

УДК 627.212. 656.613  
JEL D43, F36

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## ОСОБЛИВОСТІ ФУНКЦІОНУВАННЯ МОРСЬКОЇ ТА РІЧКОВОЇ ПОРТОВОЇ ІНФРАСТРУКТУРИ В СИСТЕМІ АДАПТАЦІЇ К ЗОВНІШНІМ УМОВАМ ПОЗИЦІОНУВАННЯ

**Актуальність.** Доцільність розробки наукових положень пов'язана з необхідністю урахування нових умов функціонування підприємств морської галузі України та їх адаптації. Також важливим є аналіз та обґрунтування параметричних особливостей позиціонування підприємств морського транспорту. Насамперед необхідно урахувати: фактори розвитку світового ринку морської торгівлі, тенденції та перспективи глобальної морської галузі, стан та конкурентне позиціонування портового бізнесу, функціонування та перспективи розвитку логістичних - мультимодальних транспортних систем.

**Мета та завдання.** Систематизація факторів та обґрунтування особливостей позиціонування підприємств морської та річкової інфраструктури України, уточнення нових умов розвитку транспортних підприємств в структурі регіонального транспортного ринку. Досягнення поставленої мети дослідження обумовлено необхідністю вирішення наступних завдань: аналіз та обґрунтування параметричних особливостей розвитку світового ринку морської торгівлі, умови розвитку глобального морського торговельного флоту, аналіз середовища міжнародних інвестицій та інвестиційна привабливість морської галузі України, тенденції та особливості позиціонування розвитку приватної та державної власності в структурі національного стивідорного ринку, обґрунтування стратегічного значення морської та річкової інфраструктури України в забезпеченні економічної безпеки країни та подолання продовольчої кризи в світі.

**Моделі і методи.** Науковою базою досліджень стали методи аналізу та синтезу, методи математичної статистики, методи групування, методи прийняття раціональних рішень, методи дослідження операцій, а також офіційні дані статистичної інформації, дані конференції організації об'єднаних націй з торгівлі та розвитку, міністерства інфраструктури України, аналітичні матеріали державної статистики України, аналітичні дані адміністрації морських портів України.

**Результати.** Розглянуто тенденції та перспективи розвитку світової морської торгівлі. Представлена динаміка провізної спроможності світового торговельного флоту за 2018-2021 рік. Дана оцінка стану ринку морської торгівлі. Проаналізовано потоки прямих іноземних інвестицій та виявлені фактори які впливають на їх динаміку. Обґрунтовано стан портової інфраструктури України. Наведена динаміка вантажообігу морських торгових портів Чорноморського регіону за 2005 – 2021 рік. Проаналізовано стан та функціонування приватного та державного секторів портового бізнесу в Україні. Представлена динаміка вантажообігу приватних та державних стивідорних підприємств в Україні за 2013-2021 рік. Підкреслено важливість ролі державної власності у стивідором бізнесі в Україні з урахуванням воєнного стану. Підкреслено важливість функціонування портової та річкової інфраструктури України в забезпеченні продовольчої безпеки в світі. Проаналізовано роботу портових операторів по «Зерновій угоді».

**Висновки.** Систематизовано фактори ефективного функціонування транспортних підприємств. Представлена інформаційно-логістична модель, яка враховує умови адаптації підприємств морської та річкової галузі України з урахуванням воєнного стану. Враховані економічні вимоги позиціонування складових транспортної інфраструктури України з урахуванням негативного впливу зовнішнього середовища. Підкреслено вплив використання принципу цифровізації, «єдиного вікна» на ефективність позиціонування логістичних ланок доставки вантажу. Виявлено необхідність розширення акваторії портів на річки Дунаю та розвиток логістики портів Дунайського регіону для забезпечення функціональної стійкості потенціалу транспортної галузі України.

**Ключові слова:** світова морська торгівля, транспортна галузь, стивідорні оператори, Зернова угода, логістичні ланки доставки вантажу.

