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Importance of the maritime industry, evolution and statistics

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Abstract. This paper aims to highlight what the maritime industry really means, as well as its contribution to the development of the global economy. In addition to the problems caused by COVID – 19, the maritime industry continues its struggle with other challenges, such as climate, economic, social changes, the new generation of industry 4.0 technologies, especially autonomous ships, which requires the maritime industry to be ready to accept these challenges as an opportunity rather than a threat.

This paper will look at global shipbuilding situations, the biggest shipping companies, which countries have the most ships, where the ships are registered and which are the most famous merchant fleet recycling areas.

The paper will also analyze the situation of the maritime industry, in recent years, regarding the transport of goods at the global, European and national level in order to have an overall perspective of the importance of the maritime industry as well as the statistics for each situation.

Keywords: maritime industry, seaborne trade, merchant fleet, supply chains, economic globalization.

1. Introduction

The maritime industry is much more than the current merchant fleet operating worldwide. This industry includes the fleet of tugs and barges, all port and terminal operations, pilotage, freight forwarding, chartering, intermodal services, industry legislation, recreational services for passengers on specialist vessels, lake and waterway transport interiors, shipbuilding and repair, naval architecture and marine engineering, marine training, government programs and shipping, ship classification, marine insurance, communications, pleasure boating and more.

The maritime industry has contributed to the economic growth of each country and implicitly to the economic development worldwide. The development of modern worldwide transportation systems and

economic globalization has been driven by the shipping industry, the leader of the transportation industry.

In the maritime industry, the term maritime transport refers to the overseas transit of goods using specialized vessels [1, 2]. The shipping industry is also synonymous with global trade as it is the major leader in the trade industry [3]. Today, the maritime industry faces both new challenges and opportunities. More than 80% of global trade is carried out by ships and seaports around the world, highlighting the role of the shipping industry as the backbone of the world economy. [4]. This mode of transport is relatively cheap and efficient compared to other modes of transport, and its importance is not expected to decrease. In addition, the shipping industry has faced various challenges such as social, climate change, economic and most importantly, rapid technological development, which requires the industry to be ready to accept these challenges as an opportunity rather than a threat [5]. Therefore, the new generation of Industry 4.0 technologies, such as autonomous ships, have the potential to address maritime challenges [6].

Figure 1 illustrates the complexity of the maritime industry with many participants and a vast network of relationships between them.

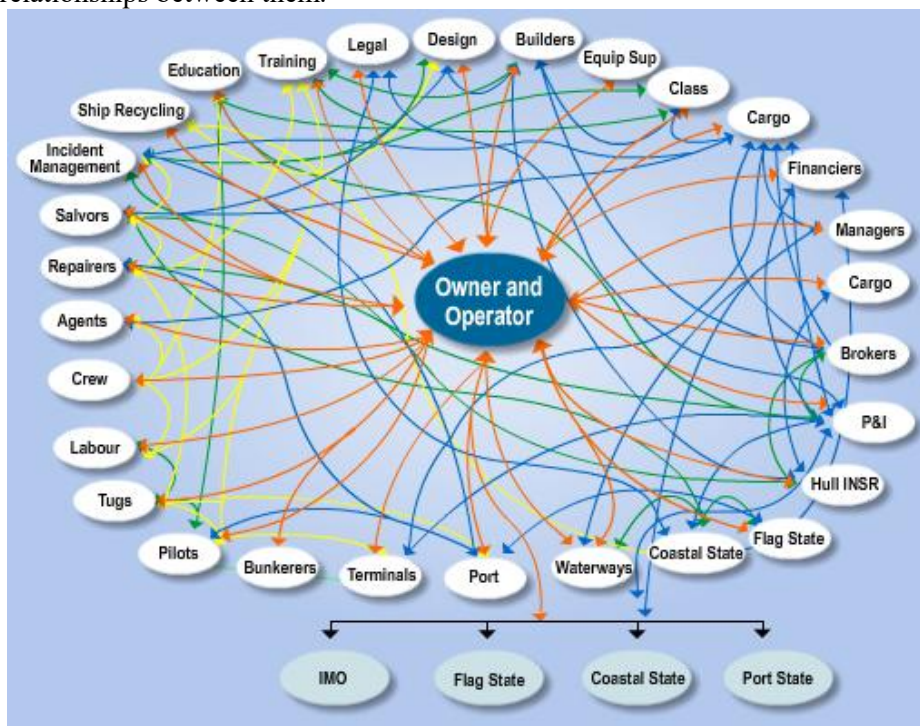


Figure 1. Participating organizations in the maritime industry [7]

This paper aims to highlight the importance of the maritime industry by making aware of all the activities it is responsible for to ensure all the goods and services we need every day. Also, this paper highlights the trend of the maritime industry from the beginning of this century to the present, focusing on the pre-pandemic and post-pandemic period, using real data recorded in various official sources in the field. Therefore, the paper will focus on the defining data for the maritime industry worldwide, European and for Romanian ports in order to better understand what has happened to the maritime industry so far, what is the future trend and especially the future challenges. This type of research is the basis of all research in this field because we need to know what the problems are, what is developing well and quickly, what is required in the future in order to be able to optimize the factors of time, cost and resources in a timely manner in order not to lose keeping pace with market requirements, vital for every port operator. This type of study is also necessary for the academic community to guide research projects towards problematic or successful aspects and last but not least to exemplify to students all the important aspects that this industry involves.

