

Current Threats to Sustainable Shipping – from War Risks to Climate Changes

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ABSTRACT

The article analyzes the current global risks faced by the maritime industry and explores potential solutions to minimize their negative impact on supply chains. It highlights the damaging effects of regional armed conflicts and the challenges associated with different stakeholders working together to ensure connectivity in combat zones at sea. The article also examines the impact of climate change on maritime transport, using the Suez and Panama Canals as examples. In both instances, the instability factors cause significant changes to shipping routes, volumes, and types of cargo transported by sea. These effects can also be observed beyond the region affected by the destabilizing factors or the corresponding types of cargo.

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Introduction

Securing maritime supply chains requires solutions at global, regional, and national levels to address modern challenges and threats to sustainability, which is critical for optimizing the productivity of maritime businesses (Koilo, 2024). Over the last four years, various events have significantly impacted maritime transportation, either due to their global reach or the involvement of multinational companies. These events include the COVID-19 pandemic, which caused a 3.8 % decrease in maritime trade in 2020, the war in Ukraine, which is one of the largest global exporters of food, and extreme weather events like hurricanes, floods, and heatwaves, which have affected countries such as Australia, Brazil, Pakistan, East Africa, and the USA (Węcel et al., 2024). The international nature of the maritime industry renders it extremely sensitive to geopolitical issues that impact both shipping intensity and patterns (Georgoulas et al., 2024). One of the most researched issues is the amplification of the connection between oil prices and freight rates due to geopolitical risks. These risks have a short-term impact on oil prices and a mid-term impact on freight rates (Khan et al., 2021). In addition, most geopolitical crises result in replacing supply sources, which causes goods to travel long distances, increasing ton-miles, ship capacity, and freight rates (Casaca & Loja, 2023). Indicatively, such an impact can be observed far beyond crisis or conflict zones due to the global significance of maritime communications (Childs, 2023). For example, the Russo-Ukraine war, apart from the direct effect upon merchant shipping in the Black Sea, has globally impacted the direction and volume of LNG flows. Structural changes were observed, including changes in the weighted degree of nodes and the composition of port communities (Xiao et al., 2024). Moreover, geopolitical crises have broader effects than just supply chain disruptions and transportation sector decline in the maritime industry. Crises often lead to increased nationalism and protectionism, which can cause a retreat in globalization. This can result in calls for more diversified global value chains and the decoupling of economies, which can have negative

impacts on the survival and sustainable growth of the shipping industry (Chen et al., 2021). Throughout the 2020s, the modern maritime industry has faced events not encountered for a long time. Although the consequences of the pandemic and the COVID crisis on the industry have been overcome, armed conflicts and environmental factors still have a growing impact. This leaves global shipping at higher risk, with negative consequences that are significantly greater in scale than those that existed in previous decades.

Methodology

This article explores the destabilizing factors within the maritime industry and assesses measures to mitigate their impact on supply chain efficiency and survivability. The research methodology employed a qualitative case study approach, utilizing process tracing and document analysis as primary methods. The first section of the paper focuses on war-related risks in the Black Sea and Red Sea. The second section examines the effects of climate change on maritime traffic based on an analysis of the practices of the largest shipping companies.

1. War Risks in Shipping in the Black Sea and the Red Sea

The impact of military risks on merchant shipping sustainability shifts the emphasis to security issues, altering shipping routes, volumes, and structures. Security changes in the Black Sea region have occurred because of the Russo-Ukrainian armed conflict. Ukrainian authorities have been taking numerous steps to restore maritime connectivity, which include expanding the use of the Danube port cluster, launching the Black Sea Grain Initiative (BSGI) from 2022 to 2023 (Kormych et al., 2024), and creating a new trade route called the New/Alternative Trade Corridor (Reuters, 2023). The latter passes through the territorial waters of neutral Romania, Bulgaria, and Turkey. These steps have helped to increase shipping (Hordiichuk, 2023) and expand the range of cargo (Panasenکو, 2024) that was previously affected by hostilities. These steps have also contributed to the development of Ukrainian Danube ports (Kuznietsov et al., 2023). Additionally, they have led to the signing of a mine clearance agreement between NATO countries in the region (European Pravda, 2024b). As a result, in January 2024 Ukraine managed to increase export volumes by sea to the same volumes as they were pre-war, worth \$1.9 billion per month (Berest, 2024). By March 2024, 90 % of Ukraine's total foreign trade turnover came from the Danube ports and the ports of Greater Odesa (Agropolit, 2024). Between mid-September 2023 and February 19th, 2024, more than 750 dry cargo and tanker ships sailed through the New Trade Corridor to export over 23 million tons of Ukrainian products to various destinations across Europe, Asia, and Africa (Volnoretz, 2024). As of the beginning of March 2024, this number has already exceeded a thousand ships (Dumskaya, 2024).

