



Volume 121

2023

p-ISSN: 0209-3324

e-ISSN: 2450-1549

DOI: <https://doi.org/10.20858/sjsutst.2023.121.9>

Journal homepage: <http://sjsutst.polsl.pl>



Article citation information:

Macioszek, E. Jurdana, I. Transport of goods on the example of a selected section of transport in Poland. *Scientific Journal of Silesian University of Technology. Series Transport*. 2023, 121, 127-140. ISSN: 0209-3324. DOI: <https://doi.org/10.20858/sjsutst.2023.121.9>.

Elżbieta MACIOSZEK¹, Irena JURDANA²

TRANSPORT OF GOODS ON THE EXAMPLE OF A SELECTED SECTION OF TRANSPORT IN POLAND

Summary. The article presents the issue of the transport of goods in relation to sea transport. Sea transport has been known to mankind for a long time. Currently, maritime transport is not limited only to the transport of goods and/or passengers along sea routes, which are carried out between seaports using appropriately adapted means of transport. It is a branch of transport, which consists of a very good knowledge of navigation, highly specialized staff, and a wide range of containers for transporting various types of cargo, often requiring specialized conditions. In addition, sea transport is perfectly combined with intermodal transport, so that in the end, the transport process is the most beneficial for all participants, i.e., the customers, sellers, distributors, and manufacturers. The main purpose of the article was to present the volume of goods transported in this branch of transport. The article, after introducing the issue, presents the classification of sea vessels, refers to the market of maritime transport services and its conditions for further development, and analyzes the overall volume of goods transported in the seaports of Gdańsk and Gdynia against the background of other Polish seaports in the years 2011-2021.

Keywords: sea transport, transport, maritime transport services market

¹ Faculty of Transport and Aviation Engineering, The Silesian University of Technology, Krasińskiego 8 Street, 40-019 Katowice, Poland. Email: elzbieta.macioszek@polsl.pl. ORCID: <https://orcid.org/0000-0002-1345-0022>

² Faculty of Maritime Studies, University of Rijeka, Studentska Ulica 2, HR-51000 Rijeka, Croatia. Email: irena.jurdana@pfri.uniri.hr. ORCID: <https://orcid.org/0000-0002-3287-1383>

1. INTRODUCTION

In general, transport means the movement of people and goods using appropriate means of transport. Transport is divided into road transport, rail transport, air transport, and sea transport. Different means of transport can be distinguished (e.g., car, bicycle, tram, passenger ship, plane, train, bus, etc.), forms of transport (e.g., public transport, by bike, by private car, on foot, by boat, by plane, etc.), and various transport functions (primary and secondary). There are many classifications of transport due to the adopted criteria [19, 20, 23].

Water transport means the transport of passengers and cargo using water vessels through waters, e.g., seas, oceans, and rivers, from the source port to the destination port. Water transport is further divided into sea transport (long and short) and inland waterway transport. Despite the rapid development of other forms of transport and the fact that water transport is not the fastest form of transport, it is still used on a large scale (mainly due to relatively low transport expenses). Relatively low transport expenses are one of the main advantages of this form of cargo transport. In addition, the ships are characterized by a very high load capacity, thanks to which it is possible to transport many more goods at one time than using any other form of transport. The disadvantages of this form of transport include mainly the long duration of the entire transport process, which is much longer than in the case of other forms of transport. The transport of goods by sea is carried out mainly by ships. Maritime transport is divided into coastal, domestic, and international.

According to the regulation of the European Union [9], a seaport is an area of land and water where there is such infrastructure and equipment that allow for receiving ships, their loading and unloading, storage of goods, collection and delivery of these goods, and embarkation and disembarkation of passengers, crew, and other persons, as well as any other infrastructure necessary in the port area. On the basis of various definitions of a seaport available in the scientific literature, seaports can be classified according to their geographical location and technical functions, i.e., a port should consist of appropriate infrastructure, technology, and labor resources. A seaport performs specific transport functions in terms of passengers and goods [11, 22, 27].

Currently, seaports have greatly developed their importance, which is why a seaport should be perceived not only as a transport or geographical element but also as a logistic, economic, administrative, and social factor that provides integrated logistics services. Due to the importance given to them, seaports must constantly develop [14, 26]. The condition for a properly functioning port is a constantly improved IT and telecommunications system. In order to increase their efficiency and effectiveness, seaports decide to build logistics and distribution centers as a separate unit because it is a determinant of logistics competitiveness and market position [30]. Their task is to collect, analyze and transfer information about loads and means of transport, thanks to which they can efficiently manage the logistics transport chain [2, 21]. Seaports are also an integral hub connecting many different companies in land and sea transport. They serve as the points of sending and receiving cargo, and larger ports, which are an important part of coastal areas and port cities, are the whole of the complex production mechanism. In addition, seaports are characterized by complexity based on the international flow of goods and diversified industrial and commercial activities [6, 16, 28].

