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**GLOBAL DISRUPTIONS ARE THREATENING  
MARITIME TRANSPORT. THE FRAGILITY OF  
CHOKEPOINTS AND THE REPERCUSSIONS ON  
THE SUPPLY CHAINS.**

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## ABSTRACT

The present paper has the purpose of identifying which are the possible evolutions of the bulk shipping market and the relative shipowners' choices about the deployment of the vessels due to the Red Sea Crisis, the Russian-Ukrainian conflict and the Panama Canal crisis. The first chapter concerns the scenario of the re-routing via Cape of Good Hope instead of via Suez Canal, the impact on freight rates and delays on the supply chains. The second chapter deals with the major liquid and dry commodities, their characteristics of extraction, custody and transportability, and the source diversification from the economic powers. The third one identifies weaknesses and possible threats of the main bottlenecks in maritime traffic and which challenges are facing in order to guarantee the most efficient flow of the goods. The dissertation ends with my personal consideration on the topic, with the hope of conveying to the reader the importance of these issues in our daily lives.

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Il presente elaborato si pone l'obiettivo di identificare quali sono le possibili evoluzioni del mercato del trasporto marittimo alla rinfusa e le relative scelte degli armatori riguardo al posizionamento delle proprie navi a causa della crisi in Mar Rosso, del conflitto Russo-Ucraino e della crisi del canale di Panama. Il primo capitolo affronta lo scenario della diversificazione della rotta verso Capo di Buona Speranza rispetto al canale di Suez, l'impatto sul livello dei noli e i ritardi causati nelle catene logistiche. Il secondo capitolo analizza i principali beni alla rinfusa trasportati liquidi solidi, le loro caratteristiche di estrazione, custodia e trasportabilità, e la diversificazione delle fonti da parte delle potenze economiche. Il terzo capitolo identifica le debolezze e le possibili minacce dei principali colli di bottiglia dei traffici marittimi e quali sfide stanno affrontando in modo da garantire il flusso più efficiente delle merci. L'elaborato conclude con le mie considerazioni personali sull'argomento, con la speranza di trasmettere al lettore l'importanza di questi temi nella nostra vita quotidiana.

## **I. Introduction**

The world of shipping is threatened by the ongoing of global disruptions. Current humanitarian emergencies are influencing the routes, the markets and the environment, reflecting those in our lives such as higher costs for primarily goods, higher costs of energy sources and prices increase from most of the supply chains to the citizens. This paper has to purpose to make an overview on the major turbulences affecting the bulk shipping and how the operators have chosen to behave in order to face this crises. I have chosen this topic due to its relevance nowadays, with the idea to illustrate how our lives are directly linked to the shipping industry and what happen if some arteries should be stopped. The major crisis are dealing with the Red Sea region, where the conflict between Israel and Hamas is generating thousands of victims, children, civilians, and it is suspending the commercial operations at Suez due to the entrance in the conflict by the Houtis rebels, based in Yemen. Most of shipping companies, especially vessels that carry goods with higher added value such as container ship and tanker vessels had chosen to change route and pass via Cape of Good Hope, extending the duration of the voyage but safeguarding the crew, the vessels and the goods on board. Other types of vessels like dry bulkers, Ro-Ro and some product tankers are still continuing to sail through the Red Sea, escorted and protected by the Navy, however assuming notable risks. The other crisis debated in this paper are the Russian-Ukrainian conflict, that is affecting in particular the grain and petroleum trades but also it is slackening the marine traffic in the Black Sea region. It is a marginal area rather than Suez Canal but also relevant for the countries neighboring. The last arteria in difficulty is the Panama Canal. Due to a limited drought the athority is reducing the number of daily passages and obliging some ships to lighten, in order to pass through the reduced sluices. The paper is so structured, the first chapter deals with the issues created by the re-routing of the vessels, the second chapter aims to give an overview to the major commodities carried worldwide and the last chapter analyses the fragililty of the most important chokepoints of the shipping industry, with a final consideration on the arctic route and how it could create competition to the traditional routes in the near future.

## **II. The phenomenon of re-routing**

### **II.1 Relevance of Red Sea in the globale trade**

Since 1869, thanks to the opening of Suez Canal, the Red Sea has represented one of the most crucial passage in the shipping industry. At the beginning only the smaller ships could sail through this way and the liner market didn't exist yet. In 1965, a truck driver called Malcom Mclean had the idea that idea that rapidly would have changed the world. A brilliant thought that cites "Would it not be great if my trailer could simply be lifted up and placed on the ship without its contents being touched?".<sup>1</sup> His idea was to cut as much costs as possible for loading and discharge goods. Years ago the operations were really slow and the ships had to wait several days before commence a new voyage, consuming precious time and resources. The most important rules, that everyone should know in the field of maritime management are "safety first" and "the vessel gains when it sails" and since 1965 it has started what the economic literature called the Containerization. It concerns in a process that has revolutionised the shipping industry, making carriage of goods worldwide more manageable and efficient. This innovation transformed the global trade increasing efficiency and reducing labor costs associated to loading and discharging cargo at each stage of transportation. Nowadays around 90% of non-bulk cargo worldwide is carried via container, highlighting its relevance in facilitating international commerce.<sup>2</sup> The global trade grew up esponentially by few years. This fact allowed the Suez Canal to start new works and extend the measures of the canal, reaching the current levels: lenght of 193,3 km, draft of 24 metres, and width of 225 metres.<sup>3</sup> The Red Sea region became soon one of the most important trade passage with two entries: the Suez Canal in the north and the Bab Al-Mandab Strait in the south. Today it is a strategic waterway and it allows to move an enormous number of consumer goods, commodities and sources of energy from the Indian Ocean to the Mediterranean Sea and accounts around 12% of global trade. During 2023, around 26,000 vessels crossed the Suez Canal. Bulk Carriers accounted for 28% of the total

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<sup>1</sup> The Maritime Executive, December 28, 2016, "The story of Malcom McLean"

<sup>2</sup> InboundLogistics, September 2023, "Containerization of shipping containers: definition, types and process"

<sup>3</sup> NauticaReport, January 19, 2024, "Il canale di Suez e il turismo, la vera economia egiziana"

traffic, followed by oil tanker 24% and container ships 23%.<sup>4</sup> The remaining percentage is associated to small niches of market. The region of Red Sea, along Africa's northeastern coast and the Arabian Peninsula, is poised for a huge growth. The population is projected to rise from about 620 million to nearly 1,3 billion by the early 2050s, with a potential rise in GDP (Gross Domestic Product) over the same period from \$1.8 trillion to \$6.1 trillion. However today the area is largely underdeveloped, limited by a lack of infrastructure and large commercial ports.<sup>5</sup> This area has acquired a notable relevance for global trade allowing the shipping companies to reduce voyage costs and reaching their destination, the Mediterranean and the big ports of North Europe, more rapidly avoiding the circumnavigation of the African continent. The importance of this way for global trade were most acutely demonstrated by the six-day blockage by the giant container ship Ever Given. The incident led to more than 100 vessels being trapped on each side of the canal and to the interruption of an estimated \$9.6 billion on trade flow each day. Given that 12% of global trade passes through the Suez Canal, the traffic disruption impacted not just the global shipping industry but also countless businesses and supply chains, from manufacturers to domestic transport providers to retailers and supermarket.<sup>6</sup> The Red Sea is still an hotspot of political instability, regional conflicts and geopolitical relevance. Recent political transformations in Sudan and Ethiopia, economic developments in the Horn of Africa amidst instability and debt, ongoing war and humanitarian crisis in Yemen, Middle Eastern conflicts and their regional effects and China's increasing presence have all intensified geopolitical interest in this area.<sup>7</sup> Middle Eastern countries, including the UAE, Saudi Arabia, Qatar and Turkey are aggressively competing for influence in the Horn of Africa. They are all eager to build ports and military bases on the Red Sea coast. This rivalry has escalated tensions in the region. Meanwhile, the arrival of China in the port of Djibouti has increased the

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<sup>4</sup> UNCTAD, February 2024, "Impact to global trade of disruption of shipping routes in the Red Sea, Black Sea and Panama Canal"

<sup>5</sup> Arab Center Washington DC, October 27, 2021, "The complicated nature of Red Sea geopolitics"

<sup>6</sup> EUI, July 23, 2021, "The Red Sea Link. Geo-economic projections, shifting alliances and the threats to maritime trade flows"

<sup>7</sup> US Institute of Peace, April 1, 2020, "China's impact on conflict dynamics in the Red Sea arena"

number of foreign military owners in the already contested country, further complicating the geopolitical landscape. Major powers like China, France, Italy, Japan and the United States have established military bases near the strategic junction of the Red Sea and the Gulf of Aden. India and Saudi Arabia are also considering to set up bases in Djibouti. Russia has expressed interest in a military presence in the Horn of Africa. For the vulnerable african nations bordering the Red Sea, this increased involvement from external powers brings both opportunities and challenges. The most obvious sign of the “new scramble for Africa” is the rapid construction of seaports and military facilities along the Red Sea coast. Many rumors have been spread about these acquisitions, but a comprehensive understanding of this real estate boom is still lacking.<sup>8</sup> The Red Sea has different nations along its coast: Egypt, Sudan, Eritrea and Djibouti on the west, and Saudi Arabia, Yemen Israel and Jordan on the east. Israel owns an important port in the northeast called Port Eilat. These countries, Egypt, Israel and Saudi Arabia are significant regional powers while the others are weaker, poorer and more unstable. Given this situation, it’s not surprising that more and more powerful countries are getting involved in the region militarily, mainly to safeguard the global trade against possible crisis due to the political instability in the bordering countries. Russia’s recent announcement to establish a naval base in Sudan, coupled with China’s existing military base in Djibouti, highlights their shared objective of expanding influence in African continent. China’s decision to maintain a forward operating base was reinforced by the need to evacuate its citizens from Lybia in 2011 and Yemen in 2015. Meanwhile, the United States’ presence in Djibouti, along with its strategic alliances with Egypt, Israel and Saudi Arabia, as well as its participation in multinational efforts like the CMF (Combined Maritime Force) solidifies its role in the regional geopolitics. The growing presence of these major economic powers in the Red Sea is indicative of a changing landscape. Against the backdrop of the Yemeni conflict since 2015, the United Arab Emirates and Saudi Arabia have actively searched to limit the influence of the Iran-supported Houthis and counter Iranian presence in the southern Red Sea region. To achieve this, they have expanded their influence and military footprint by forging partnership with Sudan, Djibouti and Eritrea. Additionally, Turkey aims to rebuild the

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<sup>8</sup> Brookings Doha Center, August 2019, “Red Sea rivalries: the gulf, the horn and the new geopolitics of the Red Sea”

port of Suakin in Sudan, which will complement its existing presence in Somalia. The regional rivalries among these Middle Eastern actors introduce a significant dimension to the overall geopolitics of the Red Sea.<sup>9</sup>

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<sup>9</sup> ORF, July 16, 2022, “The US and changing geopolitics of the Red Sea”



## **II.2 Analysis of Red Sea Crisis and how it affects the shipping routes**

The Red Sea serves a crucial passageway for oil and derivatives, liquified natural gas, bulk commodities and consumer goods. The Houthi rebels have been actively targeting vessels passing through the Bab Al-Mandab Strait, also known as the Gate of Tears, a narrow channel spanning 20 nautical miles that is notoriously hard to sail. The rebels have expressed their allegiance to Hamas and have explicitly stated their aim to attack ships en route to Israel, using drones and rockets against foreign-owned ships. Due to the risks posed at Bab Al-Mandab Strait, ships now are forced to take a longer and safer route, circumnavigating the African continent and extending their journey by more than 10 days, incurring in significant financial costs. On October 7th, 2023, the Palestinian militant group Hamas began an unprecedented offensive against Israel, involving hundreds of armed individuals infiltrated in small communities near the Gaza Strip and killing more than 1,200 people between civilians and soldiers. In response to the attacks, Israel launched a military operation against Hamas that is still in development. The health ministry in Gaza, under Hamas control, reported a death toll exceeding 40,000 people since the commencement of the conflict, including more than 13,000 children. Concerning the relevance of the Red Sea in maritime transport, about 30% of the total passages are conferred to the container traffic. Billions of dollars of traded goods and pass through the waterway every year, which means that delays there can affect petrol prices, the availability of finished products and other business of global trade. Recent escalations in ship attacks have prompted shipping companies to halt travel through the Bab al-Mandab Strait, situated between Yemen on the Arabian Peninsula and Djibouti and Eritrea on the African coast.<sup>10</sup>

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<sup>10</sup> BBC, December 18, 2023, “BP pauses all Red Sea shipments after rebel attacks“

Figure II.1 “The Route via Cape of Good Hope”



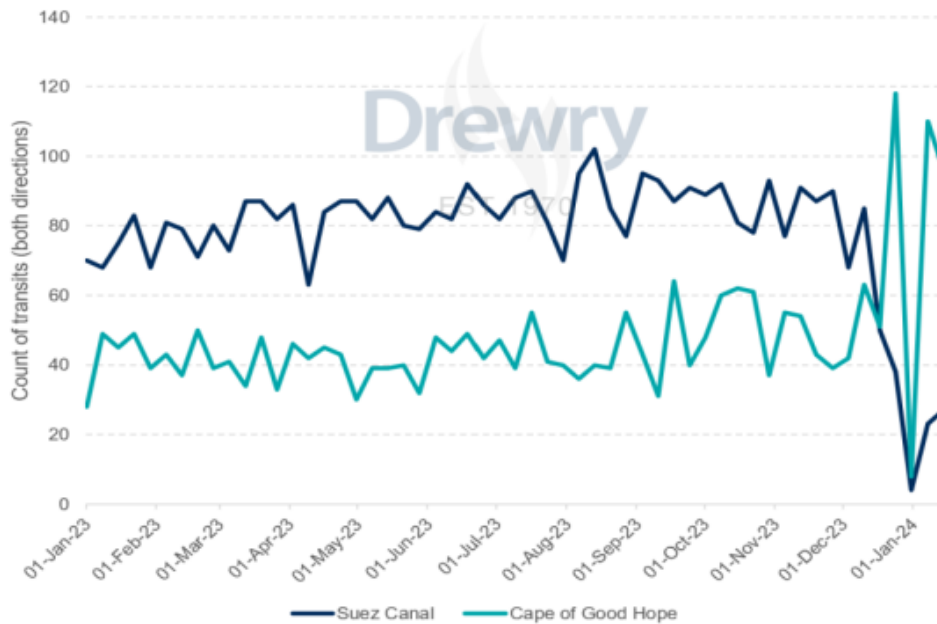
Source:czapp, January 18th, 2024

The Houthis are a rebel group based in Yemen and currently they hold control over the western part of the country, including the Red Sea coast. Although they receive support from Iran maintaining their political independence. While many Muslim nations and organizations have chosen to not intervene in the conflict involving Hamas in Gaza, the Houthis took a different approach by declaring war on Israel in late October. Initially, they attempted to strike Israel with long-range ballistic missiles, but these proved to be ineffective as many of them were intercepted by the military defence of United States and Saudi Arabia. However, in mid-November, the group shifted their focus to targeting commercial shipping. This new strategy began with the dramatic capture of the *Galaxy Leader*, an incident that was captured on video through rebel body-worn cameras. Despite the Houthis initially claimed that only ships heading to Israel would have been targeted, the threat to global trade has escalated, as vessels flagged to other countries unrelated to Israel have also come under attack.<sup>11</sup> Diversions from Egypt’s Suez Canal, which feeds into the Red Sea, are hurting capacity. Re-routing vessels around the Cape of Good Hope adds two to four weeks to a round-trip voyage. Ocean alliances need more ships on each Asia-East Coast route to maintain an efficient network schedule.

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<sup>11</sup> The Guardian, December 19, 2023, “Red Sea Crisis explained: what is happening and what does it mean for global trade?”

Figure II.2 “Count of Transits per route”



Source: Container-Management, January 22, 2024

The disruptions caused by the attacks in the Red Sea are sending shock waves through all global trade, resulting in a sharp increase in voyage costs. This surge in expenses is raising concerns about the possibility of inflation resurfacing if the disruption persists. According to a recent report by S&P Global Market Intelligence, the diversion of container ships from the Suez Canal to the Cape of Good Hope in South Africa is causing a "global contagion" effect on freight rates. The Suez Canal plays a vital role as a gateway between Asia and Europe, and the impact on trade between these two regions has been particularly severe. The cost of shipping a 40-foot container from North Asia to Europe has skyrocketed by over 600% to more than \$6,000 since the outbreak of the Israel-Hamas war in October. However, the repercussions of the Red Sea crisis are not limited to Asia and Europe. Shipping costs between Asia and the United States have also experienced a significant spike. Rates for shipping a 40-foot container from North Asia to the U.S. East Coast have surged by 137% to \$5,100 since early October, while rates to the U.S. West Coast have jumped by 131% to \$3,700 during the same period. If this disruption persists, there is a growing concern that inflation may once again become

a pressing issue.<sup>12</sup> The dry bulk sea freight index of the Baltic Exchange experienced a notable increase, rising by 1.8% to reach 3084 points. This marks its highest level since January 10th. Furthermore, the index recorded a 4% increase for the second week of February. Specifically, the Capesize index, which measures rates for larger shipping vessels, saw a gain of 2.3%, reaching 2448 points. The average daily earnings for capesize vessels, known for transporting cargoes such as iron ore and coal weighing more than 150,000 tons, witnessed a rise to \$20,304 per day. Similarly, the panamax index, which tracks rates for medium-sized vessels, continued its upward trajectory for the ninth consecutive session. It had mark an increase of 9% during the same period and the average daily earnings for panamax vessels, typically carrying coal or grain cargoes weighing between 60,000 and 70,000 tons, also experienced growth, rising by \$210 to \$14,817 per day. Among smaller vessels, the supramax index rose by 13 points to reach 1071 points, reaching a one-month high.