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## **FEATURES OF MARINE AND RIVER PORT INFRASTRUCTURE FUNCTIONING IN THE SYSTEM OF ADAPTATION TO EXTERNAL POSITIONING CONDITIONS**

**Topicality.** The expediency of developing scientific regulations is related to the need to take into account the new operating conditions of maritime enterprises of Ukraine and their adaptation. It is also important to analyze and justify the parametric features of the positioning of maritime transport enterprises. First of all, it is necessary to take into account: factors of the development of the global maritime trade market, trends and prospects of the global maritime industry, the state and competitive positioning of the port business, the functioning and prospects of the development of logistic - multimodal transport systems.

**Purpose and tasks.** Systematization of factors and substantiation of the peculiarities of the positioning of marine and river infrastructure enterprises of Ukraine, clarification of new conditions for the development of transport enterprises in the structure of the regional transport market. Achieving the set goal of the research is conditioned by the need to solve the following tasks: analysis and substantiation of parametric features of the development of the global maritime trade market, conditions for the development of the global maritime merchant fleet, analysis of the environment of international investments and the investment attractiveness of the maritime industry of Ukraine, trends and peculiarities of the positioning of the development of private and state property in the structure of the national stevedore market, substantiating the strategic importance of the marine and river infrastructure of Ukraine in ensuring the economic security of the country and overcoming the food crisis in the world.

**Models and methods.** The scientific basis of the research was methods of analysis and synthesis, methods of mathematical statistics, methods of grouping, methods of making rational decisions, methods of operations research, as well as official data of statistical information, data of the United Nations Trade and Development Conference, the Ministry of Infrastructure of Ukraine, analytical materials of state statistics of Ukraine, analytical data of the administration of seaports of Ukraine.

**The results.** The trends and prospects for the development of world maritime trade are considered. The dynamics of the shipping capacity of the world merchant fleet for 2018-2021 is presented. The assessment of the state of the maritime trade market is given. Flows of foreign direct investments were analyzed and factors affecting their dynamics were identified. The state of the port infrastructure of Ukraine is substantiated. The dynamics of the cargo turnover of sea trade ports of the Black Sea region for 2005-2021 are given. The state and functioning of the private and public sectors of port business in Ukraine are analyzed. The dynamics of cargo turnover of private and state stevedoring enterprises in Ukraine for 2013-2021 is presented. The importance of the role of state ownership in the stevedore business in Ukraine, taking into account the state of war, is emphasized. The importance of the functioning of the port and river infrastructure of Ukraine in ensuring food security in the world is emphasized. The work of port operators under the "Grain Agreement" was analyzed.

**Conclusions.** Factors of effective functioning of transport enterprises are systematized. The information and logistics model is presented, which takes into account the conditions of adaptation of enterprises of the maritime and river industry to Ukraine, taking into account the state of war. The economic requirements of the positioning of the components of the transport infrastructure of Ukraine are taken into account, taking into account the negative impact of the external environment. The impact of the use of the principle of digitalization, "single window" on the efficiency of the positioning of logistics links of cargo delivery is emphasized. The need to expand the water area of the ports on the Danube River and develop the logistics of the ports of the Danube region to ensure the functional stability of the potential of the transport industry of Ukraine has been revealed.

**Keywords:** world maritime trade, transport industry, stevedore operators, Grain Agreement, logistics links of cargo delivery.

### **Problem statement and its connection with important scientific and practical tasks.**

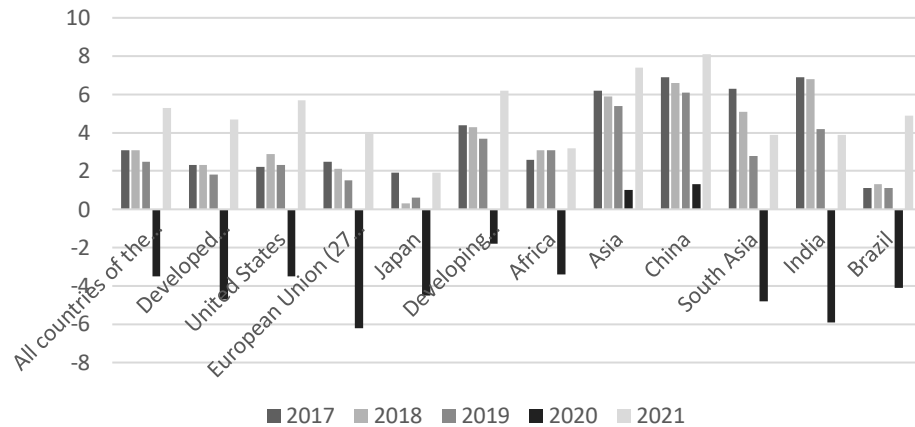
Globalization of production processes entails the widespread use of sea transportation. International trade, in turn, determines the needs for the development of the maritime transport industry.

