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Problems realating to the statistical research of the national market of logistics services in war conditions

Nataliia Hrynchak[1], **Olha Yatsenko**[2], **Olena Bulatova**[3], **Olena Ptashchenko**[4]

ABSTRACT

The article discusses the theoretical principles of statistical research with regard to the national market of logistics services during wartime. The system of statistical indicators of the research of the logistics services market is structured through the allocation of separate blocks of indicators by priority of their estimation in war conditions. The market of logistics services of Ukraine is characterised by selected blocks of indicators. The paper identifies the main structural changes that occurred due to the hostilities faced by the country. Moreover, the authors determine the main factors influencing the functioning of the analysed market during war, as the statistical study of these factors is considered necessary for the transformation and development of logistics services. It is substantiated that taking into account such statistical indicators as the level and availability of logistics infrastructure, security, the human factor and changes in legislation are likely to result in a new alternative direction of logistics routes and contribute to the development of the logistics services market in general. The authors proposed the construction of a centralised electronic service (or several services) with the purpose of consolidating information about the logistics infrastructure. The software system should offer the option of an operational interactive visualisation.

Key words: logistics service, logistics services market, system of statistical indicators, freight transportation, warehousing.

[1] National Academy of Statistics, Accounting and Audit, Kyiv, Ukraine. E-mail: gnatalia@ukr.net. ORCID: http://orcid.org/0000-0002-2046-6014.

[2] Kyiv National Economic University Named After Vadym Hetmana, Ukraine. E-mail: yacenkoolgakneu@gmail.com. ORCID: https://orcid.org/0000-0003-4399-2217.

[3] Mariupol State University, Ukraine. E-mail: olena_bulatova@yahoo.com. ORCID: https://orcid.org/0000-0001-7938-7874.

[4] Simon Kuznets Kharkiv National University of Economics, Ukraine. E-mail: helenavaleriya@gmail.com. ORCID: http://orcid.org/0000-0002-2413-7648.

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1. Introduction

The war with Russia has become a serious challenge for Ukraine, which requires general consolidation and optimization of all social processes. War is not only a battlefield, it is also an economic confrontation, where the effective functioning of the logistics services market plays a key role and to some extent is a competitive advantage over the aggressor.

David Beasley, the Executive Director of the UN World Food Programme, during the World Economic Forum in Davos, stressed that closed Ukrainian ports will have a significant impact on global food security (see: https://www.weforum.org/press/2022/05/global-food-crisis-must-be-solved-alongside-climate-crisis/). Due to the war waged by Russia against Ukraine, not only maritime but also other logistics routes and centres were affected, so optimization of logistics, reformatting of the logistics services market (LSM) are the next issues after military action that are crucial for Ukraine's survival, economic development of partner countries and eliminating the risks of the global food crisis.

To build an efficient and effective wartime economy, it is necessary to be able to comprehensively study the market of logistics services, including assessing logistics infrastructure, track the dynamics of cargo movement, fuel consumption, reputation of carriers, solve problems in the organization of loading and unloading, warehousing. An important issue is not only the survival of the population and businesses, but also the ability of the country's economy to develop in new conditions. This requires reliable and timely statistical information that will allow to analyze and structure the factors of influence that superdynamically shape the new state of the logistics services market, and optimize activities in new conditions.

The purpose of the study is to substantiate the theoretical and methodological foundations of statistical evaluation of the market of logistics services in Ukraine during the war and to identify the factors that will most influence its transformation.

2. Theoretical problems of statistical research of national markets for logistics services

Statistical study of national markets for logistics services has its own characteristics. Logistics infrastructure, the number and range of services of logistics providers in many countries differ significantly. The choice of type of transport carrying freight transportation depends on a number of factors (cost, speed, safety, etc.). National markets for logistics services are undergoing rapid transformation, in peacetime – in terms of supply and demand, during the war - also due to the lack of logistics infrastructure or limited access to it, as a result of increased security risk. Against this background, before outlining the boundaries of the national market of logistics services, its structure and potential, we define and justify the statistical classification of logistics services.