The insurance and freight market for vessels operating in the northwest part of the Black Sea has stabilized due to Ukraine's importance in the global maritime supply chain for foodstuffs and raw materials and the involvement of regional actors (Boiko, 2024; Kuzmenko, 2023; Maritime Logistics, 2023). Arguably, the reason why the new corridor is relatively stable with a lack of any attacks on vessels is because of the owners' registration or the Flag States of the vessels involved. The Russian Federation avoids open confrontation with other states to prevent Russian-affiliated vessels being denied entry in their ports. The following list shows the countries with the highest percentage of vessels' flags sailing to and from Ukrainian ports: Greece (25.6 %), Turkey (25.6 %), China (4.8 %), Lebanon (4.6 %), followed by the Marshall Islands, Liberia, Germany, Panama, Poland, United Arab Emirates, Ukraine, Egypt, the Netherlands, Romania, Singapore, Belize, Cyprus, Montenegro, Philippines, Albania, Honduras, Great Britain, Malta, Japan, and Bulgaria (Klymenko, 2024). This case highlights the importance of shipowners' quick and adaptable actions. It has also become evident that the quality and

class of the fleet plays a crucial role in restoring the maritime supply chains. For instance, the involvement of Panamax vessels in Ukrainian war-time grain exports had a more significant impact than small dry bulk vessels (Karakas et al., 2023).

The situation in the Red Sea is causing further instability for the shipping industry. The Red Sea is a significant route for global trade, with around 12 % of the world's total trade passing through it, including 30 % of all container traffic (Yerushalmy, 2023). However, the ongoing hostilities in the region have resulted in major shipping and oil companies such as BP, Maersk, Hapag-Lloyd, MSC, CMA-CGM, and Evergreen Line either reducing or completely halting their vessels from sailing through the Red Sea. According to the Suez Canal Authority, revenue in the January 2024 amounted to \$428 million, which is down from \$804 million in the same period the previous year. The number of ships passing through the canal decreased by 36 % (Rozgon, 2024).

It is interesting to note that ship owners are taking measures to protect their vessels by manipulating the Automatic Identification System (AIS) to account for other conflicts. Some ships sailing through the Red Sea have changed their destination in the AIS data destination field to 'VL NO CONTACT ISRAEL' in the hopes that they can avoid Houthi attacks. Additionally, there has been a significant increase in the use of 'ARMED GUARDS ON BOARD' in the AIS data destination field towards the end of 2023 compared to the same period in the previous year (Batavier, 2024).

The recent alteration of the shipping route through Bab-el-Mandeb, the Red Sea, and the Suez Canal was a crucial development in maritime trade. This change led to some of the traffic between Europe and Southeast Asia returning to the route around the Cape of Good Hope (Figure 1). The International Monetary Fund has stated that the ongoing hostilities in the Red Sea are jeopardizing crucial trade routes. In early 2024, shipping volume through the Suez Canal declined by 28 %, while the shipping volume through the Cape of Good Hope increased by 67 % during the same period (Hellenic Shipping News, 2024a). The increase in time and distance, as expected, had a negative impact on the cost of deliveries, insurance, and terms of contract execution, slowed down maritime trade (Robinson, 2024), and created risks for the global economy (Batavier, 2024; Lane, 2024) and EU energy (Hellenic Shipping News, 2024b).



Figure 1. The impact of Houthi attacks on trade traffic between the EU and China (Economist, 2024)

To reduce the risks of attacks, a decision was made to launch joint military operations. The United States initiated Operation Prosperity Guardian (Secretary of Defense, 2023) with the participation of over 20 other countries (Stewart, 2023), while EUNAVFOR launched Operation ASPIDES (European External Action Service, 2024). Despite these efforts, ships are still being attacked (U.S. Central Command, 2024; European Pravda, 2024a), and some of these attacks result in oil spills (Schuler, 2024). The inadequate effort to ensure regional security is evident in the continued negative impact on international maritime trade.