Global maritime trade has been experiencing the negative impact of the pandemic for the past three years, but it should be noted that the short-term outlook remains positive. Over the past two decades, seaborne trade has grown at a compound annual rate of 2.9 percent, which is expected to slow to 2.4 percent between 2022 and 2026, according to UNCTAD analysts.

In 2021, there will be a global economic recovery, but the impact of the pandemic has made it necessary to ensure rational risk management, as well as ensure the financial stability of maritime enterprises.

The strategy to ensure financial sustainability includes reforming the port business and global logistics, as well as the reorganization of maritime transport and transport networks.

The data of fig. 1 reveal the nature and features of the development of individual components of the global economy. From the given data, a significant differentiation of economic growth rates can be seen, which reflects the systemic features of the state of individual structures.



**Fig. 1. World economic growth, 2019 - 2021, (annual percentage change)**

Source: according to the data Trade and Development Report (2022)

As of January 2021, the carrying capacity of the global merchant fleet was 2.13 billion dwt (table 1).

Table 1.

**Structure of the world fleet broken down by main types of vessels (thousands of deadweight)**

	2018	2019	2020	2021
tankers	562035	567533	601163	619148
bulk carriers	818921	842438	879330	913032
vessels for the transportation of general cargo	73951	74000	76893	76754
container ships	253275	265668	274856	281784
gas carriers	64407	69078	73685	77455
chemical carriers	44457	46297	47474	48858
others (including auxiliary offshore structures)	102215	104380	103664	109500
ferries and passenger ships	6922	7097	7289	8109
all countries of the world	1926183	1976491	2064354	2134640

Source: according to the data Review of Maritime Transport (2021).

Among the delivered vessels, the main share of the world merchant fleet is accounted for by bulk carriers, and in 2021 their volume was 42.77% of the total volume of the world merchant fleet (an increase of 3.79% by 2020), oil tankers make up 29% and container ships - 13, 2%. In the conditions of the supply of vessels, owners and operators also bought more old vessels, which led to an increase in prices for this group of vessels.

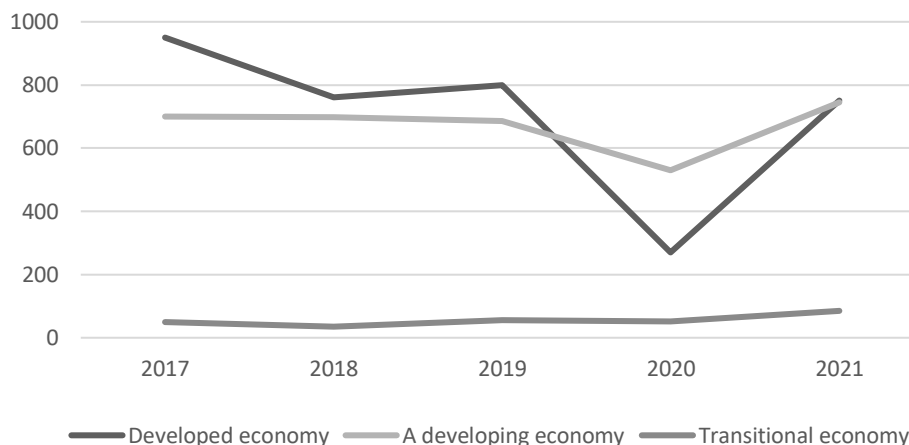
The bulk fleet is the main link in the sustainable positioning of foreign economic relations. The development of the bulk fleet affects the growth of production in industries that serve the needs of merchant shipping.

