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RESEARCH OF THE SPECIFICITY OF THE DEVELOPMENT OF INTERNATIONAL SEA CONTAINER TRANSPORTATION

Summary. *The rapid development of container transportation in the world requires acceptance of strategic decisions in the logistical and technical support of cargo delivery by sea transport with the aim of achieving effective development of the maritime logistics system and identifying the leaders of maritime logistics. The article considers the process of containerization in sea transport in the international context. This type of transportation has a lot of advantages over other types of cargo transportation, including low cost, large volumes of transportation, clear and unambiguous rules, legal norms of sea transportation, defined sea routes. In the course of the study, countries with access to the sea or the ocean were studied. Such countries include Germany, Sweden, Belgium, Austria, Japan, the Netherlands and Singapore – countries with a developed logistics system.*

Quantitative and qualitative indicators of the development of the world's leading ports were analyzed, in particular, the number of ships of various types, including depending on the flag, their carrying capacity, and the time spent in the port. The development of maritime trade, which is carried out along the following main routes, is analyzed: Non-mainlane East West, North-South, South-South, Intra-regional.

According to the results of the study, the classification of the world fleet by the main types of vessels was carried out. In the course of the analysis of the modern development of the world market of container transportation, a steady trend towards an increase in the volume of cargo transported in containers was established. This is explained by the fact that containerization allows increasing the efficiency and competitiveness of logistics enterprises significantly, which is of great importance in the conditions of a market economy. The development of the system of container transportation by sea transport is a rational way to improving the quality of the organization of cargo transportation, which, thanks to economic efficiency, will allow reducing transportation costs during the transportation of cargo. The prospective directions of their development are substantiated.

Key words: *maritime logistics, container transportation, trade routes, economy of shipowners.*

1. INTRODUCTION

The development of market relations in modern conditions is primarily characterized by the closeness and effectiveness of partnership relations that arise in the process of carrying out production and commercial activities by business entities. In the conditions of intensifying competition and accelerating the pace of socio-economic activity, the problems of logistics are becoming more and more important.

2. RELEVANCE OF THE STUDY

In the conditions of economic globalization, the delivery of goods around the world is becoming more and more affordable for most consumers, both at the level of states and for individuals. Logistics service is becoming less and less tangible for the average consumer. This characterizes the high level of quality of these services. At the same time, in view of the growing demand for goods around the world, the deepening of the international division of labor and globalization processes, new problems arise in international logistics, the solution of which requires effective strategic solutions.

Cargo transportation plays a leading role in the logistics management system. Sea transportation is very important in international logistics. This type of transportation has a lot of advantages over other types of cargo transportation, including low cost, large volumes of transportation, clear and unambiguous rules, legal norms of sea transportation, certain sea routes, etc. However, in the conditions of geopolitical changes, increased globalization, increasing the level of international competitiveness, new interested parties enter the market, new challenges arise in the field of international maritime logistics.

3. ANALYSIS OF THE LATEST RESEARCH

Literature sources contain versatile studies on transport logistics. Problems of transport logistics in various fields, including maritime, are considered by O. V. Komelina, Y. V. Samoilyk, L. M. Boldyreva, and V. V. Krapkina [7], M. Zos-Kior, I. Kuksa, M. Storoshka [10], A. Gani [5], O. Soner, E. Akyuz, M. Selik [12], L. Song and M. van Genhuizen [13], J. Tongzon and W. Heng [16]. These studies are multi-vector and allow assessing the state, level of development and strategic management of material and technical support in the world and individual regions.

Ran Yan, Shuaian Wang, Lu Zhen, Gilbert Laporte proposed new approaches applied to the study of maritime transport. They classify maritime transport problems into two main categories, namely shipping and port. In addition, scientists have applied new approaches to the practical problems of maritime transport in terms of data, model, users and goals [8].

Eva Anggrenik, Tridoyo Kusumastantok. They investigated maritime logistics in the economic development of archipelagos in eastern Indonesia. Scientists believe that maritime logistics plays an important role in the development of the local economy. In maritime logistics systems, transport is an important component in the distribution and transportation of goods by sea [4]. Alama-Sabater, Marques-Ramos and Suarez-Burgue note that the connection of transport networks in logistics systems can increase the trade flow of industrial goods between countries [1]. Bensassi, Márquez-Ramos, Martínez-Sarzoso and Suarez-Burguet have an interesting opinion on the quality of maritime transport infrastructure, which is extremely important for maintaining the efficiency of maritime logistics systems, increasing economic added value and competitiveness in international trade.