2. Research methodology

The research methodology of this paper is based on the own interpretation of the official data provided by the official organizations in the field of the maritime industry, the emphasis being on what has happened in recent years to actually summarize the recent state of the trend of this industry. The first step is to analyze the important pillars on which this industry is based worldwide: building, owning, registering and recycling ships generating the results achieved worldwide by the fleet of ships of all types. Secondly, the collection of statistical data aims to highlight the global, European and even for Romanian ports the importance of the maritime industry as a world actor in the transport of goods at a global level.

3. Research

3.1. Merchant fleet – an overview

The ship operator is responsible for managing the ship's performance, pricing for the quality and quantity of transported goods, and for scheduling navigation routes [8]. In most cases, ship operators are also ship owners. The largest shipping companies are: A.P. Møller-Mærsk, COSCO, Nippon Yusen and Mitsui OSK Lines.

The design of marine vessels is primarily the responsibility of naval architects. Naval architects carry out the design spiral, an iterative process starting from the main dimensions of the ship and the shape of the hull, to the hull structure, propulsion, stability calculations and other aspects, and finally the design costs will be estimated. A ship design process follows the requirements of the ship owner as well as the rules and guidelines of a classification society. Typically, a ship owner defines the mission the ship should perform (e.g. transporting petroleum products, containers, general cargo, etc.), the cruise speed at which the ship should run at optimal cost, and the maximum cargo weight that can be transported. Strict cost constraints are most often set with respect to the design, construction and operation of the vessel. One of the main concerns of a ship owner is fuel consumption and crew numbers, but he may have other requirements related to ship construction, ship maintenance, etc. There is usually a series of iterations that include interaction between the ship owner and the designer to achieve the desired characteristics of the ship within the cost limits specified by the owner.

Shipbuilding is dominated by a large number of Chinese shipyards and mega South Korean shipbuilding companies such as Hyundai, Samsung and Daewoo. Shipbuilding has always been a labor intensive industry requiring highly skilled workers. It is not uncommon for it to take 2 years to build large cargo ships or cruise ships. However, shipyards are being heavily upgraded with robots and are improving by innovating manufacturing techniques and processes. Due to the high level of complexities, the procedures required and the limited workforce in possession of the necessary knowledge, they often specialized for niche markets, for example: the construction of oil tankers, containers, cruise ships, etc.

There are numerous national, regional and international rules and regulations imposed on ship owners and operators to ensure that their operations are conducted in a safe and secure manner. The most important governing body is the International Maritime Organization (IMO). Because the chain of ownership and management surrounding any ship can span many countries and because ships spend their economic lives moving between different jurisdictions, the IMO was created to develop international standards that govern the maritime industry.

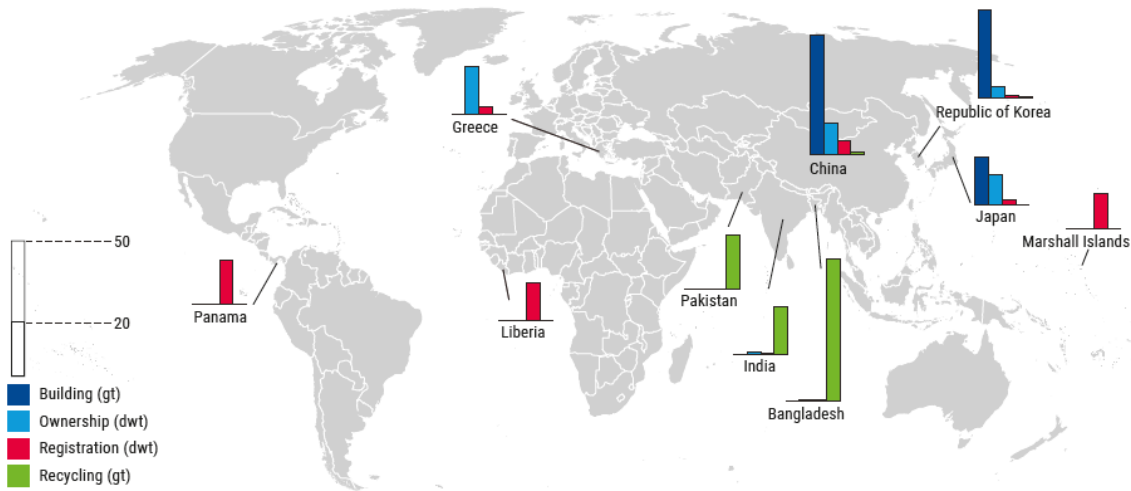


Figure 2. Building, ownership, registration and recycling of ships, 2021 (Percentage of world total) [9]

In 2021, there were no changes in terms of global shipbuilding and recycling areas compared to the previous year, still focusing on the areas of China, the Republic of Korea and Japan. These three economies spearheaded shipbuilding in terms of gross tonnage and accounted for 94%. In terms of ship recycling, there were small percentage changes compared to the previous year for the areas established Bangladesh, India and Pakistan in the sense that they increased by a few percentage points thus, Bangladesh together with Pakistan increased together to 72%, and India is on 3rd place with an increase to 18%. [9, 10]

Regarding the data on the ownership of the fleet of ships, there were no significant changes compared to the previous years, with the countries with a tradition in the field successfully maintaining their positions held until now, and the top 5 ship-owning economies, in the year 2022, represented 53% of the world fleet tonnage.

