

PROBLEMS OF MARKETING LOGISTICS AND INFRASTRUCTURE IN UKRAINE UNDER MARTIAL LAW: WAYS TO SOLVE THEM IN THE CONTEXT OF EUROPEAN INTEGRATION

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Purpose. The purpose of the article is to assess the level of development of logistics and infrastructure in the pre-war economy of Ukraine, to identify problems and peculiarities of its functioning during the martial law, as well as to formulate measures for its restoration and improvement in the context of European integration.

Results. The logistics system of Ukraine in the years before the Russian-Ukrainian war had a tendency to progressive development. This is evidenced by the positive dynamics of the national Logistics Performance Index. The most developed component of the domestic logistics system was the timeliness of cargo deliveries, and the least developed – the quality of trade and transport infrastructure. The hypothesis that during military operations on the territory of Ukraine, its logistics infrastructure underwent fundamental changes was confirmed. The most painful thing for the country is the destruction and damage of infrastructure and infrastructure connections. Analysis and consideration of these factors will allow logistics companies to adapt to changing, critical conditions and operate more efficiently. The phenomena and processes affecting Ukrainian logistics during martial law have been identified.

Scientific novelty. The study identified factors that influenced the change in logistics services in Ukraine during the war within four groups: people, infrastructure, security, legislation. The authors proposed two groups of measures (short-term and long-term) that will resume Ukraine's foreign trade

activities, as well as improve logistics within the country in the context of its European integration.

Practical value. The practical value of this study is that it can be used as a source and tool in the development of specific measures and programs for the development of the logistics infrastructure of Ukraine, in particular, the construction of new logistics routes and logistics centers.

Key words: logistics, infrastructure, Ukraine, effectiveness, export, innovations in logistics.

Introduction. The development of transport and logistics infrastructure is an important factor in Ukraine's integration into the world economic space, as it reduces the impact of distance between countries on their economic growth, integrates the national market and reduces the cost of transportation to foreign markets. As a result of a large-scale Russian attack on Ukraine, about 30 % of Ukraine's infrastructure has been damaged or destroyed in just three months. The greatest losses were suffered by those regions where the fiercest battles took place or are still going on – Donetsk, Luhansk, Kyiv, Chernihiv, Sumy, Kharkiv, as well as – Kherson, Mykolaiv and Zaporizhia regions (Kreidenko, 2022).

The amount of direct documented damage caused to the infrastructure of Ukraine as of September 1, 2023 reached USD 151.2 billion. In the total amount of direct losses, the largest share belongs to losses of the housing stock – USD 55.9 billion. In second and third place in terms of the amount of losses are the spheres of infrastructure and industry and enterprise losses: USD 36.6 billion and USD 11.4 billion, respectively. Since the beginning of hostilities, 18 airports and civil airfields of the country, 344 bridges and overpasses, more than 25 thousand km of state and local highways and communal roads have been damaged. At least 426 large and medium-sized private enterprises and state-owned companies suffered industrial losses.

Logistics optimization is a vital issue for Ukraine's survival in modern conditions. A working economy and logistics are becoming one of the determining conditions for achieving victory over the aggressor. Reconstruction of Ukraine's transport infrastructure after the war is considered in the context of the restoration and reconstruction of the whole country. A corresponding National Council has already been formed, which includes representatives of the Cabinet of Ministers, the Office of the President, etc. Substantive negotiations are underway with the leadership of some European countries to participate in the reconstruction of Ukrainian infrastructure. For example, the United Kingdom and Sweden have already agreed to help rebuild Kyiv and Mykolayiv oblasts, respectively.

Due to large-scale Russian aggression, six seaports: Yuzhny, Mykolayiv, Olvia, Odesa, Chernomorsk, and Bilhorod-Dnistrovsky, are unable to accept and send cargo. The ports of Mariupol, Berdyansk, Skadovsk, and Kherson are generally closed due to their temporary occupation.

Thus, under today's conditions, Ukraine needs urgent measures to restore the transport and logistics infrastructure, as the industry has suffered significant losses as a result of Russian military action. In addition, the entire logistics system of Ukraine needs significant changes, in particular, issues of formation of new logistics centers, change of transport corridors and logistics chains are becoming urgent.