The general methodology of the research was based on such methods as monographic, comparison, graphic, economic-statistical and analysis methods. In the study of container transportation by sea, data from the World Bank, UNCTAD, the world's leading ports, and personal calculations were used [17, 20].

4. FORMULATION OF THE PROBLEM

The modern system of supply chain management and formation of commodity flows requires new logistic approaches. The closeness of relations between countries is deepening more and more, and any changes in the logistics system of one state lead to changes in the entire logistics system. An example is the impact of military operations in Ukraine. As a result of the military actions in the South of Ukraine, seaports were blocked, logistical and economic chains were broken, as a result, Ukrainian producers who need an uninterrupted supply of raw materials, including fuel, seeds, plant protection products, fertilizers, spare parts and other goods, suffer from a lack of strategic products. As a result, new stakeholders enter the international market, new challenges arise in the field of international sea freight transportation.

5. FORMULATION OF THE AIM AND ARTICLE TASKS

The purpose of the article is the identification of the leaders of maritime logistics and the substantiation of trends in the development of container transportation in the context of improving the quality of the organization of international cargo transportation.

To achieve the set goal, it is necessary to determine the peculiarities of the functioning of maritime transport in the conditions of international integration; identify the structure of the world fleet by types of vessels; give an assessment of the market of container sea transportation in Ukraine and carry out a classification according to the criterion and necessity of the destination; outline the vector of strategic development of maritime logistics.

6. PRESENTATION OF BASIC MATERIAL

Maritime transport is a very important part of the world economy. This sector contributes to the growth of imports and exports of goods and resources and provides employment opportunities. More than 80% of trade in goods in the world is carried out using the maritime logistics system.

Considering the structure of sea transportation, it is worth considering the types of vessels that are the most popular in the world. Bulk carriers are the most used in the world – 879725 thousand tons of deadweight (42.47%) in 2020 and 913032 thousand tons of deadweight (42.77%) in 2021. All numbers of these types of vessels increased by 3.79% (Fig. 1).

Bulker is a type of dry cargo vessel specializing in the transportation of bulk cargoes, grain, coal, ore, cement, etc. The second place in terms of popularity in maritime trade is taken by oil tankers. This type of vessel is used in the oil industry to transport this type of fuel. Container transportation plays an important role in maritime trade. In 2021, 281784 thousand tons of deadweight cargo were transported (13.2 %). This is 2.48 % more compared to 2020. The main distribution of containers by size: 20 feet (6.06×2, 44×2.59 m) and 40 feet (12.19×2.44×2.59 m).

Containers are divided according to the criterion and necessity of the purpose:

1. High (High Cube) – a 40-foot container with a height of 2.9 m;
2. Flat rack (Flat Rack / Platform) – a container with only front and back walls, which allows transporting oversized cargo weighing up to 39 tons;
3. Open container (Open Top) covered with a strong tarpaulin, used for transporting cargo whose height exceeds 2.4 m, as well as cargo that must be ventilated, the maximum weight of the cargo can be 31.5 tons;
4. Tanks (Tanktainer) for the transportation of liquid or bulk cargo, fuel;
5. A reefer container (Reefer) allows maintaining the temperature in the range from -20 °C to +20 °C, there are also reefer containers with a height of 2.9 m, this is a 45-foot container; a container with a capacity of 83 cubic meters, which is used for large-sized cargo, the maximum weight of the cargo reaches 27.9 tons [15]. All containers are standardized regardless of their purpose.

Size and mass, connecting devices for transportation by various types of transport, as well as for equipment that unloads and loads them, door openings, etc. are brought to the appropriate standards. Thanks to various types of containers, container transportation of any overall cargo, as well as cargo that requires low temperature during transportation, is possible today.

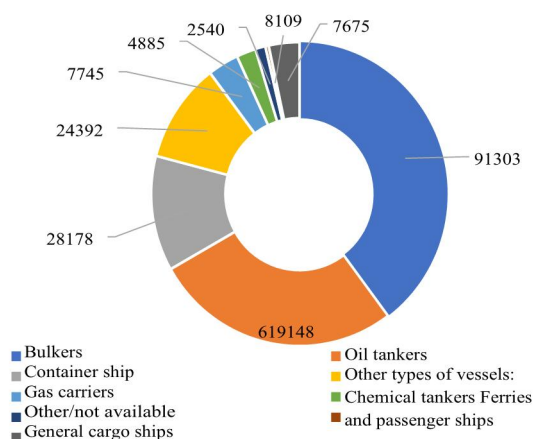


Fig. 1. A world fleet by basic vessel type, 2021
(thousand dead-weight tons and percentage)
[9, 15, 17]

Thus, the largest share of transportation in the world is carried out with the help of beam vessels. They are divided into large and small [17].