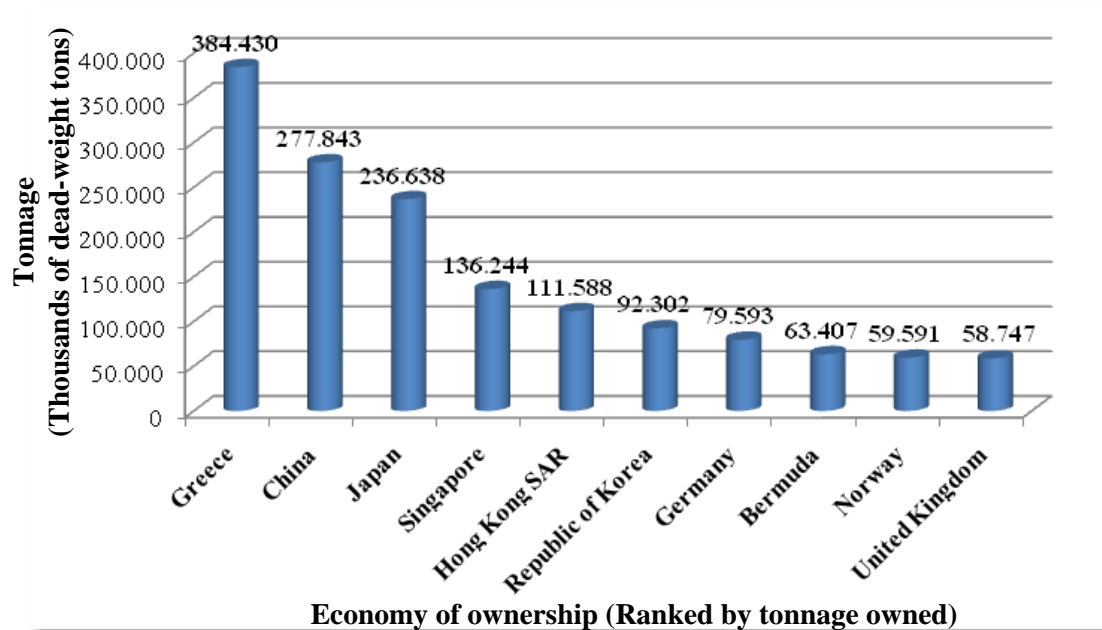


Figure 3. Major economies holding registered tonnage worldwide [9, 10]¹

¹ Graph valid for commercial ships of 1000 gt and above.

Figure 3 exemplifies the world's top 10 economic powers with the largest capacity of ships to transport goods which are registered under different flag states.

Regarding the data on the ownership of the fleet of ships, there were no significant changes compared to the previous years, with the countries with a tradition in the field successfully maintaining their positions held until now, and the top 5 ship-owning economies, in the year 2022, represented 53% of the world fleet tonnage. Greece ranked first with a market share of 18%, followed by China with 13%, Japan 11%, Singapore 6% and Hong Kong SAR 5%. But when we talk about holding the majority in world tonnage (dead-weight), the ranking has a different form, Asian companies holding half of the world tonnage. Owners in Europe saw a slight decrease to 39% and owners in North America held steady at 6%. Companies in Africa, Latin America and the Caribbean had a share of just more than one percent each, and Oceania had just bellow one percent. It should be noted that under the conditions presented in figure number 3, in January 2022, the capacity of the global fleet was 2.2 billion dwt, an increase of 63 million dwt compared to the previous year. [9, 10]

At the beginning of 2022, the global merchant fleet increased by 2.95% compared to the beginning of 2021, which is a historically high product, reaching a total of 102,899 vessels of 100 gross tons or more, reaching the aforementioned global fleet capacity.

