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MSc IN SHIPPING MANAGEMENT

LNG SHIPPING:
A STUDY ON FLAG SELECTION, CREW COSTS AND REGULATORY IMPACTS

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This thesis is dedicated to Ms. Alexandra I. Theodorou.

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ΠΕΡΙΛΗΨΗ

Η παρούσα διπλωματική εργασία στοχεύει στην ανάλυση των παραγόντων επιλογής σημαίας για τα πλοία υγροποιημένου φυσικού αερίου (LNGC) σε μια ανερχόμενη αγορά, η οποία υπόσχεται μακροοικονομική συνέχιση στην αγορά ενέργειας για τα επόμενα χρόνια με βάση τις πολιτικές, οικονομικές, κοινωνικές και περιβαλλοντικές ανάγκες.

Πραγματοποιήθηκε διεξοδική έρευνα για τον εντοπισμό του συνόλου των πλοίων μεταφοράς LNG με βάση τον αριθμό IMO, από το 1969 έως το 2030. Οι αριθμοί IMO (1147 συνολικά) ταξινομήθηκαν σύμφωνα με το κράτος σημαίας και την κατάσταση υπηρεσίας: ενεργό, βιβλίο παραγγελιών και εκτός υπηρεσίας. Από τα δεδομένα που συλλέχθηκαν, πραγματοποιήθηκε περαιτέρω έρευνα, για την ταξινόμηση των πλοίων ανά χωρητικότητα, ηλικία, ολική χωρητικότητα, πλοιοκτήτη, ναυπηγό, τύπο συστήματος πρόωσης και συγκράτησης.

Επιπλέον, αναλύονται οι παράγοντες που επηρεάζουν την επιλογή σημαίας ενός μεταφορέα υγροποιημένου φυσικού αερίου, εστιάζοντας στο κόστος του πληρώματος, τη φορολογία, τους κανονισμούς και άλλες οικονομικές και λειτουργικές εκτιμήσεις. Έμφαση δίνεται στους σημαντικότερους παράγοντες που επηρεάζουν τη λήψη αποφάσεων σχετικά με την εγγραφή της σημαίας, οι οποίοι διαπιστώθηκε ότι είναι το κόστος πληρώματος και το τελευταίο νηολόγιο πριν από το τέλος της εμπορικής δραστηριότητας του πλοίου.

Ο στόχος αυτής της έρευνας χρησίμευσε στον προσδιορισμό της επιλογής, μέσω της χρήσης της προαναφερθείσας μεθόδου, του μητρώου σημαίας. Αυτό οδήγησε στο συμπέρασμα του πρωταρχικού λόγου της μείωσης του συνολικού κόστους των λειτουργικών εξόδων, των φόρων και της έμμεσης μεγιστοποίησης των συνολικών εσόδων από την αποφυγή καλών πρακτικών διάλυσης πλοίων.

ABSTRACT

This thesis aims to analyse the flag selection factors for a liquified natural gas carrier (LNGC) in a rising market, which promises macro-continuation in the energy market for the upcoming years based on political, economic, social, and environmental needs.

Thorough research was made to identify the total LNG carriers by IMO number, from 1969 to 2030. The IMO numbers (1147 in total) were classified as per flag registration and service status: active, orderbook and out-of-service. From the collected data, further in-depth analyses were conducted, using various databases, to classify the vessels as per capacity, age, gross tonnage, shipowner, shipbuilder, propulsion and containment system type.

Moreover, what is analyzed is the factors influencing the flag selection of a liquified natural gas carrier, focusing on crew costs, taxation, regulations, and other economic and operational considerations. Emphasis is given in the most significant factors influencing the decision making on the flag registration, which was found to be the crew costs and the last registry prior the end of commercial activity of the vessel.

The objective of this research served to determine the selection, through the use of the aforementioned method, of the flag registry. This led to the conclusion of the primary reason of narrowing the total cost of operational expenses, taxes and the indirect increase of total incomes by avoiding good ship dismantling practices.

KEYWORDS

LNG Shipping, flag registration, FOCs, ship operating costs, profit maximization, ship recycling-scrapping, crew, regulations

1 INTRODUCTION - THE IMPORTANCE OF NATURAL GAS

Nowadays, natural gas has become an important commodity following important factors influenced by the shift from coal and oil to other types of energy. In the last, approximately 50 years, the markets have been expanding, as we know from the demand-supply indexes. Such growth may be derived, among others, from the biggest factor, which is population growth. According to the demographic analysis of the United Nations (2003), the world's population reached more than three times the population in 1950, resulting in a parallel increase in demand for energy resources (Lindgren et al., 2020).

The transition from conventional fuels, such as solid (coal) and liquid (diesel), to gaseous fuels (LNG, hydrogen), which are more environmentally friendly in terms of CO2 emission, was facilitated by the advancement of technology and the development of countries (GECF, 2024). This does not imply that the world has finally given up on the primary and most ancient forms of energy. However, major industrial regions (North America, Asia) continue to consume large amounts of coal and oil.

2 VALUE CHAIN OF LIQUIFIED NATURAL GAS MARKET

2.1 OVERVIEW OF SUPPLY CHAIN

The natural gas value chain is a comprehensive and cohesive process encompassing three stages: from the production of natural gas to the transportation of LNG and ultimately the distribution to the end users. These categories are upstream, midstream, and downstream (Ritz, 2019).

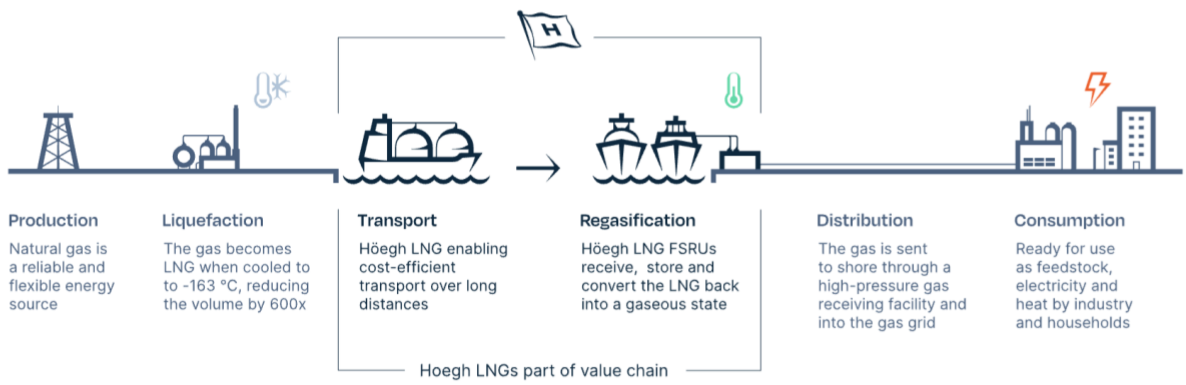

Figure 2.1: Value Chain (Hoegh LNG Website)

To execute these processes, companies may be engaged through either horizontal or vertical integration strategies. In the case of horizontal integration, distinct entities operating at the same level of the supply chain or within the same market sector collaborate or consolidate to enhance market share, reduce competition, or access new customer bases. For example, in the midstream segment, as shown in Figure 2.1, Hoegh can extend its operational growth by integrating with other companies of the same segment. Alternatively, vertically integrated companies control multiple stages of the production process, from raw material extraction and transportation to final distribution, as exemplified by BP or Shell[1]. In these cases, the companies manage all aspects of production, distribution, and retail, which allows for greater operational efficiency, cost control, and supply chain management.

[1] It is important for this research to examine whether the goods and/or services produced by companies operating under horizontal or vertical integration diversify the selection of flag registration for their assets.

2.2 UPSTREAM PROCESS

The upstream segment, which is frequently referred to as the exploring and production of natural gas, is the starting point of this value chain. The dry natural gas undergoes processing to remove other substances such as oil, water, sulfur, and carbon dioxide, and other compounds of natural gas liquids (NGLS) such as ethane, propane, butane, and pentane to keep the wet natural gas, which contains mostly methane (CH4). Then it is subjected to the liquefaction process, where it is cooled to approximately -162°C (-260°F) to convert it into a liquid state, resulting in the reduction of the volume of the gas by about 600 times, making it much easier for long-distance transportation via LNGCs (Songhurst, 2014).

2.3 THE MIDSTREAM PROCESS

The midstream segment of the value chain involves the transportation of the product, loaded by the buyer using free-on-board (FOB) terms or by the seller using delivery ex-ship (DES) terms. The liquefied gas is carried from the liquefaction terminal via cryogenic loading pipes to load the vessels that are equipped with cryogenic tanks that maintain the product at the required low temperatures during transition. At the destination, the LNG is moved to the regasification terminals through unloading cryogenic pipes, which also include storage tanks, vaporizers, odorization, and metering stations (Hafner and Luciani, 2022).

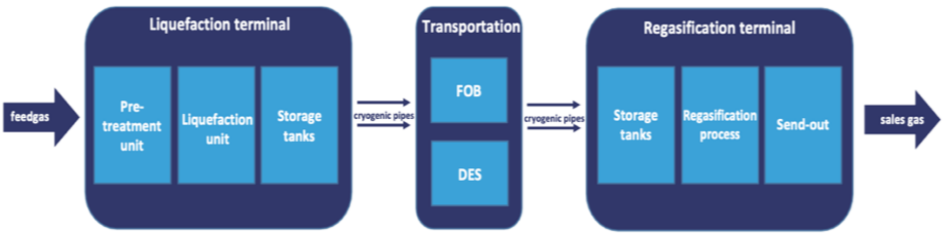

Figure 2.2: Simplified scheme of Midstream Process
(Source: Hafner and Luciani, 2022)

2.4 THE DOWNSTREAM PROCESS

In the downstream segment, the liquified natural gas is being processed from liquid to gaseous form, namely the regasification process. The product will then be distributed to a wide range of end consumers, such as power generating companies, industrial facilities, and residential consumers, such as households or automobile industries. In the LNG market, both spot market sales and long-term contracts are necessary to manage supply and demand dynamics globally.

Based on the vertical integrated gas business of SHELL Co. illustrated in Figure 2.3, each process is classified. Emphasizing the downstream segment, the liquefied natural gas is regasified and distributed to the end consumer, both individuals and companies. This integration across the supply chain results in a reduction of total expenses, including the cost of services provided in transportation and the cost of goods sold (COGS) for natural gas. By controlling and optimizing operations across each segment, from production to distribution, Shell reduces dependency on third party companies and minimizes cash outflows by consolidating each operation. For example, by owning or managing its own vessels and/or by operating its own facilities, the company optimizes the 5 Ws and H business enquiries: who, what, when, where, why, and how. This results in cost savings by reducing the COGS and improving its key performance indicators (KPIs).