Figure II.3 “Baltic Dry Exchange Index”



Source: Tradingeconomics, September 16<sup>th</sup>, 2024

This surge in the index can be attributed to shipping companies redirecting container vessels away from the Red Sea due to the escalating number of Houthi militant attacks since early December. These attacks have disrupted supply chains for companies that

<sup>12</sup> CNBC, January, 11, 2024, “Red Sea crisis could jeopardize inflation fight as shipping costs spike globally”

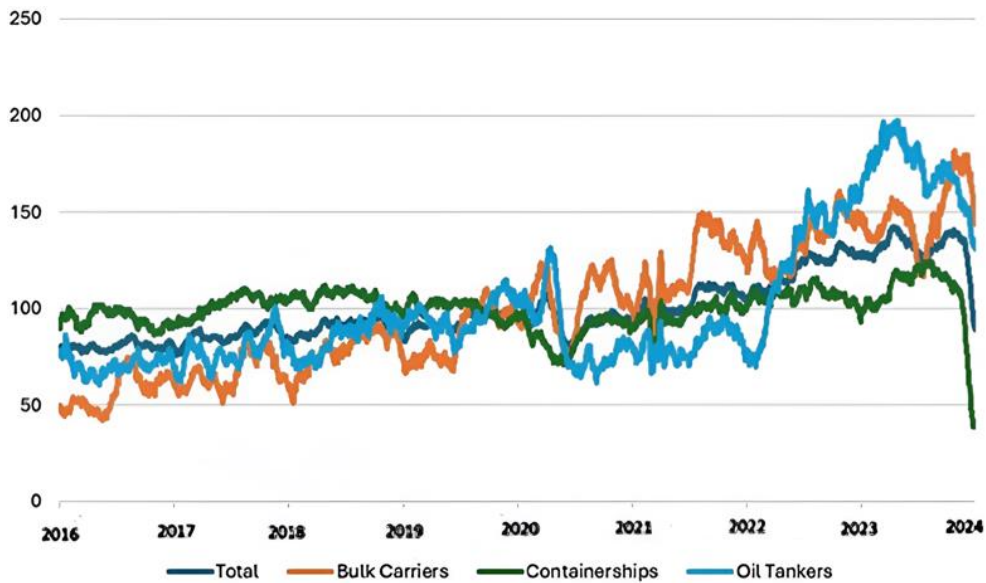
heavily rely on the Suez Canal for transporting goods from Asia to Europe.<sup>13</sup> Shipping companies such as Maersk, Hapag-Lloyd, and MSC have made the decision to avoid using the Red Sea. According to the Atlantic Council, seven out of the top 10 shipping companies in terms of market share have suspended their operations to avoid the high-risk areas. This diversion has resulted in an increase in journey time by up to two weeks minimum, on the basis of speed. Furthermore, the insurance risk premiums for sailing through these areas have been on the rise. Initially, shipping companies paid a risk premium of only 0.07% of the ship's value at the beginning of December. This premium has increased to approximately 0.5% to 0.7%. It remains uncertain when commercial shipping groups will regain enough confidence to allow their vessels passing through the Bab el-Mandeb strait once again. Analysts predict that if the attacks on vessels persist and more oil companies halt their shipments through the Red Sea, energy costs are likely to increase much more than we can imagine. Shipping companies are so facing a binary choice: traveling through the Red Sea and bear the risk originated by war and the increased insurance costs, or divert their vessels. Both options come with the risk of higher expenses, although diverting ships around Africa also introduces the possibility of delays.<sup>14</sup> The Gulf of Aden has experienced a significant decrease in ship tonnage entering the area, with a decline of more than 70% between December 2023 and February 2024.

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<sup>13</sup> HellenicShippingNews, February 17, 2024, "Baltic Index posts weekly rise on stronger vessels rates"

<sup>14</sup> The Guardian, December 19, 2023, "Red Sea Crisis explained: what is happening and what does it mean for global trade?"

Figure II.4 “Daily transits via Suez 2016-2024”

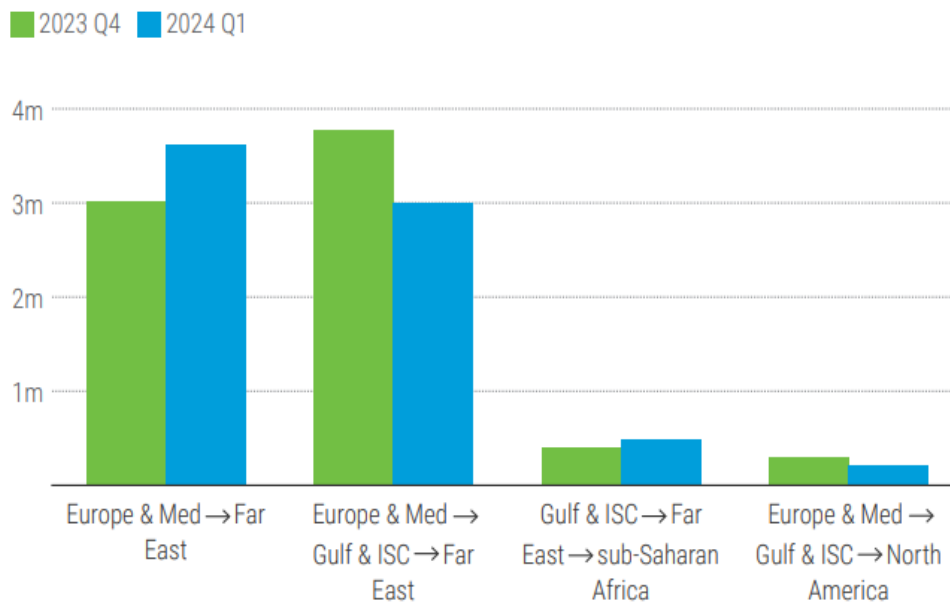


Source: The Red Sea crisis, ramification for vessel operations, shipping networks and maritime supply chains, February 20th, 2024

The Cape route so has seen an increase of 60% in vessel traffic passing through. Just in the middle of February, more than 600 container vessel have chosen this way. Different businesses such as construction, automotive, chemical and machinery, which rely on intermediate imports from the Asia-Pacific region, are vulnerable due to the disruptions in the supply chain. Additionally, the energy supply, food security and environmental sustainability are also affected. Suez Canal has the role that allow to the vessel to save time and distances. In example, an oil tanker travelling from Ras Tanura in Saudi Arabia to Rotterdam would have cover a distance of 10,358 km through the Red Sea. The alternative route via Cape of Good Hope would be of 17,975 km resulting in a 57% increase of the journey length. Another example could take a container vessel starting from Singapore to Rotterdam. It would register a 70% reduction in travel distance by using the Suez Canal. The rerouting of ships through longer distances increases the demand for more fleet capacity. Over the years, maritime cargo distances have increased due to shifts in global trade geography and evolving globalization trends. The ongoing events in the Red Sea are expected to further reinforce this trend, which has already been intensified by the war in Ukrain, in particular for oil and grain trades. Currently Egypt sources its grains from Brazil or USA instead of Ukrain, while Russian

oil shipments are directed to India and China instead of Europe. The rerouting of vessels to the Cape route has had significant impact to different supply chains. This diversion results in additional expenditures, such as increased fuel costs and depreciation of time sensitive cargoes. Moreover there are other supplementary costs associated with security concerns, in particular threat of piracy in the proximity of the Horn of Africa. These circumstances have led to a surge in insurance and legal claims from companies whose vessel experience delays and disrupted shipments. Data of the first quarter of 2024 reveals a shift in container fleet deployment, with a decrease in capacity allocated to the Gulf regions and an increase of services to and from Africa.<sup>15</sup>

Figure II.5 “Companies are rerouting their ships to avoid Middle East”



Source: UNCTAD, February 2024

Concerning other shipping trends, oil and product tankers are now redirected to the Cape route. At the moment no liquified natural gas vessels are using the Suez Canal. Bulk trade, instead, is not that dependent on the Suez route and has slow exposure to its disruptions. It has seen limited market impacts, but also numerous bulkers have been diverted, in particular for grain and soybeans trades. Vessel prices and charter rates have begun to increase since December 2023. The ongoing crisis in the Red Sea centered at

<sup>15</sup> UNCTAD, February 2024, “Impact to global trade of disruption of shipping routes in the Red Sea, Black Sea and Panama Canal”

Bab el-Mandab Strait, has had significant impact on the global trade. The escalation of tensions and attacks, such as the strike on the Marlin Luanda, a product tanker which was carrying Russian naphtha, and the seizure of the Suezmax St Nikolas by Iran, have resulted in an enormous decrease of vessels crossing the Red Sea. In February, there was a 23% month on month decrease in tanker, a 27% decrease in dry bulk carriers and a 73% decrease in LNG vessels. As a consequence, the average daily transits of bulk commodity carriers have reached their lowest point in over two years. This disruption signifies various macroeconomic implications, first of all inflation. Consequently, this can drive up the prices of primary goods, in Europe in particular, which heavily relies on imports from Asia. If the situation continues at these levels, there will be a potential for long term inflationary pressure as the prices of manufactured goods are expected to rise, ranging from clothing to furniture. This reduction of daily passages for bulkers and tankers has had a substantial impact on global trade flows, particularly in terms of clean tanker transits. The LNG and LPG market have been affected, resulting in changes in trade routes and freight rates, although the impact has been somewhat less severe. The tensions in the region have also influenced most oil tankers, where oil prices have been trending upward. Although there was a temporary decline in Brent crude prices and WTI at the beginning of February 2024. During 2023, crude oil carried through the Suez Canal accounted for around 8% of global crude flows, indicating an increase from the previous year. The rerouting of shipments around the Cape of Good Hope is resulting in extended transit times and potential effects on the prices of refined products. This market includes various commodities such as jet fuel, gasoline, naphtha, diesel and it is encountering different impacts, based on the specific product and region. For instance jet fuel is facing delays of from 15 to 20 days due to the rerouting, while diesel remains unaffected since exports from the refinery located in the middle of the Red Sea, in particular in Egypt and Saudi Arabia. So they are not threatened by passing through the Bab el-Mandab Strait. The carriage of chemical, biofuel and dry bulk commodities such as grains, oilseed, iron ore, coal, bauxite, steel coils, fertilizers and petcoke crossing the Suez Canal varies depending on the type of commodity. As a small percentage of global trade flows for these goods use the Suez route accounting 3% for bauxite, 7% for coal and 3% for Iron ore. They have mostly experienced minimal impact or have redirected to avoid the Red



Sea.<sup>16</sup> Ocean spot rates have significantly increased. While the impact has been most pronounced on Asia-Europe shipping lanes, costs on other routes may also rise as capacity is redirected. This situation could worsen if shipping orders are rescheduled in anticipation of longer delays. Consequently, retailers heavily reliant on sea freight may face financial pressure. Despite many retailers having hedged their freight exposure and secured rates at more stable levels for the first half of 2024, some freight partners have renegotiated rates lower, potentially leading to upward renegotiations in the current circumstances. The Red Sea shipping crisis has the potential to contribute to inflationary pressures, as the increased shipping costs are expected to translate into higher prices for the imported goods. The extent to which this will occur depends on the duration and the severity of the crisis. However, there are certain factors that could either dampen or amplify the impact on prices. In example, if there is a period of weak consumer demand, companies may choose to absorb a larger portion of the shipping costs in order to protect the civilians against the inflationary pressure to the goods.<sup>17</sup> Since the commencement of the Houthis attacks to the commercial vessels, within their controlled areas, more than sixty ships have been targeted, with not all of them being successfully hit. The sinking of the Rubymar bulk carrier, twelve days after being struck by an Houthi ballistic missile, could potentially escalate the crisis. The incident highlights the capability of Yemeni forces to sink a large merchant vessel despite the presence of military ships from different nations ensuring a safe passage. The full extent of the consequences of this event is yet to be determined, but the impact on maritime freight rates and insurance costs in the upcoming days will indicate if the risk level in the area has indeed increased significantly. The French container CMA CGM announced plans to partially resume sailing in the Red Sea, relying on the protection of French military vessels. However, the implementation of this decision remains uncertain, as the company mentioned that it would be evaluated on a case by case basis. Missiles and drones targeting merchant ships are not the sole threat in the region. The risk to the natural gas supply from Kuwait to Europe due to insufficient gas carriers sustain current levels via the circumnavigation of the African continent. The extended travel time reduces the number of trips per ship, leading to a surge of the freight rates. Additional

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<sup>16</sup> Kpler, February 6, 2024, "Red Sea disruptions: implications for shipping and trade"

<sup>17</sup> HellenicShippingNews, February 12, 2024, "What are the impacts of the Red Sea shipping crisis?"

risks involve the escalating cyber attacks on operational technology systems within the maritime industry, from 50 in 2017 to over 500 in 2020. The potential severing of submarine cables is crucial for internet connections worldwide and major lines near Yemen are under observation from pirates and terrorists. The Italian Navy's presence in the region allows for the activation of the Virtual Regional Maritime Traffic Control system. This virtual network connects the operational centers of participating Navies, sharing unclassified information on merchant traffic. The data are transmitted in the Mersit format developed by the Italian Navy and is centralized at the Command in Chief of the Naval Fleet (Cincnav) for access by all participants.<sup>18</sup>

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<sup>18</sup> TrasportoEuropa, March 4, 2024, "The sinking of the Rubymar could worsen the Red Sea crisis"

### **II.3 Repercussions and consequences on the supply chains**

The Houthi rebels justify their assaults in the Red Sea by framing them as a gesture of solidarity with Palestinians. Their aim is to exploit the resulting disruptions in trade as a means to induce western governments to push Israel into accepting a ceasefire in Gaza. Simultaneously, they are capitalizing on the situation to boost their popularity among Yemenis. Faced with urgent economic and humanitarian challenges following years of conflict, the Houthis are struggling to address the basic needs of the population. These assaults help amuse attention from domestic problems and allow the Houthis to position themselves as significant actors in a regional confrontation involving Israel and the United States, all under the guise of backing the Palestinian cause. Furthermore, lacking international legitimacy, the Houthis are working towards gaining global acknowledgment and asserting that major powers cannot ignore them. The Red Sea crisis has had a direct impact on cargo shipping delays and price hikes. Although the attacks on vessels are linked to the ever-changing conflict in the Middle East, making them difficult to predict in the medium to long term, it is highly probable that delays and costs increases will persist in the coming months as shipping companies prepare for a prolonged conflict. The increase in ship diversions leads to higher bunker costs, while also reducing the amount of cargo traffic reaching its intended destination. The revenues of Egypt's Suez Canal have been negatively affected by ship diversions. From January 2024, revenues have declined by 40% compared to the levels in 2023. This poses a further challenge for the Egyptian economy as canal fees are paid in foreign currency, which the government has struggled to obtain due to rapidly rising inflation. The diversions and subsequent price increases have varying impacts on different shipping industries. Bulk carriers, which transport less valuable cargo such as raw materials, are not affected in the same manner as cargo ships that carry more valuable goods such as tankers and container vessels. The route from Asia to Europe, typically passing through the Gulf of Aden and the Suez Canal, have witnessed the most significant price hikes. Drewry's data reveals that the average cost of shipping from Shanghai to Genoa exceeds \$6,000 per 40ft. Nevertheless, the repercussions are also felt in unaffected routes, as seen in the spike in rates from Shanghai to Los Angeles, which rose from \$1,985 to \$3,860 per 40 ft between December 2023 and January 2024. Although these figures

indicate immediate price escalations, various economic factors will play a role in determining shipping freights. As reported by the Financial Times, shipping companies have been increasing their vessel acquisitions. It is projected that by 2025, the global capacity of container shipping will grow by approximately 25%, aiding in price stabilization.<sup>19</sup> The Red Sea Crisis is intricately linked to the ongoing conflict in the Middle East. While it is not explicitly clear whether the Houthis are targeting cargo ships in complete solidarity with the Palestinian cause, the urgent humanitarian situation in Gaza provides the Houthis with international political cover to continue their attacks. This poses a challenge for key regional players like Saudi Arabia and Egypt, who are cautious about being perceived as taking sides with Israel. Governments worldwide are actively involved in diplomatic and strategic calculations that prioritize their shipping interests. India has emerged as a strong supporter of Israel and relies on the Suez Canal for its exports to the Mediterranean. Consequently, India is significantly affected by the Red Sea Crisis. The Indian Ministry of Commerce and Industry has revealed that approximately 80% of all goods exported to Europe are transported through the region. Furthermore, exports to the European Union account for 15% of India's total goods exports. In response to the Houthi attacks, the Indian government has engaged in diplomatic discussions with Iran and is implementing additional measures to safeguard its exporters. China, dependent on shipping for 95% of its exports, has a significant economic interest in securing Red Sea shipping routes. Chinese authorities have expressed concerns about U.S. led military operations, opting to keep a distance from any involvement. It is possible that China has assessed that its vessels in the Red Sea are less likely to be targeted by Houthi attacks compared to western ships with more connections to Israel. Some Chinese ships in the region have reportedly used signals to indicate their nationality and lack of economic links to Israel. Despite diplomatic efforts, attacks on ships are expected to continue in the near future. The Houthis are gaining support in Yemen and are unlikely to cease their attacks as long as the conflict in Gaza persists. Furthermore, these attacks may persist even after the conclusion of the war in Palestine. The Houthis see engaging in direct conflict with the United States as a way to enhance their legitimacy and do not view it as a threat to their rule. The Cape of

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<sup>19</sup> CSIS, January 22, 2024, “The global economic consequence of the attacks on Red Sea shipping lanes”

Good Hope has become a preferred route for higher-value shipping. However, bulk carriers, which are lower-value shipping vessels, continue to transit the Red Sea. As a result, shipping prices for high-value cargo have consistently risen, while they have returned to normal for bulk carriers. Due to the ongoing Israel-Hamas conflict, which shows no signs of abating, the Houthis have realized that their attacks gather international attention and divert the Yemeni population's focus from their failure to provide essential services. This realization further reinforces their current actions.<sup>20</sup> With 12% of global shipping trade passing through the Suez Canal, the Red Sea shipping crisis is upending supply chains. This is compounded by the ongoing shipping disruptions caused by blockages in the Panama Canal, which is experiencing one of the region's worst droughts since the 1950s. Disruptions here reverberate across the global economic landscape, underscoring the interconnected nature of international trade and its susceptibility to geopolitical tensions. The Cape Route not only increases operating costs for shipping companies and logistics providers but also places additional financial strain on businesses that depend on the Suez Canal, leading to higher inventory and transportation expenses. These changes have the potential to trigger a new wave of global inflation, affecting consumer prices and economic stability on a global scale. There has been a contraction in available market capacity, a phenomenon not isolated to the Red Sea but also influenced by the drought situation in the Panama Canal and the cyclical effect of the Chinese New Year. The impact on businesses during this crisis will depend on the complexities of their supply chain strategies, which include factors such as the selection of the routes, choice of carriers, and the ability to adapt operational frameworks. The alternative route around the Cape of Good Hope, adds an additional 3,500 nautical miles to the distance between Shanghai and Rotterdam, and 8,500 nautical miles between Jebel Ali and Port Said. When ships travel at speed of 13 knots, the voyage from Shanghai to Rotterdam, including the detour, will take over 44 days. However, maintaining a speed of 17 knots, it could reduce the duration to 33 days, aligning more closely with the original transit time without the detour. It is important to note that higher speeds lead to increased fuel consumption and subsequent higher emissions charges, creating a complex trade-off between speed, cost, and environmental

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<sup>20</sup> CSIS, January 22, 2024, "The global economic consequence of the attacks on Red Sea shipping lanes"

impact.<sup>21</sup> According to the US Energy Information Administration 2023, an annual average of 8.8 million barrels of oil shipments pass through the Bab al-Mandab strait each day, representing around 8% of the global demand. The Suez Canal route is normally used by nearly one-third of global container traffic and around 12–15% of global goods trade. About 1500 merchant vessels per month would normally transit the Suez Canal before the start of the Red Sea crisis. While the full impact of the Red Sea crisis on shipping and global supply chains is yet to be seen, businesses and shipping lines are trying, as far as possible, to mitigate the potential logistics ramifications of the crisis.