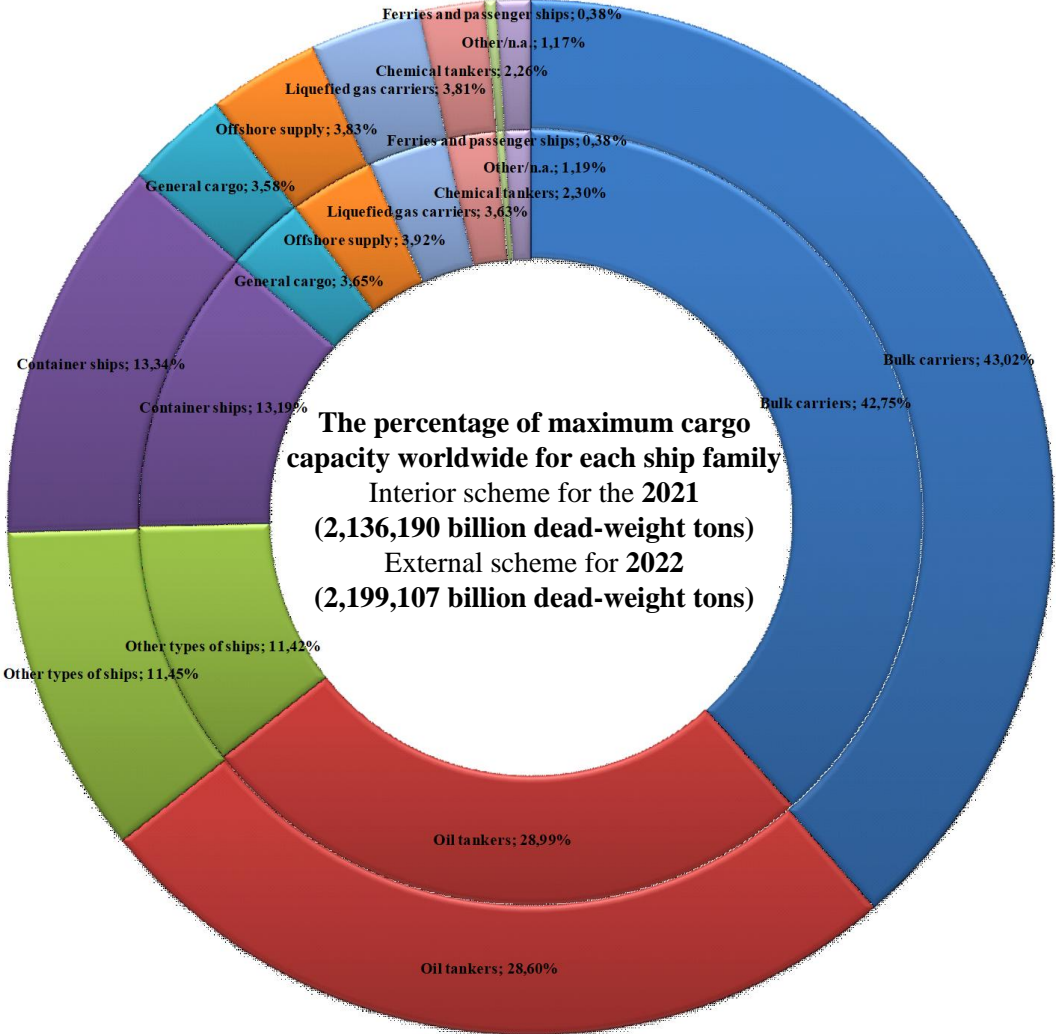


Figure 4. Comparison of leading economies, by ship family, holding worldwide registered tonnage between 2021 and 2022 [9, 10]

Figure 4 shows the percentage change in the maximum load capacity for each family of ships, in the period 2021 - 2022, as well as the comparison between the maximum load capacity for all types of ships, calculation valid for the same period.

As can be seen from figure 4, almost all economies by ship families were increasing or as stable in 2022 as in the previous year, but there were also some that registered small decreases and we can see that oil tankers and general cargo ships had small decreases, but overall the transport capacity of ships worldwide, in 2022 compared to 2021, increased by approximately the average value of goods handled in the port of Constanta during 2020-2022.

Unfortunately, the average age of the global fleet has continued to increase in recent years, and from 2011 to the present, the total fleet has aged by 7.5%, reaching from 20.4 years to 22 years. The newest ships are bulk carriers with an average age of 10 years, followed by container ships 11 years and oil tankers 11.3 years. The world's fleet continues to age as ship owners and operators struggle to meet International Maritime Organization (IMO) restrictions on sulfur limits in marine fuel, meeting air pollution limits from ships and more problems, thus investments in new equipment are difficult to make, and new ships are very expensive and of large capacities. [10, 11, 12]

3.1.1. The state of the global maritime industry

Despite the negative effects of the COVID-19 pandemic on the maritime industry in 2020, in 2021 there was an increase of 3.2%, compared to the previous year, in terms of the traffic of goods transported by sea, continuing to satisfy the requirements of the population worldwide and at competitive costs.

