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INTERNATIONAL LINER SHIPPING: CURRENT CHALLENGES AND THREATS

Summary. The article considers modern challenges and threats to the operation of ships in the liner form of traffic organization. Taking into account the dynamics of liner shipping development and its exceptional importance in ensuring international trade, it is proposed to analyze the main trends that are recorded both by statistical and analytical publications and by scientists from different fields of knowledge. Since any accident, under certain conditions, can be legally recognized as force majeure, maritime practice provides the widest range of challenges and threats to the commercial activities of enterprises. The originality of the review lies in the fact that the whole range of potential challenges is applied to the liner shipping sector. In this article, the analysis is done in several steps: 1) incidents that may have consequences of different nature (for human life and health, material losses, environmental damage) were grouped into 6 main groups; 2) articles indexed in Scopus Web of Science databases of the period 2020-2024 were investigated to substantiate the importance of these challenges specifically on international liner shipping; 3) the link between the challenges in ICC and BIMCO terminology and articles in relation to each of the proposed groups was established; 4) statistical material and individual cases for the same study period (2020-2024) for each group of challenges were provided to substantiate the importance of the impact on liner shipping. The study showed causal

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relationships between the challenges to liner shipping (such as geopolitics-economics link or forces of nature and economics/operational, etc.), correlation of scientific publications and recent challenges. In general, the article gives an idea of the content of modern threats to liner shipping in terms of source, interconnection of these threats and nature of consequences.

Keywords: liner shipping, shipping challenges, shipping treats, container carrier container ship, intermodal transport, risk

1. INTRODUCTION

Thanks to ensuring the preservation of goods during transportation, the shortest delivery times over long distances, the breadth of geography, the variability of batch volumes, the nomenclature of goods that can be presented for sea transportation, the rhythm of shipments and the established schedule, container transportation technology from the moment of its introduction in the 1950s to today is considered the most dynamic. The main idea that was laid by containerization – the immutability of transport containers at all delivery points forces us to take into account not only "purely sea" challenges that the container industry experiences, but also those that are related to adjacent transport modes (rail, road), the operation of transport hubs, etc. Thus, the efficiency of liner transportation, which is achieved by "non-transshipment movement" of transport units through multiple modes, requires an organization to anticipate potential risks and obstacles at the intermodal level.

The main share of containerized cargo in the structure of liner shipping gives reason to consider the challenges faced by containerization as typical for the entire liner fleet. It is known that the nature of the process of transportation of any goods is stochastic. In addition to general transport factors that are difficult to predict, the system of container transportation has a significant impact on a number of specific factors that are related to the peculiarities of such transportation. Mainly, the sensitivity of small consignments to external factors is explained by the nature of liner shipping: predetermined transportation schedules, container flows consist of many small parties, increased requirements for cargo preservation (due to the high value of the transported goods), etc. It should be noted that additional challenges are created by the presence on one ship during the voyage of cargoes of the most diverse nature (IMO and IMDG classes, physical and chemical, transport properties), which is not observed during transportation by the tramp form of shipping. It is the consignor's responsibility to provide full information on the nature and nature of the cargo, and as a result of the diversity of the nomenclature, it cannot be controlled or rechecked by the carrier before acceptance on the ship. Thus, on most liner ships there is always a risk of undeclared hazards in relation to the IMO/IMDG class, exact weight, specific properties of the cargo or handling instructions.

Thus, the liner shipping industry is affected by the cargo, the sea vessel, the crew, the participants of the transportation due to the circumstances that occurred during the transportation onboard (or at port), as well as due to those that are the result of the influence of the external environment: military operations, pandemics, strikes, natural disasters etc.

2. ACADEMIC LITERATURE REVIEW

The comprehensiveness of the sources, the manifestations and consequences of the challenges faced by international liner shipping is of interest to scientists from various fields of knowledge: lawyers, economists, management researchers, engineers, etc.

The basis for the research was statistical and analytical papers of the last years, which highlighted the problems of liner shipping and scientific articles indexed in the international databases Scopus and Web of Science during 2020-2024.

Despite the diversity of the fields that study the challenges of liner shipping, the types of scientific articles, the aspects they touch on and their focus according to their tasks, their analysis is proposed according to the 5 main groups (A-E) given at tab. 1.

- Geopolitical;
- Social;
- Forces of Nature;
- Market and Economic;
- Operational.

It should be noted that this distribution is quite conditional, since some of the social and economic and market challenges have their source in geopolitical changes, as well as some operational threats occur due to the forces of nature, etc.