Most of them are transported by large-sized ships, in particular, 3181 million tons in 2020, which is 1.1 % less than in 2019. Most of them transport iron – 1503 million tons or 47.2 %. In second place is coal – 1165 million tons, or 36.6 % in 2020, but compared to 2019, it is 9.3 % less. Such decreases are primarily related to the coronavirus pandemic. In addition, the global demand for coal is gradually decreasing, which is connected with the global strategy of reducing the mining industries due to their significant impact on the environment and, accordingly, the development of alternative energy. Grain transportation is also popular, accounting for 16.1 % of all large-sized transportation. Despite the pandemic, in 2020 the volume of transportation of these products increased from 478 million tons to 512 million tons, or by 7.1 %. This is due to the growing demand for food.

As for small-sized shipments, their total volume is 38.4 %, in particular, steel and forest products are most transported by this type of sea transport.

Main East-West is considered the main trade route, which transports 39.7 % of container traffic (Fig. 2).

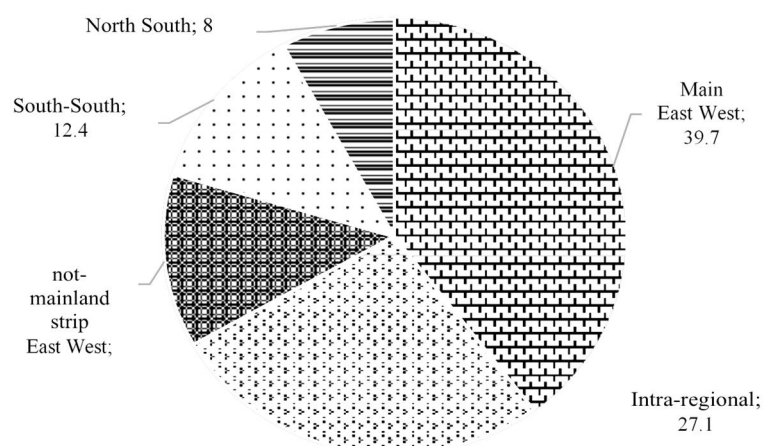


Fig. 2. Global container trade by route, 2020
(market shares, percentage of total global TEU) [9]

The East-West non-continental belt is a trade that includes West Asia and the Indian subcontinent, Europe, North America, and East Asia. North-South is a trade that includes Oceania, sub-Saharan Africa, Latin America, Europe and North America. The South-South route includes Oceania, West Asia, East Asia, Sub-Saharan Africa and Latin America. Intra-regional trade is within Europe, Africa, Asia, North America, Latin America, and Oceania (Table 1).

Table 1

**Analysis of the dynamics of container trade on the East-West trade routes,
2016-2020 (million TEU) [9]**

Routes	Years					2020 to 2016, %
	2016	2017	2018	2019	2020	
Main East-West routes	54480143	57520472	60323619	59317350	59168679	8.6
Other routes	80879086	86095802	88844890	91538274	90046704	11.3
of wich Non-mainlane East-west	18005252	19056910	19049879	19960498	19299089	7.2
North-South	11120656	11745000	12086773	2099662	11882623	6.9
South-South	15533787	16920644	18175418	18892469	18430527	18.6
Intra-regional	36219391	38373249	39532821	40585645	40434465	11.6
World total	135359229	143616274	149168509	150855624	149215383	10.2

In 2020, the volume of container trade in Main East-West routes amounted to 59168.7 billion TEU, which is 8.6 % more compared to 2016 and 2 % less compared to 2018, the decrease of this indicator in 2020 is related to the impact of the coronavirus pandemic. It is worth pointing out the growing role of other maritime trade routes. The volume of trade within other routes amounted to 90 trillion TEU in 2020, which is 11.3 % more than in 2016. Intra-regional routes are popular. Within this route, trade amounted to 40 trillion TEU in 2020, which is 11.6 % more than in 2016. The volume of trade in the South-South section increased significantly – 18.6 % and amounted to 18.4 trillion TEU. The volume of trade on the Non-mainlane East-west route amounted to 19.3 trillion TEU in 2020, which is 7.2 % more than in 2016.

In general, it is possible to note the growth of trade volumes on all trade routes. In 2020, World total maritime trade amounted to 149.2 trillion dollars, which is 10.2 % more than in 2016.