The article analyzes Ukraine's logistics system in the years before the Russian war against Ukraine. Factors that influenced the change of logistics services in Ukraine during the war were revealed. Two groups of measures (short-term and long-term) are proposed, which will allow to restore Ukraine's foreign economic activity, as well as improve logistics within the country in the context of its European integration.

The authors hypothesize that during the military operations on the territory of Ukraine, its logistics infrastructure underwent fundamental changes. The authors propose to group the main factors that influenced changes in the logistics service in Ukraine during the war into the following groups: people, infrastructure, security, legislation. A number of measures to improve Ukraine's foreign trade in the context of European integration have been proposed.

Review of literature. Various issues in the field of logistics are investigated in articles by such authors, as Antonowicz & Araszkiwicz (2015), Dyczkowska (2019), Pluta-Olearnik & Jadach (2019), Wiechetek & Mędrak (2018), Antonowicz & Żurek (2017), Erbel & Kinsey (2015), Yudenko (2018), Trushkina (2019), Kolodiichuk (2016), Reshetnikova et al. (2021).

This makes logistics a critical element of fighting power because it alone "determines what military forces can be delivered to an operational theatre, the time it will take to deliver that force, the scale and scope of forces that can be supported once there and the tempo (speed) of operations" (Uttley & Kinsey, 2012, p. 401). "Throughout history many military leaders had not realized the essence and importance of logistics and failed to appreciate its impact on the battlefield. They paid dearly for their negligence. George Washington in the American War of Independence, Napoleon in Spain and in Russia, General Ludendorff in WWI, Fieldmarshal Montgomery in WWII and General MacArthur in the Korean War are just a few examples of commanders who excelled in combat planning and execution, but whose disregard of logistics resulted in grave operational consequences" (Kress, 2016, p. 19).

World indices that are formed on the basis of numerous estimates of logistical indicators indicate an unacceptably slow pace of development of all areas of logistics in Ukraine, which determines the immediate need to improve everything organizational and economic mechanism for managing logistics activities, which should ensure not only its growth efficiency, but also its greening (Kolodizieva, 2018).

Assessment of economic stability of the transport industry of Ukraine was studied in the work of Semenova et al. (2020). Komchatnykh et al. (2021) considers modern condition and development perspectives of transport at whole and the transport infrastructure of Ukraine.

Hrytsyna & Koshivska (2018) note that more urgent for Ukraine is participating in the implementation of international transport and logistics projects with the involvement of EU financial instruments and the funds of EU financial institutions. Strutynska & Marcovuch (2018) analyzes the place and role of Ukraine in the European logistics system. Dyczkowska & Reshetnikova (2022) analyzed the possibility of creating a logistics center in Lviv. Chukhlatyi (2021), Chuhlata (2021) made analysis

of the planning of logistics processes in the daily activities of military units of the National Guard of Ukraine. Scientists have ascertained the impact of the events of recent years on all types of transport. Melnyk & Nehoda (2022) analyzed the impact of the Covid-19 pandemic and the Russian-Ukrainian war on world logistics.

“Logistics decisions, in particular supply related problems, rely on estimates of future consumption and attrition rates. The values of these parameters depend on combat situations, military scenarios, and battlefield outcome – factors that embody a considerable amount of uncertainty. These types of decisions are taken therefore in an uncertain environment where pertinent input data are subject to unpredicted variability that may hinder logisticians from reaching the right decisions. Moreover, absent solid input data, logistic planners may tend to make decisions based on intuition or, even worse, made-up inputs that have little or no bearing to the actual situation” (Kress, 2016, p. 27).

However, the problems in Ukraine’s logistics during the war are still poorly understood and need further coverage, and ways to solve existing problems need to be developed.

Materials and methods. The purpose of the article is to assess the level of development of logistics and infrastructure in the pre-war economy of Ukraine, to identify problems and peculiarities of its functioning during the martial law, as well as to formulate measures for its restoration and improvement in the context of European integration.

Analysis and synthesis were used to determine the level of the Logistics Performance Index in Ukraine and the main factors affecting its level. Using the competitiveness polygon, a comparative assessment of the values of indicators that form the Logistics Performance Index of Ukraine, Poland and Germany was carried out. Dynamics of the Logistics Performance Index in Ukraine, value of the Logistics Performance Index in terms of some countries, ranking of world leaders in wheat export are presented using a graphic method. Techniques of the abstract-logical toolkit made it possible to formulate intermediate and final conclusions.