In conclusion, this results in an economic reduction of the total operational expenses, the cost of services provided in transportation, and the cost of goods sold[2] by interfering in any segment of the integrated gas business. This can be used to identify prospective strategic management of the company, particularly in the midstream segment, including the selection of the flag registry for its 20 LNG vessels (SHELL, 2024b).

[2] As of cost and management accounting, a company can minimize its costs by allocating cost factors to operate in the integrated business. An integrated company can centralize and distribute overhead costs, such as administration and maintenance, across multiple business units rather than maintain separate support services. This consolidation of overheads lowers the cost of the end product for each segment.

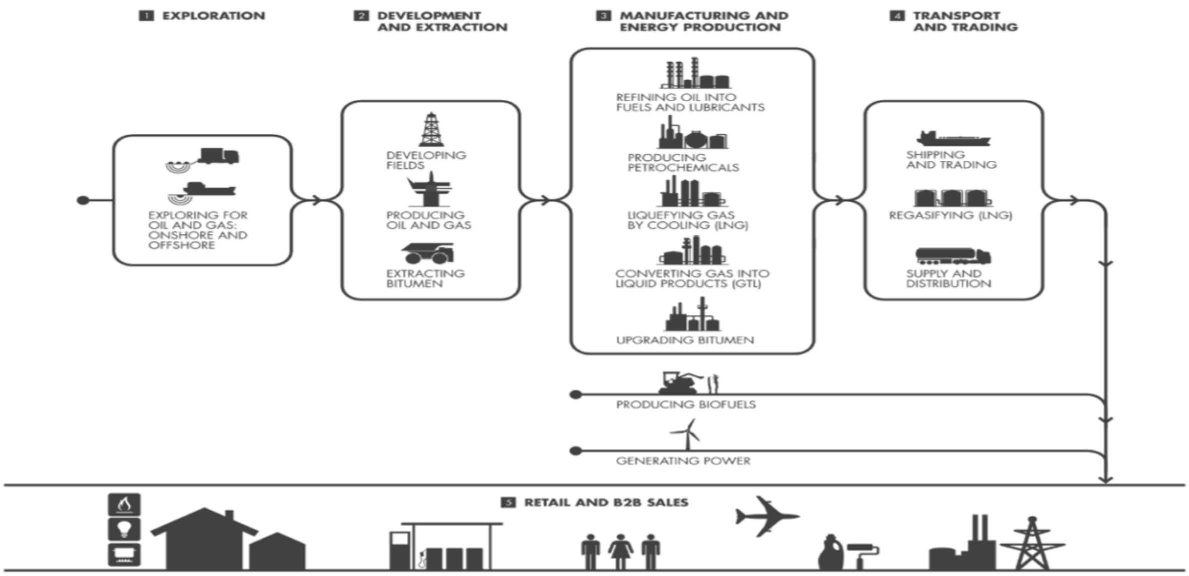

Figure 2.3: Overview of Shell's Integrated Gas Business.

2.5 PIPELINES NETWORK

The development of the infrastructure for transferring and storing energy is of high importance. Whether established or still growing, communities and their industries should have direct access to the product supply to meet their needs (David, 2022).

There are numerous international modes of transportation for liquefied cargoes, which are classified based on the distance between the source and shipment, the quantity, and the mode of transportation. Pipelines and vessels are the primary methods of transporting large quantities of liquefied cargo.

The transportation network of pipelines requires financial and technical support from the companies that hold the technical capability and means to provide the needed service requirements and construction, as well as from the government of the specific country that will provide the necessary ground for the allowance of transportation (David, 2022).

The global network of pipelines used for transporting natural gas is up to 2.3 million kilometers. According to market research conducted as of November 2023, the United States is home to the largest network of pipelines. Other prominent players in the natural gas pipeline market are India, China, Russia, and Canada, and the United States, Canada, Algeria, Saudi Arabia, and Russia have crucial roles in the natural gas market. Regarding China's Xinjiang-Guangdong-Zhejiang LNG gas pipeline, it was the longest pipeline scheduled to open in November 2023 (GlobalData UK Ltd., 2023).

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3 SEABORNE TRANSPORTATION

3.1 OVERVIEW OF SEABORN TRANSPORTATION

In the industrial sector, the production of goods arises from the general development of the world. These products are mainly transported by vessels from the port of origin to the port of destination to fulfil the needs of every industry that provides goods to the general external environment. These goods may be raw materials, semi-finished, or even finished products ready for consumption. In our case, it is more complicated, as in order for the LNG to be transported, it had to be processed in the liquification stage of the midstream segment, as explained in the previous chapter.

3.2 LNG VESSELS

Liquefied Natural Gas (LNG) vessels have been specially designed to transport LNG, a natural gaseous product that has been previously cooled to a liquid form (as mentioned in Chapter 2.2), for storage and transport.

According to the Institute of Chartered Shipbrokers (2015), LNG vessels are different from other types of vessels due to their unique design and structure. These vessels are equipped with highly specialized suppression systems to store the LNG safely at very low temperatures. The primary types of suppression systems used in LNG vessels are:

- Moss Type Spherical Tank Vessels are large and spherical tankers that are typically designed from aluminium or nickel-steel alloys, designed to resist low temperatures and pressure of the liquefied gas.
- Prismatic tank vessels are characterized by thin membranes supported by the ship's structure, often made of materials like stainless steel, that offer higher capacities and efficient use of space compared to spherical tanks.

3.3 OPERATION OF LNG TANKERS

LNG carriers have dual-fuel engines that can consume both typical marine fuel and boil-off gas (B.O.G.), where the natural gas evaporates from the LNG cargo during transit. Utilizing B.O.G. improves the vessel's efficiency and reduces CO2 emissions, aligning with global efforts to decrease the environmental effect of seaborne transportation.

Modern navigation and safety systems typically equip LNG carriers to manage the complexity of the logistics and transportation of LNG cargo. The loading and discharging process involves advanced cryogenic handling techniques to make sure the LNG remains in liquid form throughout transportation.[3]

The size of LNG vessels is growing at a comparatively high rate, which relates to the overall increase in energy consumption. The carrying capacity of vessels increases concurrently with the constant development of terminal infrastructure to accommodate more berthing space. The terminal infrastructure of the ports enables the berthing of larger vessels. Moreover, the storage infrastructures are developing in parallel, enabling the storage and distribution of larger capacities of wet cargo through multimodal transportation methods in the demand zones (Stopford, 2009).

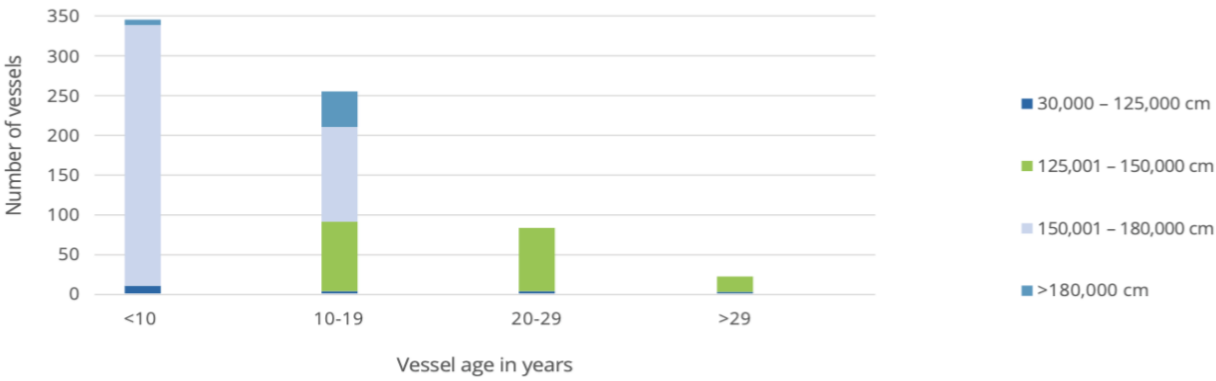

Figure 3.1: Fleet capacity by vessel age, end-August 2024 (Source: IGU, 2024)

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[3] Rate of Loading and Discharging LNG product. These rates affect the total cost of wages of the seafarers by increased hours of operation of the vessel. Does this observation affect the flag selection?
[4] In the authors' research as of the end of August, two LNGCs were sold for scrap, namely SOVEREIGN IMO# 9038816 flagged in Saint Kitts & Navis and SURYA A IMO# 9060534 flagged in the Bahamas.

3.4 GLOBAL LNG TRADE

The utilization of LNG vessels has seen a substantial increase alongside the expansion of the global LNG trade. Significant importers include Japan, South Korea, China, and several European countries, while major exporting regions include Qatar, Australia, the United States, and Russia. LNG vessels play a crucial role in facilitating these long-distance trades, offering flexibility and supply security that pipeline infrastructure cannot rival.

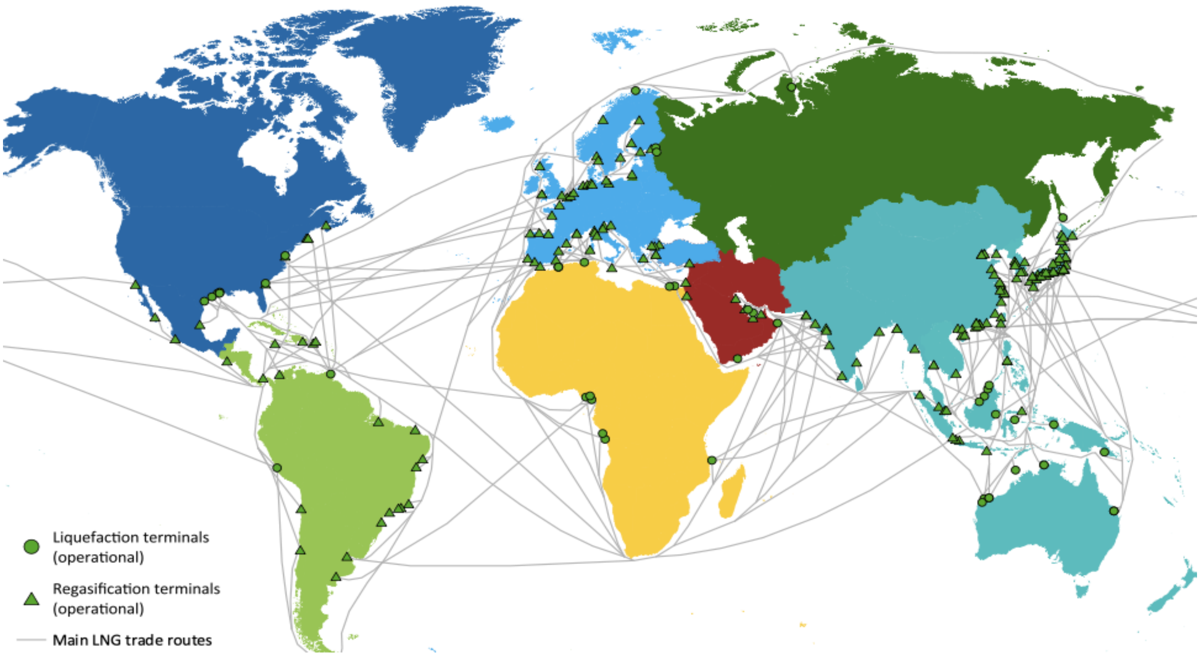

Figure 3.2: Major LNG Shipping Routes (source: IGU, 2024)

3.5 MARKET INSIGHTS

The global energy market plays a crucial role in shaping the business sectors of transportation. In the era of green transition, including more environmentally friendly fuels, the demand for LNG carriers is driven by the following key factors.