As can be seen from figure 5, the shipping industry has seen a general trend of increasing the volume of goods handled worldwide. Also, technological advances, the continuous development and optimization of specialized terminals by involving modern means of modeling and simulating processes on all levels, the need to adapt to global requirements regarding the increase in the volume of goods have made the maritime transport of goods increasingly as efficiently and quickly as possible. [9, 13]

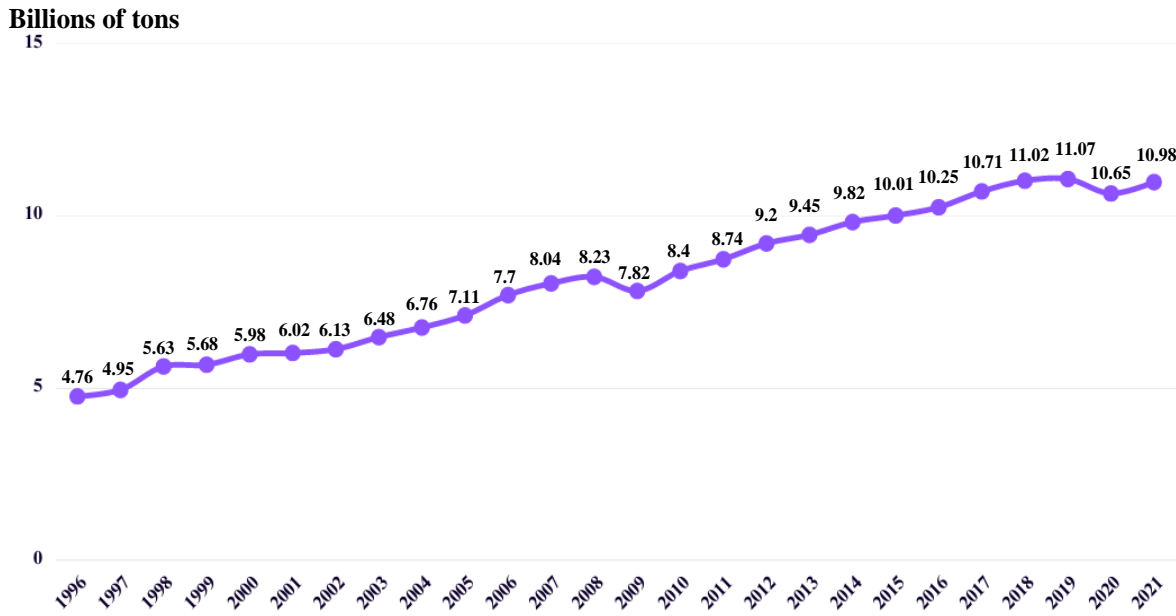


Figure 5. Goods loaded worldwide in the period 1996 - 2021 (billions of loaded tons) [14, 15]

As we have come to expect, Asian ports dominate global cargo handling, handling 4.6 billion tons of cargo or about 42% of all cargo loaded at ports worldwide and discharged 7.1 billion tons or 64% of

the total cargo unloaded worldwide. Looking at the ranking of ports worldwide, it can be easily seen that the first 10 places are occupied by Asian ports in terms of handling different types of goods. [16] The changing trend in cargo requirement is an important aspect to consider for the future of this industry as the requirement has shifted toward the transportation of dry cargo including bulk and container rather than petroleum products.

3.2. The situation of the maritime industry regarding the transport of goods at the European and national levels

In 2021, a gross cargo weight of 3.5 billion tons was handled in the EU ports, which meant an increase of 4.1% compared to 2020. This increase shows a partial recovery of the maritime industry, which collapsed due to the COVID-19 pandemic and the subsequent restrictions imposed in the EU and around the world, registering in the year 2020 a significant decrease comparable even to what happened in the period 2009-2014, due to the global economic crisis.

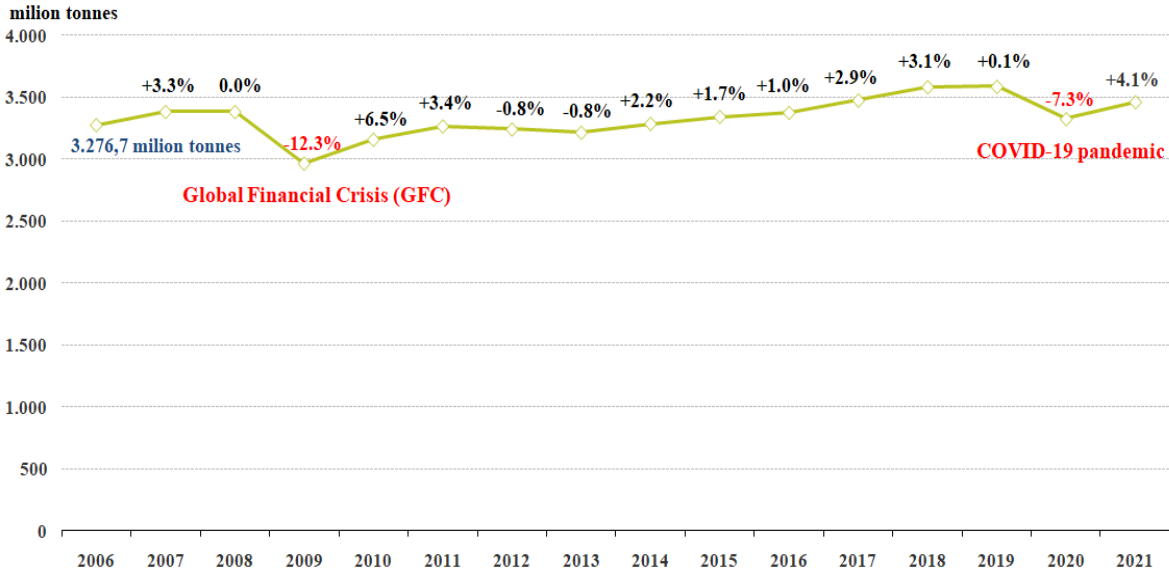


Figure 6. Gross weight of seaborne freight handled in all EU ports in the period 2006 – 2021 (million tonnes) [17]