Results and discussion. According to experts, Ukraine’s logistics system in the years before the Russian war against Ukraine tended to develop progressively. This is clearly demonstrated by the dynamics of the national Logistics Performance Index, compiled by the World Bank every 2 years in 160 countries (Reshetnikova et al., 2020).

In Figure 1 presents data on the dynamics of the national logistics efficiency index for the period from 2012 to 2023 according to the Logistics Performance Index. According to the data, the LPI rating is quite dynamic. In 2023, Ukraine ranks 79th among 160 countries in terms of the efficiency of the logistics system. The value of the logistics efficiency index in 2023 is 2.7 points, compared to 2.83 in 2018. In 2014 this figure was much higher (2.98 points). The most developed component of the domestic logistics system is the timeliness (3.1), and the least developed – the customs and infrastructure (2.4). It should be noted that in 2023 there is an initial decrease in values for all indicators, which is caused by the significant destruction of Ukraine’s

infrastructure as a result of the full-scale invasion of Russia.

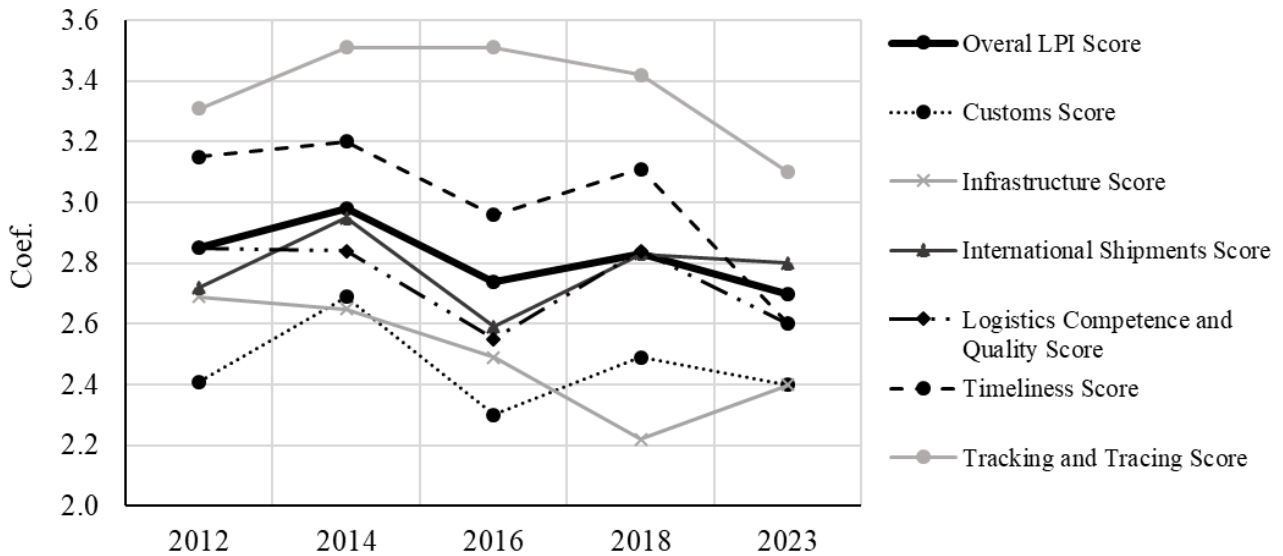


Figure 1. Dynamics of the Logistics Performance Index in Ukraine, 2012–2023

Source: authors' own study based on data (The World Bank, 2012–2023).

Let's consider in more detail the value of the Logistics Performance Index in terms of some countries participating in the ranking for comparison (Figure 2).

