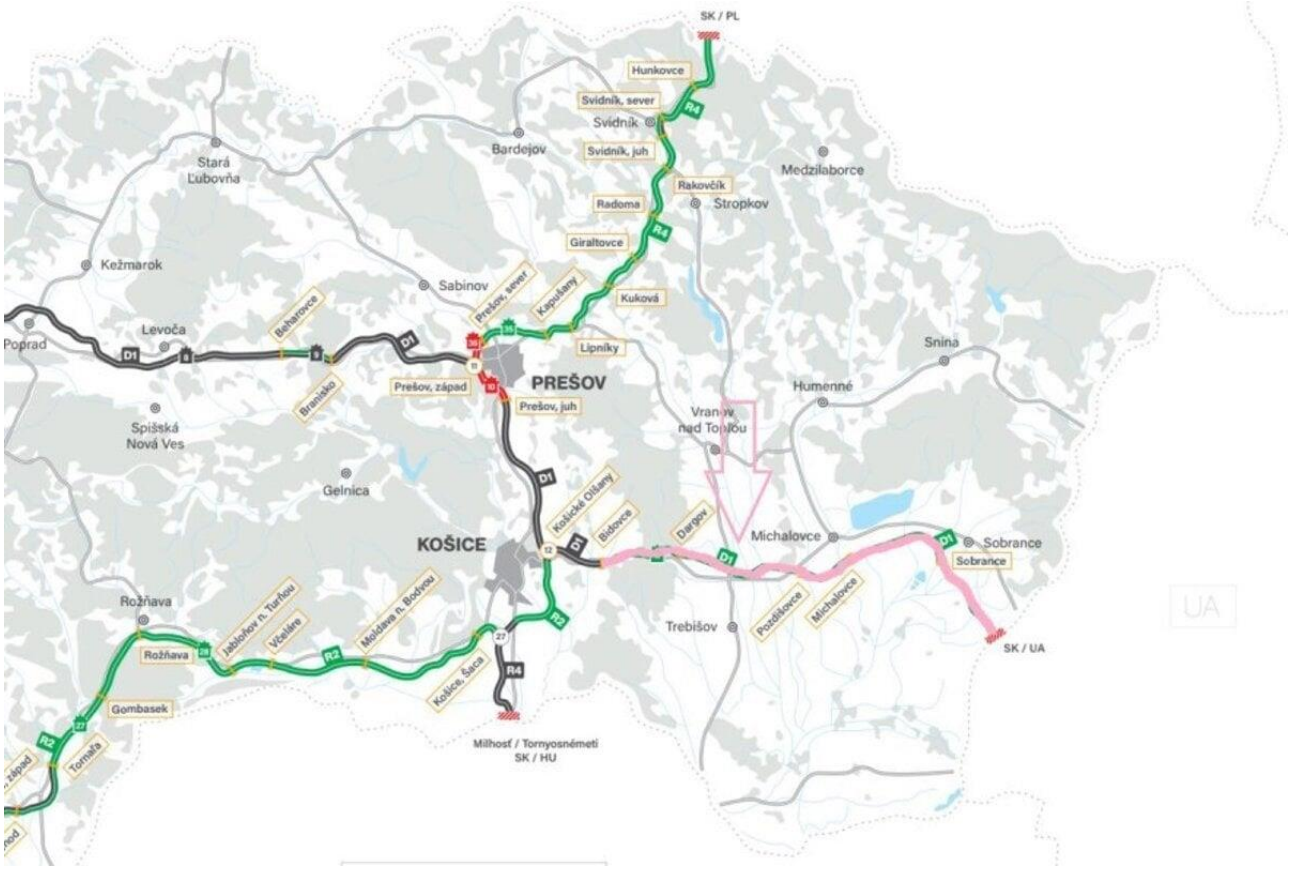


Fig. 5.7. Planned D1 section Bidovce - the state border with Ukraine
Source: Svrček (2022)[87]

Currently, a multimodal feasibility study Bidovce – state border SK/UA (I/19 Bidovce – Vyšné Nemecké) motorway section is in preparation. There are proposals of building the motorway from the border crossing and using finances from the Connecting Europe Facility (CEF).

While at the moment, motorway D1/ road I/19 corridor is mainly the gateway from Ukraine to Slovakia, in the future, the material aid from EU countries to Ukraine will flow in this direction.

Nowadays, European freight carriers, primarily railways, are under pressure due to a significant increase in the volume of transportation of food raw materials from

[87] Svrček, M. (2022). Situácia na Ukrajine ovplyvní aj budúcu výstavbu diaľnice cez Zemplín. Sme, 18. máj 2022. https://blog.sme.sk/svrcek/ekonomika/situacia-na-ukrajine-ovplyvni-aj-buducu-vystavbu-dialnice-cez-zemplin

Ukraine. Some routes pass through Slovakia. The current situation is caused by the Russian military blockade and, in some cases, the destruction of Ukrainian ports on the Black Sea (before the war, 75% of Ukraine's external trade was carried out at seaports). This situation does not allow the country to export grain and sunflower oil to the markets of Africa and Asia. Rail transportation of products remains the only way out at the moment. Therefore, in Slovakia, the urgent question of the construction of the Global Logistics and Industrial Park (GLIP) near Košice arose again. The issue was raised in 2019 but still remains only on paper. In Košice, the site of the future facility is located near the US Steel metallurgical plant - the logistics park should ensure the transhipment of goods from the broad gauge to the European gauge and vice versa. A few years ago, the joint-stock company Glip Košice was founded to support the construction of the park. Even the signed contract between the Košice region and the company Interport Partners Group. According to the plans, the logistics industrial park in the area of Bočiar near Košice was supposed to serve as a transhipment point for the so-called "New Silk Road" from China. Implementation and construction of the project will require also state support (Čermáková a Lendel 2022)[88].

[88] Čermáková, J., Lendel M. (2022). Na prepravu surovín z Ukrajiny nemáme kapacitu. Niektorým štátom hrozí hladomor. Korzár, 20. máj 2022. https://kosice.korzar.sme.sk/c/22914392/na-tranzit-surovin-z-ukrajiny-nemame-kapacitu-niektorym-statom-hrozi-hladomor.html

VI. TRANSPORTATION FACILITIES ACROSS THE HUNGARIAN-UKRAINIAN BORDER: AN ANALYSIS OF THE EXISTING INFRASTRUCTURAL BACKGROUND

Analysis of the existing border infrastructure along the border of Hungary-Ukraine

The M3 motorway, which is part of the international Corridor V (Mediterranean corridor: Venice-Trieste-Ljubljana-Budapest-Uzhhorod-Lviv-Kyiv), passes through Szabolcs-Szatmár-Bereg county. This connects the county to the national motorway network and links it to the capital (Figure 6.1).

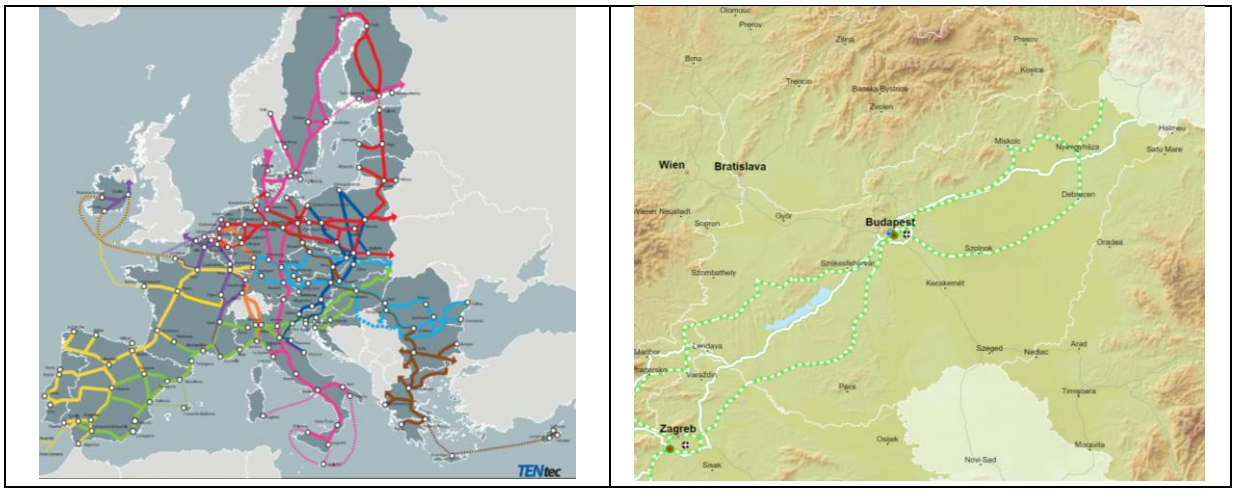
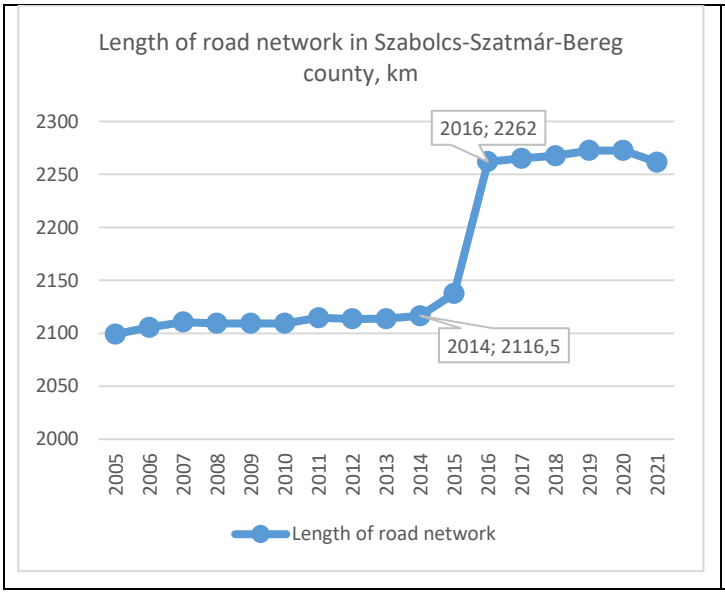


Fig. 6.1. Road transport networks connecting Hungary with Ukraine
Source: https://op.europa.eu/webpub/eca/special-reports/core-road-network-9-2020/en/

Szabolcs-Szatmár-Bereg county expanded its road network in the past ten years, the increase is partly due to the construction of Motorway 3 towards the state border, and partly to the developments on the municipality level (Figure 6.2).



Road No.	From	To
M3	Budapest	Nyíregyháza-Vásárosnamény
M34	**M3 motorway Vásárosnamény**	**Záhony area – state border**
	M3 motorway Őr area	**Csengersime – state border**
4/I	Budapest	Záhony
41/I	**Nyíregyháza**	**Beregsurány – state border**
36/II	Polgár	Nyíregyháza
38/II	Road 37 Tokaj	Nyíregyháza
49/II	**Road 41 Vaja**	**Csengersima – state border**
338/II	M3	Road 36
381/II	Sátoraljaújhely	Kisvárda
403/II	M3	Road 4
471/II	Debrecen	Mátészalka
491/II	**Road 49 Győrtelek**	**Tiszabecs – state border**

Fig. 6.2. Transport network: NUTS 3 level situation on the Hungarian side of the Hungarian-Ukrainian border (length of road network and name of roads)
Source: ksh.hu

Due to the positive changes in the road network of the border region, it is in a relatively favourable position in terms of accessibility. The fastest route to the nearest motorway junction in the case of the border settlements is between 15 and 44 minutes, while the fastest route to the nearest railway station is between 5 and 24 minutes (with a distance of 20 kilometres on average) (Figure 6.3). Both accessibility values are worse than the county average, and around the national average (road: 30 minutes; railway station: 11 minutes).

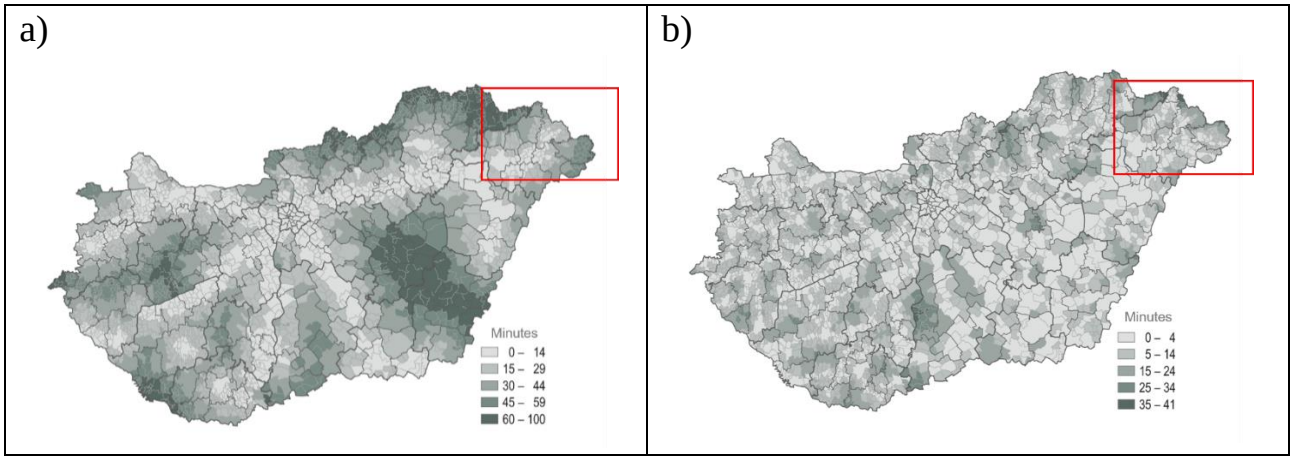


Fig. 6.3 (a) Road access time to the nearest motorway junction on the fastest route, 2019; (b) Road access time to the nearest railway station by the fastest route, 2019
Source: National Spatial Development and Planning Information System (TEIR)[89]

The railway line connects the major Hungarian settlements beyond the border with Uzhhorod and Mukachevo in Ukraine. This line belongs to the Mediterranean Rail Freight Corridor (RFC6, Spain-France-Italy-Slovenia-Croatia-Hungary; start date: November 2013) with a RFC6 Terminal in Záhony. MÁV Zrt. is the exclusive infrastructure provider. The railway company is responsible for the operation of the railway network, while large-scale investments and upgrades are managed by organisations outside MÁV. A significant part of the upgrades and renewals on the domestic sections of freight corridors have been completed in order to match the required track capacity and TEN-T parameters, and the ongoing or planned investments are expected to be completed by 2025-2027.[90]

9 secondary railway lines play an important role in passenger and freight transport within the region. The only rail lines used for freight are the wide-gauge railways around Záhony and Eperjeske. Stations in and around Záhony have been developed as rail transhipment hubs. Freight traffic is carried over two major Tisza bridges (Chop, Batiovo). One standard gauge and two wide-gauge marshalling yards have been built in the area. Special wide-gauge railway lines, used only for freight transport, include

[89] Összefoglalás. URL https://www.ksh.hu/docs/hun/xftp/idoszaki/jelszall/2020/index.html
[90] Európai vasúti árufuvarozási folyosók, 2022. URL: https://hungrail.hu/2022/10/31/rfc-europai-vasuti-arufuvarozasi-folyosok-2022-magyar-vasut-ii-evfolyam-19-szam/

the Záhony-Komoró, Tuzsér-Eperjeske-Crossing, Záhony-Eperjeske, Eperjeske marshalling yard-Eperjeske transhipment yard, Eperjeske marshalling yard-Tornyospálca transhipment yard sections (Figure 6.4).

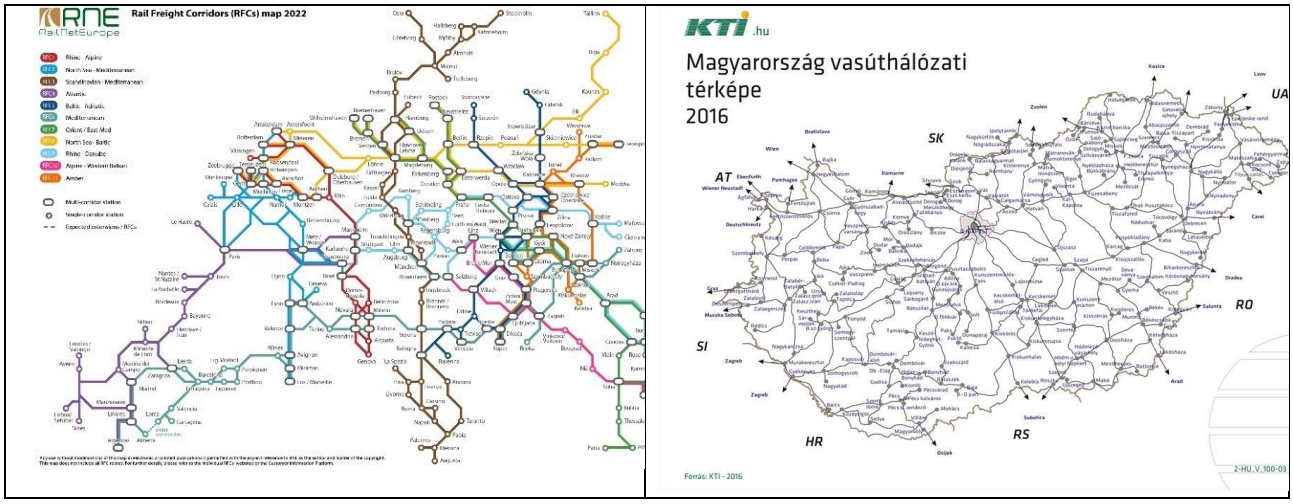


Fig. 6.4 Railway transport networks connecting Hungary with Ukraine
Source: RNE[91]

In addition to the road and railway networks, Nyíregyháza (county seat of Szabolcs-Szatmár-Bereg county) has an airport which is not an international airport but an airport with border opening rights. The River Tisza, as a border river, offers the possibility to connect with neighbouring countries, and the section of the Tisza River between Tokaj and Vásárosnamény is an international waterway (though there are no qualified – international - ports on the area of Szabolcs-Szatmár-Bereg county). The navigability of the river only allows for purposes of tourism and sports navigation. The volume of goods transported is small and only occasional.

Cross-border sections of the European road, railway and waterway networks are of special importance in international terms – especially along the external borders of the European Union – as well as at the national level – particularly considering the growing importance of the accessibility of cross-border urban centres for the cross-border settlements. "Cross-border sections need to be given particular attention as gaps in the cross-border infrastructure lessen the intended impact of the EU-wide network. Relevant corridor work plans identified several incomplete cross-border sections, both between Member States (for example between Poland and Slovakia in Baltic-Adriatic corridor) and concerning sections leading to a border with a non-EU country (for example extension of the Hungarian M3 motorway to Ukrainian border in the Mediterranean corridor)"[92].

[91] Ibid.
[92] The EU core road network: shorter travel times but network not yet fully functional. European Court of Auditors, Special Report, September 2020, 55p. URL: https://op.europa.eu/webpub/eca/special-reports/core-road-network-9-2020/en/ (Last retrieved: 10 March 2023)

Development of economic nodes/economic centres

The transhipment area in the Záhony area developed during the years of socialism and was a good alternative for transport. However, after the change of regime, the railways and the area/region/Eastern Hungary were devalued and the country did not take advantage of the opportunities offered by the railways. In recent years, the increase in the volume of goods coming from the East and the war has focused attention on the area. In the summer of 2020, a consortium called Záhony Logistics and Industrial Belt was established, with MÁV-REC Ltd. and Záhony Port Zrt. as members, and CECZ Central Europe Ltd. joined the CELIZ consortium in February 2021. Their aim is to join the Chinese government-backed Belt and Road Initiative and create a logistics, rail and freight hub.[93]

The government is also supporting the development of the Záhony district with HUF 12 billion. According to a decision published in the Hungarian Gazette, a total of 2 970 metres of wide and 4 618 metres of standard gauge track upgrades are needed at Záhony wide station and Fényeslitke South marshalling station, as well as the reconstruction of 18 sidings and related safety, equipment, lighting and overhead line interventions.

The East West Gate Terminal, located in Fényeslitke, was developed in a year as a brownfield project using state-of-the-art techniques, learning from similar terminals abroad, on an 85-hectare site (Figure 6.5).