Many researchers have tried to classify logistics services using different classification criteria. Thus, S. Sremac, Ž. Stević, D. Pamučar, M. Arsić, B. Matić (2018) offer the following classification criteria for logistics services: type of service, degree of intangibility of the service, frequency of contact with the client, motive for purchasing the service, terms of service, type of service buyer. G. Rosa, M. Jedliński, U. Chrącholl-Barczyk (2017) grouped all logistics services into two categories: resource-oriented logistics services and intelligent logistics services related to supply chain planning and organization. A. Bhattacharjee (2018) distinguishes three groups of logistics services depending on the type of recipient / customer: logistics services for individual consumers, for end-users and for industrial enterprises.

Studies of classifications of logistics services confirm that there is no single universal set of logistics services. Moreover, the available classifications show the diversity of services, which is primarily related to the development of the logistics services market.

During the war, while a significant number of private providers of logistics services operating in the Ukrainian market, completely or partially suspended their activities in the occupied territories, the State Enterprise "Ukrposhta" continued to provide logistics services. Thus, in cooperation with WindRose, Ukrposhta resumed exports to the United States via Poland on March 1, 2022 to support small and medium-sized businesses. During the two months of the war (March – April 2022) the company delivered more than 926 tons of export shipments to countries around the world (see: https://www.ukrposhta.ua/ua/news).

In view of this, when assessing and analyzing the Ukrainian market of logistics services, subsection 53.1 "Activities of the national post office" should be included in the types of economic activity that determine MLS. This subsection covers the retrieval, sorting, transportation and delivery of domestic and international postal items in the form of parcels and packages by postal service, which may be carried out by one or more types of transport, both private and public, as well as the collection of letters and parcels from private mailboxes or post offices. Accordingly, statistical evaluation and analysis of the structure of the national market of logistics services is proposed, excluding passenger traffic.

The most pressing problem of assessing the market of logistics services is the complexity of its structure and the link of logistics activities with many other economic activities. Statistical research of the logistics services market should be carried out on the basis of a combination of quantitative estimates with analytical, attributive, descriptive characteristics. For studying the state of the logistics services market, the formation of a scientifically sound system of statistical indicators which characterize each element of the market structure is an extremely important and necessary task in the context of finding optimal functioning of regional transport systems in wartime and the need to recover the economy of the country in general.

3. Methodological principles of formation of a system of statistical indicators of evaluation of national market for logistics services

D. Leończuk (2016) included energy consumption, delivery time, transport speed, flexibility, reliability and load on vehicles to key indicators for assessing the efficiency of the logistics services market. E. Plambeck and B. Kalkanci (2020) noted that the efficiency of the logistics services market can be increased by harmonizing and coordinating different operations in supply chains. E. Bottani, A. Rizzi, G. Vignali (2014) outlined an integrated approach to achieving efficiency, which involves integrated management of packaging, procurement, warehousing and transport activities. Note that all these approaches have a number of disadvantages: the assessment of goods turnover is based on cost indicators, which contain the inflation component, which does not allow to correctly assess its dynamics; quantitative indicators of infrastructure development do not reflect its quality and efficiency of use; the size of warehouse space incorrectly reflects the volume of the logistics services market, as a significant part of warehouse space is used by representatives of wholesale and retail trade for their own purposes; most macroeconomic indicators do not reflect the development of new key business competencies, including in the logistics services market.

A system of statistical indicators for studies of the logistics services market needs to comply with the following set of core criteria:

- the statistical indicators must be correct, quantifiable, and must have a reliability required for practical purposes;
- the statistical indicators must be aggregated: it means that when aggregated they must allow for moving from one level to another by the use of various statistical methods;
- the statistical indicators must be politically neutral and applicable for an economic statistical analysis with identification of the causalities.

In order to comprehensively study the market of logistics services, especially given the negative effects of the war and the importance of effective functioning of this market for the recovery of the country, we propose to use a system of statistical indicators of logistics services market assessment (Figure 1). This system contains three blocks and allows you to diagnose the state and trends of the market development, taking into account the influence of other related markets and types of economic activities, as well as to predict and model the ways of development of the national market of logistics services.