Energy policies and regulations are refocusing the global market on conventional fuels. This has a direct and indirect impact on the processes involved in using and transporting fewer polluting fuels. The Resolution MEPC.304(72) of the International Maritime Organisation's Greenhouse Gas Strategy aims to the adoption of environmentally friendly fuels, and the market is adjusted to meet these decisions and comply, driving in the adjustment of the seaborne transportation and the increase in demand for newbuild LNG carriers.

Technological advancements and innovations in vessels' designs include, as of IMO's Energy Efficiency Design Index (EEDI) and Energy Efficiency Existing Index (EEXI), improved hull design and propeller system optimization. According to this research, it is found that there is an obvious shift in the LNG containment systems type of vessels with membrane systems. Actively, there are 700 LNG vessels above 100.000 cbm, of which 584 are built with membrane coatings. As of the newly built orderbook, it is shown that the entire fleet of 353 vessels is built upon the membrane coating system. Regarding the propeller systems, there are mainly three advanced types selected for the newbuild fleet. The M-type Electronically Controlled Gas Injection (ME-GI), Generation X dual-fuel engine (X-DF), and more recently the (ME-GA) M-type electronically controlled gas admission (IGU, 2024) [4]

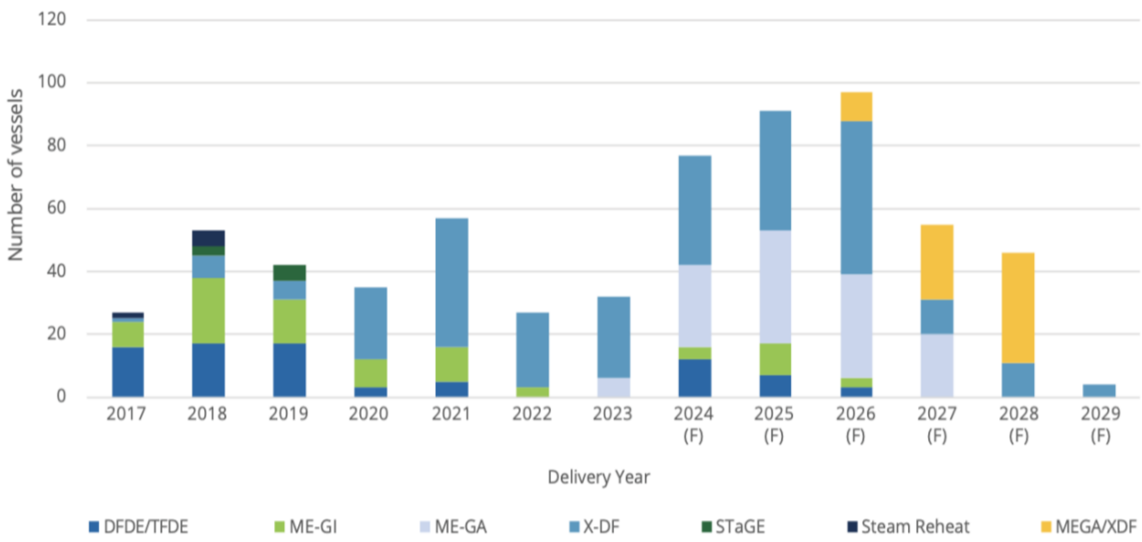

Figure 3.3: Historical and future vessel deliveries by propulsion type, 2017-2029 (source: IGU, 2024)

[4] In this paragraph the conclusions mentioned are also cross-referenced with IGU's World LNG Report of 2024.

Geopolitical factors such as political relationships between countries significantly impact the shipping industry, influencing the trading of natural gas exports and imports between regions. For example, the war in Ukraine has had a great impact on the exporting of gas reserves of Russia (see Note 2, chapter 2.4). Additionally, the area of seaborne transportation regarding the routing from Asia to Europe through the Suez Canal due to the conflicts in the Middle East can lead to increased shipping costs, i.e., higher insurance premiums and/or higher freight rates from rerouting, among other cost factors.

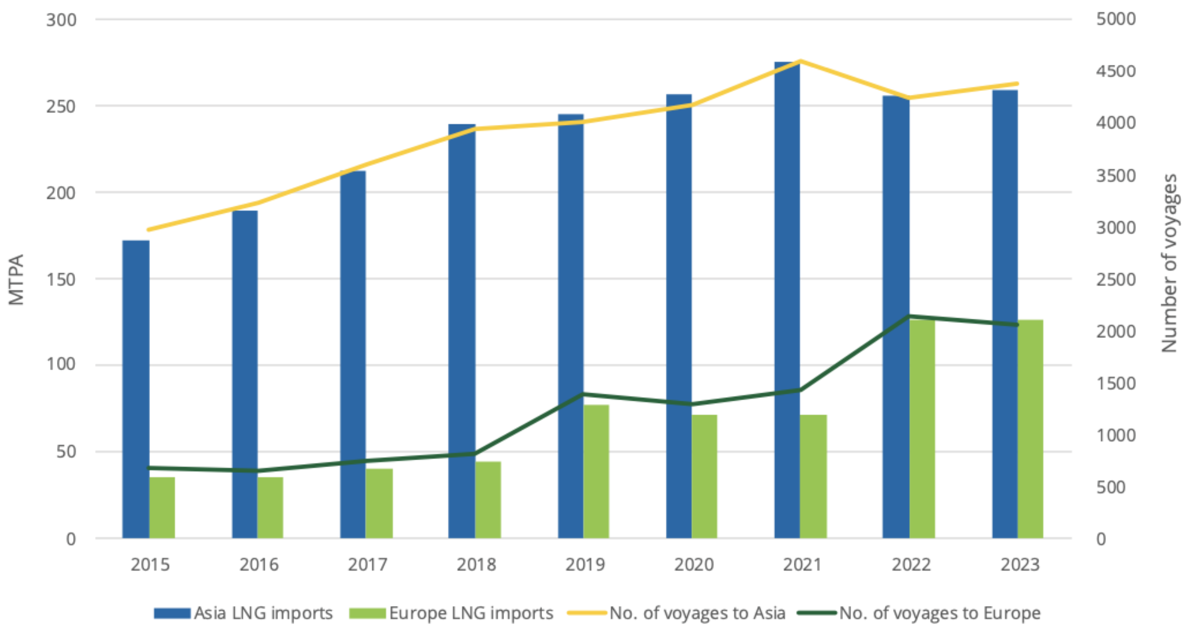

Figure 3.4: LNG imports and number of voyages to Asia and Europe, 2015-2023 (source: IGU, 2024)

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4 FLAG REGISTRIES

4.1 REGISTRATION OF SHIPS

The Flag Registries play an important role in the shipping industry, serving as a regulative foundation for the operation of a merchant vessel. After registering at a port of registry, a vessel acquires a particular flag to fly. Flying a nation's flag means the ship represents and follows all the rules provided regarding the regulatory framework under which the vessel operates. This framework includes the flag state's maritime laws, labor standards, and safety regulations.

The concept of selecting the preferred flag state significantly impacts both the internal and external environment of a shipping company. This environment includes the parts involved in the operation of a merchant economic asset, such as the ship management companies, the owners, the vessel itself, the charterers, the port entities, the countries, the regulatory organizations, the individuals, the environment, etc. These parts of interest are affected by economic, legal, and operational matters, which are the links for imposing the rules for economic, political, safety, and compliance in the taxation of shipping companies, the minimum qualifications of seafarers, and the safety of life at sea (van Fossen, 2016).

In the context of maritime law, Article 94 of the United Nations Convention on the Law of the Sea (UNCLOS) establishes the comprehensive duties of the flag state concerning ships flying a particular flag. This article mandates that every state exercise effective jurisdiction and control over administrative, technical, and social matters related to these ships. Specifically, it requires flag states to maintain a ship registry, assume jurisdiction over matters related to the ship and its crew, and ensure safety at sea through measures such as ship surveys, proper manning, and compliance with international regulations. Furthermore, it underscores the importance of adherence to international standards, requiring states to conduct enquiries into marine casualties that involve their flagged vessels, especially when incidents result in significant harm or involve nationals of other states.

The responsibilities outlined in Article 94 include:

• Jurisdiction and control: The flag state must effectively exercise its jurisdiction and control over the linked vessels flying its flag concerning technical, administrative, and environmental matters and compliance with relevant regulations.

• Safety at sea includes the construction and the equipment carried on the vessel. Operation by qualified and sufficient mariners on board, masters, and officers with qualifications and certifications in seamanship, navigation, communications, marine engineering, labor conditions, and training.

• Surveys and Certification: To guarantee a vessel's ability to navigate safely, surveys must be carried out by a certified inspector prior to registration. Charts, nautical publications, and navigational aids are essential for safe navigation on board the ship.

• Compliance with international regulation concerning safety, collision prevention, marine pollution, and maintenance is ensured by the master's, officer's, and crew's familiarity with the aforementioned.

• Investigation and Enquiries: The flag state is required to investigate any reports suggesting that it has not exercised appropriate jurisdiction and control. It must also conduct investigations into maritime accidents or incidents on the high seas involving its ships, particularly those that caused loss of life, serious injury, or substantial damage.

• Cooperation: The flag state must cooperate with other states in enquiries into marine casualties or incidents involving its ships, particularly when these incidents involve nationals or property of other states.

4.2 FLAGS OF REGISTRATION

"Every state shall fix the conditions for the grant of its nationality to ships, for the registration of ships in its territory, and for the right to fly its flag. Ships have the nationality of the state under whose flag they are entitled to fly. There must exist a genuine link between the state and the ship." (United Nations, 1982, page 59)

According to the Institute of Chartered Shipbrokers (2016), there are three main categories of flag registration. The traditional (or national) flags include nations such as Greece, France, the United Kingdom, and Germany. Flying a national flag means the national or company is "linked" to the flag state by citizenship or by establishing its headquarters in the state. These companies must comply with stringent regulations, including crew, safety, environmental standards, and local laws.

The open registries, also known as Flags of Convenience (FOC), allow vessels from foreign nationals or companies to register under their flag and include flags such as Panama, Liberia, the Bahamas, Malta, and Cyprus. These registries are considered maritime service providers rather than flag states, and their policies offer more lenient regulations, lower taxes, fewer restrictions on crew wages and nationalities on board, and other cost-saving facilitations.