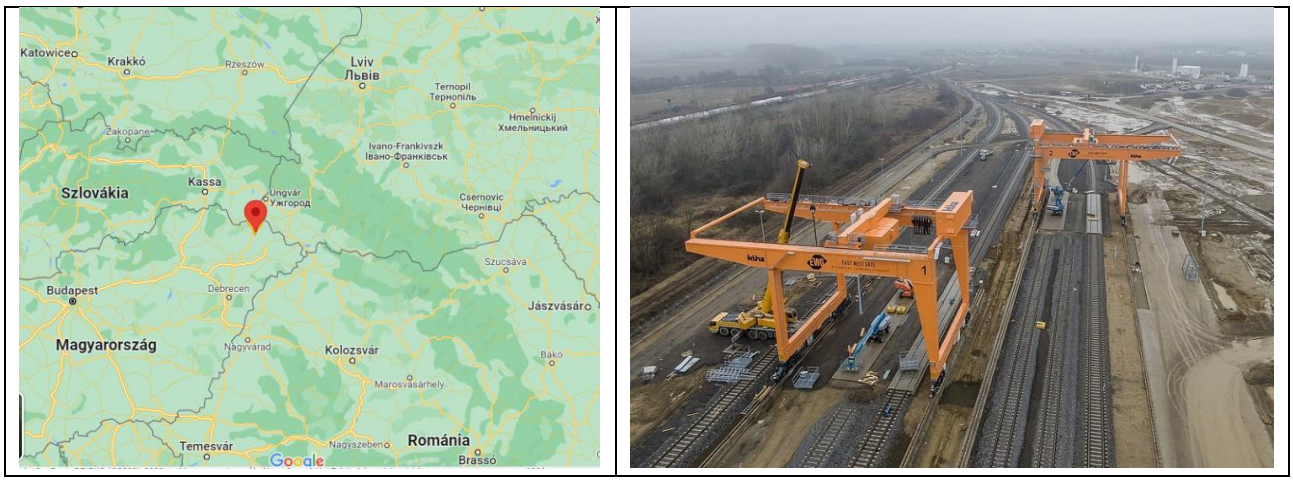


Fig. 6.5. Fényeslitke: the largest intermodal terminal in Central Europe

Source: https://www.napi.hu/magyar-vallalatok/east-west-gate-ewg-intermodalis-terminal-east-west-intermodalis-logisztikai-szolgaltato-zrt-fenyeslitke-logisztikai-kozpont-vasuti-fejlesztes-logisztika-atrako.742547.html

An intermodal terminal, the essence of which is to combine two or more modes of transport, has the advantage of using standard containers and waybills. In Fényeslitke there is a combination of road and rail. The cranes are controlled by the state-of-the-art 5G wireless connection from an operator's room with the most modern equipment. Their tasks include transferring containers from a wide-gauge rail car or

[93] Rólunk. URL: https://celiz.org/rolunk/

truck to a standard-gauge rail car or truck, and vice versa. Container inspection, repair, cleaning, haulage, semi-trailer transhipment, photo OCR identification, storage, warehousing, dangerous goods handling and storage, and customs clearance. Grain, crude cooking oil and fertilisers are transported from China, Japan, South Korea and Central Asian countries to Europe, Germany, Italy, Austria, Croatia and Slovenia.

Development of a network of checkpoints

Transport networks have a multiplier effect on the development of regions. Connecting regions, and more specifically connecting countries, by viable transport lines is essential for international integration. The border region has international connections to Ukraine by road and rail. There are 5 road and 2 rail border crossing points for the movement of people and goods along the Ukrainian border. The only weighing-scale point along the Hungarian-Ukrainian border can be found in Záhony which works for both directions (entry and exit) (Figure 6.6).

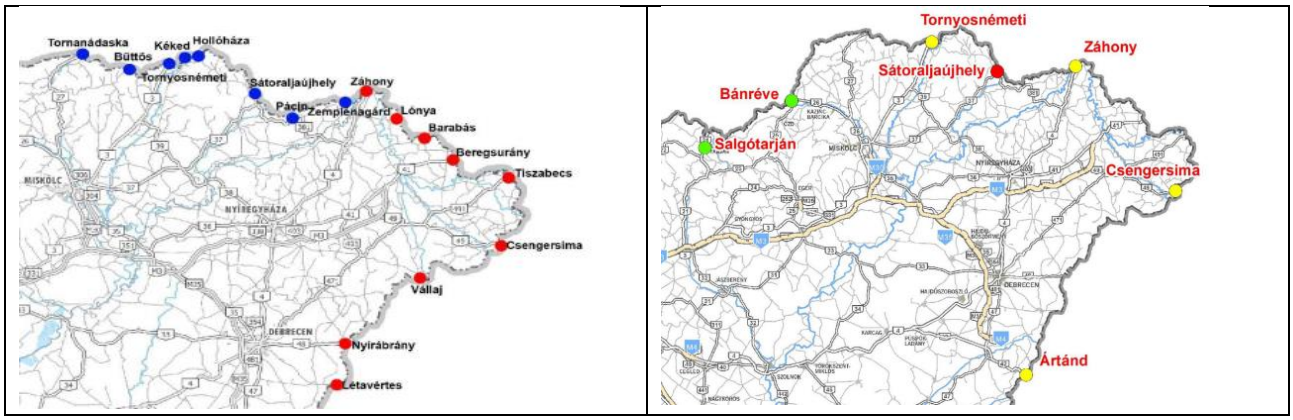


Fig. 6.6. Transport network: public road network, border checkpoints and weighing-scale points along the Hungarian-Ukrainian border (*blue dots: Schengen internal border, red dots: Schengen external border, yellow dots: weighing-scale in both directions, green dots: weighing-scale for the control of domestic traffic*)
Source: National Road Network Information Scoreboards (February 2021)

The International border crossings along the HU-UA border play an important role in connecting Ukraine with the EU. Cross-border workers play an important role in the economic, labour market and social relations of border settlements. The border crossing at Lónya ensures international passenger traffic between 8.00-16.00 and the border crossing at Barabás between 7.00-19.00. Rail border crossing with Ukraine at Zahony and Eperjeske. Only freight traffic is possible at the Eperjeske crossing point (Table 6.1).

Table 6.1

International border crossings along the Hungarian-Ukrainian border

Hungary	Ukraine	Cars	Buses	Trucks	OPEN
Záhony	Chop	■	■	■	00-24
Lónya	Dzvinkove	■			8 a.m.-4 p.m.
Barabás	Koson'	■			7 a.m.-7 p.m.
Beregsurány	Astei	■	■	■	00-24
Tiszabecs	Vylok	■	■		00-24
Záhony	*Chop*	*RAILWAY*			00-24
Eperjeske	*Salovka*				00-24

Analysis of the bottlenecks in Hungary-Ukraine rail/road connectivity

Data were collected to see the permeability at border checkpoints. In November 2022 all checkpoints were observed every two hours for passenger cars, lorries/trucks and buses to see how many hours they had to wait. The data retrieved from the official information source (police.hu) was complemented by data from the BorderWatcher application which is a platform providing information about the car traffic at every Hungarian border crossing. The application gets the data periodically from the official website, but the information found there isn't accurate. To provide more accurate information it is necessary that you indicate how long did your border crossing take. The data were analysed according to the direction of crossing and the type of vehicles. Based on that the following observations were made for the month:

1. There are no significant bottleneck situations at the international border checkpoints along the Hungarian-Ukrainian border from Hungary to Ukraine from the aspect of passenger cars. Increased waiting time was found only at the Beregsurány-Astei checkpoint on 14 days out of the 30 days, exceeding 60 minutes only on two days, but generally being around 30 minutes. At the Záhony-Chop checkpoint, 120 minutes was experienced in the evening hours on 15 November.

2. In the case of lorries and trucks from Hungary to Ukraine, the Beregsurány-Astei checkpoint had no real bottleneck situations, it occurred only three times on two days and meant only a 30-45 minutes delay. At the Záhony-Chop border, however, there was very heavy traffic all month with extremely long hours at the weekends (Table 6.2).

3. From Ukraine to Hungary at Astei-Beregsurány there was more passenger traffic with 30-35 minutes waiting time everyday, and there were also 19 days with 45-60 minutes waiting time for lorries and trucks.

Table 6.2

Bottleneck situations at the international border crossings along the Hungarian-Ukrainian border from Hungary to Ukraine (lorries and trucks, November 2022)

	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
6								120	120	240	180			240	180	180	240	300					300	360	360		60	120
8		60	120	120				120	120	240	180			240	180	180	300	300					300	360	360		60	120
10		60	120	120			120	180	120	240	240			120	180	180	300	300					300	360	360	60	60	120
12		60	240	120			120	180	180	240	180			120	180	180	300	300				120	300	360	240	60	60	180
14	120	120	240	120		60	120	180	180	240	120			180	240	240	300	240			60	120	300	360	240	60	60	180
16	120	120	240	120		120	120	180	180	240				180	240	240	300	240	60		120	180	360	360	240	120	60	180
18	120	120	240	120		120	120	180	180	240				180	240	240	300	240	60		120	180	360	360	240	120	180	240
20	120	120	240	60		120	180	180	240	240			120	180	240	240	300	180	60	60	120	240	360	360	240	120	180	240
22	120	120	240			60	180	180	240	240		60	240	180	240	240	300	120	60	120	120	240	360	360	180	120	180	180
24		120	120			30	180	180	240	240		60	240	180	240	240	300	60	60	120	120	300	360	360	180	120	180	180

One of the poorest heavy vehicle traffic was found in the Hungarian-Ukrainian border region in 2019 with less than 500 heavy vehicles using the main roads and motorways per day while the other border sections are much more loaded (Figure 6.7).

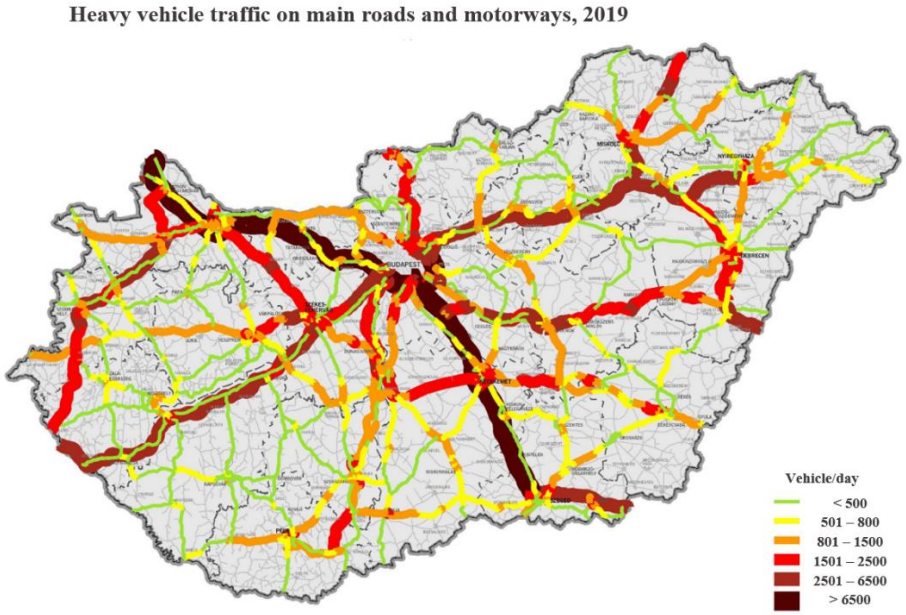


Fig. 6.7. Heavy vehicle traffic on main roads and expressways in Hungary (2019)
Source: National Road Network Information Scoreboards (February 2021)

In Hungary, as shown in Figure 6.8, road freight transport takes the largest share of all modes of freight transport, both in terms of the weight of goods transported (the sum of the weight in tonnes of goods loaded on and transported by means of transport, which includes the weight of packaging and containers used for transport in addition to the net weight of the goods) and in terms of tonne-kilometres (the natural unit of measure of freight transport performance, 1 tonne-km is the distance of 1 tonne of goods transported over 1 km).

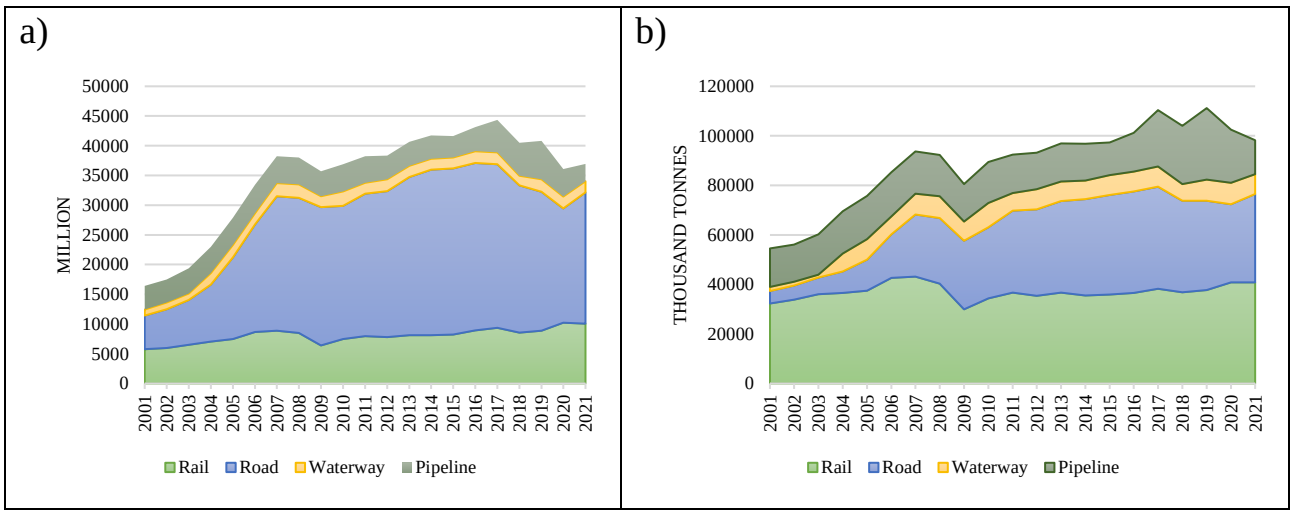


Fig. 6.8. International transport of goods by mode of transport in Hungary: (a) freight kilometres, million (b) transported goods, thousand tonnes
Source: based on CSO data

In terms of the direction of freight transport, international performance is higher than domestic performance. Due to Hungary's location, international transit performance is the highest.

As for rail freight transport, the international export, import and transit performance by weight of goods carried had similar values in 2021, though the increase in international transit performance just began in 2018 – until then it was rather fluctuating. Nevertheless, in terms of freight tonne-kilometres, it has exceeded both the international export and important performances since 2015 with a definite increase after 2018 (Figure 6.9).

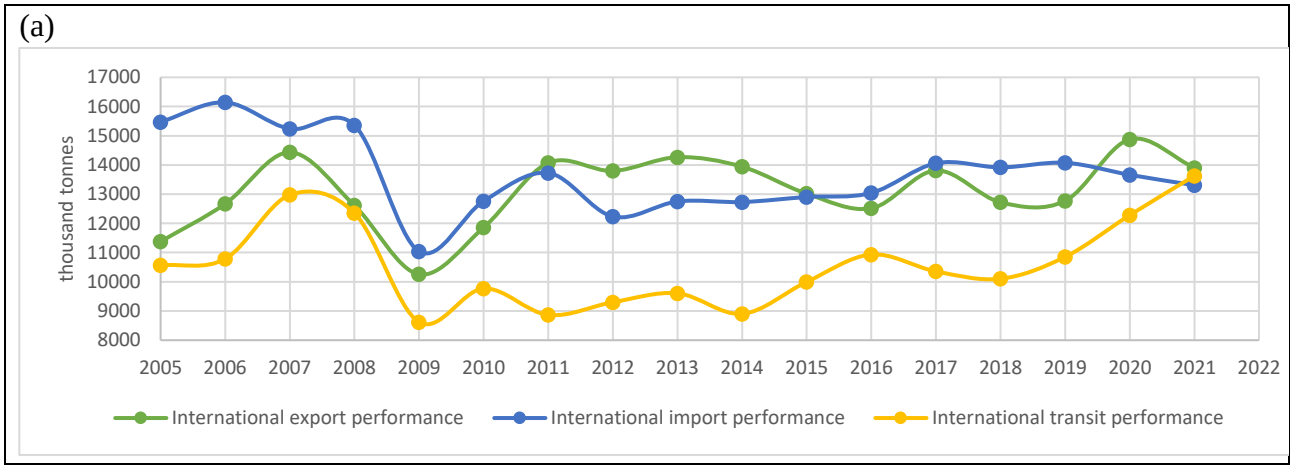


Fig. 6.9. Rail freight transport by direction of traffic in Hungary: (a) weight of goods carried
Source: based on CSO data

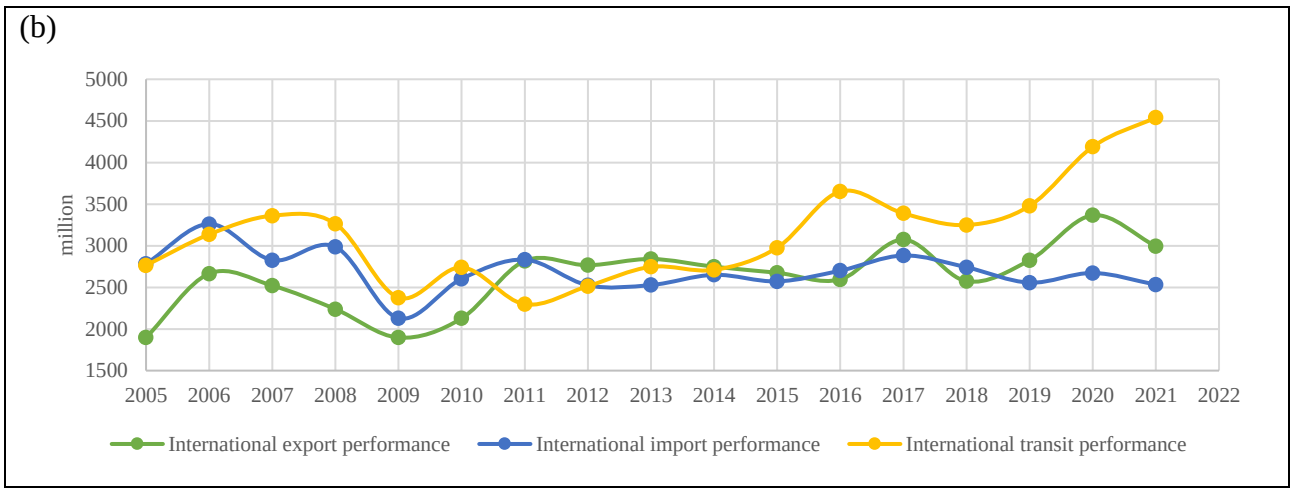


Fig. 6.9. Rail freight transport by direction of traffic in Hungary: (b) freight tonne-kilometres, million
Source: based on CSO data

As regards the import trade of goods at the Záhony road border crossing point, the volume of goods entering the country exceeded 1.5 million tonnes in 2018. This figure decreased in 2019-2020 due to the effects of the Covid epidemic, and the volume of goods entering the country increased in 2021, but the war in 2022 led to a decrease in the volume of goods entering the country. In 2022, data are available until October, and these monthly data show that the volume of imports normalised compared to previous years, before starting to rise from August, the beginning of the harvest, as an alternative to grain transport. The monthly figures suggest that if this upward trend continues, the volume of imports in 2022 could exceed that of recent years (Figure 6.10 a).

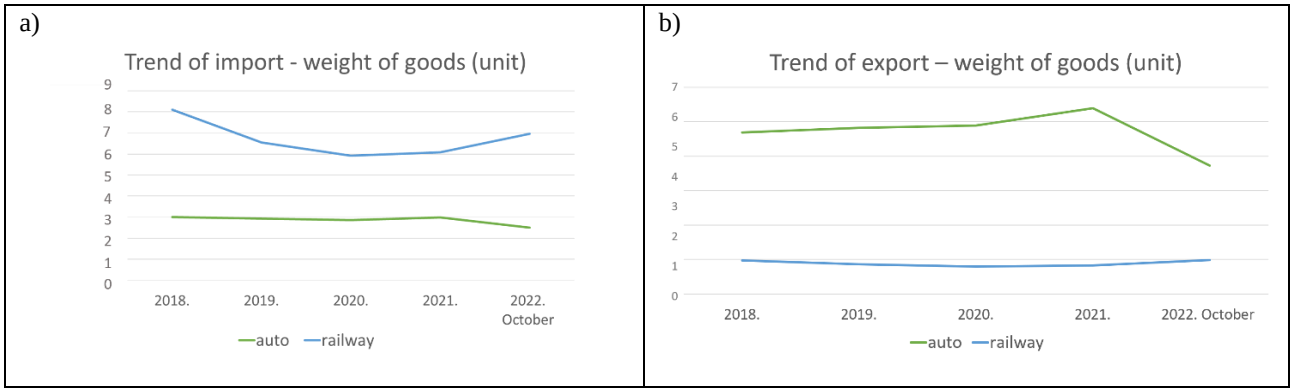


Fig. 6.10 (a) Import and (b) Export trends by weight of goods between 2018 and 2022 (unit)
Source: based on data from National Tax and Customs Administration

The rail import traffic is an aggregation of Eperjeske and Záhony data, which also shows the global problems of the past period and their effects, with the difference that the volume of imported goods is higher. The chart also shows that in October 2022, the volume of goods entering the country already exceeded the total volume of the last 3 years.

Figure 6.10b shows the quantities of goods leaving the country, where the total quantities are lower than the quantities that enter. In addition, the quantity of goods arriving by road is higher than the quantity of goods arriving by rail. The total volume of outgoing goods decreased mainly between March and May and then increased until the end of October, but this figure remained low for the rest of the year. The number of empty lorries leaving increased compared to previous years. The volume of freight outbound by rail is lower than by road, but by the end of October it had already exceeded its 2018 peak. The number of empty wagons exiting the market has also increased compared to previous years.

In terms of international rail freight transport, the weight of goods transported in import traffic, according to the Central Statistical Office, was 1 988 000 tonnes of goods from Ukraine in 2020, and in 2021 the total volume of goods was 13 million tonnes, of which 16%, 2 153 000 tonnes of goods, came from Ukraine. According to the data presented by the National Tax and Customs Administration at the 13th Transport Logistics Conference, the volume of goods transported from Ukraine exceeded 2.3 million tonnes in 2022[94] (Figure 6.11).

