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THE DEVELOPMENT OF DANUBE PORTS AMID WAR AND POST-WAR RECOVERY OF THE UKRAINE

Purpose: assessment of the development of Danube Ports amid war and post-war recovery of the Ukraine as part of the security system for Ukraine, Europe, and the world as a whole.

Methods. In the research general scientific (analysis and synthesis, induction and deduction, analytical grouping) and special (abstraction, modelling, etc.) methods of studying economic phenomena and processes have been used. **The object** of the study is the Danube river ports.

Results. The conducted analysis showed that in the conditions of war and the blockade of the ports of Greater Odessa, export transportation through the Ukrainian Danube ports of Reni, Izmail, and Ust-Danube has been activated. This was also facilitated by the dredging works in the Bystre estuary, which allowed its transport capabilities to be used for the passage of vessels with a draft of up to 6.5 meters, and not only the Romanian Sulina canal. The analysis showed that, in addition to positive results for Ukrainian ports, there was also an increase in cargo handling volumes in Romanian ports, for example, the Sulina port has shown an increase in cargo movement volumes in recent years. Overall, if we compare the growth rates in the direction of Danube-Black Sea and in the opposite direction, the preference is given to the Danube-sea direction. Regarding transportation through the Danube-Black Sea canal, recent years have also seen an increase in cargo transportation volumes, but this is mainly due to international transportation. Domestic transportation does not show similar dynamics. The Constanta port has also been increasing cargo handling volumes in recent years due to sea transportation, but river transportation is also growing, although not as significantly. Unlike the mentioned ports, the Romanian port of Galati has been decreasing cargo handling volumes since 2021. The reason for this is that, among the two routes considered - the Danube and the Danube-Black Sea to the Constanta port, preference is given to the latter.

Conclusions. The conducted research has shown that the further expansion of navigation along the Danube using the routes Ukraine - Galati, Ukraine - Regensburg, and Ukraine-Constanta (via the Danube) will ensure the effectiveness of the mentioned ports and create additional conditions for the development of transport logistics in the Danube region as part of the security system for Ukraine, Europe, and the world as a whole.

An additional advantage of such decisions is their environmental orientation, since among all types of transport, water transport is the most environmentally friendly.

KEY WORDS: Danube ports, river logistics, eco-friendly transport, freight transportation, international transportation, transport logistics, Danube region

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Introduction

One of the most important tasks today is the restoration of Ukraine, overcoming the consequences of hostilities on its territory, and addressing issues of national security and defense capability. This focus is emphasized in the developed Plan for the Recovery of Ukraine, presented in the EU. This document identifies three most important areas on which the future of the country and its national security depend: logistics, reconstruction of infrastructure, and energy. Therefore, it is possible to solve logistical and infrastructure tasks by expanding the use of water (sea and river) transport and its infrastructure. Emphasizing the Danube River is important given the limitations of using traditional waterways.

An analysis of the main publications shows that the issue of river logistics development is considered by many researchers. For example, studies by Krčum, M., Plazibat V., Gorana J. M., Wójcikiewiczza R., Kaupb M., Nowakowski T., Kulczyk J., Skupień E. & Tu-

bis A., Kolář J. & Stopka, O., Krile S. focus on solving specific issues in the context of individual countries, such as the Croatian transport system and directions for integrating sea and river ports [1], the specifics of the operation of inland water transport in Szczecin (Poland) [2], the determinants of the transformation of the Lower Vistula river ports [3], the search for the location of a multimodal logistics center at the port on the Labe (Elbe) River [4], the development of the inland water transport market, and the strengthening of European cooperation in the field of inland water transport [5]. Problems of river transport and logistics development are also considered by a number of domestic scientists [6-12], among others.

Purpose of our study assessment of the development of Danube river Ports amid war and post-war recovery of the Ukraine as part of the security system for Ukraine, Europe, and the world as a whole.

Results and Discussion

In the research process, both general scientific methods (analysis and synthesis, induction and deduction, analytical grouping) and specialized methods (abstraction, modeling, etc.) were utilized for studying economic phenomena and processes. The object of the study is the Danube river ports.

The Danube River is one of the most important transport routes in Europe: it not only crosses ten countries but also connects with the Black Sea. The Danube has significant economic importance for all Danube countries. The river is navigable for 2500 km from the mouth. To improve navigation conditions, a network of canals has been constructed, the fairway has been deepened in some sections, and bank revetments have been carried out, among other things. The Danube is connected by canals with the basins of the Rhine, Elbe, Odra, and the Black Sea (Danube-Black Sea Canal).

In recent years, access to the Black Sea through the Ukrainian part of the Danube has gradually lost its significance. The only acceptable through route to the Black Sea via the Danube for a long time has been the Romanian canals - the Sulina and the Chornavoda-Constanta. Previously, more than 1 million tons of cargo were annually transported through the Ukrainian ports of Ust-Danube, Izmail, and Reni to the ports of the Mediterranean and back.

However, these positions of Ukraine have gradually been lost. With the start of the war, due to the impossibility of using traditional sea transportation through the Black Sea, the importance of Danube logistics has increased.

If we analyze the volume of cargo transportation through Ukrainian ports in recent years, it has decreased by 2,6 times in 2022 compared to 2021. In 2023, Ukrainian ports increased cargo handling by 5% year on year - up to 62 million tons. This result was achieved thanks to the opening of a temporary maritime corridor. As a result, 430 ships were accepted through the corridor under loading, and 400 ships were sent, exporting 12,8 million tons of cargo.

However, the dynamics of cargo handling by ports compared to 2022 is ambiguous. Thus, the port of Odessa saw an increase of 9% to 84 million tons; the port of Chornomorsk saw a decrease of 3% to 11,4 million tons; and the port of Pivdenny saw a decline of 34% to 10,1 million tons.

The most dynamic increase in handling is observed in the Danube ports (Izmail, Reni, and Ust-Danube). By the end of 2023, the total cargo turnover in these ports almost doubled - to 32 million tons in 2022 - tripled to 16,5 million tons from 5,5 million tons in 2021. In particular, last year the volume of handling in the port of Izmail amounted to 202 million tons (an in-

crease of 2,3 times compared to 2022), in Reni – 10,1 million tons (+47% year on year).

Cargo transportation through these ports was carried out using the routes shown in Figures 1 and 2.