Figure II.6 “Impact of Cape rerouting on sailing distance”

	Unit	Red Sea/ Suez route	Cape route	Increase (%)
Total roundvoyage sailing distance	nm	24000	31000	29.2
Average sailing speed	kn	16	17	6.3
Average total port time per call	days	1.7	1.7	
Number of Asian port calls	no.	5	5	
Number of North European port calls	no.	4	4	
Total sailing time	days	62.5	76.0	21.6
Total port time	days	15.3	15.3	
Total roundvoyage time	days	77.8	91.3	17.3
Required number of vessels for weekly service	no.	11	13	17.3

A vessel speed increase from 16 to 17 knots typically leads to a 10% increase in bunker consumption per day for a mega container ship.

Source: The Red Sea Crisis: ramifications for vessel operations, shipping networks, and maritime supply chains, February 2024

The rerouting of vessels via the Cape of Good Hope has several impacts. First of all the impact on fleet capacity concerning rerouting requires significantly more capacity to carry the same quantity of goods in the same and frequency. A typical liner service requires 10 to 15 vessels to guarantee a weekly frequency. Assuming commercial vessel speeds remain unchanged, the Cape route diversion will require the inclusion of at least two additional vessels in the loop to ensure a weekly departure schedule. While this adjustment enables carriers to address the excess fleet capacity that emerged in the

<sup>21</sup> World Economic Forum, February 23, 2024, “charting the course: how the shipping industry is adapting to tensions in the Red Sea”

market since 2022, it also leads to temporary capacity constraints due to sudden fleet deployment modifications. Consequently, a shortage of slot space for shippers is anticipated just before the Chinese New Year. Around 2.6 million TEU of slot space is required to address the shortfall in capacity caused by the diversions. This represents some 200 extra vessels, taking into account the ship sizes deployed and the region served. A lot of new capacity is scheduled to enter the market in 2024: 478 vessels, and approximately 3.1 million TEU, beating the previous record of 2023 by 41%.<sup>22</sup>

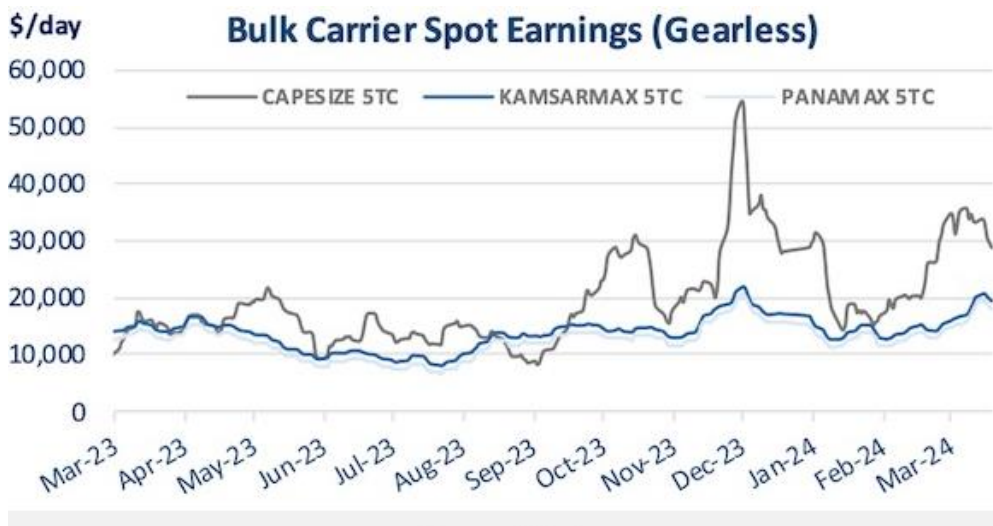
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<sup>22</sup> Maritime Economics & Logistics, February 20,2024, “The Red Sea Crisis: ramifications for vessel operations, shipping networks, and maritime supply chains”

## II.4 How the bulk shipping market is affected by the Red Sea Crisis

The growing tension in the Red Sea linked with the attacks by the Houthi rebels are having an impact on the national and European economic system. Despite the significant number of vessels being targeted by ballistic missiles, the bulk market remains relatively unaffected compared to other segments such as containers and oil tankers. Suez Canal Authority data for 2019 showed that the bulk sector represented only 13.2% of all tonnage that passed through the canal and 22.5% of all ships for that whole year. Additionally, the majority of dry bulk shipping passing through the canal is considered safer due to its origins from countries not under target by the Houthis, in theory. As a result, the dry bulk freight sector is expected to be less impacted by the ongoing crisis in the region.<sup>23</sup> During the first quarter of 2024, the demand for dry bulkers continued to exhibit intensity. The dry bulk S&P activity was rapid, with more than 220 vessels being sold or long term chartered for the first three months of 2024. This means an approximate 35% increase when compared to the corresponding period in 2023.

Figure II.7 “Bulk Carrier Spot Earnings”



Source: HellenicShippingNews, March 2024

<sup>23</sup> OFI, February 13, 2024, “Dry bulk trade less impacted than container shipping in Red Sea Crisis”



The data indicates that the Capesize sector has achieved its strongest Q1 in terms of sales, surpassing the performance of the past 10 years, despite the rise in second-hand prices. The prices of Capesize vessels in the second-hand market have experienced the highest increase compared to other segments, with prices for 5-year, 10-year, and 15-year-old vessels rising by 21%, 35%, and 39% respectively. Additionally, the Panamax/Kamsarmax and Post Panamax sectors have also had a promising start, with a total of 58 vessels finding new owners, more than double the number compared to the same period in 2023.<sup>24</sup> The shipping industry is currently undergoing a prolonged phase of favorable market conditions, with the ClarkSea Index reaching approximately \$24,000 per day in the first quarter of 2024. This represents a significant 35% increase compared to the 10-year average and is consistent with the strong performance observed in 2023. Factors contributing to this trend include the growth in underlying trade volumes, a constrained shipbuilding market, and various supply and demand implications. These complexities are influenced by a range of factors, such as geopolitical disruptions, shifting trade patterns, and the implementation of stricter emissions regulations. Despite the mixed signals in the global economy, seaborne trade volumes experienced a notable 3% growth, reaching 12.4 billion tonnes in 2023, largely due to strong support from Chinese trade. Underlying shifts towards longer voyages, disruptions events are further enhancing the "distance kicker" effect on overall shipping demand. The traffic passing through the Red Sea, which represents approximately 12% of global trade, has witnessed significant declines, dropping by 70% as vessels opt to reroute via the Cape of Good Hope, resulting in extended voyage distances and adjustments in trade flows. It is estimated that these diversions are currently generating an additional 3% in global vessel demand, equivalent to a full year of typical trade growth, with the container sector alone experiencing an 11% increase. Restrictions on transits through the Panama Canal, due to low water levels have also had an impact, leading to a one-third decrease in tonnage transits. Furthermore, the tonne-mile effects of redistributed Russian oil and gas exports, and European imports, continue to have repercussions on the industry. Market conditions in the major 'volume' sectors have

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<sup>24</sup> HellenicShippingNews, March 29, 2024, "Dry Bulk second hand sales grew by 35% during the first quarter of 2024"

significantly improved compared to six months ago. The tanker markets continue to experience intensity, with average earnings exceeding \$40,000 per day. This is attributed to the combination of low fleet growth, ongoing long-haul trade flows, and disruptions in the Red Sea, which have led to a spike in the product tanker market during the first quarter. Bulk carriers, especially Capesizes, have had a strong start to the year due to firm cargo volumes and a limited newbuild orderbook. The offshore oil and gas markets are currently in a positive situation, with day rates showing a significant increase and approaching previous market peaks.<sup>25</sup> The dry bulk market crossed a rebalancing phase towards the end of March 2024. The underlying fundamentals of the dry bulk industry did not justify the previously elevated spot rate levels. Instead, it was the disruptions in vessel supply, particularly in the Atlantic market, that contributed to the recent surge in spot rates, defying the usual seasonal patterns. The market has now achieved a state of equilibrium, with the supply and demand shifting in favor of the Atlantic market, causing challenges for the Capesize market due to the increasing number of vessels available. Furthermore, the collapse of the Baltimore bridge has resulted in a disruption of coal exports, leading to the release of several pre-committed Capesize ships into the Atlantic market. Additionally, concerns about delays and potential force majeure in Guinea are adding pressure on the demand for bauxite. Considering the significant increase in iron ore and coal shipments in recent months, there is an expectation that bulk volumes will revert to the average, thereby exerting pressure on spot freight rates. While market participants remain optimistic, it is important to note that shipping markets primarily rely on historical data, limiting the ability to draw definitive conclusions. The think of shipping players is that the market state has not yet reached its lowest point. The bulk shipping industry is currently experiencing favorable market conditions with robust cash flow. It is crucial to closely monitor geopolitical developments and global economic risks, as well as potential supply-side constraints and the effects of emission regulations. These factors will play a significant role as the industry navigates through disruptions and transitions towards a more sustainable future.<sup>26</sup>

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<sup>25</sup> HellenicShippingNews, March 29, 2024, “Clarksea Index moves 35% above trend”

<sup>26</sup> HellenicShippingNews, April 3, 2024, “Dry Bulk Market rebalancing evident as Capesize rates drop by 40%”

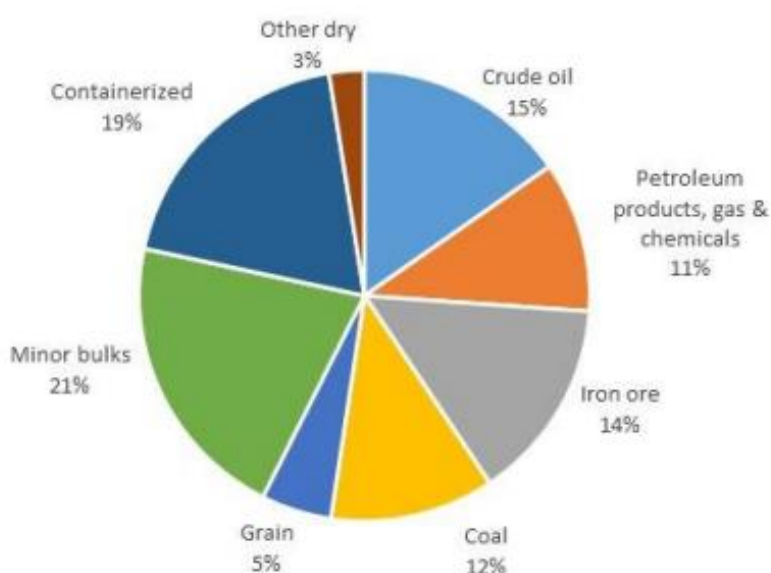
### **III. Relevance of economic powers and sources diversification**

#### **III.1 State of Dry Bulk Market**

When we approach the topic of the Bulk Shipping business we have to divide two big areas, the Dry Bulk Market and the Liquid Bulk Market. In order to identify all the aspects involving the market and to understand how it is changing due to the current geopolitical events, from the rebels at Bab-El Mandeb Strait to the water crisis at Panama Canal. Starting from demand and supply analysis is relevant to clarify which are the variables that are affecting most the shipping routes and the global trade. The focus is on the demand of goods that will generate a demand of transport. It means we are facing a business demand driven and where the freight rates are variable and unpredictable in the long term. There are several reasons, first of all it is a matter of fact that there are unconditioned macroeconomic factors to analyse. Variables like the ongoing of the Gross Domestic Product between countries and the ongoing of their economy affect the choices of the shipowners, obliged to guarantee safety and security of people onboard and cover all the costs depending on the contract. This phenomenon is reinforced by all the external events that affect, and sometimes stop, the global trade. The most recent episodes are the Covid-19 crisis, the Ever Given stranding in the Suez Canal, the Russian-Ukraine war, the Israel and Palestine war and the join in the conflict by Iran, and natural events like earthquakes, storms and general accidents. Each geopolitical event involving shipping industry has a reflection on the supply chains, and therefore, to the consumers. The freight rates in the shipping industry fluctuate rapidly, in particular in the short term. When a shipowner starts a new building, he knows that the ships will be able to operate in next 2-4 years, depending on the complexity and technology onboard, but he cannot know how will be the level of rates and if will be economically affordable the use of the ship. This fact demonstrates that we can't predict the levels of freights in the long term. Currently we are able to know the current fleet updated at 2024, divided by size, age and capacity. From the age we can calculate how many ships will leave the market and how many will enter, thanks to the data from the orderbook of shipyards. However these data won't be precise because more variables influence the choices of many companies. Firstly when the freight rates have an high

ranking, the oldest vessels continue to operate, the scrapping activities will be postponed and the orderbook will grow. On the contrary, when rates collapse very few vessel will enter in the market and sometimes due to the level of rates, shipowners may decide to postpone the delivery of new vessels, if possible. The demand is driven by the raw materials that have to be carried and this is related on the economic growth of the countries. According to the review of maritime transport 2022 by UNCTAD, the global fleet is divided in this scheme and accounts more than 100,000 commercial ships.

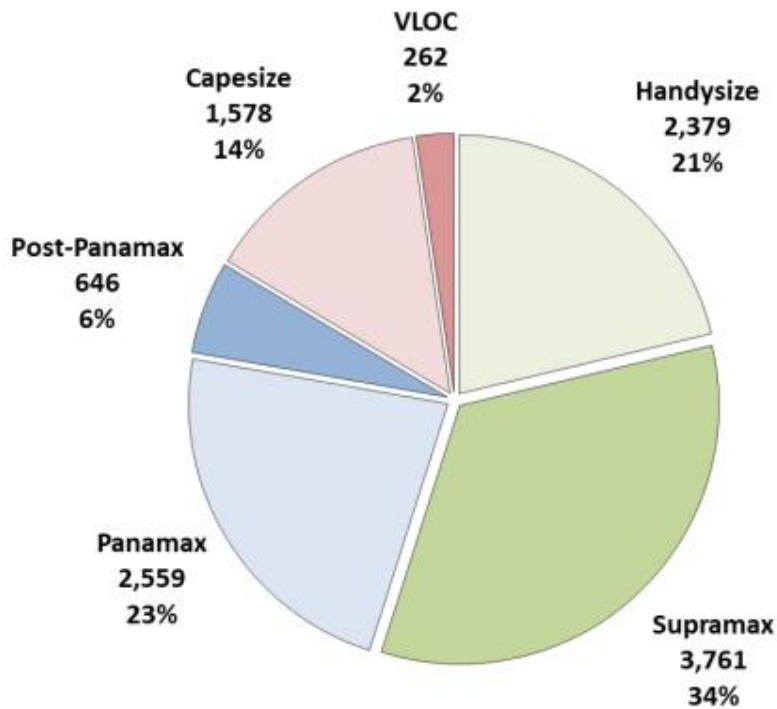
Figure III.1 “The commercial fleet”



Source: UNCTAD 2022

Concerning the bulk shipping, a key point is the concept of the tonn-miles. It indicates the routes covered by the main goods and due to the wars and the geopolitical crisis, the routes have been prolonged, increasing the value of the tonn-miles carried. The major dry bulk goods are iron ore, coal and grain accounting respectively 1517 , 1232 and 528 million tonnes carried per year, according to the data of 2022 and these 3 are the most transported commodities moved in dry bulk, over 60% of the total trade. Minor dry bulk instead, are more than 200 commodities, many of which account for less than 1% of the total trade. The most important minor bulk commodities are steels, clinker, limestone, gypsum, bauxite, fertilizers, soybeans and forest products.

Figure III.2 “Dry Bulk fleet by size in number of units”

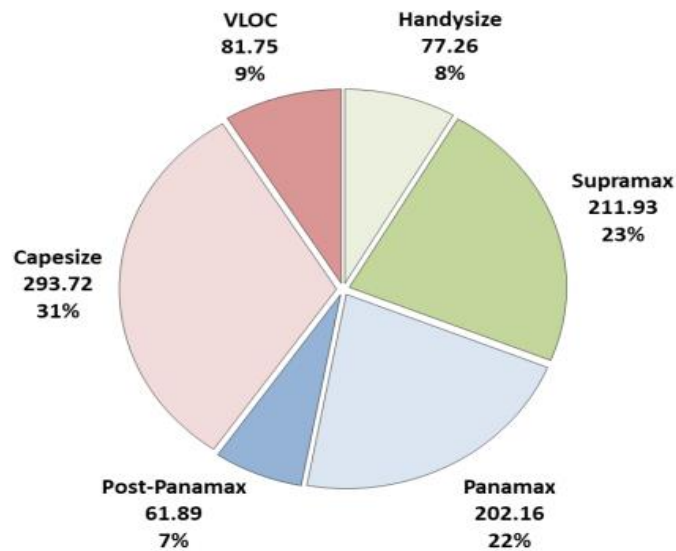


Source: University Course of Geography, Commodities trading, Geopolitics, 2024

In the beginning of 2023, China lifted its Covid restrictions and reopened its economy, which led many Dry Bulk owners to anticipate a significant increase in their earnings. However, this expectation did not come to fruition. As of October 2023, the BDI Index was trading nearly 15% lower than the average recorded between 2017 and 2022. The decline in earnings was primarily driven by the Capesize and Panamax segments, with the Capesize BDI Index falling more than 10% below the seasonal average. It is important to note that the decrease in earnings was not a result of declining demand. The high demand for Panamax and Handymax vessels can be attributed to strong coal demand from Asian countries and changing trade flows due to the Russian invasion of Ukraine. Even the iron ore trade has not been negatively affected thus far, despite weak signals from the Chinese property sector. Chinese steel companies have chosen to maintain their output in order to build up steel inventories. The grain market has boosted by record soybean trade from Brazil to China. The port congestion of Dry Bulk vessels decreased from 31% of the fleet in January to 29% by October. Furthermore, the

Panama Canal has been adversely affected by a severe drought this year, leading authorities to impose restrictions on the number of vessels allowed to transit.