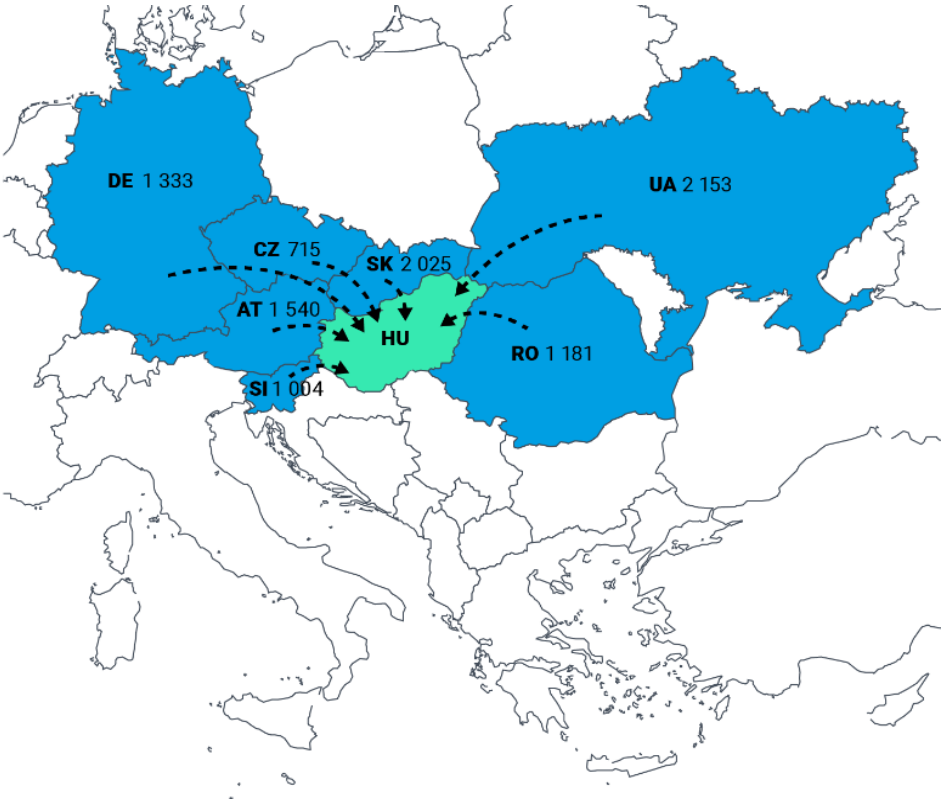


Fig. 6.11. Weight of goods transported in import (from) traffic (thousand tonnes)
Source: ksh.hu

[94]Bezuhant a vízi szállítás a háború és az aszály miatt tavaly. URL: https://mlszksz.hu/bezuhant-a-vizi-szallitas-a-haboru-es-az-aszaly-miatt-tavaly/?v=35b5282113b8; A szállítás, raktározás ág hozzájárulása a GDP volumenének éves változásához. URL: https://ksh.hu/s/helyzetkep-2021/#/kiadvany/szallitas/a-nemzetkozi-vasuti-aruszallitas-volumene-tonnaban-orszagok-szerint-2021; Tizedével alacsonyabb az áruszállítási teljesítmény. URL: https://www.ksh.hu/docs/hun/xftp/idoszaki/jelszall/2020/index.html#tizedvelalacsonyabbazruszlltsiteljestmny

Recommendations on the ways of increasing the capacity of border infrastructure for freight transportation (strategic planning)

Strategic planning for increasing the capacity of border infrastructure for freight transportation includes the implementation of specific projects in the border region. The following recommendations have been made so far in this respect:

1. The "Carpathian Euroregion 2020 Strategy" is based on the "Sustainable Development of Border Regions provided by the effective functioning of the Carpathian Euroregion" ENPI project prioritising mobility and border compatibility. "The competitiveness of a country or region is mainly determined through the availability and development of infrastructure. It is important that all existing motorways to the border are to create trade routes in the European Union and in general, to be more compatible and faster on the European continent, and meet the needs of freight, road transport and mobility."

2. The "Modern Border Infrastructure – Successful Carpathian Region (MOBI)" was implemented within the framework of the Programme 2014-2020 Hungary-Slovakia-Romania-Ukraine ENI CBC between 1 March 2020 and 31 January 2023 with a total budget of 1051980 euros. The thematic objective of the project is the improvement of accessibility to the regions, development of sustainable and climate-proof transport and communication networks and systems. "The main project objective is to create a sustainable platform for effective cross-border mobility of people and goods by improving transport and border infrastructure and public lines connection, strengthening cooperation between self-governments and professional organizations aimed at transport and border infrastructure development. The main challenge, however, is that due to the associated EU membership of Ukraine and non-visa regime provided for Ukraine, the level of mobility of people and goods has increased and border infrastructure and connection between EU target regions and Ukraine need to be improved. There are great needs to develop the effective Mobility Strategy based on sustainable development and planning, synchronization of activities on the different sides of the border, because of the weak connection and infrastructure inequalities, low infrastructure network quality, poorly developed public transport services and lack of public lines connections in border regions. Within the project the strategic approach to the sustainable and effective development of transport and border infrastructure are planned to be provided by developing the feasibility studies and pilot infrastructure project implementation in Ukraine, namely 4 350 km of the bicycle roads. As a result of the project, the mobility of goods will be increased, the business will become more mobile and due to economic development and improved infrastructure, increase of the number of tourists and visitors in border regions is expected. Expected results: increased number of vehicles using the built modernized transport and border management infrastructure (number of vehicles per day); 4 350 km of the bicycle roads

will be reconstructed. Created innovative approach of the project related to providing the connection of 8 target regions the population of which will benefit using the improved services."[95]

3. The "Via Carpathia Expressway" is a transport corridor connecting Central and Eastern Europe and Hungary opened in 2021. The road is designed to branch out to Ukraine, Belarus and Turkey, reaching from the Baltic sea Polish harbours (Tricity) to the Black Sea and the Aegean Sea (Figure 6.12).

Figure 6.12. Via Carpathia expressway

Its primary role is to embed the area into the process of advancing economic and territorial cohesion of the European Union, and to contribute to the social and economic development of Central and Southern Europe. It includes parts of the M30 motorway in Hungary. The Hungarian section was opened to public in October 2021 by completing the missing link between Miskolc and the Hungarian-Slovakian border.

4. A strategic agreement on the creation of a new industrial park was signed on 9 February 2023 between the East-West Gate Terminal and the mayors of Döge, Fényeslitke and Komoró. The planned industrial park will cover an area of five hundred hectares and will be suitable for the construction of industrial, commercial and logistics facilities, as well as for serving the industrial plants of Debrecen and Nyíregyháza. The industrial park, to be completed in two to three years, will be one of the largest in Hungary and will be a driving force not only for the development of the three settlements, but also for Kisvárda, Záhony and the region. Transport links in the area are already good with the construction of the terminal in Fényeslitke, and once the M34

[95] Modern Border Infrastructure - Successful Carpathian region. URL: https://keep.eu/projects/23162/Modern-Border-Infrastructur-EN/

motorway is completed, suppliers and back-up logistics service providers for industrial plants in Debrecen and Nyíregyháza will be able to set up in the area.[96]

Out of the 22 findings concerning cohesion in the cross-border region which were drafted by the CESCI, 5 were found as the most relevant from the aspect of the focus of the present study (Table 6.3).

Table 6.3

Factors strengthening or weaking cohesion and the strategic response to them

STRENGTHENS COHESION	WEAKENS COHESION	STRATEGIC RESPONSE
establishment of an industrial and logistics zone in Záhony-Chop region	rivalry and uncoordinated, parallel logistics capacities	industrial and logistics cooperation
existing joint ventures, local business knowledge	weak intercorporate relations and cooperation, bureaucratic obstacles	support for economic networking
interest in investment opportunities, industrial zones to be developed	poor industrial infrastructure, incubation services, investment and business promotion in Ukraine	joint investment promotion and business development ("incubators")
border crossing point development opportunities	Schengen border with strict border control	support for border infrastructure investments
presence of agents who represent smaller producers and coordinate production	lack of sectoral and intersectoral collaboration	cooperation between sales and production

Source: CESCI (2016)

Based on the factors strengthening and weakening cohesion, the CESCI suggested four specific objectives to support the overall objective of the Tisza EGTC (and consequently the Hungarian-Ukrainian border region) which is to create a border region with high level of integration. The focus of our research is the presence and future of transport and trading networks in the region, therefore we found that "SC_02 To develop a cross-border network economy" clearly refers to the essence of the expected cross-border region activities.[97]

The border region has a unique location and position from the aspect of both countries. For Hungary it means the Eastern Gate, while for Ukraine this means a Gate to the European Union. As it is a double tripoint border area – Hungary-Slovakia-Ukraine and Hungary-Romania-Ukraine – it has undoubtedly a very strong international integration potential. Within the Carpathian Basin, there is a strong urban pole system (Kosice, Uzhhorod, Satu Mare, Oradea, Debrecen, Miskolc, Nyíregyháza) developing during the past decades. The expected further strengthening of international integration in the region is based on the improvement of transport networks at all levels connecting these poles with subpoles, or subpoles with subpoles (e.g. Nyíregyháza-Kosice, Nyíregyháza-Uzhhorod, Nyíregyháza-Munkacevo, Nyíregyháza-Satu Mare) (Figure 6.13).

[96] Az ország egyik legnagyobb ipari parkját hozzák létre egy újonnan elkészült intermodális csomópont mellett. URL: https://magyarepitok.hu/mi-epul/2023/02/az-orszag-egyik-legnagyobb-ipari-parkjat-hozzak-letre-ujonnan-elkeszult-intermodalis-csomopont-mellett

[97] CESCI: Tisza EGTC Cohesion Analysis and Integrated Development Strategy, Extract, 2016, p.13.

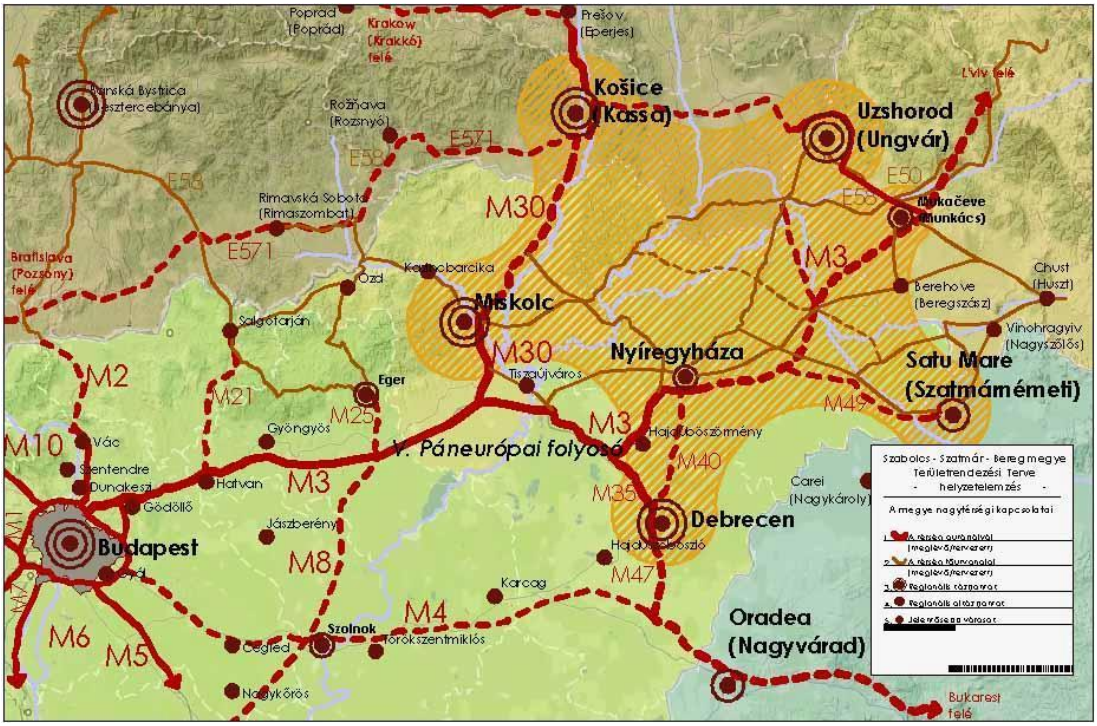


Fig. 6.13 Regional/Metropolitan relations of Szabolcs-Szatmár-Bereg County[98]

Source: spatial planning plan of Szabolcs-Szatmár-Bereg county

Nevertheless, it should also be noted that the border in the past century acted more like a barrier rather than a bridge. After World War 2 it has become one of the most isolated and closed borders in Europe with the Soviet Union protecting its borders with special care and using her western neighbours as a buffer zone. This meant that there were no developments and investments coming to the border region for strategic purposes on either side. At that time, it was only the rail freight connection at Záhony, which served the strategic purposes of the regime. This resulted in intensive outmigration from the region, leading to depopulation of the settlements located along the border, and causing economic desertification and poverty. The current trend is to invite investments and co-operation to this border region serving the economic, social and strategic needs of the neighbouring countries.

[98] Szabolcs-Szatmár-Bereg megye Foglalkoztatási Stratégiája, 2017-2021. (Employment Strategy of Szabolcs-Szatmár-Bereg county, 2017-2021), 235p. URL: https://docplayer.hu/69002579-Szabolcs-szatmar-bereg-megye-foglalkoztatasi-strategiaja.html (Last retrieved: 10 March 2023)

VII. THE ROMANIAN-UKRAINIAN FREIGHT TRAFFIC FLOWS. AN EVALUATION OF CURRENT SITUATION

Analysis of the existing border infrastructure along the border of Romania-Ukraine

From the perspective of the transport network operating at the Romanian border with Ukraine we will start from the general to the particular, more precisely, from the TEN-T corridors, making the transition to the European roads, as well as their subdivisions connecting the two countries, both at road and rail level. Thus according to the TEN-T network at European level there are no less than 9 TEN-T Core Networks Corridors[99], as shown in Annex D, Fig. D.1, and of these only the Rhine - Danube intersects with Romania, but which has no connectivity with Ukraine. Connectivity between Romania and Ukraine is achieved through the European road networks (E) according to Annex D, Fig. D.2, where two main European roads are identified in the north part of Romania, going to the border with Ukraine, namely: E 58 going to the Halmeu-Diacovo crossing point and E 85, going to the Vișcani - Vadu Siret crossing point and E 87 helping connectivity with Ukraine in the east of Romania.

From the point of view of the railway infrastructure we are talking about two totally different systems, which operate on the structure of two different types of gauges, the European gauge, the one used by Romania, and on the other hand Ukraine because it uses the wider Soviet-type gauge system which is much wider compared to the European or Romanian one. The basic railway structure linking the Romanian-Ukrainian border is not a very diversified, modern one, here we are talking about two main connections, namely Halmeu-Diacovo and Vișcani - Valu Siret, respectively Galați, as shown in Annex D, Fig. D.3. According to the infrastructure of the railway network crossing the Romanian-Ukrainian border, we are talking about simple non-electrified lines.

From this point of view, we can discuss about a precarious situation in terms of road and rail infrastructure, which cannot support a European standard connectivity between Romania and Ukraine. In order to justify the answer offered as a conclusion to the road network, we do not discuss the crossing of the Romanian-Ukrainian border by TEN-T corridors, motorways, or modern roads. The only connectivity regarding the road infrastructure is from Romania to Ukraine, through the three European roads mentioned above. As far as rail transport infrastructure is concerned, the two countries do not have a universal track gauge, with two types of track gauges, which make it difficult to communicate by rail by switching from one system to another. The communication is also difficult because of the lack of modernised railway lines and the existence of simple electrified lines.

[99] Baltic-Adriatic, North Sea Baltic, Mediterranean, Orient / East-Med, Scandinavian – Mediterranean, Rhine – Alpine, Atlantic, North Sea – Mediterranean and Rhine - Danube

Development of economic nodes/economic centers *(transport and industrial hubs, parks, logistics centers, economic development zones)*

The success of logistics activities and trade between Romania and Ukraine is also ensured by the pan-European cargo network. The war in Ukraine demonstrated, if anything, that any security crisis can have devastating effects on global food markets. In Ukraine's case, connectivity with Europe for both exports and imports depends on finding alternative logistical routes to link it to major EU ports, from where goods could be shipped further afield[100]. This means not only identifying which transport networks can be used and using transport modes as efficiently as possible, but also exploring the resources needed in logistics activity. We are referring to cargo transport hubs, logistics parks and centres or economic development zones, which have infrastructure and logistics assets that can be quickly converted and used to facilitate EU-Ukraine bilateral trade or to facilitate Ukraine's exports.

As regards Ukraine's access to the Black Sea and Danube routes, the operationalisation of grain shipments has also been facilitated by the reopening in June 2022 of the 706J wide gauge line Galati Largă Ana - Galati Bazin - Galati Cargo - Port Docuri and the standard gauge line Siloz Port Docuri - Galati Cargo - Galati Passengers. In this way the first train from Ukraine, via Republic of Moldova, completed customs formalities at Galați Largă station, group A on 17 August 2022, the 15 wagons being taken directly from Siloz by a Cargo operator and deposited on the standard gauge line to the loading docks[101].

However, in terms of economic development, the North-East Development Region of Romania (RDN-E), which includes Suceava and Botoșani counties, had a GDP growth rate of 55% between 2008 and 2017, lower than the national average of 59%. At the level of the region, out of the 6 counties that compose it, Suceava is the third most important municipality in terms of economic importance, its location near Iasi being a reason for the slow pace of economic growth. However, in the period 2011-2018, Suceava records a growth of 59%, higher than that of Iași (53%), due to the costs and wage levels in Iași. At RDN-E level, the distribution of enterprises is uneven, with the regional average being exceeded by Iași, Bacău and Suceava counties. In 2018, Suceava ranks first in the number of restaurants (846 establishments), second in construction (1326 firms), first in agriculture (362 firms, about half of the regional total), first in the manufacture of articles of straw and other plaited vegetable materials

[100] European Commission, *Communication from the Commission to the European Parliament, The Council, The European Economic and Social Committee and The Committee of The Regions. Action plan for EU-Ukraine Solidarity Lanes to facilitate Ukraine's agricultural export and bilateral trade with the EU*, available at https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52022DC0217&from=EN, accessed in March 2023

[101] Mirabela Tiron, "Linie de cale ferată ce ajunge în portul Galați, redeschisă după 22 de ani, pentru un tren de cereale din Ucraina [Railway line that reaches the port of Galati, reopened after 22 years, for a grain train from Ukraine], in *Ziarul* Financiar, on line edition, 19th of August, 2022, available at https://www.zf.ro/eveniment/linie-de-cale-ferata-ce-ajunge-in-portul-galati-redeschisa-dupa-22-21098167, accessed in March 2023

(493 firms), last in the metal construction and metal products industry (116 firms); second place in the manufacture of furniture (117 establishments), third place in the manufacture of rubber and plastic products (52 firms), first place in the manufacture of other non-metallic mineral products (87 establishments), last place in the manufacture of textiles (43 enterprises), second place in leather goods (65 firms). 30% of these firms are based in the Municipality of Suceava, 37% of employees in the county are employed by these firms (unemployment rate is 4.8% in 2019). In terms of competitiveness index, the municipality of Suceava is ranked 36th in a national ranking with an index of 1.537501, and regarding the attractiveness index, it is 1.821512 (21st place in a national ranking). This means that Suceava's performance is below potential, requiring a greater effort to attract investors. Workforce training is one of the county's attractive factors, which could help attract foreign capital to the area. Botoșani county ranks last at national level in terms of the number of active local establishments, ranking third in the number of firms involved in the manufacture of articles made of straw and other plant materials (128), second last in the number of SMEs (4631), with a density of 11.6 enterprises/1000 inhabitants. The competitiveness index is very low (0.911036, 121st place nationally) and the attractiveness index is 1.362201 (38th place nationally). The employment rate in 2019 was 58.2%, below the national average (69.6%)[102].

As regional and local development tools, industrial parks are included by public authorities in strategies and policies to increase the above indicators, with the aim of attracting investment. In the studied area, Botoșani Industrial Park is the first one established, in 2003, it has a surface of 129.500 sq.m., and is located in the northern part of Botoșani municipality, on the national road DN 29B. The specialization field of the park is manufacturing, mechanics, machine building, but there may also be secondary fields (business, distribution and services)[103]. The park has direct road access from the DN 29B - Dorohoi road, the Botoșani CFR station being 1 km away and the Suceava airport 30 km away. It is 7 km from the E58 European road and 90 km from the E85[104].

The Siret industrial park on the northern border of Romania is the first of its kind in Suceava county. Established in 2016, the park is managed by the company Industrial Park East European Border SRL and has an area of 15.94 ha, mainly for production and trade of goods between the EU and non-EU (Ukraine). The park has an

[102] Suceava City Hall, *Strategia Integrată de Dezvoltare Urbană a Zonei Urbane Funcționale Suceava 2021-2030* [Integrated Urban Development Strategy of the Suceava Functional Urban Area 2021-2030], available at https://mitocudragomirnei.ro/assets/documente/info_publice/anunturi/strategie/2.%20Sec%C8%9Biunea%202.%20Analiza%20situa%C8%9Biei%20actuale%20%C8%99i%20contextul%20urban_SIDU%20Suceava/2.2.%20Profil%20Economic_SIDU%20Suceava.pdf, accessed in March 2023, p. 16-92

[103] Botoșani City Hall, *Parcul Industrial Botoșani – o ofertă atractivă* [Botoșani Industry Park - an attractive offer], available at *https*://www.primariabt.ro/pdf/diverse/pib/pibro.pdf, accessed in March 2023

[104] Idem

infrastructure of industrial halls, goods logistics halls, customs warehouses, temperature-controlled warehouses and office space[105]. The main target industries are light, woodworking, mechanical, food, textile and warehousing. The park has a road access to the E85 European road and railway line and Suceava airport is located 50 km away[106]. The second industrial park, Bucovina Industrial Park, is located in the town of Salcea and the commune of Dumbrăveni, Suceava county, near the Stefan cel Mare airport[107]. Established in March 2020, the park has an area of 13.74 ha on which are built two buildings and 8 industrial halls, located 12 km from the municipality of Suceava and 30.5 km from the municipality of Botoșani. Road access is via DJ 290A, which connects via E58 with E85 towards Bucharest and E576 towards Cluj-Napoca. For rail transport, there are 14 km between the industrial park and the Burdujeni-Suceava railway station. Eligible activities include: manufacturing industry, agri-food industry, distribution, warehousing and logistics[108].