The international (or second) registries are established by the national flags to repatriate the vessels that are flagged out and include flags such as the Marshall Islands, Isle of Man, Hong Kong, Singapore, and the Norwegian International Registry (NIS). These registries aim to maintain the vessels under the control and jurisdiction of the national flag while offering more flexible, cost-saving advantages.

4.3 DOUBLE REGISTRATION

In some circumstances, it is optional for a vessel to register under a double flag. This permits the vessel to maintain two flags: the flag of the nation where it is registered, and a flag chosen based on the advantages it offers the company or the nationality of the charterer (also known as flagging out). The registration of the second flag requires that the flag be willing to accept such agreements, such as the registry of Malta (Stopford, 2009).

In relation to the double-flag mode and according to the charter party contract among the owner of a vessel (referred to as the "owner") and the charterer (the party that rents or leases the ship), are defined the legal binding agreements under which the vessel is chartered, including the rights and responsibilities of both parties.

There are different types of charter parties, such as voyage charter, time charter, and demise/bareboat charter, depending on the duration and scope of the agreement.

In voyage charter parties like Bimco's Gas Tanker voyage charter party (ASBAGASVOY Version 2020), it is clear that the ship usually stays with the flag state of the ship operator. There are no other instructions about flag selection in part 2 of the main or supplementary clauses (BIMCO, 2020).

On the other hand, it is evident from time charter parties, such as Bimco's Gastime charter party (BIMCO, 1980), that the new vessel operator has the option to select his own flag house. This can be found in Clause 27, with the following wording:

“The charterers also to have the option of flying their house flag during the currency of this charter.”

4.4 FLAG SELECTION FACTORS

The primary step for a ship management company is the selection of the flag that best protects the business's financial stability and expansion. There is no direct revenue increase as a result of the flag choice, but the owner does benefit indirectly from lower central expenses from flagging out. These expenses are of great importance and affect the operational central cost accounts, particularly the secondary accounts, registration costs, taxes, management fees, crew costs and wages, local taxes, as well as the income statements of the company (Luo, Fan and Li, 2013).

In the Maritime Moore Index (MMI) database, we can identify the operational expenses (OPEX) for each industry of seaborne transportation. The cost categories for the operation of a vessel are classified as crew, stores, repairs & maintenance (R&M), insurance, and administration. Researching the cost significance in the shipping industry, it was identified that among all cost categories, the crew costs were the highest, starting from 49% (bulk carriers) up to 56% (liquid gas carriers) of the total OPEX (Moore Maritime Index, 2024).

In Table 4.1 and Figure 4.2, is illustrated the difference between the cost factors for the operation of liquid gas carriers (LGCs), signifying the importance of the highest cost factor, in the operation and decision making.

Opex	Crew	Stores	R & M	Insurance	Admin
Observations	62	62	62	60	62
Average	$3,948	$605	$1,010	$350	$1,163
Lower bound	$3,023	$386	$443	$145	$618
Higher bound	$4,528	$789	$1,311	$583	$1,664
Median	$3,291	$527	$685	$191	$738
stDEV	$1,569	$306	$999	$302	$1,041
CoV	0.40	0.51	0.99	0.86	0.90
Age (AVG)	11.32	11.32	11.32	10.98	11.32

Table 4.1: LGCs OPEX (source: MMI, 2024)[5]

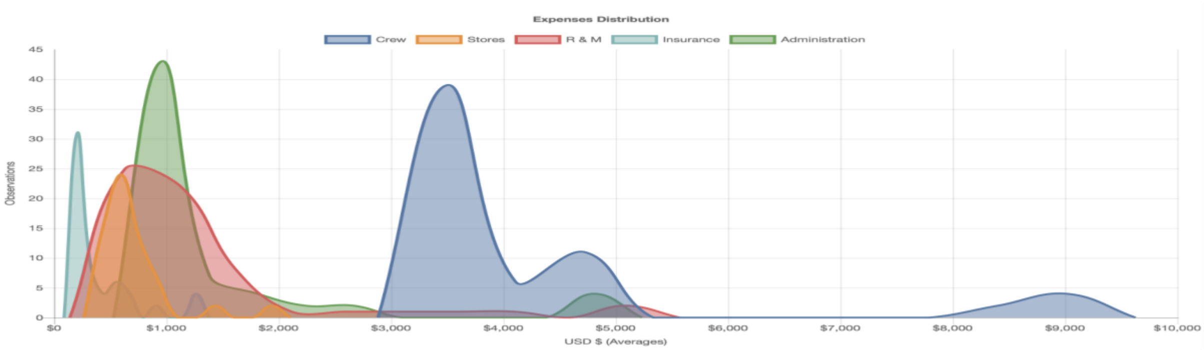

Figure 4.1: Distribution of expenses in LGCs (source: MMI, 2024)

[5] The observations are not adequate to focus on the LNG market. The author requested for LNG observations, through telecommunication with executives of the company providing the data. The platform was unable to provide to the public, KPI's, due to insufficient number of submitted data of LNGCs by the management companies. Due to this the author focused and analyzed the 2023 Annual report statement of a PLC, namely DYNAGAS LNG PARTNERS LP.

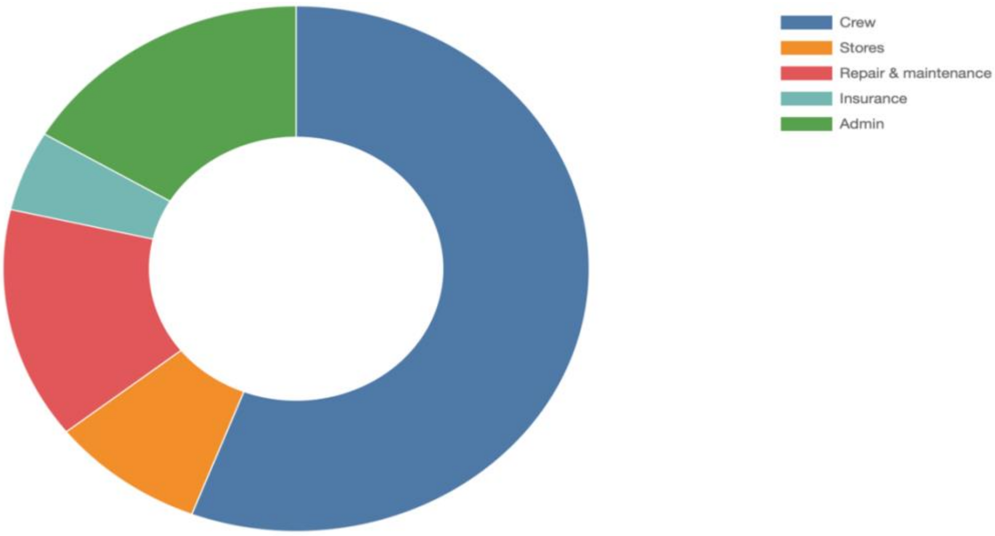

Figure 4.2: Proportional Distribution of expenses (source: MMI, 2024)

Analyzing the annual reports of various public shipping companies, it was verified that the crew cost expense is for the highest account factor affecting the total operational expenses of the shipping company. According to these reports, a particular company, is analyzed. Dynagas LNG Partners LP, operates in total six conventional LNG carriers of 155.000 cbm and 149700, flies an ITF flag, and has 16 crew members (source: ITF, 2024) on board each vessel (DYNAGAS LTD, 2024[6]). It was observed that the OPEX, accounted about 29.6 – 34.4 million USD for the fiscal years 2021 to 2023, resulting in the crew cost of about 15 million USD per year, divided by 6 vessels, resulting in 2.5 million crew cost per vessel (for further research, having the rankings of the crew on board it may be possible to identify the wages of each of the 16 seafarers, using the ITF's minimum wages).

In conclusion, it is understood that the crew costs reflect the highest cost factor (about 50%) of the operation expenses and a point of discussion in the potential minimization of the total expenses, with consideration to other factors such as the minimum number of crew on board according to the vessel's age (Stopford, 2009).

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[6] Dynagas LNG PARTNERS LP, annual report of 2024, has a complete overview of the LNG Shipping market, and the author referred to the report to identify key aspects of the market for the completement of this research.

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5 GLOBAL DYNAMICS IN LNG SHIPPING: AN ANALYSIS OF ACTIVE AND

5.1 OVERVIEW OF GLOBAL LNG VESSEL CAPACITIES

The maritime industry is central to global trade, and LNG vessels play a vital role in transporting liquefied natural gas across international waters. This chapter provides an in-depth analysis of global active and ordered LNG vessel capacities as of August 2024, focusing on the dominant flag states and the factors influencing shipowners' choice of flag. These decisions have a significant impact on the expansion of global fleets, regulatory environments, and the future of the LNG market. Additionally, this chapter explores how these factors intersect with environmental challenges and regulatory developments.

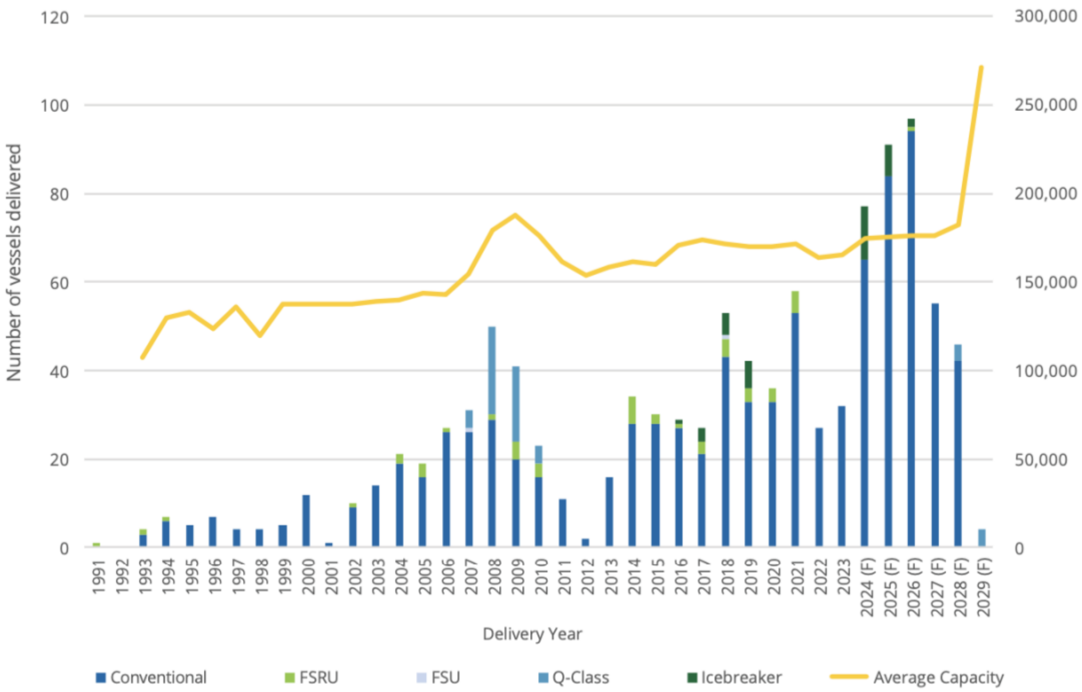

Figure 5.1 : Global active LNG fleet and orderbook by delivery year and average capacity, 1991-2029 (Source: IGU, 2024)

As of August 2024, the global LNG fleet consists of 117.1 million cubic meters (cbm) in active vessel capacity, with an additional 64.7 million cubic meters (cbm) ordered for delivery until 2030. This represents 35.6% projected expansion of the total fleet growth capacity, which is expected to reshape global trade routes and economic dynamics. This projected growth comes in response to the rising global demand for LNG. As global LNG trade continues to expand, shipping companies are investing heavily in new vessels to meet future demand, which will also involve more efficient and environmentally friendly designs (IGU, 2024).

