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## TRANSFORMATION OF UKRAINE'S LOGISTICS SYSTEM IN WARTIME AND PROSPECTS FOR ITS DEVELOPMENT

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Logistics plays a crucial role in the economy of any country, ensuring the uninterrupted movement of goods, raw materials, and services. During wartime, Ukraine's logistic system faced unprecedented challenges such as infrastructure destruction, port blockades, driver shortages, and disruptions in supply routes. Despite this, Ukrainian businesses and government institutions have managed to adapt to the new reality by developing alternative transportation schemes and employing innovative solutions. This article explores the main problems encountered by Ukraine's logistics system during the Russian- Ukrainian war and outlines possible paths for its recovery and future development.

Since the beginning of the full-scale invasion, thousands of kilometers of highways, railways, bridges, and logistic hubs have been destroyed. According to the Ministry of Infrastructure of Ukraine, in the first months of hostilities, more than 23,000 kilometers of roads were destroyed, and over 300 bridges were damaged. This significantly complicated cargo transportation and increased logistics costs. The

situation with ports was particularly critical. Before the war, around 60% of Ukraine's exports relied on maritime shipping, but the blockade of Black Sea ports drastically reduced export capabilities. The destruction of critical logistics infrastructure such as warehouses, grain elevators, and logistics centers led to the loss of reserves and the breakdown of established supply chains. A significant portion of infrastructure in the eastern and southern regions was completely destroyed or mined, rendering it unusable for an extended period. Demining of territories and infrastructure objects will become a separate challenge in the post-war period.

One of the key issues was the reduction of the freight vehicle fleet and a shortage of drivers. Many transport companies ceased operations due to hostilities or were forced to evacuate personnel. In addition, a significant number of drivers were mobilized into the Armed Forces of Ukraine, leading to a shortage of workers in the transport sector. Due to the destruction of traditional routes, companies were forced to seek alternative delivery paths. Major changes included:

- Reorientation of exports to Western countries through railway crossings with Poland, Slovakia, Hungary, and Romania.
- Increased use of river transport along the Danube.

All the above-mentioned factors led to a significant increase in logistics expenses. According to expert estimates, the cost of freight transportation in Ukraine rose 2–3 times compared to the pre-war period. This posed a serious challenge for businesses, especially for small and medium and m-sized enterprises, to adapt logistic systems and innovative solutions of alternative transport corridors development.

In response to the port blockade, Ukraine actively developed new land transport corridors to the European Union. The European Commission supported Ukraine by launching the "Solidarity Lanes" initiative, aimed at simplifying border crossing and accelerating freight movement. Rail transport between Ukraine and Poland, Slovakia, and Romania significantly increased. Ukrainian businesses also actively used Danube ports such as Reni and Izmail for exports. In addition to the "Solidarity Lanes," Ukraine initiated negotiations with Turkey and Bulgaria to expand access to Black Sea port infrastructure. This made it possible to diversify routes beyond just western

directions. Ukraine is also working on improving the logistics capacity of western border crossings by constructing new terminals and expanding infrastructure.

The war accelerated the digitalization of logistics processes in Ukraine. Many companies implemented GPS tracking systems, automated warehouse management, and electronic document flow to optimize supply chains. Digital solutions enabled businesses to respond quickly to changes and find new logistics partners. Due to logistical difficulties, many companies switched to multimodal transport, combining different modes of transportation. For example, goods were delivered by rail to Poland or Romania and then transferred to trucks or river transport for further delivery. This approach reduced dependency on a single mode of transport and improved the reliability of deliveries.

The functioning of logistics was strongly supported by international partners. The EU and individual countries provided Ukraine with financial assistance, logistic expertise and simplified access to border checkpoints. In particular, customs and certification procedures were simplified to speed up the movement of humanitarian and commercial goods. Large international logistics companies such as DHL, DB Schenker, and Maersk have also adapted to the new conditions. For example, DB Schenker launched special transport corridors from Ukraine to Germany and other EU countries, while Maersk developed new multimodal chains involving Polish and Romanian ports. These changes helped Ukrainian exporters maintain access to foreign markets despite the loss of traditional sea routes.