High tariff rates were observed for container transportation in 2021, and this trend may threaten the recovery of the world economy in the future. UNCTAD analysts emphasized that a 10% increase in container transportation tariffs in the US could cause a 1% reduction in industrial production.

The development of the world trade fleet determines the requirements for specialized cargo terminals of stevedoring operators and the principles of their concentration.

The objective importance of maritime enterprises determines the optimization of their positioning in the regional and global transport system. A climate of investment attractiveness is being formed around the basic trading ports, which in turn increases their functional and economic sustainability.

In 2021, global foreign direct investment flows amounted to 1.58 trillion dollars, which is 64% more than the exceptionally low level of 2020 (Figure 2). The recovery in investment flow is associated with rapid growth in markets and international financing, which in turn is associated with favorable financing conditions and large incentive programs for infrastructure development.



**Fig. 2. The flow of foreign direct investments in the world and from economic groups, billion dollars, 2017-2021**

*Source:* according to the data World investment report (2022)

The global environment of international investments has changed dramatically since the beginning of the war in Ukraine. Investor uncertainty and risk aversion could put significant downward pressure on global foreign direct investment in the near term.

**Analysis of recent publications on the problem.** In scientific studies, a lot of attention is paid to the problems of the functioning of maritime transport enterprises in the structure of the maritime trade market. The parameters of the development of maritime enterprises (Ilchenko, S. V., & Oneshko, S.V) are substantiated, the specific conditions of port business functioning are revealed (Frasyniuk T.I.).

**Allocation of previously unsolved parts of the general problem.** However, it should be noted that the conditions of adaptation of maritime enterprises, taking into account the negative impact of the external environment and the new conditions of operation of the port business in Ukraine, have not been fully investigated.

**Formulation of research objectives (problem statement).** The purpose of the article is to substantiate the parametric features of the functioning of maritime and river industry enterprises in Ukraine and clarify the new conditions for the positioning of maritime and river transport enterprises in Ukraine and their adaptation to external development conditions.

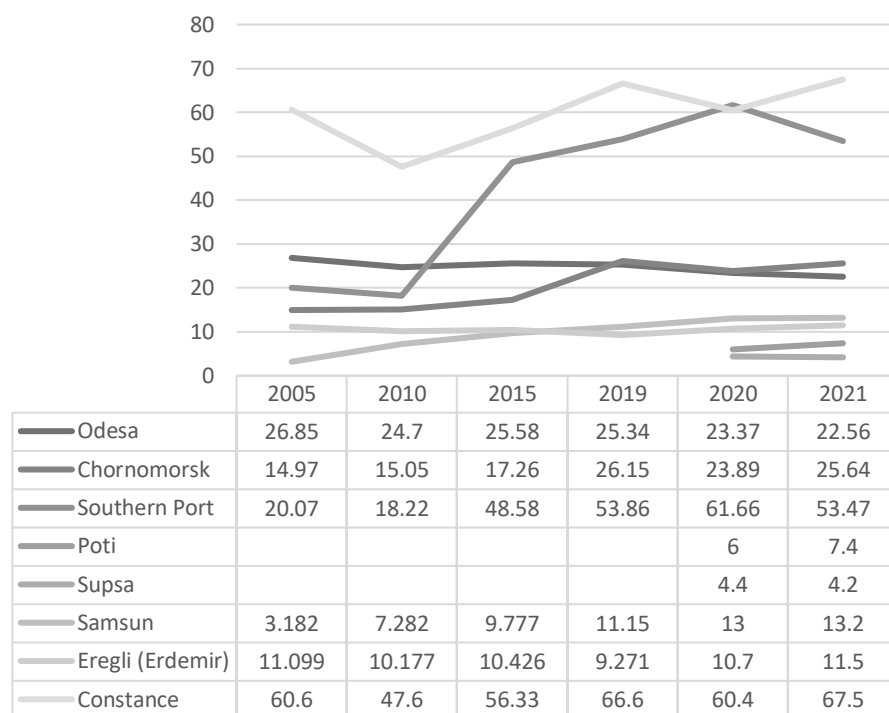
**Materials and Methods.** The scientific basis of the research was methods of analysis and synthesis, methods of mathematical statistics, methods of grouping, methods of making rational decisions, methods of operations research, as well as official materials of statistical information, analytical materials of the United Nations Trade and Development Conference, the Ministry of Infrastructure of Ukraine, analytical materials of state statistics of Ukraine, analytical materials of the administration of seaports of Ukraine.