State Flags	Total Capacity of Vessels (cbm)				Total Number of Vessels			
	Active	On Order	Total	Increase %	Active	On Order	Total	Increase %
Marshall Islands	23.936.400	10.248.000	34.184.400	30,0%	132	54	186	29,0%
Liberia	5.901.110	14.443.000	20.344.110	71,0%	38	83	121	68,6%
Singapore	7.118.690	11.768.520	18.887.210	62,3%	45	65	110	59,1%
Bahamas	13.730.100	2.784.000	16.514.100	16,9%	83	16	99	16,2%
Malta	11.180.029	2.994.000	14.174.029	21,1%	66	16	82	19,5%
Panama	9.090.145	1.213.800	10.303.945	11,8%	59	7	66	10,6%
Greece	7.692.600	2.258.520	9.951.120	22,7%	46	13	59	22,0%
Bermuda	8.793.702	696.000	9.489.702	7,3%	55	4	59	6,8%
Unknown		8.863.000	8.863.000	0,0%		41	41	-
Hong Kong	5.811.600	2.795.000	8.606.600	32,5%	36	16	52	30,8%
France	3.307.000	3.480.000	6.787.000	51,3%	20	20	40	50,0%
Malaysia	3.326.328		3.326.328	0,0%	24		24	0,0%
Russia	312.100	2.589.000	2.901.100	89,2%	2	15	17	88,2%
Japan	2.488.578		2.488.578	0,0%	22		22	0,0%
Cyprus	1.613.700	545.200	2.158.900	25,3%	10	3	13	23,1%
Spain	2.065.400		2.065.400	0,0%	13		13	0,0%
Norway	1.752.578		1.752.578	0,0%	12		12	0,0%
Indonesia	1.199.249		1.199.249	0,0%	10		10	0,0%
Belgium	1.155.600		1.155.600	0,0%	8		8	0,0%
Korea	1.070.900		1.070.900	0,0%	8		8	0,0%
UK	1.039.000		1.039.000	0,0%	6		6	0,0%
Brunei	603.600		603.600	0,0%	4		4	0,0%
Gabon	514.400		514.400	0,0%	3		3	0,0%
Australia	507.400		507.400	0,0%	4		4	0,0%
Denmark	505.000		505.000	0,0%	3		3	0,0%
Palau	504.800		504.800	0,0%	4		4	0,0%
Algeria	343.600		343.600	0,0%	2		2	0,0%
Turkey	340.000		340.000	0,0%	2		2	0,0%
Italy	307.100		307.100	0,0%	2		2	0,0%
India	180.000		180.000	0,0%	1		1	0,0%
Isle of Man	174.000		174.000	0,0%	1		1	0,0%
Bahrain	173.400		173.400	0,0%	1		1	0,0%
Norwat	145.000		145.000	0,0%	1		1	0,0%
Croatia	138.000		138.000	0,0%	1		1	0,0%
Netherlands	123.600		123.600	0,0%	5		5	0,0%
China	30.000		30.000	0,0%	1		1	0,0%
Total	117.174.709	64.678.040	181.852.749	35,6%	730	353	1.083	32,6%

Table 5.1: Overview of Flag Registries selected by LNGCs, Active fleet and Orderbook in quantity and capacity of cbm (Sources: IGU Report 2024; VesselFinder.com; VesselTracker.com; et al).

(Note: This table was created by the author.)

5.2 DOMINANT FLAG STATES AND SHIPPING NATIONS

Several key nations dominate the LNG shipping landscape due to their large fleet sizes and attractive flag registration policies. The Marshall Islands is the leading flag state, with 23.9 million cbm in active vessel capacity and an additional 10.2 million cbm as of the future order book. Known for its favorable legal frameworks, the Marshall Islands continues to attract significant international fleets seeking competitive registration options.

Other prominent flag states include Liberia, with 5.9 million cbm in active vessels and the highest order of 14.4 million cbm (1st highest order), the Bahamas with 13.7 million cbm in active vessel capacity and 2.8 million cbm on order, and Malta with 11.1 million cbm in active vessel capacity and 3 million cbm on order.

Traditional maritime centers, such as Singapore and Hong Kong, remain key players as well. Singapore, with 7.1 million cbm in active vessels and 11.7 million cbm in future orders (2nd highest order), stands out for its ambitious growth and strategic location as a global shipping hub. Hong Kong, another significant maritime hub, reflects a similar pattern, balancing its 5.8 million cbm in active vessels with 2.8 million cbm on new orders.

Despite not offering the regulatory leniencies typical of flags of convenience, Greece, and France have nonetheless emerged as significant flag state players in the LNG sector. With its 7.69 million cbm in active LNG vessel capacity, Greece continues to leverage its deep-rooted maritime tradition to maintain a substantial presence in the global market. Furthermore, the Greek registry will add 2.26 million cbm from orders, reflecting a 23% increase in capacity, which underscores its strategic approach to fleet expansion.

The French registry, although traditionally less prominent in shipping, is making substantial growth in its LNG fleet registrations. As of August 2024, France has 3.31 million cbm in active capacity, with a remarkable 3.48 million cbm on order, representing a 51% increase. This ambitious expansion strategy highlights France’s commitment to enhancing its influence in the LNG market. Both countries, while not benefiting from the same regulatory advantages as open registries, are leveraging their established maritime infrastructures and strategic foresight to compete in an increasingly competitive sector.

Moreover, Russia demonstrates a particularly aggressive approach to fleet growth. Currently, there are only 2 actives registered LNGCs under its national registry. The shipping companies behind the orders of 15 vessels will reserve about 2.6 million CBM for the natural gas industry of the country. This reflects the growing necessity and dependence on chartering vessels through shadow business collaborations with other ship management companies. These consequences, which originated from the sanctions from the United States and Europe, leave Russia aside to integrate in the LNG market and operate with their own fleet and distribute its product in collaboration with obscure shipping players, such as ship owners, charterers, and shipping centers overseas. The article (Tani and Telling, 2024) of Financial Times argues the amass of 50 LNG carriers from unknown buyers linked to Moscow, resulting in the dark fleet existence under the service of Russian LNG marketers.

The integrated gas business of Russia holds significant importance. Affected by the sanctions imposed by the United States, Russian companies are unable to continue their export activities in natural gas reserves. This accounts for increased disqualification of the transportation companies to collaborate with Russian exporting entities and for Russian shipyard “ZVEZDA” to delay the completion of its shipbuilding program of 15 LNGC's amounting to 2.6 million cbm (see Table 5.1) of useful transport capacity (Harry Papachristou, 2024).

5.3 INFLUENCE ON FLEET EXPANSION BY CHOSEN FLAG

The choice of flag state plays a crucial role in the global fleet. The Marshall Islands, Liberia, and Malta are particularly favored due to their open registry systems, which offer shipowners lower operational costs, minimal regulatory constraints, and beneficial tax regimes. These factors significantly reduce operational expenses, allowing companies to focus more on fleet expansion and modernization.

5.4 THE ROLE OF UNSPECIFIED FLAGS

An interesting observation from the analysis is that the 8.8 million cbm of vessel capacity is listed as "Unknown." This category represents a portion of the global LNG fleet for which the flag registration has not yet been specified. It is more likely for this fleet to be registered under flags of convenience offering new or more favorable regulatory environments. This uncertainty reflects the fluidity of flag state registration, with shipowners constantly evaluating competitive legal and tax frameworks before making their final decisions (van Fossen, 2016).

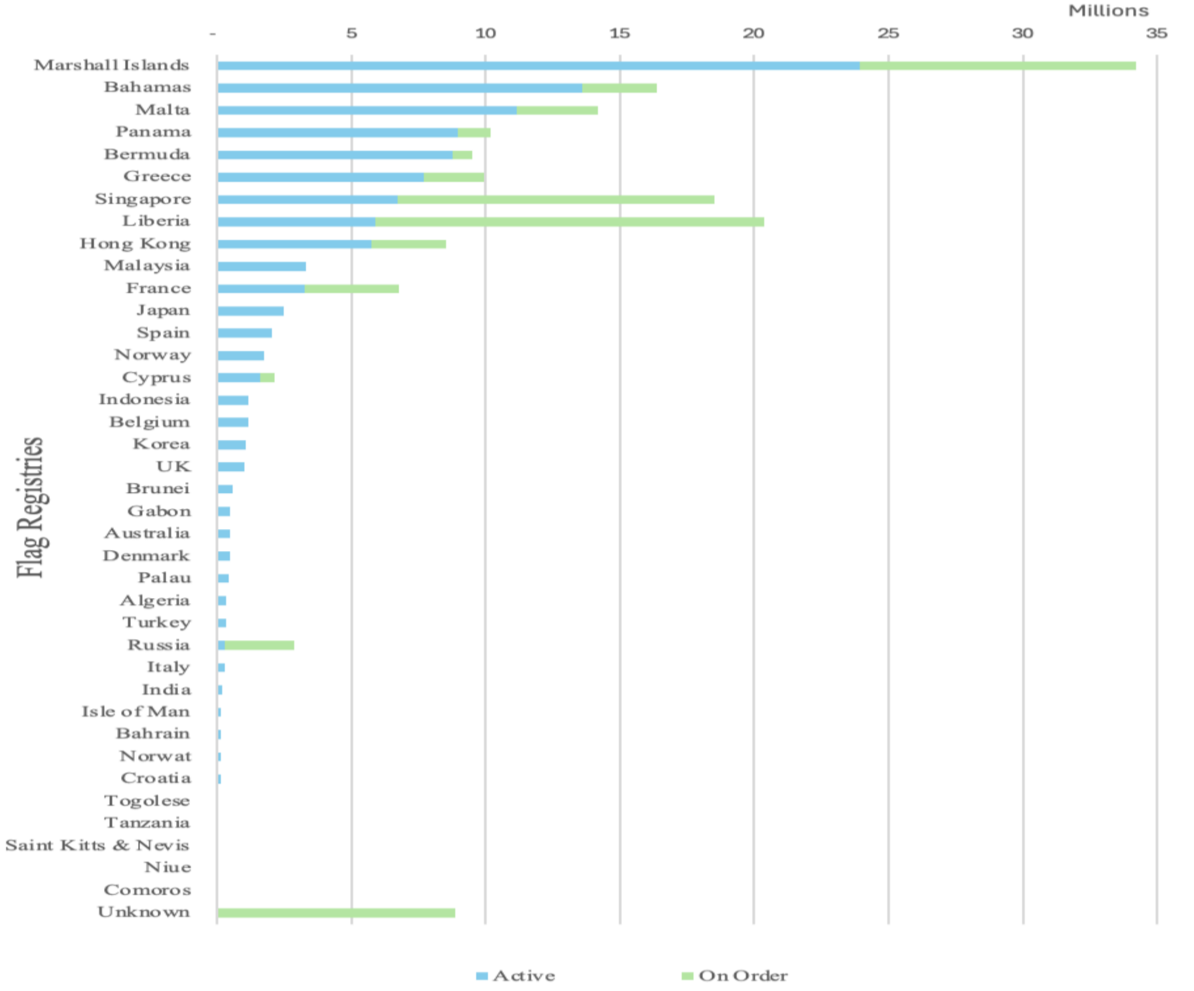

Figure 5.2 : Global active LNG fleet and orderbook by flag registry and capacity in cbm, end-August 2024 (Sources: see Table 5.1)