At the European level, the Netherlands continues to lead the statistics on the volume of cargo handled in Dutch ports. In 2021, 590 million tons of cargo were handled in Dutch ports, which represents 17% of the total cargo handled in EU ports in 2021. The Netherlands was followed by Italy with 14.5% and Spain with 13.8%. Between these two top places, an important competitor is Türkiye, which handled 520 million tons of goods in 2021.

Compared to 2020, the year in which the COVID-19 pandemic caused major problems for the maritime transport industry, most European countries registered growth in maritime cargo transport activity. Therefore, Romania was in first place with a relative increase of 12.5%, followed by Slovenia, Poland and Belgium with more significant increases, but below 10%. At the opposite pole, with the biggest relative declines were Malta with -41.3%, as in 2021 the construction and transport industry stopped and there was no more requirement for dry bulk cargo, Cyprus, Finland, Latvia and Lithuania with percentage decrease below 10%.

In terms of the top 5 EU ports with the highest port activity regarding cargo handling, Rotterdam remains by far the port with the highest activity in all cargo areas except mobile Ro-Ro units. In the second place is Antwerp-Bruges, in third and fourth places are Hamburg and Amsterdam, and in fifth place is HAROPA whose products are registered in figure 7. The classification of ports was done according to the gross weight of goods handled in the third semester of 2022.

As can be seen in figure 7, the port of Hamburg recorded a decrease of 3.8% and the port of Rotterdam maintained its stability. The highest increase was achieved by HAROPA at 7.8%, and Amsterdam and Antwerp-Bruges maintained the upward trend with 7.3% and 2.3% respectively.

It is important to note that starting from 2022, the ports of Antwerpen and Zeebrugge have merged and the data is reported under the name Antwerp-Bruges and also the ports of Le Havre and Rouen are reported under the name HAROPA.

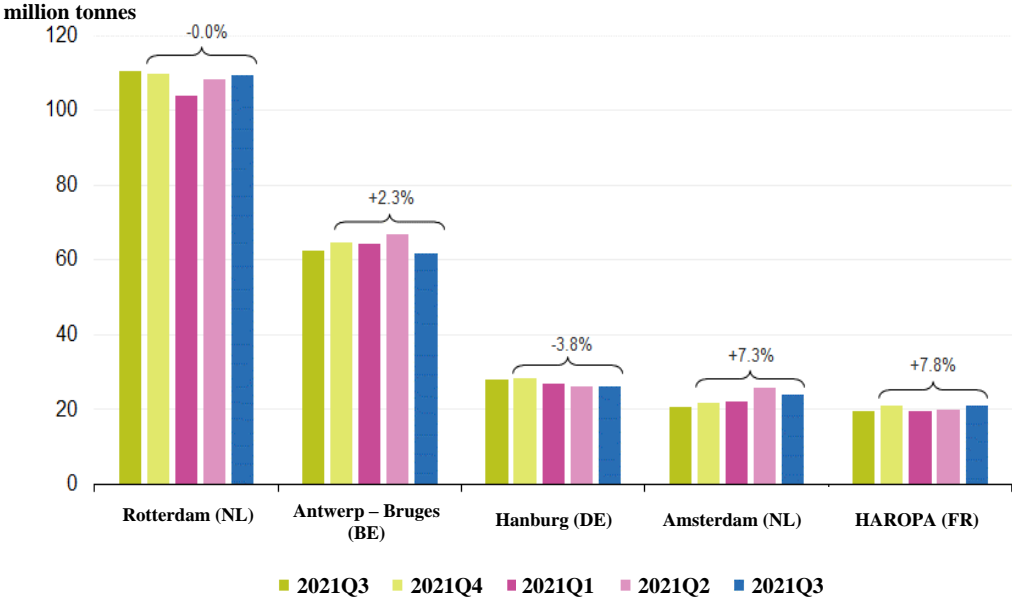


Figure 7. Top 5 EU maritime ports, 2021Q3-2022Q3 (million tonnes) [18]

If we analyze the statistics on the types of goods transported in the main European ports, we can see that in the third quarter of 2022, the transport of containerized and mobile Ro-Ro units suffered decreases compared to the same period of 2021. In contrast, dry bulk goods, liquid bulk goods and general cargo registered increases. These fluctuations are shown in figure 8.