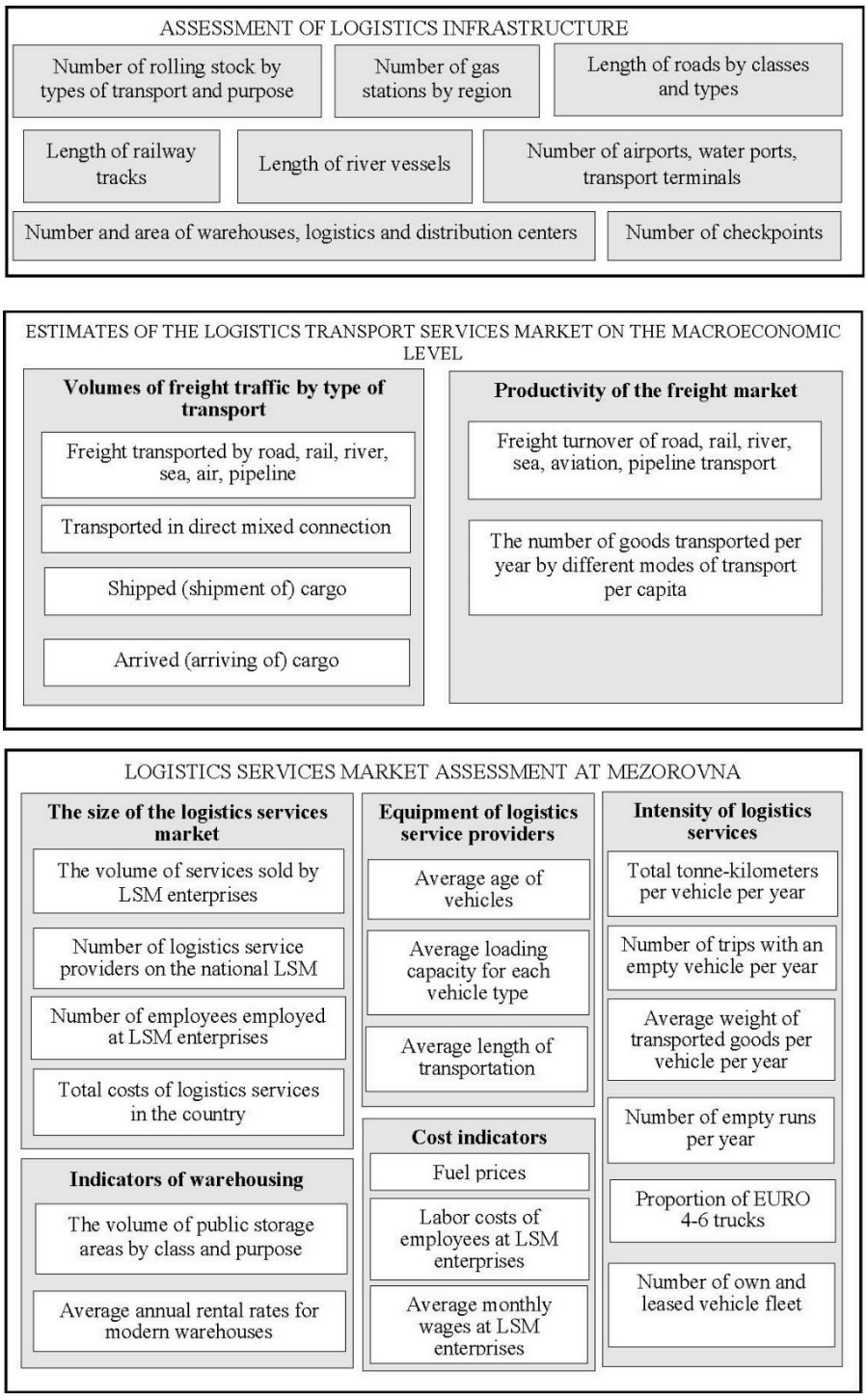

Figure 1. System of indicators for evaluating the national market of logistics services

If in peacetime the problem for logistics service providers was the economic assessment of the logistics market, then during the war the priority is to study the statistical characteristics of logistics infrastructure (density, length and accessibility of roads, number of actually functioning airports, water ports, transport terminals, warehouse size areas, the number of logistics centres, distribution centers, etc.), as the possibility of their safe use will allow to implement logistics services.

The second block is the study of transport logistics services, because transportation is a key type of these services. Socio-economic development of the country requires coordinated, highly efficient work of transport, clear cooperation with all sectors of the economy. This can be achieved through better use of vehicles, improved coordination of all types of transport, widespread use of advanced forms of transportation.

