ТЕОРЕТИЧНІ ОСНОВИ РОЗВИТКУ МОРСЬКОЇ ІНФРАСТРУКТУРИ УКРАЇНИ В УМОВАХ ПОВОЕННОГО СТАНУ

Актуальність. Морська інфраструктура нашої країни має велике значення для економічного та соціального розвитку і процвітання нації, яка намагається вступити в лави ЄС, тому розвиток та відновлення морської інфраструктури в наслідок зруйнування під час агресії Росії має найвищий приоритет.

Мета дослідження. Мета статті полягає у визначенні напрямків розвитку та відновлення морської інфраструктури України у період післявоєнного часу.

Матеріали та методи. В статті для рішення завдань були використані: методи теоретичного дослідження, а саме: метод структурного аналізу при проведенні аналізу стану морської інфраструктури України; методи раціональних рішень, а також офіційні дані статистичної інформації; аналітичні дані Адміністрації морських портів України.

Результати. Відновлення та розвиток морської інфраструктури в умовах післявоєнного стану є стратегічно важливим завданням для України. Цей процес вимагає цілеспрямованого регуляторного впливу з боку держави на різних етапах. Цей вплив має сприяти переходу до прогресивної фази розвитку та підтримувати позитивну тенденцію.

Висновки. Базуючись на дослідженнях та впровадженні світового досвіду, використовуючи найсучасніший організаційний дизайн та інструменти для підготовки та формулювання управлінських рішень, інноваційне переосмислення та перепроектування необхідні для всіх бізнес-процесів суб'єктів морської інфраструктури. Поєднання національного регулювання і ринкової самодисципліни забезпечує ефективний розвиток морської інфраструктури та її основи – морського транспорту.

Для забезпечення успішної роботи та безпеки морської інфраструктури потрібна відповідна інформаційна технологія. Це особливо важливо в системах управління виробництвом, де діяльність дуже динамічна, а робота пов'язана з впливом зовнішніх імовірнісних факторів.

Ключові слова: морський транспорт, морський порт, приоритет, післявоєнне відновлення.

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THEORETICAL BASIS OF THE DEVELOPMENT OF THE MARINE INFRASTRUCTURE OF UKRAINE IN THE POST-WAR CONDITIONS

**Topicality.** The maritime infrastructure of our country is of great importance for the economic and social development and prosperity of the nation that is trying to join the EU, therefore the development and restoration of the maritime infrastructure as a result of the destruction during the aggression of Russia has the highest priority.

**The aim of the study.** The purpose of the article is to determine the directions of development and restoration of the maritime infrastructure of Ukraine in the post-war period.

**Materials and methods.** In the article, the following methods were used to solve the problem: theoretical research methods, namely: the method of structural analysis - when analyzing the state of the marine infrastructure of Ukraine; methods of rational decisions, as well as official data of statistical information; analytical data of the Administration of Sea Ports of Ukraine.

**Research results.** Restoration and development of maritime infrastructure in post-war conditions is a strategically important task for Ukraine. This process requires targeted regulatory influence from the state at various stages. This influence should contribute to the transition to a progressive phase of development and maintain a positive trend.

**Conclusion.** Based on research and implementation of world experience, using the most modern organizational design and tools for preparation and formulation of management decisions, innovative rethinking and redesigning are necessary for all business processes of maritime infrastructure entities. The combination of national regulation and market self-discipline ensures the effective development of maritime infrastructure and its basis - maritime transport.

Appropriate information technology is required to ensure the successful operation and safety of maritime infrastructure. This is especially important in production management systems, where activity is very dynamic, and work is associated with the influence of external probabilistic factors.

**Key words:** sea transport, sea port, priority, post-war reconstruction.

**Statement of the problem and its connection with important scientific and practical tasks.** The maritime infrastructure of our country is of great importance for the economic and social development and prosperity of the nation that is trying to join the EU, therefore the development and restoration of the maritime infrastructure as a result of the destruction during the aggression of Russia has the highest priority.

The combination of national regulation and market self-discipline ensures the effective development of maritime infrastructure and its basis - maritime transport. To ensure the development of the port economy, it is necessary to combine and coordinate the state-regulated infrastructure with the management of land resources for the formation of an appropriate and effective economic policy.

The state of the Maritime Transport System of Ukraine is analyzed in the context of its establishment and development in the conditions of the post-war state. The socio-economic-ecological approach to the concept of development and restoration of the Marine infrastructure is considered. Conceptual principles of maritime transport development are proposed.