Figure III.3 “Dry Bulk Fleet by size in DWT”



Source: University Course of Geography, Commodities trading, Geopolitics, 2024

The current orderbook remains at historically low levels, representing only 8% of the existing fleet. It is expected an expansion, supported by the scheduled deliveries of handymax and panamax in 2024 and 2025, which will increase the amount of global capacity. Since January 2024, the European Union Emissions Trading System will gradually extend its inclusion in the shipping industry. This regulatory change could result in significant costs for vessels trading into the European ports. As a consequence, it is probable that shipowners will choose to shift younger vessels to the European traffics and redeploy older vessels to the other markets not covered by the regulation. In 2022, there were 334 bulkers older than 20 years that either loaded or discharged in the European Union. Many of these vessels could be substituted partly reducing hold capacity. Chinese property market, which accounts for nearly half of global iron ore import, has continued to decrease. This deterioration results in lower demand of the raw material. Factors like slowdown of population’s growth and the increasing number of empty houses, are likely to limit investments in the real estate sector.<sup>1</sup> Dry Bulk

<sup>1</sup> Danish Ship Finance, May 2023, “Shipping market review”

shipping is affected by the fluctuation of the freight rates and repentine regulatory changes. The shipping market works in cycles, causing freight rates to oscillate between peaks and down even in short period. In expample during 2019, rates for Capesize vesseld accounted to approximately 34,000\$ per day. In 2020, due to the pandemic rates fell down to 2,500\$ per day, resultin in an collapsed demand for commodities and shipping services. This it the reason because of companies must have flexibility adaptability to changing market dynamics. It is relevant their capability to adjust their fleet capacity against demand flucutations and get market opportunities. One strategy could be diversify the flet in order to include vesseld able to carry different types of commodities.. Meanwhile is of absolute importante to comply with market regulations. The International Maritime Organization has implemented regulations with the aim to reduce greenhouse gas emissions of 50% with the purpose to reach net zero emission by 2050. This poses a challenge for all the shipping companies, needing investments in new technologies and the adoption of new strategie to mitigate emission of contamianants. Different ways could be investing in high quality vesseld, strategies to reduce operating costs and offering exceptional customer services. Companies that can offer rliable and cost effective servicies will have a competitive edge in the industry. Innovation like vessel and terminal automation, artifical intellignece and digital platforms will bring numerous advantages to the industry.<sup>2</sup>

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<sup>2</sup> Team Bulk Carriers, April 27, 2023, “Navigating the challenges of the Dry Bulk Shipping Industry”

## III.2 Dry Bulk major commodities and trades analysis

### III.2.1 Iron ore

Iron ore is a particular raw material that serve the industry of steel products. It consists in rock and minerals from which iron ore can be extracted. The top quality iron ore can be inserted directly into the blast furnaces while lower qualities are utilised for producing pig iron. Major producers are Brazil, Australia, and South Africa and carry their products generally in Capesize and Panamax vessels. The biggest importer are China, Japan, Korea, and Europe. Iron ore is initially extracted from big mines and transported by train to the closest port. Once at the port, it is stocked on large land surfaces to be loaded easily on board using grabs or conveyor belts. These giants of the sea then carry the iron ore to other terminals, where it is unloaded and transported to the steel plants, which serve as its final purpose. These vessels have the highest capacity and for iron ore it is suitable. They allow loading up to 300,000 dwt and sometimes more. The largest iron ore carrier in the world was the Berge Stahl, constructed in 1986. It boasts a length of 343m and a deadweight capacity of 364,767dwt.<sup>3</sup>

Figure III.4 “The Berge Stahl”



Source: The geography of transport system

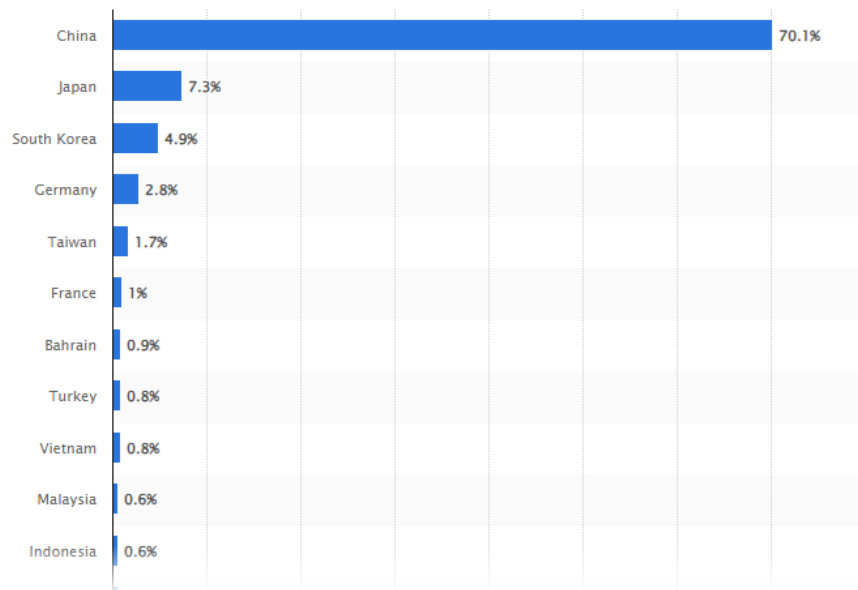
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<sup>3</sup> Massachusetts Institute of Technology, October 25, 2006, “Iron Ore transportation in Capesize Bulk Carriers”



Iron ore is so transformed in various steel metals for the construction industry, automotive and household tools. This trend can't be used to containerized goods, which primarily consist in semi-processed or finished products. Australia transports its iron ore mainly to China and Southeast Asian countries. Brazil takes an alternative route, passing through Atlantic Ocean, the Indian Ocean, the Malacca Strait, and the South China Sea, making the journey almost halfway around the world and to reach the Asian markets. Iron ore could be divided in two groups: high-grade, which contains over 50% pure iron, and low-grade, which contains less than 50%. Low-grade iron ore typically needs capital-intensive and time-consuming processes known as "beneficiation" before it can be utilized. Chinese iron ores has low-grade characteristics, with an average Fe content of only 32%, necessitating extensive beneficiation. In contrast, Brazilian iron ore contain an average Fe levels of 66%, surpassing the Swedish iron ores, which historically were considered the best available in the market in terms of quality. Australia's average Fe content stands at 58%. High-grade iron ore perceives a significant premium. However, low-grade ores are often cheap enough to be economically viable despite the costs associated with the beneficiation. Nevertheless, the beneficiation of iron ores with less than 30% Fe content is typically deemed uneconomical, regardless of the ore's affordability, the energy consumption and the scale of operations. This situation raises questions about the economic feasibility of China's extensive utilization of domestic low-grade iron ore. Iron ore shipping routes link major producers with key consumption centers, ensuring the smooth flow of this commodity in international trade.

Figure III.5 “Distribution of Iron Ore Imports based on value in 2021”



Source: Statista, May 2024

The iron ore trade is overwhelmingly directed at East Asia. Data of 2021 shows China at the first place China accounting for 70%, Japan for 7%, and South Korea for less than 5%. Germany, the biggest European economy, accounts for only 2,8%. The majority of iron ore exports originate from the north-west Australia, and the significant surge in production over the past ten years has been exclusively directed towards meeting the iron demands of China's steel companies. Remarkably, even the 2008 Financial Crisis did not significantly impact the quantity of iron ore produced in Australia, because of the implementation of various stimulus programs by the Chinese government to support their heavy industries. However, unloading the largest dry bulk carriers, determines a notable challenge even for the biggest ports. The unloading process for bulk cargo is not a simple task of emptying the holds; it is of utmost importance to maintain equilibrium while discharging each hold and ensure the cargo remains as level as possible. Failure to do so can lead to the ship capsizing or even suffering structural failure. The hull must be continuously monitored for fatigue cracks during the unloading procedure, a responsibility that falls under the supervision of the ship's first mate, reminiscent of the

Age of Sail.<sup>4</sup> The efficient and stable supply of iron ore is crucial for the Chinese and Korean steel industry, which heavily depend on imports from foreign countries. In this regard, the terms of shipping contracts play a pivotal role in ensuring a continuous flow. The primary purpose of a long-term shipping contract is to mitigate the potential risks arising from volatile market conditions. These risks include unpredictable charter rates, freight charges, and unforeseen limitations in vessel availability. These contracts allow shipowners to forecast their future income, enabling them to engage in practical business planning. Iron ore trade routes are relatively limited, resulting in a small number of load ports and the primary countries involved in iron ore exports are Australia, Brazil and in a minimum part south Africa. Iron ore could be dangerous for its characteristics during navigation. Its tendency to liquefy poses potential risks during shipping. Cargo liquefaction has been a concern for seafarers for more than a century. To mitigate this risk, all the shipment' stakeholders must comply the regulations outlined in the International Maritime Solid Bulk Cargoes Code (IMSBC), established by the International Maritime Organization. All parties involved must comply moreover with the Transportable Moisture Limit (TML) when loading the cargo. If there are suspicions regarding the loading of the cargo onboard, the captain has the authority to halt the process and request a moisture test. Additionally, liquefaction often occurs during the sea passage, so the captain and crew must make adjustments to ensure an adequate metacentric height, which safeguards its stability. Although iron ore is not a complex cargo to load and does not require special care, its liquefaction nature necessitates a careful understanding of its behavior and experience from the shipper, shipowner, and crew. The preference for large shipments is inherent due to the nature of the steelmaking process. However, the iron ore market poses significant entry barriers for many shipping companies. One major challenge is the high cost associated with operating or owning a fleet of Capesize or larger vessels, which is considerably higher compared to smaller handysize vessels. Additionally, without a long-term shipping contract in place, it becomes difficult for middle or small-sized shipping companies to guarantee stable voyages. Furthermore, the construction a Capesize vessels is exorbitant compared to that of handy and panamax vessels.<sup>5</sup> The global iron ore market size was

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<sup>4</sup> Wolf Street, July 28, 2018, "The largest ships in the huge iron ore trade"

<sup>5</sup> Glonav, April 24,2020, "A study on customary practices in irone ore and steel products"

valued at \$279.35 billion in 2023 and it projected to grow from \$290.25 billion in 2024 to \$397.98 billion by 2032, exhibiting a CAGR (Compounded Average Growth Rate) of 4% during the forecast period. Generally, after the process to extract the iron, it must be treated to remove impurities, determining the grades and quality of iron ore. The market is driven by demand for steel, and it is boosted by a quick industrialization and urban development in emerging economies such as China, strong since its rapid growth started in 2000, and India.<sup>6</sup> Iron Ore could be shown in different ways but in general its colour is a dirty red and there is no need to clean the hull of the vessel if it carries only this commodity. Due to its strategic use for the steel industry, the necessity of Capesize is fundamental to reach economies of scale. Sometimes could happen that ports are not available to welcome these vessels because of their draft. The practice of lightening outside the port consists to move part of the commodity from the Capesize to another small vessel or a barge, reducing the draft and allowing to the mother vessel to enter in the port and discharge the iron ore, followed by the second vessel. The economic convenience is given by the fact that this extra operation is acceptable due to an higher freight rates for the long trip. This amount allows to cover the costs of transshipment. The most important thing during loading activity is the calculation of the stowage factor. It is the ratio of weight to volume of the commodity and it is applicable to all the goods that are carried in bulk vessels. This ratio shows how much volume we need to load 1 ton. If the Stowage Factor is high, the volume will be higher than weight. Fortunately iron ore has a low Stowage Factor, so vessels don't need to load the full space into the hull because with a reduced quantity they reach the maximum quantity of weight they are allowed to carry.<sup>7</sup>

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<sup>6</sup> Fortune Business Insights, August 5, 2024, "Iron ore market size, share and industry analysis, by type, by application and regional forecast 2024-2032"

<sup>7</sup> Source: the author

### **III.2.2 Soybeans**

Soybeans are one of the most relevant commodities used mainly for animal feeds. It could exist in a various range of sizes, and come in diverse hull or seed coat colors like black, brown, blue, yellow, green and mottled. The mature bean's hull is rigid, resistant to water, and serves as a protective layer for the germs against potential harm. Soybeans are a perishable good and can't be stored indefinitely. The storage must guarantee specific conditions able to preserve the health of the soybeans. However, the key factors that affect their storage are heat and moisture. The duration of safe storage, before deterioration occurs, primarily is dependent by the initial moisture content, the temperature during loading and discharging and the storage conditions. The higher temperatures and moisture content accelerate the rate of deterioration. Once fully matured, soybeans can be stored for an extended period after drying. With a water content of 8%, soybeans have a favorable storage life, making them suitable for transportation over long distances and in large quantities. Shipping can be done throughout the year, but it is advisable to transport the beans soon after harvest to avoid dealing with excessively old goods. Soybeans are carried generally by bulk vessels, however sometimes they are transported in bags. The commodity shipped in bulk exhibit a tendency to deteriorate if the moisture content exceeds 14%, leading to a microbiological activity, especially in the route from Indonesia to Northern Europe. This deterioration significantly diminishes the value of the beans upon arrival. When the moisture content falls between 12 % and 14 % without micro-biological activity, there exists a potential risk of deterioration during the voyage. This moisture content range between 12 % and 14% is commonly known as the "grey area". However, it is essential to assess each cargo individually, taking into account factors such as age, moisture content, oil content, FFA levels (Free Fatty Acids), temperature, storage conditions, and transportation history. Local regulations may also declare that below a certain moisture level, the cargo is considered suitable for shipment based on their standards. These regulations often overlook other factors that involve the life or the time limit of carrying the commodity. This oversight has led to challenges when shippers claim a parcel is suitable for shipment based solely on reported moisture content. A single parcel with a high risk of deterioration can impact the entire cargo in a hold, potentially leading to rejection of the entire cargo at the discharge port and subsequent significant claims.

Considering that the average voyage from Brazil to China takes around 32 days it is important to implement measures to safeguard the cargo. In equatorial and tropical climates, these organic products tend to release warm and moist air during the transportation. To prevent ship's overheating, it is compulsory to ventilate the holds during transportation. Ventilation led to replace the warm moist air by the cargo with drier outside air before condensation can form inside the hold. Ventilation has a limited impact on the surface of the cargo, primarily removing heat from the top layer. Due to the characteristics of soybean cargoes, fluctuations in temperature and humidity on the surface of a fully loaded hold don't permeate throughout the entire hold. Therefore, ventilation can be conducted whenever dew point or temperature suggest. This procedure should be adopted to minimize the risk of surface damage to the cargo. There is no need to halt ventilation during day or night, unless external conditions warrant it. Frequently, shippers fail to provide instructions to the vessel on how to stow and the cargo on board, leaving this responsibility to the Master's judgment, in accordance with the terms of the charter party between owners and charterers. The most important goal of ventilation is to mitigate any unfavorable changes that could lead to moisture related damage to the cargo.<sup>8</sup>

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<sup>8</sup> Cargohandbook, March 2024, "soybeans"

### III.2.3 Wheat

Wheat is a nutritious cereal grain that has been cultivated extensively for over seven centuries in numerous countries worldwide. It contributes to around 20% of the daily protein intake for global population. Its suitability to various soils and climates plays a significant role in its consumption. Major exporters are Russia, USA, Canada, France and Ukraine. On the other hand, major importers are Indonesia, Egypt, Turkey and the Philippines. All the world is interested in the wheat trade, for its essential role in different supply chains. The Trade Finance Global has recently revised its manual, featuring details on the main importers and exporters. Wheat exists in different forms, each distinguished by protein levels and kernel hues. The two main categories are winter wheat and summer wheat, divided by the respective growing seasons. Food remains the main purpose of wheat cultivation but it also serves other businesses. The presence of gluten and starch in wheat gives it elasticity and the ability to retain water, making it suitable for various products such as :

- Animal feed : in particular for poultry and livestock and middlings due to their high protein content.
- Biofuel: for producing ethanol, a biofuel that can be used as a substitute or supplement for gasoline.
- Bioplastics: wheat used as a raw material for the production of biodegradable plastics. It is an eco-friendly alternative to the traditional petroleum based plastics.
- Paper production: wheat as a substitute for wood pulp. This practice aids in reducing deforestation and promotes more sustainable manufacturing.
- Construction materials: wheat processed into materials like bales and particleboard.

The wheat market is characterized by its influence of weather conditions that affect crop yields. On the supply side, countries located in the Black Sea region have been increasing their production. Despite accounting for less than 10% of the global grains market in the early 2000s, this region now represents approximately 25% of the market

trade. The demand for biofuel is one the rise and it is expected to be driven by China's engagement to clean energy targets set to be implemented in the upcoming years. Wheat will become soon the preferred grain in emerging economies. It faces competition from other feed grains such as corn and rice, leading to speculations that this rivalry could hinder its growth in the foreseeable future. The price of wheat is also influenced by other factors. First of all the development of emerging markets. The population is growing in Middle East, Africa and Southeast Asia and this fact increases demand for staple foods. Secondly weather conditions play a significant role in determining crop yields, which in turn affect the supply. Favorable weather conditions lead to higher yields and lower prices, while adverse weather conditions cause prices increase. Other important aspects are the government subsidies, especially in the US with the aim to promote ethanol production and allocate more land to the cultivation. Moreover the fluctuations of the value of the US dollar can impact the price of the commodity, because wheat is quoted in US currency. A stronger dollar typically results in lower wheat prices. In the end regulations and policies like the implementation of import tariffs and incentives can influence the supply and demand for wheat, thereby affecting its price. The commodity is priced in US dollars per bushel or per metric ton, depending on the market. A bushel is a volume based unit of measurement, used in the US and equivalent to roughly to 27,216 kilograms. In the global market, wheat is frequently priced per metric ton. The commodity is generally carried in bulk, by truck, rail and ship, depending on the destination. Trucks are commonly employed for shorter distances, while rail is preferred for medium distances within a country or across borders. For international trade over long distances, ships are considered the primary mode of transport, with wheat being loaded onto the largest bulk carriers.<sup>9</sup> The projected global wheat production for the 2024/2025 season is estimated to reach a bit less than 800 million tons, showing an increase of 10.5 million tons rather than the previous years. This growth can be associated to the government support programs that have incentivized farm workers to increase their wheat production, especially in China and India. Meanwhile, Europe and the Black Sea region are expected to see a decline in wheat production. Unfavorable rainfall in Europe has led to a reduction in cultivated area, resulting in lower production. The ongoing war in Ukraine is a significant factor that contributes to the decline in

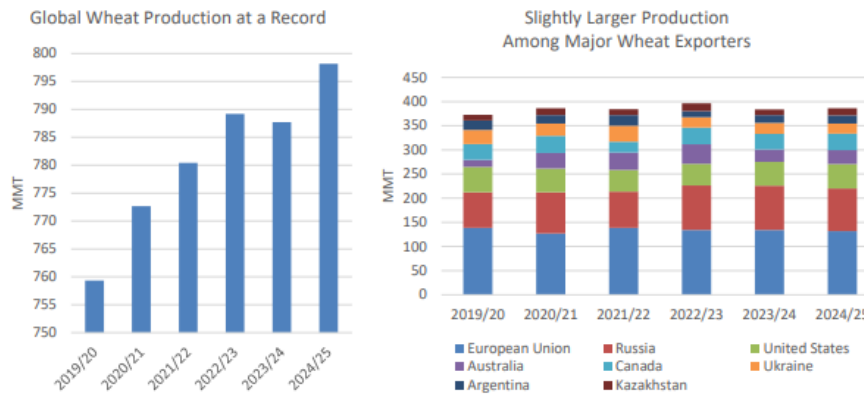
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<sup>9</sup> Tradefinanceglobal, July 7, 2018, "all you need to know about wheat"



wheat production, which the country projected to have its smallest crop since 2012/13 season, mainly due to a decrease in planted areas.