Statistical study of freight transport characterizes the transportation of goods and freight by type of public transport, including by the regions of the country, the structure of transport by type of cargo, freight and freight turnover on a commercial basis by certain types of transport. Economic indicators that characterize the market include data on freight in terms of tonnage and destination/country of origin for all types of transport, including sea, air and land.

4. Statistical study of the Ukrainian market of logistics services during the war

Problems of functioning of the national market of logistics services during the war stem from the need to ensure the security of logistics providers and the destruction of logistics infrastructure. Analysts of the analytical department of the Kyiv School of Economics KSE Institute (see: https://kse.ua/ua/about-the-school/news/zagalna-suma-pryamih-zbitkiv-infrastrukturi-vzhe-perevishhuye-105-5-mlrd/?__cf_chl_tk=_Rsabj8LNS9STF11odv8ew007nhqfaD.KoLjDWi2mpQ-1653740310-0-gaNycGzNCP0) within the project "Russia will pay", with the support of the Office of the President of Ukraine, the Ministry of Economy, the Ministry of Infrastructure and the Ministry of Communities and Territories Development, determined that a total amount of direct losses of the Ukrainian economy from the damage and destruction of residential and non-residential buildings and infrastructure already exceeds $ 105.5 billion or over UAH 3.1 trillion as of May 25, 2022. Losses of the Ukrainian economy from the damage to physical logistics infrastructure since the beginning of the war, as of May 25, 2022 amount to $ 43.5 billion (Table 1).

The provided statistical information on numerous damages and destructions is not exhaustive due to the inability of citizens and public authorities to promptly record the damage in the context of each city and town.

Table 1. Destruction of Ukraine's logistics infrastructure since the beginning of the war as of May 25, 2022

№	Infrastructure facilities	Amount	Total losses, million dollars USA
1	Roads, thousand km	23.8	29879
2	Civil airports, units	11	6817
3	Railway infrastructure and rolling stock, including:		3676
	– railway tracks, thousand tracks	6.3	
	– railway bridges, units	43	
4	Bridges and bridge crossings, units	295	1646
5	Ports and port infrastructure		471
6	Military airfields, units	12	468
7	Warehouse infrastructure, units	181	286
8	Oil depots, units	28	227

Many branches of logistics companies were literally destroyed, and most employees were forced to leave their homes. With the end of hostilities in the regions, the logistics infrastructure began to recover, but suffered severe damages. The war made it impossible for the key highways connecting the West, Center and East (Lviv-Kyiv and Kyiv-Kharkiv routes) to operate, bridges were blown up, and railway junctions were destroyed. Accordingly, logistics routes have become longer, with the use of detours over safe roads. This, in turn, increased the delivery time of parcels, cargo, etc.

Aviation and water transport logistics amount to zero. All logistics services related to freight transport are carried out by road and rail, but due to the occupation and high risks of road transportation, the delivery of goods to certain parts of the country is delayed.

Studies of the structure of cargo transportation by certain modes of transport in peacetime have shown that despite the impact on the development of the country's logistics services market factors of the political environment and the presence of temporarily occupied territories, economic activity indicators of which are not included in the country's statistics, there were no significant changes in the structure of cargo transportation within the last 10 years. In the implementation of freight, road and rail have been and will remain the main types of transport (Figure 2). The share of road transport in the total volume of all freight traffic in 2020 compared to 2011 increased

by 9 points and amounted to 75%, and the share of freight by rail and pipeline decreased by 19% and 6%, respectively (in 2011 it was 25% and 8%).

Analyzing the total volume of freight traffic by all modes of transport, it should be noted that in the presence of a declining trend in 2011-2015, this figure increased by 61 million tons in 2018 (so the annual growth was 1.03%), in 2019 decreased by 64 million tons, but in 2020 almost reached the level of 2018 (Figure 2).