In western regions of Ukraine, near the borders with the EU, new logistics hubs and warehouses were established, serving as transshipment points for goods en route to Europe. These clusters not only supported the economy during wartime but also laid the foundation for future integration with the European logistics system. Examples include hubs in L'viv, Vinnitsa and Zakarpattia regions, where international investment and infrastructure development made it possible to increase cargo flow volumes and create new jobs.

One promising direction for logistic development in Ukraine is the implementation of sustainable (green) logistics principles. The war prompted a

reevaluation of logistics' environmental impact. More companies are focusing on energy efficiency, reducing $CO_2$ emissions, reusing packaging materials, and adopting eco-friendly technologies. In 2023, the Ministry for Communities Territories and Infrastructure Development of Ukraine, with support from the EU and UNDP, launched the "Green Transport of the Future" program, initiating pilot projects to create electric freight hubs and charging stations near logistics clusters in L'viv and Zakarpattia regions.Ukrainian logistics companies also began investing in electric vans and hybrid vehicles. For instance, "Meest Express" announced the purchase of its first batch of electric vehicles for domestic deliveries within Kyiv. Furthermore, in 2024, Ukraine joined the Green Freight EU initiative, allowing Ukrainian companies to receive support in developing transport decarbonization strategies.

It is important to note that green logistics is becoming particularly relevant against the background of Ukraine's aspirations for European integration. In the European Union strict environmental standards already apply to transport and logistics centers. Therefore, implementing green solutions in Ukraine is not only a domestic initiative but also a prerequisite for integration into the EU single market. In the coming years, we can expect the active implementation of energy-efficient technologies in logistics processes — from LED warehouse lighting to the use of alternative energy sources.

Many companies adopted to Wartime Conditions among them mention should be made of Nova Poshta - the largest logistics company in Ukraine, quickly adapted to wartime conditions. The company expanded its international activities by opening branches in Poland, Lithuania, and Germany. In addition, mobile offices were introduced, allowing deliveries even to frontline areas, Ukrzaliznytsia (Ukrainian Railways) played a key role in wartime logistics. The company increased rail freight volumes to European countries, helping businesses export goods despite logistical challenges. Moreover, Ukrzaliznytsia ensured the evacuation of millions of people from dangerous regions, Fozzy Group is, one of Ukraine's largest retail chains, adapted its supply chains to ensure uninterrupted food supply.

The private sector also plays an increasingly significant role in the

modernization and resilience of Ukraine's logistics industry, especially under the conditions of war. Despite ongoing hostilities, many Ukrainian logistics companies continue to function, adapt, and invest in infrastructure. Notably, Nova Poshta has maintained and even expanded its operations during the full-scale invasion, introducing new international services and automated sorting centers, thereby ensuring the continuity of domestic and cross-border logistics. Ukrposhta, Ukraine's national postal service, has also invested in modernizing its logistics hubs and expanding rural delivery capacity. The contribution of domestic IT companies to the sector is equally noteworthy, with innovations in fleet management systems, smart warehousing, and digital route optimization playing a growing role in improving efficiency. Public-private partnerships (PPPs) are becoming a key mechanism for attracting investment and expertise to large-scale logistics projects. Ukraine has developed a legislative framework that allows for PPPs in transport infrastructure, particularly in the construction and management of toll roads, modernization of seaports, and development of intermodal terminals. Successful implementation of such partnerships can bridge funding gaps and distribute risks between the public and private sectors.

International donors and financial institutions also contribute significantly to the development of Ukraine's logistics capabilities. The European Bank for Reconstruction and Development (EBRD), the World Bank, and the European Investment Bank (EIB) have all provided financial support for critical infrastructure projects and logistics reforms. Their programs often focus on the modernization of railway and port infrastructure, promotion of green and digital transport corridors, and improvement of customs procedures and border control. In addition, the European Union's "Solidarity Lanes" initiative has enhanced Ukraine's connectivity with European markets, enabling the export of vital goods such as grain while creating a foundation for long-term logistics integration.

Nevertheless, serious challenges remain. The high-risk environment caused by ongoing military activity deters many foreign investors, particularly in regions close to the front lines. War-risk insurance and guarantees are often unavailable or insufficient. Additionally, systemic issues such as bureaucratic inefficiency, legal uncertainty, and

occasional corruption reduce investor confidence. Transparent procurement processes, regulatory stability, and institutional reforms are essential to unlocking the full potential of the private sector and donor assistance in the development of Ukraine's logistics sector.