Regarding the logistics capacity of the Suceava - Botoșani area, the transport & logistics attractiveness index is between 1 and 1.9 [109], which is due, on the one hand, to the lack of transport infrastructure connecting the area to the pan-European transport corridors, and on the other hand, to the lack of transport hubs. However, in the study area, 15 freight transport companies and 13 warehousing companies operate in Suceava county (see Table 7.1), and 13 transport companies and 5 warehousing companies operate in Botoșani county, employing a total of 910 people (726 in Suceava county and 184 in Botoșani county). SC ORIENT SRL has the highest turnover (more than 117 million lei/year) based in Rădăuți, and the highest number of employees is registered at SC COMILGA SRL (84) based in Iaslovăț. In Botoșani county, SC MERCUR EXPRES SR has the highest turnover (over 10 million lei/year) and the highest number of employees (29) [110].

However, in terms of economic development, the North-West Development Region of Romania, of which Satu Mare and Maramureș counties are part, had in the period 2012-2017 GDP increased by 67.41%, with an annual growth of 8.22%, passing the value of 10% in 2017, generally following the dynamics of national GDP[111]. In real terms, between 2012-2017, the GDP of the NV Region recorded an average annual

[105] Chamber of Comerce, Industry and Agriculture from Botoșani, *Analiza mediului antreprenorial din Regiunea Nord-Est* [Analysis of the entrepreneurial environment in the North-East Region], available at https://www. cciabt.ro/wp-content/uploads/2021/05/analiza-economica-final.pdf, accessed in March 2023, p.18 and Ministry of Development, Public Works and Administration, *Politica urbană 2020 – 2035 și Planul de acțiune [Urban Policy 2020 – 2035 and Action Plan]*, available at https://www.mdlpa.ro/userfiles/sipoca711/anexe_livrabil3_1.pdf, accessed in March 2023, p. 644

[106] Ibidem

[107] Ibidem

[108] Ibidem

[109] Ministry of Development, Public Works and Administration, *op.cit.*, p. 618

[110] Ibidem

[111] North-West Regional Development Agency, North-West Regional Development Plan 2021-2027, p.122 *https://www.nord-vest.ro/wp-content/uploads/2021/02/PDR-NV-2021-2027-versiunea-feb-2021.pdf*

growth of 7.95%, with a maximum of 10.21% in 2017. From the point of view of GDP/capita growth by county, in the period 2012-2016 (the last year for which there are values at county level) the highest growth was recorded in Cluj county (37.7%), followed by Bihor, Sălaj and Maramureș counties, with increases of 35.3; 33.5; 28.8% respectively. The last counties are Maramureș (28.8%) and Bistrița Năsăud (25.5%)[112].

Table 7.1

Number of transport and storage companies in Suceava and Botoșani counties

Suceava county		Botoșani county	
No. of transport companies	**No. of storage companies**	**No. of transport companies**	**No. of storage companies**
3 Rădăuți	3 Suceava	8 Botoșani	2 Botoșani
3 Suceava	1 Câmpulung Moldovenesc	1 Curtești	1 Vlădeni
2 Frătăuții Vechi	1 Dumbrăveni	1 Dorohoi	1 Sulița
1 Câmpulung Moldovenesc	1 Gura Hăiții	1 Mileanca	1 Ștefănești
1 Iaslovăț	1 Horodniceni	1 Ipotești	
1 Pojorâta	1 Ilișești	1 Dărăbani	
1 Prelipca	1 Rotopănești		
1 Spătărești	1 Șerbănuți		
1 Volovăț	1 Sfântu Ilie		
1 Bosanci	1 Vatra Dornei		
	1 Rădășeni		

Source: own processing of the information provided by Romanian Companies Database, available at https://www.lista-firme-romania.ro/en/, accessed in March 2023

In terms of enterprise size, in 2018, micro enterprises (0-9 employees) accounted for 89.31% of all active enterprises in the region, small enterprises (10-49 employees) accounted for 8.94% of all active enterprises, medium-sized enterprises (50-249 employees) accounted for 1.49%, and large enterprises accounted for only 0.25%[113]. On the other hand, the share of large firms, with a significant contribution to the growth and economic development of the regions, out of the national total of 1,779 large firms, the North-West Region (203) ranks third after Bucharest-Ilfov (629) and Centru (233)[114]. In the regional hierarchy, most large firms are located in Cluj County (86) and Bihor County (49). The share of SMEs in total firms, at regional level, remained relatively constant with a slight decrease of 0.11 percentage points in the period under review, representing in 2018 99.75%, a share similar to that recorded at national level

[112] Ibidem, p.123
[113] Ibidem, p.134
[114] Ibidem

(99.69%). In the North-West Region the number of large firms increased by 19 (10.3%) in the period 2014-2018[115].

According to data provided by ONRC, enterprises in the region generated in 2018 a turnover of 156,062 million lei, representing 10% of the total turnover at the national level and provided jobs for 534,490 people (10.3% of the national total). Compared to 2014, this indicator increased by more than 10%. In the same year, the SME sector contributed 70.9% to the total turnover at the regional level, providing employment for 73.0% of the workforce. At the regional level, the highest value of turnover in 2018 was recorded in the branch "Wholesale and retail trade; repair of motor vehicles and motorcycles" (36.03% of total turnover at the regional level), followed by "Manufacturing industry" (30.42%)[116].

Regional and local development has in the foreground industrial parks, which are a main source in attracting foreign investors, creating jobs in order to develop the main cities, the county and the region as a whole. In Satu Mare county we identify several industrial parks, the first of which is an integrated part of the urban development of Satu Mare 2016-2020, so that in the vicinity of Satu Mare Municipality, 3 km from it, is located the Vetis Industrial Park, located 15 km from Satu Mare International Airport and 12 km from the border point Petea (border with Hungary). In addition to the industrial park in Vetiș, there are 3 other industrial parks in Satu Mare county, as follows: Agriș Industrial Park (Agriș commune), Schwaben Petrești Industrial Park (Petrești commune) and Carei Nord Industrial Park.

Moving on to Maramureș County, the situation is totally different, given the fact that the county is ranked in terms of economic development, in the last 10 ranked in Romania, therefore there are no industrial parks here[117], but there is Decision no.200 of 07.07.2022, by which the Maramureș County Council decides to manage and administer a land area of 343,398 sqm located in Baia Sprie, for the development of the network of Industrial Parks in Maramureș County[118].

In terms of logistic capacity, the following transport and warehousing companies are operating in Satu Mare and Maramureș counties, according to Table 7.2:

- In Maramures county 20 transport companies and 6 storage companies;
- In Satu Mare county 21 transport companies and 11 storage companies respectively

[115] Ibidem
[116] *Ibidem, p.135*
[117]Strategie firma judetului Parcuri Industriale SA, care nu administreaza niciun parc industrial, loveste din nou: prezenta la cel mai mare targ de investitii imobiliare din Europa, La Munchen cu un.. pupitru cu pliante. URL: https://2mnews.ro/strategie-firma-judetului-parcuri-industriale-sa-care-nu-administreaza-niciun-parc-industrial-loveste-din-nou-prezenta-la-cel-mai-mare-targ-de-investitii-imobiliare-din-europa-la-munchen-cu-un/
[118]Strategie firma judetului Parcuri Industriale SA, care nu administreaza niciun parc industrial, loveste din nou: prezenta la cel mai mare targ de investitii imobiliare din Europa, La Munchen cu un.. pupitru cu pliante. URL: https://2mnews.ro/strategie-firma-judetului-parcuri-industriale-sa-care-nu-administreaza-niciun-parc-industrial-loveste-din-nou-prezenta-la-cel-mai-mare-targ-de-investitii-imobiliare-din-europa-la-munchen-cu-un/

Table 7.2

Number of transport and storage companies in Maramures and Satu Mare counties.

Maramureș county		Satu Mare county	
No. of transport companies	**No. of storage companies**	**No. of transport companies**	**No. of storage companies**
9 Baia Mare	2 Seini	15 Satu Mare	2 Satu Mare
1 Satul Noi de jos	1 Baia Mare	2 Carei	2 Carei
1 Sarbi	1Dumbrăvița	2 Mediesu Aurit	1 Homorodu de Mijloc
1 Viseu de Sus	1 Rus	1 Culciu Mare	1 Vetis
1 Baia Sprie	1 Satu Nou de Jos	1 Paulesti	1 Tataresti
1 Sighetu Marmației			1 Viile Satu Mare
1 Sasar			1 Aliceni
1 Tautii Magherus			1 Trip
1 Dragomirești			1 Ciumești
1 Campulung Tisa			
1 Seini			
1 Catalina			

Source: own processing of the information provided by Romanian Companies Database, available at https://www.lista-firme-romania.ro/en/, accessed in March 2023

Development of a network of checkpoints

The Protocol between the Government of Romania and the Cabinet of Ministers of Ukraine amending the Agreement between the Government of Romania and the Cabinet of Ministers of Ukraine on the conditions of reciprocal travel (19 December 2003), which entered into force on 24 August 2006, provides for 4 common border crossing points (2 land and 2 water) for cargo traffic (see Table 7.3) [119].

Table 7.3

The number of entry/exit lines for each RO-UA crossing border point

	Halmeu - Dyakove permanent operation, trucks and train	**Siret - Porubne** permanent operation, only for trucks	**Galați - Giurgiulești - Reni** permanent operation, river	**Isaccea - Orlivka** permanent operation, river (2 ferries)
Number of entry lines	1	6	2	1
Number of exit lines	1	3	2	1

Source: Border Police, *Online Traffic Platform*, available at https://www.politiadefrontiera.ro/en/ traficonline/?vt=2, accessed in November 2023

[119] Government of Romania, *The Protocol between the Government of Romania and the Cabinet of Ministers of Ukraine amending the Agreement between the Government of Romania and the Cabinet of Ministers of Ukraine on the conditions of reciprocal travel*, 19 December 2003, 3rd Annex

For the Romanian-Ukrainian border crossing points (BCPs) located on the territory of Romania (Halmeu, Siret, Galati and Isaccea) a study was carried out on the existing capacity of the BCPs in terms of cargo transit, namely an analysis of the cargo traffic registered between Romania and Ukraine by rail or road. The data needed for these analyses concerned waiting times at the border, i.e., the volume of cargo and the number of trucks transiting the border at the Halmeu-Dyakove, Siret-Porubne, Isaccea-Orlivka BCPs. Data on the volume of cargo and the number of wagons transiting the Romanian-Ukrainian border through Halmeu-Dyakove, Vadu-Siret-Vicșani BCPs were also collected and analysed.

For the measurement of waiting times, data could only be obtained for the truck traffic registered in the above mentioned BCPs, and the Romanian Border Police's *Trafic online* platform was used for data collection, which provides real-time information. The data was collected during the period 3 November - 7 December 2022, by directly monitoring the platform and creating a database containing waiting times and messages displayed by the platform for traffic conditions. For the first 3 days, wait times were recorded every 2 hours, in the hourly interval 6-24, and for the next 32 days, data was collected automatically through a software specifically created to record items hourly on a continuous basis. The following results were obtained from the data processing:

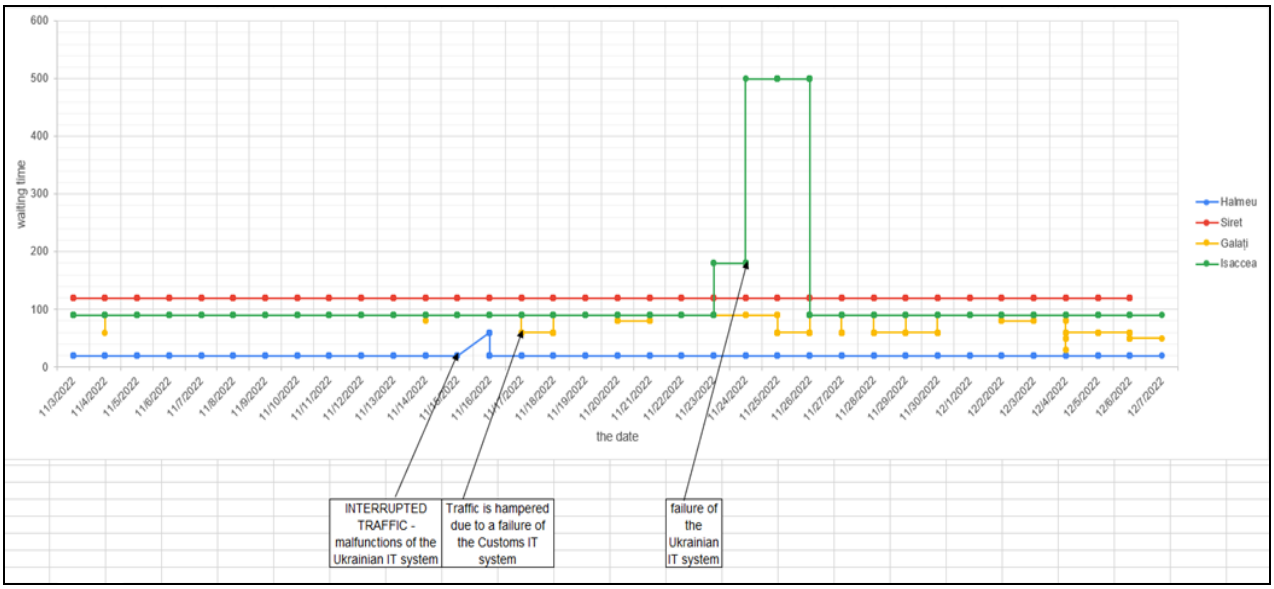


Fig. 7.1. Waiting time (minutes) when entering Romania via Halmeu, Siret, Galați and Isaccea

From the graphical representation of the waiting times recorded at the entrance to Romania, it can be seen that they range from 20 min (recorded at Halmeu) to 120 min (recorded at BCP Siret). Small variations were recorded in BCP Galați due to the connection with BCP Giurgiulești in the Republic of Moldova, while the large variations recorded at the end of November in BCP Isaccea are due to power cuts in Ukraine, which disconnected the IT system in BCP Reni. As regards the entry into

Romania (see Fig. 7.2), waiting times vary from 20 minutes (Halmeu) to 700 minutes (Galati). The power cuts announced by Ukraine also influence the waiting times in all the BCPs, but a special case is the variation of the times recorded for BCP Galati, the explanation being the crossing of the border with one means of river transport and the connection with BCP Giurgiulesti.

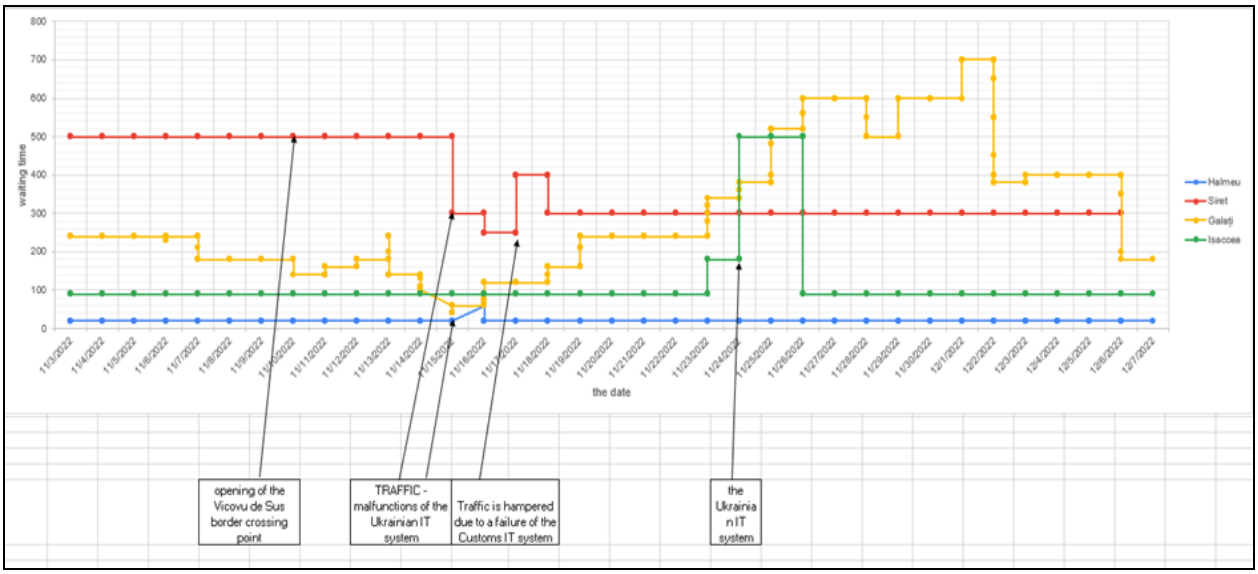


Fig. 7.2. Waiting time (minutes) when exiting Romania via Halmeu, Siret, Galați and Isaccea

As regards the volume of cargo and the number of trucks transiting the border through Halmeu-Dyakove, Siret-Porubne, Isaccea-Orlivka, respectively the number of wagons transiting the Romanian-Ukrainian border through Halmeu-Dyakove, Vadu-Siret - Vishani, data were requested from the Romanian Customs Authority and the General Inspectorate of the Romanian Border Police, which were supplemented with data received from Ukrainian partners. The replies received did not contain the volume of goods transited, only data on the number of trucks transiting the border and the number of trains, not wagons, passing through the mentioned BCPs. However, for freight transit by lorries the results are shown in graphs 7.3 and 7.4 below.

As can be seen from the graphical representation of the results, in the period 2018-2020, goods imported and exported from Ukraine were transported by trucks only via the Halmeu-Dyakove and Siret-Porubne river-BCPs, and from 2021 the third one, Isaccea-Orlivka, will also be used. The highest truck traffic was recorded in Siret BCP, which was to be expected given the large number of entry (6) and exit (3) lines available to trucks. The peak of imports and exports was recorded in 2019, when about 60,000 trucks entered and left through this BCP. For 2018, the data received from the above-mentioned institutions show an anomaly in terms of the number of trucks that exited Romania via the Siret BCP and the number of trucks that entered Ukraine via the Porubne BCP. We attribute the discrepancy to a reporting error on the part

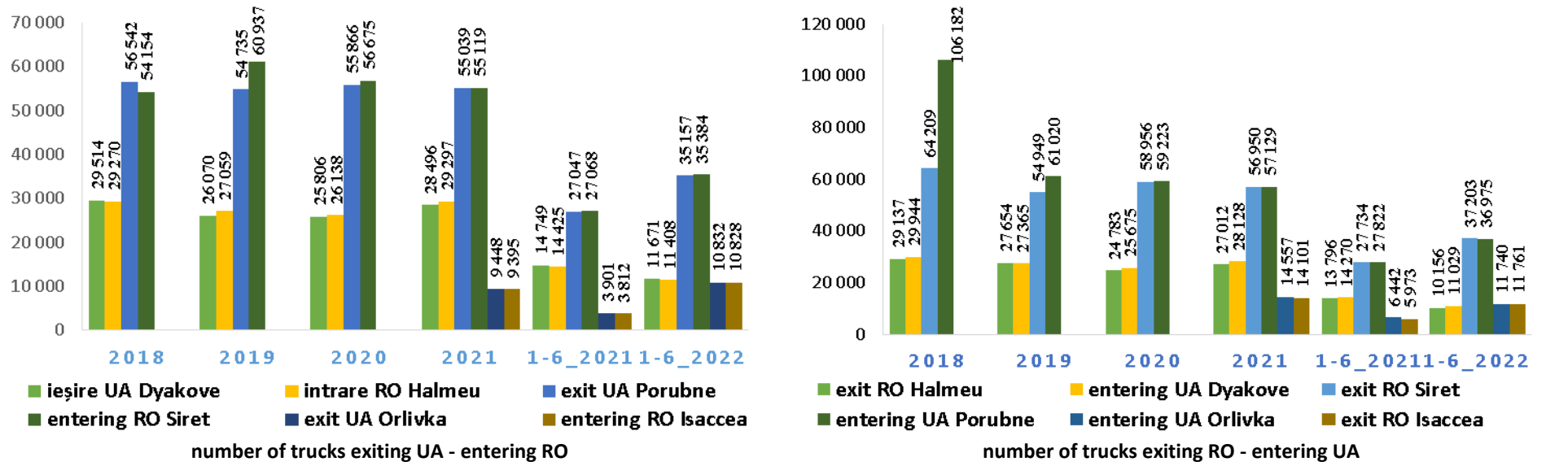


Fig. 7.3. Number of trucks transiting Romania's border with Ukraine between 2018 and June 2022

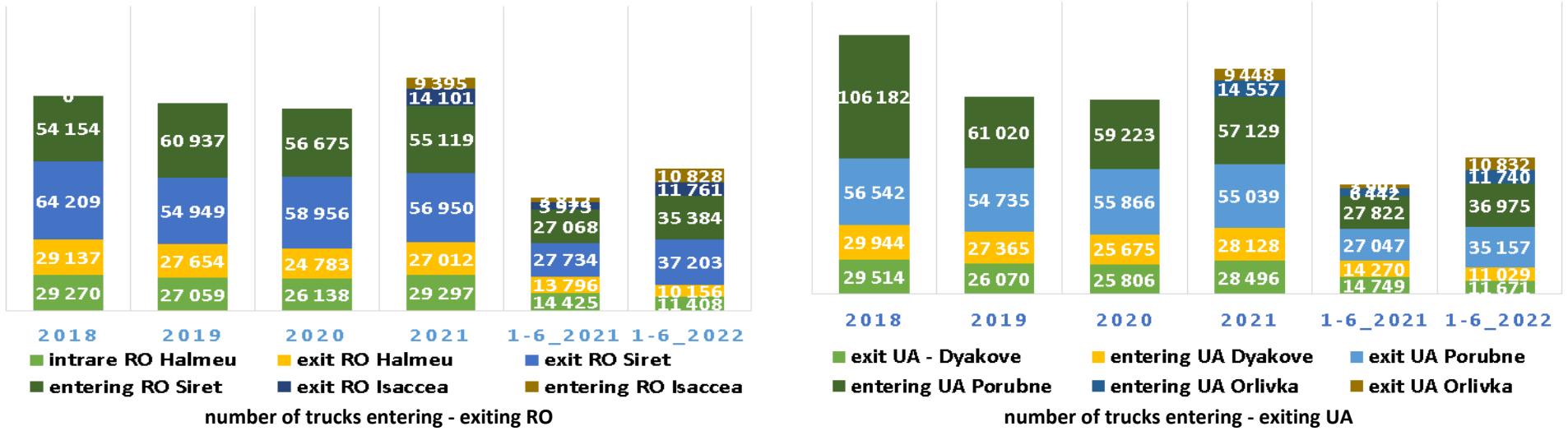


Fig. 7.4. Number of trucks entering/exiting Romania and Ukraine respectively via Sirect, Halmeu, Isaccea, Dyakove, Porubne, Orlivka, in the period 2018 - June 2022

of the Romanian authorities, taking into account the trend in the following years, when the reporting differences are below 6000 trucks/year. The Covid-19 pandemic did not influence Ukraine's trade, instead the outbreak of war by Russia in February 2022 resulted in increased pressure on the Romanian-Ukrainian border BCPs, with the number of trucks recorded in the first half of 2022 being more than 11,000 trucks higher than the figure recorded in the first half of 2021. Also, due to the need to transfer cargo from Ukraine to the Black Sea and Danube ports as quickly as possible, i.e., to supply Ukraine with the necessary goods, and to shorten transport routes, higher traffic figures were recorded in the first half of 2022 in the Siret - Porubne (approximately 10,000 more trucks compared to the first half of 2021) and Isaccea-Orlivka (approximately 5,000 more trucks compared to the first half of 2021) BCPs.