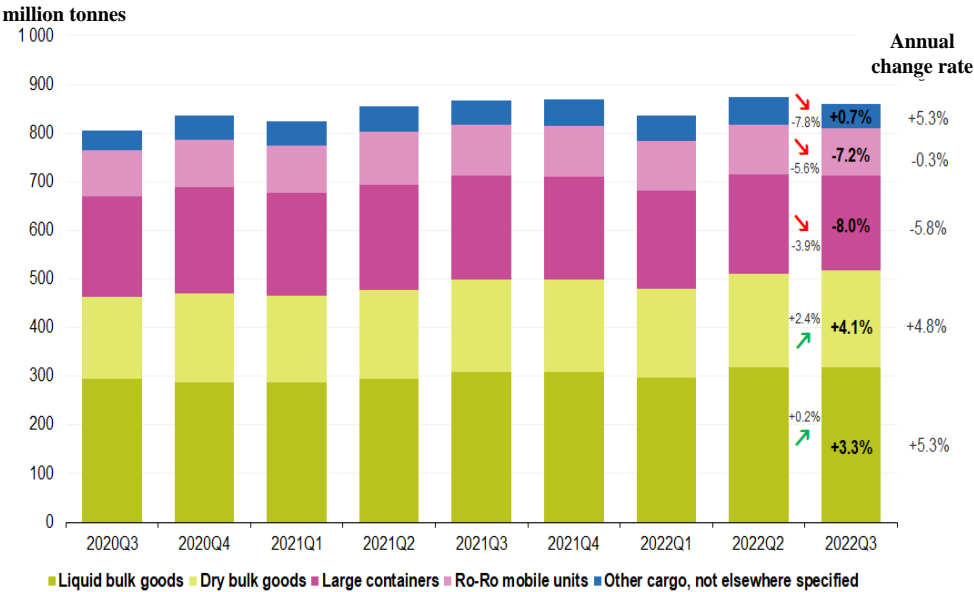


Figure 8. Gross weight of seaborne goods handled in main EU ports by type of cargo, 2020Q3-2022Q3 (million tonnes) [18]

Constanța Port is located at the intersection of trade routes connecting the markets of the landlocked countries of Central and Eastern Europe with Transcaucasia, Central Asia and the Far East. It is the main Romanian port on the Black Sea and plays a crucial role as a transit hub for the landlocked countries of Central and South-Eastern Europe.

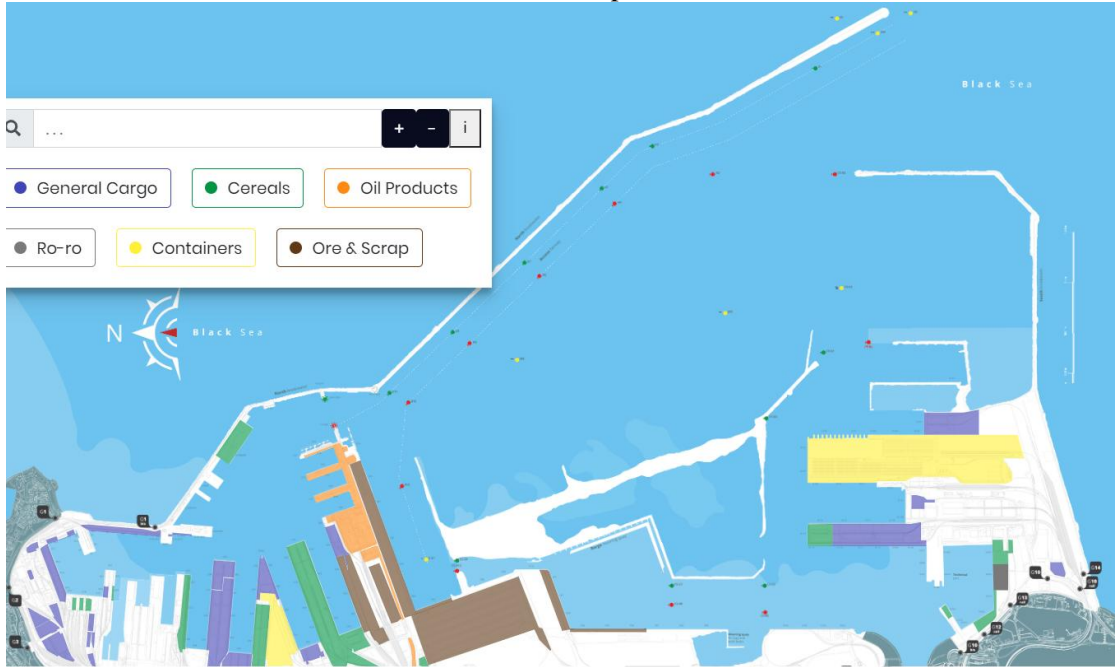


Figure 9. Overview of the port of Constanța with examples of the most important cargo terminals [19]

The total traffic of goods in Romanian seaports registered in 2021, 67.5 million tons, up 11.8% compared to 2020, reaching a new record in the history of Romanian seaports, according to data published by CN APMC, the company that administers the two ports (Constanța and Mangalia).

The previous record of 62.3 million tons was set in 1988.