Tab. 1

Scientific articles on liner shipping challenges (2020-2024)

| Challenge | Author(s) | Key words | Subject area |
|-----------|----------------------|--|----------------------------------|
| A. | Friedman Sh. | law of the sea; naval warfare; blockades; Ukraine; Russia | Maritime Law |
| | Ilyas M., et al. | maritime security; maritime containers; Delphi expert survey; maritime supply chains | Maritime containers supply chain |
| | Stanivuk T., et al. | parametric methods; shipping companies; impact of war; stocks | Maritime Studies |
| | Irtysheva I., et al. | war economy; world economic growth; post-war economic development; war in Ukraine | Business & Economics |
| | Oral F., Paker S. | transportation security; risk assessment; Delphi; SWOT; AHP | Risk Management |
| B. | Nwokedi T., et al. | maritime; security; governance; piracy; ship types; ship's crew | Maritime Management |
| | Yıldız R.O., et al. | talent management; resource-based view; RBV; systematic literature review; SLR; content analysis; container shipping | Human Resources Management |
| | Sandkamp A., et al. | trade; transport; China; piracy; container shipping | Maritime Management |

| | | | |
|----|------------------------------|--|------------------------------|
| C. | Troch C., et al. | long-period waves; infra-gravity waves; seiching; numerical modelling; Surfbeat; extreme storm; measured data; forecast system; moored ship response; surge; non-intrusive | Engineering & Oceanography |
| | Charłampowicz J. | COVID-19; service quality; maritime container terminal; container shipping; maritime container supply chains | Service quality |
| | Yazir D., et al. | COVID-19; coronavirus; cruise; shipping industry; tanker | Maritime Studies |
| | du Plessis F., et al. | bibliometric analysis; climate change; cold chain logistics; marine cargo insurance; port operations; systematic literature review | Marine Cargo Insurance |
| | Notteboom T., et al. | ports maritime shipping; supply chains; shocks; resilience; pandemics; COVID-19 | Maritime Studies |
| D. | Matsuda T., et al. | container shipping market; monopoly; oligopoly; H-statistic; non-structural test; competition | Business & Economics |
| | Lixian F.R., et al. | shipping industry; container ship; ship investment; ship demolition; simultaneous equations model (SEM) | Maritime Policy & Management |
| | Kollia S., Pallis A. | liner shipping; vertical integration; container terminals; competition; European Commission | Business & Economics |
| | Saeed N. et al. | prophet forecasting; COVID-19; machine learning; natural language processing; container freight | Business & Economics |
| | Rožić T., et al. | supply chain; volatile freight rates; maritime container industry; crises | Economics & Business |
| E. | Sunaryo M., Hamka A. | container terminal; loading unloading; risks assessment; safety | Risk and Safety Management |
| | Melnyk O., Onyshchenko S. | ship operational condition; navigation complex; navigational safety; Markov chain model; safety assessment | Safety, Navigation |
| | Nguyen S., et al. | risk assessment; risk analysis; container supply chain; operational risk; container shipping | Risk analysis and assessment |
| | Erdem P., et al. | human error; risk analysis, IT2Fs; SLIM; FTA; container loss | Risk Analysis |
| | Longo F., et al. | ergonomics; working postures; containers cargo; lashing/de-lashing operations; simulation; safety; security | Human Ergonomic Simulation |
| | Prabowo A., et al. | impact loading; ship structure; freight container; internal energy; displacement tendency | Engineering |

Obviously, among the geopolitical upheavals that have affected international shipping and global economics and security in general, the Ukrainian war takes center stage among recent publications. Thus, the article [1] addresses the impact of geopolitics in the context of the legal status of the suspension of navigation by the Russian Federation and the legal status of the Azov Sea under international humanitarian law. Also related to the impact of the invasion of Ukraine is the article [4], which is a study on the general evaluation of parametric methods that focuses on the impact of the conflict between Russia and Ukraine on shipping companies. The overview [5] examines the impact of the war in Ukraine on world economic growth, analyzing the war economy and post-war economic development in Ukraine. In addition to the Ukrainian war in the context of the geopolitical instability of liner shipping, the article [6] considers incidents arising from the Yemeni civil war (attacks on ships off the coast of Yemen), the conflict between Iran and the US in the Persian Gulf, and the tensions between China and the US in the Southern China Sea, the Taiwan coastal area, and the Eastern Mediterranean after the Israeli-Hamas war. The authors used to assess the situation using SWOT analysis.

The article [7] on maritime piracy determines empirical probability coefficients for pirate attacks across maritime zones, measures probabilities of death, kidnapping for ransom, and injury, and estimates an empirical probability coefficient taking into account the likelihood of pirate attacks on ship's types on the main shipping lines (used empirical statistical method with the MATLAB-soft). The research paper [3] centered on 64 risks factors through the following three indexes: the likelihood index, severity index, and average risk index. The authors assess the risks using the Delphi expert survey, and emphasize the importance of the impact of the war factor on the maritime container industry. An important finding in the research paper [9] was the rationale for the decrease in the number of container ships passing through regions that had previously experienced a surge in pirate activity. The results prove that liner ships respond to areas of pirate activity by changing their routes. Innovative in terms of subject matter is the paper [8], where the authors study novel and developing social research area – "Talent Management" in container shipping industry. The researchers resorted to systematic literature review and combined method of in-depth interviews and qualitative content analysis to investigate the most common talent management practices in shipping industry.