Yemen's location is strategically advantageous, as it allows for control over three directions: the Red Sea, the Indian Ocean, and the Persian Gulf. This can lead to complications in a significant portion of shipping. Moreover, the rising cost and delivery time of goods have created opportunities for other transportation routes. These include shipping through the Northern Sea Route, which is under the control of the Russian Federation, as well as the use of land routes and the Arctic component of China's Belt and Road Initiative (Martins, 2023). Additionally, the North-South logistics corridor is being activated, which combines several routes and involves 11 countries including Russia, Iran, Azerbaijan, and India. They aim to develop this corridor as a land alternative to the Suez Canal, making it invulnerable to Western sanctions (Kushh, 2024). The Houthi group has shown a particular interest in the close relationship between Russia and China. They have made public statements indicating that they will not attack any ships belonging to these two countries in the Red Sea Region (Dagher & Hatem, 2024).

It has become evident that defense institutions must be able to make crucial decisions and respond quickly to emergencies with real-time data to protect major waterways. Situational awareness and speed are crucial (Batavier, 2024). However, temporary measures without a strategic solution to the problem are not always successful. The situation in the Red Sea and the mediation attempts during the Russo-Ukrainian conflict are similar in this regard. Limited measures have only provided temporary relief in both cases. In order to restore stable shipping in the region, it is necessary to develop a strategic approach towards resolving conflicts and establishing long-lasting peace with security guarantees. This requires sustained international cooperation and diplomatic efforts to address the underlying conflicts that contribute to regional instability (Youvan, 2024). Today, it is important to have a dialogue and maintain contacts to create a contractual basis to trade, considering all new initiatives and solutions used to organize stable maritime traffic. This can help preserve and ensure the safety of traditional shipping communications, which is crucial for ensuring the security of the Red Sea.

It is important to consider the impact of military actions and restrictions on the labor market of different industries. This has been particularly evident in the humanitarian sector, which is still facing a crisis, albeit not as severe as before. Currently, the crisis is associated with the risks posed by war, as well as the need to provide seafarers with the option to decline voyages to hazardous areas. This requires proper monetary compensation and repatriation measures to be in place.

In February 2024, due to the escalating threats in the Red Sea, Black Sea, and West Africa regions, the Warlike Operations Area Committee (WOAC) of the International Bargaining Forum (IBF) took action. They agreed to implement additional measures to ensure the safety and welfare of seafarers in the Gulf of Aden area. The IBF has designated a list of high-risk zones in regions affected by armed conflict (Figure 2). This list, importantly, provides benefits such as compensation for seafarers and the right to repatriation at the company's expense, demonstrating the commitment to seafarers' well-being (International Bargaining Forum, 2024).

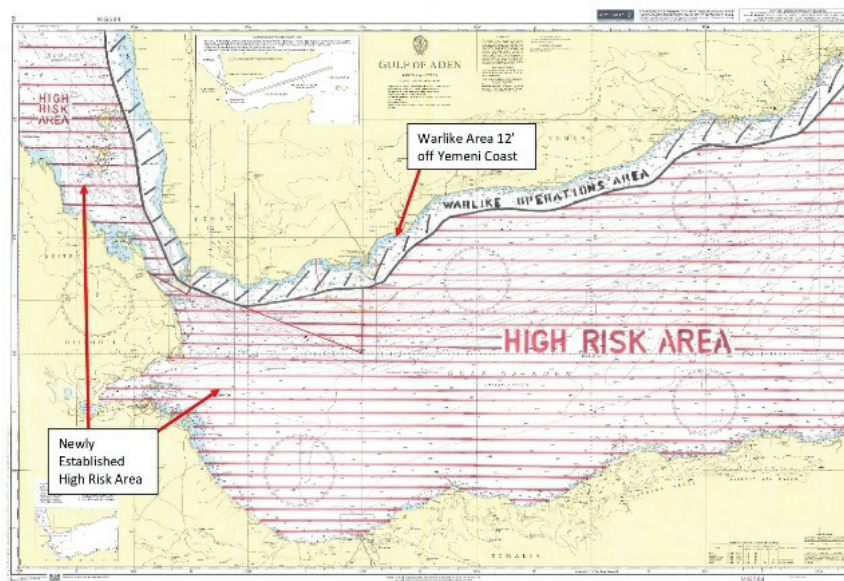


Figure 2. IBF High Risk Area (HRA) – Southern Red Sea and the Gulf of Aden

Subsequently, the IBF WOAC unanimously agreed to designate the Red Sea and the Gulf of Aden as 'Warlike'. This decision was made during a meeting on March 12th, 2024, in response to a Houthi attack on M/V True Confidence, which resulted in the loss of three seafarers. The Warlike Operations Area previously covered 12 nautical miles off the Yemeni coast. However, the recent decision expanded the area to include the Southern Section of the Red Sea and the Gulf of Aden, extending to the Eritrean coast. Additionally, the area now includes the Bab El Mandeb Strait and the entire Maritime Security Transit Corridor (MSTC) within the Gulf of Aden. This move is intended to emphasize the situation's gravity and ensure the safety of all seafarers operating in the region.