Figure III.6 “Tracking the production of wheats”



Source: United States department of agriculture, August 2024

Competition is expected to persist among Russia, EU and Ukraine for the commercial years 2024/2025. Exports by EU are expected to decline by 1 million tons especially in the key exporting member state France. In 2023/24, Russia strengthened its presence in many Middle Eastern and African markets that previously relied on EU or Ukrainian supplies. This trend is probable to continue during 2024/2025, as Russian supplies are expected to remain competitive rather than other suppliers. In a market with limited producers, Russia, EU and Ukraine will deplete their stocks and compete for market share in Middle East and Africa, where a significant increase in import demand is expected. In the next year 2025/2026 it is anticipated an increase in the production of high quality wheat from major suppliers such as Canada, Australia and USA. Canada's exports are projected to rise by 500,000 metric tons rather than last years, mainly because of larger crops, in particular for durum wheat. Similarly, the United States are expected to live a 1,5 million ton increase in export, attributed to more various supplies and consequently more competitive prices. However despite the expansion in production, Australia's exports are expected to decrease by 2.5 million tons. This decline could be

attributed to the heightened competition in the key asian markets where both ands USA also export their wheat.<sup>10</sup>

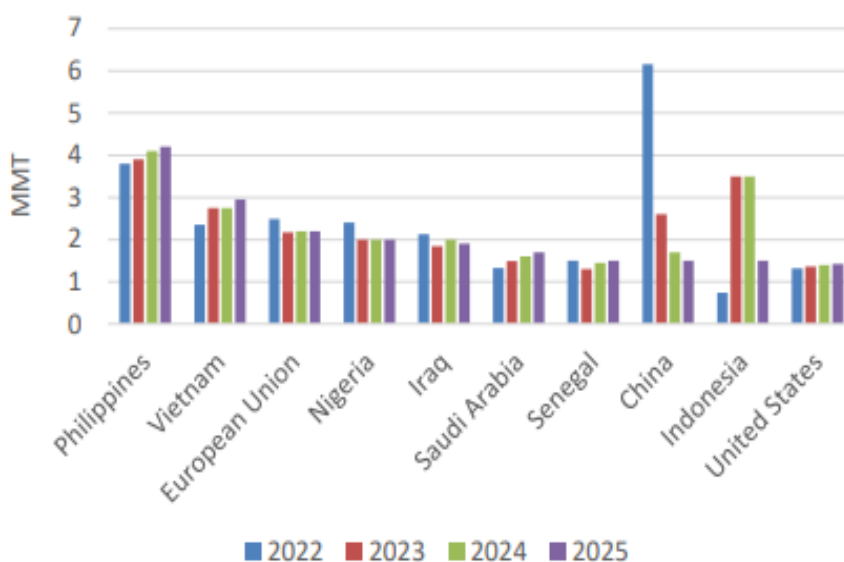
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<sup>10</sup> United States department of agriculture, August 2024, “Grain: world markets and trade”

### III.2.4 Rice

Rice is one of the largest dry commodities traded in the world. Global rice production is grown by 10.3 million tons from the previous year to reach a new record of 527.6 million tons in 2023/2024. The biggest increase is accounted for India, where rice production is expected to hit a record in the history. China is also forecast to increase. Together these two producers account for more than half of global rice production. Larger crops are also forecast in major producing countries including Indonesia, Pakistan, and Bangladesh. Consumption in India, the second largest consuming country, is projected to reach a record high at 120 million tons, as the Government of India continues to allocate rice in public distribution programs. Consumption in China, the largest consuming country, is projected to decline for the third consecutive year. This decline is a consequence of a decrease in utilization of rice as a substitute for coarse grains in animal feed. Consumption in SubSaharan Africa, South Asia, and the Middle East is forecast to continue growing, also due to the constant rising populations. China and India together account for 80% of global stocks. The governments in both countries maintain public stockholding programs. Overall, stocks in major rice exporting countries are forecast to rebound.

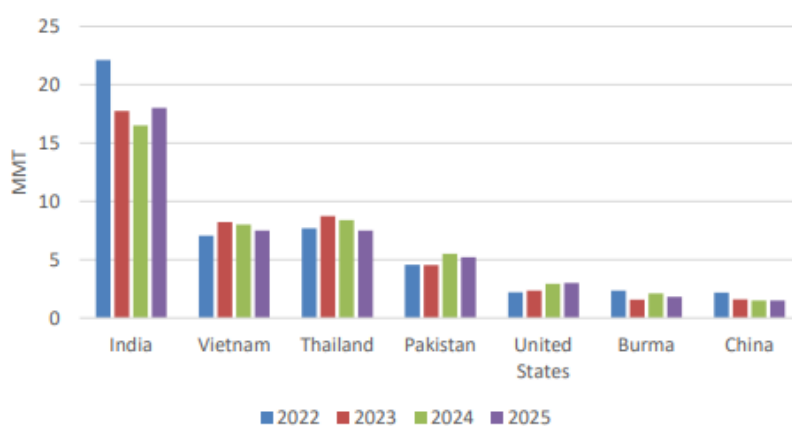
Figure III.7 “Top 10 global rice importers”



Source: United States department of agriculture, August 2024

Indonesia in forecasting to change policy in wheat imports in 2025. It is expected a slowdown from 2 million tons to 1.5 million tons due to larger crops and sufficient beginning stocks. With a larger crop and high international prices, China is expected to continue its decline in imports, forecast at only 1.5 million tons. This is well below the quota of 5.3 million tons as high global prices reduce the incentive to import. In contrast, the Philippines imports are forecast up to a record 4.2 million tons on continued growth in consumption and maintain the title of the first global rice importers. Vietnam imports are projected up to a record 3 million tons, making it the second largest importer. European Union imports forecast are not changed stable at 2.2 million tons, making it the third-largest global importer. Imports in the Middle East and Sub-Saharan Africa are forecast to increase. Increased consumption, boosted by expanding populations and shifting diets, is driving the growing demand in these regions. Notably, in the Middle East, Saudi Arabia is expected to see an increase in domestic rice consumption, due to both tourism and a growing immigrant labor force to facilitate the construction of large-scale projects.

Figure III.8 “Top global rice exporters”



Source: United States department of agriculture, August 2024

Exports from India are expected to partly offset declines from other major Asian exporters: Vietnam, Thailand, Pakistan, and Burma. Together, these four exporters are forecast down 1.9 million tons, mainly on increased competition from India and reduced demand from Indonesia. India is forecast to remain the largest rice exporter in 2025

with exports projected at 18 million tons, up 1.5 million tons from the previous year and accounting for over a third of global rice trade. Despite restrictive measures for rice exports, volumes are set to remain strong. Vietnam exports are forecast at 7.5 million tons, down 500,000 tons from the prior year, primarily due to sharply lower demand from Indonesia. The Philippines and China, together accounting for over 50 % of Vietnam exports and are expected to continue purchasing large amounts of rice. Demand for Vietnamese rice in Sub-Saharan Africa remains steady, led by Côte d'Ivoire and Ghana. Thailand rice exports are forecast at 7.5 million tons, down 900,000 tons from the prior year. Pakistan exports are down 300,000 tons to 5.2 million tons mainly due to lower demand from Indonesia and expected increased competition from India. The 2024/25 production is forecast at a record high, which will keep Pakistan export prices competitive. Strong demand from Western Hemisphere importers and the EU is a key component behind South America's growing rice exports. Brazil's export growth represents the largest increase with a forecast at 1.3 million tons, up 200,000 tons from the previous year. U.S. rice exports are forecast to rise modestly with a larger crop and lower prices. Long-grain exports will benefit from tariff-rate quotas and duty-free access to several Western Hemisphere countries, while available supplies at the beginning of the 2024/25 marketing year will improve export prospects to East Asia compared with the year before.<sup>11</sup>

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<sup>11</sup> United States department of agriculture, August 2024, "Grain: world markets and trade"

### III.2.5 Coal

Coal is a primary fossil fuel that has high content of carbon and typically it is shown brown or black. The different types of coal are a result of variations in plant material, coal rank and different impurities. While most coal deposits are found in sedimentary deposits, they can undergo changes due to high temperatures and pressures caused by igneous intrusions or mountain building processes, leading to the formation of anthracite and graphite. Coal is a natural resource that serves various purposes such as an energy, chemical for the production of synthetic compounds like dyes, oils, waxes, pharmaceuticals, and pesticides, and in the creation of coke for metallurgical processes. It plays a significant role in generating electrical power through steam generation. Following a substantial surge in coal consumption in the early 2000s, largely due to China's economic growth, global coal usage reached its peak in 2012. Since then, there has been a consistent decrease in coal consumption, with natural gas consumption seeing a notable increase. Coal utilization is linked to a range of air pollutants. Incomplete combustion of coal results in the creation of numerous contaminants, some of which have carcinogenic properties. The combustion of coal leads to the emission of sulfur and nitrogen oxides, which combine with moisture in the atmosphere to form sulfuric and nitric acids, commonly known as acid rain. Additionally, the coal burning generates particulate matter known as fly ash, which can be carried by winds over long distances of thousands kilometers. Coals can be categorized in various ways. These types carry genetic implications as they are dependent on the present organic materials and the coalification processes that led to the formation of the coal. The properties of coal, including the heat output during combustion, the release of contaminants gases after heating, and the suitability of the coals for liquefaction or coke production, are all influenced to some extent by the rank.<sup>12</sup> During 2024, Chinese steel production has been significantly boosted by infrastructure, manufacturing, and exports to other Asian markets. It is registered that coal shipments had experienced a growth of 5% in 2023, followed by a forecasted decline of 2% in 2024 and an expected decrease of 3% in 2025. By 2030, under the least ambitious climate scenario outlined by the IEA, global coal demand is projected to be 13.8% lower than the levels observed in 2022, based on the policies declared by governments. Additionally, coal demand is already decreasing

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<sup>12</sup> Britannica, August 7, 2024, "Origin of Coal"

in numerous advanced economies. The expansion of coal mining in China and India poses a threat to imports in those regions. In China, imports have managed to stay competitive with domestic coal, and safety concerns in mines have resulted in limited growth in 2023. Since May 2022, coal imports have been benefiting from no import tariffs. In India, mining has been rapidly increasing, but so has demand, which has kept imports steady. It is expected that Chinese and Indian coal imports may either remain stable in the upcoming years or even experience growth. Nevertheless, the collective import demand growth in emerging Asian economies might not surpass the decline observed in advanced economies. The demand for coal imports and exports has surged due to a significant increase in electricity consumption, while industrialization has driven the demand for iron. Advancements in technology have made it possible to track product shipments worldwide using unique identification numbers. These factors are expected to create new opportunities for growth in the dry bulk shipping industry. Notably, the market trend for dry bulk shipping has undergone a significant shift with the increased shipment of steel and coal. Additionally, the expansion of global seaborne trade stands as one of the primary drivers fueling the growth of the dry bulk shipping market. Iron ore and coal demand has increased due to the rise in industrialization and economic liberalization, primarily satisfied by the industry through seaborne trade. These two materials are essential for power generation and long-term infrastructure development. Factors such as rapid economic growth, population expansion, urbanization, and increased steel production will further drive the need for transporting various commodities, coal in particular. Furthermore, supply chain management systems are accelerating the automation of production planning in the automotive industry. Given that maritime transport is the most cost-effective mode of shipping, an increase in sea transportation is expected to benefit the dry bulk market, increasing the levels of freight rates. The growing production of coal and iron ore will contribute to the rise in demand for the global market in the foreseeable future. The increased transportation of steel and coal has led to a notable shift in the dry bulk shipping market share. The demand for steel has risen due to the growth in infrastructure projects, prompting producers to employ various strategies and innovations to enhance the value of their products and alter consumer perceptions of their quality. As per the World Steel

Association, steel demand increased by 0.4% in 2022 and by 2.2% in 2023.<sup>13</sup> The global trade in coal has been shifting towards the east. Traditionally, the coal trade was concentrated in the Pacific and Atlantic markets. However, the volumes of coal traded across the Indian Ocean have now surpassed those in the Atlantic. This shift can be attributed to the declining demand for coal in Europe and the increasing demand from countries like India, Pakistan, and Bangladesh. The Asia Pacific region remains the primary source for coal exports, with approximately 78% of all exports directed towards countries in this region. The heightened demand and concerns over supply security, following Russia's invasion of Ukraine and tensions in the gas market, were the driving factors behind Germany's increased coal imports. In terms of export volume, Indonesia took the lead in 2022, exporting a total of 471 million tonnes of coal. Australia followed closely behind, exporting a total of 344 million tonnes, representing a quarter of global exports. Indonesia also surpassed Australia in terms of energy exports, becoming currently the largest exporter. This shift can be attributed to Indonesia's coal having an average Calorific Value, the unit of measurement of coal, around 25% higher than Australia. Lastly, Russia secured its position as the third largest exporter, with approximately 224 million tonnes of coal exported in 2022. Despite facing competition from Indonesia and Australia, Russia maintained a significant presence in the global coal market. Due to the conflict with Ukraine, along with the international sanctions, coal supply chains has been reorganized. These sanctions have had a significant impact on business operations, including exclusion from SWIFT, an international payment service, and disruptions in physical deliveries. Specifically, the European Union started a ban on Russian coal imports, with the prohibition on new coal purchases from Russia in April 2022. This ban was fully enforced in August 2022, leading to a cessation of all coal deliveries from Russia. Before 2022, Russia predominantly exported tons of coal by rail to countries such as Ukraine, Poland, Germany, and China. However, following the outbreak of the conflict and the EU ban, Russia's rail exports decreased by 75%, with China being the primary destination for its exports. In an effort to strengthen its partnership with China, Russia is making investments in eastbound railway projects.<sup>14</sup>

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<sup>13</sup> Knowledge Sourcing, May 5, 2024, "the impact of steel and coal production on the dry bulk shipping market"

<sup>14</sup> IEA, December 2023, "coal analysis and forecast to 2026"



### **III.3 Tanker Market trade analysis**

Tankers are vessels specifically built for the transportation of liquid commodities in large quantities. These ships vary in size, with capacities ranging from few hundred tons for smaller ports and coastal areas, to several hundred thousands tons for long distance voyages. Tankers are utilized for carrying a several number of products, including substances like oils and derivatives, LPG, LNG, and chemicals. Additionally, tankers can carry fresh water and even wine. Due to the unique requirements of different products, specialized tankers have been developed, such as chemical tankers and oil tankers. LNG carriers, a type of tanker designed for the transportation of liquefied natural gas, are relatively uncommon in comparison to other vessels. Tankers are categorized on their capacity. The company Shell Oil introduced the AFRA system (Average Freight Rate Assessment) for financial purposes. The tankers were grouped into various categories according to their sizes. During the 1970s, the classification list was extended, with the tonnage being measured in long tons.

- General Purpose tanker : 10,000–24,999 dwt
- Medium Range tanker : 25,000–44,999 dwt
- LR1 (Large Range 1) : 45,000–79,999 dwt
- LR2 (Large Range 2) : 80,000–159,999 dwt
- VLCC (Very Large Crude Carrier) : 160,000–319,999 dwt
- ULCC (Ultra Large Crude Carrier) : 320,000–549,999 dwt

Tanker vessels are essential components of the energy value chain, primarily responsible for transporting crude oil from production sites to the refineries. In addition to their transportation role, these tankers are occasionally utilized for the storage of crude oil after production. A clear example we have seen during pandemic of Covid-19 to preserve big quantities of crude oil. Crude tankers can also be employed for the carriage like fuel oil and othe dirty products. Conversely, 'clean' or 'product' tankers are designated for moving refined products from the refineries, characterized by their smaller size due to the smaller parcel sizes associated with these trades. The construction process for crude oil tankers typically spans from 9 to 15 months, starting from the laying of the keel. Consequently, it takes a minimum of two years from the

moment a newbuilding contract is signed until the vessel is delivered. This happens because of several critical components have to be ordered and manufactured before the building of the ship can commence. Given their giant size, the construction of crude oil tankers can only be carried out at a limited number of builders concentrated in Asia, particularly in South Korea, China, and Japan. The cost of contracting a newbuilding tanker is influenced by various factors, such as the price of energy, steel, labor costs, and the availability of construction finance. Additionally, the relative demand for new tonnage also plays a significant role and can impact both the waiting time for delivery and the overall price. Over the past decade, the cost of a new Very Large Crude Carrier has fluctuated between approximately USD 80 million and USD 160 million. In terms of payment, the payment profile for these ships tends to be heavily back loaded. Typically, a 10% deposit is required upon signing the contract, followed by milestone payments ranging from 20% to 40%. The remaining 50% to 70% of the payment is made upon delivery of the vessel. The payments are settled on the state of progress of the vessel. Tanker shipping operates within a business to business framework. The key customers primarily consist of oil majors, including National Oil Companies (e.g. Unipetec, Saudi Aramco, Petrobras) and International Oil Companies (e.g. Total, Shell, Chevron), as well as trading houses like Trafigura and Glencore. Trading companies engage in more opportunistic oil trading activities, leading to a higher level of unpredictability. Most counterparties in the large crude tanker sector are multinational corporations with strong credit standings. The customer is commonly known as the 'charterer' of the vessel. When a charterer needs a tanker to transport oil from one place to another, they typically engage a ship broker who then contacts various shipowners to negotiate the price, terms, and conditions for transporting the oil. The demand for crude tankers is directly influenced by the demand for oil. As the global need for oil continues to increase, there is a corresponding increase in the demand for transporting this oil from production sites to refineries. Over the years, the global demand for oil has consistently risen, with an average annual growth rate of 1.1 million barrels since 1990. During 2023 the consumption of oil and derivatives has reached the highest levels registered in the history. The most important fact is that in our society we have enough crude oil to power the environmental transition. Estimating this demand growth involves a rough calculation, which can be illustrated as follows: assuming a daily

demand growth of 1 million barrels, the annual demand would amount to 365 million barrels. If all this increased demand were transported using Very Large Crude Carriers in parcels of 2 million barrels each, it would result in an additional 182 cargoes per year. Considering that a VLCC typically completes an average of six voyages annually, we can deduce that fulfilling these extra cargoes would necessitate approximately 30 additional ships, assuming all the additional demand is transported by sea. The main factor influencing tanker markets is the supply of vessels and it plays a crucial role in market fluctuations. When there is a shortage of ships, the cost of chartering a vessel increases, whereas it decreases when there is an excess of available ships. The balance of vessel supply and demand can be observed on a global scale by considering the total supply of ships, which impacts long term trends in freight rates. Additionally, this balance can also be analyzed on a regional level, where the number of ships available in a specific area affects short term freight rates fluctuations, leading to variations in different regions. On a global level, the supply of ships is determined by the delivery of newbuild vessels compared to the removal of ships from the fleet. Tanker shipping is a highly cyclical industry where freight rates are influenced by a multitude of factors. However, in the medium to long term, the main drivers of freight rates are vessel supply and demand. The tanker market cycle typically begins with an oversupply of vessels, leading to depressed earnings and subsequent capital outflows from the sector. This encourages some owners to sell off older ships that are no longer economically able to operate. As vessels are taken out of the fleet, the market gradually rebalances, resulting in increased profits for owners and attracting more capital into the sector. This situation prompts owners to place orders for new vessels, although the delivery lead time is typically two years. Once these newly ordered vessels enter the market, it becomes oversupplied again, leading to a decline in earnings and restarting the cycle. These cycles vary in duration but generally span five to ten years, with some variability in length similar to seasonal patterns. The various sizes of ships are designed to accommodate different trade routes. Smaller ships are utilized for transporting oil derivatives and the bigger carry mainly crude oil. However, even within the crude tanker category, there is a divergence in ship sizes. This is primarily influenced by economies of scale. The larger size of VLCCs makes them more cost-effective for longer international trade routes between major ports that have the physical capacity to

handle their size. On the other hand, as the vessel size decreases, the trade routes tend to become more regional. Nevertheless, there exists a cross elasticity between vessel sizes. For instances where the cost of utilizing a VLCC becomes prohibitively expensive, it may be more economically viable for customers to opt for two Suezmax vessels to transport the same volume of oil. This mean we can observe competition between Suezmaxes and VLCCs for long-haul voyages. This dynamic also is applicable to the smaller vessels. It is crucial to recognize that trade routes are not fixed but they are highly influenced by the flow of oil. Currently the tanker market is undergoing a period of significant transformation, influenced by external factors such as geopolitical tensions and environmental concerns, as well as internal industry dynamics like aging fleets and technological advancements. The upcoming years are expected to involve strategic adjustments as companies adapt to the changing landscape, balancing economic opportunities with environmental responsibilities and regulatory requirements. It is expected that the capacity of the crude tanker fleet is projected to experience modest growth of 0.6% in 2024 and 1.1% in 2025, with the Aframax and Suezmax segments leading this expansion. On the other side, the capacity of the product tanker fleet is anticipated to rise by 1.8% in 2024 and significantly by 4.3% in 2025, with the LR2s and MRs segments showing the most rapid growth.<sup>15</sup> Concerning the main trades, hereunder are discussed which liquid commodities are transported mainly, from where and by size. Very Large Crude Carriers are the giants of the sea and aren't able to pass from the canals like Panama or Suez and therefore they are obliged to load and discharge only in the big ports or do the so called lightening, berth lenght permitted. The main trades for crude oil involve exporter countries from Persian Gulf to basically all the world, mainly Far East , USA and EU. Other important portions see Nigeria to USA and EU and from North Sea countries to USA. The vessels type Aframax also carry fuel oil and crude oil and go to the ports where generally the VLCC are not accepted. Sometimes Aframax could be coated taking the name of Medium Range or Long Range based on their capacity. When a vessel is coated it means that they have the tanks painted in a very detailed way so to be able to carry clean products located on the top of the refining tower. Coating is a measure to prevent the corrosion of the steel. The Panamax tankers have the same dimensions of the dry bulkers and they are not coated