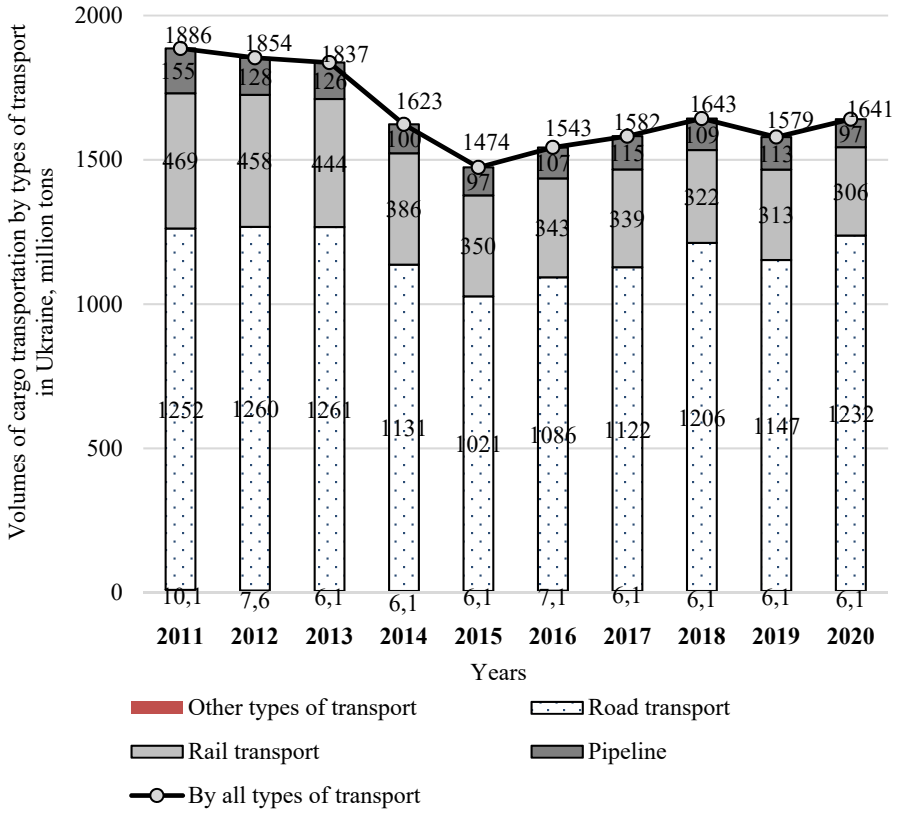

Figure 2. Volumes of cargo transportation by types of transport in Ukraine

Analysis of the productivity of the market of transport and logistics services in Ukraine based on the indicator of freight turnover by type of transport showed that in 2020 the total freight turnover by all types decreased by 30% compared to 2011 and this is primarily due to lower freight turnover by rail and pipeline (Figure 3).