The "forces of nature" group includes articles from the last five years that dealt with natural challenges: epidemics, natural disasters or extreme natural events. It is clear that COVID-19, which had a catastrophic impact on shipping, is in the spotlight, and articles dedicated to mitigation of the pandemic continue to be published. An example of such a scientific article is [11], which substantiates the connection between the impact of COVID-19 on container shipping and the of container terminal services quality. The review [12] examining the effects of COVID-19 examines maritime transportation in four groups, including container shipping. The authors concluded that transportation participants faced operational losses and inconvenience due to health and safety issues. Secondly, they believe that effective port state inspections based on IMO conventions can significantly reduce potential risks and provide opportunities for a successful turnaround.

Extreme weather conditions have been a serious challenge to shipping since ancient times, and are a typical example of the challenges of the forces of nature. Thus, the article [10] deals with modeling and measurement of low-frequency wave motions associated with extreme storm events (Post-Panamax container vessels were observed, measured and modelled during the extreme storm event). Another example of nature's challenges are changes in climatic conditions that affect shipping and supply chains, among others. The aim of the study [13]

was to identify trends, gaps in published scientific papers on the impact of climate change risks on marine cargo insurance in cold chains through a systematic literature review.

Economic and market challenges (as shown in fig. 1) can be caused by external environmental factors, or can be influenced by competition, global or sectoral economic problems, or problems within the individual shipping company itself. Sometimes the authors' economic-market studies touch on more than one of the groups we have identified, so the focus of the article [24] is on the changes in freight rates in the maritime container industry due to the COVID-19 pandemic (the “force of nature” group) and Russia's invasion of Ukraine (the “geopolitics” group), as well as the effects of these crises on changes in consumer goods prices in the European Union. The value of the paper [14] is that it is based not at the level of the container ship route, but at the level of the shipping company. This is important in view of the fact that the same vessel can carry cargo from several companies. The article aims to investigate the extent of market competition. In the focus [15] - decisions on investment activities for fleet development of shipping companies based on the analysis of market factors, operating conditions, and shipping alliances. Another research [16] is a critical review of the European practice of vertical integration of liner shipping companies and container terminals, and examines its impact on competition. [17] proposes a new combined methodology for forecasting container transportation rates, including taking into account the impact of COVID-19, it assists container market participants in developing and implementing strategies to reduce losses when transportation rates fluctuate.

The breadth and ambiguity of definitions of “operational risks” is noted in the article [20]. The operational challenges faced by liner shipping are multifaceted. The most common are the consequences of risks during operations on board (both at sea and in port). The study [18] aims to provide a safety assessment that can be further used to minimize occupational accidents at the port (during loading/unloading operations). The study [19] proposes to investigate the change in the safe state of a ship based on a Markov's model considering safety from 3 components: motion and handling control system; navigation and motion parameters indicating system, ship's communication and safety system. The paper [21] proposes a hybrid approach to highlight the paramount importance of the human factor in container shipping operations. Also, the influence of human factors in lashing/de-lashing operations is investigated in paper [22]. The article [25] is also related to the behavior of crew members on board ship and the impact of maritime situational awareness on safe ship operation. The work [23] evaluates the strengths of structures at the contact between a ship and a container at the moment when these objects come in contact with each other and create an impact load on both structures.

3. LINER SHIPPING CHALLENGES SURVEY

While the literature review provides a first impression of the challenges in the liner shipping industry, we will consider the challenges faced by maritime transport participants in the context of the definitions given by the International Chamber of Commerce (ICC) and the Baltic and International Maritime Council (BIMCO).

ICC [25] lists the 7 groups of challenges:

1. war (whether declared or not), hostilities, invasion, act of foreign enemies, extensive military mobilization;
2. civil war, riot, rebellion and revolution, military or usurped power, insurrection, act of terrorism, sabotage, or piracy;

3. currency and trade restriction, embargo, sanction;
4. act of authority whether lawful or unlawful, compliance with any law or governmental order, expropriation, seizure of works, requisition, nationalization;
5. plague, epidemic, natural disaster or extreme natural event;
6. explosion, fire, destruction of equipment, prolonged break-down of transport, telecommunication, information system or energy;
7. general labor disturbances such as boycotts, strikes and lock-outs, go-slows, occupation of factories and premises.

In 2022, BIMCO [26] defined a list of events (circumstances) that prevent the parties to the transportation from fulfilling one or more of their contractual obligations, provided they prove:

1. actual, threatened or reported war, act of war, civil war or hostilities; revolution; rebellion; civil commotion; warlike operations; laying of mines;
2. act of piracy and/or violent robbery and/or capture/seizure; act of terrorists; act of hostility or malicious damage;
3. blockade, generally imposed trade restriction, embargo;
4. act of government or public authority whether lawful or unlawful, compliance with any law or governmental order, expropriation, seizure of works, requisition, nationalization;
5. plague, epidemic, pandemic;
6. act of God, natural disaster or extreme natural event such as earthquake, landslide, flood, or extraordinary weather condition;
7. explosion; fire; destruction of equipment; destruction of port facilities; obstruction of waterways; cybersecurity incident; break-down of transport, communication, information system or power supply; in each case unless caused by negligence of the Affected Party;
8. ionizing radiation or contamination by radioactivity, chemical or biological contamination;
9. general labor disturbance such as boycott, strike and lock-out, occupation of factories and premises; in each case unless limited to the employees of the Affected Party or a third party engaged by it; or
10. any other similar event or circumstance, unless caused by negligence of the Affected Party.