As regarding the volume of freight transported by rail and the number of trains transiting Halmeu-Diakove and Vadu-Siret-Vicșani railway terminals, only the data provided by the Ukrainian partners were processed, with the following results:

Table 7.4

Volume of freight transited through Halmeu-Dyakove and Vadu-Siret-Vicșani FPs, 2018-June 2022

	Halmeu - Dyakove		Vadu Siret - Vicșani		Halmeu - Dyakove		Vadu Siret - Vicșani	
	exit UA - Dyakove	entering RO Halmeu	exit UA Vicșani	entering RO Vadu-Siret	exit RO Halmeu	entering UA Dyakove	exit RO Vadu-Siret	entering UA Vicșani
	Nr. vagoane	Nr. trenuri	Nr. vagoane	Nr. trenuri	Nr. vagoane	Nr. trenuri	Nr. vagoane	Nr. trenuri
2018	4,090	386	24,718	1,288	388	4,082	1,482	24,811
2019	3,143	410	16,381	1,218	413	3,261	1,408	16,075
2020	3,973	411	24,569	998	416	3,826	1,396	24,308
2021	6,803	488	23,671	1,053	494	6,759	1,462	23,602
1-6_2021	3,279	249	11,595	473	252	3,214	673	11,743
1-6_2022	6,733	383	16,474	646	394	6,395	870	16,218

Table 7.5

Number of wagons transiting through Dyakove and Vishani WTPs, 2018-June 2022

	Dyakove – freight volume (thousand tones)		Vicșani – freight volume (thousand tones)	
	exit UA	entering UA	exit UA	entering UA
2018	155.0	2.9	1,018.1	30.5
2019	132.0	7.3	848.0	6.2
2020	309.4	7.1	1,204.1	28.4
2021	520.4	9.5	1,257.0	3.3
1-6_2021	303.4	7.1	584.7	3.3
1-6_2022	359.6	183.3	790.9	113.8

From the data presented in Tables 7.4 and 7.5, it appears that the highest traffic is recorded at the Vadu-Siret - Vicșani rail terminal, due to the lower logistical costs determined by the shorter route and the direct link with the Black Sea and Danube ports, from where the goods transported are taken on ships or barges bound for other ports in Europe, Asia or Africa. Nor had the Covid-19 pandemic had an effect on this type of transport, instead the war has intensified the use of this type of transport, especially for grain, fuel, fertiliser, etc., with the volume of cargo transported in the first half of 2022 being the same as in 2018. Also, despite the fact that the number of wagons entering and leaving Ukraine through the two BCPs is roughly the same, the volume of cargo exported by Ukraine far exceeds imports.

On 12 May 2022, the European Commission proposed to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions an *EU-Ukraine Solidarity Corridor Action Plan to facilitate Ukraine's agricultural exports and bilateral trade with the EU*. On this occasion, the Commission noted that "Ukraine's access to the Black Sea routes has been restored, but there is still an urgent need to establish alternative logistical routes using all modes of transport and connecting the EU with Ukraine"[120]. The European Commission's priority is to mobilise and make optimal use of existing infrastructure, expand capacity and increase and diversify trade routes[121]. In this context, at its meeting on 7 September 2022, the Romanian Government approves the *Memorandum on: Measures to streamline freight and passenger traffic in the border area with Ukraine and the Republic of Moldova in the context of the armed conflict in Ukraine* with the aim of reducing waiting and delay times in traffic and eliminating blockages in cross-border sectors. As a first measure, the document provides for the opening/opening of border crossing points with Ukraine and ensuring their accessibility[122]. For the implementation of the measures, an Interministerial Committee for the efficiency of freight and passenger traffic in the border area with Ukraine and the Republic of Moldova was established on 29 September 2022[123].

[120] European Commission, *op.cit.*, p.1
[121] Ibidem
[122] Government of Romania, *Informații de presă privind actele normative adoptate în ședința Guvernului României din 7 septembrie 2022* [PRESS INFORMATION regarding the normative acts adopted during the meeting of the Romanian Government on September 7, 2022], available at https://gov.ro/ro/guvernul/sedinte-guvern/informatie-de-presa-privind-actele-normative-adoptate-in-cadrul-edintei-guvernului-romaniei-din-7-septembrie-2022, accessed in November 2022
[123] Government of Romania, *Decizia nr. 487/2022 privind constituirea Comitetului interministreial pentru eficientizarea traficului de mărfuri și pasageri în zona de frontier cu Ucraina și Republica Moldova în contextual conflictului din Ucraina* [Decision no. 487/2022 on the establishment of the Interministerial Committee for the efficiency of goods and passenger traffic in the border area with Ukraine and the Republic of Moldova in the context of the conflict in Ukraine], available at https://lege5.ro/gratuit/gezdombvgu4ds/decizia-nr-487-2022-privind-constituirea-comitetului-interministerial-pentru-eficientizarea-traficului-de-marfuri-si-pasageri-in-zona-de-frontiera-cu-ucraina-si-republica-moldova-in-contextul-conflict, accessed in March 2023

Among the first results achieved, we can mention the completion on 10 November 2022 of the modernization and reopening of the border crossing point between Romania and Ukraine at Vicovu de Sus - Krasnoilsk. Operating until 2010 only for light traffic (permanent car and pedestrian access valid only for Romanian and Ukrainian citizens with permanent residence in the border counties and regions)[124] and having had its activity suspended due to the fact that it did not meet the necessary requirements of an external border crossing point, according to the Schengen Catalogue, in October-November 2022 works were carried out to refurbish it and bring it up to the appropriate standards. The works were done so that it would be available also for international road cargo traffic. The border crossing point has two control arteries in each direction, in permanent operation, and a Customs Border Office[125]. The second border crossing point for small traffic, modernised and reopened, is the one between Rakavit and Diakivti. Since 10 February 2023, it has been operating under international traffic rules, with two control lanes in each direction, with a permanent schedule, and is for the time being only for passenger traffic, unloaded lorries and tankers. After further work, the BCP will also be able to handle general cargo[126]. The reopening of this BCP/border crossing point has reduced by 200 minutes the waiting time when exiting Romania via BCP Siret (see Fig. 7.2).

Two other border crossing points for small traffic are scheduled to be upgraded and reopened in the areas of Ulma-Ruska and Izvoarele Sucevei - Șepit with the aim of decongesting the Siret-Porubne[127] border crossing. BCP Ulma-Ruska will operate for lorries up to 3.5 tonnes, without freight, with opening hours from 8.00 to 20.00[128] .

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[124]Government of Romania, *The Protocol between the Government of Romania and the Cabinet of Ministers of Ukraine amending the Agreement between the Government of Romania and the Cabinet of Ministers of Ukraine on the conditions of reciprocal travel*, 19 December 2003, 3rd Annex

[125] Romanian Border Police, *Punctul de trecere a Frontierei Vicovu de Sus-Krasnoilsk, deschis traficului international la frontiera cu Ucraina* [Vicovu de Sus-Krasnoilsk border crossing point, open to international traffic on the border with Ukraine], available at https://www.politiadefrontiera.ro/ro/sighetu-marmatiei/i-punctul-de-trecere-a-frontierei-vicovu-de-sus--krasnoilsk-deschis-traficului-international-la-frontiera-cu-ucraina-31454.html, accessed in March 2023

[126] Cosmin Pîrv, "S-a redeschis Punctul de trecere a frontierei Racovăț (România) – Diakivti (Ucraina)" [The border crossing point Racovaț (Romania) – Diakivti (Ukraine) has been reopened], in *Mediafax Press Agency*, online platform, 10th of February, 2023, available at https://www.mediafax.ro/social/s-a-redeschis-punctul-de-trecere-a-frontierei-racovat-romania-diakivti-ucraina-21593754, accessed in March 2023 and Botosani24 Editorial Office, "Punctul de trecere a frontierei Racovăț-Diakivtsi va fi deschis initial pentru personae, camioane fără încărcătură și cisterne" [The Racovaţ-Diakivtsi border crossing point will initially be open for persons, trucks without cargo and tankers], in Botosani24, online edition, 16th of July, 2022, available at https://botosani24.ro/punctul-de-trecere-a-frontierei-racovat-diakivtsi-va-fi-deschis-initial-pentru-persoane-camioane-fara-incarcatura-si-cisterne-17195.html, accessed in March 2023

[127] Suceava News Editorial Office, "Flutur: Este o chestiune de câteva zile până la deschiderea PTF Vicovu de Sus-Crasna. Urmează punctele de la Ulma-Rusca și Izvoarele Sucevei - Șepit" [Flutur: It is a matter of a few days until the opening of BTP Vicovu de Sus-Crasna. Next are the points from Ulma-Rusca and Izvoarele Sucevei - Șepit], in *Suceava* News, online edition, 21st of September, 2022, available at https://www.svnews.ro/flutur-este-o-chestiune-de-cateva-zile-pana-la-deschiderea-ptf-vicovu-de-sus-crasna-urmeaza-punctele-de-la-ulma-rusca-si-izvoarele-sucevei-sepit/312230/, accessed in March 2023

[128] Ibidem

Analysis of the bottlenecks in Romania-Ukraine rail/road connectivity

In the document proposed by the European Commission in May 2022, the main types of bottlenecks affecting Ukraine's trade are mentioned, namely[129] :

- lack of available vehicles;

- the existence of certain restrictions on transport rights and other rules that hinder the cross-border movement of trucks;

- administrative problems related to the issue and validity of documents;

- shortage of truck drivers (especially in Ukraine, but also in the EU);

- waiting time of trucks at the border, which in the case of the BCPs/ border crossing points analysed is on average 1 h 25 min. on entry into Romania and 4 h 40 min. on exit from Romania. To this is added the time spent by the truck for checks and customs formalities (on average 30 minutes/truck only on the Romanian side of the border);

- unnecessary and costly delays due to phytosanitary and veterinary checks required by national customs clearance procedures, as EU legislation does not require any such certification for cereal imports, nor for transit through the EU;

- the gauge of the Ukrainian railways (broad gauge, 1520 mm wide) differs from the EU standard gauge (UIC type, 1435 mm wide), requiring transhipment near border crossing points either by changing bogies or by unloading and loading goods into wagons corresponding to the gauge type;

- insufficient transhipment capacity and little equipment near the BTPs.

In addition to those mentioned by the EC, the following blockages affecting cross-border transport between Romania and Ukraine can be identified from the analysis in point 1:

- lack of links between the newly reopened FRPs and the pan-European road transport corridors;

- road transport routes are often established along national roads where the speed limit is 90 km/h and often pass through localities where travel speeds are limited to a maximum of 50 km/h. Romania has 934.55 km of motorways and expressways in use in 2022, but no high-speed roads are in the vicinity of Romanian-Ukrainian border crossings[130];

- local protests and blocking of roads connecting to the Siret FPT due to heavy traffic and speeding lorries, with accidents and damage to roads and houses in transit towns[131];

[129] European Commission, *op.cit.*, p.2

[130] Victor Cozmei, "Autostrăzile din România" [Highways in Romania], in *HotNews Press Agency, online* platform, 28th of December, 2022, available at ttps://monitorizari.hotnews.ro/stiri-infrastructura_articole-25988636-atat-aproape-borna-1-000-autostrazi-drumuri-expres-vor-inaugurate-2023-scenariul-optimist-realist.htm, accessed in March 2023

[131] Tirmagazin3 Editorial Office, "*Sătenii au blocat un drum pentru a împiedica trecerea camioanelor*" [Villagers blocked a road to prevent trucks from passing], in *Tirmagazin3, online edition*, 12 of August, 2022, available at

- increased transport costs due to rising fuel prices in the wake of the geopolitical crisis generated by Russia and the sanctions imposed on it by the EU[132];

- the rerouting of grain to Romania involves transport by rail to the Danube ports, then loading the grain onto barges sailing to the port of Constanta, a complex and costly process[133];

- Romania could take 8 times more grain from Ukraine, but needs more drivers, more engines and wagons, more bogies to adapt Ukrainian wagons to European gauge. The maximum capacity at Halmeu would be 2 trains/day, at Vadu-Siret 1 train/day, and if there are enough bogies, another 4 trains/day can be added[134].

Recommendations on the ways of increasing the capacity of border infrastructure for freight transportation

Based on the quantitative and qualitative data collected on road and rail infrastructure, the following conclusions can be drawn:

1. The number of entry/exit lines for each RO-UA CBP are insufficient to cover the volume of goods, vehicles and trains who cross the road and rail checkpoints, resulting in a high number of waiting minutes

2. The TEN-T road corridors do not have continuity on the territory of Romania, the connection with Ukraine being made through the roads with speed restriction (E 85 and E 58), hence a source of road blockages.

In conclusion the road transport infrastructure does not facilitate a sustained connection between Romania and Ukraine

3. From the perspective of rail transport infrastructure there is an even greater discrepancy, the main impediment being the different gauges on which the two railway systems operate, the Ukrainian one being wider compared to the Romanian one. The lack of electrified lines is another impediment to the efficiency of rail transport and, last but not least, the number of railways crossing points, which, compared to the length of the Romanian-Ukrainian border are few.

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https://tirmagazin.ro/news/satenii-au-blocat-un-drum-pentru-a-impiedica-trecerea-camioanelor, accessed in November 2022

[132] Tirmagazin3 Editorial Office, "*60 milioane euro de la Comisia Europeană, ajutor pentru transportatori*" [60 million euros from the European Commission, aid for carriers], in *Tirmagazin3, online edition*, 28 of June, 2022, available at https://tirmagazin.ro/news/60-milioane-euro-de-la-comisia-europeana-ajutor-pentru-transportatori, accessed in November 2022

[133] Wall-Street Editorial Office, "*Blocaje în exporturile de cereale ale Ucrainei prin România și Polonia*" [Blockages in grain exports of Ukraine through Romania and Poland], in *Wall-Street Journal, Romanian online edition, 13th* of June, 2022, available at https://www.wall-street.ro/articol/International/286570/blocaje-in-exporturile-de-cereale-ale-ucrainei-prin-romania-si-polonia.html#gref, accessed in March 2023

[134] Adrian N. Ionescu, "*Gruia Stoica, Gampet: România ar putea prelua de 8 ori mai multe ecporturi de cereale din Ucraina. Ce lipsește rețelei feroviare*" [Gruia Stoica, Gampet: Romania could take over 8 times more grain exports from Ukraine. What the rail network lacks], in *Curs de Guvernare, on line platform, 17th* of August, 2022, available at https://cursdeguvernare.ro/gruia-stoica-grampet-romania-ar-putea-prelua-de-8-ori-mai-multe-exporturi-de-cereale-din-ucraina-ce-lipseste-retelei-feroviare.html, accessed in March 2023

The existing differences between the Romanian and Ukrainian railway infrastructure require large investments, which cannot be achieved in a short period of time.

4. The regions adjacent to Romania's Northern border with Ukraine are relatively underdeveloped, but have the potential to increase transport and storage capacity, which can be made available in the short term.

5. The Romanian authorities are making efforts to respond to the EU requirements for the solidarity corridors, but the infrastructure projects are only achievable in a medium time horizon.

6. The measures taken by the Romanian authorities are effective and sufficient for strengthening EU-Ukraine connectivity is validated in the medium and long term, based on the projects of the Romanian authorities. In the short term, the Romanian measures to strengthen EU-Ukraine connectivity, which are operationalized by opening of 3 new CBPs, are effective but not sufficient (Racovăț-Diakivstsi, Vicovu de Sus-Krasnolisk și Ulma - Rusca).

7. In addition, to the projects mentioned in the Romanian Government's memorandum, we also propose the following measures to increase the carrying the capacity for freight transportation on the Ukraine-Romania border section:

- Diversion of heavy traffic outside the villages by building bypass routes that allow higher traffic speed (express roads or highways);
- Allocation of a greater number of entry/exit lines in the border crossing points
- Simplification of Romanian customs, phytosanitary and veterinary control procedures;
- Upgrading of European road infrastructure;
- Developing and modernising the railway infrastructure by electrifying the railway lines linking Romania and Ukraine;
- Aligning the Ukrainian track gauge to European standards, but this investment is not feasible for Ukraine in the short term;
- Upgrading of existing border crossing points through the digitisation process (checking documents, reducing waiting time at customs, etc.), opening of lines in and out of existing customs;
- Opening of new modern border crossing points, where the infrastructure of the old ones does not allow their development;
- Upgrading, specialisation of staff at border crossing points (customs and border police staff).