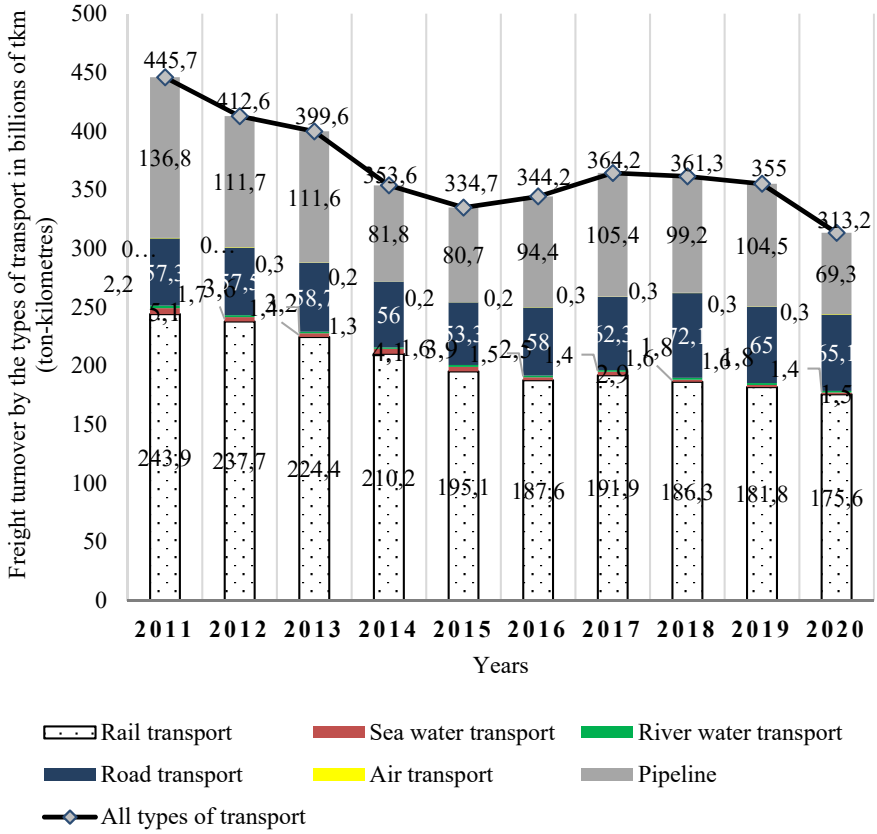

Figure 3. Dynamics of cargo turnover by types of transport in 2011–2020

In terms of cargo volumes by type of transport, even in terms of individual regions, statistical research of the transport logistics market carried out, as a rule, by all analysts in peacetime, cannot show the problems of the logistics market related to the impossibility of sea and air freight. In this case, it is more appropriate to conduct a statistical study of the volume of freight traffic by certain types of transport in terms of individual groups of goods, especially exported and imported products.

Let us take the example of transportation of grain freights. According to the information and analytical agency "APK-Inform" (see https://www.apk-inform.com/uk) and the State Statistics Service of Ukraine (see http://www.ukrstat.gov.ua/), grain exports from our country in the pre-war period was carried out mainly by sea. After the annexation of Crimea in 2014 and before the war, there were 13 seaports in Ukraine. The main volumes of grain exports in Ukraine before Russia's attack on Ukraine passed through the seaports of Mykolaiv, Odessa and Chornomorsk. In total, this is 95% of

grain cargo exported by sea. Another 5% fell on Mariupol and Berdyansk. Most grain was transported to ports by rail. As a result of blocking ports due to Russian military aggression, rail traffic in this direction is expected to decline. If in February more than 96% of all grain consignments were loaded in the direction of ports, in March this figure dropped to less than 4%. Accordingly, the share of traffic in the direction of railway border crossings on the western border of Ukraine in March increased to 55% against 2% in February (Figure 4) (https://www.apk-inform.com/uk/news/1526420).

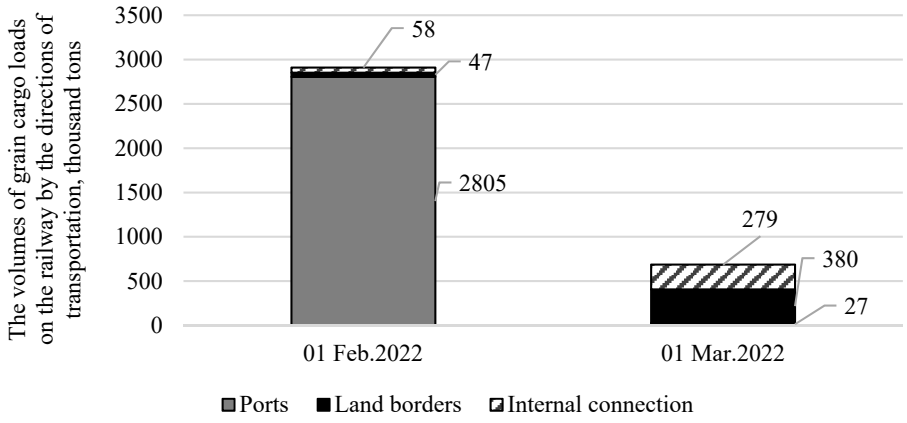

Figure 4. Structure of grain cargo loads on the railway by the directions of transportation

The global disadvantage of freight transport during the war is the lack of stable logistics chains that can provide the necessary volumes of goods, especially exports. That is, logistics operators, manufacturers, exporters need to establish new stable logistics chains, taking into account not only the danger and limitations of logistics infrastructure, but also the peculiarities of transportation of certain products. And here it is critical to pay attention to those areas of activity that were not a priority in peacetime. This requires reliable statistical information on the main problematic aspects of the implementation of logistics services that hinder the normalization of national and international freight transport, namely:

1) capacity of railway stations on the border with European countries in terms of resuming of exports / imports;
2) the number of European railway cars for the export of agricultural products from Ukraine (primarily the number of cars for grain transportation);
3) length and safety of roads by classes and types, as limited land freight transportation is not always caused by safety risks. Unfortunately, not all domestic roads allow for heavy-duty vehicles;
4) the number of vehicles for the carriage of respective goods (commodity groups);

5) the number of drivers for international road transport;
6) capacity of European logistics centres;
7) the number of railway cars for fuel import.