The MSTC was created by the Combined Maritime Forces (CMF) in 2017 (Combined Maritime Forces, n.d.) (Figure 3). The primary objective of this corridor is to provide a recommended route for merchant traffic around which naval forces can concentrate their presence and surveillance efforts. It is advisable that all vessels utilize the MSTC to take advantage of military presence and surveillance (Combined Maritime Forces, 2017).

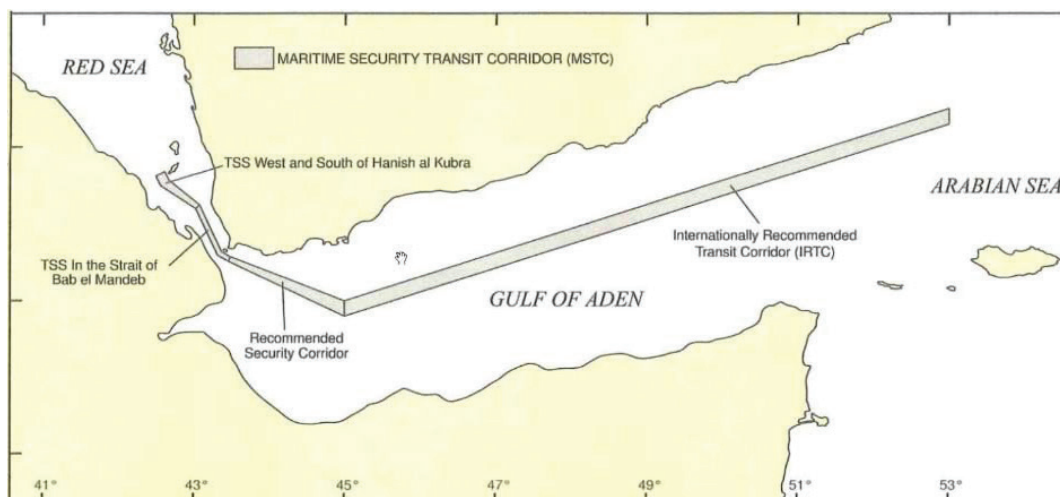


Figure 3. Maritime Security Transit Corridor (MSTC)

It is important to mention that some of the features of the MSTC can be observed in the development and operation of the Ukrainian sea corridors, such as the Black Sea Guarding Initiative (BSGI) from 2022 to 2023 and the Humanitarian (Alternative) Corridor since 2023. These all represent a new development of traditional UNCLOS types of sea corridors, focusing not solely on traditional navigation safety and optimization but mainly on ensuring security.

The design and establishment of sea corridors are governed by the rules of Articles 22, 41, and 53 UNCLOS. Due to said rules, the establishment of sea lanes and traffic separation schemes is based on several principles, including ensuring the safety of navigation, the special role of the International Maritime Organization (IMO), consideration of the routes usually used for international navigation and generally accepted international rules, and mandatory notification. It should be noted that even under armed conflict at sea, UNCLOS norms still hold significance, as demonstrated by the establishment of the Humanitarian (Alternative) Corridor in 2023, which Ukraine also communicated through the IMO.

2. Environmental Factors and Shipping Sustainability

Maritime transportation is often at risk due to unfavorable weather conditions, and each voyage carries a certain level of risk. Weather, in addition to causing damage, affects ship routes (Perera & Soares, 2017), speed (Taskar & Andersen, 2020), and fuel (Ormevik et al., 2023). Environmental factors are crucial in determining whether a port is safe or not (Fasii, 2023). Additionally, the aforementioned war risks and damages have environmental implications that must be considered in restoring the maritime industry (Rieznyk, 2023). One significant example of how environmental factors affect the stability of the maritime industry in the 2020s is global warming and low precipitation. These factors have led to the most crucial Panama and Suez canals becoming shallower, leading shipowners to use outdated and less cost-effective routes around the Cape of Good Hope and Strait of Magellan.

The Suez Canal is responsible for almost 12 % of global trade (Wan et al., 2023). In 2021, the movement of cargo through the Suez Canal was severely disrupted due to the grounding of *Ever Given* (IMO 9811000) on March 23. This happened because of incorrect navigation during strong winds (Fan et al., 2022). The global economy was estimated to have suffered losses of about \$400 million per hour due to the blockage of the canal (LaRocco, 2021). Grounding incidents in the canal are not uncommon, such as *Affinity V* (IMO 9645401) in August 2022 (Farrer, 2022) and *Glory* (IMO 9288473) in January 2023 (Magdy, 2023). While these incidents did not have a significant impact on shipping as the *Ever Given*, they highlighted the canal's tendency to become shallower. This is influenced by factors such as water levels in the Mediterranean and Red Seas, as well as atmospheric pressure and wind patterns in the region (Ibrahim et al., 2023).