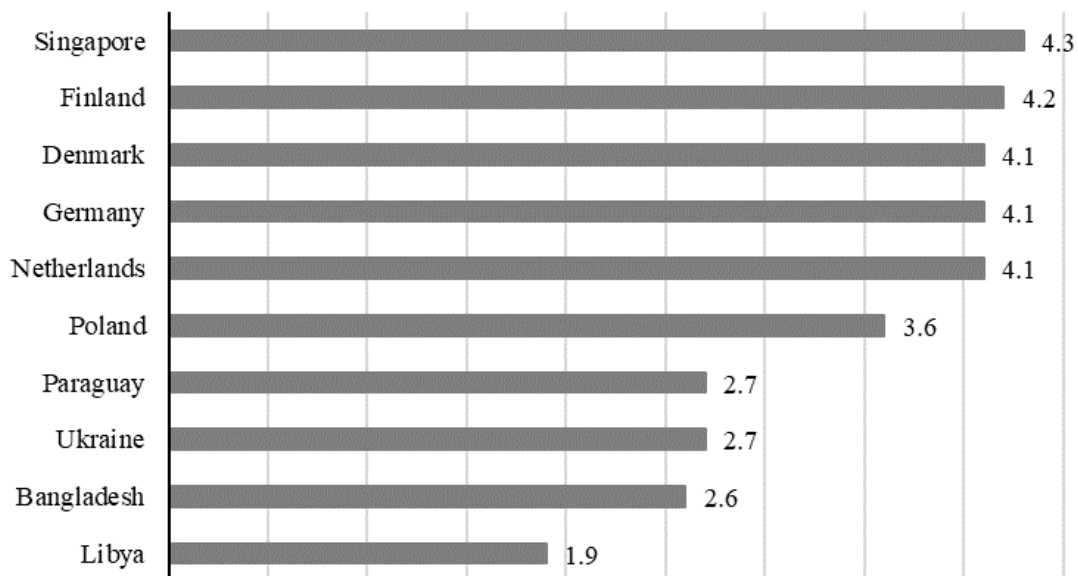


Figure 2. Sampling of values of the Logistics Performance Index of the world, 2023

Source: authors' own study based on data (The World Bank, 2023).

The first place in the Logistics Performance ranking in 2023 was taken by Singapore (LPI = 4.3), the second place was taken by Finland (LPI = 4.2), and the third place was taken by Denmark (LPI = 4.1). Germany (LPI = 4.1) and Netherlands (LPI = 4.1) are also in the top five in 2023. Of the closest neighbors, Poland ranked 26th with a value of LPI = 3.6. But Russia was in 96th place with a value of LPI = 2.6, i.e. significantly behind Ukraine. Ukraine's neighbors in the 2023 ranking are Paraguay

(LPI = 2.7) and Bangladesh (LPI = 2.6). The last place in the ranking is Libya with a value of LPI = 1.9.

According to the results of this study, it should be noted that for the development of logistics infrastructure in Ukraine in the postwar period, it is necessary to take into account the experience of logistics in countries that occupy leading positions in the ranking. For comparison, we present the values of the LPI components of Ukraine, Poland and Germany (Figure 3).

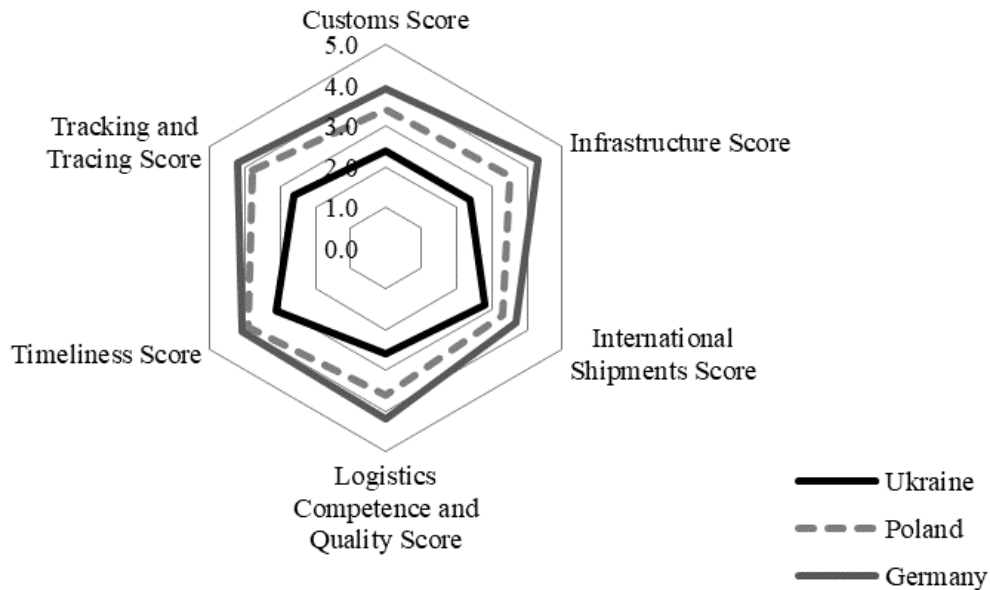


Figure 3. Comparative values of indicators that form the Logistics Performance Index of Ukraine, Poland and Germany, 2023