(Note: This chart was created by the author)

5.5 NEWBUILD ORDERBOOK BY SHIPYARDS

The table shows the capability of major shipbuilders total LNG carriers built and orderbook. South Korean shipyards, Hyundai Heavy Industries Group, Samsung Heavy Industries, and Hanwa Ocean have dominated the shipbuilding market of LNG carriers, maintaining the lead with 72% of the active and on-order fleet. Meanwhile, Zvezda Shipbuilding, a Russian company, currently hasn't built any vessels, but 13 are under construction, accounting for only 4% of the total orderbook fleet.

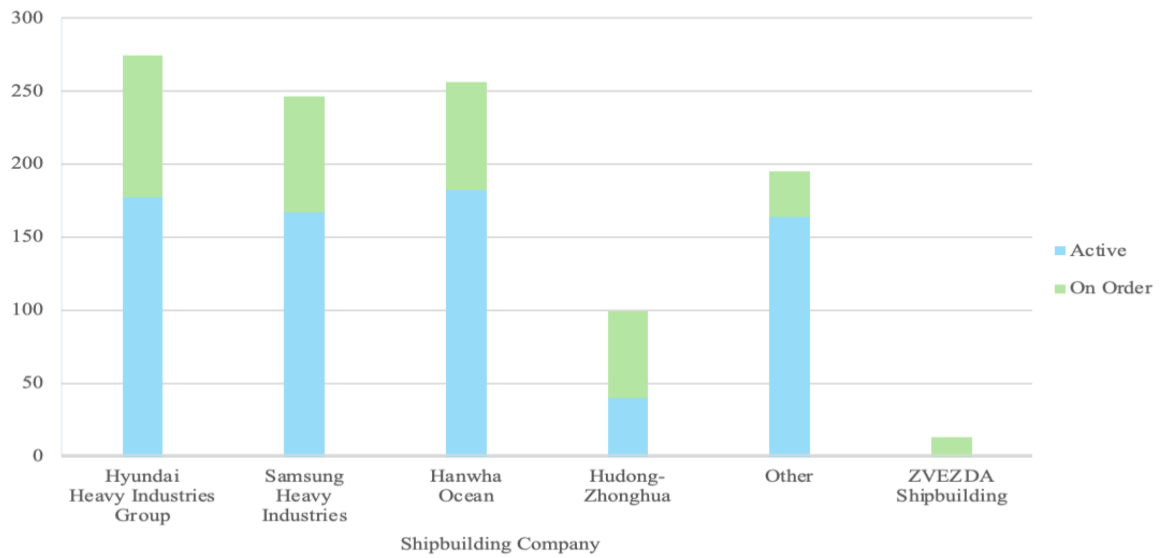

Figure 5.3: Newbuild orderbook by shipbuilder, end-August 2024
(Note: This chart was created by the author)

This reflects Russia's Arctic LNG 2 project, where Zvezda is forced to delay the building of ice-class LNG carriers. U.S. sanctions have interrupted this process, preventing Russia's ability to either transport, store, or/and sell liquefied natural gas (LNG) from the Arctic region. Furthermore, the incapability of Russia's project affects the country itself as it is missing important cashflow from operating activities, causing a delay of the multibillion-dollar project due to an insufficient number of important spare parts, and either forcing Russia to reshape its economic policy and political pressure on Ukraine or continuing to lose revenues.

5.6 FUTURE GROWTH AND ENVIRONMENTAL CONSIDERATIONS

While the projected increase in vessel capacity is critical for global trade, it raises concerns regarding potential overcapacity and environmental sustainability. The maritime sector, responsible for 3% of global greenhouse gas emissions (GHG emissions), faces growing pressure to adapt to stricter environmental regulations (IRENA, 2021). The shipowners, who are investing heavily in LNG vessels and other sustainable fuels, are poised to lead the global push toward green shipping practices.

Overcapacity could intensify market volatility, as a sudden surplus of vessels may lead to laid-up vessels with fixed capital and operational costs to lower freight rates and financial strain on ship operators. The industry's efforts to modernize fleets, scrap older ships, and invest in green technologies are crucial in balancing fleet growth with environmental and economic sustainability (UNCTAD, 2023).

5.7 HISTORICAL FLAG SELECTION FOR LNG CARRIERS

The total number of flags that have been selected for an LNG carrier by a shipowner is presented in Table 5.2. The observations are arranged according to their status, which includes Active, Cancelled, Laid-Up, Not in Service, On Order, and To Be Broken Up. Additionally, the grand total for each flag appears in the last column of this table in numerical count and in percentage increase.

According to the table, it is observed that, except for the selection of particular flag registries due to legal, economical, regulative, etc. leniencies, there are also other factors that influence the de-flagging from those most used registries to registers that are more lenient. Specifically, it is seen that a lot of flag registries do not have active or on-order vessels, but they are selected at a period of time before the end of their useful life.

Row Labels	Active Ships#	Active %	No. of Orders	Order %.	Not in Service	Laid-Up	Cancelled	To Be Broken Up	Total Vessel	Total.
Marshall Islands	132	18%	54	15%	8	6			200	17%
Liberia	38	5%	83	24%		1			122	11%
Singapore	45	6%	65	18%	1				111	10%
Bahamas	83	11%	16	5%				1	100	9%
Malta	66	9%	16	5%					82	7%
Panama	59	8%	7	2%	4	2			72	6%
Bermuda	55	8%	4	1%					59	5%
Greece	46	6%	13	4%					59	5%
Hong Kong	36	5%	16	5%					52	5%
Unknown		0%	41	12%			2		43	4%
France	20	3%	20	6%	1				41	4%
Malaysia	24	3%		0%		2			26	2%
Japan	22	3%		0%					22	2%
Russia	2	0%	15	4%					17	1%
Spain	13	2%		0%					13	1%
Cyprus	10	1%	3	1%					13	1%
Norway	12	2%		0%	1				13	1%
Indonesia	10	1%		0%		1			11	1%
Brunei	4	1%		0%	7				11	1%
Korea	8	1%		0%	3				11	1%
Palau	4	1%		0%	5	1			10	1%
Belgium	8	1%		0%					8	1%
UK	6	1%		0%					6	1%
Saint K. & N.		0%		0%	5			1	6	1%
Netherlands	5	1%		0%					5	0%
Comoros		0%		0%	4				4	0%
Australia	4	1%		0%					4	0%
Italy	2	0%		0%	2				4	0%
Denmark	3	0%		0%					3	0%
Gabon	3	0%		0%					3	0%
Tanzania		0%		0%	2				2	0%
Turkey	2	0%		0%					2	0%
Isle of Man	1	0%		0%	1				2	0%
Algeria	2	0%		0%					2	0%
Bahrain	1	0%		0%					1	0%
Sierra Leone		0%		0%	1				1	0%
Togo		0%		0%	1				1	0%
Norwat	1	0%		0%					1	0%
China	1	0%		0%					1	0%
Croatia	1	0%		0%					1	0%
India	1	0%		0%					1	0%
Niue		0%		0%	1				1	0%
Grand Total	730	1	353	1	47	13	2	2	1147	1

Table 5.2: Frequencies of flag selection in LNGCs, by Flag registry and total vessels[7]

(Note: This table was created by the author)

[7] This table illustrates the selection of the flag registry as stated in the end every calendar year.

5.8 LNG CARRIERS OUT OF SERVICE

As of the research in the LNG carries' fleet, it is observed that a number of vessels shift to even more attractive flag registries, remain as laid-p and out of service to be then sold for scrap. For example, a particular vessel has been built and flagged to a specific registry, sold in the secondhand market to other Shipowning company and flagged under other registry (or as may be) and then be sold again to other company (with the right of changing flag) that will only acquire the titles of the vessel without the intend of operational activities but for her scrap value as of the lightship weight. This may lead to a higher frequency of the times a flag registry has been selected, for a particular vessel, which in our case it's not collected but observed in most of the cases, during the research in the LNGCs fleet. This can be of great importance to understand, statistically, the most selected flag registry for further research.

Moreover, the selection of the flag will determine the option of the owner to scrap the vessel at a non-recycling yard, such as Bangladesh, India or Pakistan, or at an approved recycling yard. These options have an impact to the cash statements of the company, either to earn the lightship value by selling it to a non-environmental regulated scrap yard or to not earn potential cash from choosing an approved recycling yard. In conclusion, the option chosen is the company's decision according to its policy rules and the financial needs, which affect the selection of the state of flag.

A vessel may have been flagged by a state more than one time (sometimes multiple times) due to the Sell and Purchase (S&P) of the secondhand and demolition markets. Additionally, for each vessels' flag counted, the flag recorded in this research, is the one listed as the last flag a vessel had at the end of the calendar year.

This necessitates a more thorough investigation of instances exceeding one flag registry per vessel within the overall maritime sector, with particular emphasis on the LNG industry for the purposes of this research. In the collected data, we examined not only the state flagged by a vessel, but where possible the flag state the vessel was registered before the last registration.

During the course of this research, the data collected regarding the vessels, particularly those not in service, resulted in the management method of the shipping companies before their last voyage. This conclusion is cross-referenced with findings aligned with reports by the NGO Shipbroking Platform, which monitors shipbreaking activities. A key aspect identified in both datasets is the common practice of flagging out from international flags of convenience to less compliant flags of convenience (FOCs).