**An outline of the main results and their justification.** The consequences of russia's aggression against Ukraine led to a crisis in the food, fuel and financial systems in the world. The war affected far beyond the borders of Ukraine, causing a crisis of life, rising prices, and decreasing real incomes of billions of people around the world.

It should be noted that despite the war, Ukraine remains the guarantor of food security in the world.

Sea trade ports are of strategic importance for ensuring the country's economic security. When choosing a form of ownership, it is necessary to clearly separate the functions of stability, security and commercial activity.

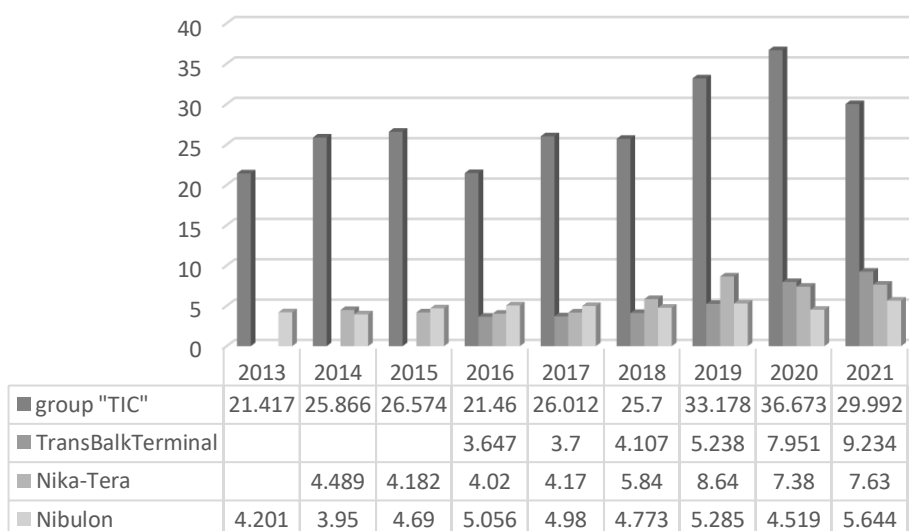
In fig. Figure 3 presents the dynamics of cargo turnover of sea trade ports of the countries of the Black Sea region.



**Fig. 3. Dynamics of cargo turnover of seaports of the Black Sea region 2005-2021, million tons**  
*Source:* according to the data The last peaceful year (2022)

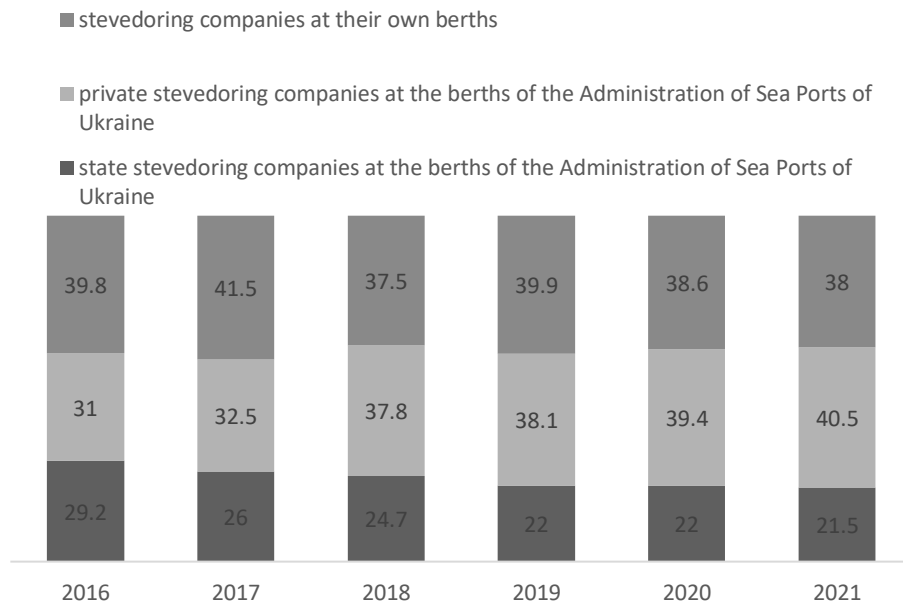
In 2021, the seaport of Konstanz occupied a market share of 12.1% in the Black Sea region, one of the largest ports of Ukraine - the "Southern" seaport - 9.6%. The known advantages of the territorial location of the transport complex of Ukraine should be intensively used in two directions - both as a factor of real integration and as a significant source of foreign currency income.