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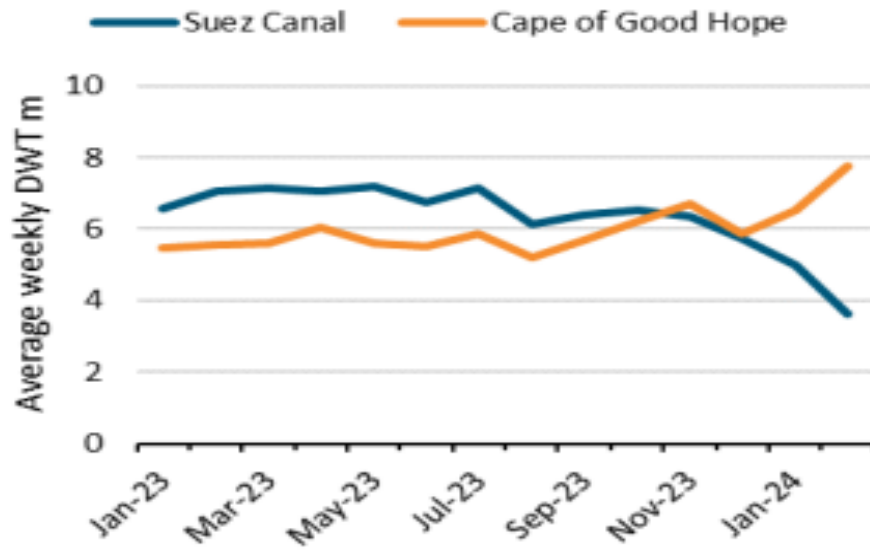
<sup>15</sup> Hellenic Shipping News, April 9, 2024, "Tanker primed for further growth moving forward"

and in general they carry dirty products. LR1 are vessels with the same size of a Panamax but coated and carry predominantly gasoil and diesel oil. Vessels such as MR and Handy are also coated adapted to carry clean products while chemical tankers are also more different. Their size move from 16,000 to 24,000 dwt and their tanks are made with stainless steel and a more sophisticated type of coating. Chemical is a niche of market. The ongoing crisis in the Red Sea has led to an increase in sailing distances as ships opt to avoid the Suez Canal and prefer the route via the Cape of Good Hope. Among the various segments, LRs and MRs are expected to experience the most significant growth in capacity, with growth rates of 13.9% and 5.3% respectively by 2025. Moreover, these two sectors are also expected to witness the highest demand growth. Asset prices, rates, and earnings have predominantly exhibited strength throughout the current year and have surpassed the levels observed last year. According to the International Monetary Fund, projections indicate that growth rates for 2024 and 2025 will reach 3.1% and 3.2% respectively. In 2023, the global oil demand experienced a continuous growth, as reported by the International Energy Agency. The demand increased by 2.3 million barrels per day. Notably, the growth in demand within advanced economies has significantly slowed down. Countries such as China, India, Brazil, and Saudi Arabia continue to experience an upward trajectory in demand. These four nations accounted for 70% of the demand growth observed in 2023 and are expected to contribute to more than 80% of the growth in 2024. The reshaping of tanker trades remains heavily influenced by geopolitical events. Following the Russian invasion of Ukraine in February 2022, the imposition of sanctions on Russian oil exports has had a deep impact on the oil trading landscape. As a result, Russia has been forced to seek alternative export markets, while the European Union has been forced to identify new suppliers. Consequently, this has led to a surge in average sailing distances and an upsurge in the demand for tankers. Starting from November 2023, Houthis are hitting vessels in the Red Sea and the Gulf of Aden have led to a growing number of ships opting to navigate via the Cape of Good Hope. It is projected that the average sailing distances will experience a 10% increase for crude tankers and a 17% increase for product tankers. Since november, Suez Canal transits have plummeted by close to 50%.<sup>16</sup>

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<sup>16</sup> BIMCO, February 2024, “Tanker shipping market overview”

Figure III.9 “Tanker transits after October 7, 2023”



Source: BIMCO, February 2024

### III.3.1 Crude Oil

Crude oil and petroleum are classified as fossil fuels due to their composition of hydrocarbons derived from the organic matter of ancient animals and plants, that occupied the marine environment millions of years ago. The heat and the pressure forced by these layers of rocks transformed the organic matter into what is now known as crude oil or petroleum.<sup>17</sup> Crude oil is found underground at varying pressures, which depend on the depth at which it is located. It can contain a significant amount of natural gas, which is kept in solution due to the pressure. Additionally, water often enters an oil well along with the liquid crude and gas. All of these fluids are gathered using surface equipment in order to separate them. The clean crude oil is then sent to storage facilities, where it is stored at nearly atmospheric pressure. These storage facilities typically consist of cylindrical steel tanks, which can have a diameter of up to 30 meters and a height of 10 meters. Transporting crude oil from widely dispersed production sites to treatment plants is compulsory. This transportation is primarily done through pipelines for overland movement or with tanker ships. The capacity of these vessels can vary, ranging from 100,000 barrels to over 3,000,000 barrels. The refinery is the primary destination for most of the crude oil. Firstly it is subjected to fractional distillation, which separates the various hydrocarbon types into fractions with similar properties. Secondly, the separated hydrocarbons are chemically transformed into more desirable reaction products. Lastly, the resulting products are purified to eliminate any unwanted elements and contaminants. Fractional distillation is the primary method employed to separate the hydrocarbon components of crude oil. The fractions obtained through distillation are further processed to produce a wide range of products like naphtha, gasoline, jetfuel, gasoil and diesel oil. Considering that the current demand trends, particularly the high demand for transportation fuels like gasoline, the market value of a crude oil generally increases as the yield of light products rises.<sup>18</sup> Nowadays, the imposition of sanctions on oil transportation from Russia, Iran and Venezuela by the Department of the Treasury' Office of Foreign Assets Control has brought attention to the global oil market and its operational dynamics. The terms shadow, ghost and dark fleet have been utilized to describe the difficulties associated with identifying and

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<sup>17</sup> EIA, June 12, 2023, "Oil and Petroleum products explained"

<sup>18</sup> Britannica, 2024, "Crude Oil"

monitoring tankers transporting oil from these nations. Numerous members of the congress have shown interest in evaluating the effectiveness of the sanctions and exploring potential measures to eliminate the flow of oil revenues from these countries. A comprehensive examination of the institutions and characteristics of the oil tanker market could offer valuable insights into the challenges and opportunities related to enforcing sanctions. Throughout history, the oil tanker industry has demonstrated its ability to adapt to various global events, such as wars, conflicts, piracy, canal closures, restrictions, extreme weather conditions, technological advancements like fracking, and regulatory changes such as the introduction of double hull and emissions regulations. Due to the global nature of their customers, shipowners work on an international scale. While refineries may have preferences of certain grades of oil, the commodity is generally interchangeable. Consequently, oil shippers can easily find alternative buyers or sellers based on the prevailing world circumstances, which are subject to continuous change alongside oil prices. The presence of shipbrokers and oil traders who don't own physical assets, plays a significant role in facilitating swift market adjustments. International standards for safety and security of ships serve the purpose of eliminating substandard ships and can also aid in the enforcement of sanctions to some extent. The prevention and security, primarily lies with the flag state. There has been a shift in the burden of enforcement from the flag state to the "port state". This means that countries enforce these standards when ships arrive at their ports or as a prerequisite for entering in their coastal water. These international standards are established through treaties and convention that has been agreed upon by nations involved. The International Maritime Organization plays a fundamental role in reaching these regulations. The establishment and implementation of international conventions for ship safety and security, but not only, can be traced back to the response following the tragic disaster of Titanic in 1912. Three key standards are of notable relevance. These include the convention SOLAS that means International Convention for the Safety of Life at Sea 1974, the convention MARPOL that stands for International Convention for the Prevention of Pollution from ships 1973, modified by the Protocols of 1978 and 1997, and lastly the third pillar the convention STCW as for International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, including the 1995 and 2010 Amendments. The role classification societies is relevant in enforcing sanctions, as



tanker owners heavily rely on financial institutions such as insurers and bank loans. Apart from considering factors like the age and the chosen flag, the selection of an insurance carrier and classification society can aid port state control authorities to identify suspicious vessels. Insurers have an interest in upholding shipping standards to accurately assess risks and charge appropriate premiums. To evaluate a vessel's seaworthiness, the insurance industry relies on marine engineers and surveyors employed by the classification societies. These organizations conduct regular inspections to ensure that vessels meet and maintain the required class criteria for construction and maintenance. There exists a notable difference between the sanctions imposed on Iran and Russia in terms of classification societies. These organizations can face sanctions when dealing with tankers carrying Russian oil. Russia has its own classification society, although it has been expelled from the International Association of Classification Societies, which is an industry self-regulatory body. Similar to how flag states are evaluated based on their safety performance by the Paris MOU and the Tokyo MOU, classification societies are subject to ranking by these Memorandum of Understanding. Ship insurers commonly offer hull and machinery coverage, while shipowners have established mutual insurance clubs to cover also protection and indemnity liability, including coverage for oil spills and damages to third parties. Liability insurance is compulsory for the tanker vessels under the International Convention of Civil Liability of Oil Pollution Damage, published by IMO in 1992. The traditional hubs for marine insurers are London, Switzerland and New York. Nevertheless, due to sanction constraints, Russia and India have considered to establishing their own insurance clubs.<sup>19</sup>

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<sup>19</sup> Congressional Research Service, March 18, 2024, "The global oil tanker market: an overview as it relates to sanctions"

### III.3.2 Fuel Oil

Fuel oil is predominantly composed of residues obtained from distillation of crude oil. Its primary application is in steam boilers found in power plants, as well as on ships and industrial facilities. In order to achieve the desired viscosity and flash point, commercial fuel oils are typically mixed with other fractions of petroleum. Efforts to mitigate emissions from ships, such as the implementation of stricter regulations concerning the permissible sulphur content in maritime fuels, have resulted in a decline of the utilization of the Heavy Fuel Oil within the maritime shipping industry. Historically, HFO has been the fuel most adopted by the majority of ocean vessels. This preference can be attributed to its exceptional energy density, which allows ships to cover notable distances with relatively small quantities of fuel. Furthermore, HFO has been an economically favorable option due to its lower cost rather than other alternative cleaner fuels. During refining, fuels known as distillates are extracted for utilization in various modes of transport, leaving behind HFO as a residual fuel. However, the recent focus on reducing emissions has prompted the implementation of stricter regulations regarding the sulphur content in marine fuels. As a result, the use of HFO has been curtailed in favor of cleaner alternatives, leading to a significant shift in the shipping consumption patterns. In contrast to other types of fuels, the heavy fuel oil has a dense consistency and needs preheating in order to achieve a smooth flow for utilization in the engines of the ship. Regrettably, the residual component contains numerous impurities. While the sulphur content in the fuel aids in lubricating the engine, it transforms into air pollution, in particular SO<sub>x</sub> and NO<sub>x</sub>, becoming one of the major contaminants resulting from incomplete burning. Although shipping is not the sole contributor, it is estimated to account for approximately 13% of the global sulfur oxide emissions, thereby posing significant health and ecological risks. In order to face this issue, the International Maritime Organization is implementing measures with the purpose to mitigate sulfur oxide pollution. The most comprehensive measure implemented is the IMO 2020 Regulation since January 2020, which set a limit of 0,5% ppm for the sulphur content in marine fuel and a limit of 0,1% in SO<sub>x</sub> Emission Control Areas (SECA). This regulation signifies an important step toward reducing the environmental impact of sulphur oxide emission in the maritime sector. In order to adhere to the 0,5% sulphur limit set by IMO, shipowners have different options. They

could opt to burn fuel oil with a reduced sulphur content, therefore switch to a low to a low sulphur marine gasoil or liquefied natural gas. Alternatively, they can still utilize heavy fuel oil at the condition to install an exhaust gas cleaning system, commonly known as scrubbers, in order to remove the excess sulphur content from the exhaust gas before it is emitted into the atmosphere. While scrubbers have been approved by the IMO as a compliant method and comply with international guidelines, they have become a subject of controversy. This is primarily due to the waste generated by scrubbers and the potential environmental impact this waste may have on the ocean. Major oil companies are now seeking a way to reduce the sulphur content in HFO, either by blending it with low sulphur distillate fuels or by refining processes that remove sulphur. The COVID-19 pandemic and the resulting economic slowdown have complicated the production and supply of marine fuels. While HFO is not expected to disappear entirely, especially for ships equipped with scrubbers, the attractiveness of them as an alternative may diminish if the price of very low sulphur fuels continues to decline. This would erode the price advantage that HFO once held. Moreover, the International Maritime Organization set the goal to reduce greenhouse gas emissions by 100% by 2050. This goal will force additional pressure to adopt alternative fuel. The industry is actively exploring various energy sources, such as fuel cells, batteries, solar and wind power and nuclear propulsion, either as independent power sources or in combination with other systems.<sup>20</sup> In recent years, the issue of global warming has gathered increasing attention, particularly in relation to the emissions produced by international shipping. As a response to this, areas SECA were established in various regions worldwide. These designated areas are characterized by stringent regulations aimed at reducing emissions from ships, as outlined in Annex VI of the 1997 MARPOL Protocol. The implementation of these emission control zones began in 2005 and included regions such as the Baltic Sea, the North Sea including the English Channel, the US and Canadian coasts and the Caribbean. It is estimated for the next future that new areas will become SECA, such as Mexican coast, the Mediterranean Sea, Japan, China and South Korea coasts. To adhere to the current regulations, which require a sulphur content of 0.1%, vessels operating within these zones are required to use distillate fuels with sulphur content below this specific threshold. The amendment made

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<sup>20</sup> ClearSeas, June 20, 2024, "Marine fuels: what is heavy fuel oil?"

to Annex VI of the 1997 MARPOL Protocol resulted in a significant reduction in the permissible sulphur content in fuel oils outside emission control zones. This regulatory change had a deep impact on the bunker industry. It is important to note that the utilization of an exhaust gas scrubber must receive approval from the flag state of the respective vessel.<sup>21</sup>

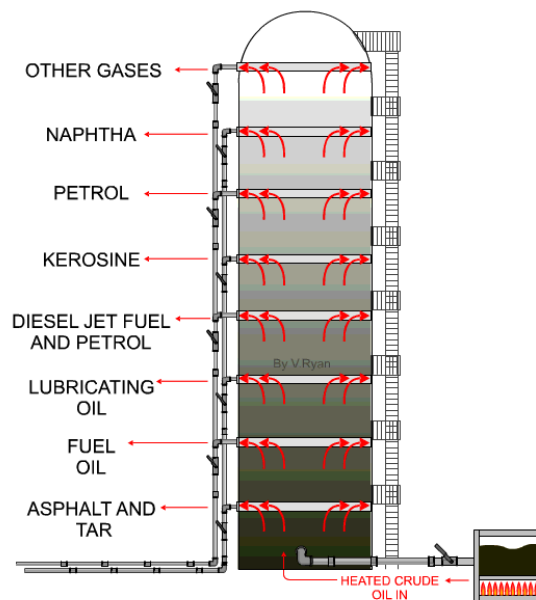
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<sup>21</sup> BrookesBell, January 9, 2024, “what is a bunker fuel? A complete guide”

### III.3.3 Product Tankers

Everybody knows product tankers such as particular vessels able to carry derivative products in output from refineries. These type of vessels have the hold coated to prevent corrosion and facilitate the cleaning operations. Into the main hull there are different segregation in order to avoid any kind of risks of blend or contamination. It is important due to their ability to carry different products on the same vessel. The so called refining tower is the base to understand which products are made by the refining process, where is located their demand and why exist a product tanker market.