According to the factors causing the challenges of liner shipping, the totality of all presented threats can be attributed to one of the following groups:

- A. caused by politics and geopolitical factors;
- B. occurred as a result of social phenomena;
- C. occurred as a result of an irresistible force of nature;
- D. consequences of economic and market changes;
- E. operational (occurred during operations with the person/vessel/cargo/equipment).

Tab. 2
Events/circumstance types according to group of challenges

| Source | A | B | C | D | E |
|--------|-------------|-------|----------|-------|----------|
| ICC | 1, 2, 4 | 7 | 5 | 3 | 6 |
| BIMCO | 1, 2, 4, 10 | 9, 10 | 5, 6, 10 | 3, 10 | 7, 8, 10 |

Due to the heterogeneity of the origins, nature, and consequences of liner shipping challenges, they should be considered from both an intermodality and an environmental perspective (fig. 1).

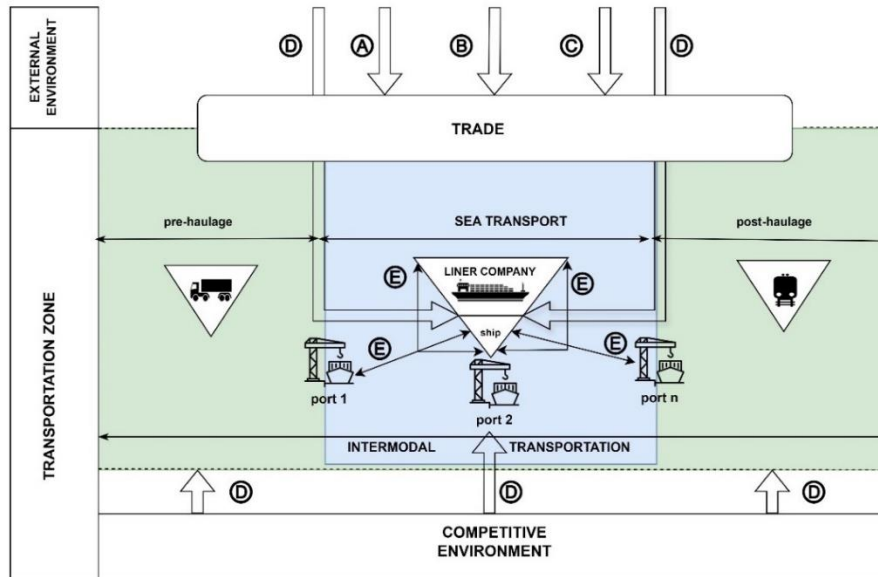


Fig. 1. Impact areas on liner shipping

3.1. Geopolitics

Geopolitical threats in the context of this article can be defined as any events that affect the domestic and/or foreign policy of certain geographical areas with consequences that determine the level of favorability for container transportation. Such threats may result in financial losses of transportation participants due to disruptions, delays, damage to the vessel, cargo, and those that pose a threat to health and human life.

Global geopolitical threats are not limited to a particular sector of the maritime business, but have an impact on international shipping in general.

A recent example is Russia's military invasion of Ukraine in February 2022. The event resulted not only in the closure of all container services involving Ukrainian ports, but also in changes at the macroeconomic level. UNCTAD notes that the war in Ukraine and other related shocks have affected global economic performance, leading to a cost-of-living crisis. Growing poverty, hunger, and debt difficulties have reversed progress on a number of sustainable development goals midway to their 2030 deadline. In 2022, the world's domestic product grew by 3.2%, which is half the 6.1% recorded in 2021 [27].

Another case of a geopolitical challenge is the threat of missile attacks in the southern Red Sea and the Gulf of Aden, which have been reported by liner container operators since mid-December 2023. Rocket attacks on the merchant fleet led to tragic incidents with the deaths of crew members of the bulker "True Confidence" (06.03.2024) and the sinking of the m/v "Rubymar" (02.03.2024), which caused serious environmental threats. These and other incidents have caused an increased risk for shipping in the region, which has led to a complete revision of routes by liner carriers. Most container operators are now determined to replace the Red Sea by sailing through the Cape of Good Hope, bypassing Africa [28], which is reflected in a significant increase in rates on the main routes.

3.2. Social challenges

Piracy has long been a significant threat to global merchant shipping. Pirate attacks have consequences for the crew, vessel, and cargo. For the crew, the threats are: abduction, hostage-taking, death, injury, and disappearance; for the vessel – damage, especially as a result of the use of weapons or in cases where pirates deliberately damage ship machinery, equipment, and property; for cargo – theft or cargo damage.

During the period 01.01.2024-30.06.2024, container ships were attacked by pirates in the waters of Southeast Asia (excluding the Strait of Malacca): m/v “Nordpuma” (01.02.2024), “ESL Dachan Bay” (09.05.2024), Indian Subcontinent “Name Withheld” (03.02.2024), “Maersk Hai Phong” (16.02.2024), “Maersk Chattogram” (07.04.2024), in the American region: “Asian Trader” (12.04.2024), in the Africa region (excluding Somalia, Gulf of Aden, Red Sea): “Lodur” (05/14/2024), “Maersk Sarnia” (06/20/2024).