The strategic prospects for the development of Ukraine's economy are largely determined by its status as a maritime state. In the conditions of the decline of maritime infrastructure during wartime, seaports are the basis of the country's maritime transport complex. Ukraine had a powerful port potential, formed by twenty state sea trade ports located along the coast of the Black and Azov seas.

**Analysis of recent publications on the problem.** The problems of the development and functioning of marine infrastructure are considered in the works of domestic and foreign scientists, such as: B. Burkynskyi, S. Ilchenko, N. Maslii, S. Kotenko, V. Nitsenko, I. Ganzhurenko, A. Vardiashevili, V. Hryshchenko, I. Hryshchenko (Burkynskyi, B.V., Ilchenko, S.V., Hryshchenko, V.F. & Hryshchenko, I.V. 2022), O. Senko, G. Glushko, I. Petrov, N. Primachev, L. Sotnychenko, S. Tabensky and many others. These studies were considered using the methods of theoretical research according to the method of structural analysis, an analysis of the state of the maritime infrastructure of Ukraine before the beginning of the war and at the present time was carried out. Our work is based on the methods of rational solutions, as well as analytical data of the Administrations of seaports of Ukraine.

**Allocation of previously unsolved parts of the general problem.** It is possible to determine the problems of maritime infrastructure in the priority development of seaports and transport of Ukraine in accordance with the current crisis. The experience of the EU countries in establishing cooperation with cargo owners: the government, regional administrations, local government bodies, enterprises and private individuals regarding the highly effective restoration and development of maritime infrastructure requires the most detailed study.

**Formulation of research objectives (problem statement).** The following crisis years in the conditions of the post-war state can be safely
considered a reference point in the use of fundamentally new approaches to the problems of restoration and development of maritime infrastructure. In the Ukrainian economy, the specifics of the marine transport infrastructure are as part of the agricultural, industrial, communication and transport-logistics direction, which contribute to the rational organization of cargo flows and are designed to ensure the development of the transport market, which guarantees the satisfaction of the demand for quality and comprehensive transport services both in Ukraine itself and in the countries of the European Union, and their regional associations.

Currently, Ukraine is showing signs of a crisis in the main sectors of the real economy, which gives grounds for further positive developments in its development. Ukraine's transition to a new phase of socio-economic growth, the course towards European integration requires the complete restoration and development of the country's entire transport system and its security. At the same time, evaluating options for the development of the transport system of Ukraine, one cannot neglect the requirements of the market environment and the development of society (Senko, O.V. 2018; Senko, O.V. & Primachev, N.T. 2018).

Considering the globalization of the world economy, transport as one of the main factors of the economy is the most important tool of integration processes. Taking into account the geopolitical interests of the country and ensuring competitive conditions for the development of maritime infrastructure expresses the high efficiency of the realization of the national foreign trade potential in the world arena of maritime transportation.

Marine infrastructure has significant advantages in the implementation of foreign economic activities, such as high transport capacity, relatively low transport costs, high carrying capacity, and the possibility of transporting a large number of goods. The significant potential of Ukraine's integration into the global economic space and the development of maritime transit transport necessitates the need to improve the quality of maritime infrastructure and increase cargo flow. The main tasks of maritime infrastructure should be: ensuring the safety of cargo transportation, attracting transit and cabotage flows of cargo, speeding up the provision of services, reducing prices and costs of transport services. It is also worth considering that the environmental friendliness of transport and the systematic implementation of measures to improve safety usually lead to an increase in the overall efficiency of the entire transport system.

The national system of regulation of maritime infrastructure development in Ukraine consists of a number of interconnected mechanisms: socio-ecological (social responsibility, consumer and ecological culture, social and ecological safety, etc.); institutional (social dialogue, policy, support for forms of self-organization (clusters, startups); normative and legal (programs, legislation, international standards, strategies, concepts), cross-border cooperation, public-private partnership, etc.); financial and investment (functioning of development funds and extrabudgetary financing, insurance, budget financing, tax benefits, subsidies, lending, investment incentives); administrative (certification, standardization, licensing, compliance with standards, quotas, sanctions, requirements, price restrictions, agreements, consumerism); trade (stimulation of multimodal transportation, changes in the market, antimonopoly measures, cooperation with subjects of related industries); innovative (research and development activities, stimulation of innovations); foreign economic (export/import of services, regulation of international services and logistical support, border crossing procedures); information and communication (assessment, reporting, monitoring, software, mass media, information technologies).