The main purpose of the article was to present the volume of transport of goods in this branch of transport. The article, after introducing the issue, presents the classification of sea vessels, refers to the market of maritime transport services and its conditions for further development, and analyzes the overall volume of goods transported in the seaports of Gdańsk and Gdynia against the background of other Polish seaports in the years 2011-2021.

2. SEA-SHIP CLASSIFICATION

According to [13, 15] sea transport ships in general can be classified as:

- cargo ships:

- for the transport of dry cargo (general and bulk carriers),
- for the transport of bulk liquid and dry cargo,
- for the transport of liquid cargo (tankers): for the transport of oil, chemical tankers and gas tankers,

- passenger ships:

- passenger liners,
- excursion,
- passenger ferries,
- car and passenger ferries,

- passenger-cargo and cargo-passenger ships:

- universal, conventional passenger and cargo ships,
- passenger and cargo ferries.

There are many different types of ships that are designed to transport certain types of cargo. Ships may also be classified by ship type as: gas carriers, oil and product carriers, chemical carriers, other tankers, combined bulk carriers, bulk carriers, self-discharging bulk carriers, other bulk carriers, passenger and general cargo carriers, general cargo carriers, container carriers, refrigerated carriers, timber carriers, ro-ro general cargo carriers, ro-ro passenger cargo ships, passenger ships, cruise ships, other dry cargo ships, vessels for various activities, fishing vessels, other fishing vessels, offshore supply ships, other offshore ships, pushers and tugboats, dredgers, research vessels and others, e.g. transport of one specific liquid cargo (e.g. juice, wine, water, oils, etc.). The most numerous groups of vessels are tankers, fishing catching vessels, pushers and tugboats, general cargo vessels.

Container ships are ships equipped with guides, intended for transporting containers in which loading and unloading takes place vertically. Bulk carriers are ships designed to transport goods without packaging. These goods are placed in a specially separated hold, thanks to which a large amount of cargo can be transported. Bulk carriers mainly transport dry cargo in bulk, such as ore, coal, grain, etc. They are also used to transport semi-bulk goods, such as packaged wood, sheets, rails, rolls of paper, and even containers. General cargo - as the name suggests - are used to transport general cargo, i.e. individual elements that are placed in crates, barrels, and bags. Thanks to the appropriate design and advanced technology, tankers (ship-tank) are used to transport chemical liquid substances. They are most often associated with the transport of crude oil. In turn, LNG carriers are used to transport gas in a volatile state. Refrigerated vessels are used to transport perishable products, the transported goods are placed in specially cooled holds. In addition to the fleet performing commercial, tourist, passenger and service functions, military ships can also be distinguished. Units of this type are used to perform military operations. Examples of selected ship types are shown in Fig. 1.

a). Container ship coming from the Atlantic Ocean along the Tagus River to the port of Lisbon (Portugal)



b). Loading of container ships at the logistics center in Barcelona (Spain)



c). Dredger off the coast of the Tyrrhenian Sea (Italy)



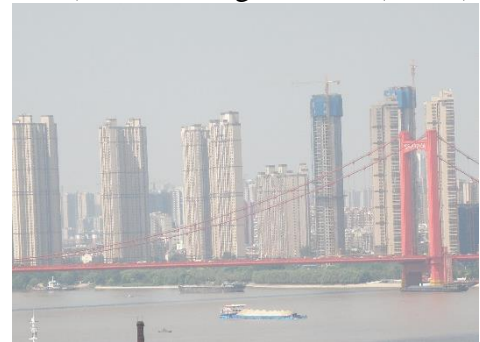
d). Lumber ship on the Yangtze River (China)



e). Tanker on the Yangtze River (China)



f). Ship for the transport of bulk materials (e.g. sand) on the Yangtze River (China)



g). Chemical/Oil tanker na morzu północnym w Badstrand Vlissingen (Holandia)



h). Specialist vessels for transporting barrels, Douro river, Porto (Portugal)



i). Fishing vessels in the Atlantic Ocean, Essaouira (Morocco)



j). Military ship off the coast of the island of Rhodes (Greece)



k). Yacht off the coast of Hydra Island (Greece)



l). Passenger liner off the coast of the Aegean Sea (Greece)



m). Passenger liner off the coast of the Mediterranean Sea (Spain)



n). Passenger ship on the Yangtze River (China)



o). Water tram on the Vistula River, Warsaw (Poland)



p). Tourist ship on the Yangtze River (China)



Fig 1. Examples of ships performing various transport functions
Source: own photo documentation

3. MARKET OF MARITIME TRANSPORT SERVICES AND ITS DEVELOPMENT CONDITIONS

In the scientific literature on the subject, a service is defined as any activity or benefit offered by one party to another [25]. The basic features of services include intangibility, impermanence, simultaneous production and consumption processes, non-uniformity, and a lack of possibility to acquire ownership [7]. In addition to the listed features above, services should also have features such as perishability, location, variety, and quality [8, 17]. The service sector is a very diverse and extensive sector of the economy. Each type of service, regardless of its purpose, should be precisely defined, depending on the industry. Services are developing as fast as technologies or variously emerging innovations related to various sectors of the economy. When purchasing a specific service, the customer expects not only to satisfy his needs, but also to receive additional benefits of the highest quality. The variety of services results from the variety of buyers. For many people, an important criterion will be the location and convenience of purchase, and for others, the low price of the service. Due to its specific nature, the buyer has great difficulty comparing the services available on the market. Such a situation influences the consumer's perception of the services offered on the market as unequal products [8, 18].