Transshipment of cargo in the ports of Ukraine is mainly carried out by private stevedore companies, the share of which in 2021 was 78.5% of the total cargo turnover. The largest privately owned stevedore operators are the TIC terminal group, TransBalkTerminal and Nika-Tera (Fig. 4)



**Fig. 4 Cargo turnover of private business in seaports of Ukraine, million tons**  
*Source:* according to the data magazine Ports of Ukraine (2022)

During the last period, the share of state ownership in the structure of the national stevedore market has been decreasing. In 2021, the share of state stevedore operators in the ports of Ukraine was 21.5% (Fig. 5).



**Fig. 5. Dynamics of the share of state and private terminal operators involved in cargo processing in sea trade ports of Ukraine for 2016-2021.**

*Source:* according to the data magazine Ports of Ukraine (2022)

It is necessary to emphasize, taking into account the strategic importance of stevedoring enterprises in the economic security of Ukraine, it is necessary to find a balance between private and state ownership in the port business.

According to the results of recent years, Ukraine held the leadership within the framework of the World Food Program in the supply of food for humanitarian operations. In total, in 2021, Ukraine sent 20% of food under the UN program.

At the end of March 2022, many Ukrainian companies reoriented their logistics to the river route to Europe: goods were sent by river transport from the south of Odesa to Romania, and then the goods were transhipped onto sea vessels.

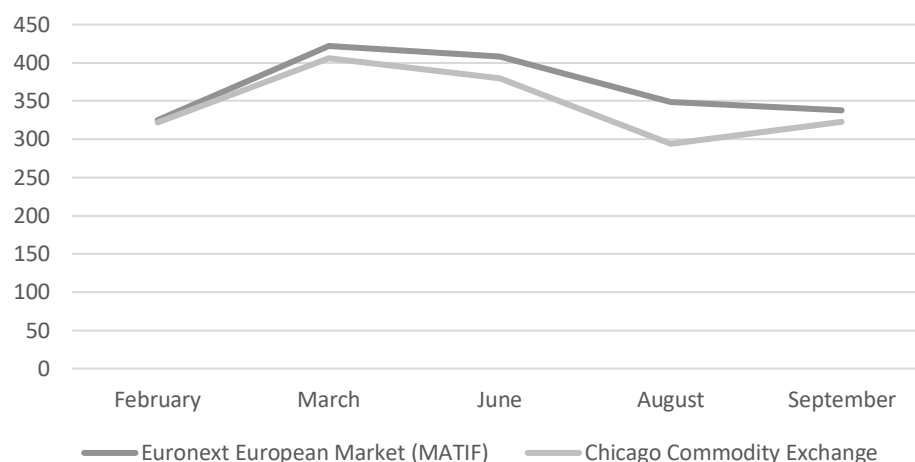
From the cob of the Danube port transshipment of grain vantage is close to 100 thousand tons per month, but it is necessary to indicate that before the war, Ukraine transported 3.5 million tons each. In May 2022, the Danube port revenues reached 1.3 million tons per month, and in June - 1.4 million tons. On 9 July 2022 after release, after the Armed Forces of Ukraine had called the Zmeiny Island, it became possible to win for the roar of ships another estuary of the Danube - the Bistre estuary.