ANNEXES

ANNEX A

Table A.1

Commodity structure of Ukraine's foreign trade

Codes of UCT ZED	2019		2020		2021		2022	
	% to the total value	% to the total weight	% to the total value	% to the total weight	% to the total value	% to the total weight	% to the total value	% to the total weight
I. Live animals and livestock products	2.13	0.61	2.37	0.64	2.08	0.62	2.56	0.86
II. Plant products	13.32	27.9	13.41	25.82	12.5	24.49	14.87	35.42
III. Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	4.51	2.91	5.83	3.32	5.29	2.52	6.03	3.50
IV. Finished food industry products	5.28	3.84	6.12	4.15	5.21	3.58	4.88	4.58
V. Mineral products	16.15	44.90	13.48	45.74	16.97	47.21	20.92	39.82
VI. Products of chemical and allied industries	8.52	4.31	9.05	4.39	8.88	4.81	7.33	2.66
VII. Polymeric materials. plastics and articles of them	3.88	0.87	4.04	0.9	4.19	1.00	3.59	0.96
VIII. Raw leather and curry leather	0.39	0.02	0.37	0.02	0.33	0.02	0.33	0.02
IX. Wood and articles of wood	1.55	2.07	1.67	2.18	1.73	2.22	2.01	2.76
X. Paper bulk from wood or other vegetable fibres	1.3	0.58	1.45	0.6	1.16	0.64	1.00	0.57
XI. Textiles materials and articles of textiles	2.92	0.24	2.97	0.23	2.49	0.25	3.05	0.31
XII. Footwear, hats umbrellas	0.6	0.03	0.58	0.02	0.54	0.02	0.72	0.03

Continued table A.1

XIII. Products from stone, gyps, cement	1.09	1.07	1.15	1.13	1.07	1.23	0.93	0.84
XIV. Natural or cultured pearls, precious stones, metals and preparations thereof	0.17	0.00	0.27	0.00	0.25	0.00	0.11	0.00
XV. Base metals and preparations thereof	12.59	8.89	11.86	9.2	14.40	9.54	8.29	5.61
XVI. Machines, equipment and mechanisms, electric and technical equipment	16.09	0.74	15.56	0.67	13.77	0.73	12.47	0.74
XVII. Ground, air and water transport facilities	6.38	0.82	6.29	0.74	5.85	0.82	5.78	0.98
XVIII. Optical, cinematographic apparatus	1.14	0.01	1.39	0.01	1.2	0.01	1.25	0.01
XX. Different industrial products	1.7	0.2	1.95	0.23	1.83	0.28	1.63	0.3
XXI. Art articles	0.29	0.00	0.21	0.00	0.26	0.00	2.26	0.03

Source: Calculated based on https://customs.gov.ua/statistika-ta-reiestri

Table A.2

TOP-10 export and import commodity groups (in value equivalent)

2019				2020			
Export		**Import**		**Export**		**Import**	
Maize	10.43%	Oil and oil products	8.8%	Sunflower, safflower or cottonseed oils	10.81%	Passenger cars and other motor vehicles intended primarily for the transportation of people	6.46%
Sunflower, safflower or cottonseed oils	8.54%	Passenger cars and other motor vehicles intended primarily for the transportation of people	5.99%	Maize	9.91%	Oil and oil products	6.26%
Wheat	7.31%	Oil gases	4.94%	Ores and iron concentrates	8.62%	Medicinal products are dosed or packaged for retail sale	3.63%
Ores and iron concentrates	6.79%	Coal stone, anthracite	4.66%	Wheat	7.31%	Oil gases	3.59%
Carbon steel semi-finished products	5.71%	Medicinal products are dosed or packaged for retail sale	2.83%	Carbon steel semi-finished products	5.59%	Coal stone, anthracite	3.12%
Flat rolled carbon steel 600 mm wide or more, hot-rolled, unplated, without galvanic or other coating	3.88%	Diodes, transistors; photosensitive semiconductor devices; light-emitting diodes; piezoelectric crystals	2.15%	Flat rolled carbon steel 600 mm wide or more, hot-rolled, unplated, without galvanic or other coating	3.25%	Electrical telephone or telegraph devices; video phones	2.05%
Insulated wires, cables and other insulated electrical conductors; fiber optic cables	2.93%	Electrical telephone or telegraph devices; video phones	1.61%	Insulated wires, cables and other insulated electrical conductors; fiber optic cables	2.75%	Insecticides, rodenticides, fungicides, herbicides, disinfectants	1.65%
Rape seeds	2.56%	Insecticides, rodenticides, fungicides, herbicides, disinfectants	1.54%	Oilcakes, solid waste from the extraction of vegetable fats and oils, except 2304, 2305	2.4%	Automatic information processing machines and their blocks; magnetic or optical reading devices	1.14%
Soya beans	2.33%	Fertilizers with 2-3 nutrients N, P, K	1.25%	Rape seeds	2.05%	Fertilizers with 2-3 nutrients N, P, K	1.13%
Oilcakes, solid waste from the extraction of vegetable fats and oils, except 2304, 2305	2.02%	Tractors, other than tractors of heading 8709	1.01%	Recycled cast iron and mirror cast iron in ingots, ingots or other primary forms	1.87%	Tractors, other than tractors of heading 8709	0.96%
The share in the value equivalent	52.5%	The share in the value equivalent	34.8%	The share in the value equivalent	54.56%	The share in the value equivalent	30%
The share in physical equivalent	51.04%	The share in physical equivalent	46.5%	The share in physical equivalent	73.89%	The share in physical equivalent	53.41%

Continued table A.2

2021				2022			
Export		**Import**		**Export**		**Import**	
Ores and iron concentrates	10.13%	Oil and oil products	7.66%	Maize	13.45%	Oil and oil products	14.77%
Sunflower, safflower or cottonseed oils	9.38%	Oil gases	6.80%	Sunflower, safflower or cottonseed oils	12.37%	Oil gases	10.45%
Maize	8.65%	Passenger cars and other motor vehicles intended primarily for the transportation of people	6.03%	Ores and iron concentrates	6.59%	Passenger cars and other motor vehicles intended primarily for the transportation of people	4.95%
Wheat	7.45%	Coal stone, anthracite	3.4%	Wheat	6.06%	Other goods	3.91%
Carbon steel semi-finished products	6.01%	Medicinal products are dosed or packaged for retail sale	2.98%	Rape seeds	3.49%	Medicinal products are dosed or packaged for retail sale	2.61%
Flat rolled carbon steel 600 mm wide or more, hot-rolled, unplated, without galvanic or other coating	5.49%	Electrical telephone or telegraph devices; video phones	1.83%	Insulated wires, cables and other insulated electrical conductors; fiber optic cables	3.01%	Coal stone, anthracite	1.98%
Rape seeds	2.48%	Insecticides, rodenticides, fungicides, herbicides, disinfectants	1.44%	Sunflower seeds	2.84%	Electrical telephone or telegraph devices; video phones	1.71%
Recycled cast iron and mirror cast iron in ingots, ingots or other primary forms	2.14%	Fertilizers with 2-3 nutrients N, P, K	1.32%	Carbon steel semi-finished products	2.7%	Insecticides, rodenticides, fungicides, herbicides, disinfectants	1.53%
Insulated wires, cables and other insulated electrical conductors; fiber optic cables	2.33%	Automatic information processing machines and their blocks; magnetic or optical reading devices	1.18%	Flat rolled carbon steel 600 mm wide or more, hot-rolled, unplated, without galvanic or other coating	2.28%	Tractors, other than tractors of heading 8709	1.34%
Oilcakes, solid waste from the extraction of vegetable fats and oils, except 2304, 2305	1.88%	Crude oil and oil products	1.13%	Soya beans	1.95%	Power generating units and rotating electrical converters	1.16%
The share in the value equivalent	56.23%	The share in the value equivalent	33.74%	The share in the value equivalent	54.74%	The share in the value equivalent	44.40%
The share in physical equivalent	71.68%	The share in physical equivalent	56.25%	The share in physical equivalent	75.78%	The share in physical equivalent	59.61%

Source: calculated on the basis of Statistical export and import of goods. URL: https://customs.gov.ua/statistika-ta-reiestri

Table A.3

Geographical structure of Ukraine's foreign trade

Region	2019				2020				2021				2022				Foreign trade indexes, 2022/2021, %
	Import		Export		Import		Export		Import		Export		Import		Export		
	Thous. USD	%	Thous. USD	%	Thous. USD	%	Thous. USD	%	Thous. USD	%	Thous. USD	%	Thous. USD	%	Thous. USD	%	
Total	60 414 393	100	50 061 057	100	54 234 489	100	49 194 543	100	73 298 598	100	68 087 661	100	59 506 436	100	44 172 875	100	-26.67
Australia and Oceania	116 820	***0.2***	60 535	***0.1***	45 817	***0.1***	68 698	***0.1***	178 139	***0.2***	86 904	***0.1***	230 593	***0.4***	29 994	***0.1***	-1.68
Asia	16 187 350	***26.8***	15 372 584	***30.7***	15 422 071	***28.4***	18 452 395	***37.5***	20 218 445	***27.6***	23 190 546	***34.1***	17 412 526	***29.3***	9 606 090	***21.7***	-37.76
America	4 344 013	***7.2***	1 468 231	***2.9***	4 220 396	***7.8***	1 548 663	***3.1***	4 763 704	***6.5***	3 270 246	***4.8***	3 158 913	***5.3***	1 191 359	***2.7***	-45.85
Africa	797 350	***1.3***	4 970 896	***9.9***	808 073	***1.5***	4 046 407	***8.2***	1 189 917	***1.6***	5 614 618	***8.2***	595 033	***1.0***	2 128 930	***4.8***	-59.97
other European countries	1 598 518	***2.6***	510 868	***1.0***	1 490 463	***2.7***	440 119	***0.9***	3 773 669	***5.1***	1 707 902	***2.5***	2 168 528	***3.6***	855 289	***1.9***	-44.84
EU countries	25 514 873	***42.2***	20 751 489	***41.5***	23 744 529	***43.8***	18 610 970	***37.8***	29 634 373	***40.4***	26 795 766	***39.4***	27 401 936	***46.0***	27 915 233	***63.2***	-1.97
CIS	11 850 473	***19.6***	6 755 805	***13.5***	8 503 093	***15.7***	5 934 534	***12.1***	13 540 018	***18.5***	7 284 196	***10.7***	8 538 814	***14.3***	2 399 140	***5.4***	-47.47
Undefined regions	4 996	***0.0***	170 652	***0.3***	41	***0.0***	92 707	***0.2***	338	***0.0***	137 492	***0.2***	91	***0.0***	46 839	***0.1***	-65.95

Source: calculated on the basis of Statistical export and import of goods. URL: https://customs.gov.ua/statistika-ta-reiestri

Table A.4

Separate indicators of special customs statistics on the movement of goods and vehicles across the customs border of Ukraine by border sections

Adjacent country / section of the customs border of Ukraine	2014	2016	2018	2020	2021	2022
VEHICLES OMITTED, MILLION UNITS						
Poland	6.99	7.65	6.49	2.86	3.77	4.40
Slovakia	1.44	1.49	1.21	0.58	0.76	0.92
Hungary	2.06	2.50	2.40	0.99	1.06	1.06
Romania	1.00	1.49	1.52	0.61	0.80	1.31
Total border with EU countries:	**11.50**	**13.13**	**11.62**	**5.04**	**6.39**	**7.70**
Russian Federation	5.46	3.74	3.89	1.74	1.90	0.15
Belarus	1.86	1.85	2.51	1.09	0.99	0.13
Republic of Moldova	2.49	2.77	2.96	0.90	1.13	1.43
Total border with CIS countries:	**9.81**	**8.36**	**9.36**	**3.73**	**4.02**	**1.71**
Through sea checkpoints	**0.27**	**0.08**	**0.08**	**0.10**	**0.14**	**0.04**
Through airport checkpoints	**0.10**	**0.10**	**0.13**	**0.06**	**0.11**	**0.01**
GOODS OMITTED, MILLION TONNES						
Poland	20.84	20.56	21.32	19.01	24.01	30.19
Slovakia	17.26	17.17	17.59	12.20	15.66	15.04
Hungary	6.34	5.24	5.95	5.22	5.17	6.09
Romania	4.08	5.01	3.90	4.25	4.77	9.04
Total border with EU countries:	**48.52**	**47.98**	**48.76**	**40.68**	**49.62**	**60.36**
Russian Federation	85.06	51.05	51.62	39.44	43.43	3.03
Belarus	13.90	17.78	19.52	18.86	22.94	3.02
Republic of Moldova	9.49	7.57	9.23	6.08	7.30	7.55
Total border with CIS countries:	**108.44**	**76.41**	**80.36**	**64.38**	**73.66**	**13.61**
Through sea checkpoints	140.89	130.33	175.89	228.73	209.63	76.85
Through airport checkpoints	0.12	0.19	0.06	0.05	0.08	0.01

Source: Built on the basis of Statistics of declaration, movement of goods and vehicles. URL: https://customs.gov.ua/en/statistika-ta-reiestri

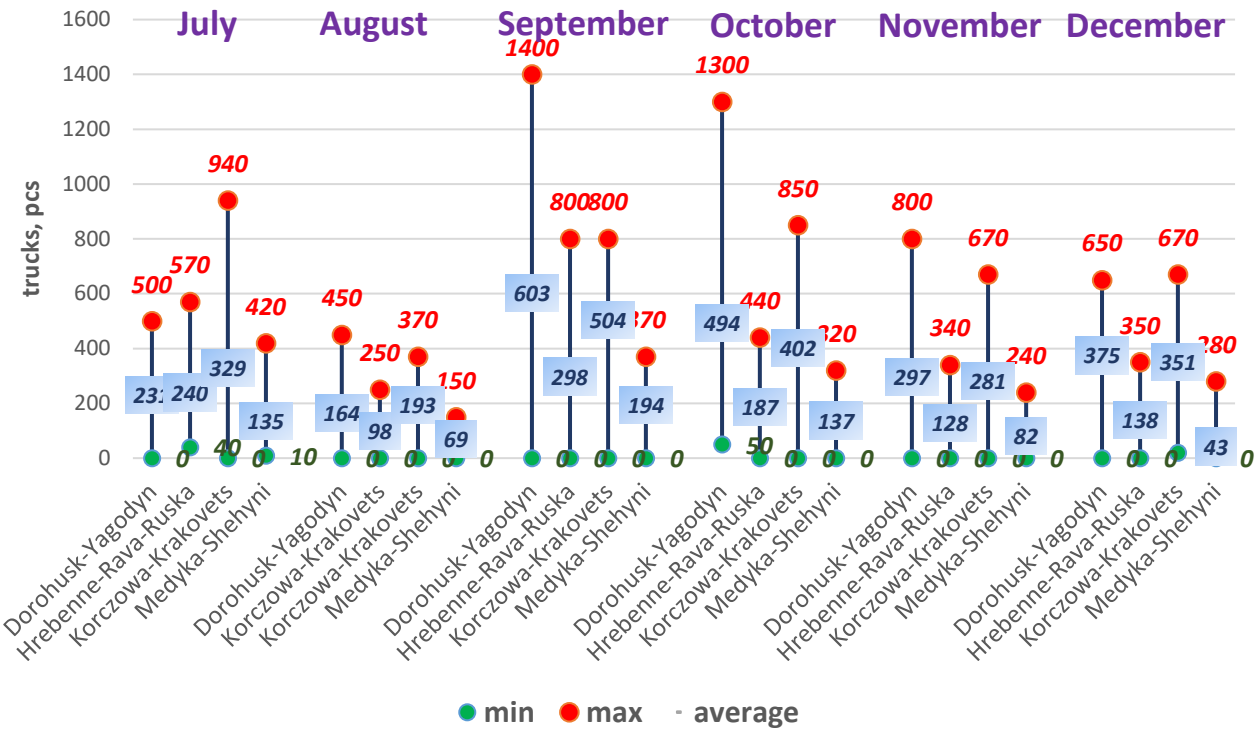

Fig. A.1. Queues in front of automobile checkpoints in the direction "to Ukraine" on the Ukrainian-Polish section of the border, units

Source: built on the basis of the data of the State Customs Service of Ukraine

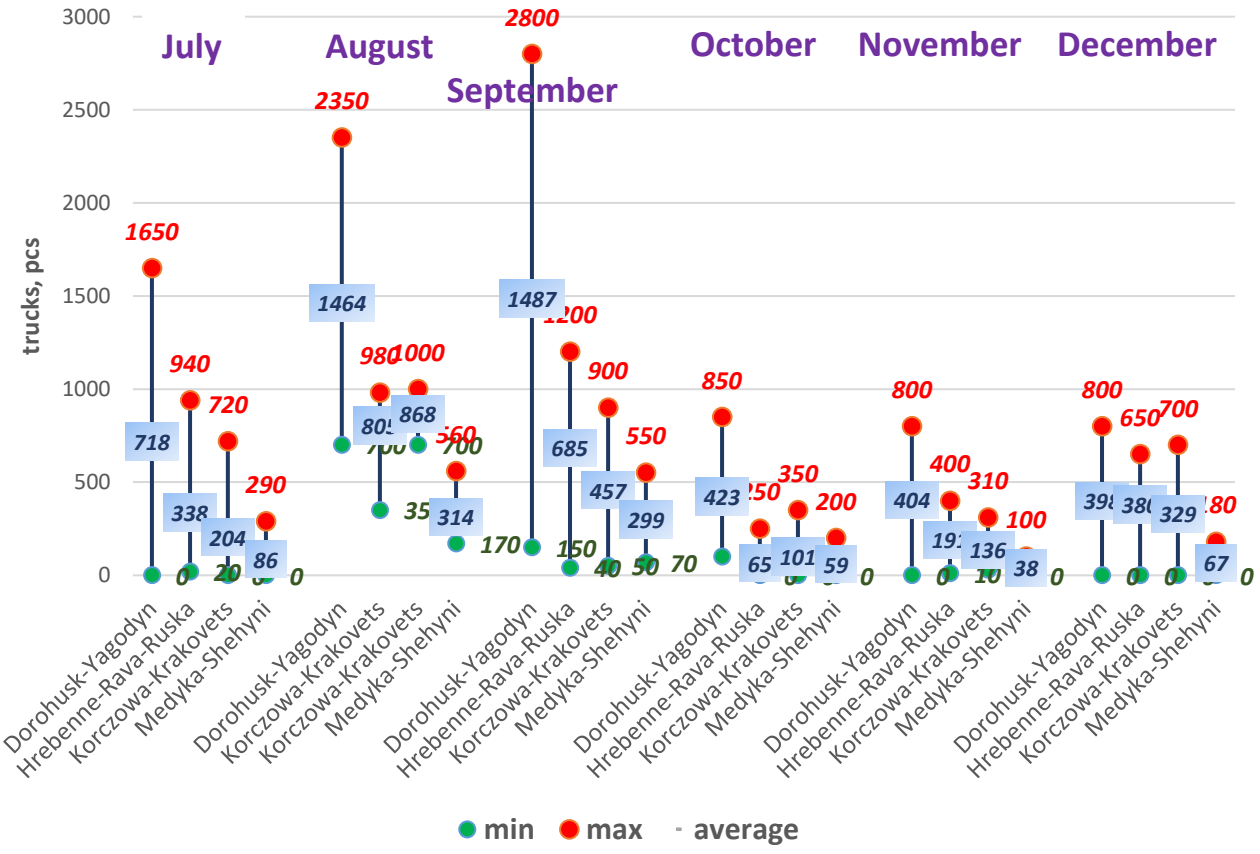

Fig. A.2. Queues in front of automobile checkpoints in the direction "from Ukraine" on the Ukrainian-Polish section of the border, units

Source: built on the basis of the data of the State Customs Service of Ukraine

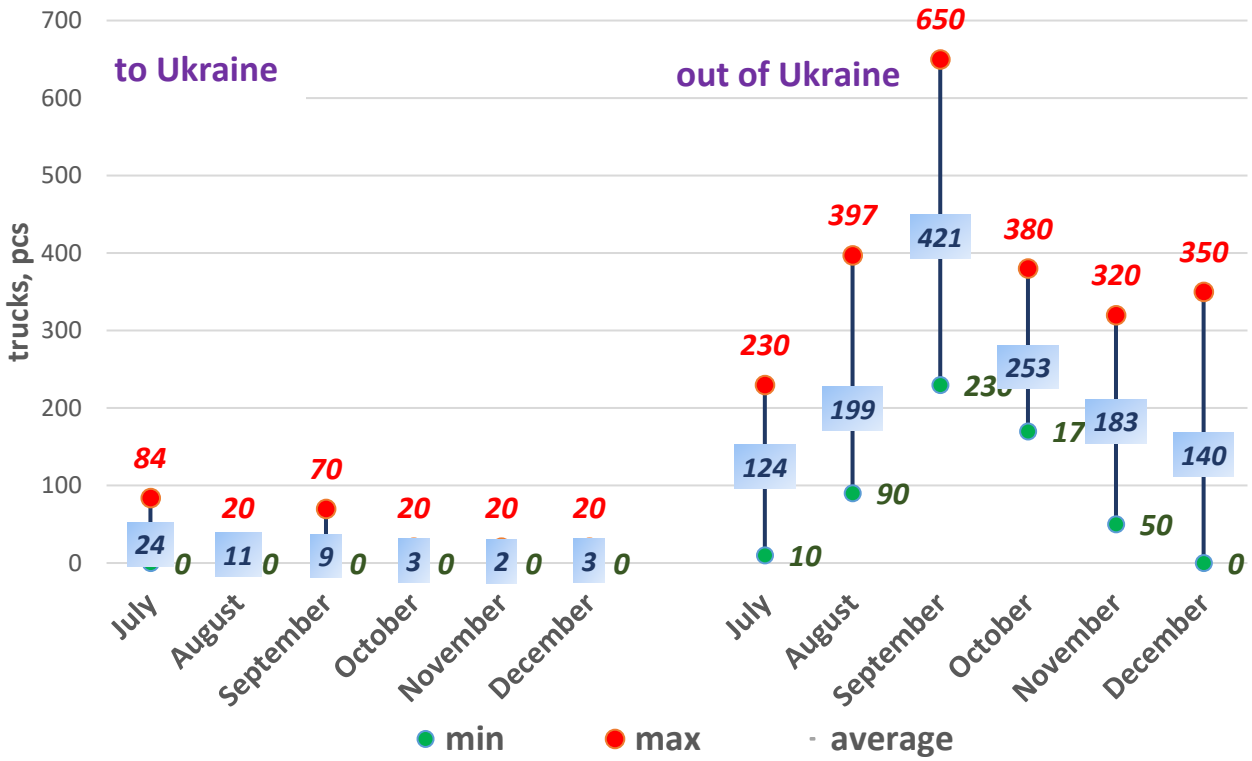

Fig. A.3. Queues in front of Vysne Nemecke-Uzhhorod BCP in the directions "to Ukraine" and "from Ukraine" on the Ukrainian-Slovak section of the border, units
Source: built on the basis of the data of the State Customs Service of Ukraine