Using the concept of the distribution of goods, proposed by P. Nelson, M.R. Darby and E. Karni [7], in the classification of services, one can distinguish the so-called trust products. In the case of this type of service, it is difficult to assess the quality of the service even after its purchase, e.g., educational services and experienced products. The quality of the sea freight service can be assessed during or after the purchase of the service, so it counts as an experienced product.

Seaports are a link in maritime logistics, connecting various types of organizational and technological activities, leading to the movement of cargo from the place of production to the place of consumption. They are adapted to provide such types of services as [1, 10, 24]:

- disposition services related to the organization and planning of the transport of goods in land-sea relations,
- technical and executive services (active services), which in turn are divided into three main categories: technical and nautical services, which include activities such as towing, pilotage, mooring; cargo services, including loading, quantity and quality control, reloading, storage, unloading, distribution services, and others; and services related to passengers, which include embarkation and disembarkation at port terminals,
- services related to various types of facilitation and facilities (passive services), include activities related to enabling the safe entry, stay and departure of the ship and cargo in the port, as well as securing roads and the possibility of resuming transport in land-sea relations, or even enabling the organization of comprehensive transport and commercial services.

The quality of the services provided is one of the most important factors of competitive advantage. The general list of quality features of services and their measures includes [1, 10]: massiveness, speed of service provision, availability, reliability, pro-environmental character, safety, professionalism, and completeness.

4. TRANSPORT OF GOODS IN THE SEA PORTS OF GDAŃSK AND GDYNIA IN 2011-2021

The maritime potential of Poland is related to its direct access to the Baltic Sea, where the length of the coastline reaches 788 km. In terms of transport, the Baltic Sea is the most exploited of all water bodies in the world. Every year, around 400,000 ships leave or enter the Baltic Sea, while around 2,000 vessels may be at sea at a time. Due to the connection with the Pacific Ocean as well as the most important sea routes leading through the Danish Straits, the size of passing sea vessels is limited [12, 30]. The main seaports in Poland where specialized handling of various high-quality cargo is carried out include the seaports in Gdańsk, Gdynia, Świnoujście and Szczecin. These ports are significant links in the basic trans-European transport network TEN-T, in the Baltic-Adriatic water channel.

According to the data presented by the Central Statistical Office in Poland [4], cargo turnover, passenger traffic and the number of ships calling at Polish seaports increased in the last year. In international transport, an increase in cargo transported by the sea fleet by Polish carriers and an increase in passenger transport were recorded. At the end of 2021, the maritime transport fleet had fewer ships than a year ago, which resulted in a slight decrease in their total deadweight and gross tonnage. The number of units in the Polish fishing fleet has not changed, but their total gross tonnage and engine power have increased. Cargo turnover in seaports in 2021 amounted to 96.7 million tonnes, i.e., 9.2% more than in 2020. An increase in turnover was recorded in Świnoujście (by 13.7%), Gdańsk (by 11.0%), Gdynia (by 7.2%) and Szczecin (by 3.4%), while a decrease was recorded in the port of Police (by 16.1%). The volume of transshipments enables a precise assessment of the position of given seaports on the competitive market. This is a feature that proves the dynamics of economic development. Depending on the economic situation, the volume of cargo transport in the ports of Gdynia and Gdańsk changes. Fig. 2 shows the total cargo turnover in the seaports of Gdynia and Gdańsk, as well as in the seaports of Szczecin and Świnoujście for comparison.

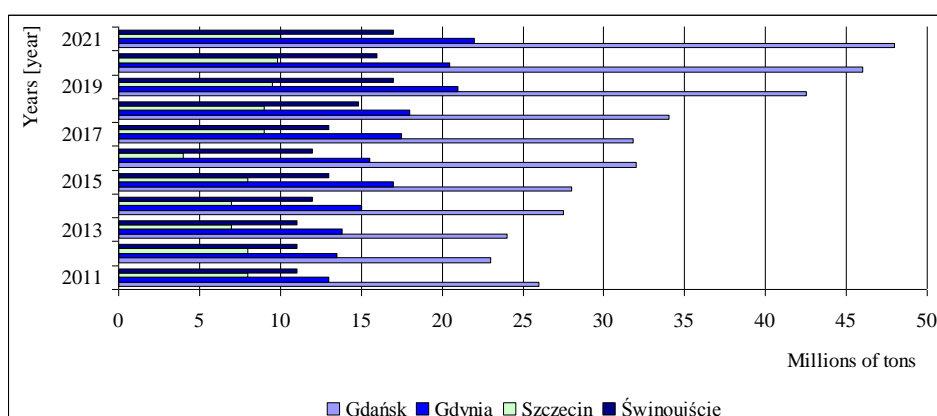


Fig. 2. Cargo turnover in Polish seaports in 2011-2021

Source: own research based on data presented in Central Statistical Office in Poland [5]