One part of the vantagny transport streams goes through the inland land cordons, and in the other - through the ports of Reni, Izmail and Ust-Dunaysk. Considering laws to drink and propositions of the freight rate immediately rose, which guaranteed the high income to the river fleet. Ale, as it was already planned, the estuary of Bistre sprung up, the number of the river fleet increased, and all the factors in the future will be added to the charter rate - they will go down the giblets.

"Grain Agreement" in Ukraine started on April 22, 2022 for the support of the United Nations, as a support for safe shipping for the export of grain. The export geography of the "grain initiative" commends the work of three ports in Ukraine - the commercial sea ports "Odesa", "Chornomorsk", "Pivdenny".

Prescriptions in favor of the mechanism for transferring merchant sea vessels in caravans along the back of the hardened corridors from the turnaround near Istanbul. Ukrainian grain is direct to Europe, Asia, Africa. For example, for 2 months of work " Grain Agreement " (August - September 2022) 58% of the total exported corn went to Europe, and 68% of the total wheat went to Africa and Asia.

The presence of Ukrainian grain on the world market of sea trade affects the reduction of prices. The dynamics of the price of wheat on world markets is presented in fig. 6.



**Fig. 6. Dynamics of wheat prices on global markets, dollars per ton, February - September, 2022**  
*Source:* according to the data Report by the Ministry of Infrastructure of Ukraine (2022)

Thus, the price of wheat on the European and American markets fell significantly during the period of operation of the "Grain Corridor". Food becomes more accessible to those who are one step away from a humanitarian disaster.

Russia's blocking of the "Grain Agreement" is instantly reflected in global commodity markets, causing a food crisis in the world.

**Conclusions and perspectives of further research.** Those port systems that use the effect of scale and invest in innovative port technologies and use the principle of "digitalization" are competitive.

Simplifying the procedures of world trade and maritime transportation involves the development of digitalization and the mechanism of automation of customs procedures, the organization of the work of maritime enterprises according to the "single window" principle. This increases the efficiency of the entire logistics chain and has a positive effect on the work of all maritime enterprises.

In fig. 7 presents an information and logistics model that reflects the conditions of adaptation of enterprises of the maritime industry of Ukraine in the structure of the regional maritime trade market.

It should be emphasized that using the principle of "digitalization" means, firstly, increasing the efficiency of export, import and transit operations, secondly, improving the management of the maritime industry, and thirdly, reducing the time and money spent by participants in the transportation process, and it is also a mechanism that expands access and transparency of the global maritime trade market.