Source: authors' own study based on data (The World Bank, 2023).

Consumption and disposal rates should be systematically forecasted to mitigate the negative impact of uncertainty on logistics decisions. There are a significant number of forecasting techniques, from formal statistical models such as time series and linear regression to ensemble decision models that take subjective assessments from subject matter experts and evaluate them methodically. Distribution models predict the optimal method of transportation from a set of supply sources to a set of destinations such that the total cost of the transportation plan is minimized.

The main factor influencing decisions at the strategic level is efficiency, which is a measure that takes into account the economic cost of efficiency. Decision makers must weigh competing alternatives with a limited defense budget, as economic resources are often limited. The efficiency of a business entity is usually measured in terms of the ratio between its benefits and its costs, or, more generally, the output/cost ratio. Costs (inputs) are measured by various types of costs associated with packages of logistics resources and capabilities. The goal of efficiency is to maximize the output/output ratio.

Important criteria for the sustainability of the logistics business is the ability to operate on change within four areas: people, infrastructure, security, legislation (Figure 4).

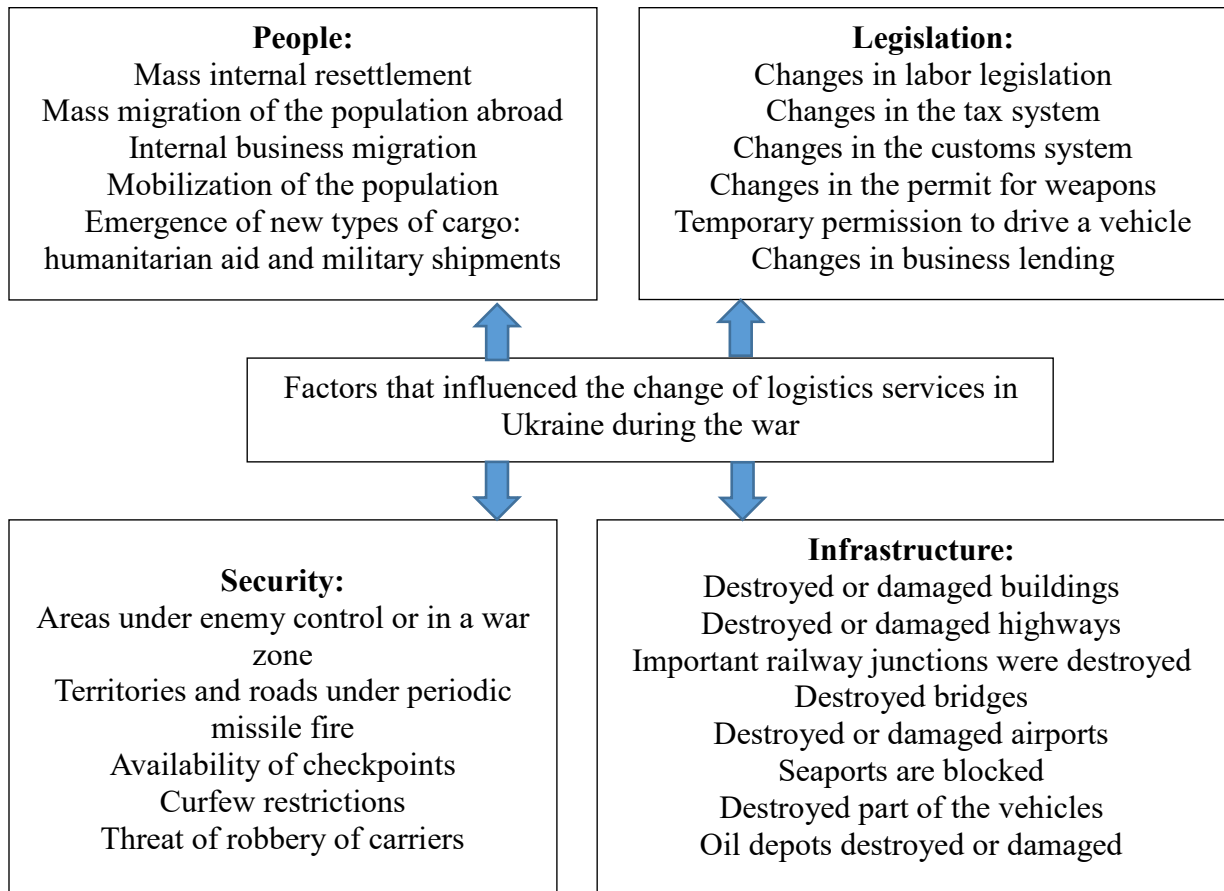