The largest ports in the world are concentrated in China (Fig. 3).

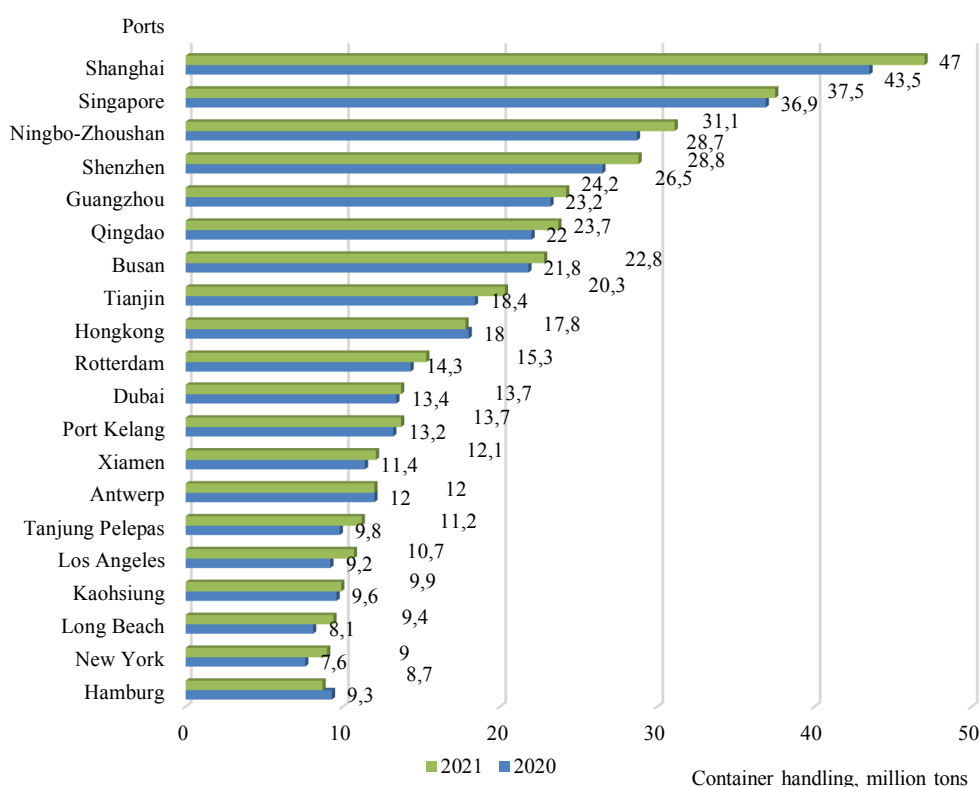


Fig. 3. Top 20 container ports by container processing, 2020–2021, million tons, previous [17, 20]

International sea transportation is the most important component of China's foreign trade. The entire southern and eastern part of the country is washed by the seas, so China's seaports have become the most important hubs of world trade, centers for the distribution of cargo flows throughout the globe. Of the ten largest ports in the world, 6 are located in China. Shanghai is considered the largest port in the world. Shanghai is the main seaport of China. It occupies an advantageous geographical position, being located between the northern and southern parts of China. Another advantage of the port is direct access to the sea. Main export-import specialization: petroleum products, rolled metal, ores, lumber, various equipment, knitwear, agricultural products (especially grain), coal, fertilizer. The area of the container site is more than 9960000 m². The area of the covered warehouse is more than 3760000 m².

In 2021, the port of Singapore increased its container traffic by 1.6 % compared to last year – to 37.47 million TEU, which is a record value in its history. The total cargo handling at the port of Singapore in 2021 increased by 1.4 % – to 599 million tons. The volume of bunkering in the port exceeded 50 million tons for the second time in the history of the port. including the sale of conventional marine fuel

was 49.99 million tons, and LNG – 0.05 million tons. The largest owners of various types of vessels are Japan, Greece, and China (Table 2).