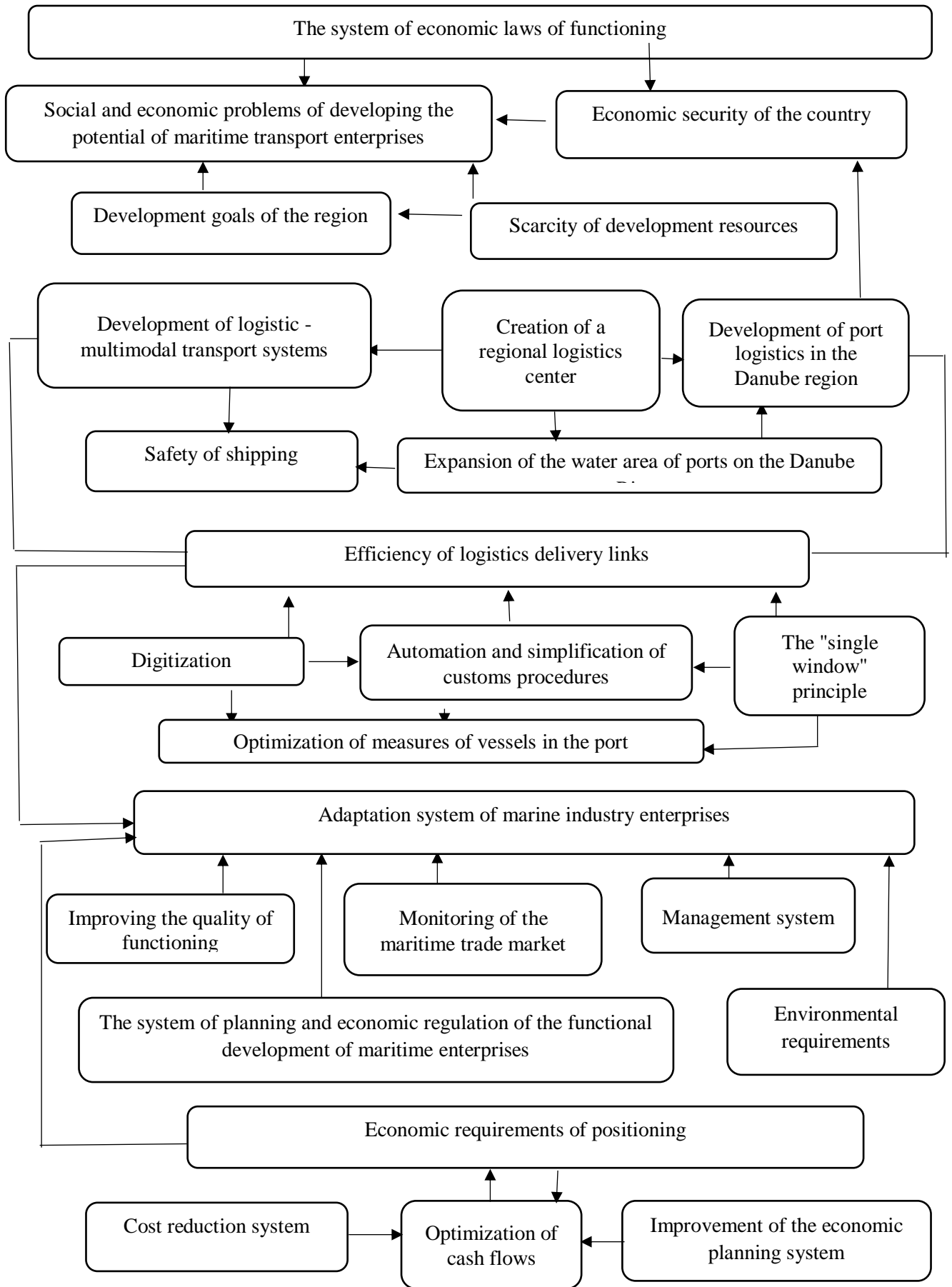
The effectiveness of the work of maritime enterprises in the structure of the maritime trade market depends on the efficiency of the functioning of the logistic links of cargo delivery, the monitoring mechanism of the maritime trade market, the quality management system, the improvement of the planning system and the assessment of positioning risk and effective management.

Also, an important factor in the adaptation system of maritime enterprises is the simplification of the procedures of world trade and sea transportation, which allows to reduce the time and costs of carrying out customs and other trade procedures and to introduce innovative technologies for the performance of administrative services.

The principle of digitization creates a paperless environment and all sea trade procedures are carried out online, and as the practice of recent years has shown, under the influence of the pandemic, this is one of the main conditions for the functioning of enterprises in the maritime industry.

As for the maritime and river industry in Ukraine, in recent years, thanks to the introduction of new technologies and the provision of administrative procedures, the efficiency of logistics supply chains has increased.

The main economic requirements for the adaptation of stevedoring enterprises in the structure of the maritime trade market are: improving the quality of cargo flow processing to regional parameters of competitiveness; development of production infrastructure that ensures the functioning of enterprises in the maritime industry; solving socio-economic and environmental tasks of functioning on the basis of job creation; expansion of the export of transport services due to the development of the logistics system.



**Fig. 7. Terms of adaptation of maritime enterprises of Ukraine**

*Source: own development*

The constant need to improve the transport service of global economic ties, taking into account the rate of increase in freight turnover, is one of the main factors in the development of maritime enterprises. An important direction of such improvement is the development of logistics chains of product delivery. The basic principles of building such systems include:

- territorial optimality of transport routes according to criteria of minimization of energy intensity and environmental safety;
- absolute compliance of the technical and economic level and economic and legal status of national zones with international transport corridors.

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