Under such conditions, there are all reasons to pay special attention to navigation on the Danube. Due to the periodic blocking of Ukraine's western border with Poland, increasing cargo transportation to Europe via the Danube is becoming important.

Today, the Ukrainian Danube Shipping Company (UDSC) has proposed to redirect cargo that was transported to EU countries by trucks to river transport. The UDSC has developed three lines for barge caravans:

1. Ukraine – Galati. The fastest route for transferring cargo through the western border to EU countries. Given the long distance, the

river caravan can make 5-7 trips to Galati per month. So the delivery time of containers is only a few days.

2. Ukraine – Regensburg. The route allows delivery of cargo to Germany to the closest point to the main market for Ukrainian exports. Or to any port on the Middle and Upper Danube. However, the duration of the trip is longer than in the case of delivery to Galati.

3. Ukraine – Constanta. Delivery of cargo to one of the largest European seaports with the possibility of further export to any point in the world.

In this context, it should be understood that such transportation has both advantages and disadvantages, including risks.

There is indeed a threat of a seasonal drop in the water level in the Danube, which may affect transportation. There are cases

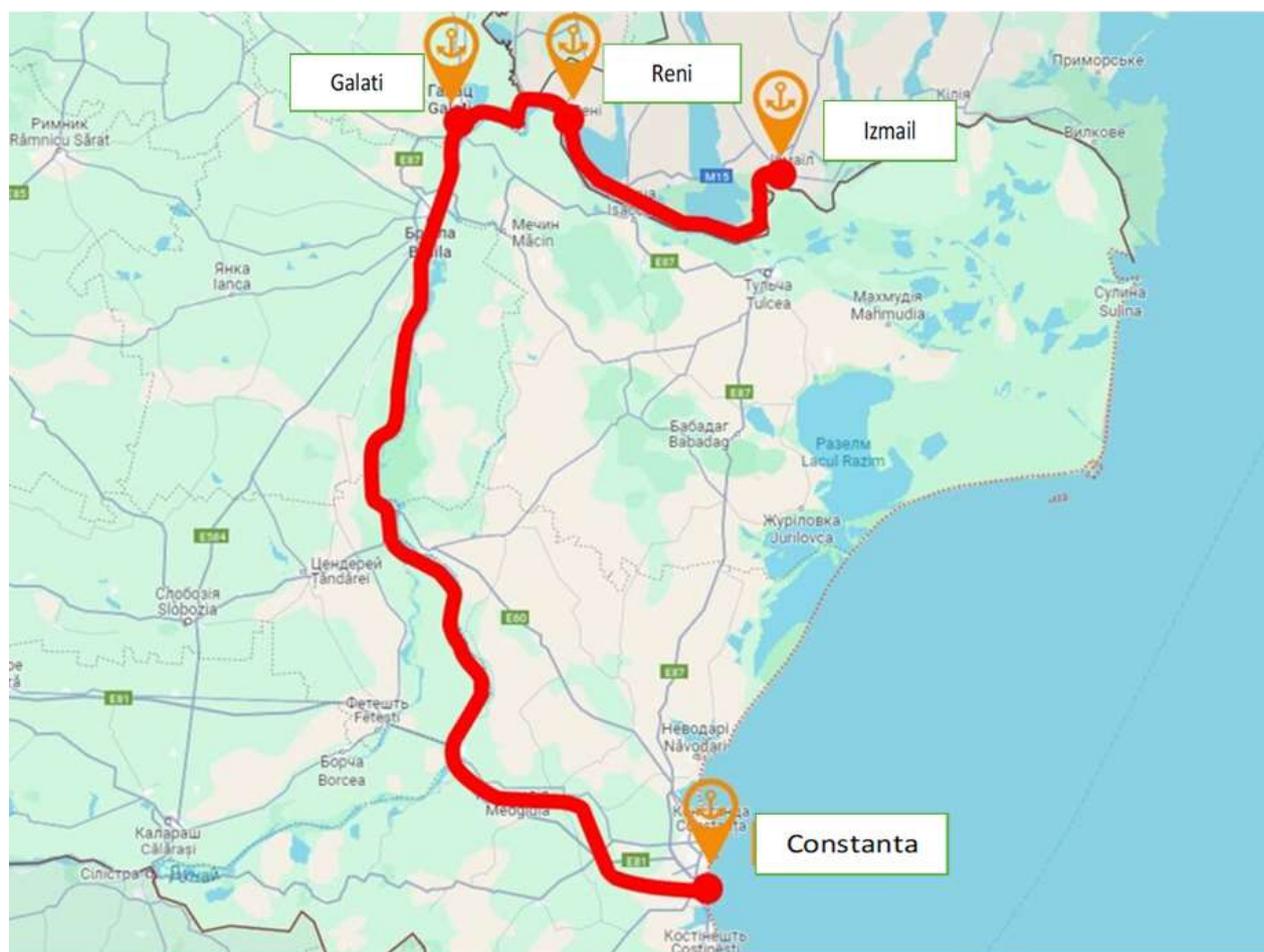


Fig. 1 – Danube route to the port of Constanta

[<https://uga.ua/meanings/sergij-kalkutin-pro-osvoyennya-dunajskih-marshrutiv-eksport-ukrayinskoyi-agroproduktsiyi-cherez-konstantsu-osoblivosti-richkovoyi-logistiki-nyuansi-tsinoutvorenniya-ta-bezpekovi-riziki-dlya-ukrayinskog/>]