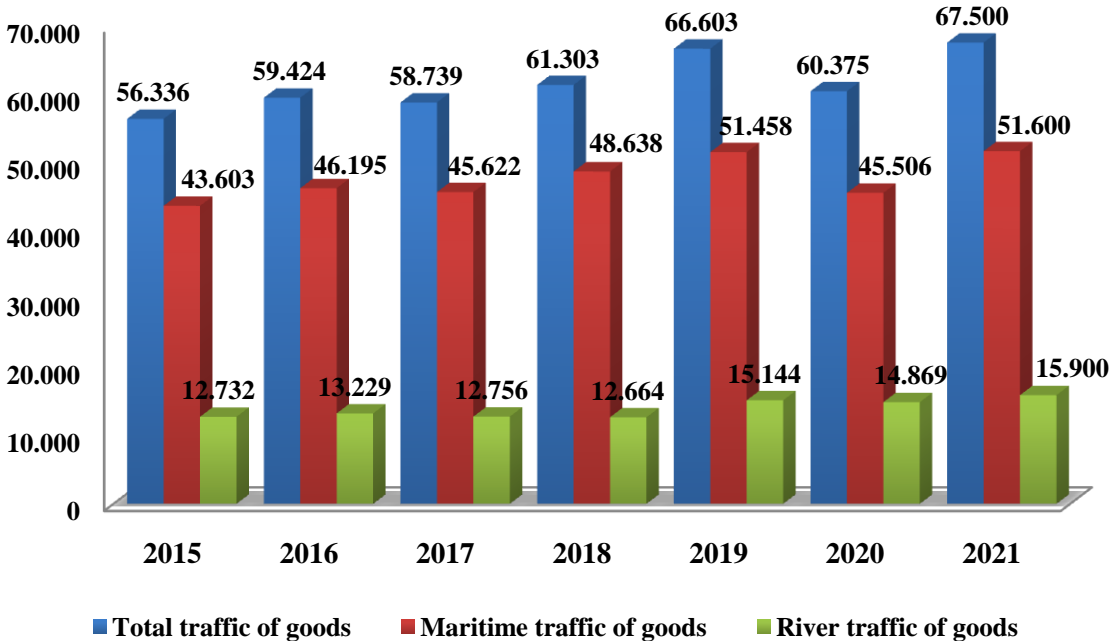


Figure 9. Overview of the port of Constanța with examples of the most important cargo terminals [20]

Constanta's ports also experienced an intense activity (61.8 million tons of traffic) in 2008 before the economic crisis. Of the total traffic in 2021, the largest share (37.3%) was held by grains, followed by crude oil (10%), petroleum products (8.1%), iron ore, scrap iron (7.1%), fertilizers (natural and chemical, 6.1% in total) and solid mineral fuels (5.1%).

Of the total traffic, 76% is maritime traffic and 24% is river traffic. Both sea and river traffic increased significantly.

Maritime traffic increased by 13.4% in 2021, reaching 51.6 million tons, while river traffic increased by 6.7%, reaching 15.9 million tons.

4. Results

This paper presents an overview of the main features of the maritime industry. Through the methodology applied regarding the study of the literature in the field and the interpretation of the reported values, it is desired to highlight the importance of the maritime industry as the main actor in terms of globalization as well as the trend in recent years (containerization), thus obtaining the following results:

- above 80% of world trade volume and more than 70% in value is done with the help of the maritime industry infrastructure;
- shipping by sea is the cheapest and most efficient compared to other modes of transport, especially at threshold distances of greater than 500 nautical miles;
- international shipbuilding standards are governed by the International Maritime Organization (IMO), and the strongest shipyards are in China and South Korea (Hyundai, Samsung and Daewoo);
- the poles regarding the construction, ownership, registration and recycling of ships worldwide are well defined and in very large proportions owned by 3 countries each, of course where the legislation is more attractive for each individual field;
- the transport capacity of the global fleet as well as the traffic of goods is on an upward slope, the transported goods being more than doubled in 25 years, but the average age of the ships is increasing. Asian ports are the main dominating ports of cargo handling worldwide;
- the COVID-19 pandemic affected the trend of the maritime industry, being affected the transport of absolutely all types of goods, but in 2021 there was an increase of 3.2% compared to the previous year, which proves the resilience of this industry;
- European ports, especially those in the Netherlands, Italy, and Spain, play a vital role in the movement of goods worldwide;
- European ports record performance from year to year, and continued investment in their automation and expansion is a priority;
- at the national level, the port of Constanta has demonstrated that it can perform, recording in 2021 a historical maximum of handled goods.

5. Conclusions

The maritime industry is the backbone in the development of global trade, playing an important role in the economy of every developed or developing country, greatly supporting the development of port areas. More than one and a half million people around the world serve this maritime sector for the smooth functioning of the entire chain with the main purpose of distributing goods through different types of ships depending on the situation, which once again proves the importance of this industry. Also, the maritime industry is the most efficient way to transport goods over long distances, thus being able to export goods to areas where they are not found (for example coffee and many other retail goods), and the fact that over 50% of the world's population lives less than two nautical miles from a sea or river area, proves that ships are all around us, they are the main engine of this industry. Without the maritime industry, our daily lives would change and we couldn't imagine what it would be like if we didn't have all the goods and conveniences we enjoy today.

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