Based on the data presented in Fig. 2, it can be concluded that the port of Gdańsk has by far the highest turnover of goods compared to other Polish ports. In 2020, the volume of this turnover reached over 45 million tonnes, which accounted for 48% of the total cargo turnover this year in all ports in Poland. In other ports in Poland, i.e., in Gdynia, Świnoujście and Szczecin, the volume of transported cargo is definitely lower than in the port of Gdańsk,

but the annual growth trend of transported cargo is also visible. Comparing the average value of transported cargo in the port of Gdańsk in the years 2011 to 2021, it can be stated that it increased by approximately 53.6%. The average annual growth rate is 4.9%. The largest increase can be seen in 2019, compared to the previous year, by as much as approximately 25%, i.e., 8.5 million tonnes. In Gdynia, cargo turnover in the analyzed period increased by almost 72% with an average annual increase of 5.8%. The largest increase was in 2019, which reached 2.5 million tonnes (13%). The turnover in this port decreased in 2016 (8.6%), and in 2019 by 2.7% compared to previous years. Summing up, it can be said that both ports, the port in Gdańsk and the port in Gdynia, increased the turnover of goods by over 50% in the analyzed period. This proves the very good technological and logistical development of these ports. In this way, these ports strengthened their competitive position in relation to other ports, i.e., the port in Szczecin or the port in Świnoujście.

Fig. 3 shows the share of individual ports in total cargo transport in seaports in Poland during the analysis period. This figure confirms by far the largest share of the port of Gdańsk in the transport of goods carried out in Polish ports.

According to the data presented on the official website of the city of Gdańsk [29], in the first three months of 2022, 14.802 million tons of cargo were handled in the port of Gdańsk, which is an increase of 11.3% compared to the first quarter of 2021. This places the port of Gdańsk in second place among the ports on the Baltic Sea, after Ust Luga (Russia) with a volume of transshipment of 26.1 million tons, and ahead of two other Russian ports, such as Primorsk and Saint Petersburg. The largest cargo group at the Port of Gdańsk is still general cargo, which accounts for approximately 6 million tonnes (an increase of 2% compared to 2021). In second place are liquid fuels, for which an increase of 25.7% was recorded, reaching a result of 5.7 million tonnes. There was also an increase in the transport of coal, with over 1.6 million tons transhipped, container transport (9% more), passenger transport (12.3% increase), and Ro-Ro cargo transport (19.6% increase). In 2022, a record amount of wood was transported: in the first quarter of 2022, it was 3,535% more than in the same period of 2021. In addition, after the first quarter of 2022, the port of Gdańsk, with a result of 561,396 TEU (20-foot container) and an increase of 9%, maintains the first place in the transshipment of containers on the Baltic Sea. The next place is the port of Saint Petersburg - 437,858 TEU, and the port of Gdynia - 237,712 TEU. Currently, the Port of Gdańsk serves 21 regular sea connections. This port is the only Baltic port that supports direct container connections with China. The largest transoceanic vessels in the world call at the port, requiring deep-water berths.