Figure 4. Factors that influenced the change of logistics services in Ukraine during the war

Source: authors' own study based on (Kachan, 2022).

The most painful thing for the country is the destruction and damage of infrastructure and infrastructure connections. There is an urgent need to actually fix the damage and destruction to understand the extent of the possibility of moving goods across Ukraine and the new rules of transportation. The calculation of the optimal routes of the main flows can be done on the basis of the tool Lean-logistics – mapping the flow of value creation of the logistics process. The security category is crucial for the calculation of new logistics routes. Analysis and consideration of these factors will allow logistics companies to adapt to changing, critical conditions and operate more efficiently.

Due to the Russian-Ukrainian war, there are serious problems in the global food supply chain. Globally, there are six countries, which together produce about two-thirds of the world's agricultural commodities. For a long time, Ukraine has been one of the most important countries producing food not only for its population, but also for people around the world. Ukraine accounts for about 10 % of world wheat exports (Figure 5) and 13 % of corn exports. It is also the world's largest producer of sunflower oil.

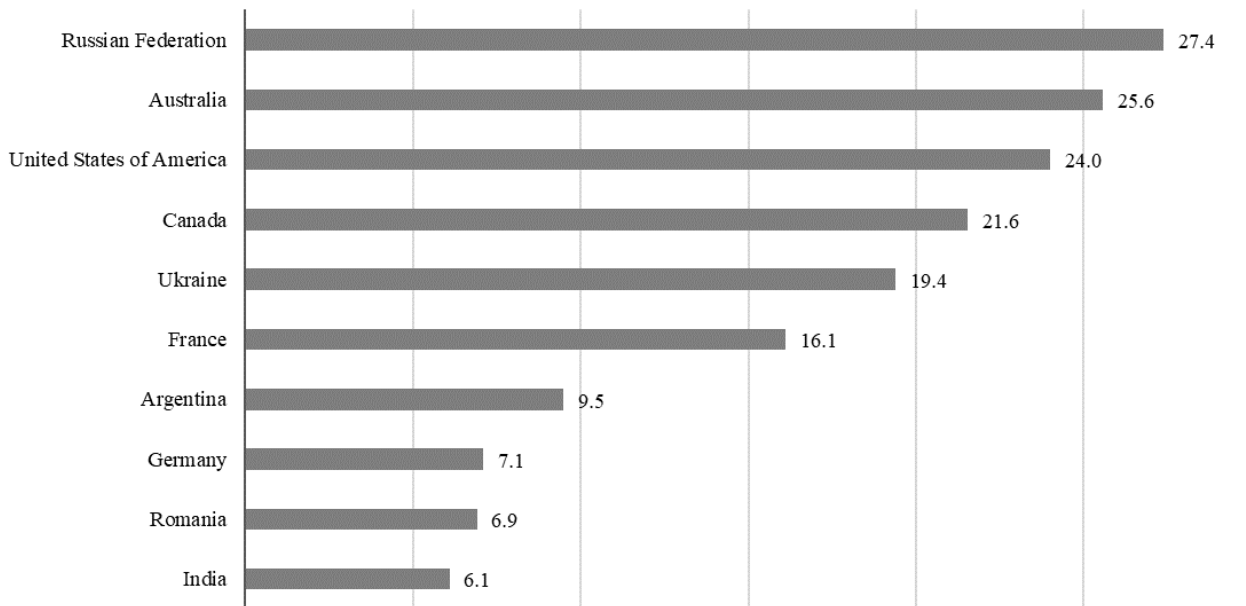


Figure 5. Top 10 world exporters of wheat, 2020, million tons

Source: authors' own study based on data (FAOSTAT, 2023).