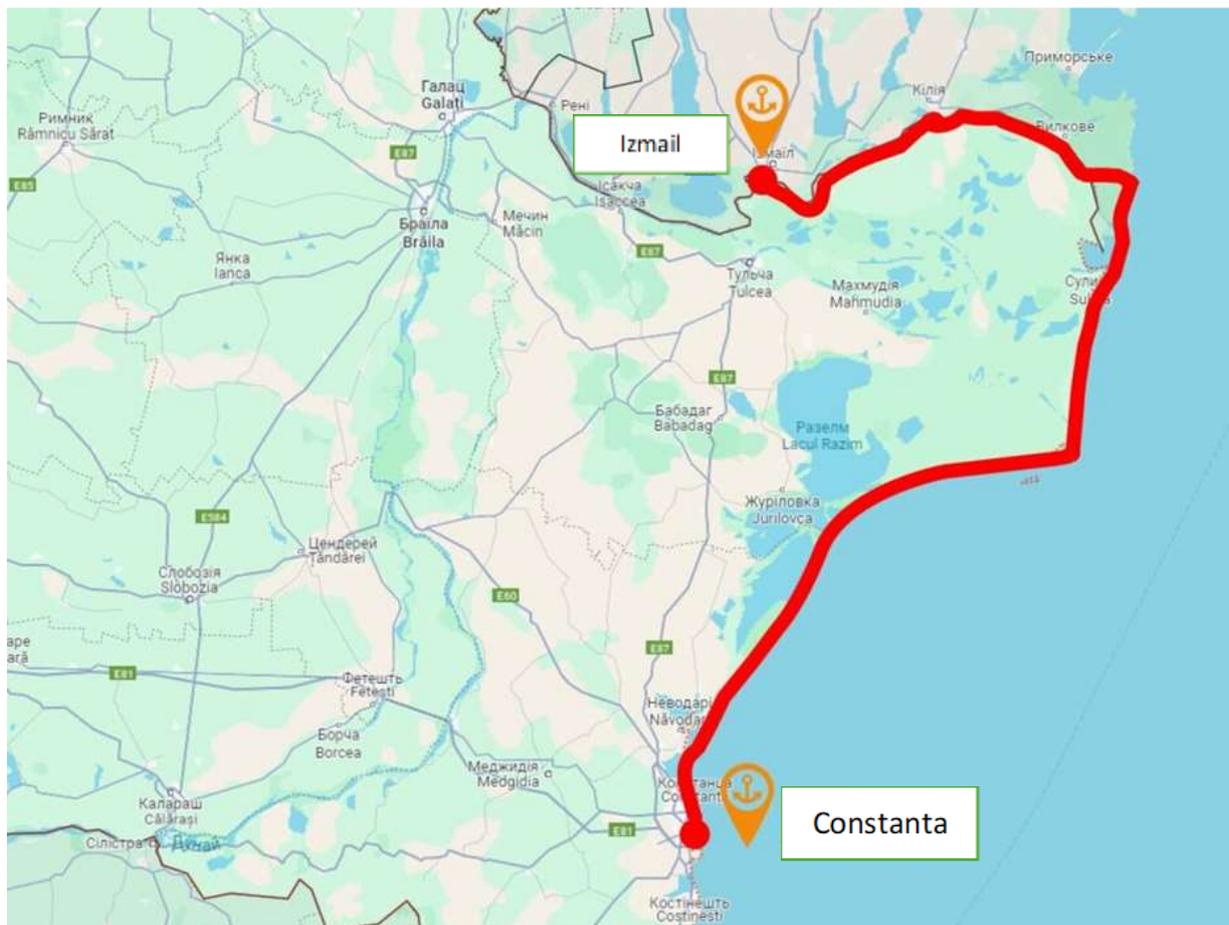


Fig. 2 – Danube-Black Sea route to the port of Constanta

[Source: <https://uga.ua/meanings/sergij-kalkutin-pro-osvoyennya-dunajskih-marshrutiv-eksport-ukrayinskoyi-agroproduktiyi-cherez-konstantsu-osoblivosti-richkovoyi-logistiki-nyuansi-tsinoutvorenniya-ta-bezpekovi-riziki-dlya-ukrayinskog/>]

when caravans on the Middle Danube get stuck: while loading, the water level dropped, and it cannot pass through the shallow. And then they have to wait for the water level to rise again. Last year, 2023, the water level fell to a critical level. All operations on the Middle (Slovakia, Serbia, and Hungary) and Upper (Austria and Germany) Danube were closed. But there were opportunities to use the Lower Danube (Romania, Bulgaria, and Ukraine). The loading of barges fell by 30% - instead of 1,5 thousand tons, they loaded 1,1 thousand tons. But the caravans were running. There is no problem stated in the year 2024. The water level fell, but much less than last year. Currently, some cities in Europe are experiencing a critical rise in the water level.

But there are far more advantages. The Danube, for a very long time in 2022-2023, replaced the lack and significant limitations of Ukrainian Black Sea ports. And the route through the Danube naturally began to be used less after the blockade of the ports of Odessa was lifted thanks to the actions of the Armed Forces of

Ukraine. The route through Poland is not a replacement for the Danube and Odessa, it is an additional route for the implementation of a small amount of products. Moreover, grain is not exported to Poland; it transits mainly to the Baltic countries and Germany. Delivery of cargo to one of the largest European seaports with the possibility of further export to any point in the world.

According to the UDSC's plans, it is planned to install additional barge caravans on container lines, which will ensure the delivery of 2?1 thousand TEU per month to Regensburg (Germany) or 5?9 thousand TEU to Constanta (Romania). The UDSC can work with TEU/FEU containers as well as reefer containers.

River transportations only by the UDSC fleet are an alternative to 2-5 thousand trucks, which has additional environmental significance. In general, the increase in the turnover of road transport compared to rail and sea transport is not a positive trend since, as you know, the average CO₂ emissions per ton-kilometer in road transport amount to 139.8 g, while in rail

transport - only 15.6 g. Water transport is more environmentally friendly.

Replacing road transport with river transport will significantly reduce the specific weight of CO₂ emissions by freight road transport. Instead of transporting large volumes of cargo by roads, river transport can become a more environmentally sustainable option. For example, diesel fuel consumption for transporting 1 ton of cargo by river over a distance of 400 km is 3,95 kg/t. The same transportation by road transport requires 7,73 kg/t. As we can see, fuel savings will be 3,78 kg.

Reorienting transport flows to river transport can be a profitable strategy in terms of reducing the specific weight of CO₂ emissions by freight road transport. This will not only reduce fuel consumption but also contribute to reducing carbon dioxide emissions and improving the environmental condition.

Thus, the emphasis on the use of rail and water transport is the most effective way to integrate the domestic transport system into the European one, including taking into account environmental standards.

It is quite understandable that water transport also creates a certain environmental burden, namely: increased noise (both above water and underwater), possible oil and wastewater spills, exhaust gas emissions (CO₂, carbon monoxide, sulfur oxides, nitrogen oxides, particulate matter).

However, modern river transport is the most environmentally friendly, along with rail and road transport, which significantly enhances its competitiveness given the latest trends in EU greening and the implementation of relevant standards. According to research by Delft University of Technology (Netherlands), CO₂ (carbon dioxide) emissions from inland water transport are approximately three times lower (per 1 ton/km) than those from road transport.