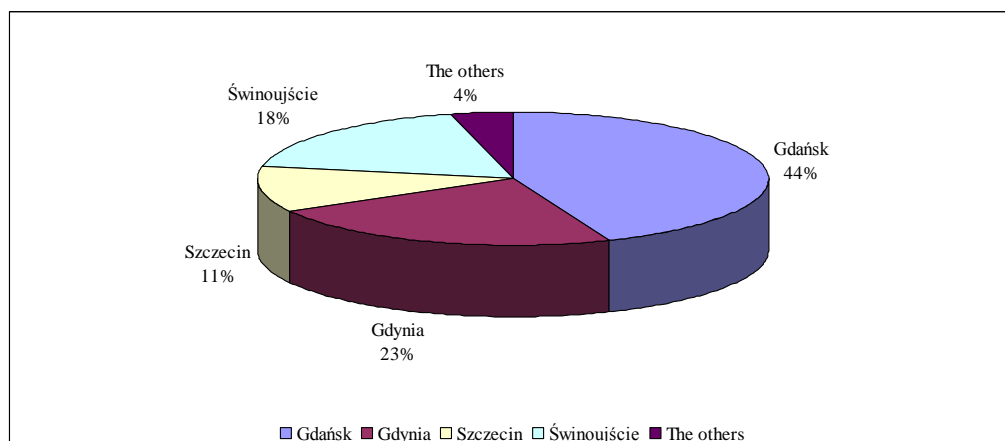


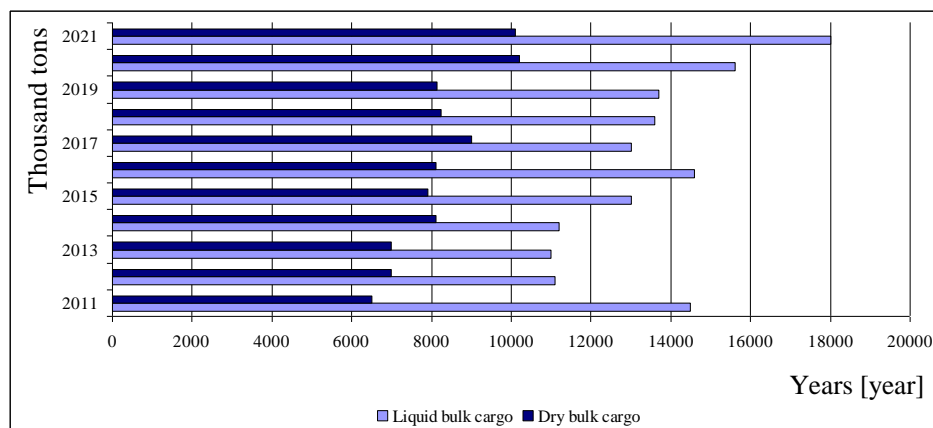
Fig. 3. Share of Polish seaports in the transport of goods in 2011-2021

Source: own research based on data presented at the Central Statistical Office in Poland [5]

Taking into account the types of transported cargo, it should be stated that in the analyzed period, dry bulk cargo was the most transported (34%, including coal and coke 33%), as well as liquid bulk cargo (25%, including crude oil 77%). In the transport of goods, there is an equal and significant share of transport of goods in large containers, self-propelled rolling containers, non-self-propelled rolling containers, and the transport of other types of general cargo.

In the analyzed period, the transport of liquid bulk goods dominated in Gdańsk (38%) (Fig. 4). In 2011, the volume of this transport amounted to 14.8 million tonnes, while in subsequent years, fluctuations in the volume of transport of liquid bulk goods can be observed. Ultimately, the level of turnover increased by 22%, reaching almost 18 million tonnes. In turn, in the port of Gdynia, the same category of goods remained at an average level of about 1.5 million tons of transport per year. In 2017, there was significant progress in the transport of liquid bulk goods compared to previous years (an increase of 132%). On the other hand, the transport of dry bulk goods was definitely higher in the case of the port in Gdynia than in the port in Gdańsk and amounted to 32% of the total transported goods. The average volume of transported goods remained at 6.5 million per year, the largest increase was recorded in 2013 (which was an increase compared to the previous year by approximately 20%).

a).



b).

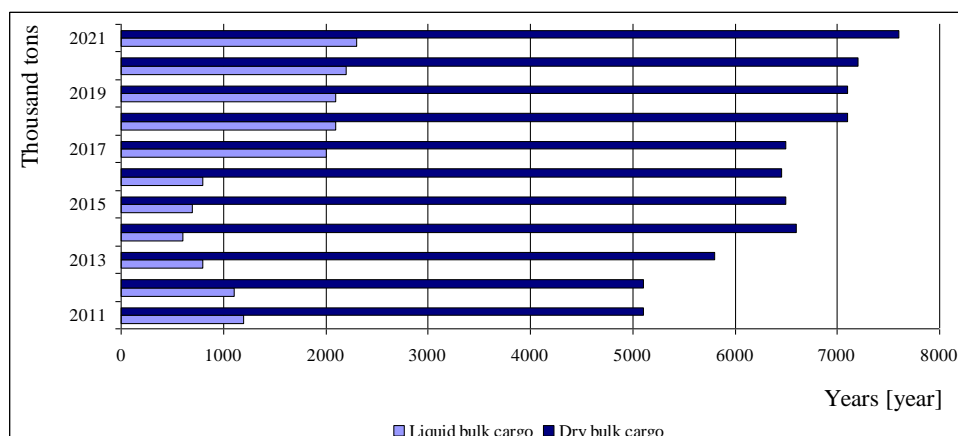


Fig. 4. Transport of liquid bulk cargo and dry bulk cargo in seaports
 a). in Gdańsk; b). in Gdynia in 2011-2021

Source: own research based on data presented in Central Statistical Office in Poland [5]

Considering the directions of transported goods, it should be stated that in the case of both seaports, transport to other European countries dominated. In the analyzed period, in the case of the seaport in Gdańsk, transport to other European countries amounted to 96.3 million tonnes, in the case of the port in Gdynia 56.3 million tonnes. The share of goods transported to the rest of the world was as follows [5]:

- Asia - Gdańsk 16%, Gdynia 7%,
- Africa - Gdańsk 10%, Gdynia 5%,
- North America - Gdańsk 4%, Gdynia 3%,
- Central and South America - Gdańsk 3%, Gdynia 11%,
- Australia and Oceania - Gdańsk 3%; Gdynia 1%.

The modern maritime economy is characterized by high-quality services, a high level of information technology, and modern solutions. Undoubtedly, an efficient and constantly improving logistics system as well as rich facilities in seaports in the form of, among others, ships and navigation devices affect the appropriate level of customer service, which in turn contributes to a higher competitive position on the market. Fig. 5 shows the size of the sea transport fleet in 2021 (status as of December 31, 2021).