Therefore, it is evident that most vessels changed names and shifted to less compliant FOCs shortly before their final voyage. For example, vessels that were flagged under more regulated jurisdictions such as the Marshall Islands, Bahamas, Liberia, or Norway transitioned to less regulated or monitored flags like Comoros, Palau, Saint Kitts and Navis, Palau, Tanzania, or Togo. It is the management practice that focusses on or avoids stricter regulations, taxes, and other regulations with effect on human life and the environment.

Furthermore, the majority of the vessels were scrapped in less compliant shipbreaking areas, such as Bangladesh, India, Turkey, and Pakistan. As of the 47 vessels not in service, the majority of the shipping companies had used less compliant scrapping management practices. For example, change of company, name, and flag. By cross-referencing the IMO number in the reports of NGO Shipbreaking Platform, it was clear that the total LNG carriers listed, 30 in number, was also found in the database provided by the author.

In conclusion, the practice of shifting the flag before scrapping is widespread, emphasizing the need for regulatory attention by the major control organizations. The IMO numbers of the vessels scrapped can be found in Table 5.4 researched by the author and Table 5.5 as of NGO Shipbreaking Platform's annual lists.

IMO#	Flag	Vessel Name	Shipowner	Shipbuilder	Delivery Year
6910702	Comoros	ARCTIC	Sovcomflot	Kockums Malmo Sweden	1969
6905616	Italy	LNG PALMARIA	Snam	Societa per Azioni Ansaldo	1969
6901892	Saint Kitts & Nevis	ARIS	Breakers	Kockums Malmo Sweden	1969
6928632	Italy	LNG ELBA	Snam	Societa per Azioni Ansaldo	1970
7035494	Sierra Leone	SUPREME (ex-Mel)	Argo Systems	Chantiers du Nord et de la Med.	1971
7121633	Brunei	BEBATIK	Brunei Gas Carriers	Chantiers de l'Atlantique	1972
7217896	Brunei	BEKALANG	Brunei Gas Carriers	Chantiers de l'Atlantique	1973
7235939	Brunei	BEKULAN	Brunei Gas Carriers	Chantiers de l'Atlantique	1973
7320344	Norway	NORMAN LADY	Hoegh	Rosenberg Verft	1973
7347794	Brunei	BELAIS	Brunei Gas Carriers	Chantiers de l'Atlantique	1974
7368841	Comoros	CHILL (ex-Margaret Hill)	Pollar Energy	Rosenberg Verft	1974
7229459	France	TELLIER	Gaz De France	Chantiers de la Ciotat	1974
7347732	Brunei	BILIS	Brunei Gas Carriers	Chantiers du Nord et de la Med.	1975
7359785	Brunei	BUBUK	Brunei Gas Carriers	Chantiers du Nord et de la Med.	1975
7347768	Brunei	BELANAK	Brunei Gas Carriers	Chantiers de la Ciotat	1975
7229447	Saint K. & N.	MARISA (ex-Isabella)	Twilla Shipping	Chantiers du Nord et de la Med.	1975
7360124	Panama	WEST ENERGY	Sinokor Merchant Mar.	Chantiers de l'Atlantique	1976
7359955	Togolese	MOSTEFA (ex-Mostefa Ben Boulaid)	Izmir Geni	Chantiers de la Ciotat	1976
7360136	Korea	EAST ENERGY	Sinokor Merchant Mar.	Chantiers de l'Atlantique	1977
7359670	Palau	SUN	Southeastern	Dunkerque Chantiers	1977
7361934	Saint K. & N.	Gandria	Golar LNG	HDW	1977
7390193	Marshall Islands	LNG ARIES	Burmah Gas Transport	General Dynamics	1977
7400663	Tanzania	BEN	HYPROC	Chantiers du Nord et de la Med.	1977
7391197	Isle of Man	LNG DELTA	Argent	Newport News SB & DD Co,	1978
7391202	Singapore	GALEOMMA	Shell	Newport News SB & DD Co,	1978
7357452	Saint K. & N.	ETHAN (ex-METHANIA)	EXMAR	N V BOELWERF SA	1978
7391214	Palau	DAHLIA (ex - OCEAN QUEST)	Hong Kong LNG	Newport News SB & DD Co,	1979
7413232	Palau	GC (ex - LNG Libra)	Golden Concord Hol.	General Dynamics	1979
7400675	Tanzania	BACHIR (ex-Bachir Chihani)	Breakers	Chantiers du Nord et de la Med.	1979
7619575	Korea	CARIBBEAN ENERGY	Sinokor Merchant Mar.	General Dynamics	1980
7619587	Panama	SOUTH ENERGY	Sinokor Merchant Mar.	General Dynamics	1980
7400704	Palau	MOURATO (ex-Mourad Didouche)	HYPROC	Chantiers de l'Atlantique	1980
7428445	Comoros	LIMA (ex-Tenaga Lima)	Breakers	Chantiers du Nord et de la Med.	1981
7428471	Marshall Islands	FORT (ex- Tenada Dua)	Compass Energy	Dunkerque Chantiers	1981
7428469	Marshall Islands	LUCKY (ex- Tenaga Tiga)	Breakers	Dunkerque Chantiers	1981
7708948	Marshall Islands	PACIFIC ENERGY	Sinokor Merchant Mar.	Kockums Malmo Sweden	1981
7411961	Palau	MADAME (ex-Ramdane Abane)	Breakers	Chantiers de l'Atlantique	1981
8013950	Marshall Islands	Baltic Energy (ex_Wilpower)	Sinokor Merchant Mar.	Kawasaki	1983
8014409	Marshall Islands	NORTH ENERGY	Sinokor Merchant Mar.	Mitsubishi	1983
8110203	Marshall Islands	ADRIATIC ENERGY	Sinokor Merchant Mar.	Mitsubishi	1983
7702401	Korea	ATLANTIC ENERGY	Sinokor Merchant Mar.	Kockums Malmo Sweden	1984
8125832	Marshall Islands	MEDITERRANEAN ENERGY	Sinokor Merchant Mar.	Mitsubishi	1984
8014473	Panama	SENSHU MARU	MOL	Mitsui	1984
8702941	Panama	GRACE ENERGY	NYK Line	Mitsubishi	1989
9001772	Comoros	LARA	Seapeak	Ihi Marine	1993
9001784	Saint K. & N.	ARTICA	Seapeak	Ihi Marine	1993
9064231	Saint K. & N.	SOVEREIGN	SK Shipping	Hyundai Heavy Industries Group	1994
9038816	Bahamas	SURYA AKI	Hiroshima Gas	Kawasaki	1996
9030840	Niue	TERI F (ex - PUTERI FIRUS)	Breakers	Chantiers de l'Atlantique	1997

Figure 5.4: List of scrapped LNG vessels, end-August 2024 (Sources: see Table 1)

This table was created by the author.

VESSEL			FLAG		OWNERSHIP					DESTINATION		
IMO#	NAME	BUILT	LAST FLAG (CHANGE FOR BREAKING)	PREVIOUS FLAG	BENEFICIAL OWNER	BO COUNTRY	COMMERCIAL OPERATOR	REGISTERED OWNER	RO COUNTRY	PLACE	COUNTRY	ARRIVAL
8125832	MEDITERRANEAN ENERGY	1984	Marshall Islands		Sinokor Merchant Marine Co Ltd	Korea (South)	Xiang CH9 HK International	Xiang CH9 HK International	Hong Kong	Chittagong	Bangladesh	1/7/21
8014409	NORTH ENERGY	1983	Marshall Islands		Sinokor Merchant Marine Co Ltd	Korea (South)	Xiang CH10 HK International	Xiang CH10 HK International	Hong Kong	Chittagong	Bangladesh	1/11/21
7121633	Bebatik	1972	Brunei		Brunei Govt	Brunei	STASCO	Brunei Shell Tankers Sdn Bhd	Brunei	Jiangyin	China	1/5/18
7347768	Belanak	1975	Brunei		Brunei Govt	Brunei	STASCO	Brunei Shell Tankers Sdn Bhd	Brunei	Jiangyin	China	1/6/18
7708948	PACIFIC ENERGY	1981	Marshall Islands		Sinokor Merchant Marine Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	Xiang CH8 HK International	Hong Kong	Chittagong	Bangladesh	1/4/21
8013950	BALTIC ENERGY	1983	Marshall Islands		Sinokor Merchant Marine Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	Haoda International Ship Lease	Hong Kong	Chittagong	Bangladesh	1/8/21
7619587	SOUTH ENERGY	1980	Marshall Islands		Sinokor Merchant Marine Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	South Energy 1 SA	Marshall Islands	Chittagong	Bangladesh	1/11/21
7702401	ATLANTIC ENERGY	1984	Korea (South)		Sinokor Merchant Marine Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	Sinokor Maritime Co Ltd	Korea (South)	Chittagong	Bangladesh	1/4/21
7619575	CARIBBEAN ENERGY	1980	Korea (South)		Sinokor Merchant Marine Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	Sinokor Maritime Co Ltd	Korea (South)	Chittagong	Bangladesh	1/6/21
8702941	GRACE ENERGY	1989	Panama		Sinokor Maritime Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	Grace Energy 1 SA	Panama	Chittagong	Bangladesh	1/4/23
7360136	East Energy	1977	Panama		Sinokor Maritime Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	Sinokor Maritime Co Ltd	Korea, South	Chittagong	Bangladesh	1/3/18
7360124	West Energy	1976	Korea, South		Sinokor Maritime Co Ltd	Korea (South)	Sinokor Maritime Co Ltd	Sinokor Maritime Co Ltd	Korea, South	Chittagong	Bangladesh	1/10/18
7391197	LNG Delta	1978	Isle of Man		Royal Dutch Shell plc	United Kingdom	Shell Tankers (U.K.) Limited	Shell Bermuda (Overseas) Limited			Zhoushan, China	7/2/13
7347732	Bilis	1975	Brunei		Royal Dutch Shell plc	United Kingdom	Shell International Trading & Shipping Company Limited (STASCO)	Brunei Shell Tankers Sendirian Berhad	Brunei	Zhoushan	China	4/12/14
7359785	Bubuk	1975	Brunei		Royal Dutch Shell plc	United Kingdom	Shell International Trading & Shipping Company Limited (STASCO)	Brunei Shell Tankers Sendirian Berhad	Brunei Darussalam	Jiangyin	China	23/4/15
9001772	LARA	1993	Comoros	Bahamas	Seapeak Maritime Operating LLC	Bermuda	Seapeak Maritime Glasgow Ltd	Seapeak Polar LLC	Marshall Islands	Alang	India	1/7/23
9001784	ARTICA	1993	St Kitts & Nevis	Bahamas	Seapeak LLC	Bermuda	Seapeak Maritime Glasgow Ltd	Seapeak Arctic LLC	Marshall Islands	Alang	India	1/3/23
9030840	TERI F	1997	Niue	Malaysia	PETRONAS	Malaysia	MISC Bhd	Puteri Firus Sdn Bhd	Malaysia	Chittagong	Bangladesh	1/9/21
7428445	Lima	1981	Comoros	Malaysia	Petronas	Malaysia	MISC Bhd	MISC Bhd	Malaysia	Chittagong	Bangladesh	1/12/18
7428469	LUCK	1981	Marshall Islands		LNG Easy S Pte Ltd	Singapore	LNG Easy S Pte Ltd	Lucky FSU One Ltd	Marshall Islands	Chattogram	Bangladesh	1/6/20
8014473	SENSHU MARU	1984	Panama		NYK Line	Japan	Kawasaki Kisen Kaisha Ltd	Nippon/Mitsui/Kawasaki/Indigo	Japan	Alang	India	1/1/21
7359670	SUN	1977	Palau	Indonesia	Sunrise	P.T. Energi Dian Kemala	Indonesia	Energi Dian Kemala PT	Indonesia	Chittagong	Bangladesh	1/5/19
7411961	MADAME	1981	Palau	Algeria	Sonatrach Petroleum Corp	United Kingdom	Hyproc Shipping Co	Hyproc Shipping Co	Algeria	Chittagong	Bangladesh	1/12/21
7391214	DAHLIA	1979	Palau	Norway	Elliot SWG	Hong Kong	Hong Kong LNG Ltd	Hong Kong LNG Ltd	Hong Kong	Alang	India	1/5/22
7413232	GC	1979	Palau	Marshall Islands	Golden Concord Holdings Ltd	Hong Kong	Golden Concord Holdings Ltd	GCL LNG Ltd	British Virgin Islands	Alang	India	1/1/20
7361934	RIA	1977	St Kitts & Nevis	Marshall Islands	Golar LNG Ltd	Norway	Golar Management Ltd	Golar Gandria NV	Netherlands	Alang	India	1/12/23
7428471	FORT	1981	Marshall Islands		Compass Energy Pte Ltd	Singapore	Compass Energy Pte Ltd	Fortune FSU Two Ltd	Marshall Islands	Chattogram	Bangladesh	1/6/20
7229447	Marisa	1975	Saint Kitts and Nevis	Liberia	Marine Service GmbH & Co. KG	Germany	Chemikalien Seetransport GmbH	New Isabella Shipping Corporation			Alang, India	16/12/13
7391202	Galeomma	1978	Singapore		Argent Marine Operations Incorporated	United States of America	Argent Marine Operations Incorporated	Argent Marine Operations Incorporated			Zhoushan, China	28/2/13
8110203	ADRIATIC ENERGY	1983	Marshall Islands		Sinokor Merchant Marine Co Ltd	Korea (South)	Adriatic Energy 1 SA	Adriatic Energy 1 SA	Marshall Islands	Chittagong	Bangladesh	1/3/23