The possibility of installing particulate filters on river vessels allows for a reduction of up to 90% in NO_x (nitrogen oxide) emissions, which are responsible for smog formation and the greenhouse effect, and a reduction of up to 98% in PM₁₀ particulate matter levels. River transport enables the transportation of large volumes of cargo. For example, a barge with a carrying capacity of 900 tons can replace 18 railcars or 45 twenty-ton trucks.

To substantiate the ecological and economic advantages of the aforementioned transportations along the Danube, we will conduct appropriate analytical assessments. Figure 3 shows the possibilities of transportation within

the Danube countries-participants of the Danube Commission.

Figure 4 shows the results of the analysis of cargo turnover of the ports of Danube countries.

In most countries, there is an increase in cargo transportation volumes over the study period.

Germany: cargo transportation volumes significantly decreased from 4.031 thousand tons in 2014 to 2.283 thousand tons in 2023. The lowest figure was recorded in 2022 - 241 thousand tons.

Austria: after minor fluctuations in 2014-2017, cargo transportation volumes began to gradually decrease from 7,604 thousand tons in 2018 to 3.688 thousand tons in 2023.

Slovakia: the cargo turnover remains stable with slight fluctuations, from 1.8 thousand tons in 2014 to 1.619 thousand tons in 2023. The peak was in 2015 with 2.009 thousand tons.

Hungary: the volume of transportation increased from 5.673 thousand tons in 2014 to 6.742 thousand tons in 2020, after which it decreased to 3.664 thousand tons in 2023.

Croatia: the cargo transportation indicators are relatively stable with minor fluctuations. The lowest indicator was in 2018 (0.521 thousand tons), and the highest was in 2017 (0.6827 thousand tons).

Serbia: there has been a significant increase in the volume of cargo transportation, from 7.27 thousand tons in 2014 to 12.440 thousand tons in 2023. Notably, there was a sharp increase in 2022 to 12.023 thousand tons.

Bulgaria: the data for the study period is incomplete, but there is an increase from 5.689 thousand tons in 2014 to 7.357 thousand tons in 2023.

Romania: the indicators remain high, from 23.406 thousand tons in 2014 to 28.129 thousand tons in 2023. There has been steady growth since 2020.

Republic of Moldova: the volume of cargo transportation increased from 0.678 thousand tons in 2014 to 2.605 thousand tons in 2023, with a noticeable increase after 2019.

Ukraine: there has been significant growth in the volume of cargo transportation from 4.547 thousand tons in 2014 to 32.940 thousand tons in 2023. A particularly sharp increase was recorded in 2022 (16.505 thousand tons).

The total cargo transportation volume increased from 62.196 thousand tons in 2014 to 95.090 thousand tons in 2023, with a noticeable increase after 2021.

Among the Danube countries, Romania has the largest transportation volumes, followed



Fig. 3 – Objects from Danube Commission’s hydrological database

<https://danubecommission.maps.arcgis.com/apps/View/index.html?appid=4c9e7f38b65541deb9c8d974b9ab2923&extent=7.9149,39.0323,32.9638,51.3481>