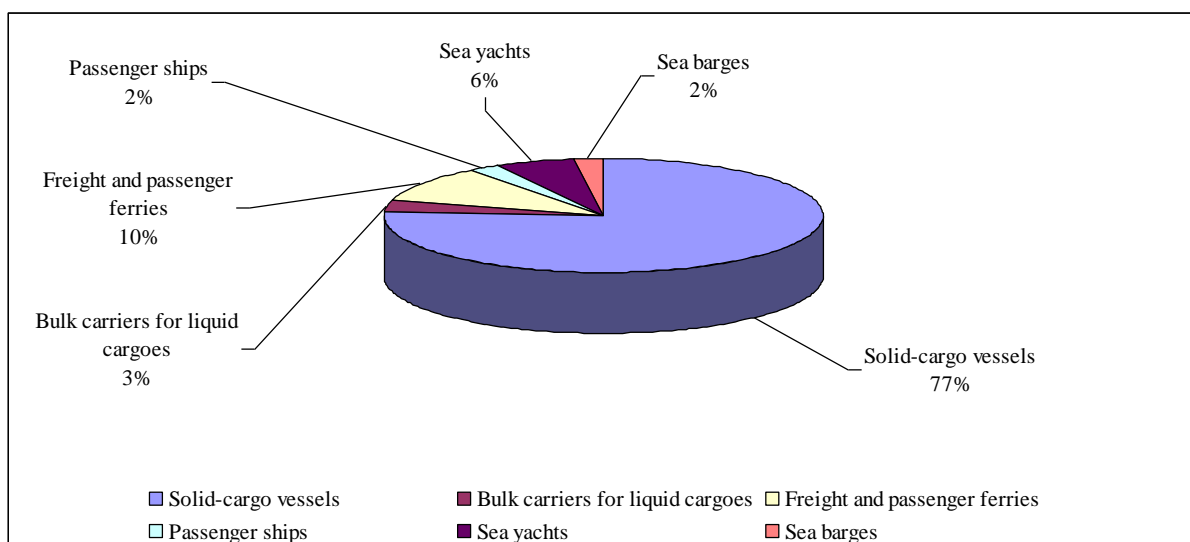


Fig. 5. Sea transport fleet in 2021 (status as of December 31, 2021)

Source: own research based on data presented at the Central Statistical Office in Poland [4]

As shown in Fig. 5, the largest group of ships for the analyzed ports in Poland in 2021 were solid-cargo vessels (77%), followed by freight and passenger ferries (10%). The share of other types of vessels was lower than 10%.

5. SUMMARY

The sea transport of goods is the most economical type of transport. It allows the transport of almost any types of goods, regardless of their size, type, and quantity. It is distinguished from high-speed air transport by its low cost. However, a significant difference is the time of the transport service, which is usually counted in weeks (depending on the length of the transport route). The most popular forms of sea transport are groupage transport (LCL - Less Container

Loading), and full container transport (FLC - Full Container Loading). Groupage transport (LCL) allows to ship both a single item, e.g., a package, and 20 pallets. This transport is also carried out in sea containers, which perform protective functions for the transported goods. Full container transport (FLC) is used in the case of large orders, in which the amount of transported goods is at the level of several tons and several dozen cubic meters.

Polish seaports (Gdańsk, Gdynia, Szczecin, Świnoujście, Police) carry out both domestic and international, passenger and cargo transport. In these ports, on an international scale, stable unloading and loading can be observed, maintaining a similar level in subsequent years. On the other hand, when analyzing domestic turnover, a certain increase in landings and loadings is also noticeable compared to previous years. In recent years, in Polish seaports, in the case of international unloadings, the following dominated: dry bulk, liquid bulk, crude oil, and large containers; and in the case of loading, dry bulk, large containers, and liquid bulk cargo dominated. The share of other exported cargo was less than 10%. On the other hand, in domestic traffic in recent years, both in the case of unloadings and loadings, liquid bulk cargoes, crude oil products, crude oil, dry bulk cargoes, and agricultural products dominated. In addition, various types of containers, iron and steel products, dry bulk, and crude oil were transported. However, the share of these loads in the total number of transported goods on a national scale was small.

Acknowledgments: This publication is supported by the Rector's Pro-Quality Grant, Silesian University of Technology grant number 12/040/RGJ23/0054 and Silesian University of Technology grant number BK-264/RT4/2023, 12/040/BK_23/0052.