A number of basic provisions regarding the selection and optimization of socio-economic tasks and directions for the implementation of the "maritime infrastructure development strategy" to ensure its development, an approach to the implementation of the strategy aimed at achieving the "maritime infrastructure development strategy" Fig. 1 (Senko, O.V. 2018). It was determined that maritime infrastructure should focus on measures aimed at achieving sustainable development of maritime transport networks, ensuring safety and efficiency of transport operations. The EU policy on the development of maritime infrastructure is studied and its strategic priorities are summarized. It is worth noting that the main concern of the European authorities is the uneven development of the maritime transport infrastructure. The development of the common EU information space is based on the development of relevant trans-European networks (for Ukraine, there are Trans-European Networks).

Materials and methods. On the continental part of Ukraine, in the Black Sea and Azov basins, as well as in the Danube delta, there are 13 seaports: Reni, Izmail, Ust-Dunaisk, Bilhorod-Dnistrovskyi, Chornomorsk, Odesa, Yuzhny,
Mykolaiv, Olvia, Kherson, Skadovsk, Berdyansk, Mariupol. The largest among the sea ports of Ukraine, before the start of hostilities, were the ports of Yuzhny, Odesa, Mykolaiv and Chornomorsk, the share of which was about 82% of the total capacity of the sea ports of Ukraine.

The most important advantage of these ports is the presence of deep-water approaches, which make it possible to serve large-tonnage sea vessels, other sea ports could serve vessels with a smaller berth (Information, 2023).

Fig. 1 Definition and composition of the processes of formation and implementation of the strategy of sustainable development of maritime transport in Ukraine on the basis of harmonization of stakeholders’ interests (Senko, O.V. 2018).

The research was carried out by the method of structural analysis and the method of rational solutions of the maritime infrastructure of the Odesa region, thanks to which several groups of indicators were identified.

The most important indicator of the decrease in
the structure of cargo flows passing through the sea ports of the Odesa region reflects the real decline of the economy. From this, we logically mean that the indicator of industrial turnover is the cargo turnover of seaports of Ukraine, which affects the dynamics and development of the population's income level.

The next indicator of the activity of the maritime infrastructure of the Odesa region (in the private sector) is regulatory and legal relations, which significantly lag behind the real processes of cargo movement through domestic ports, which narrows the spectrum of development and opportunities as much as possible. Due to the presence of more qualified personnel in the private sector, the performance of terminals and berths is higher than the state ones. The private sector in the territory of state ports sometimes encounters anti-competitive actions on the part of the management of these ports. These actions hinder the development of the efficiency of maritime infrastructure in general. The development trend of the global maritime industry shows that the share of container transportation in the structure of port cargo transportation is increasing every year. The low throughput capacity of Ukrainian ports is associated with insufficient production capacity and the complexity of control activities of state bodies that check import and transit cargo. For the effective development of Ukrainian seaports, it is necessary to continue the work on the popularization and unification of control procedures, reducing the time of handling ships in ports, ultimately, increasing the competitiveness and investment attractiveness of Ukrainian ports (Yatskevych, I.V. & Litvinenko, V.V., 2020).

In order to ensure the restoration and innovative development of the maritime infrastructure, the regulations for the management of investment programs are proposed, which present the directions for the creation of a full-scale maritime state, the parameters of cargo terminals and the fleet, which is determined by the strategic tasks of environmental, economic and social security. The monitoring of the effectiveness of the implementation of the investment plan is of particular importance.

**An outline of the main results and their justification.** According to the results of the analysis of modern trends in the development of maritime infrastructure in Ukraine, a systemic crisis of this industry is observed, which is characterized by: a violation of inter-sectoral relations and proportions, structural deformation, technological degradation, a weak economic basis for the justification of future development, etc. The necessity of measuring the stability of cargo flows, the level of competition in market segments and the characteristics of cargo cycles has been proved.

Definition. When solving the task of choosing to enter the market segment of the transport services market, the starting point is the analysis of the possibilities of the operators. The calculation of operational indicators of the current park will form the necessary information base for the formation of appropriate standards of the investment plan, which is especially important in conditions of limited financial resources (Glushko, G. M. & Ilchenko, S. V., 2017a).