Before the full-scale invasion, Ukraine exported 40–50 million tons of grain a year, but today the country can actually export only 15–25 % of the old volumes. The country has deep-water ports that provide easy access to international markets. The combination of these factors has allowed Ukraine to be called the breadbasket of Europe and become a key exporter of agricultural products. In peacetime, more than 75 % of Ukraine's foreign trade took place through sea routes. More than 90 % of the total turnover passed through the ports, which are now either closed or blocked. Before the war, Ukraine exported up to 5 million tons of agricultural products through the ports of Odessa and Mykolaiv every month. 95 % of exports of grain and oilseeds went through seaports, 41 % of foreign exchange earnings Ukraine received through exports of agricultural products.

A year ago, the Ukrainian agricultural sector found itself in a trap: the remnants saved for the spring could not be exported due to Russian aggression, and the enterprises had already started harvesting the new crop. In July 2022, Ukraine had more than 20 million tons of unexported harvest of the previous season, and could export at best 3 million tons per month.

According to the United Nations, Russia's blockade of Ukrainian ports threatens the economic collapse of Ukraine's agriculture, which feeds 400 million people worldwide. This is a critical issue not only for Ukraine but also for the rest of the world. The inability to export grain from one of the world's largest exporters of wheat, barley and sunflower oil could turn into a global food crisis.

The situation was saved by the "grain initiative", which became operational on August 1, 2022. Since then, more than 30 million tons of crops have been shipped by sea. Russian exporters intercepted Ukrainian contracts while the Black Sea was blocked. Even after the start of operation of the corridor, Ukraine was not able to return

all buyers, first of all, the Egypt. Due to the fact that the ship was waiting for inspection in Istanbul, the charterers broke the contracts, and the buyers refused the cargoes.

Due to the fighting and the occupation of part of the Ukrainian territories, the harvest in 2022 was much smaller than in 2021. Today, there are only 9 million tons of transitional grain residues on the market. The capacities of railways, motor vehicles and Danube ports increased significantly during the year. The railway can transport more than 1 million tons of grain per month, cars – more than 600 thousand tons. Danube ports export more than 2 million tons per month and can increase capacity to 3 million tons. Ukraine agreed with Romania to increase the number of pilots on the Sulina channel and to work around the clock from August. So, if in 2022 only 2 million tons of grain were exported every month by all three routes, then in 2023 the dry land and the Danube can provide for the export of about 5 million tons (Gordiychuk, 2023).

Ukrainian agricultural lands are turning into battlefields (Baliuk et al., 2023). And Russia is firing missiles at the country's road and port infrastructure. The food supply chain in Ukraine has come to a complete halt. Due to curfew, there are restrictions on the duration of working hours at both agricultural and transport enterprises. Part of the agricultural machinery was destroyed, former skilled workers of the enterprises were killed or injured in the war, and the time period for preparing the fields for sowing has already been lost.

The damage caused to the transport infrastructure has made it difficult to supply food within the country itself. The World Food Program estimates that 45 % of Ukraine's population is concerned that they will not have access to enough food.

Some countries are highly dependent on Ukrainian crops. Reductions in grain exports will hit Africa and the Middle East particularly hard, where most Ukrainian wheat goes. Ukraine accounts for 80 % of Lebanese wheat imports. It is a leading supplier to countries such as Somalia, Syria and Libya. Egypt imports almost two-thirds of the wheat it consumes, making it the largest importer of wheat. More than 80 % of its import wheat comes from Russia and Ukraine. Most imports go to domestic consumption, but Egypt also processes these goods for export to East Africa. Thus, the consequences of the Russian-Ukrainian war will be felt in many countries.

A number of issues that hinder the normalization of export processes currently hampers grain traders, including:

- low capacity of railway stations on the border with European countries;
- bureaucratic state barriers of European countries regarding grain import and certification;
- limited freight by land;
- lack of sufficient European wagons for grain transportation;
- limiting the capacity of European logistics centers;
- lack of drivers for international road transport.