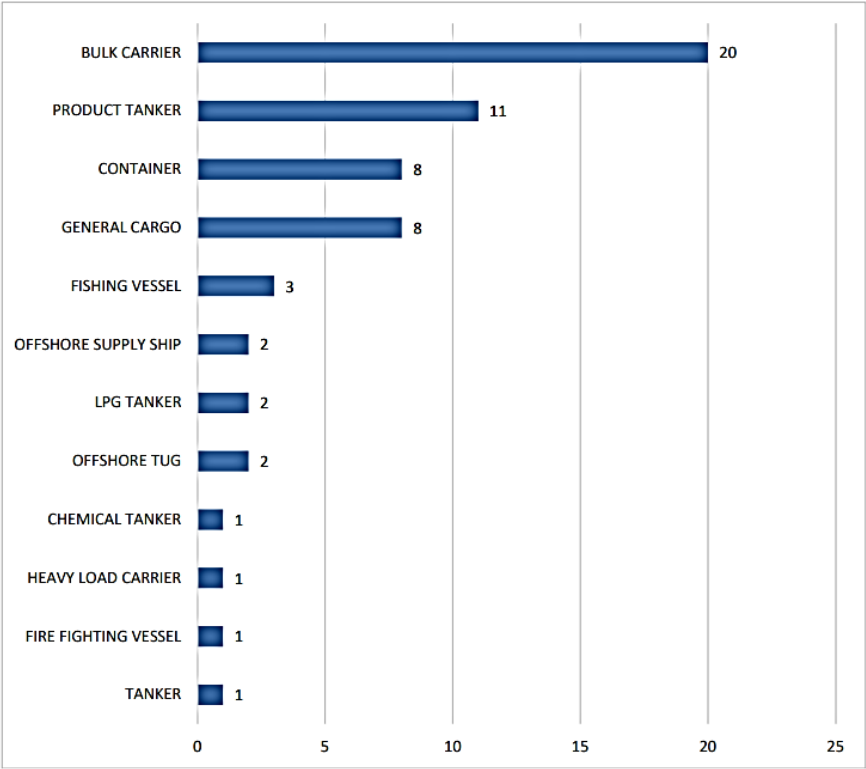


Fig. 2. Pirate attacks by vessel type, January - June 2024
Source: IMB piracy [29]

A strike announced by the International Longshoremen's Association (ILA) on October 1, 2024, is a vivid example of a social origin challenge. The Union has 85 thousand members compared to the previous year. Workers were concerned about the automation of processes introduced by APM Terminals and Maersk Line, which threatens to cut jobs. Thus, cargo owners are already concerned about the possibility of downtime in the ports of the Atlantic Ocean and the Gulf Coast [30].

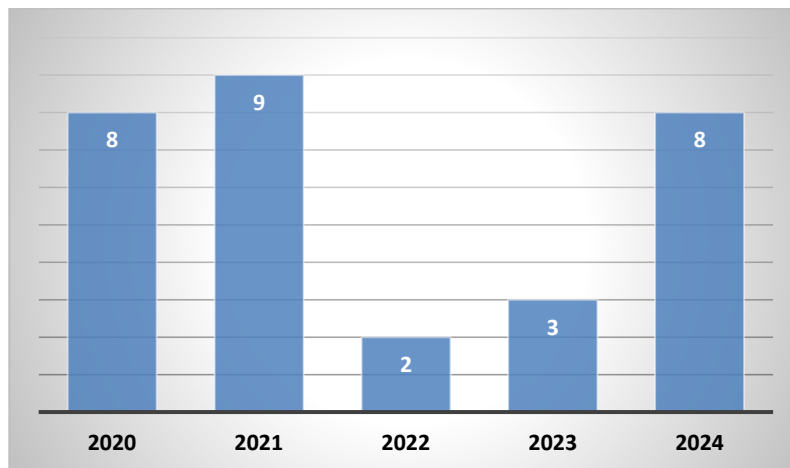


Fig. 3. Incidents of pirate attacks on container ships 2020-2024
Source: own research based on data presented by the IMB piracy [29]

3.3. Challenges due to a Nature's irresistible force

In the context of this article, Nature force challenges are those caused by the external environment: plague, epidemic, natural disaster or extreme natural event, etc.