Figure III.10 “The refining tower”



Source: Technologystudent

At the lowest levels we observe asphalt and bituminous products that serve mainly the industrial construction market. This type of products are called dirty. If we give a look to the two levels above we find fuel oil and lubricating oil. These are used on the majority of the vessels for propulsion and maintenance of main engine and auxiliaries. On the next step there are placed jet fuel and diesel oil. These products are surely clearer than the lowest and are used for propulsion in the air industry and auxiliary engines on the commercial vessel, especially when they enter in the port or in protected areas. On

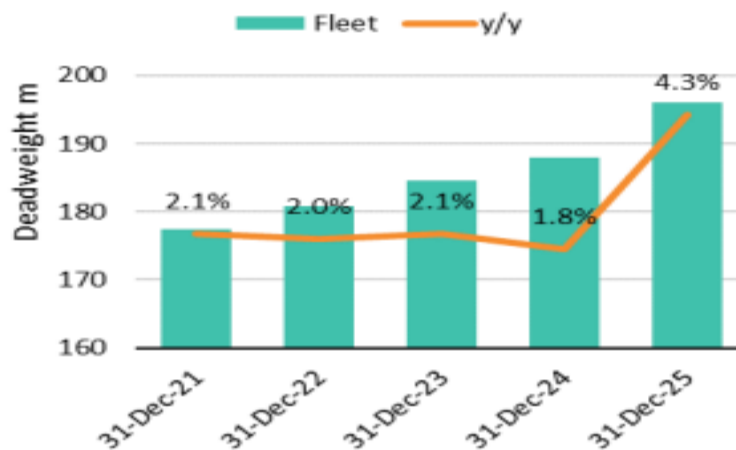
the highest levels we find clean products like gasoline, petrols and naphtha. They are mainly used by road vehicles and in the petrochemical industry. The difference at every step of the tower is the coefficient of variation, that is the ratio between the standard deviation to the average of the products in terms of quantity related to a single barrel. Product tankers are frequently engineered to accommodate the transportation of chemical cargoes as well. This needs the implementation of distinctive construction methods and equipment, including the incorporation of stainless steel in cargo tank construction, the utilization of corrugated bulkheads, deep well pumps, and the integration of more intricate piping systems.<sup>24</sup> The Red Sea crisis is expected to have an impact on east/west trade routes, leading numerous vessels opting for the route through Cape of Good Hope. Additionally, the increase in volumes resulting from reduced refinery operations in Europe is likely to contribute to longer sailing distances in both 2024 and 2025. Refinery operations are projected to grow in East and West Asia thanks to the ongoing expansion of capacity of production. The establishment of the Dangote refinery in Nigeria is expected to lead to an increase in refinery operations in Africa. Conversely, the International Energy Agency foresees a decline in refinery operations in the Americas and Europe. The rise in refinery operations in Kuwait and Oman, has led to an increase in the production of refined products in West Asia. As a result, there is expected to be a rise in exports of clean products, which may come at the expense of crude oil exports. If there is a reduction in inflation and interest rates in Europe and North America, it could negatively impact the demand for refined products. Another significant concern is the ongoing crisis in China's real estate sector. If this crisis won't be resolved in a timely manner, it could further damage consumer confidence and consequently affect the demand for refined products. The duration of the Red Sea crisis and its impact on shipping is challenging. It is important to note that extended voyages and increased freight rates through the Cape of Good Hope may lead European purchasers to prefer crude oil and products from the Americas rather than from Asia. The capacity of the product tanker fleet experienced a growth of 2.4% in 2023, reaching a total of 184.6 million deadweight tonnes. It is projected that the fleet will continue to expand, with an additional increase of 1.8% in 2024 and 4.3% in 2025. The majority of the expected growth in the product tanker fleet will be concentrated in the LR2 and MR

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<sup>24</sup> International chamber of shipping, "Tankers"

segments. The Handysize segment is anticipated to experience a decline in capacity by 4.9%. In 2023, the contracting of newbuilding product tankers reached its highest level in a decade, with a total of 17.3 million deadweight tonnes. This resulted in the order book to fleet ratio increasing to 12.9%. On the other hand, the recycling of product tankers reached its lowest recorded level in 2023, with only 0.3 million deadweight tonnes leaving the fleet. It is expected that recycling will remain at a similar level in 2024 and increase to 0.9 million deadweight tonnes in 2025. Furthermore, in 2023, the sailing speed for product tankers increased by 0.3%, while crude tankers experienced a boost of 1.9%. This contributed to the supply growing at a faster rate than the fleet.<sup>25</sup>

Figure III.11 “Product Tanker Fleet”



Source : BIMCO, February 2024

The entrance of new refineries into the market could potentially lead to a shift in cargo flows within the product tanker market. Shipbroker Gibson highlighted that refining margins worldwide reached record levels in 2022, following Russia's invasion of Ukraine. Although these margins have since declined, they have generally remained good, even in Europe. This is due to the structural shortage of distillates that favours the competitive advantage of larger and more sophisticated Asian refineries rather than European ones. The International Energy Agency predicts that Middle East refining throughput will increase by 650,000 barrels per day this year due to recently commissioned facilities. Kuwait's Al Zour plant, with a capacity of 615,000 barrels per

<sup>25</sup> BIMCO, February 2024, “Tanker shipping market overview”

day, reached full operational status few months ago. Additionally, the Duqm refinery, in Oman, with a capacity of 230,000 bd, was formally inaugurated in early February 2023 and began product exports in April of last year, increasing the volume of clean products transported worldwide.<sup>26</sup>

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<sup>26</sup> Hellenic Shipping News, March 19, 2024, “Product tanker market: cargo demand could shifts to new markets”



### III.4 The Scrubber System

The scrubber is a system used for cleaning exhaust gases emitted by ships, removing particulate matter and harmful substances like sulfur oxide (SO<sub>x</sub>) and nitrogen oxide (NO<sub>x</sub>). Prior to the implementation of exhaust gas cleaning systems in the shipping industry, emissions were released directly into the atmosphere, causing significant environmental and health issues. By employing scrubbers, up to 98% of SO<sub>x</sub> emissions can be eliminated. There are three types of scrubbers available: open-loop, hybrid, and closed-loop scrubbers. Open-loop scrubbers were previously favored due to their lower installation and operational costs. However, this method does not ensure full compliance, as many countries have already banned open-loop scrubbers and the discharge of scrubber wash water to prevent ocean acidification. Therefore, the focus has shifted towards hybrid and closed-loop scrubbers as they offer compliance and contribute to a sustainable future. The primary reason for utilizing scrubbers is to adhere to the lower limits of sulfur emissions imposed by the institutions. The Exhaust Gas Cleaning Association reports that around 10-13% of sulfur oxide emitted worldwide must be attributed to the shipping industry. In order to substantially decrease this emission, the International Maritime Organization has enforced an international sulfur cap, which decreases the exhaust gas limit from 3.5% m/m to 0.5% m/m. Consequently, the exhaust must be lower or equivalent to using fuel with 0.1% sulfur. The IMO sulfur cap does not apply into the Emission Control Areas. These areas are defined by the Annex VI of the MARPOL convention and encompasses particularly sensitive waters. Here the upper limit for sulfur in exhaust gas is 0.1% m/m. With the implementation of the IMO 2020 regulation, the volume of sulfur oxide emissions released from vessels is consequently reduced by up to 77%. This reduction is equivalent to an annual decrease of approximately 8.5 million tons of SO<sub>x</sub>. Such decline is advantageous for the environment and human health, particularly for individuals living in port cities and coastal regions of Asia-Pacific, Africa, and Latin America.<sup>22</sup> Denmark recently made the decision to prohibit the discharge of scrubber water into territorial waters within a 12 nautical miles range from the coast. This move aligns with similar actions taken by Germany, France, Portugal, Turkey, and China, which have also implemented national bans or restrictions. In Sweden, there is currently no ban in place, although certain ports

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<sup>22</sup> Liqtech, "what is a marine scrubber"

such as the Port of Gothenburg have independently prohibited scrubber water discharges within their jurisdiction. In terms of the number of vessels equipped with scrubbers, there has been a notable increase since the 2010. In 2018, there were 178 ships with scrubbers operating in the Baltic Sea. Today, researchers estimate that this number has multiplied by four. Globally, approximately 5,000 vessels, accounting for 5% of the global fleet, are equipped with scrubbers. It is important to note that this 5% represents a significant 25% of the global demand for heavy fuel oil, as scrubbers are primarily installed on ships with high fuel consumption.<sup>23</sup>

Figure III.12 “The Scrubber System”



Source: DNV, 2020

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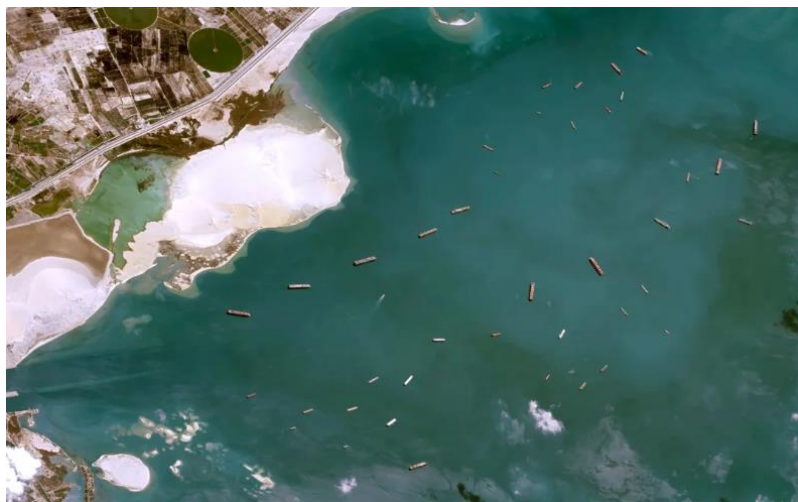
<sup>23</sup> Splash247, May 7, 2024, “Shipping making billions by using scrubber to run on heavy fuel oil, study claims”

## **IV. The fragility of chokepoints and the rift in world trade**

### **IV.1 Overview of bottlenecks in the international trade**

The shipping industry is characterized by some crucial points that delimit the flow of the goods. These chokepoints represent the arteries of the global trade, because of their relevance during navigation. A single issue in one bottleneck could increase the level of freight rates and force shipowners to change their program. Think for instance at the incident of the Ever Given in the Suez Canal. It has been a critical situation for the industry. On the 23rd March 2021 the vessel stranded on the eastern coast of Suez Canal and blocked the transit for 7 days creating distress on the entire global supply chains. A few more days and many companies would have not supported the financial costs.

Figure IV.1 “Traffic in front of Suez after incident of the Ever Given”



Source: CNN, March 2021

To ensure the continuous operation of the interconnected global supply chain, the uninterrupted carriage of various types of goods worldwide is crucial. Nevertheless, recent years have witnessed the emergence of significant challenges to global maritime cargo transportation due to the rapidly evolving global landscape and the escalating impacts of abnormal weather patterns and climate changes. The potential disruptions

and delays in cargo transportation at chokepoints, which are bottlenecks in maritime transport, can lead to widespread chaos in the supply chain and have consequences on the global economy. A chokepoint denotes a strategic location where an opponent can be strategically constrained to achieve kind of dominance. Specifically within the maritime domain, it refers to a location where shipping routes converge, creating a bottleneck in maritime transport.<sup>1</sup> Maritime chokepoints play a crucial role in connecting larger areas and enabling global trade. These narrow passages, often in the form of straits or canals, are susceptible to various risks such as structural weaknesses, geopolitical tensions, and piracy, due to the high volume of traffic passing through them. The difference between strait and canal is referred to as the building by human workforce. A canal is planned by civil engineers and built upon the dry land, while a strait represents a bottleneck where the sea passage is limited by natural sediments or configuration. Currently, over half of the worldwide maritime trade is facing potential disruptions in four significant regions across the globe. Despite the extensive coverage of the Red Sea conflict, there are additional three maritime routes that are in danger of becoming chokepoints as a result of geopolitical or environmental issues. The closure of Red Sea shipping routes by shipping companies due to attacks by Houthis rebels have had a significant impact on global trade. The Red Sea is a crucial chokepoint for oil shipments, although not as critical as the Strait of Hormuz or the Strait of Malacca. Nevertheless, the current situation has already led to fluctuations in global oil prices. Additionally, the Red Sea serves as a vital transit point for global food and fertilizer shipments, a sector already facing disruptions due to the conflict in Ukraine and consequent blockades of Black Sea shipping routes. Prior to the pandemic and the Ukraine crisis, strait of Bab-el-Mandeb facilitated the transit of nearly 20% of global rice and almost 15% of global wheat, making it a key hub for shipments as well. The primary chokepoints for global trade, based on the amount of volume carried, are concentrated around China owing to the country's significant export activities. Approximately 80% of globally traded goods are transported via sea routes, a figure that remains at 70% when considering the value of goods traded.<sup>2</sup>

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<sup>1</sup> MOL Solutions, May 3, 2024, "Global Choke Points"

<sup>2</sup> Statista, Jan 3, 2024, "Global Shipping's Chokepoints"

## **IV.2 The Suez Canal**

Since its construction in 1869, the Suez Canal has served as a crucial link between the East and the West, under the control of various nations and playing a pivotal role in the worldwide economy. The recent incident involving a massive container ship, the Ever Given, highlights a contemporary issue: approximately 12% of global trade relies on the Suez Canal, and the possibility of a prolonged obstruction could have significant repercussions. The canal lies in a strategic location being the sole direct water link between Europe, the Indian Ocean, and the Asia-Pacific region. Without the Suez Canal, shipments between these areas would be forced to travel across the entire African continent, resulting in increased expenses and significantly longer journey durations. The construction of the 120 nautical miles waterway through the Egypt into the Red Sea provided a solution to this issue after centuries of searching for one. Completed in the 1869 over a ten-year period, this remarkable achievement was made possible by the discovery that the Mediterranean and Red Seas were at similar altitudes. The advantages by the passage are really precious. For example, a vessel traveling from an Italian port to India would cover approximately 4,400 nautical miles if it passed through the Suez Canal, taking about 9 days at a speed of 20 knots instead of via the Cape of Good Hope and around Africa, taking three weeks at the same speed, covering a distance of 10,500 nautical miles. The Suez Canal's relevance is further underscored by the absence of alternatives; without the Red Sea extending above the Horn of Africa, along Sudan and Egypt, there would be no narrow land masses to support an artificial waterway connecting Europe with the Asia. The canal's location now leads to the transit of nearly 19,000 vessels annually. Following the commencement of Houthis attacks to the vessels in late 2023, hundreds liner container ships have been redirected. The recent incidents in the Red Sea region have led to a decrease in traffic flow through the Suez Canal. Consequently, numerous shipping companies have opted to reroute their vessels in order to safeguard their crew and assets. This decision has resulted in an average increase of delivery times, adversely affecting businesses with limited stockpiles. Conversely, on the opposite side of the globe, an intense drought at the Panama Canal has compelled authorities to implement restrictions that have significantly curtailed the number of daily ship transits since October of last year. This reduction has slowed down maritime commerce through another crucial chokepoint, which typically contributes to around

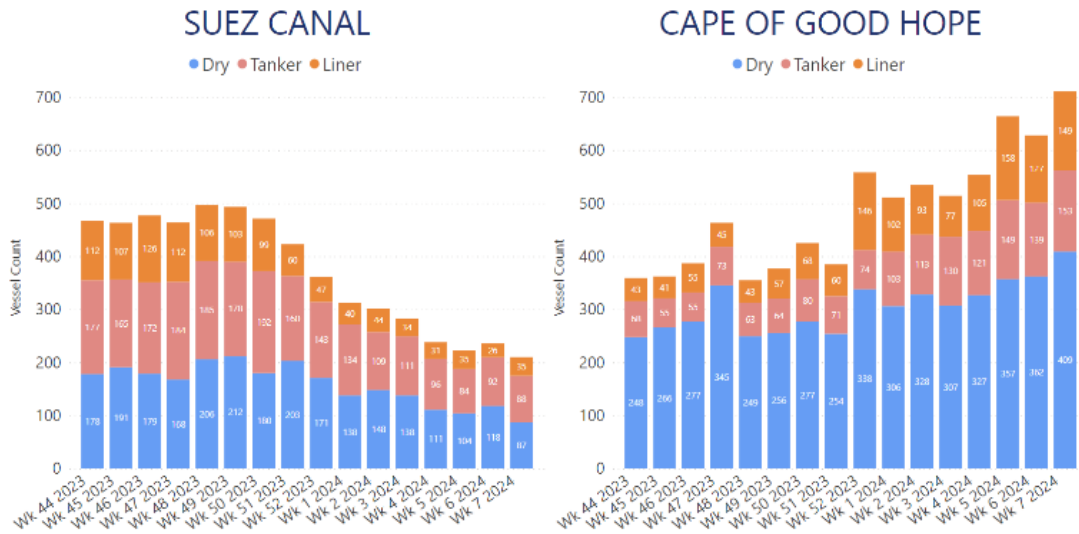
5% of global maritime trade.<sup>3</sup> So the global trade has been diverted from the Suez Canal to the Cape of Good Hope, while less trade has passed through the Panama Canal. In recent years, the logistic industry has faced significant challenges, from the impact of COVID-19 through the conflict in Ukraine. In 2024, a new obstacle has emerged. The decision to navigate around Africa has resulted in extensive delays, as the traditional route from Asia to Europe through the Suez Canal and the Red Sea has become dangerous due to assaults by Houthi rebels. These attacks are part of a boarder conflict in the region. While the alternative route around the Cape of Good Hope avoids the danger, it comes at a considerable expense for a multitude of companies that rely on these pathways. Cargo ships are favored thanks to their large capacity, making them a cost-effective choice for transporting goods. Nevertheless, the current challenges in the Red Sea region are prompting businesses to consider other transportation options based on their specific requirements. The longer routes and additional expenses incurred by bypassing the Suez Canal can strain their finances and impact their ability to meet orders promptly. Consequently, these businesses may encounter delays in receiving supplies and face difficulties in maintaining customer satisfaction levels. Hence, it is essential to prioritize transparency and minimize intermediaries when selecting a transportation partner. Companies that have direct oversight of operations in critical areas can provide increased transparency and potentially lower hidden costs.<sup>4</sup>

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<sup>3</sup> IMF Blog, March 7, 2024, “Red Sea attacks disrupt global trade”

<sup>4</sup> The Baltic Times, May 30, 2024, “How are the Suez Canal and the Red Sea Crisis going to affect your logistics?”