In 2014–2015, the canal was expanded to enable two-way traffic of ships through The New Suez Canal mega-project (Suez Canal Authority, n.d.). Looking ahead, it's crucial to continuously improve shipping practices to maintain the smooth and safe operation of this crucial global maritime communication channel. These measures may include: (i) providing weather reports and warnings regarding probable weather anomalies or phenomena that may affect the movement of ships with varying characteristics in the canal; (ii) implementing a risk management system; and (iii) assessing the technical data of ships and cargo.

Similar problems occur at the Panama Canal, the second most important choke point, where more than 14,000 ships with 275 million tons of cargo pass each year (Kumar, 2022). In 2023, the Panama Canal and its associated areas experienced an unprecedented dry spell. According to data from the Smithsonian Tropical Research Institute (STRI), rainfall was nearly 50 % below normal. This year was one of the two driest years in the country's 143 years of record keeping (Ripper, 2023). Due to the decreased water levels in the lake, the Panama Canal Authority has

been forced to limit ship transits and draft. For instance, container ships that would typically draft 50 feet were restricted to 44 feet since the Summer 2023 (Bureau of Transportation Statistics, 2024). Starting from November 3rd, 2023, the number of available booking slots was reduced from 31 to 25 per day. Over the following three months, the number was further cut to 18 slots per day by February 2024 (Panama Canal Authority, 2023). The situation negatively impacted the cost and feasibility of shipping.

The congestion at the Panama Canal may benefit Europe, as US supplies of liquefied natural gas are likely to bypass Asia (Shiryayevskaya, 2023). This means that diversification has both negative and positive aspects. It shows that new solutions can be found and are likely to be just as effective as standard ones. Moreover, working on negative factors can open new opportunities and catalyze changes in normal supply conditions. This can attract new participants and expand the range of goods.

It's important to consider technical aspects when addressing water shortages. According to a Bloomberg report, officials in Panama suggested that the best solution would be to construct a dam on the Indio River and then create a tunnel through a mountain that would transport fresh water 8 kilometers (5 miles) into Lake Gatún, the main reservoir of the Panama Canal. The construction of the Indio River reservoir is expected to increase vessel traffic by 11 to 15 per day. This would ensure that Panama's primary source of revenue, the Panama Canal, operates at full capacity. Additionally, the reservoir would provide fresh water to Panama City, which has seen significant growth in recent years with the construction of many skyscrapers. However, Panama would need to build more dams to guarantee a consistent supply of water through to the end of the century (Millard & McDonald, 2024). Investing in improving the canal infrastructure would be a wise decision for the future of this developing country and could help combat the issue of the canal's shallowing, which is a major concern for global trade.

Conclusions

In the second decade of the 21st century, the maritime industry needs new ways to ensure stability. These years have also highlighted that regional problems, whether political or natural, can have a global impact on maritime transport. The architecture of measures to address these issues includes strategic (permanent) and operational (temporary) components. However, these components can sometimes conflict with each other, as temporary solutions may worsen problems in the long term. Ensuring the stability of the maritime industry in the face of potential threats involves the cooperation of various stakeholders including states, international organizations, shipowners, insurers, and transport infrastructure operators. Typically, such threats necessitate significant changes to the routes, volumes, and types of cargo transported by sea. This also requires the adoption of new navigation techniques, advanced ship equipment, crew training, and work practices.

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Ківалов С. Поточні загрози сталому судноплавству – від воєнних ризиків до кліматичних змін. – Стаття.

У статті проаналізовано поточні глобальні ризики для морської галузі та досліджено потенційні рішення для мінімізації їхнього негативного впливу на ланцюги постачання. Підкреслено згубні наслідки регіональних збройних конфліктів і виклики, пов'язані з різними зацікавленими сторонами, які працюють разом для забезпечення сполучень у зонах бойових дій на морі. У статті також розглядається вплив кліматичних змін на морський транспорт на прикладі Суецького та Панамського каналів. В обох випадках фактори нестабільності викликають значні зміни маршрутів судноплавства, обсягів і типів вантажів, що перевозяться морем. Ці ефекти можуть спостерігатися і за межами регіону впливу дестабілізуючого фактора або відповідних видів вантажів.

Ключові слова: судноплавство, морська галузь, воєнні ризики, зміни клімату, Червоне море, Чорне море, безпека.