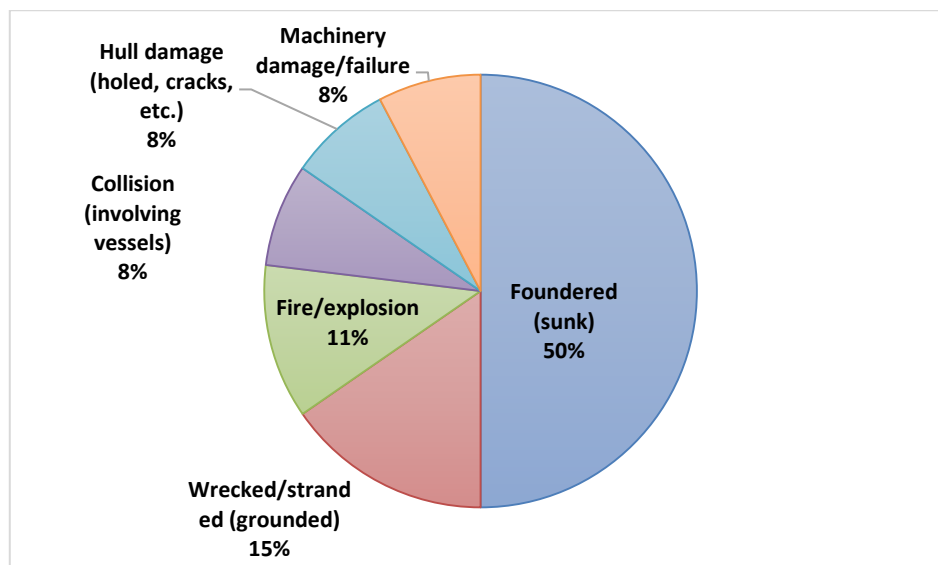


Fig. 4. Causes of ship losses in 2023

Source: own research based on data presented by the Safety and Shipping Review I [31]

In 2023, the main cause of ship loss was sinking (13 incidents). The second place is occupied by an accident/grounding (4 incidents), and the third place is occupied by fire/explosion (3 incidents). Fire activity decreased during 2023, but in the last five years alone, a total loss of 55 ships due to fires was recorded. It is specified that extreme weather conditions caused at least 8 losses in 2023. 2 collision incidents resulted in ship losses in 2023 [31].

The drought caused significant obstacles to global shipping, which slowed the transit of ships through the Panama Canal. The lack of rain and the El Niño climate phenomenon contributed to the year becoming the second driest in the 110-year history of the Canal.

In May 2023, the Panama Canal Authority (ACP) announced draft restrictions for transit vessels and reduced the number of transits per day. Restrictions continued in 2024. According to Clarkson's Research, restrictions on transit through the Panama Canal, which accounts for 2.5% of world trade, led to a reduction in transit tonnage by one third [32].



Fig. 5. Changes in transit time in accordance with the new route as a result of the Panama crisis

Source: McKinsey & Company [32]

Container operators recover additional costs by introducing a basic freight surcharge for routes that involve crossing the Panama Canal. Thus, Maersk introduced and revised the Panama Canal Surcharge (PCC) for all cargoes transiting the Panama Canal in August 03.08.2023 (175 USD/20', 305 USD/40') [33].

3.4. Economic and market

The economic and market impacts experienced by liner companies in individual countries can be caused by the external environment (global impacts of wars, epidemics, and other factors), processes taking place in the countries themselves (the level of containerization of ports, the development of economies, the strength of foreign trade links), or come from influences that occur within the company itself.

A striking example of global market impact is the rise in fuel prices, which liner carriers compensate for by adding a corresponding BAF (bunker adjustment factor) to freight rates. Such rate adjustments allow carriers to compensate for unexpected impacts on transportation costs. For example, the rise in crude oil prices that followed Russia's invasion of Ukraine was significantly reflected in bunker prices. Across all trade routes, average fuel charges increased by almost 50%, reaching almost 600 USD /FEU. For example, bunker surcharges for transportation between the ports of the Far East and the US West Coast increased from 540 USD /FEU in January 2022 to 1150 USD/FEU in mid-May 2022 [36].

It should be added that container shipping rates continued to rise in 2023-2024. The latest Drewry WCI of 5551 USD/FEU is 47% lower than the one recorded at the peak of the pandemic at 10377 USD (September 2021), but 291% higher than the 2019 average (before the pandemic) of 1420 USD.

The average composite index for 2023 was 3996 USD/FEU, which is 1204 USD higher than the 10-year average of 2791 USD (which was inflated by the exceptional period of Covid 2020-22).

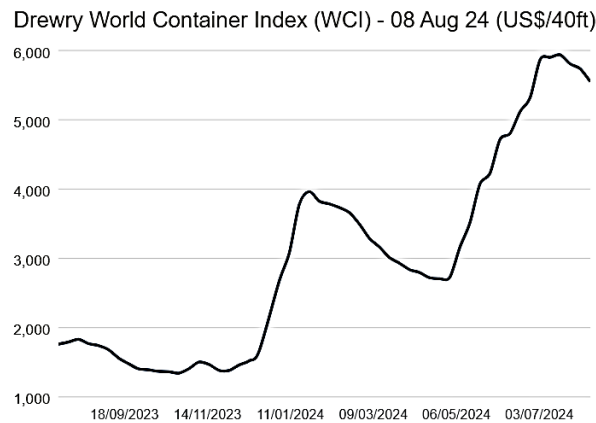


Fig. 6. Drewry WCI composite index (September 2023 - July 2024)
Source: Drewry [35]