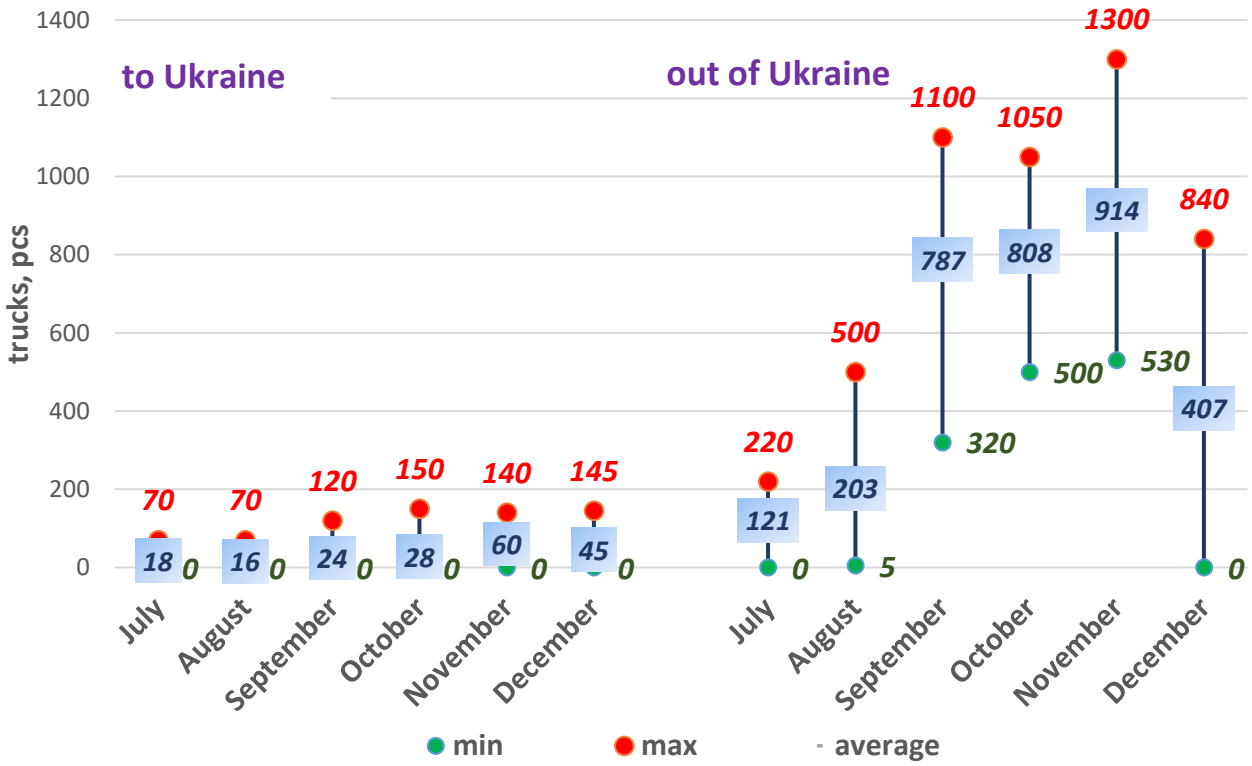

Fig. A.4. Queues in front of Chop (Tysa) - Záhony BCP in the directions "to Ukraine" and "from Ukraine" on the Ukrainian-Hungarian section of the border, units
Source: built on the basis of the data of the State Customs Service of Ukraine

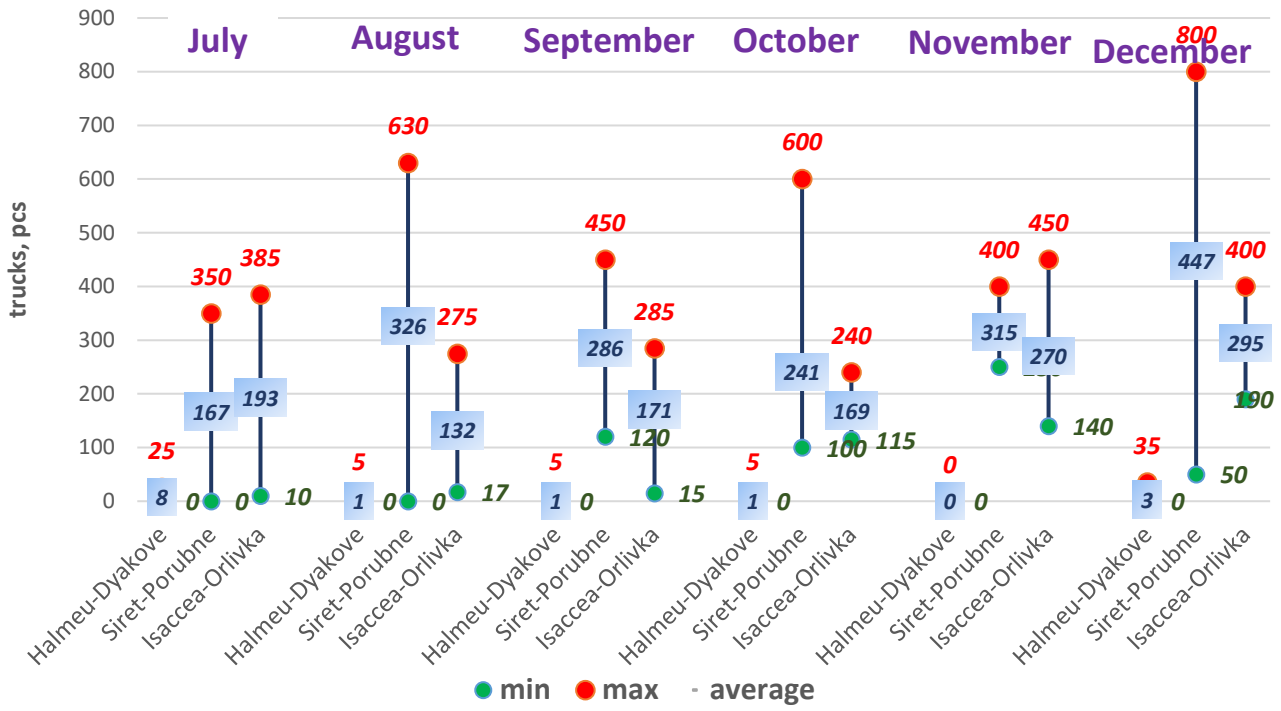

Fig. A.5. Queues in front of automobile checkpoints in the direction "to Ukraine" on the Ukrainian-Romanian section of the border, units

Source: built on the basis of the data of the State Customs Service of Ukraine

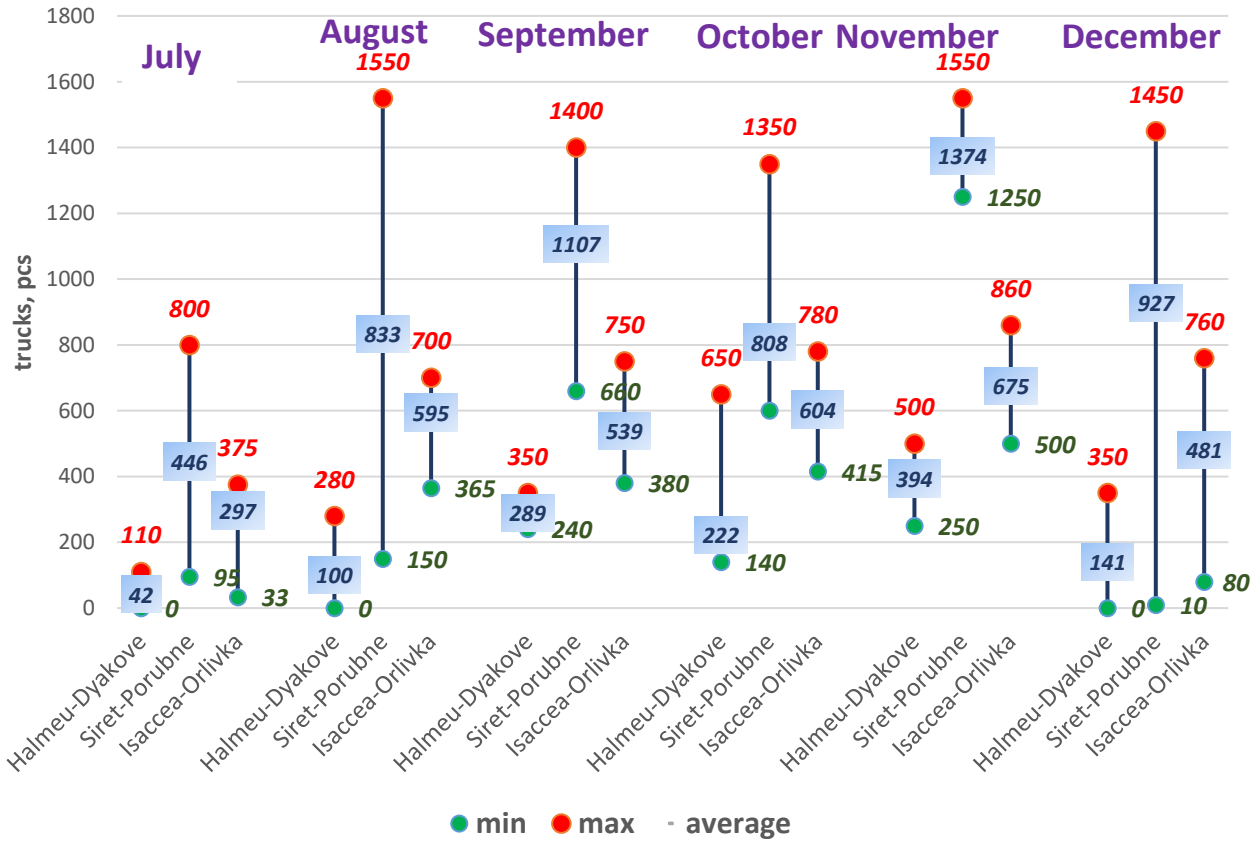

Fig. A.6. Queues in front of automobile checkpoints in the direction "from Ukraine" on the Ukrainian-Romanian section of the border, units

Source: built on the basis of the data of the State Customs Service of Ukraine

ANNEX B

Fig. B.1. Development of transport infrastructure in Volynska oblast

Source: based on data of State Statistics Service of Ukraine, State Customs Service of Ukraine

Lvivska oblast

Total length of public roads - 8399 km among them 97.8% is paved roads
Roads of national (347.1 km) and international importance (552 km)

Pan-European transport corridors III and V
M-06 "Kyiv– Chop" (border with Slovakia and Hungary), **M-09** "Lviv – Rava-Ruska" (border with Poland),
M-10 "Lviv – Krakovets" (border with Poland), ***Part of European route E40***
M-11 "Lviv – Shehyni" (border with Poland), **M-12** "Stryi - Ternopil - Kropyvnytskyi- Znamianka (throught Vinnytsya)
TEN-T Corridors – 1)"North Sea – Baltic", 2) "Baltic - Black - Aegean Seas", 3) "Rhine-Danube". 4) "Baltic Sea – Adriatic Sea"

In 2020 the average indicator of roads category - **3.64** (I - motorway, V- regional road)
Density of paved public roads (per 1,000 km^2 of territory) - **376 km**

In 2021, **55 parking lots and parking spaces for vehicles were in oblast.** 75% of them located on the roads of international importance (M-06, M-09, M-10, M-11, M-12)

In 2020, the length of the public railway - 1263 km, 32% - electrified
Railway's density (per 1,000 km^2 of territory) - 58 km

4 Road border crossing points **FOR FREIGHT** with Poland: Rava-Ruska - Hrebenne BCP, Krakivets - Korczowa BCP, Shehyni - Medyka BCP, "Smilnytsa- Kroscenko"
2 Rail border crossing points **FOR FREIGHT**: Rava-Ruska - Werchata BCP, Mostyska - Przemyśl BCP

Fig. B.2. Development of transport infrastructure in Lvivska oblast

Source: based on data of State Statistics Service of Ukraine, State Customs Service of Ukraine

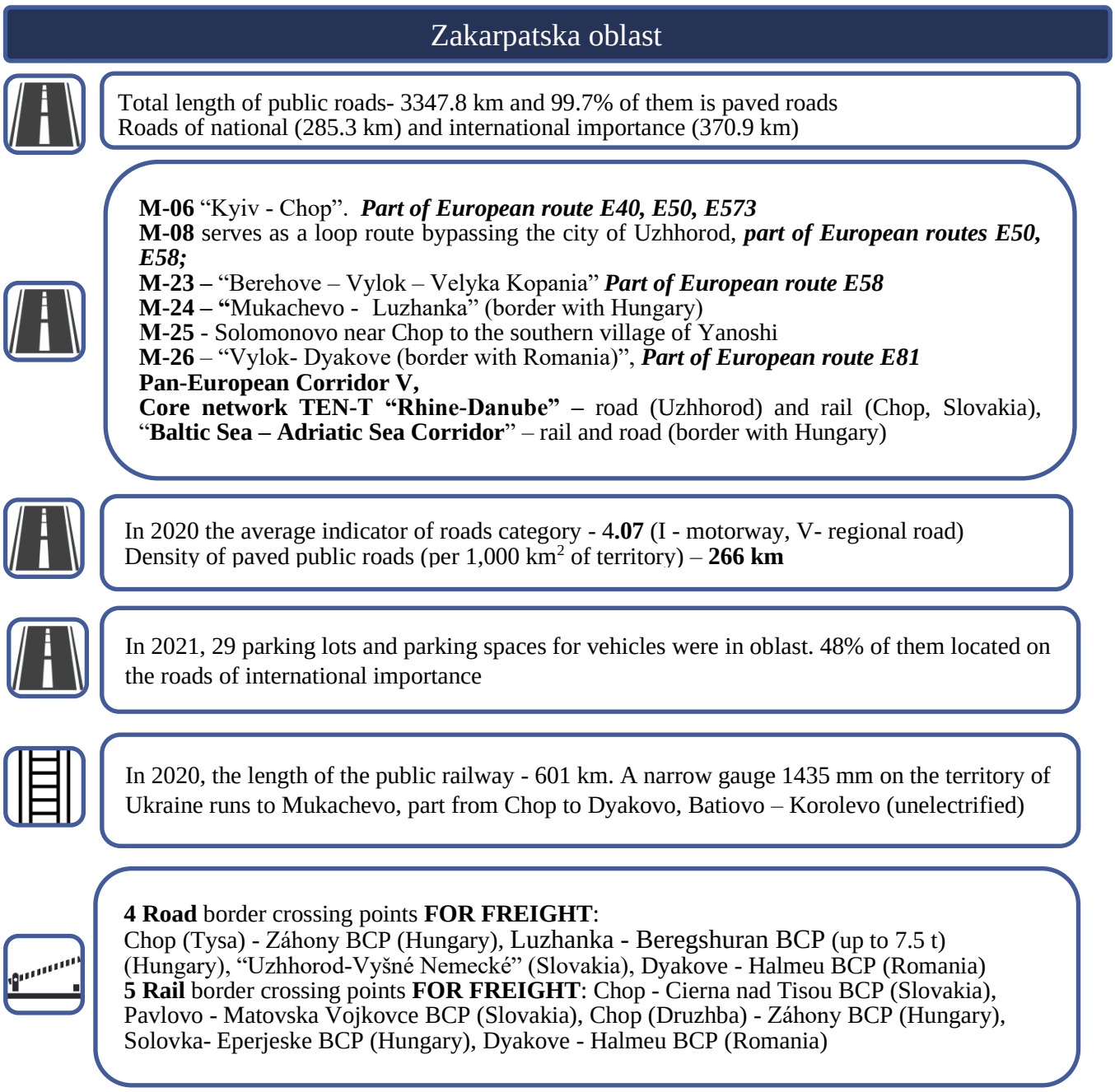

Fig. B.3. Development of transport infrastructure in Zakarpatska oblast

Source: based on data of State Statistics Service of Ukraine, State Customs Service of Ukraine

Table B.1

Road border crossing points for freight on the border with Poland and Slovakia

BCP	working hours	type	type of transportation	Number of lanes (in/out)	planned capacity of freight vehicles, per day	Inspectors	Road	Transport Corridors
POLAND								
Yahodyn-Dorohusk	24/7	international	passenger, cargo	13/13	800	Phytosanitary, Veterinary	M-07 / E373	TRACECA, Via Carpatia
Rava-Ruska-Hrebenne	24/7	international	passenger, cargo	12/12	250	Phytosanitary, Veterinary, Sanitary and epidemiological	M-09 / E372	Via Carpatia
Krakivets-Korczowa	24/7	international	passenger, cargo	10/10	500	Phytosanitary, Veterinary	M-10 / E-40	Pan-European III, Core TEN-T (North Sea – Baltic & Baltic - Black - Aegean Seas) TRACECA
Shehyni-Medyka	24/7	international	passenger, cargo	9/6	120	Phytosanitary, Veterinary, Sanitary and epidemiological	M-11	Pan-European III, TRACECA
Smilnytsya-Kroscienko	24/7	international	passenger, cargo (up to 7.5 t)	5/6	100	Sanitary and epidemiological	T-1401	-
SLOVAKIA								
Uzhhorod-Vyšné Nemecké	24/7	international	passenger, cargo	7/7	500	Phytosanitary, Veterinary	M-08 / E50	Pan-European V, Core TEN-T (Rhine-Danube), TRACECA

Source: State Customs Service of Ukraine, State Border Guard Service of Ukraine

Table B.2

Rail border crossing points for freight on the border with Poland and Slovakia

BCP	working hours	type	type of transportation	Gauge (mm)	designed capacity of freight wagons, per day	Inspectors	Transport Corridors
POLAND							
Yahodyn-Dorohusk	24/7	international	passenger, cargo	1435 and 1520	250	Phytosanitary, Veterinary	TRACECA, Via Carpatia
Volodymyr-Volynskyi (Izov)-Hrubieszów	24/7	international	cargo	1520	1000	Phytosanitary, Veterinary	TRACECA
Rava-Ruska-Werchata	24/7	international	cargo	1520	n/a	-	-
Mostyska-Przemyśl	24/7	international	passenger, cargo	1435 and 1520	40	n/a	Pan-European III, Core TEN-T (North Sea – Baltic & Baltic - Black - Aegean Seas) TRACECA
SLOVAKIA							
Chop - Cierna nad Tisou	24/7	international	passenger, cargo	1435 and 1520	2000	Phytosanitary, Veterinary	Core TEN-T (Rhine-Danube), TRACECA
Pavlovo - Matovska Vojkovce	24/7	international	cargo	1520	990	n/a	Pan-European V, TRACECA

Source: State Customs Service of Ukraine, State Border Guard Service of Ukraine

Table B.3

Average load coefficient (freight wagons, trucks per day) for each BCP

BCP from Ukrainian side	adjacent country	type	designed capacity per 24 h (trucks or freight wagons)	2018		2019		2020		2021		2022	
				calculated average capacity	%	calculated average capacity	%	calculated average capacity	%	calculated average capacity	%	calculated average capacity	%
Yahodyn	Poland	road	800	829	104%	905	113%	893	112%	954	119%	976	122%
Rava-Ruska	Poland	road	250	498	199%	404	162%	391	156%	493	197%	554	221%
Krakivets	Poland	road	500	576	115%	476	95%	574	115%	550	110%	595	119%
Shehyni	Poland	road	120	494	412%	203	169%	195	163%	296	246%	359	299%
Smilnytsia	Poland	road	100	60	60%	1	1%	1	1%	4	4%	12	12%
Uzhhorod	Slovakia	road	500	302	60%	258	52%	241	48%	249	50%	301	60%
Yahodyn	Poland	rail	250	76	30%	75	30%	60	24%	77	31%	208	83%
Volodymyr-Volynskyi (Izov)	Poland	rail	1000	813	81%	792	79%	652	65%	735	73%	838	84%
Mostyska	Poland	rail	40	239	598%	134	334%	103	256%	161	402%	304	760%
Pavlovo	Slovakia	rail	990	624	63%	439	44%	331	33%	521	53%	404	41%
Chop	Slovakia	rail	2000	580	29%	560	28%	500	25%	595	30%	666	33%

Note: The data of designed capacity of freight wagons (per day) in “Rava-Ruska-Werchata” is unavailable

Source: Author’s calculation based on data of State Customs Service of Ukraine

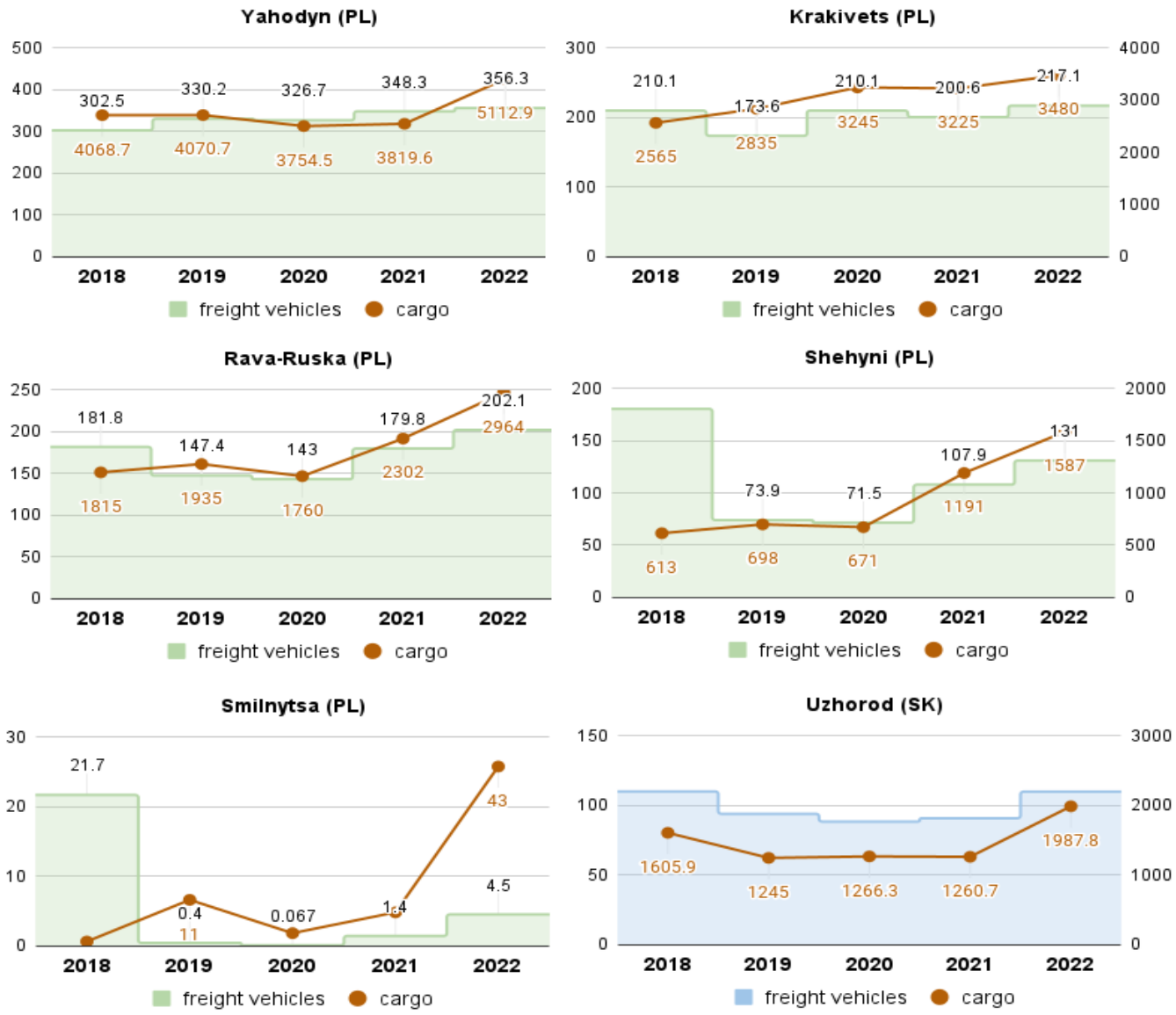

Fig. B.4. Number of freight vehicles (thousand) and cargo (thousand tonnes) crossed Ukraine-Poland and Ukraine-Slovakia BCPs in 2018-2022