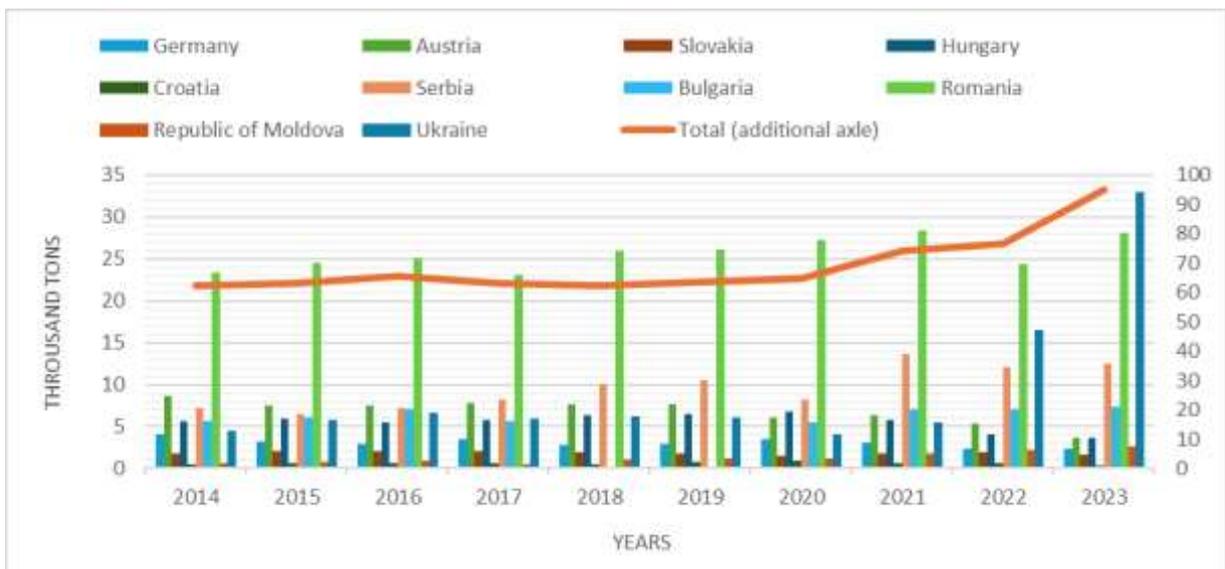


Fig. 4 – Cargo turnover volumes in different countries over the years

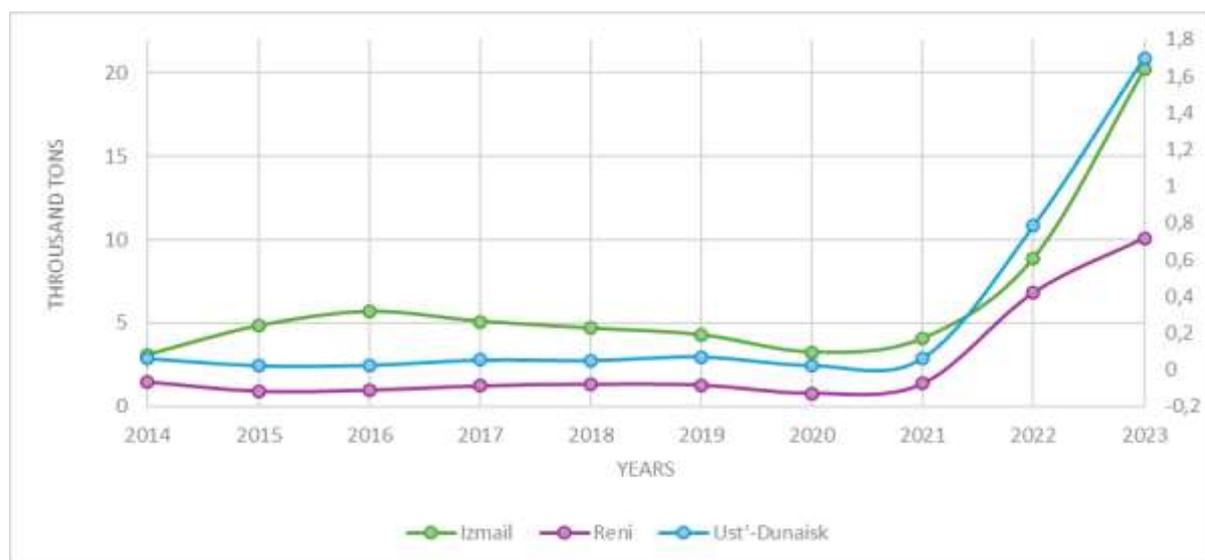


Fig. 5 – Cargo turnover volumes through the channels Izmail, Reni, Ust-Danube from 2014 to 2023

by Serbia. With the start of the war, Ukraine's transportation volumes have significantly increased due to the possibility of using the ports of Reni, Izmail, and Ust-Danube (Figure 5).

Regarding Izmail, from 2014-2016, cargo turnover increased, reaching a peak in 2016 (5.682 thousand tons). From 2017-2020, there is a decrease to the lowest level in 2020 (3.245 thousand tons). From 2021-2023, there is a significant increase, especially in 2022 and 2023, with the highest volume of 20.2 thousand tons in 2023.

Regarding Reni, from 2014-2016, there are minor fluctuations with a peak in 2014 (1.4648 thousand tons). From 2017-2020, relatively stable volumes with slight fluctuations. From 2021 to 2023, there was a sharp increase in 2022 and 2023, reaching 10.1 thousand tons in 2023.

Regarding Ust-Danube, from 2014-2020, cargo turnover is relatively stable and low with minor fluctuations. From 2021-2023, there is a significant increase, especially in 2022 and 2023, with the highest volume of 1.7 thousand tons in 2023.

Izmail has the highest cargo turnover volumes among the three channels, especially since 2022. Reni, in turn, is second in terms of volumes with significant growth in 2022 and 2023.

Ust-Dunaisk has the lowest cargo turnover volumes but also shows growth in 2022 and 2023. All three ports demonstrate sharp increases in 2022 and 2023.

The greatest increase is observed in Izmail, where cargo turnover volumes more than doubled in 2023 compared to 2022. All three

channels show significant growth in 2022 and 2023. Izmail consistently has the highest cargo turnover figures, indicating its crucial role in regional transportation.

Analysis of the situation in the Romanian Danube ports. Figure 6 presents the analysis results of cargo transportation volumes through the Danube-Black Sea canal from 2012 to 2023. It includes three types of shipments: combined cargo turnover, international transportation, and domestic transportation.

The volumes of cargo transportation through the Danube-Black Sea canal during 2012-2023 showed steady growth. During this period, joint cargo turnover almost doubled from 1.372 million tons in 2012 to 2.336 million tons in 2023. International transportation during 2012-2023 accounted for the majority of joint cargo turnover. Their share in total transportation volumes from 2012 to 2023 ranged from 46% to 78%.

The analysis of cargo turnover through the Sulina port is shown in Figure 7.

The volumes of cargo transportation through the Sulina canal during 2018-2023 showed steady growth. During this period, cargo turnover increased more than three times. Transportation in the direction of "Danube-Sea" during 2015-2023 accounted for the majority of cargo turnover. Their share in total transportation volumes from 2015 to 2023 ranged from 63% to 78%. During 2015-2023, the volumes of cargo transportation through the canal showed steady growth, indicating its growing role in the global transportation system.