It is now critical to strengthen international partnerships in the field of logistics, in particular in solving the problems of finding alternative ways of delivering goods. For example, Romania has allowed Ukrainian grain to be exported through its own port, and Lithuania and Bulgaria are considering the same option. This is a difficult path, it will certainly lead to higher prices for Ukrainian products, but will preserve the export potential. According to the Minister of Agriculture and Rural Development of the Republic of Poland H. Kowalczyk, his country is currently working on the creation of a "dry port" on the border with Ukraine in order to increase transport capacity for export of Ukrainian agricultural products, including to third countries (see: https://minagro.gov.ua/news/ukrayina-ta-polshcha-nalagodzhuyut-bezperebijni-postavki-agroprodukciyi).

Another direction is road transport. With the beginning of the war, international companies suspended their work in Ukraine for various reasons. And this creates opportunities for domestic carriers. Europe has allowed our companies to carry out bilateral and transit traffic on no permits basis (see: https://delo.ua/uk/transport/bude-skladno-ale-zrestoyu-galuz-rozkvitne-logistika-pid-cas-viini-reformi-ta-maibutnje-industriyi-397214 /).

Based on the generalization of the volume of services provided by enterprises of section H by types of economic activity presented in Table 1, it is determined that the size of the logistics services market in Ukraine in peacetime, despite a slight decline in 2020 compared to the previous year, which mainly features the activity in the conditions of COVID-19, has grown 2.8 times for the last 10 years. The conducted study revealed that the rapid growth of services provided by enterprises of economic activity H "Transport, warehousing, postal and courier activities" is due to the growth in logistics services sold (Figure 5).

Given the situation that has developed in connection with the war in Ukraine, the respondents do not submit statistical reports today. According to the Law of Ukraine "On protection of the interests of the subjects of reporting and other documents during martial law or state of war" of 03.03.2022 № 2115-IX, natural persons, natural persons – entrepreneurs, legal entities shall submit accounting, financial, accounting, settlement, audit reports and any other documents within three months after the cessation or abolition of martial law or state of war for the entire period of non-reporting or obligation to submit documents (see: https://zakon.rada.gov.ua/laws/show/2115-20#Text). This makes it impossible to quickly assess the market of logistics services by the volume of logistics services sold.

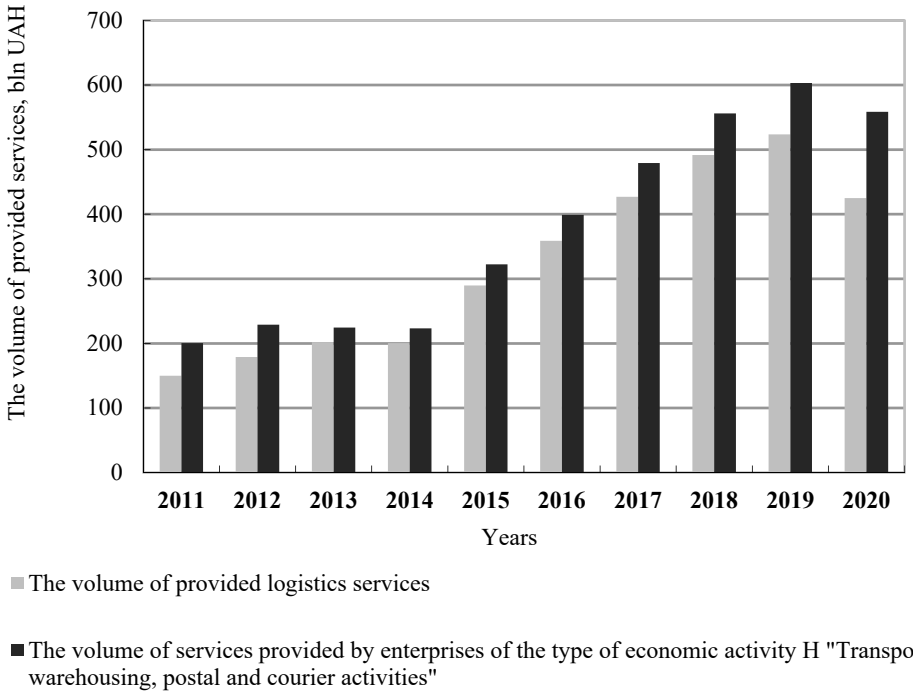

Figure 5. Dynamics of the volume of products sold by enterprises of the logistics services market for 2011–2020