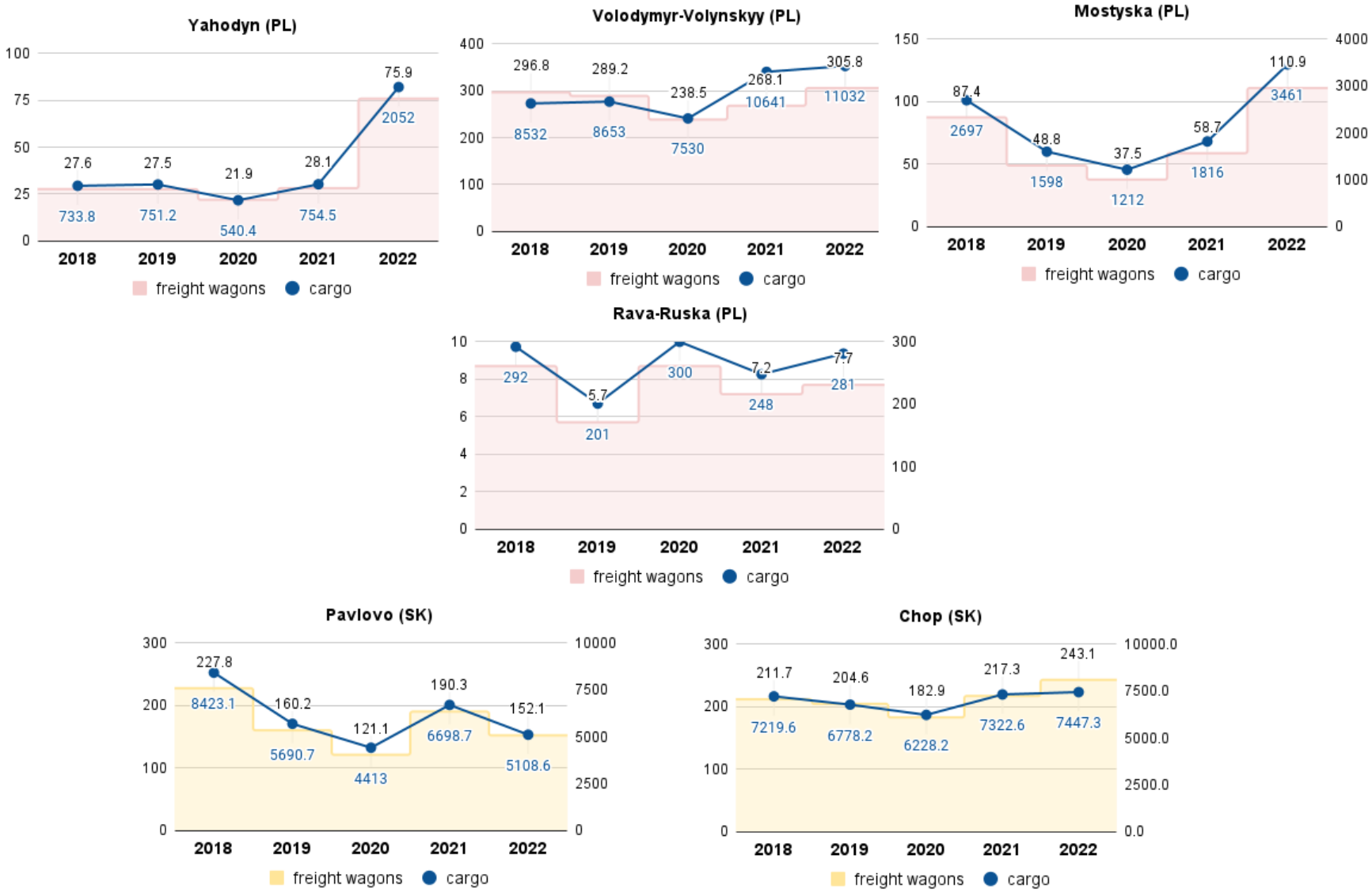

Fig. B.5. Number of freight wagons (thousand) and cargo (thousand tonnes) crossed Ukraine-Poland and Ukraine-Slovakia BCPs in 2018-2022

ANNEX C

Table C.1

Characteristics of industrial parks located in the regions of Ukraine bordering with Romania

№	Name, founding date	Area, ha	Activity	Infrastructure	Advantages
Zakarpatska oblast					
1	Maramuresh Industrial Park (03 June 2022)	33.2063 ha	Wood processing, furniture and machine-building industry	Two access roads	Located 1 km to H09, 3 km to Solotvino railway station, 4.7 km to Solotvino - Sighetu Marmaciei crossing point, 19.5 km to Teresva - Kimpulung la Tisa crossing point and 25.7 km to Dilove - Vala Vyšeului crossing point
Ivano-Frankivska oblast					
2	Dolyna Industrial Park (03 February 2014)	27.4 ha	Light industry, wood processing, engineering, and instrument manufacture	Access road, gas control point, electrical substation, water supply and sewerage	Located 2 km to H-10; 50 m to the railway line for industrial use
3	Kalush Industrial HAB Industrial Park (30 August 2021)	18.7306 ha	Machine-building industry, wood processing industry, production of building and heat-insulating materials	Production areas, engineering and technical infrastructure	Potential eco-industrial park; located 1 km to H10; 200 km to Krasnoilsk - Vikovu de Sus crossing point; 175 km to Smilnytsia – Kroscienko crossing point
Chernivetska oblast					
4	Novodnistrovsk Industrial Park (13 January 2017)	15.36 ha	Manufacture of electrical equipment, motor vehicle parts, and food products	Transport and technical infrastructure.	Located 60 km to Kelmentsi international railway border checkpoint; 20 km to the Sokyryany railway station; preferences for payment of customs and share contributions to the infrastructure development in the settlement
5	Hotyn Invest Industrial Park (19 July 2022)	13.7244 ha	Textile and wood processing industry	Closeness of communications	Located 3 km to H03, 30 km to the Mamalyga-Kryva crossing point

№	Name, founding date	Area, ha	Activity	Infrastructure	Advantages
					(Ukraine-Moldova border)
6	Bukovyna Energy Industrial Park (19 July 2022)	15.0093 ha	Food and wood processing industry	Closeness of communications	Located near P63, 19 km to the road and railway checkpoints Sokyryany – Oknytsia (Ukraine-Moldova border), 7 km from the Romankivtsi railway station
Odeska oblast					
7	iPark Industrial Park (01 September 2014)	16.0 ha	Processing: instrument manufacture, chemical and electrical engineering	Water supply, gas supply, electricity, sewerage.	Located 25 km to Odesa and 5 km to Yuzhne; 1 km to E-58; close to three railway stations; 5 km to Sea Trade Port Yuzhnyi
8	Podilsk Industrial Park (22 March 2019)	31.0704 ha	Processing. Logistics.	Water supply, gas supply, electricity supply, sewerage.	Located 2 km to the hub railway station; close to T-16-12; consulting services

Table C.2.

Average daily passage of freight cars/vehicles through the checkpoint on the Ukrainian-Hungarian and Ukrainian-Romanian sections of the border

Name of checkpoint	*Project daily capacity for freight vehicles / wagons*	*Actual daily capacity for freight vehicles / wagons*									
		2018		*2019*		*2020*		*2021*		*2022*	
		units	*%*	*units*	*%*	*units*	*%*	*units*	*%*	*units*	*%*
Rail											
Chop–Druzhba – Záhony	***700***	*48*	*6.8*	*36*	*5.0*	*31*	*4.4*	*33*	*4.7*	*63*	*9.0*
Salovka – Epereshke	***860***	*229*	*26.6*	*219*	*25.5*	*221*	*25.7*	*237*	*27.6*	*308*	*35.8*
Dyakove – Halmeu	***720***	*22*	*3.1*	*17*	*2.36*	*21*	*2.9*	*37*	*5.1*	*101*	*14.0*
Vadul-Siret – Vicşáni	***720***	*136*	*18.9*	*89*	*12.4*	*134*	*18.6*	*130*	*18.1*	*222*	*30.8*
Road											
Chop–Tysa – Záhony	***500***	*659*	*131.8*	*691*	*138.2*	*451*	*90.2*	*447*	*89.4*	*459*	*91.8*
Luzhanka – Beregshuran	***20***	*24*	*120.0*	*12*	*60.0*	*8*	*40.0*	*14*	*70.0*	*18*	*90.0*
Dyakove – Halmeu	***200***	*163*	*81.5*	*146*	*73.0*	*142*	*71.0*	*155*	*77.5*	*175*	*87.5*
Porubne-Siret	***500***	*446*	*89.2*	*317*	*63.4*	*314*	*62.8*	*151*	*30.2*	*624*	*124.8*
Orlivka - Isaccea	***150***	-	-	-	-	*15*	*10.0*	*66*	*44.0*	*165*	*110*
*Krasnoilsk – Vikovu de Sus**	**-**	-	-	-	-	-	-	-	-	*122*	-

* Automobile border crossing point was opened in November 2022. Passage is allowed for passenger cars and empty trucks.

ANNEX D

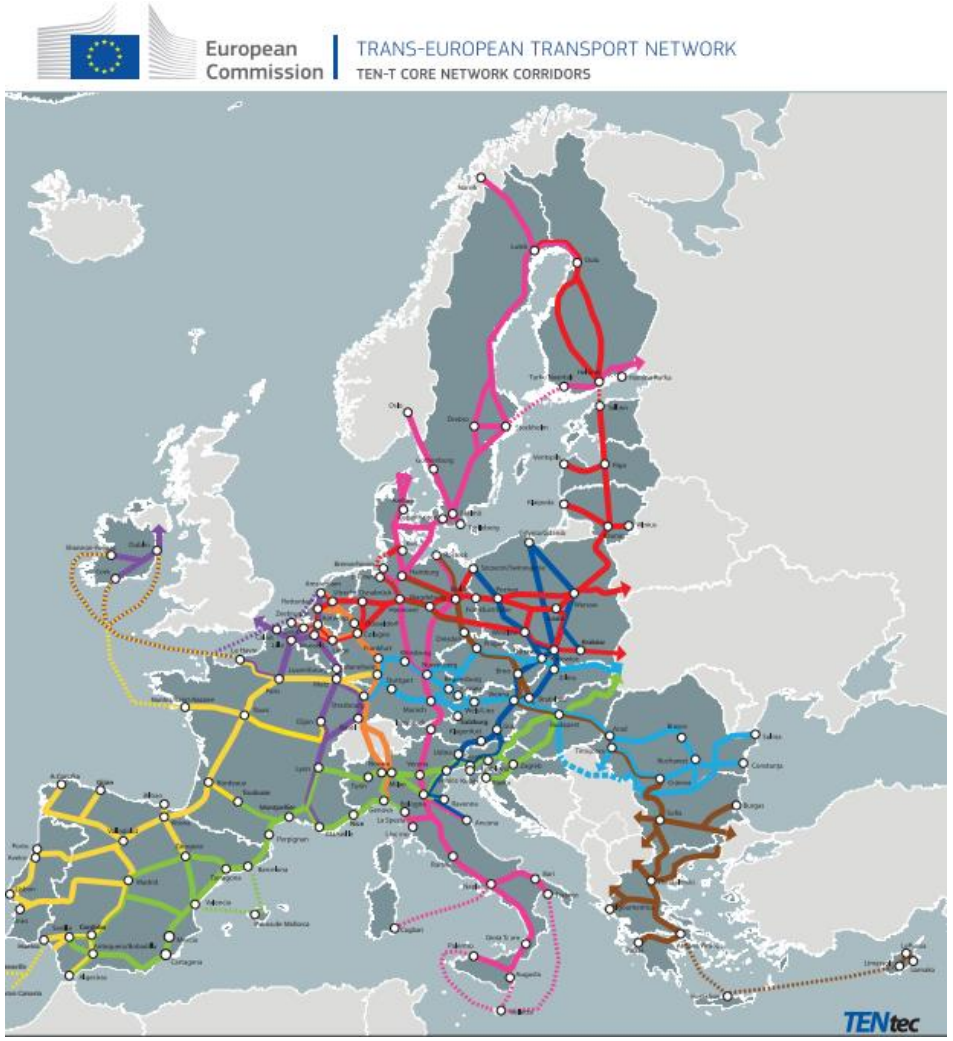

Fig. D.1. Trans-European transport network

Source: https://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/site/maps_upload/SchematicA0_EUcorridor_map.pdf

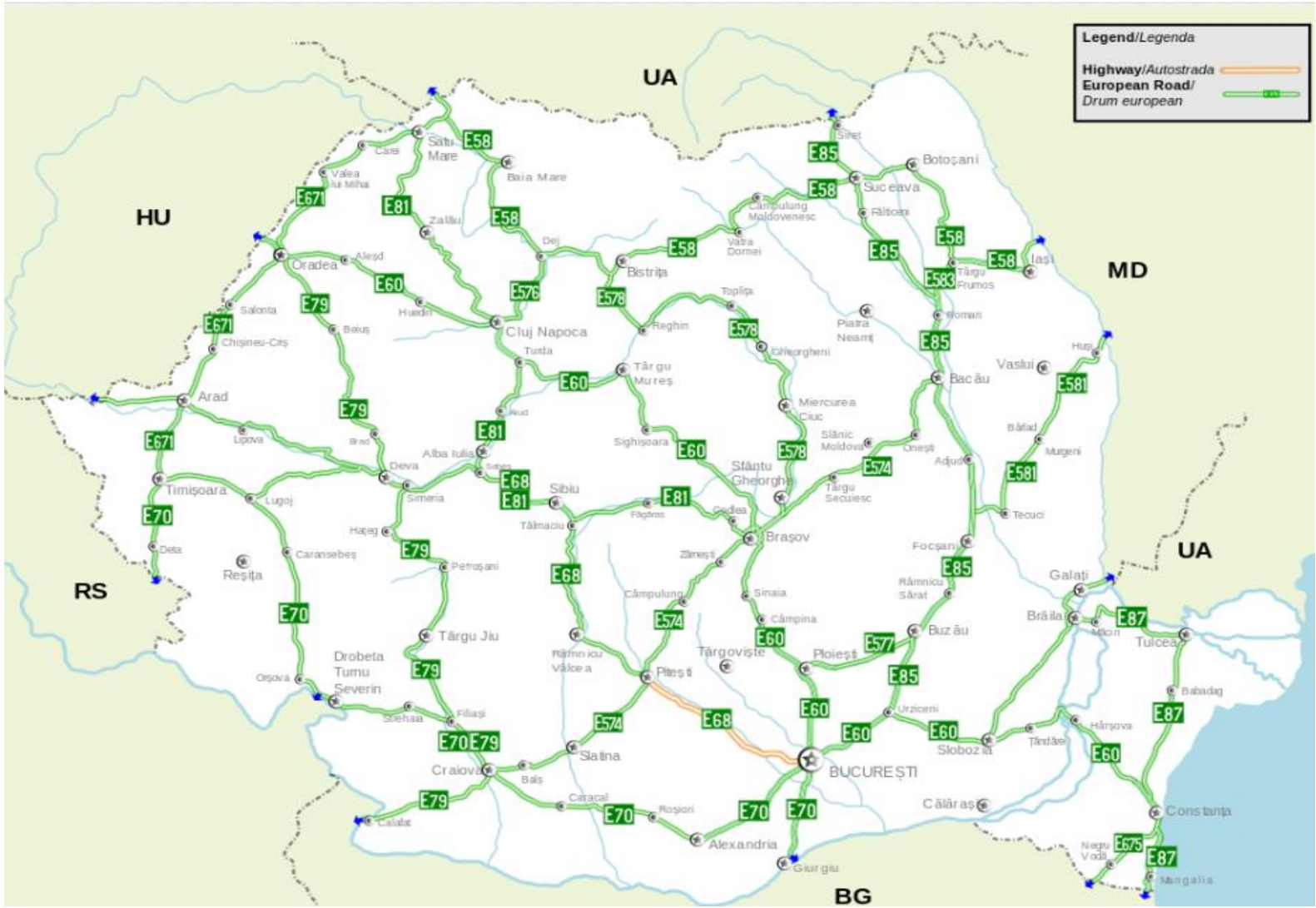

Fig. D.2. European road network in Romania

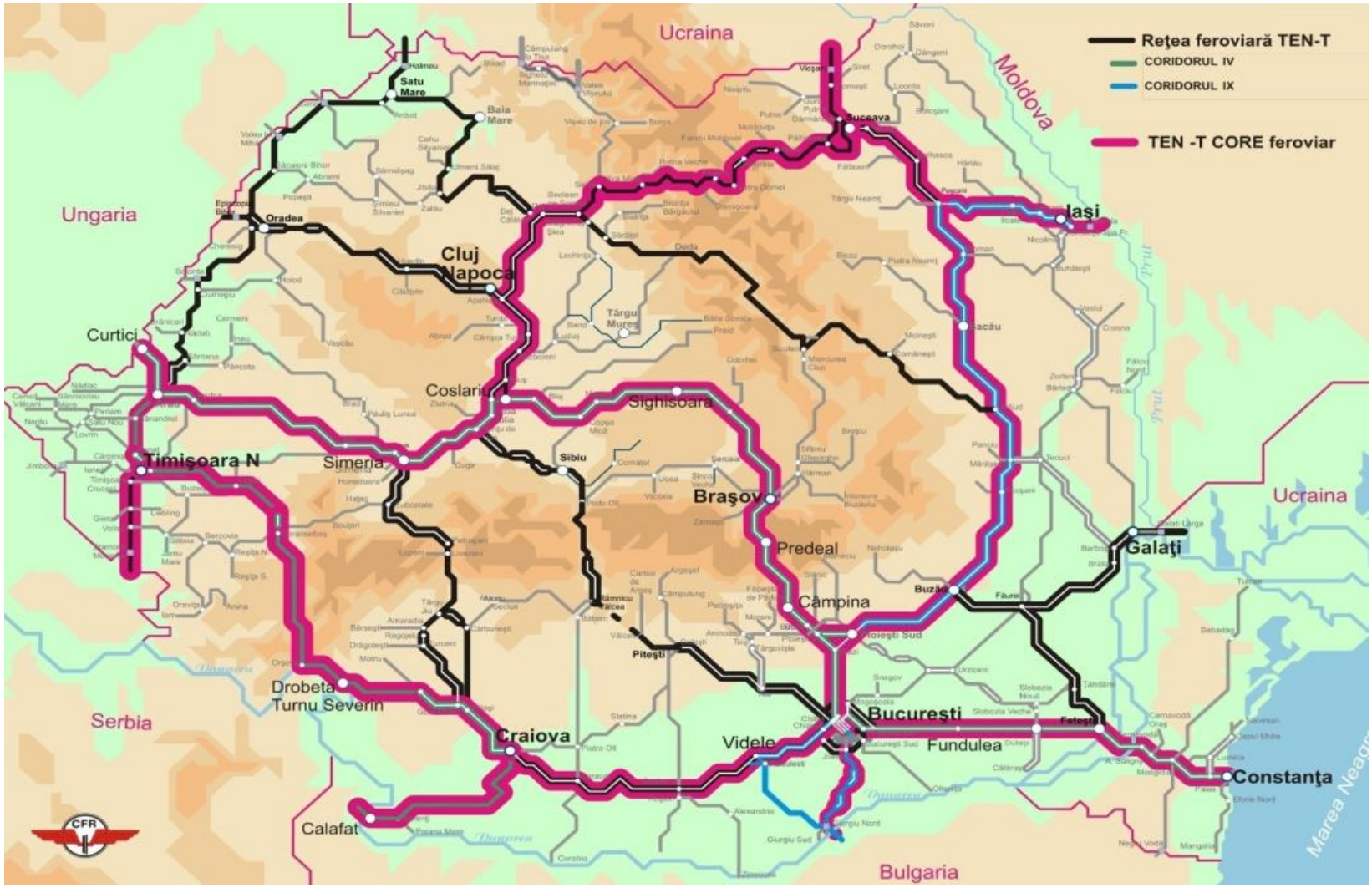

Fig. D.3. TENT-T rail network in Romania

Source: https://monitorizari.hotnews.ro/stiri-infrastructura_articole-21817821-analiza-cum-ajuns-infrastructura-rutiera-din-romania-paragina-nu-transporta-navetisti-bucuresti.htm