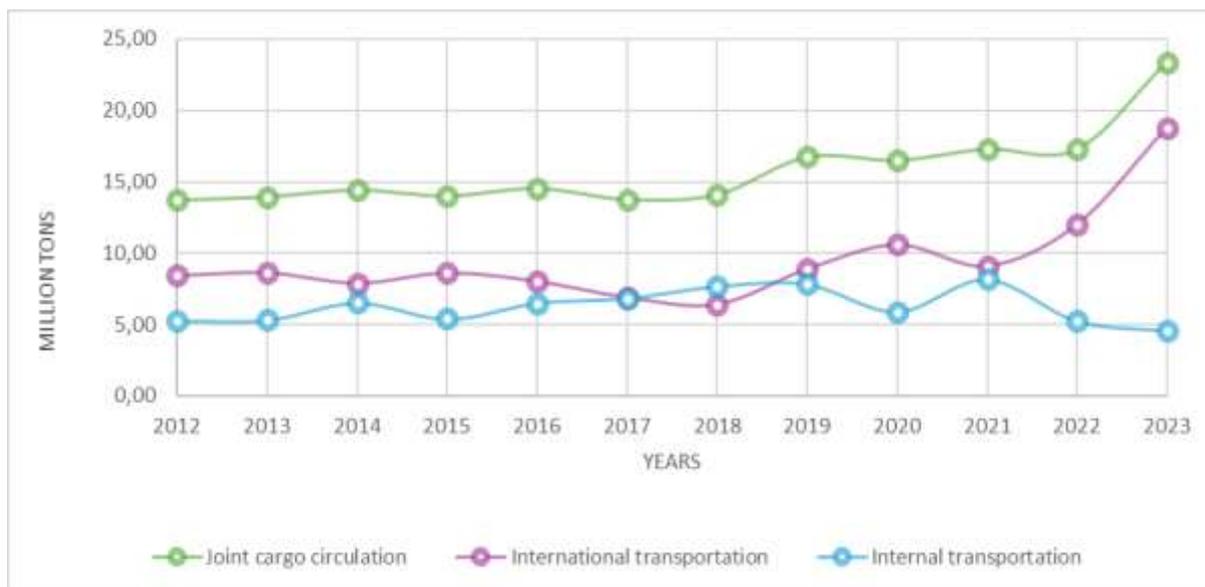


Fig. 6 – Cargo volumes through the Danube-Black Sea canal over the years

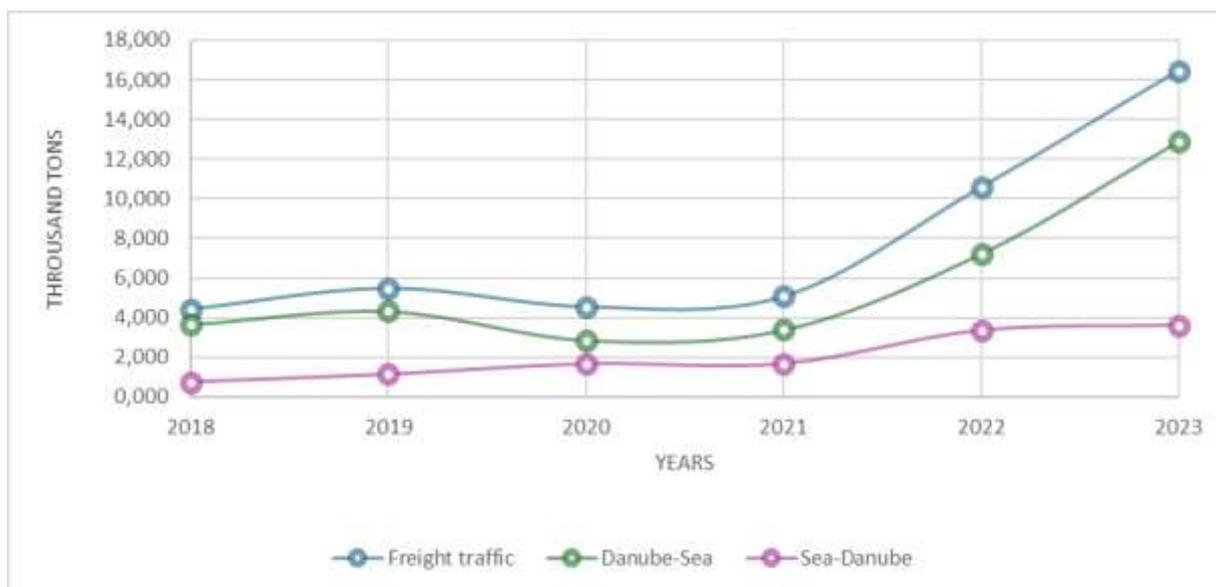


Fig. 7 – Cargo volumes through the Sulina canal over the years.

The port of Galati holds significant importance in the transportation market along the Danube River. Figure 8 shows the volumes of cargo turnover by river and sea vessels to the port of Galati from 2015 to 2023.

Regarding cargo turnover by river vessels, from 2015-2019, there is relatively stable cargo turnover with fluctuations ranging from 2,961-3,287 thousand tons. In 2020, there is a slight decrease to 2.831 thousand tons. In 2021, there is an increase to the highest level of 3.350 thousand tons. In 2022, there is a slight decrease to 3.054 thousand tons. In 2023, there is a significant decrease to 0.915 thousand tons, which may be the

result of significant changes in economic conditions and other factors.

Regarding cargo turnover by sea vessels, from 2015-2019, there is relatively stable cargo turnover with fluctuations ranging from 3,821-4,072 thousand tons. In 2020, there is a slight increase to 4,252 thousand tons. In 2021, there is an increase to the highest level of 4,635 thousand tons. In 2022, there is a slight decrease to 4,470 thousand tons. In 2023, there is a significant decrease to 2,784 thousand tons, which may also be the result of significant changes in economic conditions and other factors.

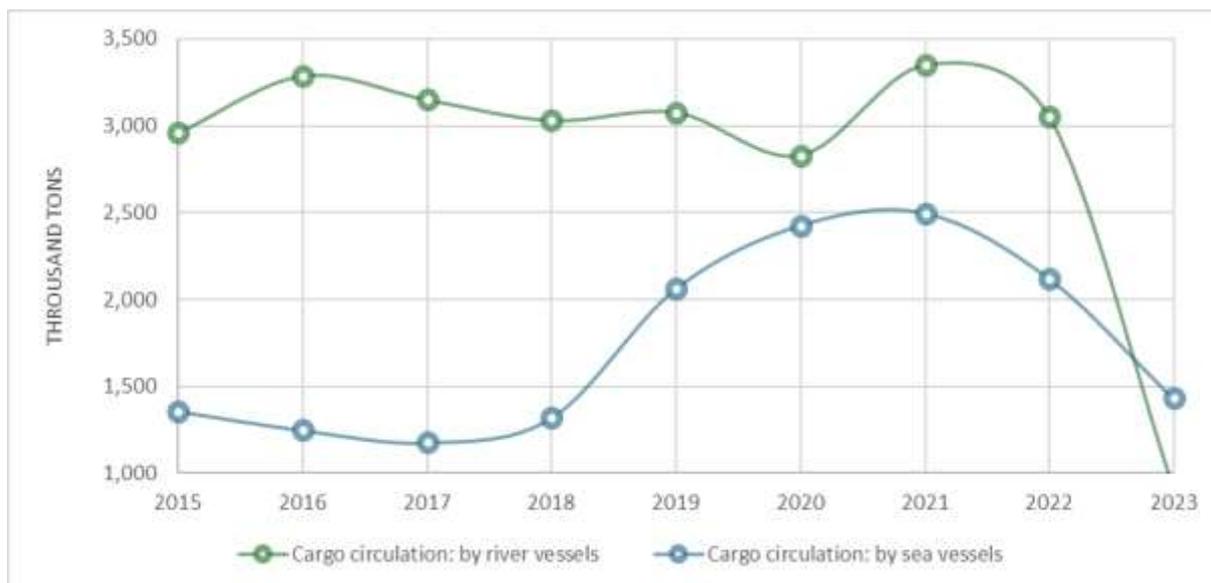


Fig. 8 – Cargo turnover by river and sea vessels to the port of Galati from 2015 to 2023

Regarding cargo turnover by sea vessels, there was a consistent decline from 1.357 million tons in 2015 to 1.177 million tons in 2017. From 2018 to 2019, there was an increase, particularly sharp in 2019 to 2.061 million tons.

From 2020 to 2021, this growth continued to 2.496 million tons in 2021. There was a slight decrease in 2022 to 2.119 million tons. However, in 2023, there was a significant decrease to 1.431 million tons.