Figure IV.2 “Weekly Vessel traffic per type”



Source: AxsMarine, February 2024

Approximately four months following the official commencement of the conflict, the overall number of merchant vessels passing through the Suez Canal has decreased by approximately 55% on a weekly basis. Data from AXS identifies the several impacts of the crisis to the three primary vessel markets. Although liner vessel traffic began to reflect the events in the Bab al-Mandab Strait as early as November of the previous year, the count of Dry Bulk and Tankers passing through the Suez Canal has been affected a few weeks later. Container vessels, in particular, experienced the most significant decline in traffic through the Canal. This marked an historic low, which had only been observed once in the last decade when the Ever Given obstructed the Suez Canal in 2021. It represented a 76% decrease, compounding the already substantial 64% drop in Container ship traffic recorded throughout January. The Dry Bulk segment has shown the least impact from the Red Sea crisis in terms of percentage. While Container ships were already diverting to the Cape of Good Hope, vessels carrying Dry Bulk cargo set a new record of 212 crossings through the Suez Canal in the first week of December 2023, with traffic remaining strong throughout the entire month. However, in January 2024, the number of Dry Bulk vessels traversing the Canal decreased by 18%. The decrease in traffic was even more significant in the first weeks of February, dropping by over 55%. The relatively slow response of this market segment could be

attributed to the fact that the most commonly carried Dry Bulk commodities are primarily shipped to China from Australia, or in second place Brazil, by vessels routing already through Cape of Good Hope. Additionally, compared to Tankers and Container Ships, Dry Bulkers are the only fleet segment that traditionally sees more vessels passing via the Cape of Good Hope rather than the Suez Canal. That being said, the increase in traffic around the southernmost point of Africa currently measures at over 120.4% year-over-year since the start of 2024. Tanker traffic, which includes LNG and LPG carriers, maintained a consistent flow through the Suez Canal until mid-December 2023. However there has been a significant decline in tanker traffic, with only slightly over 80 vessels crossing the Suez Canal in the initial week of February. It is important to note that VLCCs are not included in this count, as they are unable to pass through the Suez Canal when fully loaded, which could distort the observed statistics.<sup>5</sup>

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<sup>5</sup> AxsMarine, February 21, 2024, “Nearly 300 less ships per week through Suez Canal due to Red Sea crisis”



### IV.3 The Panama Canal

The Panama Canal supports the flow of numerous commodities between the Atlantic and Pacific Ocean. The canal is currently living a significant drought as a result of the El Niño weather phenomenon. In response to the decreased water levels, the governing authority of the canal has implemented temporary measures such as reducing the number of transits and ensuring that cargo weight is appropriate.<sup>6</sup> This water shortage is putting in danger the global trade and it has experienced a decline in daily transits worsened by climate change. The impact of drought limitations, stemming from decreased rainfall at Gatún Lake, the primary water source for the canal, has resulted in a 15 million tons reduction in capacity in 2023. Prior to facing water-related challenges, the canal accommodated up to 38 ships passing through daily. The recent constraints are expected to lower this number. This vital sea passage has been obliged to scale back its operational capabilities, adding complexity to the global shipping network and compelling shippers to explore alternative routes and transportation methods. This adjustment is expected to increase the total ocean transport costs for trade through the Panama Canal by roughly 5%. This strategic shift highlights the wider impact of climate and environmental factors on global logistics and trade efficiency.<sup>7</sup> The issue was initially expected to be a short term inconvenience, but it has now escalated into a persistent problem. The Panama Canal Authority oversees the transportation of goods worth \$270 billion annually, but this year has been plagued by an unprecedented water shortage. The Canal Authority foresees revenue losses ranging from \$500 million to \$700 million in 2024. Moreover, the outlook suggests that water levels will continue to decrease. The dilemma is quantified in terms of elevation. Gatún Lake, a reservoir in Panama that supplies water to the Canal, has seen its water level drop from 27,06m above sea level in late 2022 to a mere 24,85m presently. This level is inadequate to accommodate the Canal's standard traffic of 38 ships daily. Consequently, the Canal Authority has restricted the passage to only 20 vessels per day, with a potential further reduction to 18 in the near future. The restrictions imposed have led to bottlenecks, delays, higher shipping costs, and an air of uncertainty regarding the future of the Canal, which is celebrating its 110th anniversary this year since its opening. In a recent study

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<sup>6</sup> BCG, February 21, 2024, "These four chokepoint are threatening global trade"

<sup>7</sup> Wefreight, February 26, 2024, "Maritime chokepoints: the achilles heel of global trade"

published on Nature, a team of researchers cautioned that the Earth will witness more severe drought conditions similar to those currently being experienced in Panama due to the El Niño, a climatic turbulence connected to the warming of the Pacific Ocean. In a conservative estimate, these patterns are projected to affect around three billion individuals globally. In a more pessimistic scenario, this number could rise to as high as five billion people, representing 66% of the world's population, by the close of the century. The inflationary repercussions of the situation in Panama have already been noticeable to consumers since the middle of the previous year. With 40% of the container traffic of goods bound for the United States passing through Panama, which serves as an alternative to the network of roads and railways connecting the country's Eastern and Western coasts, the final cost of goods has risen. The Canal underwent a significant investment of nearly \$5 billion a few years ago, allowing for the passage of larger ships. However, this unexpected impact of climate change has caught the attention of authorities, leading them to apply stricter regulations. The effects of climate change are creating a new waterway in northern Canada due to melting ice, potentially connecting Asia and Europe through North America. This adds to the existing chokepoints in global trade. The recent military actions by the United States and the United Kingdom against Houthis targets in Yemen have further escalated the conflict in the Middle East. In response, the Houthis have started targeting commercial ships in the Red Sea, which is connected to the Mediterranean via the Suez Canal, the other crucial route for global trade.<sup>8</sup> The Red Sea's recent developments coincide with the Panama Canal facing challenges due to the low water levels. The Canal Authority has implemented measures to conserve water, reducing the number of vessels allowed to transit. This reduction in transits has immediately impacted container shipping, which is the dominant traffic in terms of both the number of crossings and net ship tonnage. Other affected traffic includes dry bulk carriers, gas and chemical carriers, and car carriers. The reduction in transits across the Panama Canal has led to an increase in transits through the Cape of Good Hope, particularly for cargo originating from Asia, obliged to don't pass through the Suez Canal. This shift in traffic has had economic implications for both large and smaller economies that rely on Panama. The Canal plays a crucial role in the foreign trade of countries on the West Coast of South America.

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<sup>8</sup> ElPais, February 20, 2024, "The Panama Canal suffers a water crisis"

Specifically, around 22% of Chilean foreign trade volumes rely on the Canal, with 19% of imports and 24% of exports passing through it. Similarly, for Perù, almost 22% of total foreign trade volumes are carried through the Panama Canal, with 14% of exports and 32% of imports. Ecuador is even more reliant on it, with 26% of its foreign trade volumes crossing the canal, including 18% of its exports and almost 39% of its imports. In the United States, the demand for rail transport services has increased due to the inability to use the Suez Canal as an alternative. The land bridge, which connects the ports of Los Angeles and Long Beach in the United States by rail with the wider North American hinterland, is the other main competitor for the Panama Canal.

Figure IV.3 “Global maritime chokepoints”



Source: ING, April 2024

An increasing number of oil tankers are now being redirected to sail through the Cape route. Currently, there is a lack of liquefied natural gas carrying vessels passing the Suez Canal, as they have all been diverted away from the region. Bulk trade, which is less reliant on the Suez route and has minimal exposure to its disruptions, has lived limited market effects thus far, although there has also been a diversion of bulker ship capacity. Rerouting has impacted most grain and soyabean trade flows. For more than ten years, the maritime industry has implemented reduced sailing speeds in order to decrease fuel expenses and control the release of greenhouse gases from ships.

Adherence to new technical and operational regulations established by the International Maritime Organization, with the goal of reducing emissions from the shipping sector, has become compulsory for vessels engaged in international shipping. The disruptions in the Red Sea and Suez Canal, connected with the factors related to the Panama Canal and the Black Sea, which have led to the rerouting of ships along longer paths, have resulted in an increase in vessel sailing speeds. Shipowners are using this strategy to maintain schedule reliability and manage fleet capacity. The consumption of ship fuel also rises with higher speeds and longer distances. For a 1% increase in speed typically leads to a 2.2% increase in fuel consumption. For instance, a rise from 14 to 16 knots would result in a 31% increase in fuel consumption per nautical mile. In this scenario, the longer distances covered due to rerouting suggest that greenhouse gas emissions for a round trip Singapore to Northern Europe would surge by more than 70% per journey. These developments could damage the environmental benefits that had been attained through slow steaming.<sup>9</sup> The cost of insurance and coverage has been significantly affected by the increase in war risk premiums for vessels transiting through the Red Sea. The Joint War Committee expanded its listed areas in the Indian Ocean, Gulf of Aden, and Southern Red Sea region on 18th December 2023. The war prices surged in the final weeks of 2023, with a transit through the Red Sea now attract a premium of over 0.3% of a ship's value, double the amount charged in the middle of October and higher than before 7th October. By early February 2024, premiums were reported to have risen to around 0.7% to 1% of a ship's value. Despite these increases, there are still many players in the sector willing to provide coverage. The inflationary pressure due to soaring food and energy prices, poses a direct threat to global supply chains, potentially leading to delayed deliveries, heightened costs, and inflation. The crisis is impacting global prices, with longer distances and higher freight rates potentially leading to increased costs and disruptions in grain shipments from the Russian Federation, Ukraine, and Europe, posing risks to global food security.

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<sup>9</sup> UNCTAD, February 2024, "Impact to global trade of disruption of shipping routes in the Red Sea, Black Sea and Panama Canal"

#### **IV.4 The Strait of Hormuz**

Located between Iran, UAE and Oman, the strait of Hormuz holds great relevance for the carriage of energy sources, in particular crude oil and derivatives. Approximately 20% to 20% of the world's oil trade crosses this strait, along with a substantial portion of global shipping traffic. Iran should become more deeply involved in the current Middle Eastern conflict, the movement of ships through the waterway may be jeopardized.<sup>10</sup> Geopolitical tensions pose a significant risk to another crucial maritime passageway, potentially disrupting the industry. The ongoing conflicts in regions such as the Red Sea and the Gulf of Aden have already caused disruptions. Any turbulence in the operations of the strait of Hormuz could have severe consequences on the oil market. More than 80% of international trade in goods is conducted through maritime transportation, making it a crucial aspect of the global economy. Any disturbance in this sector can significantly affect economies worldwide. The Strait of Hormuz, liable for moving most of the world's oil, is a key area of concern due to its history of being a focal point for geopolitical tensions. Disruptions in this region could further intensify the negative economic consequences on a global scale, leading to change in trade patterns, increased transit time, production delays and heightened inflation rates. However, the security of other maritime regions is also cause for deep apprehension. Trade and shipping have become closely connected with the political issues. As a result, the Red Sea has been largely avoided. Additionally, there are concerns about shallow water in the world's main inland shipping waterways, which may face challenges throughout the year. The Strait of Hormuz is therefore a crucial pathway for the transportation of global oil and natural gas. This maritime chokepoint connects the Persian Gulf with the Gulf of Oman, making it a focal point for trade analysts. The importance of the strait stands in its role in the transportation of oil and petroleum products. Countries such as Saudi Arabia, Iraq, UAE, Kuwait, Iran and Qatar collectively produce 22,8 million barrels of oil per day, with approximately 15 million barrels being carried daily through this strategic route. It accounts for around 20% of the world's consumption of crude oil and refined products. Any attempt by Iran to disrupt or block the flow of oil through the strait would not only impact the country itself but also severely affect the other nations. These countries rely on the strait for the transportation

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<sup>10</sup> BCG, February 12, 2024, "These four chokepoints are threatening global trade"

of 100% of their crude oil exports, with no viable alternative route available instead of the Red Sea. While the East-coast crude pipeline, also known as Petrolina and connecting Qatar with the Red Sea coasts, and the Abu Dhabi Crude Oil Pipeline offer kind of alternatives for Saudi Arabia and United Arab Emirates, they don't fully replace the importance of the Strait of Hormuz. Moreover, a great volume of LNG passed through it every day. State of Qatar, the third largest natural gas exporter in 2023, shipped 108 billions cubic meters of gas thorough the chokpoint of Hormuz, representing approximatley 20% of the toal global natural gas trade. With Qataeir plannin to increase its capacity to over 170 cubic meters by 2027, the relevance of the strait of LNG is expected to grow. In particular, given Europe's increasing reliance on LNG following the Russia / Ukraine conflict, any disruptions in the LNG market will have a more pronounced impact on Europe. The recent increase in oil prices reflects existing tensions, with a significant risk premium already factored in prior to the recent events. This situation has the potential to resul in supply disruptions if tensions continue to escalate. Most of crude oil and derivatives trasnported through the Strait of Hormuz are directed to the Asian markets, making these economies particularly vulnerable to any potential disruptions in supply. Nevertheless, beacuse of the interconnected nature of global oil market, all regions would feel the impact of higher oil prices in the event of a stop in the production. The tanker shipping industry is facing additional challenegs as a result of these tensions, following previous disruptions caused by sancitons on Russia which altered oil trade routes and increased sea distances. These ongoin tensions are expected to maintain elevated tanker rates and potentially could drive them even higher. Currently, the oil supply remains stable, however there is a growing concern about potential tensions in the Middle Eas intensifying the situation. The lack of a significant price response after Iran's recent attack to Israel can be attributed to the fact that the market hasid already factored in a substantial risk premium. Moreover, the market is in a state of uncertainty as it awaits Israel's response to the aggression. The longer the market remain in this state, the more likely it is for the risk premium to diminish. The risks to oil suppluüy are at their highest level since October of the last year. Any further escalation could bring the oil market closer to actual supply disruptions.<sup>11</sup> By far, the strait of Hormuz is one of the most important chokepoint in the world, with an estimated

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<sup>11</sup> ING, April 18, 2024, "The Strait of Hormuz is a key route for global oil and LNG transport"

15 million barrel of oil flow passing through it daily. Moreover, exports from the world's largest liquified natural gas exporter Qatar pass through it directed to Asia and Europe. Most of the crude exported through the strait goes on long shipments and is typically carried in Very Large Crude Carriers which can contain over two million barrels of oil per voyage. A Traffic Separation Scheme has been recognized by the IMO in these restricted water areas in order to be in a position to control the traffic of biggest vessels. The TSS shall comprise of shipping lanes that are two mile wide, one for the incoming and for the outgoing traffic. In the middle there would be a two mile buffer zone. So, therefore, it is a narrow network at the narrowest point which is 21 miles wide. The two shipping lanes separated by a buffer zone in the two shipping lanes are situated inside Omani territorial waters. It would, therefore, mean extra costs and too the use of alternate pipeline routes in case closure of the strait occurs. However, a lot of this vulnerability for western consumers is reduced nowadays, thanks to the construction of the East-West pipeline, which provides an outlet in the Red Sea coast.

## **IV.5 The Strait of Bering and the Arctic Route**

The Bering Strait is 44 nautical miles wide and allow the entrance to the Arctic Ocean from the Pacific. The flow of water, the annual movement of sea ice, and the presence of a continental shelf result in an extremely productive marine ecosystem. The volume of vessel traffic in the Bering Strait has been on a consistent upward trajectory. This increase in Arctic maritime activities can be largely attributed to the development of natural resources facilitated by the reduction of ice and the region's integration into the global economy. While shipping operations in this area remain relatively minimal compared to other industrialized regions worldwide, the capacity to offer assistance and support to vessels navigating the strait is significantly more constrained than in other locations. The presence of extreme weather conditions, characterized by turbulent seas, ice, and fog, renders the response to oil spills or other incidents in these remote waters nearly unfeasible. Considering the cultural, ecological, and economic significance of the region, the potential ramifications of an accident would be really substantial. The cape route is used every time passage through Suez has been disrupted. However, another sea passage exists between the two continents, the Northern Sea route. This way, which runs from the Barents Sea near Russia's border with Norway, to the Bering Strait between Siberia and Alaska may be preferable and will be readily available in the near future as if global warming continues at the forecast rate. Research projects that complete melting of summer sea ice along the Siberian coast will be accomplished by 2035. Even if complete removal of the ice is not achieved, the layer of ice, that is one of the most dangerous obstacles to Arctic navigation, will be notably reduced. Arctic navigation is thereby estimated to be feasible at the start of the next decade. Traffic between Shanghai and Rotterdam, for example, would be cut by some 3,000 nautical miles compared with the Suez route and by 6,200 miles compared with the Cape route. That would cut the sailing time between eastern Asia and northern Europe from 32 days via Suez to just 18 days, potentially revolutionising the shipping route competition. Navigation in the Arctic is also done at very slow speeds. Thus, based on the speed at which one is sailing and the type of fuel applied, a cargo ship that passes the Arctic route could use as much as 40% less fuel and produce as high as 80% fewer emissions than if it took the Suez route. Sailing in the Arctic also requires escorting behind a nuclear-powered icebreaker ship and the number of icebreakers is limited at the



moement. Just five were in operation on the route in 2021, but they are rising to nine by 2030. Capacity issues also relate to the Northern Sea route. The so called "mega-vessels" of about 20,000 container capacity and more are deployed for trade between Asia and Europe. In contrast, these massive vessels cannot be traded via the Northern Sea route due to the imposition of restrictions based on depth of sea ice. Today's standards, only ships with an estimate capacity of 5,000 containers can barely sail across the arctic route during the summer period. Shipping through this waterway would potentially emit less carbon compared to those ships passing via Suez. However, this route has other environmental issues to contend.<sup>12</sup> The Arctic takes a long time to recover from environmental disasters, such as oil spills. Accidents in those sensitive regions may thus lead to unimaginable marine pollution. Most of the cargo ships take in ballast water to ensure stability while on various points of operation. The ballast water is taken in or discharged out, away from the course of the ship, always according with Ballast Water Management Convention in order to avoid the migration of invasive species into the unique Arctic environment. In its present form, the Northern Sea route cannot handle the vessel traffic and amount of cargo that travels via Suez. However it might be a very viable alternative in some future date, if and only if progress were faster in controlling global warming and setting up a regulatory framework for use of the Arctic waters.

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<sup>12</sup> The Conversation, January 19, 2024, "Red Sea Shipping disruptions could be avoided in the future by using Arctic – but it could spell trouble for fragile ecosystems"

## V. Conclusion

Disruptions to the international shipping routes and maritime chokepoints create an extremely challenging environment for the shipping industry. Two major maritime trade waterways are being disrupted currently. Furthermore, these waterways remain in the process of adapting to changes in network configurations and trade patterns brought by the previous disruption in the Black Sea. Developing countries are especially vulnerable to disruptions in shipping networks that cause huge raise costs, alter connectivity and constrain market access. Longer delivery distances, higher freight rates have already shown their impact on food prices in the case of the Ukraine conflict, higher energy costs and delays in different business. Shipping schedules and service reliability, security measures for ships and ports, shipment delays and delivery timelines, increasing freight rates and insurance premiums, shipping connectivity, and the general geography of trade will be some of the main issues for monitoring. The shipping world is wonderful and challenging and had led the development of the big port cities as we know nowadays. It has boosted the volume of the flows of goods and increased the wellness of people. However, during these last two years, the shipping industry has changed and the turbulences ongoing are putting shipowners at the corner concerning where and how operate their vessels. There are two kind of shipowners: some are merely investors, they practice the so called “asset playing” e and try to make a profit playing on the fluctuation of the freight rates that reflect the value of the ship on the second hand market. The other type of shipowners are operators, they choose to deploy one or more vessels for a certain amount of time or number or voyages in return for a payment dealt at the stipulation of the contract. Despite the immensity of our planet and the diverse and numerous areas were loading and unloading of bulk goods can take place, maritime transport is bound by nature to very critical waterways, which if they are obstructed as is happening nowadays, a domino effect occurs on all the main logistic chains deriving from the products carried. This is because underlying the transport contract there is a contract of sale and purchase, from which we can understand the mechanism of demand driven. As mentioned earlier, one of the areas most prone to geopolitical friction and directly affecting the shipping world is the Red Sea, where Houthis have for several months been threatening the passage of commercial

vessels to support Palestinian people. Their motivation would be to help the Palestinians against the atrocities committed in the Gaza Strip by Israel. Given that between the Bab Al Mandab Strait and the Suez Canal passes between 10% and 15% of the world's oil, most of which comes from the Persian Gulf, attack on tankers are disrupting the logistics of one of our world's most important energy sources. Shipowners are thus forced to choose between a longer and safer but more expensive route, given the enormous crossing involved in circumnavigating the African continent in terms of bunker costs and lubricating oil, or the faster route via Suez, assuming the tremendous risk of being hit by drones or ballistic missiles. The Panama Canal on the other hand, is enduring another major crisis. The decrease in the level of its water has led to fewer passages and consequently to inconveniences due to long waits at both ends. This is happened due to the presence of El Niño, a meteorological phenomenon responsible for the evaporation of water from the Panama Gatun Lake, and by the increase in the average global temperature, which does not help the already perilous situation. What will happen in the near future, both in the Black Sea and the Red Sea, will be decisive for the maritime traffic. The alternative of the Arctic route would be geographically excellent but as analysed above, it is not economically viable today due to the difficulties in sailing and precarious environment. It will be the responsibility of shipowners to adopt preventive solutions to ensure protection to their crew, vessels and safeguard the marine environment, for future and better social welfare.

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