It is worth focusing on the changes caused by the war in Ukraine which relate to the segment of warehousing logistics; the activity of the enterprises belonging to a kind of economic activity H 52.1 is meant. According to Alex Isachenko, the founder of digital warehousing provider WareTeka and CoreTeka, the elimination of the centre of gravity has been the first and most important change in Ukraine's warehousing logistics since the beginning of the war. The largest warehouse hub in Ukraine - 70-80% of all professional warehouse space - is located in Kyiv region, where 1.8-2.2 million square meters of professional warehouses were concentrated. According to WareTeka analysts, about 400,000 square meters of warehouses have been destroyed near Kyiv, this is about 20% of all professional warehouse real estate in Ukraine (see: https://mind.ua/openmind/20241674-zberegti-ta-zabezpechiti-yak-zminilasya-logistika-v-ukrayini-pid-chas-vijni).

With the beginning of the war, large companies, followed by medium and small ones, were forced to move their warehouse leftovers and goods to Western Ukraine, where such a large amount of warehouse space did not exist in general. The premises, which began to be used as warehouses, gave way to the former area, organization of

space and level of service. All this has greatly changed the logistics processes, supply chains and the cost of the operations themselves.

The war has shown that it is unwise to place infrastructure in one place, as was the case in Ukraine. It is necessary to distribute warehouses throughout the country and create a buffer to keep them. We expect that the centre of gravity will change greatly when building new warehouses.

The situation in Ukraine is indicative of the whole world. The most important thing that can be learned about warehousing logistics is that the country must be able to quickly manage its logistics flows in emergencies. And in order to correct mistakes in the future, to invest wisely in the development of warehousing logistics at the national level, it is necessary to conduct a statistical study of the total area of warehouses not only by region but also by types (classes) of the warehouses.

Warehouse real estate companies develop their own warehouse classifications. Due to the lack of a generally accepted classification of warehouses in Ukraine, the most common is the international classification of warehouses from the brokerage agency Knight Frank. According to it, the warehouses are divided into 6 types: A +, A, B +, B, C, D (see https://content.knightfrank.com/resources/knightfrank.ru/pdf/research/ind.pdf). Knight Frank's classification is based on requirements for technical parameters, territory, equipment and communications.

It is also important to have state reserve warehouses, as it is organized in European countries: Germany, the Czech Republic, Poland. A large amount of humanitarian aid that Ukraine now receives from Europe comes from the state reserve.

In order to implement the principle of economy in freight transport, it is necessary to create logistics centres and centralized electronic services that would coordinate the actions of large carriers. Such consultation centres will help to fill any vehicle moving through the territory of Ukraine, in terms of both the commercial component and humanitarian aid. It is necessary to popularize the idea of competent logistics on the basis of reliable, up-to-date statistical data, which would unite the efforts of the state and business aimed at rebuilding the country. The war showed that these factors are also critical for work. Initiatives that can be useful for carriers, volunteers and refugees, such as the Crisis Logistics Center and VzayemoDiya, have now begun to emerge.

Another problem is that the main logistics stops working at night due to the curfew and the difficulties at checkpoints.

5. Conclusions

In the conditions of an ongoing war on the territory of Ukraine, the security risks of cargo transportation by road and rail have increased significantly. During the war, the management and coordination of logistics activities based on a statistical

assessment of the availability and capabilities of the logistics infrastructure, both at the level of individual logistics service providers and at the state level in general, is of primary importance. In particular, the territorial level and potential of logistics development in the regions of Ukraine needs more statistical research.

In order to determine the criteria for the stability of the logistics services market, it is important to have statistical data which are grouped according to two aspects: logistics infrastructure and the human factor.

According to the results of the evaluation, analysis and structuring of relevant indicators and factors affecting the development of the logistics services market, their priority is determined according to the type of logistics services (warehousing, freight transportation, management and coordination of logistics activities), which makes it possible to identify new opportunities for development both at the micro- and at the macro level.

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