Therefore, regarding river cargo turnover, the figures remained relatively stable with minor fluctuations between 2015 and 2019. The year 2021 was the most successful with a volume of 3.350 million tons. However, there was a significant decrease in 2023 to 0.915 million tons. As for maritime cargo turnover, there was a gradual decrease until 2017, followed by stable growth until 2021. The peak volume was reached in 2021 at 2.496 million tons. There was a decrease in 2023 to 1.431 million tons.

River cargo turnover demonstrates more stable figures throughout the period from 2015 to 2019, while maritime cargo turnover shows more pronounced fluctuations. Both types of cargo turnover reached their peak values in 2021, but river cargo turnover exhibited a sharper decline in 2023. Both types of cargo turnover show a trend of growth until 2021, after which both decrease, though maritime cargo turnover remains more stable compared to river cargo.

Let's analyze the cargo turnover of the Port of Constanta (Figure 9). The majority

share of the port's cargo turnover is provided by maritime transportation. However, the port also utilizes the capabilities of river transport facilities.

Regarding cargo turnover by river vessels, there was a decrease from 13.229 thousand tons in 2016 to 12.664 thousand tons in 2018. From 2019 to 2021, there was recovery and growth, reaching the highest volume of 15.863 thousand tons in 2021. From 2022 to 2023, there were minor fluctuations with a peak volume of 15.679 thousand tons in 2023.

As for cargo turnover by sea vessels, there was a slight decrease from 46.195 thousand tons in 2016 to 45.622 thousand tons in 2017. From 2018 to 2019, there was significant growth to 51.458 thousand tons in 2019. In 2020, there was a noticeable decrease to 45.506 thousand tons. From 2021 to 2023, there was steady growth to a peak volume of 76.821 thousand tons in 2023.

Cargo turnover of sea vessels has significantly increased, especially in 2022 and 2023, reaching 76.821 thousand tons in 2023. The cargo turnover of river vessels remains relatively stable with a slight increase to 15.679 thousand tons in 2023. Sea vessels handle significantly larger volumes of cargo compared to river vessels, which is a crucial indicator for international trade development.

Considering the viability of expanding cargo transportation through Danube River ports, it would be worthwhile to examine the situation in the context of the Port of Regensburg (Germany).

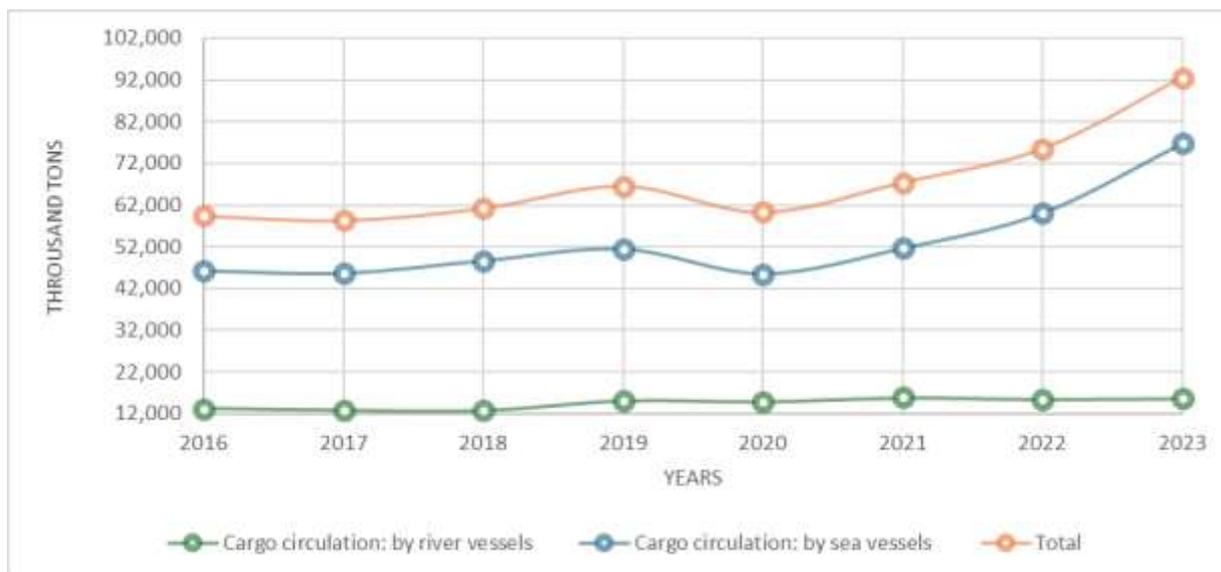


Fig. 9 – Volume of cargo turnover by river and sea vessels at the Port of Constanta from 2016 to 2023