References

1. Andrzej Grzelakowski, Maciej Matczak. 2012. *Współczesne porty morskie*. Gdynia. Wydawnictwo Akademii Morskiej w Gdynii. ISBN: 978-83-7421-178-9. [In Polish: Andrzej Grzelakowski, Maciej Matczak. 2012. *Contemporary Seaports*. Gdynia. Gdynia Maritime University Publishing House. ISBN: 978-83-7421-178-9].
2. Basma Belmoukari, Jean-Francois Audy, Pascal Forget. 2023. „Smart port: a systematic literature review. *European Transport Research Review* 15: 1-12. ISSN: 1866-887. DOI: <https://doi.org/doi.org/10.1186/s12544-023-00581-6>.
3. Bishal Dey Sarkar, Ravi Shankar, Apran Kumar Kar. 2023. „Port logistics issues and challenges in the Industry 4.0 era for emerging economies: an India perspective”. *Benchmarking: An international Journal* 30(1): 50-74. ISSN: 1463-5771. DOI: <https://doi.org/doi.org/10.1108/BIJ-08-2021-0499>.
4. Central Statistical Office. „Maritime economy in Poland in 2021”. Available at: <https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/gospodarka-morska-w-polsce-w-2021-roku,7,19.html>.
5. Central Statistical Office. „Maritime transport databases”. Available at: <https://stat.gov.pl/>.
6. Chiara Koltringer, Thomas Stevens, Martin Lindner, Yunus Baykal, Amin Ghafarpour, Farhad Khormali, Natalia Taratunina, Redzhep Kurbanov. 2022. „Quaternary sediment sources and loess transport pathways in the Black Sea - Caspian Sea region identified by detrital zircon U-Pb geochronology”. *Global and Planetary Change* 209: 1-31. ISSN: 0921-8181. DOI: <https://doi.org/10.1016/j.gloplacha.2022.103736>.

7. Dariusz Mongiało. 2007. „Czynniki wpływające na strukturę rynku usług”. *Gospodarka Narodowa* 3: 85-98. ISSN: 0867-0005. [In Polish: Dariusz Mongiało. 2007. „Factors influencing the structure of the services market”. *Gospodarka Narodowa* 3: 85-98. ISSN: 0867-0005].
8. Donald Waters. 2001. *Zarządzanie operacyjne: towary i usługi*. Warszawa. Polskie Wydawnictwo Naukowe. ISBN: 9788301194802. [In Polish: Donald Waters. 2001. *Operations Management: Goods and Services*. Warsaw. Polish Scientific Publishing House. ISBN: 9788301194802].
9. Dz.U. L57 z 3.3.2017. *Rozporządzenie Parlamentu Europejskiego i Rady (UE) 2017/352 z dnia 15 lutego 2017 roku ustanawiające ramy w zakresie świadczenia usług portowych oraz wspólne zasady dotyczące przejrzystości finansowej portów*. Bruksela: European Union. [In Polish: Dz.U. L57 z 3.3.2017. *Regulation (EU) 2017/352 of the European Parliament and of the Council of 15 February 2017 establishing a framework for the provision of port services and common rules on the financial transparency of ports*. Brussels: European Union].
10. Hanna Klimek. 2010. „Jakość usług portowych”. *Studia Gdańskie. Wizje i rzeczywistość* 7: 46-58. ISSN: 1731-8440. [In Polish: Hanna Klimek. 2010. “Quality of Port Services”. *Gdańsk Studies. Visions and Reality* 7: 46-58. ISSN: 1731-8440].
11. Hanna Klimek. 2016. „Funkcjonowanie i rozwój portów morskich w chińskiej republice ludowej”. *Gdańskie Studia Azji Wschodniej* 10: 76-95. ISSN: 2084-2902. [In Polish: Hanna Klimek. 2016. „The functioning and development of seaports in the People's Republic of China”. *Gdańsk East Asia Studies* 10: 76-95. ISSN: 2084-2902].
12. Hanna Klimek, Janusz Dąbrowski. 2018. „Polskie porty morskie na rynkach usług portowych”. *Studia i Materiały Instytutu Transportu i Handlu Morskiego* 15:1-17. ISSN: 2080-6302. DOI: <https://doi.org/10.26881/sim.2018.15.02>.
13. Ireneusz Grajewski, Józef Wójcicki. 1981. *Mały leksykon morski*. Warszawa. Wydawnictwo Ministerstwa Obrony Narodowej. ISBN: 83-11-07297. [In Polish: Ireneusz Grajewski, Józef Wojcicki. 1981. *A Little Marine Lexicon*. Warsaw. Published by the Ministry of National Defense. ISBN: 83-11-07297].
14. Ivana Jovanović, Nikola Vladimir, Maja Perčić, Marija Korićan. 2022. „The feasibility of autonomous low-emission ro-ro passenger shipping in the Adriatic Sea”. *Ocean Engineering* 247: 1-12. ISSN: 0029-8018. DOI: <https://doi.org/10.1016/j.oceaneng.2022.110712>.
15. Jerzy Kujawa. 2015. *Organizacja i technika transportu morskiego*. Gdańsk. Wydawnictwo Uniwersytetu Gdańskiego. ISBN: 978-83-7865-684-5. [In Polish: Jerzy Kujawa. 2015. *Organization and technology of sea transport*. Gdansk. University of Gdańsk Publishing House. ISBN: 978-83-7865-684-5].
16. Julian Ashford, Michael Dinniman, Cassandra Brooks, Lian Wei, Guoping Zhu. 2022. „Tying policy to system: Does the Ross Sea region marine reserve protect transport pathways connecting the life history of Antarctic toothfish?”. *Marine Policy* 136: 1-11. ISSN: 0308-597X. DOI: <https://doi.org/10.1016/j.marpol.2021.104903>.
17. Krzysztof Leja. 2003. *Instytucja akademicka. Strategia, Efektywność. Jakość*. Gdańsk. Gdańskie Towarzystwo Naukowe. ISBN: 83-87359-7206. [In Polish: Krzysztof Leja. 2003. *An academic institution. Strategy, Efficiency. Quality*. Gdansk. Gdańsk Scientific Society. ISBN: 83-87359-7206].
18. Maciej Urbaniak. 2004. *Zarządzanie jakością: teoria i praktyka*. Warszawa. Wydawnictwo Difin. ISBN: 83-7251-428-0. [In Polish: Maciej Urbaniak. 2004. *Quality Management: Theory and Practice*. Warsaw. Difin Publishing. ISBN: 83-7251-428-0].