Ukraine's logistic sector is poised to play a critical role in the country's post-war recovery and long-term economic transformation. The rebuilding of destroyed cities and transport infrastructure will create massive demand for logistics services, particularly in the construction industry. Efficient logistics will be essential for the delivery of building materials, equipment, and humanitarian aid, as well as for managing temporary warehouses and supply chains near reconstruction zones. Logistic companies will need to develop rapid deployment strategies and scalable service models to support these national recovery efforts.

In the long term, Ukraine has the potential to become a key logistics hub bridging the European Union, the Caucasus, and Central Asia. Its geographic location provides natural advantages for the development of international freight corridors and intermodal transport systems. The establishment of inland dry ports near cities like L'viv or Vinnitsa, the modernization of port infrastructure along the Black Sea and the Danube, and the revival of inland waterway navigation along the Dnipro River all present promising opportunities. Rail connections to China via the Trans-Caspian International Transport Route (Middle Corridor) could further enhance Ukraine's role in Eurasian logistics.

Strategic infrastructure projects supported by the EU and international institutions offer a concrete path forward. Integration with the Trans-European Transport Network (TEN-T) is already underway, with priority projects such as the modernization of the L'viv-Chop corridor and the expansion of border crossings with Poland, Slovakia, and Romania. The development of multimodal terminals, logistics clusters, and smart distribution hubs will further support Ukraine's transition to a modern logistics economy. Sustainable logistics is another key area for development. In alignment with the EU Green Deal, there is an increasing emphasis on low-emission transport, the electrification of railways, and the deployment of energy-efficient

delivery vehicles in urban areas. Innovations such as smart warehouses, artificial intelligence for logistics forecasting, and the use of Internet-of-Things (IoT) technologies in cargo monitoring are expected to become standard in the post-war period.

Human capital will play a decisive role in shaping the logistic landscape. There is a growing need for specialized training programs, vocational education for warehouse and transport workers, and university-level degrees in logistics and supply chain management. International partnerships with EU institutions could facilitate knowledge transfer and capacity building in this field.

Finally, several scenarios for the development of Ukraine's logistics sector can be envisioned. In a best-case scenario, the war ends quickly, reconstruction begins in earnest, and Ukraine advances rapidly toward EU integration, attracting foreign direct investments into logistic infrastructure. A moderate scenario would see slow but steady progress, hindered by regional disparities and institutional bottlenecks. The worst-case scenario, involving prolonged conflict and limited reform, could leave Ukraine with fragmented, underperforming logistic networks. The direction the country takes will depend largely on political stability, security guarantees, and the successful implementation of reform and investment strategies supply chains. Fozzy Group managed to keep stores operational in most regions of the country.

*Conclusion* The war brought enormous challenges to Ukraine's logistic system but also acted as a catalyst for rapid adaptation and innovation. By developing alternative transport corridors, digitalizing processes, and strengthening international cooperation, Ukraine is laying the groundwork for a modern and resilient logistic system. With proper investment and strategic planning, Ukrainian logistics will not only recover but also become one of the most advanced in Europe.The successful transformation of Ukraine's logistic system is possible only through a comprehensive approach that combines investment, educational programs for training specialists, support for small businesses in logistics, and the adoption of modern technologies. Government policy should focus on creating a favorable environment for logistic companies, encouraging innovation, and fostering close cooperation with international

partners. Foundations are already being laid for a competitive and flexible logistic system capable of not only overcoming the consequences of war but also becoming a driver of economic growth

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## CRISES AND LOGISTICS. IMPACT OF PANDEMICS, WARS AND NATURAL DISASTERS

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In today's interconnected world, logistics plays a pivotal role in the functioning of the global economy. It ensures the efficient movement of goods and services across borders, supporting international trade, economic growth, and everyday life. Logistics is the backbone of global trade, facilitating the movement of raw materials, intermediate products and finished goods from manufacturers to consumers worldwide.

The logistics sector faces numerous challenges posed by various crises, including pandemics, wars, and natural disasters. These crises significantly disrupt supply chains, leading to delays, increased costs, and lost opportunities. For instance, the COVID-19 pandemic highlighted the fragility of global supply chains, causing widespread disruptions in manufacturing, distribution, and demand. Similarly, geopolitical conflicts and natural disasters can severely impact logistics operations, necessitating rapid