Table 5.3: List of scrapped LNG vessels, as of NGO Shipbreaking Platform, 2024

(Note: This table was created by the author who collected these observations from different yearly reports of the source mentioned, starting from 2013)

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6 CREW WAGES REGULATIONS

6.1 CREW REGULATIONS

From the research conducted, crew wages are regulated primarily by international conventions and agreements. The most significant among these is the Maritime Labour Convention (MLC), which sets out comprehensive rights and protections for seafarers, including minimum wage standards. The International Labour Organisation (ILO), through its Joint Maritime Commission (JMC), plays a crucial role in recommending minimum wage levels. Additionally, Collective Bargaining Agreements (CBAs), such as those negotiated by the International Transport Workers' Federation (ITF) and other seafarers' unions, also regulate crew wages.

6.2 MINIMUM WAGE FOR SEAFARERS

The minimum wage for seafarers is set through a collaborative process involving various international bodies. The International Labour Organisation's (ILO) Joint Maritime Commission (JMC) plays a pivotal role in this process. The JMC meets every two years to discuss and recommend adjustments to the minimum wage for seafarers. This process is a concerted effort between the International Transport Workers' Federation (ITF), the International Chamber of Shipping (ICS), and representatives from key maritime nations. The commission considers various factors, such as changes in consumer prices, exchange rates, and the purchasing power of the US dollar, to ensure the recommended wages are fair and reflective of current economic conditions. This global consultation ensures that the wage standards are equitable and relevant across different regions and nationalities (ILO, 2022).

6.3 MARITIME LABOUR CONVENTION (MLC) AND EMPLOYMENT CONTRACTS

The Maritime Labour Convention (MLC) mandates that every seafarer must sign an MLC-compliant seafarer's employment contract. This contract outlines the terms of employment, ensuring they meet the minimum standards set by the MLC. Additionally, any documentation required by the Flag State for a seafarer to work on a vessel must be provided at the company's expense. Regulation 2.2 provides the minimum requirements and safeguards seafarers from wage exploitation. The Convention thus serves as a comprehensive framework to protect seafarers' rights and ensure decent working conditions (MLC, 2020).

6.4 ITF AGREEMENT

The International Transport Workers' Federation (ITF) Agreement is a collective bargaining agreement (CBA) that is negotiated and approved by the ITF. These agreements aim to ensure fair wages, proper working conditions, and protection of seafarers' rights, especially, but not exclusively, on ships registered under Flags of Convenience (FOC). FOC vessels often have lower regulatory standards, and as a result, seafarers on these vessels are at a higher risk of exploitation. The ITF Agreement, therefore, plays a crucial role in safeguarding the welfare of seafarers by setting minimum standards for wages, working conditions, and other employment terms. These agreements are enforced globally and are a key element in the ITF's efforts to improve conditions in the maritime industry. To verify whether a ship is covered by an ITF Agreement, through a Special Total Crew Cost (TCC) Agreement between the union and the shipping company, one can search by ship name or IMO number on the ITF Seafarers' website or mobile application (ITF, 2023).

6.5 COLLECTIVE BARGAINING AGREEMENTS (CBA)

Collective Bargaining Agreements (CBAs) are another critical mechanism for establishing minimum wage standards for seafarers. These agreements are legally binding contracts between a company and its employees, who are represented by an independent trade union. The ITF is a prominent player in negotiating CBAs within the maritime industry. CBAs typically cover various aspects of employment, including wages, working hours, rest periods, holidays, vacation leave, overtime payments, and procedures for dispute resolution. By setting these terms, CBAs help ensure that seafarers receive fair treatment and adequate compensation, thereby enhancing their overall working conditions (ITF, 2023).

According to the data collected on LNG carriers there are observed 38 total flag registries. The 15 of those are included in the ITF's Flag of Convenience (FOC) list, among other flags, that account for 43 in total.

- Antigua and Barbuda	- Cyprus	- Lebanon	- Panama
- Bahamas	- Equatorial Guinea	- Liberia	- San Marino
- Barbados	- Eswatini	- Madeira	- Sao Tome & Príncipe
- Belize	- Faroe Islands	- Malta	- Sierra Leone
- Bermuda	- French Inter. Ship Registry (FIS)	- Marshall Islands	- Sri Lanka
- Bolivia	- Gabon	- Mauritius	- St Kitts and Nevis
- Cameroon	- Georgia	- Moldova	- St Vincent
- Cayman Islands	- German Inter. Ship Registry (GIS)	- Mongolia	- Tanzania
- Comoros	- Gibraltar	- Myanmar	- Togo
- Cook Islands	- Honduras	- North Korea	- Vanuatu
- Curacao	- Jamaica	- Palau	

Table 6.1: The campaign of ITF against the FOCs on its current List (Source: ITF, 2024)

These 15 FOCs—which include the Bahamas, Bermuda, Comoros, Cyprus, the French International Ship Registry (FIS), Gabon, Liberia, Malta, Marshall Islands, Palau, Panama, Sierra Leone, Saint Kitts & Nevis, Tanzania, and Togo—account for a sizeable portion of the total active capacity of LNG (cbm) traded. Out of the total 117.1 million cbm of LNG capacity, the number of cubic meters under those is 78.5 million cbm, or 67%.

Furthermore, about 470 out of 730 vessels, or about 69 out of 78.5 million cbm of LNG, are managed by at least 100 of the 128 companies that have not yet signed an agreement. However, a number of Greek-interested firms have signed an ITF agreement, including Dynagas Ltd., TMS Cardiff Gas, Thenamaris, Minerva Marine, and Capital Gas, Tsakos, Latsco, and others such as BP, SHELL, and EXMAR.[8]

Additionally, as of ITF Inspections (2023), companies operating the vessels that fly the aforementioned FOCs either have signed an ITF agreement, adhere to the rules of the ILO-MLC agreements, or neither of them.

[8]This conclusion was reached after at least one vessel from each company was cross-referenced with the research on the global LNG fleet and the ITF's list.

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7 CONCLUSION

This thesis explores the intricate dynamics of flag registries, the implications of flag changes within the lifecycle of Liquefied Natural Gas Carriers (LNGCs), and the regulatory frameworks governing crew wages in the maritime industry. Through an extensive examination of the data on LNGCs and an analysis of current maritime practices, several critical findings have emerged that significantly contribute to our understanding of maritime operations and labor regulations.

Firstly, the study highlights the frequent transition of LNGCs to less regulated flags, particularly those classified as Flags of Convenience (FOCs). This trend reveals a troubling relation between flag changes and the eventual scrapping of vessels. As observed, the shift to FOCs is often a strategic decision driven by shipowners seeking to minimize operational costs and regulatory burdens. However, such transitions raise concerns regarding safety standards, labor conditions, and environmental compliance, undermining the overarching objectives of maritime law and international conventions, such as the Maritime Labor Convention (MLC).

Secondly, the investigation into crew wages underscores the complexities involved in maritime labor regulations. The collaborative efforts of the International Labor Organization (ILO), the International Transport Workers' Federation (ITF), and other stakeholders to set minimum wage standards demonstrate a proactive approach to protecting seafarers' rights. However, the existence of multiple flag registries and the prevalence of FOCs pose challenges in enforcing these standards, particularly for those crew members working on vessels registered under less regulated jurisdictions.

The findings suggest that while there are frameworks in place aimed at ensuring fair treatment for seafarers, gaps remain, especially regarding the enforcement of these regulations. The data indicates that a significant proportion of LNGCs operating under FOCs are managed by companies that have yet to sign an ITF agreement, leaving many seafarers vulnerable to wage exploitation and poor working conditions.

In conclusion, this research contributes to the broader discourse on maritime practices by illuminating the nuanced relationship between flag selection, operational decisions, and labor regulations. As the shipping industry continues to evolve, it is imperative for policymakers, industry stakeholders, and regulatory bodies to address these challenges head-on. Future research should focus on developing more robust frameworks for monitoring and enforcing labor standards across all flag states, particularly those identified as FOCs. Additionally, further exploration into the economic implications of flagging practices on the sustainability of the maritime industry will be crucial for ensuring that both economic and ethical standards are upheld in this vital sector.

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