Table 2

The 210 largest shipowners by vessel type as of January 1, 2021 (million USD) [9, 17]

Country or Territory of Ownership	Bulk Carriers	Container Ships	Offshore vessels	Oil Tankers	Ferries and Passenger Ships	Gas Carriers	General Cargo Ships	Chemical Tankers	Other
Japan	39564	15101	4746	9529	3236	15436	3130	5203	7888
Greece	39853	11670	197	32602	2512	14572	182	977	402
China	34735	20632	9967	12838	4979	4115	5120	3344	3207
United States	3734	1938	15494	5117	51259	1454	1320	1098	791
Singapore	14564	9274	4304	12569	32	4377	870	4778	534
Norway	4384	2514	21748	5570	3208	7620	900	2433	2719
Germany	6207	24166	687	1767	9460	1627	2789	704	347
United Kingdom	4001	7123	10064	3829	5661	5816	791	1354	2239
China, Hong Kong	11117	12982	73	6288	2387	1114	918	269	886
Republic of Korea	9123	5363	240	5558	433	4791	680	1480	2673
Bermuda	5863	2301	5198	5919		8107		297	51
Denmark	1526	12847	1701	3416	1032	2049	751	1032	108
Switzerland	822	9012	3056	596	9521	213	183	169	12
Netherlands	704	412	13273	441	525	686	2969	1892	2046

The value of bulk carriers in Japan is 39564 million US dollars, Greece – 39853 million US dollars, China – 34735 million US dollars.

In terms of the value of containers, Germany ranks first with 24.166 million US dollars (Germany's largest port is Hamburg). China ranks first in other types of ships. Japan is the leader in all types of ships, Greece, China, USA, Singapore, Norway, Germany, Great Britain, Hong Kong, and South Korea are among the leaders.

7. CONCLUSIONS AND FUTURE RESEARCH PERSPECTIVES

Maritime logistics plays an important role in the development of world trade and economy. Countries with access to the sea or ocean have a developed logistics system. These countries include Germany, Sweden, Belgium, Austria, Japan, the Netherlands and Singapore. In the course of the analysis of the modern development of the world market of transport containers, a steady trend towards an increase in the volume of goods transported in containers has been established. This is explained by the fact that containerization allows increasing the efficiency and competitiveness of logistics enterprises significantly, which is of great importance in the conditions of a market economy.

The development of the system of container transportation by sea transport is a rational way to improve the quality of the organization of cargo transportation, which, thanks to economic efficiency, will allow reducing transportation costs during cargo transportation. The main indicators that determine the vector of strategic development of maritime logistics are: the number of vessels of various types, including depending on the flag, their carrying capacity, time of stay in the port. On the basis of the evaluation of the proposed indicators, the leaders of maritime logistics, who play a leading role in the formation of the international maritime logistics system, were identified, and the prospective directions of their development

were substantiated. Further research is aimed at increasing the role of the maritime logistics system in the development of the “blue economy”.

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ДОСЛІДЖЕННЯ СПЕЦИФІКИ РОЗВИТКУ МІЖНАРОДНИХ МОРСЬКИХ КОНТЕЙНЕРНИХ ПЕРЕВЕЗЕНЬ

Анотація. Стрімкий розвиток контейнерних перевезень у світі вимагає прийняття стратегічних рішень в матеріально-технічному забезпеченні доставки вантажів морським транспортом з метою досягнення ефективного розвитку морської логістичної системи та визначення лідерів морської логістики. У статті розглядається процес контейнеризації на морському транспорті в міжнародному контексті. Цей вид перевезень має масу переваг перед іншими видами вантажоперевезень, серед яких низька вартість, великі обсяги перевезень, чіткі та однозначні правила, правові норми морських перевезень, визначені морські маршрути. В ході дослідження вивчалися країни, що мають вихід до моря або океану. До таких країн належать Німеччина, Швеція, Бельгія, Австрія, Японія, Нідерланди та Сінгапур – країни з розвинутою системою логістики.

Проаналізовано кількісні і якісні показники розвитку провідних портів світу, зокрема кількість суден різних типів, у тому числі залежно від прапору, їх вантажопідйомність, час перебування в порту. Проаналізовано розвиток морської торгівлі в розрізі основних морських шляхів: Non-mainlane East West, North-South, South-South, Intra-regional.

За результатами дослідження проведено класифікацію світового флоту за основними типами суден. У ході аналізу сучасного розвитку світового ринку контейнерних транспортних перевезень встановлено стійку тенденцію до збільшення обсягів вантажів, що перевозяться в контейнерах. Це пояснюється тим, що контейнеризація дозволяє значно підвищити ефективність і конкурентоспроможність логістичних підприємств, що має велике значення в умовах ринкової економіки. Розвиток системи контейнерних перевезень морським транспортом є раціональним засобом підвищення якості організації перевезень вантажів, який завдяки економічній ефективності дозволить знизити транспортні витрати при перевезенні вантажів, а також перспективні напрямки обґрунтовано їх розвиток.

Ключові слова: морська логістика, контейнерні перевезення, торговельні шляхи, економіка судновласників