19. Maciej Kaczorek, Marianna Jacyna. 2022. „Fuzzy logic as a decision-making support tool in planning transport development”. *Archives of Transport* 61(1): 51-70. ISSN: 0866-9546. DOI: <https://doi.org/10.5604/01.3001.0015.8154>.
20. Maciej Kruszyna. 2021. “Investment challenges pertaining to the achievement of the goals of the Mobility Policy based on the analysis of the results of traffic surveys in Wrocław”. *Archives of Civil Engineering* LXVII(3): 505-523. ISSN: 1230-2945. DOI: <https://doi.org/10.24425/ACE.2021.138068>.
21. Maja Perčić, Nikola Vladimir, Ivana Jovanović, Marija Korićan. 2022. „Application of fuel cells with zero-carbon fuels in short-sea shipping”. *Applied Energy* 309: 1-19. ISSN: 0306-2619. DOI: <https://doi.org/10.1016/j.apenergy.2021.118463>.
22. Marian Iwanejko. 1963. „Stanowisko portów morskich w świetle prawa międzynarodowego”. *Zeszyty Naukowe Uniwersytetu Jagiellońskiego. Prace Prawnicze* 11: 1-180. ISSN: 0088-4394. [In Polish: Marian Iwanejko. 1963. "The position of seaports in the light of international law". *Scientific Papers of the Jagiellonian University. Legal Papers* 11: 1-180. ISSN: 0088-4394].
23. Marianna Jacyna, Mariusz Wasiak, Konrad Lewczuk, Michał Kłodawski. 2014. „Simulation model of transport system of Poland as a tool for developing sustainable transport”. *Archives of Transport* 31(3): 23-35. ISSN: 0866-9546. DOI: <https://doi.org/10.5604/08669546.1146982>.
24. Mauro Marini. 2022. „Transport, persistence, and toxicity of pollutants in the sea”. *Applied Sciences* 12(14): 1-4. ISSN: 2076-3417. DOI: <https://doi.org/10.3390/app12147017>.
25. Philip Kotler, Gary Armstrong, John Saunders, Veronica Wong. 2002. *Marketing. Podręcznik europejski*. Warszawa. Polskie Wydawnictwo Ekonomiczne. ISBN: 978-83-208-1706-5. [In Polish: Philip Kotler, Gary Armstrong, John Saunders, Veronica Wong. 2002. *Marketing. European Manual*. Warsaw. Polish Economic Publishing House. ISBN: 978-83-208-1706-5].
26. Rizwan Shoukat, Zhang Xiaoqiang. 2023. „Sustainable logistics network optimization from dry ports to seaport: a case study from Pakistan”. *Transportation Research Record* 2677(3): 302-218. ISSN: 0361-1981. DOI: <https://doi.org/10.1177/03611981221115121>.
27. Srećko Krile, Nikolai Maiorov. 2021. „Infrastructure changes of the sea passenger port based on a digital transport model”. *Transport Problems* 16(4): 207-215. ISSN: 1896-0596. DOI: <https://doi.org/10.21307/tp-2021-072>.
28. Stanisław Szwankowski. 2000. *Funkcjonowanie i rozwój portów morskich*. Gdańsk. Wydawnictwo Uniwersytetu Gdańskiego. ISBN: 8370179088. [In Polish: Stanisław Szwankowski. 2000. *Functioning and development of seaports*. Gdansk. Publishing House of the University of Gdańsk. ISBN: 8370179088].
29. The official website of the city of Gdańsk. „The Port of Gdańsk ranked second in transshipments on the Baltic Sea after the first quarter”. Available at: <https://www.gdansk.pl/wiadomosci/Port-w-Gdansk-na-2-miejscu-na-Baltyku-po-I-kwartale,a,218479>.
30. Tiago A. Santos, Miguel A. Fonseca, Pedro Martins, Guedes Soares. 2022. „Integrating short sea shipping with trans-european transport networks”. *Journal of Marine Science and Engineering* 10(2): 1-24. ISSN: 2077-1312. DOI: <https://doi.org/10.3390/jmse10020218>.



Scientific Journal of Silesian University of Technology. Series Transport is licensed under a Creative Commons Attribution 4.0 International License