Restoration and development of maritime infrastructure in post-war conditions is a strategically important task for Ukraine. This process requires targeted regulatory influence from the state at various stages. This influence should contribute to the transition to a progressive phase of development and maintain a positive trend.

The combination of national regulation and market self-discipline ensures the effective development of maritime infrastructure and its basis - maritime transport. To ensure the development of the port economy, it is necessary to combine and coordinate the state-regulated infrastructure with the management of land resources for the formation of an appropriate and effective economic policy.

Under the current situation, in order to promote the recovery and development of the shipping industry, it is necessary to revise the principles of national supervision:

- ensuring environmental safety requirements;
- the economic benefits of maritime transportation activities are reflected in the improvement of the quality of service and the optimized combination of economic use of resources;
- compliance with the strategic objectives of the development of the national and regional economic system;
- to ensure the implementation of activities only in the legal field;
- optimization of the interests of ports, transport system with adjacent infrastructure (Glushko, G. M. & Ilchenko, S. V., 2017a; Information...2023).

The direction of activity and development of maritime transport in the post-war period:

1. Minimization of losses: Development of additional transport corridors for the import of humanitarian aid and the export of Ukrainian
exports to the countries of the European Union. Maintenance of the current fleet of vehicles and replacement with new ones with the principle of: cost, utility, energy efficiency, in the future ecological transport.

2. Intensive restoration of infrastructure: Rapid work with restoration and repair of ports. Increasing the throughput capacity of energy carriers Ukraine - the countries of the European Union to cover the needs of Ukraine bypassing the Russian gas and oil market. Return of property to places of deployment before martial law.

3. Laying the foundation for future development and modernization: Directing exports from Ukraine to the EU or their transport hubs. Use of joint ventures or concessions with EU transport companies. Priority use of the latest technology in the process of development and modernization of maritime infrastructure (greener transport, more modernized port treatment facilities, etc.) (Glushko, G. M. & Ilchenko, S. V., 2017b; Ports of Ukraine, 2021).

There are many problems in the development of seaport infrastructure: limited funds, the need to take into account various interests that determine the mechanism for choosing the priority of investment activity. In such cases, marine terminal development plans should dictate the order of issues based on their importance to achieving macroeconomic, regional and local goals. Forms and methods of stimulating commercial activity in commercial structures should be the basis of mechanisms for managing the stability of the Ukrainian water transport port segment in the regional market of transport services:

- provision of state support for the development of ports;
- introduction of state and private or collective ownership of ports, develops economic and legal equality.

One of the main ways to ensure the economic sustainability of seaports of Ukraine should be the rational development management and maintenance in a safe condition of hydrotechnical structures, territories, water area and navigational environment.

In addition, the function of port supervision and the function of monitoring the compliance of merchant vessels should be implemented in the form of a national administrative authority. Modern economic conditions and the technical condition of the port infrastructure, as well as the level of development of information technologies, create additional requirements for the management system and the methods used. Competition and related factors in the market of transport services dictate the need to use an adaptive approach in management, which allows the transport system management system to make and implement decisions in conditions of limited time resources.

Conclusions and perspectives of further research. Based on the research and implementation of world experience, using the most modern organizational design and tools for the preparation and formulation of management decisions, innovative rethinking and redesign (relocation of commercial ports outside the city limits, which determines the security of ports and the access of cargo transport outside the city limits, which affects the improvement of environmental bridges and unloading city roads from freight transport), without exception, taking into account 3 types (economic, environmental and social consequences), necessary for all business services of maritime infrastructure entities. Only on this basis can we ensure the high-quality development of the shipping industry (balance supply and demand, optimize the allocation of resources to increase efficiency, flexibly change capacities and products, develop and implement innovative technologies), develop fundamental modern industries and ensure its international competitiveness.

To ensure the successful operation of these processes, appropriate information technology is required. This is especially important in production management systems, where activities are much more dynamic and work is associated with the influence of external probabilistic factors (weather conditions, social and political unrest, oil prices on international markets). Maritime transport belongs to a management system with a division of labor and working conditions that are constantly and rapidly changing. Use the level of development of communication and data transmission systems, computer networks and information technologies (Internet, space communication systems, microcomputers and mobile communication systems, etc.), using innovative information technologies, such as expert systems and neural networks under certain conditions to improve the management systems of marine infrastructure of Ukraine.
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