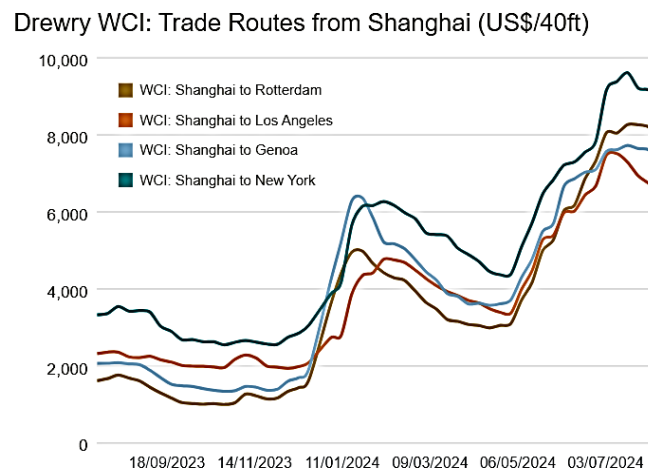


Fig. 7. Drewry WCI composite index:
Trades from Shanghai September 2023 - July 2024
Source: Drewry [35]

It is impossible to ignore the impact on the economy and the market that the Russian transportation industry has experienced as a result of the invasion of Ukraine: transportation sanctions by the EU, the US, and the UK. Most of the world's shipping lines have left the Russian market after the invasion of Ukraine, with the exception of MSC, whose volumes have continued to grow since 2022. This vacuum was quickly filled by Turkish and Asian carriers, as well as new Russian carriers formed from various domestic logistics companies.

3.5. Operational

Regrettably, the threats arising during the operation of ships, containers and cargo, ship and port technical equipment are the most frequent. Investigating accidents on container ships (as the largest group of liners), the following factors can be identified among the factors that cause accidents in operation:

- human error: this is the most common cause of accidents at sea. Human error may include (errors in navigation, among other things), cargo handling and ship maintenance;
- technical failures (ship's machinery, equipment, defects in the ship's design);
- fire hazards (spontaneous combustion, chemical reactions and electrical);
- collisions with other vessels or objects: this may occur on (due to congestion of shipping routes, in poor visibility conditions).

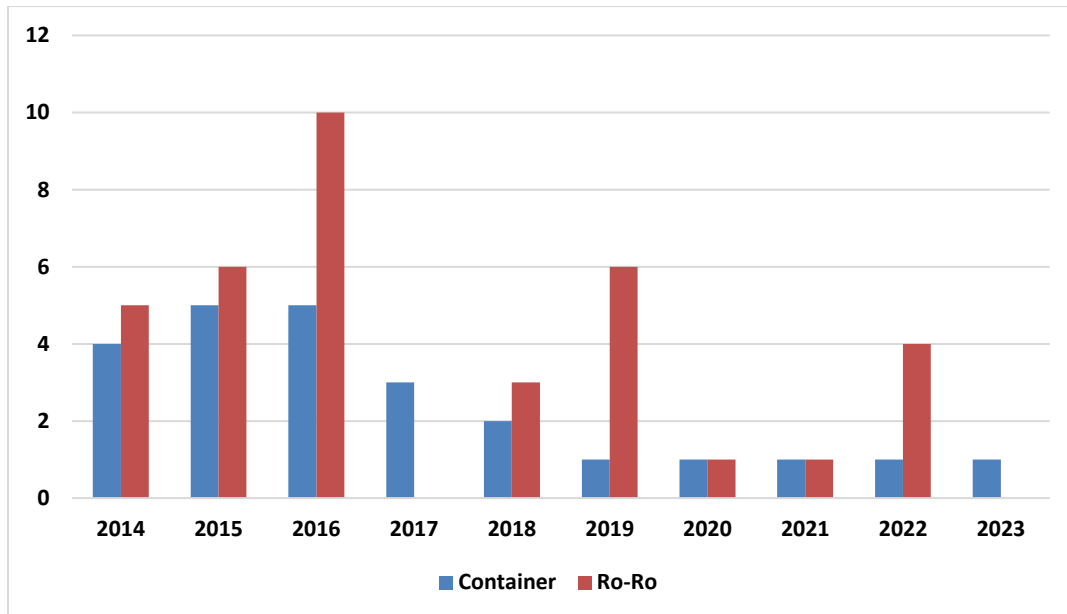


Fig. 8. Statistics of liner vessel loss (container ships and ro-ro) in 2014-2023

Source: own research based on data presented by the Safety and Shipping Review I [31]

It is specific that in liner shipping accidents occur to a greater extent during berthing and exceed the number of those that occurred at sea – 48% of accidents occurred in port areas, 19% in the high seas (in/outside the EEZ, exclusive (maritime) economic zone) and 18% within the territorial sea (fig. 9).

It is interesting to note the share of voyages where incidents occurred according to the distribution: “ship-related” and “person-related”. For “ship-related” incidents, the most frequent event was contact with port infrastructure or obstacles upon arrival at the port. The vast majority of “person-related” accidents involved a vessel at anchor or nearside while in port.