The main global disadvantage of wartime trade is the lack of stable logistics chains that can provide the necessary exports (Korol, 2022).

The transportation infrastructure comprises two types of components – dynamic

components and static components. The static components include the railway systems, network of roads, waterways, aerial routes, sea-lanes, airports, and seaports. The dynamic components are means of transportation like trucks, ships, trains, cargo planes, containers, and transporters. The search for alternative routes for the export of Ukrainian grain through seaports in other countries continues. The nearest Black Sea port to Odessa is Constanta in Romania. Another way out of the situation could be to direct cargo through Poland to the port of Gdansk in the Baltic Sea. Official Vilnius also offers a solution. If Belarus agreed to transport grain along the humanitarian corridor to Lithuania, the problem of track width would be solved. And the Lithuanian port on the Baltic Sea – Klaipeda – could be an opportunity for further transportation of Ukrainian grain (Vlasenko & Vezel, 2022).

Currently, Ukraine controls the largest ports, which accounted for more than 85 % of sea freight traffic: Odesa, Mykolaiv, Olbia, Black Sea and Southern. Three small ports on the Danube are fully operational and increasing cargo handling: Izmailskiy, Reniiskiy and Ust-Dunaiskiy. They accounted for slightly less than 5 % of exports in peacetime. There is great potential in this direction, given the situation with other ports. Before the opening of the grain corridor, the country's export logistics were based on it.

To improve Ukraine's foreign trade in modern conditions, it is necessary to combine the maximum capabilities of railways, river ports and road transport. We offer two groups of activities.

Short-term measures:

- create separate zones for passing cars to prevent traffic congestions;
- speed up document flow;
- simplify customs control, as well as make staff available 24 hours a day, seven days a week;
- to transport grain in containers, because they can be quickly reloaded by cranes from Ukrainian railway platforms to European ones;
- provide international financial institutions and credit agencies with additional guarantees for EU transport companies so that they are not afraid to send their wagons, trucks or barges to Ukraine.

Long-term measures to improve Ukraine's connection with the EU and develop key transport corridors:

- to extend European railway tracks to Ukraine;
- improve the navigability of the Rhine-Danube corridor;
- development and modernization of internal transport infrastructure;
- construction of logistics centers in western Ukraine, in particular in Lviv;
- extension of the European transport corridor TEN-T to Ukraine.

Conclusions. Thus, the above indicates that the logistics system of Ukraine in the years before Russian-Ukrainian war had a tendency to progressive development. This is demonstrated by the positive dynamics of the national Logistics Performance Index. The most developed component of the domestic logistics system was the timeliness of cargo deliveries (3.42), and the least developed – the quality of trade and transport

infrastructure (2.22). The hypothesis that during military operations on the territory of Ukraine, its logistics infrastructure underwent fundamental changes was confirmed. Regarding the issue of key changes and factors affecting Ukrainian logistics during the martial law, it is worth mentioning the following phenomena and processes:

1. Reconstruction of logistics routes.
2. Vulnerability of the logistics system close to the frontline regions.
3. The trend towards abandoning long-term storage of goods in warehouses.
4. Instability of delivery cost.
5. Lack of drivers.
6. Lack of vehicles in the frontline regions.
7. Increase in export costs and decrease in import costs.

The study identified factors that influenced the change in logistics services in Ukraine during the war within four groups: people, infrastructure, security, legislation. The most painful thing for the country is the destruction and damage of infrastructure and infrastructure connections. Analysis and consideration of these factors will allow logistics companies to adapt to changing, critical conditions and operate more efficiently. Due to the Russian-Ukrainian war, there are serious problems in the global food supply chain. The main global disadvantage of wartime trade is the lack of stable logistics chains that can provide the necessary exports. The authors proposed two groups of measures (short-term and long-term) that will resume Ukraine's foreign trade activities, as well as improve logistics within the country in the context of its European integration.

We would also like to mention the limitations of the research. Data on damage to Ukrainian infrastructure is constantly changing as hostilities on the territory of the country continue. Further research is needed on the formation of logistics centers in Ukraine under modern conditions.

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