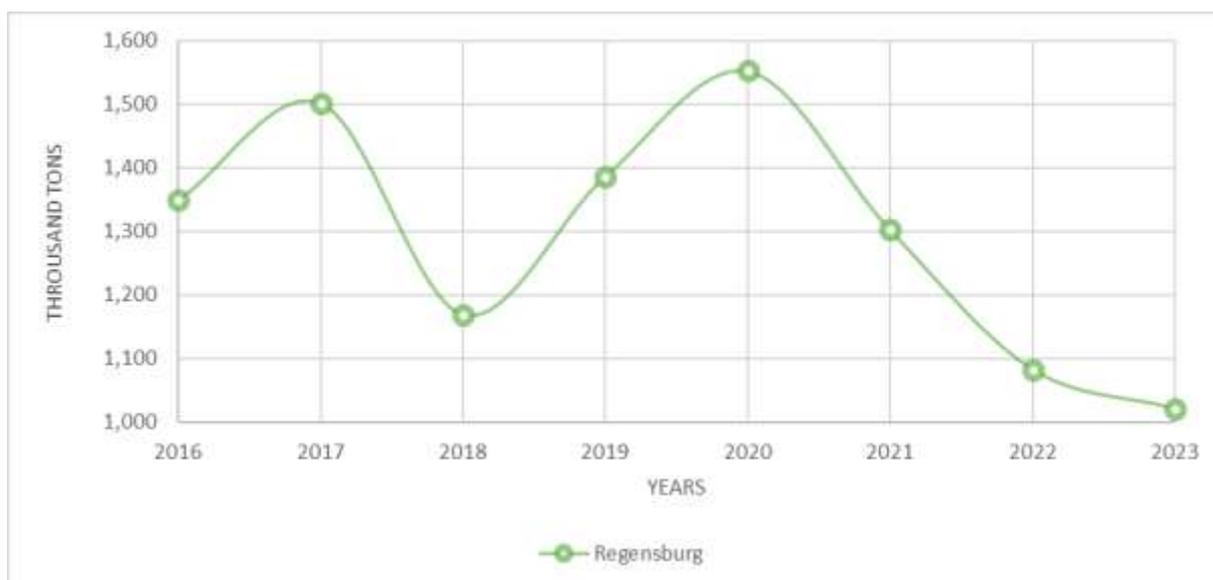


Fig. 10 – Volume of cargo turnover at the Port of Regensburg from 2016 to 2023

Figure 10 presents data on cargo transportation at the Port of Regensburg. The cargo turnover of the Regensburg port shows significant fluctuations during the analyzed period. The highest volume was in 2020, after which there is a stable decline. The largest growth was observed in 2017 and 2020, with a peak in 2020 (1.553 thousand tons). Significant decline in 2018 and after 2020. The lowest level of cargo turnover was recorded in 2023 (1.021 thousand tons). From 2016-2017, cargo turnover increased by 11,3% from 1.350 thousand tons in 2016 to 1.502 thousand tons in 2017. However, from 2017 to 2018, there was a sig-

nificant decrease by 22.2% to 1.169 million tons. From 2018 to 2019, there was a recovery with an increase of 18.6% to 1.387 million tons. From 2017-2019, cargo turnover decreased by 25% to 1.130 thousand tons. From 2020-2023, there is a decrease of 33% to 1.021 thousand tons.

The trends of recent years, as we can see, are negative, although there are positive examples in 2017 and 2020. Therefore, there are all reasons to expect that the expansion of navigation on the Danube will increase the cargo turnover volumes in the Regensburg port to its planned capacities.

Conclusions

The conducted analysis showed that in the conditions of war and the blockade of the ports of Greater Odessa, export transportation through the Ukrainian Danube ports of Reni, Izmail, and Ust-Danube has been activated. This was also facilitated by the dredging works in the Bystre estuary, which allowed its transport capabilities to be used for the passage of vessels with a draft of up to 6.5 meters, and not only the Romanian Sulina canal.

The analysis showed that, in addition to positive results for Ukrainian ports, there was also an increase in cargo handling volumes in Romanian ports, for example, the Sulina port has shown an increase in cargo movement volumes in recent years. Overall, if we compare the growth rates in the direction of Danube-Black Sea and in the opposite direction, the preference is given to the Danube-sea direction.

Regarding transportation through the Danube-Black Sea canal, recent years have also seen an increase in cargo transportation volumes, but this is mainly due to international transportation. Domestic transportation does not show sim-

ilar dynamics. The Constanta port has also been increasing cargo handling volumes in recent years due to sea transportation, but river transportation is also growing, although not as significantly.

Unlike the mentioned ports, the Romanian port of Galati has been decreasing cargo handling volumes since 2021. The reason for this is that, among the two routes considered - the Danube and the Danube-Black Sea to the Constanta port, preference is given to the latter.

This gives reason to expect that the further expansion of navigation along the Danube using the routes Ukraine - Galati, Ukraine - Regensburg, and Ukraine-Constanta (via the Danube) will ensure the effectiveness of the mentioned ports and create additional conditions for the development of transport logistics in the Danube region as part of the security system for Ukraine, Europe, and the world as a whole.

An additional advantage of such decisions is their environmental orientation, since among all types of transport, water transport is the most environmentally friendly.

Conflict of Interest

The author declares no conflict of interest regarding the publication of this manuscript. Furthermore, the author has fully adhered to ethical norms, including avoiding plagiarism, data falsification, and duplicate publication.

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РОЗВИТОК ДУНАЙСЬКИХ ПОРТОВ В ПЕРІОД ВІЙНИ ТА ПІСЛЯВОЄННОГО ВІДНОВЛЕННЯ УКРАЇНИ

Мета: Оцінка розвитку дунайських портів в умовах війни та післявоєнного відновлення України як складової системи безпеки України, Європи та світу в цілому.

Методи. Загальнонаукові (аналіз і синтез, індукція і дедукція, аналітичне групування) та спеціальні (абстрагування, моделювання та ін.) методи дослідження економічних явищ і процесів.

Результати. Проведений аналіз показав, що в умовах війни та блокади портів Великої Одеси активізувалися експортні перевезення через українські дунайські порти Рені, Ізмаїл та Усть-Дунай. Цьому також сприяли днопоглиблювальні роботи в лимані Бистре, що дозволило використовувати його транспортні можливості для проходу суден з осадкою до 6,5 метрів, а не лише румунського Сулінського каналу. Аналіз показав, що, окрім позитивних результатів для українських портів, також спостерігалось збільшення обсягів перевалки вантажів у портах Румунії, наприклад, порт Суліна демонструє збільшення обсягів перевезення вантажів за останні роки. Загалом, якщо порівнювати темпи зростання в напрямку Дунай-Чорне море та у зворотному напрямку, то перевага надається напрямку Дунай-море. Що стосується перевезень через канал Дунай-Чорне море, то останніми роками також спостерігається збільшення обсягів перевезень вантажів, але це відбувається переважно за рахунок міжнародних перевезень. Внутрішні перевезення не демонструють подібної динаміки. Порт Констанца також збільшує обсяги перевалки вантажів в останні роки за рахунок морських перевезень, але річкові перевезення також зростають, хоча не настільки значно. На відміну від згаданих портів, румунський порт Галац з 2021 року зни-

жує обсяги перевалки вантажів. Причиною цього є те, що серед двох розглянутих маршрутів – Дунайський та Дунайсько-Чорноморський до порту Констанца, перевага надається останній.

Висновки. Подальше розширення судноплавства по Дунаю за маршрутами Україна – Галац, Україна – Регенсбург, Україна – Констанца (через Дунай) забезпечить ефективність роботи зазначених портів і створить додаткові умови для розвитку транспортної логістики в Дунайському регіоні як частина системи безпеки України, Європи та світу в цілому.

Додатковою перевагою таких рішень є їх екологічність, оскільки серед усіх видів транспорту водний є найбільш екологічним.

КЛЮЧОВІ СЛОВА: Дунайські порти, річкова логістика, екологічно чистий транспорт, вантажні перевезення, міжнародні перевезення, транспортна логістика, Дунайський регіон

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