Among the accidents of 2024, we highlight the following:

On 26.03.2024, the container ship “Dali” instantly lost control and collided with the Francis Scott Key Bridge, Baltimore, USA. At the time of the incident, the vessel was under pilotage. Based on records, the Maritime and Port Authority of Singapore confirms that the vessel's classification society and statutory certificates were in compliance. According to the results of the investigation, the cause of the accident was a technical malfunction that caused a loss of power to the ship's equipment [37].

On 09.07.2024, during a voyage from Asia to Europe, the container ship “CMA CGM Benjamin Franklin” got into a storm off the coast of South Africa and suffered the loss of 44 containers, another 30 containers were damaged [38].

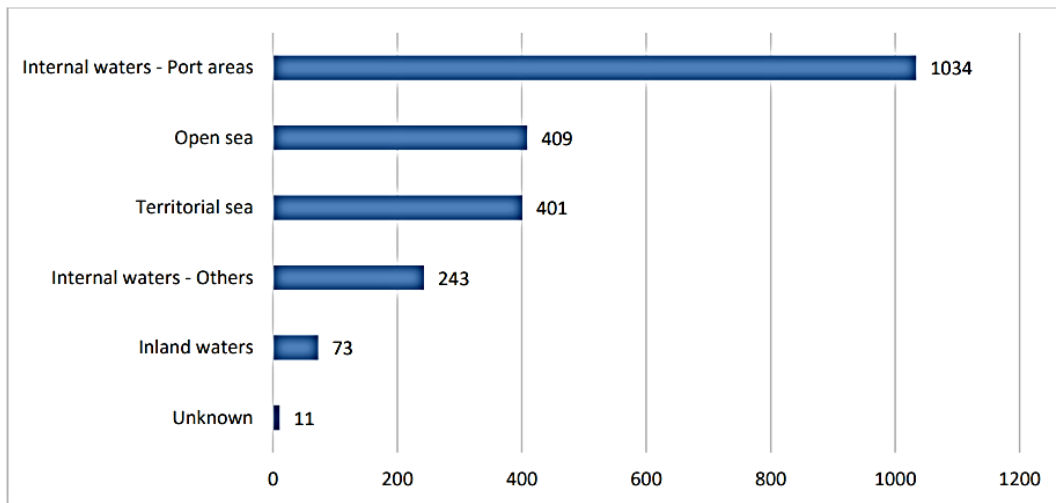


Fig. 9. Distribution of maritime accidents with container ships according to areas

Source: EMSA [36]

| | Event type | Voyage segment | | | | | Unknown | TOTAL |
|--------------------------------------|--------------------------|----------------|-----------------------|------------|------------|------------|-----------|-------------|
| | | Transit | Anchored or alongside | Arrival | Mid-water | Departure | | |
| | Occur. with persons | 86 | 233 | 64 | 121 | 32 | 27 | 563 |
| O c c u r r i p | Loss of control/cont. | 129 | 30 | 54 | 106 | 47 | 13 | 379 |
| | Collision | 82 | 77 | 86 | 62 | 37 | 25 | 369 |
| | Contact | 103 | 26 | 149 | 4 | 42 | 12 | 336 |
| | Damage to ship or equip. | 79 | 90 | 34 | 39 | 35 | 9 | 286 |
| | Grounding | 37 | 3 | 32 | 16 | 27 | 5 | 120 |
| | W i t h | Fire/Explosion | 27 | 25 | 8 | 26 | 6 | 1 |
| | Flooding/Foundering | 8 | 1 | 0 | 4 | 1 | 1 | 15 |
| | Listing/capsizing | 2 | 1 | 0 | 2 | 0 | 0 | 5 |
| | TOTAL | 553 | 486 | 427 | 380 | 227 | 93 | 2166 |

Fig. 10. Container vessel accidents: ship and persons

Source: EMSA [36]

On 19.07.2024, it became known about the fire on the “Maersk Frankfurt” (built in 2024, operated by Bernhard Schulte Shipmanagement). The fire on the container ship became known when the vessel was 50 miles from Karwar, India. The vessel was carrying dangerous cargo. The fire, caused by a short circuit, led to explosions and the death of a crew member [39].

On 09.08.2024, the liner carrier Yang Ming reported a fire on the container ship “YM Mobility” in the port of Ningbo. The causes of the incident are still under investigation. According to preliminary data, the explosion occurred in a container with dangerous goods. According to the shipper's declaration, the refrigerated container was used as a substitute for a dv-container and did not require an electrical connection [40].

4. CONCLUSION

The dynamics of maritime trade growth in general and the high involvement of liner shipping in ensuring trade relations inevitably lead to an expansion of the range of problems faced by managers of shipping companies, cargo owners, ship crews, and port and terminal workers. Taking into account the participation of liner shipping in the shipment and receipt of consumer goods for the population, all of these challenges ultimately affect every consumer in general. Certain manifestations of threats to liner shipping are not specific, but have a global scale (military invasions, pandemics, piracy at sea), cannot be attributed to a specific field of knowledge, and require an interdisciplinary and integrated approach to solving. Such solutions are possible with the involvement of specialists at all levels: from international interdisciplinary expert groups to develop or revise international regulations and conventions in accordance with the current situation to standardizing provisions to combat shipping challenges at the level of shipping companies, on ships and in ports.

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